Pointers from the paddock

Landholders have significant bank of knowledge in managing invasive native scrub (INS). This section profiles a number of landholders who are managing INS across a range of landscapes and through a range of techniques.

In this section:
- Waterspreading and restoring native grasslands on ‘Florida’
- Burning to rehabilitate native pastures on ‘Norma Vale’
- Chaining and burning to rehabilitate native pastures on ‘Mirrabooka’
- Burning to manage invasive native scrub encroachment at ‘Gundabooka’
- Thinning with herbicides on ‘Bairnkine’
- Controlling grazing pressure at ‘Hermitage Plains’
- Pulling mulga and encouraging groundcover at ‘Landsdowne’
Waterspreading and restoring native grasslands on ‘Florida’

The history of ‘Florida’

Located approximately 80 km west of Nyngan, ‘Florida’ was typical of many properties in the region.

Particularly since the 1950s, ‘Florida’ has experienced encroaching and thickening native scrub which has led to reduced carrying capacity, lower biodiversity and increased erosion.

Before European settlement the region was a mosaic of open grasslands with patches of scrub and open woodlands – now INS dominates the landscape.

In 1979 the then Western Lands Commissioner Dick Condon set up a 250 hectare waterspreading trial on ‘Florida’ with landholders Kevin and Gwen Mitchell with the aims of restoring grasslands on the property, improving biodiversity, increasing carrying capacity and ensuring farm viability.

Since then, the Mitchells have continued to manage INS and restore native grasslands through waterspreading and carrying out a range of management activities.

Please note:

- Waterspreading is suitable for landscapes with gentle slopes. Correct design and construction is essential to avoid problems such as scouring in channels and gaps; erosion at bank ends; bank breaching during high flows; sediment build-up; and overflows.

- Managing INS species requires approval under the Native Vegetation Act 2003. Special provisions are available for landholders wishing to clear INS under this legislation.

- While every care has been in taken in preparing this document, the results are based on specific property experiences and people should take their own property situation into account when planning management activities.

For these reasons, seek appropriate advice before commencing any on-ground work.

Top: Central West CMA officer Ray Thompson (left) and ‘Florida’ owner Kevin Mitchell inspect one of the established native grasslands. This site was thick invasive scrub with nil carrying capacity 18 months beforehand.

Middle: Kevin standing in one of the waterspreading sills.

Bottom: A typical Invasive Native Scrub site on ‘Florida’ – note the absence of groundcover, even after recent rainfall of 200 mm.
Ray Thompson from the Central West Catchment Management Authority (CMA) has been working with Kevin and Gwen during this time to implement waterspreading systems and manage INS.

As ‘Florida’ is located across a CMA boundary, this work has been supported by both the Central West and Western CMAs.

The improvements in groundcover, carrying capacity and biodiversity over this period have been amazing.

This case study shows the management decisions and ongoing practices that led to this transformation and demonstrates how farm productivity and environmental outcomes can go hand-in-hand.

**Waterspreading to restore native grasslands**

Rainfall events at ‘Florida’ need to be utilised carefully as it is in an area with an average of 375 mm per annum, with a lot of variability between years. The Mitchells use waterspreading to use this resource wisely.

Waterspreading is a land management technique used to evenly spread and disperse rainwater flows over country with gentle slopes. The key advantage is that the energy of water flow is reduced, meaning almost no soil erosion and better water infiltration.

Waterspreading basically involves creating a series of small banks to direct water away from drainage lines to areas where it would normally not flow. Each bank has a series of gaps one hundred metres apart to allow water to flow through, fill a level sill on the low side of the bank and then flow out evenly across the ground. This means better infiltration to suit native grasses and herbage.

Waterspreading banks were initially constructed on ‘Florida’ through the Soil Conservation Service. Now CMAs are working with landholders in INS affected areas to devise and implement waterspreading schemes.

**The INS management cycle on ‘Florida’**

Since the original Soil Conservation Service trials of 1979-82, Kevin Mitchell has continued to establish waterspreading sites and manage INS.

Throughout this period, he has observed a distinct cycle in restoring native grasslands.

“Restoring a native grassland from a woody weed site is a long-term exercise and can take five to seven years, depending on the season and soil of the area,” said Kevin.

“Firstly the invasive scrub area is thinned or cleared through chaining, raking and burning, followed by ploughing if necessary because of regeneration of turpentine and bimble box.

On ‘Florida’, Kevin doesn’t plough unless necessary, so as to avoid damage to soil structure.

“If it doesn’t need ploughing I don’t touch it. It’s important not to plough when very dry and powdery; otherwise the paddock will turn to bulldust. Also, we don’t plough when the soil is wet as moisture lets roots live and sucker. The ideal conditions is when the ground clods evenly and is not susceptible to wind erosion.”

After this initial management, pioneer plants such as yellow burr daisy and galvanised burr will establish.

“We leave these untouched as they provide some groundcover and will be replaced by native grasses and herbage after around two years. The pioneer plants then disappear as they don’t like the competition.

“Scrub regrowth can be managed through ploughing, grubbing or spot spraying.

“I generally have to treat regrowth annually for the first few years and then every three years or so until the grasslands thicken and out-compete woody weed growth. In the first
area developed in 1982, it takes me about half an hour to spot spray 250 hectares of scattered regrowth that periodically occurs, so follow-up spot herbicide treatment has some advantages.

“We have also used short-term cropping and stubble retention to control woody weed regrowth. This provides competition to scrub regrowth, retains soil moisture and shelters native grasses when establishing.”

After the initial clearing Kevin uses waterspreading to manage the flow of water over the paddock. This technique involves the construction of a series of banks. The banks have openings every 100 m which effectively allow rainwater to flow evenly across the ground’s surface.

By slowing overland flows and spreading this water across areas other than drainage lines, rainfall can infiltrate the surface and support groundcover.

When an even water flow is established, Kevin manages scrub regrowth to allow native grasses to establish and dominate the site.

