Lake Baroon Catchment Implementation Plan

LAKE BAROON CATCHMENT CARE GROUP

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Front Cover: Lake Baroon viewed from Montville Road

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1. Executive Summary

The production of this document; the Lake Baroon Catchment Implementation Plan (LBCIP), resulted from the need to align two strategies: the BMRG natural resource management plan for the Burnett Mary region, Country to Coast, *A Healthy Sustainable Future* (C2C); and the Lake Baroon Catchment Management Strategy (LBCMS) produced in 1997 by AquaGen and the Lake Baroon Catchment Care Group. This plan contains 39 specific management strategies designed to improve water quality and ecological health within the catchment. These 'implementation actions' (IA's) are derived from the combination of management actions contained in the overarching documents mentioned above. The IA's are set to specific deliverable timeframes and linked to implementation partner organisations such as community groups, all levels of government and industry.

The IA's are organised under the themes of:

- on-ground works,
- weeds & pests,
- stormwater,
- reserves,
- catchment management and;
- monitoring & research

In addition to presenting a series of practical outputs that help to implement both C2C and the LBCMS, this document prioritises geographical areas within the Lake Baroon Catchment for protection and remedial works. The prioritisation was developed using the methodologies described in relevant Australian literature (Hydrobiology Pty Ltd, 4 Site Pty Ltd & MSC 2005; Bennett *et al* 2002; Stockwell 2001; Rutherfurd, Jerie & Marsh 2000 and Dunn 2000). The prioritisation system used in this plan followed the steps described below:

1. examining how the catchment has changed since European settlement (essentially a literature review);
2. dividing the catchment into strategic sub-units or management units;
3. assessing the assets and problems of each management unit; and
4. assessing the sub-units against each other based on their biophysical characteristics and to a lesser degree their social characteristics, thus producing a priority for targeted actions.

Through this process, a priority listing of management units was developed. Two management units were listed as very high priority: WA4 which includes Mary Caincross Park, and BR4, which is located on the south-west end of Lake Baroon.
Both of these management units have high naturalness and recovery scores, and include extensive areas of remnant forest (Regional Ecosystems). Management strategies for both BR4 and WA4 management units will first be aimed at protection, enhancement and, where appropriate, rehabilitation of these reaches.

Other high priority management units include reaches on Lexys Creek and Bridge Creek that also score highly in the naturalness and recovery rankings, and that impact moderately on catchment water quality.

The five management units that scored a low priority ranking are reaches which have practically no intact riparian vegetation, having been extensively cleared for dairy and other pastoral landuses. These reaches have very high nutrient inputs and therefore impact highly on the water quality of the catchment. These reaches are considered last for protection and rehabilitation by the plan due to the extremely high costs of effective on-ground works.

2. Introduction

South East Queensland is currently experiencing a period of unprecedented growth which in many cases is having a deleterious effect on the environment. The natural environment of South East Queensland not only provides raw materials that drive industry and aesthetic qualities that support tourism. The natural ecosystems of the South East operate as filters to clean the air and water. Without healthy natural ecosystems and the life support systems they provide, the prosperity of South East Queenslanders would decline.

All land managers from politicians to farmers must balance human interests with the interests of the natural environment. On the macro scale the State Government may need to set aside natural areas for conservation or open up areas for resource extraction and housing. On the micro scale a farmer may need to preserve vegetation for a wind break or to minimise erosion. A farmer may decide to clear native vegetation in order to increase the area of land set aside for crop production. As South East Queensland's population continues to expand, this balance will become more difficult to maintain.

Possibly the greatest challenge facing South East Queensland is the sustainable supply of water to meet the needs of the community and the environment. The sustainable management of the water cycle is directly linked to the water quality issues faced by South East Queensland. The problem faced by water managers is not just adequate supply of water, but more importantly the quality of water supplied.

Traditionally dams have supplied the bulk of Australia's water needs. Baroon Pocket Dam (also known as Lake Baroon) is an important, strategic water supply situated on the Maleny Plateau in the headwaters of the Mary River in South East Queensland. With an annual yield of approximately 20,000 ML/yr, Baroon Pocket Dam supplies all of Caloundra City and most of Maroochy Shire's potable water. Baroon Pocket Dam is filled by water that falls as rain and subsequently flows overland, down gullies and eventually to creeks. The Dam also receives water from groundwater flows. The area in which rain falls that enters the Dam is called the catchment. The catchment of Lake Baroon comprises an area of 74.3 km^2. Current and historical land uses have degraded the natural aquatic ecosystems that constitute the catchment of Baroon Pocket Dam. As water travels through gullies and creeks on its way to the Dam it collects most of the pollutants it comes into contact with. This pollution then finds it way into the Dam.

Recent examples of water resource management demonstrate the economic value of treating water quality problems at their source rather than allocating large amounts of money to end of the line treatment processes (Windle, Rolfe, & O'Dea 2005). AquaGen Water and Renewable Energy (formerly Caloundra-Maroochy Water Supply Board) is responsible for managing Baroon Pocket Dam and has sought to invest in this type of management. AquaGen owns and manages Baroon Pocket Dam and an advanced water treatment plant at Landers Shute.

Due to water quality issues in Lake Baroon, the Sunshine Coast Hinterland community formed the Lake Baroon Catchment Care Group (LBCCG) in 1992. LBCCG is an independent community organisation that aims to improve water quality through the

development and management of water quality improvement projects. The group also works to raise community awareness of the importance of water quality, and liaises with all other like-minded groups in the region. In the thirteen years since LBCCG began they have developed more than 70 projects worth a combined total of over $470,000. The majority of these projects have involved on-ground remedial works.

The development of a partnership in 1993, between LBCCG and AquaGen sought to halt the decline in the health of the waterways that feed Lake Baroon through the development of the Lake Baroon Catchment Management Strategy (LBCMS) and the implementation of on-ground remedial works. This three volume document (developed in 1997, revised in 2004 and currently undergoing a third revision) described the state of the catchment, outlined policies and strategies to negate the decline in catchment health and presented the water quality data that AquaGen had been collecting for six years. The LBCMS should be referred to for information regarding the state of the catchment. The strategy was endorsed by Caloundra City Council in 2004.

LBCCG and AquaGen saw an opportunity to expand their water quality improvement works within the Lake Baroon catchment by entering into a cooperative partnership with the Burnett Mary Regional Group for Natural Resource Management Inc (BMRG). BMRG is the peak coordinating body for natural resource management in the Burnett Mary region. The organisation was formed under the National Action Plan for Salinity and Water Quality and the Natural Heritage Trust programs. BMRG, in partnership with the community, industry and local government, has developed a natural resource management plan for the Burnett Mary region, Country to Coast, *A Healthy Sustainable Future* (C2C).

In July 2005 LBCCG and AquaGen signed a Memorandum of Understanding with BMRG to host the position of the Lake Baroon Catchment Officer. The first priority of the Lake Baroon Catchment Officer set out in the MoU was to align the regional management actions provided in C2C with the catchment based management actions contained in the LBCMS in order to identify mutually beneficial actions that would deliver the targets in both plans. The alignment of the two strategies culminated in the production of this document; the Lake Baroon Catchment Implementation Plan (LBCIP). In addition to presenting a series of practical outputs that help to implement both C2C and the LBCMS, this document prioritises geographical areas within the Lake Baroon Catchment for protection and remedial works.

The LBCIP was developed by adapting the model put forward by Rutherfurd, Jerie & Marsh (2000) for rehabilitating Australian streams. Figure 1.0 shows the approach adapted, beginning with the alignment of C2C with LBCMS. This was followed by four steps, starting with examining how the catchment has changed since European settlement (essentially a literature review). The second step involved breaking the catchment up into strategic sub-units or management units, then assessing the assets and problems of each management unit. Finally, the sub-units were assessed against each other based on their biophysical characteristics and to a lesser degree their social characteristics and given a priority for targeted actions.

3. Description of the Methods

This document is based on similar work recently produced in South East Queensland and on the methods described by Rutherfurd, Jerie & Marsh (2000), Dunn (2000) and Bennett *et al* (2002) for the rehabilitation and protection of Australian waterways. Furthermore, the work of Hydrobiology Pty Ltd, 4 Site Pty Ltd & MSC (2005), Stockwell (2001) and DNR (2002) has been heavily drawn upon. The framework suggested by these authors was used as the basis for this plan and many of the methods described below were directly derived from these works. The process followed for development of this plan was based upon Rutherfurd, Jerie & Marsh (2000) and is outlined in Figure 1.0.

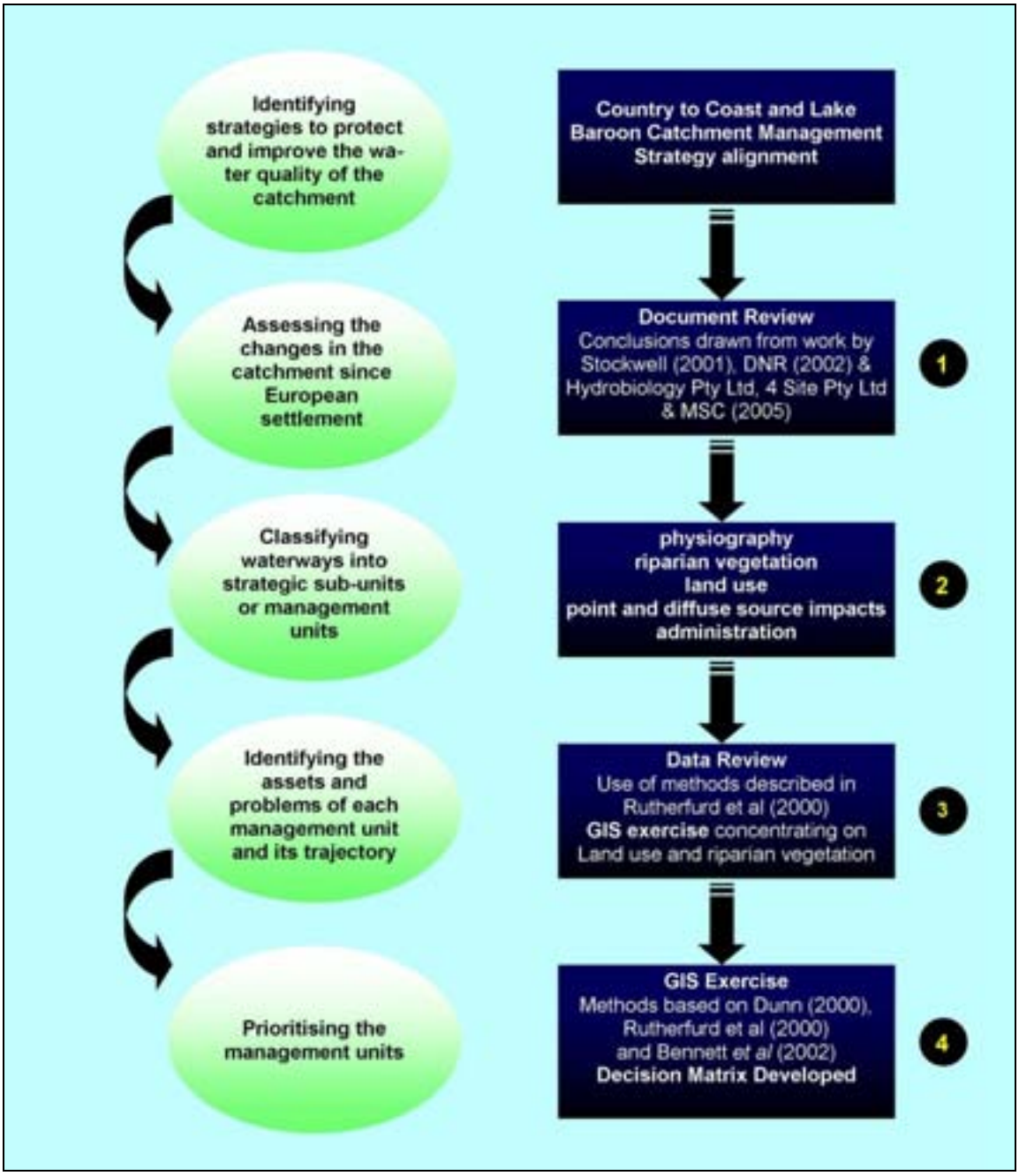


Figure 1.0: Description of methods used to develop the Lake Baroon Catchment Implementation Plan

The implementation plan is separated into two distinct sections. The first section focuses on the devolution of management actions from the two overarching strategies this document is derived from, C2C and the LBCMS. The second concentrates on the geographical prioritisation of catchment for protection and remedial works.

During the production of this document no new data sets were collected. Instead, the wealth of existing data relating to the catchment was reviewed and combined to elicit a picture of the state of the catchment and its trajectory, and to develop achievable management actions. Table 1.0 refers to the sources of data used throughout this plan. There were some limits to the useful application of this data as some data sets were collected on a macro scale (SEDNET (2002) and RE Data Version 5.0 (2005)). Despite this, the biophysical status of the catchment was derived and a decision matrix was produced to prioritise sections of the catchment for remedial works.

Table 1.0 : Data sets used in the development of the Lake Baroon Catchment Implementation Plan

Title	Author	Date
Regional Patterns of Erosion and Sediment and Nutrient Transport in the Mary River Catchment, Queensland (SEDNET)	De Rose *et al*	2002
Survey and Mapping of 2003 Remnant Vegetation Communities and Regional Ecosystems of Queensland, Version 5.0	Queensland Herbarium	2005
Slope Stability and its Constraints on Closer Settlement on the Mapleton-Maleny Plateau, South East Queensland	Willmott	1983
Rural Aerial Photography 0.25m resolution 1:20,000	Caloundra City Council	2005
MSC Aerial Photography 0.125m resolution	Maroochy Shire Council	2005
Drainage	Caloundra City Council	2006
Stream Network	Maroochy Shire Council	2006
MSC Land Parcels	Maroochy Shire Council	2006
Planning Cadastre	Caloundra City Council	2006
Land Use Map	Caloundra Maroochy Water Supply Board	1993
Historical Water Quality Data	AquaGen	2006

SECTION 1

Alignment of the strategies and development of actions

S1.1 The underpinning strategies

BMRG's NRM plan, "Country to Coast a Healthy Sustainable Future" (C2C) is a comprehensive document that outlined aspirational targets for the Burnett Mary region covering almost 100,000 km^2 of land and sea. These plan targets were developed in alignment with the primary outcomes of the National Heritage Trust and the National Action Plan for Salinity and Water Quality. They were derived from community consultation, validated by a technical advisory group and prioritised for action. In C2C, the region's desired outcomes were defined as resource condition targets (RTC's) which have particular regard to federal "National Outcomes" and state "Matters for Target". Underpinning the RCTs were management action targets (MATs) and management actions (MAs). The MATs and MAs contained broad explanations and methodologies to fulfil the regional outcomes of the RCTs. These actions were intentionally broad to encompass the wide range of threats to natural resources faced by the region (BMRG 2005b).

The Lake Baroon Catchment Management Strategy (LBCMS) focussed on a much smaller geographic area (75 km^2) and contained information to influence local government policy and manage the land and waterways. Rather than outlining a series of objectives, the first version of the document delineated a number of strategies relating to water quality improvement in the catchment. These strategies were divided into two categories; issues relating to local government and the community. The local government section addressed stormwater, effluent disposal, industrial and commercial land use as well as new developments. The community section concentrated on household actions for catchment management, farm planning, farming practices, pesticides, herbicides, fertilisers and stream rehabilitation (Aldridge, Pulsford & Traill 1997b).

The update of Volume II in 2004, built on the work in version one by providing a set of specific outcomes underpinned by acceptable solutions. Key performance indicators (KPIs) were then allocated to the outcomes and acceptable solutions to measure the progress of the strategy in terms of protecting and enhancing environmental values associated with water quality in Lake Baroon. Current, political, financial and community constraints on strategy implementation have made the achievement of these KPIs difficult in the short term.

S1.2 Alignment of the strategies

In order to align C2C with the LBCMS, similar objectives and acceptable solutions in the updated Volume II of the LBCMS were summarised into 31 specific actions. These actions were then linked to the prioritised RCTs, MATs and MAs from C2C. Actions were linked via the similarities of deliverable outcomes i.e. LBCMS actions that involved the conservation and restoration of habitats of species of regional significance were linked to RCTs, MATs and especially MAs that were designed to improve the habitat and range of endangered, vulnerable, rare (EVR) and iconic species. As a

result an effective linkage was established between regional and local NRM aspirations.

The summarised LBCMS actions were clustered together in accordance with C2C's action programs, derived from national and state objectives to maintain a deliverable consistency. Each of these action programs is funded through BMRG's regional investment strategy either partly or wholly by the National Action Plan for Salinity and Water Quality and the National Heritage Trust. These action programs include;

- Biodiversity Conservation
- Community Capacity & Partnerships
- Coastal & Marine Management
- Sustainable Use
- Water Quality & Equitable Use
- Weeds & Pest Management

Linked LBCMS actions were coded to reflect this grouping. Of the 31 LBCMS summarised actions, seven fell under biodiversity conservation, three fell under sustainable use, three fell under weeds and pest management, two fell under community capacity & partnerships and 16 fell under water quality and equitable use. Table S1.1 illustrates the alignment of the two strategies.

S1.3 Development of implementation actions, timeframes and partners

A set of 39 implementation actions (IAs) was derived from the outcomes and actions developed in C2C and the LBCMS. The IAs were summaries of potential, achievable projects fashioned from directives and suggestions in C2C, the LBCMS as well as by stakeholders in the community, industry and local government. The themes of on ground works, weeds & pests, stormwater, reserves, catchment management and monitoring & research were the drivers behind project ideas and IAs were grouped together within these themes. Many IAs were direct adaptations of acceptable solutions from the updated Volume II of the LBCMS however the incorporation of C2C objectives imbued the projects with a regional perspective.

