USQ5: INTEGRATING PADDOCK AND CATCHMENT PLANNING: A WOOLGROWER DRIVEN APPROACH TO SUSTAINABLE LANDSCAPE MANAGEMENT

MILESTONE NO. 4 & FINAL REPORT

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native vegetation and biodiversity
improving farm profits through biodiversity
LandWater&Wool
Shaping the future
Australian Government
Land & Water Australia
another australian wool innovation limited

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Darren Marshall and Brett Coppard from QMDC provided spatial data and advice for the mapping and Darren, Tania Robinson and Samantha Williams provided inputs from the sub-catchment planning process. Armando Apan advised on, and undertook, some of the GIS analysis.

Claudia Baldwin conducted interviews and focus groups, while Sarah McMenniman conducted additional interviews and David Grassby helped run the focus groups. Funding for the project came from the Land, Water & Wool program with additional institutional support from the University of Southern Queensland.

In particular, the research would not have been possible without the participation of the people in the Traprock who provided time and effort to take photographs and participate in interviews and focus groups.

FINAL REPORT

ABSTRACT

Integrating paddock and catchment planning: a woolgrower driven approach to sustainable landscape management

Start: 04/04 **Finish:** 05/06

Project team members

Dr Geoff Cockfield
Dr Andrew Le Brocque
Professor Charlie Zammit
Associate Professor Grace Pretty
Mr Greg Ford
Ms Lyn Pullen
Mr Clive Smith
Mr Andrew Ferrier
Mr Andrew Finlay
Mrs Denzil Mills

Objectives

To strengthen wool grower capacity to use scientific and socio-economic information and research to support integrated biodiversity and production planning from property to catchment level.

To ensure more effective wool industry input into catchment and regional planning objectives by developing integrated management principles and practices for profitable and sustainable wool production that links property to sub-catchment scales.

To design and test a coordinated NRM monitoring and reporting protocol for wool growing regions by developing a Toolkit for monitoring productivity and biodiversity for profitable and ecologically sustainable wool production.

Methodology

This is a multi-disciplinary project with three interrelated research elements and an 'extension' toolkit. The ecology element comprised:

- A study of the effects of vegetation on grazed woodlands and remnants. The 47 study sites were stratified across the landscape. Statistical tests were used to determine or investigate patterns in floristic composition, floristic composition between different tree density treatments, species richness, diversity and cover.
- A study of the responses of vegetation and ground invertebrate assemblages following the exclusion of sheep grazing. Above-ground vegetation was weighed; overstorey cover and recruitment were determined; as were stand structural characteristics, including foliage projective cover of distinct strata, and cover of litter, logs and rocks, and general habitat condition were also determined at each site. Patterns in floristic composition were determined as above.

- Arthropods were also sampled from the exclosures using pitfall traps. All specimens were identified to order level and there were analyses of abundance, richness and diversity indices, MDS ordinations of community composition, community composition between treatments and an BIOENV analysis of environmental factors most responsible for community composition and observed population trends. Preliminary ant analysis included one-way ANOVAs of abundance across tree density and grazing management treatments and assessment of changes to functional group composition in relation to tree density and grazing exclusion.

The social science analysis of landholders' attitudes to biodiversity, landscapes and relationships to the landscapes comprised a photo-voice survey. Participants took pictures on their properties according to prescribed themes. In a follow-up interview participants were asked to identify which photos best represented the different themes and why. Participants then participated in a focus group and each group produced a collage of photos representing their discussions and discussions were transcribed by a researcher. Text and photos were then matched and analysed and iteratively sorted according to sub-themes.

The property planning component of the project involved modelling spatio-economics at the property and catchment scale. The two main outputs were results from an *Excel*-based farm finance calculator and a property planning approach developed in a Geographic Information System (GIS). Relevant social, economic and environmental goals were identified from national and local NRM programs and from the social and ecological elements of this project. Consideration of these goals and social and economic constraints led to the selection of a range of land management changes that would be both acceptable to landholders and make progress towards the NRM goals. Net benefits for each change were calculated and compared with 'current' incomes. In addition, Patch Analysis in ArcView was used to produce some indicators of the extent and shape of woodlands from regional maps.

The monitoring toolkit is designed to enable individual land-holders to implement a simple, efficient and realistic monitoring program for production and biodiversity values on their property. The pasture assessment component is based on the *GRASS Check* package, modified to reflect the simpler style of the *Pasture Health Kit* developed for the north-west slopes of NSW. It is designed around a three-point scale which broadly reflects relative condition of pasture. Pasture condition is rated by:

- productivity - yield, palatability and weediness;
- stability - perenniality and ground cover; and
- nutrient cycling - organic litter.

The vegetation and habitat assessment includes consideration of:

- amount and spatial distribution of habitat patches;
- structural complexity of vegetation within patches; and
- condition, or healthiness, of patch vegetation.

The latter is derived from the *Focal Species* approach to landscape-scale biodiversity planning (Lambeck 1997) and the *Habitat Hectares* approach to vegetation quality assessment (Parkes *et al.* 2003), with reference to the draft *BioCondition Field Assessment Manual* being developed by the Qeensland Environmental Protection Agency, which is similar to *Habitat Hectares*.

Habitat complexity is assessed from an adaptation of the method developed for measuring complexity in relation to small mammals (Catling and Burt 1995) subsequently modified and refined, and now used widely in assessing habitat values in landscape-scale ecological studies (e.g. Watson *et al.* 2001, Short and Parsons 2004). This version is based on one developed locally for the QMDC vegetation

condition assessment program, which, in turn, was modified from that described by Watson *et al.* (2001).

Habitat condition refers to the relative healthiness of native vegetation. The key determinants of condition reported on are:

- regeneration – lack of seedlings, saplings and semi-mature individuals (i.e. mixed age stand) of the dominant species is detrimental to the sustainability of the habitat patch
- tree health – advanced or accelerated senescence of dominant trees may cause substantial change in the community structure, or even complete loss of the habitat patch
- regrowth – advanced thickening of one or more native woody species could cause an ecological imbalance in the community, resulting in loss of biodiversity value
- weediness – if exotic woody species dominate the understorey, there may be a marked reduction in diversity and abundance of native species that would otherwise occur there

Implications

With the scope of this project there are many implications and so only a few are reported here. Regrowth woody vegetation provides something of a unique plant community, and therefore is a contributor to biodiversity, however landholders see regrowth as a significant production threat so recommendations to 'conserve' regrowth for biodiversity needs careful consideration. It may be however, that landholders are treating regrowth 'too early' in economic terms.

Fencing off remnant woodlands and reducing grazing pressure so as to improve habitat condition will generally only incur a small economic loss. Fencing off riparian areas and reducing grazing impacts for water quality protection is a relatively more expensive process, especially for properties with narrow or negative profit margins. If however, a change in property plan, so as to facilitate higher rotation grazing, is intended, the marginal cost of fencing to protect remnant and woodland areas at the same time is much lower. The cost of the resource protection can then be covered by an increase in carrying capacity with the additional benefit of increased ground cover.

Landholders have a strong sense of place, which provides significant psychological benefits to individuals. This sense and its components are strongly linked to landscapes, usually as they currently are. Therefore, a change in the landscape for NRM benefits can have a negative impact on the sense of place. Furthermore, landholders are hostile too and wary of policy changes, such as some NRM initiatives, that they see as being unnecessary and ill-founded.

Collaboration

The project was funded by Land, Water & Wool (LWW) as a joint venture between Land & Water Australia and Australian Wool Innovation P/L. The research was managed by the University of Southern Queensland (USQ) working with the Traprock Woolgrowers Association (TWA) and the Queensland Murray Darling Committee (QMDC).

Sponsors

The project is directly funded by LWW with contributions from USQ, TWA and QMDC.

