



Mactaggart

Natural Resource Management

BIODIVERSITY MANAGEMENT PLAN

**FOR
BATHURST REGIONAL COUNCIL**

Barbara Mactaggart and David Goldney

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FOREWORD

In Australia we have approximately one million species of plants, animals and microorganisms. This represents about 7% of the earth's total number of species. Biodiversity is all living things and the ecosystems upon which they depend. It is not just plants and animals but also includes a myriad of microscopic organisms which largely go unnoticed. All things are here for a reason, even though the reason may not be obvious at first glance.

As custodians of Bathurst region we have the responsibility to protect and manage biodiversity, but we recognise the task is very big and our resources and knowledge are limited. As a Council we have developed and nurtured a number of alliances and partnerships in the Bathurst and surrounding areas which help us with this endeavour. The strong Bathurst Orange Dubbo Alliance and the cooperative development of the Environmental Sustainability Action Plan were instrumental in attracting the Urban Sustainability grant from the NSW Environmental Trust which funded the development of this Biodiversity Management Plan.

As Bathurst continues to grow and develop so do the challenges to ensure our region's natural habitats and biodiversity are protected and enhanced. The development of the Bathurst Biodiversity Management Plan has been driven out of a desire to meet these challenges in a strategic and coordinated way. We recognise that as a Council we are just one participant in this endeavour and that we must work with other government tiers and agencies, community groups and individuals in complementary and cooperative ways in order to achieve the best outcomes for the protection of biodiversity.



Greg Westman

Mayor of Bathurst

EXECUTIVE SUMMARY

Background

Bathurst Regional Council (BRC) has taken the lead on biodiversity for the Bathurst Orange Dubbo Alliance (BOD) project - 'Inspiring and Integrating Change'. This project was funded by the NSW State Government through its Environmental Trust Urban Sustainability Program to implement actions of the BOD Environmental Sustainability Action Plan (2007). It identified that a comprehensive Biodiversity Management Plan (BMP) for the BRC Local Government Area (LGA) was needed to assist Council with future planning, monitoring and management of biodiversity. With increasing pressures on our natural resources, heightened public awareness and growing community sentiment, issues of ecologically sustainable development and biodiversity conservation have become more critical for councils to administer. The BMP will be used to assist BRC in developing policies, inform strategic planning decisions, assist in the assessment of development applications and define a program of on-ground actions for BRC and the community to work towards. A forerunner to the BMP was the Biodiversity Management Issues Paper (Issues Paper) prepared in 2010 for BRC by Applied Ecology Pty Ltd. The Issues Paper provided context for the BMP and covers many biodiversity-related management issues.

The aim of the BMP is to identify strategies and prioritised actions by which Council can better monitor, protect and manage biodiversity assets within the Bathurst Regional Council Local Government Area (Bathurst Region).

This aim is to be achieved with the adoption of a number of project objectives, these being:

- Improve the integration of biodiversity conservation into land use planning instruments and the development assessment process;
- Protect and enhance the biodiversity of natural areas on land under Council care and control;
- Identify priority conservation areas and biodiversity values to be maintained and restored across all land tenures;
- Provide strategies to improve community awareness as well as encourage and support community participation in biodiversity conservation;
- Be guided by national, state and regional targets, including the Central West Catchment Action Plan, the Lachlan Catchment Plan, the NSW State Plan, the NSW Biodiversity Strategy 2010-2015 and Australia's Biodiversity Conservation Strategy 2010-2030; and
- Improve biodiversity knowledge and data management within the Bathurst Region.

The report is structured in five parts:

Part A: Provides an introduction to the BMP.

Part B: Presents the contextual background to the BMP and explores the definition of biodiversity, describes the biodiversity assets and threats to biodiversity, and identifies biodiversity data gaps in the Bathurst Region.

Part C: Describes the methodology and presents the key findings of the biodiversity condition assessment undertaken on land owned and controlled by Council as part of the BMP process.

Part D: Comprises the strategic framework of the BMP and presents key objectives, strategies and actions for the management of biodiversity in the Bathurst Region.

Part E: Addresses the next stages in the Plan implementation, monitoring, evaluation and reporting.

Contextual background

Understanding the meaning of the term 'biodiversity'

Biodiversity has often been described as the variety of all life forms including genetic diversity, species diversity and ecosystem diversity. How biodiversity is being regarded is changing over the decades and it has moved away from simply meaning species diversity to including the more integrative and complex perspective of ecosystem processes. It is being valued for its intrinsic qualities as well as for the ecosystem services it provides for human well-being. The values and perceptions of biodiversity also depend on our cultural beliefs and background with indigenous understandings dating back millennia and European culture in the region dating back only 200 years.

Biodiversity assets

The Bathurst Region is rich with biodiversity assets and is home to thousands of animal and plant species; many thousands of lower taxa organisms such as microbes; a great diversity of terrestrial and aquatic ecosystems; a variety of natural and cultural landscapes across rural and urban environments; an infinite number of ecosystem processes operating at all spatial scales and a number of different land uses that rely on many different ecosystem services these assets provide.

Many of the biodiversity assets are threatened and some are listed under New South Wales and Commonwealth legislation, while others are in decline or are being degraded and are not protected through the legislative framework. Habitat for 11 flora, 3 amphibian, 36 bird, 4 fish, 1 invertebrate, 22 mammal and 6 reptile threatened species is known to occur in the Bathurst Region. Depending on climatic conditions, the Region also has habitat features that provide for migratory bird species protected under bilateral agreements with Japan, China and the Republic of Korea.

Widespread clearing, land use change and habitat modification since European settlement has put huge pressures on many ecosystems in the region causing their widespread degradation or their virtual disappearance. Four ecological communities known or predicted to occur in the Bathurst Region have been listed as endangered ecological communities under state and/or federal legislation. These include the 'Box-Gum Woodland'; 'Tableland Basalt Forest'; 'Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland' and the 'Montane Peatlands and Swamps' endangered ecological communities.

Threats to biodiversity

Some of the biodiversity assets in the Bathurst Region are threatened by a myriad of current pressures and there are also threats that are a lag response to activities that occurred many decades ago, such as widespread clearing. The threats to biodiversity have pushed a number of terrestrial and aquatic ecosystems to a state where they can no longer self-recover and the overriding impact has been the loss of their inherent ecological integrity, resilience and the ability to function without significant losses of key elements such as water, nutrients and carbon.

Many threats to biodiversity in the Bathurst Region are legally recognised as they have broad scale relevance to other parts of the state or country and their impacts on biodiversity have been determined to be significant. More specifically a number of threats have been recognised that impact on the EECs in the Bathurst Region and these include a number of

land management practices (e.g. grazing, clearing, groundcover slashing); secondary impacts due to the loss of integrity of the EECs; lack of recognition of the significance of the EECs as well as intentional and inadvertent modification of the EECs.

In addition, a number of threats have been identified that impact on the aquatic ecosystems in the Bathurst Region. Most are in response to long-term ecosystem degradation, such as stream bank instability and sediment flux. Further, locally-specific issues have been identified that threaten biodiversity and these include planning issues, growth and development, lack of biodiversity knowledge and resources to manage biodiversity, the undertaking of inappropriate activities and pests and weeds.

Biodiversity data gaps

The data gaps relevant for the management of biodiversity in the Bathurst Region centre on the lack of mapping resources for adequate biodiversity protection, conservation and enhancement through the local planning instruments; the lack of understanding of what and where the biodiversity assets are; lack of knowledge on some key issues of biodiversity management and matters relating to community education.

Biodiversity condition assessment

The biodiversity condition assessment undertaken as part of the BMP provided a biodiversity assessment of parcels of land owned or controlled by BRC. This was achieved by rating the ecosystem condition of each parcel of land and rating its value for biodiversity conservation. The results provide a benchmark for future studies, identified biodiversity assets and formed the basis for developing some site-specific strategies, recommendations and actions.

A project-specific methodology was developed for the rapid assessment of BRC controlled land in the urban and rural landscapes. The method has the flexibility to assess terrestrial and aquatic ecosystems as well as a combination of both. The key ecosystem condition attributes cover upper and midstorey vegetation, groundcover vegetation, terrestrial and aquatic habitat, water quality and geomorphic and hydrologic characteristics. Components of these attributes address such elements as endemism, vegetation structure and connectivity in the landscape, composition and health. Attributes for conservation value address the values of vegetation, habitat, ecosystem services and other conservation elements, ecosystem processes and function.

Key findings

Ecosystem condition of land parcels owned or Controlled by BRC within the former Bathurst City LGA (refer to Appendix F: Condition Assessment Maps)

Ecosystem condition in the majority of land parcels were rated as being **very poor to poor** with the cleared or prior treeless grassland areas of Kelso, Raglan, the Macquarie River floodplain and Llanarth being the most degraded. These land parcels include urban drainage and road reserves, urban parks, parcels with amenity facilities, playing fields, access roads, agricultural land as well as operational land in the Mount Panorama precinct. Some of the factors contributing to the very poor/poor condition include the malfunctioning of ecosystem processes, the loss of remnant vegetation, modification of the ground layer, mechanical alteration of the land parcel, replacement of the original vegetation with exotic species, change in the local hydrology, loss of vegetation structure, removal of habitat complexity and the lack of interconnectedness in the wider landscape.

Parcels rated as being in **moderate ecosystem condition** tend to include terrestrial and aquatic areas with remnant vegetation (though often with a degraded mid and understorey),

areas of derived grasslands or areas replanted with native vegetation. Areas include Blayney Road Reserve, open space areas and parks adjacent to the Macquarie River, McPhillamy Park on Mount Panorama, Jaques Park along Hawthornden Creek, Hector Park and Booth Street Reserve.

Areas of **good ecosystem condition** are proportionally very small and are restricted to parcels or portions of parcels with good quality vegetation remnants and are located in the upper hillslopes inside Mount Panorama racetrack and in the Sir Joseph Banks¹, Boundary Road Reserve and Brooke Moore Oval Reserve. There are no areas in the former Bathurst City LGA that are rated as having **very good ecosystem condition**.

Conservation value of land parcels within the former Bathurst City LGA

The conservation value of Council controlled land is mostly **very poor to poor** and these include parcels of land similar to those with **very poor to poor** ecosystem condition. Clearing of the native vegetation for agriculture as well as significant gullyng of drainage reserves has resulted in a poor conservation base for urban development for the suburbs of Kelso, Raglan, Llanarth and Abercrombie.

There are a number of parcels of Council controlled land rated as having **moderate conservation value** and the majority of these run from the Mount Panorama precinct and thread northwards through the suburbs of Mitchell, West Bathurst, Windradyne and along Sawpit Creek. These parcels contain remnant stands of the Box-Gum Woodland and Tablelands Basalt EECs or are Box-Gum Woodland Derived Grasslands (albeit degraded in terms of structure, species composition or disturbance impact). Other parcels comprise a section of a waterway that although they may not be in good condition within the parcel provides an important conservation linkage in the urban landscape.

The areas with **good conservation value** (Boundary Road Reserve, Sir Joseph Banks Reserve, Brooke Moore Oval, Hector Park and the proposed Bike Park between Vale and College Roads and sections of the Macquarie River) look proportionally quite large compared with the other land parcels. However, while the parcels tend to contain remnant patches of vegetation that could be rated as being **good** or **very good**, there are other areas within the parcel that devalue the overall condition rating. All these parcels (except along the Macquarie River) contain significant remnants of the Box-Gum Woodland EEC or the locally restricted White Box (within the Box-Gum Woodland EEC) and the preliminary determination of the Tablelands Basalt Forest EEC (comprising a good groundcover composition) on Mount Panorama.

The urban area of Bathurst is devoid of parcels with **very good conservation value**, but there are patches *within* parcels that rate very highly and these are around Mount Panorama, Boundary Road Reserve and Brooke Moore Oval.

Village and rural areas

There are some parcels in the villages and rural areas that were assessed with good or very good ecosystem condition ratings and conservation values. These include areas around Peel village, the Wattle Flat and Hill End racecourse sites, Trunkey Creek, Turon River (Oakey Creek campground), Napoleon Reef, Mount Tarana and Winburndale Dam precinct.

¹ Although no longer under the control of BRC the reserve, now under the control of the Bathurst Aboriginal Land Council, was assessed due to its conservation significance in the Mount Panorama precinct and proximity to BRC controlled lands

Areas of moderate **ecosystem condition and conservation values** include the Turon River reserves downstream of Sofala and near Turondale, Pipers Creek reserve at Rockley and Chifley Dam precinct. The biodiversity assets at these sites were the presence of Box-Gum Woodland EECs and/or aquatic ecosystems. Weeds were a common threat in these areas.

There were a number of other parcels rated with poor or very poor ecosystem condition or conservation value in the villages and rural areas. These land parcels were often small blocks that functioned as recreational parks, stockpile sites on a road reserve, rural fire sheds, vacant land and pump sites, etc.

