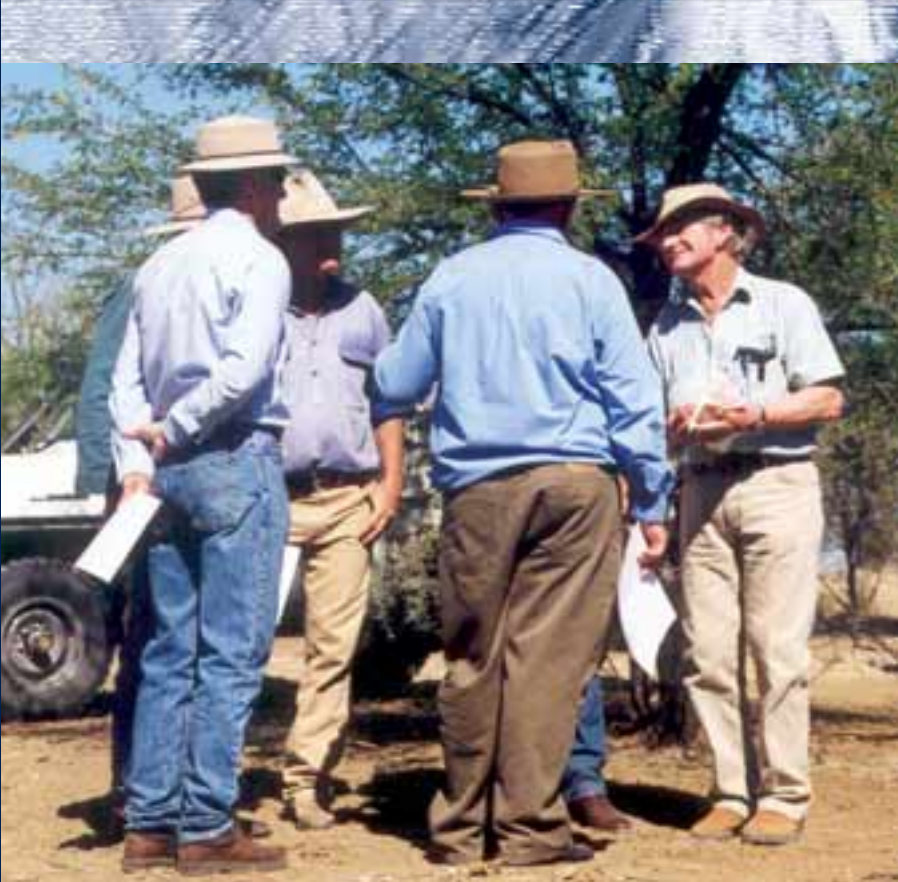


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# Developing strategies



Section 2

# Developing strategies

## Development and adoption of best practice—the research years

Peter Jeffrey

### Introduction

I was very pleased when asked to write this case study as it gives me a chance to highlight the incredible amount of cooperative research that was undertaken in developing the methods currently available for managing prickly acacia. Those involved included research staff at the then Department of Lands and at the Tropical Weeds Research Centre (TWRC), together with a host of property owners and managers from across the geographic range of prickly acacia in Queensland. Often these property owners not only provided research sites, funding, labour, machinery and accommodation, but also expressed their ideas, needs, plans and aspirations, thereby giving the research direction.

I take this opportunity to thank my former departmental colleagues and the agrochemical companies for their help and support in this project.

### The chemical solutions

When I arrived at the TWRC in 1985, the only chemical registered for control of prickly acacia was 2,4,5-T for use in basal bark or cut stump treatment. As this was to be phased out over the next two years, finding a replacement was our first priority.

The initial trials involved testing a range of herbicides (supplied by agrochemical companies) for their suitability for basal spray, cut stump or soil application techniques at

four sites across the range of prickly acacia (Bowen, Aramac, Winton and Maxwelton). As a result, 2,4-D ester, Starane® and Garlon® were registered as basal bark treatments, and Velpar L® registered for spot gun application. More importantly, this work introduced the research team to landholders dealing with prickly acacia, and gave us an insight into what situations required technical solutions.