FINAL REPORT

FINAL REPORT

MILESTONE NO.:	4	**DATE OF FINAL REPORT:**	25/05/06
LWA PROJECT REFERENCE NO.:	USQ5		
PROJECT TITLE:	Integrating paddock and catchment planning: a woolgrower driven approach to sustainable landscape management		
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PROJECT OBJECTIVES AND BRIEF RATIONALE FOR WHY THE PROJECT WAS ESTABLISHED:

Rationale

The rationale for the project was the perceived need for landholder to effectively engage in NRM planning and to be seen to be doing so. This was seen to be driven partly by market expectations (green consumerism) and partly by government policy initiatives (for example NAP & NHT). Key policy initiatives were seen to be shifting responsibilities to landowners requiring the integration of top-down and bottom-up approaches to NRM. Perceived impediments for landholders fully participating in these processes were seen to be reliable lack of access to or engagement with, scientific, economic and other information and a lack of capacity or perhaps means to monitor and report on key indicators of production systems. The Traprock Wool Association Inc was seen as an ideal project partner given the level of organisation and interest in both marketing of wool and landscape condition. The experience from the project is that this is still the appropriate rationale and the imperatives for this and similar initiatives have, if anything, strengthened.

The original objectives were:

To strengthen wool grower capacity to use scientific and socio-economic information and research to support integrated biodiversity and production planning from property to catchment level.

1. To enhance the knowledge base for integrated regional planning and management by systematically documenting the productive capacity and biodiversity assets of the Traprock landscape under a range of native vegetation cover, pasture and grazing conditions (remnant, regrowth, open/sparsely wooded pasture) using information compiled through a current community-based property planning program.

2. To build wool grower capacity for documenting and assessing pasture condition, land capability and biodiversity values of properties using field-based participatory learning methods.
3. To strengthen wool grower confidence in land use planning options available to them by collaborating with them on socio-economic assessments under different land and environmental management scenarios using the information from 1 and 2 above.
4. To document the key success factors and monitor and evaluate the progress of the Traprock Wool Association in this project through individual and group surveys and to make the lessons learnt available to other wool grower and community groups.

To ensure more effective wool industry input into catchment and regional planning objectives by developing integrated management principles and practices for profitable and sustainable wool production that links property to sub-catchment scales.

5. To work with wool growers to develop key principles and approaches for land use/landscape configuration that meet both production and biodiversity objectives, and to incorporate these in an NRM Toolkit for use by others in the wool industry and beyond.
6. To develop and refine property and sub-catchment vegetation management plans that incorporate landscape principles through collaboration between project partners and wool growers, and to document approaches in the Toolkit for use by others.
7. To strengthen the capacity and effectiveness of wool growers to engage State and regional bodies in the development and incorporation of bioregional and catchment-based natural resource management plans to better achieve profitable wool production, sustainable landscape management and biodiversity conservation.

To design and test a coordinated NRM monitoring and reporting protocol for wool growing regions by developing a Toolkit for monitoring productivity and biodiversity for profitable and ecologically sustainable wool production.

8. To work collaboratively with wool growers in the evaluation of existing approaches and Toolkits for monitoring production and biodiversity in grazing landscapes and to use this analysis as a basis for an NRM Toolkit designed for the wool industry.
9. Develop an integrated monitoring and reporting Toolkit with wool growers that combines the outcomes of the above review and evaluation process and with woolgrower aspirations. The Toolkit will include:
    a. Management principles and guidelines for wool growers to maintain profitable and sustainable production and biodiversity.
    b. Procedures and tools for assessing the feasibility of different land use options at property to catchment scale for enhancing successful wool-producing enterprises and retaining biodiversity values.
    c. Tools and methods for monitoring, assessing and reporting productivity and biodiversity at property to catchment scale.
    d. Monitoring, data management and reporting protocols and mechanisms for data interpretation and incorporation into property and sub-catchment planning review processes.
10. Liaise with other regional projects in the Native Vegetation and Biodiversity sub-program of Land, Water & Wool, such as the New England Tablelands (UNE43) and those within the Murray Darling Basin on options for the wider application of the Toolkit to other wool-producing regions.

MILESTONE:
Components

4.1 Completion of Monitoring & Reporting Toolkit for woolgrowers & 4.6 Information management system in use.

4.2 Toolkit endorsed by woolgrowers in Traprock and other regions.

4.3 Completion of second social survey.

4.4 Feedback on landowner satisfaction with property plans and GIS maps.

4.5 LWW project outcomes accounted for in regional NRM planning.

4.7 Progress made against the agreed Communication Plan.

ACHIEVEMENT RESULTS FOR COMPONENT 4.1 & 4.6: Monitoring & Reporting Toolkit for woolgrowers & Information Management System in Use

The web-based prototype of the monitoring and reporting toolkit has been completed and is open for limited use and viewing. Sample pages from the website as at May 24 are in the report attachments and an updated version can be viewed at javaram.com/traprock. The web toolkit was officially launched by the Parliamentary Secretary for Agriculture on April 21, 2006 at Terrica. News reports of that event are in the Attachments Section 10. Some landholders (15-20) have already registered and entered data. There will need to be a second round notification following further refinements. TWA have undertaken to do this notification through their email system. TWA have agreed to shift their water quality and pasture monitoring on to the web-based system. Summary historical tables are on display but it is the intention to replace these with a more sophisticate database.

Updates of the system are expected to continue for some time with feedback from LWW and landholders. Issues under discussion are:

- How to report worm monitoring. This would be an important 'hook' to achieve regular use of the system but the format of irregularly reported events needs some more careful design;
- How to report spot monitoring of birds. A prototype system has been designed.

There is still capacity within the funding allocation for the web designer to continue with some of this work, although it is important to note the recommendations that this system must:

- Continue to be adapted by and for landholders, with appropriate guidance;
- Have some agency or institutional support; and
- Be used to feed information to marketing activities as an incentive for use.

In particular, the issue of hosting must be resolved soon. This system is currently on the web designer's private location and there is no obligation for this to continue past her contract. This issue was raised with both LWW and TWA some time ago and we proceeded on assurances that there would be hosting. It is likely that TWA will host it but the funding for, and timing of that is uncertain.

The accompanying glovebox guide is at page proof stage and copies are in the attachments. The reason for holding back on the printing was to ensure a match with the web-based system, with perhaps minor matching, of wording on instructions and so on.

ACHIEVEMENT RESULTS FOR COMPONENT 4.2: Toolkit endorsed by woolgrowers in Traprock and other regions.

Endorsement is at three levels:

- The landholder project advisers have approved the toolkit as at the final planning meeting in March and in a subsequent review of the project launch. They do however, have further requests with regard to spot monitoring (see previous section) and these updates are being addressed. There may be a limit to how far the project resources can stretch to accommodate anticipated requests;
- A significant proportion of landholders in the region (50%+) have viewed the system. Their reactions are reported and summarised from the open day evaluations (Attachment Section 8). There was interest, though it was not seen as being the most useful or interesting part of the project. The real test of acceptance will be its use over time**.**
- There is no formal indication of 'endorsement' by other woolgrowers except for the very small number of responses from other wool growers on the open day (see evaluation reports). Efforts were made to engage other woolgrowers through networks, such as leading sheep and to invite key industry leaders. Responses from the SWAG woolgrower members are included in the evaluation reports, showing more interest or perceived value.

Again, the tools really need to be assessed over time with the test being whether or not they are actually used at all.

ACHIEVEMENT RESULTS FOR COMPONENT 3: Completion of second social survey

A second social survey was not completed. This eventuality was anticipated earlier in the project but the milestone was not officially adjusted. The reasons for the lack of achievement lie in the background, development and method of this part of the project. The original plan was to survey to detect attitude change with regard to the understanding or interpretation of biodiversity amongst landholders, using a simple survey. It was however, discovered at the start of the project that the landholders had been recently subject to an extensive management survey for other research and so it was decided to switch to another method of data collection and interpretation.

The photo-voice approach then opened other research possibilities and so the scope was expanded to include broader responses to relationships with place and landscapes. The difficulty was that the text data was then so extensive that processing proved very time consuming, thus delaying finalisation of the first round. In addition, it proved difficult to get skilled qualitative researchers. The report on this work is in Attachment 4.

