



Department of Conservation & Land Management



Landholder Survey 2003

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Issue Date: September 2005

Summary

The Buntine-Marchagee Recovery Catchment (BMRC) is one of six Natural Diversity Recovery Catchments in Western Australia, managed by the Department of Conservation and Land Management. It was established as part of the Western Australian State Salinity Strategy, for mitigation of expanding environmental threats, particularly salinity and biodiversity loss.

As 94% of the Catchment is privately owned and 73% of the 13% remaining remnant vegetation is on private property, Landholder and community consultation and involvement is vital for the management of key biodiversity assets and threat mitigation.

The purpose of the survey was to gain an insight into the environmental and social condition of the Catchment. It provided valuable information into how Buntine-Marchagee Landholders view the natural biodiversity assets within the Catchment, the threats affecting these, as well as the land management actions employed by Landholders to address degradation issues. The survey also aimed to give Landholders a greater familiarity with the Catchment Project and improve communication and information flow between the BMRC Team, Landholders and community groups.

Seventy percent of the 84 Landholders within the BMRC boundary participated in the Survey. Within the Catchment community there is an even spread of age groups, although there is slight trend towards younger families. The majority of the farms are family run businesses, with property passing from generation to generation. While some properties will eventually pass out of family hands, it is likely that most properties in the Catchment will continue to be run by people who are currently in the Catchment. The main land use for farms within the Catchment is cereal cropping (over 75%) and 84% of Landholders have sheep and 14% cattle.

Salinity is seen by Landholders as the greatest on-farm threat (although acidic soils covered a greater area than that affected by salinity). Landholders indicated they are aware of the major environmental threats in the Catchment and in many cases are attempting to mitigate these. Earthworks (banks and drains) are the main way Landholders are attempting to combat salinity, although fencing and revegetating sandy seeps is also widely used. Most Landholders felt these methods helped in the alleviation of the impacts of salinity.

The lack of time and money were seen as the greatest barrier to Landholders in the implementation of biodiversity conservation. Investment in works, including fencing, earthworks and revegetation by Landholders was generally \$3000 or less per year. Hence, financial incentives were seen as the best way of encouraging the implementation of conservation works in the Catchment.

Landholders acknowledged that there was much to learn about biodiversity conservation and the impacts of salinity, and supported greater interaction and consultation between stakeholder groups and an ongoing commitment to the project by the BMRC Recovery Team, Landholders, and Landcare and community groups. Most Landholders have a vision for; a better way of combating salinity; healthy and productive farms, with greater aesthic appeal; and improved wildlife conservation. Recommendations were derived from the Survey's results, which include improving Landholder and community knowledge of biodiversity values and conservation actions, and encouraging and facilitating conservation management practices.

Document History and Status

Version	Date	Reviewed By	Approved By	Revision Details
Draft Ver 1	Dec 03	CALM Midwest Regional Staff	Kelly Gillen	Colmar Brunton issued draft report to CALM for review.
Ver 2	Mar 04	CALM Midwest Regional Staff	Kelly Gillen	Colmar Brunton incorporated review comments and issued to CALM.
Ver 3	Apr 05	CALM Midwest Regional Staff	Kelly Gillen	CALM completed results and discussion. Prepared report for external review.
Ver 4	Aug 05	 Alison Doley Anthony Desmond Clare Anthony Claire Johnsen Fiona Falconer Gavan Mullan Glen Daniel Jodie Watts Kelly Gillen Lindsay Bourke Rebecca Carter Robyn Nicholas Tammie Reid 	Kelly Gillen	External review comments incorporated into final report.
Final	Sep 05	CALM Midwest Regional Staff	Kelly Gillen	Final report issued to BMRC Landholders and Stakeholders.

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Acknowledgements

This project could not have been completed without participation and assistance from a large number of people and in particular, those Landholders who took part and gave their time and expertise, it was greatly appreciated. Thank You:

Alan Barnes Ivan Bean Phil Stone Alan Kau J F Peterson Phillip Moore Anton Wilson J Northover Richard Noble Jack and Kathy Stone Beth Southcott Rob & Ruth Nankivell Bruce Manuel James Ellison Robert Harris Jeff & Cath Bothe Charles Hyde Robert Walton Charles McNeill Rod & Shelley Birch Jill Just John & Alison Doley Robyn Benton Colin Pearse D & J Pitchers John & Helen Nankivell Ron & Merrie John O'Neill Carlshausen Dean Smith Frank & Jeanie Crago John, Robyn & Brian Ross Fitzsimons Gary Cheeseman Stacy Roy West Shane Sutherland Garry Parker Liam Carter Geoffrev Bell **Lindsay Cousins** Stephen Wilson Graeme Barnes Mark Mailey Steve & Moira Girando Graeme Maley Michael O'Callaghan Stuart McAlpine Graham Pearse Michael Ray Terry Reynolds Greg Boucher Neville Atkinson Terry & Stuart Counsel Harry Hyde Peter Hyde Vern and Jan Muller

CALM would also like to acknowledge the support and assistance given by other people and groups involved in this project, including the reviewers of the report,

Peter Syme

Peter Vanzetti

- The survey team and supervisors
 - Lisa Stott, Warwick Shirreff, Sue Downes and Timothy Downes, Jodie Watts, Fiona Falconer, Marie Strelein, Susie Murphy-White

Vince Bryant

Wayne Cail

Colmar Brunton

Ian & Helen Hunt

Ian Syme

- Bernadette Hawkes, Elainne Davidson and Greg Nelson
- Steering Committee (August 2002 meeting)

This support will ensure the document is relevant, readable and captures Landholder information for input in the Recovery Catchment project.

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1. Introduction & Background

The Department of Conservation and Land Management (hereafter known as *The Department* of CALM) is committed to protecting and conserving our States natural wonders in partnership with the community. As part of its corporate vision the Department aims to 'protect biodiversity from threatening processes, agents and activities'. This is achieved through the management of over 24 million ha of State land and water reserves in sympathy with the surrounding environment.

The Department also has the responsibility to ensure that regionally significant natural areas, such as wetlands, are protected in perpetuity (State Salinity Strategy, 2000)². This is achieved through a regionally coordinated Natural Diversity Recovery Catchments (NDRC) program.

The Buntine-Marchagee Catchment is the fifth NDRC established by the Department. It targets a naturally saline braided wetland system that is at risk from hydrological changes, such as rising water tables, salinity and waterlogging.

The aim of the Buntine-Marchagee Recovery Catchment (BMRC) is to 'maintain the native species in a range of representative wetlands within the Buntine-Marchagee catchment by 2020'.

The BMRC is managed by CALM's Midwest Region and directed by a project Steering Committee. The Steering Committee is made up of key stakeholder groups, with local <u>Landholders</u> comprising more than half the committee. The other stakeholders include catchment groups, private industry, the Department of Agriculture (Dept of Ag.), the Department of Environment (DOE), CSIRO, local government and researchers.

The output from the Buntine-Marchagee Recovery Catchment project will be a recovery plan that sets out the strategic and localised work that is recommended to protect the biodiversity assets of the catchment.

¹ Department of Conservation and Land Management (2002) Corporate Plan 2003-2005, Perth.

² State Salinity Council (2000) Natural Resource Management in Western Australia: The Salinity Strategy, Government of Western Australia, Perth.

1.1 Catchment Selection

The Buntine-Marchagee Catchment area was selected as a NDRC because;

- It contains significant diversity of terrestrial and wetland plants and animals;
 - 39 Taxa are listed on the Department's Declared Rare and Priority Flora
 List
 - 37% of all known mammals and 29% of all known reptiles found in the Wheatbelt, and it is likely that surveys will increase this representation
 - It contains naturally saline braided wetlands that have a unique biota that are poorly represented regionally;
- It contains good examples of remnant vegetation found in the Northern Agricultural Region (NAR), such as a good representation of shrublands and woodlands
- There is a mix of salt-lake invertebrates, including one species never before discovered in Australia, one species found in only two places in Western Australia, and another species found only in southern Australia.
- It straddles two biogeographical systems; the
 - o Geraldton Sandplains, and
 - o The Avon-Wheatbelt
- It provides an opportunity for research as it is focused on a system which is naturally saline and under threat of secondary salinity

1.2 Purpose of Landholder Survey

The Steering Committee recognised the need to survey all Landholders within the Catchment to gain a better understanding of the people living and working in the area, and their perceptions and attitudes to conservation and sustainable land management.

This survey will provide considerable information for use in assessing, planning, predicting and evaluating the success of the Recovery Catchment project over-time.

1.3 Landholder Survey Outcomes

The desired outcomes of the Buntine-Marchagee Catchment Landholder Survey were:

- Increase knowledge and understanding of, and participation in, the Recovery Catchment project.
- Improve knowledge and understanding of;
 - Land degradation issues facing Landholders in the catchment;
 - The type of remedial works and accompanying techniques employed by Landholders to address land degradation issues;
 - Landholder perceptions of the effectiveness of the remedial works and accompanying techniques employed to address land degradation issues;
 - Landholder priorities in relation to property land management, motivations and barriers in undertaking certain works. For example, conservation values – how important is biodiversity conservation to the Landholder; and
 - Landholder perceptions of certain topics, such as the recovery catchment objectives or farm sustainability.
 - Why natural resources are important to Landholders.
- Determine Landholder understanding of the processes involved in land management and landscape functions e.g. causal factors of secondary salinity.
- Further develop a relationship with the Landholders through ownership of the data collected.
- Improve Landholder attitudes and/or beliefs regarding conservation management and the value of biodiversity.

1.4 Landholder Survey Objectives

The specific objectives of the Buntine-Marchagee Catchment Landholder Survey were to:

- Build an ecological picture of the catchment from Landholder information.
- Ensure relevant catchment/environmental data is utilised and not duplicated by determining the availability of data within the catchment e.g. weather stations, species monitoring, and water quality measurements.
- Identify opportunities for environmental projects in the catchment by determining what Landholders have done in relation to biodiversity conservation and where they would like to see improvements or increased awareness.
- Contribute information to broader community for planning, monitoring and evaluation purposes.
- Monitor the success of the recovery catchment and document any changes.
 Establish a baseline of Landholder information at a point in time.
- Identify social networks within the Recovery Catchment.

- Establish a benchmark of farming systems and farm management practices.
- Interview all Landholders within the Buntine-Marchagee Catchment and provide a one-on-one opportunity to explain the Recovery Catchment project.
- Provide feedback of survey results to all Landholders.

1.5 Landholder Survey Outputs

- Documentation of the Landholder Survey process and collation of all survey information in a comparable, retrievable, accessible and easily understood format (database).
- An analysis and summary of key findings, recommendations and actions from the survey (this report).

1.6 Landholder Benefits

Each Landholder has been given the opportunity to provide their perspective (Figure 1) on a range of issues/aspects regarding the Recovery Catchment. This ensures that the information and express opinions the Landholders provide can be considered by the Department and the Recovery Catchments Steering Committee in the preparation of the Recovery Plan, and the subsequent recommendations it will make to Government.

In addition each Landholder who participated received;

- A reference book of their choice on nature conservation or landcare, and
- An up-to-date 1:20,000 Orthophoto base map of their property which can be used for mapping new farm management activities.

All Landholders residing in the Recovery Catchment were provided with a copy of this report for their reference.



Figure 1: Interviewers, Lisa Stott and Sue Downes completing the survey with Landholder, John O'Neill

1.7 Buntine-Marchagee Natural Diversity Recovery Catchment

The BMRC is located approximately 230 kilometres north-northeast of Perth (Figure 2). It is situated between the towns of Coorow, Buntine, Dalwallinu and Watheroo.

The project boundary follows the watershed (Figure 3) of the Buntine-Marchagee wetland system. The catchment is approximately 181,000 ha (<u>Boundary 1</u> in Appendix 8 – Glossary).

Approximately 13% (24,000 ha) of the Buntine-Marchagee Catchment (the Catchment) is native remnant vegetation; of this, less than 2% (2,225 ha) is managed by the Department in six widely geographically scattered nature reserves. Private property makes up 93.7% (169,527 ha) of the Catchment.

Broad acre farming is the predominant industry, with farming systems typically comprising wheat, lupins, wool, meat and other cereal and pulse-crops. Cattle numbers are low but increasing on areas of <u>perennial</u> pasture.



Figure 2: Buntine-Marchagee Catchment Location

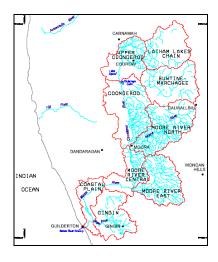


Figure 3: Buntine-Marchagee Catchment boundary within the Moore River System³.

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DEPARTMENT OF AGRICULTURE (2002) Moore River Catchment Appraisal: Resource Management Technical Report. Department of Agriculture.

2. Methodology

The methodology chosen for this survey was an 'assisted self-completion' survey, completed as much as possible by the participant, but checked and assisted by a CALM interviewer. This methodology was chosen above mail and telephone surveys to ensure that the long and information intensive survey was completed correctly and in a manner that made certain all information was comparable.

This methodology had the added benefit of ensuring that Landholders had face-to-face contact with a representative of the Recovery Catchment, thus raising awareness and understanding of the Recovery Catchment. Included in the interview, and referred to in the questionnaire, was a program of mapping that was designed to collect spatial information about the Catchment.

2.1 Design Parameters

2.1.1 The Sample

The population of people considered in this survey are those who hold land within the Recovery Catchment. In terms of defining a sampling frame, the population is made up of representatives from each property (a property can be made up of a number of farms or parcels of land).

In the course of this survey it was established that there are approximately 84 Landholders in the Catchment, many owning more than one property. Appendix 1 to Appendix 4, show Landholders and their property boundaries (September/October 2003). The term 'Landholder' is used throughout this research to signify those who own or occupy a property or a number of properties. While the term is used in the singular, it is recognised that when families are taken into account there are many more 'Landholders'.

Given the total population of the Catchment is relatively small in statistical terms (population of 84 Landholders), and the questions were specific to the Landholders living within the Catchment, a census sampling approach was considered appropriate⁴. This involved attempting to interview a representative from all of the 84 properties.

2.1.2 The Questionnaire

The questionnaire used in this survey was planned and designed over several months, with input from the Steering Committee, Landholders and various Departmental officers. Some of the questions and topics were inspired by previous Natural Diversity Recovery Catchment surveys, in particular Lake Warden⁵ and Lake Bryde⁶, and adapted to suit the Buntine-Marchagee Catchment. The Recovery Catchment team also consulted other local community and natural resource surveys⁷, and more general

⁴ A reliable random sample from a population of 84 people would involve speaking to almost all the population.

⁵ Lake Warden Recovery Catchment Land Management Survey (1999) prepared by Tilo Massenbauer (RCO) for the Lake Warden Recovery Catchment Project, Department of Conservation and Land Management, (unpublished).

⁶ Lake Bryde Recovery Catchment: Demographics and Needs of the Catchment Landowners (2000) prepared by Emma Bramwell (RCO) for the Lake Bryde Recovery Catchment Project, Department of Conservation and Land Management, (unpublished).

⁷ Annan, G and Dearden, M (2000) Agriculture Statistical Overview 1996/97 (Shires of Moora, Coorow, Perenjori and Dalwallinu), Department of Agriculture, Sustainable Rural Development Program.

Clarke, Mike (2002) Marchagee Focus Catchment Survey: Remnant Vegetation Survey Results, Department of Agriculture, Geraldton, (not publicly available).

Clarke, Mike. (2002) Rapid Catchment Appraisal, The Moore River Catchment, Department of Agriculture, Geraldton, (not publicly available).

Coorow Shire Landcare Survey (1995) prepared by Edwina Lefroy, Landcare Project Officer, (unpublished).

social scientific literature to develop the final questionnaire. The final questionnaire was then refined in discussions with Colmar Brunton⁸ (Social Research Consultants). The questionnaire includes cross-reference points indicating when mapping was required, but did not include direct questions pertaining to the mapping. A copy of the questionnaire is available in Appendix 5.

2.1.3 Pilot Survey

The questionnaire was piloted with four Landholders, and changes were made as a result. As the majority of the questions remained unchanged, the piloted census sampling approach was still used; these pilot surveys have been included in the final data and analysis.

2.1.4 The Mapping

Mapping was included to improve and build upon the Department's knowledge of spatial characteristics within the Recovery Catchment. At the interview each Landholder was provided with a map of their property (base map). Throughout the interview the Landholder was asked to indicate the location and dimensions of physical characteristics, which were then drawn onto the base map by either the interviewer or the participant. The mapping worked in tandem with the questionnaire, for example, Landholders were asked to map existing conservation earthworks whilst answering questions about their perceived effectiveness.

Mapping Limitations

Spatial data (eg salt scalds) collected in the project were drawn onto laminated base maps and then digitised. This method of data capture produces errors due to scale differences.

Base maps were produced at a scale of 1:20,000 i.e. 1 centimetre equals 200 metres on the ground or 1 millimetre, the width of the pen used to draw features onto base maps, equals 20 metres on the ground. Therefore features smaller than 20 metres were accompanied with a width (in metres) so that it could be adjusted when digitised.

In addition to the data captured in this survey, Sinclair Knight Merz collected spatial data during the Surface Water Management Plan (SWM) pilot project completed in March 2003⁹. In some cases this spatial data has been used in statistics or in maps, in these instances a footnote has been included or it is noted in the map legend.

Nancarrow, Blair E., Johnston, Catherine S. and Syme, Geoffrey J. (2002) Community Perceptions of Roles, Responsibilities and Funding for Natural Resource Management in the Moore Catchment, Australian Research Centre for Water in Society, CSIRO Land and Water.

⁸ Colmar Brunton - PO Box 1077, West Perth, W.A. 6005.

⁹ Sinclair Knight Merz (2003) Buntine-Marchagee Natural Diversity Recovery Catchment Surface Water Management Plan (Includes - Catchment Report, Demonstration Report and Individual Property Reports). Sinclair Knight Merz Pty Limited, Perth

2.2 Response Rate

Seventy per cent of the total Catchment population (59 out of 84 Landholders) answered the questionnaire, which in terms of area covered in the Recovery Catchment equates to approximately 75% (135,086 ha). One Landholder did the mapping but not the questionnaire so 60 Landholders completed the mapping part of the project. Hence mapping in this report is based on 60 responses. Appendix 6 - shows the area of land held by the Landholders who took part in the survey.

The majority of those who declined to participate in the survey did not have the time to take part. A small number declined as they believed that it was not worth their while, that such projects are not beneficial and they thought it unlikely that they would receive feedback from CALM following the survey.

Sample size directly impacts the reliability with which results can be extrapolated to the wider population. In crude terms, the more people used to represent a population (assuming the sampling is representative) then the more reliably the sample result will estimate the real population result.

This is measured by a concept known as sample error, and is indicated as $\pm X\%$ at the 95% confidence level. Literally this means that for the given sample we can be 95% sure that the result we would have got by doing a census survey would be within $\pm X\%$ of the sample result. The larger the sample, the smaller 'X' is, and the more reliable the results are. So a response rate of 59 out of a possible 84 gives a sample error of $\pm 7\%$ at the 95% confidence level. However, this should be viewed with care for two reasons:

- The overall population is relatively small in statistical terms; therefore, it is unlikely that it could be described as a 'normal' population, especially since it is doubtful that any 'norms' exist in the data being collected.
- Despite a high response rate, Landholders were not chosen randomly; therefore, they cannot be described as representative of the population of the Wheatbelt.

Nonetheless, the results presented here can be considered *representative* of the Buntine-Marchagee Recovery Catchment community, as a Census approach was utilised.

2.3 The Process

Four interviewers were contracted for the interviewing period and given three days of intensive training prior to beginning their roles. They were trained in face-to-face interviewing techniques, mapping and given general training on the Recovery Catchment project. The Recovery Catchment officers also worked as interviewers/supervisors during the survey period.

The interviewing process took place over a six-week period in September and October 2003. This was an opportune time for Landholder participation, prior to the busy harvesting period.

The first step in the process was a telephone call to see if the Landholder was willing to participate. When possible a Senior Departmental Officer, who was known to the Landholder, made the call to add authority and familiarity to the caller, in order to maximise the response rate. If the Landholder was willing to take part then a time was agreed and the Landholder was sent a questionnaire to read and, if possible, fill in

prior to the interview. The mapping component of the interview was mentioned in the letter but the Landholder did not complete this until the interview.

Prior to beginning the interview, the Landholder was asked to read and sign a letter to ensure they understood the purpose of the survey and signify that they were willing to have the results displayed in this document and used for Recovery Catchment purposes (Appendix 7).

Each interview was completed by a team of two interviewers, one working through the questionnaire with the Landholder and the other completing the mapping as required. To eliminate interviewer bias, interviewer teams were regularly changed and all of the interviewers worked with each other at some stage in the process.

2.4 The Report

This report details the results from the Landholder survey that was carried out in September and October of 2003. This survey is one of a number of information gathering tools that have been used since the Recovery Catchment project began, and was not designed to duplicate existing information but to fill gaps in knowledge.

This report is largely a report on the Landholder survey questionnaire, but some statistics and spatial data from the mapping component of the project are also included in areas where it was felt that Landholders were more accurate in mapping than vocal description. However, unless otherwise specified, all information in this report comes from data collected via the questionnaire.

Fifty-nine Landholders completed the survey and the unit of measurement throughout this report is 'the Landholder who completed the survey'. One Landholder might own two or more parcels of land or 'properties', but that does not mean that they count for two or more responses in the survey.

The questionnaire collected statistical data and qualitative open ended data, therefore results are presented as statistics and in discussion format.

2.4.1 Audience

This report will be utilised in planning, monitoring and evaluating the success of the Recovery Catchment project over-time. Therefore the audience is considered to be; Landholders living in the Catchment, CALM, the project's Steering Committee and other key stakeholders groups.

2.4.2 Report Format

For each figure, table or piece of analysis in this report there is a corresponding n=x. This n=x refers to the number of responses that part of the report is based upon. Due to the length and complexity of questionnaire, the n=x's vary for most questions. This is because some Landholders did not answer the question because they felt it did not apply to them.

For consistency, available results have been presented as a percentage (%) throughout this document for example 70% (59:84 - 59 responses out of a possible 84).

<u>Underlined</u> words can be found in the glossary with an accompanying definition (Appendix 8). Acronyms are also listed in the glossary. All maps have been appended to the report for printing purposes and Landholder direct quotes have been shown in *italics*.

