



Final report

PDS: Cooperative, integrated weed management in the BBB catchment

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Abstract

“Cooperative, integrated weed management in the BBB catchment” (the Bowen, Broken, Bogie River Catchments of the Burdekin Dry Tropics) aimed to demonstrate a cooperative and integrated approach to the management of high priority weeds on six demonstration grazing properties.

Weed management plans were implemented in six project areas and extension support was provided for adoption of improved practices and any successfully demonstrated technologies. The project also worked with other graziers to increase weed management activity.

The project reinforced the significance of weed management for graziers in the project area and created social and extension “chatter” about weeds, which extended into local and regional communities.

Demonstrating practical cooperation across property boundaries was a challenge but networks were important in encouraging implementation of improved landscape management.

Legislation uncertainty was a key challenge for improved weed management practices and better extension is required.

The project resulted in a marked increase in weed management activity and impressive production benefits, with four of the six core project producers rating the project 7 out of 10 in assisting them to manage their livestock enterprise better.

The uptake of simple, inexpensive but efficient technology can be high after successful demonstration, with the Auscrimper sucker puller a standout for this project.

Executive summary

Background

The “Cooperative, integrated weed management in the BBB catchment” project aimed to demonstrate a cooperative and integrated approach to identify the best practice management of the highest priority economic weeds in the Bowen, Broken and Bogie River (BBB) Catchments, of the Burdekin Dry Tropics.

The demonstration and implementation of improved weed management practices aimed to have immediate benefits for the demonstration properties but, more importantly, to be closely observed by neighbours and other graziers. The demonstrations were intended to have important flow on impacts on weed management for the more than 70 commercial grazing properties in the BBB.

Objectives

- The project trialled integrated approaches to the management of the highest priority weeds in the BBB, on six demonstration grazing properties and evaluated the approach.
- Explored two of a target of three test cases for improved approval procedures for large scale weed management activities.
- Collaboratively held seven of a target of nine field days and other extension activities, including in adjoining regions e.g. the Don River Catchment.
- Encouraged development and implementation of weed management plans, through direct project support and collaboration from other projects and Whitsunday Regional Council.

Methodology

- Developed weed management plans for six cooperating properties and implemented the plans in designated project areas.
- Collaboratively provided promotion and extension support for adoption of improved practices and adoption of any successfully demonstrated technologies.
- Worked with groups of graziers (cluster groups) to increase implementation of weed management activity.

Results/key findings

- The project reinforced the significance of weed management for graziers in the project area and beyond: the loss of production, impacts on ecological/landscape function, and the time, effort and resources required to manage weeds in a grazing landscape.
- A focussed weeds project creates social and extension (technical advice, field days, workshops, property visits etc.) “chatter” which extends into the local community.
- Networks are important in encouraging implementation of improved landscape management: providing rapid technology transfer and exchange of ideas and approaches.
- It was a challenge to demonstrate practical cooperation across property boundaries without external drivers (e.g. cash, equipment, labour etc.) and adequate coordination support to encourage joint action.
- Legislation misapprehension and uncertainty is a key challenge for implementation of improved weed management practices.

Benefits to industry

- The project trialled and encouraged a wide range of weed management approaches, both current and some new technologies for the region, which resulted in a marked increase in weed management activity and impressive production benefits, through increased pasture biomass and pasture quality of treated country.
- Four of the six core project producers provided a rating of 7 out of 10 for how valuable the PDS was in assisting them to manage their livestock enterprise.
- All core project producers nominated that they had made or intend to make other changes to their business as a result of participating in this PDS.
- The region's graziers now have access to, and expanded knowledge of, a range of tried and tested weed management approaches and technologies which were not available prior to commencement of the project.
- The uptake of simple, inexpensive but efficient technology can be high after successful demonstration, with the Auscrimper sucker puller a standout for this project.

Future research and recommendations

- *Grewia* (*Grewia asiatica*) was frequently mentioned by graziers as an emerging weed of significance across the region. Research is urgently required to improve control options for graziers before it becomes the new rubber vine or prickly acacia of the region.
- Many funding organisations seem reluctant to invest in weed projects, presumably due to the scale of the issues and ongoing costs, however, targeted programs can result in big gains for production and ecological outcomes when graziers are provided with incentives to test techniques at a manageable scale, are actively engaged, and are encouraged to share information.
- There is a need for active extension by the custodians of key relevant legislation to provide practical weed management solutions for landholders.

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1. Background

1.1 Project overview – cooperative, integrated weed management in the BBB catchment

This Producer Demonstration Site (PDS) project aimed to demonstrate a new, cooperative and integrated approach to identify the best practice management of the highest priority economic weeds in the Bowen, Broken and Bogie River Catchments, of the Burdekin Dry Tropics.

Many grazing businesses in the Bowen, Broken and Bogie River catchment (the BBB), of the Burdekin Dry Tropics region, are supported through NQ Dry Tropics programs. A NQ Dry Tropics weed forum held at Collinsville in March 2018 identified the major weeds of concern to the BBB and agreed that cooperative approaches, the application of emerging technologies, on-farm biosecurity and improved grazing management were critical factors in the long term management of the priority weeds.

Subsequent interactions with BBB graziers showed that more than 92% of graziers in the Catchment identified weeds as being the biggest threat to the long-term sustainability of their businesses. Lantana (*Lantana camara*), rubber vine (*Cryptostegia grandiflora*), prickly acacia (*Vachellia nilotica*), bellyache bush (*Jatropha gossypifolia*) and chinee apple (*Ziziphus mauritiana*) were identified as the major weeds of economic and productive significance.

These weeds are costly to manage (increasing production costs), are highly invasive (reducing carrying capacity of properties), and compete strongly with pasture (reducing the ability to produce beef) while reducing effective ground cover. They are either:

- of concern across the entire Catchment e.g. rubber vine and chinee apple
- of significance due to their potential impact e.g. bellyache bush
- of particular significance to a segment of the Catchment e.g. lantana in higher rainfall areas and prickly acacia on more productive soils.

Some graziers in the BBB were successfully managing major weeds through an integrated approach - attention to biosecurity, consistent and vigilant management of weed occurrences, adoption of the latest technologies, and maintenance of vigorous pasture to ensure competition with potential weed species.

Recommendations for more collaborative, integrated approaches between properties and with other land managers, and adopting neighbour friendly approaches to weeds, were well received in discussions with graziers. Although these approaches have been encouraged through regional weed management planning processes, through regional government programs and through State government legislative and extension efforts, they were still not widely adopted.

Groups of graziers ("cluster" groups) formed in the BBB as a grazer support approach of the NQ Dry Tropics, Landholders Driving Change (LDC) project. Cluster groups were a critical part of engagement for this PDS, particularly Bowen River and Exmoor Road cluster groups and, initially, Scottville cluster group.

This project aimed to develop demonstration projects on six cooperating BBB enterprises, from within the existing and newly forming grazer groups, to further trial and promote integrated approaches to the management of the five major economic weeds of the region. The core group of cooperating properties were typical of the area, ranging in size from 15-40,000ha and running 2-5,000 breeders.

The NQ Dry Tropics Landholders Driving Change project provided up to \$22,000 in cash for each of the six demonstration enterprises to initiate the demonstration, adoption and implementation of the improved weed management practices (e.g. through whole of property weed management planning,

new technology, equipment and resources, and access to technical expertise), and provided locally based facilitators in the first two years of the project.

Demonstration and implementation of improved weed management practices aimed to have immediate benefits for the demonstration properties but, more importantly, to be closely observed by neighbours and participating cluster group members. The demonstrations were intended to have important flow on impacts on weed management for the more than 70 commercial grazing properties and around 50 smaller properties operating in the BBB.

2. Objectives

By December 2022, in the Bowen, Broken and Bogie River catchments, Burdekin Dry Tropics region of Queensland:

- Trial a cooperative and integrated approach (compared to the current ad hoc and uncoordinated approaches taken by many graziers in the region) to the management of the highest priority weeds on six demonstration grazing properties across 10,000ha in the Bowen, Broken and Bogie River catchments.
- Evaluate the approach with a network of cluster groups formed (and forming) in the area using measures such as:
 - hectares under treatment pre and post demonstration site activities
 - areas of restored pasture under production as a result of weed management activities
 - historical weed management costs pre and post demonstration site activities
 - documentation of the social and legacy benefits of the collaborative/cooperative approaches
- Develop at least 3 test cases for improved approval procedures for large scale weed management activities, with officers from the Department of Natural Resources, Mines and Energy.
- 50% of demonstration group neighbours and the cluster group businesses will adopt the cooperative weed management approach and an additional 5 producers in the Catchment will trial the approach.
- At least 35 properties will have documented weed and pest management plans with evidence of implementation progress on a high proportion of those plans.
- Six short case studies will be produced on the outcomes of the approach for each weed theme.
- Conduct 3 cluster group field days/annum and other extension activities to adjoining regions e.g. the Bowen/Burdekin and Mt. Coolon areas, to showcase the demonstration site results, and encourage adoption of key practices by a minimum of 5 attending producers from other parts of the Burdekin Catchment.

3. Methodology

3.1 NQ Dry Tropics support

The NQ Dry Tropics LDC project provided cash and facilitation support to the project, including facilitators (Mick Shannon, Adrienne Hall then Rodger Walker) in the first two years. Mick Shannon initially negotiated the LDC investment with landholders, following site visits and discussions on the best approaches to managing the property's priority weed(s).

COVID health measures created some initial logistical and operational disruption to the initiation and implementation of the project. Personnel changes at NQ Dry Tropics also caused some delays in reporting by the responsible facilitators. The project remained on track and achieved the majority of project objectives.

The LDC financial contribution (\$22,000 project investment/property except \$11,000 for Inkerman station) to the PDS project sites allowed new techniques and weed management approaches to be trialled. On-ground project support through the LDC investment included:

- Glenalpine station, Bowen – emerging weeds. LDC supported the purchase of 1 x Auscrimper sucker puller attachment, 1 x splatter gun kit plus accessories, 1 x 20l Genesis spray kit, plus weed clearance using the sucker puller.

