Goulburn Broken Catchment Management Authority

Biodiversity Monitoring Action Plan
(Working Document)

Original by Kate Brunt & Rod McLennan, November 2006
Updated by Vanessa Keogh, July 2010

GB Biodiversity Team

Biodiverse and Healthy Landscape

GOULBURN BROKEN CATCHMENT MANAGEMENT AUTHORITY

Introduction

Monitoring has long been identified as an important activity for the GB CMA Biodiversity Program. Monitoring assists in tracking the Catchment's progress towards the Resource Condition Targets (RCTs) and helps inform decision making relating to review, evaluation and development of projects. As a result, this Monitoring Action Plan for Biodiversity has been developed.

This plan concentrates on two of the RCTs:
1. Increase the cover of all endangered and applicable vulnerable EVCs to at least 15% of their pre-European vegetation cover by 2030 (pg 3-13)
2. Improve the quality of 90% of existing (2000) native vegetation by 10% by 2030 (pg 14- 23)

It should be noted that whilst there is a chance that the RCT's will alter in the future the basic premise of RCT's are rigorous and likely to be reflected in any new RCTs.

Currently, reporting on progress towards these targets is achieved through the use of the following equation:

Outcomes (RCTs) = Outputs (on-ground achievements) x Assumptions.

There are 3 types of Assumptions relating to each RCT:
1. Assumptions on Targets themselves and projected increases.
2. Assumptions used in calculating progress towards RCT from outputs recorded.
3. Further implied assumptions in calculations

Each of the assumptions used in the annual reporting process is allocated a certainty rating. This rating is required as the information used to inform the assumptions ranges from empirical data to local knowledge and best guesses. Therefore, this rating helps to identify gaps in our knowledge and areas where further knowledge is required to improve our certainty. By using the assumptions as the basis for monitoring, a direct link to annual reporting process, the RCTs (outcomes) and the decision making process about projects and programs can be made.

It is not the intention for this Action Plan to develop complex and costly monitoring activities, rather identify monitoring methods that can be built into the GBCMA and its partners current work activities, whilst still providing valuable and accurate data to better report on the Catchments Biodiversity vegetation targets.

The Goulburn Broken Biodiversity Strategy Working Group (BSWG) (formerly the Biodiversity Integration Group (BIG)) has been involved in reviewing the assumptions used in the reporting process; the information provided by BIG has informed and provided direction for this Action Plan. At this stage, the focus of assessing progress is on private land as this is

Key Research Questions

1. What is the change in quality at :
- Revegetation sites - Priority H
- Remnant protection sites - Priority H
- Covenants - Priority M
- Bush Returns sites - Priority H
- Green Graze sites - Priority H
- Unfunded sites - Priority VH

(Quality assumptions 2.1b-i, 2.2)

2. What are the losses in veg through indirect processes (dieback) - Priority VH
(Extent and Quality Assumption 2.5)

3. How does fire and salvage harvesting affect short medium and long term habitat extent & quality.
(New assumptions around fire?)

4. How much natural regeneration is occurring in the catchment? Is all natural regeneration considered an increase in extent and quality? - Priority VH
(Extent and Quality Assumptions 2.3)

Emerging Themes

- GBCMA needs to improve understanding of the outcomes of regulatory/compliance activities such as native vegetation laws, wood utilisation plans and timber release plans.

Increase the extent of native vegetation in fragmented[2] landscapes by 70,000ha by 2030 in order to restore threatened EVCs and improve landscape connectivity (relative to 2005 levels).

	Assumptions	Assumption Number	Certainty Action=Outcome	Importance for decision-making
2. Assumptions used in calculating progress towards RCT from outputs recorded				
Calculation (progress towards RCT): A = F + V + LU - R - D				
F=	Area increased through funds provided via GB CMA (Assumptions 2.1b, 2.1c, 2.1 e and 2.1g)	**2.1**	H	M
	2.1b 100% area revegetated (planted or direct seeded contributes to an increase in extent	**2.1b**	H	VH
	2.1c 5% of the area fenced (terrestrial, wetland or stream/river) contributes to an increase in extent through regeneration	**2.1c**	L	L
	2.1f 80% of "Bush Returns" sites contributes to an increase in extent through natural regeneration	**2.1f**	M	H
	2.1h 30% of "Green Graze" sites contributes to an increase in extent through natural regeneration	**2.1h**	M	H
	Therefore F = b + c + 0.05d + 0.8f + 0.3h			
V =	Area increased through privately funded activities = F. Assumption 2.2	**2.2**	H	VH
LU =	Area increased from changed land use = 300 ha per year	**2.3**	L	VH
R =	Area reduced by direct removal = 200 ha per year*	**2.4**	H	H
D =	Area reduced by indirect removal (dieback) = 200 ha per year	**2.5**	L	H
Once-off assumptions (2009)				
2009 Fires				
	Assume area burnt will return and therefore not a loss of extent		M	H
	"Timber harvesting is assumed to deliver no net loss over time" or "code of practice and prescriptions adequate for habitat retention"		M	H
	*Area reduced by direct removal post fire = 1125 ha + 28 ha		L	M
Offsets				
	Area reduced by direct removal (legal clearing) but offset in other parts of Victoria (ie not offset in GB catchment) -area yet to be determined			
DELETED				
	3.1 Success rate of extent established when revegetating = 100%.		H	H

Improve the quality of 90% of existing (2000) native vegetation by 10% by 2030.