We therefore request that this milestone be adjusted, retrospectively, with the objectives of 'determining the elements and extent of sense of place and attitudes to landscapes' accepted as worthwhile goals instead. It is effectively a substitution of knowledge of a specific attitude change for an increase in the breadth of knowledge of landholders' attitudes to landscapes and place.

It is worthy of note that landholders are willing to re-do the photo-voice process, according to team member, Clive Smith, but this feedback has raised a particular concern with the method. Landholders received the results from the open day and concluded that they had not 'done well' on biodiversity. They therefore wish to try again and this attitude may however, suggest participants entering the process with some pre-determined responses in mind.

ACHIEVEMENT RESULTS FOR COMPONENT 4: Feedback on landowner satisfaction with property plans and GIS maps.

The mapping work is completed to the stage possible with available and affordable technology and data. This work is described in the Property Planning Report in Attachment 5. Within the sub-catchment planning process, participants are using the images supplied to the project by QMDC to develop property plans. These have not yet explicitly linked this work to the financial estimations of on-ground changes, as is proposed in the technical report. On the other hand, the concept of connecting NRM planning, mapping and financial estimation has been explained at 2 rounds (by 5 repeat meetings) of sub-catchment meetings and at the open day. For feedback on that element see the open day evaluation results. Not the high ratings for mapping activities. As a result of that latter presentation a key landholder (not on the project team) in the region has requested a specific planning session to examine the impacts of one of the recommended changes in the report, using the linking of maps to the financial calculator. This is set for June 22nd and is considered to be an important indicator of acceptance and possible leading farmer breakthrough.

ACHIEVEMENT RESULTS FOR COMPONENT 5: LWW project outcomes accounted for in regional NRM planning.

The outcomes from this program are not easily separated from those intended by TWA and QMDC, since the processes were set up to run in parallel and to cross-fertilise. The impact of this project is in accelerating the adoption of recommendations and goals common to all parties and in adding some qualifying or new recommendations based on the research results from other parts of the project. Findings are summarised in a later section and recommendation outlined in the technical reports but in summary:

- Most (of the nine) sub-catchment groups are planning for at least some riparian zone areas with off-stream watering points and reduced stock impacts. Adoption will depend somewhat on incomes and approval for subsidised work;
- Some groups and individuals have indicated an intention to fence remnant woodland patches and reduce grazing pressure though this will be generally ad hoc and a low management priority;
- TWA has publicly (at the open day) adopted the concept of rotational regrowth control so as to enhance biodiversity, As explained in the Photo-voice and Property Planning reports, this may take some time to achieve on-ground, given the attitudes to woody vegetation; and
- There is a stated intention by TWA to use the monitoring system to input trend data and targets into their EMS, known as the Traprock Integrated Management System (TIMS), which will ultimately feed into marketing activities.

A likely additional activity to promote adoption of the outcomes in NRM planning will be to present and review project findings with QMDC.

ACHIEVEMENT RESULTS FOR COMPONENT 6: Progress made against the agreed Communication Plan.

The reporting here is against the detailed communication updates submitted in the last milestone report and these are summarised in the table below.

Activity	Timing	Target/s	Review Comment
Feedback on photo-voice via web viewing & email	Early March	Participants	Not achieved. Results not available in time. Also some privacy issues.*
	Late March	All Traprock landholders	
	April 21	All Target groups	
TLMIS operation & incorporation of feedback	Early March	Selected landholders	Achieved in late March through: • Project team meeting • On-farm visit with web designer • Phone and email correspondence with 2 landholders
	Late March	Additional landholders (snowballed)	Not achieved due to time lost.
	Early April	All Traprock, QMDC	Some QMDC (2 people) feedback incorporated.
	April 21	All target groups	Achieved. See open day evaluations. 15 landholders registered for use.
Pre-launch publicity	Early April	Media	Achieved. See media attachments.
Showcase all components: poster displays, interactive computer displays & official launch	April 21	Traprock & other woolgrowers	Achieved. See media reports and evaluations.
		Resource protection agencies & other landholders	

** Concerns arose about the explicit linking of texts to photos given that local people are very familiar with the landscapes and so the image would effectively reveal who the 'authors' were and given the nature of some comments, we erred on the side of caution. Samples of photo and text in the technical report are not explicitly linked.*

The key additional communication work was the attendance by the project leader at 8 sub-catchment meetings from November to March to update producers. This was vital in the run up to the open day and to raise the profile of the project. In addition, the open day surpassed expectations and we believe that the reach, especially through media, helped to make for some of the communications non-achievements earlier in the project.

SUMMARY OF PROJECT METHODS:

This is a multi-disciplinary project with three interrelated research elements and an 'extension' toolkit. Details of the research methods are in the five technical reports so the following are summaries, with a slightly more extensive description of the development of the toolkit.

- The ecology studies comprised:
    - A study of the effects of vegetation on grazed woodlands and remnants. The 47 study sites were stratified across the landscape. Patterns in floristic composition were determined using Indicator Species Analysis and non-metric multi-dimensional scaling. Analysis of similarity (ANOSIM) was used to determine whether there were significant differences in floristic composition between different mature tree density treatments, with or without woody regrowth. Kruskal-Wallis tests were used to determine if treatments differed significantly in terms of species richness, diversity and cover of distinct strata. Mann-Whitney U-tests were used to determine which treatments were contributing to differences.
    - In addition to the ecology work, a survey was conducted to determine how landholders subjectively assessed the production and biodiversity values of patches in the landscape. Landholders were shown a photo of a site and then asked to rate its production (pasture yield) and biodiversity values. The sites were then assessed, as above and grass yields were estimated.
    - A study of the responses of vegetation and ground invertebrate assemblages following the exclusion of sheep grazing. There were 18 study sites each with 3 levels of exclosure: full; partial (native animal access); and open. Above-ground vegetation ('biomass') was clipped and weighed; overstorey cover and recruitment were determined; as were stand structural characteristics, including foliage projective cover of distinct strata, and cover of litter, logs and rocks, and general habitat condition were also determined at each site. Patterns in floristic composition were determined as above. Arthropods were also sampled in the same locations using pitfall traps. All specimens were identified to order level. Analyses for order level included one-way ANOVAs of abundance, richness and diversity indices, MDS ordinations of community composition, ANOSIM analysis of community composition between treatments and BIOENV analysis of environmental factors most responsible for community composition and observed population trends. Preliminary ant analysis included one-way ANOVAs of abundance across tree density and grazing management treatments and assessment of changes to functional group composition in relation to tree density and grazing exclusion.
- The social science analysis of landholders' attitudes to biodiversity, landscapes and relationships to landscapes was built on a photo-voice survey. Participants were sent a disposable camera and took pictures on their properties according to prescribed themes. In a follow-up interview participants were asked to identify which photos best represented the different themes and why. From that 29 landholders then participated in a set of focus groups and each group produced a collage of photos representing their discussions and discussions were transcribed by a researcher. The two data sources for analysis were individual and group conversation text and the photos chosen by individuals and the three focus groups. These were analysed by matching text and photos and then iteratively sorted according to theme.

- The property planning component of the project is built on spatial mapping at the property and catchment scale, combined with financial analysis of land use change at the property level. The two main data outputs are net farm returns generated from *Excel*-based spreadsheet and a property planning approach based on a Geographic Information System (GIS) and satellite imagery. Relevant social, economic and environmental goals were identified from national and local NRM programs and from the social and ecological elements of this project. Consideration of these goals and social and economic constraints led to the selection of a range of land management changes or 'projects' that would be both acceptable to landholders and make progress towards the NRM goals. Net benefits for each change were calculated. In addition, Patch Analysis in ArcView was used to produce some indicators of the extent and shape, and by inference habitat benefit, of woodlands from the full regional map.

The monitoring toolkit comprises a number of interdependent components. It was developed in close consultation with Traprock landholders and based largely upon existing toolkits and monitoring methods. The toolkit is designed to enable individual land-holders to implement simple, efficient and realistic monitoring program for production and biodiversity values on their property. Where possible, the methods/contents of the toolkit were designed to align directly with existing regional monitoring programs being undertaken by the Traprock Wool Association (TWA) and the Queensland Murray-Darling Committee Inc (QMDC).

