FINAL REPORT

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Disclaimer

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1. Executive Summary

The Green Graze pilot project was initiated under the DAFF Native Vegetation Regional Pilot program. The project delivered incentives and advice to graziers in the Goulburn Broken and North Central Catchments using a competitive tender. It encouraged significant change in how farming businesses are run so as to improve environmental outcomes. This is a non-regulatory approach to achieving improved native vegetation management on-farms.

The project drew on previous research that identified management strategies for woolgrowers to improve environmental outcomes and which were found to be profitable in most cases.

Green Graze targeted areas where land is typically managed for livestock production, to improve grazing management and environmental outcomes at a broad scale. The Green Graze pilot project has resulted in large areas of native vegetation being selected for improved grazing management, that are predicted to increase in perenniality, understorey diversity and natural regeneration. The pilot has generated a number of recommendations that will be useful for future investment in this type of scheme that seeks to achieve change at the landscape level. The approach could potentially be applied across grazing properties across the south-west slopes and tablelands of NSW and the central uplands of Victoria.

Approximately 18,000ha of grazing enterprises were assessed under the project, of which 35% (6,165ha) was put forward for management under Green Graze, representing areas of remnant vegetation, scattered trees and native pasture. A total budget of $265,700 was available to participating graziers. From 18 graziers who submitted expressions of interest, 16 placed bids (89%) for financial assistance to change their grazing and fertiliser management. Five bids covering 2,032ha were successful based on available funding. These graziers will receive total payments over three years ranging from $22,000 to $98,700. Management plans developed by bidding graziers designated significant proportions of the total farm as areas to be managed for improved native vegetation outcomes under Green Graze. Successful bidders have an average of 48% of their properties managed under a Green Graze plan.

The pilot assessed grazing management and native vegetation across the whole property, not just on areas included in the Green Graze project. This enabled landholders and the project team to jointly identify and assess ways in which the farm management system could be adjusted. New investments in land class fencing and watering points, and significant changes to how livestock are managed, were required in most cases. The intention was to encourage broad-scale changes to farming operations that could have benefits for large areas of native vegetation including remnant vegetation, scattered trees and native pastures. The approach was used successfully across land types on all Green Graze properties, which included steep hills, undulating and plains country. Once the major investments are made, perenniality of pastures is expected to improve thus supporting more livestock as well as improved environmental outcomes. Hence, once the three year contract period is over, the graziers are not likely to return to their traditional management practices, but this will require monitoring.

Tender projects can be situated on a continuum in relation to the extent to which they involve whole farm considerations. Green Graze is towards one end of the continuum, with successful participants making major changes that impact on their whole farm business. It is highly likely that the expectations of graziers about future profitability, cash flow and risk associated with the changes have been major considerations for them. It is likely that dry climatic conditions have made participants more cautious, and risk-averse in structuring their bids to cover most if not all the capital costs. Further surveys of participating farmers and possibly testing issues with volunteers in an experimental laboratory setting may help determine if different external circumstances and project design might result in lower bids in tenders targeted at whole farm change, as well as increasing participation rates.

Alternative grazing strategies and changes in fertiliser management have been incorporated into Green Graze management plans. The grazing strategies included in the management plans were deferred grazing, rotational grazing, crash grazing and/or complete rest from grazing. The recommended strategies depended on the condition of vegetation and availability of soil Phosphorous. Cessation of fertiliser inputs was incorporated in the management plans as a key strategy for improving likelihoods of eucalypt recruitment and the diversity of native understorey plant species.

Ecologically sustainable grazing practices, including the cessation of fertiliser use over large areas of native pastures, will contribute significantly to regional targets relating to biodiversity, salinity, water quality and river health. Improved perenniality of native pastures across all the areas under the management plans will contribute to all of these targets. Of the 2,032ha under Green Graze management, 73% covers threatened Ecological Vegetation Classes including Grassy Woodlands, which are currently a major priority for native vegetation restoration in the Goulburn Broken and North Central Catchments. The predictive model estimates that the five successful bidders will generate a minimum of 360 ha of natural regeneration, and native plant species richness has potential to increase over most of the bid area. Encouraging the perenniality of pastures and eucalypt regeneration will also contribute to the buffering role of native pastures around patches of higher quality remnant vegetation.

As well as broad areas of lower quality native vegetation, the Green Graze management plans also captured smaller areas of high quality remnant native vegetation supporting good over-storey tree cover and diverse ground layer vegetation. Recommendations for management of these areas are similar to those of other incentive schemes, although they were not scored as in BushTender, and so improvements in condition of native vegetation are likely to be comparable. Whether these higher quality remnants are being managed at greater cost efficiencies than in other comparable schemes that specifically target such areas needs to be investigated. Monitoring management changes on these sites will be important.

Overall the Green Graze trial worked very well, especially given the short time available for development and implementation. A survey found that satisfaction of participating graziers was high. Recommendations for enhancing the approach are included in the report.

An expanded trial is recommended. It is proposed that the Green Graze approach be further developed and trialled across a much larger portion of hill country in Victoria, with a considerably larger budget available as incentives. The trial should focus on the ability of the approach to deal with a larger area and participation rate, and also consider reducing the eligible size of properties to less than 500 ha to investigate the effect on bid value per unit of vegetation benefit, and allow neighbours to potentially develop joint bids.

2. Introduction

The Green Graze pilot project (originally named the *native vegetation incentives for graziers* pilot project), tested a tender approach to providing monetary incentives to help graziers change the farm management system, to ultimately lead to improved native vegetation[1] on their properties.
Participating graziers had the opportunity to submit a bid for financial incentives to adopt a management plan jointly devised by the Green Graze project team and each grazier. A total of $265,700 was available for participants.

The idea for the project developed out of interest in the Farm Business & Biodiversity projects, which investigated the relationship between biodiversity outcomes, pasture management and the farm business (Crosthwaite *et al.* 2006, Dorrough *et al.* 2007, see also www.landwaterwool.gov.au). These projects were funded through Land Water & Wool (a joint program of Land & Water Australia and Australian Wool Innovations) and Land & Water Australia's Native Vegetation R&D program.

The project was a partnership between the Goulburn Broken CMA and North Central CMA and was funded through the Federal Department of Agriculture, Fisheries & Forestry. The Department of Sustainability and Environment provided support in project design and management. A one year time frame was provided to complete the project from ground-up.

The project sought to test opportunities to bring about the large scale change that is required across landscapes to conserve biodiversity and improve ecological health. The project aims were to:

1. improve native vegetation and biodiversity by changing the grazing system at the level of the whole farm;
2. develop a model to predict native vegetation outcomes arising from changing grazing management, and establish a monitoring strategy to measure these changes in the future;
3. identify the level of incentives required to trigger property managers towards making the required changes;
4. identify management options that allow the grazier to maintain or improve profitability without significant increase in production risk;
5. enrol a sample of representative graziers in the pilot to test interest in the application of changed grazing management approaches at the whole farm scale; and
6. explore the application of spatial tools (e.g. eFARMER) to improving farmers/land managers understanding and stewardship of natural resources.

The Goulburn Broken (GB) and North Central (NC) CMAs recognise the need to achieve large-scale protection and restoration of native vegetation to address multiple NRM issues (GBCMA and NCCMA Regional Catchment Strategies). Much of the potential to achieve landscape change lies with improved private land management. Private land is the dominant land tenure in both catchments, and is arguably where change is most imperative. We therefore need to find effective ways of supporting landholders to achieve environmental outcomes while also maintaining profitable farming systems.

There is potential within the GB and NC Catchments for perennial native pasture systems to be making a significantly larger contribution to profitable and sustainable grazing systems, through better natural resource management. Trees and shrubs also contribute to habitat,

[1] We define native vegetation, as referred to throughout this report, as including native pasture species.

water balance and quality, and to production through their shelter benefits. Scattered paddock trees provide a range of ecological services including habitat for biodiversity, hydrological regulation, shade and shelter for stock and crops, seed for regeneration and have considerable cultural and aesthetic value. These values are being lost as scattered large trees senesce (Manning et al 2006). Dorrough and Moxham's (2005) scenario analyses across select farms in central Victoria suggested that under current patterns of tree cover (2.7%), 40% of the total area had a high probability of supporting natural regeneration in the absence of livestock grazing. However, due to paddock tree decline this could be reduced to 18% of total farm area if no management action is taken in the next 30 years.

Landcare has encouraged participation in NRM activities, raised awareness, improved understanding of NRM issues and grant programs have funded many small-scale revegetation initiatives. Regulation has limited the clearance of further bush areas, but has had little effect on management of native pasture/woodland ecosystems or the on-going decline of scattered paddock trees. Productivity-orientated programs have led to the adoption by some farmers of grazing management systems based on increased fertiliser use and introduced pasture species, which have undoubtedly accelerated the loss of some native vegetation. Few of these initiatives have achieved substantial landscape change, nor directly addressed the need for integrated solutions that address both the whole farm business and natural resource management issues. There is growing acceptance that current rates of positive land use change are insufficient to stop the decline in catchment health and that new approaches are needed (Alexandra 2003). The GBCMA's Bush Returns program has made a major advancement to more effectively work towards the desired landscape change, however refinement and further investment as well as other reforms are required.

A key challenge facing landholders in relation to native vegetation management is accessing quality information and knowledge that assists them in the farm scale decision making. In particular they would benefit from improved access to information on the values of biodiversity assets across their property, conservation strategies that may be integrated with their production system, and the effects on productivity, profitability and other farm business implications.

There is a growing interest by government agencies and industry (e.g. wool industry) in farm level solutions to environmental health concerns e.g. interest in Property Management Planning for landscape wide problems relating to biodiversity and NRM.

Currently the Goulburn Broken and North Central Catchments support some large and resilient areas of native vegetation, however there are also many areas of relictual, senescing remnant vegetation and extensive areas of degraded native pasture. The resilience and function of these landscapes is under severe threat and landscape scale changes in management are required to address their on-going dysfunction. As Pannell (2005) pointed out, there is a need to replace traditional, short-lived or annual agricultural pastures with longer lived perennial species, to address problems of dryland salinity, biodiversity loss and soil erosion. In addition to protecting remnant bushland, active regeneration and revegetation and conservation of native grasses are required to secure catchment and ecological health for the region and its dependent fauna (Alexandra 2003).

3. Methods

Project development and management

Jim Moll led a project team that also included Josh Dorrough and Carla Miles. A small steering committee was formed to guide the project; it included representatives from DAFF, Goulburn-Broken CMA and the Department of Sustainability and Environment. A technical reference group was also formed to provide expert advice where required.

The project team engaged the services of an independent economist (Ann Cole) to help work through the pros and cons of running a tender scheme, versus individually negotiated agreements with graziers, given the aim of influencing the whole farm system. Staff from the DSE BushTender team, as well as the GBCMA's Bush Returns project, were consulted and provided insight and knowledge of how a tender could be organised for Green Graze. A tender approach was decided to be the best way to deliver incentive money to participating graziers, using information and knowledge from staff with expertise in tender schemes. A consensus was reached on the approach and that the design issues could be dealt with in time for a tender to be run.

An unpublished paper (Crosthwaite & Miles 2006) was prepared to guide the adaptation of BushTender type trial to a whole farm situation. How the key issues were addressed is covered in the following sections, particularly the section on design of Green Graze contracts.

Integrity of process
The project team engaged probity advice from an external consultant, to ensure integrity in all project processes. All dealings with landholders ensured fairness and impartiality, consistency and transparency, security and confidentiality.

Cost, payment and score details remained confidential between the landholder and the project team. For public accountability purposes, information on the geographic location of sites under agreement and the associated management plan are available from the project team. The project team may also make available general statistics from the trial, in compliance with the *Information Privacy Act, 2000*.

Project scope and roll-out

Scope
Green Graze targeted areas where land is typically managed for livestock production, to improve grazing management and environmental outcomes at a broad scale. Similar landscapes are found throughout the south-west slopes of NSW and the central uplands of Victoria.

The project was piloted in central Victoria, and invited participation of commercial graziers in the Benalla Rural City, Mansfield, Murrindindi, Strathbogie and Mitchell Shires located in the Mid and Upper Goulburn Broken Catchments, as well as commercial graziers located in the Avon-Richardson catchment near Avoca in the North Central catchment. Seventeen graziers who directly participated in the recent farm business & biodiversity research projects across central and northern Victoria were also invited to submit an expression of interest.

The project was targeted at commercial farms. A minimum size of 500ha was required.

Green Graze was limited to changes in grazing management, which included changes to fencing layout, grazing management systems and cessation of fertiliser. It did not cater for active revegetation, including planting or direct seeding of native vegetation.

Multiple outcomes such as salinity and water quality were also not assessed under Green Graze, such as salinity and water quality. This enabled Green Graze to provide an achievable focus and restrict transaction costs, given the 12 month time frame for completion.

Landholder participation – a summary

With each eligible grazier, a farm appraisal was carried out, including assessments of past and intended land management and some native vegetation condition assessments for model verification. A grazing management plan including maps was then developed to highlight actions required to improve native vegetation condition, and how this can be done as part of a grazing enterprise. The management plan highlighted the milestones that need to be met in order for a successful landholder to receive annual incentive payments.

Landholders developed their own bid for incentive money based on the management plan requirements. Successful landholders were then selected via a tender system that chose the most cost effective proposals for achieving improvements in native vegetation extent and condition. Bids were assessed objectively using modelled results of current and future native vegetation species richness and area of likely tree recruitment. Alongside the likely gains and outcomes for native vegetation, the conservation significance of the Ecological Vegetation Class was taken into account, however this did not have a major influence on the overall score.

Successful landholders were invited to sign formal 3-year management agreements, upon which up-front incentive payments were made followed by successive annual payments upon meeting agreed milestones.

Steps in project roll-out

1. Advertisement in each pilot region	The project team engaged landholders to participate in the project, through an advertising program in each pilot region. Advertisements were placed in each of the relevant local newspapers to invite interested landholders to attend an initial information session to find out more about the pilot. Group coordinators (i.e. Landcare, Bestwool etc), were also provided with information to spread amongst their group networks and local extension officers were notified by relevant email networks. The 17 hill country grazing properties that participated in recent Land Water & Wool research project were also invited to submit an EOI, even though many were not located in the pilot regions.
2. Information session in each pilot region	The information session allowed more detailed information on the pilot to be available to landholders, including: • Overview of issues and purpose of pilot (e.g. native vegetation issues, land degradation etc and relationship to livestock grazing) • Outline/description of various management strategies to better manage native vegetation as well as farm profits through provision of extension notes: Land Water & Wool Farm Business & Biodiversity research project findings, including Broadford grazing trial and Steep Hills project findings. • Sample of whole farm appraisal based on a representative farm from previous LWW project and hypothetical native vegetation/grazing management plan • Likely environmental outcomes from various management strategies

	based on recent research, and preferences identified to enable landholders to weigh up options • Expression of interest (EOI) form • Information sheet with questions and answers format for graziers •
3. Selection & eligibility of graziers	Graziers submitted a formal EOI form if they were interested in participating in the pilot. EOI forms were obtained directly from the Information sessions being held, or by phoning the GBCMA. To participate, all graziers had to meet the following eligibility criteria: • be located in the Mitchell, Murrindindi, Mansfield, Strathbogie and Benalla Rural City shires, or in the Upper Avon-Richardson and Upper Avoca catchments in central Victoria • have a property area of at least 500ha • have native vegetation on their properties • be willing to sign a 3 year management agreement • not have a current grant (with similar and current obligations under another agreement) on a potential Green Graze site.
4. Site visit and assessments	Property information was collated and discussed and assessed at the initial farm visit, including: • Areas: property and paddock boundaries • Farm records: Fertiliser, soil test, and land use history • Grazing regime (current and intended), stock type, grazing history, stocking rate history, length and timing of grazing, rest periods, pasture types (introduced and native) • GIS information e.g. EVC bioregional conservation status • Sample native vegetation assessments (Habitat Hectares) to verify modelling results • Proposed/agreed grazing management for each paddock for the life of the agreement
5. Provide management plan and other information required for landholder bidding	A management plan was prepared for each property, with each grazier's input and agreement. The property data collected was recorded using ArcMap GIS mapping software which was used to generate property maps, management zones and boundaries for each participating farm. eFARMER couldn't be used for this process as initially thought, due to issues with lack of data coverage in some of the Green Graze areas. A database was also created with data from all properties that was required by the predictive modelling process to generate predictions on native vegetation condition for each property. Property maps generated by ArcMap software were an integral part of each property management plan. Each property management plan included the following information: • Map of whole property showing Green Graze and non-Green Graze areas • Map of property highlighting proposed grazing management in Green Graze areas, including the location of any proposed new fencing. • Map of ecological vegetation classes (EVCs) found across the property • A table for each year showing management actions for each paddock, based on fencing & alternative water and grazing & phosphorous management requirements. • Native vegetation/grazing management plan (which was be the basis for landholder bidding and if successful, the contract between CMA and

	grazier), that specifies actions that the grazier needs to carry out in order to meet improved native vegetation outcomes for each year of the contract. • Checklist of benefits and costs to help structure a bid for incentive $. This checklist included a brief explanation of the basis for and priorities for assessment. • Bid sheet and reply paid envelope
6. Ongoing property visits	After the pilot project officially ends in August 07, GBCMA and NCCMA representatives will visit participating properties annually to monitor the implementation of agreed management plans and to administer annual incentive payments until the 3-year landholder contracts end in 2010. Ongoing findings will be reported to DAFF and DSE.

Native Vegetation Assessment Procedure
The native vegetation assessment procedure was carried out on each property as per the above table. Once all property assessments were complete, the land management attributes collected for each paddock at each property were provided to CSIRO and Josh Dorrough (Arthur Rylah Institute, DSE) for use in the predictive model. A summary of the total native vegetation benefit associated with each property/proposal was provided back to the GBCMA to incorporate into the native vegetation benefits index developed for bid assessment.

