Beyond Bolac Catchment Action Group
Landcare Project Review and Audit

Final Report

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Submitted to:
Beyond Bolac Catchment Action Group

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Contents

Introduction

Biodiverse and native landscapes are vital for the preservation of ecosystem function. However, native landscapes have been altered and fragmented by anthropogenic modifications globally (Foley et al. 2005). In southeastern Australia, the native landscape has been irreparably altered by land clearing practices, livestock grazing and broad-acre cropping (Robertson 1997). Remnant native landscapes are currently fragmented, often confined to narrow riparian corridors, wetlands margins and rocky outcroppings; places unfavorable to the economic drivers of modern land-use practice. There is a growing recognition that current practices are unsustainable and this has led to numerous local revegetation efforts and land protection projects guided by community groups, indigenous leadership, landholders, and government agencies (Bennette et al. 2000).

Since its inception in 2006, Beyond Bolac Catchment Action Group (BBCAG) has dedicated itself to promoting, protecting, and enhancing local ecosystems to improve habitat, water quality, and native species diversity. In particular, the group focuses on restoration and protection of waterways within the Fiery Creek and Salt Creek sub-catchments. These habitats support high levels of biodiversity and are critical in controlling flows of energy and nutrients (Naiman and Décamps 1997). Ensuring water quality and water availability for lotic and lentic waterbodies, including Lake Bolac, have been central to the mission of BBCAG. Beginning in 2006, federal grant funding supported projects that included fencing and/or revegetation of riparian, wetland and biodiversity corridors. The premise behind these projects was to protect waterways, reduce in-stream salinity and bank erosion and provide habitat for native fauna and flora (BBCAG 2016). Grants have been successfully procured by BBCAG on an annual basis; 42 projects have been completed since 2006 (Table 1).

Through these grant programs, large areas of habitat within the Fiery and Salt creek sub-catchments have been revegetated or fenced to exclude grazing pressures. Wetland perimeters have been revegetated and corridors planted to connect projects across the landscape.

The BBCAG committee recognized the need to review the progress of these revegetation and habitat protection projects and initiated the study reported here to assess some of the Landcare project sites and also consider the project success from the landholder's perspective.

Table 1. Funded Landcare projects completed through BBCAG since 2006.

Grant funding name	Funding year	Number of funded projects
2nd Generation Landcare 06-07	2006-2007	5
Community Water Grant	2008-2009	4
2nd Generation Landcare 08-09	2008-2009	4
HERO project Fiery Creek Restoration	2009-2010	5
2nd Generation Landcare 11-12	2011-2012	2
Caring for Country	2012-2013	6
Victoria Landcare Grant 12-13	2012-2013	3
Victoria Landcare Grant 13-14	2013-2014	1
Victoria Landcare Grant 14-15	2014-2015	2
Victoria Landcare Grant 16-17	2016-2017	3
Victoria Landcare Grant 17-18	2017-2018	2
Victoria Landcare Grant 18-19	2018-2019	4
Victoria Landcare Grant 19-20	2019-2020	1

Project objectives

The purpose of this study is to quantify the success of BBCAG funded projects and provide recommendations to improve project success and identify project sites for long-term monitoring. Project objectives include:

(1) Using a questionnaire approach, quantify the views of the landholder regarding project history, planting techniques, and personal motivations.
(2) Using rapid assessment techniques, quantify the degree of project success of up to ten Landcare-funded projects within the H11 and H12 sub-catchments (i.e. Salt Creek and Fiery Creek).
(3) Identify sites that could be used in a long-term monitoring plan based on the rapid site assessment.

Methods

The audit of Landcare projects used two survey methods. The first survey was a questionnaire to be completed by landholder who had completed Landcare projects. The second survey was an on-site assessment conducted by River Bend Ecology.

Landholder questionnaire

A brief questionnaire comprising15 questions was developed to investigate the landholders' motivation, techniques and perception of project success (Appendix 1).

Contact information for landholders was extracted from the BBCAG database provided by the BBCAG Facilitator. If contact information was missing or inaccurate, we contacted locals recommended by the BBCAG Facilitator for contact information. Consideration was taken for landholders that were known to have moved or were deceased. Any updated contact information obtained was entered into the database developed for the study reported here and will be shared with BBCAG.

The survey was initially sent out as an online survey (Google Form) to all landholders who had participated in Landcare projects on their property. Landholders that did not respond to emailed surveys or their email addresses could not be located were sent hard copies of the questionnaire via Australia Post along with self-addressed stamped envelopes.

Responses from the online and paper questionnaires were collated in the project database developed for this study.

On-site assessment

The on-site assessment was designed to categorize the broad variation of Landcare project types implemented by BBCAG. Variation in project types include restoration activities (planting and/or fencing), habitat type, planting techniques, planting/regeneration success, and habitat status.

The rapid assessment methodology used in this project was adapted from established rapid assessment techniques (DSE 2004, Burdett 2005, Jansen et al 2007). The aim of the assessment was to quantify the success of the Landcare projects from the initial implementation and planting to the current state of a project. In the on-site assessment, we assessed key characteristics of vegetation, trees, fauna, and microhabitats (Appendix 2). We used a rank score to rapidly quantify these characteristics (0 = none, 1 = low, 2 = medium, 3 = high) based on prior observations in agricultural landscapes of the region.

We coordinated with 10 landholders to assess a total of 17 Landcare projects for this study (Figure 1). Of these Landcare project audits, one project site was funded through the Upper Hopkins Land

Management Group (UHLMG) and another by an earlier local Landcare Community Group within the Fiery Creek catchment, but were still included in the data reported. At each Landcare project site, two or three (depending on project size) 200 m transects were established to make observations on project status. A minimum of a 50 m buffer was used between transects and at upper and lower project boundaries. At the start and stop of each transect GPS coordinates (UTM, Datum GDA94) were recorded. Numerous photos were taken within each transect. Observations about the project site were recorded on standardized data sheets (Appendix 2). Satellite imagery was used to obtain transect widths and project lengths.