“Ongoing management of scrub regrowth is vital. Initially this must be done annually, then every couple of years until grasslands are established enough to restrict invasive scrub regrowth.”

Post-treatment grazing pressure needs to be managed to allow desirable ‘soft’ native grasses to re-establish. Achieving a diversity of native grasses and herbage needs careful management of stock and control of feral animal grazing pressure.

“Ongoing management of scrub regrowth is vital. Initially this must be done annually, then every couple of years until grasslands are established enough to restrict invasive scrub regrowth.”

Post-treatment grazing pressure needs to be managed to allow desirable ‘soft’ native grasses to re-establish. Achieving a diversity of native grasses and herbage needs careful management of stock and control of feral animal grazing pressure.

“Endangered species like Major Mitchell cockatoos, superb parrots and others are returning to the region – we have sighted and documented 121 species of birds.

“The property is viable now too. Before INS removal and waterspreading began, invasive scrub meant our best stocking rate was one dry sheep to nine hectares. Now we can run one sheep to one hectare with very good lambing percentages and wool production.

Results
Since Kevin and Gwen started managing invasive scrub and undertaking water spreading they have seen dramatic improvements in productivity and biodiversity across the country.

“We now have such a diversity of desirable native grasses, with around 120 species of spring and summer grasses and approximately 40 species of autumn and winter herbage across the property,” said Kevin.

A recent vegetation survey of the property revealed that a treated site had on average 35 times the dry weight of groundcover than an adjacent untreated INS site. The treated area was chained in 2002, and raked and waterspread in 2006.

“Endangered species like Major Mitchell cockatoos, superb parrots and others are returning to the region – we have sighted and documented 121 species of birds.

“The property is viable now too. Before INS removal and waterspreading began, invasive scrub meant our best stocking rate was one dry sheep to nine hectares. Now we can run one sheep to one hectare with very good lambing percentages and wool production.

It’s important not to flog it when establishing pastures. We found that heavy stocking can cause monocultures of spear grasses.”

Results
Since Kevin and Gwen started managing invasive scrub and undertaking water spreading they have seen dramatic improvements in productivity and biodiversity across the country.

“We now have such a diversity of desirable native grasses, with around 120 species of spring and summer grasses and approximately 40 species of autumn and winter herbage across the property,” said Kevin.

A recent vegetation survey of the property revealed that a treated site had on average 35 times the dry weight of groundcover than an adjacent untreated INS site. The treated area was chained in 2002, and raked and waterspread in 2006.

“Endangered species like Major Mitchell cockatoos, superb parrots and others are returning to the region – we have sighted and documented 121 species of birds.

“The property is viable now too. Before INS removal and waterspreading began, invasive scrub meant our best stocking rate was one dry sheep to nine hectares. Now we can run one sheep to one hectare with very good lambing percentages and wool production.

It’s important not to flog it when establishing pastures. We found that heavy stocking can cause monocultures of spear grasses.”
“This is compared to the district average in open country of one sheep to two hectares.”

Waterspreading and INS management have also allowed the Mitchells to run a beef cattle enterprise.

“Before it just wasn’t possible to run cattle, but now we can run one head to nine hectares on waterspreading areas.

“When we started we thought we’d never see results in our lifetime, but looking back it is fantastic to see the restoration of the landscape.

“The difference between treated and INS sites is clear cut. For example, after eight inches of recent rain our grasslands are flourishing, but there is absolutely no groundcover on our scrub sites. The water can’t penetrate the surface and just runs off.”

According to Kevin, the banks are an asset of the property and a resource during dry times.

“The waterspreading system means native grasslands respond very well to heavy falls, but the real worth is during the hard times.

“It is the difference between having some groundcover or nothing at all during dry seasons.”

The banks at ‘Florida’ are also quite robust.

“People have asked whether they wash away.

“Once they have pasture cover, water can flow over without any damage. There is no erosion on our treated areas because of the groundcover.

“They must be rolled to consolidate first though and we do this with a wheel tractor.

“We’ve received great encouragement from former Western Lands Commissioner Dick Condon and Ray Thompson from the Central West CMA in carrying out this work.”

Both sides of the fence: adjacent INS and treated sites

The photos from ‘Florida’ below demonstrate the results from waterspreading and INS treatment after 200 mm of rain in early 2008. The treated site has thick and diverse native grasses and herbage, while the adjacent INS has poor groundcover response.
Before and after comparison sites

The ‘Florida’ sites below show typical impacts of rain on treated and untreated sites. Photographs were taken in late 2006 and early 2008. There was a wet period immediately before the 2008 photos.

Site 1 – Managed for INS

The project monitoring site photos below show the improvements due to waterspreading. The 2006 photograph was taken two weeks after clearing thick turpentine.

Site 2 – Managed for INS

These photos show improvements in a treated site. INS was removed from this site in 2006. The lower photo shows the second year of rehabilitation back to native pastures. This will take about five years.
Site 3 – Unmanaged INS (adjacent to Site 2)

This site is adjacent to Site 2. Over the same period there are still bare patches of soil, as well as low levels and diversity of native grass and herbage.

Key points from ‘Florida’

1. Managing INS is a long-term commitment. Paddocks generally need five to seven years of ongoing management to establish dominant grasslands. With appropriate grazing they will then maintain groundcover.

2. Follow-up management is vital. Bimble box suckering and woody weed regrowth need ongoing management otherwise INS will re-establish.

3. You don’t have to do it all at once. INS management and waterspreading have taken place paddock-by-paddock on ‘Florida’ as resources have allowed since the 1970s.

4. Managing INS needs an integrated approach. A variety of management techniques are needed to manage and control INS.

5. Leave scattered trees and shelter belts of trees. Livestock need shade and shelter, and trees also provide native fauna habitat.

6. Don’t flog it. Overgrazing can cause a spear grass monoculture or, worse, a bare paddock.

7. Plough when cloddy (not very dry or too wet) to control INS, and only if needed.

8. Don’t make banks and channels too big if waterspreading. Too much water is stored in big channels, and smaller channels allow more water to flow over the paddocks.