3. Results, Discussion & Recommendations

The Landholder Survey questionnaire was broken down into fourteen sections to make it easier to follow and for data management purposes. This chapter follows those sections:

- Section 3.1: Property Details
- Section 3.2: Social Structure
- Section 3.3: Farming Systems
- Section 3.4: Farm Management
- Section 3.5: Remnant Vegetation
- Section 3.6: Revegetation
- Section 3.7: Plants and Animals
- Section 3.8: Water
- Section 3.9: Proposed Works
- Section 3.10: Sources of Landcare Information
- Section 3.11: Funding for Landcare
- Section 3.12: Bush on Reserves
- Section 3.13: General
- Section 3.14: The Recovery Catchment

Each section is further divided into three parts. The first part describes the intended purpose/s of that section, the next part presents the results of the survey and finally each section has a short discussion concluding with recommendations for the Recovery Catchment project.

Each recommendation has been given a ranking based on:

- Whether it is important to act upon it immediately (high priority) or not (medium to low priority)
 - High Priority (HP) actions are ones where recommendations will be implemented within the next 1-5 years
 - Medium Priority (MP) recommendations will be implemented within the next
 6-10 years
 - Low Priority (LP) recommendations will be implemented beyond the next 10 years.
- Whether it is a short, medium, or long term action.
 - Short Term (ST) recommendations will be implemented over a 1-5-year period.
 - Medium Term (MT) recommendations will be implemented over a 6-10-year period and
 - Long Term (LT) recommendations will be implemented over more than a 10-year period

3.1 Property Details

The purpose of the first section was to verify the property boundary (<u>Boundary 2</u>) and gain basic land information, such as the date of first clearing and area of land under covenant. It also covered contact details and whether the Landholder had a farm plan for reference during the interview.

3.1.1 Landholder Association with Property

The majority of Landholders in the Recovery Catchment have a long association with the land on which they work. Many properties have been owned by families for several generations.

3.1.2 Dates of Land Clearing in the Recovery Catchment

The earliest response from Landholders, regarding the decade in which land clearing began on their property, was the early 1900's, while the majority of land was reportedly cleared in the 1920's and 1950's (Figure 4). Clearing continued throughout the twentieth century with the last reported clearing being in the 1990's.

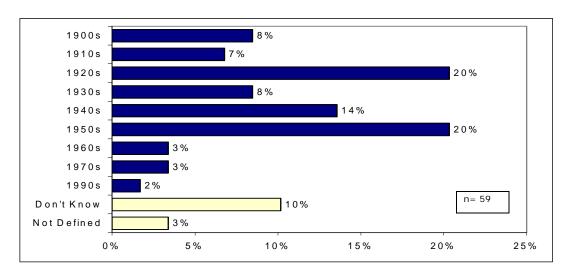


Figure 4: Landholder responses to what decade land clearing began on their property.

According to Landholder responses, it was found that clearing expanded from three nodal points; the northwest part of the Catchment, the south of Buntine and the west of Wubin (Appendix 9 - shows the initial decade when land clearing commenced for each property). The southwest of the Catchment was cleared much later, mostly in the 1950's.

3.1.3 Land Under Covenant

Fourteen percent (8:59) of the Landholders reported having remnant vegetation protected by the voluntary placement of a legally-binding covenant on their land title. Some of these covenants are binding in perpetuity, while others are limited in time (usually thirty years). Seven of these Landholders (one did not give details of their covenant) reported a total of 745 ha under covenant.

Table 1 details the covenant schemes in use in the Catchment; it should be noted that some Landholders have land in both covenant schemes. The National Trust and the Remnant Vegetation Protection Scheme (RVPS) are the two covenants mentioned by Landholders. No Landholder reported having land under a CALM covenant, despite this being an option on the questionnaire.

Table 1 Covenant schemes in use

Covenant Scheme			Number of Landholders	
Remnant Vegetation Protection Scheme				6
(Dept. of A	(g)			
National T	rust			5

Sample n = 8

"We put our land under a covenanting scheme, someone came out and assessed the area and it all went ahead, we got our assistance to fence the area. That was ten years ago, we expected someone would monitor our compliance with conditions but we have never seen anyone since."

3.1.4 Discussion

The first land was cleared for farming about a century ago and since that time about 87% of the original vegetation of the Catchment has been cleared. Of the remaining 13%, less than 1% is protected under a covenant and less than 2% is put aside in conservation reserves.

The vegetation associated with areas first cleared in the catchment were woodlands of Salmon Gum (*Eucalyptus salmonophloia*), York Gum (*E. loxophleba sp*) Gimlet (*E. salubris*) and Red Morrel (*Eucalyptus longicornis*), growing on heavy soil types identified as having good potential for agriculture. The south-western part of the Catchment, located in the Geraldton Sandplains <u>IBRA</u> subregion, comprises sandier soils. Hence, these poorer sandy soils were not cleared until the 1950's, when the development and use of leguminous pastures and trace element fertilisers enabled utilisation of what had previously been regarded as unsuitable agricultural soils.

Landholders are the custodians of the majority of remnant vegetation within the Catchment (11% out of a total of 13% land that contains remnant vegetation) and therefore it is primarily their responsibility to manage these areas. Implicit in this statement is the fact that Landholders are the chief protectors of biodiversity assets within the catchment. Some Landholders are conserving, protecting and managing their biodiversity assets but they are in the minority.

Covenanting can offer a way of protecting native vegetation for perpetuity. It offers assistance with fencing costs and establishes guidelines and conditions for management in consultation with the Landholder.

Some Landholders, however, were discouraged from entering into covenant agreements because they felt it placed unacceptable restrictions on land use and access, and could be a disadvantage when selling. Additionally, Landholders felt covenants did not necessarily offer any better protection, particularly if no-one checks on their progress.

3.1.5 Recommendations

It is recommended that the BMRC Recovery Team;

- a. Increase awareness of the types of covenant schemes available and the advantages of having land under a covenant. (HP, ST) (Section 3.1 Property Details)
- Increase awareness of voluntary non-binding programs that recognise and support Landholders who, while not wishing to establish legally binding covenants on their land title, wish to manage some of their land for biodiversity conservation. (HP, ST) (Section 3.1 – Property Details)
- c. Promote the adoption and increase the area of land protected under legally binding covenants within the Catchment. (HP, LT) (Section 3.1 Property Details)
- d. Develop and implement a follow-up program for farmers already involved in remnant protection schemes, such as covenant, to determine their success. (MP, MT) (Section 3.1 – Property Details)

3.2 Social Structure

Another aim of this survey was to collect information on the social structure of the Recovery Catchment. This information is vital for communication purposes and targeting developmental programs at particular age groups within the Recovery Catchment.

Identification of landcare groups will also enable the BMRC Recovery Team to work with already established conservation networks - helping to coordinate activities, share resources and expertise.

3.2.1 Age Demographics

Landholders were asked to specify how many people were living on their property and the age groups into which these people fitted.

There are a total of 235 people living on the properties included in this survey, giving an average of 4 people living on each property. The maximum amount of people reported living on a property was 11, while 4 Landholders report having no-one living on their property in the Catchment.

Figure 5 breaks down the residents by age groups. The age groups with the largest proportions are <10 yrs (17%), 31-40 yrs (16%) and 41-50 (16%).

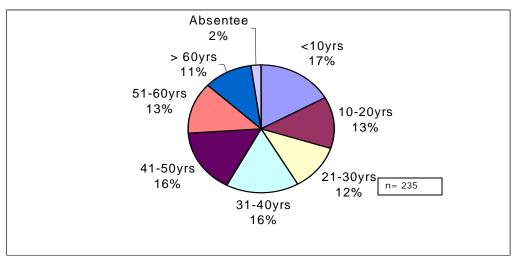


Figure 5: Age groups of residents on properties

3.2.2 Existing Landcare Groups within the Catchment

The majority of the Landholders in the survey belong to some form of landcare organisation or group. These groups, in addition to their specified functions, are important as social networks operating in the Catchment. They facilitate the transfer of information between Landholders and also provide a network through which information can be disseminated. As such, these groups should be important partners for the Department. Many Landholders are members of two or more groups.

3.2.3 Membership of Land Conservation District Committees

Land Conservation District Committees (<u>LCDC</u>) work under a formalised structure created under the Soil and Land Conservation Act (1982). They undertake on-ground land conservation activities within a defined boundary. There are 9 LCDCs that Landholders are involved in, although some of these are outside of the catchment (Table 2).

The Buntine West Wubin LCDC and the West Nugadong LCDC were the most commonly mentioned LCDCs, with 9 Landholders being involved in the Buntine West Wubin LCDC and 8 being members of the West Nugadong LCDC. However, both of these groups are currently inactive.

The Pithara-Dalwallinu LCDC and the Coorow LCDC were each mentioned by 4 Landholders.

Table 2 Land conservation district committees

Land Conservation District Committees	# involved
Buntine West Wubin LCDC	9
West Nugadong LCDC	8
Pithara-Dalwallinu LCDC	4
Coorow LCDC	4
Waddy Forest LCDC (note: predominantly outside the	1
Recovery Catchment)	
West Maya LCDC	1
Milling LCDC (note: predominantly outside the Recovery	1
Catchment)	
Latham LCDC (note: predominantly outside the	1
Recovery Catchment)	
Goodlands LCDC (note: predominantly outside the	1
Recovery Catchment)	

Sample n = 59

Length of membership in the Pithara-Dalwallinu LCDC ranges between 10 to 25 years. The group has been involved in information gathering, applying for grants, building demonstration sites and promoting tree planting, however, this group has reportedly been inactive in recent times.

Coorow LCDC is mentioned as the umbrella body for the Marchagee Catchment Group.

Most groups report having 1 or 2 members per property involved in a Landcare group and attend, on average, one meeting per year if the group is still active.

3.2.4 Catchment Groups

The Marchagee Catchment Group (MCG) was by far the most popular Catchment group with 32% (19) of Landholders being members of this group, from between 3 to 5 years (Table 3). The MCG has been running since 1998, with the majority of members reporting that it is an effective group and that they attend, on average, 1 meeting per year. This group recently completed a large-scale 'Bushcare' project, however since this project it appears to have become inactive.

The Yarra-Yarra Catchment Sub-Regional Natural Resource Management Group and the Moore Catchment-Sub Regional Natural Resource Management Group are incorporated groups. Two Landholders mentioned being members of the BMRC Steering Committee.

Table 3 Number of Landholders involved in catchment groups

Catchment Group	# involved
Marchagee Catchment Group	19
Yarra Yarra Catchment-Sub Regional Natural Resource	1
Management Group	
Moore Catchment-Sub Regional Natural Resource	1
Management Group	

Sample n = 59

3.2.5 Farm Improvement Groups

Farm Improvement Groups are established and run by farmers to improve profitability and sustainability, by encouraging and facilitating research and innovation of agricultural practices. The most common farm improvement group is the Liebe Group with 34% (20:59) Landholders reporting being members (Table 4).

Table 4: Number of Landholders involved in farm improvement groups

Farm Improvement Group	#
	involved
Liebe Group	20
Kondinin Group	1
Mingenew-Irwin Group	1

Sample n = 59

The Liebe Group started in February 1997. On average 3 people from each property are involved with the Liebe Group. There are up to 15 Liebe group sessions held per year (meetings, field days, updates etc.) with Landholders attending an average 4 sessions per year. This group is reported to be very beneficial and relevant.

3.2.6 Other Groups

The only other group mentioned by Landholders was the Annual Ryegrass Toxicity Group (ARGT) with one Landholder being a member of this group.

3.2.7 Discussion

The survey demonstrated that the largest age group were children under ten years. Consequently, the BMRC Recovery Team could potentially reach its largest demographic over the next couple of years by targeting primary school children and their parents.

Recent trends have suggested that the age demographic of farmers over 50 years of age is increasing for rural communities in Western Australia. However, the survey results suggest a slightly greater proportion of 21-40 year olds (28%), compared to 51->60 year olds (24%). Indicating either a younger than average population in the BMRC region, or a discrepancy in assessing the number of people living on farms as compared to the number working on farms.

The facility to allow the formation of Land Conservation Districts Committees (initially Soil and Land Conservation Districts) was introduced in the Amendments to the Soil and Land Conservation Act of 1982. The intent was to "provide an opportunity for land users within a specified area to collectively contribute to defining and implementing solutions to their land degradation problems" (Discussion Paper No.2 Select Committee into Land Conservation 1992). In relation to the LCDC's, the survey found that the three 'oldest' LCDC's are currently in recess. This indicates that there is a degree of 'burn out' amongst the members of the groups that were established as part of the 1982 Amendments; in response to increasing concern about dryland salinity and its impacts on agricultural productivity. 'Burn out' could be a result of too many demands placed on the committee and/or a lack of effective results attained.

Of the other groups mentioned the Marchagee Catchment Group and Liebe production group were the most active. By targeting established networks the Recovery Catchment could tap into relationship building processes that already exist.

3.2.8 Recommendations

It is recommended that the BMRC Recovery Team;

- a. Encourage/facilitate the education of community members, with a particular focus on families and school children, on the BMRC project, covering the values, threats and management options for plants and animals within the Catchment. (HP, ST) (Section 3.2 Social Structure).
- Target established landcare groups, including those currently 'in recess', to facilitate information exchange, coordinate activities, share resources, and expertise and Catchment planning. (HP, ST) (Section 3.2 – Social Structure)

3.3 Farming Systems

The purpose of this section was to establish a benchmark of farming systems against which future land use changes may be monitored. The information will also assist in the calculation of the Catchment's water-balance, i.e. by knowing the area of land under crop, pasture or trees a leakage value can be determined.

3.3.1 Landholder Response to Property Area

The total property area reported by Landholders was 133,174 ha, which includes a small proportion of land outside the BMRC (<u>Boundary 3</u>). The average property size is 2,513 ha, ranging from 142 ha to 7,961 ha. However, due to a large standard deviation (1,601 ha) the median figure of 2,300 ha is probably a more useful figure in this case.

3.3.2 Landholder Response to Crops Grown on Arable Land

Eighty-four percent (111,217:133,174 ha) of the total property area is arable land (n=53). Landholders were asked to identify what they were growing on their arable land in 2003. Table 5 shows land use as of October 2003. Seventy three percent (81,311 ha) of arable land is in crop while 27% (29,786 ha) is in pasture. Less than 1% is planted with <u>perennial</u> shrubs or commercial trees. Within pasture, less than 1% of arable land was used for Lucerne, <u>perennial</u> grasses or Tagasaste.

Cereals were the most commonly grown crop, with 60% (66,544 ha) of the total of reported arable land being under cereals.

Table 5: Landholder response to arable land plantings

Plants	% of total	Total Area (ha)
Crops	73	81,311
Cereals	60	66,544
Legumes	12	13,828
Oilseed	1	912
Summer	<1	27
Pasture	27	29,786
Lucerne	1	973
Perennial grasses	1	1222
Tagasaste	1	560
Other Perennial shrubs	<1	310
Other Pasture	24	26721
Commercial trees	<1	120
Total Arable Land	100	111,217 ha
Sample n = 53		

3.3.3 Livestock in the Recovery Catchment

Landholders were asked about the types of livestock they had on their property and the number of each animal present. Eighty-six percent (50:58) of Landholders who answered this question reported having livestock (n=58).

Figure 6 represents the make up of livestock. Sheep were by far the most common animal with 98% (49:50) keeping sheep. Sixteen percent (8:50) reported having cattle, while 12% (6:50) had some other form of livestock. The 'other' consisted mainly of angora goats, horses, ponies and alpacas.

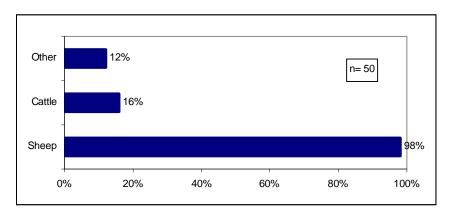


Figure 6: Percentage distribution of livestock owned by Landholders

Table 6, below, lists the total and average number of head of livestock, per property, for the Landholders who responded to the question.

Table 6: Livestock

Livestock	Total numbers	Average per property keeping this type of livestock
Sheep (n=47)	87,241	1,856
Cattle (n=8)	1,196	150
Other (n=7)	107	15

The highest number of livestock reported by Landholders was for sheep, with a total of 87,241 and an average of 1,856 head of sheep. These values are for 47 Landholders, as two Landholders, who reported having sheep, did not indicate how many they had. The 16% (8:50) of Landholders, who responded as having cattle, owned a total of 1,196 head of cattle.

3.3.4 Other Enterprises

Five Landholders report having other enterprises on their property (n = 57). Two Landholders are involved with aquaculture, 1 with manufacturing, 1 with building and 1 with Shetland pony breeding.

3.3.5 Discussion

More than 75% of the Catchment (<u>Boundary 3</u>) was identified as arable land, with the main land-use being cropping – mostly cereals. Of the arable land, less than 0.4% (430 ha) was planted to perennials i.e. commercial trees, <u>perennial</u> shrubs or grasses. With so few perennials across the landscape the Catchment farming systems would be classed as low water-use systems.

One of the biggest land degradation issues in the Recovery Catchment is secondary salinity caused by too much water leaking through the soil profile, filling-up the groundwater table and bringing dissolved salts towards the land surface. Therefore, improved water utilisation across the Catchment is essential for protecting agricultural systems, natural assets and infrastructure from secondary salinity.

The results showed that for the percentage of Landholders with livestock (50:58), 98% (49:50) stock sheep and 16% (8:50) responded as having cattle. This emphasises the need for protection of remnant vegetation and revegetation, from degradation by stock. This can be achieved with good pasture management techniques and fencing.

3.3.6 Recommendations

It is recommended that the BMRC Recovery Team;

- Facilitate research and development into profitable perennial species, to increase water uptake of farming systems in the Catchment. This includes supporting current research projects being conducted in the Catchment by CALM, Oil Mallee Company, CSIRO, Agricultural Department, and UWA. (HP, LT) (Section 3.3 – Farming Systems)
- b. Increase strategic high water use plantings develop revegetation programs aimed at increasing the amount of water being utilised. (HP, LT) (Section 3.3 Farming Systems)
- c. Encourage/facilitate fencing to protect remnant vegetation and revegetation from stock (HP, LT) (Section 3.3 Farming Systems)

3.4 Farm Management

There are six common land degradation issues faced by Landholders in the Catchment:

- 1. Salinity
- 2. Soil acidification
- 3. Wind erosion
- Water logging
- 5. Water erosion
- Water repellent soils

This section details farm management practices undertaken by Landholders to address these land degradation issues. It also provides a qualitative assessment of how Landholders perceive these actions to be functioning, i.e. are they being effective or ineffective in addressing degradation and why? The reasons for implementing particular works were explored and Landholder understanding of the various practices was ascertained. This data was also mapped for each property so that quantitative measurements of the threats could be examined. Again, this information provides a benchmark for the future.

3.4.1 Landholder Perceptions of Land Degradation Threats to Production

Figure 7 shows the survey results for what Landholders perceive as threats to their property and productivity. Salinity was the most commonly reported land degradation threat, mentioned by 88% (52:59) of Landholders, closely followed by soil acidification with 81% (48:59).

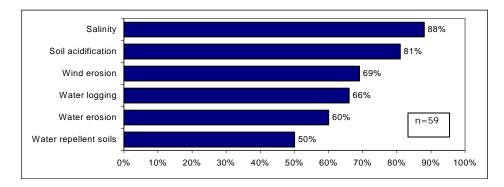


Figure 7: Percentage of Landholders who consider certain land degradation threats to be present.

Table 7 shows the percentage of Landholders who consider each threat to be present on their property, and the total area of land affected. Many Landholders had difficulty estimating the area of land affected therefore 'n' varies considerably between answers (see bracketed text).

Table 7: Landholder Estimates of Extent of threats to production

Threat	% of Landholders who considered threat present	Estimated total amount of land affected (ha)
Salinity	88%	7,701 (n=54) ¹⁰
Soil acidification	81%	55,029 (n=38)
Wind erosion	69%	7,407 (n=33)
Water logging	66%	2,304 (n=29)
Water erosion	60%	1,461 (n=30)
Water repellent soils	50%	11,904 (n=27)

Sample n = 59

By considering the area of land affected by a threat (Figure 8), soil acidification was reported as affecting the largest area (55,029 ha) followed by water repellent soils (11,904 ha), wind erosion (7,407 ha) and then salinity (7,701 ha) (Figure 8).

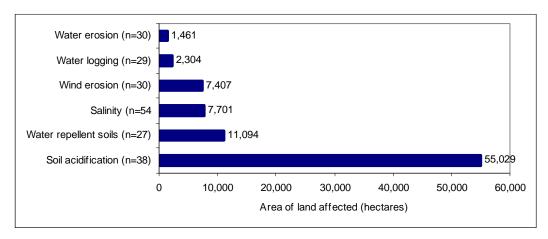


Figure 8: Landholder Estimates of total amount of land affected by land degradation threats

Across the Catchment the total area of land reported by Landholders as affected by secondary salinity is (7,701 ha). The maximum reported affected area was 30% of one Landholders property, while seven Landholders reported that they had no secondary salinity on their land (n=59).

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¹⁰ Landholders were not asked the exact number of ha affected by salinity; they were asked to provide a percentage figure of what they believed was affected on their property. The total salinity figure was calculated by multiplying the percentage of land that each property owner reported as being affected by salinity by their total property area.

Landholders, who indicated they had encountered the above threats, were asked to rate the severity of the threat on a scale of 1 to 5, where 1 is not severe, 3 is moderate and 5 is severe. All threats were rated moderate, with salinity being rated as a more severe threat. Figure 9 shows the average rating for each threat.

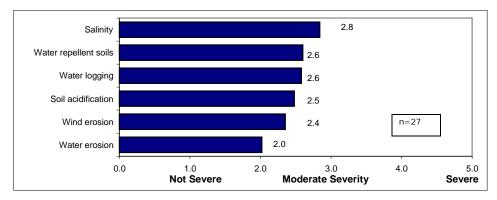


Figure 9: Average Landholder rating of the severity of land degradation threats

While water repellent soils are only considered a threat by 50% of Landholders, those who *do* consider them a threat believe it to be almost as severe a threat as salinity. Water erosion was considered the least severe of the threats, with Landholders giving an average rating of 2 out of a possible 5.

Many Landholders felt that they had to qualify their ratings with some comments on the nature of the threat. By their nature these threats are hard to quantify, and Landholders found it difficult to identify consistent areas where these threats are present.

For the most part wind erosion, water erosion and water logging were believed to be seasonal in nature or, in some cases, only occurred as a result of an extreme weather event. The recent drought was mentioned as a particular cause for wind erosion. Many of the soils are reported to be naturally acidic and some Landholders see soil acidification as a result of agricultural activity. Water repellent soils occur in small patches dotted over the landscape, making them particularly hard to map and quantify.

3.4.2 Mapping of Affected Areas

Landholders were asked to map areas where wind erosion, water erosion, waterlogging and salinity were consistently a moderate to severe problem. Table 8 shows the areas mapped by Landholders (<u>Boundary 3</u>).

Salinity, present as salt scalds, affected the largest area of Landholder's land (3.6%), followed by waterlogging (1.9%).