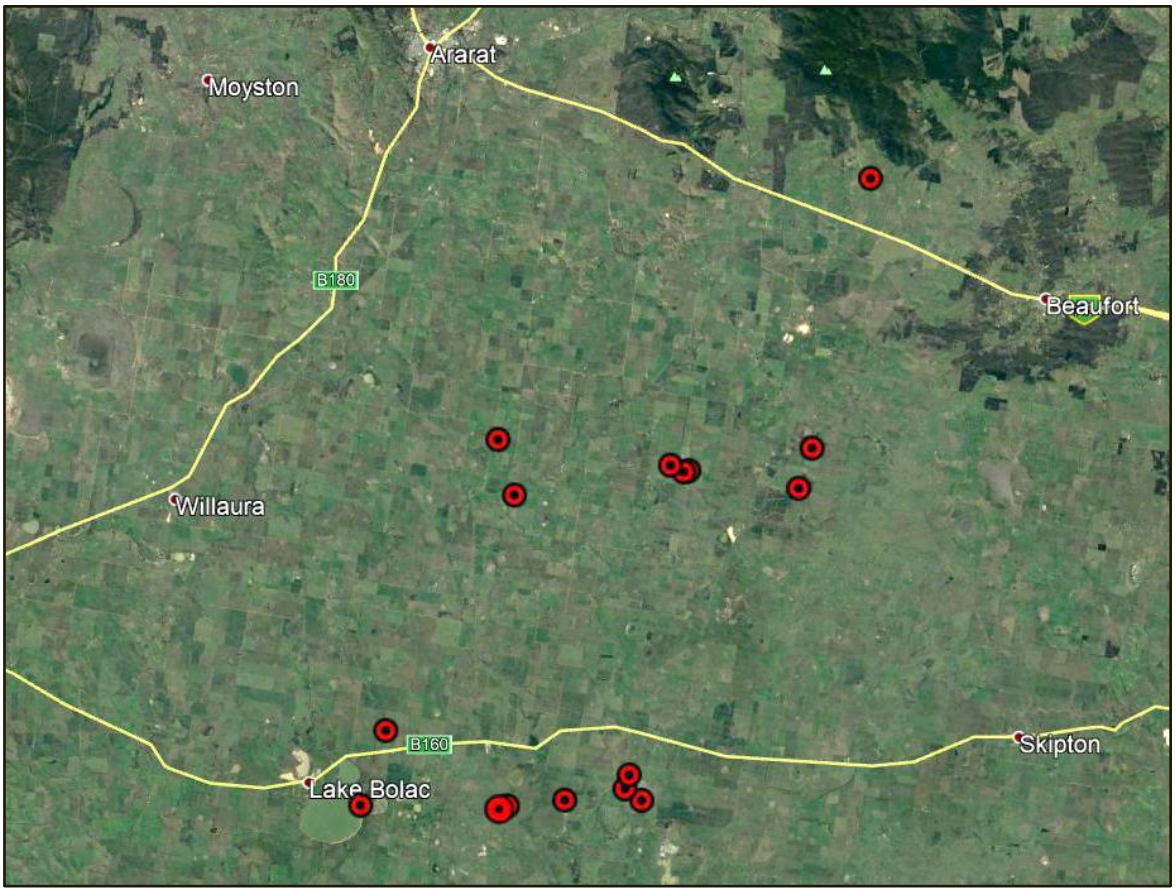

Figure 1. Map of Landcare project sites assessed in on-site surveys (depicted as red dot with black center).

Data and analysis

Date generated from this project were entered into an Access database that was developed specifically for this project. The landholder questionnaire and on-site assessment surveys were designed using categorical rank scoring so that data could be compared, tabulated and graphically presented. No statistical analysis was performed as the number of sites was low relative to the variation among the sites, and any analysis would have extremely low statistical power.

Results

Over 80% of Landcare projects completed by BBCAG have engaged in the protection of water resources and waterways (Figure 2). Riparian protection and revegetation projects compose over half of all completed projects. Riparian projects fall into two categories: fencing only or fencing with revegetation.

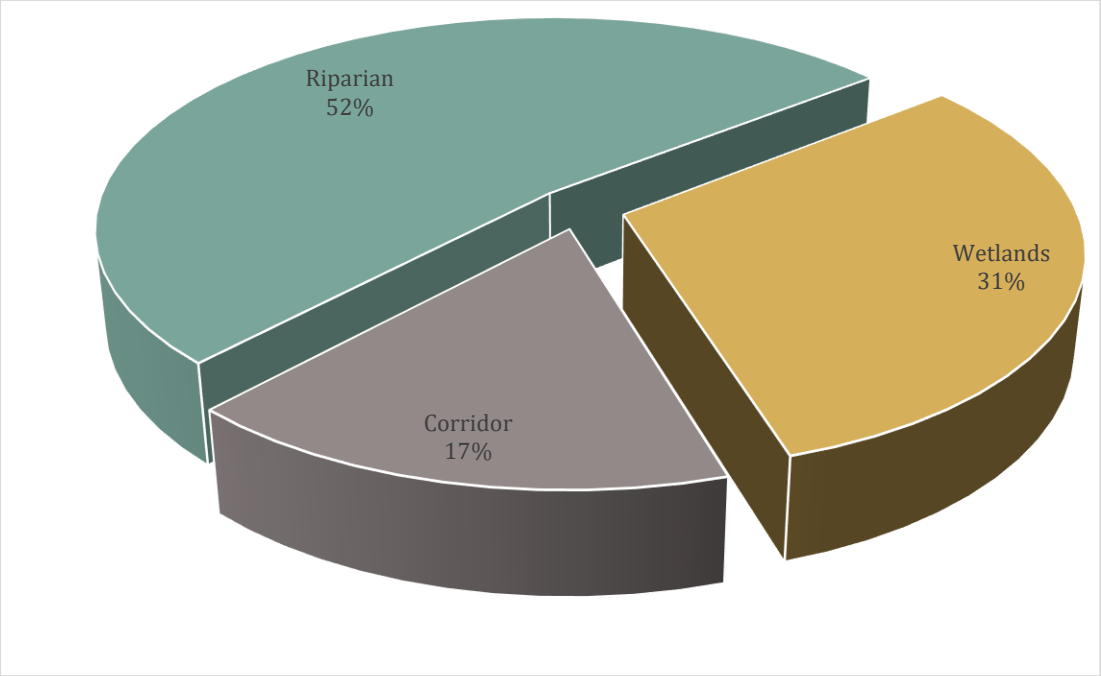

Figure 2. Proportion of different types of project (defined by broad habitat categories) since 2006 through BBCAG acquired grant funding.