Figure 1: Bobcat mounted Auscrimper sucker puller, Glenalpine, Bowen



- Glenroc station, Gumlu – rubber vine. LDC supported the purchase of 1 x Twin Reel 600l QuikSpray slip on unit, 2 x splatter gun kits plus accessories, 1 x Genesis 20l power spray kit, plus 20 hours of dozer hire for fire breaks.

Figure 2: QuikSpray unit on Coll's Earthmoving vehicle ready for rubbervine spraying at Glenroc, Gumlu



- Inkerman station, Inkerman – chinee apple. LDC supported the purchase of 2 x splatter gun kits plus accessories and 2 x Genesis 20lt power spray kits, plus weed spraying which was not completed due to the sale of the property in August 2021.
- Sonoma station, Collinsville – prickly acacia/mimosa bush. LDC supported the purchase of 1 x excavator hammer mulcher head and 1 x splatter gun kit plus accessories.
- Strathalbyn station, Bowen – bellyache bush. LDC supported the purchase of 1 x Auscrimper sucker puller attachment, a Kiwitech electric fencing set-up for temporary grazing cells plus weed clearing (a Forestry Raptor mulcher was used).

- Turrawulla/Exmoor stations, Nebo/Collinsville – lantana. LDC supported the purchase of 2 x splatter gun kits plus accessories, 2 x Genesis 20l power spray kits and 1 x excavator 125-EZ flail mulcher head.

3.2 Core demonstration sites

The demonstration focus for the project was to trial and adopt new, cooperative and integrated approaches on the six demonstration properties and to identify the best practice management of the highest priority economic weeds in the BBB catchments. An initial cooperating property, Strathmore station (prickly acacia), withdrew from the project and was replaced by Sonoma station, Collinsville. Sonoma did not have prickly acacia but a weed with similar characteristics, mimosa bush (*Vachellia farnesiana*).

The six enterprises worked with the following weeds:

- Glenalpine station, Bowen (23,379 ha) – emerging weeds
- Glenroc station, Gumlu (11,140 ha) – rubber vine
- Inkerman station, Inkerman (16,180 ha) – chinee apple
- Sonoma station, Collinsville (14,287 ha) – mimosa bush
- Strathalbyn station, Bowen (32,916 ha) – bellyache bush
- Turrawulla/Exmoor stations, Nebo/Collinsville (50,980 ha) – lantana

The properties tackled the weeds of most importance to their area, explored and, where practical, implemented a suite of options, including mechanical and chemical controls, combined with grazing best practices. Glenalpine also investigated the most effective methodologies and tactics for control of emerging weed threats for their operation.

The demonstration properties applied on-farm biosecurity, developed and implemented integrated weed management plans, applied current and emerging technologies to the task, utilised the equipment and machinery purchased through the LDC financial support, implemented grazing best practices and establishment of competitive pasture swards for inhibiting weed germination and establishment. An aim was to seek opportunities to adopt neighbour friendly and collaborative weed management practices (with neighbours, industry service providers, utilities/mining companies, local government/extension officers etc.).

Core demonstration property owners have applied project strategies and approaches across all managed landholdings. Through property purchases and joint management the scope and scale of project influence has dramatically increased since project inception.

Table 1: Core property manager landholdings

Entity	Managed Property	Area (ha) – approx.	Breeders	Total cattle
O'Sullivan Pastoral Holdings	Glenalpine (core)	23,400	2000	8000
	Lucie, Dingo (purchased)	4,500	0	1000
Colls Earthmoving	Glenroc (core)	11,100	1,000	1,900
LD Grazing	Inkerman (core/change ownership)	16,200	1,500	1,500
Sonoma Grazing	Sonoma (core)	14,300	1,500	2,800
	Milwarpa, Bowen (additional)	8,500	1,300	1,400

Entity	Managed Property	Area (ha) – approx.	Breeders	Total cattle
Wentworth Cattle Co.	Strathalbyn (core)	32,900	7,000	9,000
	Tabletop/Amberkolly (additional/purchased)	33,000	3,000	6,000
Comerford Brothers	Turrawalla (core)/Exmoor (joint management)	51,000	4,000	9,000
	TOTALS	203,700	21,000	40,000

3.3 Supplementary on-ground project activity

Follow up on-ground projects were implemented through MLA PDS project resources. All projects utilised contractors or on-site operators and other resources to undertake weed management activities, based on successfully demonstrated practices. This project activity utilised machinery and equipment purchased through LDC project contributions to the PDS project, other LDC project investment or through landholder equipment and resources.

- Glenalpine – continuation of the demonstration project by expanding the implementation of control works, employing an operator to utilise the Auscrimper sucker puller, and pushing back infestations to creek areas and ensuring follow up of previously treated areas. A suitable seed mix will be broadcast on treated areas to ensure re-establishment of a competitive pasture sward to assist in long term management of weed regrowth.
- Glenroc – continuation of the demonstration project by expanding the implementation of control works, employing an operator to clear further areas of dense rubber vine, and pushing back infestations to creek areas and ensuring follow-up of previously treated areas.
- Inkerman – continuation of the demonstration project by undertaking control works for chinee apple, pushing back infestations to creek areas and ensuring follow-up of previously treated areas through an on-site operator.
- Strathalbyn – continuation of the demonstration project by expanding the trialled techniques in an implementation phase. The most important learning from the trials was the critical role of re-establishing competitive pasture to assist in long term management of weed regrowth. A number of pasture mixes were trialled and Strathalbyn now have a mix that both establishes well and outcompetes weeds through vigorous growth and a competitive canopy. A pasture seed mix was broadcast on treated areas to ensure re-establishment of a competitive pasture sward.
- Collinsville Horse and Pony Club – a good neighbour project with Sonoma station – using contractors to undertake a weed eradication project to ensure that the Club are not a seed source onto the recently managed boundary with Sonoma. The project was supported by technical and chemical contributions from the Whitsunday Regional Council.
- Bowen River cluster group (Blue Valley, Glenmore, Hellsgate, Mt. Wickham and Riverview stations) – the properties engaged a local contractor to undertake weed management work using a range of control strategies, across the properties, utilising group equipment. One property also broadcast a pasture mix on treated areas to ensure re-establishment of a competitive pasture sward to assist in long term management of weed regrowth.
- Exmoor Road cluster group (Turrawalla/Exmoor, Exevale and Eungella stations) – the properties have active weed management programs with the project activities aimed at a continuation of control works and ensuring the follow-up of previously treated areas, particularly for lantana which is a serious weed for the properties. The properties engaged contractors/operators to

undertake lantana management work using a range of control strategies. Turrawalla/Exmoor works were a continuation of the demonstration project.

3.4 Grazier engagement and extension

A range of grazer engagement and extension activities were delivered through the project. Three weed focussed field days were organised through this project and jointly branded with the LDC project. Attendance at the three field days totalled 94, including staff from NQ Dry Tropics, the Department of Agriculture and Fisheries and Whitsunday Regional Council, consultants, weed contractors and agronomists, and the owners, managers and station hands from 33 properties.

Figure 3: Sonoma station's Shane Watts demonstrates a splatter gun, a low volume, high concentration herbicide applicator, at the weeds field day held at Sonoma on 17 March 2021



The LDC project provided collaborative and complementary field activities, largely prompted by discussions with cluster groups, and addressing specific issues raised by graziers around weed issues. These activities included training in weed hygiene, biosecurity and chemical application, and improved procedures and knowledge around legislation and broad scale weed management.

4. Results

4.1 Project outcomes

4.1.1 Trial a cooperative and integrated approach

Objective: Trial a cooperative and integrated approach (compared to the current ad hoc and uncoordinated approaches taken by many graziers in the region) to the management of the highest priority weeds on six demonstration grazing properties across 10,000ha in the Bowen, Broken and Bogie River catchments.

Summary of project weed management activity across 8,660 ha from July 2020 to January 2023:

Glenalpine station

Develop biosecurity protocols for emerging weed management and trial innovative weed management practices.

- Attended biosecurity, chemical application and vehicle clean-down training.

- Established designated clean-down area with high pressure air and water washdown facilities.
- Established and implemented vehicle hygiene protocols for all vehicles entering the property.
- Limited rubber vine management had occurred on the property prior to commencement of the project.
- Utilised an Auscrimper sucker puller, to trial rubbervine (and some prickly acacia) treatment on better soils and riparian areas across 390 ha trial area.
- Purchased another Auscrimper sucker puller and an (airconditioned) bobcat and treated an additional 490 ha.
- Some spot spraying in hard to access areas and trialled the scatter gun on regrowth and germinating seedlings.
- There was a significant increase in grasses/pasture growing where it was previously bare ground under the dense rubber vine infestations.
- Employed a contractor for four months (to January 2023) to work across 1200 ha of river country controlling rubbervine and other woody weeds with the sucker puller.

Figure 4: Auscrimper sucker puller removing prickly acacia (left) and completed (right)



Learnings:

- Weed hygiene protocols were easy to establish and maintain.
- Auscrimper sucker puller proved an efficient and cost effective technique for managing rubbervine and similar structured weeds.
- The sucker puller can be used at any time, as long as there is sufficient moisture e.g. riparian areas in the dry season, with a 99% positive result.
- As the process is very selective, there has been virtually no impact on non-target species.
- The dense rubber vine was a harbour for feral pigs.
- Re-establishing a competitive pasture sward in cleared rubbervine on better soils is critical to manage seedling recruitment.

Glenroc station

Undertake trial treatments for predominately intact and regrowth rubbervine and some areas of lantana - chemical application, mechanical (dozer) and burning.