Table 8: Threats to the land

Threat	Total (ha)	Percentage of Landholders Land		
Salt Scalds (Salinity)	6,486	3.60%		
Water Logging	3,325	1.90%		
Wind Erosion	383	0.20%		
Water Erosion	276	0.20%		
Totals	10,470	5.9%		

Note: Total area of all land occupied by Landholders (Boundary 3). The total figures in this table represent moderately to severely affected areas where there is a consistent problem. Information from participating Landholders and from the SWM project.

3.4.3 Works Undertaken to Address Land Degradation Threats

Landholders were asked if they undertook management actions to mitigate land degradation threats. Those who did were asked to give further details on the physical magnitude of the action, what they considered the action was alleviating and whether they considered it to have been successful.

Usage of Banks

Seventy-two percent (42:58) of Landholders had <u>banks</u> (the type of banks i.e. level banks or gradient banks was not specified) on their property as a land management action. Figure 10 details the threats that Landholders consider they are addressing by constructing banks. The majority of Landholders who have banks believe that they are acting against water erosion. Others believe that banks are effective in alleviating water logging and salinity. And a few Landholders considered that the banks were addressing more than one threat.

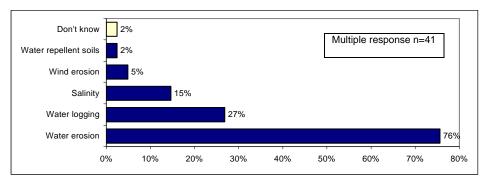


Figure 10: Landholder perceptions of the threats being addressed by banks

When talking about their experience of using banks a number of **advantages** emerge from Landholder discussion:

- Effective in controlling surface water and arresting surface run off. This effectively reduces soil scouring and erosion
- Good for channelling water in other direction, eg into dams
- Banks are effective in the upper and mid-slope areas
- Effective for reducing water logging in lower areas
- Directs water into the natural drainage line
- Controls flooding
- Allows working paddocks on the contour
- Controls speed of water flow
- Stops water flowing into and accumulating in salt affected areas

On the other hand the **disadvantages** listed by Landholders included:

- Tends to create water build-up that can cause damage when released at once.
- Banks themselves become eroded.
- No-till and stubble retention are more cost effective.
- Moving away from using banks and now using no tillage and running crops along the contour.

Landholders were asked about the effectiveness of implementing banks to address threats. Ninety-three percent (38:41) of Landholders thought that their banks had been effective in alleviating the threat, while 5% (2:41) did not think that the threat had been lessened and the remainder did not know.

Drains

Fifty percent (29:58) of Landholders had constructed <u>drains</u> on their property as a form of management action. Figure 11 details the threats that Landholders believe that they are addressing by constructing drains. Salinity and water logging are the main threats that Landholders are hoping to address when they build drains.

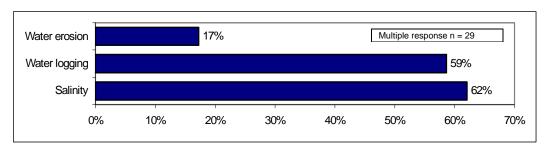


Figure 11: Landholder perceptions of land degradation threats being addressed by drains

Of the 29 Landholders who had constructed drains on their property, 26 responded about the effectiveness of the drains. Eighty-eight percent (23:26) thought that the threat had been successfully addressed, 8% (2:26) reported that they had not been successful and 4% (1:26) did not know (n=26). Where drains were reported as being unsuccessful, the threat in question was water logging.

When commenting on how drains worked, the following points emerged:

- Removes surface run off and subsurface water to alleviate increases in the water table and water logging
- Moves water away quickly before it causes problems such as the development of new salt affected areas
- Reduces the water table and therefore salinity
- The drains concentrate water and direct it to drainage lines and dams to avoid water logging
- Have used Shallow Relief Drain –i.e. excavation of natural drainage line
- Allows excess water to continue along natural water course

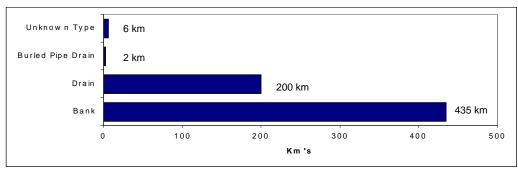
Mapping of Earth Works

Landholders were asked to map their existing banks and drains. This data was then incorporated with similar data from the SWM Project¹¹.

The map of existing earthworks in the BMRC (Appendix 10) shows the majority of banks are concentrated in the west of the Catchment. There is also a collection of banks towards the south west of the Catchment. Appendix 10 also illustrates that the main concentration of drains is in the eastern side of the Catchment.

Due to particular Landholders not participating in the survey (Appendix 6), there are large areas in the centre of the map in Appendix 10 that do not display any earthworks.

Figure 12 shows the length of banks and drains as mapped during the Landholder Survey and the SWM Project. There are a total of 435km of banks and 200km of drains on the properties of those who took part.



Note: Based on Boundary 3

Figure 12: Length of existing earthworks

Table 9 shows details of the proposed works, as ascertained from the Landholder Survey and SWM Project. Landholders are planning a further 80km of banks and 87km of drains.

Table 9: Length of proposed earthworks

Category	Landholder Survey Length (km)	SWM Project Length (km)	Total (km)
Bank	8	72	80
Drain	87		87
Burled Pipe Drain	0.3	0.6	0.9
Flumes (Culvert)		0.05	0.05
Waterway Levee		1	1
Total	95	73	167

Note: based on Boundary 3

Flumes

Three Landholders reported having <u>flumes</u>. The number of <u>flumes</u> on these properties is 4, 1 and 3. The flumes were put in place to address water erosion and all had been deemed successful. When asked to describe how flumes alleviated the threat, Landholders said that flumes stopped erosion by containing or redirecting water.

11

SINCLAIR KNIGHT MERZ (2003) Buntine-Marchagee Natural Diversity Recovery Catchment surface water management plan (Includes - Catchment Report, Demonstration Report and Individual Property Reports). Report prepared for the Department of Conservation and Land Management.

Groundwater Pumping for Remediation

Three Landholders engage in ground water pumping for remediation of land. One Landholder did not know how much water was being pumped, while the others were pumping between 40,000 and 50,000 litres per day. The threats being addressed were water erosion, water logging and salinity; and were judged to be successful by 2 Landholders, while the third did not answer the question.

Liming

Approximately two out of every three Landholders are using lime on their property, covering a total area of 49,046 ha (n=58). The smallest area being limed on a Landholders property was reported to be 80 ha, while the largest was 6,144 ha.

All of the Landholders who were using lime were using it to control soil acidification. Eighty-two percent believed that liming was successfully alleviating the problem with soil acidification, while the remainder did not know or did not answer the question. Many Landholders had intentions to do some liming but had not implemented this as yet.

When asked about how liming alleviated the threat, the following points emerged:

- Increased soil pH by about 1 unit, allowing better cereal production
- Increases pH / neutralised soil
- Pasture management procedure rather than conservation
- Decreases acidity, more moisture available to the plant, decreasing water logging

Stubble Retention

Seventy-eight percent (45:58) of Landholders use stubble retention as a land management action, encompassing a total area of 77,377 ha. The smallest area of stubble retention reported on a property was 105 ha and the largest was 6,144 ha.

Ninety-five percent (55:58) of Landholders are using stubble retention to combat wind erosion and 19% (11:58) thought it was effective against water erosion. However, all of those who commented that it alleviated water erosion also mentioned wind erosion.

When asked if stubble retention was effective against threats, all 36 Landholders who responded believed that the threats had been alleviated.

When asked to describe how stubble retention works to alleviate threats, the main answers given by Landholders were:

- Stubble retention helps to protect the soil from wind and water erosion.
- Improves soil structure and soil health.
- Increases water infiltration and soil organic matter, however, it can also increase the incidence of water repellent soils.
- Helps prevent wind erosion by maintaining a surface cover.
- Burn as little as possible, mostly retain the stubble which helps hold soil together.
- Adds organic matter to the soil, increases soil microbe and nitrogen levels, and improves the soil profile.

Minimum Till

Seventy-nine percent (46:58) of Landholders reported using minimum till as a management action to alleviate land degradation threats (n=58). Landholders practice minimum till on 76,601 ha (42:58). The smallest area on a property was 100 ha while the largest was 10,000 ha.

Eighty-one percent (37:46) of Landholders using minimum till believe it to be effective in alleviating land degradation threats. However, some Landholders that use minimum till had issues with weed control, in that they required the use of more chemicals than for conventional crop preparation techniques.

Landholders were asked to describe how minimum till actually alleviated the threats, and the following points emerged:

- Improves soil structure/less damaging to soil structure
- Helps to protect the soil from wind and water erosion
- Conserves moisture/improves absorption capacity
- Less tractor hours/less soil disturbance
- Allows earlier crop establishment and improves soil structure on clay soil
- With low rainfall, minimum till benefits the crops
- Mostly done for profitability
- Used with stubble retention, increases germination, decreases runoff.

Gypsum

Forty percent (23:58) of Landholders use gypsum as a land management action. Twenty-one Landholders provided figures on the area of land they are treating, contributing to a total of 8,588 ha, giving an average of 429 ha per property. The smallest area being treated is 20 ha while the largest is 1,000 ha.

Gypsum is used mainly to address the loss of or degradation of soil structure. Fifteen Landholders responded to the question of whether gypsum was successful and they all agreed that it was.

When asked to describe how gypsum worked to alleviate threats, the main answers given by Landholders were:

- Increases infiltration so that soil is able to absorb and use rainfall
- Is a maintenance management activity
- Conditions soil softens and breaks up hard surface to improve water penetration and reduce surface erosion.
- Improve soil structure
- Counteracts sodium salts and opens the soil for better water management
- Alleviates low sulphates which improves soil structure
- Liming reduces the sulphur content of the soil, so need to add sulphur (gypsum)
 to counteract effect of liming

Other

Other management actions, used to help alleviate land degradation threats, talked about in this section include:

- Furrow seeding to alleviate water repellent soils, which the Landholder believed was successful
- Contour farming and ripping to alleviate wind and water erosion, which the Landholder believed was successful
- Infill with concrete in a gully to alleviate water erosion, which the Landholder believed was unsuccessful as it got washed away.

Annual Expenditure on Conservation Works

Landholders were asked to estimate their annual expenditure over the past 5 years on three specific types of conservation works; fencing, earthworks and revegetation. Figure 13 shows the areas of expenditure.

Fencing and revegetation were more likely to receive investment than earth works. The most likely amounts to be invested in any of the three conservation works were sums of \$3,000 or less.

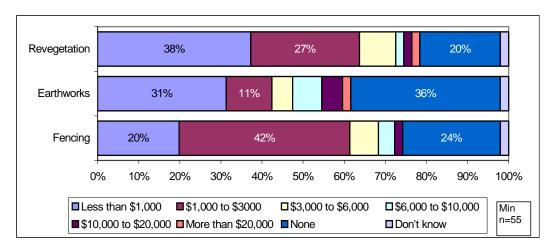


Figure 13: Landholder perceptions of average annual expenditure on conservation works over the last 5 years

It is difficult to compare expenditures on conservation works, as the market cost of each of the works is different. Other factors also affect the amount of money being spent, such as difficult years, when Landholders have less money to spend on conservation. Investment into conservation projects (eg. <u>Bushcare projects</u>), also depends on the availability of funding, Landholder awareness of funds and the availability of support to apply for and use these funds.

3.4.4 Discussion

Salinity was identified as the biggest threat to production by 88% of all Landholders surveyed, with an estimated 7,701 ha of land affected (n=54). However, the survey also shows that soil acidification was reported as affecting a much larger area (55, 829 ha) of land within the Catchment (n=38).

Some soils are naturally acidic, while others have become acidic due to agricultural practices involving application of fertilisers containing nitrate and the growth of legumes to build up organic nitrogen reserves in the soil. The majority of Landholders are monitoring soil pH and using the application of lime to address soil acidity and maintain productivity.

Salinity is a more complex issue. Without access to maps or historical knowledge of pre-European vegetation, it is difficult to determine what is primary (naturally) salinity and what is secondary (post-clearing) salinity. In addition, Landholders often underestimate the area of land affected by salinity. For example, if there are no obvious salt crusts, soil testing, or observation bores indicating that the land is salt affected, often other issues such as waterlogging are attributed to the problem.

Secondary salinity was being tackled by Landholders principally in two ways, by earthworks, (i.e. <u>banks</u> and <u>drains</u>), or through fencing off and revegetating seepage areas. Many Landholders intend on constructing more banks and drains in the future. This emphasises the need for integrated farm planning across the catchment, to avoid adverse impacts of water transfer onto adjoining land; whether productive farmland or remnant vegetation.

The groundwater monitoring network of piezometers and observation bores, established by the BMRC Recovery Team, will increase understanding of groundwater and surface water hydrology within the Catchment. Provision of monitoring information to the Landholders, and interpretation of their results, may assist in development of management options to address secondary salinity.

There is a large percentage of Landholders with sheep in the Catchment. Salt land agronomy is a field in which some Landholders in the Recovery Catchment are working with researchers, to develop options for sustainable productive use and rehabilitation of salt-affected land.

3.4.5 Recommendations

- a. Facilitate <u>Integrated Catchment Planning</u> within the Catchment (HP, ST) (Section 3.4 – Farm Management).
- b. Facilitate research and development into native plant species for salt land revegetation and productive use, and rehabilitation of saline land (HP, LT) (Section 3.4 Farm Management).
- c. Continue monitoring the groundwater table to quantify salinity risk within the Catchment (HP, LT) (Section 3.4 Farm Management).
- d. Facilitate monitoring of landscape condition, particularly where rehabilitation of saline land is implemented (HP, ST) (Section 3.4 Farm Management).

3.5 Remnant Vegetation

The purpose of this section was to examine how Landholders value remnant vegetation, rank threatening processes, and applied management actions. It also asked Landholders whether they observed the health of their remnant vegetation and if so, were they able to evaluate its condition.

3.5.1 Importance of Remnant Vegetation

Landholders were asked to rate the importance of remnant vegetation in their farming systems for each of the following purposes:

- Stock shelter
- Windbreak
- Water table control
- Wildlife habitat
- Seed source for revegetation
- Aesthetic.

Ratings were on a five-point scale, with 1 being not important, 3 important and 5 very important. Figure 14 shows overall average ratings for each item.

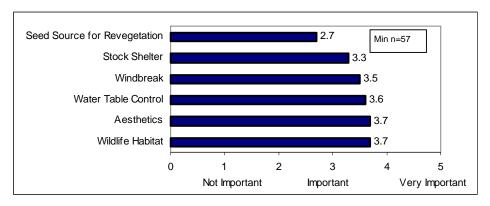


Figure 14: Landholder rating of importance of remnant vegetation

Overall, Landholders rated remnant vegetation between being important and very important for almost every purpose mentioned. Landholders rated aesthetic and wildlife habitat reasons as being the most important (3.7 out of 5). Remnant vegetation was also rated least important as a seed source for revegetation (2.7 out of 5).

3.5.2 Threats to Remnant Vegetation

Landholders were offered a list of possible threats to remnant vegetation and asked to rank the threats in order of greatness. Figure 15 details their responses.

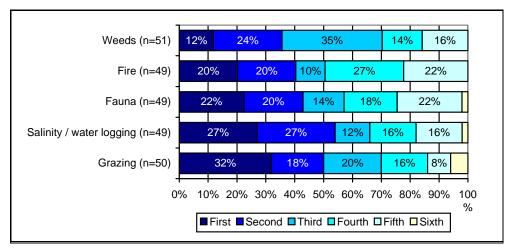


Figure 15: Landholder ranking of threats to remnant vegetation

All threats are shown and the rankings are aggregated so that a clear picture is given of how Landholders ranked each threat. For example, 86% of Landholders ranked weeds as a threat to remnant vegetation, and of those 12% ranked it as being the greatest threat, 24% ranked it as being second greatest, etc.

The proposed threats were taken seriously, with each threat considered the most important or second most important by at least some of the Landholders. However, grazing and salinity were marginally more likely to be selected as first and second most problematic for remnant vegetation, with weeds most likely to be selected as a third choice.

Landholders commonly listed Galahs, Little corellas, Emus, and Western Long-billed corellas as the most problematic animals.

Of the 51 Landholders who considered weeds a problem, 30 listed particular problem species. Wild radish and oats, rye grass, and Pattersons' Curse were discussed as being especially problematic and widespread. Unspecified grasses are also a problem mentioned by many Landholders. Other specific weeds that were mentioned were: Cereal grasses, Brome grass, Ice plant, Doublegee, Wild turnip, Erodium, Barley grass, Capeweed and Couch.

Other threats to remnant vegetation Landholders mentioned were:

- Drought
- Human destruction (eg clearing)
- Tornadoes
- Wind erosion
- Seasonal adversity

Fenced Remnant Vegetation

Seventy-one percent (41:58) of Landholders who participated have fenced their remnant vegetation (n=58). Table 10 details the Landholders' views of the condition of fenced remnant vegetation on their properties. The numbers in Table 10 do not add up to 41 as most Landholders had examples of remnant vegetation that is regenerating, staying the same and declining all at once. It should also be noted that the time since the vegetation was fenced was not included in the survey, possibly influencing the Landholders perceptions of regenerative success.

Twenty-six Landholders have some remnant vegetation that is regenerating; and where this is happening, 13 Landholders reported that this is the case in more than half of the area of fenced remnant vegetation.

The majority of Landholders who have fenced vegetation, which is now regenerating, attribute their success to having prevented stock trampling and grazing of the vegetation, particularly young plants. Water table management was mentioned by one participant as a reason for their regeneration success.

Twenty-five Landholders have some fenced remnant vegetation that is staying the same, and 14 Landholders report having an area that is declining. Nine of those Landholders, who have areas of declining remnant vegetation, indicated that these areas make up less than half of their whole area of remnant vegetation.

Table 10: Landholder perceptions of condition of fenced remnant vegetation

Fenced Remnant Vegetation	Y/N	%	Division	%
Regenerating	Yes	26	26 Less than or equal to 50%	
			More than 50%	13
			Don't know	1
	No	17		
Sample	n = 43		n=23	
Staying the Same	Yes	25	Less than or equal to 50%	7
			More than 50%	17
	No	18		
Sample	n = 43		n=24	
Declining	Yes	14	Less than or equal to 50%	9
			More than 50%	5
	No	28		
Sample	n = 42		n=14	

There were a wide variety of reasons provided as to why fenced remnant vegetation is staying in the same condition. Many Landholders believe that the recent dry weather and fires have meant that remnant vegetation has not been given a chance to grow. Others believe that it is more to do with the condition of the soil, the types of plants in the area, or the level of maturity of the plants / trees in the area.

When asked why areas were declining, salinity was the most common answer. Introduced and problem animals and weeds were also commonly perceived to be causing vegetation to decline. Lack of management was suggested as a possible cause, specifically a lack of fire and flooding regimes. Drought was also seen to be having an adverse effect on regeneration success.

Unfenced Remnant Vegetation

Landholders were also asked to provide details about their unfenced remnant vegetation, results from this are shown in Table 11.

In contrast to the 26 Landholders that have fenced remnant vegetation that is regenerating, only 8 Landholders report having an area of unfenced remnant vegetation that is regenerating.

The main reason given for unfenced remnant vegetation regenerating was because stock did not damage the plants. This happened either because there was no stock grazed in the vicinity of the remnant, or the vegetation was too dense for stock to penetrate.

Thirty-six Landholders reported having some unfenced remnant vegetation that is unchanged. Twenty-seven of these said this was the case for more than half their unfenced remnant vegetation.

Thirty-four Landholders reported having an unfenced area that is declining. Seventeen of those who have declining unfenced remnant vegetation report that this accounts for over half of their total area.

Table 11: Landholder perceptions of condition of unfenced remnant vegetation

Unfenced				
Remnant Vegetation	Y/N	%	Division	%
Regenerating	Yes	8	Less than or equal to 50%	5
			More than 50%	3
	No	45		
	Don't Know	1		
Sample	n = 54		n=8	
Staying the	Yes	36	Less than or equal to 50%	9
Same			More than 50%	27
	No	18		
	Don't Know	1		
Sample	n = 55		n=36	
Declining	Yes	34	Less than or equal to 50%	14
			More than 50%	17
			Don't know	1
	No	20		
	Don't Know	1		
Sample	n = 55		n=32	

Reasons listed for unfenced remnant vegetation staying the same included; not having any stock, stock being kept out, not overstocking, drier previous seasons, not using chemicals, the size of the area, size of the plants, and the age of remnant vegetation.

Those who had declining unfenced remnant vegetation attributed the decline mainly to stock and grazing. Introduced and problem animals, especially rabbits, were also blamed. Salinity, waterlogging and the need for burning were also reasons mentioned by a few Landholders.

Weed Control in Remnant Vegetation

Eleven Landholders reported they were controlling weeds in remnant vegetation (n=58). Of those who do control weeds, 3 control weeds on a regular basis and 8 do so occasionally. The majority of weed control involves spraying, and in many cases, spraying for specific weeds such as Pattersons' Curse, Wild Radish and Saffron Thistle. A number of Landholders control weeds by allowing stock to graze on the area. Hand pulling and burning were also mentioned as methods of control.

3.5.3 Barriers to Managing Remnant Vegetation

Landholders were asked to rank the importance of the 3 factors that may prevent them from managing their remnant vegetation; management advice, time and financial cost. Figure 16 illustrates that the majority of Landholders listed financial costs as the main barrier, closely followed by time.

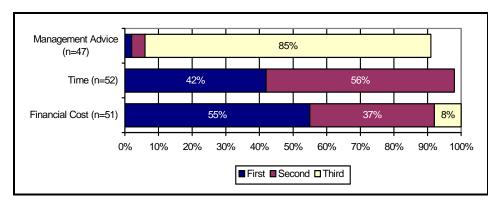


Figure 16: Ranking of barriers to managing remnant vegetation

A number of Landholders listed other factors that prevent them from managing their remnant vegetation. These included:

- No equipment available to assist farmers in managing remnant vegetation
- The area of remnant vegetation is too rocky to allow for maintenance
- Difficulty accessing the area. Cannot get weed spraying equipment into the area
- Maintaining sheep shelter

A small number of Landholders do not see a need to manage remnant vegetation, especially if it is regenerating.

3.5.4 Monitoring Techniques

Twelve Landholders implemented techniques for monitoring remnant vegetation on their property (n=58). Of these 12 Landholders 5 took photos, 3 did transect and 2 used quadrats. Other methods mentioned included:

- Using video
- Placing a picket to measure growth
- Plant surveys
- General observation.

3.5.5 Discussion

While Landholders considered remnant vegetation to be an important component of the farming system for all purposes mentioned, aesthetic considerations and wildlife habitat were most highly rated, while seed source for revegetation was rated least important.