Landholders needed to reduce the amount of prickly acacia around bore drains and turkey nest dams as it made the facilities difficult to manage—it was causing leaks in dams and making mustering difficult in the dense growth around the water points. It was also making the delving of drains difficult and expensive and, by using up water, was shortening their effective length.

The first step was to develop the use of diuron. This gave excellent results, and the methodology and herbicide were registered for use in 1987. This research was not without its dramas and would not even have been possible without the help of Frank and Sandra Richards on Clareborough at Richmond, and Graham and Jo Thompson on Olive Downs at Maxwelton. Both families supplied machinery, accommodation, funding and labour—the Richards also lost some garden trees and a nice little grove of coolibahs in a creek at the end of a drain. The first rule of adaptive research is that we learn from our mistakes and, thankfully, the Richards family were forgiving.



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▲ Conducting diuron trials in the Richmond area

Research into the use of basal bark and soil applied herbicides continued with trials into the timing of application. This coincided with ecological studies into the life cycle of prickly acacia and the effects of environmental conditions on its growth. New herbicides such as Access® were registered for use. Extension efforts, also beginning to take effect, culminated in a large field day at Olive Downs in September 1989. Here we demonstrated foliar application to control seedling regrowth—necessary because large numbers of seedlings had emerged after the death of mature trees treated with diuron. This led to the registration of Starane® as a foliar treatment for seedling regrowth in the early 1990s.

Though the Department of Lands provided vehicles, office space, staff wages and other support for this research, the project was conducted on a very limited budget—from as little as \$1500 in 1985, to no more than \$10 000, at any stage, till completion of the project in 1992. Results would have been far more modest without the support of the agrochemical companies from whom we begged product, and the cooperating landholders from whom we begged and borrowed most of the other resources we required. We did not steal—borrowing without the hope of repaying is just sharp business!

The profile of prickly acacia had risen remarkably in this period, and alternative

methods of control, especially mechanical, were being trialled. Stock and land management techniques were also used. The project was expanded to include researching these other techniques and expanding the herbicide work into integrated management of prickly acacia.

With a revitalized budget and additional resources, we took to the air in an attempt to deal with some broadacre problems. The research yielded promising results but failed to achieve a practical solution. Though it led to registrations, these have not been adopted by landholders or pursued with any vigour by the agrochemical companies—probably because they supplied a solution to only a limited number of situations. Perhaps there is a place for aerial control in the future, but for now everyone seems to be fairly satisfied with the control techniques available.

### **The mechanical solutions**

All three mechanical solutions researched came from landholders with the insight to realize that more than a chemical solution was required, and that waiting for a 'silver bullet' biological control method was impractical. Basically, the research involved monitoring the effectiveness of these mechanical methods and getting this information to the extension network.

When a technique works reasonably well in the first instance—particularly when it has been developed and demonstrated to be effective by one of their own—landholders will adopt, review, improve and adapt it to their specific circumstances faster than a researcher can monitor or altogether explain.

When I first started research into prickly acacia, the golden rule was to keep machinery away from it or it would turn a bad situation into a nightmare. Hence my respect for the courage and insight of the three people who first approached me for help in further developing the mechanical techniques they were using to control prickly acacia.

In 1990, Graham Thompson, who had built a grubber attachment for his four-wheel drive tractor was the first to approach the TWRC for help. The method proved to be cost-effective, equivalent to basal bark treatment of scattered to medium-density infestations, and nowhere near as physically demanding. The results of this research were published at the *Queensland Weeds Symposium* in 1992 and the technique is now used relatively widely.

Frith Fysh from Acacia Downs, Muttaborra was the next to approach us to investigate the pulling of prickly acacia. The results were spectacular—especially in an area that was double chain-pulled. The results of this research were also published at the *Queensland Weeds Symposium* in 1992.

This turned out to be an incredible opportunity for the TWRC—with the cooperation of the Fysh family the project evolved into a commercially sized study of the integrated management of prickly acacia. Ecological studies, pasture reclamation, aerial treatment, and stock and property management techniques were applied and studied. The work culminated in the 'Integrated management of prickly acacia' field day held at Acacia Downs in 1998.



Peter Jeffrey

▲ Chain pulling trials on Acacia Downs

This was the first adaptive management trial for the control of a weed undertaken by the TWRC.