Key biodiversity assets

The key biodiversity assets identified in these areas included the riparian areas within the former Bathurst City LGA, villages and rural areas; areas of Box-Gum Woodland and the possible occurrence of the Tablelands Forest EECs; high value woodland and forests; parcels with large ponds and dams and areas with derived native grasslands.

Key threats and management issues

There are a number of threats that impact on vegetation condition or the conservation value of Council controlled land. Some of these threats are from past actions, such as clearing, and have had long-term impacts on the condition and conservation value of the vegetation. The key threats and management issues identified for BRC controlled land include:

- Historic clearing
- Pests and weeds
- Sheet, rill and gully erosion
- Current land use of the parcel and associated impacts
- Residential growth and development
- Slashing of groundcover
- Firewood collection
- Fire
- Alteration of natural flow regimes
- Barriers to fish passage
- Anthropogenic induced climate change

Strategic framework

Vision

To set the scene for the strategic framework a sense of our collective vision for how biodiversity will look in the Bathurst Region over the next 25 years provides an aspirational direction for what needs to be achieved. Personal visions recorded by a number of community members have been expressed with passion, hope and with a great sense of responsibility towards the sustainable management of our natural resources. The biodiversity vision is a composite of visionary statements, short essays and poetic verse that reflect the sentiment of the authors.

A shared responsibility in biodiversity management

Managing biodiversity in the Bathurst Region is a shared responsibility that involves many government agencies, organisations, community groups and individuals across all land tenures and landscapes. Management is addressed across all scales from high-level strategic

planning, legislative and policy frameworks to locally initiated on-ground activities. BRC is, therefore, one player amongst many others that are actively responsible for biodiversity management in the Bathurst Region.

Key directions for biodiversity management

The strategic framework has been organised into six identified roles of Council with a hierarchical approach being taken to structure the framework. The top level is set with a number of objectives for each role, the next level lists a number of strategies designed to meet each objective and these are further supported by recommendations and actions. The key directions that the objectives, strategies, recommendations and actions are founded on and set according to Council's roles are:

- Council as a strategic land use planner and development controller
 - Identification and mapping areas of conservation value
 - Protection and enhancement of areas with high biodiversity conservation value through local planning provisions
 - Development control compliance
- Council as an environmental regulator
 - Regulation and enforcement through the regulatory framework
 - Regulation communicated through community awareness
 - Regulation through Council initiatives
- Council as an operator of major infrastructure and facilities
 - Regulatory compliance
 - Identification and assessment of assets and threats
 - Management of assets and threats
- Council as a manager of community and operational land
 - Regulatory compliance
 - Management planning
 - Protection and enhancement
 - General management
 - Research and investigation
 - Monitoring
- Council as a community leader and facilitator of community action
 - Building awareness
 - Gauging and creating interest
 - Building capacity
 - Motivating for change
- Council as a member of regional and local partnerships
 - Education and facilitation
 - Information sharing
 - Project development, funding and implementation
 - Regulation
 - Plans of management and policy planning
 - Opportunities and initiatives
 - On-ground management

Site-specific management

As an aid in facilitating management by BRC and the community site-specific recommendations for Council controlled land in both the urban and rural environments have been provided. These recommendations incorporate the BMP strategies, recommendations and actions that are applicable for each site: with the actions being prioritised against such criteria as cost-benefit and ease of implementation. In addition, applicable strategies from the Bathurst Vegetation Management Plan and the Urban Waterways Management Plan have been included to ensure some degree of integration between planning documents. Approximately 185 sites have been allocated for site-specific management.

Implementation, monitoring and reporting

The implementation of the BMP over the next 25 years will essentially be driven by BRC, though it is recognised that the wider community, either as autonomous groups or individuals or in functioning partnerships, will be inextricably involved in the adoption and undertaking of the strategies, actions and recommendations as outlined in this document. Success of the BMP implementation phase will depend on the human resources best able to manage its implementation, the risks involved, degree of stakeholder engagement, available funding and the effectiveness of the monitoring, evaluation processes and subsequent feedback into ongoing action.

To ensure valuable resources are wisely utilised and biodiversity benefits are maximised, actions derived as a process of the BMP have been prioritised. Very high rating requires immediate implementation (<2 yrs), high rating requires short-term implementation (2-5 yrs), medium rating requires medium-term implementation (5-10 yrs) and low rating requires long-term implementation (>10 yrs). Actions with very high and high ratings are spread across all Council roles with a particular weighting to Council as a strategic land use planner and development controller where all actions are recommended to be implemented within five years.

The on-going process of monitoring the status of biodiversity and evaluating it against how it is managed in the Bathurst Region requires a multi-pronged approach. This includes evaluating the BMP to determine its overall performance in achieving its objectives; monitoring the effectiveness of actions undertaken as recommendations in the BMP; monitoring ecosystem condition and conservation value of BRC controlled land and finally, evaluating the directional trend of the regional biodiversity status using a set of key performance indicators.

Reporting of the BMP will communicate its progress and some of the key evaluation findings for reasons of accountability (to funding agencies and internally within BRC), to demonstrate links to catchment targets, to allow for adaptive management decision making and to inform the wider community of biodiversity-related issues in the Bathurst Region.

Finally, for the life of the BMP there will be the constant need for the implementation programs to be funded. As such many of the BMP objectives and strategies have been developed to link to larger scale natural resource planning frameworks as a means of securing funds through external agencies. The implementation of the funded programs will contribute to the CAP targets and also the NSW Catchment Action Targets and the national Caring for our Country priorities.

ACKNOWLEDGMENTS

The authors wish to acknowledge the contributions made by many individuals and to thank them for their generosity of time, the imparting of their knowledge and the spirit in which these were given. As locals, we especially value the sense of community this collaboration has engendered and the opportunities in sharing in the important journey towards a biodiverse-rich Bathurst region that is well managed for future generations.

We would like to give particular acknowledgement to Deborah Taylor from Bathurst Regional Council for her tireless dedication to the project, her trust in us and continued support. Other Council staff including Joel Little, Anna Stapleton, Janet Bingham and Nick Murphy from Environment and Planning for their significant contributions and feedback; Gerard Ryan for the great assistance he has given us with GIS queries and requests; Doug Patterson and Darren Sturgiss from the engineering department for their review and input; and the Mayor and Councillors for their recognition of the Biodiversity Management Plan's (Plan) value.

Throughout the development of the Plan there has been the involvement of a specially convened Steering Committee whose role was to provide feedback and direction in Plan content and structure. The significant contribution made by the committee has resulted in a balanced, well considered and rigorous document that will direct the management of biodiversity in the Bathurst Region for many years. Representatives of the committee we would like to acknowledge and thank are Deborah Taylor, Joel Little, Janet Bingham and Nick Murphy (Bathurst Regional Council); Chris Marshall (Chair Boundary Road Reserve Landcare Group); Ashley Bland (Skillset); Clayton Miller and Allan Wray (Central West Catchment Management Authority, Bathurst); and Garry Germon and Robert Taylor (Office of Environment and Heritage - OEH). Members of the Committee have also assisted us on various aspects of the Plan outside the structure of the Steering Committee and for that, too, we are grateful.

Others we would like to credit are Dr Andrew Rawson (OEH) for his advice on climate change issues and responses; Ian McCartney and other anonymous or deceased Wiradjuri people who shared their understanding of their culture and knowledge of the natural order; Steve Woodhall (National Parks and Wildlife Service, OEH, Bathurst) for his contribution and feedback and John Fry for sharing his knowledge of biodiversity issues in the region. For their vision statements we value the contributions from Chris Marshall (bird watcher), Ros Rees (Flyfisher girl), Tracey Carpenter (Councillor), John Fry (Rahamin Ecological Learning Centre) and Ashley Bland (environmental scientist, naturalist).

Dr Col Bower gave permission to use Figure 3 -a landscape transect relating landscape to Eucalyptus species across the Bathurst Region - as well as providing his view on the possibility of the identification of an additional threatened community being present on Mount Panorama. Chris Marshall and John Kellett commented on some aspects of the vision section of the report.

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PART A:

INTRODUCTION

1. INTRODUCTION

1.1. Background

In 2008 the Bathurst-Orange-Dubbo (BOD) Alliance was successful in obtaining a project grant from the NSW State Government's Environmental Trust Urban Sustainability Program to assist with the implementation of the Environmental Sustainability Action Plan. Bathurst Regional Council (BRC, Council) is taking the lead on biodiversity for the project and has identified the need to develop a comprehensive Biodiversity Management Plan (BMP) for the BRC Local Government Area (Bathurst Region) to assist Council with future planning, monitoring and management of biodiversity. Ecologically sustainable development (ESD) and biodiversity conservation are regarded as core business for local councils and with increasing pressures on our natural resources, heightened public awareness and growing community sentiment these issues have become more critical for councils to administer. The BMP will be used to assist Council in developing policies, inform strategic planning decisions, assist in the assessment of development applications and define a program of on-ground actions for BRC and the community to work towards.

As a prelude to the commission of the BMP the 2010 Biodiversity Management Issues Paper (Issues Paper) was prepared for BRC by Applied Ecology (2010). The aim of the Issues Paper was to produce a document that outlines the issues Council would need to consider in the development of the BMP. It is a repository of material that covers many aspects of biodiversity management. The BMP addresses these issues and endeavours to explore additional factors that provide the necessary background to the strategic management of biodiversity in the Bathurst Region. However, while the BMP is a stand-alone document, it is not the intent to repeat the level of background detail covered in the Issues Paper. In lieu of unnecessary repetition in the BMP and to give an appreciation of what was covered in the Issues Paper the executive summary is presented in **Appendix A**.

1.2. Aim and objectives

The aim of the BMP is to identify strategies and prioritised actions by which Council can better monitor, protect and manage biodiversity assets within the Bathurst Region.

This aim is to be achieved with the adoption of a number of project objectives, these being:

- Improve the integration of biodiversity conservation into land use planning instruments and the development assessment process;
- Protect and enhance the biodiversity of natural areas on land under Council care and control;
- Identify priority conservation areas and biodiversity values to be maintained and restored across all land tenures;
- Provide strategies to improve community awareness as well as encourage and support community participation in biodiversity conservation;
- Be guided by national, state and regional targets, including the Central West Catchment Action Plan, the Lachlan Catchment Action Plan, the NSW State Plan, the NSW Biodiversity Strategy 2010-2015 and Australia's Biodiversity Conservation Strategy 2010-2030; and
- Improve biodiversity knowledge and data management within the Bathurst Region.

1.3. Project area

The project area covers the Bathurst Region – an area of approximately 3,820 km², which is located approximately 200 km west of Sydney with the main centre, Bathurst City, being at the junction of the Great Western, Mid Western and Mitchell Highways. BRC serves village and rural communities from Hill End in the north, Trunkey Creek in the south, Sunny Corner in the east and Fitzgerald's Mount in the west (Figure 1). Bathurst is the oldest inland settlement in Australia and was declared a town site in 1815 and proclaimed as such in 1852 (Bathurst Regional Council 2009).