- Historically, there was limited weed management activity on the property prior to commencement of the project.
- Dozed 20 ha trial area and further 20 ha of dense rubbervine and lantana.
- Completed foliar spray with Metsulfuron of rubbervine around edges of trial area and along tracks across 2800 ha, with an initial kill of 95%.
- Pushed fire breaks around the stacked weed piles and the sprayed areas. Tried a hot fire but there was not a sufficient fuel load to be successful.
- Received technical advice on use of splatter gun and will utilise to reduce chemical costs in treatment of rubbervine regrowth.

Learnings:

- Have since purchased a Challenger plough to fully rehabilitate better soil areas infested with rubbervine and reseed with competitive pasture and legumes.
- Some regrowth occurred due to insufficient spray coverage and seedling recruitment in bare areas.
- Require higher fuel loads to successfully use fire and will modify grazing practice to try again.
- Will utilise splatter gun for regrowth.
- Investigating the use of a drone to chemically treat Parthenium.

Inkerman station

Trial chemical and mechanical control of predominately intact and regrowth chinee apple, as well as prickly acacia, rubbervine, and some areas of lantana.

- Limited weed management activity on the property prior to commencement of the project.
- Original owners trialled splatter gun on two 10 ha trial sites, then property sold in August 2021.
- New owners stick raked, cutter barred and ploughed 740 ha in two paddocks and reseeded with forage sorghum.

Figure 5: Stick raking of chinee apple and prickly acacia at Inkerman station, September 2021



- Aerial application of Grazon to suppress weed regrowth across 270 ha.
- Aerial application of Starane to kill mature chinee apple across 220 ha.
- Basal bark spot spray treatment of regrowth around house and yards and holding paddocks across 250 ha.
- Received technical advice on use of the splatter gun and will utilise to treat scattered lantana across 1800 ha.

Learnings:

- As much of the property was historically cleared, the new owners considered that full development was the most effective technique for controlling the dense weed infestations on better soils at a cost of \$330/ha for around 90% reduction in weeds.
- Weed seed recruitment occurred mostly on heavily grazed areas such as around water points.
- Aim to plough regrowth weeds once forage sorghum declines in vigour and re-establish a mixed pasture.
- Aerial application was useful in suppressing mature weeds at a cost of \$65/ha, for a 50-75% reduction in weeds, until more effective techniques can be applied.
- When planning aerial treatments, neighbouring properties, and surrounding land use needs to be taken into consideration to mitigate spray drift risk.

Sonoma station

Trial chemical and mechanical control of predominately intact and regrowth mimosa bush, as well as rubbervine, chinee apple and other woody weeds.

- Active weed management implementation on the property, including the grazing of camels for reduction of weed growth and seed production, prior to commencement of the project.
- Weed management trials of intact and regrowth mimosa bush
 - Mechanical removal trial using corner tip on dozer to remove plants across 40 ha was successful with adequate soil moisture.
 - Basal bark treatment using Access and diesel across 20 ha was highly successful.
 - Tebuthiron aerial application across 160 ha was successful with 98% kill.
- Mechanical removal trial using the Flail Mulcher on 5 ha of dense rubbervine and chinee apple.

Figure 6: Utilising the Flail Mulcher to remove chinee apple, Sonoma station



- Splatter gun trial with Metsulfuron across 2 ha trial area
 - Control of chinee apple and rubbervine was successful when actively growing.
 - Was unsuccessful on *Grewia asiatica*.

Learnings:

- Regulatory requirements need to be fully considered with aerial application of Tebuthiron and cannot be utilised in certain situations.
- Dozer corner tip gave an 85% kill of mimosa with good subsoil moisture but an increase in seedling germination if used on chinee apple.

- Chemical or other treatment of regrowth is required after mechanical interventions.
- A 99% kill of rubber vine and an 80% kill on chinee apple, under 2 metres tall, with the splatter gun.
- The flail mulcher head was slow going with pickets and wire and rubbervine wrapping around the mulching drum. A high cost activity which is probably too cost prohibitive, except on targeted sensitive, eroded, creekbank areas.

Strathalbyn station

Trial chemical and mechanical control of predominately bellyache bush, as well as rubbervine, chinee apple, Parkinsonia and other woody weeds.

- Limited weed management activity in the project area prior to commencement of the project.
 - Treatment of bellyache bush and rubber vine on riparian areas was previously through fencing, spraying and burning.
 - Rubbervine was successfully managed in other areas of the property, from mid-2018, using an Ellrott plough.
- The predominately rubber vine/bellyache bush weed infestation in the project area was not conducive to ecological or landscape function. The weeds out competed native species, with rubber vine often collapsing tree canopies, and created a simplified landscape in D/C land condition. The large body of weeds also resulted in low to no ground cover underneath the canopy.
- Sprayed 120 ha of trial area using a custom made boomless jet spray (30 metre swath) with 7000 litre tank and trailer for foliar spray with Metsulfuron Methyl and wetter and as follow-up for mechanical interventions at cost of \$140/hr.
- Trialled mulching an area of dense bellyache bush, with other weeds, across 50 ha using a Raptor Forestry Mulcher.
 - Prohibitively expensive at \$800/ha.
 - Utilised a Kiwitech temporary electric fencing arrangement to bale graze (1000 breeders on bales of hay over 5 days) treated areas to assist establishment and management of vegetation (forage sorghum based pasture seed mix).
 - Follow-up spray of regrowth weeds.

Figure 7: Riparian area densely covered in bellyache bush and rubbervine (left) and forage sorghum based pasture after treatment, December 2022 (right) at Strathalbyn station



- Trialled an Auscrimper sucker puller attached to a bobcat across 120 ha which proved very effective for scattered clumps and individual woody plants at about \$95/hr. Now treated across about 500 ha.
- In the last 18 months, utilised an Ellrott blade plough to rehabilitate large expanses (about 400 ha) of dense predominately rubbervine/bellyache populations, generally on flood out, black soil flats at a cost of about \$250/hr. Reseeding as it ploughs.
- Reseeded treated areas with forage sorghum based pasture mix which has proved highly successful.
- Follow-up spray of regrowth weeds.

Learnings:

- Historically limited weed management had occurred in the treatment areas. Previously fencing, spraying and burning of bellyache bush so treatment trials have been very useful.
- Wouldn't use the Kiwitech and bale grazing approach again as it was time consuming and costly, and also not necessary now, due to extensive permanent fencing/stock water improvements.
- The Auscrimper sucker puller was not robust enough initially and needed modification. The manufacturer has adapted the machine based on the feedback from Strathalbyn.
- The sucker puller did not work with creeping mimosa and for chinee apple it doesn't work when plants are over 10cm diameter. All plants under a thickness of a thumb will break off. The operator needs to ensure that every root is detached when removing a plant. The puller works best when there is some moisture to aid removal.
- Ellrott blade ploughing shouldn't be undertaken with expected rainfall within two of days of ploughing – the top 10cm of soil needs to be dry – or the rate of return of weeds is significantly higher.
- Spray treatments gave a generally 90% kill. Need to get full coverage of rubbervine to ensure it dies and only treat when actively growing. Cannot undertake spraying after approximately 10 am when winds pickup and temperatures rise. Plants not to show any signs of stress.
- Prior to undertaking weed management the treatment areas carried 1 beast to 40 ha and in 2022 carried 1 beast to 2.5 ha.

Turrawalla/Exmoor stations

Trial chemical and mechanical control of predominately intact and regrowth lantana.

- Active weed management program across the properties prior to commencement of the project.
- Trialled the splatter gun on 10 ha of lantana regrowth for a 60% kill. The area was later burnt to improve the control on the site.
- Utilised the turbo mister to complete spraying of over 200 ha of mature lantana growing on cleared country on Turrawalla with a 95% kill achieved.
- An additional 200 ha of mature and regrowth lantana was treated across Turrawalla and Exmoor.
- Will trail a flail mulcher head on sensitive creek areas.

Learnings:

- Only chemically treat plants when they are showing no signs of stress and have full leaf coverage.
- Chemical to be applied using the mister prior to 10 am when winds are low and temperatures are down.

- Only utilise the mister in areas where lantana is a monoculture to limit off target damage.
- Ensure there is fuel to carry a fire successfully through regrowth lantana, with timing critical for a successful burn.

Collinsville Horse and Pony Club

Contractors completed a weed eradication project with multiple woody weeds to ensure the Club grounds were not spreading weed seed onto neighbouring Sonoma station. The Whitsunday Regional Council developed a weed management plan with the group and the Council supplied Access for the spraying operations.

- Mechanical clearing of weeds across 40 ha and stick raked into piles. Firebreaks pushed for a controlled burn.
- Fire permit obtained to undertake a planned burn in conjunction with the local fire brigade.
- Follow-up spraying of regrowth.

Exmoor Rd. cluster group

Using on-property operators to undertake weed management activities, particularly lantana, using a range of methods and using property and group sourced equipment. All properties have active weed management programs, particularly for lantana.

- Mainly spraying of dense mature lantana on Turrawalla/Exmoor (200 ha), Exevale (20 ha) and Eungella stations (20 ha).

Figure 8: Before (left) and after (right, January 2023) lantana spraying at Eungella station



Bowen River cluster group

Following a meeting at the Bowen River Hotel in August 2019, the properties (Blue Valley, Glenmore, Hells Gate, Mt. Wickham and Riverview) participated in a range of weed related activities through the Landholders Driving Change project and with a Reef Assist team. The group has access to a range of weed management equipment to support coordinated weed management activities across the properties. The project encouraged additional weed management work through a local contractor to undertake weed management activities on the properties using a range of methods and utilising group equipment.

- Mainly application of Tebuthiuron pellets and spraying to manage lantana and *Grewia asiatica* (Mt. Wickham across 120 ha), rubbervine (Hellsgate across 150 ha), creeping mimosa and parthenium (Riverview across 60 ha) and bellyache bush (Blue Valley across 120 ha).

- One property, Glenmore, re-seeded areas treated for weeds by the landholder to ensure a competitive pasture sward was established to manage emerging and regrowth weed species.