9. Keep learning. According to Kevin and Gwen, managing INS is a cycle of continuous learning and improvement – they are still finding ways of doing things better.

Thanks to Kevin and Gwen Mitchell for their assistance in preparing this case study.
Chaining and burning to rehabilitate native pastures on ‘Mirrabooka’

The history of ‘Mirrabooka’

In a region dominated by thickening and encroaching INS, David Betts has been achieving production and environmental outcomes through a program of burning and scrub management.

Through treating INS and rehabilitating native pastures, David is restoring a mosaic environment of grasslands and grassy woodlands on his property ‘Mirrabooka’, 95km south of Cobar.

In 1998, David decided it was time to do something about the encroachment of white cypress pine on ‘Mirrabooka’. Thick pine was spreading across his open areas and even after good rains, groundcover and carrying capacity were slowly decreasing as a result.

Evidence from previous wildfires convinced David that burning could be the answer to limiting this encroachment and keeping his open areas open.

After a number of successful burns, coupled with other INS treatments, David has seen the return of thick native perennial pastures and groundcover.

Please note:

- A fire permit may be required from the Rural Fire Service (RFS) for management burns undertaken, particularly during the bushfire period (generally early October to late March).

- Managing INS species requires approval under the Native Vegetation Act 2003. Special provisions are available for landholders wishing to clear INS under this legislation.

- While every care has been taken in preparing this document, the results are based on specific property experiences and people should take their own property situation into account when planning management activities.

For these reasons, seek appropriate advice before commencing any on-ground work.

Top: ‘Mirrabooka’ owner David Betts (right) and Western CMA Fire Extension Officer Brian Dohnt in a paddock that was restored to native pastures through management burns.

Middle and Bottom: Fire is thought to have played an important role in maintaining a mosaic environment before European settlement and can be an effective tool to manage INS.
This case study highlights the principles and management actions used by David, and demonstrates how farm profitability and environmental sustainability can go hand in hand.

**Native grassland rehabilitation and INS treatment on ‘Mirrabooka’**

In a region known for the invasive behaviour of cypress pine and turpentine, David has been using burning in conjunction with a number of other INS treatment techniques to keep his open areas open and rehabilitate native grasslands.

Following a wildfire in 1984, David started to think about how he could be using fire to open up his country and increase his carrying capacity.

“My father was always burning, and after seeing the results of wildfires I started to think about using fire,” he said.

“The wildfires seemed to keep the scrub in check and I wanted to be able to get the same results with management burns.”

Unfortunately, competition from the encroaching pines meant there was not enough fuel (grass and herbage) to burn. David set about chaining the worst of his property to knock down the scrub. His plan was to burn at a later time when there was sufficient fuel.

Other than opportunistic crash grazing, David de-stocked the chained areas and then burnt in 2001.

“Some of the local RFS came out to help, which was great and gave people a chance to get experience with fire.

“We used drip torches and burnt in clumps. The grasses that had established, plus the timber on the ground and small whipstick pine missed by chaining, was enough to get a good burn.

“It was just enough to get the fire through the burn site and then die down.”

While effective on pine, David found that not all INS species are controlled by fire.

“Fire knocks the pine, but not so much turpentine. We found we had to plough it out to control regrowth properly.”

David also used stick raking on some of his chained areas as part of his management program.

“On some sites I stick-raked the timber up in rows for burning – raking also roughs up the soil and encourages grasses to establish.”

Now that he has established grasslands, David will focus on controlling INS regrowth and keeping his native pastures open.

“Some INS sites on the property are too big to manage now, so I’m focusing on keeping my open areas open.

“I carry out small cool burns now to control regrowth – around 20 hectares at a time. Goats and sheep grazing will also be used to keep the regrowth down.”

David will also cultivate and crop to kill the small seedlings that have emerged and to re-establish some groundcover.

This integrated program of short-term cropping, grazing management and an occasional fire (once every 5-10 years) should control any INS germination.

Now seven years after the initial burns and 10 years after chaining, native grasses are well established on the burn areas.

“In the end we did it properly and I didn’t realise at the time how well it worked. To see the little black stumps amongst the thick grasses now is incredible.

“Some of these areas were originally so thick with INS you couldn’t walk through them.”
Managing invasive native scrub

Through restoring native pastures, Mirrabooka’s carrying capacity has increased. Also, mustering is far easier and quicker due to the reduced areas of wall-to-wall pine.

No longer are areas dominated by one or two INS species – a wider range of habitat is available and this will improve the biodiversity of the property.

David’s approach and management have worked well. Through chaining and burning over a long time frame, he has spread his expenses over a number of years. The amount of lost production time has been reduced.

‘Mirrabooka’ sites: INS and rehabilitated grasslands

Site 1 - Burnt in 2001

David had ample fuel for a burn in 2001 to control pine seedlings and smaller trees. Due to drought the site had limited groundcover for some years afterwards, but native pastures have since recovered after good summer rains. Photo taken May 2008.

Site 2 - Area chained in 1998-99 and burnt in 2001

This area was chained, and then the pulled-down timber burnt in clumps. Chaining was undertaken selectively to leave larger trees. Photo taken July 2008.
Site 3 - Chained in 1998-99 and burnt in 2001

This site was burnt, but some clumps of pine remain where there was insufficient fuel for the fire to scorch the juveniles or affect the larger timber. Photo taken July 2008.

Site 4 - Country experiencing pine regrowth and in need of a management burn

If burnt at this stage, young pine can have up to a 100% mortality rate. Well-planned grazing management will help to generate sufficient fuel load. Photo taken May 2008.

Site 5 - Area chained in 1998-99 and burnt in 2001

The site was previously dominated by cypress pine so thick in parts that you could not walk through it. Now the area is restored to a mix of open pasture and scattered trees selectively left from chaining. Photo taken July 2008.