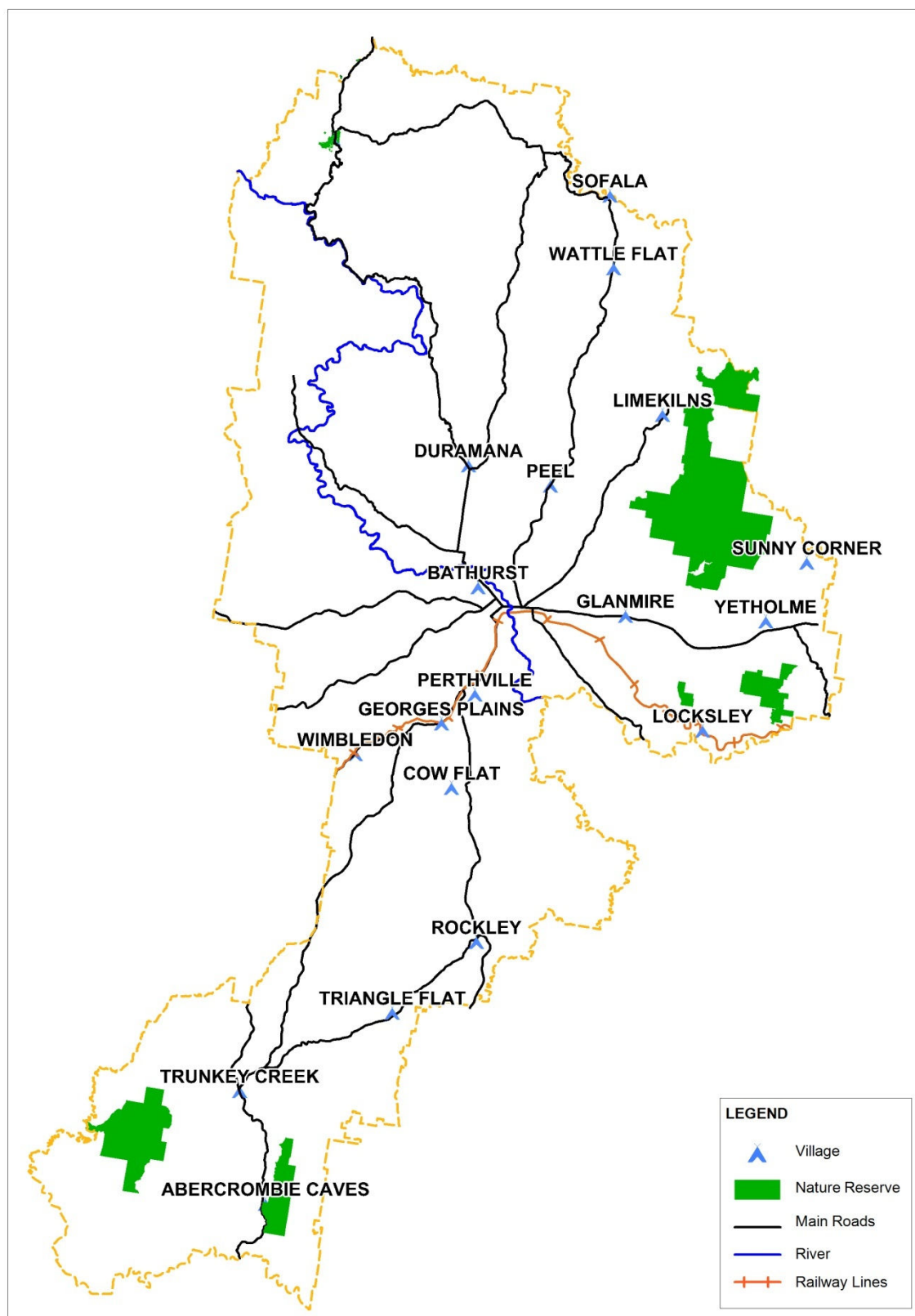


Figure 1. The Bathurst Regional Council LGA. Source: Bathurst Regional Council (2009).

1.4. Report structure

This report has been structured into five parts - the synopsis of which is presented below.

Part A: Introduction

Provides an introduction to the BMP, outlines the aim and objectives of the project and indicates the area of the Bathurst Region.

Part B: Contextual Background

Examines the meaning of biodiversity, explores the importance it has in supporting life on earth (including human society) and challenges its established constructs. It also provides an historical narrative of the changing state of the biological diversity in the Bathurst Region, and offers a sneak peak of the richness that may have once occurred. In addition, this Part provides summaries of current biodiversity assets and data, biodiversity data gaps which might be targeted in future studies, and key threats to biodiversity in the Region - including anticipated threats from climate change.

Part C: Biodiversity Condition Assessment

Presents the methodology and key findings of the biodiversity condition assessment on land owned or controlled by Council.

Part D: Strategic Framework

This part begins with visionary statements for biodiversity and how the Bathurst region will look from the perspective of biodiversity being managed appropriately in the future. It gives a contextual background to the strategies by recognising the responsibilities of all tiers of government, non-government organisations and the wider community in managing our natural resources. It also addresses the legislative and policy framework that underpins regionally-based governance. This is followed by the key component of the BMP; that is the strategic framework that has been developed to govern biodiversity management in the Bathurst Region. The structure of the framework is explained and finally the 'nuts and bolts' of the BMP is presented as a set of objectives, strategies and actions. Detailed implementation guidance for the recommendations and actions are presented in **Appendix G**.

Part E: Implementation, Monitoring, Evaluation and Reporting

Addresses how the Plan can be utilised by Council, the community and other stakeholders to progress biodiversity management into the future through strategic implementation, monitoring, evaluation and reporting.

PART B:

CONTEXTUAL BACKGROUND

2. UNDERSTANDING BIODIVERSITY

2.1. Current definition

The current concept of biodiversity and why it is important has been covered in the Issues Paper (Applied Ecology Pty Ltd 2010), which is an extraction from the draft 'Australia's Biodiversity Conservation Strategy 2010-2020 (Natural Resource Management Ministerial Council 2009).

A summary statement of biodiversity as described in the recently published Australia's Biodiversity Conservation Strategy 2010-2030 (Natural Resource Management Ministerial Council 2010) is:

Biodiversity, or biological diversity, is the variety of all life forms. There are three levels of biodiversity:

- *genetic diversity—the variety of genetic information contained in individual plants, animals and micro-organisms*
- *species diversity—the variety of species*
- *ecosystem diversity—the variety of habitats, ecological communities and ecological processes.*

Biodiversity occurs in all environments on Earth - terrestrial, aquatic and marine.

Biodiversity is not static; it is constantly changing. It can be increased by genetic change and evolutionary processes, and it can be reduced by threats which lead to population decline and extinction.

2.2. From obscurity to a globally important concept

Has our understanding of biodiversity changed over the decades and is it likely to in the future? If so, what implications does this have for long-term biodiversity management in the Bathurst Region?

First coined as a contraction between two words 'biological diversity' in 1985 the term biodiversity initially was not readily accepted. In 1988 it was noted the term 'biodiversity' did not appear as a keyword in Biological Abstracts and its duality, 'biological diversity', only appeared once. Then in 1993, 'biodiversity' appeared seventy-two times and 'biological diversity' nineteen times (Faith 2008). A quarter of a century after its inception the concept of biodiversity has since reached unheralded significance around the world, the term is universally used and recognised although still often mistakenly equated with species diversity alone. The term 'biodiversity' enamours communities struggling to protect their local ecosystems and livelihoods and galvanises global organizations and governments who effectively need to manage the environment sustainably. Not surprisingly, the biodiversity concept has evolved and is mired by different value judgements, definitions and how it is measured. In its early incarnation, biodiversity for ecologists was simply measured as species richness and heterogeneity (Krebs 1994). It is now challenging scientists in reconciling process-based and elements-based perspectives on biodiversity (Faith 2008). (Perspectives on biodiversity are discussed in Section 2.3). Norton (1994) has argued that there will never be a single 'objective scientific definition' of biodiversity, in the sense of a prescription for how to measure it. In fact, Norton claims that any increase in our

understanding of biodiversity will make it less likely that there will be a single objective measure. Instead, biodiversity will be defined on what values are important to the decision-maker. The problem of defining biodiversity is that it is hard to exclude anything from a concept that is taken so easily to mean ‘everything’ (Faith 2008) or ‘all of biology’ (Sarkar 2005).

2.3. Examining biodiversity perspectives and values

Biodiversity is seen by many as a symbol for our lack of knowledge about the components of life’s variation and their importance to humankind. Biodiversity can then be viewed as capturing the two-fold challenge of unknown variety – having unknown value (Faith 2008). Further, value judgements can differ depending on perception; that is whether the viewer is, for example, an ecologist (with an understanding of ecosystem process within the bounds of relatively short timescales), a geologist (with an understanding of process driven change over geological timescales), a climate scientist (with climatic uncertainties), an economist (with a cost-benefit paradigm) or a policy maker (with the necessity to integrate social and economic issues).

2.3.1. Species/elemental perspective

The species/elemental perspective is the basis for the current definition given above as presented in the Australian Biodiversity Conservation Strategy. It focuses on an ‘inventory’ of species, genes and ecosystems - in other words it uses the species richness/diversity² model. It is the perspective most readily understood and is likely to remain a key focus as it is more easily measured than functional or process-orientated attributes and it provides discriminatory data for the comparisons of ecosystems in time and space. It has also been postulated by Faith (2008) and Posadas *et al* (2001) that the extreme of this perspective - phylogenetic diversity - which integrate not only species richness but also the evolutionary history of the taxa, area endemism, and complementarity³ between biotas, is necessary to give a broad perspective on conservation priorities.

Scientific approaches to conservation have been criticised for being reductionists and relying on the elemental perspective while ignoring social factors, long timescales and differing perspectives – essentially hyper-focusing on some aspects while neglecting the broader interconnectedness and complexity of ecosystems and of the human – nature relationship (Lynch *et al.* 244).

Another inherent problem and limitation to measuring biodiversity is that the full expression of the diversity of life in a given area is highly unlikely to be determined as, for example, cryptic, elusive and very small species, species yet to be identified or which inhabit understudied ecosystems (such as sub-surface communities) could be missed. In addition, our general knowledge gap of genetics diversity within species groups and the problem of differentiating ecosystems at different scalar levels further contribute to a less than complete biodiversity census.

Issues also arise when considering whether biodiversity should be approached through the process of differentially valuing species, so that choices can be made in the face of a budget, or to regard species as the fundamental unit and try to protect them all (Faith 2008). Commodity or other direct values are accepted because they reflect known values, but a key problem is that species need to be conserved for reasons other than any known value as

² Species richness is the number of species in a given area, whereas species diversity gives a weighting to species relative abundance

³ Measures the number of species not shared between two areas, such that it allows the number of areas protected to be minimized while the number of species preserved is maximized (Posadas *et al.* 2001).

resources for human use (Sober 1986). Differentially valuing species and the allocation of funds and resources also applies to whether the species are distinctive (e.g. Wallaroo c.f. soil-borne fungi), have rare or threatened status (e.g. Flame Robin c.f. Noisy Miner), are of productive value (e.g. high value c.f. low value native pasture species) and have a populist or iconic value (e.g. Bathurst Copper butterfly c.f. Common Brown butterfly) or are perceived as cute and cuddly (e.g. Koala c.f. Broad-headed Snake).

Another fundamental problem of using the elemental perspective is its underlying notion that it is often linked to ecosystem stability and productivity and has underpinned many research endeavours and conservation initiatives locally, nationally and globally (e.g. Margalef 1969; Tilman 1996). The enormous research and conservation efforts in support of maintaining or increasing species diversity is in spite of mounting evidence that suggests that 'diversity may not beget stability' (Lepš 2005). For example, usually small and contained ecosystems such as bogs (an area of wet, nutrient-poor, acidic and peat forming substrate) contain few species (Grime 1997) and lowland swamps may be dominated by a single species (Moss 1988). However, a point could be reached at which further loss of key species could impair ecosystem functioning (Grime 1997). An analogy is the idea of rivets in an airplane wing where if one species (or rivet) disappears, the loss of the ecosystem's functioning would be relatively small, but if more species (more rivets) are lost then the system (airplane wing) could collapse (Ehrlich & Ehrlich 1981).

2.3.2. Ecosystem process perspective

An alternative view is to consider biodiversity through a functional perspective – shifting the focus to ecosystem processes (Norton 1994). Norton (1994) argues that focusing on an 'inventory' of species, genes and ecosystems has neglected processes that create and maintain natural values. The focus on ecosystem processes is on maintaining the functions of healthy ecosystems and requires us to consider a multitude of interactions, such as soil formation, nutrient cycling and plant pollination. Understanding ecosystem processes prepares us in adapting to changing conditions such as global warming (Spellerberg & McNeely 2010) and its process orientation is compatible with the recent thinking towards ecosystem services.

Norton's views assume greater importance in Australian agricultural landscapes, including the Bathurst Region, where both species losses and land degradation are occurring simultaneously, and have done so for nearly 200 years. At some point in the unfolding dynamics, not to address the repair of malfunctioning ecosystem processes is likely to exacerbate the rate of species loss. This concern has been raised by Goldney *et al* (2007) and Herr *et al* (2004) in their landscape assessments of the status of vertebrates of the Central West of NSW. Indeed their analyses suggest that more emphasis has been given to species conservation and their habitats, whereas the underlying loss of ecosystem integrity as a threatening process, perhaps now a major threat, has largely been ignored.

2.3.3. Integration of elemental and process perspectives

These two views may be considered as being not mutually exclusive; however, Faith (2008) suggests a trade-off perspective based on complementarities between function/process and element/inventory perspectives is good for balancing different values and for setting priorities in a given region.

2.3.4. Ecocentric and ecosystem services values

An ecocentric perspective is associated with the intrinsic value of a species or ecosystem, whereas an ecosystem services perspective is used to encompass the conservation, preservation and human welfare ecological values (Coffey & Wescott 2010). Examples of ecosystem services values include benefits derived from provisioning services (food and

fibre), regulating services (floods, drought), supporting services (soil formation and nutrient cycling) and cultural services (recreational, spiritual, religious, aesthetics and other non-material benefits) (Millennium Ecosystem Assessment 2005). There is always the risk that in programs that seek to maximise cost-benefit that some ecocentric assets may be overshadowed with a focus on ecosystem services.