The utilisation of genetic resources in plant and animal breeding is recognised as being integral to the advancement of agriculture. The genetic diversity found in remnant vegetation is perhaps less appreciated and understood, but can offer an invaluable resource for revegetation and habitat reconstruction. For example, high genetic diversity can ensure population survival through major environmental changes, by maintaining a genetically robust population that can adapt to a new environment.

Similarly, naturally saline areas have been identified as potentially containing genetically diverse plants, beneficial for salinity control/revegetation of the Wheatbelt. These plants include broombush (and other melaleuca species), saline adapted shrubs and bunch grasses.

Grazing and secondary salinity were the threats identified as being most damaging to native vegetation, exacerbated by weed invasion and pressure from feral animals and problem native animals.

Survey findings indicate that unfenced remnant vegetation is more likely to be declining than fenced remnant vegetation, especially in areas with livestock. This can be attributed to the adverse impact stock have by trampling and eating vegetation, particularly young plants.

Where livestock is not a factor, Landholders suggested a number of reasons why fenced and unfenced vegetation is 'staying the same'. These include fire regimes, age of vegetation, drier seasons and size of the remnant.

This situation highlights the complexity of issues faced by Landholders in managing remnant vegetation to maintain its resilience. However, given the higher than expected percentage of Landholders with livestock in the catchment, fencing of remnant vegetation is an immediate priority.

Cost and time were identified as the main barriers to managing remnant vegetation.

Few Landholders are implementing monitoring techniques for remnant vegetation. This means that there will be little information available in the future to identify change or evaluate management activities.

3.5.6 Recommendations

- a. Prepare a remnant vegetation protection and revegetation plan, aimed at protecting high priority biodiversity assets within the Catchment (HP, LT) (Section 3.5 Remnant Vegetation)
- b. Promote incentive programs that are currently operating in Western Australia and are available to private Landholders who want to conserve biodiversity on their property. (HP, ST) (Section 3.5 Remnant Vegetation)
- c. Encourage/facilitate the coordination of an integrated approach to the control of weeds within the Catchment (HP, ST) (Section 3.5 Remnant Vegetation)
- d. Offer incentives (eg. cost sharing) and assistance to Landholders within the Catchment, to encourage/facilitate protection and expansion of remnant vegetation and high-priority biodiversity assets (HP, LT) (Section 3.5 – Remnant Vegetation)
- e. Facilitate interactive plant and animal surveys and field days within the Catchment; to raise awareness of biodiversity and allow Landholders the opportunity to work with researchers on their properties. (HP, ST) (Section 3.5 Remnant Vegetation)

3.6 Revegetation

Landholders were asked to give details of their revegetation sites. This was done to create an overall picture of revegetation works in the Catchment. It is important to identify reasons for successes and failures in revegetation works for future planning and development.

Landholders reported to have a total of 395 revegetation sites across the Catchment, with an average site size of 6.3 ha and a total combined area of 2,472 ha. This information was obtained from mapped data gathered during this survey, and augmented by data from the earlier SWM Project.

According to information from the Landholder questionnaire data, 79% of revegetation is fenced. There are 7 Landholders who do not have any revegetation and one who does not know (n=58).

3.6.1 Landholder Priorities for Implementing Revegetation

Landholders were asked to rate a number of priorities for implementing revegetation. Again ratings were on a five-point scale, with 1 being not important, 3 being important and 5 being very important (Figure 17).

Salinity management was, on average, the most important priority when revegetating; achieving an average score of 4.2 out of a possible 5. Water use was the next most important priority, followed by aesthetic value. Farm forestry and wildlife habitat were rated as the two least important priorities.

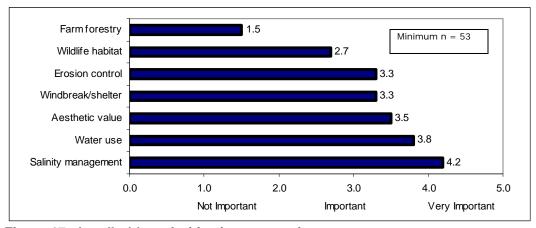


Figure 17: Landholder priorities in revegetation

Where Landholders were asked to list any other priorities they have in revegetation, they made comments regarding improving biodiversity and animal fodder.

3.6.2 Species Used in Revegetation

Landholders were asked to list all of the species that they used in their revegetated areas. Appendix 11 lists the species mentioned by the Landholders, and the percentage of Landholders (in descending order) using each species.

Eucalyptus camaldulensis (River Red Gum), Eucalyptus loxophleba (York Gum) and Eucalyptus sargentii (Salt River Gum) were the most popular species used in revegetating, used by 70%, 62% and 58% of Landholders respectively.

3.6.3 Barriers to Planning/Implementing Revegetation

Landholders were asked to rank possible barriers to implementing revegetation on their properties. Figure 18 details the results. As with managing remnant vegetation, financial cost is most likely to be ranked as the number-one barrier in planning and implementing revegetation. Of the 52 Landholders who ranked financial cost, 46% ranked it as number-one. Forty-four percent of the 50 Landholders who ranked time as a barrier ranked it as being their most important barrier.

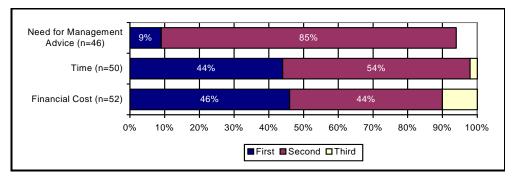


Figure 18: Landholder ranking of barriers to planning/implementing revegetation

Landholders were then asked to list any other barriers they perceived in planning and implementing revegetation. Other common barriers listed by Landholders included:

- Climate and droughts
- Stock and kangaroos
- Plagues (eg locust)
- Management issues
- Lack of equipment

Some Landholders do not see the value of revegetation, while those who are leasing land tend not to revegetate.

3.6.4 Monitoring Techniques

Landholders were asked about any monitoring techniques they are using on their revegetated sites. Ten Landholders implemented monitoring techniques on their revegetation. Of these, 3 used photo points, 1 did regular and recorded species counts, 1 took random photos, while the remaining Landholders made occasional observational checks.

3.6.5 Discussion

From the Landholder Survey and SWM Project, a total of 2,472 ha (or 1.8%) are classified as revegetation in the Catchment (<u>Boundary 4</u>). Landholders identified salinity management and water use as the key reasons for revegetation.

Landholders have used more than sixty different plant species for revegetation in the Recovery Catchment. The most widely planted species (in decreasing order) are *Eucalyptus camaldulensis* (River Red Gum), *Eucalyptus loxophleba* (York Gum) and *Eucalyptus sargentii* (Salt River Gum).

The popularity of these species may be due to recommendations from past research trials on species tolerance to waterlogging and salinity, and water use efficiency. In addition, in the late 1980's and early 1990's, there were few nurseries from which to purchase seedlings; of these few nurseries, *Eucalypt* species were the predominant stock.

However, there is an increasing awareness of the importance of using local provenance seed, from a variety of tree and understorey species that have inherited characteristics to cope with the local environment. There are now more nurseries with a greater variety of plant species available for revegetation. Where the environment has been changed, for example by salinity, seed from plants growing on local and naturally occurring saline areas has the potential to be used in rehabilitation works.

Species diversity is also required in revegetation, to mimic the structural and species diversity of remnant vegetation in the Catchment. Of the sixty plant species used in revegetation, species belonging to the *Myrtaceae* Family predominate. Only two species belonging to the *Proteaceae* Family have been used in revegetation, *Banksia prionotes* and *Hakea coriacea*. While collection of seed from some Proteaceous species is relatively easy, many, particularly *Grevillea* species, flower and disperse seed at variable times, making cost-effective seed collection difficult. However, the inclusion of *Grevillea* species in revegetation projects would add to diversity and increase value as habitat for native animals.

3.6.6 Recommendations

- a. Promote results from research into water use of revegetation planting configurations. (HP, LT) (Section 3.6 Revegetation)
- b. Educate Landholders and local NRM groups as to the value of diversity in revegetation plantings, to improve its value as wildlife habitat. (HP, ST) (Section 3.6 Revegetation)
- c. Educate Landholders of the processes involved in seed collection and propagation techniques. (MP, ST) (Section 3.6 Revegetation)
- d. Prepare guidelines for planning and implementing revegetation projects on farms i.e. matching plants to soils, identifying plants, bird associations (HP, ST) (Section 3.6 Revegetation)
- e. Encourage local nurseries to trial growing new species for revegetation and/or those perceived to be difficult to propagate (MP, LT) (Section 3.6 Revegetation)

3.7 Plants & Animals

There is a lack of quantifiable data about plants and animals in the Recovery Catchment; therefore, anecdotal accounts from Landholder observations can provide an indication of the changes that have taken place in the Catchment over time.

Landholders were asked to rate their knowledge of native plants and animals that occur on their properties, and then to identify those plants and animals that they perceive to have either increased or decreased.

3.7.1 Landholder Knowledge of Native Plants and Animals

When asked how they would rate their knowledge of native plants and animals on their property on a scale of 1 to 5, where 1 is limited and 5 is extensive, the average rating was 2.3 out of 5. Just over half (51%) rated their knowledge as limited (1 or 2 out of 5), 40% as adequate (3 out of 5) and 9% rated their knowledge as extensive (4 or 5 out of 5).

3.7.2 Landholder Perceptions of Increasing and Decreasing Species of Plants and Animals

Landholders were asked to list all the species of plants and animals they perceived to have increased or decreased, and provide a reason as to why this might have happened.

Landholders were also asked to estimate, to the nearest decade, when they perceived the increase or decrease had occurred. However, as most reported having difficulty remembering when changes may have happened this information was not included.

Table 12 to Table 15 lists the species mentioned by Landholders, and provides the reasons that were suggested as to why the increase or decrease might have occurred.

Table 12: Landholder perceptions of decreasing animal species.

	-			
Species	Reason			
Banded Lapwing Vanellus tricolor	More cropping / foxes and cats / cropping /drier seasons / more land is now cleared			
White-tailed Black Cockatoo Calyptorhynchus latirostris	Less available nesting sites / white cockatoos taking nesting sites			
Western Brush Wallaby Macropus irma	Predators - fox			
Boodie Bettongia lesueur	Foxes, rabbits took over their holes. Species locally extinct.			
Australian Bustard Ardeotis australis	Better seasons further east / predators / chemicals and land clearing / hunting / feral cats / predators / foxes / loss of habitat.			
Bush Stone Curlew Burhinus grallarius	Foxes, cats, loss of habitat			
Fat-Tailed Dunnart Sminthopsis crassicaudata	Old stumps in paddock pulled out with better machines / more cats			
Short-beaked Echidna <i>Tachyglossus</i> aculeatus	Foxes			
Elegant Parrot Neophema elegans	Lack of vegetation			
Emu Dromaius novaehollandiae	Hunted and loss of habitat			
Fox Vulpes vulpes	Baiting / community baiting			
Rufous Songlark <i>Cincloramphus mathewsi</i> Brown Songlark <i>Cincloramphus cruralis</i>	Increases in foxes			
Major Mitchell's Cockatoo Cacatua leadbeateri				
Mallee fowl Leipoa ocellata	Fluctuate depending on season / foxes, predators, cats / clearing of bush areas / start of 1080 use			
Thorny Devil Moloch horridus	Foxes			
Mulga Parrot Psephotus varius	Lack of vegetation			
Little Button-quail <i>Turnix velox</i> Painted Button-quail <i>Turnix varia</i> Quails <i>Coturnix spp.</i>	Increases in foxes			
Rabbit Oryctolagus cuniculus	Virus releases / shooting / APB induced clearing in the early 1970s / Control measures			
Red-tailed Black Cockatoo Calyptorhynchus samueli	Breeding area / less double gees in paddocks now.			
Regent Parrot Polytelis anthopeplus				
Scarlet Robin <i>Petroica multicolour</i> Red-capped Robin <i>Petroica goodenovii</i>	Foxes and cats			
Salt lake water birds	Salt systems have dried up			
Little Corella Cacatua sanguinea westralensis				
Small birds	Foxes and cats			
Water birds	Foxes			
Wedge-tailed Eagle Aquila audax	Humans			
White-browed Babbler <i>Pomatostomus</i> superciliosus				
Woma Aspidites ramsayi				

Table 13: Landholder perceptions of increasing animal species.

Species	Reason
Birds of prey	
Black Swan Cygnus atratus	Seasonal. Back this year
Cat Felis catus	We think a litter of kittens was dumped here about 10 years ago / fox baiting
Cockatoos (unspecified)	Clear land and more food
Corella (unspecified)	Feedlot beneficiaries / hardy breeds / Corella big problem in woodland
Crested Pigeon Ocyhaps lophotes	Breed quickly due to abundance of food and water.
Crimson Chat Epthianura tricolor	Wet season - (4 sighted)
Crows (unspecified)	Increase in sheep numbers
Short-beaked Echidna Tachyglossus aculeatus	Fox baiting
Emu <i>Dromaius novaehollandiae</i>	Seasonal conditions / hole cut in emu proof fence / stopped shooting
Fox Vulpes vulpes	Natural cycle / clear land and more food
Galah Cacatua roseicapilla	Increase water and grain / cereal crops grown, livestock fed, water in every paddock / More wheat / cleared land
Western Grey Kangaroo <i>Macropus</i> fuliginosus	Increase of supply of food and water / Seasonal - increase after floods, decline with drought. Partly connected to lake system and scrub / seasonal movement across landscape / people not eating kangaroo / lack of culling / stopped shooting / natural cycle / cereal crops grown, livestock fed, water in every paddock.
Long Billed Corella	
Major Mitchell's Cockatoo Cacatua leadbeateri	Increase grain production and water points. All laid on for the species.
Mallee fowl Leipoa ocellata	Baiting foxes, killing cats / natural bush next door
Mulga Parrot Psephotus varius	
Galah Cacatua roseicapilla	Water / Food availability - grain. / Because CALM won't agree for them to be poisoned /
Australian Ringneck Barnardius zonarius	Stopped shooting. Drought, so come closer to property.
Rabbit Oryctolagus cuniculus	Seasonal - increase after floods, decline with drought. Partly connected to lake system and scrub. / Not eating
Red-capped Robin Petroica goodenovii	Drought
Small birds	Natural cycle
Regent Parrot Polytelis anthopeplus	
Sulphur –crested Cockatoo Cacatua galerita	Breeding more
Wedge-tailed Eagle Aquila audax	People don't shoot them anymore / Maybe drier seasons / Feed availability, water availability / due to less foxes
Western Long-billed Corella Cacatua pastinator butleri	Provided with food and water / Not allowed to shoot them / Increased grain
Yellow throated miner <i>Manorina</i> flavigula	

Table 14: Landholder perceptions of decreasing plant species

Species	Reason
Banksia spp	Clearing
Broombush Melaleuca uncinata	Drought
Clover Trifolium spp	Spray topping
Everlastings	Sheep grazing
Gimlet Eucalyptus salubris	Old
Jam Acacia acuminata	Droughts and cyclone in 1978
Baxter's Kunzea Kunzea baxteri	
Native Peach Santalum acuminatum	Seasonal - can't regenerate after dry seasons / Stock
Woody Pear Xylomelum angustifolium	Clearing / Stock
Native wattles Acacia spp.	Dry season
Orchids (unspecified)	Spray drift / grazing stock / Churkhou
Salmon Gum Eucalyptus salmonophloia	Not much natural revegetation occurring / Not regenerating
Small shrubs	Rabbits etc - eat all new shoots.
Spider Orchids Caladenia spp.	Weeds, road side verges
Tamma Allocasuarina campestris	Droughts
Tea Tree Melaleuca spp.	Rabbits etc - eat all new shoots. Balance is the problem - not as much in the bush now.
Featherflowers Verticordia spp.	Stock
Cauliflower Verticordia Verticordia	
eriocephala	Clearing
Yellow Popflower Glischrocaryon aureum	Stock

Table 15: Landholder perceptions of increasing plant species

Species	Reason			
Wattles Acacia spp.	Fenced areas off - no sheep			
Barley Grasses Hordeum spp.	Cropping			
Short-leaf Blue Bush Maireana brevifolia	Fenced areas off - no sheep			
Brome Grasses Bromus spp.	Fertilising ground			
Caltrop Tribulus terrestris	Declining sheep & unusual summer rainfall events / Wet summers			
Capeweed Arctotheca calendula				
Maireana brevifolia, & other halophytes	Remnant veg and saline water logged areas fenced from stock.			
Melaleuca spp.	Fenced areas off - no sheep			
Patterson's Curse Echium plantagineum	Water movement			
Prickly Pear Opuntia stricta	Since fencing			
Wild Radish Raphanus raphanistrum	Lack of control / Fertilizing ground			
Soft Roly-poly Salsola Kali	Wet summers / Winds and lack of control or saline land			
Rye Grasses Lolium spp.	Cropping / Fertilizing ground			
African Lovegrass Eragrotris curvula	Escaping from paddocks and spreading around district			
Wild Oat Avena fatua	Vehicle movement - carting of grain.			
Doublegee Emex australis				
Curly Windmill Grass Enteropogon acicularis	It is a native grass, so it has obviously blown in from somewhere, possibly the 1999 floods.			

3.7.3 Problem Animals

Ninety-seven percent (57:59) of Landholders report having problem animals on their property. Figure 19 details the animals that are reported to be a problem.

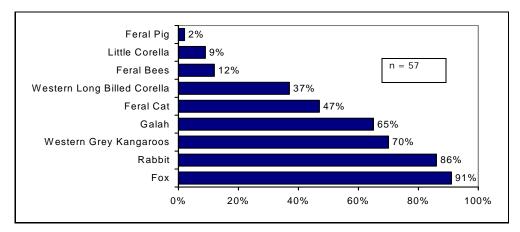


Figure 19: Percentage of Landholders who reported problem animals

Foxes and rabbits are the most commonly reported problem animals, followed by Western Grey Kangaroos.

When asked if there were any other problem animals, 2 Landholders had problems with emus and 2 with Australian Ringnecks. No Landholders reported having a problem with feral goats, even though it was included as a potential problem animal.

Management of Problem Animals

Having identified the animals that were a problem, the survey went on to discuss the frequency with which Landholders dealt with problem animals, and the techniques they used.

Figure 20 shows that the animals considered most problematic are those more likely to be dealt with regularly. For example, of the 91% of Landholders who considered foxes a problem 59% (30:51) use various methods for management on a regular basis.

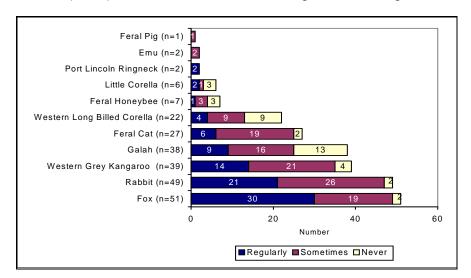


Figure 20: Landholder frequency of managing problem animals

Table 16 gives a breakdown of the management techniques used by those who regularly or sometimes manage problem animals. Foxes and rabbits are managed mainly by shooting and poisoning, while kangaroos are managed solely by shooting. Shooting is the main method of dealing with all other problem animals, with the exception of bees, which are poisoned.

Table 16: Landholder techniques to manage problem animals

Type of problem animals	Management techniques used by Landholders				
	Shooting	Poisoning	Trapping		
Fox (n=50)	74%	76%	2%		
Rabbit (n=47)	64%	85%	4%		
Western Grey Kangaroo (n=36)	100%	-	-		
Galah (n=25)	96%	-	-		
Feral Cat (n=25)	92%	8%	17%		
Western Long Billed Corella (n=13)	92%	-	-		
Feral Honeybee (n=4)	-	50%	-		
Little Corella (n=3)	100%	-	-		
Australian Ringneck (n=2)	100%	-	-		
Emu (n=2)	100%	-	-		
Feral Pig (n=1)	100%	-	-		

Landholders were asked to list any other methods that they used in controlling problem animals. Fox hunting and fox baiting programs were mentioned by a large number of Landholders, and some Landholders stated they shoot at birds to scare them away.

Barriers to Implementing Measures to Reduce Threats from Problem Animals

Landholders were asked to rank the importance of the four most commonly stated barriers (cost, time, paperwork and leadership/coordination) to implementing measures that reduce threats from problem animals. Figure 21 shows the ranking of those barriers.

Sixty-three percent (32:51) of Landholders rated time as being the number-one barrier. Paperwork associated with baiting programs was rated as being the main barrier by 6 Landholders, and rated as the second most important barrier for 18 of the 46 who ranked it.

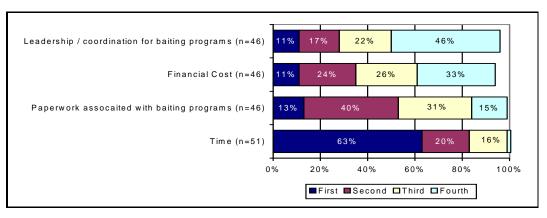


Figure 21: Landholder stated barriers to reducing problem animals

Landholders were asked to identify any other barriers they experienced in reducing problem animals. Landholders mentioned;

- Agricultural Protection Board (APB) is no longer based in the local area
- Difficultly in getting 1080
- The risk of poisoning dogs is too great
- Rules about native birds etc. make it too difficult
- Difficulty in obtaining suitable baits.

Fifty-four percent (32:59) of Landholders report being actively involved in a project aimed at reducing threats from problem animals. The majority of these programs are fox baiting programs co-ordinated by various groups, such as the North Central Mallee Fowl Group or the Waddy Forest <u>LCDC</u>. The North Central Mallee Fowl Group seems to be strongly represented within the Recovery Catchment. Some Landholders are also involved in informal fox and kangaroo shooting and baiting programs with neighbours.

Wildlife Habitat

Landholders were asked if they were implementing any measures to extend, improve or protect wildlife habitat. Forty-six percent (27:59) of Landholders report engaging in some kind of work. The common habitat work being done is biodiversity planting, with one Landholder stating they install nest boxes.

Landholders were asked to identify any other measures they were using to enhance wildlife habitat, they included:

- Wildlife corridors
- Fencing and protecting remnant vegetation, link corridors
- Control of feral and introduced species, eg poisoning bees and baiting foxes
- Maintenance of remnant vegetation. e.g. Covenant to maintain bush corridor
- Shooting corellas to give Carnaby's Black Cockatoo a chance.

Plague Events

Landholders were asked if they remembered any specific plague events and the years in which they took place (Figure 22). Locusts were the most common plague events, with 75% (44:59) of Landholders remembering some kind of locust plague. Over half also remembered mouse plagues.