Details about planting techniques were obtained from landholder questionnaires, the BBCAG database, on-ground site assessments, and informal conversations with landholders. Most often, revegetation projects used tube-stock planted in sprayed and ripped lines.

Landholder questionnaire

Questionnaires were sent to 70% of landholders that participated in Landcare projects through BBCAG (n=22), and we received 11 completed questionnaires. Most landholders (>75%) felt the grant process, facilitated by BBCAG, was straightforward (Figure 3). The main motivation for implementing a Landcare project was identified as "farm management" by nearly 60% of landholders. Promoting biodiversity, a healthy landscape, and addressing erosion and salinity were also regarded as important (43-50% of landholder responses). Half of respondents were interested in future funding opportunities and another 43% might be interested in future Landcare projects.

Relating to Landcare project outcomes, most landholders reported that they were satisfied with the outcomes, particularly in terms of the perceived long-term success of their project (Figure 3).

Observations of the project area by landholders noted an increase in trees, birds, native and invasive mammals, and pasture grass (particularly *Phalaris*) (Figure 4).

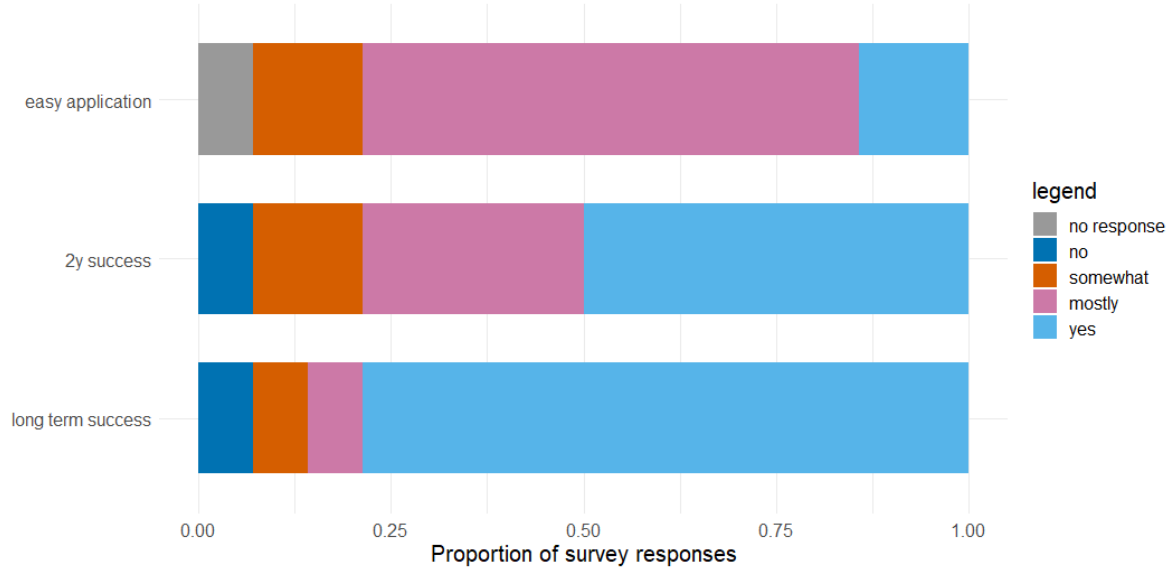

Figure 3. **Proportional responses to project application and temporal success of Landcare projects. Landholders were asked: (1) Was the process of applying and implementing your project straightforward? (2) Do you feel your Landcare project was successful in the first two years? (3) Do you feel your Landcare project was successful in the long term?**

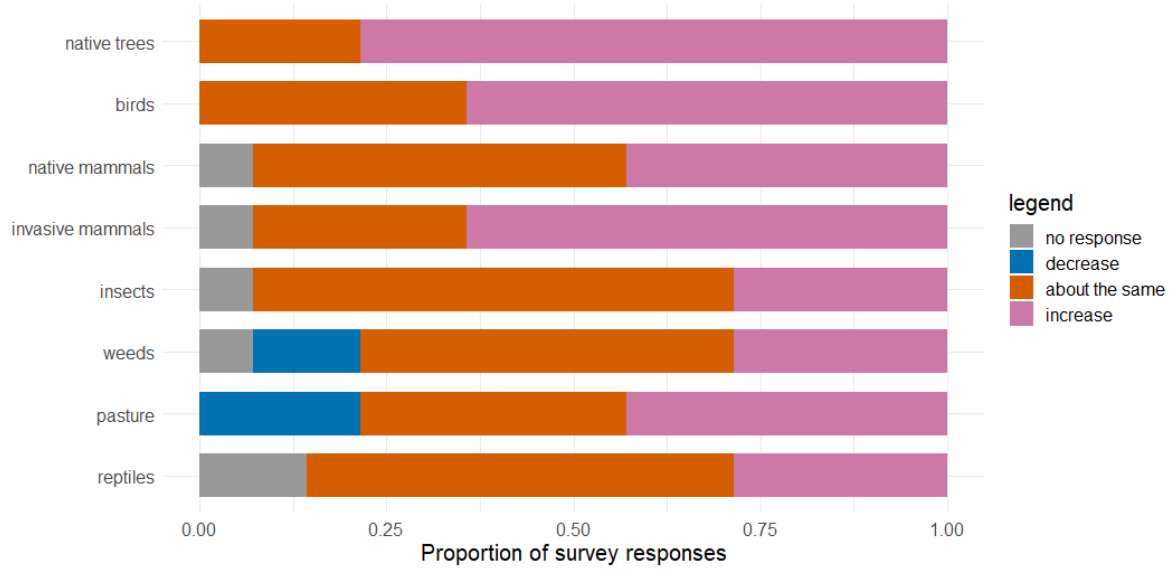

Figure 4. **Biotic and abiotic observations by landholders within individual Landcare projects. Landholders were asked to report changes observed in the flora and fauna within the project area as a decrease, about the same, or an increase.**

On-site assessment

The on-site rapid assessment surveys were conducted during winter and spring (14 July to 22 September 2020). Ground cover was abundant at nearly all sites (Figure 5). The proportion of understory cover was variable across the different project sites. This layer was comprised of shorter vegetation species and younger or planted trees. Canopy cover indicates the presence of larger established trees, which were absent or in very low abundances at nearly 75% of Landcare project sites.