All of the IAs were deliverable through:

- the provision of on-ground works
- the support and delivery of education programs
- monitoring
- macro and micro scale planning

Specific timeframes were allocated to each IA to guarantee judicious delivery of water quality benefits for the catchment. Whilst care was taken to estimate accurate timeframes, the period for project inception, development and completion may vary as new, pertinent information arises. Furthermore, the very nature of many projects required progressive development over numerous years (e.g. waterway regeneration) consequently timeframes for these IAs were continuous.

Partners that would aid in the development and facilitation of projects were assembled for each IA. These partners ranged from high and low capacity community groups, to

schools, to all levels of government, to state agencies, industry organisations and regional NRM groups.

Table S1.2 contains the IAs matched to their respective timeframes and partners. In addition the table shows the relationship between IAs, LBCMS summarised actions and C2C RCTs, MATs and MAs.

Table S1.1 Alignment of summarised actions from the Lake Baroon Catchment Management Strategy with actions from the NRM plan Country to Coast - a healthy sustainable future

Lake Baroon Catchments Management Strategy Summarised Actions	C2C Resource Condition Targets	C2C Action Program
LBBC1.1 Delineate key ecological processes performed by the riparian lands to identify habitat requirements of terrestrial and aquatic keystone species, determine the width required for each stream type by linking the most sensitive ecological processes to ensure connectivity to sensitive vegetation areas and to re-establish ecological values of riparian lands.	FB1.2, TB2.2, FB1.1, FB2.1, FB3.2, TB1.1, TB2.3, TB1.2	Biodiversity Conservation
LBBC1.2 Conserve and restore habitats of species of regional significance. All potential habitats of species and population of target species of regional significance are rehabilitated.	FB1.2, TB2.2, FB1.1, FB2.1, FB3.2, TB1.1, TB2.3, TB1.2	
LBBC1.3 Provide incentive, advice and encouragement for riparian landholders to retain and manage all existing native vegetation within the riparian buffers and support the conservation of key areas.	FB1.1, FB2.1, FB3.2, TB1.1, TB2.3, TB1.2	
LBBC1.4 All remnant/significant vegetation within 100m either side of a watercourse should be protected.	TB2.2, FB1.1, FB2.1, FB3.2, TB1.1, TB2.3, TB1.2	
LBBC1.5 Implement revegetation initiatives focusing on building linkages with remnants of conservation significance and increasing vegetation on floodplains and hill slopes to slow the flow of water and assist in the retention of nutrients as opposed to releasing untreated wastewater into the waterways.	FB1.2, TB2.2, FB1.1, FB2.1, FB3.2, TB1.1, TB2.3, TB1.2	
LBBC1.6 Protection of watercourses within Lake Baroon Catchment that considers the multiple functions of riparian lands.	FB1.2, TB2.2, FB1.1, FB2.1, FB3.2, TB1.1, TB2.3, TB1.2	
LBBC1.7 Reclaiming and rehabilitating habitats of species and vegetation of regional significance; and collaborate with other non government and government entities on projects that enhance native vegetation within riparian lands including revegetation initiatives.	FB1.2, TB2.2, FB1.1, FB2.1, FB3.2, TB1.1, TB2.3, TB1.2	
LBSU1.1 Inform and educate owners of water bores about sustainable use of water bores.	WR3.1	Sustainable Use
LBSU1.2 Work with Caloundra City Council and Maroochy Shire Council to develop an awareness amongst the business and commercial sectors within the catchment of the principles of Cleaner Production. Establish a process that rewards businesses for their efforts to improve their production standards and application of innovative techniques to minimise impacts upon water quality.	LR2.1 LR4.1 LR6.1	
LBSU1.3 Public Education program that addresses demand management through household actions to	LR2.1	

reduce water bore consumption for garden use (e.g. mulching, greywater systems) and health risks associated with consuming contaminants from water bores.	**WR3.1, FB2.1, FB3.2, CD1.1**	
LBWPM1.1 Reduced threat from invasive environmental weeds.	**LR3.1, LR3.2, TB3.1, TB3.2,** **FB2.2, FB2.3**	**Weeds and Pest Management**
LBWPM1.2 Control and detain the spread of Salvinia within the Walkers Creek/Fryers Creek sub-catchments Target and prioritise reaches of Obi Obi and Bridge Creek catchments that have been invaded by woody and viny environmental weeds e.g. Camphor laurel, privet etc that impact upon the aquatic ecology of the creek system and appropriate action taken to remove and control weed species.	**LR3.1, LR3.2, TB3.1, TB3.2,** **FB2.2**	
LBWPM1.3 Control aggressive environmental weeds, commencing with those threatening reaches of regional or local conservation significance.	**LR3.1, LR3.2, TB3.1, TB3.2,** **FB2.2, FB2.3**	
LBCCP1.1 Educate and inform landholders and residents of appropriate land management techniques and impacts of household routines upon nutrient loads. In particular on site wastewater disposal systems; use of fertilisers; designing vegetation filter buffers to waterways and use of underground water reserves.	**CD1.2, CD1.4, CMD1.3, WR3.2, WR1.1, LR2.1, TB2.2** **CD1.1, IA1.4, FB2.3, FB2.1** **KRT1.1**	**Community capacity and partnerships**
LBCCP1.2 Assist and support the CCC and MSC in the implementation of an education program on the operational procedures and maintenance requirements for the Maleny and on-site wastewater disposal systems.	**WR3.2, IA1.3, LR2.1** **CD1.1, IA1.4, FB2.1, FB3.2** **KRT1.1**	
LBWQ1.1 90% of physical and chemical parameters and biological indicators are to meet relevant standards for unimpacted streams by year 2011 (eg. SIGNAL Score =>6) with gradual improvements recorded every two years.	**CMD1.3, WR1.1, WR3.2, TB2.1** **FB1.1, FB2.1, FB3.2, WR1.2, WR3.1, WR4.1, WR5.1** **FB1.3**	**Water quality and equitable use**
LBWQ1.2 Adopt and implement urban stormwater management system including reuse options from detention ponds to reduce diffuse source urban pollution.	**CMD1.3**	
LBWQ1.3 Settling ponds/stormwater detention basins must incorporate design specifications to treat all nutrients prior to release into natural waterways.	**CMD1.3** **FB3.2**	
LBWQ1.4 Reductions in turbidity, dissolved oxygen, faecal coliform, reductions in sediments for oil and grease, petroleum hydrocarbons, organochlorine, pesticides and heavy metals.	**CMD1.3, WR1.1, WR3.2, TB2.1** **FB1.1, FB2.1, FB3.2, WR1.2, WR3.1, WR4.1, WR5.1** **FB1.3**	

LBWQ1.5 Revegetate and rehabilitate riparian lands to ensure the protection and ongoing maintenance of instream plant health and aquatic ecosystem function, filtration of nutrients, reduce power of flood events, slow the flow of surface water runoff and stabilise creek banks.	**WR5.1**	
LBWQ1.6 An increase in the size of buffers which are dependent upon slope (length and angle), soil permeability, surface runoff, subsurface flow, water table depth, rainfall, soil erodability, channel sinuosity, and stream order.	**WR1.2, WR5.1**	
LBWQ1.7 Reducing nutrient loads from poorly performing on site waste water disposal systems, reducing pollutant loads from entering waterways from stormwater, and demand management strategies to reduce water consumption.	**WR1.2, WR3.1, WR4.1**	
LBWQ1.8 Encourage and support land holders to stabilise unstable slopes and slip zones through on ground projects.	**WR5.1**	
LBWQ1.9 A public health and safety risk assessment of stormwater quality (surface runoff) and associated infrastructure is conducted.	**WR1.1, CMD1.3**	
LBWQ1.10 Consistent approach to the collection of data (e.g. AusRivAS, ISO 9001 compliant process).	**WR1.1,**	
LBWQ1.11 Community and stakeholder involvement in the setting of environmental values and subsequent water quality objectives (numerical values).	**WR1.1, WR3.2**	
LBWQ1.12 Baseline data needs to be established e.g. macro invertebrate diversity, aquatic ecosystem requirements (such as canopy cover, in stream plant structure, and environment flows).	**WR1.1**	
LBWQ1.13 Establish and incorporate biological indicators to develop a more holistic perspective of water quality.	**WR1.1**	
LBWQ1.14 Expand physical and chemical parameters to establish guideline values in sediment for heavy metals, phenols, polycyclic aromatic hydrocarbons, petroleum hydrocarbons, organochlorine pesticides, oil and grease.	**WR1.1**	
LBWQ1.15 Continue to support tertiary research programs to detect pathogen hot spots.	**WR1.1** **WR1.2, WR4.1**	
LBWQ1.16 Develop, support and implement research projects that maximise the opportunity for nutrient and water quality reuse by filtering vegetation uptake.	**WR1.2, WR3.1, FB3.2** LR6.1	

* Colours indicate priority rankings for resource condition targets from country to coast a healthy sustainable future

CRITICAL	HIGH	IMPORTANT	MODERATE

Table S1.2 Alignment of summarised actions from the Lake Baroon Catchment Management Strategy with actions from the NRM plan Country to Coast - a healthy sustainable future

LBCIP Activity Theme	Implementation Actions	LBCIP Partners	LBCIP Timeframe	LBCMS Code (Refer to Table S1)	BMRG Resource Condition Target	BMRG Management Action Target	BMRG Management Action	BMRG Program
On ground	**OG1** Develop on ground works for water quality improvement and aquatic biodiversity maintenance & improvement	BMRG, LBCCG, Barung, AquaGen, CCC, MSC, MRCCC, community groups, DPI, EPA, State Gov, DNR&W, industry, landholders	**Mar07:**- Use prioritisation tool to identify priority areas for riparian revegetation in the catchment **Apr07continuing** Liaise with landholders in priority areas to establish cooperative approach **Apr07continuing** Develop on-ground project submissions and commence on-ground works	LBBC1.1 LBBC1.2 LBBC1.3 LBBC1.4 LBBC1.5 LBBC1.6 LBBC1.7 LBWPM1.1 LBWPM1.2 LBWPM1.3 LBWQ1.1 LBWQ1.4 LBWQ1.5 LBWQ1.6 LBWQ1.8	**WR5.1:** 50% of priority riparian zones (as classified by PAP2.2) are under Rivercare works aimed at Water Quality outcomes (indicators to be defined) by 2015.	**WR5.1.2:** Land management factors directly responsible for riparian zone instability and locations for feasible rehabilitation with both water quality and biodiversity outcomes are identified, on a stream reach basis, throughout the region by 2007.	**WR5B:** Implement protection and Rehabilitation Planning (Rivercare works for WQ outcomes) for the 50 percentile most significant locations identified by PAP2.2.	Water Quality & Equitable Use
						WR5.1.3: Remedial works targeting priority reaches as identified in Rivercare Plans to prevent degradation or enhance condition are commenced in 2005 and ongoing as plans are completed throughout the Region.	**WR5C:** Develop and implement remedial works program with associated devolved grants program.	
					FB1.1 High value freshwater biodiversity areas are maintained at 2007 condition and extent and improved/extended by X% by 2025.	**FB1.1.2:** By 2009, the information from FB1.1.1 is used in local area land use, rehabilitation and management planning and implementation.	**FB1C:** Implement support to Landholders under Rivercare initiatives with Aquatic Biodiversity Outcomes in priority areas	Biodiversity Conservation
					TB1.2 Remnant Vegetation condition and function at 2007 levels are maintained or improved (e.g. representative native species composition in all regional ecosystems) by 2025.	**TB1.2.3:** Regional and subregional tract size distributions are maintained or improved in rural areas (based on 2007 levels) and reductions in urban areas are minimised by 2007.	**TB1H:** Implement a targeted investment program of habitat management, including appropriate rehabilitation/ restoration supported by a creative, integrated and effective incentive package, to retain, restore and regenerate native remnant and regrowth vegetation	

On ground	**OG2** Support and develop on ground works for habitat recovery	LBCCG, BMRG, Barung, AquaGen, CCC, MSC, MRCCC, community groups	**Nov05**:- Liaise with partners re activities that involve EVR habitat recovery **Jan06continuing** facilitate and initiate activities by sourcing funding and resources **Mar06continiuing:**- monitor and evaluate progress and outcomes of activities	LBBC1.1 LBBC1.2 LBBC1.3 LBBC1.4 LBBC1.5 LBBC1.6 LBBC1.7	**FB1.2:** The status and condition of identified priority EVR and iconic species are improved and there is no net decline in status for all EVR taxa by 2015	**FB1.2.1:** Endangered Species Recovery Plans are developed for critically Endangered species by 2007 (and implemented by 2008), and other priority EVR/iconic species by 2010.	**FB1G:** Support development and implementation of Endangered Species Recovery Plans, with an emphasis on habitat restoration.	Biodiversity Conservation
On ground	**OG3** Locate high value areas within catchment and target for protection and remediation	BMRG, LBCCG, Barung, AquaGen, CCC, MSC, MRCCC, community groups, Consultants	**Jan06-Mar07:**- Use prioritisation tool from IP to identify at risk ecosystems and high value areas in the catchment **Apr07c**ontinuing Liaise with landholders in priority areas to establish cooperative approach to protection, remediation **and expansion of areas** **Jul07continuing** Develop on-ground project submissions and commence on-ground works	LBBC1.2 LBBC1.3 LBBC1.4 LBBC1.5 LBBC1.6 LBBC1.7 LBWPM1.1 LBWPM1.2 LBWPM1.3 LBWQ1.5 LBWQ1.6	**TB2.1:** No RCT. (Indicative: X % High Value native species and ecological communities are protected by 2015.	**TB2.1.2:** All locations of high value are protected by Local Government planning initiatives by 2010.	**TB2B:** Identify location status and condition of High Value areas across region using existing information sources (e.g. BPAs, Criteria E, H & I). (Note: current PAPs will largely complete this management action.) **TB2C:** Review existing information and develop a prioritisation matrix for improving the abundance and distribution of? at risk? ecosystems in the region; support investment in priority areas. (Note: current PAPs will largely complete this management action	Biodiversity Conservation
					FB 3.2 The ecological function of wetlands and riparian zones of the top 10% (as prioritised by PAP3.4 and 3.6) are restored and protected by 2020	**FB3.2.2:** Initiate a program of restoration for degraded wetlands, flood plains and riparian areas by 2007.	**FB3K:** Prioritise needs, develop and implement rehabilitation plans to improve condition and create buffer zones	
On ground	**OG4** In-stream aquatic habitat restoration for Mary River Cod and Queensland Lungfish, Spiny Cray	CalAqua, BMRG, LBCCG, Barung, AquaGen, CCC, MSC, MRCCC, community groups, DPI, EPA, State Gov, QPWS, DNR&M	**Jan06-Mar07:**- Use prioritisation tool and IP to identify priority areas for restoration of in-stream aquatic habitat for EVR/iconic species in the catchment **Apr07continuing** Liaise with landholders in priority areas to establish cooperative approach	LBBC1.1 LBBC1.2 LBBC1.3 LBBC1.4 LBBC1.5 LBBC1.6 LBBC1.7 LBWPM1.1 LBWPM1.2	**FB1.3** Priority aquatic habitat linkages and passages are enhanced through removal of or passage through 20% of barriers by 2025.	**FB1.3.2:** In-stream aquatic habitat restoration needs for EVR/iconic species are identified and appropriate rehabilitation strategies developed by 2007 and implemented by 2008.	**FB1L:** Identify restoration needs for in-stream aquatic habitat for EVR/iconic species. Support development and implementation of rehabilitation strategies.	Biodiversity Conservation

			Jul07continuing Develop on-ground strategic riparian regeneration projects	LBWPM1.3 LBWQ1.1 LBWQ1.4 LBWQ1.5 LBWQ1.6 LBWQ1.8		**FB1.3.3:** Increase of 10% in in-stream aquatic habitat for EVR/iconic species by 2010.	**FB1M:** Strategically implement restoration of in-stream aquatic habitat for EVR/iconic species starting with: - Queensland Lungfish, Mary River Cod - Mary River Turtle, Burnett River Snapping Turtle - Conondale Crayfish	
On ground	**OG5** Continue the Mary River Cod and other suitable species restocking program in Lake Baroon and upper Obi Obi Creek	BMRG, LBCCG, AquaGen, LBFSA, BMRG	**Dec06continuing:**- Identify suitable habitat areas for Mary River Cod and other suitable species with IP and prioritisation tool **Feb07continuing** Liaise with LBFSA to develop a fish stocking program in identified areas **Apr07continuing** Start fish stocking program and provide ongoing support to partners	LBBC1.1 LBBC1.2 LBBC1.3 LBBC1.4 LBBC1.5 LBBC1.6 LBBC1.7	**FB2.1** Stream reaches in good condition in 2007 are protected, and by 2020 a 10% improvement in moderate and degraded condition stream reaches is achieved.	**FB2.1.3:** A program to promote sustainable use of aquatic biodiversity is underway in each subcatchment by 2007	**FB2D:** Support the reintroduction of target recreational native fish species (e.g. jungle perch, freshwater mullet, barramundi) and associated rehabilitation activities (habitat, passage, water quality requirements).	Biodiversity Conservation
Weeds & pests	**WP1** Weeds and Pest Management	CalAqua, BMRG, LBCCG, Barung, AquaGen, CCC, MSC, MRCCC, community groups, DPI, EPA, State Gov, DNR&W, industry	**Jan06-Mar07:**- Use Lake Baroon GIS, prioritisation tool from IP and liaise with partners to locate and record weed hot spots in catchment **Apr07 continuing**:-develop partnerships with proponents in weed hotspots to control significant infestations that contribute to poor water quality (e.g. Salvinia and other highly invasive species) and strategically target new outbreaks that may lead to larger infestations Oct 05 continuing:- support partners in developing and administering integrated pest management **particularly projects that involve innovative**	LBBC1.3 LBWPM1.1 LBWPM1.2 LBWPM1.3	**LR3.1:** Weeds and pest animals of significance to productivity and biodiversity values are controlled in cleared agricultural land (including grazing and cultivated areas) and do not spread into remnant vegetation areas by 2015.	**LR3.1.1:** Weed and pest threats to the region are identified and actions prioritised (as part of current PAP), and partnership weed control programs of all declared weeds (with emphasis on WONS) are underway by 2006.	**LR3C:** Implement program of proactive measures to prevent introduction or limit impact of weeds or pests of economic importance (e.g. public "alerts" for non-resident weeds that pose a significant threat; inclusion of weed ID resource to welcome kits	Weeds and Pest Management
					LR3.2: Weed and Pest (flora and fauna) Management Programs for control of all known weeds and pests of economic and biodiversity values importance in uncleared estate are developed and	**LR3.2.1:** At least one landholder in each subcatchment is involved in a Weed or Pest Management Program for control of priority weeds by 2008.	**LR3D:** Implement weed and pest management programs to address significant economic weeds and/or pests by land managers and shires throughout the region.	