4.1.2 Measured outcomes and cattle production benefits

Objective: Evaluate the approach with a network of cluster groups formed (and forming) in the area using measures such as:

- hectares under treatment pre and post demonstration site activities

Many of the project properties have active weed management programs, often with station hands, fulltime or seasonally, dedicated to weed management or through engagement of seasonal weed management contractors, aimed at managing a suite of weeds. However, Inkerman and Glenroc had limited weed management programs prior to project commencement and Glenalpine and Strathalbyn had minimal weed management activity in the project areas prior to commencement.

Weed management activity is also closely related to seasonal conditions and, with seasonal conditions being favourable across the project period, weed management activity was high.

It was generally difficult to separate pre and post project weed activity, particularly with the high cattle prices that prevailed through the project period. Anecdotally, most participating graziers reported that property expenditure for all management activities, e.g. property improvements, such as fencing and stock water infrastructure, road and track construction and maintenance, weed management and equipment purchases, had dramatically increased in the past few years.

In addition, the Landholders Driving Change project supported the acquisition of weed management equipment for the Exmoor Road and Bowen River cluster groups, in addition to the support provided to the core MLA project properties. The equipment includes three turbo misters, an Epple Skattergun and a 400l QuikSpray unit. This equipment has increased the capacity and capability for cluster group members to implement more efficient and effective weed management.

Table 2: Property weed treatment in trial areas, nearby paddocks, supplementary projects and using equipment/resources provided through LDC project funding contributions July 2020 – January 2023

Property/Project	Core project area activity Jul 20-Jun 22 (ha)	Supplementary project activity Jul 22-Jan 23 (ha)	Other related weed management activity Jul 20-Jan 23 (ha)	Total area of weed management Jul 20-Jan 23 (ha)
Glenalpine	390	1200	490	2080
Glenroc	20	20	2800	2840
Inkerman	760	250	490	1500
Sonoma	70	Not applicable	160	230
Strathalbyn	290	400	380	1070
Turrawalla/Exmoor	90	200	120	410
Collinsville Pony Club	Not applicable	40	Not applicable	40
Exmoor Road cluster	Not applicable	40	Not applicable	40
Bowen River cluster	Not applicable	450	Not applicable	450
Totals	1620	2600	4440	8660

- areas of restored pasture under production as a result of weed management activities

Excepting Sonoma, where weed infestations weren't severe enough to limit pasture growth, the trial weed management locations on core properties were seriously impacted by the targeted weeds. Effectively, there was limited pasture biomass and limited livestock production due to severe

competition from weeds, including capture of resources and canopy shading of the understorey, with often bare ground under many of the weeds. Baseline monitoring of these sites generally placed them in D or low C land condition.

The main project area at Strathalbyn, mainly infested with bellyache bush and rubber vine, was typical of other project sites with very low productive capacity prior to treatment. Carrying capacity was around 1 to 40 ha prior to treatment and post treatment was estimated at 1 to 2.5 ha.

Figure 9: Significant production potential from management of dense bellyache bush (image left) at Strathalbyn – 120 ha trial area (image right) sprayed left & untreated right of track, 2020



Following weed management, many areas revegetated with a range of pasture and pioneer species in the following wet season but sometimes with softer invasive weeds such as Parthenium e.g. at Turrawalla following spraying of lantana. Many pastures recovered well, however, and Glenalpine observed green panic and other soft grasses and legumes establishing after removal of rubbervine and Turrawalla and Exmoor reported similar observations after treatment of lantana.

Figure 10: Green panic & Urochloa re-established after lantana treatment at Turrawalla, January 2023



Strathalbyn (approximately 450 ha) and Inkerman (approximately 740 ha) re-seeded treated areas with forage sorghum or a forage sorghum based pasture mix, where mechanical disturbance was part of the control method, and this resulted in exceptional pasture and livestock production, after favourable seasonal conditions following re-seeding. Glenalpine has purchased a similar pasture mix to Strathalbyn and will be reseeded approximately 200 ha of more productive soils during the 2022/23 wet season,

following removal of rubber vine. Glenroc will also re-seed areas of more productive soils, in future, after treatment with a Challenger plough.

- historical weed management costs pre and post demonstration site activities

With some of the producers having limited weed management activity prior to project commencement, added to the significant increase in costs from pre to post project for labour, fuel, chemicals and other weed management expenses, pre and post demonstration site costs proved an unhelpful indicator for project outcomes.

All core producers agreed in their producer surveys that the most cost effective way to control infestations of weeds was to maintain a high level of groundcover: providing weed competition and suppressing weed germination and establishment.

Several of the core landholders have implemented significant grazing and pasture management changes to their properties over the last few years, aimed at improving ground cover and productivity. This can incur major investment costs through improving water infrastructure and decreasing paddock size to better control stocking rates, pasture utilisation and stock distribution within paddocks. NQ Dry Tropics has supported the core properties to implement some of these changes through land management projects, generally through sub-divisional fencing and installation of water infrastructure such as piping, tanks and troughs.

Some of the properties have not, historically, undertaken significant weed management activities and others had implemented limited weed management activity in the project area. Generally, however, most properties commit to total annual weed management programs which can cost in the \$100k's.

Table 3: Some examples of project weed management costs

Property	Activity	Cost/ha
Inkerman	Stick raking, cutter barring, re-seeding old cultivation/two mile paddocks (744 ha)	\$330
	Aerial application of Grazon in camel paddock with 50% kill (265 ha)	\$65
	Aerial application of Starane in Cooper's Paddock with 75% kill (220 ha)	\$65
Sonoma	Corner tip on D6K dozer to remove regrowth mimosa (40 ha)	\$150
	Mulcher head on excavator on dense creeklines (5 ha) - regrowth to be sprayed	\$380
Glenalpine	Kubota/Caterpillar 75horsepower bobcats with Auscrimper sucker pullers (880 ha)	\$30
Strathalbyn	Bobcat with Auscrimper sucker puller (500 ha)	\$23
	Raptor Forestry mulcher (50 ha) plus hay, seed cost and follow-up sprays	\$800
	Ellrott blade plough - dense rubber vine on flood out flats (405 ha) plus seed cost	\$255

- documentation of the social and legacy benefits of the collaborative/cooperative approaches

The six core project producers participated in a post project survey.

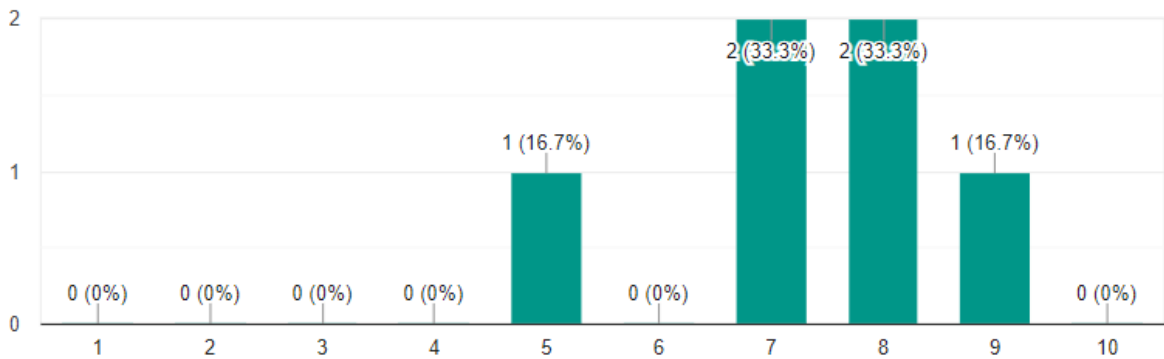
Overall the producers were satisfied with the PDS and all producers would recommend the PDS program to others. Four producers provided a rating of 7 out of 10 for how valuable the PDS was in assisting them to manage their livestock enterprise.

Two producers made comment about how the PDS could be improved:

"Some how-to guides to undertake works using new techniques or equipment would be useful. "

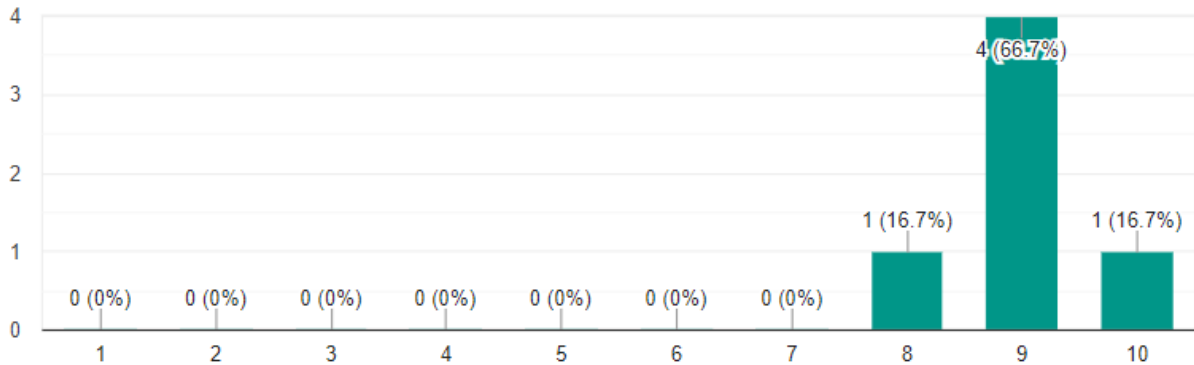
"More dollars to expand the program and replicate across property."

Figure 11: Overall, how satisfied are you with this PDS (6 responses)?



All producers were very confident about their ability to manage weeds but only two observed that the PDS project had increased their knowledge and skills of weed management, presumably due to their existing knowledge.

Figure 12: How confident are you in controlling weeds (6 responses)?