Pasture assessment

This is based on the "GRASS Check" system (Department of Natural Resources 1997), which is used by TWA for their regional pasture monitoring program. It has been modified to reflect the simpler style of the *Pasture Health Kit* developed for the north-west slopes of NSW (Sustainable Grazing Systems Program - Meat & Livestock Australia; NSW Department of Primary Industries). The assessment scheme is designed around a three-point scale which broadly reflects relative condition of pasture and is similar to the condition scale used for native vegetation and habitat components of the monitoring kit. Pasture condition is rated according to three main "functional" aspects:

- productivity - yield, palatability and weediness;
- stability - perenniality and ground cover; and
- nutrient cycling - organic litter.

Native vegetation and habitat assessment

The key responses for this theme build a picture of the:

- amount and spatial distribution of habitat patches;
- structural complexity of vegetation within patches; and
- condition, or healthiness, of patch vegetation.

The methods are modified (and somewhat simplified) from those developed for the *Focal Species* approach to landscape-scale biodiversity planning (Lambeck 1997) and the *Habitat Hectares* approach to vegetation quality assessment (Parkes *et al.* 2003). Reference is also made to the draft *BioCondition Field Assessment Manual* being developed by the Qeensland Environmental Protection Agency, which is similar to 'Habitat Hectares'

Site classification – patch features

For this part of the toolkit, each monitoring site is described in terms of relative density and species dominance of mature trees, as determined for the research undertaken in the project and shown to affect biodiversity values and patch size, patch shape, and connectivity, which are key biodiversity determinants described and measured in 'Focal Species' and 'Habitat Hectares' approaches (see above)

Habitat complexity

Complexity of native vegetation is strongly correlated to the diversity of species likely to be present, so complexity is a good indicator of biodiversity values in on-farm vegetation patches. This part of the scheme is an adaptation of the method developed for measuring habitat complexity in relation to small mammals (Catling and Burt 1995) subsequently modified and refined, and now used widely in assessing habitat values in landscape-scale ecological studies (e.g. Watson *et al*. 2001, Short and Parsons 2004). This version is based on one developed locally for the QMDC vegetation condition assessment program, which, in turn, was modified from that described by Watson *et al.* (2001)

Habitat condition

In the context of this monitoring kit, 'vegetation condition' simply refers to the relative healthiness of native vegetation. The key determinants of condition are:

- regeneration – lack of seedlings, saplings and semi-mature individuals (i.e. mixed age stand) of the dominant species is detrimental to the sustainability of the habitat patch.
- tree health – advanced or accelerated senescence of dominant trees may cause substantial change in the community structure, or even complete loss of the habitat patch.
- regrowth – advanced thickening of one or more native woody species could cause an ecological imbalance in the community, resulting in loss of biodiversity value.
- weediness – if exotic woody species dominate the understorey, there may be a marked reduction in diversity and abundance of native species that would otherwise occur there.

Sources for Toolkit Components

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STATEMENT OF KEY FINDINGS, THEIR INTERPRETATION AND PRACTICAL SIGNIFICANCE AGAINST EACH PROJECT OBJECTIVE:

The project is based on three broad objectives and the findings cut across three disciplinary elements of the project. The findings are reported by themes, highlighted and linked to those objectives where there is practical significance.

Vegetation Management and Biodiversity

One of the main focuses of the research project was the management of native vegetation. The number of plant species recorded for this research is comparable to previous studies on woodland communities in Australia. From the exclosure study, mean species richness was 17 per 4 m^2 indicating that:

the Traprock region has a significant biodiversity component (in terms of plant species).

However, there is

little evidence of overstorey species recruitment which suggests that the wooded sites sampled in this study may not be viable over-time.

The recruitment of overstorey species depends on a number of factors such as suitable environmental conditions, adequate seed supply, and absence of herbivory. Possible explanations for the lack of recruitment are that there may not have been suitable environmental conditions for the germination of overstorey species since exclosure establishment and the fact that exclosure plots were only for a 12 months testing period. Another possibility is that disturbance (e.g. fire) may be necessary to enhance germination.

While landscapes in the region have been subject to considerable disturbance, some of these activities have had a positive impact on biodiversity.

The range of vegetation treatments (fire, mechanical clearing, chemical control) used in the region contribute to biodiversity through the creation of a range of vegetation types, which in turn were found to be associated with differing floristic composition.

The results suggests that both grazing and tree clearing have resulted in a vastly different understorey in low and medium density patches, with a higher annual species richness (in low and medium density treatments), higher herb/forb species richness (in medium density treatments), and lower shrub species richness (in low density treatments) compared to that of more ‘natural’ ironbark/gum woodlands. However, it should be noted that there were no differences in total or native species richness between groups. The higher annual species richness in low and medium density treatments is possibly related to the more intense grazing and tree removal practices that have historically occurred in these areas. Annuals are reported to be more tolerant of disturbance than perennials due to their fast growth rates and early and prolific seed set and many studies within Australia have reported an increase in annual species in areas that were frequently grazed by livestock. Similarly, the higher herb/forb richness in medium density treatments compared to high density treatments may be a response to reduced tree density/cover.

In addition to plant biodiversity:

Arthropod communities at order level were found to be greatly influenced by tree density.

Abundance was found to be greater in low tree density areas than in medium and high tree density areas, although in the second and wetter year of the study, abundances were also considerable in the high-tree density sites. Potential reasons for this include a proliferation of species that are hot-climate or disturbance specialists (e.g. ants of the genera iridomyrmex and rhytidoponera) and population of a few taxa due to a decrease in inter-specific competition (due to decreased diversity in low-density areas).

Richness was found to operate inversely to abundance, with greater richness at the order level apparent in medium and (particularly) high tree density areas. This may be due to lower levels of disturbance and greater levels of habitat complexity. Ordinations of order level community structure found that communities in low tree density areas were distinct from those in medium and high tree density areas. This all points to the presences of trees being the overriding factor in determining arthropod populations in this landscape, as is further supported by the BIOENV analysis that singled out tree presence, leaf litter cover and presence of fallen dead-wood as the most important determinants of arthropod community composition.

In both the vegetation and arthropod studies, there was no difference between open pasture areas which were deemed to differ by dominant original vegetation.

That is, open pasture areas were similar in biodiversity no matter location in the landscape or original vegeation, though the open pasture areas are distinct from other land cover types. In relation to vegetation diversity, woody regrowth areas have a different composition to other areas, though with some similarity to woodlands with no regrowth.

Plant diversity may actually be less in pole stage regrowth (20-50 years) than in open woodlands (medium density of 6-20 stems/ha).

The order level taxonomic data from the arthropod studywould appear to support the vegetation data in concluding that:

medium-level tree density may be sufficient to retain considerable arthropod diversity in the landscape.

However, management recommendations based upon such coarse taxonomic level are to be treated with caution. The 2006 arthropod data, even at order level, revealed that richness was higher in high-density areas compared to medium-density areas, and it is certainly conceivable that many species (possibly of great functional significance) are restricted to areas of high tree density, perhaps due to cooler temperatures, greater litter cover, etc. More detailed ant data may be indispensable in unravelling this relationship, as it operates at finer taxonomic resolution of a comparatively well understood group and allows compartmentalisation into recognised functional groups. There may therefore be a case for thinning some areas, especially as this would increase pasture yield. On the other hand, there is also a (biodiversity-based) case for allowing some regrowth.

These findings from the ecology studies go to objective 1 in relation to providing scientific information to landholders.

1. To strengthen wool grower capacity to use scientific and socio-economic information and research to support integrated biodiversity and production planning from property to catchment level.

While these particular findings do not provide landholders with easy choices, there is now more science to inform those choices. In general, landholders now know some of the vegetation management practices that will contribute to, or detract from, plant and arthropod biodiversity, and presuming these to be indicators, possibly also of system health. This leads onto management principles as inherent in objective 2.

2. To ensure more effective wool industry input into catchment and regional planning objectives by developing integrated management principles and practices for profitable and sustainable wool production that links property to sub-catchment scales.