Hatton *et al* (2010) comment that community preferences based on what people are able to understand and value influence decision-making and public policy. For example, farming communities may regard local or regional grassy woodlands as having little value and, therefore, would not be willing to pay (e.g. by a levy) for good quality habitat. Conversely, urban dwellers living outside the local or regional area may value these habitat types more highly.

2.3.5. Indigenous values⁴

It is somewhat presumptuous for two white fellas to write about indigenous matters, more so about Wiradjuri⁵ understanding of flora and fauna at the time of European settlement, their ‘conservation’ values and their understanding of contemporary ideas enshrined in the discipline of ecology (not part of their world view) or its precursor, the study of natural history (much closer to parts of their world view). What need did the Wiradjuri have for a term such as ‘conservation’ when excesses were rarely indulged and where Sacred Places and Totems helped underwrite the Aboriginal equivalent of ‘ecological management’ of Country, thereby facilitating the well-being of highly valued resources (Gammage 2011; Main 2005) and possibly creating the ‘biggest estate on earth’ if Gammage is to be believed? Aboriginal nations in Australia were once joined (parts still are) by ties between Country (sky water and land) rather than landscapes *per se*, linked together by dreaming tracks, song-lines, trade routes, marriage, knowledge and information networks that were thousands of years old, and further cemented together by ritual communities and ‘highways of cultural influence⁶’. Deborah Bird Rose (1996) has poetically intoned about Aboriginal Australia: ‘There is no place without a history; there is no place that has not been imaginatively grasped through song, dance and design, no place where traditional owners cannot see the imprint of sacred creation’ (Bird 1996). Through European eyes in geographical terms, Wiradjuri Country was nevertheless one of the largest Nation-Country (clan-Country?) in Aboriginal Australia, and Wombool (Macquarie River) was effectively the Gateway to Country.

It seems now incontrovertible that Aboriginal people helped create the Australian landscape (Gammage 2011), but perhaps not to the extent that Gammage proposes. Fire-ravaged landscapes, either from natural or frequent summer wildfire or initiated for cultural reasons likely accelerated the formation of the dominance of fire-tolerant vegetation communities over thousands of years, through so called ‘firestick farming’. But ‘fire-stick’ burning was never likely to have been applied to all of Country, perhaps at most to 50%. After all, the Wiradjuri Nation at the time of settlement numbered relatively few people, estimated somewhere between 20,000 – 50,000 persons, spread mainly in clusters around critical water resources (Conyers 1987). It is unlikely that in 1815 the Bathurst Wiradjuri numbered more than a few thousand inhabitants. That is quite a different scenario than the one that confronts us today as we search for ‘sustainability’!

⁴ Based on Goldney (2012)

⁵ One author (DG) has a long standing friendship with particular Wiradjuri, including Ian McCartney (Wellington Wiradjuri) and a number of others who cannot be identified for cultural reasons, as well as with the late John Bland (d:2008) and the late Percy Gresser (d:1969), the former a Yetholme landholder and the latter a retired shearer, both with extraordinary knowledge of Wiradjuri and neighbouring aboriginal nations

⁶ A phrase first used by anthropologist W. Stanner (1976)

What Europeans forcibly took from the Wiradjuri from 1815 onwards was a cultural managed landscape (Pearson 1981), in effect an anthropogenic biome of sorts, if not in whole then likely substantially so. We Europeans have as yet not determined how to create an anthropogenic biome. That surely is part of the journey we are embracing through this BMP. We will learn much if we reflect on Wiradjuri management of Country, but unlikely to find all the solutions required in what is now a much more complex society with global links and population pressures unimaginable to the Wiradjuri in 1815.

2.3.6. Biodiversity as saints and sinners

Some ecosystem processes or elements within ecosystems can be seen as good or bad depending on individual perceptions and this presents challenges for BRC in its desire to better manage biodiversity. To illustrate, three examples are presented below.

The periodic overbank flooding of rivers and streams - The hydrological connection between the streams and their floodplains is a highly beneficial process as it facilitates the exchange of carbon, nutrients and organisms (Thoms & Sheldon 2000), sediment and other biotic interactions (Brierley *et al.* 1999). As well the floodplains can influence the flood routing pattern in a catchment reducing flood impacts (Leopold 1974) and providing base-flow to the drainage system over an extended period (Burt *et al.* 2001). The bad outcomes, of course, are the devastating economic and social impacts floods can have on infrastructure, property, agricultural crops and livestock.

Forests and forest fires - Forests are an asset, but may also be the fuel source for major bushfires. Fires can be a threat to property or can be a tool in the maintenance or enhancement of biodiversity.

Flying foxes - Another topical example is the flying-fox visitation in the Central West with unprecedented populations being recorded in the Bathurst/Orange districts in 2010. A report commissioned by Orange City Council, 'Options for Managing Future Occurrences of Grey-headed Flying Fox Camps in Orange City with Particular Reference to Cook Park and the Immediate Surrounds' by Goldney (2010) sought to address the status and management of the these animals. There has been, and continues to be, strong public sentiment arguing that flying-foxes cause significant damage to the orchards and public parks. The conundrum is that these species are recognised as being vulnerable in the state and commonwealth legislature. This is a threatened biological asset critical as a pollinator and seed disperser of native trees and integral in many coastal ecosystems. It is also responsible for crop losses, destroying cultural amenity such as trees in parks and creating considerable noise in the built environment.

2.3.7. What does this all mean for biodiversity management in the Bathurst Region?

If the recommended approach to biodiversity management is the integration of function/process and elements/inventory perspectives then biodiversity management within the Bathurst Region needs to broaden from its often narrow focus on threatened species, species diversity and revegetation programs. Additional major issues challenging biodiversity management are the integration of conservation with the other needs of society and focusing on key issues and not attempting to manage all of biology.

2.4. Brief history of biodiversity within the Bathurst Area⁷

Understanding the extant biodiversity within the Bathurst Region rests on a number of increasingly well understood phenomena (Goldney 2012; Steffen 2009):

- Australia is an ancient landform once part of a great southern landmass with consequently ancient linkages with what are now separate land entities, particularly South America, India, South Africa and Antarctica;
- Breaking free from Gondwanaland made possible the evolution of suites of flora and fauna with a high level of endemism, often many species within a single genus, and the available ecological niches being filled with unique species;
- A trend towards aridity over millions of years (Australia lies within the latitudes where the world's major deserts are located) has led to biodiversity that is well adapted to dry environments and is able to tolerate episodic drought and flood events as well as extreme temperature variability;
- Recent ice ages did not result in ice sheets over most of mainland Australia that pre-empt the formation of deep fertile soils from glacier pressure and scraping. This resulted in nutrient poor soils (long-term leaching) and waterways, not surprisingly resulting in a flora and fauna very well adapted to a low nutrient environment (e.g. the low metabolic rates of many native herbivores);
- Aridity, slow decomposition rates and widespread sclerophyllous vegetation leads to high fuel loads and a bushfire regime that in a feedback mechanism maintains low soil fertility as well as fire-adapted flora and fauna;
- Jet streams, ocean currents, latitude and longitude together with the influence of an ancient topography have resulted in very variable weather and climate systems;
- Because of its age Australia is a very flat landscape leading to very broad valley systems with massive ephemeral floodplains and where sediment waves are deposited on land in unique formations rather than delta formations at river mouths or out to sea;
- Whilst natural fire is a recurring theme in the history of Australia, the evidence is now very much favouring the view that Aboriginal Australia created a series of anthropomorphic landscapes that optimised lifestyle choices.

The extant biomes that were present in Australia in 1788 are still well imprinted on the landscape in spite of the impacts of European clearing, land degradation and biodiversity losses.

2.4.1. Geodiversity

The earth is 4.5 billion years old and the universe 14.7 billion. Bathurst as a European cultural entity is less than 200 years old, but the granite that dominates the surrounding landscape resulted from an intrusion of hot molten rock around 310 million years ago (Mya) and was wholly contained within the existing geological layers, unlike the volcanic eruption (larva) that burst through numerous geological layers and flowed from Mount Canobolas 10-12 million years ago. At the commencement of the recorded geology of the Bathurst Region the eastern coastline of 'Australia' was where Broken Hill is today and 'Bathurst' was part of the continental shelf. It seems almost unimaginable that 310 Mya the height of the various geological layers above where Bathurst now sits possibly stretched 3-5 km above the present exposed granite country. Water, wind and biological agents have gradually cut through layers of rock and sediment aeons of years old, carving out the Macquarie River basin and

⁷ Based primarily on Goldney (2012)

other valleys in the process, exposing granite tors and batholiths as well as the derived granite soils. Stranger still, about 500 Mya Australia was part of a super continent Gondwanaland that began to break up about 154 Mya to form the land masses that we know today. Throughout this great time span reworking of prior geologies and deposits continued and new depositions, uplifts and landscape sinking followed by infilling with sediments on a grand scale continued unabated. Plant succession from early colonisers on parent rock to forests would have stopped and started in response to the level of cataclysmic activities and prevailing climate conditions.

2.4.2. Ancient vegetation formations and climate change

Around 130 Mya conifers, cycads and ferns were the dominant plants and thereafter the age of flowering plants and mammals⁸ began to unfold. From the late Cretaceous the climate became warmer and rainforests dominated the continent. The Australian-New Guinea continent sharing the same tectonic plate began to separate from Antarctica around 55 Mya and by the middle Eocene Australia was a truly island continent dominated by various forest communities, but not with the same surface areas as modern Australia. Concurrently such events were accompanied by major climatic changes with Australia becoming drier as ocean currents flowed for the first time between Antarctica and modern Tasmania and consequently sclerophyll plants were beginning to dominate those parts of Australia above sea level from 10-25 Mya. The eventual collision between the Indo-Australian plate with the Pacific plate pushed up towering New Guinea mountains, thereby creating a significant rain-shadow across Australia and hence exacerbating the further drying of Australia and facilitating the rise of arid landforms and vegetation. The formation of the ENSO (El Niño Southern Oscillation) driving climate system is thought to have begun to express itself around 400,000 years ago. Some of the oldest animal fossils are monotremes⁹ from around 120 Mya, followed by marsupials and bats around 55 Mya. The subsequent diversification of marsupials within a rainforest environment is a classic case of empty niche spaces providing unlimited opportunities for evolutionary expression offered by an unoccupied 'new' land mass (Johnson 2006). The subsequent drying and cooling of the climate saw the retreat of the Eocene rainforests and the commencement of an era of dry land species diversification, including the further evolution of the megafauna from around 10 Mya. The eventual extinction of the megafauna occurred around the same time as Aboriginal people arrived in and spread across Australia between 40 to 60,000 years ago and continues to be a much debated topic.

3. BIODIVERSITY ASSETS WITHIN THE BATHURST REGION

This section provides an account of the biodiversity assets within the Bathurst Region and is supported by biodiversity asset information described in the Issues Paper. Assets that the Issues Paper address are those that have been described or recorded in the Bathurst Region or extrapolated from larger scale resource material including threatened species, endangered ecological communities, items listed on the INFFER¹⁰ database, native vegetation types, native vertebrate fauna, wetlands, waterways and riparian areas. The Issues Paper also includes land identified as being in the public reserve system and indigenous biodiversity values.

⁸ To simplify the story somewhat discussion of changes in fauna over geological time are mainly limited to vertebrate animals only.

⁹ Mammals that lay eggs

¹⁰ INFFER (Investment Framework for Environmental Resources) is a tool that assists decision makers to assess and rank environmental/natural resource projects comparing aspects such as value for money, degrees of confidence in technical information and the likelihood of achieving stated goals (INFFER 2011).

Compilations of biodiversity assets tend to be gross underestimates of the rich biodiversity in the region. There is a general omission of biodiversity assets that consider, for example, organisms that live in the soil, in the water and within and on other living organisms: the terrestrial or aquatic microbes including macroinvertebrates, invertebrates, bryophytes, viruses and bacteria. There is also a paucity of regional knowledge in relation to genetic diversity and floral diversity - their evolution, status, distributional patterns, taxonomic distinctness, area endemism and phenotypic/genotypic variances.

Further omissions in the biodiversity asset 'register' are those that are valued from an ecosystem process perspective, either for their economic, social and cultural services they provide, or for their intrinsic value. If ecosystem processes were included in the register the list would be infinitely long. An audit of all biodiversity assets in the Bathurst Region would, therefore, be an impossible undertaking and this section can only attempt to describe the readily known, understood and observable assets. (In the context of addressing biodiversity assets within the BMP the species and ecosystems are listed or described regardless of the differing value judgements that may prevail. That is, Flying Foxes, for example, are valued as an asset - not a pest).