Key points on burning

1. **Total grazing pressure management is vital.** Grazing pressure from feral, native and domestic animals must be controlled to allow fuel loads to develop and for native grasslands to establish after a burn.

2. **Target seedlings and keep open areas open.** INS species are most susceptible to treatment by fire when at the seedling stage. When INS is well established more expensive management techniques are needed.

3. **Cool burns are better.** Autumn and spring burns can effectively control INS. They present less risk to infrastructure and the environment than hot summer fires, which can also ‘cook’ the earth and limit grasses re-establishing.

4. **Burning alone won’t control INS.** Management and follow-up burns, other treatments (e.g. chaining), infrastructure and grazing management all need to be integrated to successfully rehabilitate native grasslands.

5. **Work with your local authorities.** Experience counts with burning, so working with the RFS and CMA on your burn will be a great advantage.

6. **You don’t have to do it all at once.** David’s initial chaining and burning program took place over a three year period as conditions and finances suited.

7. **Carefully plan your burn** and have experience on hand.

Thanks to David Betts for his assistance in preparing this case study.
Burning to rehabilitate native pastures on ‘Norma Vale’

The history of ‘Norma Vale’

Located 80 km south of Cobar, ‘Norma Vale’ sits in a region affected by thickening and encroaching invasive native scrub (INS).

‘Norma Vale’ owner Barry Francisco has a history tracing back four generations in the Cobar region and he advocates fire as a management tool to treat INS and restore native grasslands.

Barry first experienced the potential of burning for restoring native grasslands after a bushfire in the 1950s. After the fire swept through a section of his property, areas of thick scrub were transformed into rich and diverse native grasslands.

Since then he has observed the results of wildfires and management burns carried out over the years and is firm believer in the benefits of a burning program.

The work carried out to restore native grasslands on ‘Norma Vale’ has improved the profitability and long-term sustainability of the property for generations to come.

Please note:

- A fire permit may be required from the Rural Fire Service (RFS) for management burns undertaken, particularly during the bushfire period (generally early October to late March).

- Managing INS species requires approval under the Native Vegetation Act 2003. Special provisions are available for landholders wishing to clear INS under this legislation.

- While every care has been in taken in preparing this document, the results are based on specific property experiences and people should take their own property situation into account when planning management activities.

For these reasons, seek appropriate advice before commencing any on-ground work.
This case study highlights the principles and management actions of this work and demonstrates that farm profitability and environmental sustainability can go hand in hand.

**Native grassland rehabilitation and INS management on ‘Norma Vale’**

Since seeing first-hand the effects of bushfires, Barry’s eyes have opened to the role that fire can play in a program to restore and maintain healthy native grasslands.

“While I could see the results from the ‘57 bushfire, it still took me a while to appreciate how I could be using fire on my property,” said Barry.

“I first started carrying out follow-up burns after wildfires and have been managing my grasslands through burning for over 20 years now.

“I used to be afraid of burning but now it is the best way for me to manage my native pastures and keep the scrub in check,” he said.

The results from management burns depend on the INS species in question.

Pine and hopbush are most susceptible to fire and Barry has had success in controlling these species with burning. Other species can be harder to manage with a burn.

“I’ve found fire won’t kill turpentine and spraying is needed as a follow-up. I also use spraying to control bimble box regrowth.

“Fire alone will only achieve so much.”

INS species are most susceptible to burning when less than 50 cm tall, so regular monitoring and timely action is needed to keep open areas open.

There are also some practical points to be observed when burning. Good fire breaks are needed and be prepared to move stock quickly.

Total grazing pressure management is essential for developing a fuel load and allowing grasslands to re-establish on burnt areas.

Grazing management and exclusion are used on ‘Norma Vale’ to allow grasses to establish for a fuel load. Barry also uses timber on the ground as fuel.

Grazing pressure comes from feral, native and domestic animals, so all of these should be managed in any program to rehabilitate native grasslands. Barry uses two-barb fencing and has a feral animal control program for this reason.

“I pay particular attention to controlling ferals. You need to get feral goats off your pastures for burning to be effective. We set traps around the tanks to help with this.

“Pigs will damage drains and tanks so they go too.”

Once native grasslands are established, water can be an issue. Better groundcover and infiltration means that run-off will be lower and planning is needed to avoid empty tanks. Barry uses his roads and other bare areas as drains to make sure he has enough water.

After a burn galvanised burr can dominate, but this soon gives way to native perennial grasses, according to Barry.

“Galvanised burr will come but it is there to protect the soil until grasses develop. The diversity soon follows.”

These two native pastures on ‘Norma Vale’ are the direct result of wildfires and management burning to control INS.

**Results**

The return of native perennial pastures to ‘Norma Vale’ has increased Barry’s ability to carry stock and gives long-term sustainability.

“Burning keeps it profitable and the main thing for me is to pay the bills every month,” he said.

“It has reduced farm inputs and lowered overheads. As a mechanism to control INS, it costs me virtually nothing.”

The balance is there too.
Managing invasive native scrub

“We don’t get a thick body of crowfoot or spear grass anymore. We’ve got a diversity of grasses and heavy groundcover.

“We now only need 15 mm every few months or so to maintain stock.”

“There is active bird life on the property as a result of the mosaic landscape. The grasslands are established and trees are still there to give habitat diversity.

“I’m rapt in the country. It’s healthy and I am proud of it.”

‘Norma Vale’ sites: INS and rehabilitated grasslands

Site 1 - not affected by fire but evidence of ring-barking

Ringbarking was conducted in the late 1960s at this site. At the time of ringing, the larger trees in the background were seedlings hidden in the grass. Bushfires in 1975 and 1985 did not affect this area and cypress pine subsequently encroached into the open areas.