	Assumptions	Assumption Number	Certainty	Importance for decision-making
2. Assumptions used in calculating progress towards RCT from outputs recorded				
F	Area improved through funds provided via GB CMA =		H	H
	Proportion of all revegetation (planting or direct seeding) that complements native vegetation that existed in 2000 (0.9) x	2.1a	L	M
	area revegetated (planted or direct seeded) +	2.1b	M	VH
	area fenced (terrestrial, wetland or stream/river) +	2.1d	M	VH
	100% of "Bush Returns" sites contributes to an increase in quality through natural regeneration	2.1f	H	H
	100% of "Green Graze" sites contributes to an increase in quality through natural regeneration	2.1h	M	H
	area of land managed actively for natural regeneration - "Covenanted"]	2.1i	M	H
	area of land managed actively for natural regeneration - "Bush Tender" (awaiting data on area)	2.1j	M	M
	Therefore, F = 0.9b + d + f + h + i +j			
V	Area increased through privately funded activities = F.	**2.2**	M	VH
LU	Area improved from changed land use = 100 ha per year	2.3	L	H
R	Area reduced (declined in quality by at least 10%) by direct removal = 200 ha per year*	**2.4**	L	H
D	Area reduced (declined in quality by at least 10%) by indirect removal (dieback) = 500 ha per year	**2.5**	L	H
	Calculation (progress towards RCT): A = F + V + LU - R - D			
	3.3 Data for actions undertaken 2000-01 to 2002-04 were interpolated from 2003-04 and 2004-05 results.		M	L
	3.4 Cumulative actions achieved in 10 years to 2000-01 = 1,000 ha.		L	M
	Once-off assumptions (2009)			
	2009 Fires			
	Assume area burnt within the 'minimum fire interval' will result in a loss of quality. (figure to be determned) - area yet to be determined		M	H
	Timber harvesting is assumed to deliver no net loss over time" or "code of practice and prescriptions adequate for habitat retention"		L	H
	*Area reduced by direct removal post fire = 1125 ha + 28 ha		L	M
	Offsets			
	Area reduced by direct removal (legal clearing) but offset in other parts of Victoria (ie not offset in GB catchment) - area yet to be determined			

Assumptions used in calculating progress towards RCT from outputs

	Extent	Certainty	Importance	Quality	Certainty	Importance
2.1a:	n/a	0	0	Proportion of all revegetation (planting or direct seeding) that complements native vegetation that existed in 2000 (0.9) x	L	M
	Definitions/Explanation:			***Definitions/Explanation:***		
				It is assumed that 90% of the area of each revegetation site contributes to an increase in the quality of existing vegetation. This assumption relates to the proportion of revegetation works that contribute to the quality target.		
	Rationale/Information Sources:			***Rationale/Information Sources:***		
				CAMS: Prior to 06/07, revegetation didn't contribute towards this target as it was thought that it was not improving the quality of existing vegetation. The BIG decided in 2007 that revegetation works should contribute towards this target as most revegetation in the GBC occurs adjacent to or links with remnant vegetation and therefore can be considered as increasing the quality of existing vegetation 90% was estimated, it takes into account that some sites won't be near existing vegetation. See assumption 3.1 and 3.2 for assumptions relating to the success of revegetation sites.		
	Actions			***Actions***		
				Examine CAMS spatial data to determine the proportion of works occurring near remnant vegetation. Encourage users to record spatial information (shapefiles) in CAMs - not completed Work with Landscape Logic, Project 3, to clarify/test this assumption - ongoing		

Assumptions used in calculating progress towards RCT from outputs

	Extent	Certainty	Importance	Quality	Certainty	Importance
2.1b.	**Area revegetated (planted or direct seeded)**	H	VH	**Area revegetated (planted or direct seeded)**	M	VH
	Definitions/Explanation:			***Definitions/Explanation:***		
	It is assumed that 100% of the area of each revegetation site contributes to an increase in the extent of vegetation (75% of which will be applicable EVCs as per assumption 2.1a). / It is assumed that all revegetation sites contribute to increasing the extent of native vegetation. See 3.2 for assumptions relating to the success and composition of revegetation works.			It is assumed that revegetation sites will increase in quality by 10% over 10 years (90% of which contributes to the target as per assumption 2.1a)		
	Rationale/Information Sources:			***Rationale/Information Sources:***		
	BIG/BSWG: It is assumed that 100% plant survival rate is not required in order to establish a site and therefore that 100% of a site contributes to increases in cover. **EMG Audit** looked at the % cover of established native vegetation of revegetation sites. The % cover of native vegetation was variable. 68 sites (56%) had less that 75% cover, 41 sites (34%) had less than 50% cover, 21 sites (17%) of sites had less than 25% cover. However as the sites were monitored when they were quite young, little can be inferred about their long-term success. It was agreed that the sites are likely to improve over time and the area will contribute to an increase in extent. Certainty rating changed from VH to H. ***Environmental Project Monitoring Report (2007):*** 13 reveg sites visited. An "assessment of habitat quality " completed - understorey scores increased from average of 2.2 in 2005 to 3.0 in 2007, indicating good success rate at sites. ***Baschin et al:*** revisited 17 sites up to 20 years old in Glenaroua. Found there was plant survival at all sites. However, regeneration at most sites was limited, and it was acknowledged that this may have implications on the long term viability of the planted sites. ***Lake et al (2008):*** preliminary results found overall mortality at planted sites was less than 30%. Also found natural regeneration of red gums at fenced sites, as compared with no regeneration at control (unfenced) sites.			**BIG/BSWG:** It is assumed that revegetation will increase the quality of the site by at least 10% in 10 years, but it is thought that this will mainly be through understorey planting. Long term data that compares change in site quality is needed. **EMG Audit** provided information on the current condition of 115 EMG Sites (includes remnant and reveg sites). The average score for the 115 VQAs was 6.71 (out of a possible 20), while the median was six. The audit also reported that "Understorey results were reasonably high, presumably resulting from the planting of such species into the sites". It is therefore assumed that there is at least 10% improvement in quality on (90% of) reveg sites mainly through planting of understorey. ***Munro et al (2007). R*** eviewed 27 studies. Review suggests that revegetation provides habitat for many species of bird and some arboreal marsupials, with species richness of birds being greater in revegetated areas that were large, wide, structurally complex, old and near remnant vegetation. This provides some evidence that revegetation does improve habitat quality. ***Environmental Project Monitoring Report (2007):*** 13 reveg sites visited and an "assessment of habitat quality " completed. Understorey scores increased from ***Baschin et al:*** revisited 17 sites up to 20 years old. Found there was plant survival at all sites. However, regeneration at most sites was limited, and it was acknowledged that this may have implications on the long term viability of the planted sites. Acacia were not abundant but it was thought this reflected the original species mix planted. Revegetation standards have improved since. ***Lake et al (2008):*** preliminary results found overall mortality at planted sites was less than 30%. Also found natural regeneration of red gums at fenced sites, as compared with no regeneration at control (unfenced) sites. Also found 10% reduction in bare ground at fenced sites with a 5% increase in bare ground at unfenced sites.		