This biodiversity assets section has been structured into the following themes:

- Species and elemental assets:
 - Regional flora and fauna
 - Threatened species
 - Migratory species
 - Endangered populations
 - Species increasers and decliners
 - Genetic diversity
 - Lower order taxa
- Ecosystem assets:
 - Vegetation types
 - Endangered Ecological Communities (EEC)
 - Critical habitat
 - Aquatic ecosystems
 - Urban environment
 - Conservation assets
 - INFFER
- Ecosystem process assets
 - Natural ecosystem processes
 - Ecosystem services

3.1. Species and elemental assets

3.1.1. Regional flora and fauna

Flora effectively means native flowering plants (Angiospermae or Magnoliopsida), ferns (Filicopsida) and cycads and conifers (Gymnospermae). Fauna refers to native vertebrate fauna (animals with backbones). Other plant and animal groups are briefly covered below.

The number of native flowering plant, ferns and gymnosperm species within the Bathurst Region based on Atlas records is around 1,200 species, but this is almost certainly an

underestimation of actual numbers. In our view the likely number of native plant species will eventually be found to be nearer 2,000 species.

We are fortunate to have a very good understanding of the vertebrate diversity in the Bathurst region at 1:100,000 scale, but remain much less confident about our ability to describe it at Bathurst Region scale although it is very likely to be a subset of those data. Bathurst Region is located within four 1:100,000 mapsheets, Bathurst (western half), Orange (the eastern section), Blayney (more or less the eastern section) and Oberon (the north western section) (Figure 2). The majority of the Bathurst Region is within the Central West Catchment with the southernmost section of the south west projection wholly within the Lachlan Catchment.

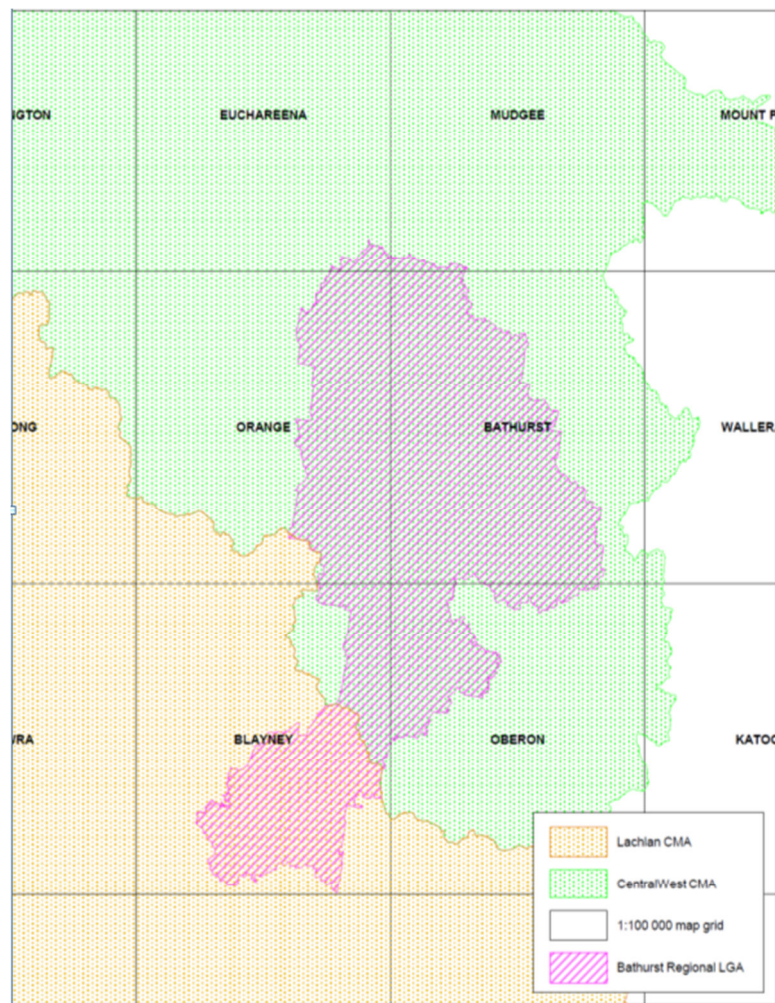


Figure 2 Location of the Bathurst Region in relation to the Bathurst 1:100,000 mapsheets (source Applied Ecology Pty Ltd 2010)

The first assessment of vertebrate species diversity in the Bathurst Region was published by Goldney (1987b), but the available data used in the analysis was finalised in 1980. This assessment was based on the best available data at that time including a number of scientists and field naturalists active in the Central Western Region in and before the 1970s. It is likely that segments of their collective data sets are not included in the Wildlife Atlas. The second assessments were completed in 2007 and 2008 based on each 1:100,000 mapsheet of the Lachlan and Central West Catchments by Goldney *et al* (2007) and Kerle *et al* (2008).

Vertebrate species diversity in the four mapsheets in 2007 varied between 301 and 387. Assessed vertebrate species diversity in 1987 was significantly lower than that assessed in 2007/2008, most likely due to the inadequacies and limitations of available databases prior to the introduction of computer and GIS technology, as well as the lack of intentional and

exhaustive resource databases in NSW at that time. There is an approximate 85% overlap of the vertebrate species lists of the four mapsheets. Species outside of the overlap are predominantly either coastal or slopes species. While it would be possible to prepare a list of extant species for the Bathurst Region using the Wildlife Atlas database it is very likely that such a list would significantly underestimate species diversity since no systematic vertebrate sampling across all habitat types has ever been attempted.

The likely best estimate of species diversity in the Bathurst Region is to use the data for the Bathurst 1:100,000 mapsheet based on Goldney *et al* (2007) and Kerle *et al* (2008). That indicates that up to 387 vertebrate species could be present including 61 mammal species, 257 bird species, 46 reptile species and 24 amphibian species. Whilst for various reasons fish were excluded from the 2007/2008 studies, the 1987 study indicated that 14 native fish were either once present in the Bathurst 1:100,000 mapsheet or were then currently extant. The Central West Catchment 2007 study indicated that the Bathurst mapsheet is one of 14 mega-diverse mapsheets in the Central West (including both the Lachlan and Central West catchments), that is approximately 16% of the 89 mapsheets in the Central West (whole or part) have vertebrate species diversity in the range 313-394 including Bathurst with 387 species. Not unexpectedly then the Bathurst Mapsheet also demonstrates regional mega-diversity for amphibians (24 species), reptiles (46 species), birds (257 species), and mammals (61 species).

The species accumulation curve over time for the Bathurst 1:100,000 mapsheet begins to asymptote (flatten out) at around the 250 species. This indicates that few additional species are likely to be located with further field surveys. In order to record 80% of species about 7,500 records were required, whereas to achieve a 90% species count about 23,000 records were needed. Further, to locate any additional species, which would be expected to be in low numbers is a resource demanding activity. While additional species may still be found these are likely to be due to one or more of the following circumstances: improved survey techniques, introductions of regionally or locally extinct species, species nomadism or vagrancy, temporary or permanent range extensions and targeted surveys for rare or threatened species in low numbers.

The vertebrate species diversity (387 excluding fish) within the Bathurst mapsheet represents 70.2% of the total vertebrate species of the Lachlan and Central West catchments, 66.7% of frog species, 40.7% of reptile species, 80.8% of bird species and 89.7% of mammal species in the combined catchments.

Individual regional species distribution maps across the Central West, their relation to the whole of NSW and their Australian-wide distribution are available elsewhere (Goldney *et al.* 2007; Kerle *et al.* 2008). These data are important in understanding the distribution of species in their wider context known to occur in the Bathurst 1:100,000 mapsheet including their NSW and Australia-wide distributions. A complete list of vertebrate species in the Bathurst mapsheet up until 2007 is provided in Goldney *et al* (2007) and in the Issues Paper.

3.1.2. Threatened species

The conservation of biodiversity, and in particular threatened species, is an important part of protecting our natural heritage and maintaining sustainable, productive landscapes. In NSW more than 1000 native species, populations and ecological communities are threatened with extinction (NSW OEH 2011c), of which over 80 are known or are likely to occur in the Bathurst Region. The number continues to increase, partly due to the ongoing effects of land management practices, but also as our understanding of individual species and their conservation status increases.

The first attempt to understand ‘endangered’ vertebrate species in the Bathurst area was made by Goldney (1987) in his assessment of the vertebrate species of the Central West of NSW including the Bathurst 1:100,000 mapsheet and the three other mapsheets within which the Bathurst Region is located (see Figure 3). The nature of the available data in 1980 only allowed for a broad-scale assessment of endangered vertebrate species to be attempted. Nevertheless historically it was an important milestone in our understanding. Furthermore, 1:100,000 scale distribution maps were provided for each vertebrate species, including the then known endangered species (see Bower *et al.* 1987; Goldney 1987a; Goldney *et al.* 1987; McCartney & Goldney 1987; Waters *et al.* 1987). Goldney *et al.* (2007) and Kerle *et al.* (2008) point out that many protected vertebrate species in the Central West including within the Bathurst Region, not listed as threatened under the TSC or EPBC Acts, are in regional terms actually threatened species, but not yet recognised as such. Based on expert opinion, they identified that greater than 50% of native vertebrate species in the Central West (313/551) are either regionally vulnerable or endangered compared with 72/551 species that are actually legally threatened. Exactly how these estimates translate to vertebrate species located within the Bathurst Region is uncertain but it likely points to the number of actual species being under threat within the Bathurst Region being much greater than the 71 identified by Mjadwesch (2011a, b).

Mjadwesch (2011a, b) identified most of the likely records of species listed as threatened under the TSC, FM and EPBC Acts for the Bathurst Region, using data from a range of sources including the NSW NPWS Wildlife Atlas and a range of other extant and historical sources. Nevertheless, BRC threatened species database (Mjadwesch 2010) provides an important database and mapped point locations of records that can be built on in the future. The full list of endangered species and their conservation status are provided in the Issues Paper. A summary of this list includes 11 flora, one invertebrate, three amphibia, six reptiles, 36 birds and 22 mammal species.

Bathurst Copper Butterfly

An iconic threatened species in the Bathurst Region is the Bathurst Copper butterfly (*Paralucia spinifera*) (NSW NPWS 2001). It is particularly important species given its endemism to this area (one of only a handful of species), its rarity and the only invertebrate species listed for the Bathurst Region, unique life-cycle and listing as a threatened species in the state and commonwealth legislation. It is also the central feature of BRC’s logo. The Bathurst Copper butterfly is listed as endangered under the TSC Act and vulnerable under the EPBC Act and is only found between Bathurst and Hartley in the Central Tablelands of NSW. All of the known sites occur in the Bathurst and Lithgow LGAs with recordings in the vicinities of Yetholme, Sunny Corner, Winburndale Nature Reserve, Mount David, Mount Everden, Eusdale Nature Reserve and Turon State Forest (Mjadwesch 2011b). Furthermore local citizens and scientists have been at the fore in securing the future of this species including officers from the local NPWS, Ray Mjadwesch and the late Joyce Moffett from Yetholme.

3.1.3. Migratory species

Over the last three decades, Australia has played an important role in international efforts to conserve migratory birds of the East Asian - Australasian Flyway. The Australian Government has entered into three bilateral migratory bird agreements. These are:

- Japan-Australia Migratory Bird Agreement (JAMBA)
- China-Australia Migratory Bird Agreement (CAMBA) and
- Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA)

All migratory bird species listed in the annexes to these bilateral agreements are protected in Australia as matters of national environmental significance under the EPBC Act. Australia is also party to the international Convention on the Conservation of Migratory Species of Wild Animals (also known as CMS or Bonn Convention).

A number of migratory species are known or are likely to occur in the Bathurst Region. Council therefore has a role in protecting and conserving important habitats, which is part of the JAMBA and CAMBA agreement to protect these species. Notable sightings of migratory bird species include Japanese Snipe, Sharp-tailed Sandpiper, Glossy Ibis and Australian Painted Snipe (Chris Marshall, *pers comm.* 2012). A number of these migratory species were once reasonably common in the Bathurst area, particularly along wetlands associated with the Macquarie River floodplain around Bathurst, the Gorman's Hill area, wetlands along the tributaries of the Macquarie River including the Fish River and Campbells River catchments. They almost certainly were once present in the once ubiquitous swampy meadow system now mostly degraded. Wetland migratory species were annual occurrences at the Lagoon south of Bathurst between 1972 and 1985, and despite some degradation in the catchment The Lagoon remains an important wetlands site for waterbirds (Goldney *pers observations*).

The Wanderer Butterfly (*Danaus plexippus*) has also been listed as a migratory species in the EPBC Act and has the potential to occur in Bathurst. The species originates from the USA and became established following European colonisation and the establishment of the food plants, therefore the species has no real significance in Australia; it is also migratory so its occurrence in Bathurst would be irregular and transitory. The core breeding areas for this species occur on the NSW coast (Michael Braby *pers. Comm.* 2011).