Site 2 - experienced two wildfires

This area was burnt during the 1975 and 1985 wildfires. It has now recovered very well to native pastures. Even though these results were from wildfires, the same effect can and will take place with controlled burning. Cool burns can control seedling pine.
Site 3 - experienced two wildfires

This area was also burnt during the 1975 and 1985 wildfires. The area has recovered well with a nice scattering of mature trees and open grassland remaining.

Site 4 - experience wildfire in 1985

This site was burnt in 1985 bushfire, and now 23 years later the area is in need of another burn to eliminate the new germination of cypress pine (seen in background).

Key points on burning

1. **Get experience and confidence.** Barry has developed his burning experience and skills and has seen the benefits – profitability, viability, sustainability and diversity.

2. **Total grazing pressure management is vital.** Grazing pressure from feral, native and domestic animals must be controlled to allow fuel loads to develop and for native grasslands to establish after a burn.

3. **Target seedlings.** Cool autumn and spring burns can control INS seedlings. They present less risk to infrastructure and the environment than hot summer fires. Barry prefers to conduct autumn burns on 'Norma Vale' to establish groundcover before summer.

4. **Burning alone won’t control INS.** Management and follow-up burns, other treatments (e.g. spraying), infrastructure, and grazing management all need to be integrated to successfully rehabilitate native grasslands.

5. **A few trees are still needed.** They carry out important farming functions (shade, wind shelter, etc) and are part of the environment.

6. **You can’t do anything without water.** Rainfall run-off from established native grasslands is lower, so planning is needed to avoid empty tanks.

7. **Carefully plan your burn** and have experience on hand. Make good fire-breaks.

Thanks to Barry Francisco for his assistance in preparing this case study.
Western grazier Tony Falkenhagen of ‘Gundabooka’ station carried out a large scale burning program during 2001 to help control invasive native scrub (INS) that was thickening over his property and affecting its groundcover and overall viability.

Turpentine (an INS listed species) in particular was establishing thickly on Tony’s open pastures, leading to reduced perennial groundcover.

Tony carried out management burns over 4,500 ha of ‘Gundabooka’ through the WEST 2000 Plus program. This work was done to see how burning can be carried out on a large scale to control emerging woody shrubs and trees.

“Much more of my property was open pastures 20 years ago – the scrub has thickened a lot since then. I didn’t want to see this keep going and be left with no open land,” said Tony.

“Burning was the best choice to control it because I had the fuel loads and was prepared to experiment with fire.”

The experiences from this burning program are valuable to others considering a burning and INS management program.

Please note:

- A fire permit may be required from the Rural Fire Service (RFS) for management burns undertaken, particularly during the bushfire period (generally early October to late March).

- Managing INS species requires approval under the Native Vegetation Act 2003. Special provisions are available for landholders wishing to clear INS under this legislation.

- While every care has been in taken in preparing this document, the results are based on specific property experiences and people should take their own property situation into account when planning management activities.

For these reasons, seek appropriate advice before commencing any on-ground work.

Top: Tony on one of the burn sites.
Bottom: This 2005 photo shows the impact of the post-burn drought.
Importance of planning

The ‘Gundabooka’ burn demonstrated a number of important issues, according to former West 2000 Plus officer, Angus Atkinson.

“Tony recognised he had an INS issue long before West 2000 Plus existed and was using the best techniques available at the time to manage it,” said Angus.

“He determined that INS encroachment had become too big a problem and he was never going to beat it by spraying individual plants establishing over nearly 4000 hectares.

“It was becoming uneconomical and labour intensive.

“Tony evaluated the scale of encroachment and options available.

“He saw the opportunity to experiment with fire and treat large areas of INS.

“He should be recognised for treating the problem effectively. ‘Gundabooka’ would be a very different landscape now if not for his effective management.”

INS management at ‘Gundabooka’ highlights the importance of:

- early recognition of the natural resource management problem (i.e. encroaching turpentine)
- developing an INS management plan (treat open areas before dense stands)
- adopting the most cost-effective treatment technique, monitoring the results and then modifying/changing the technique if needed.

Carrying out the burn

The burn was conducted over two days with a number of people and vehicles present during and after the event.

“The actual burn did not take long at all. We did the largest block during the first day and then the smaller blocks took about another half day to burn,” said Tony.

“I set up a fire break beforehand with the grader. It was two blades wide and did a great job on containing the burn.

“My neighbours were all alerted and happy with the precautions we had in place.

“When we actually burnt, we had six people helping out and three vehicles with water. Two vehicles patrolled the perimeter during and after the burn to make sure it was well contained.

“I plan to burn again over the next few years, but will carry out the burning program piece by piece over smaller areas.”
Managing regrowth
Tony manages regrowth on his burn sites and other open areas through spraying.
"I monitor my property on motorbike and spray any individual plants which works quite well.
"Spraying on bare ground underneath the plant’s drip zone will get best results."

Managing total grazing pressure
Tony is conscious not to overgraze his grasses and herbage.
"I’m careful to maintain my perennial pastures. Having agistment cattle gives me more control over grazing pressure.
"Having not enough stock on is better than too many for maintaining groundcover.
"Pastures will catch water, grass seeds and other resources and respond quickly to rainfall. Bare ground won’t."
In addition, Tony is careful to manage grazing pressure from feral animals.
"There aren’t too many feral goats on the property, but I have traps set up around water tanks to keep them in check."

Results
The effects of drought meant that much of the burn area did not respond as quickly as hoped.
"There was not much rain for the two years after the burn so profitability fell in the short-term," said Tony.
"However grass butts responded well once the season improved and groundcover has now returned.
"Without the burn, turpentine and other invasive shrubs would have continued to spread. I would have lost much of my open country without some sort of intervention.
"The burning program stopped it getting any thicker."
The burn killed most of the juvenile turpentine and around half of the bigger plants.
"I followed up with spraying and the combination of fire and chemicals worked well to maintain my open areas.
"Some patches of INS did not have enough grass fuel underneath so did not burn as well."
Another site on ‘Gundabooka’ had a storm a few weeks before, so grass was greener and had more moisture. Fire did not burn as well on this site compared to some of the drier areas.
"One of the main things I would do differently is to burn smaller blocks over a longer time frame, rather than a large area at once. This would take a lot of the risk out of post-burn seasonal conditions."
Key points from ‘Gundabooka’

1. **Focus on keeping open areas open.** Tony implemented his burning program during the early stages of encroachment for effective control of INS.