			approaches including biocontrol, education and integration with other regions (e.g. Water Weed Watch Network with CCC)		piloted by 2015.		**LR3E:** Support research into biocontrol agents for significant weeds.	
Weeds & pests	**WP2** Aquatic weeds status assessment	CalAqua, BMRG, LBCCG, Barung, AquaGen, CCC, MSC, MRCCC, community groups, DPI, EPA, State Gov, DNR&M, industry	**May06:**- Liaise with partners to Water Weed Watch Network pilot **Feb07** source funding for network **Jul07** commence volunteer training **Aug07** commence network operations **Sep07continuing** support growth and expansion of network	LBBC1.3 LBWPM1.1 LBWPM1.2 LBWPM1.3	**FB2.2:** FB resources are protected and enhanced by 2020 through: - eradication or containment of new or recent introductions of ecologically significant invasive weed species within 1 to 10 years of detection - no establishment of new ecologically significant weed species	**FB2.2.1:** Current status of aquatic weed threats is known by 2005 and management/control plans are developed and implementation commenced by 2008 for weeds posing major threat to FB.	**FB2G:** Undertake current Status Assessment. (Note: current PAPs will largely complete this management action.)	Weeds and Pest Management
Weeds & pests	**WP3** Aquatic and riparian weed projects	CalAqua, BMRG, LBCCG, Barung, AquaGen, CCC, MSC, MRCCC, community groups, DPI, EPA, State Gov, DNR&W, industry	**Dec07:**-Use Water Weed Watch Network to identify aquatic and riparian weed hotspots in the catchment **Feb08continuing** Develop on-ground weed remediation project submissions with an emphasis on harvesting, reuse and biocontrol	LBBC1.3 LBWPM1.1 LBWPM1.2 LBWPM1.3			**FB2I:** Support strategic projects addressing aquatic and riparian weeds - Include novel approaches, such as harvesting and selling various products (e.g. Camphor Laurel project). Support development/implementation of biological control programs	Weeds and Pest Management
						FB2.2.2: Spread of weeds within streams and between stream basins is controlled so that Class 1 weeds are contained in current locations and spread of other weeds is minimised by 2007.	**FB2J:** Support development and implementation of Aquatic Weed Control Programs (e.g. partnership between water providers, LGAs and community groups).	
Weeds & pests	**WP4** Aquatic pest animal strategies	CalAqua, BMRG, LBCCG, Barung, AquaGen, CCC, MSC, MRCCC, community groups, DPI, EPA, State Gov, DNR&M, QPWS	**Jan08continuing:**- expand Water Weed Watch Network to include monitoring of key aquatic pest animals in the catchment **Mar08** liaise with partners to assist in aquatic pest animal control	LBBC1.3 LBWPM1.1 LBWPM1.2 LBWPM1.3	**FB2.3:** No RCT (Indicative: Maintenance or X% improvement of FB resources through Aquatic Pest Fauna threat abatement by 2025).	**FB2.3.1:** Achieve understanding of the threat to aquatic biodiversity posed by pest fauna by 2007 to set RCT.	**FB2K:** Collate all data on key aquatic pest animals and prioritise implementation strategies.	Weeds and Pest Management
						FB2.3.2: Aquatic pest animal species identified and threat abatement plans in place by 2008 to set an RCT.	**FB2L:** Collate all data on aquatic species and habitats which may be at risk from aquatic pests.	

Weeds & pests	**WP5** LGA pest management plans	MSC, CCC, BMRG, LBCCG, Barung	**Jan06continuing:-** Liaise with Councils to identify existing and proposed pest management plans **Mar06continuing** provide ongoing support	LBBC1.3 LBWPM1.1 LBWPM1.2 LBWPM1.3	**TB3.1:** No net increase in the extent of established ecologically significant invasive species into areas of high conservation value (as defined by PAP3.4 and 3.5) by 2020 through: - eradication where possible or containment of new or recent introductions	**TB3.1.2:** Partnership agreements in place with LGAs and LC groups for joint implementation of weed eradication activities by 2005.	**TB3C:** Support development & implementation of LGA pest management plans.	Weeds and Pest Management
Stormwater	**SW1** Stormwater management improvement	CalAqua, BMRG, LBCCG, Barung, AquaGen, CCC, MSC, MRCCC, community groups, DPI, EPA, State Gov, DNR&M	**Jan06-Mar07:**- Use Lake Baroon GIS and prioritisation tool from IP to identify Stormwater Quality Hotspots **Apr07continuing:**- Liaise with MSC and CCC to help implement respective Stormwater Quality Management Plans **May07 continuing:-** Assist Councils and partners to develop BMP stormwater design/management, WSUD and innovative approaches to stormwater management including urban surface water collection within catchment	LBCCP1.1 LBWQ1.1 LBWQ1.2 LBWQ1.3 LBWQ1.4 LBWQ1.5 LBWQ1.6 LBWQ1.7 LBWQ1.8 LBWQ1.9	**CMD1.3:** Impacts on coastal and marine resources from discharge loads from point sources and urban stormwater are reduced to 50% of 2005 loads by 2025.	**CMD1.3.1:** Stormwater collection and beneficial re-use targets within urban and rural areas are incorporated into residential development to reduce the impact of water quality on the receiving coastal environments by 2007.	**CMD1I:** Provide planning support to LGAs: - review LGA Urban Stormwater Management Plans - develop guidelines on BMP stormwater design/management for coastal habitats and ecosystems. **CMD1J:** Provide BMP advice and implementation support to LGAs to incorporate urban surface water collection, waste and pest management and reuse practices into future developments.	Coastal and Marine Management
Stormwater	**SW2** Support development of best practice stormwater management within Maleny township	CalAqua, BMRG, LBCCG, Barung, AquaGen, CCC, MSC, MRCCC, community groups, DPI, EPA, State Gov, DNR&M	**Jan06continuing:**- Identify urban water quality hotspots and liaise with CCC to implement CCC Stormwater Management Plan, develop projects and source funding	LBBC1.1 LBBC1.2 LBBC1.3 LBBC1.4 LBBC1.5 LBBC1.6 LBBC1.7 LBCCP1.2 LBWQ1.1 LBWQ1.2 LBWQ1.3 LBWQ1.4 LBWQ1.7 LBWQ1.16	**FB 3.2** The ecological function of wetlands and riparian zones of the top 10% (as prioritised by PAP3.4 and 3.6) are restored and protected by 2020	**FB3.2.1:** Identify requirements of significant freshwater wetlands, flood plains and riparian areas in terms of providing an optimal level of ecosystem services by 2007.	**FB3H:** Support construction of ecological systems (including artificial wetlands and riparian areas) to treat/use wastewater & polish runoff.	Biodiversity Conservation

Reserves	**RE1** Nature refuges	BMRG, LBCCG, Barung, AquaGen, CCC, MSC, MRCCC, community groups, DPI, EPA, State Gov, Industry, Landholders, DNR&M	**Dec05continuing:**- Identify locations within catchment that have existing covenants or are suitable for refuges **Jan06continuing** Support landholders in developing applications for nature refuges and management agreements **Mar06continuing** assist partners in submission of management agreements **Dec05-Continuing:-** During the development of on-ground works capture lands suitable for refuges and management agreements	LBBC1.1 LBBC1.2 LBBC1.3 LBBC1.4 LBBC1.5 LBBC1.6 LBBC1.7	**TB1.1:** The biodiversity status or area of regional ecosystems at 2007 levels are maintained or improved by 2020 resulting in no net loss of regional ecosystem diversity at the subregional level.	**TB1.1.3:** No reduction in the area of regional ecosystems of limited subregional extent by 2007.	**TB1D:** Work towards achieving best practice conservation management within the protected area estate and other gazetted reserves (e.g. gazetted under the Land Act 1994) through landscape management plans (with EPA and land managers) and on ground action.	Biodiversity Conservation
						TB1.1.4: Regional ecosystem representation on non-reserve lands is improved by 20% by 2009.	**TB1E:** Support the use of nature refuges and management agreements to achieve biodiversity outcomes on privately held lands, including devolved grants.	
Reserves	**RE2** Private Forested Estate	CalAqua, BMRG, LBCCG, Barung, AquaGen, CCC, MSC, MRCCC, community groups, DPI, EPA, State Gov, DNR&M	**Jan06-Mar07:**- Compile an inventory of private forested estate within catchment via Lake Baroon GIS and IP **Apr07 continuing:-** Support partners in the management of PFE through development of PMP's, regeneration (where appropriate) and PNF codes of practice	LBBC1.2 LBBC1.3 LBBC1.4 LBBC1.5 LBBC1.6 LBBC1.7 LBSU1.1 LBSU1.2 LBSU1.3 LBWPM1.1 LBWPM1.2 LBWPM1.3 LBCCP1.1 LBCCP1.2 LBWQ1.5 LBWQ1.6 LBWQ1.7 LBWQ1.8	**LR4.1:** All Private Native Forestry practices undertaken in Remnant Vegetation on Freehold Land to be ecologically sustainable by 2015, and a 30% increase in the uptake (by area) of environmentally responsible management practices in private native forestry	**LR4.1.1:** Programs initiated to assess and improve (where necessary) existing native forestry enterprises by 2006.	**LR4B:** Develop assessment criteria and compile a baseline condition assessment of Private Forested Estate (PFE), identify and quantify those parts of the estate that have regionally significant commercial and biodiversity value.	Sustainable Use
							LR4C: Establish a long term "resetting" program for PFE which have been excessively high graded to re-establish optimum combination of habitat and productivity; promote whole of property management plans.	
							LR4E: Support uptake of Private Native Forestry Codes of Practice that reflect desired environmental and commercial outcomes at subcatchment level.	
Catchment management	**CM1** Develop a program where by all landholders involved in on ground activities initiate PMP's as part of application process	BMRG, AquaGen, LBCCG, Barung, Noosa Landcare, SEQ Catchments, DNR&W, LBCCG, MRCCC	**Jan07:**- Liaise with Noosa Landcare, SEQ Catchments and BMRG re: PMP's and landholders toolkit **Mar07** Collate existing land management data into database Apr**07** Use database to develop individually tailored toolkits for landholders undertaking project work with LBCCG	LBBC1.1 LBBC1.2 LBBC1.3 LBBC1.4 LBBC1.5 LBBC1.6 LBBC1.7 LBCCP1.1 LBWQ1.1	**TB 2.2** The status and condition of High and Moderate Value TB sites identified in 2005 are maintained or improved by Land Management by 2015.	**TB2.2.1:** Land management impacts on high value, moderate or better condition TB values are identified and programs to minimise or reverse impacts are in place by 2008.	**TB2F:** Provide support to landholders to improve the biodiversity value of priority hotspots through incentives and PMP development. (Note: Baseline condition assessment and relationship to land management impacts on high value TB completed under existing	Biodiversity Conservation

			Apr07(continuing) update and expand database				**TB2G:** Develop a Land Management Toolkit for use by shires, land managers and community groups for identified priority areas. (Toolkit to address fire, grazing, passive/active recreational use and weeds.) **TB2H:** Use Toolkit with devolved grants process to support infrastructural and other interventions to preserve values (e.g. Rivercare works to protect Biodiversity Values) in conjunction with PMP and Vegetation Management Plans.	
Catchment management	**CM2** Property Management Planning Toolkit	CalAqua, BMRG, LBCCG, Barung, AquaGen, CCC, MSC, MRCCC, community groups, DPI, EPA, State Gov, QDO, DNR&M	**Jan07:-** Liaise with Noosa Landcare, SEQ Catchments and BMRG re: PMP's and landholders toolkit **Mar07** Collate existing land management data into database Apr07 Use database to develop individually tailored toolkits for landholders undertaking project work with LBCCG **Apr07continuing** update and expand database **May07continuing:**- All new on-ground projects initiated will entail a PMP	LBBC1.2 LBBC1.3 LBBC1.4 LBBC1.5 LBBC1.6 LBBC1.7 LBSU1.1 LBSU1.2 LBSU1.3 LBWPM1.1 LBWPM1.2 LBWPM1.3 LBCCP1.1 LBCCP1.2 LBWQ1.5 LBWQ1.6 LBWQ1.7 LBWQ1.8	**LR2.1:** Soil productivity, health and structure are maintained at 2004 levels (or better) within the cultivated lands and exports of nutrients, sediment and agrochemicals in runoff is within EV/WQO targets by 2015.	**LR2.1.1:** Identify priority cultivated landscapes and critical components of farming system to target RWQPP outcomes by 2005, and support development and implementation of whole of property plans for land managers in identified areas. **LR2.1.2:** Annual increments of 10% or more of cultivated land resources are under Peak Industry Groups based Whole-of-Farm Property Management Plans from 2006 to achieve >50% by 2011.	**LR2A:** Use predictive systems modelling and farming systems analysis to identify priority landscapes (e.g. nutrient sensitive zones) and critical components of farming systems to be addressed in PMP. **LR2B:** Support development and implementation of PMP in priority locations or subcatchments through extension and devolved grants programs to minimise environmental impacts (e.g. through bioremediation, water recycling and reuse, biological effluent treatment **LR2C:** Initiate a program of support for the development of Whole of Property Plans, LWMP and FMS in partnership with landholders and Peak Industry Groups based schema.	Sustainable Use

Catchment management	**CM3** Weeds toolkit	CalAqua, BMRG, LBCCG, Barung, AquaGen, CCC, MSC, MRCCC, community groups, DPI, EPA, State Gov, DNR&W, industry	**Jan07:- L**iaise with Noosa Landcare, SEQ Catchments and BMRG re: PMP's and landholders toolkit **Mar07** Collate existing land management data into database **Apr07** Use database to develop individually tailored toolkits for landholders undertaking project work with LBCCG **Apr07continuing** update and expand database **May07continuing:-** All new on-ground projects initiated will entail a PMP	LBBC1.2 LBBC1.3 LBBC1.4 LBBC1.5 LBBC1.6 LBBC1.7 LBSU1.1 LBSU1.2 LBSU1.3 LBWPM1.1 LBWPM1.2 LBWPM1.3 LBCCP1.1 LBCCP1.2 LBWQ1.5 LBWQ1.6 LBWQ1.7 LBWQ1.8	**LR3.1:** Weeds and pest animals of significance to productivity and biodiversity values are controlled in cleared agricultural land (including grazing and cultivated areas) and do not spread into remnant vegetation areas by 2015.	**LR3.1.1:** Weed and pest threats to the region are identified and actions prioritised (as part of current PAP), and partnership weed control programs of all declared weeds (with emphasis on WONS) are underway by 2006.	**LR3A:** Incorporate economic and environmental weeds and pests into Toolkit for use by land managers and shires; prioritise management strategies to target aquatic/terrestrial weeds of both economic importance to cultivated agriculture and which threaten bi	Weeds and Pest Management
Catchment management	**CM4** Adoption of BMP for point and concentrated diffuse pollution	CalAqua, BMRG, LBCCG, Barung, AquaGen, CCC, MSC, MRCCC, community groups, DPI, EPA, State Gov, DNR&W, landholders, industry	Liaise with respective landholders to establish best management practices for identified areas and implement strategic on-ground remittance works **Jun07continuing:-** Monitor water quality hotspots through existing and future planned networks (e.g. AquaGen water quality monitoring, community Waterwatch program, MRCCC, BMRG, SEQ Catchments	LBBC1.2 LBBC1.3 LBBC1.4 LBBC1.5 LBBC1.6 LBBC1.7 LBCCP1.1 LBCCP1.2 LBWQ1.1 LBWQ1.2 LBWQ1.3 LBWQ1.4 LBWQ1.5 LBWQ1.6 LBWQ1.7 LBWQ1.8	**WR1.2:** Both concentrated diffuse and point sources loads are reduced by 50% (or are consistent with the EV/WQO program targets) throughout region by 2020 and region-wide standards and BMP are widely used in ERA license reviews.	**WR1.2.2:** Best practice guidelines for point and concentrated diffuse sources of nutrients, sediments and agrochemicals and associated land development are identified by 2006 and priority pilot projects implemented in 2007.	**WR1S:** Support adoption of best practice codes for point and concentrated diffuse sources of nutrients through partnerships and support to industry.	Water Quality & Equitable Use