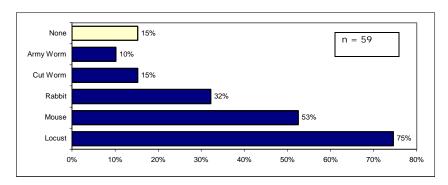


Figure 22: Percentage of Landholders who remembered plague events

Table 17 below details the decades in which Landholders remember the plague events occurring. Landholders report all of the plague events happening in recent years. Rabbit plagues have been occurring since the 1940's.

Table 17: Landholder recollection of decades when plague events took place

Plague Event	40's	50's	60's	70's	80's	90's	00's
Locust				Х	Х	Х	Х
Mouse		Х		Х	Х	Х	Х
Rabbit	Х	Х	Х	Х	Х	Х	
Cut Worm					Х	Х	Х
Army Worm				Х	Х	Х	Х

Other plague events mentioned include emu migrations in 1972/1973 and in 2002, kangaroos in 2003 and blowflies in 1973. Other plagues mentioned, but for which specific dates were not given, include web-worm, Diamond Back moths, cats and foxes.

3.7.4 Discussion

Landholders demonstrated a broad understanding of reasons for the changing status of plants and animals in the catchment. However, more than half of the Landholders surveyed considered their knowledge of plants and animals less than adequate. There were also inconsistencies in Landholder knowledge of plant and animal species that were once or still are present in the Catchment. This could be due to any number of reasons, such as variations across the catchment, or recency of Landholder occupation within the BMRC. Nonetheless, the information provides valuable qualitative base-line data for later comparison.

Key factors identified by Landholders as reasons for increasing and decreasing species of animals included loss of habitat, changing agricultural systems, seasonal fluctuations and feral animals. Fragmentation of habitat was not specifically identified as a reason for decreasing species of animals. Factors attributed to the decline or increase of plant species included clearing for agriculture, cropping and grazing, feral animals and problem native animals.

A number of animal species were recorded as both increasing and decreasing in numbers, such as the emu, fox, rabbit, wedge-tailed eagle and echidna. This is probably indicative of localised variations across the catchment.

All plague events were recorded as occurring in comparatively recent years, i.e. since the 1940's. Again, this may be a reflection of the age demographic surveyed. It may also relate to clearing for agriculture and the decline and/or changed distribution of natural predators.

Foxes, rabbits and kangaroos are the problem animals identified by Landholders as having the most significant economic and environmental impacts. However, if viewed collectively, rather than individually, it is obvious that Galahs and Corellas (both the Little Corella and Western Long-Billed Corella) are perceived as having a significant environmental impact. Time was identified as a major barrier to implementing measures to reduce threats from problem.

The organization and coordination of community baiting for foxes and rabbits is an area where Landholders acknowledge a need for support.

The plants that were perceived to be increasing were almost exclusively weeds, with the exception of some *Acacia* spp, *Melaleuca* spp, *Marianna brevifolia* (Bluebush) and other halophytes (salt loving plants) -all increasing in fenced off areas. The plants noted to be decreasing were largely identified as native species.

3.7.5 Recommendations

- Publicise CSIRO Sustainable Ecosystem's 'Landscape design for bird conservation in the Catchment' work to encourage understanding of the concepts of landscape design and on-ground works by Landholders to reconstruct and rehabilitate habitat. (HP, ST) (Section 3.7 – Plants and Animals)
- b. Encourage/facilitate research into solutions for reducing cockatoo damage to remnant vegetation and revegetation, and destruction of habitat for hollow-dependent wildlife (HP, LT) (Section 3.7 Plants and Animals)
- c. Encourage/facilitate the coordination of feral animal baiting programs (HP, LT) (Section 3.7 Plants and Animals)
- d. Facilitate the establishment of monitoring sites in the Catchment to quantify changes over time. (HP, LT) (Section 3.7 Plants and Animals)

3.8 Water

Eighty-three percent (49:59) of Landholders maintain rainfall records (n=59). The average lengths of time for which records have been kept is 38 years, and the longest period that any Landholder has been keeping records is 95 years (n=47). Some Landholders stated they record rainfall data for the Bureau of Meteorology. Landholders reported annual rainfalls between 250mm and 400mm, with an average of 333mm (n=46).

3.8.1 Monitoring Bore Holes

Forty-five percent (26:58) of Landholders have monitoring boreholes on their property (n= 58). Five Landholders report having taken some action as a result of data from the monitoring boreholes. These actions include graphing trends and keeping records, decisions associated with sowing, and planting sorghum and forage.

3.8.2 Farm Water Quality

Landholders were asked about the quality of their farm water supply, and how that quality might be changing (Table 18). As expected, many Landholders reported having different qualities of water on their property.

Division across water sample Quality Y/N # % # % points 83% ess than or equal to 50% 5 Yes 10% 1 17% More than 50% Improving No 52 90% Sample n = 58n=6

Table 18: Landholder reporting of farm water quality

Same	Yes	50	86%	Less than or equal to 50%	5	11%	
	162	50	00%	More than 50%	42	89%	
	No	8	14%				
Sample $n = 58$						n=47	
Declining	Yes	22	38%	Less than or equal to 50%	14	70%	
	res	22	30%	More than 50%	6	30%	
	No	o 36 62%					
Sample $n = 58$				n=20			
			•	·			

Eighty-six percent of Landholders reported farm water staying the same and, of these, 89% (42:47) report that most of their water (>50%) is not changing.

Thirty-eight percent of landholders (22:58) said they have water that is declining in quality, of these, 70% (14:20) report that this is happening to less than half of their water.

When asked about possible reasons for a decline in water quality, all but one of the Landholders attributed the decline to salinity. The remaining Landholder attributed the decline to a problem with drainage.

Ten percent of Landholders (6:58) report having some farm water that is improving, but in the majority of these cases (5:6), this is less than or equal to half of the water supply.

Landholders attributed improvements in the quality of their water to the wet season in 1999, a decline in salt, and increased rainfall.

3.8.3 Water Analysis

Sixty-nine percent (41:59) of Landholders have had their water analysed. The main reason for water analysis was to check if the water was usable, for domestic use on the property, livestock and/or crops. In these cases, the water was usually tested for salt content, acidity and chemical content. Others had more specific reasons for testing water, such as monitoring for reverse osmosis, for aquaculture (specifically the possibility of growing snapper) and for a water pipeline grant application.

3.8.4 Discussion

This section on water indicated that Landholders are collecting a large amount of information, such as rainfall data, groundwater depths and farm water quality, within the Catchment.

Eighty-three percent of Landholders maintain rainfall records, with the longest records covering 95 years. Just under half of Landholders surveyed had monitoring bores on their property. Most of these were installed by the Marchagee Catchment Group (MCG) or the Buntine-Marchagee Recovery Catchment (BMRC), and monitored by the MCG and CALM respectively.

The relative stability of water quality could be due to the use of sand plain seep water across large areas of the catchment, where high rates of water movement through the sand have prevented the build-up of significant quantities of salt.

Declining water quality in the Catchment is attributed to salinity. The decline of water quality is of great concern for the sustainability of animal production, particularly where livestock are grazing salt land pastures and access to fresh water is essential to offset salt being consumed in feed.

Where the data is anecdotal, it provides a valuable insight into perceived changes. In contrast, quantifiable data (from bore monitoring results) will be used as a baseline for future comparisons. Commitment to ongoing monitoring is therefore paramount in identifying trends in the Catchment's water quality, depth and depth rate of change.

3.8.5 Recommendations

- a. Encourage/facilitate quantifiable, standardised and centrally recorded water information within the Catchment (HP, LT) (Section 3.8 – Water)
- Encourage/facilitate integrated property water management plans within the Catchment, targeted at high priority biological assets (HP, ST) (Section 3.8 – Water)
- c. Provide information and education on integrated water resource management, through delivery of workshops, education packages and field days. (HP, ST) (Section 3.8 Water)

3.9 Proposed Works

This section focuses on the works that Landholders are planning in the future, such as revegetation, fencing and earthworks. Landholders were asked if they were planning any future works. If their plans were far enough advanced, they were asked to map their planned works.

Sixty-nine percent (41:59) of Landholders are planning some future revegetation on their property, with 21 of these Landholders able to indicate their plans on a map. Thirty-one Landholders have plans to fence remnant vegetation or revegetation areas on their property (n=57). Thirty-five Landholders are planning on implementing earthworks (n=58).

3.9.1 Discussion

Responses to questions in previous sections of the survey relating to remnant vegetation, and revegetation have revealed areas in which the Recovery Catchment could help Landholders plan future works. Essentially, Landholders need knowledge of and access to information sources (both people and publications) and practical onground help and support to implement plans.

3.9.2 Recommendations

- a. Encourage/facilitate Landholder access to natural resource management skills and services. (MP, LT) (Section 3.9 – Proposed Works)
- Identify where high priority biodiversity assets coincide with Landholder proposed works, and encourage/facilitate nature conservation works. (HP, ST) (Section 3.9 – Proposed Works)

3.10 Sources of Landcare Information

Landholders were asked to identify their sources of information on landcare (Figure 23). Books, magazines and newspapers are the most popular, with 69% (41:59) of Landholders reporting that they obtained information from these sources. Thirty-seven Landholders got information from field days and workshops, while 32 Landholders cited landcare groups as a source (n=59). A quarter of Landholders reported using CALM as an information source.

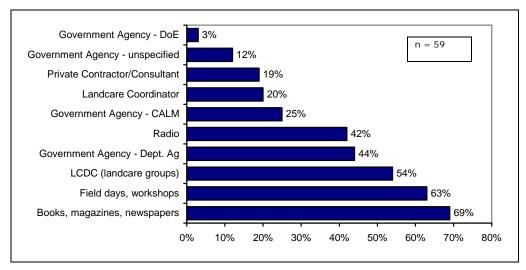


Figure 23: Percentage of Landholders who use current sources of landcare information

Landholders were asked to list all their other sources of information, and these sources included:

- a. Other farmers and friends
- b. Farming groups, including the Liebe group
- c. Previous experience
- d. Land for Wildlife magazine
- e. Overseas trips
- f. Site evaluations.

3.10.1 Preferred Sources

Landholders were then asked to rate their *preferred* sources of landcare information as opposed to the way they *currently* get information. Figure 24 details their choices.

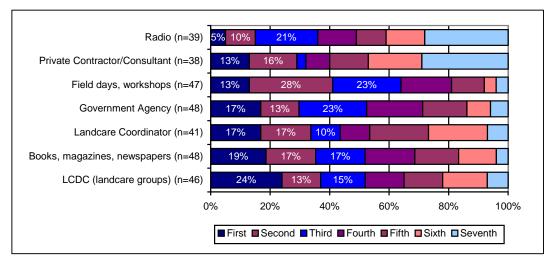


Figure 24: Landholder ranking of preferred sources of landcare information

The combination of the top three Landholder choices for receiving information, indicated that Landholders preferred to receive landcare information via field days, reading material, government agencies and landcare groups, respectively.

Radio and private contractors were the least preferred sources of information.

3.10.2 Discussion

Currently there are several groups that provide information via field days to Landholders in the Catchment, for example;

- Landcare groups such as LCDC's, the Marchagee Catchment Group, the Northern Central Mallee Fowl Group
- b. Production groups such as Liebe, Salt Graziers, Oil Mallee Company
- c. Organisations such as Moore Catchment Council, NACC (Northern Agricultural Catchments Council) or
- d. Agencies such as, CALM, Dept of Ag., DOE etc.

In fact, several Landholders commented that they did not have enough time to attend so many workshops. Landholders are more likely to attend a production-orientated field day than one focused on landcare or natural resource management.

Reading material was also highly regarded as a source of landcare information, presumably because it is easy to refer to and available at any time. This highlights the value of newsletters/literature, developed specifically for Landholders in the recovery catchment.

Government agencies also scored well on providing information. With further development of the BMRC Project, this perspective will hopefully be applied to CALM.

LCDC's within the Catchment are currently in recess or meeting infrequently, and it is unlikely that they could become the main source of landcare information without capacity-building support from Government Agencies and the natural resource management body NACC.

3.10.3 Recommendations

- a. Develop a communication plan for disseminating landcare and natural resource management information to Landholders within the Catchment (HP, ST) (Section 3.10 – Sources of Landcare Information)
- b. Encourage/facilitate improved Landholder access to information on biodiversity conservation. (MP, MT) (Section 3.10 Sources of Landcare Information)
- c. Encourage the reinvigoration of the local NRM group by providing the natural resource management body, NACC, with a summary of the relevant findings of this report (HP, ST) (Section 3.10 Sources of Landcare Information).

3.11 Funding for Landcare

Landholders were asked about their funding sources for landcare work (Figure 25). The word 'landcare' was used to encapsulate many different types of conservation activities.

While 98% (53:54) of Landholders reported funding their own works, 22% (12:54) still obtained funding from Natural Heritage Trust (NHT) schemes, including Envirofunds and the Marchagee Bushcare Project.

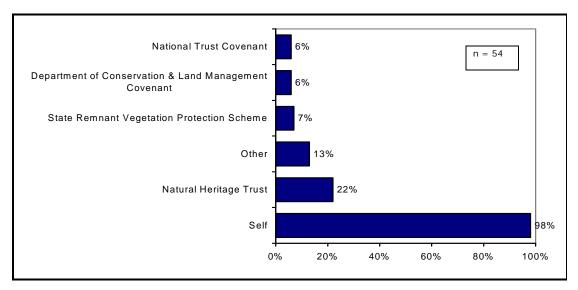


Figure 25: Landholder sources of landcare funding

Others sources of landcare funding mentioned by Landholders included:

- The Department of Agriculture;
- Calingiri Landcare Office;
- The owners of lease property;
- Landcare groups; and
- Alcoa.

Twenty-seven percent (15:56) of Landholders report having had problems with landcare funding bodies. The most frequently mentioned problems are restriction on what is funded and the complexity of the applications.

3.11.1 Discussion

While Landholders cited financial barriers as the key impediments to the implementation of conservation works, such as fencing of remnant vegetation and revegetation, most fund their own works rather than seek assistance from outside sources. Landholders have been reluctant to seek funding because funding applications are perceived to be complex and restrictive.

3.11.2 Recommendations

- a. Encourage/facilitate applications for natural resource management funding assistant within the Catchment (HP, ST) (Section 3.11 Funding for Landcare)
- b. Identify and promote landcare funding opportunities through the Catchment newsletter (HP, ST) (Section 3.11 Funding for Landcare)
- c. Encourage/facilitate fair and equitable incentives for conservation works, standardised across the Catchment/region, to improve protection of high priority biodiversity assets (HP, MT) (Section 3.11 Funding for Landcare)

3.12 Bush on Reserves

The purpose of this section was to gauge Landholder perceptions of nature reserves within the Catchment. Ninety-seven percent (57:59) of Landholders were aware there were nature reserves in the Catchment, and 95% (56:59) think that these reserves play an important part in conserving natural heritage.

3.12.1 Advantages

The main advantages that Landholders see in having reserves in the Recovery Catchment were;

- Aesthetics natural beauty
- As a breeding ground for birds
- Conservation of vegetation and biodiversity
 - 'Valuable to have an area that can be left undisturbed by any man made interference. One would hope that chemical overspray/drift can be avoided and so the area can be as native as possible.'
- Conservation of animals by giving them a natural habitat a refuge for animals
 - o 'Preserving plants and animals. Giving native animals a place to live.
 - Preserving rare plants & trees. Keeping the bush in an original state, for future generations & as a reference point for surrounding cleared areas of what originally grew there.'
- Conservation of native species in untouched habitat
 - 'Nature reserves are extremely valuable for the preservation of plants and animals in the region. Where possible they should be the basis for a system of corridors through the Catchment.'
- Good to have an area that shows what the bush would have been like without interference from farmers. A representation of the original plants and animals.
 - 'It shows the public what the landscape was like before settlement. Haven for native plants and animals'
- To propagate seeds, to see what species of plants are natural to the area
- Prevents farmers from clearing land
- Water management help water evaporation, and erosion help with water table and salinity

3.12.2 Disadvantages

The main disadvantages that Landholders see in having reserves in the Recovery Catchment were:

- Breeding ground for kangaroos, rabbits and vermin
 - o 'A breeding place for vermin.'
- Farmer provides all fencing and upkeep on fencing. Farmer provides all firebreaks
- They are fire hazards and when fires start in reserves they are difficult to control due to large amount of decomposing material
- Haven for weeds
- Lack of management with regard to fire and weeds

3.12.3 Suggested Changes

The main changes suggested by Landholders to improve reserve management within the Catchment involved CALM becoming more responsible for vermin and weed control, and fire prevention. Specifically, Landholders suggested:

- Improved control of feral animals, including consistent, co-ordinated baiting programs
- Increased control of problem weeds and improved management of roadside vegetation
- Improved fire management through increased fire breaks, regular prescribed burning and authorised access in fire situations
- Shared fencing

3.12.4 Fence Setback on Adjoining Road Reserves

Landholders were asked if, when renewing boundary fences adjoining road reserves, they would consider moving fences away from the reserve and revegetate within the enlarged road reserve.

Sixty-two percent (36:58) of Landholders indicated that they would be willing to consider fence setback and revegetation within that setback, when renewing boundary fences adjoining road reserves.

Figure 26 details how much Landholders are willing to allow a setback. Fifty-four percent (19:35) of those who are willing to consider setback would be willing to consider a setback of up to 5 metres. Over a third (12:35) would be willing to consider a setback of between 6 to 10 metres. Twelve percent (4:35) of Landholders would consider a setback of greater than 10 metres.

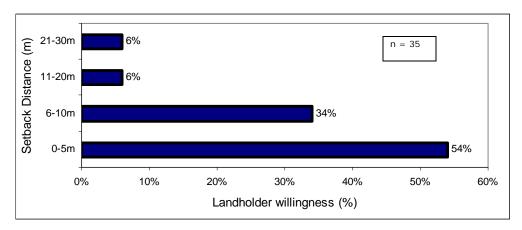


Figure 26: Landholder willingness to allow a fence setback, of various distances.

Comments

Landholders provided several comments when asked about how far they would consider a fence set back, they included;

- Many Landholders already have some form of setback. Many are willing to leave old fences in place and leave space between it and the new fence.
- Clearing should occur on road reserves near heavily vegetated areas for safety due to kangaroos and fire risks. Therefore would probably consider fence setback
 where there is little vegetation.
- Setback cuts into title size. Willing to help revegetate road reserves, but not on property.
- Possibly, if part of a funded program.
- Fence set back will not stop shire graders from encroaching into this area.
 Telecom have cables just inside most roadside boundaries knowing the farmer owners will take care of the cable. Shires do not have the same respect for this cable.
 - 'If you look at responsibilities for roads, Landholders are responsible for the shoulder to the fence. Therefore control of weeds and vermin becomes the responsibility of the Landholder. When you have a lot of fences along roadways, it then becomes a financial and time burden. Also, radish was initially spread from grain carted with no covering. It is hard to control weeds on road verges it is a Shire problem.'
- Potential problems with weed control and fire.
 - 'No because road reserves now are just weed collection points and fire risks. Not enough is being done to control these problems now'

- Only if there was a written commitment from the Coorow shire to remove all the
 excess material from the side of the road & if a new fence was installed at no cost.
- Particular sites have different needs. Each must be evaluated for a decision to be made.
- This was already done in 1960's-1970's re-fencing program.
- Would be willing to allow spraying buffers and windbreaks.

3.12.5 Discussion

The majority of Landholders recognised and appreciated the nature conservation and landscape values of nature reserves within the Catchment. However, when prompted to answer how many Reserves there were in the Catchment or their location, Landholders were unsure.

Concerns were raised in regard to the lack of management of feral animals and weeds in reserves, and their impact on adjoining farm land. Similarly, issues were identified in relation to the management of road reserves by Shire Councils, particularly in relation to weed control.

Management advice must be targeted at Landholders, as the majority of the 13% remnant vegetation within the Catchment is on private property, with less than 2% of the remnant vegetation in conservation reserves.

Over half of Landholders surveyed would consider fence setback adjoining road reserves. The long-term resilience of remnant vegetation within road reserves will be determined by their width and management practices undertaken within and adjacent to them. Fence setback and revegetation within the setback would increase their resilience in the long term and their value for wildlife, by providing linkages between remnant vegetation across the landscape.

3.12.6 Recommendations

- Promote awareness of Nature Reserves within and in close proximity to the Catchment, and promote their intrinsic value to Landholders (HP, MT) (Section 3.12 – Bush on Reserves)
- b. Encourage consistent feral animal control programs with groups (such as CALM, local government, landholders, NRM groups and catchment groups) keen to participate in long-term control over large areas (MP, LT) (Section 3.12 Bush on Reserves).
- c. Improve publicity of management activities for reserves in the BMRC through the Catchment News (HP, MT) (Section 3.12 Bush on Reserves).
- d. Investigate the preparation of Interim Management Guidelines (IMG's) for reserves in the BMRC (LP, LT) (Section 3.12 Bush on Reserves).
- f. Investigate the options of fence setbacks with Shire Councils (MP, MT) (Section 3.12 Bush on Reserves)

3.13 General

The purpose of this section was to gain a general understanding of the Landholders perceptions on various topics, including their opinion on various measures that might be used to encourage biodiversity conservation.

3.13.1 Biological Surveys

Seventy-two percent (39:54) of Landholders are interested in taking part in biological surveys (n=54).

3.13.2 Secondary Salinity

Landholders were asked to rate their knowledge of secondary salinity and the processes associated with its development on a scale of 1 to 5, where 1 is limited and 5 is extensive. The average rating was 2.8 out of a possible 5 (n=57).

3.13.3 Measures to Increase Biodiversity

This part of the survey explored Landholders reactions to possible measures for improving the adoption of biodiversity conservation. Landholders were asked to rate fourteen possible measures that might encourage biodiversity conservation and these measures are divided into seven market and seven non-market measures.

Market Measures

The following figure details Landholder rankings of various measures that could be used to increase biodiversity conservation (Figure 27). Landholders were offered 14 possible measures and asked to rank them from 1 to 14 by preference. Some Landholders ranked everything from 1 to 14 while others did not complete the sequence. For this reason there are different n=x for each measure.

As can be seen in Figure 27, tax incentives are by far the most preferred measure for improving the adoption of biodiversity conservation (61%, 30:49). Cost sharing incentives and rate concessions were also highly ranked.

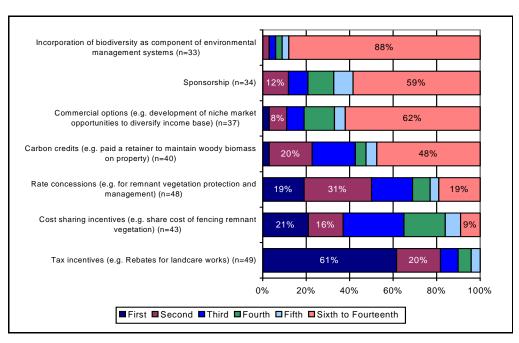


Figure 27: Landholder ranking of market incentive preferences

Commercial options, sponsorship, and the incorporation of biodiversity as a component of an environmental management system, were the least favoured market measures; ranked between 6th and 14th in preference.