2. **Prepare for the burn and have people on hand.** Tony’s burn was well planned and implemented and there were enough people on site to carry it out safely.

3. **Manage groundcover and grazing pressure.** Controlling feral goat numbers and managing stock numbers means that groundcover can establish before and after a management burn.

4. **Smaller burns over a longer timeframe may reduce seasonal risk.** The original burns took place over a large area. Smaller burn areas will reduce from seasonal conditions.

5. **Plan your INS management and remain flexible.** Tony was managing INS on ‘Gundabooka’ through spraying but changed his approach to burning when he realised the problem was too great to manage through spraying alone.

Thanks to Tony Falkenhagen for his assistance in preparing this case study.
A thinning program on Walgett property ‘Bairnkine’ is helping rehabilitate native pastures on areas previously thick with invasive native scrub (INS).

This work was supported by the Western Catchment Management Authority’s (CMA) 2008 incentives program.

On ‘Bairnkine’, flooding events led to coolibah establishing in mass on parts of the property. These have developed into thick stands of INS, marked by lack of groundcover and reduced diversity of native grass species.

Competition for light, water and other resources means that trees remain stunted and will not readily grow to mature sizes without treatment such as thinning.

Landholders, the Zell family, undertook an INS thinning program to allow groundcover to establish. This also means that selected trees can now grow to provide better ecological and farm services.

Ken Norman works as a consultant to the Zell family and coordinated the thinning program.

“With emerging INS, groundcover was decreasing, along with farm production,” said Ken.

“Groundcover under the coolibah stands was very limited and species diversity reduced.

Please note:

- When using herbicides always read the product label carefully before using and only use according to manufacturer’s instructions.
- Managing INS species requires approval under the Native Vegetation Act 2003. Special provisions are available for landholders wishing to clear INS under this legislation.
- While every care has been taken in preparing this document, the results are based on specific property experiences and people should take their own property situation into account when planning management activities.

For these reasons, seek appropriate advice before commencing any on-ground work.

Top: Ken Norman (right) with Western CMA Officer Brian Dohnt.
Middle and bottom: Adjacent areas demonstrating the affect of INS on perennial groundcover.
“The thinning program, coupled with changes to grazing management and supportive seasons, will mean a return of thick native perennial grasses.”

**INS treatment**

The herbicide thinning program was conducted in early 2009. Undertaking the program during the warmer months meant sap in the trees was flowing more and poisoning more effective.

The program of spot treatment was undertaken through an INS Property Vegetation Plan (PVP) negotiated with the Western CMA. Herbicides have the advantage of no disturbance to soil and groundcover.

“We undertook a thinning program over 570 hectares of the property to give native pastures a chance to establish,” said Ken.

“In the thinning work we used stem injection as it is more selective. Spray drift in this situation could have hit large trees and non-target species.

“The team used Velpar ® mixed with water at a 2:1 ratio. Two cuts were made per tree and two millilitres injected per cut with good results.

“Costs per hectare varied depending on thickness and size of the scrub, but the overall thinning program cost around $96,000.

“Sixteen people were working at $200 per day over 18 days, meaning labour costs were around $63,000. Herbicides cost a total of $32,000.”

Landholders should also take into account ongoing management when costing a program. While poisoning on ‘Bairnkine’ had a high mortality rate, if treatment is not carried out correctly areas will need re-treating.

Future germination events also need to be considered and managed. If treated early, costs will be much lower.

When using herbicides always read the product label carefully before using and only use according to manufacturer’s instructions.

**Planning**

Much planning has gone into INS and property management on ‘Bairnkine’.

Through the PVP process, the extent of INS on ‘Bairnkine’ was mapped and its management planned.

Up to 80% of the extent of INS can ultimately be treated through a PVP. This amount can generally be treated all at once though poisoning and other low disturbance methods. Treatments that disturb the soil and groundcover are undertaken over a staged process to allow pastures to establish.

Property planning also saw nature corridors established along ridgelines for biodiversity benefits, such as providing connectivity for animal movement across the landscape.

Vegetation buffers were also established along warrambools (drainage depressions), as retaining native vegetation along water lines is important for filtering run-off, trapping nutrient and sediment, and preventing erosion.

According to Ken, one thing they would do differently when setting up infrastructure for grazing is to take into account the grazing pressure livestock put around water troughs.

“When we put in the water system, we didn’t consider the extra pressure that livestock contribute around water points,” he said.
“Having them in a straight line meant that grazing was not spread across the paddock.

“In hindsight we would have been better staggering the position of water points to encourage livestock movement over a wider area.”

**Grazing management**

Successful INS treatment depends on resting the site after treatment and appropriate ongoing grazing management for the re-establishment of native pastures.

Sites must be rested from grazing after treatment otherwise pastures will not easily establish. Seasonal conditions affect the resting length.

Ken and the Zell family have seen first hand the benefits of improved grazing management and rotational grazing on their pasture areas and INS sites.

Previous set stocking had resulted in paddocks full of copper burr and other less desirable species, but now native grasses are re-establishing.

“I’d like to see curly Mitchell grass develop, but I am happy with the response seen to date. Given time it will come,” said Ken.

**Results**

The chemical thinning program has seen an increase in groundcover on the INS sites.

“Groundcover is still establishing under the coolibah we’ve thinned with herbicides, but it is a vast improvement on what was there before.”

The whole property has benefited from better grazing management, with established pastures also much healthier now.

“Even the property’s open pastures have better groundcover and are ready to respond to rainfall.

“Although there is more feed, the property is not carrying more stock. This means we can maintain better overall groundcover and livestock are healthier.”