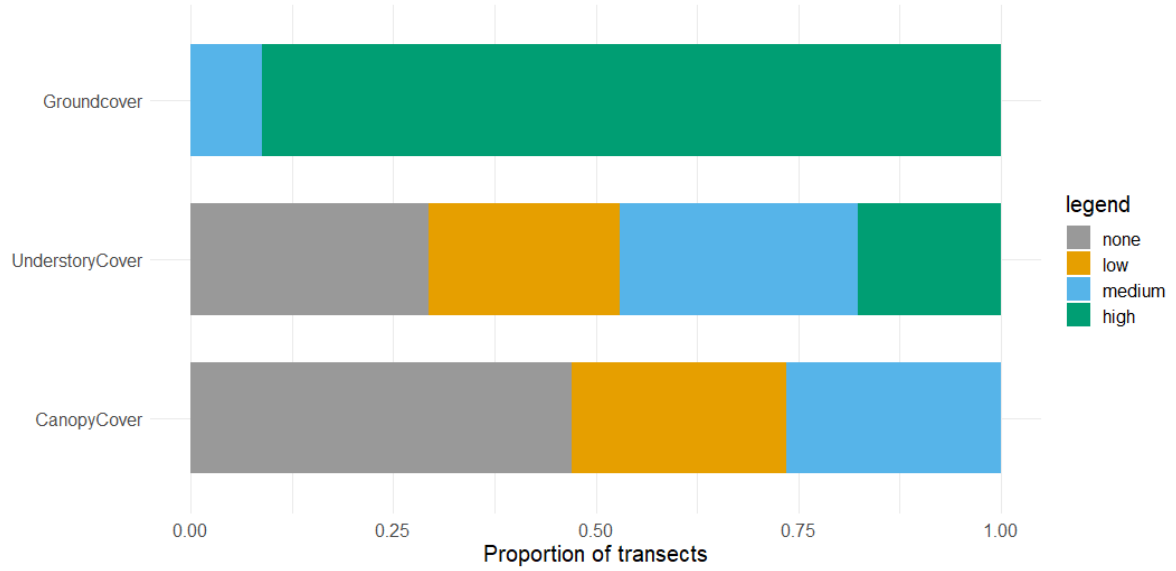

Figure 5. Rank scores of each general structural layer within Landcare project sites from the rapid on-site assessment. "Ground cover" includes grasses, forbs and other small vegetation (<1m). "Understory cover" includes plants 1m – 3m in height, and "canopy cover" includes plants >3m.

A high proportion of trees were assessed to be in good health across Landcare projects and over half of the sites visited had a moderate to high success rate of planted trees (Figure 6). Sites that had remnant trees had a higher likelihood of successful regeneration.

Habitat complexity tended to be low in most Landcare project sites with sparse to no logs, dead trees, or ground debris. Conversely, few sites exhibited eroded banks or patches of bare ground (Figure 7).

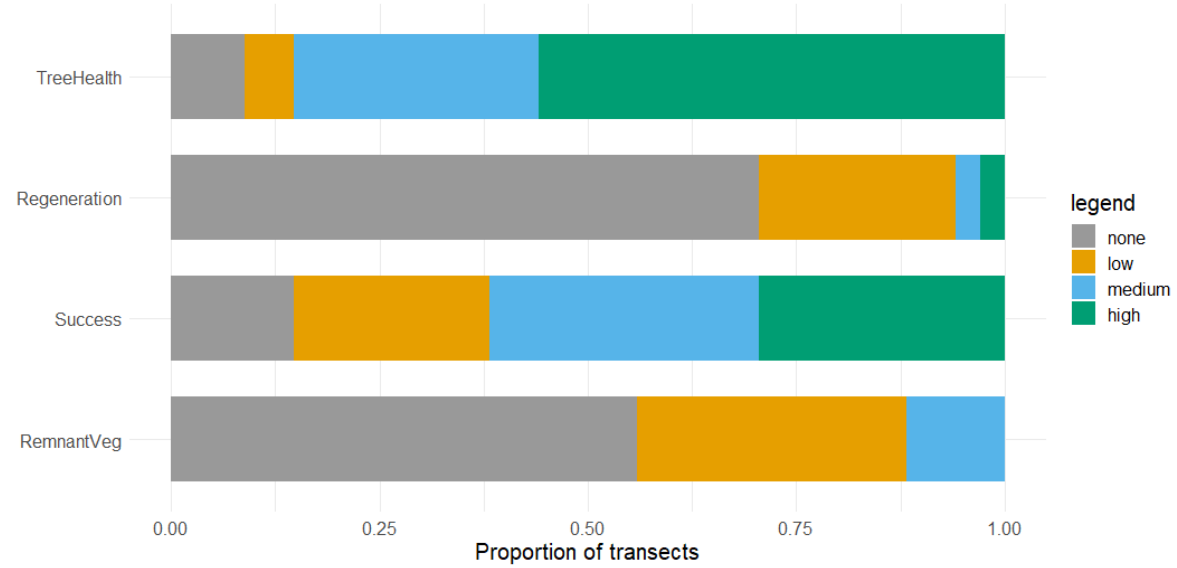

Figure 6. **General tree assessments at Landcare project sites from the rapid on-site assessment. "Tree health" considered the colour and vigor of the leaves and branches, and overall size of the tree depending on age. "Regeneration" refers to trees that appeared to have developed from natural seeding rather than by direct drilling or tubestock. "Success" indicates the success of seedling establishment in a planting project. "Remnant vegetation" indicates the relative amount of old, established trees at a site compared to other sites in the region.**