Assumptions used in calculating progress towards RCT from outputs

	Extent	Certainty	Importance	Quality	Certainty	Importance
	Actions			***Actions***		
	Develop monitoring program to provide data on if 100% of revegetation is contributing to an increase in vegetation extent, building on existing information sources - in progress Work with Landscape Logic, Project 3, to clarify/test this assumption - ongoing Liaise with DPI regarding the potential development of a VQA data collection and storage system for extension staff - in progress Review literature (incl Wilson et al. The effectiveness of habitat works for the survival and population status of the Grey-crowned Babbler Pomatostomus temporalis) - ongoing			Develop monitoring/research program to provide data on if there is a 10% improvement in 10 years on revegetation sites, building on existing information sources. Work with Landscape Logic, Project 3, to clarify/test this assumption - ongoing Liaise with DPI regarding the potential development of a VQA data collection and storage system for extension staff - in progress Review literature (incl Wilson et al. The effectiveness of habitat works for the survival and population status of the Grey-crowned Babbler Pomatostomus temporalis) - ongoing		
2.1d:	**5% of the area fenced (terrestrial, wetland or stream/river) contributes to an increase in extent through regeneration**	L	L	**area fenced (terrestrial, wetland or stream/river).**	M	VH
	Definitions/Explanation:			***Definitions/Explanation:***		
	It is assumed that areas that are fenced off (ie remnant protection) will have a 5% increase in vegetation extent through natural regeneration (75% of which will be in endangered and applicable vulnerable EVCs). This is the only contribution that remnant protection works contribute to this RCT. Assumption 2.3 considers regeneration in other areas of the catchment.			It is assumed that areas of native vegetation protected (fenced terrestrial, wetland or stream/river) will improve in quality by 10% in 10 years		
	Rationale/Information Sources:			***Rationale/Information Sources:***		

Extent	Certainty	Importance
EMG Audit: A total of 76 sites (66%) surveyed had some form of natural regeneration occurring on them (both reveg and remnant sites). This suggests that it is reasonable to assume there is some natural regeneration occurring on remnant protections sites. The amount/extent of natural regeneration was not looked at therefore we cannot be sure how much is occurring. Certainty (2.1c): L. We have no data and little anecdotal evidence of how much. Certainty (2.1d): H. Reduced the certainty due to the use of this output in CAMS – ie waterways use to document the 'area protected' even if there is no remnant vegetation present. DSE net gain accounting data (tree change layer) was considered, however analysis of the data revealed significant inaccuracies, and hence the data will not be used to inform the assumptions in 07/08. ***Environmental Project Monitoring Report (2007):*** found natural regeneration of overstorey species at 10 of the 13 sites monitored. Recruitment scores increased from 0.3 in 2005 to 1.1 in 2007, indicating that more natural regeneration is happening at these sites. Observed natural regen of Hooked Needlewood and Buloke. However, also observed dieback in mature Red Gum and Grey Box, however this does not appear to have worsened from 2005-2007. ***Baschin et al (2003):*** revisited 17 sites up to 20 years old. Found there was plant survival at all sites. However, regeneration at most sites was limited, and it was acknowledged that this may have implications on the long term viability of the planted sites. ***Lake et al (2008):*** preliminary results, found natural regeneration of red gums at fenced sites, as compared with no regeneration at control (unfenced) sites.		