A more detailed description of the assessment procedure can be found in an additional project report entitled, "Models of native vegetation to support the Victorian Vegetation Incentives Green Graze Pilot", (Dorrough & Cawsey 2007).

Development of management plans

Management plans were developed jointly by the field officer/s and participating landholders based on agreed strategies to improve native vegetation condition. Landholders decided on the level and type of management strategies they would commit to, after being provided with information about the preferred strategies and method of predicting environmental benefits associated with each.

Landholders were provided with case study information drawn from the recent Farm Business & Biodiversity projects. These case studies highlighted the potential impact of four management strategies on farm investment, profits and cash flow. The Green Graze team discussed these findings with each landholder and related them to the business, agronomic and environmental situation of their property. The team were careful not to provide specific financial information for particular properties, however general farm business information based on district averages and recent findings aided landholders to think about this relevance to their specific situation.

The list of recommended changes to grazing management is as follows.

Rotational Grazing
Rotational grazing involves regular periods of intense grazing and resting. Allowing the pasture to experience rest periods enables pastures to recover from grazing and has a number of benefits including reduced selective grazing, reduced effects of stock camps and better root development for perennial grasses. Rest periods between grazings should be at least 80 days but may need to be closer to 120-160 days depending on pasture growth rates and animal densities. The length of a grazing period may be in the order or 1 – 5 days. Rest timing and frequency need to be based on the amount of available feed and pasture growth rates. This

aims to keep pastures in their most active growth stage. Phosphorous application is not recommended, in order to enhance the diversity of native vegetation.

Deferred Grazing
Deferred grazing is a strategy to purposely withhold grazing at critical times of plant development (commonly over late spring/summer). This method aims to increase pasture groundcover, increase the persistence of native perennial grasses for improved health and yield, and improve pasture species composition and the persistence of desirable pasture species. The timing and duration of deferred grazing will depend on what is to be achieved, the pasture types, soil and climate conditions. Deferred grazing from early November until the Autumn break, has been shown to increase pasture ground cover and persistence of native perennial pastures. Phosphorous application is not recommended, in order to enhance the diversity of native vegetation.

Crash Grazing
Crash grazing is where pasture is grazed at high stock density for a short period of time (1 to 2 days) followed by a long rest (one to several years depending on establishment and growth of native species or abundance of weeds). In areas with high soil moisture and nutrient availability, crash grazing can promote species diversity by reducing bulk of feed, and thereby preventing understorey species from being smothered. It can also be used to graze undesirable plant species before they set seed. In less productive areas (i.e. drier or with low nutrient availability) crash grazing may be required less frequently. Phosphorous application is not recommended, in order to enhance the diversity of native vegetation.

Grazing exclusions
Ungrazed refers to total exclusion of stock at all times of the year. This approach is used to improve regeneration of native vegetation particularly on fragile soils and land types, with marginal grazing value. Zero application of fertiliser.

Natural regeneration of native vegetation
Management should involve the following:

1. Prioritise areas with scattered mature tree cover, low fertility pastures and little or no history of pasture sowing
2. To maximise likelihood of regeneration completely eliminate livestock until saplings are >1m
3. If no seedlings are present and there is excessive grass/weeds, crash graze over Spring, prior to Eucalypt seeding in summer
4. If no seedlings are present and annual weeds are present, crash graze in autumn

General pasture management
Average pasture height should be between 4 – 10 cm, and ground cover at least 85%. These measurements should be taken at the "toughest" times of the year, i.e. mid summer or just before the Autumn break. Pasture height and cover targets are to be used as a guide. Pasture density, species and maturity has a major impact on this association.

A ruler or measuring stick may be used to estimate pasture height. Ground cover is best estimated by using a 30cm x 30cm pasture square or ring thrown randomly onto the ground and estimating the amount of bare ground versus cover of pasture inside

The draft management plan and supporting documents
Following the site visit, landholders were sent a draft management plan that reflected the grazing management discussions that took place at the property. Typical actions included:

- land class or subdivision fencing,
- installation of watering points,
- fencing for natural regeneration,

- specific grazing periods/rests, and
- no phosphorous fertiliser application.

The plan included the preferred extent and timing of specific management actions for each year of the plan. Each management plan depended on the requirements of the site and the aspirations of the landholder. A sample management plan is attached in Appendix 3.

Other information such as maps identifying relevant zones, a bidding checklist and a bidding sheet were also included. This information was sent via registered post and landholders had 3 weeks after the receipt of delivery of the management plan to lodge a bid. Landholders had a short window of opportunity to amend the plan, after which time a new 3 week period would begin and the plan would become the basis for the landholder's bid.

The bidding process and bid assessment

Developing a bid

Landholders were advised to consider any direct and opportunity costs associated with implementing the management plan and submit a sealed bid (single price for the life of the management plan) within the 3 week period. Late bids were not accepted unless a reasonable explanation was made in writing.

In costing a bid, landholders were advised to consider what payment they would accept to undertake the management plan. The way in which landholders assess the cost of their bid and how competitive their bid was up to them. The estimate would inevitably be influenced by a number of factors including the management effort and capital costs required, any production or other benefits, the proportion of costs acceptable to the landholder, and the amount and importance to the landholder of any potential income that may be foregone. Project staff were not able to advise on how much to bid.

Bid assessment

Bids were progressively submitted over the course of the management planning phase. Bids remained sealed until bid assessment day. When all bids were received they were all opened on the same day and compliance with the return period requirement was checked for each bid against the delivery of receipt records.

Once all bids were received, bids were assessed and compared in a consistent manner according to a numerical index of native vegetation benefit. Bids were assessed according to criteria that compared the relative native vegetation benefits, against the cost of each bid.

Using the Native Vegetation Benefits Index, a landholder's bid was placed in merit order with all other bids and the available funds were allocated to those representing the best "value for money". This meant that those proposals that had high native vegetation benefit, and a relatively low cost scored the highest. Importantly the assessment of a site was not just about the cost, but rather the return (outcome) that government/community will receive for their investment. The winning bids were those that fell within the cumulative sum of available funding, comprising $265,700.

Value for money was calculated using an index of $ per unit of native vegetation benefit. This was calculated by dividing the bid price by the summed value of total predicted regeneration area and total predicted area of species richness as a result of adopting the agreed management plan. These predicted areas were generated by the predictive model, as described in Appendix 1.

Reserve price
A reserve pricing strategy was not adopted in Green Graze.

Awarding contracts/management agreements
Successful and unsuccessful bidders were be notified after the bid assessment process was completed. Successful bidders were offered the opportunity to enter into a formal contract with the GBCMA to provide for improved native vegetation outcomes. The contract was a 3-year common law agreement and detailed the obligations of both parties, and importantly schedules relating to the site, management actions, restrictions and reporting requirements.

Predicting and monitoring native vegetation outcomes

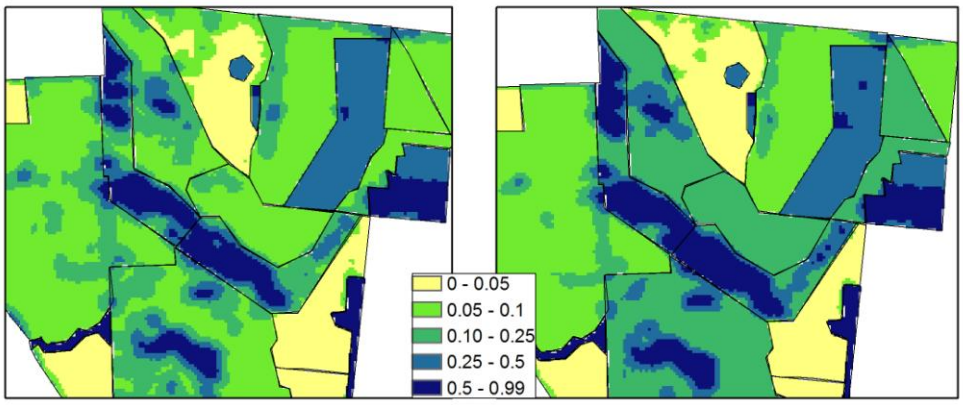
Predicting outcomes
The estimation of future native vegetation condition expected to result from changing management was carried out using a predictive model, which is outlined in detail in Dorrough & Cawsey (2007) – see Appendix 1. There is now considerable ecological data, from the relevant landscapes, that can be used to develop models that estimate changes in vegetation condition in the understorey and over-storey over time.

Green Graze used land management attributes and existing field data from previously surveyed properties in the GB and NC CMA regions to predict understorey species richness and probability of eucalypt seedlings/saplings (Fig. 1). The models used during Green Graze (Dorrough & Cawsey 2007) were largely adapted from two models that have been published in the peer reviewed scientific literature (Dorrough & Moxham 2005; Dorrough *et al.* 2006). These models predict relationships based on prior land management and inherent site landscape features (e.g. topography and lithology). Models were adapted to enable prediction of future species richness and regeneration under changes in management. In some cases relationships with management variables recommended by Green Graze were unknown (e.g. deferred grazing and rotational grazing). Conservative estimates of their likely effects were made based on evidence in scientific literature where available, with the distribution of their parameter estimates contained within bounds of current observed data. Data collected through this incentive pilot and others can be used to update these models.

The models used in Green Graze vary in their suitability for scaling up to provide whole of farm estimates of native vegetation benefits. Eucalypt regeneration easily scales up from small surveyed areas (approx 0.1ha) to whole farm and multiple farm scales (as an estimate of the predicted area supporting regeneration). However, estimates of species richness at 0.1 ha scales are difficult to translate into estimates at broader scales as rates of species turnover vary among land-uses and habitat types. Although an attempt was made to scale estimates of species richness up to whole of farm scales, it was not entirely satisfactory and the method can be improved (Dorrough and Cawsey, 2007).

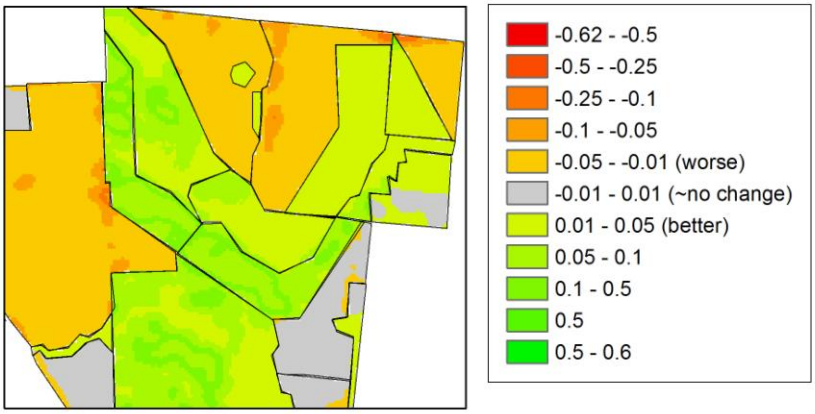
The relationships between predicted values of regeneration and native species richness are generally very well correlated with various elements of the habitat hectares site scoring procedure. Predictions of the likelihood of presence or absence of eucalypt seedlings/saplings will provide similar estimates to the recruitment score in the habitat hectares site score (assessments of the model fit i.e. ability to predict eucalypt recruitment, are provided in Dorrough and Moxham 2005). Understorey plant richness best reflects the understorey score and is also well correlated with the summed values of all understorey components of the habitat hectares sites score (i.e. understorey + organic litter + lack of weeds) (see Figure 2).

Fig. 1. An example of the spatial outputs from the model. Predicted current and future probabilities of natural regeneration, and the difference map, showing areas where regeneration is likely to get worse, stay the same or improve.



Probability of natural regeneration under current conditions

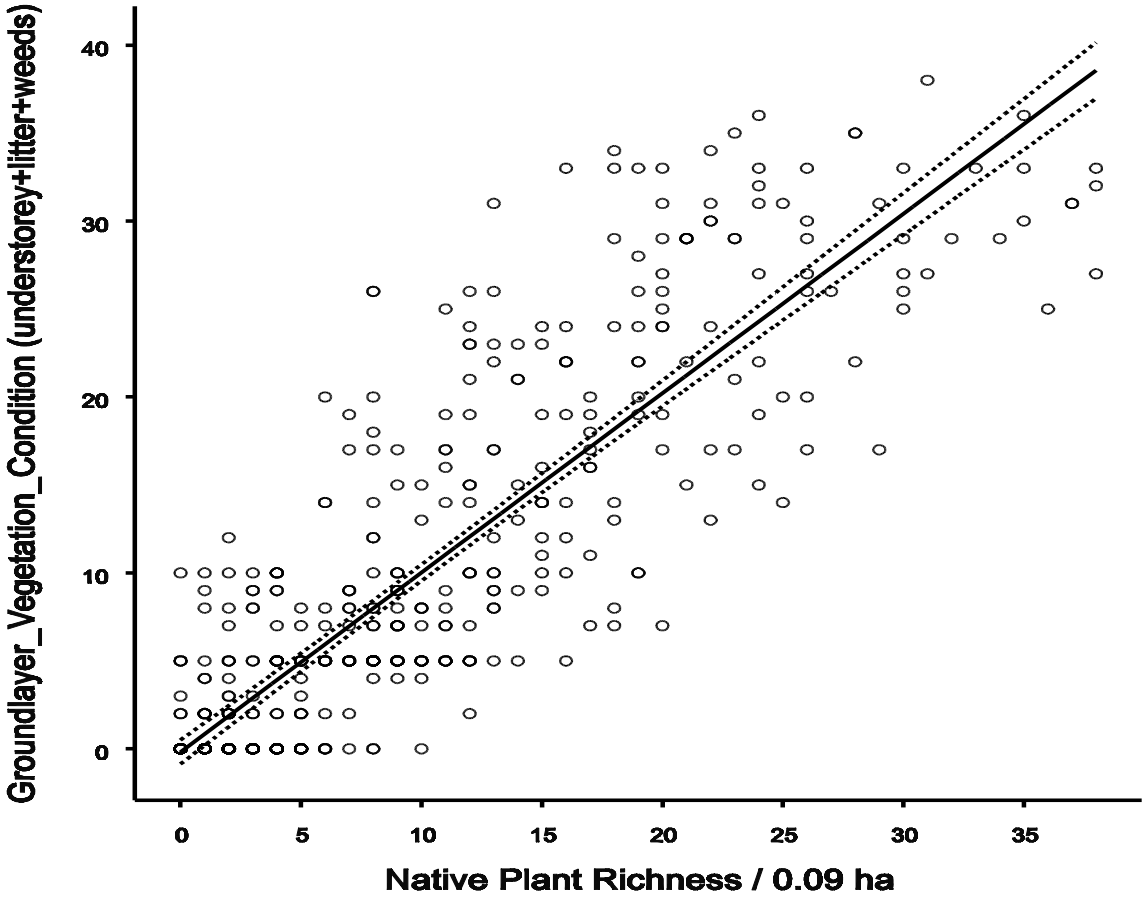
Probability of natural regeneration under future conditions



Difference between future and current natural regeneration probability values; negative values indicate that there is lower probability of regeneration under future management regimes than under current management regimes. Positive values indicate and improvement in regeneration.

The modelling approach applied also explicitly attempts to account for possible changes in vegetation outside of those managed under Green Graze. Current research suggests that native vegetation is undergoing constant steady decline in the absence of active management. The rate of decline is accelerated where more intensive management practices are applied. The predictive models assumed that on all farm areas, other than those in the Green Graze management plans, intensive forms of management are possible and so the native vegetation condition is assumed to decline as a result. Areas where landholders intended to manage for environmental outcomes were almost always included within Green Graze.

Fig 2 Relationship between under-storey native plant richness and total under-storey vegetation condition as assessed using the habitat hectares methodology. Data is from 17 farms in central Victoria and was collected during the Victorian Farm business and biodiversity research.



Measuring and monitoring

In a large-scale public program investing in natural resource outcomes, there is a need to have appropriate assessment and monitoring tools. Both the cost and level of expertise required are important issues.

A whole farm tender introduces new complexities to measuring and monitoring environmental outcomes. These include:

- The larger area of the farm that is involved, and the variability in soils, topography, aspect and vegetation across the farm
- The range of farm management activities that might be included in the agreement, and which might occur in different ways on different parts of the farm,
- Other farm management activities, not covered by the agreement, that might influence outcomes
- Changes in farm management generating multiple rather than a single outcome
- Adequately monitoring compliance with grazing regimes, which are based on specific periods of grazing and rest.

The recent Farm Business & Biodiversity research projects have piloted monitoring methods which start to address these points, in a whole-farm context and through utilising a team of

specialists i.e. agronomist, ecologist and economist expertise. The Green Graze project team also utilised the skills of a team of specialists, and has also further refined the modelling aspect through the development of predictive modelling tools to determine vegetation condition and predict outcomes across a farm, for a given landscape such as the uplands of central Victoria.

The monitoring program outlined in Appendix 2, has been devised for successful Green Graze properties for a period covering their 3 year contracts:

Monitoring will focus on measuring changes in the condition of native vegetation, as the area (size) alone does not reflect the level of management of change or outcomes that are likely to occur. Management practises occurring on areas outside of the Green Graze areas will also be monitored, as they could have impacts on how Green Graze areas are also managed e.g. Change of enterprise mix from sheep to cattle or cropping.

There is a requirement to also monitor changes to management practises and their impact on production and profitability of each Green Graze property.

Contracts and reporting

Design of Green Graze contracts

The content of Green Graze contracts included management plans and maps developed for Green Graze areas, grazing management definitions and guidelines, restrictions and requirements, and other sections relating to incentive payments, compliance and processes for variation, default and termination. A sample Green Graze contract can be viewed in Appendix 3. The contract has a three-year timeframe and is the basis for specifying required grazing management activities to be carried out in order to achieve native vegetation outcomes. It is acknowledged that changes in the condition of native vegetation are unlikely to be measurable during either the one-year pilot, or length of the short-term contracts. A native vegetation monitoring strategy has nevertheless been developed to start measuring the impacts of Green Graze.