3.1.4. Endangered populations

There are no endangered populations currently listed in Part 2, Schedule 1 of the TSC Act or in Part 2 Schedule 4 of the FM Act in the Bathurst Region.

3.1.5. Species increasers and decliners within the Bathurst Region

It is very difficult if not impossible to assess a species' status purely from the perspective of the Bathurst Regional area. A much wider landscape canvas is usually needed. However, the status of species in the landscape has undergone a dramatic shift since the commencement of widespread clearing of vegetation, the modification of native fauna and flora habitats and the proliferation of pests and weeds. There are species in the Bathurst Region that are relatively stable, others are declining and a few are increasing (see Goldney *et al* 2007 for the status of each vertebrate species). There are also those that have benefited from European occupation and our attendant land use practices with notable increases in animals such as Galahs, Noisy Miners and Magpies, to identify just a few, as well as *patchy* increases in plant density or regrowth of some native plant species. Such vegetation changes following clearing or post-fire are termed successional vegetation changes. These are often quite important changes in the landscape since they create a variety of habitat niches that can be subsequently exploited by a range of animal species. Perhaps one of the better known examples is the regrowth of Sifton Bush (*Cassinia arcuata*), which occurs subsequent to a clearing event of usually sub-optimal agricultural land. The initially slowly forming community follows an exponential pathway, that eventually results in a massive proliferation over a 10-30 year period before eventually succumbing to the formation of a woodland or open Eucalyptus forest. Similar observations, but with different dynamics, can also be observed in Eucalyptus regrowth following clearing or fire and River She-oak regeneration following an ecological resetting event initiated by a massive flood event.

Conversely, changes in available habitat and habitat quality as well as a general decline in landscape function have impacted on many other native species, pushing some to the point of

extinction, while others have a tenuous hold on survival and are listed as threatened. This latter group are the decliners and the causal factors for their slow disappearance or absence in parts of the landscape is a very complex story. The decline can also be the result of a lag response from past historical pressures post 1815 with a likely trajectory towards ultimate extinction unless a range of interventions can reverse the trend. There appears to be two different sets of dynamic at work for vertebrate species within the Bathurst region: species who are moving inextricably towards extinction (e.g. the Common Bandicoot and the Spotted-tailed Quoll) and species who appear to have significantly declined but appear to be 'hanging on' in spite of extant threatening processes at work, now possibly better characterised as 'rare but stable' species (e.g. the Blotched Blue-tongued Lizard and the Feather-tailed Glider). We know very little about the ecology of most species that occur within the Bathurst Region. The individual species that have been studied in depth in the Bathurst Region and the immediate surrounds include orchids and their relationship with insect pollinators (Col Bower), population dynamics of Five Corners (*Styphelia triflora*) (Sylvia Cardale at Wombool Nature Reserve), River She-oak Ecology (Jon Graftdyk in the Macquarie River catchment), population dynamics of the Bathurst Copper butterfly (see above), White-winged Chough (Steven Cox at O'Connell), the Koala (Heather Price and Steven Cox at Rockley Mount), the Wombat (Anne Buchan and David Goldney at Yetholme), population dynamics of the Brown Marsupial Mouse and the Southern Bush Rat (David Goldney, Rod Kavanagh, Wynn Rohan-Jones and Sarah Kamarudin at Yetholme), and platypus ecology (David Goldney, Steven Cox and Mandy McCleod at Duckmaloi Weir).

3.1.6. Genetic diversity

All living organisms have a genetic signature and this distinguishes them from other organisms within and between species. Genetic diversity refers to the total number of genetic characteristics such as genes, chromosomes, nucleotides and whole genomes of a species.

In agriculture the role of genetic diversity is well understood - particularly in plant production. Experience has shown us that a farming system heavily reliant on a crop (e.g. an orchard with one variety of apple) with low genetic diversity has a greater chance of crop failure if threatened by an outbreak of a disease or pathogen, or by an adverse environmental factor compared with a highly diverse crop (e.g. orchard with many apple varieties). The biodiversity of agricultural crops and livestock in the region in terms of its genetic diversity and variability is relatively rich due to variability in factors such as weather and climate, soils and geology, topography, moisture as well as the fragmented nature of relatively small cropping areas.

The implications of low genetic diversity for natural populations often receive less attention. In recent times, however, the plight of the Tasmanian Devil has focused attention on this problem. The infectious facial cancer that has decimated devil populations may be facilitated by low diversity in the species immune genes. This example highlights the problem that a loss of diversity within a natural population can hinder that population's ability to adapt to changing environmental conditions and threats (Jump *et al.* 2009), especially at a time when there is growing climate uncertainty. Genetic diversity serves as a way for populations to adapt to changing environments. With more inherent variation within a population, it is more likely that some individuals will possess variations that are better suited to the requirements of a changing environment, and hence those individuals are more likely to survive to produce offspring.

Genetic diversity of some species in the Bathurst Region is inherently low or has the risk of becoming low due to species rarity (both in terms of overall species numbers and geographic restriction), decline in a species numbers and increasing population fragmentation and isolation. Rare species in the Bathurst Region with a very restricted geographical range and

extremely small population numbers, therefore, are likely to have low genetic diversity compounding their survival risk. Examples of such threatened species include *Lepidium hyssopifolium* and *Zieria obcordata*.

An example of a plant with known genetic **variation** enabling it to adapt to environmental variation is the Blackwood Wattle (*Acacia melanoxylon*). This species possesses considerable variation among populations in a range of parameters including phyllode¹¹ and fruit shape and size, and in the age it changes from bipinnate¹² to phyllodineous¹³ leaves according to environmental variations such as moisture availability (Farrell & Ashton 1978).

3.1.7. Lower order taxa

Very little is known about the lower order taxa in the Bathurst Region. This group includes the soil-borne organisms, algae, protozoa, bryophytes, invertebrates and aquatic macroinvertebrates, etc. With arguably more than half consisting of species that are parasitic on more conspicuous free-living species (Dobson *et al.* 1992) it comes as no surprise, then, that our knowledge of these organisms is comparatively low and poorly understood - especially at a regional scale.

Microscopic organisms including soil organisms

These organisms provide the greatest species diversity and the greatest numbers of living species both within the Bathurst Region and in all terrestrial ecosystems. They include macro soil fauna (invertebrates 2-20mm in size), mesofauna (100 micrometres to 2mm such as mites and springtails) and the most diverse and numeric group, the microfauna and microflora, only visible under the microscope (yeasts, bacteria, fungi, protozoa, roundworms and rotifers) (Briones 2008). A gram of soil can have bacteria numbers up to 3 billion, and one million yeasts and moulds. These organisms underwrite the health and well-being of the more obvious components of biodiversity such as terrestrial flora and fauna, through their role in symbiotic relationships, early-stage decomposers, the nitrogen, water and carbon cycles, the creation of soil nutrients etc.

Aquatic macroinvertebrates

We know little about macroinvertebrate fauna within the Central West of NSW and even less within the Bathurst Region. Nevertheless, a number of studies have been conducted mostly as a result of requirements associated with Environmental Impact Assessments, such as the raising of the Chifley Dam and the construction of large dams providing water for the Lithgow-based Power stations. One of the most detailed studies of macroinvertebrates undertaken in the region was by the Environmental Studies Unit between 1997 and 2001 (now defunct) at the Bathurst Campus of Charles Sturt University (Hayman 2008; Herr *et al.* 2004). Their four-year study focused on the adequacy of consent environmental flows being able to maintain riverine health in the Cadiangullong Creek within the Cadia Valley operations south of Orange. Whilst Cadiangullong Creek is a tributary of the Belubula River and rises on the slopes of Mount Canobolas, it shares many of the features of typical tablelands streams including the many River She-oak lined streams within the Bathurst Region. There is little reason to believe that their findings would not be mirrored in similar settings within the Bathurst Region.

In their studies Hayman (2008) and Herr *et al* (2004) identified 162,677 organisms from 119 families and from 335 genera and/or species. This represents quite a stunning diversity of

¹¹ Phyllode: modified leaf (leaf stalk is flattened and functions like a leaf)

¹² Bipinnate: leaf is divided into pairs

¹³ Phyllodineous: the leaf changes from being bipinnate to a single phyllode

families and genera/species particularly when compared with the number of families located in other studies from elsewhere in NSW (e.g. Hunter River, 121; Nepean and tributaries, 75; Clarence and Richmond River basins, 65; Karuah River catchment, 58; and smaller streams within the Cadia Valley operational area or the immediate surrounds, 42-61). These results are even more remarkable given that Cadiangullong Creek has a history of mining and very adverse impacts from historic mining, including significant heavy metal pollution (Hayman 2008). Based on these data we can predict that it is very likely that degraded streams when restored can regain a high level of species diversity, suggesting inherent resilience within our freshwater streams and rivers. This is in marked contrast to the inherent resilience of vertebrate species.

Aquatic macroinvertebrates of Bathurst's urban waterways have a low overall macroinvertebrate diversity (see Mactaggart & Goldney 2010). Nine taxa showed high dominance and constancy across sites and these included Nematoda, Gastropoda (exotic species only), Ostracoda, Copepoda (Cyclopoida), Cladocera (Daphniidae), Ephemeroptera (Baetidae), Hemiptera (Corixidae, Notonectidae) and Chironomidae. The suite of taxa recorded in the urban waterways was indicative of streams in sub-optimal health. The species composition of macroinvertebrates in streams outside the former Bathurst City LGA is unknown.

Terrestrial invertebrates

Little is known about invertebrates within the Central West of NSW and less so within the Bathurst Region in spite of their economic importance. Together with other so – called lower flora and fauna groups, they hardly rate a mention in the NSW State of the Environment Report 2009. Australia is home to over 300,000 species of terrestrial and freshwater invertebrates, about 100,000 are described or named and around 80% of these are endemic to Australia (compare this with the approximate number of 16,000 plant species in Australia). The most common group are the insects with more than 600 known families. It is likely that there are thousands of insect species within the Bathurst Region and very likely a number are area endemics such as the Bathurst Copper Butterfly.

Freshwater algae

These include green algae, filamentous algae, the somewhat infamous blue-green algae, diatoms, phytoplankton, etc. They are basic components of food web and chains as well as contributing to essential ecosystem processes. There are about 2,800 known species excluding diatoms, and likely as many that are not described - 350 of these are visible to the naked eye (ARBS 2007). Some algae are also exclusively terrestrial in nature rather than being truly freshwater species. It is likely that the algal species within the Bathurst Region are a sub-set of Australian algae. Virtually nothing is known about this group in the Central West other than related to the occasional blue-green algae outbreaks that occur.

Fungi and lichens

Lichens are actually composite organisms, species of fungi (the bulk of the organism) that contain within their tissues symbiotic species of cyanobacteria (also known as 'blue-green algae'). These are capable of photosynthesis and provide the host fungal body with food. The most commonly recognised species within the Bathurst Region are those that grow on rocks and on tiled roofs, beginning the slow process of soil formation through the gradual breakdown of parent rock surfaces. They are also commonly seen as epiphytes on leaves and branches of trees, fenceposts and on exposed soils where they are important in forming biological crusts. There are about 5,000 lichen species in Australia and of these only 1,000 are appropriately described (Filson 1996). Virtually nothing is known about the lichens of

the Central West and within the Bathurst Region in spite of their ecological importance. Almost certainly there are rare and endangered species within the Bathurst Region.

Fungi are technically not plants, but form a kingdom of their own. It is estimated that there are about 250,000 fungal species in Australia including around 5,000 mushrooms species, and only about five percent of these have been described (ARBS 1996). They are important economically because of their role in disease of economic crops, their contribution to ecosystem services and their role in the decline of many native frog species due to Chytrid fungal infection. Little is known about native fungi in the Central West and within the Bathurst Region.

Bryophytes

Bryophytes include mosses and liverworts, including a lesser known group – the hornworts. There are estimated to be around 500 Australian liverworts and about 700 mosses (ARBS 2006; McCarthy 2003). Their significance in ecosystems relates to their ability to stabilise soils, trap and hold moisture, exchange cations and their ability to withstand desiccation even though they can appear ‘dead’ at times. They can be located as part of soil crust communities (bryophytes, lichens, algae and fungal filaments), wet forests, swamps, wet riparian areas, clay banks and in a range of rocky or shaded areas where appropriate micro-climates favour their presence. They have an important colonising role of bare rock, building up humus on granite outcrops (now rarely seen due to human disturbance). Sphagnum moss was likely once common within the Bathurst Region in a well-known association with some forms of swampy meadows, but that is no longer the case. *Sphagnum* is a protected genus in NSW under the *National Parks and Wildlife Act 1974*.