When asked if they had made/intend to make any other changes to their business as a result of participating in this PDS, the responses were:

- Seek more advice on how to use and put together the splatter gun.
- Continue to do more development work based on current results of the cutter bar, stick raking, ploughing and reseeding works.
- Continue to use an integrated approach – “Tweezers”, spraying, blade ploughing reduction of bulk weed cover. Reseeding. Grazing management.
- Employ a machinery operator to undertake the operation of the excavator mulcher.
- Yes, continuation of sound weed management practices, improve splatter gun technique and also aerial application and the corner tip of dozer.
- Looking at more regenerative practices using minimal chemical. Continue to use an integrated approach – “Tweezers”, follow up following tweezer work or chemical (sparingly). Reseeding where required and grazing management.

Individual grazier reflections on the PDS included:

Barry O’Sullivan, Glenalpine station “Managing weeds is our biggest challenge. Weed management is a heavy user of our time and therefore, a great expense on our business. However, if we don’t start

eradicating weeds the job will become out of control, especially considering the amount of seed that continues being spread.

Being involved with a group, and having professional advisers to help with technical information, as well as monitoring sites, gives me the motivation to get into it. It's good to be part of a group to be able to compare equipment and poisoning applications and techniques.

At the end of the project, success for our property will be to have the weeds gone from the open forest country, and weed populations along the creek areas becoming less every year through a planned strategy."

Shane Watts, Sonoma station "Weeds is one of the most pressing management issues for landowners and public land managers. Management requires integrated control approaches and everyone needs to be involved - government of all levels, NRM groups, and landholders across all agricultural industries."

Bristow Hughes, Strathalbyn station, "Navigating the regulatory process can be confusing resulting in delays and additional requirements, especially when you're being passed from one government department to another trying to get an answer.

As a grazier, there can be short windows in which you have the time and money available for a project to improve your land and business. As soon as you start the process of seeking approval for that project, you lose momentum because it's so drawn out. If the government can close that lag time, then that would be a good outcome for the grazier, the environment and government.

Having relevant government department representatives on-ground in the paddock to discuss the issue meant questions around regulation were explained and clarified promptly, and the process to undergo treatment, shortened.

It made all the difference in me getting a good outcome, and I now have contacts in relevant government departments that I can go to directly to seek clarification or advice. Bringing the right people together to tackle a problem or issue has been ideal. We're not going to have successful uptake of practice change, or people undertaking on-ground works to improve their country if we don't have strong relationships with all stakeholders working together."

Bristow commented that "One of the toughest challenges facing producers is weed management. There's no simple solution to weed control, it needs an approach that combines integrated tactics, such as mechanical, chemical and management practices. It's about working smarter, not harder, because weeds will never be eradicated. Constant management is key. Being part of the MLA PDS group enabled us to demonstrate practices and technologies that worked well."

At Glenroc station, historically, limited weed management had been undertaken across the property. Managers Cade and Chrisop Colls have been encouraged by the project to implement a more planned approach to weed management and have invested in a Challenger plough, as well as utilising the QuikSpray unit on continued management of the project area and surrounding paddocks. Cade has started to use a drone to monitor weeds and pasture coverage and will trial the use of a drone to spray Parthenium.

Cade said "The NQ Dry Tropics offer to be part of the MLA weeds group's war on weeds could not have come at a better time. We had just started our weed management plan and it had become an overwhelming job. We started small, treating fence lines and small infestations, but knew we had to do more. As a result we have employed a worker two days a week, primarily for weed management. We use a mix of clearing, foliage spray and basal barking. So far our war on weeds has proved labour intensive and expensive but we find a great sense of accomplishment when we see how well a paddock responds after weeds have been eradicated".

Jim Rollinson, manager Inkerman station, said that gaining local knowledge about what other producers and specialists are doing is very useful in developing a management plan to manage weed infestations. Jim and wife Tracey attended the MLA field day at Nyoola in March 2019 and a Department of Agriculture and Fisheries field day at Jerona station on property development. With significant development works planned when the property was purchased in 2021, the events were important for them to better understand the options for implementation.

There was a heavy focus by the new property owners on getting the most productive areas of the property in order. “It was good to have the opportunity to test techniques to improve both land condition and production outcomes. Rather than trying to tackle weeds across the property all at once, which is costly, we focussed on two paddocks. They were stick raked and cutter barred and then planted with forage sorghum. Starting from scratch meant we could restore paddock health and production, resulting in improved cattle weight gain. Over time, with regular treatment, weed control should get easier. We’ll now move on to improving the next paddocks”.

Tracey noted that “Managing weeds is time consuming especially when dealing with regrowth. We’ve had a great wet season, and weeds love and respond to the moisture.” Project support allowed the Rollinsons to engage a contractor to treat weeds while they got on with the rest of the business.

“The Farmmap 4D program has been very useful in the planning of paddock development and weed projects, while a DJI Mavik 25 drone has been used to monitor weed regrowth across paddocks. This technology has provided a better understanding of what regrowth is coming through on the ground and enabled far better decisions to be made about treatment programs and when follow-up should occur”.

4.1.3 Adoption of the approach in the Catchment

Objective: 50% of demonstration group neighbours and the cluster group businesses will adopt the cooperative weed management approach and an additional 5 producers in the Catchment will trial the approach.

An additional seven producers from the Exmoor Road (Exevale and Eungella stations) and Bowen River (Blue Valley, Glenmore, Hellsgate, Mt. Wickham and Riverview stations) cluster groups implemented sound weed management practices as part of this project. Additionally, the Collinsville Horse and Pony Club undertook a weed eradication program to support the weed management practices of neighbouring Sonoma station.

Figure 13: Bowen River cluster group member Owen Howard, Hellsgate (right), demonstrates an Epple Skattergun for controlling infestations of prickly acacia and other weeds, with from left, cluster group members Jim Hillier, Glenmore, Greg Sibson, Blue Valley and Luke Woodhouse, Mt. Wickham



There has been a high uptake of some of the technologies demonstrated through this project. An excellent example is that the original purchase of an Auscrimper sucker puller by Strathalbyn resulted in the purchase of another nine to date in the region, including two at Glenalpine, Strathalbyn’s neighbour De Salis station and well known coastal property Glencoe station. The Glenalpine property owners purchased an additional sucker puller attachment and bobcat as a result of its initial success.

Thirty-three properties were represented at the three dedicated project field events. Feedback from 27 graziers at the March 2021 field days, held at Sonoma and Nyoola stations, indicated that 67% of feedback respondents provided an 8, 9 or 10 response, out of 10, to the question “How likely are you to apply what you have learnt on your property?”

Objective: At least 35 properties will have documented weed and pest management plans with evidence of implementation progress on a high proportion of those plans.

Belinda Callanan, TH9 Outdoor Services, conducted property visits to the six core project properties early in the project and provided technical and weed management planning support. Weed management plans were subsequently developed for each of the properties as a strategic basis for project implementation and for a broader approach to weed management on each property.

Whitsunday Regional Council was actively involved in delivery of field day activities in 2021 and 2022 and promoted Council’s weed management programs at the events. The Council’s weeds incentive program, an herbicide rebate scheme, provides encouragement for landholders to implement weed management plans. The Council continues to get new enquiries about their programs.

With the Collinsville Horse and Pony Club, the Council developed a weed management plan which was implemented during spring and summer 2022/23 through project supplementary activity and the Council’s weeds incentive program.

The MLA project coincided with a marked increase in the Council’s weed management program outcomes with regional property owners.

Table 4: Whitsunday Regional Council Weed Management Program outcomes 2019-2022 source: Pest Management Plan Annual Report 2021-2022

Financial Year	Number of active property weed management plans	Total area managed under the Plans	Number of landholders in weeds incentive program (herbicide rebate scheme)
2019-20	104	187,000 ha	49
2020-21	121	269,000 ha	52
2021-22	151	301,000 ha	64

4.1.4 Grazier engagement and extension

Objective: Develop at least 3 test cases for improved approval procedures for large scale weed management activities, with officers from the Department of Natural Resources, Mines and Energy.

In regional grazing lands, weeds such as rubber vine, chinee apple, bellyache bush, prickly acacia (and mimosa bush) and lantana are highly invasive: creating significant losses of productive capacity and degraded natural vegetation, particularly in riparian areas. Highly productive heavier soils, often naturally treeless, can become dominated by rubber vine, chinee apple and prickly acacia, while Eucalypt savannahs, acacia scrubs, dry rainforests and intact riparian zones of creeks and rivers have been seriously invaded by all of the major focus weeds of this project, impacting on ecological function.

Landholders report the invasive nature of these weeds as one of the most difficult challenges for weed management, particularly balancing legislative requirements with practical weed management options, across large areas of their properties.

- Following a request by Strathalbyn station around implementation of weed management actions for the MLA project area, a field visit was organised on 24th July 2020. Rae Schlecht Office of the Great Barrier Reef, and Michelle Sangricoli and Laura Sellen from the Department of Natural Resources and Mines met with Dyan and Bristow Hughes, Strathalbyn station, Don Rea, Kirknie station, and Rod Kerr and Mick Shannon, NQ Dry Tropics to explore the management options for bellyache bush and other weeds in the intact riparian and fringing vegetation of the proposed MLA project area. Departmental officers discussed acceptable treatment options under the accepted development vegetation clearing code (ADVCC) for managing weeds. The officers discussed how a mixture of mechanical and chemical treatments could be carried out under the ADVCC.
- On the 3rd December 2020, eleven people comprising seven landholders from the Exmoor Road cluster group, two Department of Resources and two NQ Dry Tropics staff attended a workshop hosted by Noel and Carmel Comerford at Turrawalla station, Nebo. The workshop was led by Kari Paton and Kerri Bardon from the Department of Resources.
 - Discussions and issues addressed included clarification around clearing along fence lines, the difference in metres of land that can be cleared if the grazier has a Fire Management Plan, and chemical usage (what can be used, and what other stakeholders are using in easement areas). The meeting was supplemented with an on-site inspection.