In Green Graze, the contracts were designed taking into account the following considerations

- whether specification of outcomes, or even indicators of achievements towards outcomes, is possible. Outcomes were covered in the vision and aims of the management plan and were measured through the predictive modelling process as described earlier. These estimated outcomes were modelled based on extensive data identifying relationships between land management and native vegetation condition. As with many other MBI programs the CMA has borne the risk of not achieving outcomes through performance-based payments to landholders.
- While we have largely focussed on performance-based contracts with participating landholders (performance being achievement of actions), we have attempted to incorporate outcome-based targets by specifying minimum ground cover percentages and pasture height ranges alongside specific grazing regimes. This approach will hopefully encourage landholders to keep a close eye on the effects of different grazing patterns and to ensure sustainable outcomes.
- whether the agreed management plan relates to the whole farm, or just to the area where the proposed activities will occur. While the management of the whole farm is considered in the modelling and assessment of each property, the management plan covers only the Green Graze areas, where activities beneficial to the native vegetation are included.
- if and how the contract can include activities that bear little direct relationship to environmental outcomes. For example, some landholders may wish to increase farm profitability through targeted fertiliser use, which may enable them to fund improved management of native vegetation areas. Early in the project's development, it was agreed

that only activities that result in a public benefit should be included in the management plan and subject to payments.

- how activities such as inappropriate fertiliser use which might cause some environmental losses, on or off-farm, are to be addressed. The modelling process took into account any past and intended (future) phosphorous applications, which resulted in negative predictions for native vegetation condition and reduced chances of success for participants. All Green Graze paddocks included a specific action of "No phosphorous application". This prescription was also applied to a buffer of 50m around native vegetation areas
- the terms under which progress payments are made, given that production outcomes might be apparent long before environmental outcomes. Payments were set up for achievement of actions, more than environmental outcomes. An objective of Green Graze is to trigger a change in grazing management that is (hopefully) continued beyond the contract period.
- the requirement for landholders to notify the GBCMA of any significant change in management, anywhere on the farm. This was made possible through the contract design, whereby landholders are required to seek approval for any variations to their management plans and communicate in writing any major changes in farm management occurring outside of Green Graze areas.
- penalty and enforcement issues that arise because production and environmental issues are inter-twined. Any breach of the Green Graze contract results in termination of the contract and any future payments.

Reporting and Payments

Once management agreements were signed, the successful landholders were eligible for remuneration based on meeting performance based milestones according to a payment schedule. An upfront payment (50% of total) was made initially (July 2007). Landholders will then receive annual payments for 3 years, subject to satisfactory completion of agreed actions. Payments will be made subject to landholders submitting a report verifying the actions undertaken in the preceding 12 months and the property being inspected by a GBCMA representative.

Acquittal of on-ground funds by DAFF occurred by June 07, with the GBCMA managing funds until the end of the contracts with landholders. DAFF and DSE will receive annual reports that update the grazier contracts and payment process until the final payment is made to graziers. There will be added value of GBCMA representatives visiting participating graziers during the 3 year contract, to monitor the implementation of agreed management plans. Formal ecological monitoring will also take place over the three years to test predictions made in the modelling exercise.

4. Results

Information about the participation rate and the properties is presented first. This is followed with an outline of the changes in management that have been agreed, and the outcomes that are then expected. Costs and cost-effectiveness results follow.

Participation rate and the properties

Participation rates were high in the pilot project. Local government statistics show that there are approximately 1900 graziers in the 2 pilot regions, however it is estimated by average property size, that there are 692 graziers that meet the GG eligibility criteria (commercially viable properties over 500 ha in size). There were 30 expressions of interest in total from the 2 pilot regions, which culminated in 18 property assessments. This equates to 5.5% of estimated "eligible" graziers submitting an EOI. Of the 18 property assessments, 17 management plans were developed (Fig 3), and 16 of these placed bids for financial incentives to change their grazing management.

From 18 property assessments, there were 17 management plans developed (one property decided not to go ahead after the property assessment highlighted that there was no change in grazing management required in some areas or incompatibility of objectives in other areas). Of the 17 management plans developed, 16 placed bids for money to change their grazing management.

Fig 3. Green Graze Bidding Curve

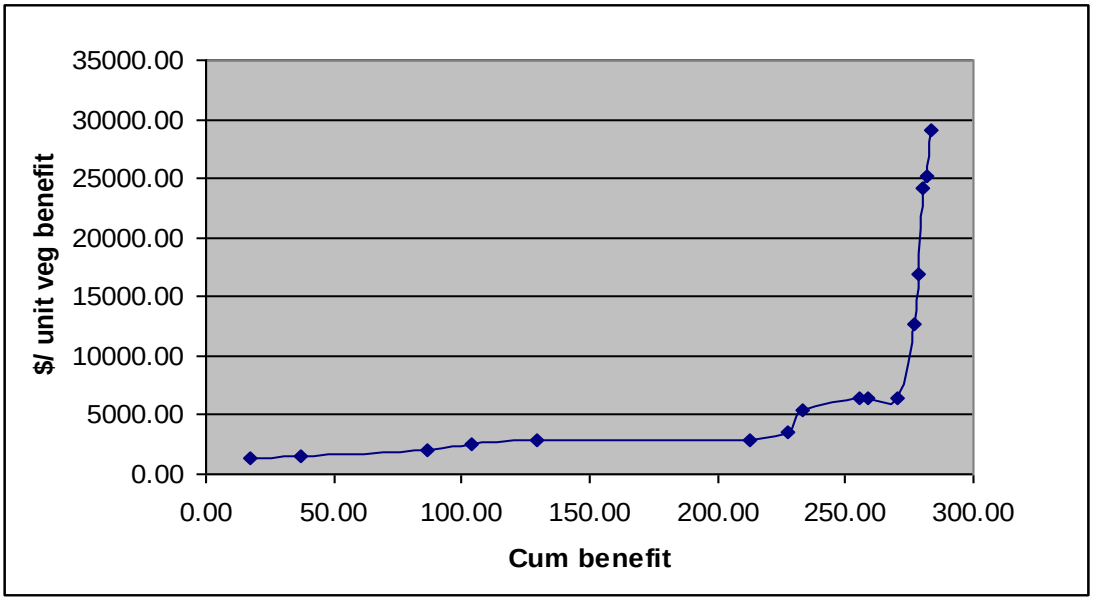
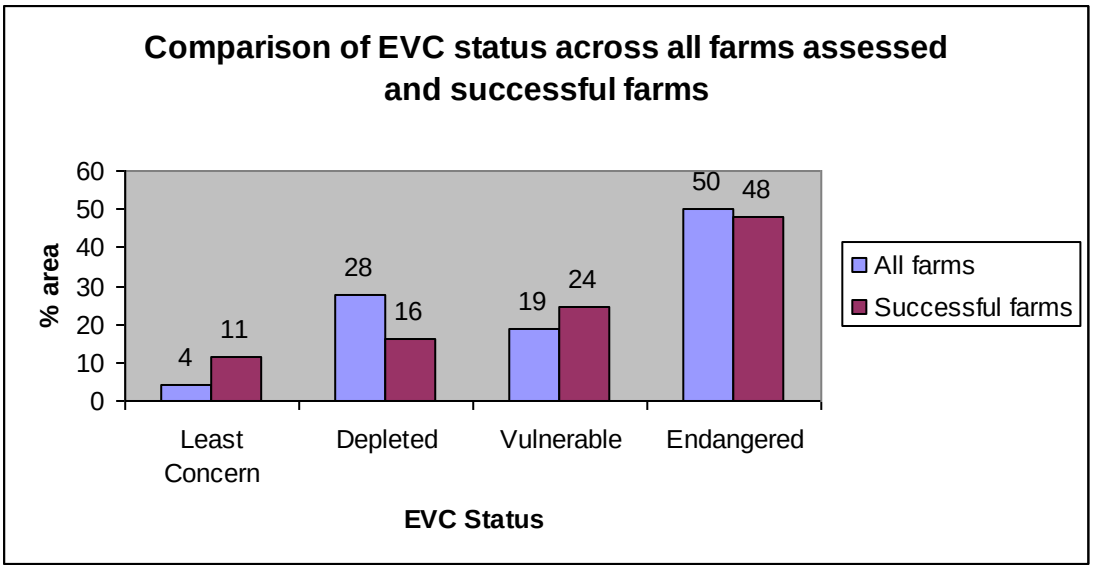


Fig 4. EVC status across farms assessed and selected



Expected Native Vegetation Outcomes

Approximately 18,000ha of grazing enterprises were assessed under the project, of which 35% (6,165ha) was put forward for management under Green Graze, therefore representing areas of remnant vegetation, scattered trees and native pasture (Table 2).

Large areas of native vegetation are being managed under Green Graze, with the condition and extent expected to increase. There is 2,032ha area under Green Graze management. Improved perenniality of native pastures are expected across most of this area.

Priority Ecological Vegetation Classes that have endangered and vulnerable status dominated the properties assessed (Fig 4). These are a major priority for native vegetation restoration in the Goulburn Broken and North Central Catchments.

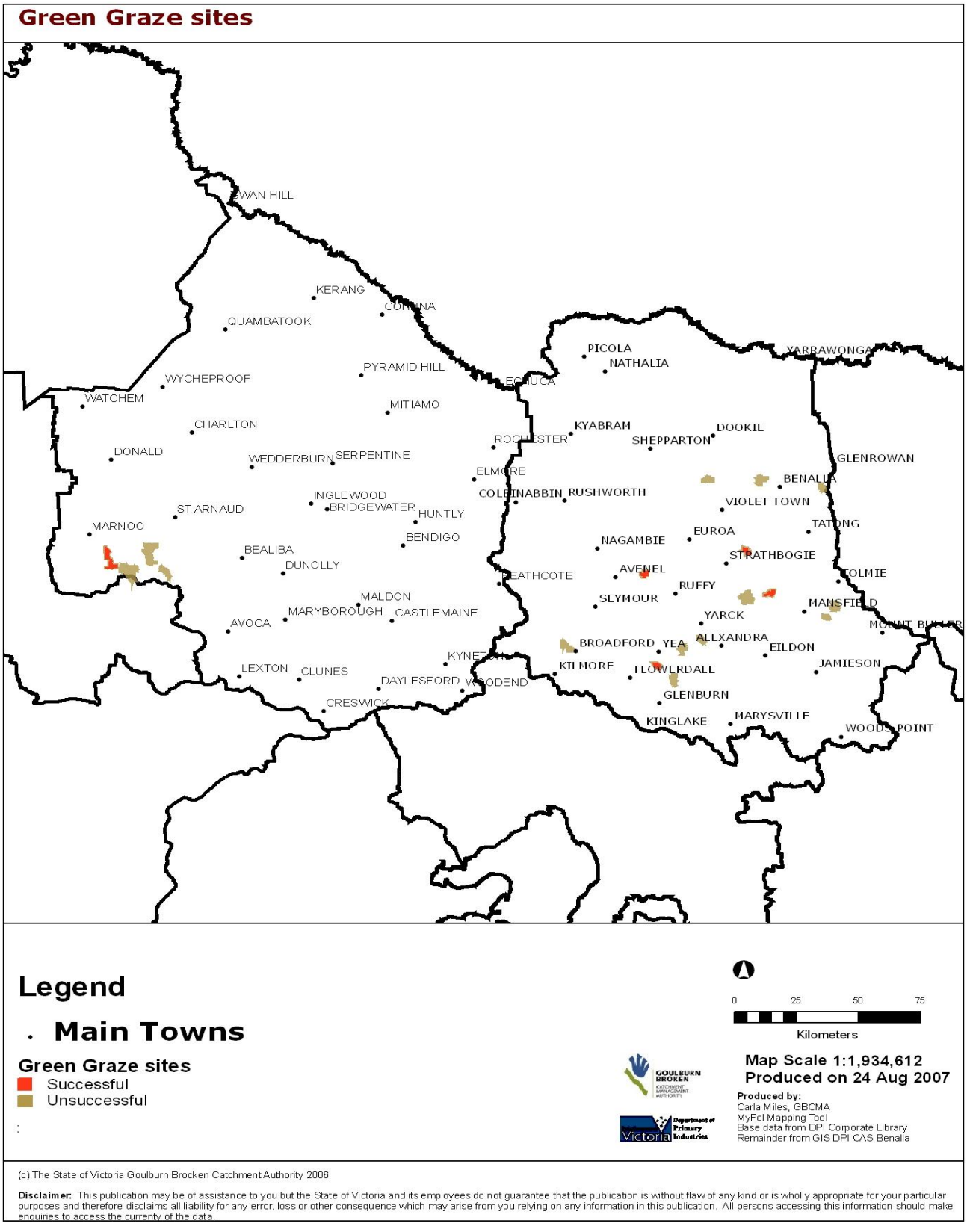
As well as large areas of native pasture, the management plans captured smaller areas of high quality remnant native vegetation supporting good over-storey tree cover and diverse ground layer vegetation.

The predictive model estimates that the five successful bidders will generate a minimum of 360 ha of natural regeneration, with the area on each property varying between 52 ha and 107 ha (Table 2).

Species richness is predicted to have potential to increase over most of the 2,032 ha. Actual increases in species richness are however more difficult to estimate given considerable ecological uncertainties (see Dorrough and Cawsey, 2007 for more detailed discussion).

Although not specifically modelled, the changes in fertiliser and grazing management are likely to have long-term benefits for the perenniality of pastures. Along with better control over grazing and fertiliser management, this could potentially act as a buffer around patches of higher quality remnant vegetation.

Fig 5. Green Graze Site Map



Bid assessment results

The five successful properties nominated 2,032ha for management under a Green graze program, with an incentives budget of $265,700. **Successful GG bidders will be paid an average of $2,015 per unit of vegetation benefit** that was predicted to be gained from adopting the agreed management plan (Table 2). The vegetation benefit is a combination of size of managed area, EVC status, future vegetation condition (increase in species richness and probability of tree recruitment).

The model conservatively estimates that across the five successful bids 360 ha will support eucalypt regeneration, which is equivalent to $736/ha of regeneration or $245/ha of regeneration/year.

Levels of financial incentives required for GG participants are low. Successful graziers bids ranged between $26 /ha and $304 /ha, and averaged $165 /ha (Table 2). These figures are totals for 3 year contracts. This suggests the level of monetary incentive will need to be on average $55 /ha per year of the contract.

Table 1. Bidding Statistics (draft)

	Green Graze pilot project 2006/07
Bidding rate	89%
Success bidding rate	31%
AV agreement area size per property/site	406
AV % success farm under agreement	48%

The shape of the bid curve was similar to that found in other tender projects. Figure 3 shows how the cumulative vegetation benefit changes in relation to the cost per unit of vegetation benefit as each of the 17 properties is included, starting with the property that has the lowest cost per unit. The cost per unit is below $5,000 on seven properties. After another four properties are added, the curve then rises steeply with cost per unit reaching $30,000 on the last property. The five successful properties account for half of the total vegetation benefit obtainable.

The cost – supply curve (Fig 6) demonstrates why the five properties were chosen. It shows changes to the relationship between total cost and cumulative vegetation benefit as each property is added. The cumulative vegetation benefit rises steeply for relatively small additional cost as seven properties are added. However, the total budget is exhausted after adding the fifth property.

If the budget was larger, bid number 6, although a large bid amount and area, would also be successful. For this bid, the $ per ha (bid of $195/ha compared to average of first 7 bids= $179/ha, range $26 to $304) and $ per vegetation benefit ($2,920/unit of vegetation benefit) is unlikely to be significantly different from the two prior bids. It also probably represents substantially better value than the 7th bid ($3,591/unit). In addition, the absolute benefits from bid 6 in terms of natural regeneration alone captures 25% of all regeneration across all bids, and spp richness (0.83 of maximum farm richness) (Table 2).

The $ per vegetation benefit score was driven by both bid value and predicted vegetation score. It was also discovered that properties with a greater proportion of their farm under Green Graze, had a much higher likelihood of being successful.

Figure 7 demonstrates that properties with greater than 40% of their total farm area being managed under Green Graze, generated higher farm vegetation benefit:cost (which is the total

veg score / $ bid) as well as had a much higher chance of being successful in the bidding process. Properties with less than 40% of the total farm were not successful under the Green Graze pilot, which reflects the importance of area in calculating native vegetation benefit score. Successful GG bidders had an average of 48% of their properties being managed under GG, with an average area of 406 ha per farm. The average total property size of successful GG bidders was 839 ha (Table 1).