Catchment management	**CM5** Sustainable water use program	CalAqua, BMRG, LBCCG, Barung, AquaGen, CCC, MSC, MRCCC, community groups, EPA, DNR&M, landholders, SCU	**Oct05 continuing:-** Target the top 5 water users in the catchment for development of project submissions that involve sustainable water use in catchment, submit and provide on going support for programs	LBSU1.1 LBSU1.2 LBSU1.3	**WR3.1:** Greater than 75% of water supplied and used is managed by water use efficient practices across irrigation, urban, industrial and other uses by 2015.	**WR3.1.1:** >65% users (by volume across all regional industries) and water providers adopt WUE targets by 2008.	**WR3E:** Encourage urban water use efficiency programs including stormwater/tank collection and grey water/ waste water re-use through LGA extension activities, technology transfer and incentives.	Water Quality & Equitable Use
Catchment management	**CM6** Community involvement	BMRG, LBCCG, Barung, MRCCC, community groups, Maleny Primary School, Maleny High School, River School, Industry, AquaGen, CCC, MSC,	**Dec05continuing:-** Engage and maintain contact with community stakeholders through news letters and media releases	LBBC1.3 LBSU1.1 LBSU1.2 LBSU1.3 LBCCP1.1 LBCCP1.2 LBWQ1.11	**CD1.2:** At least 50% of NRM stakeholders in the region feel that their ownership and trust in the NRM planning process has increased by 2015.	**CD1.2.1:** From 2005 onwards, NRM stakeholders and key community groups participating in planning processes at least twice a year.	**CD1C:** Proactively maintain contact with agencies and community members to ensure that activities are followed through.	Community Capacity and Partnerships
Catchment management	**CM7** Stakeholder Survey	BMRG, LBCCG, Barung, MRCCC, community groups, landholders, Industry, AquaGen	**Apr07:-** Conduct landholder survey to determine attitudes towards NRM project development within catchment Jul07:- collate data and utilise to determine future directions of project development in catchment	LBBC1.1		**CD1.2.2:** BMRG maintains an 80%? strike rate? on communicating follow up activities to stakeholders regarding their input.	**CD1D:** Conduct annual surveys of members and stakeholders.	
Catchment management	**CM8** Transition in NRM practice	CalAqua, BMRG, LBCCG, Barung, AquaGen, CCC, MSC, MRCCC, community groups, DPI, EPA, State Gov, DNR&M,	**Dec05continuing:-** Initiate and support transition in NRM practice in 100% of new on-ground projects involving NRM stakeholders	LBBC1.3 LBSU1.1 LBSU1.2 LBSU1.3 LBWPM1.1 LBCCP1.1 LBWQ1.3 LBWQ1.8	**CD1.4:** At least five pathways for transition in NRM practice are implemented in the region (e.g. landholders change from riparian zone grazing to protection of riparian areas) by 2015.	**CD1.4.1:** By 2007, identify, analyse and develop economic transition strategies in top 10% priority NRM situations as defined by PAP 2 & 3.4.	**CD1H:** Liaise with stakeholders to identify, analyse and extend economic transition strategies.	Community Capacity and Partnerships
Catchment management	**CM9** Setting water quality targets for catchment	CalAqua, BMRG, LBCCG, Barung, AquaGen, CCC, MSC, MRCCC, community groups, DPI, EPA, State Gov, DNR&W, landholders	**Dec05-Mar07:**- Liaise with consultant RE updated Vol 2 of LBCMS **Jun07** Compile all existing data into a baseline condition and trend assessment for the purposes of target setting **Aug07** Survey communities expectations of water quality in catchment **Jan08** Integrate findings into water quality targets discussion paper **May08**	LBWQ1.10 LBWQ1.11 LBWQ1.12 LBWQ1.13 LBWQ1.14 LBWQ1.15 LBWQ1.16	**WR1.1:** No RCT (Indicative: End of Catchment/Basin Targets are established by 2007. Water Quality Improvement Plans (WQIPs) are implemented throughout the region to halt or reverse decline in water quality parameters by 2015.)	**WR1.1.1:** Interim end of catchment WQ Targets are set by July 2005. (Note: dependent on timeline of agencies responsible for running models such as SedNet). **WR1.1.2:** End of Catchment/Basin WQ targets for the Mary and Burrum are established by 2006	**WR1A:** Compile all existing data into a baseline condition and trend assessment for the purposes of target setting. **WR1C:** Develop WQ targets for all Burnett Mary Basins with: - Coastal Catchment Initiative/SedNet - EV/WQOs - State Agency - Community monitoring framework	Water Quality & Equitable Use

			Release findings for public comment **Jul08** Incorporate into IP		**WR3.2:** Optimal environmental flows are achieved by WRP/ROPs developed and implemented throughout the region by 2015.	**WR3.2.1:** Surface water allocation WRP/ROPs are in place for all catchments by 2007. (Note: BMRG supports an early completion of this target but recognises dependency on State Agency water reform agenda timelines).	**WR3H:** Promote engagement of community in water management decision making and management processes.	
						WR3.2.2: Community stream management groups, industrial users and providers, and state agencies are working in partnership to review WRP/ROPs by 2008.	**WR3I:** Assist communication efforts to enhance common community and industry understanding of ?shared resource? concepts and engagement in establishing and reviewing performance measures of key WRP outcomes (e.g. environmental flows and water allocation security objectives).	
Catchment management	**CM10** Community involvement	BMRG, LBCCG, Barung, MRCCC, community groups, Maleny Primary School, Maleny High School, River School, Industry, AquaGen, CCC, MSC,	**Dec05:-**Continue the distribution of LBCCG news letter and other media releases **Dec05continuing:-** LBCCG to continue to show significant presence at local events and AquaGen to continue sponsorship of community events	LBBC1.3 LBSU1.1 LBSU1.2 LBSU1.3 LBCCP1.1 LBCCP1.2 LBWQ1.11	**CD1.1:** At least 50% of NRM stakeholders in the region and peak community representative bodies have ongoing, meaningful communication and/or collaboration with BMRG by 2015.	**CD1.1.1:** Each year from 2004, an increase in stakeholder satisfaction with communication and engagement processes is demonstrated.	**CD1A:** Maintain a high level of community engagement and frequent information dissemination activities to allow community members to be informed and to participate in NRM actions; conduct annual reviews.	Community Capacity and Partnerships
						CD1.1.2: By 2006, a gap analysis of disengaged individuals and groups by location has been completed.	**CD1B:** Develop strategies to engage disengaged community members and increase community confidence in the NRM planning process.	
Catchment management	**CM11** Industry involvement in NRM	BMRG, LBCCG, Barung, MRCCC, Industry, AquaGen, CCC, MSC, QDO	**Dec05continuing:**-Advertise links between LBCCG, AquaGen and BMRG before, during and after on-ground project works with signage etc	LBBC1.3 LBSU1.1 LBSU1.2 LBSU1.3 LBCCP1.1 LBCCP1.2 LBWQ1.11	**IA1.4:** Increased participation of industry groups in NRM related activities by 2015.	**IA1.4.1:** Implementation of capacity building processes to improve partnership arrangements by 2006.	**IA1J:** BMRG to strengthen its relationship with existing industry groups in the region.	Community Capacity and Partnerships

Catchment management	**CM12** Training and skilling stakeholders in NRM	CalAqua, BMRG, LBCCG, Barung, AquaGen, CCC, MSC, MRCCC, community groups, DPI, EPA, State Gov, DNR&M, Sunshine Coast TAFE, SCU, landholders	**Dec05-Continuing:**- All new on-ground projects initiated will incorporate the introduction of proponents to NRM training possibilities	LBBC1.3 LBSU1.1 LBSU1.2 LBSU1.3 LBWPM1.1 LBCCP1.1 LBWQ1.3 LBWQ1.8	**KRT1.1:** Participation rates in NRM related training have increased by 30% by 2015.	**KRT1.1.2:** By 2007, at least 100 landholders or other stakeholders have accessed training and skilling through BMRG engagement.	**KRT1C:** Refer landholders and other stakeholders to appropriate training and skilling.	Community Capacity and Partnerships
Catchment management	**CM13** Develop a prioritisation tool for Lake Baroon Catchment	BMRG, LBCCG, Barung, AquaGen, CCC, MSC, MRCCC, community groups, DPI, EPA	**Nov05:**- Develop prioritisation tool **Dec06** revise prioritisation tool **Mar07** prioritise reaches of catchment with prioritisation tool and publish in draft IP	LBBC1.1 LBBC1.2 LBBC1.3 LBBC1.4 LBBC1.5 LBBC1.6 LBBC1.7	**FB2.1** Stream reaches in good condition in 2007 are protected, and by 2020 a 10% improvement in moderate and degraded condition stream reaches is achieved.	**FB2.1.2:** By 2010 achieve a 5% improvement in condition of stream reaches across the region.	**FB2B:** Prioritise rehabilitation needs of degraded aquatic habitats and initiate ongoing adaptive management program for restoration.	Biodiversity Conservation
Catchment management	**CM14** Update Vol2 LBCMS and incorporate it into IP	BMRG, LBCCG, Barung, AquaGen, CCC, MSC, MRCCC, community groups, Consultants	**Dec05:**- Liaise with consultant during update of LBCMS **Feb07** review updated strategy **Dec06continuing** Integrate revised LBCMS into IP	LBBC1.1 LBBC1.2 LBBC1.3 LBBC1.4 LBBC1.5 LBBC1.6 LBBC1.7	**FB2.1** Stream reaches in good condition in 2007 are protected, and by 2020 a 10% improvement in moderate and degraded condition stream reaches is achieved.	**FB2.1.1:** Identify stream reach condition for all subcatchments by 2007. **FB2.1.3:** A program to promote sustainable use of aquatic biodiversity is underway in each subcatchment by 2007	**FB2A:** Collate all data on aquatic habitat condition and trend, identify knowledge gaps and develop mechanisms to address gaps. **FB2C:** Collate all data on fish stocks and aquatic habitats which may be at risk from over-utilisation or from other aquatic and land-based activities, and identify potential impacts & benefits of restocking with target recreational native fish species.	Biodiversity Conservation
Catchment management	**CM15** Develop a community education program about waterways	BMRG, LBCCG, Barung, AquaGen, CCC, MSC, MRCCC, community groups, DPI, EPA, State Gov,	**Jan06continuing:**- Liaise with groups to identify knowledge gaps in community impacts on water quality **Jul07** develop a targeted education strategy in partnership with groups **Aug07** implement strategy and provide	LBBC1.1 LBBC1.2 LBBC1.3 LBBC1.4 LBBC1.5 LBBC1.6 LBBC1.7		**FB2.1.4:** Threats posed to freshwater biodiversity by poor water quality through effective implementation of WQ initiatives are minimised by 2010.	**FB2E:** Increase community awareness that activities on land as well as on water, in addition to fishing, may have significant negative impacts on fisheries resources and aquatic habitats.	Biodiversity Conservation

		Maleny Primary School, Maleny High School, River School, Industry	ongoing support to partners	LBSU1.3 LBCCP1.1 LBCCP1.2 LBWQ1.1			**FB2F:** Promote awareness of the need to ensure that aquatic biodiversity resources are only used in ways which protect dependent ecosystems as well as the fish stocks.	
Catchment management	**CM16** Develop and support ecosystem recovery plans	BMRG, LBCCG, Barung, AquaGen, CCC, MSC, MRCCC, community groups, DPI, EPA, State Gov, Industry, DNR&W	**Dec05continuing:**- Liaise with partners to identify the need and existence of local ecosystem recovery plans **Feb06continuing** develop submissions in conjunction with partners **Apr06continuing** submit plans and provide ongoing support to partners	LBBC1.1 LBBC1.2 LBBC1.3 LBBC1.4 LBBC1.5 LBBC1.6 LBBC1.7	**TB1.1:** The biodiversity status or area of regional ecosystems at 2007 levels are maintained or improved by 2020 resulting in no net loss of regional ecosystem diversity at the subregional level.	**TB1.1.1:** No decrease in status of regional ecosystems (i.e. no Of Concern classed as Endangered, no Not Of Concern to Of Concern status) by 2007.	**TB1B:** Support development and implementation of Ecosystem Recovery Plans.	Biodiversity Conservation
Catchment management	**CM17** Recovery action plans	BMRG, LBCCG, Barung, AquaGen, MSC, CCC, MRCCC, Community groups, EPA, QPWS, Industry, Landholders, DNR&W	**Dec05:**- Liaise with partners to determine what recovery action plans exist in catchment **Jan06-Continuing** Support partners with implementation of recovery plans through on-ground works	LBBC1.1 LBBC1.2 LBBC1.3 LBBC1.4 LBBC1.5 LBBC1.6 LBBC1.7	**TB2.3:** By 2015 all identified sites of EVR taxa in freehold land estate are covered by recovery plans.	**TB2.3.2:** Recovery action plans are developed and implemented for priority EV species/multi-species groups by 2007.	**TB2L:** Support implementation of existing recovery action plans for priority EV species/multi-species groups.	Biodiversity Conservation
Monitoring & research	**MR1** Water quality hotspots	CalAqua, BMRG, LBCCG, Barung, AquaGen, CCC, MSC, MRCCC, community groups, DPI, EPA, State Gov, DNR&W, BMRG, USC, SEQC, landholders	**Jan06-Mar07:**- Use Lake Baroon GIS, prioritisation tool from IP and liaise with partners to locate and record water quality hot spots in catchment **Apr07 continuing**:- Liaise with respective landholders to establish best management practices for identified areas and implement strategic on-ground remittance works **Jun07continuing:-** Monitor water quality hotspots through existing and future planned networks (e.g. AquaGen water quality monitoring, community Waterwatch program, MRCCC, BMRG, SEQ Catchments	LBBC1.3 LBBC1.4 LBBC1.6 LBWQ1.1 LBWQ1.2 LBWQ1.3 LBWQ1.4 LBWQ1.5 LBWQ1.6 LBWQ1.7 LBWQ1.8	**WR1.1:** No RCT (Indicative: End of Catchment/Basin Targets are established by 2007. Water Quality Improvement Plans (WQIPs) are implemented throughout the region to halt or reverse decline in water quality parameters by 2015.)	**WR1.1.5:** Water Quality? hot spots? are identified; mitigation programs are developed and commence by 2007.	**WR1G:** Develop programs of support and incentives to involve regional stakeholders to mitigate impacts in 'hotspots'	Water Quality & Equitable Use

Monitoring & research	**MR2** Expand community Waterwatch program	CalAqua, BMRG, LBCCG, Barung, AquaGen, CCC, MSC, MRCCC, community groups, DPI, EPA, State Gov, DNR&W, CSIT, landholders, Maleny Primary School, Maleny High School, River School	**Nov05:**- Discuss with partners and stakeholders high value areas of catchment and monitoring needs **Mar07** Revise AquaGen water quality monitoring program and align with community monitoring **Jun07** Capture volunteers with "Name that Stream " project for community monitoring **Sep 07** implement monitoring program	LBWQ1.10 LBWQ1.11 LBWQ1.12 LBWQ1.13 LBWQ1.14		**WR1.1.6:** Community Based Freshwater Quality Monitoring network is expanded and aligned with DNR&M ROP and EPA estuarine monitoring by 2007 and considered an integral component of activities to halt and reverse the decline of water quality.	**WR1I:** Identify, adequately resource and invest in Integrated Community Waterwatch Monitoring to monitor: - water quality 'hot spots' - locations that impact greatest on water quality - sites of major implementation focus under NRM Plan and PAP's - Rivercare works/rehabilitation sire - sites addressing target-related issues or not adequately covered by line agency monitoring networks	Water Quality & Equitable Use
Monitoring & research	**MR3** Water quality data and GIS	BMRG, LBCCG, Barung, AquaGen, CCC,	**Mar06:**- Liaise with partners to develop possible catchment data integration into existing GIS programs already accessible by the public **Apr06** begin data integration **Aug06continuing** Develop Lake Baroon GIS and allow non sensitive data to be accessed by partners and proponents	LBCCP1.1L BWQ1.10 LBWQ1.11		**WR1.1.8:** WQ Information Services are in place to provide WQ information and other NRM information to community groups, land managers and the public by 2008.	**WR1M:** Develop accessible formats and indices and collate regional WQ data GIS.	Water Quality & Equitable Use
Monitoring & research	**MR4** Develop and implement a water quality monitoring project for the catchment	BMRG, LBCCG, Barung, AquaGen, DPI, DNR&M, EPA, CCC, MSC, MRCCC, community groups	**Nov05:**- Discuss with partners and stakeholders high value areas of catchment and monitoring needs **Mar07** Revise AquaGen water quality monitoring program and incorporate community monitoring **Jun07** Capture volunteers with "Name that Stream " project for community monitoring **Sep 07** implement monitoring program	LBBC1.1 LBBC1.2 LBBC1.3 LBBC1.4 LBBC1.5 LBBC1.6 LBBC1.7	**FB1.1** High value freshwater biodiversity areas are maintained at 2007 condition and extent and improved/extended by X% by 2025.	**FB1.1.1:** Locations are adequately mapped, identified and classified by 2007 to set an RCT.	**FB1A:** Assist in identifying high value areas (including condition assessment), by evaluating threat status and conservation priorities.	Biodiversity Conservation
Monitoring & research	**MR5** Identification of point and concentrated diffuse pollution	BMRG, LBCCG, Barung, AquaGen, CCC, MSC, MRCCC, community DPI, EPA, DNR&W, landholders, industry	**Jan06-Mar07:**- Use Lake Baroon GIS, prioritisation tool from IP and liaise with partners to locate and record water quality hot spots in catchment	LBWQ1.10 LBWQ1.11	**WR1.2:** Both concentrated diffuse and point sources loads are reduced by 50% (or are consistent with the EV/WQO program targets) throughout region by 2020 and region-wide standards and BMP are widely used in ERA license reviews.	**WR1.2.1:** All point and concentrated diffuse sources of nutrients, sediments and agrochemicals within the Burnett Mary Basin are identified and information on nutrient, sediment and agrochemical exports is collated in 2005.	**WR1P:** Identify, map and categorise all point, concentrated diffuse (e.g. collective impact of household septic tank discharge along the coastal fringe, intensive livestock) and diffuse sources within region from LGA, DNR&M, DPI&F and EPA resources.	Water Quality & Equitable Use