Quality	Certainty	Importance
BIG/BSWG: The Biodiversity Integration Group (BIG) indicated that 10% may be a conservative figure for these sites. BIG suggested for reporting purposes it is appropriate to consider a common rate of improvement achieved under different incentive programs. For example the gains achieved by Conservation Covenants and Environmental Management Grants are consistent until more information becomes available to show otherwise. It is recognised that currently there is no available data to dispute this assumption. More information concerning vegetation condition change in the GB Catchment is required in order to answer the above questions. Certainty reduced due to the use of this output in CAMS – ie waterways use to document the 'area protected' even if there is no remnant vegetation present. ***EMG Audit:*** provided information on the current condition of 115 EMG Sites (includes remnant and reveg sites) but little can be inferred about the changes to date, or anticipated future changes. ***Environmental Project Monitoring Report (2007):*** reports that " from comparisons made using the photograph series and on-site observations, the overall health of the remnant vegetation is improving". Observed natural regen of Hooked Needlewood and Buloke. However, also observed dieback in mature Red Gum and Grey Box, however this does not appear to have worsened from 2005-2007. ***Baschin et al:*** revisited 17 sites up to 20 years old. Found there was plant survival at all sites. However, regeneration at most sites was limited, and it was acknowledged that this may have implications on the long term viability of the planted sites. Acacia were not abundant but it was thought this reflected the original species mix planted. Revegetation standards have improved since. ***Lake et al (2008):*** preliminary results found overall mortality at planted sites was less than 30%. Also found natural regeneration of red gums at fenced sites, as compared with no regeneration at control (unfenced) sites. Also found 10% reduction in bare ground at fenced sites with a 5% increase in bare ground at unfenced sites.		

Assumptions used in calculating progress towards RCT from outputs

	Extent	Certainty	Importance	Quality	Certainty	Importance
	Actions			***Actions***		
	Develop monitoring program to provide data on if regeneration is occurring in fenced sites - in progress Work with Landscape Logic, Project 3, to clarify/test this assumption - ongoing Liaise with DPI regarding the potential development of a VQA data collection and storage system for extension staff - in progress Review literature relating to amount of natural regeneration - ongoing			Develop monitoring program to provide data on if there is a 10% improvement in 10 years on fenced sites, building on existing information sources. Consider investigating difference in the rate of change in vegetation condition between different incentive programs - in progress Work with Landscape Logic, Project 3, to clarify/test this assumption - ongoing Liaise with DPI regarding the potential development of a VQA data collection and storage system for extension staff - in progress Review literature - ongoing		
2.1f:	**80% of "Bush Returns" sites contributes to an increase in extent through natural regeneration**	**M**	**H**	**100% of "Bush Returns" sites contributes to an increase in quality through natural regeneration**	**H**	**H**
	Definitions/Explanation:			***Definitions/Explanation:***		
	It is assumed that there will be an increase in the extent of vegetation on 80% of each Bush Returns site (75% of which will be applicable EVCs as per assumption 2.1a). This is only counted once for each site, not 80% annually.			It is assumed that there will be a 10% improvement in vegetation quality over 10 years on all Bush Returns sites.		
	Rationale/Information Sources:			***Rationale/Information Sources:***		
	This assumption is an estate provided by Carla Miles and supported by the BIG. The % is higher than for Green Graze as natural regeneration is a bigger focus of this program. As part of the Bush Returns project, there will be annual monitoring of sites by the University of Melbourne which may provide information on the amount of natural regeneration occurring. ***Vesk et al 2007:*** monitored 110 plots across the 22 BR sites, and 67 plots across the 5 Green Graze sites. Seedlings were found at less than a quarter of plots. This focussed on euc regen. Regen of other native vegetation including grasses not considered. ***Landholder monitoring/photopoints & CMA inspections:*** evidence of regeneration of eucalypt and non-eucalypt species, including significant increases in the cover of native grasses. Provides some evidence that there is an increase in the extent of native veg at these sites.			This assumption is an estimate provided by Carla Miles and supported by the BIG. As part of the Bush Returns project, there will be annual monitoring of sites by the University of Melbourne which may provide information on the changes in vegetation quality at these sites. ***Vesk et al 2007:*** monitored 110 plots across the 22 BR sites, and 67 plots across the 5 Green Graze sites. Seedlings were found at less than a quarter of plots. This focussed on euc regen. Regen of other native vegetation including grasses not considered. ***Landholder monitoring/photopoints & CMA inspections:*** evidence of regeneration of eucalypt and non-eucalypt species, including significant increases in the cover of native grasses. Provides evidence that there is an increase in quality at these sites.		
	Actions			***Actions***		
	Investigate the ability of the of the Bush Returns Monitoring project to inform this assumption - ongoing			Investigate the ability of the of the Bush Returns Monitoring project to inform this assumption - ongoing		