Non - Market Measures

The non-market measures proved to be less popular than the market measures (Figure 28); very few Landholders rated any of the non-market measures as either a first or second choice. A local environmental/development officer to channel information and identify opportunities was the most favoured of the non-market measures, with 13% (5:39) of Landholders who ranked it, ranking it as either their first or second choice. Education and training was the next most favoured non-market measure with 10% of the 41 Landholder ranking it as a first or second choice.

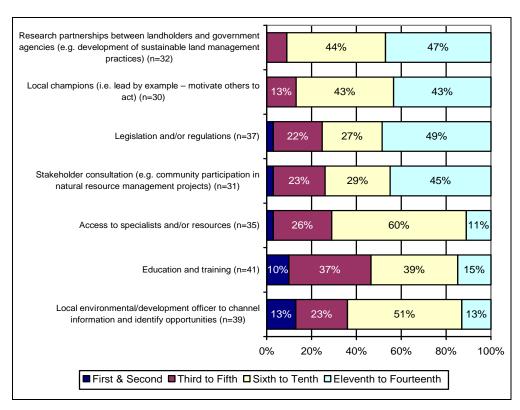


Figure 28: Landholder ranking of non-market incentive preferences

Many Landholders qualified their choices in the above charts and there was some discussion around the comments raised. The general feeling of Landholders was that, for them, any kind of financial (market) measure would be more beneficial for biodiversity conservation than non-market measures. Many Landholders made their rating choices based on this belief, either rating all of the financial (market) options before the non-financial (non-market) options, or only rated the financial options.

There was some discussion about the individual measures, specifically,

- It was felt that some of the options could be considered, but only if certain circumstances applied.
- Advice from specialists is always welcome, particularly from hydrologists. i.e. give advice as to where to plant, eg. valley floor or mid-slope.

- Some Landholders distrust the efficiency of government agencies as personnel are constantly changing and information is not traded between departments. They believe that too much money is being spent on studies from which there are no results or follow through actions.
- Local management action would be preferred over state interference, as a local management body can take specific circumstances into account.
- It was believed by some Landholders that rates concessions would not work, as the money would just be taken from somewhere else.
- Landholders were sceptical about carbon credits and did not believe that companies could be found to take part. There was also a view that those who pollute should be punished and not allowed to compensate by paying for carbon credits.
- Sponsorship was agreed to be a good idea in theory but Landholders did not believe that sponsors could be found.
- Local champions were thought to be a good idea.
- Landholders believe that the farming sector is over regulated and legislated and do not believe that more legislation would have any benefit.

3.13.4 Sustainability and Viability of Farming

Landholders were invited to give their views on the sustainability and viability of farming in the short and long term.

Threats - On Farm

The key on-farm threat identified by Landholders was the over riding problem of salinity. The current market for farm exports and the problem of declining farm incomes was also discussed as being a particular threat. Other problems specific to the land include increased resistance of weeds to herbicides, increased soil acidification and problems with the climate. Landholders also report having difficulty finding skilled people willing to work on the land.

Solutions - On Farm

Landholders were then asked how they believed these threats could be countered. Possible solutions mentioned were:

- a. Better farm management
- **b.** Use of expert advice
- **c.** Continued conservation work
- **d.** Continued liming
- e. Better drainage to prevent salinity
- **f.** Use of deep-rooted pasture species
- g. Control of water table and wind erosion by using earth works and drains
- Details of geological structure below surface being made available to farmers for free
- i. Not using chemically resistant crops
- j. Chaff cart to stop weeds regrowing
- k. Pumping water
- Raised beds, growing wild flowers on poor soils
- m. Revegetation

- Remaining educated and trying to be forward thinking to prevent problems getting out of control
- **o.** More information
- p. Less government & trade union control.
- **q.** Water rights rainfall should belong to the land it falls on.
- **r.** Family law act
- s. Gene patentability

- t. Increased knowledge of climate (better forecasting)
- **u.** Improved pastures (eg saltbush)
- v. Productive use of saline land
- w. Trial plots
- x. Less cropping
- y. More research into sustainable practices and an overall approach to soil degradation
- **z.** More money to input into farming.

Threats - Off Farm

The main off farm threats were thought to be:

- a. World market and world prices moving in unfavourable directions from the point of view of Australian farmers
- **b.** The fluctuations of the Australian dollar against other currencies
- **c.** Increases in world commodity prices
- **d.** Capital costs of farming are increasing
- **e.** Government regulation are making farming more difficult
- **f.** World trade agreements. Poor terms of trade.

- **g.** Green movement creating issues with little understanding of agriculture
- h. Introduced pests
- i. Shrinking markets
- j. Demand for quality assurance
- **k.** Water rights will create problems for farming
- I. Loss of single desk.
- m. Local community getting smaller
- n. Paperwork
- o. Politicians
- p. The continuous decline in the terms of trade for agricultural products. The lack of free trade for agricultural products overseas.

Solutions - Off Farm

Solutions suggested to off-farm problems included:

- **a.** 150% tax rebate on approved environmental works
- **b.** Be very wary of trade agreements with the USA
- c. Better education
- **d.** More scientific research in the development of disease resistant crops
- Decentralisation of Government departments and other infrastructure
- f. Improved marketing strategies
- **g.** Become a price maker rather than price taker

- h. Index tax brackets. Scrap goods and services tax & capital gains tax.
- i. Keep single marketing desk
- j. Less bureaucracy, and more understanding and consultation
- k. Lobby governments etc
- I. Minimise regulations
- m. More input from farming bodies
- **n.** Tighter restrictions on border crossings (i.e. Customs).

3.13.5 Vision for Future

Landholders were asked about their vision for the future and how they would like to see their property in 10-20 years. Main themes emerged from Landholders, with visions such as healthy and productive farmland, and to have successfully found a way of dealing with salinity. Most Landholders want to have improved their land in some way, whether this be through better conservation of wildlife, improvements in production or improvements in the aesthetic appeal of the farm.

3.13.6 Discussion

Financial incentives were perceived to be fundamental to encouraging investment in biodiversity conservation. Tax incentives were reportedly the most preferred financial incentives for improving the adoption of biodiversity conservation.

Non-market measures proved far less popular, with very few Landholders rating them. A local environmental/development officer to channel information and identify opportunities was the most favoured of the non-market measures.

Landholders identified the broader issues that will influence their future in farming as climate change, the global economy and associated declining terms of trade for agriculture and government policy - all issues over which they can have little influence.

There was general consensus that salinity poses the greatest threat to on-farm sustainability. Landholders acknowledged that there is much more to learn, in partnership with researchers, about the processes associated with the development and management of salinity. .

3.13.7 Recommendations

It is recommended that the BMRC Recovery Team;

- a. Further investigate the viability of measures for improving the adoption of biodiversity conservation (outlined in Figure 27) within the BMRC. (HP, LT) (Section 3.13 – General)
- b. Further investigate the barriers to and requirements for adoption of non-market measures for improving biodiversity conservation (outlined in Figure 28). With particular focus on having a local environmental/development officer to channel information and identify opportunities, and on education and training. (HP, LT) (Section 3.13 General).

3.14 The Recovery Catchment

The purpose of this section was to firstly find out how many Landholders were aware of the Recovery Catchment Project and what they thought about it, and secondly to gauge the effectiveness of the Catchment newsletter in disseminating information about Catchment projects.

Ninety-one percent (54:59) of those interviewed had heard of the Buntine-Marchagee Recovery Catchment prior to the interview. Generally Landholders thought that the Recovery Catchment was a good idea, but were waiting to see what results would be forthcoming.

To date, Landholders have appreciated the feedback they have received and the results they have seen. Landholders noted some positive aspects of having the Recovery Catchment, such as getting the community to work together and address their common problems. Landholders noted that the project would succeed if farmers work together, and if there is continuity in the plans and strategies put forward for the long-term management of the Catchment.

There are concerns about the project administration being a little distant (Geraldton based) compared to the Bushcare project which had a locally based co-ordinator. One Landholder would like to see the Catchment Group establishing closer relations with the Liebe Group. Another Landholder would like the Catchment boundary to follow property boundaries. In this way, all of a Landholders' property would be included.

3.14.1 Buntine-Marchagee Catchment News

The Buntine-Marchagee Catchment News is a quarterly newsletter, distributed to Landholders, community groups and other stakeholders within the BMRC. The newsletter provides updates on the progress of the Recovery Catchment Project, and other relevant Catchment information. Eighty-three percent (49:59) of Landholders stated they had received the Catchment newsletter (Catchment News).

Thoughts on Content

The majority of comments on the newsletter were favourable, and most Landholders acknowledged that it was a good idea to have a publication that was intended for the Catchment. Aside from the content of the newsletter, the very fact of its existence was encouraging for Landholders.

The main thoughts of Landholders on the content are summarised in the following points:

- A lot of information.
- Well presented
- Concise, informative, not too much fact, short and to the point
- Informs Landholders about the existence of the Recovery Catchment
- Effective information on key plant and animal species
- Good to have a newsletter. May not be very relevant but keeps people informed
- Keeps Landholders in touch with what is happening.

Suggestion for future issues of the newsletter were given by Landholders, these included:

- Continue to keep articles short and to the point
- More interesting snippets from plant, bird, wetland, surveys
- Information on control and remedies of salinity. New ideas on salinity
- Local case studies, innovative ideas. i.e. local people doing innovative stuff
- Make available via email
- Point out funding availability outside of catchment project and include application forms
- Keep Landholders informed about what is happening in the project
- Needs to be livelier, include active reminders and report on local things
- Water grants notification.

3.14.2 Discussion

Landholders are tending to adopt a 'wait and see' approach to the Recovery Catchment Project because, too often in the past, projects have been of short duration and had little to show in the way of tangible results. They also felt that a locally based Catchment co-ordinator would raise the profile of the project.

More than 60% of Landholders within the Catchment confirmed their receipt of the Catchment newsletter. The majority of Landholders felt the newsletter was a worthwhile investment and that it provided a good conduit of information on Recovery Catchment activities and conservation related issues for Landholders.

3.14.3 Recommendations

It is recommended that the BMRC Recovery Team;

- a. Promote awareness of management actions targeted at land degradation issues within the Catchment (HP, ST) (Section 3.14 – Recovery Catchment)
- Distribute Catchment news to all Landholders within the Catchment (HP, ST) (Section 3.14 – Recovery Catchment)

4. Management Implications

This survey provided valuable insights into how Buntine-Marchagee Landholders view the natural biodiversity assets within the Catchment, and what they perceive to be the threats affecting these assets. It also provided information on land management actions employed by Landholders to address degradation issues. This information will assist CALM and the project's Steering Committee with assessing, planning, predicting and evaluating the success of the Recovery Catchment Project over-time.

The Catchment was first cleared for farming about a century ago, and since that time about 87% of the original vegetation has been cleared. Of the remaining 13% of remnant vegetation, 73% is privately owned, with less than 12% in department managed conservation reserves and 16% under other land tenure (eg. Crown land). Private Landholders make up the majority of land users within the Catchment. Implicit in this statement is the fact that Landholders are the chief protectors of biodiversity assets within the Catchment, i.e. Landholders own the majority of land (94%) and remnant vegetation (72% of remaining13%).

Some Landholders are conserving, protecting and managing their biodiversity assets, however, from consultation with Landholders it was found that less than 1% of the Catchment is protected under a covenant agreement. Native vegetation protection covenants offer assistance with costs, establishment guidelines and conditions for management. Poor uptake of covenants was attributed to a lack of understanding of the types of agreements available and their advantages, as well as the fear some Landholders have that they will place restrictions on land use and could be a disadvantage when selling land.

The Catchment demographic was slightly weighted towards younger families, although there is still an even spread of age groups. The majority of the farms are family run businesses, with property passing from generation to generation. While some properties will eventually pass out of family hands, it is likely that most properties in the Catchment will continue to be run by people who are currently in the Catchment.

More than 75% of the Catchment was identified as arable land, with the main landuse being cereal cropping. Stock numbers were slightly higher than expected, given the trend in recent years towards reducing stock numbers due to higher wheat prices. This survey found that 86% of Landholders keep livestock, of which 98% stock sheep and 16% report having cattle.

Of the arable land, less than 0.4% was planted to perennials; hence farming systems within the Catchment would be classed as low water-use systems. Improving water utilisation across the Catchment is paramount to reducing the impact of secondary salinity on valley systems.

Catchment groups have provided Landholders with the opportunity to collectively contribute to defining and implementing solutions to their land degradation problems. Unfortunately, survey findings indicate there has been a high degree of 'burn out' amongst members, particularly of groups that have been established the longest.

Nonetheless, <u>Integrated Catchment Planning</u> will require working with communities to address landscape problems. By targeting established Catchment groups there are already networks set up to exchange information. Landholders are also used to working together and these groups usually have resources and expertise they can provide.

Salinity was identified as the biggest threat to agricultural production, but if you consider the area of land reported, soil acidification was affecting a much larger percentage of the Catchment. This highlights the complexity of the salinity problem. Landholders often underestimate the area affected as little is known about the extent of primary (natural) salinity versus secondary (post-clearing) salinity. On the other hand Landholders were more aware of naturally occurring acid soils or areas that had become acidic due to agricultural practices.

Landholders were found to be managing salinity in two main ways, with earthworks such as banks and drains, or through fencing-off and revegetating seepage areas. Many Landholders gave a clear indication that they intended on constructing more banks and drains in the future. This emphasises a strong need for Integrated Catchment Planning, to avoid the adverse impacts of water transferring to adjoining land, whether productive farmland or remnant vegetation.

There are several groundwater observation bores across the Catchment, monitored by numerous individual Landholders. However, there is currently no central repository for this information. CALM plans to incorporate this information into its network of piezometers and observation bores, which are monitored regularly and stored within the Department of Agriculture's bore database. This information will provide a base for future monitoring, and assist development of management options to address secondary salinity within the Catchment.

Landholders considered remnant vegetation to be an important component of farming systems, with aesthetic considerations rated the highest. Landholders considered seed resources of remnant vegetation least important. This is interesting, as farmers understand the importance of genetic resources in plant and animal breeding for agriculture, but they did not consider or understand that the genetic diversity found in remnant vegetation was just as important.

Landholders reported that unfenced remnant vegetation was more likely to be declining than fenced remnant vegetation, and this could be mainly attributed to the adverse impact of stock. Yet there were very few Landholders who reported monitoring the condition of remnant vegetation, therefore, subtle changes are likely to have gone unnoticed.

From the Survey and SWM Project only 2,472 hectares of land within the Catchment was identified as revegetation, and the average area of revegetated sites approximately 6 hectares. The main reason Landholders gave for implementing revegetation sites was to increase water use for salinity management.

Revegetated areas were mainly planted with *Eucalyptus camaldulensis* (River Red Gum), *Eucalyptus loxophleba* (York Gum) and *Eucalyptus sargentii* (Salt River Gum). The popularity of these species may be due to recommendations from past research trials on certain tree species. However, more recently there has been an increase in the awareness of the advantages of using local provenance seed from a variety of tree and understorey species.

Species belonging to the Myrtaceae Family have been used more widely in revegetated areas. Only two species belonging to the Proteaceae Family were used in revegetation; *Banksia prionotes* and *Hakea coriacea*. While collection of seed from some of the species belonging to the Proteaceae Family is relatively easy, there are plants that flower and disperse seed at variable times, such as species of *Grevillea*, that make cost-effective seed collection difficult. There is considerable diversity of *Grevillea* spp in the Catchment and its inclusion in revegetation projects would add to diversity and increase value of native habitat.

Landholders showed an understanding of reasons for the changing status of plants and animals in the Catchment; however, there were inconsistencies in Landholders knowledge of past and present plant and animal species in the Catchment. This could be due to any number of factors, such as physical variations across the catchment or due to the Landholders self-professed lack of knowledge of native plants and animals within the Catchment.

Factors identified by Landholders for the decline or increase of plants and animals included; loss of habitat, changing agricultural systems, seasonal fluctuations and feral and problem native animals. Foxes, rabbits and kangaroos were identified by Landholders as having the most significant environmental impacts. However, if viewed collectively, rather than individually, Galahs and Corellas (both the Little Corella and Western Long-Billed Corella) were also perceived as having significant environmental impact.

Time was identified as the major barrier to implementing works to reduce threats from problem animals. Landholders also expressed a need for support in organising and coordinating community Catchment baiting programs.

Plants perceived to be increasing were almost exclusively weeds and halophytes (salt loving plants), while those observed to be decreasing were largely native species. Weeds were reported as a significant environmental issue, and Landholders felt an integrated approach to the control of weeds within the Catchment was needed.

Information from Landholders has provided a valuable insight into perceived water quality and trend changes. The majority of Landholders reported that water quality has remained relatively stable over time. This result may reflect the soil types and the location from which the water is sourced. In the cases where water quality was reported to have declined, salinity was thought to be the main cause. Water quality data collected by some of the Landholders will be useful for quantifying changes to water quality over time. A commitment by the BMRC Recovery Team and Landholders for ongoing monitoring is therefore paramount for effective quantitative assessment of the success of management actions.

Landholders gave a clear indication that they prefer to receive landcare information via field days, Government agencies and landcare groups. There are currently several Landcare and production groups that provide information to Landholders via field days. These established groups could be further involved in the BMRC project, to facilitate information exchange, coordinate activities, share resources and expertise, and plan integrated catchment works. Reading material was also highly regarded as a source of landcare information. Landholders acknowledged the value of literature aimed at Landholders within the Catchment, with many commenting on the benefits of the Catchment newsletter (Buntine-Marchagee Catchment News).

Landholders cited financial barriers as the key impediment to the implementation of conservation works, such as fencing of remnant vegetation and revegetation. However, most still fund their own works rather than seek assistance from outside sources. Landholders have been reluctant to seek funding because funding applications are perceived to be complex and restrictive. The most likely amounts to be invested in conservation works were sums of \$3,000 or less.

The majority of Landholders recognise and appreciate the nature conservation and landscape values of Nature Reserves within the Catchment. Concerns were raised in regard to the lack of management by CALM of feral animals and weeds in reserves, and their impact on adjoining farmland. Similarly, Landholders identified issues in relation to Shire Council management of road reserves, particularly in relation to weed control. Nonetheless, 72% of the 13% remnant vegetation within the Catchment is on private property; therefore, nature conservation actions must be targeted at the biggest land users - the Landholders.

Fence setbacks were put forward as an alternative option to Landholders for protecting remnant vegetation. More than half those surveyed said they would consider fence setbacks adjoining road reserves, however, most indicated it would be less than 10 meters. The longevity of remnant vegetation within road reserves is be influenced by the width and management practices undertaken within and adjacent to the reserves. Fence setback and revegetation within the setback would improve the robustness of the vegetation, and improve wildlife corridors and linkages between remnant vegetation patches across the landscape.

Given the limited availability of money for conservation works, funds must be directed towards priority biodiversity assets. This will be achieved through preparation of the Recovery Catchment Plan that will identify priority biodiversity assets, to enable development of incentive programs for conservation works on key areas.

Market measures were thought by Landholders to offer the best chance at improving the adoption of biodiversity conservation, such as tax incentives and rate relief. Non-market measures on the other hand proved far less popular. The most favoured of the non-market measures was the establishment of a locally based environmental/development officer to channel information and identify opportunities.

This survey identified that there was a general consensus that salinity posed the greatest threat to the environment, and Landholders acknowledged that there was much to learn. However, Landholders were tentative about the Recovery Catchment Project because, too often in the past, projects have been of short duration and had little to show in the way of tangible results. Adoption of biodiversity conservation clearly requires extensive interaction and consultation between stakeholder groups, as well as ongoing commitment to the project by the BMRC Recovery Team, Landholders, and Landcare and community groups.

4.1 Conclusion

In conclusion, the Landholder Survey has provided a 'snap shot' of the Catchment, its community and agricultural systems. It provided an opportunity for the Department to increase awareness of the Recovery Catchment Project, and to establish a rapport with the Catchment community.

The survey provided first hand knowledge of the land degradation issues facing Landholders, and the remedial works they have employed. It has also given the Department an understanding of Landholder priorities in relation to land management, and their motivations and barriers in undertaking certain works.

The Landholder survey will assist CALM and the project's Steering Committee with assessing, planning, predicting and evaluating the success of the Recovery Catchment Project over-time.

5. Future Research

Overall this survey met all of its aims and objectives. A sizeable amount of baseline data has been collected and analysed, and this will greatly assist the Department and the projects Steering Committee in planning, predicting and evaluating the success of the Recovery Catchment Project over-time.

The depth and breath of the information gathered was greater than would normally be achieved in a Landholder Survey, and this was mainly a result of the time and care taken with the survey design and the mapping component. The survey has resulted in several outputs in terms of information, data, opinions and maps.

Over the coming years the BMRC Recovery Team will undoubtedly introduce and follow through on a broad range of initiatives. This means that the information collected here will be able to be used by the Recovery Team to evaluate the effectiveness of the project.

5.1 Recommendations

- Evaluate the success of Recovery Catchment initiatives (HP, LT) (Chapter 5 -Future Research).
- Future surveys to be focused on specific issues. (MP, LT) (Chapter 5 Future Research)
- c. Provide more supervision of future survey staff to reduce the variation in responses. (MP, LT) (Chapter 5 Future Research)
- d. Evaluate the effectiveness of the Recovery Catchment project by conducting a five year review of the Landholder Survey (MP, LT) (Chapter 5 – Future Research)

6. Recommendations

Listed from high priority, short term actions to lower priority and longer term actions.

- **HP** High priority recommendations to be implemented within the next 1-5 years
- **MP** Medium priority recommendations to be implemented within the next 6-10 years.
- LP Low priority recommendations to be implemented beyond the next 10 years
- **ST** Short term recommendations to be implemented over a 1-5-year period.
- MT Medium term recommendations to be implemented over a 6-10-year period.
- LT Long term-recommendations to be implemented over more than a 10-year period.