The potential management principles or practices, derived from the research are:

- Rotate regrowth control around the landscape;
- Allow some regeneration in selected areas, at least to open woodland stage; and
- Thin woodlands in preference to the full clearing of pole-stage regrowth where possible.

The role of fire may need to be both reconsidered and researched, with regard to the regeneration of some plants. Managed burning has largely been phased out in the region but consideration of the impacts of that were outside the scope of this project, so more work is needed if there are indications that fire may have a role.

There are however, some important qualifiers to the logic of moving from 'capacity' and 'use' from objective 1 and 'principles' from objective 2 to practice change. Landholders may accept the scientific validity of the landscape relationships and know what 'must be done' to improve biodiversity outcomes, and even agree to the principles and plans. This would certainly take landholders to the KASA stage (Bennett's hierarchy). There are however, some important barriers to practice change identified in the social science and economic work.

The photo-voice results show that:

There is a strong implied preference amongst landholders for current landscape structures.

Part of that is the attachment to a mixed landscape dominated by open pasture, representing carrying capacity. In addition, landholders see themselves, quite logically, as part of a bio-diverse system and sustainable land management is seen as an aspect of sustaining the quality of woolgrowers' everyday lives as well as the biodiversity underpinning their economic future. Of particular relevance for both woolgrowers and service providers is that:

If a change in the landscape threatens landholders' place identity, attachment and dependence then this will be a barrier to attitude change and NRM practice.

There is likely to be particular difficulty in achieving practice change with regard to regrowth control strategies. From the photo-voice focus groups:

Woody regrowth is seen by landholders as being a particular and endemic management problem.

This is understandable given the findings in the vegetation studies, exclosure sampling and financial modelling. There is a significant inverse relationship between tree density and pasture yield. In addition, the modelling from the GRASP program (see Property Planning report) shows the exponential decline of pasture yields as basal area regrowth increases. This of course translates into an exponential decline in wool returns.

From the photo-voice focus groups:

Financial concerns were a considered to be a threat by the majority of focus group participants.

This is a realistic assessment of the landholders' situation. The background financial analyses showed that no properties are likely to return more than 3 percent on capital invested and smaller properties would generally be running at an economic loss if management wages are attributed to operators. Many farm business incomes are effectively cross-subsidized with off-farm income. Thus, with small margins, even small costs or sacrifices to public good or social expectations have a disproportionate effect in reducing profit margins or extending losses.

On the other hand there may be some vegetation management strategies that do yield positive internal benefits. Some of the modelling work suggests that landholders may not be working to the economically optimum regrowth control cycle.

Where labour is costed, the cycle of chemical control of regrowth could be extended from current practice to give a net economic benefit.

This conclusion needs to be treated with great care. There are significant variations in labour time and chemical costs, as reported by landholders. In addition, there needs to be calibration of the pasture/basal area relationships as generated from pasture yield models, which are based on general climate and soil data. These appear to overestimate pasture yield for this region.

With regard to the concept of thinning woodlands, the results from the property planning case studies suggest that:

Thinning woodlands to achieve additional grass yield produces a marginal net economic benefit over no action but full clearing would be better again.

The problem is that mechanical thinning would incur additional costs over clear felling, because of the additional time taken to preserve trees, and then grass yield would be less anyway. On the other hand:

Selective native timber harvesting would make the creation and maintenance of open woodlands a more attractive proposition than merely thinning or undertaking no treatments.

The net benefits would further increase if some commercial thinnings could be harvested during the initial clearing process. There would however need to be some effort to build a forestry 'culture' and the requisite skills amongst landholders in the region, although there is some activity already. In addition, in other areas, returns are usually boosted by on-property value-adding which may require new equipment (eg portable sawmill) and skill sets.

In addition to investigating cases where a change to vegetation management yields both net farm income and biodiversity benefits, it is also possible that under some circumstances, landholders will carry some costs for public, regional or group benefit. The converse of the earlier statement on sense of place as a barrier to landscape change is that if the sense of place changes over time to embrace a 'new' landscape that includes the biodiversity orientated changes from this study, there may be some

preparedness to carry costs to develop and maintain that landscape. There is an inclination to look after resources. From the photo-voice study:

A clear majority of landholders saw ecology as an important element of sustainable production.

The older the participant the more likely that ecology is a focus point rather than economics or product quality. Participants who described Place Attachment are more likely to indicate concerns regarding diversity and ecological management practices compared to those who do not describe Place Attachment. Participants who describe Place Dependence are more likely to indicate concerns regarding product quality but they are also more likely to indicate the importance of ecological management practices than those who do not describe Place Dependence. In addition and somewhat balancing the concern about regrowth:

producers overwhelmingly accept the role of trees in biodiversity.

They see current landscapes as representing sustainable production and they do wish to conserve and regenerate the resource base. One quarter of respondents in the photo-voice survey specifically associated sustainability with the maintenance of corridors and tree borders. Hence, there is some willingness to accept pasture yield trade-offs already, though shelter belts do have stock protection benefits as well.

There are however, some qualifying, concluding comments directed at service providers and policy-makers. The process of building attachment to and identification with re-arranged landscapes is likely to require commitment, time and patience. There was considerable 'difference' language noted from the focus group study.

Landholders see themselves as afflicted by ideas and policies generated by people with limited knowledge of their circumstances or of 'real' sustainability.

This resistance to the imposition of policies and ideas generated 'elsewhere' has been noted also in other literature on rural attitudes and beliefs (see Photo-voice report). The development of place attachment, identity and dependence are necessarily long-term processes. This potential for sense of place to change so as to eventually contribute to social benefits also raises an ethical, or theoretical depending on how the argument is framed, concern. Given the tendency described above for landholders to accept low, and even negative, rates of return, which can be presumed to be at least partly compensated for by a 'psychic wage' derived from the sense of place, the ethics of using this acceptance of loss to provide public benefits would need some consideration.

Grazing Management

The project also examined possible changes to grazing management from ecological and economic perspectives. From the exclosure studies, there is some evidence to suggest that plant above-ground biomass has responded to the removal of grazing in open paddock areas, although this is not consistent across mature tree density treatments. It is suggested that a longer period of exclusion will be necessary to detect changes (if any) in plant species composition. While the distinction between vegetation type and tree density is observed in plant species composition:

The exclusion of grazing has not significantly altered composition after 12 months. There was some evidence to suggest that above-ground plant biomass has responded to the removal of grazing in open paddock areas.

In particular there was an increase in biomass from 2005 to 2006 in the complete exclosure for low density ironbark/gum woodland sites. However, no difference in above-ground biomass between exclosure plots was found for ironbark/gum woodland sites or box woodland sites, and there was no interaction between exclosure plot and tree density. Significant differences in above-ground biomass between tree density classes was indicated with a significantly higher plant biomass in low density box woodlands compared to medium and high density treatments, and a significantly higher plant biomass in low density ironbark/gum woodlands compared to high density treatments (although there were unequal variances). There was little change in the understorey of woodland communities in the Traprock region. With regard to the arthropods:

Order level arthropod communities have begun to show some potential response to grazing exclusion, with arthropod richness being significantly greater in the 1m exclosures than the control un-exclosed area.

This may be a response to greater levels of vegetative cover and resource availability in the 1m exclosure, couple with reduced disturbance from grazing stock. The time frame is too short to draw scientific conclusions leading to management recommendations. Other studies have suggested 5-7 years of data is needed. The exclosure studies have not as yet provided sufficient scientific data for sound management recommendations that contribute directly to objectives 1 and 2, although there is an implication for objective 3 reported in the next section.

As part of the economic study, three grazing management changes ore scenarios were also examined. The findings related to property management include:

Fencing remnant woodland areas and reducing grazing pressure (by 40%) generally results in small (relative to income) losses.

Remnant woodlands are here defined as areas that will not be cleared because of legal restrictions or property management considerations. The assumption was that a reduction in grazing pressure, by either or both stock numbers and grazing period, may improve habitat condition, though as noted above this is based on an assumption of habitat benefit at this stage. This financial result was expected because wool returns from dense stands are already relatively low and so the reduction in effective stocking rate has only a small relative impact.