Assumptions used in calculating progress towards RCT from outputs

	Extent	Certainty	Importance	Quality	Certainty	Importance
2.1h	**30% of "Green Graze" sites contributes to an increase in extent through natural regeneration**			**100% of "Green Graze" sites contributes to an increase in quality through natural regeneration**	M	H
	Definitions/Explanation:			***Definitions/Explanation:***		
	It is assumed that there will be an increase in the extent of vegetation on 30% of each Green Graze site (75% of which will be applicable EVCs as per assumption 2.1a). This is only counted once for each site, not 30% annually.			It is assumed that there will be a 10% improvement in vegetation quality over 10 years on all Green Graze sites.		
	Rationale/Information Sources:			***Rationale/Information Sources:***		
	This assumption is an estimate provided by Carla Miles (GBCMA) and supported by the BIG. This is a lower proportion than Bush returns as GG has less emphasis on natural regeneration/increasing cover. Annual monitoring of sites in collaboration with the Bush Returns monitoring program which may provide information on the amount of natural regeneration occurring. ***Vesk et al 2007:*** monitored 110 plots across the 22 BR sites, and 67 plots across the 5 Green Graze sites. Seedlings were found at less than a quarter of plots. This focussed on euc regen. Regen of other native vegetation including grasses not considered. ***Landholder monitoring/photopoints & CMA inspections:*** Fencing and grazing management change less that 1 year old. Only limited evidence of regeneration of eucalypt and non-eucalypt species at this stage.			This assumption is an estimate provided by Carla Miles (GBCMA) and supported by the BIG. Annual monitoring of sites in collaboration with the Bush Returns monitoring program which may provide information on the amount of natural regeneration occurring. ***Vesk et al 2007:*** monitored 110 plots across the 22 BR sites, and 67 plots across the 5 Green Graze sites. Seedlings were found at less than a quarter of plots. This focussed on euc regen. Regen of other native vegetation including grasses not considered. ***Landholder monitoring/photopoints & CMA inspections:*** Fencing and grazing management change less that 1 year old. Only limited evidence of regeneration of eucalypt and non-eucalypt species at this stage.		
	Actions			***Actions***		
	Investigate the ability of the of the Green Graze Monitoring project to inform this assumption - ongoing			Investigate the ability of the of the Green Graze Monitoring project to inform this assumption - ongoing		

Assumptions used in calculating progress towards RCT from outputs

	Extent	Certainty	Importance	Quality	Certainty	Importance
2.1i	n/a			Area of land managed actively for natural regeneration - "Covenanted"	M	H
	Definitions/Explanation:			***Definitions/Explanation:***		
	As covenanted sites are generally already well vegetated, it is not expected that they will contribute to the extent target.			It is assumed that there will be a 10% improvement in vegetation quality over 10 years on all covenanted sites.		
	Rationale/Information Sources:			***Rationale/Information Sources:***		
				This assumption is an estimate provided by Doug Robinson (Trust for Nature) and supported by the BIG.		
	Actions			***Actions***		
				Develop monitoring program to provide data on if there is a 10% improvement in 10 years on fenced sites, building on existing information sources. Consider investigating difference in the rate of change in vegetation condition between different incentive programs - in progress Work with Landscape Logic, Project 3, to clarify/test this assumption - ongoing		

Assumptions used in calculating progress towards RCT from outputs

	Extent	Certainty	Importance	Quality	Certainty	Importance
2.1j	n/a			Area of land managed actively for natural regeneration - "Bush Tender"	M	M
	Definitions/Explanation:			*Definitions/Explanation:*		
				It is assumed that there will be a 10% improvement in vegetation quality over 10 years on all Bush Tender sites.		
	Rationale/Information Sources:			*Rationale/Information Sources:*		
				This assumption is based on very little data		
	Actions			*Actions*		
				Source and review information on Bush Tender		

Assumptions used in calculating progress towards RCT from outputs

	Extent	Certainty	Importance	Quality	Certainty	Importance
2.2:	**Area voluntarily increased by works = 0.1 x area funded (F)**	H	VH	**Area voluntarily increased by works = 0.1 x area funded (F)**	M	VH
	Definitions/Explanation:			***Definitions/Explanation:***		
	Our assumption to date has been that for every hectare of native vegetation works that were funded through the GBCMA/partner programs, another hectare of works was done without any incentive from the GBCMA/partners(ie a 1:1 ratio).			Our assumption to date has been that for every hectare of native vegetation works that were funded through the GBCMA/partner programs, another hectare of works was done without any incentive from the GBCMA/partners(ie a 1:1 ratio).		
	Rationale/Information Sources:			***Rationale/Information Sources:***		
	This assumption was initially based on an estimate by the BIG. The assumptions have been tested through Landscape Logic. This research has focused on Longwood/VT (GBCMA), Muckleford (NCCMA) and Indigo Valley (NECMA). Based on this research, the x2 assumption (1:1 ratio) held true in the 1990s, but it appears to be an overestimate post 2002. The revised assumption is a ratio of 1:0.07 (reference to be provided). Previously this assumption was based on the following information: ***Abrosio et al 2009:*** Results from x2 project indicate that this assumption holds true (when considering funds that come through CMA only) ***Smith, P (2008):*** Study in wheatbelt of WA, focused on revegetation only. Found a total of 3.2 million invested in revegetation. $1.6 M(%50) - no public investment, $1.6M (%50) incentive program or full public funding. Supports the 1:1 ration (x2 assumption). Only 15% of planting were 'local natives'.			This assumption was initially based on an estimate by the BIG. The assumptions have been tested through Landscape Logic. This research has focused on Longwood/VT (GBCMA), Muckleford (NCCMA) and Indigo Valley (NECMA). Based on this research, the x2 assumption (1:1 ratio) held true in the 1990s, but it appears to be an overestimate post 2002. The revised assumption is a ratio of 1:0.07 (reference to be provided). Previously this assumption was based on the following information: ***Abrosio et al 2009:*** Results from x2 project indicate that this assumption holds true (when considering funds that come through CMA only) ***Smith, P (2008):*** Study in wheatbelt of WA, focused on revegetation only. Found a total of 3.2 million invested in revegetation. $1.6 M(%50) - no public investment, $1.6M (%50) incentive program or full public funding. Supports the 1:1 ration (x2 assumption). Only 15% of planting were 'local natives'.		
	Actions			***Actions***		
	Work with Landscape Logic, Project 3, to clarify/test this assumption - ongoing			Work with Landscape Logic, Project 3, to clarify/test this assumption - ongoing		