Very little research has been directed towards bryophytes in the Central West of NSW. However, Dowling *et al* (2002) identified 75 bryophytes on Mount Canobolas near Orange including one endangered community, as well as highlighting similar unpublished work of Robert Coveny (cited in Dowling *et al* 2002) along the Abercrombie River (part of the southern boundary of the Bathurst Region). Dowling’s and Coveny’s work suggests that there is likely to be a significant, albeit largely unknown, bryophyte diversity within the Bathurst Region.

3.2. Ecosystem assets

The ecosystem typology in the Bathurst Region is highly variable in form and function and is influenced by macro-scale factors such as time, geology, climate and landform. In addition, smaller scale dependent variables such as vegetation, hydrology, soils and geomorphology can interact to further increase variability (Schumm 1977). Landscape¹⁴ patches in the Bathurst Region comprise many different ecosystems (rivers, swamps, wetlands, floodplains, woodland, grasslands, montane and riparian forests), different land uses (urban, agricultural, forestry, nature reserves, quarrying) and different community types, successional stages or alternative states¹⁵ within a particular ecosystem (cleared woodlands, dry floodplains in gullied streams, succession and recovery following fire, floods or droughts). The diversity of the hydro-geophysical landscapes provides the foundation for a very biodiverse region. This section describes some of the significant ecosystem assets in the Bathurst Region.

¹⁴ An area of land, at the scale of hectares to square kilometres, which consists of a collection of different but interacting patches.

¹⁵ Ecosystems can exist under multiple ‘states’ (sets of unique biotic and abiotic conditions). These alternative states are non-transitory and are therefore considered stable over ecologically-relevant timescales and tend to remain in one state unless perturbations are large enough.

3.2.1. Vegetation types

Vegetation as surrogate for biodiversity

Vegetation type and condition are widely used as surrogates of biodiversity, for example in reporting Australia's State of Environment, the State-based Biodiversity Benefits Index (developed as part of the NSW Environmental Services Scheme) and for regional reporting (e.g. the Nandewar Bioregion Western Regional Assessments).

Vegetation maps are perhaps the most frequently used surrogates for biodiversity since these may be the only useful information available for a catchment or region where few or no biological surveys have been undertaken. It is also relatively easy to map vegetation at the catchment scale and using this approach it is typically assumed that protection of a proportion of each vegetation type will protect sufficient proportions of the populations of other organisms such as mammal and bird species (Greening Australia 2005). Vegetation maps may fail as surrogates in cases where sets of species are dependent on particular successional stages within a vegetation community (e.g. the old growth stage of a particular type of forest) or when species respond to environmental variables to which the vascular flora are insensitive (e.g. predator-prey relationships) (Greening Australia 2005).

Managers should be aware that the extent of native vegetation is unlikely to be a suitable surrogate when implementing strategies to conserve all biodiversity. For example, vegetation is often used synonymously with habitat, but they are not the same. Habitat is an area with a combination of resources (like food, cover and water) and environmental conditions (temperature, precipitation, presence or absence of predators and competitors) that allows a given species or population to survive and reproduce. Rocks, cracks in the soil, access to water and other factors are also important habitat for native plants and animals, and can be the key factors determining their distribution. (Greening Australia 2005).

Vegetation patterns in the landscape

The relationship between past and current geologies and soil formation is reasonably well understood as is the relationship between dominant vegetation types and geodiversity (see Bower *et al.* 2002; Keith 2011). Some of these relationships are identified in Figure 3 and demonstrate that predictable soil toposequences form across the landscape and are influenced by the underlying geology and the slope of the land (Kovac *et al.* 1989). Geological zones reflect the conditions under which parent rock were formed and subsequently the base content of parent material interacts with climatic conditions to form distinctive soil characteristics. The lack of deep soils within the Bathurst Region and elsewhere is a result of long-term erosive forces and rain induced leaching in an ancient landscape and importantly one with a lack of recent volcanism and glaciation in most of Australia. Some aeolian deposits are in the soil mix.

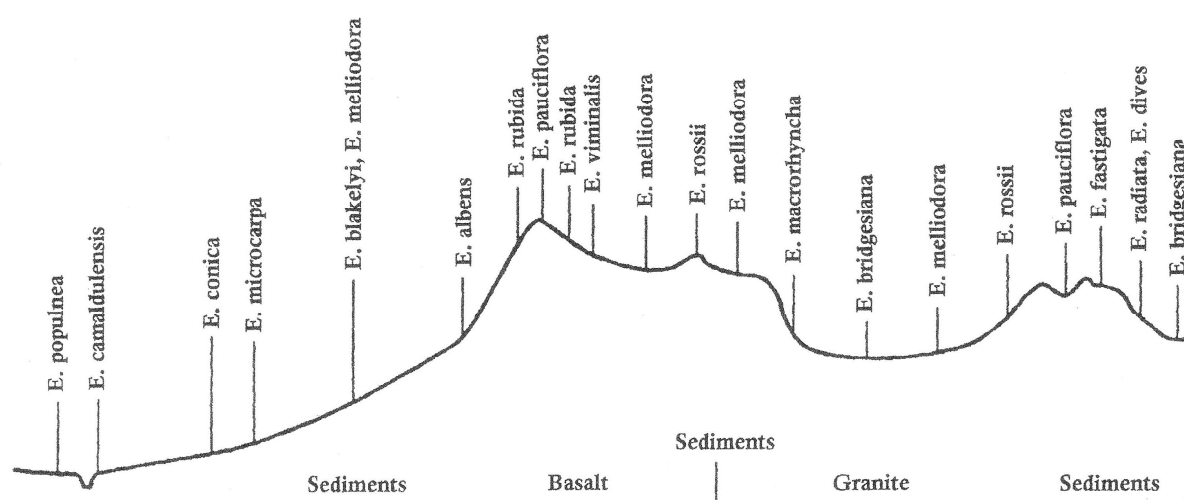


Figure 3. Typical Dominant eucalypts in an east-west transect from Parkes to east of Bathurst (from Bower *et al* 2002)

Our understanding of how and why various vegetation patterns occur within particular landscapes, and consequently associated limiting thresholds within the Bathurst Region and elsewhere has considerably improved in the last decade or so. However, whilst Rankin *et al.* (2007) found a low association between vegetation types, soil landscapes or soil type, Kovac *et al* (1989) in contrast, identified the various vegetation formations they found associated with various soil landscapes in the Bathurst area. Bower *et al* (2002) in their field guide to Eucalypts, based on a significant amount of field experience, were able to relate various dominant eucalypts to underlying geology and topography across the Central West (Figure 3). Recently Keith (2011) has demonstrated a strong relationship exists between sclerophyllous vegetation formations and classes and geodiversity (including low levels of mineral nutrients), with most vegetation types restricted to a narrow range of geological substrates, which are largely independent of the influence of climate.

Vegetation formations

The native vegetation of the Bathurst area is not yet mapped at an appropriate scale, however work on the NSW Vegetation Classification and Assessment (NSWVCA) Project by the Royal Botanic Gardens and Domain Trust is continuing in the western South East Highlands and Australian Alps Bioregions and should be completed by the end of 2012. This will form the basis for Version 4 of the NSWVCA and will add between 150 and 250 plant communities to the Version 3 classification. This will also result in a complete vegetation classification of the Murray, Murrumbidgee, Lachlan and Central West CMA areas.

In the meantime we do have a reasonably good handle on the major formations (broad-scale classifications) within the Bathurst Region (e.g. grasslands, woodland and forest -terrestrial and riparian) - but not the communities and their associations¹⁶.

Keith (2004) compiled a broad-scale classification that allows the description of native vegetation in NSW at three levels of a hierarchical relationship: formations, classes and communities. Vegetation formations at the base of the hierarchy are broad vegetation groups distinguished by structural and physiognomic (external appearance) features with the least amount of floristic information. Vegetation classes are groups of vegetation defined mainly by overall floristic similarities (i.e. shared species). A vegetation class is assigned to a

¹⁶ A community of uniform structure in which the tallest layer contains the same dominant species (Bower *et al.* 2002).

particular formation and are usually broad groupings of related communities. Plant communities in contrast, are assemblages of plant species that are found together and are the most detailed and homogeneous units in the hierarchy. Hence formation mapping is usually broad and coarse scaled (e.g. 1:1,000,000) that provides a broad overview of what is present but decidedly inappropriate when dealing with local planning issues. Keith has produced vegetation formation maps for extant native vegetation at broad scale (1:2,000,000) that cover the Bathurst Region (see Keith 2004 p296, maps section). The formations that have been identified within the Bathurst Region are Grassy Woodlands, Wet sclerophyll Forests and Dry Sclerophyll Forests and the particular vegetation classes mapped include:

- Southern Tablelands Wet Sclerophyll Forests (grassy sub-formations),
- Southern Tablelands Dry Sclerophyll Forests (shrubby sub-formation),
- Southern Tablelands Grassy Woodlands,
- North-west Slopes Dry Sclerophyll Woodlands (shrub-grass sub-formation), and
- Subalpine Woodlands.

Formations not mapped by Keith (mainly scale related) but known to be present within the Bathurst Region include Forested Wetlands and Grasslands. Keith (2004) notes that the definitions he uses differs from alliances and associations as traditionally defined in the following way:

- ‘For classes and communities similarities are assessed by considering the overall species composition of each class irrespective of which species are structurally dominant’.
- ‘In contrast alliances and associations are identified on the species composition of their tallest or dominant stratum’.

Bower *et al* (2004) identify the following Eucalypt alliances that are relevant to the Bathurst Region, together with their associations and are utilised to some degree by Kovac *et al* (1989), but are now rather dated:

- Brown Barrel (*E fastigata*) – Ribbon Gum (*E viminalis*) Open Forest alliance including two associations;
- Red Stringybark (*E macroryncha*) – Inland Scribbly Gum (*E rossii*) Open Forest and Woodland alliance including about eight associations;
- Snow Gum (*E pauciflora*) – Black Sally (*E stelluata*) Woodland alliance;
- Yellow Box (*E melliodora*) – Blakely’s Red Gum (*E blakelyi*) Woodland alliance including about six associations; and
- White Box (*E albens*) Woodland alliance including three to four associations.

Broad Habitat Types

DEC (2006a) modelled extant vegetation across the Central Western Region using Keith (2004) vegetation formations and classes at a scale of 1:250,000, but with data available at a much finer resolution. These data were used by Goldney *et al* (2007) to model the approximate distribution of Broad Habitat Types (BHTs) within each 1:100,000 mapsheet. BHTs are more focused on vegetation life form, plant structure and vegetation layers amongst other characteristics. Using the Bathurst 1:100,000 mapsheet as an example, Goldney *et al* (2007) identified the mapsheet as being 73% cleared with five BHTs occupying 662 km² including: Grassy Woodlands (3%), Dry Sclerophyll Forests (94%), Grassy Woodlands (0.3%), Forested Wetlands (2%), and Tall Open Forests (1%). Not included in this analysis are grasslands and specialist habitats such as rocky outcrops, caves, mineshafts etc. This is a highly fragmented landscape (2,453 remnant patches) with low habitat connectivity and with

little pre-European Old Growth formations still extant. Most of the forested and wooded remnants are mid-successional, hollow depauperate and tend to be habitat homogenous.

3.2.2. Endangered Ecological Communities

An Endangered Ecological Community (EEC) is an ecological community listed as facing a very high risk of extinction in the near future under both the TSC and/or EPBC Acts, unless appropriate management strategies are put in place. Currently there are no EEC listings under the FM Act in the Bathurst Region. There are four EECs that are currently known or predicted to occur in the Bathurst Region. These are:

1. Box-Gum Woodlands
 - White Box - Yellow Box - Blakely's Red Gum Woodland' (Box-Gum Woodland) listed as an EEC in the NSW TSC Act; and
 - 'White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland' (Box Gum Grassy Woodlands) listed as Critically Endangered Ecological Community (CEEC) in the EPBC Act.
2. Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions (Listed as an EEC in the NSW TSC Act);
3. Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions (Listed as an EEC in the NSW TSC Act); and
4. Montane peatlands and swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highland and Australian Alps bioregions (Listed as an EEC in the NSW TSC Act).

Box-Gum Woodland

Box-Gum Woodland is an open grassy woodland community characterised by the presence or prior occurrence of White Box (*E. albens*), Yellow Box (*E. melliodora*) or Blakely's Red Gum (*E. blakelyi*). It has a ground layer of native tussock grasses and herbs, and a sparse, scattered shrub layer. In some locations however, these characteristic tree species may now be absent from the tree layer as a result of recent clearing or thinning and, at these locations, any other tree species may be present. These locations are still considered Box-Gum Woodland EEC in the TSC Act as long as the area has the natural soil layer and seedbank intact, and therefore may recover with appropriate management (NSW DECCW 2007).