The third to approach us was Bill Ferguson of Politic, Aramac, with his root rake. Bill had been using this stick rake, with cutting blades between the tines, to clear fence lines, management points and strategic infestations. We began measuring the efficacy of the treatment, regrowth of seedlings and pasture recovery in 1992. The results were excellent, and the technique has been widely adopted across Northern Australia for the control of woody weeds (e.g. for controlling *Acacia farnesiana* on the remote Mistake Creek station on the Northern Territory – Western Australia border). A bonus is that pasture can

be sown while even the densest infestation is treated—in fact Bill’s dozer and rake were used for a trial on Acacia Downs, and also to delineate the research plots for the trial work to be conducted for the adaptive management project. The Fysh family on Acacia Downs also built a similar rake and used it for quick and successful control of prickly acacia.

One of the most important outcomes of our research was the understanding we developed of the importance of timing mechanical control. To achieve the best kills, control work should be done during the mid to late dry season (July to October). Prickly acacia pods at this time but as the seed is immature there will be little risk of spread. The plants are also suffering from moisture stress and there is less



chance of their surviving any significant root damage. The other great benefit is to stock—by undertaking mechanical control at the height of the annual protein drought, a weed is converted to a valuable fodder supplement.

If this work is carried out in the second year of a drought cycle, the effects of control and the importance of prickly acacia as fodder are increased. It doesn't hurt to remember that if you have had to sell stock due to the drought that this supplementary feeding using prickly acacia is also weed control and therefore 100 per cent tax deductible in the year of expenditure.

### **Property management solutions**

In thirteen years of researching prickly acacia, I encountered many practical solutions to problems—either by managing infestations or overcoming individual constraints to control techniques. Solutions included fencing off part of a heavily infested paddock to prevent stock access to large numbers of seed pods, or pulling prickly acacia before seed set to provide fodder during a drought.

The Stacey brothers of Lilyvale, Richmond, developed an innovative solution to weed management. In the first year of a broadscale basal bark program, they realised that getting close enough to the acacia trunks to apply the herbicide accurately cost both time and herbicide.

Before treating an acacia-infested paddock the next year, they stocked it heavily with sheep, which browsed the plants to a height they could reach. This just happened to be a

comfortable height for anyone basal spraying and, with the obstructing thorns removed, the herbicide could be applied quickly and accurately with little threat of injury to the operator, making the whole operation easier and more economical. Word got around and I believe many people now do likewise.

The best tip I can give to anyone with a prickly acacia problem is that timing of control is extremely important. Control activities undertaken after a run of dry years will give better long-term results because soil seed banks will be lower and subsequent regrowth will be less.

I would like to offer my good wishes to all those who continue the research and adaptation of management techniques for prickly acacia.

*'Timing of control is extremely important.'*



## Integrated management

Nathan March and Peter Spies

Since the explosion in the spread of prickly acacia during the wet years of the 1970s, landholders have risen to the task of finding ways to combat it. From an early, almost complete, reliance on basal bark spraying they have developed methods of control that are useful in almost all situations. This toolbox was presented in the *Prickly Acacia Best Practice Manual*, and readers are encouraged to review this information when managing prickly acacia on their properties.

However, even the right tools will not always guarantee success if used in isolation.

Effective control of prickly acacia often requires *complementary* use of management and control actions used sequentially or concurrently within a well-developed plan. An example of such integrated management is double chain pulling of a dense infestation (during the dry season or in drought), followed by the use of goats to strip the fallen trees and control the seedlings, followed by use of herbicide to control any remaining prickly acacia. Other complementary combinations of control and management actions are detailed elsewhere in this manual.

*'Effective control of prickly acacia often requires complementary use of management and control actions'.*



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▲ An integrated approach is usually required to address prickly acacia

## Control options

Nathan March and Peter Spies

The current control options for prickly acacia are:

- chemical (herbicide)
- physical (mechanical and cultural e.g. fire)
- biological (including use of browsing herbivores).

The selection of 'best bet' control options will depend on a paddock-by-paddock assessment of:

- infestation characteristics (area, density, growth stage)
- available resources
- accessibility of infestation to machinery
- pasture competitiveness and quality
- land value

Most prickly acacia occurs:

- on flat or undulating plains
- along the banks of creeks and rivers
- around dams
- along bore drains.