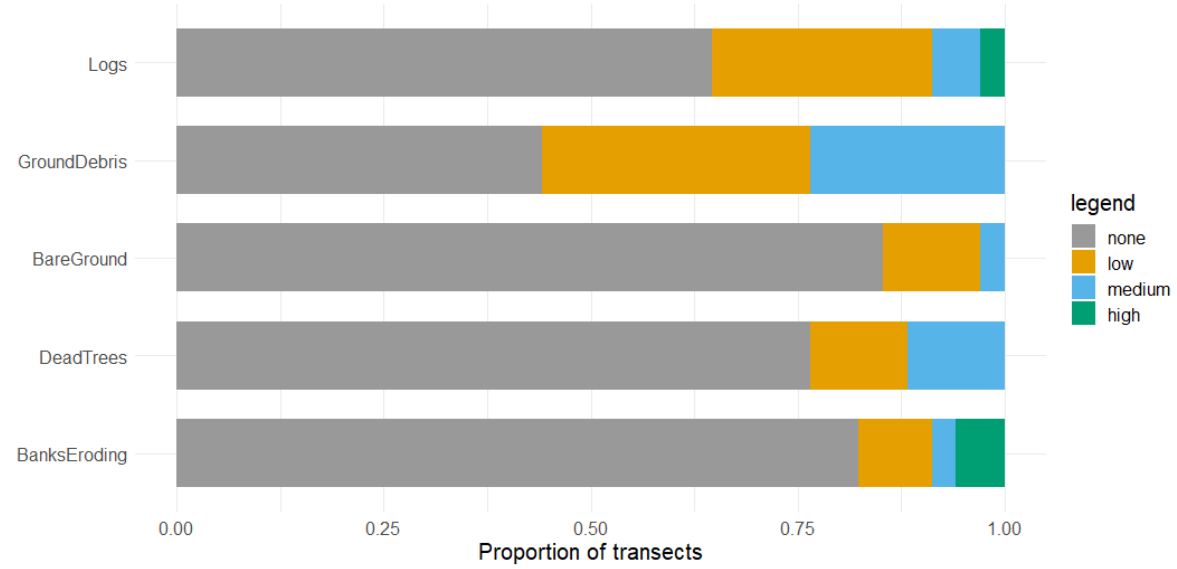

Figure 7. **Groundcover attributes at Landcare sites from the rapid on-site assessment. "Logs", "ground debris" and "bare ground" indicate the relative frequency of these types of microhabitat at each site (ground debris includes leaf litter, small twigs and dry grasses). "Dead trees" are standing dead trees. "Banks eroding" indicates soil exposed in river channels and actively eroding.**

There was an inverse relationship between native grasses and forbs to pasture cover and weeds (Figure 8). *Phalaris* was the most abundant ground cover species encountered at Landcare project sites and often tall enough to include as understory vegetation (1-3m). The density of this species at some site excluded growth of other ground cover species.

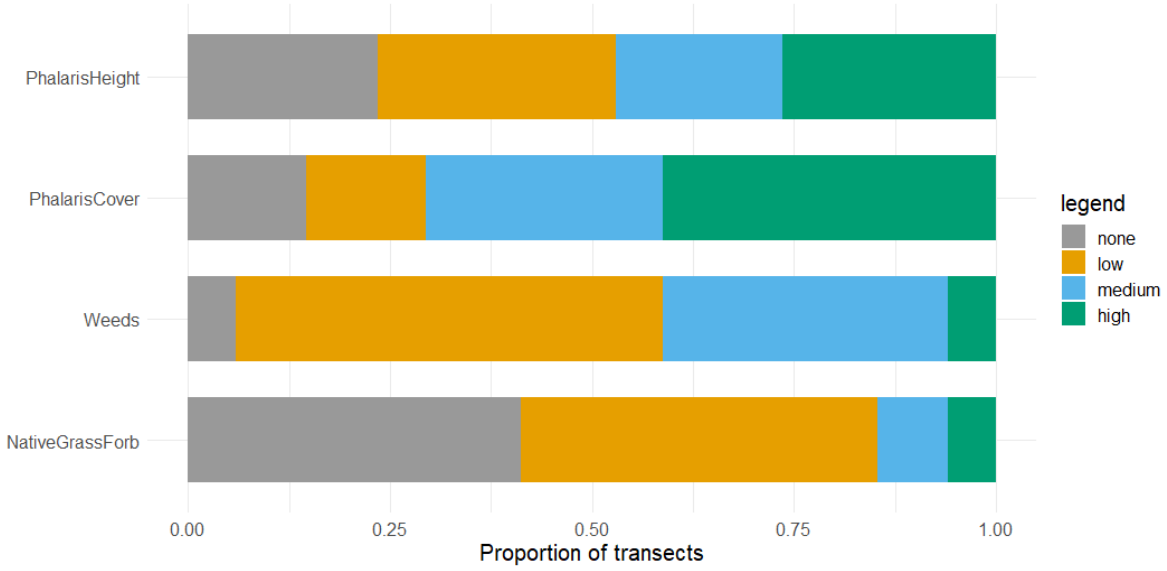

Figure 8. Proportion of ground cover vegetation types encountered at Landcare project sites from the rapid on-site assessment. *Phalaris* was assessed in terms of height and cover (or the frequency that it occurred at the site). "Weeds" describes the frequency of any non-native grasses and forbs, while "native grasses and forbs" describes the frequency of native grassland species.

Each project site was also assessed in terms of structural diversity and plant diversity to provide an overall diversity assessment. "Structural diversity" describes the relative number of different types of structural forms while "plant diversity" described the relative number of different types of plants in each transect. Structural diversity was often assessed as "low" as the trees were similar in size as they had all been planted at the same time (Figure 9). Structural diversity increased with the presence of remnant vegetation, dead trees, ground cover, and understory. Most often, plant diversity was scored "medium" because of the diversity of species planted. Plant diversity was also influenced by the presence of aquatic habitats which increased this score.