**Key points from Bairnkine**

1. **Plan and cost your INS management work before beginning.** The thinning program on ‘Bairnkine’ was well planned and achieved its set goals.

2. **Support INS treatment with appropriate grazing management and treat further encroachment.**

   Create an environment that will let native grasses grow, including managing INS seedling establishment.

3. **Rest treated sites to allow groundcover to establish.**

   Pastures need time to establish and this will vary depending on the season.

4. **Follow instructions and use correct technique to achieve a high mortality.** Follow-up work will be often needed but this can be minimised by doing it right the first time.

**Livestock will add grazing pressure to water troughs and other high traffic areas.**

**Treated coolibah INS bearing the marks of stem injections**

Thanks to Ken Norman for his assistance in preparing this case study.
Controlling grazing pressure at ‘Hermitage Plains’

Originally established as a soldier’s settler block after World War II, ‘Hermitage Plains’ has since seen good years, intermittent floods and extended drought periods.

Thickening and encroaching invasive native scrub (INS) has also had its impact on carrying capacity, productivity and the property’s natural resources over this time.

On ‘Hermitage Plains’ thick stands of cypress pine have established on open areas and are a dominant figure on the landscape. Historical photographs from the 1920s show open pastures where the thick pine has since encroached.

Even now, open areas must be regularly monitored for pine seedling growth and treated to maintain a mosaic landscape and property viability.

Landholders Terry and Kerry Pitkin have been managing ‘Hermitage Plains’ now for 10 years and have undertaken a program to treat INS and help restore native perennial pastures.

This body of work will lead to improved productivity, reduce erosion and create a more balanced mosaic landscape.

This case study has been developed to highlight the management decisions and ongoing practices carried out by the Pitkins and the results to date.

**Creating mosaics**

Like other properties in the region, ‘Hermitage Plains’ has thick stands of cypress pine and bimble box encroaching on open grasslands and reducing the diversity of native vegetation and habitats.

With the support of the Central West Catchment Management Authority (CMA), Terry and Kerry have implemented a program of INS treatment to restore native perennial pastures.

Through the Property Vegetation Planning (PVP) process, they have been able to map the property and strategically plan areas of INS to be treated. Up to 80% of INS on a property can be treated through a PVP.

INS management work on ‘Hermitage Plains’ has been supported through the NSW Farmers INS management pilot program.

*Top: Terry with a recently treated site.*

*Middle: The benefits for native grasses of leaving timber on the ground.*

*Bottom: A thick INS stand on ‘Hermitage Plains’.*
A range of treatment techniques have been used over the property to treat INS and maintain native perennial pastures and open woodlands.

**Managing INS on ‘Hermitage Plains’**

When the Pitkins first started managing ‘Hermitage Plains’, around 60% of the 3800 ha property was covered in INS, severely limiting production. Over the 10 years they have managed the country with a number of different techniques to maintain their open areas and treat heavy INS.

According to Terry, their approach is a mixture of strategy and practicality.

“We have been using a satellite map and farm planning to decide which areas to approach first. This means we can focus on opening up our paddocks more and treating sections of INS piece by piece,” said Terry.

“The sites we treat are generally chosen by where the machinery is at the time, but we do have a plan of which areas to manage.”

The Pitkins have set priority areas to treat.

“Some of our hilly areas are just too thick to deal with however, so we have fenced those off to try to get some groundcover on them.”

A range of INS treatment methods are used on ‘Hermitage Plains’. Thick pine is initially pushed over with a dozer fitted with a stick rake or chained.

“Timber on the ground can be a difficult to muster around, but has noticeable benefits in establishing groundcover – it gives protection for establishing grasses and herbage,” said Terry.

“It also has a waterspreading affect by slowing the water’s flow and trapping debris. This makes a better environment for grasses to establish and seed.”

Roughing up the ground also helps create an environment suited to establishing pastures.

“We’ve found raking and ploughing can both help roughen the soil’s surface and trap debris, seeds, water and other resources.”

Pine seedlings have also been manually grubbed to keep open areas free from INS establishment.

“At times the whole family has been out pulling emerging pine growth in our open areas. It’s a practical way for us to keep small pines from turning into thick scrub.”

Also total grazing pressure (TGP) has been managed through subdivision fencing and fencing off dams to control access to water.

“By increasing stock rotations over smaller paddock units, we are able better maintain groundcover in good and bad times.”

“TGP fencing also allows us to rest areas that have been treated. We’ll rest an area six or seven months to allow pastures to establish before grazing.

“Selected dams are also fenced off to reduce access by feral animals and kangaroos. This has a positive impact in reducing overall grazing pressure.”
Results

While an ongoing process, Terry has already seen the benefits of this work.

“Through strategically reducing the thick monocultures of INS and opening up the country, stock management is far easier and productivity has improved.

“When we first started managing the property, feral bulls would roam in and out of the scrub. They had grown wild and even attacked me occasionally.

“Our fencing system allows us to better control grazing pressure from ferals and natives, and better plan our stock grazing for healthier native pastures.

“Fortunately it means there are no more wild bulls either.”

Increased perennial groundcover means that water flow slows and infiltrates better.

“The pastures allow better water infiltration and reduce erosion. Previously you could see rain water flooding off our INS sites and over the boundary fence – carrying our soil with it.”

This has an overall positive impact on productivity and environmental outcomes, but also means that less water can be collected in tanks.

“Water infrastructure needs to be improved as your carrying capacity increases. As bare earth is reduced, run-off and the ability to collect water are too.”

By treating widespread INS and creating areas of pastures and open woodlands, ‘Hermitage Plains’ supports a wider range of plant and animal life.

Key points from ‘Hermitage Plains’

1. Use a number of treatment methods. Each treatment mechanism has positives and drawbacks, so an integrated approach is more effective.

2. Plan your water infrastructure. As groundcover increases, water collection is reduced so planning and infrastructure improvements are needed.