It is recommended that the BMRC Recovery Team;

6.1 High Priority - recommendations to be implemented within next 1-5 years

Short Term

- a. Increase awareness of the types of covenant schemes available, and the advantages of having land under a covenant. (HP, ST) (Section 3.1 Property Details)
- b. Increase awareness of voluntary non-binding programs that recognise and support Landholders who, while not wishing to establish legally binding covenants on their land title, wish to manage some of their land for biodiversity conservation. (HP, ST) (Section 3.1 Property Details).
- c. Encourage/facilitate the education of community members, with a particular focus on families and school children, on the BMRC project, covering the values, threats and management options for plants and animals within the Catchment. (HP, ST) (Section 3.2 Social Structure).
- d. Target established landcare groups, including those currently 'in recess', to facilitate information exchange, coordinate activities, share resources and expertise, and Catchment planning. (HP, ST) (Section 3.2 Social Structure)
- e. Facilitate monitoring of landscape condition, particularly where rehabilitation of saline land is implemented (HP, ST) (Section 3.4 Farm Management)
- f. Facilitate Integrated Catchment Planning within the Catchment (HP, ST) (Section 3.4 Farm Management
- g. Encourage/facilitate the coordination of an integrated approach to the control of weeds within the Catchment (HP, ST) (Section 3.5 Remnant Vegetation)

Short Term (High Priority)

- h. Promote incentive programs that are currently operating in Western Australia and are available to private Landholders who want to conserve biodiversity on their property. (HP, ST) (Section 3.5 Remnant Vegetation)
- i. Facilitate interactive plant and animal surveys and field days within the Catchment; to raise awareness of biodiversity and allow Landholders the opportunity to work with researchers on their properties. (HP, ST) (Section 3.5 Remnant Vegetation)
- j. Educate Landholders and local NRM groups as to the value of diversity in revegetation plantings, to improve value as wildlife habitat. (HP, ST) (Section 3.6 Revegetation)
- k. Prepare guidelines for planning and implementing revegetation projects on farms i.e. matching plants to soils, identifying plants, bird associations. (HP, ST) (Section 3.6 Revegetation)
- I. Publicise CSIRO Sustainable Ecosystem's 'Landscape design for bird conservation in the Catchment' work to encourage understanding of the concepts of landscape design and on-ground works by Landholders to reconstruct and rehabilitate habitat. (HP, ST) (Section 3.7 Plants and Animals)
- m. Provide information and education on integrated water resource management, through delivery of workshops, education packages and field days. (HP, ST) (Section 3.8 Water)
- n. Encourage/facilitate integrated property water management plans within the Catchment, targeted at high priority biological assets (HP, LT) (Section 3.8 Water)
- o. Identify where high priority biodiversity assets coincide with Landholders proposed works, and encourage/facilitate nature conservation works. (HP, ST) (Section 3.9 Proposed Works)
- p. Develop a communication plan for disseminating landcare and natural resource management information to Landholders within the Catchment (HP, ST) (Section 3.10 Sources of Landcare Information)
- q. Encourage the reinvigoration of the local NRM group by providing the natural resource management body, NACC, with a summary of the relevant findings of this report (HP, ST) (Section 10 Sources of Landcare Information).
- r. Encourage/facilitate applications for natural resource management funding assistance within the Catchment (HP, ST) (Section 3.11 Funding for Landcare)
- s. Identify and promote landcare funding opportunities through the Catchment newsletter (HP, ST) (Section 3.11 Funding for Landcare)
- t. Promote awareness of management actions targeted at land degradation issues within the Catchment (HP, ST) (Section 3.14 Recovery Catchment)
- u. Distribute Catchment news to all Landholders within the Catchment (HP, ST) (Section 3.14 Recovery Catchment)

Medium Term (High Priority)

- a. Encourage/facilitate fair and equitable incentives for conservation works, standardised across the Catchment/region, to improve protection of high priority biodiversity assets (HP, MT) (Section 3.11 Funding for Landcare)
- b. Promote awareness of Nature Reserves within and in close proximity to the Catchment, and promote their intrinsic value to Landholders (HP, MT) (Section 3.12 Bush on Reserves)
- c. Improve publicity of management activities in the BMRC through the Catchment News (HP,MT) (Section 3.12 Bush on Reserves)

Long Term (High Priority)

- a. Promote the adoption and increase the area of land protected under legally-binding covenants within the Catchment. (HP, LT) (Section 3.1 Property Details)
- b. Facilitate research and development into profitable perennial species, to increase water uptake of farming systems in the Catchment. This includes supporting current research projects being conducted within the Catchment by CALM, Oil Mallee Company, CSIRO, Agricultural Department, and UWA. (HP, LT) (Section 3.3 Farming Systems)
- c. Increase strategic high water use plantings develop revegetation programs aimed at increasing the amount of water being utilised. (HP, LT) (Section 3.3 Farming Systems)
- d. Encourage/facilitate fencing to protect remnant vegetation and revegetation, from stock (HP, LT) (Section 3.3 Farming Systems)
- e. Facilitate research and development into native plant species for salt land revegetation and productive use, and rehabilitation of saline land (HP, LT) (Section 3.4 Farm Management)
- f. Continue monitoring the groundwater table to quantify salinity risk within the Catchment (HP, LT) (Section 3.4 Farm Management)
- g. Prepare a remnant vegetation protection and revegetation plan, aimed at protecting high priority biodiversity assets within the Catchment (HP, LT) (Section 3.5 Remnant Vegetation)
- h. Offer incentives (eg. cost sharing) and assistance to Landholders within the Catchment, to encourage/facilitate protection and expansion of remnant vegetation and high-priority biodiversity assets (HP, LT) (Section 3.5 Remnant Vegetation)
- i. Promote results from research into water use of revegetation planting configurations. (HP, LT) (Section 3.6 Revegetation).
- j. Encourage/facilitate research into solutions for reducing cockatoo damage to remnant vegetation and revegetation, and destruction of habitat for hollow-dependent wildlife (HP, LT) (Section 3.7 Plants and Animals).
- k. Encourage/facilitate the coordination of feral animal baiting programs. (HP, LT) (Section 3.7 Plants and Animals)

Long Term (High Priority)

- I. Facilitate the establishment of monitoring sites in the Catchment to quantify changes over time. (HP, LT) (Section 3.7 Plants and Animals)
- m. Encourage/facilitate quantifiable, standardised and centrally recorded water information within the Catchment (HP, LT) (Section 3.8 Water)
- n. Further investigate the viability of measures for improving the adoption of biodiversity conservation (outlined in Figure 27) within the BMRC. (HP, LT) (Section 3.13 General)
- o. Further investigate the barriers to and requirements for adoption of non-market measures for improving biodiversity conservation (outlined in Figure 28). With particular focus on having a local environmental/development officer to channel information and identify opportunities, and on education and training. (HP, LT) (Section 3.13 General).
- p. Evaluate the success of Recovery Catchment initiatives (HP, LT) (Chapter 5 Future Research).

6.2 Medium Priority - recommendations to be implemented within next 6-10 years.

Short Term (Medium Priority)

a. Educate Landholders of the processes involved in seed collection and propagation techniques. (MP, ST) (Section 3.6 – Revegetation)

Medium Term (Medium Priority)

- b. Develop and implement a follow-up program for farmers already involved in remnant protection schemes, such as covenant, to determine their success. (MP, MT) (Section 3.1 Property Details)
- c. Encourage/facilitate improved Landholder access to information on biodiversity conservation. (MP, MT) (Section 3.10 Sources of Landcare Information)
- d. Investigate the options of fence setbacks with Shire Councils (MP, MT) (Section 3.12 Bush on Reserves)

Long Term (Medium Priority)

- e. Encourage local nurseries to trial growing new species for revegetation and/or those perceived to be difficult to propagate (MP, LT) (Section 3.6 Revegetation)
- f. Encourage/facilitate Landholder access to natural resource management skills and services. (MP, LT) (Section 3.9 Proposed Works)

Long Term (Medium Priority)

- g. Encourage consistent feral animal control programs with groups (such as CALM, local government, Landholders, NRM groups and Catchment groups) keen to participate in long-term control over large areas. (MP, LT) (Section 3.12 Bush on Reserves).
- h. Provide more supervision of survey staff to reduce the variation in responses. (MP, LT) (Chapter 5 Future Research)
- i. Evaluate the effectiveness of the Recovery Catchment project by conducting a five year review of the Landholder Survey (MP, LT) (Chapter 5 Future Research)
- j. Future surveys to be focused on specific issues. (MP, LT) (Chapter 5 Future Research)

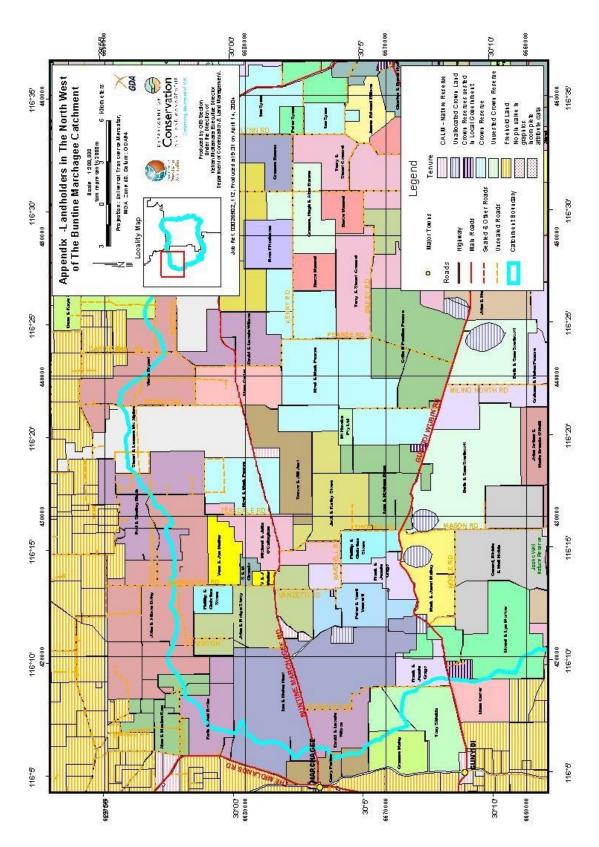
5.1.3 Low Priority-recommendations to be implemented beyond the next 10 years

Long Term (Low Priority)

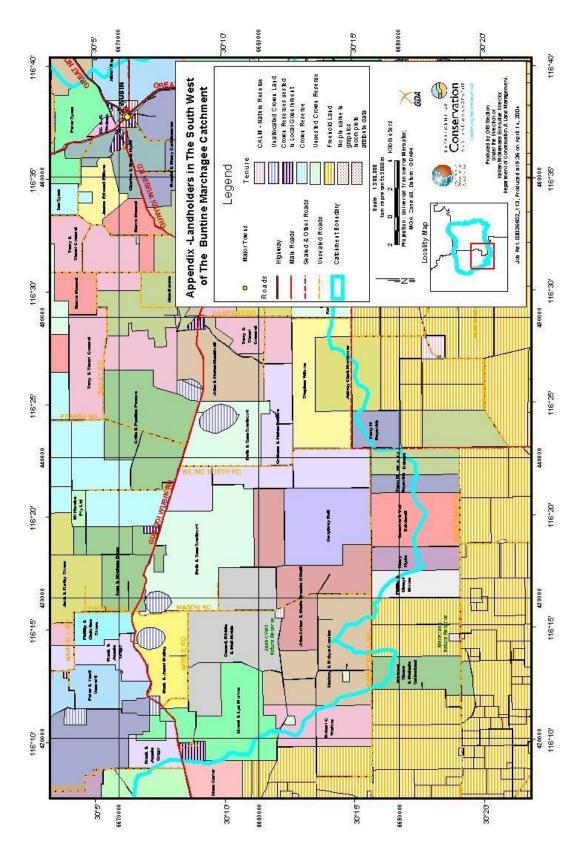
a. Investigate the preparation of Interim Management Guidelines (IMG's) for reserves in the BMRC (LP, LT) (Section 3.12 – Bush on Reserves).

7. Appendices

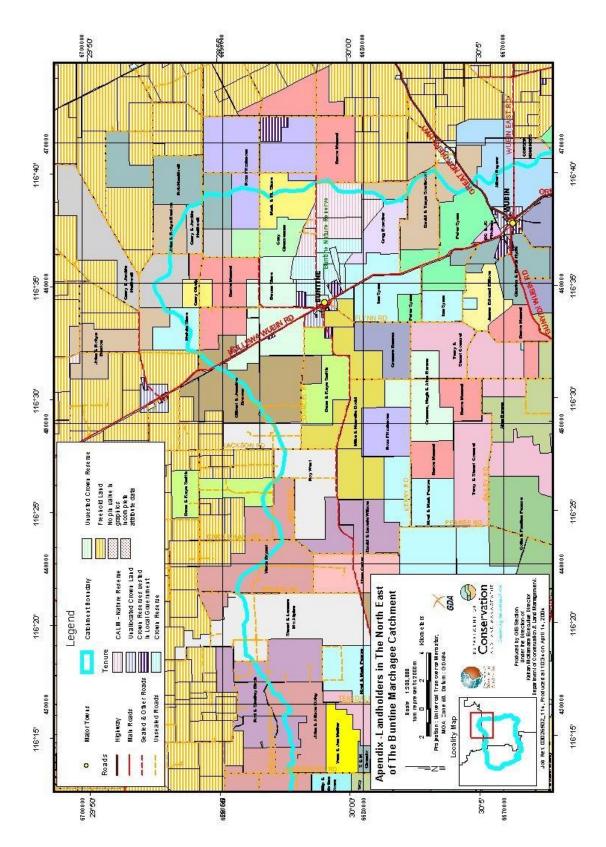
Appendix 1: Landholders and their property boundaries



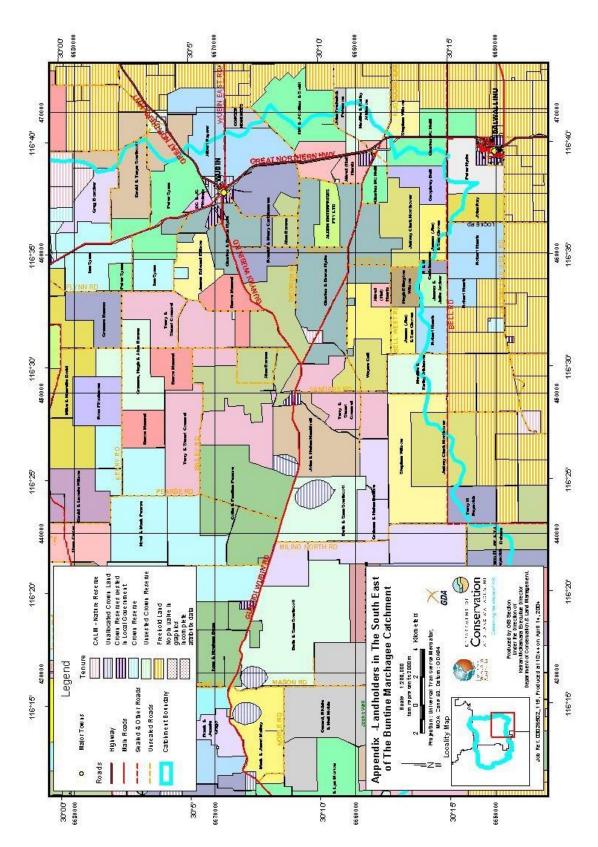
Appendix 2: Landholders and their property boundaries



Appendix 3: Landholders and their property boundaries



Appendix 4: Landholders and their property boundaries



Appendix 5: Questionnaire



Landholder Survey

	ec No.:
Indicates the interviewer will be required to map this information onto base maps pr Note: all questions relate to your entire property, not just the amount of property th Marchagee catchment boundary.	
Name: Ge	ender: M / F
What is your association with this property? Owner/Manager/Lessee	
How long have you owned and/or managed or leased this location?	
Do you live on site? Yes/No	
Company Name:Property Name:	
Postal Address:	
Phone: Fax:	
Mobile:UHF channel:	
Email:	
Do you have a farm plan we could refer to in this interview?	es/No
SECTION 1: PROPERTY DETAILS	
1. Is the boundary on the map correct Yes/No (If no, plea	ise map)
2. In what year was the land cleared? (eg 1978, if not known specify decade e.g. late 7	70's):
3. Please estimate the percentage of your property that is affected by secondary salin (Secondary salinity - i.e. salinity that has developed due to water tables rising because of	_
4a. Do you have any land under covenant? Please specify area in hectares. Yes/N	Noha

mnant Vegetation Protec	tion Scheme, etc.)?		

SECTION 2: SOCIAL STRUCTURE

<10yrs 10-20yrs 21-30yrs 31-40yrs	51-60 ₂ > 60y	yrs yrs rs tee	-			
-	or anyone else on the proving table.	operty a mer	mber of a lai	ndcare group	o? If yes, plo	ease answer the questions in
Landcare Group	Name of group	No. of people on the property involved in group	Average length of time involved with group (yrs)	No. of meetings/ field days held per year	No. of meetings attended by people on the property per year	Please make a comment on the effectiveness of the group
Land Conservation District Committee						
Catchment Group						
Farm Improvement Group						
Other (please specify)						
use (i.e.: pH r	or any of the above lando neter, tree planter, 3 poin lease specify the type of	nt linkage rip				hat is available for external Ves/No

SECTION 3: FARMING SYSTEMS ON PROPERTIES IN THE CATCHMENT 1a. What is the total area of the property? _____ha 1b. What is the total area of arable land: _____ha (Please note, figures in question 2 should add up to this total area.) In 2003, what has been the area (hectares) of arable land in? Pasture: Crop: Improved (clover etc.) ____ha Cereal _ha ha Lucerne Legume (Lupins, other) __ha Unimproved Oilseed (Canola, other) __ha Summer (Sorghum, other) ____ha Perennial grasses Tagasaste _ha Other perennial shrubs (Please specify and provide ha (Atriplex/saltbush, etc.) (Please specify and provide ha (Atriplex/saltbush, etc.) Commercial Trees: Native, i.e. Oil Mallee, if other please specify ____________ Forestry, i.e. Pines, if other please specify ha (Please note, The figures in question 2 should add up to the total area of arable land from 1b.) =_____ Total arable land 3a. Do you have livestock? Yes/No 3b. If yes, please tick and provide number. Sheep Number:_____ Cattle Number: Other. Please specify and provide numbers_____ 4a. Do you have any other enterprises on your property? Yes / No 4b. Tick more than one if needed: Horticulture

Tourism		
Aquaculture		
Other, please specify:		

SECTION 4: FARM MANAGEMENT

1. Do you consider you have any of the following threats on the property/properties? Please place ticks in the boxes next to threats you have on your property, rate the severity and list the affected areas of threat in hectares.

(Map only consistently moderate to severely affected areas. Do not include areas affected only by extreme or oneoff events)

✓/X	Threat	Please circle	Please circle a number to that represents the severity of the threat					
	Wind erosion	1 not severe	2	3 moderate	4	5 severe	ha	
	Water erosion	1 not severe	2	3 moderate	4	5 severe	ha	
	Water logging	1 not severe	2	3 moderate	4	5 severe	ha	
	Salinity	1 not severe	2	3 moderate	4	5 severe		
	Soil acidification	1 not severe	2	3 moderate	4	5 severe	ha	
	Water repellent soils	1 not severe	2	3 moderate	4	5 severe	ha	

Comments:		

2. What works have you implemented to address the threats mentioned on the previous page? Please place ticks next to the actions you have taken and record which of the above threats the actions aimed to address and whether or not the action was successful.

Please note: in the following question conservation earthworks are defined as follows:

- Banks are <u>constructed</u> earth embankments incorporating an up-slope channel. These are constructed to control surface water and typically traverse sloping land.
- **Drains** are constructed channels used to intercept and remove surface water and subsurface water. These are constructed on a grade and most of the designs are used in the lower part of the landscape.
- Flumes are shaped structures built of vegetated earth, rock or concrete to convey water to a lower level without causing erosion.

√ / x	Management Action	Description	Which threat/s did the management action intend to alleviate?	Was the threat alleviated? y/n	Was it constructed to industry standards?
	Banks	(length km)			
	Drains	(length km)			
	💠 Dams	(number)			
	Soaks	(number)			
	Evaporation Basins	(number)			
	Flumes	(number)			
	Groundwater Pumping	(litres/day)			
	Liming	(area ha)			N/A
	Stubble retention	(area ha)			N/A
	Minimum Till	(area ha)			N/A
	Fencing	(length km)			N/A
	Fallow	(area ha)			N/A
	Gypsum	(area ha)			N/A
	Other				N/A

3. Could you please describe in your own words how these works have alleviated the threats?
Banks
Drains
Dams
Soaks
Evaporation basins
Flumes
Groundwater Pumping
Liming
Stubble Retention
Minimum Till
Fencing
Fallow
Gypsum
Other

ŀ.	Over the past five years, when	hat has been the average	amount spent annually on	conservation works? Please
	tick:			
		Fencing	Earthworks	Revegetation
	Less than \$1,000			
	\$1,000-\$3,000			
	\$3,000-\$6,000			
	\$6,000-\$10,000			
	\$10,000-\$20,000			
	More than \$20,000			
	None			

SECTION 5: REMNANT VEGE	ETATION					
1. • Do you have any fencing around	l remnant veg	etation	?	Yes/I	Vo	
2. How do you rate the importance of purposes? Please circle a number that				ing sy	stem for each of	the following
Stock Shelter	1 Not Important	2	3 Important	4	5 Very Important	
Windbreak	1 Not Important	2	3 Important	4	5 Very Important	
Water Table Control	1 Not Important	2	3 Important	4	5 Very Important	
Wildlife Habitat	1 Not Important	2	3 Important	4	5 Very Important	
Seed Source for Revegetation	1 Not Important	2	3 Important	4	5 Very Important	
Aesthetic	1 Not Important	2	3 Important	4	5 Very Important	
Please rank the following threats in o your property and 6 being the least.	order from 1-6 w	vith 1 be	eing the gre	atest t	hreat to remnant v	vegetation or
Problem fauna, please list; Weeds, please list; Salinity/waterlogging Grazing Fire Other, please specify;						

4a. On your property, is **fenced** remnant vegetation...?

√ / x	Fenced Remnant Vegetation	What percentage of the fenced remnant vegetation is doing this?	Why do you think this might be?			
	Regenerating					
	Staying the same					
	Declining					
4b.	On your property is unfence	ed remnant vegetation	?			
√ / x	Unfenced Remnant Vegetation	What percentage of the unfenced remnant vegetation is doing this?	Why do you think this might be?			
	Regenerating					
	Staying the same					
	Declining					
5a.	Are weeds controlled in rem	nant vegetation?	Yes/No → If no, go to Question 6 (Section 5)			
5b.	Bb. How frequently are weeds controlled in remnant vegetation? Regularly Occasionally Never					
5c.	How are weeds controlled in	remnant vegetation?				