Assumptions used in calculating progress towards RCT from outputs

	Extent	Certainty	Importance	Quality	Certainty	Importance
2.3:	**Area increased from changed land use (resulting in natural regeneration) = 300 ha per year**	L	VH	**Area improved from changed land use = 100 ha per year**	L	H
	Definitions/Explanation:			***Definitions/Explanation:***		
	It is assumed that there are vegetation gains of 300ha every year through natural regeneration in endangered and applicable vulnerable EVCs. This is in addition to the regeneration occurring in remnant vegetation sites protected through GBCMA funding, Bush Returns sites and Green Graze sites.			It is assumed that as a result of changed land use, that there will be a 10% increase in vegetation quality on a 100ha area.		
	Rationale/Information Sources:			***Rationale/Information Sources:***		
	This assumption is based on very little data. ***Franco (2007):*** found increase in shrubby layer (acacia) in grassy woodland areas at Inverleigh, Vic. Questioned if this is the desired state for the management agency. ***Robinson, D (2006):*** Looked at changes in vegetation extent from 1971 - 2006 by looking at aerial photography. Found that there was a total of 55% increase in veg cover. Of this increase, 68% was due to natural regeneration (p100). - Koonda area, 178ha natural regeneration from 1971-2001. This equates to approx 6ha per year - Tamleugh area, 73.67 ha natural regeneration 1971-2001. This equates to 2.5 ha per year. It is recognised that this is a coarse way to look at the data given that the regeneration events were likely to be concentrated to different time periods, not spread evenly across time.			This assumption is based on very little data.		
	Actions			***Actions***		
	Work with Landscape Logic, Project 3, to clarify/test this assumption - ongoing Investigate any currently available information to determine the amount of natural regeneration contributing annually to increase in quality (Tree Change Layer, Sheep Pen Creek Report, Dorrough, Vesk et al etc) - completed/ongoing Continue discussion with Ian Lunt about 'thickening' of vegetation, and how to consider this in terms of vegetation extent. Review papers by Ian Lunt/Toby Grant.			Work with Landscape Logic, Project 3, to clarify/test this assumption - ongoing. Investigate any currently available information to determine the amount of natural regeneration contributing annually to increase in quality (Tree Change Layer, Sheep Pen Creek Report, Dorrough, Vesk et al etc) - completed/ongoing Continue discussion with Ian Lunt about 'thickening' of vegetation, and how to consider this in terms of vegetation extent. Review papers by Ian Lunt/Toby Grant.		

	Extent	Certainty	Importance	Quality	Certainty	Importance
2.4:	**Area reduced by direct removal (clearing) = 200 ha per year**	H	H	**Area reduced (declined in quality by at least 10%) by direct removal = 200 ha per year**	L	H
	Definitions/Explanation:			***Definitions/Explanation:***		
	It is assumed that there are vegetation losses of 200ha every year through direct removal such as clearing in endangered and applicable vulnerable EVCs. This assumption applies to private land and does not include vegetation losses through indirect removal such as dieback (see 2.5).			It is assumed that there is a 10% reduction in quality over 200ha through direct removal such as clearing. This assumption applies to private land and does not include vegetation losses through indirect removal such as dieback (see 2.5).		
	Rationale/Information Sources:			***Rationale/Information Sources:***		
	Geoff Lodge (DSE, NVO) estimated there would be approximately 100ha legal clearing, 100ha illegal clearing. DSE records will be able to clarify legal clearing figures in the future. DSE net gain accounting data (tree change layer) was considered, however analysis of the data revealed significant inaccuracies, and hence the data will not be used to inform the assumptions in 07/08. ***McCallum (2004):*** analysed the rate at which scattered trees were being lost in the Vic Riverina Bioregion on the GBC by analysing aerial photos from 89/93 cf to 2000/04 of 6 sites. These sites showed loss of b/w 9% and 44% of scattered trees. Biggest losses in irrigated grazing areas.			Geoff Lodge (DSE, NVO) estimated there would be approximately 100ha legal clearing, 100ha illegal clearing. DSE records will be able to clarify legal clearing figures in the future. DSE net gain accounting data (tree change layer) was considered, however analysis of the data revealed significant inaccuracies, and hence the data will not be used to inform the assumptions in 07/08.		
	Actions			***Actions***		
	Investigate availability of records through DSE (NE region DSE clearing records and net gain accounting information) - records not yet available Work with Landscape Logic, Project 3, to clarify/test this assumption - ongoing.			Investigate availability of records through DSE (NE region DSE clearing records and net gain accounting information) - records not yet available Work with Landscape Logic, Project 3, to clarify/test this assumption - ongoing		