Monitoring & research	**MR6** Groundwater management	BMRG, LBCCG, Barung, AquaGen, CCC, MSC, MRCCC, community groups, EPA, DNR&W, landholders, SCU, GIG	**Dec05continuing:**-Assist GIG to develop community monitoring of groundwater	LBSU1.1 LBSU1.3 LBWQ1.1 LBWQ1.4 LBWQ1.7 LBWQ1.12 LBWQ1.15	**WR4.1:** No RCT. (Indicative: WQO/EVs of economically and ecologically important groundwater provinces in the region are maintained or improved by X% by 2025.)	**WR4.1.1:** By 2009, options for sustainable groundwater management are identified and feasible priority actions are implemented.	**WR4D:** Review current impact of concentrated diffuse pollution sources (e.g. landfill, waste management, industries) on shallow groundwater aquifers and their co-dependencies with wetlands region-wide; develop strategy to reduce impact on WQ.	Water Quality & Equitable Use
Monitoring & research	**MR7** Deoxygenated water roll over abatement	CalAqua, BMRG, LBCCG, Barung, AquaGen, CCC, MSC, MRCCC, community groups, DPI, EPA, State Gov, QPWS, DNR&M	**Sep07:**- Identify deoxygenated water roll over locations in catchment through combined AquaGen and community Waterwatch monitoring program **Dec07continuing** liaise with respective landholders to implement strategic on-ground remittance works **Feb08continuing** develop projects in the identified areas and continue on-ground works	LBBC1.3 LBBC1.6 LBBC1.7 LBWQ1.1 LBWQ1.3 LBWQ1.4 LBWQ1.5 LBWQ1.6 LBWQ1.7	**FB1.3** Priority aquatic habitat linkages and passages are enhanced through removal of or passage through 20% of barriers by 2025.	**FB1.3.2:** In-stream aquatic habitat restoration needs for EVR/iconic species are identified and appropriate rehabilitation strategies developed by 2007 and implemented by 2008.	**FB1K:** Investigate and implement options to minimise deoxygenated water roll overs and inflows in storages and waterway pools to minimise loss of fish	Biodiversity Conservation
Monitoring & research	**MR8** Research support	USC, Sunshine Coast TAFE, CalAqua, BMRG, SEQC Barung, AquaGen, CCC, MSC, MRCCC, community groups, DPI, EPA, State Gov, QPWS, DNR&M	**Jan06continuing:**- Use historical literature and prioritisation tool to identify priority areas and species for research within the catchment **Feb06continuing** Support research institutions with the development and implementation of research projects	LBWPM1.1 LBWPM1.2 LBWPM1.3 LBWQ1.9 LBWQ1.10 LBWQ1.11 LBWQ1.12 LBWQ1.13 LBWQ1.14 LBWQ1.15 LBWQ1.16	**TB1.2** Remnant Vegetation condition and function at 2007 levels are maintained or improved (e.g. representative native species composition in all regional ecosystems) by 2025.	**TB1.2.1:** Understanding of the native species composition of priority regional ecosystems (including habitat needs of significant species) is improved by 2008.	**TB1F:** Undertake research into the diversity and abundance of a suite of species in representative areas of regional ecosystems in the BMR to identify their needs in terms of ecosystem function and habitat condition	Biodiversity Conservation

SECTION 2

Prioritising the catchment for management

S2.1 How the catchment has changed since European settlement

The Lake Baroon Catchment has changed considerably since European settlement. Chapter 1 of the Lower Obi Obi Creek Rehabilitation Management Plan (2002) summarises the history of the catchment and indicates the changes that have taken place in the last 150 years. Stockwell (2002) describes the changes that have occurred in the Lake Baroon catchment since the arrival of Europeans in the mid nineteenth century.

The Lake Baroon Catchment was originally covered in complex notophyll vine forest with sections of tall open eucalypt forest with notophyll vine understorey (Queensland Herbarium 2005). These forests were intersected by numerous waterways that in many cases rose from springs as they still do today. There were small pockets of wetlands containing native grasses and sedges, however the majority of boggy areas in the catchment, as suggested by the Revegetation and Habitat Officer at Barung Landcare, were *Archontophoenix cunninghamiana* swamps (Smyrell, G 2006, pers comm., 31 January).

According to local Aboriginal residents, the first inhabitants of the Lake Baroon Catchment were the Djala people (Hand, B 2006, pers comm., 23 November). The Djala people amalgamated with the Nalbo, Gubi Gubi and Jinnibarra peoples soon after the colonisation of Queensland to form the collective Gubi Gubi (sometimes spelt Kabi Kabi). The following is an account of the catchment's first inhabitants from '*By Obi Obi Waters – Maleny 1878 – 1978 – One Hundred Years*', written by Maleny District Centenary Committee November 1978 and relevant internet sites, cited in DNR (2002).

> They fished the rivers and creeks, hunted and harvested plants for food and medicinal purposes. These nomadic people named special features in the region some of which still bear their names. They would gather on the banks of the Obi Obi at Baroon Pocket and feast on the fruit of the Bunya Pine, exchanging songs, stories, tool and ornaments. Small areas were cleared for paths, campsites and religious rites; however, they made few changes to the landscape. There is evidence of their habitation still today, with long disused bora rings, middens and scarred trees.

With the arrival of Europeans in the mid nineteenth century the catchment began to experience rapid change often leading to significant land and water degradation.

> Timber operators in the district were first recorded in 1853. The timber men felled stands of beech, pine and cedar, selecting the best timber. These were cut into logs and taken by bullock to the junction of Mellum and Coochin Creeks where the logs were sent downstream by raft. Logging tracks were made by drawing the logs with bullock teams which inturn destroyed the understorey vegetation.
>
> The first application for land received by the Lands Department in the Maleny district was on 12 November 1878 by Isaac Burgess. He employed workers to grow sugar cane for his bullock teams, and maize and oats for his horses. More settlers quickly followed and purchased other selections in the district.

> With the influx of Europeans to the district the settlements of Maleny, Montville, Flaxton and Mapleton began to form. The aborigines were soon displaced by the newcomers.
>
> *'By Obi Obi Waters – Maleny 1878 – 1978 – One Hundred Years', Maleny District Centenary Committee November 1978 and relevant internet sites, cited in DNR (2002).*

After most of the best timber was removed, pastoralists began to move to the catchment and commenced extensive land clearing. They felled much of the remaining vegetation that was unsuitable for timber in order to open up the land for grazing and cropping.

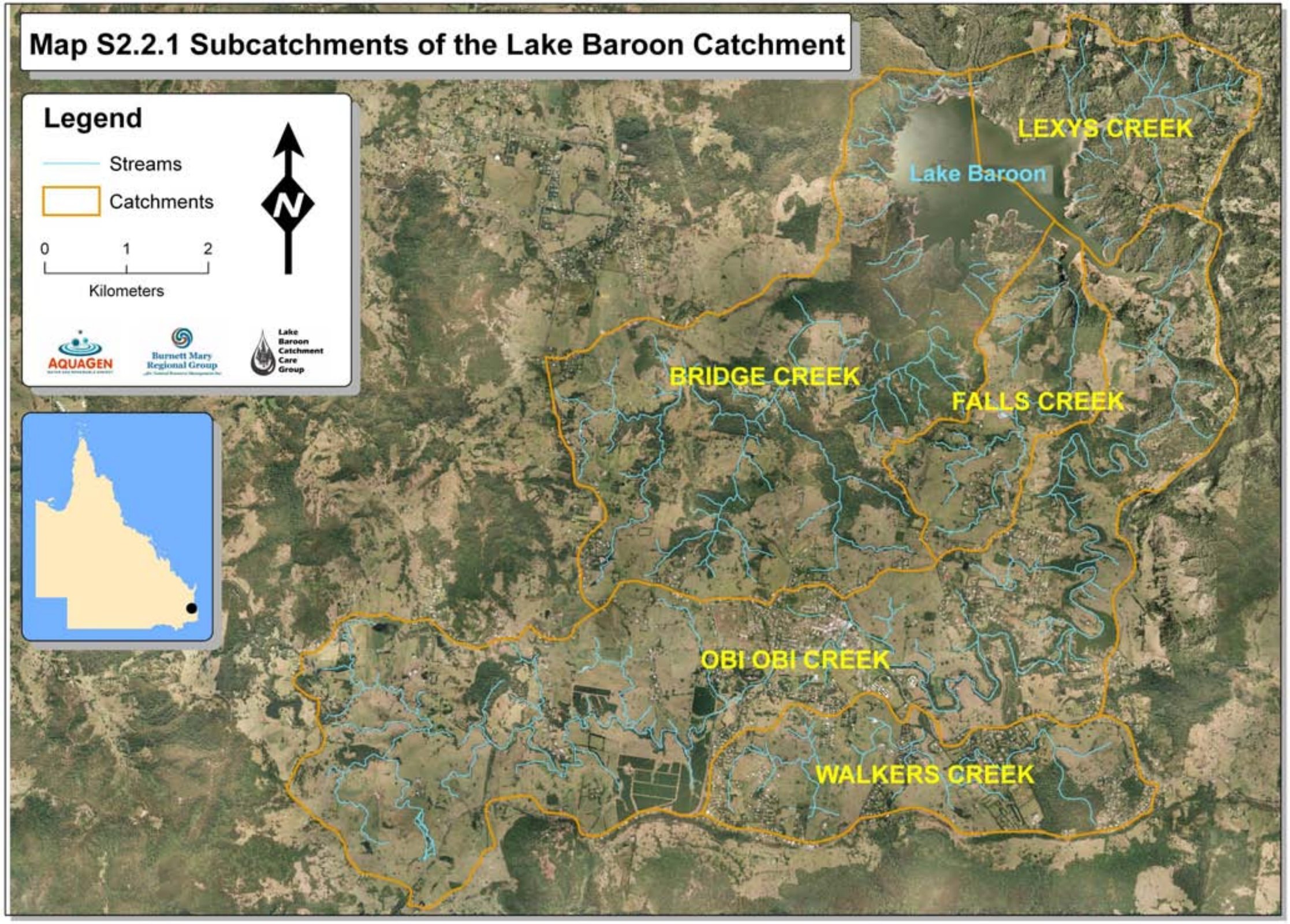
> The timber industry eventually slowed as the best timber began to vanish and gave way to dairy and beef cattle. These farmers cleared the land and planted grass for the cattle to feed on.
>
> In 1906 a sawmill was built on the banks of Fryer's Creek. By 1918 it had closed down and the machinery sold off.
>
> Floods occurred throughout the district during the 1950's. Anecdotal evidence suggested plantations established on the steep sided valley margins in the Conondale district resulted in significant sedimentation of the river.
>
> *'By Obi Obi Waters – Maleny 1878 – 1978 – One Hundred Years', Maleny District Centenary Committee November 1978 and relevant internet sites, cited in DNR (2002).*

Landuse changed again when Baroon Pocket dam was constructed and the catchment experienced the "tree change" phenomenon as farmers divided their larger holdings into smaller rural residential blocks.

> The Baroon Pocket Dam was completed in 1989. This 380 hectare freshwater lake, fed by Obi Obi Creek and its tributaries, provides the Sunshine Coast with domestic water supplies. It also provides the community with recreational and tourism facilities that include fishing, swimming, boating and canoeing. There are viewing platforms and walking trails as well as extensive picnicking and barbecuing facilities.
>
> Today, due to the climate and its proximity with Brisbane and the Sunshine Coast, the Maleny plateau is sought after for lifestyle and residential blocks. It has a flourishing tourism industry attracting many to the natural beauty of its various National Parks and reserves, conserving areas of the rainforest. The villages attract tourists to their arts and crafts shops and cafes.
>
> *'By Obi Obi Waters – Maleny 1878 – 1978 – One Hundred Years', Maleny District Centenary Committee November 1978 and relevant internet sites, cited in DNR (2002).*

S2.2 Division of the Catchment into Strategic Units (Management Units)

The catchment of Lake Baroon contains five distinctly recognisable subcatchments which are isolated from each other by the topography of the area (Map S2.2.1). The subcatchments are in many ways similar because of their geographic location however, they do display individual differences in slope, soil, vegetation and landuse


Map S2.2.1 Subcatchments of the Lake Baroon Catchment
Legend
Streams
Catchments
0
1
2
Kilometers
N
AQUAGEN
Burnett Mary Regional Group
Lake Baroon Catchment Care Group
LEXYS CREEK
Lake Baroon
BRIDGE CREEK
FALLS CREEK
OBI OBI CREEK
WALKERS CREEK

and as a result are in a different state of ecological health. Table S2.2.1 lists the subcatchments of Lake Baroon and describes some of their attributes.

Table S2.2.1 Subcatchments of Lake Baroon Catchment

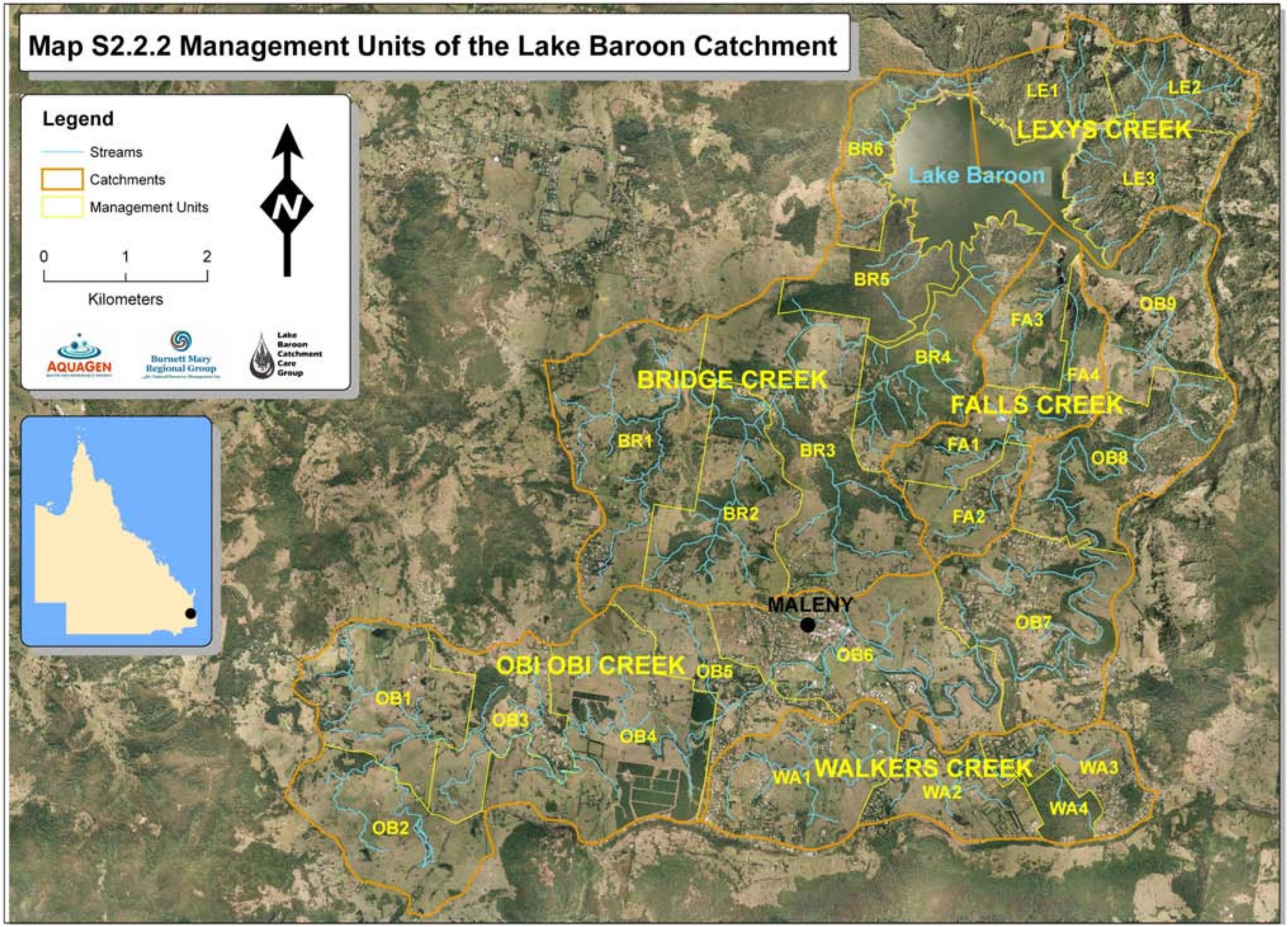
Subcatchment	Area (ha)	Total length of waterways (m)	Vegetation cover (%)
Obi Obi Creek	2880	71358	18.45
Bridge Creek	2134	52378	43.32
Falls Creek	508	12246	18.07
Walkers Creek	697	15172	10.05
Lexy's Creek	673	13475	67.32

The waterways contained in these subcatchments can be further broken down into reaches with reasonably uniform characteristics. A reach is described by Rutherfurd, Jerie & Marsh (2000) as a unit of stream (with its riparian zone) subjected to a definable flow and sediment regime, which carries a characteristic set of geomorphic units (such as bars, channel width, bed material, etc.) and a characteristic biological community (vegetation, macroinvertebrates, fish). These reaches can be defined on the basis of many features (Rutherfurd, Jerie & Marsh 2000; DNR 2002). The characterisation of reaches using River Styles® (Brierley 1999) has been a feature of recent publications (Hydrobiology Pty Ltd, 4 Site Pty Ltd & MSC 2005; Stockwell 2001). This approach concentrates on river character and behaviour then assesses a rivers evolution and trajectory which leads to the prioritisation of management effort. The scope of this document did not allow for a full application of the River Styles® framework however; where appropriate, general principals of the framework were applied to categorise the subcatchments into "management units".

The management units (MU) illustrated in Map S2.2.2 were characterised by physiography, riparian vegetation, land use, point and diffuse source impacts and administration. GIS layers were placed over aerial photographs at 0.25m (CCC 2005) and 0.125m (MSC 2005) resolution. These layers included cadastre information, landuse, stream network and 5m contours. Individual MU were then isolated from the five subcatchments with similar physical, chemical and biological features. Furthermore, the waterways inside these MUs were subject to comparable environmental threats which required analogous management responses.

Property boundaries were important in defining MUs as these administrative boundaries empower individual stakeholders to take ownership of the MU in which their property is contained.

Obi Obi Creek was divided into nine MUs, Bridge Creek into six, Falls Creek into four, Lexys Creek into three and Walkers Creek into four. Table S2.2.2 lists each of the MUs. In general, the homogenous stream reaches inside the MU were never longer than 7km. Descriptions of MUs are contained in the Appendices.