Fencing and protecting riparian areas is however, more costly.

A riparian protection project can be relatively costly, especially where profit margins are low or negative.

In these cases, a lot of fencing is required to protect a relatively small area, with the long narrow shape. In addition, up-front watering costs may be considerable. A third grazing management scenario was then considered, whereby the works for remnant and riparian protection were undertaken with a broader grazing strategy change, being to increase rotation rates. Thus, property fences and watering systems are changed across the property to accommodate this. It is presumed that the accelerated rotational system will allow for increased stocking rates and improved ground cover. Preliminary estimates suggest that:

A 9-12 percent increase in carrying capacity could pay costs (over 10 years) for the re-design of a typical property for an accelerated rotational grazing system. The higher rate would also cover the remnant and riparian protection work.

Again, costs will be highly variable, given differences in landscape relief, existing paddock formations and the location of current water sources, so care needs to be taken in generalising from these results.

These findings with regard to grazing management have implications for objectives 1 and 2.

1. To strengthen wool grower capacity to use scientific and socio-economic information and research to support integrated biodiversity and production planning from property to catchment level.

From the economic work, including that discussed in the previous section landholders now have results from indicative case studies on which to develop management decisions and they now understand the principles for treating NRM changes as projects, thus they can apply the same approach in developing their own calculations. Thus, their capacity to use economic information and principles is 'strengthened'.

2. To ensure more effective wool industry input into catchment and regional planning objectives by developing integrated management principles and practices for profitable and sustainable wool production that links property to sub-catchment scales.

With regard to the second objective, the management principles are to treat land management changes as projects, with up-front costs and returns, or losses, over time and where possible, seek to integrate resource protection strategies with production-focused strategies so as to reduce the marginal costs of any changes.

Spatial Analysis and Planning

As part of the development of property and sub-catchment planning information and principles some spatial analysis and mapping activities were undertaken. While these were not strictly research activities with consequent findings, some conclusions are made here. These relate to the planning from property to sub-catchment scales elements of objectives 1 and 2.

1. To strengthen wool grower capacity to use scientific and socio-economic information and research to support integrated biodiversity and production planning from property to catchment level.

2. To ensure more effective wool industry input into catchment and regional planning objectives by developing integrated management principles and practices for profitable and sustainable wool production that links property to sub-catchment scales.

Landholders observed in the planning processes are interested in landscape images and respond well to spatially-based planning. These processes also bolster the image of the service agency providing the data as the agency is then seen as supplying something 'useful'

Imagery and mapping function as engagement tools, as well as sources of data and the bases of planning.

One constraint in mapping processes is that the expectations of both the service providers and the landholders can be unreasonably raised. The mapping looks simple but sometimes requires considerable skill in processing. In this project, the imagery was expensive, though fortunately supplied as in-kind and more limited in flexibility than expected. In particular, the aim was to classify landscape areas according to vegetation density and perhaps even age or type. The imaging and processing hardware and software is developing, though is as yet costly and somewhat experimental. Nonetheless, a reasonable satellite image can be the basis for sub-catchment planning activities when combined with landholders developing their own maps of current and future landscapes.

Monitoring Toolkit

As with the spatial analysis, the toolkit has not been 'researched' and so there are no true 'findings', We have, however drawn some conclusions, based on observation of other monitoring systems and from some of the research findings from other areas. All of the conclusions summarised here relate to objective 3.

3. To design and test a coordinated NRM monitoring and reporting protocol for wool growing regions by developing a Toolkit for monitoring productivity and biodiversity for profitable and ecologically sustainable wool production.

From the ecology studieshe results from the correlation of grass cover and above-ground biomass indicate that:

subjectively estimating the grass cover will provide a good indication of plant above-ground biomass.

This result is important in that more confidence can be given to subjective estimates of grass cover which are often less time consuming and costly. From the survey of landholders' estimations of production yield and biodiversity it was concluded that landholders are quite accurate when assessing production values visually. This helps to validate the use of the GRASS Check approach used in the toolkit. suggest that:

Arthropods are capable of being used as a community-monitoring tool.

Order level identification is useful for detecting broad scale environmental changes (e.g. tree density), may be feasible for detecting more subtle changes (e.g. grazing management) and does not require highly specialised expertise. Ant monitoring is inevitably a more specialised pursuit, but is still well within the capabilities of an environmental consultant, post-graduate research student or the keen amateur entomologist, and as such is an achievable goal for a community group searching for a relatively novel but powerful environmental monitoring tool. To translate this into a monitoring tool needs further work.

Finally and from the spatial analysis, it was concluded that:

Interpreted satellite imagery can be used to generate vegetation patch indices can be used to compare regions and properties.

There is a need for caution with regard to setting up monitoring systems. Reviews of other monitoring systems, discussions with extension personnel and landholders suggest that consistent monitoring activity will be very difficult to maintain. It is surmised that:

Monitoring activities will only be maintained where:

There is a committed organisation with relevant skills or access to skills, sponsoring or managing the process and there is a clear product marketing imperative to monitor and report trends.

It is not apparent that 'green credentialism' has yet progressed to the stage in the wool industry where reporting of environmental performance and green labelling give a clear market advantage. It is however, the expectation amongst woolgrowers, particular those involved in marketing and overseas sales, that some labelling, backed by an EMS will be needed in the future. This proto-type system is then an investment in the future, based on an expectation about current consumer trends. The toolkit data system needs, therefore, both nurturing through the indirect benefits phase and refinement as consumer demands become more apparent. Most of all, it needs to be linked more strongly to an EMS, such as the Traprock Integrated Management System.

HOW WAS 'SUCCESS' TO BE MEASURED IN YOUR PROJECT?

The hoped for outcomes were:

- Short term:
  - Improved woolgrower capacity and preparedness for changing management practices;
  - Greater understanding by woolgrowers of biodiversity monitoring;
  - Stronger links between woolgrowers and NRM planners; and
  - Adoption rates of recommendations and outputs.
- Long term
  - Improved wool industry marketing;
  - Strengthened industry environmental credentials; and
  - Greater input from wool industry into regional planning.

These were to be 'measured' by:

- Participation numbers in activities (meetings etc);
- Understanding and acceptance of tools and recommendations (from observation, feedback and an end of project survey);
- Adoption of tools and planning (uptake indicators and survey of intentions); and
- Practice change in the landscape (observed post-project).

MONITORING AND EVALUATION:

From the original proposal, the evaluation mechanisms were to be:

- Participation numbers;
- Feedback from participatory activities; and
- An end of project survey.

A later proposal was to use the photo-voice technique to assess the attitude change with regard to biodiversity, though this did not eventuate, as discussed in Achievement Criteria 4.3. During the project the program logic was further developed (according to Bennett's hierarchy) and is summarised in the evaluation attachments section 8. That resulted in the development of further evaluation proposals to evaluate to the reactions and KASA stages. In addition, this project was used in a trial cost-benefit analysis.

Hence, the final list of evaluation activities includes:

8.2 Biodiversity Field Days: Post-presentation interviews and survey

8.3 Open Day (end of project) survey;

8.4 SWAG presentation day; and

8.5 Project Researcher Review meeting.

8.6 Cost Benefit Analysis (Preliminary and subject to further iteration)*

Details of results and summaries are at Attachments section 8. Please note that a negative outcome for the CBA is not unexpected given the nature of the evaluation method and the orientation of this project towards examining non-market, public or merit goods. There is in addition a case for considering some additional woodland preservation and water quality benefits.