Fig 6. Cumulative proportion of total vegetation benefit achieved with available budget

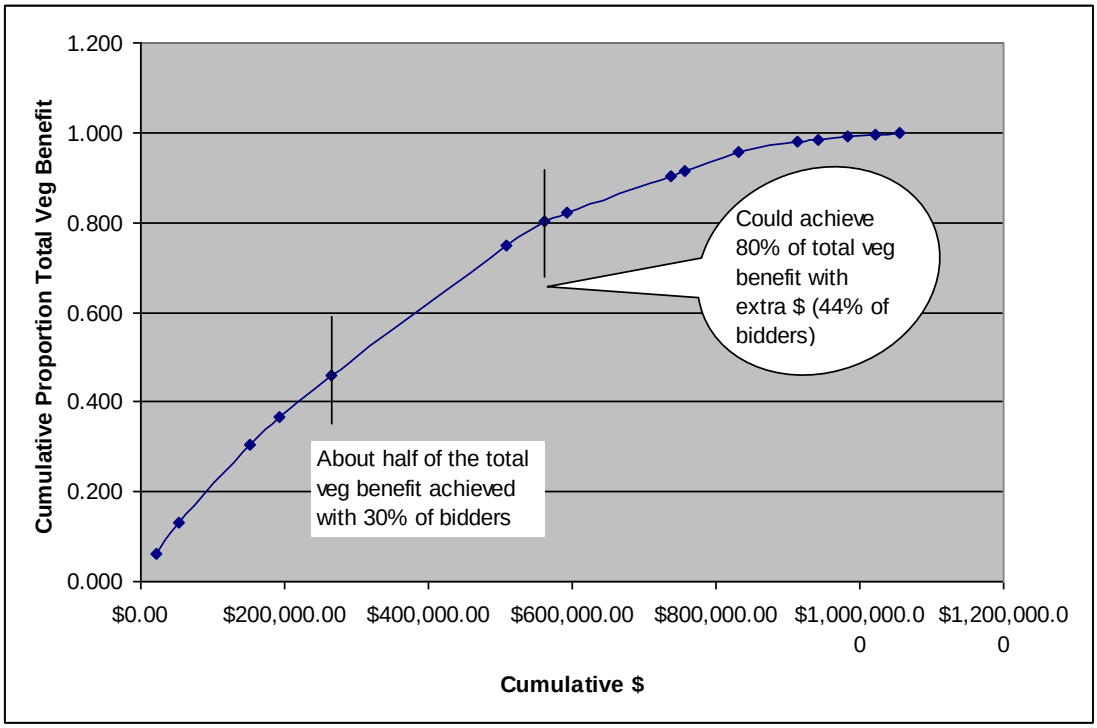


Fig 7. Proportion of farm area under Green Graze

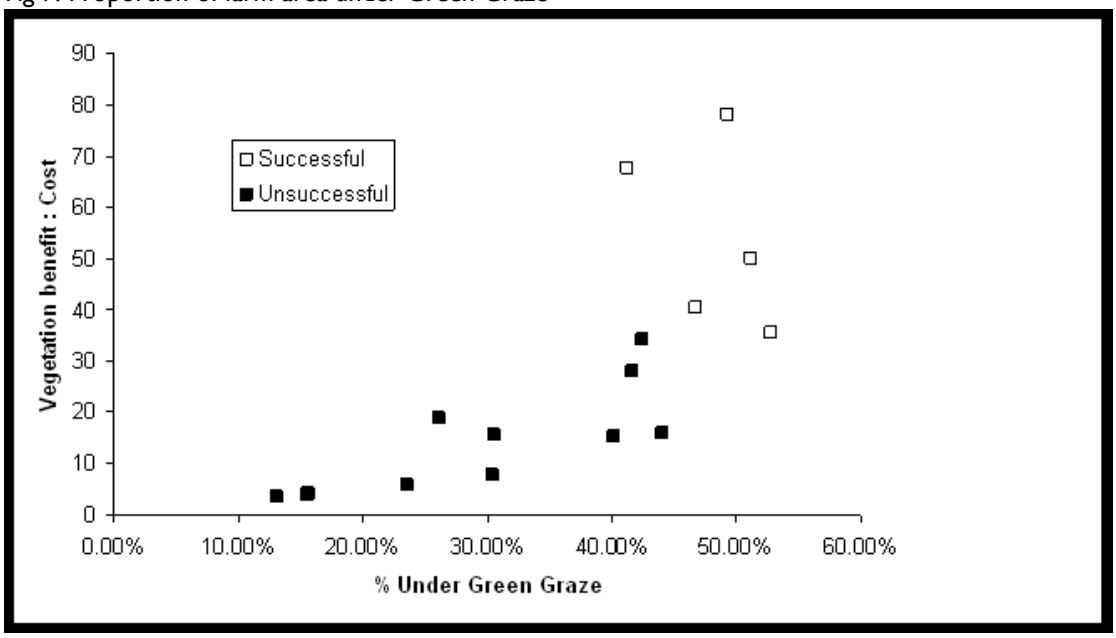


Table 2. Assessment data and bid values for Green Graze tenders

Landholder	TotalArea	%farm under bid	Bid Area	Future Weighted Mean Natural Regeneration	Natural Regeneration hectares	Standardised Natural Regeneration Hectares (NRha/SummedNRha)	Bid Area	Future Weighted Mean Species Richness	ln(Bid Area)	Total Species Richness (SppR/ha)	Standardised Total Species Richness (SppR/SummedSppR)	Bid Value ($) (provided by GBCMA)	Farm Vegetation Benefit	$/GG ha	$/Nat regen ha	$/SppR ha	$/VegBenefit
GG01	1708.65	49.33%	842.94	0.08412505	70.9123696	0.326886006	842.94	4.557273	6.7368958	30.70187325	0.52392461	$22,000.00	77.85	$26	$310	$717	$ 1,285
GG02	663.66	41.24%	273.69	0.23138747	63.3284367	0.291926216	273.69	7.245144	5.6119961	40.65971972	0.69385434	$30,000.00	67.52	$110	$474	$738	$ 1,481
GG03	634.41	51.14%	324.45	0.33032135	107.172762	0.494036179	324.45	10.134635	5.7821314	58.59979168	1	$98,700.00	50.05	$304	$921	$1,684	$ 1,998
GG04	593.19	46.76%	277.38	0.18679628	51.8135521	0.238845849	277.38	7.540848	5.6253884	42.42019892	0.72389675	$43,000.00	40.21	$155	$830	$1,014	$ 2,487
GG05	594.27	52.70%	313.2	0.21566643	67.5467259	0.311371339	313.2	8.350627	5.746842	47.98973367	0.81894035	$72,000.00	35.42	$230	$1,066	$1,500	$ 2,824
GG06	2924.28	42.51%	1243.08	0.17451252	216.933023	1	1243.08	6.818825	7.1253474	48.58649732	0.82912406	$242,100.00	34.25	$195	$1,116	$4,983	$ 2,920
GG07	554.76	41.63%	230.94	0.19261141	44.481679	0.205047984	230.94	7.829507	5.4421579	42.60941366	0.72712568	$53,546.80	27.84	$232	$1,204	$1,257	$ 3,591
GG08	1866.33	26.11%	487.26	0.06199435	30.207367	0.139247435	487.26	3.877929	6.1887979	23.9997187	0.40955297	$30,500.00	18.70	$63	$1,010	$1,271	$ 5,348
GG09	1506.15	44.02%	662.94	0.1056434	70.0352356	0.322842666	662.94	6.356794	6.4966845	41.29808498	0.70474798	$144,342.00	15.76	$218	$2,061	$3,495	$ 6,344
GG10	570.6	30.50%	174.06	0.0985172	17.1479038	0.079046996	174.06	4.363231	5.1594001	22.51165432	0.38415929	$19,490.00	15.58	$112	$1,137	$866	$ 6,418
GG11	1231.56	40.14%	494.37	0.08165267	40.3666305	0.186078771	494.37	5.9543	6.2032842	36.93621526	0.63031308	$76,000.00	15.43	$154	$1,883	$2,058	$ 6,480
GG12	916.92	30.38%	278.55	0.10459879	29.135993	0.134308703	278.55	4.959262	5.6295976	27.91864934	0.47642916	$81,440.00	7.86	$292	$2,795	$2,917	$ 12,727
GG13	599.49	23.60%	141.48	0.06863217	9.71007941	0.044760725	141.48	4.543676	4.9521584	22.50100311	0.38397753	$29,000.00	5.93	$205	$2,987	$1,289	$ 16,873
GG14	715.32	15.69%	112.23	0.10260143	11.5149585	0.053080708	112.23	3.869962	4.7205503	18.26835042	0.3117477	$40,000.00	4.14	$356	$3,474	$2,190	$ 24,172
GG15	924.93	15.59%	144.18	0.0768549	11.0809395	0.051080003	144.18	3.662713	4.9710625	18.20757531	0.31071058	$40,000.00	3.97	$277	$3,610	$2,197	$ 25,203
GG16	1242.81	13.18%	163.8	0.0521041	8.53465158	0.039342335	163.8	3.391262	5.0986462	17.29084501	0.29506666	$33,750.00	3.44	$206	$3,954	$1,952	$ 29,073
GG17	805.41	10.47%	84.33	0.08069788	6.80525222	0.031370292	84.33	3.61075	4.4347377	16.01272905		$0.00	-	$0	$0	$0	-
		35.28%	385.28438														
sum	**18053**	**35.28%**	**6165**	**ımmedNRha**	**850**	**4**		**SummedSppR**		**540.49932**	**9.2235708**	$1,055,868.80		$ 165			$ 2,015

Grazier feedback about the process

Grazier Motivation

Patterns from the participant survey (Coleman & Barclay 2007) suggest that landholders view Green Graze as being about good environmental stewardship, as well as improved farm profitability, as Table 28 in the survey report reveals.

Participants were motivated to participate for a range of reasons. Of these, the most important reasons were highlighted in the trends from the landholder survey as follows:

- an opportunity to receive funding and advice to improve farm and farm management practices
- an ability to incorporate Green Graze easily into existing management strategy
- the availability of another avenue to improve the health of the environment, both on the farm and in the district
- a desire to leave a well managed and healthy farm to future generations

Constructing bids

During bid construction, graziers had to decide how much of the costs involved with the new grazing strategies (outlined in the Methods section) to include in their bid, recognising that the grazing strategies were expected to be profitable in the long-term. It appears from the management plans and participant survey that the major costs included in bids were in the form of:

- lost income
- extra labour during the contract period
- infrastructure required to establish and maintain alternative management practices (fencing, watering points
- future maintenance

Some respondents also mentioned the cost of feeding stock that no longer grazed areas closed off for the project.

The participant survey found that the benefits included in Green Graze bids include;

- increased income over time;
- increased stock health;
- savings in fertiliser application, and
- environmental benefits, both on the farm and for the district.

The two benefits relating to environmental health scored highest in the minds of respondents, as shown in Table 16 in the survey report. Other benefits mentioned included improved livestock management, and erosion control.

Transaction Costs

Transaction costs of Green Graze are highlighted in Table 3. The cost per assessed hectare was $40/ha, which comprised an estimation of site assessment, travel and management planning costs. Set-up activities, consultants, reporting and modelling comprised approximately two thirds of the total administration budget. There are possibilities to stream-line these costs, as outlined in the Discussion section.

Table 3. Green Graze transaction costs

		Pilot project
Transaction Costs	Cost ($ K)	
Set-up activities	$	80,000
Site assessment, travel & assoc activi	$	85,000
Consultants, reporting,modelling	$	85,000
Total	$	250,000
Total area assessed (ha)		6,165
Cost / assessed ha ($/ha)	$	40

5. Discussion

We first discuss the key findings in relation to Resource Condition Targets and native vegetation outcomes, and then cost of achieving them. The issues from the grazier's perspective – both participants and non-participants – are then considered. The relevance of the whole farm approach, and issues associated it, are canvassed as the basis for a discussion about design issues.

Contribution to achievement of Resource Condition Targets

The project makes a substantial contribution to the achievement of Resource Condition Targets for the GB and NC catchments. The relevant regional catchment priorities relate to salinity, river health, water quality and biodiversity. The recommended modifications to grazing regimes will result in all of these priorities being addressed by:

- Retaining high levels of ground-layer vegetation cover over summer and autumn, resulting in higher levels of perenniality across the farm, higher levels of soil organic matter (and less acidity), greater rainfall infiltration, and less run-off of nutrients and sediments;
- Reducing grazing pressure to approximate carrying capacity will reduce pressure on grazing-sensitive plant taxa and reduce potential for weed invasion.
- Exclusion of grazing from remnant vegetation will increase vegetation quality by enhancing recruitment potential.

Green Graze addresses two of the major biodiversity targets in the GB and NC Catchment, relating specifically to improving the extent and condition of native vegetation (the two variables modelled in Green Graze, i.e. understorey species richness [major component of condition] and probability of natural regeneration). Both catchments recognise the need to protect existing habitat, including remnant patches of vegetation and resilient areas of native pastures and scattered trees. All of these assets were targeted in GG, as a way forward to improve the condition of extensive areas of native vegetation on private land in Central Victoria. Natural regeneration has the potential to contribute significantly to extent targets, providing appropriate grazing management is put in place. The GBCMA, though the Bush Returns program has a long-term monitoring program in place with the University of Melbourne to establish a greater understanding of the factors influencing successful regeneration.

The various grazing management strategies recommended under Green Graze all have the ability to contribute to an improvement in native vegetation extent and condition. Deferred grazing increases the rest period for native perennials during summer months. Rotational grazing increases the rest periods for perennial native species during the whole year. Crash grazing enables grazing to be excluded all year, except for 1-7 days where grazing is allowed for control of any excess biomass. Ungrazed excludes grazing at all times of the year, in particularly sensitive areas.

Green Graze management plans will lead to substantial reductions in Phosphorous application over large areas of native vegetation. Research suggests that this change in management alone has significant potential to improve native vegetation condition. There may be potential in the future to provide incentives for cessation of Phosphorous fertiliser use to achieve vast improvements in native vegetation condition.

Native Vegetation Outcomes

Significant achievements

Green Graze is expected to make a major contribution to native vegetation objectives as graziers implement their management plans. The contribution is significant in several ways.

Enhancing perenniality of native pasture, even if species-poor, is important. Natural regeneration will be much harder to achieve in the absence of native pasture. Native pasture also provides a buffer to remnant native vegetation.

Natural regeneration is expected across large areas as a result of Green Graze. It is an obvious alternative to planting trees and shrubs that should be pursued more in the future.

Green Graze is resulting in improved richness of existing remnant vegetation.

Major reductions in Phosphorus use are a significant first for a conservation program, and have been achieved because Green Graze provides alternative profitable strategies for graziers.

Finally, and importantly, it is expected that long-term change in the above areas has been achieved, even though the contracts are only for three years. The investments associated with the management plan involve re-orientating how the farm is run in the future. Adoption of the new grazing approaches were made knowingly and willingly by graziers.

It is expected that these achievements will be realised. On-going monitoring of all of them is required (see below),

Modelling potential improvement in native vegetation condition

The predicted (modelled) future vegetation condition (species richness and probability of tree recruitment), along with size of managed area and EVC status are fundamental to the overall benefits score.

The estimates of vegetation benefit for Green explicitly account for possible declines in vegetation condition *outside* of the Green Graze area. Because of the way the model is constructed, this has the critical implication of leading to underestimates of potential improvements within areas under contract but more realist estimates of total benefit across the whole-farm. This has never been accounted for in prior schemes, although is clearly required if estimates of total benefit are to be estimated. Further investigation of this issue is highly desirable.

Because of differences in methods of estimating vegetation benefit it is difficult to compare outcomes among different schemes. The short time available to develop the modelling approach for this project did not allow for this to be adequately addressed. Further work is needed to generate comparable measures.

The most easily interpreted measure of improving vegetation condition is eucalypt regeneration. However, the estimates provided here are likely to be an underestimate of the actual potential area of regeneration over the medium term. As Dorrough and Moxham (2005) describe, the model

upon which these estimates are derived tends to underestimate regeneration potential if a probability threshold of 0.5 is used to indicate either presence or absence. In that paper best model performance was obtained when probabilities >0.2 were used to indicate likely occurrence of regeneration. Using this criteria we get a far greater estimate of potential regeneration of 954ha ($278/ha of regeneration) across the five successful Green Graze farms. This later figure may be too large, but it does indicate that the potential benefits to native vegetation are likely to be considerable and if anything underestimated.

Major improvements in the modelling process are most likely to be obtained from research into:

1. the effects of rotational grazing and deferred grazing on understorey vegetation and probability of eucalypt recruitment
2. the rates at which available soil phosphorus declines and subsequent plant recovery
3. how vegetation recovery varies across landscapes owing to land use history, current vegetation composition, grazing management, soils and distance to potential seed sources
4. better understanding of the process of eucalypt recruitment

Monitoring of Green Graze properties and research being undertaken through the Future Farming Industries CRC, Bush Returns and Evergraze have some potential to contribute to this end, although more research specifically directed towards improving the assessment and prediction process would be desirable.

Monitoring program

The data collected over the next three years will be useful in development of future tender schemes by informing and refining the assumptions made in predictive modelling of native vegetation condition.

Monitoring changes to management practises and their impact on production and profitability of each Green Graze property is not well enough covered in the current monitoring program due to lack of financial resources. However, this is regarded as being very important information for future schemes. The project team is still investigating ways that this monitoring aspect can take place through the potential collaboration with other grazing projects.

The monitoring program for Green Graze would be enhanced significantly with extra funding. As GG areas are typically large (48% of the total property area on average), there needs to be more monitoring sites per property compared to other MBI schemes. This will therefore require more resources to monitor a larger number of sites and collect information on native vegetation condition and extent improvement over time.

Currently monitoring is restricted to basic monitoring of the adoption of agreed grazing management practises as outlined in the property management plan, along with basic monitoring of native vegetation condition annually on a small number of sites per property (Appendix 2).

Future monitoring would be improved by surveys of a larger number of sites (at least one per paddock) and more detailed assessment of changes in native vegetation under various grazing management systems—both in GG areas and non GG areas. It would also be important to monitor changes in production system, such as stocking rates, inputs such as fertiliser and sprays, and income, to calculate changes in gross margin and overall changes in farm profitability. This type of information will be important to showcase in case studies and field days, where other graziers can base their decisions on facts rather than modelling predictions.

Cost Effectiveness and risk in the Green Graze scheme

The Green Graze scheme captures both remnant vegetation and more extensive native pastures and scattered trees. By doing this in a whole farm context it highlights that native vegetation management is not just about production versus conservation, it recognises that broader landscape change is required to manage and improve extent and condition of native vegetation.

Bid prices (in terms of cost/ha) were lower than expected by the Green Graze team, especially when compared to annual gross margin from grazing enterprises. On a $/ha basis, the average incentive required was $165 /ha (ranging between $26/ha and $304/ha). The average gross margin (GM) from grazing on hill country is in the order of $80 - $160 /ha (assuming a stocking rate of between 4 and 8 DSE/ha @ $20 /DSE GM). In comparison, the average incentive required is relatively low and equivalent to approximately only one years' gross margin return on average, or even less in many cases.