Map S2.2.2 Management Units of the Lake Baroon Catchment
Legend
Streams
Catchments
Management Units
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1
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Kilometers
N
AQUAGEN
Burnett Mary Regional Group
Lake Baroon Catchment Care Group
LE1
LE2
LE3
LEXYS CREEK
Lake Baroon
BR6
BR5
BR4
BR3
BR2
BR1
BRIDGE CREEK
FA1
FA2
FA3
FA4
FALLS CREEK
OB8
OB9
OB7
OB6
OB5
OB4
OB3
OB2
OB1
OBI OBI CREEK
MALENY
WA1
WA2
WA3
WA4
WALKERS CREEK

Table S2.2.2 Management Units of Lake Baroon Catchment

Subcatchment	Code	Area (ha)	Length of reach (m)	Eastings	Northings	Dominant Landuse
Walkers Creek	WA1	298.93	7644	484838.34	7038541.70	Dairy
	WA2	185.82	4224	486618.26	7038422.04	Dairy
	WA3	155.48	2165	488502.90	7038706.23	Dairy
	WA4	569.49	1139	488143.92	7038197.68	Vegetation
Obi Obi Creek	OB1	293.03	9371	479812.65	7039484.01	Dairy
	OB2	271.95	6315	479857.53	7037943.40	Dairy
	OB3	218.39	7110	481310.35	7039614.08	Non-dairy
	OB4	467.75	10061	482804.27	7039087.82	Dairy
	OB5	182.89	3635	483907.55	7039808.53	Dairy
	OB6	447.40	11244	485802.86	7040186.82	Dairy
	OB7	399.04	10439	487875.69	7040356.54	Mixed – rural res/non-dairy/vegetation
	OB8	326.43	8674	488823.68	7042456.54	Vegetation
	OB9	273.50	4509	489276.68	7044414.01	Vegetation
Falls Creek	FA1	110.71	2659	486834.37	7042512.09	Non-dairy
	FA2	120.89	2812	486994.42	7041720.27	Dairy & rural residential
	FA3	154.57	3322	487720.50	7044125.00	Vegetation
	FA4	121.49	3453	488343.84	7043447.70	Vegetation
Bridge Creek	BR1	450.68	10869	482828.83	7042621.77	Dairy
	BR2	322.97	9810	484197.09	7041705.62	Dairy
	BR3	517.99	14022	485101.30	7042594.47	Non-dairy
	BR4	286.62	9113	486609.50	7043688.04	Vegetation
	BR5	178.51	2926	485839.03	7044596.19	Vegetation
	BR6	154.57	5638	485847.23	7046558.39	Vegetation
Lexy's Creek	LE1	170.98	3152	487949.43	7046977.41	Vegetation
	LE2	175.60	6454	489550.25	7047030.33	Vegetation
	LE3	219.11	3869	489075.43	7045861.85	Vegetation

S2.3 Assets and Problems of the Catchment

Assets are described by Rutherfurd *et al* (2000) as areas of a stream that resemble their most natural state or best available condition. They could be intact riparian vegetation or in stream habitat. Problems are the processes that degrade these assets. Problems within Lake Baroon Catchment include lack of riparian vegetation, stock access to streams and point and diffuse source pollution.

Interpretation of GIS layers and anecdotal evidence from catchment stakeholders (AquaGen Catchment Supervisor, Barung Landcare Revegetation and Habitat Officer, local community groups and landholders) indicated that the entire catchment was disturbed to some degree. This is due to the intensive land use that began with the timber getters 150 years ago and culminated most recently in an increase in urban population and the construction of the dam. Therefore any assets identified were the best available condition of the catchment. The majority of assets throughout the catchment were intact remnant riparian vegetation, protected areas, cooperative landholders and existing regeneration works. The principal problems throughout the catchment were stock access to waterways, lack of riparian vegetation and weeds. The rapid increase in rural and urban residential land will be the foremost problem for the future of the catchment.

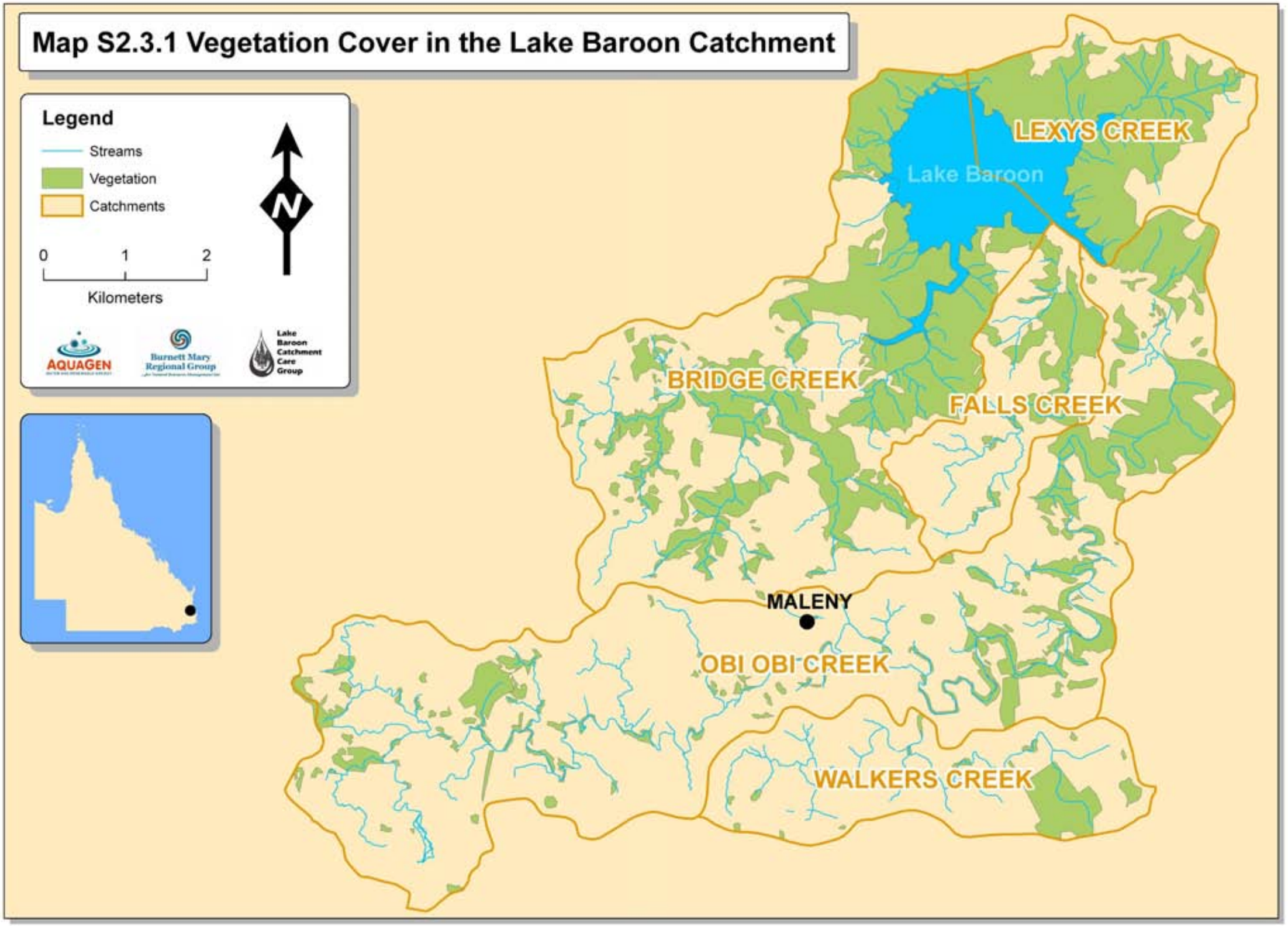
Defining the assets and problems of the catchment was a GIS exercise that drew upon several pre-existing data sources. To appropriately illustrate the catchments' assets and problems the GIS layers were assembled under a series of relevant themes which are discussed below.

- vegetation
- landuse
- water quality
- sediment and erosion

The data generated from these layers was then used in the prioritisation of the MU as discussed in S2.4 below.

S2.3.1 Vegetation

Drainage lines were laid over aerial photography at a 0.25m and 0.125m resolution, to determine the extent of vegetation assets around waterways (Map S2.3.1). This information was ground truthed with numerous site visits and discussions with stakeholders (AquaGen Catchment Supervisor, Barung Landcare Revegetation and Habitat Officer, local community groups and landholders) and combined with Regional Ecosystem Data to determine riparian vegetation structure and composition. From this, a GIS layer was produced by the Data Maintenance Officer, Geographic Information Unit; Information Service Unit; Caloundra City Council to describe the categories of riparian vegetation for the catchment. Categories ranged from predominantly native vegetation with a closed canopy and natural structure with little to no weeds to a mixture of grasses and no canopy (Map S2.3.2). Upon examination of this data it was concluded that no waterways in the catchment could be considered pristine. In fact the majority of the aquatic ecosystems in the catchment were highly degraded. In addition, the cost of regenerating a 10, 20 and 50m buffer of riparian vegetation around the waterways inside the catchment was


Map S2.3.1 Vegetation Cover in the Lake Baroon Catchment
Legend
Streams
Vegetation
Catchments
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Kilometers
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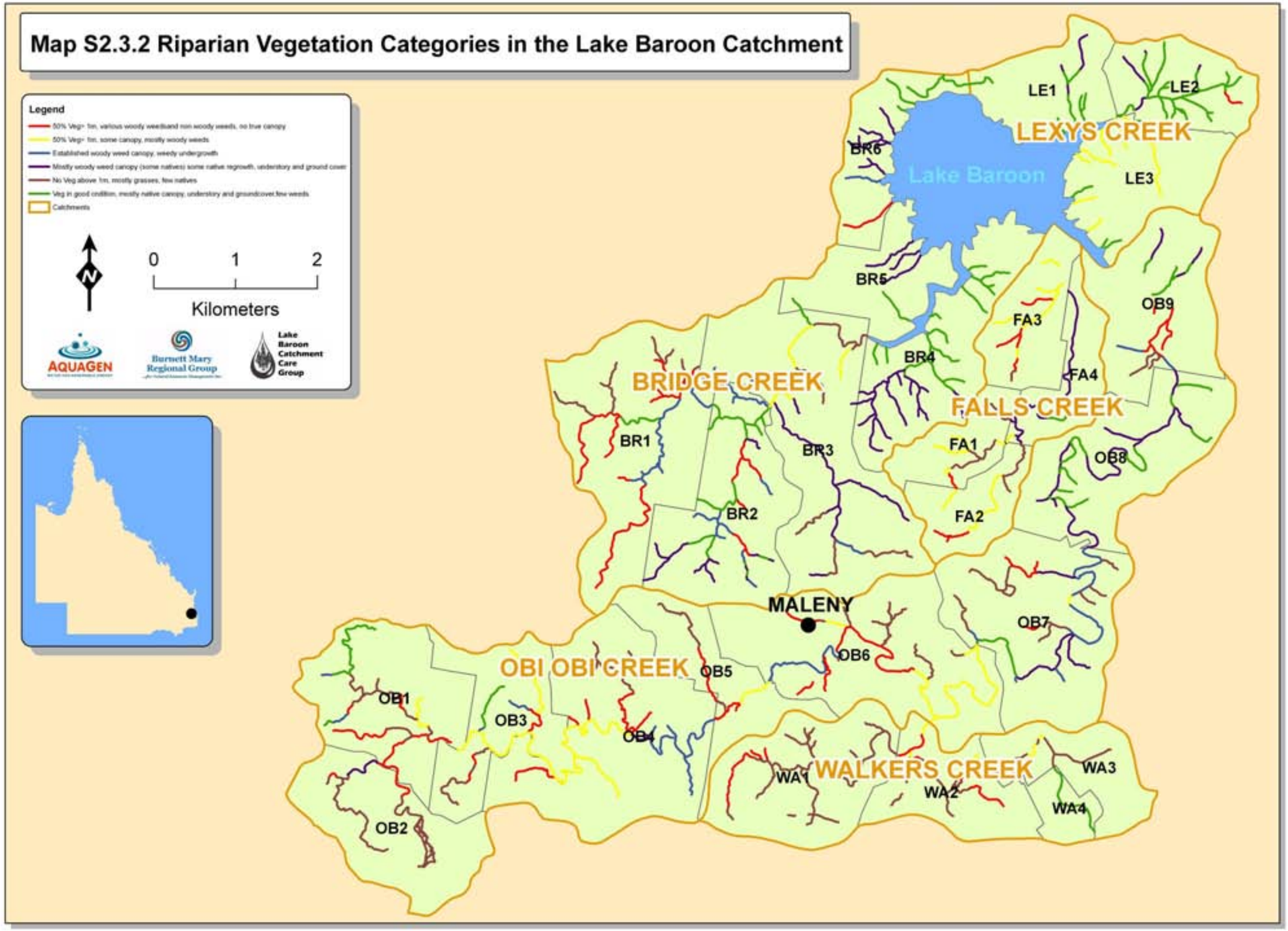
AQUAGEN
Burnett Mary Regional Group
Lake Baroon Catchment Care Group
LEXYS CREEK
Lake Baroon
BRIDGE CREEK
FALLS CREEK
MALENY
OBI OBI CREEK
WALKERS CREEK

Map S2.3.2 Riparian Vegetation Categories in the Lake Baroon Catchment



calculated based on market prices provided by a local bush regeneration contractor (Brush Turkey Enterprises).

S2.3.2 Land Use

In 1996 AquaGen in partnership with Caloundra City Council developed the Lake Baroon Catchment Land Use Map. The data from this project was converted to ESRI shape files and updated to account for the rapid changes that have occurred in the thirteen years since it was originally produced (Map S2.3.3). The major change in land use during this time was the shift from dairy grazing to beef grazing; rural residential and some horticulture.

The clearing of the majority of the catchments vegetation over the last century has lead to an increased incidence of landslides due to reduced mechanical support and a rise in groundwater pressures (Willmott 1983). Anecdotal evidence suggests more recent land use changes have had a deleterious effect on the aquatic ecosystems in the catchment. An increase in rural residential properties has seen the introduction of numerous on site sewage treatment systems. In many cases the shift in land ownership from experienced land managers like farmers to less experienced residents has lead to the spread of numerous invasive weed species. Conversely many new landholders in the catchment have resolved themselves to regenerating large tracks of riparian vegetation. The updated Land Use Map demonstrates that the majority of areas representing the most natural state in the catchment are either located within the Bridge creek catchment or within close proximity to Lake Baroon.

S2.3.3 Water Quality

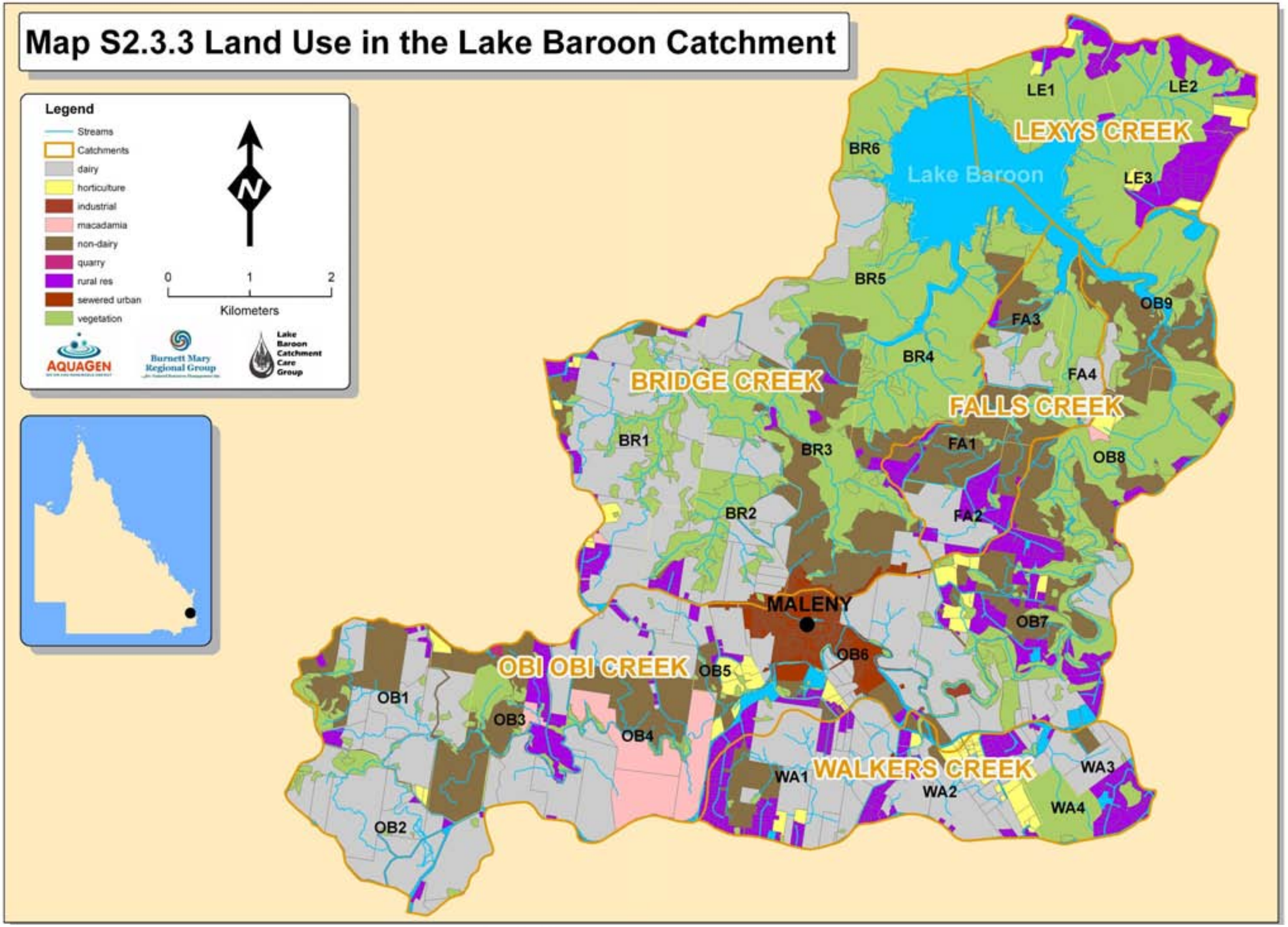
The data contained in the dissolved P and N grids generated by SEDNET for the CSIRO technical report; Regional Patterns of Erosion and Sediment and Nutrient Transport in the Mary River Catchment, Queensland (2002) was converted into ESRI shape files. The data was clipped to individual MU and used to generate a picture of high nutrient bearing areas within the catchment. Most of the catchment contained waterways that generated significant amounts of nutrient. Generally, areas that had a significant cover of vegetation contributed less to dissolved nutrients in the catchment. An exception to this was the Bridge Creek sub-catchment. Despite being generally well covered by vegetation, the majority of waterways in the sub-catchment delivered relatively high amounts of nutrient to Lake Baroon.