FINAL REPORT

SUMMARY OF COMMUNICATION, TECHNOLOGY TRANSFER OR 'ADOPTION' ACTIVITIES:

1. Presentations to 1 x 9 sub-catchment meetings (mid to late 2004)
    a. To introduce the project and recruit participants
2. Presentation to TWA Annual Meeting (2004)
    a. To explain project to almost all Traprockers
3. Biodiversity field days (3)
    a. Extension and preliminary adoption activity
4. Pre-launch media releases
    a. Awareness and recruitment for participation
5. Open day presentations and activities
    a. Results presented
    b. Adoption of toolkit
6. SWAG Presentations
    a. Results presented

ASSESSMENT OF ANY COMMERCIAL POTENTIAL:

There is some potential intellectual property with regard to the monitoring system, although this would really only be the conceptual framework, since the elements are largely adapted from existing ideas. This does raise and issue of LWA/AWI as to how to respond to requests to adapt this approach. That is, would acknowledgement or more be required?

LIST OF PRODUCTS

1 Technical reports (see attachment list)
2. Web-based monitoring toolkit (see website and pages in attachments)
3. Glovebox guide (see attachments)

WHERE CAN THE READER OF THIS REPORT OBTAIN ADDITIONAL INFORMATION

The website contains monitoring tools, an overview of the development of the toolkit and advice on adaptation.

All technical reports contain reference lists.

For information regarding the TWA, contact Margaret Smith (President at time of writing)

- Email: mulgowan@halenet.com.au

For information on the research content, contact Dr Geoff Cockfield, University of Southern Queensland.

- Phone: 07 46311246
- Email: geoff.cockfield@usq.edu

OVERALL, WHAT ARE THE KEY LEARNINGS – GOOD OR BAD – FOR THE LWW PARTNERS (AWI & LWA) FROM YOUR PERSPECTIVE

The learnings in this section are organised according to functional themes.

Project management

- Multidisciplinary projects carry additional costs and risks, including:
  - Lack of integration between components, narrowly avoided in this project, so that smaller specialised projects would have been more cost-effective with the integration left to the funding agency; and
  - An increased need for coordination/management time and skills.

  Therefore, the suggestion is that the funding bodies fund management accordingly and spend some time in refining the integration strategies within such proposals. Such projects may be higher risk but possibly more rewarding projects.
- Landholder involvement strengthens the relevance of the project but there are some issues that need careful monitoring:
  - Producers can be impatient with scientific caution and press for results ahead of proof; and
  - There can still be some pressure to 'find' the right result.

  The funding body needs to be supportive in standing by the need for rigour and caution where warranted.
- Multi-agency project participation can bring many additional inputs (skills and data) into a project but there can be some difficulties:
  - Where labour is 'shared' so is management and this can be difficult; and
  - NRM and extension agencies can have significant changes in staff and priorities, thus the promised commitment can decline over time or even suddenly (this did not happen in this case).

  While seeking partnerships is a desirable strategy the agreements in some cases may need to be stronger at the start of the project.

Research and Evaluation Methods

The use of surveys in both research and evaluations needs to be monitored and treated with care. There are several problems to consider related to the 'over-surveying' of rural people, given the seeming increasing number of researchers and diminishing number of subjects. The potential problems include:

- Irritation at, and therefore resistance to, 'another survey', thus increasing the likelihood of ill-considered or even contrary responses; and
- Such experience with surveys that there is the capacity to anticipate the response being sought.

Project Outcomes

- It is anticipated that the toolkit efforts will be largely wasted unless there is occasional or on-going support to update and develop the carrying system, thus giving TWA the support needed to keep people engaged;
- It is considered that there would be no point to trying to use a toolkit such as this without a strong producer organisation or NRM agency sponsor and guide; and

- Latitude in the design and conduct of multi-disciplinary projects is risky (see above) but can bring unexpected and interesting outcomes. The funding bodies may need to accept some risks in a whole project portfolio if innovation is sought.

RECOMMENDATIONS ON THE WAY FORWARD

Research Recommendations

- Experiments that examine mechanisms of shrub and tree recruitment could be important for implementing management practices specific for tree and shrub establishment in the Traprock region.
- The research recommendations stemming from arthropod study are that order level arthropod research should be directed at the grazing treatments, and genera-level/functional group ant research should be utilised on all the focal environmental factors.Implications for future research (Photovoice)
- Sense of place should and can be monitored as a determinant and outcome factor of NRM as well as biodiversity and woolgrower behaviour.
- The photo-voice method could be used to monitor changes in the understanding of biodiversity. Careful consideration needs to be given to the availability of skills and time. The processing of data took considerable time and the ability to analyse this type of qualitative data is not common.
    - Computerisation, involving the loading of photographs and related text could cut some of the time.
    - Reducing the number of themes, for example to biodiversity would streamline the process.

  On the other hand, the experience here was that broadening the focus did reveal some important information and ideas.
- Investigate the possible biodiversity benefits of different locations of regrowth strips or patches in landscapes;
- Calibrate the trade-off between pasture yield and regrowth rate (basal area);
- Estimate the growth rates of regrowth woody vegetation under different conditions;
- Investigate the potential for new GIS object recognition software for the classification of open woodland from images;
- Monitor the development of image interpretation techniques as they allow for more vegetation type and size discrimination; and
- Monitor the impact of an accelerated rotational grazing system on resources and profitability.

Outputs Adoption

The web-based toolkit can occupy 2 specific niches:

- to provide data to support EMS or product marketing activities where there is a skilled and committed sponsoring organisation or producer group; and
- to provide trend information to NRM agencies funding or managing landscape change projects. This system could be used to monitor progress towards funded goals, thereby reducing the transaction costs involved in paper-based reporting.

It is therefore proposed that promotion of the toolkit be highly targeted, especially given the advice with regard to the need for a sponsoring and coordinating organisation. Disaggregated adoption would harm the image of the process. It is further recommended that some time be taken to facilitate and monitor the system use in the Traprock before pushing the idea too strongly.

The photo-voice technique has considerable potential for use in NRM attitude evaluation, however it needs to be recommended or approved with caution, given the data processing issues. It should only be approved within projects where there are demonstrated skills in data management and processing unless a more focused approach is used. Recommendations with regard to changes in methodology include:

- Use digital cameras.
- Asking participants to choose a limited number of photos from their collection
- Careful annotation of photos chosen for analysis is essential to ensure accuracy of text related to the particular photos

For recommendation for NRM agencies are:

- Programs to change landscapes in order to achieve conservation goals must be part of a long-term strategy. This is because:
  - There is considerable distrust of government NRM policy;
  - Low rates of return limit the capacity of landholders to make changes;
  - There is a strong preference for current landscapes;
- Agencies could use processed imagery and Patch Analysis to monitor basic woodland indicators.
- A strategy for getting resource protection work done is to graft it on to a change in grazing management. As in these case studies, this reduces the real cost of the protection work.
- NRM personnel need greater understanding of the benefits of forestry and the barriers to its adoption and the extensive research on native timber harvesting and cooperative timber marketing needs to be drawn to the attention of woolgrowers in areas such as the Traprock.

FINAL REPORT

LIST OF ATTACHMENTS:

1. Technical Report: Vegetation and Biodiversity Study
2. Technical Report: Exclosure Experiment Study
3. Technical Report: Invertebrate Study
4. Technical Report: Photo-voice Study
5. Technical Report: Property Planning
6. Web-based Toolkit Pages
7. Glovebox Guide Page Proofs
8. Evaluation reports/survey forms
9. Lists of woolgrowers involved with experimental trials/'natural experiments'/case studies (I'll need to check the privacy provisions here, but wanted to acknowledge their input where possible)
10. Media Items
11. Conference and Other Presentations
12. Landholder Meeting Presentations

FINAL REPORT

SUMMARY of MONITORING and EVALUATION ACTIVITIES
(Please cross-reference responses to more detailed reports where available)

Project code and title: USQ5: Integrating Paddock and Catchment Planning: A Woolgrower Driven Approach to Sustainable Landscape Management

Dates:
Field Day Reviews and questionnaires (Attachment 8.2)
January – April: Feedback on financial estimations (6 property visits)
April 21: Open Day Survey (Attachment 8.3)
April 27: SWAG Survey (Attachment 8.4)
May 15: Research Team Review (Attachment 8.5)
Late May: Preliminary cost-benefit analysis (Attachment 8.6)

Context issues that have affected project progress and outcomes:

1. The after effects of Queensland vegetation management legislation influenced participants' acceptance of recommendations with regard to vegetation management.
2. Extremely dry year in 2004 affected motivation of participants.
3. Dry year followed by wet year (2005) may have affected scientific work.
4. High land prices induced an unusually high turnover of properties in a region normally regarded as tightly held. Some participants estimate up to 30 percent turnover. This had three effects. Many incomers are not taking up wool production and so effectively moved out of the target group. Second, some are absentee or 'part-time' operators and so are not available to participate in project activities and extension. Finally, new landholders arrived when project activities were well-advanced and may not have been able to 'catch up'.