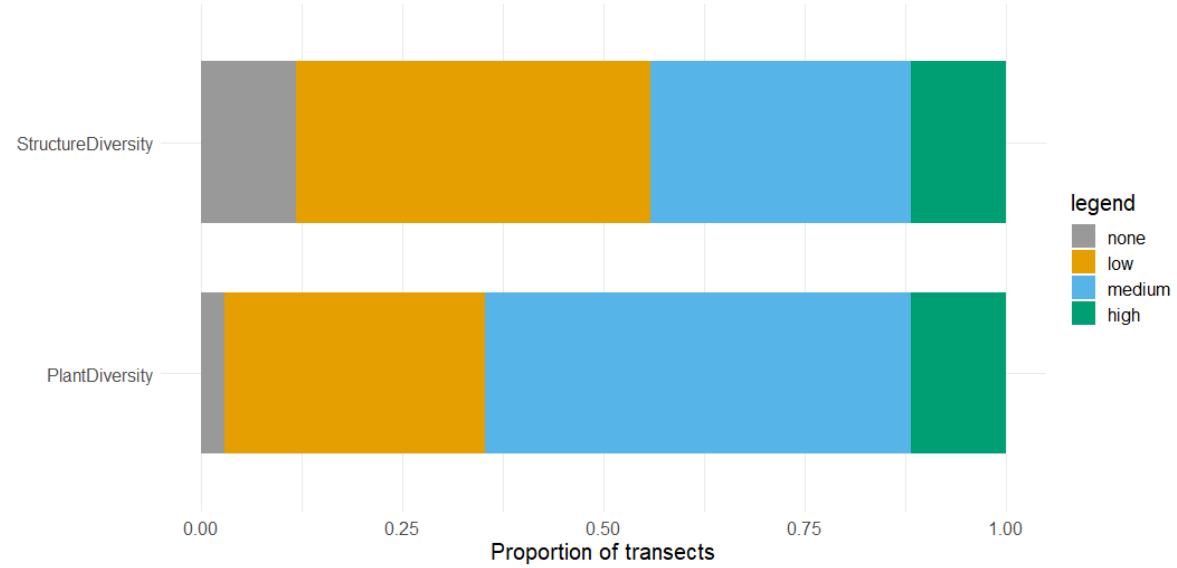

Figure 9. Proportion of Landcare project transects scored for structural and plant diversity from the rapid on-site assessment. "Structural diversity" refers to the different types of physical structures available while "plant diversity" refers to the variety of plants at a site.

A subset of the audited Landcare project sites had aquatic habitats within the project site (n=28 transects) and were assessed for riparian shading from mature trees, instream cover provided by aquatic vegetation or debris (logs and root wads) and stands of rushes (Figure 10). Canopy cover over streams and wetlands was non-existent or low as there were few large trees to create a canopy over the water surface. Similarly, in-stream cover was low as there was little debris in the river channels or wetlands. Aquatic vegetation and rushes (*Juncus*) were present at many sites in low-medium densities.

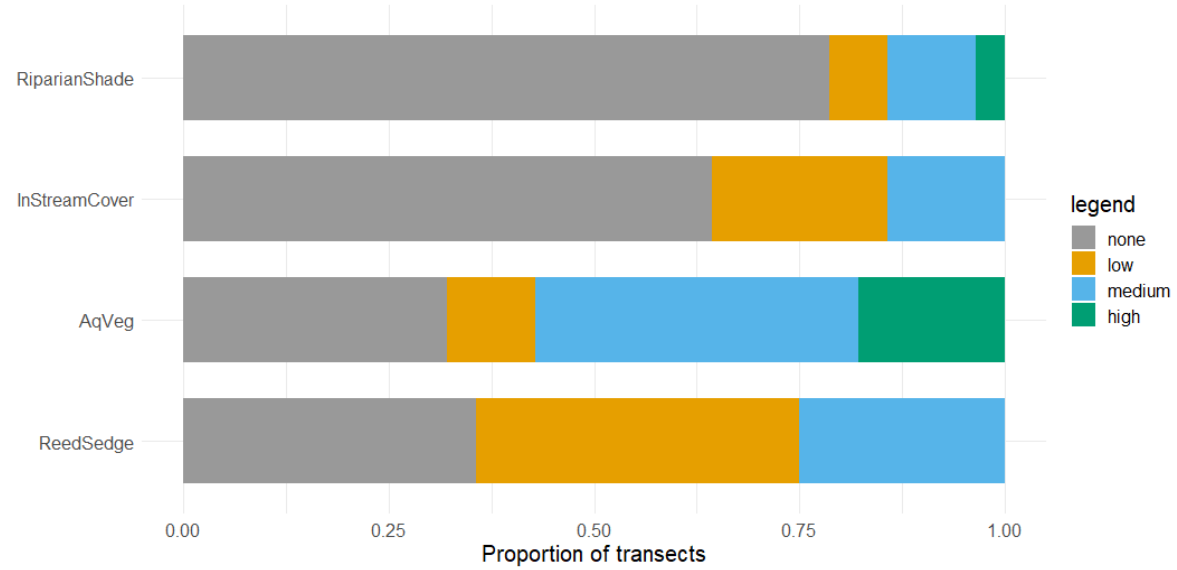

Figure 10. Characteristics of aquatic habitats assessed at Landcare project sites with riparian or wetland habitat. "Riparian shade" indicates how much shading is provided by canopy cover. "In stream cover" includes logs, rocks and other debris that provide habitat for in-stream fauna. Vegetation is classified as obligate "aquatic vegetation" (e.g. ribbon grass, *Phragmites*) or "reeds and sedges" that occur on the water edge or in ephemeral water.

The presence of animals was recorded by observations of tracks, scat, soil disturbance, grazed vegetation, and sound (e.g. birds and frogs). Birds, rabbits and kangaroos were evident at many sites, and several landholders described rabbits and kangaroos as a nuisance in their project sites (either using it as a refuge or reducing tree establishment). Domestic livestock (cows and sheep) were observed at a few sites. Cows crossing a property boundary were identified as a real problem to the establishment of trees by one landholder. Some landholders occasionally "crash-grazed" the project site with sheep to manage growth of grasses, particularly *Phalaris*. Frogs, crayfish, and feral pigs were also observed at some project sites.