If risks are better understood by participants, it is likely that bid prices may be decreased further. This may result when there is more known about production benefits and the risks associated with lost production are better explained to landholders.

Part of the reason for the relatively low bids may be tied to perceived production benefits or increased land values over time. There is now a more common perception that there are production benefits to be gained by additional fencing and watering points, which improves grazing efficiencies and stocking rates over time. This has also been highlighted in recent LWW research findings. The increase in land value due to better tree cover and amenity value is also commonly regarded as being more likely, particularly in areas where lifestyle property owners are buying into. The amenity value of land has risen significantly in areas within 2 hours drive from Melbourne.

By capturing both extensive low condition areas as well as better remnants, it may well be achieving gains in the higher condition areas for greater cost efficiency. The significant extent of changes to farm management being implemented, may mean that participating graziers will require less financial incentives to change management in the better remnants due to the larger scale of the changes being sought. This needs to be tested.

Transaction costs

Transaction costs of Green Graze are highlighted in Table 4. They accounted for approximately 50% of total costs. If funds were available to accept the next bid, the proportion would be approximately 33%.

Transaction costs have the potential to be reduced in future schemes as follows:

- The second pilot region in the North Central Catchment added costs associated with extra distance to travel for site assessments and meetings. Crossing CMA boundaries also meant extra costs associated with administration, and access to GIS and mapping data.
- Project development costs were significant in this pilot due to the uniqueness of the design. A whole of property approach had not been carried out before, and considerable time was required to develop a process for assessing whole farm management practises and the predictive modelling component to estimate impacts on native vegetation.
- Mapping took considerably longer than expected, due to difficulties in; accessing and combining GIS data/layers for various areas (multiple CMA areas), addressing inadequacies in base layers required for modelling (e.g. correcting and adding detail to the Tree25 layer), ensuring attribute tables and data were compatible with modelling requirements, creating multiple polygons (paddock by paddock), identifying new fencing requirements, making

revisions following landholder feedback, checking accuracy of integration with management plan.

In any future rounds it is possible that there will be extra time spent with each landholder, discussing management options and providing more information on likely impacts on native vegetation. This is estimated to increase assessment costs from $5000 to $6000 per property (20% increase). Savings are estimated to be generated from project development, as the whole farm approach required significant work initially, however once set-up, development of a future scheme is likely to be less (estimated 13%, decrease). We also estimate savings in the cost of modelling and associated consultants because we now have a sound predictive native vegetation model that has been developed (estimated 24% decrease).

Once these changes to the budget are taken into account, its likely that an overall savings in transaction costs of about 5% is likely, based on the above assumptions (Table 4). Therefore the impact of more time being spent with landholders is likely to be offset by efficiencies in other aspects of running the scheme.

Table 4.

	Pilot project (17 farms)		Estimated future (17 farms)		
Transaction Costs	Cost ($ K)		Cost ($ K)		SAVINGS
Set-up activities	$	80,000	$	70,000	13%
Site assessment, travel & assoc activi	$	85,000	$	102,000	-20%
Consultants, reporting,modelling	$	85,000	$	65,000	24%
Total	$	250,000	$	237,000	**5%**
Total area assessed (ha)		6,165		6,165	
Cost / assessed ha ($/ha)	$	40	$	38	
assessment cost per property	$	5,000		$6,000	est

Lessons to be applied to future work include:

- A total budget of $750,000 would ensure transaction costs are no more than one-third of total costs.
- Allowing more time for property assessments and on-going monitoring. This is likely to have a small impact on transaction costs, however is expected to be offset through other efficiencies gained from the learnings of this pilot.
- Further development of farmer/software that will streamline the development of individual management plans, particularly time taken to develop farm maps
- Consideration of regional boundaries, as running a scheme across more regions will increase transaction costs.

Participant Satisfaction

On average, respondents took almost ten hours to construct and submit their bid for Green Graze funding, ranging from three hours to thirty two hours for individual survey respondents (Coleman & Barclay 2007, Table 14). Despite the time involved, all survey respondents indicated that they had sufficient time both to submit an expression of interest, and to construct and submit their bid. Nonetheless, non-participants did indicate that time was an important contributing factor in their decision not to participate in Green Graze.

Bid assessment process The following respondent comments reflect contrasting attitudes towards the bid process:

Obtaining figures for lost grazing was difficult. I used a basic DSE rating, set stock rating and cost of supplementary feeding (if necessary). Reality is, some of it was an educated guess! Overall I found the process relatively easy.

"Put a considerable amount of time and effort towards achieving a great environmental result, and at the end of the day it is a complete waste of time"

This particularly strong comment came from a participant who was not successful in their bid. This comment is understandable given the un-seasonally dry conditions and disappointment in not submitting a successful bid. It was noted by members of the project team, that in general stress levels appeared particularly high given the drought and general poor outlook for the grazing industry, particularly for graziers' still feeding stock and the significant cost of doing so.

A number of respondents suggested that more time should also be spent by Green Graze staff evaluating the property 'on-ground', particularly regarding the presence of native vegetation and grasses, to determine to what extent farmers need to participate in Green Graze or similar projects in the first place, or whether they are already doing the right thing.

The survey results highlight that participants would find it useful to have more information (based on the experience of those participating in this pilot project), to inform them of the benefits of participation, and to provide information useful for bid construction. One way to achieve this would be through the provision of case study Green Graze examples in future schemes.

Case study information (from recent Land Water & Wool research) was supplied to all participants, included in the information kits supplied to them before the farm assessment process. This comment either means that graziers didn't read the information supplied, or requested more specific information on Green Graze or similar schemes.

The majority of survey respondents indicated that they understood the factors contributing to the success of their Green Graze bid, however respondents overall requested additional information be supplied as part of the bid assessment process, regarding management options, impacts on farm profitability, and opportunity to suggest other options. Additional information on risk, as well as a list of potential advisors, may be helpful to farmers.

Generally, it can be said that survey respondents were satisfied with the bid assessment process – on average, ratings are less than 3 but greater than 1.8, denoting an average rating somewhere in the 'satisfactory' band. The survey report (Coleman & Barclay 2007) presents the results of this question in Tables 29 and 30, and Figure 2. Nine out of ten respondents were happy with the management plan supplied for their farm (Coleman & Barclay 2007, Table 32).

Trends from the participant survey shows that four respondents felt that other management options could have been explored in more detail, such as:

'Carbon levels and measurements.'

'Splitting the bid to accommodate the less expensive/lower 'value' section from the high cost/high benefit area.'

'Feeding stock costs when taking stock off paddocks - enormous cost.'

'Pest/weed control options better outlined.'

Bidding Checklist

Eight respondents believed that the bidding checklist made it easier to construct their bid, helping them to consider costs and benefits, and to make sure that nothing was overlooked. Nine out of ten respondents felt that the bidding checklist contained about the right amount of information. Respondents were asked 'Are there any other ways in which the bidding checklist could be improved?'. Only one comment was received:

> *"Insufficient guidance on the 'value for money' assessment criteria resulted in a large amount of wasted time all round.'*

This comment came from an unsuccessful bidder, who was disappointed in missing out on the incentive money. This comment highlights the unknown aspects involved in running a pilot project. Future rounds can now address this concern as "value for money" criteria have been identified in the pilot project results. Participants will now receive a clearer understanding of the main drivers in achieving a successful bid, and influence the development of individual management plans, i.e. Size of GG area, type of grazing management strategy to be adopted etc.

Feedback on provision of farm maps

The GG team received many positive comments from participating graziers on the quality of the property maps provided to them, which showed EVC status across the property, GG areas, future grazing regimes and potential fencing requirements. The maps were a very important part of the individual management plan for each grazier and enabled the plan to be understood quickly and easily. They also assisted graziers to construct their bids.

Trends from the participant survey highlight the maps supplied to each participant were easy to understand, with the majority of survey respondents saying that they found them satisfactory or very satisfactory (Coleman & Barclay 2007).

Risks

Respondents were also asked to think about risks that might have been considered when putting their bid together. Uncertainty in the weather, and the risk of going over budget, were seen as the highest risk factors (Fig 8):

> *"'The uncertainty caused by the drought impacted on our ability to be less conservative with our bid.'"*

Six respondents identified uncertainty about the weather as a 'high risk' (the only occasion where more than one instance of 'high risk' was noted in a response category for this question). Respondents saw other factors involving some or minimal risk, and are most comfortable about their ability to meet their contract obligations. The survey report includes information on risk which respondents would have found useful.

The survey findings suggest that participants costed out a project budget, but then added a safety margin in case of cost blow-outs, income shortfall or other unforeseen circumstances.

Fig 8. Risks highlighted in Survey

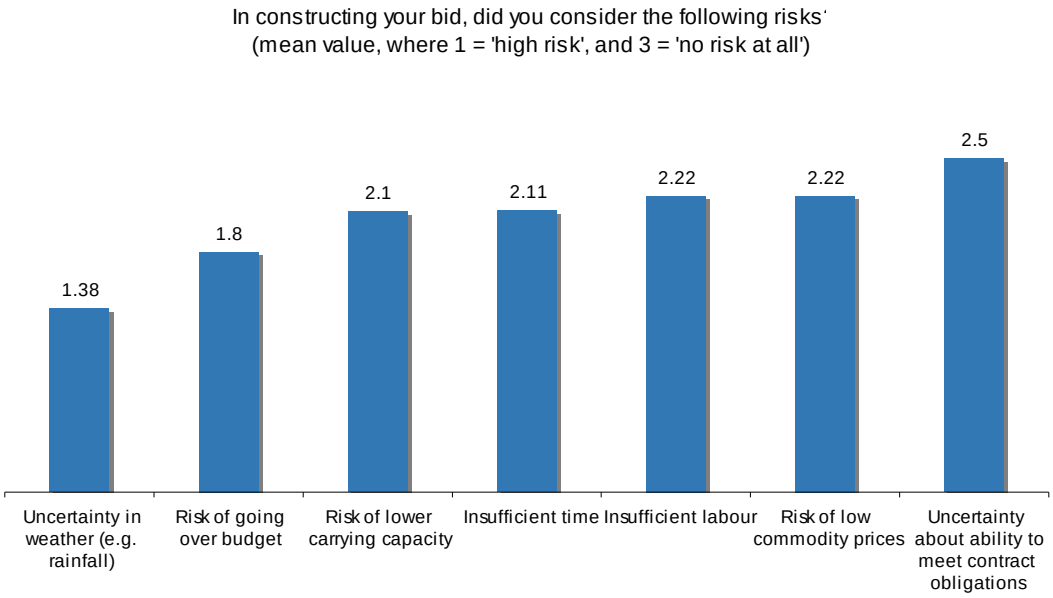


Table 5. Is there any extra information that you would have found useful when assessing risk as part of your bid?

Is there any extra information that you would have found useful when assessing risk as part of your bid?
Likely acceptability of providing high-cost fencing and water to enable better management of 'tricky' hill country.
No. The risks are just ordinary farming/business risks.
No.

Non-participant Satisfaction

The participation rate was estimated to be 5.5% of potential eligible graziers in the pilot regions.

Twelve out of the 30 EOI's submitted were not eligible to participate, mainly due to their property size being less than 500ha. Due to the small budget for this pilot ($250,000), it was necessary to try and reduce the number of eligible participants. Property size limits aided this, and also encouraged larger properties (which are likely to be more commercially viable - as agreed by DAFF during the development of this pilot) to participate. With a larger budget, it would be worth considering relaxing this criterion, however commercially viable enterprises should remain a high priority due to the large proportion of grazing landscapes they make up, and therefore the potential they offer to achieve landscape change.

There were a couple of instances (however not highlighted by the survey results) where there was an apparent perception by landholders that Green Graze management agreements could be tied to property title. This perception may have contributed to landholders not participating in Green Graze. In the future, communications and promotional material must clearly state that this is not the case, or the circumstances in which it will apply (e.g. where particularly large payments are being

made or where landholders would like to have the option – note that scoring may then also change to reflect the extra public benefit).

Non–Participant Survey

A short survey of farmers who had obtained information on Green Graze, but decided not to participate, was also conducted to identify the reasons why they chose not to be involved (Coleman & Barclay 2007). There were several reasons why graziers did not participate in Green Graze, however most related to timing or time requirements and influence of the drought, as highlighted in Table 6. The decision not to participate does not seem to be motivated by lack of interest. After all, these farmers did seek out information on Green Graze. Instead, the decision not to apply for funding seems to be related to time constraints (busy time of year coupled with drought) and lack of information, particularly on how bids would be assessed for 'value-for money'. In the future, EOI's should ideally be sought during Autumn or Winter when there is generally more time for landholders to read the Information kits provided and organise their EOI's.

As Table 34 in the survey report reveals, time (both an unsuitable time of year and the time required to construct a bid) seems to be the main reason that non-participants did not submit an EOI, with three respondents indicating time as the most important reason for non-participation, and one as the second most important reason. Other significant reasons for non-participation included the restrictive criteria (minimum property size), lack of understanding of Green Graze, and the drought. There were several instances where interested graziers commented to the project team that they were disappointed because their property size did not meet the eligibility criteria of 500ha minimum. One non-participant made the following comment in regard to the minimum eligible property size to participate in Green Graze.

"If native grazing plants are to be protected the size of property should not be a bar."

In the future, it would be worth considering reducing property size to assess the impact on cost per vegetation benefit, and the effect on participation rate.

The non-participant survey suggested that the participation rate could have been improved if they were given more time to submit bids, or if the funding was made available at a different time of the year. Non-participants were asked if there were ways in which Green Graze could be made more useful and relevant to farmers. The answers to this question continue the theme revealed by the participant survey: that more information is required by farmers before participating in a project of this nature. Now that a pilot project is in operation, this information can be made available to farmers when advertising future funding rounds, and supplied in further detail to interested farmers.

It was interesting to note that all the non-participants interviewed, would still be interested in participating in future rounds if eligibility criteria was relaxed in future schemes (Coleman & Barclay 2007 Table 35) . However, it could be argued that they are saying 'yes' depending on what time of year the funding is made available – farmers require sufficient time to both put their bid together, and to implement the management changes required as part of their Green Graze obligations. This perhaps calls for greater flexibility in when funding may be applied for, or more particularly, when changes can be made.

Some of the comments highlighted a lack of clear understanding of the project e.g. 3rd Reason. Clearer communication and messages are needed in initial promotional material.

Table 6. The three main reasons for non-participation in Green Graze

The three main reasons for non-participation in Green Graze		
1st Reason	*2nd Reason*	*3rd Reason*
Timing (drought focus)	Lack of understanding	
Timing did not suit	Another project on the go	
Difficulty of fencing off large areas in particular paddocks for grass regeneration.	Tender process too lengthy.	Area of land required for fencing off restrictive.
Short time to respond.	Drought. Has been a difficult year.	
I was advised that the property was too small.		

Seventeen hill country grazing properties that participated in recent Land Water & Wool research project, were also invited to submit an EOI, however none of theme took up the offer. Only one of the 17 graziers requested an information kit, however did not submit an EOI. General feedback and informal discussions with these graziers suggests that they felt they had learned enough and received enough information from the previous project and preferred to "let someone else have a go". Timing and seasonal conditions (drought) also appeared to be a compounding issue.

Relevance and issues associated with the Whole Farm Approach

This project extends previous work in Farm Businesses and Biodiversity projects that took a whole farm approach (Crosthwaite *et al.* 2006, Dorrough *et al.* 2007), and integrates this into the design of a tender. The adoption of a whole farm approach is unique in MBI schemes, in that it provides technical advice to landholders (financial, agronomic and ecological) to help them assess the whole farm area and prioritise areas to be managed differently. The approach then helps landholders assess the impact of these changes over the whole farm, particularly to the business (annual cash flow and annual farm profit loss and capital investment required) and likely native vegetation outcomes.

Tender projects can be situated on a continuum in relation to the extent to which they involve whole farm considerations. Green Graze is towards one end of the continuum, with successful participants making major changes that impact on their whole farm business.

While Green Graze has been successful, some of the issues identified below require further attention in design of new trials. Testing with volunteers in an experimental laboratory setting is also likely to be very helpful – an explanation and listing of relevant laboratories can be found at http://pluto.ecom.unimelb.edu.au/ednetwork/experimental.cfm.

Whole farm advice by the Green Graze team

Landholders were engaged in Green Graze with the help of the whole farm approach. Native vegetation management was canvassed through talking about changes to grazing management that has the potential to achieve gains in carrying capacity and therefore production, as well as native vegetation condition. Profitability messages at a whole farm scale were used as one of the "hooks" to capture the attention of graziers. The Green Graze team engaged specialists in the areas of farm economics, ecology and pasture agronomy. These technical skills aided discussions with landholders, and provided information to help landholders make decisions regarding parts of the property to prioritise for making changes to management on. The landholder survey revealed in some cases, that

landholders would've liked more time to explore and discuss the recommended management options and potentially explore different management options. This could be accounted for in future schemes, by allowing more time spent with each landholder and also choosing less busy times of the year to run the scheme.

Changes to farm management often impact across a larger area, therefore changes occurring outside of Green Graze areas such as change of enterprise mix or change in stocking rates, are likely to impact on the management of Green Graze areas. These could affect the estimated impact on native vegetation and therefore staff running the scheme need to be aware of how the whole property is managed over the lifetime of the contract.

Greater detail of future management needs to be obtained during landholder discussions, so these actions can be built into the modelling process. In additional to fertiliser rates, proposed changes to stocking rates, grazing regimes, watering points and fencing, stock types and classes should be collected. A system of recording changes to farm management outside of Green Graze areas during the contract period needs to be developed to assist agency staff in evaluating likely impacts on native vegetation in Green Graze areas as the contract progresses.