Activities/outputs and people involved/reached

Activity and Outputs	*No.*	*Woolgrowers involved***	*Service providers*	*Other* stakeholders*	*Comments*
Activities					
Field sites	47	12			
Planning meetings	15*	50	4-6	10	
Field visits/days	3	80	2		See Attachment 8.2
Steering Committee		2-4	2		
Open Day	1	58	36	9	
SWAG Meeting	1	9		5	
Outputs (nos)					
Conference publications	2			10	
Media articles	16	5 direct	Yes	Yes	Unknown number reached

Activity and Outputs	*No.*	*Woolgrowers involved***	*Service providers*	*Other* stakeholders*	*Comments*
Web sites Tools or guidelines	1	20-50	Yes	Yes	No count of visitors by category yet available
Other outputs	1		2		Honours Presentation (USQ) to scientists & NRM
Total people reached by project**		142	48+	34	High reliance on media so unknown reach

** Meetings were in sequence with same attendees at subsequent meetings the total number of individuals who attended one or more is reported.*

*** With the type of activities there is obvious double counting of people.*

**Please list other stakeholder groups included in the table:*

Natural resources scientists from the research sector
Funding body advisory group
Wool brokers
Other landholders (not woolgrowers)

***Please comment on interaction with/numbers of "influencers" involved at any level:*

1. Some key influencers were on the project team
2. The sub-catchment planning presentations led to directly to 3 invitations to explain and show the financial calculator. These were landholders who could be considered as influential.
3. The open day resulted in an invitation to undertake a property plan for grazing management change directly in line with the project recommendations. This is considered an important piece of extension.
4. The SWAG meeting is assumed to be engagement with influencers.
5. QMDC program managers (vegetation and sustainable landscapes) are considered influencers with one on the project team and one consulted regularly.

Key outputs or products to emerge from project of direct value* to woolgrowers

Key findings, information or product developed through project	***Level of relevance to woolgrowers in project region or state (numbers of groups, hectares of land that could be impacted on)***	***Level of relevance to woolgrowers beyond region or state (numbers of groups, hectares of land that could be impacted on)***
Change grazing management to increase carrying capacity	13 woolgrowers initially and 55 after 20 years**	Not estimated but of expected value in all woolgrowing areas.
Monitoring activities leading to accreditation and market protection (avoided losses). This has not yet been included in the BCA.	30-50 growers (30 -50,000 sheep and consequent output). Market protection premium might be 10-20 %.*	4-5 groups of 20-30 growers

** There might actually be a threshold effect where the price drops suddenly and significantly rather than steadily for 'unaccredited' wool.*

Stakeholder Reactions – to the project and LWW in general

Stakeholder group	***Summaries and examples of reactions (for example perceived usefulness or value of activities or products)***
Woolgrowers	Very useful ▪ "At last some fair dinkum data to use" ▪ "Very good as it is specific to our own 'area' not average across state" ▪ "The photo voice survey is an excellent tool that has a much wider potential to be used in other and future projects and programs" ▪ "Project will assist to help grazing enterprises cope with future issues"
Service Providers	Quite useful ▪ "An ambitious and much needed initiative" ▪ "Economic info very interesting. Very glad that someone doing this work"
Researchers	Very useful ▪ "The breadth of the project and multi-disciplinary nature provides a very good example of addressing the social, economic and environmental components of running a commercial farm. This helps to address the program goals well. The partnership between TWA, USQ and QMDC is also very much in the spirit of the LWW program."

Stakeholder group	***Summaries and examples of reactions (for example perceived usefulness or value of activities or products)***
Media reaction/ interest	Interest in web-based toolkit See Attachment section 10.
Other stakeholders	Very useful ▪ "I am aware of many of the projects undertaken but the results are new to me on the whole"

Improvement in understanding or skills in relation to program objectives

Stakeholder group	***Summaries and examples of gains in understanding or skills***
Woolgrowers	Level of new knowledge or skills learnt from participation in the open day rated very highly with the ability to develop a means of estimating financial outcomes rating less. ▪ "The NRM side is good. The economic sustainability is less easy to judge, and the exposure to woolgrowers indicates a considerable diversity of enterprise and energy. The impression is that economic sustainability is fragile." ▪ "It would be nice to study some of the biological data in more detail and it needs temporal extension and dollars." ▪ "Certainly an increased awareness of the landscape"
Service Providers	▪ "It's highlighted the importance of looking at the economics (in detail)" ▪ "Good event to get a general perspective on project and what it is achieving"
Other stakeholders	No comments that apply

Changes in attitudes or motivation in relation to project objectives

Stakeholder group	***Summaries and examples of changes in attitudes or motivation***
Woolgrowers	▪ "To understand succession planning and key motivators we need more social research like the photo voice survey. If not, there may not be a wool industry in another generation" ▪ "Knowledge gained is invaluable. Participation is essential for gaining knowledge"
Service Providers	▪ "A bigger emphasis on getting productivity and conservation

Stakeholder group	***Summaries and examples of changes in attitudes or motivation***
	goals together."
Other stakeholders	▪ "Integrate information for future involvement with Traprockers"

Changes in practice or information demand in relation to project work area as a result of project information or activities

Stakeholder group	***Summaries and examples of practice changes (including numbers and areas of change where applicable and known)***
Woolgrowers	▪ "Catchment mapping has been a useful exercise" ▪ "Help assess how other woolgrowers can use an online EMS system"
Service Providers	▪ "Good displays, good presentations - some more work to do" ▪ "Looking forward to seeing how photo voice interpretation can help in the development of extension programs."
Other stakeholders	▪ "Grower participation is very high and what level of awareness is there with urban and non-group audiences (i.e. is there a need to inform the wider community of emerging results?)"

Broader productivity, environmental or social impacts and potential impacts of project

Key findings, information or product developed through project	***Productivity benefits to date and potential benefit over the next 5 years (where possible include figures and assumptions made)***	***Environmental benefits to date and potential benefits over the next 5 years (where possible include figures and assumptions made)***	***Social benefits to date and potential benefits over the next 5 years (where possible include figures and assumptions made)***
Change grazing management to increase carrying capacity	13 woolgrowers initially and 55 after 20 years	Increased ground cover leading to better water penetration and reduced stream turbidity. Could be estimated as fraction of water quality 'price' below.	Maintenance of: • Sense of place amongst 40-50 landholder families • Community services • Employment
Monitoring activities leading to accreditation and market protection (avoided losses). This has not yet been included in the BCA.	30-50 growers (30 - 50,000 sheep and consequent output). Market protection premium might be 10-20 %.*		
Remnant protection	Possible very long term benefits to resource condition but too speculative to quantify.	6000 ha* (valued at $500/ha which is an imputed value for native woodland)	Existence value of additional habitat for citizens
Riparian protection	Possible medium to long term benefits through recovery but speculative.	20 x 200 ha/property = 4,000 ha. Value would depend on water quality 'price' which ranges from $10-40/ha/yr.	Improved water quality for domestic uses.

** Revised figure and different from BCA assumptions*

Other outcomes/benefits

Alliances developed with other projects	Queensland DNRM study of grazing in the Traprock QMDC sub-catchment planning process
Examples of innovative activity stimulated by the project	
Emerging funding opportunities to build on project activities and outputs	Some interest from QDNRM in the exclosure work.
Other projects or agencies that have picked up on findings	
Other demand for information or outputs	Request for discussions at the end of the project from a New Zealand wool grower group. Request for more information from New England woolgrowers