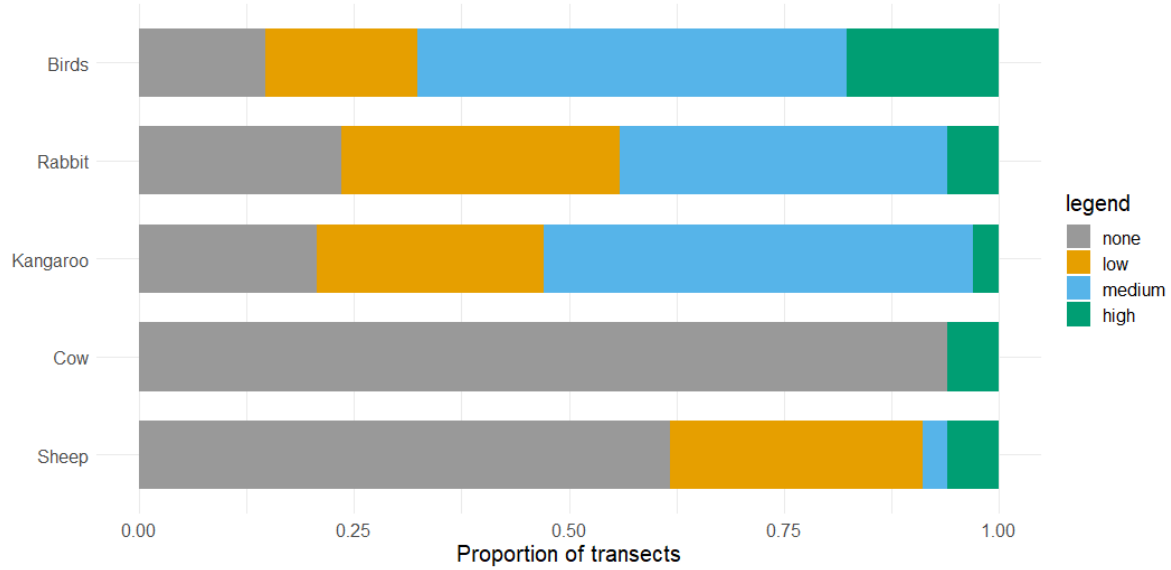

Figure 11. General observation of animal use within the Landcare project site from the rapid on-site assessment. These assessments are based on visual and auditory observations (e.g. scat, footprints, bird calls).

Observations and insights

Many of the landholders included in this survey hold an interest in - and appreciation for - their environment and have a desire to improve biodiversity on their private land. From questionnaire data and personal conversations with landholders, Landcare projects were viewed as successful overall. Some landholders recognized the trade-offs between agricultural practices and improving diverse native landscapes and a few even described their Landcare projects as "offsets" to other alterations on their farm.

Planting techniques were mostly consistent across different projects: site preparation included spraying and ripping (sometimes followed by a second spray) before planting tubestock. This technique appeared to be successful with a high proportion of tree survival and good visual tree health. A variation on this method involved using a two-disk cultivator (Figure 12) after ripping to mound the ripped soil, forming a raised bed in which to plant trees. The landholders that used this technique felt this improved planting success across different types of projects (corridors, wetlands, riparian).

Most landholders negatively described an increase in kangaroo and rabbit populations within their project areas. Furthermore, the abundance and density of *Phalaris* was possibly the most negative result we observed in fenced areas. Growing unimpeded under no grazing pressure, this grass comprised the majority of ground cover, and in some cases, understory. The dominance of *Phalaris* left little room for native grasses or other native ground cover and provided habitat for rabbits, foxes, wallabies and kangaroos. Some landholders crash grazed-the riparian area; this decreased the

height and perhaps density of *Phalaris* for a short time, but it still remained the dominant type of ground cover.

Only one project used direct drilling to plant tree seeds. This technique was cost and time effective and used in a large, relatively flat area. Germination and establishment was successful at the project site. The seeder increased planting density compared to tubestock planting.

A variety of tree guards were used across different projects including cardboard 'milk cartons', plastic bag guards held up with three bamboo stakes, plastic corflute cylinders or triangular tubes, and wire mesh guards. There were no discernable differences in the success rate of the tubestock based on guard type. Milk carton guards were shorter and provided less protection as the trees grew taller but were biodegradable. Both the plastic guards (bags and corflute) were found damaged or dislodged by strong winds and plastic guards were found scattered across some project areas. One site used felt weed mats placed around the base of the tubestock. This did not appear to add much benefit to the success of tree establishment. Tall wire mesh guards were only used sporadically and appeared to offer good protection from grazing livestock and kangaroos.

Figure 12. Homemade ripper with sprayer attached (left) and two-disk mounder (right) used in some Landcare planting projects.

Conclusions and recommendations

Most landholders used basically the same well-established technique for planting: spraying, ripping and using tubestock. Landholders in this survey generally agreed that this technique was successful, and our on-site assessments qualified this success. Many of the landholders that were included in this survey had experience planting trees and had learned the appropriate techniques for successful tree planting. For new landholders interested in planting trees, a planting guide could include tips for:

1. selecting a site and determining purpose of the project (e.g. erosion control, shelterbelt)
2. determining appropriate trees (based on soil type, aspect and plantation type e.g. riparian, wetland or corridor)
3. preparing the site adequately (spraying, ripping and fencing)
4. timing of planting (depending on site, and rainfall patterns)
5. choosing appropriate tree guards (depending on herbivore pressures)

Site selection must include consideration for the surrounding land use. One landholder described how he no longer tried to fence precisely around wetlands or riparian corridors. He found it easier to use A-B lines as a guide for fencing, creating a straight line for the "production" side of the fence and a variable width of tree planting on the "biodiversity" side of the fence.

Interestingly, structural and plant diversity was assessed as "low" or "medium" in most of the project sites. River Red Gum (*Eucalyptus camaldulensis*) was a favored tree species planted at many sites, sometimes in monoculture. Few shrub species were planted except at a few sites. Including diverse tree species and shrubs in future planting projects could have multiple benefits such as increasing structural and biological complexity to attract native wildlife. Furthermore, increasing the density of the understory layer seemed to reduce the thickness and height of *Phalaris* at some sites. Structural diversity could also be increased by providing additional forms of habitat including logs, dead trees and rocks. These features provide important habitat for native mammals, reptiles, amphibians and birds.

One aspect of this study was to identify potential monitoring sites for future study. We conducted a rapid assessment of 40% of BBCAG Landcare projects and any of the sites we surveyed would be appropriate for long-term monitoring. Over 85% of landholders surveyed were interested in the concept of long-term monitoring occurring within their project site(s). However, the number of sites included in this project is relatively low compared to the variability in the different projects (e.g. time since planting, season and rainfall of initial planting, habitat type, fencing compared to fencing and tree planting, presence of remnant vegetation, neighboring land use, etc.). Monitoring can be a powerful tool to understand the relationships among these variables, but must be planned carefully to incorporate these differences into the questions and analysis.