Figure 14: Mick Comerford, Exmoor, Kari Paton, Kerri Bardon and Buster O’Loughlin, Exevale



Objective: Conduct 3 cluster group field days/annum and other extension activities to adjoining regions e.g. the Bowen/Burdekin and Mt. Coolon areas, to showcase the demonstration site results, and encourage adoption of key practices by a minimum of 5 attending producers from other parts of the Burdekin Catchment.

- Agricultural Chemicals Distribution Certificate and washdown training workshops x 2 held in Collinsville 8th and 9th September 2020. There were 28 participants from 15 properties, including representatives from the Bowen River and Scottville cluster groups, Turrawalla/Exmoor, Strathalbyn/Tabletop and Glenalpine stations. A contingent of managers and Indigenous stakeholders of Urannah station also attended.

- Two forums were held to provide the latest information on vegetation management and addressing State requirements (with particular relevance to weed management). The Bowen River cluster group hosted the first event on 16th March 2021, with a similar event held at the DAF Research Facility, Bowen (Don River catchment) on 17th March 2021.
 - Attendance was mainly local graziers with Department of Resources presenters Maree Cali and David Lin sharing a presentation covering topics such as the definition of native vegetation under the Vegetation Act, management options e.g. self-assessment, fast track 5, use of fire, PMAV's, Vegetation Property Reports, compliance and monitoring.
- Weed machinery and weed treatment field days x 2 in conjunction with Whitsunday Regional Council held at Sonoma station, Collinsville 17th March 2021 and at Nyoola station, Bowen (Don River catchment) with the Bowen/Collinsville Landcare group 18th March 2021.
 - There were 40 participants at Sonoma station and 32 at Nyoola station with some attending both events. Owners, managers and station hands from 26 properties were represented.
- Field event feedback 17 and 18 March 2021, included these comments:
 - Industry representative, Sonoma field day - "Well executed day. Venue and topics exactly what is needed. Good cross section of presenters with a wealth of knowledge".
 - Grazier, Nyoola field day – "Very comprehensive, informative & interactive discussion".

Figure 15: NQ Dry Tropics website story on the Sonoma station field day held 17 March 2021



Stan and Judy Fordham, Emohruo Station.



Participants at the field day, held at Sonoma Station.



Results from using an excavator mulching head to remove woody weeds.

Host for one of the field days, Shane Watts, of Sonoma Station, spoke about weed control works being carried out, the resources used including chemical, mechanical and biological, and the biosecurity management and monitoring program implemented across the property.



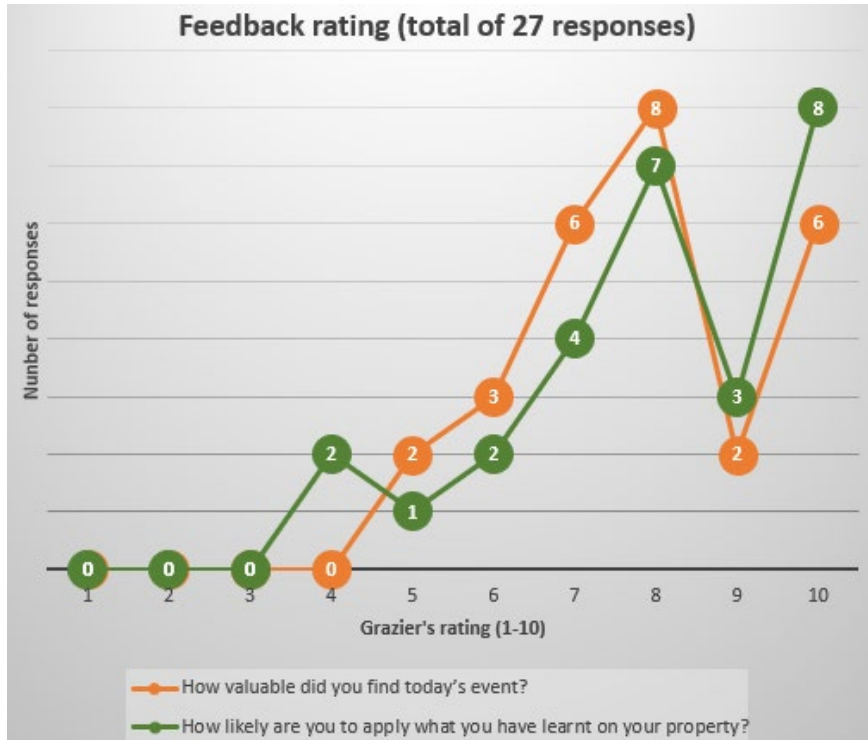
An effective biosecurity plan needs to tackle weeds and pest animals simultaneously. In this region deer and pigs are major weed spreaders, and they roam across property boundaries. This is a major issue for every grazing enterprise, and very expensive.

— Sonoma Station grazier, Shane Watts



Barry O'Sullivan, Glenalpine Station, demonstrates a tree puller that grabs hold of small trees then pulls them up and out completely, roots and all. Landholders indicated due to the powerful pulling performance of the attachment, they could use it to clear large areas effectively, or for more selective removal of saplings.

Figure 16: Graziers (27 responses) attending the 2021 field events rated the activities highly



- Weed management field day held at the Collinsville Horse and Pony Club on 9th November 2022 with 20 participants. Owners, managers and station hands from 11 properties, including from the Don River Catchment, were represented. Attendees heard from a range of speakers on a variety of topics including:
 - Wayne Vogler, DAF Tropical Weeds Centre, Charters Towers, provided an update on the Centre’s latest research;
 - Simon Wiggins, Desert Channels Group, discussed integrated woody weed management techniques; and
 - Melissa Hayes, Whitsunday Regional Council, provided an update on the Council’s weed management programs and herbicide rebate scheme.

Figure 17: The majority of graziers (12 grazier responses) attending the 2022 field event indicated they were likely to use the information from the day “fairly often” or “frequently”

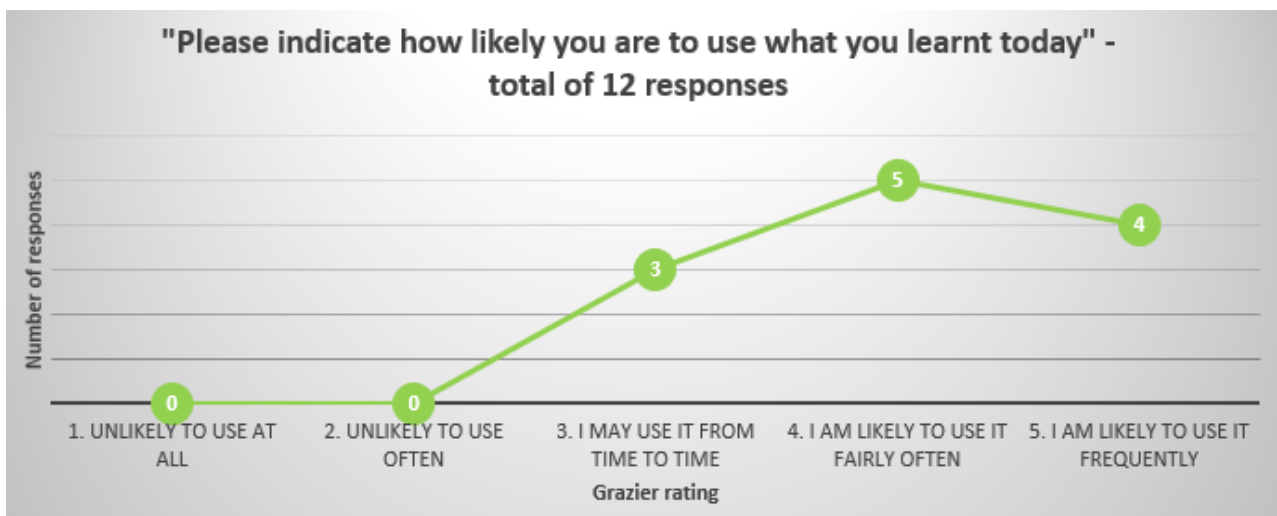


Figure 18: Wayne Vogler, Tropical Weeds Research Centre, demonstrates correct spraying techniques during the Field Day at the Collinsville Horse and Pony Club, 9 November 2022



4.1.5 Project Communications

Objective: Six short case studies produced on the outcomes of the approach for each weed theme.

Six case studies outlining outcomes from the core project properties were developed (see Appendix).

The Landholders Driving Change (LDC) website featured a project initiation story under the banner “Holistic approach to managing priority weeds” and the LDC project produced a brochure on weeds in mid-2021, which promoted the MLA PDS project.

In addition, NQ Dry Tropics social media (Facebook and Twitter) and, particularly, LDC communications such as the “Grit” (<https://ldc.nqdrytropics.com.au/the-grit/>) provided updates and insights into the progress and successes of the project.

- The Grit 21 August 2020 “MLA demonstration sites ramp up operations”.
- The Grit 24 Winter 2021 “Demo sites test the practicality of technology on the farm” and “Weeds in the spotlight”.
- The Grit 25 Summer 2021 “Waging a never-ending battle in the war on weeds”.
- The Grit 27 Summer 2022 “MLA Producer Demonstration Site Updates”
https://ldc.nqdrytropics.com.au/summergrit2022_mla_pds/

Figure 19: Tweets in October (left) and November 2022 (right), for the weeds field day held in Collinsville in November 2022, on the NQ Dry Tropics Twitter account

 NQ Dry Tropics @NQDRYTROPICS · Oct 13 ...
Proud to partner with @meatlivestock to form a Integrated Catchment-wide Priority Weed Management Group to implement a co-operative and integrated approach to identifying the best practice management of the highest priority economic weeds in the Bowen/ Collinsville catchment.



 NQ Dry Tropics @NQDRYTROPICS · Nov 17 ...
Great discussions at the Pests & Disease Field Day. Our #LDC project has partnered with @meatlivestock to develop a Producer Demonstration Site to accelerate adoption of weed management practices & technologies to improve business productivity in Bowen & Collinsville region.