Estimating impact on the whole farm business

The whole farm approach provided landholders with case study information (generated from the recent Farm Business & Biodiversity projects funded through Land Water & Wool), that highlighted the potential impact of four management strategies on farm investment, profits and cash flow. The Green Graze team were able to discuss these findings with each landholder and relate them to the business, agronomic and environmental situation of their property. The team were careful not to provide specific financial information for properties; however general farm business information based on district averages and recent findings aided landholders to think about this relevance to their specific situation.
The whole farm approach provided landholders with relevant financial information that could be adapted to individual properties.

Risks of providing advice on financial impact

The provision of financial advice to participating landholders is integral to the whole farm approach that was taken in this pilot. Advice on the potential impacts on farm cash flow, profits and required investment is critical information for landholders contemplating a large scale change in their farm management. The risks of providing this information include the probity issues for all participating landholders as well as its influence on bid price. There is an inherent risk of stated potential impacts on the farm business not eventuating; however the provision of case study examples will help explain these risks and the variability of impacts.

This information needs to be available to participants, either through the project team or similar program. In this pilot project, case study information was provided to participating landholders in the form of extension notes generated by the Land Water & Wool funded Farm Business & Biodiversity project. In future schemes, this information would be more relevant if it were generated from the case study findings from this Green Graze pilot project and made available either from the project team, or relevant CMA or agency running the program. Ideally, advice should be made available at a face to face level, and time budgeted for this to occur with each landholder.

Further work would be useful in investigating the impact of providing extra information to bidders. For example, the impact of providing additional financial information on bidding behaviour and risk, and what proportion of risk should be shared by landholders and investor.

Implications of providing information on likely vegetation benefits

The provision of environmental advice to participating landholders is also integral to the whole farm approach that was taken in this pilot. Advice on the potential impacts on condition of native vegetation on individual properties is critical information for landholders contemplating a large scale change in their farm management. This information enables participating landholders to estimate the scale of improvement in native vegetation condition that may be possible over time from changes implemented on their property.

This information may influence bid size, so needs to be provided in terms that state the nature of the predictions and the variables and key drivers involved. The information could be made available from the modelling process relevant to their farm, or via case study findings from this Green Graze pilot project. It should be made available either from the project team, or relevant CMA or agency running the program.

Estimating impact on whole farm grazing management

Changing grazing management across large areas or on many paddocks will have a significant impact on many farm businesses. This is very different to setting aside a small area within a paddock, or of remnant bush, which is usually of relatively low production value and can be fairly easily managed primarily for biodiversity or aesthetics. A whole of farm approach is therefore required to assess the impact of such broad-scale changes, on both the whole farm production system and environment.

An agronomic assessment of the property is integral to the whole farm approach and aids the landholder to identify the priority areas to change management on. For example, the least productive paddocks and pastures may be improved markedly by identifying efficiencies to be made in grazing management. Identification and assessment of highly productive paddocks and pastures may also indicate how these areas could be further improved, agronomically and environmentally.

Any new grazing system must contribute to meeting the long-term objectives of landholders, and the change-over needs to be manageable, in terms of timeframes, labour and capital required and any foregone income in the short-term. Expected risk has to be within acceptable limits. Timing of the change has to be right in terms of the landholders existing commitments and expected needs. Finally, knowledge has to be acquired, and skills to establish and manage the new system are needed. Such issues posed challenges in designing Green Graze, which involved substantial management change for some landholders. This highlights the importance of having the necessary experience and technical skills available in the project team.

The whole farm approach was used successfully on all GG properties, which included steep hills, undulating to plains landscapes. The land-type had no impact on the effectiveness of the approach, which still enabled priority areas for production and native vegetation management to be identified. Highly productive and marginally productive land were both included in Green Graze management plans. Five out of the 17 management plans developed included Green Graze areas being stocked above 8 DSE/ha, which demonstrates that these areas are not always marginally productive.

Estimating impact on whole farm native vegetation condition

Because of the broad-scale nature of Green Graze, and the strong likelihood of changes in grazing management affecting areas outside of the Green Graze areas, it was necessary to model both areas inside and outside of Green Graze management. A whole farm approach was used to estimate the likely impact of changes to grazing management, on the condition of native vegetation over the whole property, including regeneration potential of scattered paddock trees. Fertiliser and grazing history, including the nature and length of rest from grazing, was collected for the whole property, as well as intentions for future management of fertiliser and grazing. This information was critical in

determining the estimated change in condition of native vegetation in Green Graze areas, as well as for the whole property. Areas not included in the Green Graze management plan, were estimated to decline in native vegetation condition. This offset the increased condition that was predicted to occur in Green Graze areas. It was important that this offset was clearly explained to participating farmers, as this could influence the size of their bid, in particular the inclusion of any areas of native vegetation within the bid.

Improvements in condition of native vegetation are long term and are unlikely to be significant within the 3 year Green Graze contract. Future schemes would therefore be better to strive for longer contract lengths, but would require a larger pool of incentives.

The results generated from the predictive model were generally consistent with vegetation assessments and perceptions of field officers. The predictive native vegetation modelling relied upon data collected through interviews with graziers, such as fertiliser application and grazing history. The accuracy of this information was very important to accurately model individual paddocks and estimate future impacts on native vegetation. Native Vegetation assessments (Habitat Hectares) were undertaken to verify model results, although these results had limited value due to drought conditions. The model appeared to discriminate between similar proposals quite well, with the large amount of individual data collected from each property. No two properties with the same data (e.g. fertiliser, cultivation and grazing history, existing tree cover, EVC type/s and grazing recommendation) were encountered.

A detailed assessment of the modelling process and potential for future refinement is provided in Dorrough and Cawsey 2007.

Willingness to participate

Several issues could potentially influence landholder willingness to participate and level of financial assistance being sought. These issues are relevant to all incentive schemes, but may be more important when there are large changes to farm management that have major effect on business outcomes. These issues are:

- landholder knowledge of their production system, and of available management opportunities and their associated production and environmental effects
- landholder capability to implement changes to their grazing system
- risks facing the landholder, and how perceived risk might influence participation, bids and performance
- how landholders might respond to risks that later emerge, and implications for environmental outcomes
- factors, including the level of profitability and period of time, influencing whether landholders become comfortable with new opportunities

The key variables affecting the participation rate and construction of bids are as follows:

Knowledge of impacts of grazing management: Graziers are likely to require considerable exposure to new grazing systems recommended under schemes such as Green Graze before they take it up. Access by graziers to information about the impacts of various grazing management strategies on farm profitability and condition of native vegetation assists accurate tendering, and less 'risk factor' being included in the bid. Uncertainty about the profitability and riskiness of large investments of a new type increase the likelihood of large risk premiums being built into bids; this will vary depending on how risk averse each grazier is. Extension notes from recent Land Water & Wool Farm business & biodiversity research

(http://www.landwaterwool.gov.au/research.asp?section=257), needs to continue to be made available to landholders who are looking to change their grazing management. This information is important as it provides details of short and long term benefits and costs, to graziers from adopting various grazing strategies. This information also has the potential to influence the size of area that is included in Green Graze. Landholders need to be reminded to look at this type of information and related information in detail, which needs be explored further in any future schemes.

Technical staff with expertise in each of grazing management, farm business management and ecology or native vegetation management, is critical to the success of the whole farm approach. The ability to communicate and provide advice in lay terms to landholders on these specific areas is also critical.

Cost of infrastructure: Cost of additional fencing and watering points are the most common investments to be made, where substantial modifications to grazing regimes are being implemented. Variations occur in these costs due to land type (i.e. steepness and accessibility) and availability of labour etc.

Size of GG area: The size of the Green Graze area will impact on the total costs. When losses or gains from changes to grazing management are taken into account, bids are generally more cost effective when costs of infrastructure are spread over a larger area. The eligibility criteria may have therefore had an impact on size of bids. If the minimum property size had been reduced to below 500 ha, it is highly likely that smaller grazing properties would have participated and the average successful Green Graze area may have been smaller. This may have lead to differences in bid values per ha of native vegetation managed, due to economies of scale on smaller grazing properties, i.e. smaller properties may have similar costs of infrastructure to larger properties, however when these costs are spread over a smaller area, the cost per unit of area is increased. The results of the Green Graze pilot project can be roughly extrapolated to properties under 500 ha in size, however economies of scale should be considered and average results used as a guide only.

Fertiliser and grazing history: The history of fertiliser application, current soil test results and grazing history help to explain the current condition of native vegetation. The effect of actions such as a change in grazing management on the future condition of native vegetation can be predicted. It is therefore important for landholders to know the relationships between their land management practises and condition of native vegetation. This information will also help landholders to prioritise parts of their properties that might be better suited for Green Graze and cost less to manage for improved native vegetation in the future i.e. parts of the property with low fertiliser history and lower stocking rates are likely to be more suited to improve native vegetation and may cost less to change grazing management as well. In future schemes, the provision of information relating to the relationship between fertiliser and grazing management on predicted native vegetation condition, needs to be improved.

It is also critical that graziers understand the impact of the cessation of phosphorous application on Green Graze areas, and how this will impact on the farm business. This may mean reduced fertiliser expenditure, and a positive or negative impact on pasture growth and relevant stocking rates on these areas.

There are potential 'conflict of interest' risks that will need to be managed in future projects when relying on information from landholders about fertiliser and grazing history to inform estimates of benefits from their bids. This is particularly so as landholders start to understand the link between these and scoring benefits in competitive tenders. There may need to be alternative means by which these data can be collected / verified. This is an issue for further research/testing.

Issues arising when both environmental and production outputs are important

In the Green Graze pilot, the deliberate intent is to secure environmental outcomes by triggering change in the farm production system. This approach of linking environmental and production outcomes, can potentially introduce complications for program design because of transaction costs and information issues that relate to expectations, uncertainty and risk for the farm business.

Transaction costs may increase as the number or complexity of options available increases because project design complexity increases. Engaging and explaining often complex issues to landholders (and other stakeholders) is more difficult, and requirements for monitoring increases.

The issue of public versus private benefits was considered, and risks associated with working towards environmental and production outcomes were identified. Participants were rewarded with a higher farm (vegetation) score for the adoption of activities that are estimated to bring about the best native vegetation outcomes. E.g. Incorporating long rest periods into grazing regimes, and zero phosphorous application. Participants were also informed of the management actions that could result in negative impacts on native vegetation condition and therefore lower vegetation scores and lower likelihood of receiving financial incentives e.g. application of phosphorous, high stocking rates and set stocking.
There is room for improvement here in the future, with these potential impacts more clearly communicated to participants, and the farm scoring system clearly explained.

If information relating to farm production is part of the formal agreement, some issues may arise in the future. To bring production information in, then both parties need to agree that the outcomes were uncertain. In schemes such as BushTender, a landholder will be happy because they are not strictly accountable for the environmental outcomes, just for the activities. However, in a tender that has production elements such as Green Graze, the landholder may be unhappy if the agency is not accountable for the production outcomes if they provided advice that certain production outcomes may occur. If the production outcomes are advised and fail to materialise, the landholder may be unhappy because it personally affects them and they wear the uncertainty. With this in mind the Green Graze contract was similar to BushTender where only activities that would benefit native vegetation were included. The difference though is that the activities targeted in Green Graze are large-scale (e.g. grazing regimes) that have been found to have complementary outcomes for farm production.

Other project design issues

The project team and governance

The combined skills of the project team were important to the success of the project. In particular, the requirement for field officers to have expertise in both grazing management and native vegetation management was important. This needs to be maintained in the future and it is suggested that a teamed approach works well, where different skills and knowledge can be put to use (rather than expecting an individual to have all skills, which may be possible but probably rare).

Modelling expertise is also a major requirement.

Governance arrangements generally worked well, with the steering committee and technical panel convened when required.

Engaging an external consultant to provide probity advice was extremely valuable as an additional check-point. It ensured that all dealings with landholders were handled appropriately i.e. fair and impartial, consistent and transparent, secure and confidential.

Time required for development of metric and modelling

The time given to testing the metric and modelling results was shorter than required. The timeframe provided for completion of the whole project was unrealistic, given the new design and predictive model being tested. The level of work that was required for development of the metric and modelling was higher than anticipated and also took longer than anticipated. Future schemes need to allow significantly greater time for testing of the scheme and modelling process to ensure accuracy and relevancy of results and smoother roll-out.

Contract length

The length of contract may be a determinant of the size of area contemplated under Green Graze management, and therefore bid size. The participant survey indicates that landholders' willingness to include larger areas under Green Graze was influenced by time commitments and worry about not being able to meet milestones in shorter time frames. Longer contract length may remove time-frame as a barrier to implementing changes.

There is some risk that participants will follow their 3 year management plans until the end of contract, and then change their management practises on these areas, which may have detrimental effects of native vegetation outcomes. Will participants value the new management systems and maintain these practises with the aim of improving productivity in an ecologically sustainable matter? Will participants continue to implement the management plan broadly but resume Phosphorus application on some areas, and possibly make changes that are detrimental to particular areas of native vegetation?

These issues need to be monitored on Green Graze properties and considered further in design of further trials.

Management plans, mapping and use of eFARMER

Time required for farm mapping and development of management plans was underestimated during the Green Graze Pilot. In the future it would be worth allocating significantly more time to this process, unless the process is streamlined with the addition of tailored software (e.g. eFARMER) which may reduce transaction costs.

We estimated that on average, 25 hours per property were spent on all activities associated with mapping and development of the management plan, including the site visit and farm assessment.

The eFARMER tool is currently being developed for use across a number of Victorian CMA regions. The tool is intended to help farmers to plan, implement and monitor activities that influence the condition of land, water and biodiversity assets at the farm/sub-catchment scale. It provides a tool for editing and more accurately representing assets including tree cover, soils, land use and areas of degraded (e.g. salinised) land. eFARMER aims to support CMA's in monitoring catchment health and evaluating the effectiveness of RCS's. It is a web-based application that will allow farmers/land managers to identify proposed and implemented activities on their properties, and for this information to be accessible to CMA staff for the purposes of reviewing farm based planning activities against CMA catchment planning targets. It is intended that eFARMER may be used by CMAs in conjunction with detailed farm business planning for each property, incorporating risk analysis of new management practices. The whole farm plan that is developed for each landholder will highlight the likely impact of alternative management strategies on environmental and production outcomes. It will also highlight the steps required to adopt the plan, and with the help of eFARMER, provide farm maps showing areas to be managed differently. Future development of eFARMER will also focus on integration with predictive modelling tools including the CAT (Catchment Analysis Tool), thereby enabling an improved understanding of the likely biophysical changes resulting from farm scale management actions.

With some refinements to eFARMER, the Green Graze mapping and planning process could become quicker and easier. Further development to enable graziers to edit their own grazing management maps (once uploaded by GG staff) on-line. This would aid the revision process and provide participating graziers a greater level of ownership over their management plans.

Once technical aspects of editing grazing maps are overcome, eFARMER is likely to become a very important and practical tool for graziers with broadband access.

Bidding Checklist

A bidding checklist was provided to landholders to help them develop their bids and help inform participants about given potential (both positive and negative) effects on their business and livelihood. There was some contention in the team as to the potential impact such a checklist would have on landholder bidding behaviour. However, it was agreed that some guidance would help landholders to thoroughly consider both the benefits and costs of implementing their management plan and to reduce the likelihood of outcomes not being met due to landholder failure to cost the projects adequately.

An economic appraisal of individual management plans was not provided. However case-study fact sheets on environmental and economic implications of different grazing management scenarios were provided in the Land Water & Wool extension notes included in the Green Graze information kit. The cost of implementing the management plan was regarded as the business of the landholder. However it would be interesting to provide financial appraisals to participating graziers in an effort to draw landholder attention to the potential economic benefits (as identified in previous research) associated with grazing for native vegetation outcomes, and the effect this may have on bid price.

In schemes such as BushTender, economists have been concerned about leading landholders too much with bid development and not letting the market play out properly. While it is difficult to test the true impact of the Green Graze check list, the landholder feedback has been positive and the team believes it is one way to reduce the risk of landholders failing to meet agreed milestones. Feedback provided from Bush Returns participants indicated that more information to guide bid development would have been useful.
The provision of production information to Green Graze participants could be considered in any future application, and may warrant the services of independent consultants who would share the risk with the participating grazier. This would allow the Green Graze agency to remain at arms length from provision of production/business advice, and not to bear the risk.

The participant survey showed the following trend in relation to constructing their bids:

Seven out of ten respondents sought additional help or advice while constructing their bid (Table 17). Of the three respondents who did not seek advice, two believed in hindsight, that advice would have been useful. The most prevalent form of advice sought was from department or agency staff, while family members, neighbours, plumbing and fencing contractors were also sought out. Interestingly, as shown in Table 20, only three respondents believe that a list of possible advisors would have been helpful. This seems to indicate that people would rather choose their own advisors than have advisors recommended to them. However, a generic list of potential advisors would be worth considering in future schemes, with the aim of at least alerting participants to the type of advice they may require

Reserve Price

A reserve price of any nature (e.g. per landholder or per unit of benefit) was not set under Green Graze. However, to encourage more competition with a relatively limited budget, a reserve per property may have also been useful at the level of the whole farm, and should be re-assessed in the future. An issue was highlighted when one bid of $240,000 approached the total amount of money

available for incentives; this bid was unsuccessful. It also raises equity issues, and perception about providing very large payments to some graziers and not to others. A cap or reserve of total dollars per property may need to be assessed in the future that encourages competitive tendering and reflects the total amount of money available to participants, and spreads risk for the agency involved.

6. Conclusions/Recommendations

The Green Graze pilot project has resulted in large areas of native vegetation being managed under improved grazing regimes.

The trial has proven a worthwhile approach to achievement of Resource Condition Targets for the Goulburn Broken and North Central catchments, including specific native vegetation outcomes. The immediate drivers leading to this are changing grazing system and reducing Phosphorus use. These in turn are expected to result in increased under-storey diversity, tree recruitment and perenniality of native pastures.