S2.3.4 Sediment & Erosion

Defining the frequency and distribution of erosion points and sediment sources was of paramount importance for identifying assets and problems in the catchment. The majority of farming systems in the catchment are low input and in these types of systems the bulk of the nutrient load is transported attached to sediment so that sediment and nutrient transport are intimately linked (DeRose *etal* 2002). Phosphorus as well as many pesticides bond to sediment particles and are conveyed down stream as erosion occurs in the catchment. Using the work of Willmott (1983) as a GIS layer, landslide occurrence and potential as well as soil instability was spatially derived for the catchment.

In general, vegetation cover limits the loss of soil in the catchment caused by erosion and landslides. Clearing of remnant vegetation represents a high erosion risk because

Map S2.3.3 Land Use in the Lake Baroon Catchment



forested areas tend to be in the steepest and wettest parts of the catchment (De Rose *et al* 2002). Consequently maintaining and re-establishing vegetative cover is one of the highest priority management actions for the catchment.

S2.3.5 Trajectory

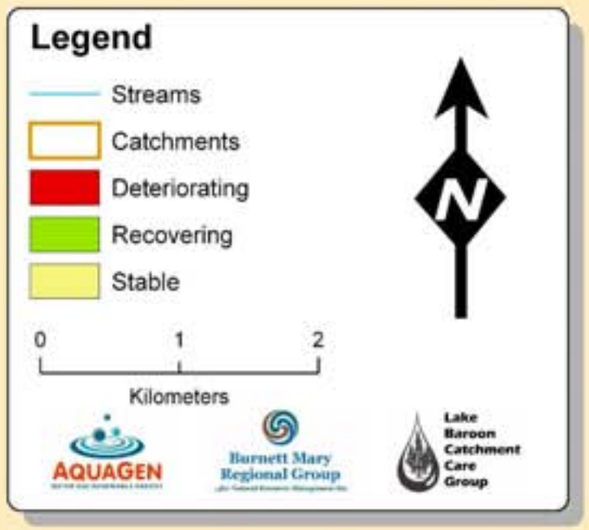
An important concept to define for the catchment once the problems and assets were identified was trajectory. Rutherfurd *et al* (2000) define trajectory as how of a stream will recover or degrade if no restoration work is carried out, i.e. if a stream is naturally recovering or degrading. Most of the MU in the catchment were subjected to extensive clearing and disturbance decades ago. While these areas remain degraded, they are also quite stable with vegetation communities dominated by weeds in a climactic state. There are also MU that have intact native vegetation that has changed little in recent decades. These areas are also quite stable with native vegetation communities in a climactic state. The MU that have experienced rapid land use change over the past decade are in a state of flux. Areas that were once dominated by farming, that are now dominated by rural residential holdings are mostly in a state of decline. This is also true for MU containing intensive land uses such as urban areas, industry and intensive agriculture. Conversely, MU containing areas that have been put under environmental covenants or that have been regenerated are in a state of recovery.

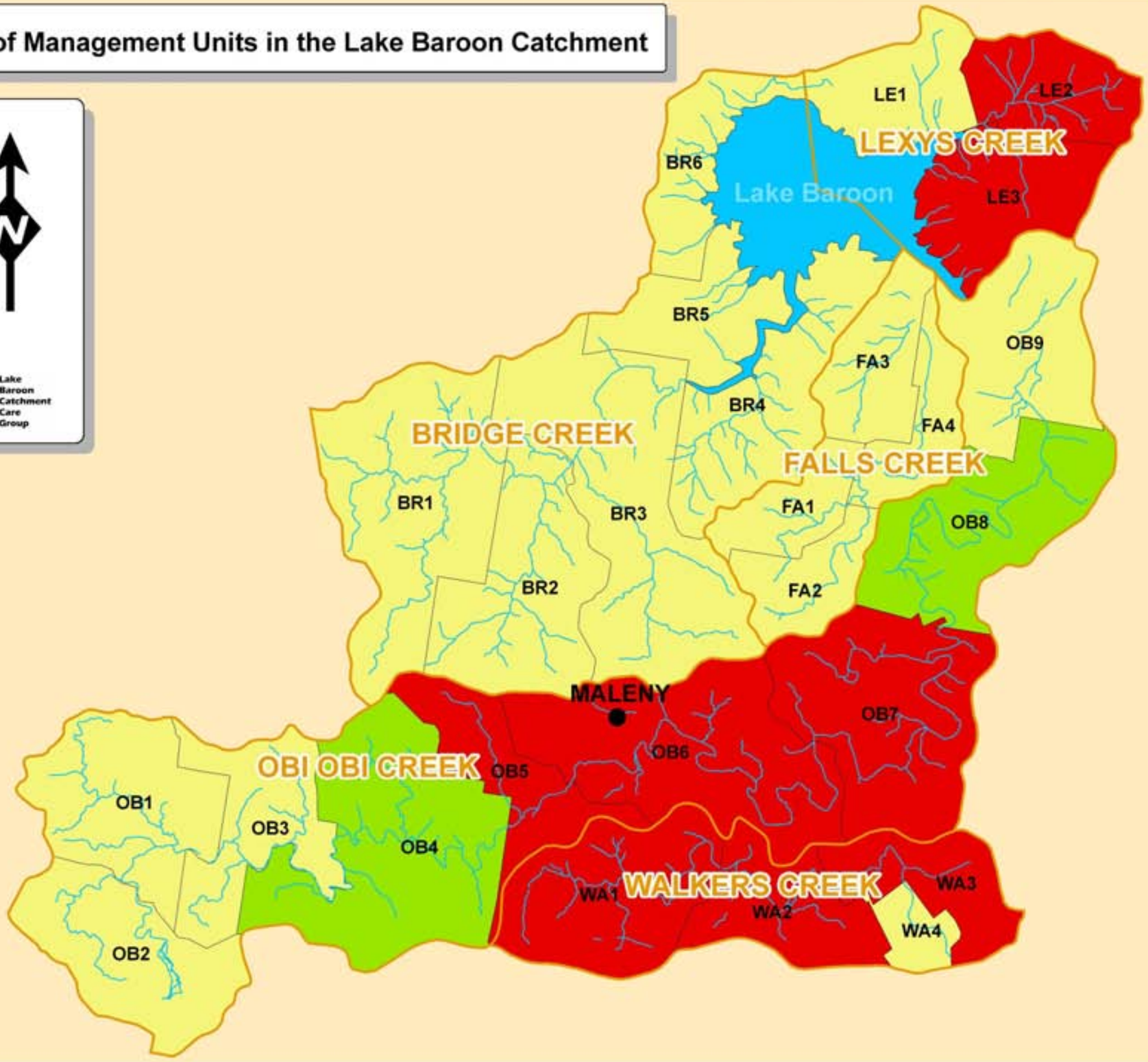
The majority of reaches are at a stable trajectory. All of reaches Falls Creek and Bridge Creek are stable as are the majority of the Upper Obi Obi. Lexys creek has one reach with a stable trajectory (LE1). These reaches have experienced limited, measured land use changes over the past two decades. Problems associated with these reaches, such as weeds have reached a climactic state (Map 2.3.4).

The middle reaches of the Upper Obi Obi Creek (OB5, OB6, and OB7), Walkers Creek (WA1, WA2, and WA3) and Lexys Creek (LE2 & LE3) are deteriorating. The core factor causing the deterioration is change of land use, namely the breaking up of relatively large dairy holdings into rural and urban residential. In addition, consistent, intensive dairy operations continue to degrade these reaches.

Two reaches of the Upper Obi Obi Creek (OB4, OB8) are recovering or the condition is improving. This is due to the large area of riparian regeneration works that have taken place and are continuing in these reaches.

Map S2.3.4 Trajectory of Management Units in the Lake Baroon Catchment





S2.4 Prioritising the Management Units

The processes and outcomes of waterway rehabilitation generally vary considerably across regions, catchments and even individual reaches. In the Lake Baroon Catchment, some waterways were highly degraded and contributed significantly to the water quality problems in the Dam, while other creeks were relatively intact and may have provided a net benefit for water quality by filtering out nutrients and sediment and lowering instream water temperatures. Moreover, the intensive land use in the catchment over the last century has left all of the waterways that flow into Lake Baroon degraded to some extent and therefore these waterways required expenditure of remediation effort.

Ideally, all of the waterways in the catchment should be completely remediated; however the human and financial resources available were insufficient to facilitate this. In order to direct the available resources to the most effective areas, a prioritisation system was developed based on relevant Australian literature (Hydrobiology Pty Ltd, 4 Site Pty Ltd & MSC 2005; Bennett *et al* 2002; Stockwell 2001; Rutherfurd, Jerie & Marsh 2000 and Dunn 2000).

The prioritisation system was based on the current accepted philosophy suggested in the above mentioned literature, most notably in the work of Rutherfurd, Jerie & Marsh (2000) where it is suggested that the most efficient use of resources is to aim recovery projects at waterways that resembled the most natural state of the catchment since these areas require the smallest amount of input for the largest value gained from their protection and enhancement.

S2.4.1 Ecological Value Assessment

Rutherfurd, Jerie & Marsh (2000) put forward a set of principles for stream recovery that are set out in table S2.4.1 below. An ecological value assessment (Bennett *et al* 2002; Dunn 2000) or ranking system was developed to reflect these principles.

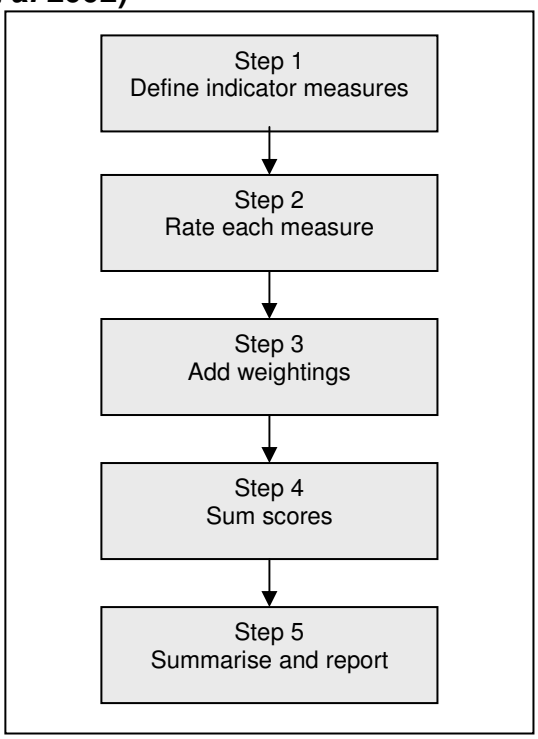
Table: S2.4.1 Five principles of rehabilitating streams (adapted from Rutherfurd, Jerie & Marsh 2000)

Rehabilitating Australian streams
Save reaches that support valuable organisms or communities (rare or endangered) before you turn to less valuable reaches that support common organisms and communities.
Protect the streams that are in the best general condition before trying to improve those that are in poor condition.
Stop streams deteriorating, rather than waiting for them to stabilise and then trying to accelerate recovery.
Improve the condition of reaches that are damaged, beginning with those that are easy to fix.
While there are still reaches that need protecting or improving don't bother trying to fix reaches that are already extremely degraded.

The ecological values assessment, reflecting similar ranking systems used recently in Australia, was designed to highlight intact, healthy stream reaches which, as Rutherfurd, Jerie & Marsh (2000) explicate are more efficient to rehabilitate than trying

to use limited resources on highly degraded areas. The system used both subjective and objective elements and was limited by the use of available data as the scope of this plan did not allow for new detailed catchment studies. Figure S2.4.1 illustrates the method used to prioritise the MUs using an ecological value assessment.

Figure: S2.4.1 Summary of method for ecological value assessment (adapted from Bennett *et al* 2002)



S2.4.2 Indicator Measures

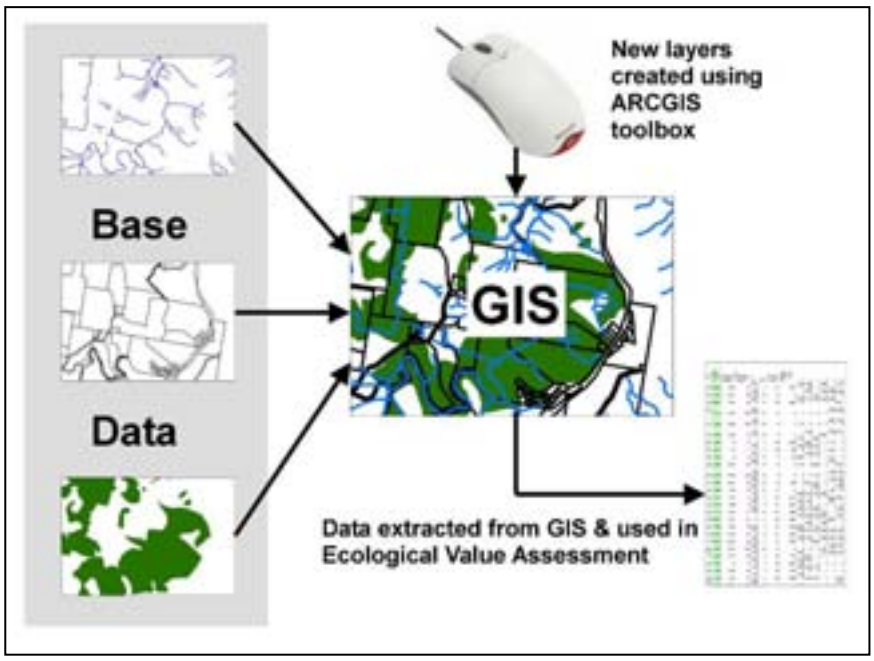
The assessment used a series of relevant indicator measures to assess the relative health of each MU. These indicator measures compared the level of disturbance between MUs or against an accepted benchmark (e.g. ANZECC guidelines). Indicator measures were chosen on the basis of available data therefore the type and number of indicators was limited. This data was taken from several sources and analysed through ARCGIS to create a series of spatial layers. These layers were then manipulated using ARCGIS analysis tools and “clipped” with individual MU. The data was then extracted for the ecological value assessment. The data analysis process is outlined in Figure S2.4.2 and Table S2.4.2 describes the initial GIS layers used to build the indicator measure layers for each MU.

Table: S2.4.2 Description of GIS layers used for priority ranking of MU of the Lake Baroon Catchment

<table>
<tr><th>Layer name</th><th>Description</th><th>Base data</th></tr>
<tr><td>Management Units</td><td>Polygons drawn over aerial photographs and cadastre information</td><td>• Catchments.shp (CCC 2005)
• Rural Aerial Photography 0.25m resolution (CCC 2005)
• dcdb.shp (CCC 2006)
• MSC Aerial Photography 0.125m resolution (MSC 2005)
• MSC Land Parcels (MSC 2006)</td></tr>
<tr><td>Landuse</td><td>Polygons drawn over aerial photographs and cadastre information combined with 1997 landuse data set</td><td>• Rural Aerial Photography 0.25m resolution (CCC 2005)
• dcdb.shp (CCC 2006)
• MSC Aerial Photography 0.125m resolution (MSC 2005)
• MSC Land Parcels (MSC 2006)
• Landuse from Baroon Pocket Dam Project (1996)
• Catchments.shp (CCC 2005)
• management_units.shp (CCC 2006)</td></tr>
<tr><td>Riparian Categories</td><td>Polylines drawn over aerial photographs and creek networks to determine condition of vegetation cover around waterways. This information was ground truthed with numerous site visits and discussions with stakeholders (AquaGen Catchment Supervisor, Barung Landcare Revegetation and Habitat Officer, local community groups and landholders). Riparian vegetation was placed into six categories:-
<table>
<tr><td>1</td><td>No vegetation above 1m, mostly grasses, no native vegetation</td></tr>
<tr><td>2</td><td>50% vegetation above 1m, some canopy, mostly woody weeds</td></tr>
<tr><td>3</td><td>50% vegetation above 1m various woody and non woody weeds, no true canopy</td></tr>
<tr><td>4</td><td>Established woody weed canopy, weedy undergrowth</td></tr>
<tr><td>5</td><td>Mostly woody weed canopy (some natives) weeds and some native regrowth, understorey and ground cover</td></tr>
<tr><td>6</td><td>Riparian vegetation in good condition, mostly native canopy, understorey and ground cover, some woody and non-woody weeds on periphery and undergrowth</td></tr>
</table></td><td>• Rural Aerial Photography 0.25m resolution (CCC 2005)
• MSC Aerial Photography 0.125m resolution (MSC 2005)
• drainage.shp (CCC 2006)
• catchments.shp (CCC 2005)
• management_units.shp (CCC 2006)
• Costings of regeneration of vegetation types 1-6 in $/m^2 including 5 years maintenance from Brush Turkey Enterprises (2006)</td></tr>
<tr><td>Dissolved P & N Input</td><td>Coverages converted into personal geodatabase of data gathered by CSIRO</td><td>• P grid and N grid from DeRose, et al (2002) SEDNET model for the Mary River Catchment</td></tr>
<tr><td>AquaGen pollution hotspots</td><td>Catchment water quality data recorded bi-monthly by AquaGen in 2006 was averaged and drawn as polylines over stream networks. Data used included; NO_x-N, NH_3-N, PO_4, turbidity and faecal coliforms.</td><td>• creeks.shp (CCC 2006)
• aquagen_sample_sites.shp (CCC 2006)
• AquaGen water quality data for Lake Baroon catchment 2006 (January to September)
• management_units.shp (CCC 2006)</td></tr>
<tr><td>RE</td><td>MU layer was placed over Regional Ecosystems version 5.0 layer.</td><td>• Survey and Mapping of 2003 Remnant Vegetation Communities and Regional Ecosystems of Queensland, Version 5.0 (Queensland Herbarium 2005)</td></tr>
</table>