5. Conclusion

5.1 Key findings

- The project reinforced the significance of weed management for graziers in the project area and beyond: the loss of production, impacts on ecological/landscape function, and the time, effort and resources required to manage weeds in a grazing landscape.
- A focussed weeds project creates social and extension (technical advice, field days, workshops, property visits etc.) “chatter” which results in:
 - increased exchange of information,
 - improved adoption of weed management technology,
 - increased expenditure/implementation on weed management, and
 - a framework for improved cooperation and coordination of weed related planning and action in a local area.
- Networks are important in encouraging implementation of improved landscape management: providing rapid technology transfer and exchange of ideas and approaches.
 - Social and geographical networks (the Exmoor Road and Bowen River cluster groups are examples) were important for the project but grazing networks in the project area (e.g. a strong regenerative grazing network in the region – also a MLA PDS project) were also useful for engaging a wide range of graziers, Agencies and industry representatives.
- It was a challenge to demonstrate practical cooperation across property boundaries without external drivers (e.g. cash, equipment, labour etc.) and adequate coordination support to encourage joint action. Properties are large, have unique grazing, financial and landscape conditions, while the graziers are very focussed on the challenges on their own property.
- Legislation misapprehension and uncertainty is a key challenge for implementation of improved weed management practices.

5.2 Benefits to industry

- The project trialled and encouraged a wide range of weed management approaches, both current and some new technologies for the region, which resulted in a marked increase in weed management activity and impressive production benefits, through increased pasture biomass and pasture quality of treated country.
- Four of the six core project producers provided a rating of 7 out of 10 for how valuable the PDS was in assisting them to manage their livestock enterprise.
- All core project producers nominated that they had made or intend to make other changes to their business as a result of participating in this PDS. This included:
 - Additional expenditure or labour for managing weeds.
 - Continuing to use equipment and techniques utilised in the PDS while
 - Two producers mentioned continuation of an integrated approach to weed management which included mechanical, some chemical, reseeding of pasture and improved grazing management.
- The region’s graziers now have access to, and expanded knowledge of, a range of tried and tested weed management approaches and technologies which were not available prior to commencement of the project.

- The uptake of simple, inexpensive but efficient technology can be high after successful demonstration, with the Auscrimper sucker puller a standout for this project.

6. Future research and recommendations

- *Grewia* (*Grewia asiatica*) was frequently mentioned by graziers as an emerging weed of significance across the region. There was some effort to manage the weed (including through this project) but with limited success. It is noted on some websites that “it poses a significant threat to the biodiversity of the tropical savannas and rangelands of northern Australia”. Research is urgently required to improve control options for graziers before it becomes the new rubber vine or prickly acacia of the region.
- Many funding organisations seem reluctant to invest in weed projects, presumably due to the scale of the issues and ongoing costs, however, targeted programs can result in big gains for production and ecological outcomes when graziers are provided with incentives to test techniques at a manageable scale, are actively engaged, and are encouraged to share information.
 - Project site reviewer, Belinda Callanan, TH9 Outdoor Services, commented that “Additional funds should be found for further promotion, and ongoing adoption, of successful practices to build on the momentum created by the project.”
- There is a need for active extension (it is cost effective to undertake through groups and organised public events) by the custodians of key relevant legislation to provide practical weed management solutions for landholders

7. Appendix – case studies



Sonoma



Integrated Weed Management – Producer Demonstration Site

The Watts family, Sonoma, Collinsville participated in the project to trial new techniques and equipment, to see if the techniques would work, where suitable and economically viable for their situation, and to tackle some of the major weed issues on Sonoma.

NQ Dry Tropics has partnered with Meat and Livestock Australia to develop a Producer Demonstration Site to accelerate the adoption of cooperative, integrated weed management in the BBB catchment.

The Project trials

A number of techniques and pieces of equipment were trialed. These included:

- Mechanical removal of mimosa bush (*Vachellia farnesiana*) using the corner tip on the blade of a dozer across a 40 ha trial area.
- Mechanical removal (mulching) using a 125EZ hydraulic drive Flail Mulcher head on an excavator to mulch dense chinee apple and rubber vine infestations across 5 ha of riparian area.
- Splatter gun treatment of chinee apple, rubber vine and *Grewia* across 2 ha trial area.
- Basal bark treatment of mimosa with Access and diesel across 20 ha.
- Aerial application of Tebuthiron® to treat mature and regrowth mimosa across 160 ha with pellets applied at 9/10 kg per ha.

Corner tip of dozer blade

The trial involved removal of regrowth mimosa using a D6K 13 tonne dozer. The removal was successful, with works carried out with a good soil moisture profile in early autumn.

Flail mulcher

The mulcher was slow and cost prohibitive for the area covered. It is recommended that a mulcher should only be considered for targeted sensitive creekbanks or eroded areas, largely due to the cost and the need to undertake follow-up chemical treatment of regrowth.

Splatter gun

Chinee apple, rubber vine and *Grewia* were targeted over summer, with Metsulfuron® used when the plants were actively growing. A 99% kill was achieved on rubber vine and about 80% on chinee apple.

However, the *Grewia* dropped leaves where contact with chemical was made but continued to grow, with no kill achieved.

NQ Dry Tropics has partnered with Meat and Livestock Australia to develop a Producer Demonstration Site to accelerate the adoption of cooperative, integrated weed management in the BBB catchment.

Basal bark

Basal barking with Access and diesel is commonly used for woody weeds and again proved a successful treatment.

Aerial application of Tebuthiron®

This was highly successful on both mature and regrowth mimosa. Aerial application was carried out in spring to take advantage of spring storms to help activate the Tebuthiron®. A 98% kill was achieved on all treated mimosa.

Vegetation and Reef Regulatory requirements need to be considered with this method and may not be suitable in certain situations. There is some prior planning that is required: checking all relevant Departmental mapping and to GPS the proposed treatment area and keep application records.

Graslan™ Herbicide Aerial Application Log

T: 4612 9887 0900
www.fmc.com.au

Contract No: **K522612**
Date of Application: **20.09.2022**

Landholder Trading Name:	Southern Grazing
Name of Landholder:	DMARK & ANNEBIA MARKS
Property name of application:	Southern
Phone: 0928855728	Landholder or Manager Mobile:
River Catchment:	BURDEKIN

Key Learnings

- Always check legislative obligations to see if the planned technique is authorised.
- Splatter gun treatment works well on rubber vine and chinee apple when actively growing and under 2 metres in height.
- The Flail Mulcher is an expensive option for weed management, however, it does have uses for sensitive areas which are difficult to access and can reach into intact vegetation.
- The corner tip on the blade of a dozer works well with removing mimosa when the soil moisture profile is good.
- An increase in chinee apple seedlings occurred if using a dozer to manage.



Glenalpine



Integrated Weed Management – Producer Demonstration Site

The O'Sullivan family, Glenalpine, Bowen participated in the project to improve property biosecurity and to trial new techniques and equipment, to see if the techniques would work, where suitable and economically viable for their situation, and to tackle some of the major weed issues on Glenalpine.

NQ Dry Tropics has partnered with Meat and Livestock Australia to develop a Producer Demonstration Site to accelerate the adoption of cooperative, integrated weed management in the BBB catchment.

Biosecurity protocols for emerging weed management

- Attended biosecurity, chemical application, and vehicle clean-down training.
- Established designated wash-down area and high pressure air and water clean-down facility.
- Established and implemented vehicle hygiene protocols for all vehicles entering the property.

Project trials

Glennalpine generally has intact vegetation with limited historical tree clearing. This creates some challenges with management of dense invasive weeds onto heavier clay soils and, particularly, with intact vegetation in riparian areas of creeks and rivers. The O’Sullivans were seeking control methods which limited damage to the environment.

A number of techniques and pieces of equipment were trialed. These included:

- Splatter gun treatment of rubber vine using Grazon®.
- Mechanical removal of dense rubber vine infestations using an Auscrimper sucker puller attached to a bobcat, predominately in riparian areas.

Splatter gun

The splatter gun was trialed on dense rubber vine, in a hard to access area, using Grazon. A 30–45% kill was achieved on larger plants, and 95% kill on smaller plants.

Auscrimper sucker puller (tweezers)

An initial creekline trial was undertaken on dense mature growth of rubber vine, lantana, prickly acacia and chinee apple.

This proved to be highly efficient with a good operator and achieved a 99% kill.

An additional tracked (and airconditioned) bobcat and another sucker puller was purchased due to the success of the trial work. The tracked bobcat was more stable

in rough areas but requires steel tracks instead of rubber, as they wear too quickly.

The success of the “tweezers” has encouraged the engagement of a full time operator systematically working across paddocks: removing scattered infestations and denser areas of weeds, particularly on creeklines and river country. Approximately 1200 ha was treated in late 2022.

Treatment can be applied throughout the year, with an increase in activity through the wet season when soil moisture is higher, moving to soils that hold more moisture into the dry season.

A trained operator minimises machinery breakdowns and also ensures plants are not missed and are removed properly.

The tweezers were unable to remove plants under about 7mm thickness and some follow-up chemical treatment is required.

A pasture seed mix (butterfly pea, green panic, Rhodes grass and a stylo) is applied to heavily disturbed areas where there is little regeneration of desirable pasture plants.



Key Learnings

- Splatter gun treatment with Grazon did not work well on rubber vine.
- There is virtually no impact on any non-target species with the sucker puller.
- A good soil moisture profile is desirable when using the sucker puller.
- Follow-up is critical after weeds are pulled. Chemically treat plants when they are showing no signs of stress and ensure good leaf coverage.

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Inkerman



Integrated Weed Management – Producer Demonstration Site

The Atkinson family, Inkerman station, Inkerman participated in the project to trial new techniques and equipment, to see if the techniques would work, where suitable and economically viable for their situation, and to tackle some of the major weed issues on Inkerman.