The tender worked well, and was able to discriminate between bids according to value for money. In this respect, the pattern of bids when compared for cost per unit of vegetation benefits was comparable to other tender programs. Contracts were awarded to properties with low bid prices per unit of vegetation benefit. The project has thus been cost effective in influencing land management over significantly large areas of grazing country.

Irrespective of whether a tender is used, Green Graze has also highlighted the likely financial resources required for graziers to undertake broad scale changes in grazing management at a farm scale, to integrate sustainable management practises.

Green Graze achieved a high participation rate, and level of satisfaction. Attracting participants in similar trials in future is not likely to be a problem, especially as poor climatic conditions may have dampened the interest of some graziers this time.

The Green Graze tender has provided a model for more widespread application and uptake across regional Australia. Green Graze could be applied more widely with a high success rate. However, further trials of Green Graze are recommended before widespread roll-out. It is important to note that BushTender is still in a trial phase, even though it is the longest running tender program in Australia.

It is recommended that the Green Graze approach be trialled across a much larger portion of hill country in Victoria. This would allow the approach to be fine-tuned using the new predictive model. Testing during a non-drought year would be advantageous. The trial should focus on the ability of the approach to deal with a larger area and participation rate and development of a much larger number of management plans and ongoing monitoring programs. It is estimated that a budget of $2M for on-ground work, would allow approximately at least 40 successful bidders. This would test the ability of a multi-skilled team and approach to deal with larger numbers of participants. The next trial could also consider reducing the minimum size of 500ha properties, to about 200 ha to investigate the effect on bid value per unit of vegetation benefit. Uptake is expected to be higher as the community becomes more familiar with the approach, and multiple rounds also allows lessons learned in the pilot round to be applied (by both the agency and landholders who were unsuccessful in the first round).

The following more specific recommendations address some of the improvements that should be adopted in a new tender, as well as issues that should be further investigated. Some of the issues can be addressed in designing and running more trials. Some issues can be usefully tested with volunteers in an experimental laboratory setting.

Research

1. Research that will improve the modelling of the relationship between management practices and vegetation outcomes should be supported, where it is not already being undertaken.
2. Participants should be surveyed carefully to determine more about their bidding behaviour, in particular whether they sought to recover all capital costs from the tender, and the extent to which climatic conditions and other risks influenced bidding behaviour.
3. Conducting experiments with volunteers in a laboratory setting will help address questions of bidding behaviour for tenders that involve farmers in major considerations of profitability, cash flow and risk.

Project scope

4. Use of the time of the project team will be maximised if the pilot area does not cross many catchment boundaries
5. Reducing minimum farm size to 200ha should be considered, provided the risk of over-subscription is addressed.
6. Investigate the ability of the approach to deal with larger areas and higher participation rates
7. Allowing joint bids from farmers should be considered.
8. Increasing the contract length should also be considered
9. Investigate the use of a cap or reserve bid amount per property
10. Total project budget should ideally be $750,000 to allow a ratio of at least 2:1 between funds to be paid in incentives and overhead costs

Modelling

11. Further development of the predictive modelling is required, particularly to track changes in vegetation condition in the understorey and overstorey over time. This will assist with more confident management planning decisions (e.g. in programs like Bush Returns and Green Graze) and monitoring progress towards catchment targets.
12. How the predictive modelling handles the farm area not under a Green Graze management plan also needs further investigation.
13. Sufficient time should be allowed to incorporate or develop measures that allow direct comparison of vegetation benefits with other tender schemes such as BushTender and Bush Returns.
14. Determining the potential cost-effectiveness of whole farm tenders in improving management of high quality native vegetation should be investigated.
15. Benefits to natural resource management, particularly in salinity, water quality and river health should be modelled. The Catchment Modelling Framework may be an appropriate tool, particularly in conjunction with eFARMER.

Information

16. The provision of information to prospective participants should be reviewed in light of feedback from the participant survey. Case study examples from this Green Graze trial may be appropriate.
17. Improvements can be made to information provided on the farm scoring system and likely impacts on scores from various management practises, including grazing regimes, phosphorous application and enterprise mix.
18. The role of eFARMER can be expanded.
19. Provision of a list to participants of where they can obtain specialist advice, should be reviewed.

Project team

20. Developing a set of guidelines or training package for agency staff carrying out the GG approach in the future. This would be important to ensure that staff involved can assess

relationships between production activities and environmental outcomes. The learnings from the GG pilot project need to be communicated to future project teams clearly.

Time & timing

21. More time overall for graziers to submit EOI's, and running the trial at a different time of the year, should be considered. We recommend that submission of EOI's and bid construction should be held during the Autumn and/or Winter months when graziers tend to be less busy.
22. Increasing the timeframe to complete a trial like this is critical to enable proper testing of modelling, metric as well as developing management plans for participating landholders
23. Extra time should be budgeted for property assessments and discussions with each landholder participant. This may allow the management options to be explained in more detail and different management options suggested by landholders to be explored. More budgeted time would also allow assessment of native vegetation to occur at the most opportune time during spring.

Monitoring

24. Improved monitoring component and resources, to capture changes in vegetation condition and farm production and profitability over time, for both Green Graze and non-Green Graze areas.
25. Monitoring should be planned to continue beyond the life of the contract to test the extent to which graziers take actions that are not consistent with their agreed management plan.

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8. Appendix 1 Calculation of the Native Vegetation Benefits at a Whole Farm Scale

We assume that the native vegetation management objectives are (1) to maximise the area most likely to support natural regeneration and (2) maximise the number of native species. These objectives were approximated using the estimates of future values alone.

8.1.1. Development of the indices of vegetation benefits.

Each grid cell (area = 0.09 ha) in the GIS has a predicted future value for each response variable denoted ur_f or nr_f for understorey richness and natural regeneration respectively. Each cell also occurs in a part of the landscape that may be more or less preferred for native vegetation management by the GBCMA. Because of the problems and lack of knowledge surrounding optimum spatial location of native vegetation management enhancement activities in these types of landscapes we focus only on preferences due to the EVC status. It as this point that the cell values are weighted by the EVC status;

$\omega ur_f = ur_f * \beta evc$

AND

$\omega nr_f = nr_f * \beta evc$

Where β is the weight given to a particular EVC and *could* take a positive value from 0-1. The following weights were applied:

Endangered	1.00
Vulnerable	0.98
Rare/depleted	0.95
Least concern	0.9

For each property the **mean** weighted cell values are calculated (ωUR_f and ωNR_f). At this point it provides an estimate of the mean weighted native plant richness or probability of eucalypt regeneration in a 0.09ha cell.

All cell values across the farm are used to calculate the mean rather than just the values for the bid area. This assumption will upwardly bias the mean score on those farms that are aiming to improve or maintain vegetation values across a larger proportion of their farm. Farms that intend on improving values on only a small proportion of the farms, while allowing values to degrade elsewhere, will receive a lower mean score than if only the bid areas were included.

It is at this point that we incorporate the bid area into the farm scores. We apply a different equation for each vegetation attribute. This is partly because they are different measures of vegetation, one an estimate of a potential process (regeneration) and the other an estimate of an amount at a particular scale (species richness). Below we describe how we calculate the farm scale area weighted estimates of each and justify our choices.

8.1.2. Natural Regeneration Area

Mean weighted estimates of natural regeneration probabilities were simply multiplied by the bid area. This provides an estimate of the total area likely to support natural regeneration.

NR ha = ωNR_f * Green Graze Area (ha)

This value can be used as a discrete "quantity" for the purposes of reporting - the total area of potential regeneration can be summed across farms to estimate the area of natural regeneration as a result of management change and incentive funding.

8.1.3. Total Estimated Species Richness

Our estimates at this point are for the density of native species within a given area (0.09ha). We wish to scale this up to some estimate of species richness across the bid area. In this case it is not sensible to simply sum the values across the bid area. It is unlikely that each 0.09 ha on a property will have an entirely new set of species. Typically, for any given habitat, there is a decreasing number of species that are encountered for each new area that is sampled; this can be represented as a species-area curve. Different habitats and different land uses typically have different species-area curves. For simplicity we assume that our estimate of the mean species richness provides us

with an estimate of the likely species accumulation rate for a given farm. We then use this value to estimate the number of species across the entire farm. We assume that farms with high mean species richness at 0.09 ha scales will accumulate species more rapidly than those with low mean species richness. We assume that our species accumulation curves are approximated by a natural log transformation of the bid area such that total species richness (SppR):

$SppR = \ln(\text{Bid Area(ha)}) * \omega UR_f$

Different estimates for total species richness given different starting species richness are given in Fig ??.

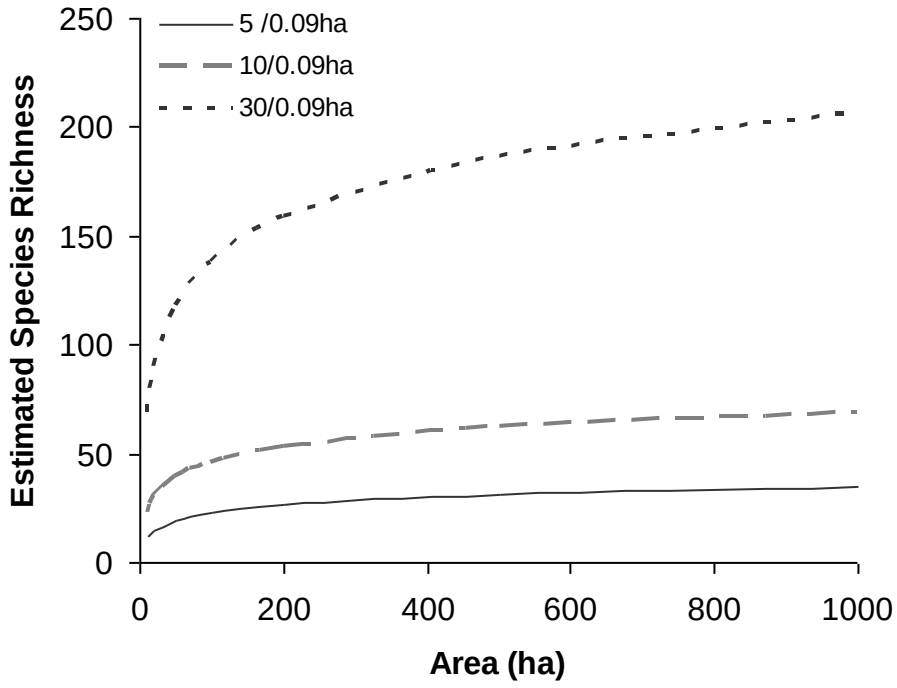


Fig ??. Estimates of total species richness for a given bid area (ha) for different estimates of species richness at a 0.09ha scale.

This methodology is simplistic and ignores species turnover that could occur owing to different vegetation or soil types or variation in rates of species turnover for different land uses. At present this approach should be treated as a method to equally calibrate all the farms, but should not be assumed to accurately represent the actual number of native species across the bid area. Improved approaches are required to estimate species richness at a whole-farm scale.

8.1.4. 5.4 Vegetation Benefit Index

On the assumption that natural regeneration and understorey native plant richness are substitutable scores were standardised and multiplied. Both the estimated natural regeneration hectares (NRha) and total species richness (SppR) were standardised to the maximum value observed across all farms. The standardised values for each farm then took a value between 0 and 1, with a value of one indicating that farm has the maximum score for a particular attribute. If preference were to be given to one component over another (i.e. understorey condition valued more greatly than natural regeneration) then weightings could be applied at this point. We assumed equivalence of value, i.e. equal preference. Standardised values were then multiplied to generate a score between 0 and 1 reflecting the combined regeneration and species richness values. This combined value (either weighted or not) was used for estimating contribution of a farm to species richness and natural regeneration per dollar (i.e. value for money) through the equation below:

$$Vegetation\ Benefit_{farm=x}/\$ = \frac{(SppR/MaximumSppR * NRha/MaximumNRha)}{BidValue(\$)}$$

The relationship between estimated vegetation benefits and bid values for all farms are relatively consistent (i.e. positively correlated) despite wide variation in farm size, bid area and predicted vegetation benefits.

9. Appendix 2 Monitoring strategy

Monitoring Strategy

1. Monitor land use/grazing management changes as described in management plan (monitoring changes in land use/grazing within contract period)

2. Anecdotal survey of graziers about adoption of grazing management (ease, how it is going) and observed changes in native vegetation composition (e.g. an increase/decrease in native perennial grasses, any tree recruitment?). Establishment and annual use of photo points is a requirement of all Green Graze participants.

3. Native Vegetation sampling

The Green Graze properties were selected on the basis of future predicted tree recruitment and native plant richness. Monitoring should target these components. Understorey plant richness was also assumed to be an approximate surrogate for the cover and biomass of native perennial plant species. Given the importance of this to other landscape and ecosystem services this should also be of primary interest for monitoring.

Establish fixed permanent 15m x 15m plots at each farm within Green Graze management area and outside. Plots should cover a gradient of tree cover and soil fertility (see fig 1). An attempt should be made to establish a minimum of 2 replicates of each level inside and outside the Green Graze area on each farm. Where certain levels are not present within the GG area, attempts should be made to sample a larger number of replicates of existing levels. Plots should be permanently marked.

		Soil Fertility		
		Low (<10ppm P?)	**Moderate** (10-25ppm?)	**High** (>25ppm?)
Tree Cover	**Open**	X	X	X
	Scattered	X	X	X

The key objective of vegetation sampling is to detect evidence of tree recruitment/establishment, estimate the composition of understorey vegetation and estimate changes in the cover of dominant herbaceous species. Soil sampling should also be conducted to estimate changes in available phosphorus over time as it is hypothesised that changes inn the availability of phosphorus may be necessary for desired improvements in vegetation. Plots will be sampled for evidence of tree recruitment and cover of native perennial vegetation.

Plots should be sampled prior to or soon after initiation of Green Graze management but sampling should be undertaken at an optimal time for surveys of vegetation composition i.e. late Oct - early

Dec. Initially plots should be sampled at annual intervals (first 3 years) and then re-sampled at 3-5 year intervals following major climatic events (i.e. severe drought, good rain) given availability of resources.

Tree recruitment

A key element estimated by models used to assess Green Graze properties was the current and future likelihood of supporting tree recruitment. Surveys to estimate the current distribution of tree recruitment and to monitor changes in tree recruitment will be essential to assess the ecological outcomes of Green Graze and the efficacy of the models employed.

A 20 min survey for eucalypt seedlings/saplings will be undertaken in each plot. The species (where identifiable) and size of all observed seedlings/saplings <1m in height will be recorded (see Table 1A).

Table 1A. Height classes of surveyed seedlings.

Height (cm)	Lignotuber
0-10	lignotuber present/absent
11-25	lignotuber present/absent
26-50	lignotuber present/absent
51-75	lignotuber present/absent
76-100	lignotuber present/absent
> 100	lignotuber present/absent

Native Plant Composition

A 20 minute survey will be undertaken to identify plant species composition in each plot. All plant species observed will be recorded. Unidentified plants to be collected for later identification.

Native perennial vegetation cover

15 x 0.25m^2 random quadrats will be sampled to estimate ground cover and biomass within each plot. Total live vegetation cover, bare ground, litter and moss/lichen cover will be visually estimated to the nearest 10%.

The dry weight rank method ('t Mannetje & Hadcock 1963) will be used to rank the dominant plant species. In each quadrat the three dominant plant species will be ranked by their contribution to biomass.

HH (habitat hectares)

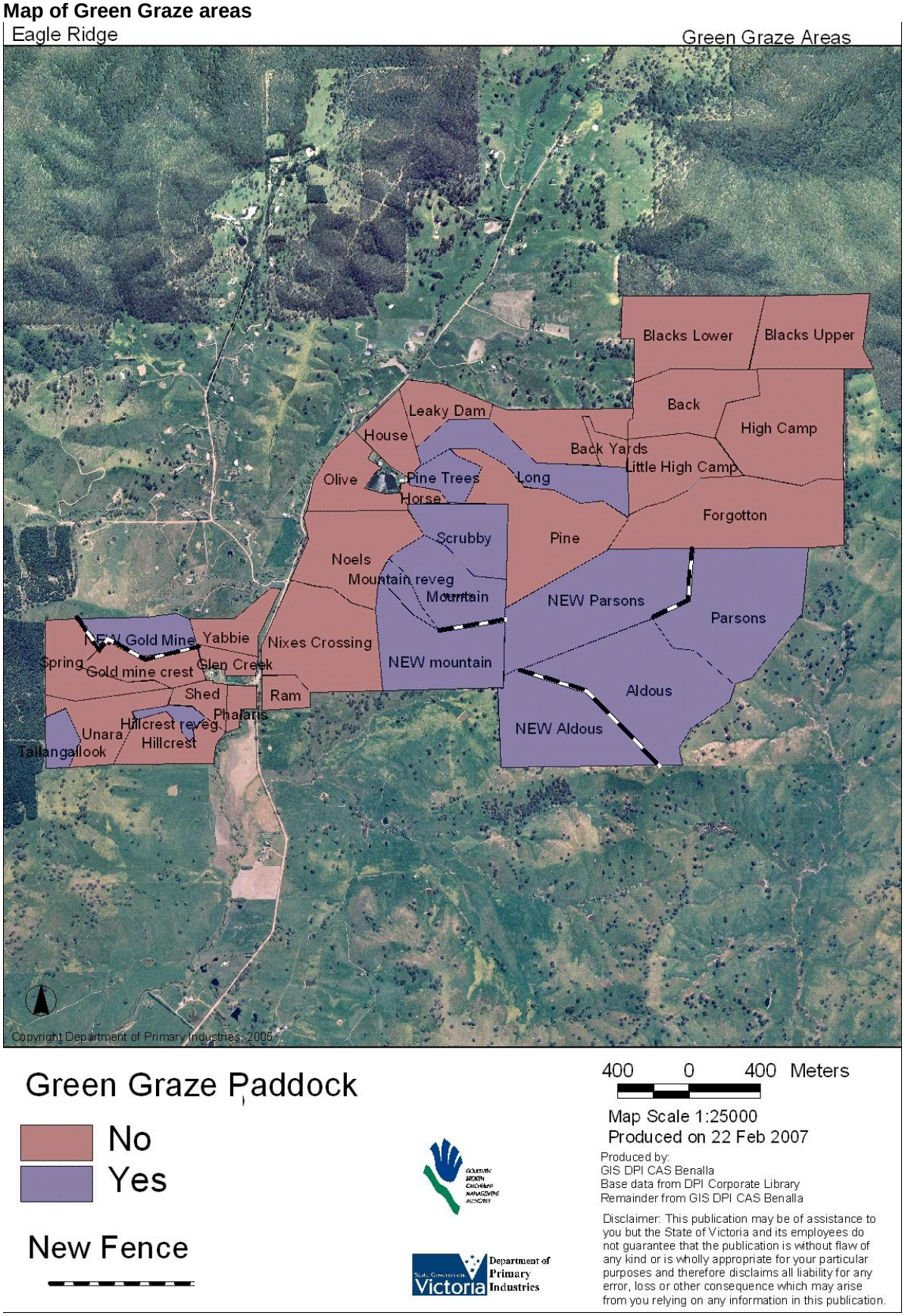
Habitat Hectares site condition score will be assessed within each 15 m x 15m plot. Given that overstorey components are not the target of this trial and nor are they expected to change during the sampling period, data on these components will not be estimated on an annual basis.