6.	Please rank the following barriers from 1 – 4 , with 1 being the most important barrier faced in managing
remn	ant vegetation on your property, and 4 being the least important barrier.
	Financial cost
	Time
	Management advice
	Other, please specify:
7a. 🗐	Have you implemented monitoring techniques for remnant vegetation on your property? Yes/No
7b.	If yes please tick (more than one if needed).
	Photopoints
	Transects
	Quadrats
	Regular and recorded species counts
	Other, please specify:

SECTION 6: REVEGETATION

1. Area of revegetation: ____ha

2. Area of revegetation fenced:ha						
3. What are your priorities in revegetation? Please	rate each prio	ority b	y circling the	appr	opriate num	nber.
Windbreak/shelterbelt	1 Low	2	3 Medium	4	5 High	
Water use	1 Low	2	3 Medium	4	5 High	
Erosion control	1 Low	2	3 Medium	4	5 High	
Wildlife habitat	1 Low	2	3 Medium	4	5 High	
Salinity management	1 Low	2	3 Medium	4	5 High	
Farm forestry	1 Low	2	3 Medium	4	5 High	
Aesthetic Value	1 Low	2	3 Medium	4	5 High	
Other, please specify:	1 Low	2	3 Medium	4	5 High	

What species have you used in revegetation on your property? Please circle. Acacia acuminata Jam E. horistes A. andrewsii E. longicornis Red Morrel A. assimilis Wodjil E. loxophleba York Gum A. hemiteles Tan Wattle E. pyriformis Pear-fruited Mallee A. microbotrya Manna Gum E. salmonophloia Salmon Gum E .salubris Gimlet A. nyssophylla A. saligna Golden Wreath Wattle E. sargentii Salt River Gum Actinostrobos arenarius Sandplain Cyprus E. spathulata Swamp Mallet Allocasuarina acutivalvis Black Tamma Hakea coriacea Pink Spike Hakea A. campestris Tamma Melaleuca acuminata A. hueglliana Rock Oak M. cordata Atriplex amnicola River Saltbush M. eleuterostachya Banksia prionotes Acorn Banksia M. lateriflora Gorada Callistemon phoeniceus Lesser Bottlebrush M. radula Graceful Honeymyrtle Calothamnus quadrifidus One-sided Bottlebrush M. thyoides Casurina obesa Swamp Sheok M. uncinata Broombush Eucalyptus arachnaea Black Marlock M. viminea Mohan E. brachycorys Cowcowing Mallee Santalatum acuminatum Quandong E. camaldulensis River Red Gum S. spicatum Sandalwood E. eudesmioides Mallallie Xylomelum angustifolium Woody Pear Other (please specify)____

5. Please refer to map and collect data for each revegetation site on the property.

	revegetation, and 4 bei		ant barrier.
Financial cos	t		
Time			
=	nagement advice		
Other, pleas	e specify:		
7			V V V
	plemented revegetation		ues? Yes/No
· .	e tick (more than one if i	needed).	
Photopoints Transects			
_	recorded species counts		
Quadrats	recorded species counts		
ш	e specify:		
oe., prode	о оросиј. <u></u>		
SECTION 7: PL	ANTS AND ANIMALS		
1. How would y	ou rate your knowledge	of native plants an	d animals on your property? Please circle a number.
1 Limite		4 5 Extensive	
2. In the follow	wing table please list the	he animal & bird	sightings that have decreased or increased on your
property, which ye	ear/s this occurred and w	hy you think this m	nay be?
		Date (eg 1978, 1970's or	
	Species Name	1978-1980 or	Why do you think this might have happened?
		gradual)	
Decreased			
Increased			
3. In the follo	wing table please list t	he plants that you	u have noticed have decreased or increased on your

property, which year/s this occurred and why you think this may be?

	Species Name	Date (eg 1978, 1970's or 1978-1980 or gradual)	Why do you think this might have happened?
Decreased			
Increased			

4. Do you have problem animals on your property? Yes/No

5. Please complete the following table

✓	Type of problem fauna	How often do you manage this type of problem fauna? (please tick)			What technique/s do you use to manage this type of problem fauna? (please tick)				
		Regularly	Sometimes	Never	Shooting	Poisoning	Trapping	Other (specify)	
	Fox								
	Rabbit								
	Feral Honeybee								
	Feral Pig								
	Feral Cat								
	Feral Goat								
	Western Grey Kangaroo (<i>Macropus fuliginosus</i>)								
	Little Corella (<i>Cacatua</i> sanguinea westralensis)								
	Western Long billed Corella (Cacatua pastinator butleri)								
	Galah (<i>Cacatua roseicapilla</i>)								
	Other (please specify)								
	Other (please specify)								

6.	Please rank the following barriers from $1-5$, with 1 being the most important barrier preventing you from
imple	ementing measures to reduce threats from problem animals and 5 being the least important barrier.
	Financial Cost
	Time
	Leadership/coordination for baiting programs
	Paperwork associated with baiting programs
	Other, please specify
7a. prog	Are you actively involved in a project aimed at reducing threats from problem animals, such as a baiting ram with neighbouring properties? Yes/No
7b.	If yes what actions have you taken to achieve this?
8a.	Are you implementing measures to extend/improve/enhance wildlife habitat? Yes/No
8b.	If yes, please tick appropriate box or boxes.
	Biodiverse plantings (5 or more mixed native species)
\Box	Nest boxes
П	Monitoring techniques
	Other, please specify
9.	What plague events have you observed on the property over the years? Please tick and provide the date (e.g
1978	3, 1970's or 1978-1980)
	Rabbit
	Locust
	Mouse
	Army Worm
	Cut Worm
	Other, please list
	Other, please list
	None

SEC	TION 8: WATER		
1a. D	o you maintain rainfall record	ds? Yes/No	
	_		uge or weather station is located.
0	O explored and of explore		W 1.0
2.	Over what period of years ha	ave you maintained rainta	all records?
3a.	What is your average annual	rainfall?	mm
3b.	Is this data stored anywhere	? Yes/No	
3c.	If yes, where?		
4.	Do you have any fresh spring	gs or seeps on your prope	erty? Yes/No
Pleas	se note, questions 5 - 8 refer	only to piezometers and/	or observation bores.
•	Piezometer - a bore tha	at has a discrete slotted ii	ntake section at its base and is sealed above the intake to
	measure groundwater pr	essure at the depth of the	e intake section.
•			otted intake section across the saturated interface that
	provides a direct measur	ement of the actual deptl	h to water table.
5.	Do you have monitoring bore	eholes on your property?	Yes/No → If no, go to section 8, question 9
6.	How many monitoring boreh	oles do you have in your	property?
7.	Where is the data stored?		
8a.	Have any actions been taker	n from hore monitoring?	Yes/No
	-	-	163/116
	-		
9a.	Over the years, have you ob	served the quality of farm	n water supplies generally:
'/ *	Water Quality	What percentage of the water supply is doing this?	If it has declined, please specify the water quality element/s that have declined
	Improvo		
	Improve		
	Stay the same		
	Decline		

10a.	Have you had water analysed?	Yes/No —	•	If no, go to question 12a, section 8
10b.	Please specify the reason for analysing your	water supplies	s:	
11.	Are your records available?	Yes/No		
12a.	Do you have any other water information that	at you think m	ay I	be relevant? Yes/No
12b.	If yes, what type of information is it? (For ex	ample, record	- ls) _	
		•		

SECTION 9: PROPOSED WORKS

For all questions in this section please indicate the proposed works on the map.

1a. Are you planning any future revegetation on your property? Yes/No

1b. If yes, is your plan developed enough to place on a map? Yes/No

(If yes, please indicate on map)

2. Do you have any plans to fence remnant vegetation areas or revegetation areas on your property? Yes/No

3. Do you plan on implementing any earthworks (drains or banks)? Yes/No

7.1 SECTION 10: SOURCES OF LANDCARE INFORMATION What is your current source of landcare information? Please tick as many as necessary. LCDC (landcare groups) Landcare Coordinator Private Contractor/Consultant Government Agency, please circle: CALM / Dept Ag / W&R / other Radio Books, magazines, newspapers Field days, workshops Other, please specify:_____ Please rank the following from 1 - 8 in order of your preference as sources of landcare information with 1 being the most preferred source and 9 being the least preferred? LCDC Landcare Coordinator Private Contractor/Consultant Government Agency, please circle: CALM / Dept Ag / W&R / other Radio Books, magazines, newspapers

Other, please specify:

Field days, workshops

7.2 **SECTION 11: FUNDING FOR LANDCARE** 1. What have been your funding sources for landcare works? Please tick more than one if necessary. Natural Heritage Trust, please specify e.g. envirofunds: State Remnant Vegetation Protection Scheme Department of Conservation and Land Management Covenant National Trust Covenant Other, please specify:_ Have you encountered any problems with landcare funding bodies? Yes/No → If no, go to next section 2b. If yes, what problems have you encountered? Please rank in order from 1-6, with 1 being the most problematic and 6 being the least. Assessment period takes too long Restrictions on what is funded (i.e.: plant species) Complexity of covenants Complex applications Knowledge/awareness of funding availability

Other, please specify:_____

SECTION 12: BUSH ON RESERVES Are you aware that there are nature reserves in the Buntine-Marchagee Catchment area? Yes/No Do you think that nature reserves play an important role in conserving natural heritage? Yes/No 2. What do you think are the advantages and disadvantages of nature reserves in this area from a conservation and management point of view? ADVANTAGES: ____ DISADVANTAGES: _____ From a management point of view, are there any changes you could suggest for the operation of nature reserves? 5a. Would you consider fence setback and revegetation within that setback, when renewing boundary fences adjoining road reserves? Yes/No 5b. If yes, how far? 0-5m 6-10m 11-20m 21-30m 30m+ Comments:

SECTION 13: GENERAL

What measures do you feel would improve the adoption of biodiversity conservation?
 Please rank each measure from 1 (the most important measure) onwards.
 Please number all boxes

Measures
Rate concessions (e.g. for remnant vegetation protection and management)
Education and training
Cost sharing incentives (e.g. share cost of fencing remnant vegetation)
Legislation and/or regulations
Access to specialists and/or resources
Local environmental/development officer to channel information and identify opportunities
Sponsorship
Local champions (i.e. lead by example – motivate others to act)
Commercial options (e.g. development of niche market opportunities to diversify income base)
Tax incentives (e.g. Rebates for landcare works)
Carbon credits (e.g. paid a retainer to maintain woody biomass on property)
Stakeholder consultation (e.g. community participation in natural resource management projects)
Incorporation of biodiversity as component of environmental management systems
Research partnerships between landholders and government agencies (e.g. development of
sustainable land management practices)
Other, please specify

Comments			
_			
-			

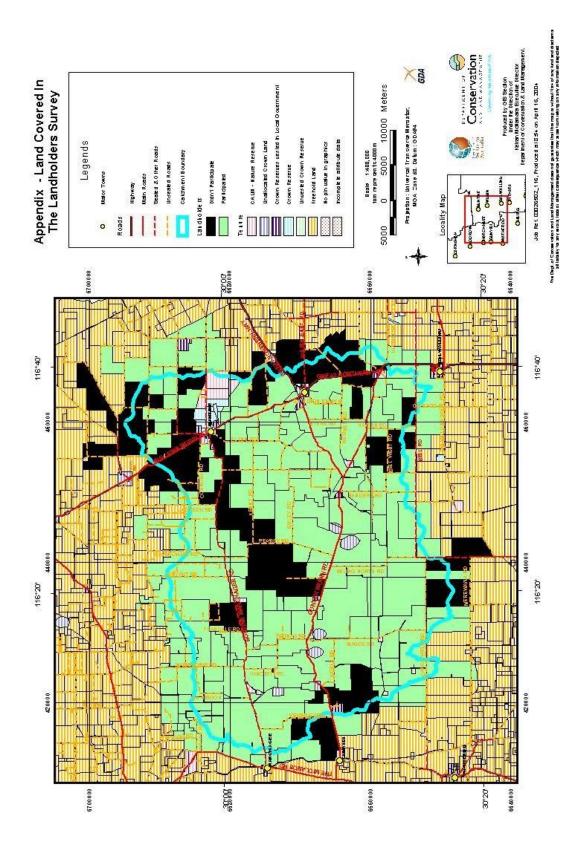
2.	Are there or have the	here been any	research projects on your property?		Yes/No
3.	If yes, please comp	olete the follow	ing table		
w	ho conducted the research?	When was it conducted?	Please give a brief description of the project Eg flora & fauna	Are the results publicly available?	If results are availab who can we contac for a copy?
4.	Would you be inter-	ested in partici	pating in biological surveys? Ye	es/No	
5.	How would you rate	e your knowled	lge of secondary salinity and the process	es associated	d with its development?
	1 2 Limited	3 Adequate	4 5 Extensive		
6.		ou perceive to	the sustainability and viability of farmin	g in the sho	ort and long term? (Key
-	its will be sufficient) - Farm:				
Off	– Farm:				
	icient)		ons to offer that could address these pe	erceived thre	ats? (Key points will be
——	– Farm:				

8.	Is there anything in addition to what we have asked in this survey that is special about your property that you
wou	uld like to mention? (e.g. registered with Land for Wildlife)
9.	Do you have any historical photographs of vegetation? Yes/No
	20 you have any motorious priotographic or togetation.
10	What would not the to see your manager last like in 10,20 years?
10.	What would you like to see your property look like in 10-20 years?
-	

SECTION 14: THE RECOVERY CATCHMENT

1. Cato	Prior to us contacting you hment?	regarding this survey, had you heard about the Buntine–Marchagee Recovery Yes/No
2. Proj		you would like to make about the Buntine-Marchagee Recovery Catchment
3. Mare	-	al environmental, historical or cultural points of interest within the Buntine- be of interest to the project? Please list and describe location.
4.	Have you received the Bun	ntine-Marchagee Catchment Newsletter? Yes/No
5. Bun	What are your thoughts tine–Marchagee Recover	s on the content and its effectiveness in informing you of the ry Project?
6.	Would you like to make an	y suggestions for future issues of the newsletter?

Appendix 6: Area of land covered by survey



Appendix 7:

Letter issued to Landholders at the commencement of the Survey



Jodie Watts
Recovery Catchment Officer
Department of Conservation & Land Management
201 Foreshore Drive
GERALDTON, WA, 6530

Dear Jodie,

Authorisation in Regard to Information Collected for Landholder Survey

I am willing to complete the landholder survey questionnaire for the Buntine-Marchagee Natural Diversity Recovery Catchment.

It is my understanding that the Recovery Catchment Officer at the Department of Conservation & Land Management, Geraldton, will retain the range of information collected about this property. The information will be kept **confidential** and only used to make various assessments including percentage landholder response to the survey, statistical interpretation and in management processes relating to the recovery catchment.

If, in answering the questionnaire, I have identified areas in which I would like to participate, for example plant surveys, I agree to the Recovery Catchment Officer providing my contact details to the appropriate person or group.

It is my understanding that I will not be bound to comply with any statements I have made in the landholder survey questionnaire.

Name:
Property Name:
Address:
Phone Number:

Date:

Yours sincerely,

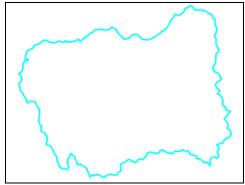
Appendix 8: Glossary

Banks

For the purposes of this report, banks were defined as 'constructed earth embankments incorporating an up-slope channel. These are constructed to control surface water and typically traverse sloping land.'

Boundary One (1) - Buntine-Marchagee Recovery Catchment Project (Recovery Catchment)

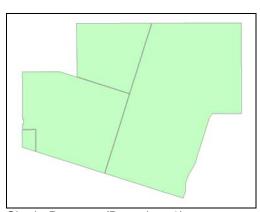
This is the Buntine-Marchagee Recovery Catchment topographical boundary. It was determined by using a digital elevation model (DEM) to map the watershed of the Buntine-Marchagee Catchment. The topographical catchment area = 181,007 ha



Recovery Catchment (Boundary 1)

Boundary Two (2) - Singular Property

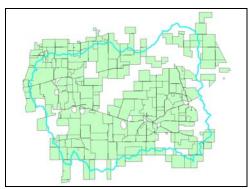
This is a singular property managed by one entity (person, company or partnership). One property can be made up of many land parcels (locations) all managed by the one entity. In some cases these properties can be intersected by roads as shown in the example.



Single Property (Boundary 2)

Boundary Three (3) – Property Area of Landholder Survey Participants

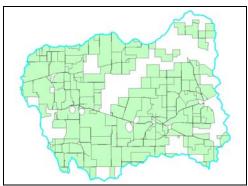
This is the entire property of each of the landholders that participated in the Landholder Survey. The portions of the property that lie outside the Recovery Catchment (Boundary 1) are also included in this boundary. The holes (white areas) are areas where the land is tenure other than private property, such as Unallocated Crown Land (UCL); or properties where the landholder did not participate in the Landholder Survey. The total area of land covered by the Landholder Survey = 176,798 ha



Property Area of Landholder Survey Participants (Boundary 3)

Boundary Four (4) - Participants Property within the Recovery Catchment

This boundary relates to only the portion of property that falls within the Recovery Catchment (Boundary 1). Only the landholders that participated in the Landholder Survey were taken into consideration for this boundary. The holes (white areas) are areas where the land is tenure other than private property, such as Unallocated Crown Land (UCL); or properties where the landholder did not participate in the Landholder Survey. The total area of land surveyed intersected with the Recovery Catchment Boundary = 135,086 ha



Participants Property within the Recovery Catchment (Boundary 4)

Bushcare Projects

Community and NRM driven projects that are formed to improve natural regeneration processes, by managing native vegetation rehabilitation and expansion.

Drains

For the purposes of this research drains were defined as 'constructed channels' used to intercept and remove surface water and subsurface water. These are constructed on a grade and most of the designs are used in the lower part of the landscape.

Flumes

Flumes are shaped structures built of vegetated earth, rock or concrete to convey water to a lower level without causing erosion.

Integrated Catchment Planning

Catchment planning that includes input from all stakeholders, and incorporates the environmental, social and economic factors that influence natural resource management practices within the catchment.

IBRA

The Interim Biogeographic Regionalisation for Australia (IBRA) is a classification system that ensures the full range of biological and biophysical diversity across Australia is encompassed in the reserve system. The IBRA divides Australia into 80 separate bioregions and 384 sub regions, based on climate, geology, soils, topography and vegetation.

Landholder

The term 'landholder' is used throughout this research to signify those who own or occupy a property or a number of properties. While the term is used in the singular, it is recognised that when families are taken into account there are many more 'landholders'

LCDC

Land Conservation District Committees (LCDC) work under a formalised landcare structure created under the Soil and Land Conservation Act. They are a focus for onground land conservation activities.

Minimum Till

The term applied to cropping practices that use minimum soil manipulation or existing soil and climatic conditions to meet tillage requirements for crop production.

Perennial

A plant that can grow for more than two seasons. Latin: per, "through", annus, "year".

Acronyms

ARGT = Annual Ryegrass Toxicity Group

BMRC = Buntine-Marchagee Recovery Catchment

CALM = The Department of Conservation and Land Management

CSIRO = Commonwealth Scientific Industry Research Organisation

DoE = Department of Environment

Ha = hectares

LCDC = Land Conservation District Committee

MCG = Marchagee Catchment Group

RVPS = Remnant Vegetation Protection Scheme

SKM = Sinclair Knight Merz

SWM = Surface Water Management

UCL = Unallocated Crown Land

Appendix 9: Land clearing decades

Appendix 10: Existing banks and drains

Appendix 11: Species used in revegetation

Species	% of Landholder who use
Freehoutes as welded as is (Pires Pad Cross)	species
Eucalyptus camaldulensis (River Red Gum)	70%
Eucalyptus loxophleba (York Gum)	62%
Eucalyptus sargentii (Salt River Gum)	58%
Casurina obesa (Swamp Sheoak)	38%
Eucalyptus salmonophloia (Salmon Gum)	38%
Atriplex amnicola (River Saltbush)	34%
Eucalyptus salubris (Gimlet)	34%
Acacia acuminata (Jam)	30%
Eucalyptus spathulata (Swamp Mallet)	24%
Acacia saligna (Golden Wreath Wattle)	20%
Melaleuca acuminata	18%
Melaleuca uncinata (Broombush)	18%
Callistemon phoeniceus (Lesser Bottlebrush)	16%
Acacia hemiteles (Tan Wattle)	12%
Eucalyptus horistes	12%
Eucalyptus brachycorys (Cowcowing Mallee)	10%
Eucalyptus longicornis (Red Morrel)	10%
Eucalyptus occidentalis (Swamp Yate)	10%
Santalum spicatum (Sandalwood)	10%
Acacia microbotrya (Manna Gum)	8%
Allocasuarina campestris (Tamma)	8%
Calothamnus quadrifidus (One-sided	8%
Bottlebrush)	201
Eucalyptus eudesmioides (Mallallie)	8%
Eucalyptus cladocalyx Sugar Gum	6%
Eucalyptus pyriformis (Pear-fruited Mallee)	6%
Melaleuca cordata	6%
Melaleuca thyoides	6%
Santalatum acuminatum (Quandong)	6%
Acacia andrewsii	4%
Acacia assimilis (Wodjil)	4%
Actinostrobus arenarius (Sandplain Cyprus)	4%
Eucalyptus arachnaea (Black Marlock)	4%
Eucalyptus hypochlamydea	4%
Eucalyptus platypus (Moort)	4%
Eucalyptus kochii, (plenissima)	4%
Eucalyptus rudis (Flooded Gum)	4%
Eucalyptus torquata (Coral Gum)	4%
Hakea coriacea (Pink Spike Hakea)	4%
Melaleuca eleuterostachya	4%
Melaleuca lateriflora (Gorada)	4%
Melaleuca radula (Graceful Honeymyrtle)	4%
Tamarix aphylla (Athel Tree)	4%
Xylomelum angustifolium (Woody Pear)	4%
Allocasuarina acutivalvis (Black Tamma)	2%
Allocasuarina. hueglliana (Rock Oak)	2%
Atriplex nummularia (Old Man Saltbush)	2%
Atriplex undulata (Wavy Leaf Saltbush)	2%
Banksia prionotes (Acorn Banksia)	2%
Callistemon sp	2%
Calothamnus gilesii	2%
Eucalyptus botryoides	2%

Eucalyptus caesia (Silver Princess)	2%
Eucalyptus eremophila (Sand Mallee)	2%
Eucalyptus erythronema (Red-flowered Mallee)	2%
Eucalyptus gomphocephala (Tuart)	2%
Eucalyptus kochii (Oil Mallee)	2%
Eucalyptus leptospira (Tammin Mallee)	2%
Eucalyptus leucoxylon (Blue Gum)	2%
Eucalyptus salicola (Salt Gum)	2%
Eucalyptus wandoo (Wandoo)	2%
Melaleuca adnata	2%
Melaleuca filifolia (Wiry Honeymyrtle)	2%
Melaleuca nesophila (Mindiyed)	2%
Melaleuca viminea (Mohan)	2%

Sample n = 50

Bibliography

DEPARTMENT OF AGRICULTURE (2002) Moore River Catchment Appraisal: Resource Management Technical Report. Department of Agriculture.

SINCLAIR KNIGHT MERZ (2003) Buntine-Marchagee Natural Diversity Recovery Catchment surface water management plan (Includes - Catchment Report, Demonstration Report and Individual Property Reports). Report prepared for the Department of Conservation and Land Management.