Assumptions used in calculating progress towards RCT from outputs

	Extent	Certainty	Importance	Quality	Certainty	Importance
2.5	**Area reduced by indirect removal (dieback) = 200 ha per year**	L	H	**Area reduced (declined in quality by 10%) by indirect removal (dieback) = 500 ha per year**	L	H
	Definitions/Explanation:			***Definitions/Explanation:***		
	It is assumed that there are vegetation losses of 200ha every year through indirect removal such as dieback in endangered and applicable vulnerable EVCs. This assumption does not include vegetation losses through direct removal such as clearing (see 2.4).			It is assumed that there is a 10% reduction in quality over 200ha through indirect removal such as dieback. This assumption does not include vegetation quality losses through direct removal such as clearing (see 2.4).		
	Rationale/Information Sources:			***Rationale/Information Sources:***		
	This assumption is an estimate provided by the BIG and is based on very little data. DSE spatial datasets (tree change layer, veg extent layer) were considered, however analysis of the data revealed significant inaccuracies, and hence the data will not be used to inform the assumptions in 07/08.			This assumption is an estimate provided by the BIG and is based on very little data. DSE spatial datasets (tree change layer, veg extent layer) were considered, however analysis of the data revealed significant inaccuracies, and hence the data will not be used to inform the assumptions in 07/08.		
	Actions			***Actions***		
	Work with Landscape Logic, Project 3, to clarify/test this assumption - ongoing			Work with Landscape Logic, Project 3, to clarify/test this assumption - ongoing.		

Assumptions used in calculating progress towards RCT from outputs

	Extent	Certainty	Importance	Quality	Certainty	Importance
3.2:	**Composition of vegetation established matches original EVC.**	H	H	**Lag time between action and 10% improvement is 10 years. (This will mean that sufficient actions will need to be undertaken 10 years before RCT date of 2030-31).**	L	H
	Definitions/Explanation: It is assumed that all vegetation established (GBCMA funded, non-GBCMA funded, natural regeneration) is in accordance with the relevant EVC.			***Definitions/Explanation:*** It is assumed there will be a 10 year lag time between undertaking the action and the 10% improvement being achieved.		
	Rationale/Information Sources: The RCT relating to increasing vegetation cover refers to increasing the extent of Endangered and applicable Vulnerable EVCs, therefore this requires revegetation activities to provide the appropriate building blocks (species selection) inline with the EVCs structure and composition. Revegetation undertaken through Environmental Management Grants are most likely to be established in accordance with the original EVCs as grant guidelines require this, however species availability is sometimes needs to be considered. ***EMG audit:*** At 101 sites (95%), there were species planted that were generally found in the sites EVC type. Five sites (5%) were recorded with species not found in the relevant EVC. Ninety five sites (90%) were recorded as using indigenous seed and/or plants. The basic structure of the site was recorded as reflecting the relevant EVC in 23 sites (22%). In the remaining 83 sites (78%) the following reasons were given as to why the site differed structurally: • Too many trees – 39 sites (47%) • Understorey missing – 36 (43%) • Ground cover missing – 56 (72%) • Too many weeds – 76 (92%) • No logs – 76 (92%) While this information provides valuable insights into current composition of revegetation sites, we need more long-term data to assess if reveg matches EVCs. We also need to consider composition of unfunded/natural regeneration sites.			***Rationale/Information Sources:*** This assumption is an estimate provided by the BIG and is based on very little data. ***Vesk et al (2007).*** This paper looks at reveg sites established between 5 years and 130 years ago. Found that dense canopy and various forms of bark resources develop in about 10 years, however large boughs, fallen timber loads and tree hollows required at least 100 years to develop. This provides some indication that a 10 year lag time is sufficient to see some improvement in quality, though our certainty remains low.		
	Actions Work with Landscape Logic, Project 3, to test/clarify this assumption.			***Actions*** Work with Landscape Logic, Project 3, to test/clarify this assumption. Develop monitoring program to provide data on the lag time associated with changes in vegetation quality.		

Assumptions used in calculating progress towards RCT from outputs

Extent	Certainty	Importance	Quality	Certainty	Importance
Once-off assumptions					
Area reduced by post - fire clearing (2009)	M	M		0	0
Definitions/Explanation:			***Definitions/Explanation:***		
Assumed that 1125 of native vegetation on roadsides was cleared It is assumed that 28 ha was cleared under the 10/30 rule			Assumed that 1125 of native vegetation on roadsides was cleared It is assumed that 28 ha was cleared under the 10/30 rule		
Rationale/Information Sources:			***Rationale/Information Sources:***		
Roadside clearing has occurred on council managed roadsides in the fire affected area of the Goulburn Broken Catchment. This is considered a loss of native vegetation extent and quality. GIS analysis was conducted to estimate the area. Firstly, the area of woody vegetation on council managed roadsides in the 2009 fire affected area before 2009. Local experts from the fire affected area estimated that 50% if the vegetation on roadsides has been cleared (= 1125 ha). There have been over 1000 residential building permits issued in Murrindini from Jan 2009 to May 2010. It is a condition of these permits that the 10/30 rule is applied. Based on this, there has been a loss of 28ha in Murrindindi (0.28ha x 1000). This is assuming houses are 15mx15m, and that they all had native vegetation around them.			Roadside clearing has occurred on council managed roadsides in the fire affected area of the Goulburn Broken Catchment. This is considered a loss of native vegetation extent and quality. GIS analysis was conducted to estimate the area. Firstly, the area of woody vegetation on council managed roadsides in the 2009 fire affected area before 2009. Local experts from the fire affected area estimated that 50% if the vegetation on roadsides has been cleared (= 1125 ha). There have been over 1000 residential building permits issued in Murrindini from Jan 2009 to May 2010. It is a condition of these permits that the 10/30 rule is applied. Based on this, there has been a loss of 28ha in Murrindindi (0.28ha x 1000). This is assuming houses are 15mx15m, and that they all had native vegetation around them.		
Actions			***Actions***		

	Extent	Certainty	Importance	Quality	Certainty	Importance
DELETED						
2.1a	**Proportion of all funded actions focusing on applicable EVC types = 75%.**					

Definitions/Explanation:

Target was revised therefore no longer relevant.
(DELETED) It is assumed that 75% of all funded actions focus on applicable EVC types. “Funded actions” are described in assumptions 2.1b – 2.1h.