Soil sampling

Soil samples (0-10cm) will be taken from each of the 15 random quadrats and then pooled for each plot. Samples will be stored in labelled plastic bags and kept in a cool location. Soil samples will be sent to a recognised and reputable analytical laboratory for independent analysis of extractable soil phosphorus (colwell), total N and total soil carbon.

10. Appendix 3 Extracts from a sample Green Graze Contract

Map of Green Graze areas



Schedule 3

MANAGEMENT PLAN (Specified Works)

Land Owner: XX landholder

Property Identifier: **GG07**

Length of Management Plan: 3 years

VISION: The long-term vision for Green Graze is to improve the extent and condition of native vegetation, including native pastures, through improved grazing management. It is predicted that improved grazing management will also provide production benefits.

IMMEDIATE AIMS:

- Implement changes to grazing management to improve native pasture composition, and improve opportunities for natural regeneration of trees and shrubs.

LONG TERM AIMS:

- Improve the diversity and cover of native pastures and vegetation
- Demonstrate environmentally and financially sustainable grazing management

SUMMARY OF MANAGEMENT ACTIONS:

- Subdivide and Defer Graze the north facing slopes of Parsons and Aldous paddocks. The south facing slope of Parsons paddock to be Rotationally Grazed.

- Subdivide and Defer Graze the north facing slope of the Mountain paddock, and Rotationally Graze the south facing slope of the Mountain paddock.

- Subdivide and Defer Graze the hill top ("crest") of Gold Mine paddock.

- Defer Graze Long paddock

- Continue current management of already fenced re-vegetation and treed areas across the property. (i.e. stock exclusion and weed control).

YEAR 1 MILESTONES (July 2007 – July 2008)

(To be completed by first anniversary of the commencement date)

KEY:

Fencing/watering requirements

Grazing/phosphorous management requirements

***definitions of grazing regimes are detailed in Schedule 4 and are the basis of what is required under the plan.**

Paddock / management area	Management actions	Suggested Implementation time
Aldous	Erect fencing to divide area according to land class (as shown on Maps), into 2 paddocks, using most practical ridgelines for fencing. New watering point (dam) may be installed to allow watering of both areas if required.	By November 2007
	Both new paddocks ("Aldous" and "New Aldous") to be Defer Grazed* from early November to at least Autumn break. Average pasture height should be kept between 4 – 10 cm, and ground cover at least 85%.	November 2007-Autumn break 2008
	No phosphorous application to these paddocks.	July 2007 – July 2008
Parsons	Erect fencing to divide area according to land class (as shown on Maps), into 2 paddocks, using most practical ridgelines for fencing. New watering point (dam) may be installed to allow watering of both areas if required.	By November 2007
	"Parsons" paddock (containing the north facing slope) to be Defer Grazed* from early November to at least the Autumn break.	November 2007-Autumn break 2008
	"New Parsons" paddock (containing the south facing slope) to be Rotationally Grazed*. Average pasture height should be kept between 4 – 10 cm, and ground cover at least 85%.	November 2007 – July 2008
	No phosphorous application to these paddocks.	July 2007-July 2008
Mountain	No phosphorous application to this paddock. (Fencing to commence in Year 2). Average pasture height should be kept between 4 – 10 cm, and ground cover at least 85%.	July 2007-July 2008
Gold Mine (hill-top)	No phosphorous application to this paddock. (Fencing to commence in Year 2). Average pasture height should be kept between 4 – 10 cm, and ground cover at least 85%.	July 2007-July 2008
Long	To be Defer Grazed* from early November to at least Autumn break. Average pasture height should be kept between 4 – 10 cm, and ground cover at least 85%.	November 2007-Autumn break 2008
Existing reveg (Pinetrees, Scrubby, Mountain reveg, Tallangalook and Hillcrest reveg)	Continue current management of these areas; exclude stock and Crash Graze* for weed control (only if required). No phosphorous application. (see Maps)	July 2007 – July 2008

YEAR 2 MILESTONES (July 2008 – July 2009)

(To be completed by second anniversary of the commencement date)

Paddock / management area	Management actions	Suggested Implementation time
Aldous	Both new paddocks ("Aldous" and "New Aldous") to be Defer Grazed* from early November to at least Autumn break. Average pasture height should be kept between 4 – 10 cm, and ground cover at least 85%.	November 2008-Autumn break 2009
	No phosphorous application to these paddocks.	July 2008 – July 2009
Parsons	"Parsons" paddock (containing the north facing slope) to be Defer Grazed* from early November to at least the Autumn break. Average pasture height should be kept between 4 – 10 cm, and ground cover at least 85%.	November 2008-Autumn break 2009
	"New Parsons" paddock (containing the south facing slope) to be Rotationally Grazed*. Average pasture height should be kept between 4 – 10 cm, and ground cover at least 85%.	July 2008-July 2009
	No phosphorous application to these paddocks.	July 2008-July 2009
Mountain	Erect fencing to divide area into 2 paddocks (North and South) (as shown on Maps). New watering point (dam) may be installed to allow watering of both areas if required.	By November 2008
	"Mountain" paddock (containing the north facing slope) to be Defer Grazed* from early November to at least the Autumn break. Average pasture height should be kept between 4 – 10 cm, and ground cover at least 85%.	November 2008-Autumn break 2009
	"New Mountain" paddock (containing the south facing slope) to be Rotationally Grazed*. Average pasture height should be kept between 4 – 10 cm, and ground cover at least 85%.	November 2008 – July 2009
	No phosphorous application to these paddocks	July 2008-July 2009
Gold Mine ("Gold-mine crest")	Erect fencing to divide Gold Mine paddock into "crest" (as shown on Maps), and lower slopes. New watering point (dam) may be installed to allow watering of both areas if required.	By November 2008
	"Gold Mine Crest" to be Defer Grazed* from early November to at least Autumn break. Average pasture height should be kept between 4 – 10 cm, and ground cover at least 85%.	November 2008-Autumn break 2009
	No phosphorous application to this ("Gold mine crest") paddock.	July 2008-July 2009
Long	To be Defer Grazed* from early November to at least Autumn break. Average pasture height should be kept between 4 – 10 cm, and ground cover at least 85%.	November 2008-Autumn break 2009
Existing reveg (Pinetrees, Scrubby, Mountain reveg, Tallangalook and Hillcrest reveg)	Continue current management of these areas; exclude stock and Crash Graze* for weed control (only if required). No phosphorous application. (see Maps)	July 2008 – July 2009

YEAR 3 MILESTONES (July 2009 – July 2010)

(To be completed by third anniversary of the commencement date)

Paddock / management area	Management actions	Suggested Implementation time
Aldous	Both new paddocks ("Aldous" and "New Aldous") to be Defer Grazed* from early November to at least Autumn break. Average pasture height should be kept between 4 – 10 cm, and ground cover at least 85%.	November 2009-Autumn break 2010
	No phosphorous application to these paddocks.	July 2009 – July 2010
Parsons	"Parsons" paddock (containing the north facing slope) to be Defer Grazed* from early November to at least the Autumn break. Average pasture height should be kept between 4 – 10 cm, and ground cover at least 85%.	November 2009-Autumn break 2010
	"New Parsons" paddock (containing the south facing slope) to be Rotationally Grazed*. Average pasture height should be kept between 4 – 10 cm, and ground cover at least 85%.	July 2009 – July 2010
	No phosphorous application to these paddocks.	July 2009 – July 2010
Mountain	"Mountain" paddock (containing the north facing slope) to be Defer Grazed* from early November to at least the Autumn break. Average pasture height should be kept between 4 – 10 cm, and ground cover at least 85%.	November 2009-Autumn break 2010
	"New Mountain" paddock (containing the south facing slope) to be Rotationally Grazed*. Average pasture height should be kept between 4 – 10 cm, and ground cover at least 85%.	July 2009 – July 2010
	No phosphorous application to these paddocks	July 2009 – July 2010
Gold Mine ("Gold-mine crest")	"Gold mine crest" be Defer Grazed* from early November to at least Autumn break. Average pasture height should be kept between 4 – 10 cm, and ground cover at least 85%.	November 2009-Autumn break 2010
	No phosphorous application to this (hill-top) paddock.	July 2009 – July 2010
Long	To be Defer Grazed* from early November to at least Autumn break. Average pasture height should be kept between 4 – 10 cm, and ground cover at least 85%.	November 2009-Autumn break 2010
Existing reveg (Pinetrees, Scrubby, Mountain reveg, Tallangalook and Hillcrest reveg))	Continue current management of fenced and un-fenced remnant areas across property (see maps), through exclusion of stock, and crash grazing for control of excessive grasses and weeds if necessary.	July 2009 – July 2010

Schedule 4

Grazing management definitions

Rotational Grazing
Rotational grazing involves regular periods of intense grazing and resting. Allowing the pasture to experience rest periods enables pastures to recover from grazing and has a number of benefits including reduced selective grazing, reduced effects of stock camps and better root development for perennial grasses. Rest periods between grazings should be at least 80 days but may need to be closer to 120-160 days depending on pasture growth rates and animal densities. The length of a grazing period may be in the order or 1 – 5 days. Rest timing and frequency need to be based on the amount of available feed and pasture growth rates. This aims to keep pastures in their most active growth stage.

Deferred Grazing
Deferred grazing is a strategy to purposely withhold grazing at critical times of plant development (commonly over late spring/summer). This method aims to increase pasture groundcover, increase the persistence of native perennial grasses for improved health and yield, and improve pasture species composition and the persistence of desirable pasture species. The timing and duration of deferred grazing will depend on what is to be achieved, the pasture types, soil and climate conditions. Deferred grazing from early November until the Autumn break, has been shown to increase pasture ground cover and persistence of native perennial pastures.

Crash Grazing
Crash grazing is where pasture is grazed at high stock density for a short period of time (1 to 2 days) followed by a long rest (one to several years depending on establishment and growth of native species or abundance of weeds). In areas with high soil moisture and nutrient availability, crash grazing can promote species diversity by reducing bulk of feed, and thereby preventing understorey species from being smothered. It can also be used to graze undesirable plant species before they set seed. In less productive areas (i.e. drier or with low nutrient availability) crash grazing may be required less frequently.

Ungrazed
Ungrazed refers to total exclusion of stock at all times of the year. This approach is used to improve regeneration of native vegetation particularly on fragile soils and land types, with commonly marginal grazing value.

Rest periods
Grasses that are repeatedly grazed (either through overgrazing or selective grazing pressure) do not get the opportunity through a rest period to grow new leaves and replenish their energy reserves - they take longer to recover, and may eventually die due to energy exhaustion. If grasses are grazed to maintain a relatively large leaf area, the pasture will provide good quality feed and be more productive, and the grasses will recover more rapidly. If grasses are repeatedly overgrazed (short rest periods), the energy reserves in the roots will diminish and the plants will late longer to recover. Due to their slower growth rates, native grasses take longer to recover from grazing than traditional pasture grasses.

In the absence of grazing (very long rest periods) or under continuous light grazing (no rest period), grasses may become rank, the nutrient content of the leaves decreases and the rate of growth again slows. However long rest periods may be necessary during times of drought, to allow seedling establishment and enable grazing-sensitive native plant species to survive.

The length of rest period on any paddock containing native pastures should be determined based on rainfall, season and growth rates of the pastures. Long rest periods are required during late spring and summer when plants are flowering and producing seed (using high amounts of energy) and possibly under moisture stress. Longer rest periods may be necessary during times of drought as plants don't have the resources required (especially water) to recover from defoliation. Rest could also be opportunistically timed to maximise establishment of new seedlings of grasses, shrubs or trees

Generally, the longer the rest period between grazing, the more chance native vegetation will regenerate and flourish. Rest periods between grazings should be at least 80 days but may need to be closer to 120-160 days depending on pasture growth rates and animal densities.
Rest could be also opportunistically timed to maximise establishment of new seedlings of grasses, shrubs or trees. For example if the objective is to encourage more trees and the area is dominated by sown/introduced pastures, grazing may be introduced over spring to reduce bulk of feed, with rest over summer when Eucalypt seed-fall is likely and also Autumn/Winter when extra moisture will favour germination.

Natural regeneration of native vegetation
Prioritise areas with scattered mature tree cover, low fertility pastures and little or no history of pasture sowing.
To maximise likelihood of regeneration completely eliminate livestock until saplings are >1m.
If no seedlings are present and there is excessive grass/weeds, crash graze in Spring, prior to Eucalypt seeding in summer.
If no seedlings are present and annual weeds are present, crash graze in autumn.

Pasture height & ground cover
Maintaining a good pasture height is necessary to maintain a healthy and productive pasture, with less bare ground. When grasses are grazed heavily (too short), regrowth is slow, as only a small leaf area remains to capture light. During this period of slow growth, energy reserves from other parts of the plant, such as the roots, are used to help the leaves regrow. Larger leaf area (greater pasture height), allows grasses to build their energy reserves and store them in their roots, which allows them to recover more rapidly from future grazing.
Pastures with a mix of tall and short grasses can provide habitat to native animals and insects. They also have a greater diversity of habitats and micro climates, enabling a greater diversity of plant species to co-occur.

Average pasture height should be between 4 – 10 cm, and ground cover at least 85%.
These measurements should be taken at the "toughest" times of the year, i.e. mid summer or just before the Autumn break. Pasture height and cover targets are to be used as a guide. Pasture density, species and maturity has a major impact on this association.
A ruler or measuring stick may be used to estimate pasture height. Ground cover is best estimated by using a 30cm x 30cm pasture square or ring thrown randomly onto the ground and estimating the amount of bare ground versus cover of pasture inside.

Restrictions and Requirements

Pasture renovation/cultivation
The L and Owner is not to cultivate or sow pastures in paddocks under Green Graze management.

Phosphorous application
There must be no phosphorous application to areas managed under the Green Graze project, unless otherwise stated in the Management Plan. Improvements in the diversity of native vegetation will be the greatest in low fertility paddocks.

Tree felling & fallen timber
In areas being managed under Green Graze, any standing large trees must not be purposefully felled or damaged. Any fallen timber is to be left for habitat and nutrient cycling.

Weeds
Weed invasion can have a significant impact on the potential for native vegetation to regenerate, in addition to reducing the productivity of pastures. Weed control may be required in some areas being managed under

Green Graze, however every effort should be made to ensure that this is done with minimal negative impact on the native vegetation and native pastures.

Changes in farm management during the contract period

On Green Graze areas: if major changes to farm management or variations in the Management Plan are anticipated on areas under Green Graze, (e.g. Selling parts of the property, changing stock enterprises, expanding cropping area etc) the landowner must notify the Green Graze team in writing, and seek approval for any changes to the management plan.

On other areas of the property: Changes to farm management on other areas of the property may impact on management of Green Graze areas. These changes are to be documented and communicated in writing to the Green Graze team.

Reporting requirements
The Land Owner is required to submit a brief annual report to the GBCMA, that details performance against actions undertaken during the previous 12 months. This will be the basis for each payment. A reporting template is provided to make this process simple (Schedule 5).

Statutory land management obligations
In addition to the management actions highlighted in the management plan, the Land Owner must continue to comply with current land management obligations under the *Catchment and Land Protection Act 1994* (e.g. pest plant and animal control).

MONITORING CHANGES TO NATIVE PASTURES & NATIVE VEGETATION

Photo Points

The use of regular photographs to record the changing extent and quality of vegetation is a simple approach for monitoring regeneration. Choose at least three points (more for larger areas) that are representative of your site and mark with a star picket or wooden post, to enable repeat photos to be taken over time. Try to take photographs at least every 4 months. After a few years, these photographs will record how the vegetation changes with management.

1) Please include photographs taken from at least three established photo points at your site. Key details to be provided with your photographs include the date the photo was taken, the location / number of your photo point within your site and the direction the photo was taken. A landmark (e.g. building, dam, hill etc) in the filed of view will provide a handy reference point. For further advice on how to set up photo points, please contact the GBCMA.

General observations over your Green Graze paddocks

2) Please report any increased native pasture cover or native vegetation regeneration you notice in the Green Graze areas in general, or in your photo-points. If possible please also report on the area, density and type of pastures/vegetation that may have regenerated, and during what time of the year.