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Project trials

A number of techniques and pieces of equipment were trialed. These included:

- Mechanical control including stick raking, cutter barring, ploughing and reseeded of chinee apple, rubber vine and prickly acacia across 740 ha.
- Basal bark treatment of scattered prickly acacia and chinee apple using Starane® and Diesel across 250 ha.
- Aerial foliar spraying of Grazon® to treat prickly acacia and Starane® to treat chinee apple.

Mechanical treatment

In 2021, a D8T was used to stick rake and cutter bar, and a John Deere 9560RT for ploughing, with offsets and re-seeding, for regrowth chinee apple, rubber vine and prickly acacia, initially in the most productive (and cleared) paddocks.



Forage sorghum was successfully established, with cattle grazing the main paddock for two months in early 2022. The forage sorghum re-shot following winter rain, with cattle again grazing the treated areas in September 2022.

A 90 % reduction of chinee apple, rubber vine and prickly acacia was noted across the trial paddocks, although some weed re-establishment occurred mainly around damp areas such as a large the dam and in a gully area.

Basal bark

Basal barking is commonly used for woody weeds and again proved a successful

treatment. Scattered chinee apple and prickly acacia was treated with Starane® and diesel off quad bikes, across 250 ha. A very high kill rate was observed across all five treated paddocks.

Aerial foliar spraying – a containment and reduction strategy

Dense regrowth was treated aurally with Grazon® across a 265 ha paddock to suppress and knock back plants prior to mechanical control. A 50% kill of smaller plants was observed.

Dense regrowth was treated aurally with Starane® across a 220 ha paddock. A 75% kill rate was observed in this paddock. A review will be undertaken in 2024 to determine an ongoing control method.

Key Learnings

- Always check legislative obligations to see if the planned technique is authorised.
- When planning aerial treatments, neighbouring properties, and surrounding land use needs to be taken into consideration to mitigate spray drift risk.
- Cutter barring works better under drier conditions so that soil flows across the cutter bar.
- Planting forage sorghum provided good competition for any germinating weeds and excellent livestock production.
- Ongoing management is still required to get on top of the weed issue. On the better soils, there is the potential to re-plough to tackle weed regrowth and, concurrently, establish pasture grasses.
- Basal bark treatment for scattered chinee apple and prickly acacia worked well, and a scatter gun will also be used to reduce chemical costs.
- Only chemically treat plants when they are showing no signs of stress.

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Turrawalla and Exmoor



Integrated Weed Management – Producer Demonstration Site

The Comerford family, Turrawalla/Exmoor, Collinsville participated in the project to trial new techniques and equipment, to see if the techniques would work, where suitable and economically viable for their situation, and to tackle some of the major weed issues on Turrawalla and Exmoor.

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Weed management planning

With neighbouring properties, Turrawalla and Exmoor sought property planning advice from the Department of Resources.

- In December 2020, NQ Dry Tropics organised a workshop for seven landholders from four properties with two Department of Resources technical officers.
- Clarification around clearing along fence lines, the advantage of having a fire management plan, and issues around chemical usage were discussed.
- The workshop included on ground inspection of a weed management area.

Project trials

A few techniques and pieces of equipment were trialed. These included:

- Splatter gun treatment of lantana with Grazon® and burning of the treated site.
- Treatment of mature and regrowth lantana with a turbo mister.
- A flail mulcher head for an excavator will be trialed to control lantana in creek zones.

Splatter gun

- The splatter gun was trialed on dense regrowth lantana across 10 ha.
- Only a 70 % kill was achieved, and timing and leaf coverage may have been contributing factors.
- The treated area was burnt later in the season but there was insufficient fuel to carry an effective hot fire.

Turbo mister

- Mature lantana across 200 ha of cleared country was treated with Conqueror® (Triclopyr and Picloram) using a turbo mister and a 95% kill rate was achieved.

- The plants had full leaf coverage and were actively growing at the time of treatment.
- A further 200 ha was treated following the success of the treatment.
- Flannel weed and other woody weeds were also killed in the treatment area.
- Grasses responded well with green panic, buffel and Urochloa returning to pastures.



Key Learnings

- Always check legislative obligations to see if the planned technique is authorised.
- Always check the chemical label to ensure the product is registered for use for the desired technique.
- Only chemically treat plants when they are showing no signs of stress and have full leaf coverage.
- Will use glyphosate with splatter gun instead of Grazon.
- Chemical to be applied using a mister prior to 10am when winds are low, and temperatures are down.
- Only utilise the mister in areas where lantana is the dominant plant.
- If using fire as a tool, ensure there is sufficient fuel load to carry a hot fire - timing is also critical to success.
- Plan weed management activity early to ensure adequate staff or contractors can be sourced to undertake required works.

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Strathalbyn



Integrated Weed Management – Producer Demonstration Site

The Hughes family, Strathalbyn, Collinsville participated in the project to trial new techniques and equipment, to see if the techniques would work, where suitable and economically viable for their situation, and to tackle some of the woody weed issues on Strathalbyn.

NQ Dry Tropics has partnered with Meat and Livestock Australia to develop a Producer Demonstration Site to accelerate the adoption of cooperative, integrated weed management in the BBB catchment.

Project trials

A number of techniques and pieces of equipment were trialed. These included mechanical removal of dense bellyache bush, rubber vine and other woody weed infestations using:

- a Raptor Forestry mulcher
- an Auscrimper sucker puller attached to a bobcat and
- a dozer and Ellrott plough.

Chemical treatment of intact and regrowth weed infestations using a custom made boomless jet spray was also undertaken.

Raptor forestry mulcher

- A 50 ha trial area of dense bellyache bush was mulched with a Raptor Forestry mulcher and a forage sorghum based pasture mix was broadcast.
- A temporary “Kiwitech” electric fence contained 1000 breeders for 5 days to bale graze – 50 large hay bales were placed across the paddock to distribute dung, urine, and the residual hay as a seed bed for the broadcast seed.
- After the wet season, there was limited weed recruitment where good stands of forage sorghum had established.
- Follow-up chemical sprays of germinated weeds have kept the trial site weed free.

Auscrimper sucker puller

- The sucker puller was a very effective tool for treating scattered clumps and individual infestations of woody weeds.
- About 500 ha was treated using an experienced operator, with a 99% kill.
- The tool was modified, given the rugged conditions, with the manufacturer adopting the modifications.

Dozer and front mounted Ellrott plough

- Stick raking and/or ploughing with an Ellrott front mounted blade plough occurred across 400 ha of dense, mature rubber vine, chinee apple,

bellyache bush, Parkinsonia, lantana and creeping mimosa.

- The Ellrott blade plough was highly successful on the heavier soils on flood-out plains with a very high kill of rubber vine.



- Treated areas were successfully re-seeded with a competitive and productive forage sorghum based pasture mix.

Jet spray

- A 120 ha trial area was sprayed using a custom made boomless jet spray (30 m swath) with 7000l tank and trailer for foliar spray with Metsulfuron Methyl and wetter and as follow-up for the mechanical interventions.
- Treatment was only carried out prior to 10 am, as the winds pickup and temperatures rise after this time.

Key Learnings

- Always check legislative obligations to see if the planned technique is authorised.
- The bale grazing trial was effective but time consuming and costly.
- A good soil moisture profile is desirable when using the sucker puller.
- Blade ploughing requires a dry top 10cm and ploughing should not occur if rain is forecast within 2 days.
- When foliar treating rubber vine, 100 % coverage of the plant is required to maximise the kill rate.

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Glenroc



Integrated Weed Management – Producer Demonstration Site

The Colls family, Glenroc, Gumlu participated in the project to trial new techniques and equipment, to see if the techniques would work, where suitable and economically viable for their situation, and to tackle some of the major weed issues on Glenroc.

NQ Dry Tropics has partnered with Meat and Livestock Australia to develop a Producer Demonstration Site to accelerate the adoption of cooperative, integrated weed management in the BBB catchment.

Project trials

Historically, there has been limited weed management work undertaken across the property, so the trial work was valuable for future activity. A few techniques were trialed, mainly targeting rubber vine and lantana. These included:

- Mechanical removal of dense rubber vine infestations using a dozer, predominately on heavier soils.
- Foliar Spray of lantana and rubber vine using a QuikSpray slip on unit.
- Burning of lantana and rubber vine, including treated areas.

Mechanical removal

Dense stands of lantana and rubber vine across 20 ha were dozed using a D6, mainly on flat heavier soil country and around creek lines. This was pushed into piles and burnt. There was considerable seedling recruitment in the disturbed soil and the regrowth will be sprayed.

As a result of the trial and observation of other rubber vine control work in the region, it was decided to purchase a Challenger plough, as full development of the more productive soils is economically feasible. Future management of the woody weeds on the heavier soils will involve ploughing with the Challenger and re-seeding with legumes and pasture grasses.

Foliar Spray

A twin reel, 600l QuikSpray unit was utilised for foliar spraying of mature and regrowth lantana and rubber vine with Metsulfuron®.



Treatment was on regrowth following the dozer work, and on mature plants along tracks and fire breaks across 2800 ha (the area targeted for burning).

The initial treatment resulted in a high kill rate, although some reshooting and seedling recruitment occurred over the following wet season.

Burning

Based on observations on other properties, the trial area was burnt during the following spring. However, this was not particularly successful as there was an insufficient fuel load to carry a hot fire.

Key Learnings

- Always check legislative obligations to see if the planned technique is authorised.
- Some regrowth occurred due to insufficient spray coverage and seedling recruitment in bare areas.
- Follow-up is critical after weeds are mechanically removed.
- Foliar spray plants when they are showing no signs of stress and have full leaf coverage and ensure full spray coverage of the plant.
- Will utilise a splatter gun as an additional treatment option for dense infestations to reduce chemical costs.
- Grazing management will be modified to ensure a sufficient fuel load is available for a hot fire. Burning is considered a (potential) cost effective option, where an adequate hot fire can be carried.
- The use of a drone to monitor the site encouraged investigations into the option of using a drone to spray softer weeds, such as Parthenium, on the property.

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