Control options for these situations are presented in Table 2.





**Table 2: Control options for prickly acacia**

Control option	Situation						
	Low density <sup>1</sup>	Flat/undulating plains Medium density <sup>2</sup>	High density <sup>3</sup>	Creeks/ rivers <sup>4</sup>	Dams	Bore drains <sup>5</sup>	Seedlings
Basal bark spraying	✓✓✓	✓✓	✓	✓✓	✓✓	✓✓	✓✓
Soil applied herbicides	✓✓✓	✓✓	✓			✓✓	✓✓
Cut stump	✓✓	✓	✓	✓✓	✓✓	✓	
Overall spraying							✓✓✓
Bore drain application						✓✓✓	
Grubbing – dozer pushing	✓✓✓	✓✓	✓				
Grubbing – wheel tyred tractors	✓✓✓	✓					
Grubbing – stickraking		✓✓	✓✓				
Double chain pulling		✓✓	✓✓✓				
Fire							✓✓
<b>Best management suggestion</b>	Basal bark spraying; soil-applied herbicide; dozer pushing; wheel tyred tractors	Basal bark spraying, soil applied herbicides, dozer pushing, stick raking, double chain pulling	Double chain pulling	Basal bark spraying, cut stump	Basal bark spraying, cut stump	Bore drain application	Overall spraying

Where (✓✓✓) indicates that suitability of the method is high; (✓✓) indicates that it is moderate; (✓) indicates that it is low, based on its effectiveness, efficiency (cost) practicality and legality.

Notes:

<sup>1</sup>Low density <50 plants/ha

<sup>2</sup>Medium density 50–150 plants/ha

<sup>3</sup>High density 150 plants/ha

<sup>4</sup>Refers to infestations growing in association with a watercourse or water body (i.e. on the banks or in the dry bed, but not growing in the water itself). Any application of herbicides to trees growing in association with a watercourse or water body must comply with the herbicide manufacturer's specifications. Due to the potential for high seedling emergence, the risk of soil erosion and other catchment protection issues, mechanical control is not recommended in these situations. Under the *Water Act 2000 (Qld)*, any mechanical works within the bed and banks of a watercourse require authorisation from the Department of Natural Resources, Mines and Energy.

<sup>5</sup>Only herbicides registered for such use (e.g. Diuron 900Wg ®) should be applied directly to the empty bore drain. In the table above, references to basal bark spraying and applying herbicide to the soil in a bore drain situation refer to individual plant treatment as per herbicide label directions.



# Prickly acacia density standards

Peter Spies

## Low density <50 plants/ha



15 plants/ha



50 plants/ha

## Medium density 50–150 plants/ha



100 plants/ha



150 plants/ha

## High density >150 plants/ha



250 plants/ha



650 plants/ha





# Management strategies

Nathan March

The best and most economical way to control weeds is to prevent or reduce their spread, and the right actions undertaken early may dramatically reduce the costs of control in the future. Effective management strategies for control often relate to the biology and/or ecology of the plant such as the means of seed dispersal as discussed in section 1.

To control prickly acacia, the following strategies should be considered:

## Landholders

- To prevent plants maturing and setting seed in previously clean areas, learn to identify prickly acacia at the seedling and sapling stages.
- Identify the most likely means of spread to, and within, your property and minimise the risk.
- In clean paddocks, monitor susceptible areas for prickly acacia (and other weeds).
- Use Weed Hygiene Declarations when transporting or supplying contaminated 'things' (i.e. fodder, grain, seed, livestock, gravel, sand, soil, mulch, packing material, machinery, vehicles or water). In Queensland, declaration forms are available from your local government weeds officer or the local office of the Department of Natural Resources, Mines and Energy.

## Stock

- Don't let stock graze where mature pods are available (pods ripen from about late October to January).

- As seed may take about six days to pass through their digestive tract, quarantine cattle when moving them from infested paddocks or properties (with pods) to clean areas.
- As sheep graze seedlings more heavily and do not spread seeds as readily, if possible, run them instead of cattle in prickly acacia infested paddocks. However, paddocks and properties running sheep can still be seriously infested with prickly acacia in the long term.
- Consider the strategic use of alternative browsing stock (e.g. goats, camels) to reduce seed production or complement control efforts.