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Acknowledgments

Anthony Casanova (Interim Facilitator) provided detailed background information, sources for landholder contact details and shared access to the BBCAG database and files. Included in those files was the 2016 review of projects and funding produced by Bill Sharp. This report was valuable in providing some historical context and funding history for projects completed through BBCAG.

Landholder participation (questionnaire and on-site surveys) was fundamental for this audit to be successful. Many thanks to the landholders that allowed us access to their project sites and sharing their insight and project background history.

This report was funded by Beyond Bolac Catchment Action Group and the Wettenhall Environment Trust.

Appendix 1. Landholder questionnaire.

Landcare Project Assessment Survey for Landholders

In 2016, Beyond Bolac Catchment Action Group (BBCAG) released a Biodiversity Blueprint. The purpose of this document was to advance the goals of the organization to secure a 'biodiverse, productive, resilient and safe catchment supporting vibrant communities and land managers'. River Bend Ecology has been contracted by BBCAG to review past Landcare projects and analyze the successes and challenges of Landcare projects in the area. This information will be used by BBCAG for future strategic planning. Any information you provide in this assessment will be kept private and anonymous. Feel free to share this survey with those that are familiar with the projects preparation, establishment and maturity.

Landholder Name_____ Property Name_____
Date_____ Contact Information (phone or email)_____

1. **Were you the landholder or manager when your Landcare project was initiated?**
   yes (go to question 2)
   no (go to question 5)

2. **What were your main reasons for implementing this Landcare project?** (Circle up to 3 most relevant)
   a. farm management (e.g. windbreaks for livestock)
   b. biodiversity
   c. safeguarding a healthy landscape
   d. addressing erosion and salinity issues in the waterway
   e. control of invasive pests
   f. pleasure/aesthetics
   g. tax benefits
   h. other_____

3. **Was the process of applying and implementing your project straightforward?**

1	2	3	4	5
disorganized				streamlined

4. **If your project involved planting trees, what did you do to prepare the site and establish the trees?**
   a. fencing
   b. ripping
   c. spraying (once or twice)
   d. direct-drill seed
   e. plant tubestock
   f. water after planting
   g. other _____

5. **Did you feel your Landcare project was successful in the first two years after the preparation and planting phase?**

1	2	3	4	5
no		somewhat		yes

6. **Do you feel your Landcare project was successful in the long term?**

1	2	3	4	5
no		somewhat		yes

7. What primary management activities occur, or have occurred, within the project area since its completion?

a. maintain fencing
b. additional tree planting
c. management of pasture grasses
d. grazing (livestock type_____)
e. erosion control
f. weed control
g. pest control
h. managed burning
i. wood cutting
j. other_____

8. How often are livestock introduced into the project area?

1	2	3	4	5
never				continually

9. What changes have you observed in the flora and fauna within the project area? (Circle arrows to represent increase or decrease in the relevant responses. Do not circle if no change was perceived)

trees and shrubs	↑		↓	insects	↑		↓
birds	↑		↓	weeds	↑		↓
native mammals	↑		↓	pasture grasses	↑		↓
invasive mammals	↑		↓	reptiles	↑		↓

10. What changes have you observed in the waterway within the project area?
(If applicable, circle arrows to represent increase or decrease in the relevant responses. Do not circle if no change was perceived)

erosion	↑		↓	water clarity	↑		↓
aquatic vegetation	↑		↓	water levels	↑		↓
fish	↑		↓	algal growth	↑		↓
amphibians	↑		↓	aquatic insects	↑		↓

11. How much do you, your family, or your community enjoy the project area?

1	2	3	4	5
not at all		somewhat		greatly

12. Since your Landcare project, what has been your involvement with the BBCAG?

1	2	3	4	5
not involved				actively involved

13. Would you consider further funding for a new project on your land?

no maybe yes

14. Would you consider allowing your project site to be utilized as a monitoring site for BBCAG to track ecosystem changes over time?

no maybe yes

15. Do you have any other comments related to the project site?

Thank you for taking time to complete this survey.

Appendix 2. On-site rapid assessment survey

On site habitat assessment

Site location		
Transect No.	date	time
Site auditors names		
GPS location (datum - GDA94, Zone 54H)	start	end
Photos	start	end

Landscape context

	0	1	2	3
Proximity (far -> near)				
Patch size (small -> large)				

nearest patch of native vegetation >10ha: 0 = > 1km, 1 = 200m-1km, 2 = contiguous, 3 = contiguous with patch > 50ha

patch size: 0 = < 200m, 1 = 200-500m, 2 = 500m-1km, 3 = > 1km

Project site

Assessment area: from fence to middle of the river, or 5m into the wetland

Project type
□ wetland
□ riparian
□ corridor

Site area
length (m)
width (m)
project length

Technique
□ tubestock
□ direct drill
□ regeneration

Rainfall during planting year
□ low
□ average
□ high

Herbicide preparation
□ none
□ spray once
□ spray twice

fencing condition
□ none
□ poor
□ fair
□ good

Follow up care

Fauna - native and introduced

	0	1	2	3
Sheep				
Cow				
Kangaroo				
Rabbit				
Birds				
Other				

Comments

Evidence of animals: 0 = none, 1 = sparse, 2 = medium, 3 = high abundance

Vegetation cover

	0	1	2	3
Canopy				
Understory				
Groundcover				

0 = none, 1 = 1-30%, 2 = 31-60%, 3 = >60%

Comments

Trees

	0	1	2	3
Presence of remnant vegetation				
Planting success				
Regeneration				
Tree health				

Comments

0 = none, 1 = 1-low, 2 = medium, 3 = high

Microhabitats

	0	1	2	3
Banks eroding				
Habitat for wildlife:				
Standing dead trees				
Bare ground				
Ground debris				
Logs				
Groundcover veg				
Native grasses & forbs				
Weeds				
Phalaris/pasture-cover				
Phalaris - height				
Riparian and aquatic veg				
Reed/sedge				
Aquatic veg (in river or wetland)				
In-stream cover (e.g. roots, logs)				
Riparian shading				
0 = none, 1 = 1-low, 2 = medium, 3 = high				

Note any high risk weeds (and their relative cover)

Site Index

	0	1	2	3
Plant diversity				
Structural diversity				
0 = none, 1 = 1-low, 2 = medium, 3 = high				

Field notes

General description and observations