Rationale/Information Sources:

CAMS:
Data is analysed annually to determine the proportion of works in endangered and vulnerable EVCs 07/08 = 70% 02/03-06/07 = 74.6% (of sites where EVC had been recorded and/or a shapefile had been attached). 75% is used as the figure as it is based on the larger data-set.

Information on the location of Bush Returns sites and Green Graze sites is available but has not been analysed therefore it was assumed that the same proportion (70%) of Bush Returns and Green Graze vegetation cover increases are in these EVCs.

Data is used for all Vulnerable EVCs, not just the ‘applicable’ ones as per the target

Actions

Analyse CAMS data every 3 years (next due in 011/12). Encourage users to record the EVC in CAMs and load the shapefile. - n/a

References

Ambrosio C., Linehan C., and McAllister A (2009). Privately funded contributions to NRM activities in the Goulburn Broken Catchment: testing the “x2 Assumption”. Report to GBCMA.

Baschin, B, Costin, B, Howells, S and Mitcehll, P.. (2003). Assessment of planations in the Glenaroua Land Management area. Report to GBCMA

Department of Primary Industries (2008). Environmental Project 2007: Monitoring Report.

Franco, J. And Morgan, J. (2007) Using historical records, aerial photography and dendrological methods to determine vegetation changes in grassy woodland since European settlement. Asutralian Journal of Botany, 55, 1-9.

Lake, P.S., Reich. P., Ladson, A.R.,Johnson, M., & Daniel, T. (2008) Evaluating the effectiveness of riparian resotration on the lowland streams of the Murray-Darling Basin: the riparian restoration experiment. Research and Monitoring workshop. March 4th 2008. GBCMA Shep.

McCallum, F. (2004) Assessment of the rate and cause of paddock tree decline in the Victorian Riverina Bioregion of GBCMA 1989-2003. Draft report prepared for the GBCMA.

Munro et al (2007). Faunal Responses to revegetation in agricultural areas of Australia: A review. Ecological Management and Restoration, Vol 8, No 3, 199-207.

Munro, N., Lindenmayer, D., and Fischer, J. (2007) Faunal response to revegetation in agricultural areas of Australia: a review. Ecological Management and Restoration. Vol 8, No 3.

Robinson, D. (2006). Is revegetation in the Sheep Pen Creek area, Victoria, improving Grey Crowned Babbler habitat? Ecological Management and Resoration. Vol 7, No 2. pp 93-104

Smith, P. (2008) Who's planting wha, where and why - and who's paying? An analysis of farmland revegetation in the central wheatbelt of Western Australia. Landscape and Urban Planning 86 pp66-78

Stothers, S. (2008) Environmental Management Grants Audit – Report on Findings. Department of Primary Industries, Benalla.

Vesk, Nolan, Thomson, Dorrough and MacNally (2007). Time lags in provision of habitat resources through revegetation. Biol Cons. Vol 141, Issue 1, pp 174-186

Vesk, P., McCallum, W., Morris, W., (2008) Monitoring eucalypt regeneration with in the Bush Returns Trial: Final Report. Year 3 (2007-2008). Report prepared for GBCMA.

Assumptions on target itself and projected increase

	Extent	Certainty	Importance	Quality	Certainty	Importance
1.1:	**The "extent" of native vegetation is a critical factor in securing the future of species.**	VH	VH	**The "quality" of native vegetation is a critical factor in securing the future of species.**	VH	VH
	Definitions/Explanation:			***Definitions/Explanation:***		
	These assumptions are fundamental to ensuring we are thinking about what we are aiming to achieve and challenges our thinking about how and why we are doing works in the GBC. While important, they raise questions about the targets themselves which is more relevant to a review of our targets. For this reason, the questions surrounding these assumptions will be covered during the development of the new Biodiversity Strategy in 2008/2009.					
	Rationale/Information Sources:			***Rationale/Information Sources:***		
	Actions			***Actions***		
1.2:	**An extent of 15% by 2030 for these EVCs represents an appropriate target being a balance of ecological, social and economic needs.**	L	VH	**An improvement of 10% by 2030 represents an appropriate target, balancing ecological, social and economic needs**	L	VH
	Definitions/Explanation:			***Definitions/Explanation:***		
	Rationale/Information Sources:			***Rationale/Information Sources:***		
	Actions			***Actions***		

Assumptions on target itself and projected increase

1.3	Annual progress towards RCT is expected to be exponential.	M	M	Annual progress towards RCT is expected to be exponential”	M	M
	Definitions/Explanation:			*Definitions/Explanation:*		
	Rationale/Information Sources:			*Rationale/Information Sources:*		
	Actions			*Actions*		
1.4:	It is assumed that public land extent is static.	H	H	It is assumed that public land extent is static.	####	####
	Definitions/Explanation:			*Definitions/Explanation:*		
	Rationale/Information Sources:			*Rationale/Information Sources:*		
	Actions			*Actions*		

Notes on BMAP process

Targets are set at a broad scale, therefore there is little value in getting too detailed with assumptions.
Key role of the BMAP is to tease out the 'big hit items' ie the things that are having big impacts on native vegetation extent and quality