## Infrastructure

- Fence off infestations or major seed source areas from susceptible country. Combined with managing stock movement, this is the cheapest way to contain prickly acacia.
- Replace open bore drains with piped water, as prickly acacia trees along bore drains are a major seed source.
- Use other means of shade where possible (e.g. shade plots or artificial shade structures).

## Pasture management

- Conserve perennial grasses to reduce establishment and growth of prickly acacia seedlings.
- Reintroduce native pasture to mechanically treated areas by managing stocking rates and/or sowing pasture.

## Control

- Control least infested paddocks first to ensure the maximum area treated per dollar spent.
- Maintain bore drains and dams free of prickly acacia to reduce seed production.
- Strategically control key infestations to improve property management (e.g. develop mustering lanes through dense prickly acacia).
- Don't try to mechanically control prickly acacia from October to January when the pods are mature. This may lead to distribution of seeds by stock at a time of year when rainfall is imminent, resulting in high germination rates.



► Treatment of bore drains will reduce prickly acacia seed production and spread



# Developing a weed control plan

Nathan March

As controlling prickly acacia can be expensive, it is important to optimise efforts by developing a weed control plan that is integrated into overall property management. Such a plan can be developed using the seven-step approach provided below:

## Step 1: Define the problem

- Draw a property map showing paddock boundaries, watering points, creeks and rivers.
- Indicate areas of weeds with notes on the size, density and species of each infestation.
- Identify and indicate land types.

Base maps can include aerial photographs, satellite imagery or hand drawn sketches—the greater the accuracy of the map, the greater its usefulness in estimating the costs of control. The use of separate overlays (plastic transparencies) for each of the components of the plan is also often useful.

## Step 3: Determine control and management options

- Identify management strategies that will reduce or prevent the spread of the weed.
- Identify currently available or affordable resources (e.g. labour, machinery, spray equipment).
- Determine the methods required to address all three phases of the control program—initial treatment, follow-up and ongoing monitoring.

Effective strategies may reduce future costs of weed control. Refer to page 23 for details of various strategies. Usually an integrated approach using a combination of control techniques will be required.

## Step 2: Determine priorities

- Determine priorities for control on both a paddock and property basis
- Assessments should be made of:
  - areas that may pose management problems
  - areas that may be a significant seed source
  - risks
  - productivity of affected paddocks
  - legal and ethical responsibilities (e.g. threat of prickly acacia to neighbouring properties).

## Step 4: Develop a financial plan

- Estimate costs of management or control for each of the priorities identified.
- Compare the costs of control with those of other operations being undertaken on the property. Identify the availability of financial incentives including tax concessions, low interest loans or labour programs.
- Integrate control costs into short-term and long-term budgets.

Control costs must be considered in conjunction with evaluation of priorities and control options. Before committing a large amount of money, conduct small-scale trials or seek advice from a professional weeds officer.

### Step 5: Schedule activities

- Consider the effectiveness of different control methods at different seasons and balance this with the time available.
- Prepare a timetable for weed control activities throughout the year.

Weed control should become an annual part of station management if weeds are, or could become, a major problem. As it is perilous to treat a larger area than you will have time to treat again in the next year or two, consider the level of follow-up required in advance.

### Step 6: Monitor progress

- Check treated areas for regrowth or seedling emergence.
- Regularly inspect 'at risk' areas for new outbreaks.
- Document the resources invested in control and assess the effectiveness of each method.

Monitoring is critical to the long term success of your efforts.

### Step 7: Follow-up what was started

- Identify areas for follow-up control from your monitoring program.
- Implement management and control options according to the situation.

Follow-up control is crucial. No control method will result in a 100% kill rate and the germination of seedling is to be expected.

### Conclusion

A weed control plan is useless without implementation. If it's difficult to start planning because of the size of the problem or lack of experience, start on a smaller scale and seek professional advice.

Developing a weed control plan and staying committed to using it are essential for effective long-term control. Such a plan should be structured but flexible enough to allow for changes brought about by uncontrollable external influences such as drought and fluctuating commodity prices. It should also be reviewed annually to assess how effective and efficient the chosen strategies and methods of control have proved to be.