		• management_units.shp (CCC 2006)
Landslip	MU layer was placed over landslip occurrence and potential derived from Willmott (1983).	• Slope Stability and its Constraints on Closer Settlement on the Mapleton-Maleny Plateau, South East Queensland (converted to GIS layer "soil_stability_ssc" by CCC 2006) • management_units.shp (CCC 2006)
Stability Geology	MU layer was placed over stability geology derived from Willmott (1983).	• Slope Stability and its Constraints on Closer Settlement on the Mapleton-Maleny Plateau, South East Queensland (converted to GIS layer "stability_geology_ssc" by CCC 2006) • management_units.shp (CCC 2006)
Stream Network	Management units and drainage placed over aerial photographs. Polylines were drawn over clearly defined streams.	• Rural Aerial Photography 0.25m resolution (CCC 2005) • MSC Aerial Photography 0.125m resolution (MSC 2005) • drainage.shp (CCC 2006) • management_units.shp (CCC 2006)
Protected Areas	Polygons were drawn over cadastre and protected area layers within MU.	• Dcdb.shp (CCC 2006) • MSC Land Parcels (MSC 2006) • management_units.shp (CCC 2006) • Land 4 wildlife (CCC 2006)
Artificial Barriers	Roads were laid over stream networks and aerial photographs next, dams, bridges, crossings, culverts and weirs were identified	• Stream_network.shp (Dunstan 2006) • road_centrelines.shp (CCC 2006) • management_units.shp (CCC 2006) • Rural Aerial Photography 0.25m resolution (CCC 2005) • MSC Aerial Photography 0.125m resolution (MSC 2005)
Vegetation Cover	Polygons drawn over landuse layer and aerial photography	• Rural Aerial Photography 0.25m resolution (CCC 2005) • MSC Aerial Photography 0.125m resolution (MSC 2005) • Landuse from Baroon Pocket Dam Project (1996)

Figure S2.4.2 GIS data analysis process for Ecological Value Assessment



The indicator measures were divided into two specific groups: Naturalness Measures and Recovery Measures. Naturalness refers to the archetypal condition of a waterway. Indicator measures for naturalness reflected the best available condition of waterways in the catchment. Recovery measures were aimed at distinguishing MUs that would exhibit the greatest gains in water quality if remediation or protection activities were developed. Table S2.4.3 lists the indicator measures along with a description of the measure and sources of data.

Table: S2.4.3 Indicator Measures for determining priorities of MU in the Lake Baroon Catchment.

Indicator Measures for Naturalness	
vegetation cover	% area of MU with vegetation cover (excluding grasses)
artificial barriers	number significant* of dams, bridges, crossings, culverts and weirs within a MU
pollution hotspots	number of pollution hotspots within a MU derived from the landuse layer and AquaGen historical water quality data
landslip	% area of MU affected by actual and potential landslip as defined by Willmot (1983)
land stability	% area of MU with unstable geology as defined by Willmot (1983)
dissolved P input	% area of MU above ANZEC guideline for dissolved P SEDNET (2002)
dissolved N input	% area of MU above ANZEC guideline for dissolved N SEDNET (2002)
Indicator Measures for Recovery	
RE	% area of endangered and of concern regional ecosystems within MU
instream shading	% of waterways within MU adequately shaded by vegetation, derived from six riparian vegetation categories**
rehabilitation impact	% of streams within MU that have type 1 riparian vegetation***
protected areas	% of MU protected under voluntary conservation agreement, conservation covenant, state or national park
10m buffer	cost of regenerating a 10m buffer around waterways in a MU
20m buffer	cost of regenerating a 20m buffer around waterways in a MU
50m buffer	cost of regenerating a 50m buffer around waterways in a MU

* significant refers to structures that could be identified using 1:20,000 orthographic images
** refers to vegetation of type 4, 5 & 6 (see Table S2.4.2)
*** type 1 riparian vegetation = no vegetation above 1m, mostly grasses, no native vegetation

S2.4.3 Rating the Indicator Measures

Each indicator measure was rated on a scale of 1-5 for consistency across the rating system. GIS software and spatial data was employed to set ratings for MUs. Information contained in the GIS layers arose from various sources including AquaGen, Caloundra City Council, Maroochy Shire Council, DNR and CSIRO (see Table S2.4.2). For dissolved phosphorous and nitrogen input, ratings were based on the accepted benchmark in the Australian & New Zealand Guidelines for Fresh and Marine Water Quality 2000 (Upland River Ecosystem). Ratings for the remaining indicators were calculated by comparing data between MUs across the whole catchment.

Figure S2.4.3 is an example of a rating spreadsheet used to calculate the Ecological Value Assessment. It shows the ranges that were used to calculate the rating for each measure. These ranges were a product of the data after it had been analysed with the GIS software. The ranges were chosen in order to accommodate the full series of results within each of the final data sets.

S2.4.4 Weightings

The ranking system was designed to identify MUs that remained as close as possible to their archetypal condition as high priority. These reaches potentially required a small expenditure of recovery effort since they would merely have to be maintained at their current condition or slightly improved, rather than completely rehabilitated. In order to capture this type of MU, weightings were applied to each indicator measure in the ecological value assessment.

The assignment of weightings was a subjective process that aimed to emphasise the indicator measures most pertinent to catchment rehabilitation (see table S2.4.4). Consequently, vegetation cover, RE, instream shading and protected areas were given a rating of 2. This was the highest weighting applied to any of the indicator measures used in the ecological value assessment.
A weighting of 0.5 was applied to artificial barriers and pollution hotspots as these indicator measures were not considered as critical for rehabilitation in the ranking system. A weighting of 1 was applied to all the remaining indicator measures.

Figure: S2.4.3 The spreadsheet used to calculate the priority of the MU Bridge Creek 1 (BR1)

Sub-Catchment:-		Bridge Creek					Code:-	BR1		
Condition Value Category		low								
low (<25%)		moderate (25-50%)			high (51-75%)			very high (>75%)		
Indicator Measure		Score					Rating (R) 1-5	Weighting (W) (also equals minimum possible score)	Weighted Rating (RxW)	Maximum possible score (Wx5)
		1	2	3	4	5				
Naturalness measures	*vegetation cover*	<20%	21-40%	41-60%	61-80%	>80%	1	2	2	10
	artificial barriers	>3	3	2	1	0	5	0.5	2.5	2.5
	pollution hotspots	>3	3	2	1	0	3	0.5	1.5	2.5
	landslip	>4%	3.1-4%	2.1-3%	1.1-2%	<1%	1	1	1	5
	land stability	>80%	61-80%	41-60%	21-40%	<20%	3	1	3	5
	dissolved P input	>80%	61-80%	41-60%	21-40%	<20%	1	1	1	5
	dissolved N input	>80%	61-80%	41-60%	21-40%	<20%	1	1	1	5
Recovery measures	*RE*	<1%	1.1-4%	4.1-7%	7.1-9%	>9%	2	2	4	10
	instream shading	<20%	21-40%	41-60%	61-80%	>80%	2	2	4	10.0
	rehab impact	<20%	21-40%	41-60%	61-80%	>80%	2	1	2	5.0
	protected areas	<20%	21-40%	41-60%	61-80%	>80%	1	2	2	10
	10m buffer $/m	>$200	$171-$200	$141-$170	$111-$140	<$110	2	1	2	5
	20m buffer $/m	>$450	$401-$450	$351-$400	$301-$350	<$300	2	1	2	5
	50m buffer $/m	>$2000	$1501-$2000	$1001-$1500	$500-$1000	<$500	1	1	1	5
TOTALS								17	29	85
								(A)	(B)	(C)
*% of Maximum Score (Range Standardised)=(1-{B-C}/{A-C})x100%									18%	
									low	

The use of models to interpret data is a subjective process. Weightings were applied in this case in order to make the model as realistic as possible. Care must therefore be taken when interpreting the results of the ecological value assessment and as such it should only be used as a guide.

Table: S2.4.4 Descriptions of indicator measures used in ecological value assessment for Lake Baroon Catchment

Indicator Measure	Weighting
vegetation cover	2
artificial barriers	0.5
pollution hotspots	0.5
landslip	1
land stability	1
dissolved P input	1
dissolved N input	1
RE	2
instream shading	2
rehab impact	1
protected areas	2
10m buffer $/m	1
20m buffer $/m	1
50m buffer $/m	1

S2.4.5 The Scoring Process

A series of spreadsheets were developed in order to calculate the ecological value assessment (see figure S2.4.3). For each MU the indicator measure scores were summed after being multiplied by the respective weighting. This score was then standardised (see equation S2.4.1) using the methods described in Bennett *et al* (2002) to account for the fact that the minimum individual score possible for each indicator measure was not zero but one.

Equation: S2.4.1 Range standardising equation for the index of priority for each indicator measure

Index of priority = (1-{B-C}/{A-C})x100%

Where:-

A = SUM of weightings
B = SUM of (weightings x indicator measure rating)
C = SUM of maximum possible scores (i.e. weighting x maximum rating)

The standardised score was then converted into a condition value category for each MU. The condition value categories were based on:-

- very high (>75%)
- high (51-75%)
- medium (25-50%)
- low (<25%).

Two MUs received a very high score: WA4 and BR4. Five MUs received a high score, fourteen received a moderate score and five received a low score.

S2.4.6 The Priority Sub-catchments

The method used to prioritise the management units of the catchment was by no means an exhaustive approach. While the data gathered for prioritisation was partially biological in nature, the disturbance ranking matrix was not strictly a biotic index. Despite this, Dunn (2000) asserts that caution must be exercised when interpreting results from biotic indices as they can often be misleading.

The priority matrix identifies two management units as very high priority. Management unit WA4 scored the highest ranking, followed by BR4. These management units both have high naturalness and ecological sustainability scores. WA4 includes the Mary Caincross Park, a 52 hectare rainforest remnant, within which four different Regional Ecosystems are represented. These include one Not of Concern, two Of Concern and one Endangered RE (see table S2.4.5 and Map S2.4.1).

Table: S2.4.5 Priority listing of management units within Lake Baroon Catchment determined by the priority matrix.

Sub-catchment	Code	Score	Priority
Walkers Creek	WA4	91%	very high
Bridge Creek	BR4	76%	very high
Lexys Creek	LE1	67%	high
Bridge Creek	BR5	63%	high
Lexys Creek	LE2	59%	high
Bridge Creek	BR2	53%	high
Bridge Creek	BR6	53%	high
Obi Obi Creek	OB8	50%	moderate
Obi Obi Creek	OB9	49%	moderate
Falls Creek	FA4	47%	moderate
Walkers Creek	WA2	32%	moderate
Obi Obi Creek	OB7	32%	moderate
Obi Obi Creek	OB3	31%	moderate
Obi Obi Creek	OB5	29%	moderate
Falls Creek	FA1	29%	moderate
Obi Obi Creek	OB2	29%	moderate
Walkers Creek	WA1	28%	moderate
Lexys Creek	LE3	28%	moderate
Falls Creek	FA2	27%	moderate
Obi Obi Creek	OB4	27%	moderate
Walkers Creek	WA3	26%	moderate
Bridge Creek	BR3	22%	low
Obi Obi Creek	OB6	21%	low
Obi Obi Creek	OB1	18%	low
Bridge Creek	BR1	18%	low
Falls Creek	FA3	15%	low

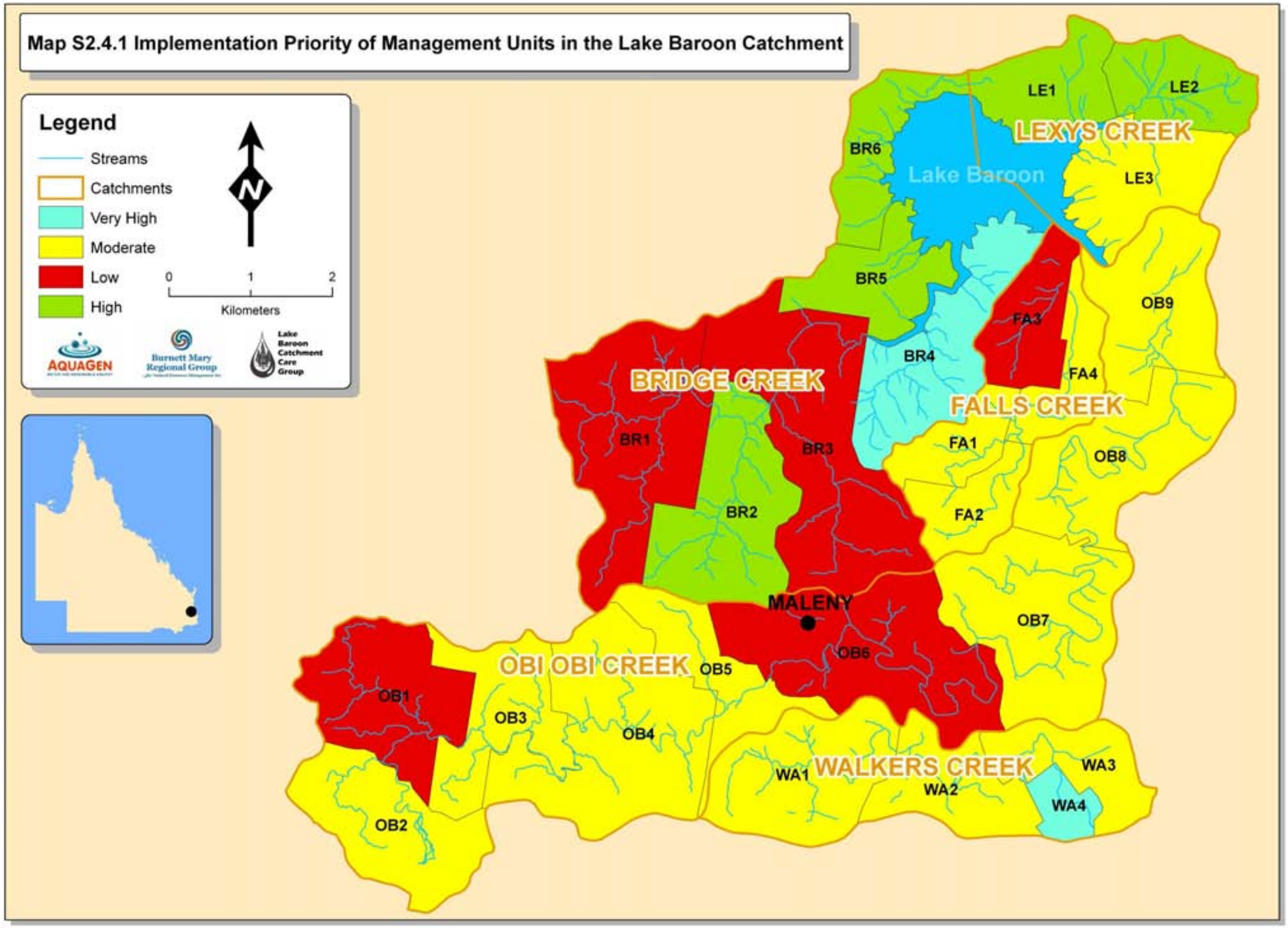
BR4 is made up of land bordering the southwest corner of Lake Baroon. Some of this land is owned by the AquaGen Board who have been active in revegetation and rehabilitation of this area. Five different Regional Ecosystems are represented on this land: two Not of Concern, two Of Concern and one Endangered. It is notable that BR4

has high erosion potential due to steep slopes and poor geology. Management strategies for both BR4 and WA4 management units will first be aimed at protection, enhancement and, where appropriate, rehabilitation of these reaches.

Other high priority management units include reaches on Lexys Creek and Bridge Creek: LE1, BR5, LE2, BR2 and BR6. These reaches all have areas of relatively intact remnant riparian lands and therefore score highly in the naturalness and recovery rankings. They all impact moderately on catchment water quality.

Management units with a priority ranking of moderate number fourteen. The majority of reaches in the catchment fall within the moderate priority ranking. Many of these reaches impact very highly on the water quality of the catchment and therefore score poorly in the recovery ranking. It is likely that on-ground works in these areas such as stock crossings, riparian fencing and revegetation will improve the water quality of these catchments. Reaches OB4, OB8, OB9 and FA4 impact moderately on catchment water quality and have relatively intact riparian lands.

Five management units score a low priority ranking. The lowest scoring reach is FA3 which impacts very highly on catchment water quality and has practically no intact riparian vegetation. BR3, OB6, OB1 and BR1 have little ecological integrity as the land has been extensively cleared for dairy and other pastoral landuses. These reaches have very high nutrient inputs and therefore impact highly on the water quality of the catchment. These reaches are considered last for protection and rehabilitation by the plan due to the extremely high costs of effective on-ground works.


Map S2.4.1 Implementation Priority of Management Units in the Lake Baroon Catchment
Legend
Streams
Catchments
Very High
Moderate
Low
High
N
0
1
2
Kilometers
AQUAGEN
Burnett Mary Regional Group
Lake Baroon Catchment Care Group
LE1
LE2
LEXYS CREEK
BR6
Lake Baroon
LE3
BR5
OB9
FA3
BR4
FA4
BRIDGE CREEK
FALLS CREEK
BR1
BR3
FA1
OB8
BR2
FA2
MALENY
OB7
OB6
OBI OBI CREEK
OB5
OB1
OB3
OB4
WA1
WALKERS CREEK
WA3
WA2
WA4
OB2

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