3. Follow-up is needed. INS treatment is not one-off and ongoing management is needed.

4. Monitor and treat INS when small. Treatment is cheapest and most effective when INS is establishing and plants are small.

5. Control total grazing pressure (TGP). TGP fencing, controlling water point access and grazing management will all lead to better establishment of native perennial pastures.

7. Create an environment better suited to grasses. Selectively leaving timber on the ground and roughening the soil surface meant that debris, grass seed and other resources were trapped to encourage groundcover.

Thanks to Terry and Kerry Pitkin for their assistance in preparing this case study.
Louth local Wally Mitchell has been carrying out a scrub pulling program to feed his livestock over an extended drought.

Hand-in-hand with this program is managing invasive native scrub (INS), encouraging perennial pastures and improving his land.

On ‘Landsdowne’ thick stands of mulga, punty and harlequin fuchsia bush dominate areas, reducing groundcover and lowering the property’s productivity.

Wally has been carrying out a program of pulling thick mulga, controlling INS regrowth and restoring native perennial groundcover.

Through his Property Vegetation Plan (PVP), Wally can treat up to 80% of the extent of INS on his 12,500 hectare property.

An active member of the Louth community, Wally has lived in the district for all his life and is still amazed by the cycles of nature.

“I recall my sister and I found a particularly striking wildflower near the Louth tennis courts during World War II,” said Wally.

“I have only seen this plant a handful of times since over the last sixty years - all around the same site. This flower’s seed has remained viable over this time, ready to go when the conditions are right.

“We’ve really been here for five minutes when you consider the scale of time and change of this land.”

**Pulling mulga and leaving timber on ground**

Wally’s mulga feeding program manages INS and improves groundcover on his property.

The original plan for developing ‘Landsdowne’ and managing INS was prepared for Wally by former Western Lands Commissioner, Dick Condon.

The program involves dividing his thick mulga sites into 150 to 200 hectare blocks. As time and resources permit, he is knocking mulga down and leaving it on the ground.

Leaving the mulga branches and trunks where they fall has several benefits.

*Top: Wally with his solar powered watering system.*

*Bottom: Diversity of native grasses has increased since the program began.*
Firstly, they provide shelter for grasses to establish and seed. Animals cannot eat the emerging groundcover and it is sheltered from extreme elements.

The material also slows the water’s flow and allows better infiltration. It doesn’t matter which way the fallen mulga is facing – across or with the water’s flow it slows down flow rates.

“I want to keep water on my property rather than see it run off. By slowing down the flow and establishing more groundcover, I can capture much more water than with bare ground.”

The timber also traps debris, grass seeds, dust and other resources. This is important to create an environment suited to grass establishment.

There are a few things to consider when pulling mulga, according to Wally.

“Timing is important. If the tree is seeding or has recently done so, then widespread germination may follow if stock trample seed into the ground.

“The other trick is to start pulling mulga on the higher country first. This suffers first in hard times and groundcover will be reduced.

“You must set a timetable to your mulga pulling program and keep to it. If fresh mulga browse is not available, sheep may start to eat the stems and fibrous parts of the plant which can kill the animal.”

Controlling sprouting turpentine and punty bush

Monitoring is an important part of INS management at ‘Landsdowne’ and Wally pays particular attention to controlling encroaching turpentine and punty bush.

“I can ride through my treated areas with a spray gun to control emerging woody regrowth. The timber on the ground isn’t a hindrance and the lanes I’ve established let me move around the property easily.

“If I can control sprouting turpentine and punty bush early, then widespread INS regrowth can be prevented.

“I am still trying different chemicals but find a sixty to one mix of diesel and Access ® is working well for hand spraying.”

Managing total grazing pressure

Another key element of the property’s management strategy is controlling water access to manage grazing pressure.

Controlling water points is an important tool in managing grazing pressure. Regardless of whether they are feral, native or domestic, animals can only graze close to water.

“I have a series of watering points on my larger blocks which I can turn on and off to move stock around. I find this works well in resting sections of land and managing grazing pressure.

“The solar powered water system is an important asset of my property.”

Wally also gives particular attention to controlling feral goats.

“Regardless of goat prices, I want them off my property. They hammer grasses and vegetation, damaging what I have worked hard to establish.

“You can’t overestimate the damage they cause to the environment and your productivity.”

A view to burn

Wally’s plan is to pull the mulga down in blocks to allow grasses to establish. If mulga regrowth needs managing and there is a sufficient fuel load, he will carry out a small scale management burn.
“Sheep will not generally graze young mulga due to its waxy coating, so burning would be a suitable option for me.

“You don’t need much fire to kill mulga, especially when it’s young.”

Results

Leaving the timber on the ground has been beneficial in allowing grasses and herbage to establish.

“Many of the emerging grasses are quite new and strange to me. It is promising to see the diversity developing,” said Wally.

“Controlling goats has helped this process and I have seen the results from limiting the damage they cause.

“My cattle have been in good condition throughout the drought. I am happy with how they are performing.”

While agriculture can be a stressful industry, Wally remains focussed on what is important.

“I have no control over the weather or markets so I try not to worry about these. All I can do is manage and improve my country, and enjoy the process as I go.”

Key points from ‘Landsdowne’

1. Leave timber on the ground. This shelters grasses and herbage and helps them establish.

2. Manage total grazing pressure. Controlling feral goats and access to water points are two tools used by Wally to manage total grazing pressure on his property.

3. Planning is vital. ‘Landsdowne’ is managed according to a plan and this helps maintain a long-term view.

4. Use a number of management techniques in combination. Wally has opened up thick mulga stands with a modified D7 bulldozer and scrub pulling attachment. He is also spraying to manage turpentine and punty bush, and plans to burn as needed.

5. Monitor open areas. Monitoring and early treatment of INS regrowth is important to keep open areas open.

6. Ongoing management is needed. Treating INS is not a one-off event and follow-up is needed.

Thanks to Wally Mitchell for his assistance in preparing this case study.