Intact stands that contain diverse upper and mid-storeys and ground layers are rare. Modified sites include the following:

- Areas where the main tree species are present ranging from an open woodland formation to a forest structure, and the ground layer is predominantly composed of exotic species; and
- Sites where the trees have been removed and only the grassy ground layer and some herbs remain.

The Australian Government listing of Box-Gum Grassy Woodland is slightly different to the NSW listing in that areas that are part of the EPBC Act CEEC must have either:

- An intact tree layer and predominately native ground layer; or
- An intact native ground layer with a high diversity of native plant species but no remaining tree layer.

The comparison of the existing vegetation to the reconstructed vegetation as mapped by Keith (2004) shows the woodlands (inferred to be the ‘Southern Tableland Grassy Woodlands’) to be significantly reduced and highly fragmented since European settlement and being confined to relatively small patches and isolated trees in the landscape. From the vegetation reconstruction the distribution of the Box-Gum Woodlands covered a large proportion of the Bathurst Region, particularly to the south-east. There are significant areas of the Box-Gum Woodland EEC in the rural areas of Bathurst Region including remnant patches in the urban/peri-urban areas around Bathurst City, principally around Mount Panorama, along watercourses and threaded through to the Macquarie River.

Tableland Basalt Forest

Tableland Basalt Forest is an open forest or woodland that typically occurs on undulating or hilly terrain about 600–900 m above sea level, on relatively fertile loam or clay soils derived primarily from basalt, but which may also be derived from mudstones, granites, alluvium and other substrates. Annual rainfall ranges approximately from 750–1100 mm. Tableland Basalt Forest has an open canopy of eucalypts with sparse small trees and shrubs and a dense ground cover of herbs and grasses. Common trees include Ribbon Gum (*E. viminalis*), Narrow-leaved Peppermint (*E. radiata* subsp. *radiata*), Mountain Gum (*E. dalrympleana* subsp. *dalrympleana*) and Snow Gum (*E. pauciflora*). Only a small area (estimated to be between 5-20%) of the original distribution of Tableland Basalt Forest remains and much of this is in poor condition (NSW OEH 2011a).

The presence of the Tableland Basalt Forest EEC is predicted in the Winburndale Nature Reserve associated with the moist forest communities dominated with *E. viminalis* and *E. dalrympleana* and located in sheltered valleys. Tableland Basalt Forest belongs to the Tableland Clay Grassy Woodlands vegetation class of Keith (2004) (NSW OEH 2011a).

Recently it has been tentatively identified by the author (BM) to be present on Mount Panorama and this analysis has been subsequently supported by OEH ecologists (Garry Germon *pers. comm.* 2012)¹⁷. The community is located on the crest and upper slopes of Mount Panorama, occurs on basaltic soils and is dominated by *E. viminalis* - intergrading with *E. bridgesiana* further down the slope. Recognising this community as an EEC is important for its conservation and for any legal responsibilities BRC has under the TSC Act; however, there are underlying concerns with its positive identification (Garry Germon *pers. comm.* 2012)¹⁸ and (Colin Bower *pers comm.* 2012)¹⁹.

¹⁷ The *E. viminalis* – *E. bridgesiana* woodland on the perimeter of the Mount Panorama plateau is consistent with the Tableland Basalt Forest EEC. After reviewing the NSW final determination I have come to this conclusion based on the following:

- The IBRA region, local government area, altitudinal range, lithology and geology are consistent with the final determination.
- The vegetation structure and component species of the Mount Panorama vegetation are consistent with the structure (woodland) and species listed to form the community in the final determination.

This conclusion was based on a limited survey of the area and a greater level of investigation would provide greater certainty to the above conclusion.

¹⁸ The EEC as listed by the NSW Scientific Committee is based on data from more eastern vegetation communities. As the Mount Panorama community is located in an area of marginal rainfall for this community type and the area where it occurs has a long history of modification for different land uses, it does not fit well with the examples of community types given in the final determination.

¹⁹ The listed community is principally a wet sclerophyl forest not a dryish open woodland and it occurs frequently around Orange on basalt. It is wrong to assume that the vegetation communities are necessarily the same as defined further to the east. The other problem with equating *E. viminalis*/*E. bridgesiana* with Tablelands Basalt Forest EEC is the high representation of *E. bridgesiana*, which is not recognised as a component, much less a dominant one in the EEC.

Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland

Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland (Tableland Woodland) typically forms an open-forest, woodland or open woodland that transitions into grassland at low tree cover. The canopy is dominated by Snow Gum (*E. pauciflora*), Candlebark (*E. rubida*), Black Sallee (*E. stellulata*) and Ribbon Gum (*E. viminalis*) either as single species or in combinations. A shrub layer may be present and subshrubs are often a component of the ground stratum. The ground layer is dominated by grasses and other herbaceous species. This EEC mainly occurs on valley floors, margins of frost hollows, footslopes and undulating hills between approximately 600 and 1400 m in altitude. The Box-Gum Woodland and Montane Peatlands and Swamps are known to intergrade with the Tablelands Woodland (NSW OEH 2011b).

This EEC has been recorded in the Bathurst Region and falls within the vegetation class of Subalpine Woodlands described and mapped by Keith (2004) and the, Broad Vegetation Type (BVT) 25 described and mapped by DEC (2006a, b) (NSW OEH 2011b). The Subalpine Woodlands lie to the east of Bathurst in the locality of Sunny Corner. A comparison between the reconstructed and existing vegetation maps in Keith (2004) show a marked decline in its distribution and extent of this vegetation class in the Bathurst Region.

Montane Peatlands and Swamps

Montane Peatlands and Swamps are generally a treeless community of plants with scattered to dense shrubs and a dense ground cover of grasses, sedges and herbs (Department of Environment and Climate Change 2008). They are also known as ‘swampy meadows’ in the literature (Mactaggart *et al.* 2008). The swampy meadow landform system, once a common and widespread feature of the pre-European drainage networks, is an integral component in the regulation and maintenance of catchment hydrology and ecosystem function. The arrival of Europeans and their attending land use practices saw an increase in the rate of swampy meadow incision and degradation.

Swampy meadows occur across the region in locations exhibiting a wide range of environmental variables; however, the greatest density occurs in the higher altitude, relatively high rainfall areas, particularly in the undulating hills and rolling to undulating low hills (Mactaggart 2008). Swampy meadows are generally absent or poorly represented in the rugged hilly environments prevalent in the northern part of the Bathurst Region. In these areas rainfall is comparatively low and the soils shallow and skeletal. Swampy meadows are mostly associated with headwater streams (the top of the stream) in small catchments (2-9 km²). Further, valley slope gradients are mostly very gently inclined (2-3 %) and valley widths often broad (50-200 m). These attributes, generally occurring together, favour a low energy environment. When coupled with environmental influences that ensure adequate moisture availability, such as relatively high precipitation to evaporation ratios, adequate discharge volumes from the catchment and underground water (e.g. springs), swampy meadows can develop. The distribution and abundance of spring-fed swamps, which are often peat-forming, in the region is not known, nor is it known how many have ‘dried-up’ over the years since the advent of land clearance, groundwater extraction, swamp draining and post-European settlement gullyng (Mactaggart 2008).

Analogues of Montane Peatlands and Swamps can form relatively quickly in urban areas associated with local earth moving and road building activities producing small semi-permanent micro-catchments. At times this provides the necessary conditions for a micro-swamp to form. However it is not the intent of the law to perceive such a landscape artefact as an EEC.

3.2.3. Critical habitat

There is no critical habitat registered under the EPBC Act in the Bathurst region.

3.2.4. Aquatic ecosystems

The relationship between aquatic habitat complexity and biodiversity is well documented in the ecological literature. It is known that in habitats ranging from pools to swamps there are significant relationships between habitat diversity and species richness at several spatial scales (Boulton *et al.* 2004). Boulton (2004) further reasons that a high degree of geomorphic complexity through its enhancement of biodiversity may promote fundamental processes in ecosystems and help maintain natural rates of ecosystem function such as organic matter cycling. In the Bathurst Region the complexity of aquatic assets include rivers, streams, upland swamps, wetlands, large dams, farm dams and even backyard ponds - and these are just the surface assets. What are little known until recently are below ground assets such as the organisms and ecosystem processes that occur in the saturated sediments lying below and alongside stream channels (the 'hyporheic zone'). In many streams they are considered to be significant to surface stream ecosystem processes and ecosystem health by altering water chemistry and generating nutrients that potentially limit productivity in the surface (Boulton *et al.* 2004).

Rivers and streams

The Bathurst Region lies within two major river catchments: the Macquarie in the north and the Lachlan in the south. The Macquarie River is formed at the confluence of the Fish and Campbells Rivers approximately 15 km below Chifley Dam with the latter two rivers forming part of the Bathurst Region boundary between BRC and Oberon. The Macquarie threads its way northward to exit the Bathurst Region in the north-west corner south of Hill End. The Abercrombie River in the south (part of the Lachlan River system) forms the partial boundary between BRC and the Upper Lachlan LGAs. Feeding into these major river systems are smaller tributary rivers and streams including the Turon River, which is an important system for Sofala village and the Hill End district.

The geomorphic diversity of waterway systems in the Bathurst Region is very high and supports an abundance of dependent plant and animal species and ecosystems. A number of processes, such as groundwater connections, flooding, nutrient cycling, leaf and insect fall into streams from the overhanging vegetation, also provide life-giving connections between the aquatic and terrestrial ecosystems. Waterway diversity is characterised by narrow rocky low order streams in the higher catchment areas with overhanging vegetation, to broad open valleys densely vegetated with tussocks, sedges and rushes. Riverine systems feature shallow, rocky riffle areas and deep pools fringed with River Sheoak (e.g. Turon River); streams cut through alluvial plains with broad floodplains (e.g. Queen Charlotte Vale Creek); and ephemeral tributary streams meandering through rolling hills timbered with grassy woodlands (e.g. creeks in the rural landscape and Bathurst's urban environment). The diversity of stream types and the component parts within each of these systems contribute significantly to the biodiversity assets of the Bathurst Region.

The sustainable Rivers Audit is a program designed to assess the health of rivers based on their hydrology, fish diversity and macroinvertebrate diversity as well as the presence of pollution indicating organisms (Murray Darling Basin Commission 2008). Their general findings for the Macquarie-Bogan Rivers were: hydrology (moderate to good), fish (very poor), macroinvertebrates (moderate), and overall ecosystem health (very poor). A similar assessment was determined for the Lachlan River, with the exception of fish diversity which was rated as extremely poor.

Artificial waterbodies

The list of dams and waterbodies below is not inclusive of all types in the Bathurst Region. However, it does illustrate that artificially constructed waterbodies can provide important habitat features for maintaining and conserving biodiversity, especially as sizeable and permanent natural non-flowing waterbodies are absent from the Bathurst Region.

Chifley Dam – This dam, located on the Campbells River approximately 17 km upstream of Bathurst is the major water storage for the city. It is an important permanent water storage for native and exotic fish including species suitable for angling. Threatened species known to occur in the area include Painted Snipe, Australasian Bittern, Little Eagle and the Murray Turtle (Mjadwesch 2011b).

Winburndale Dam - Winburndale Dam is located on the Winburndale Rivulet, some 21 km east of Bathurst. Australian Museum records show that Mountain Galaxias (*Galaxias olidus*) have been recorded climbing the spillway of Winburndale Dam. Silver Perch, Murray Turtle, Rosenbergs Goanna, Australasian Bittern, Bush Stone Curlew have been recorded and a recording in 1973 of the Green and Gold Bell Frog (Mjadwesch 2011b). Powerful Owls are also an established species in the area (McArtney 1990); Brian Stone, PhD Thesis submitted 2012, University of Sydney and Chris Marshall, *pers. comm.* 2012). Further, no European Carp species are present upstream of the dam wall, thus providing an important refugia for native aquatic species.

Sedimentation pond below Waste Management Centre – The permanent pond is fringed with native emergent aquatic plants and contains some large semi-submerged logs that provide favourable habitat for water fowl, frogs, reptiles and Australian Long-necked Turtles.

Farm dams - Farm dams are important aquatic ecosystems contributing to species diversity and providing refuges for a number of organisms such as frogs (Hazell *et al.* 2004) and macroinvertebrates (Brainwood & Burgin 2006). This is particularly so in highly disturbed agricultural landscapes where pressures on the waterways and other water resources continues.

Wetlands

Raglan Creek floodplain complex - It is likely that the Raglan Creek tributaries flowing from the slopes would have once spread out into multiple swampy channels, back swamps and reed beds across the floodplain to the Macquarie River. In today's landscape the flows are concentrated within a channelised stream running the length of the floodplain from near the railway line to where it joins a chain of lagoons. These lagoons are relict palaeo-channels of the Macquarie River and are relatively deep open water aquatic systems. The wetlands system also includes open water near St. Pats sports club and the old 'brick pits' site, which periodically fill with water. The functioning of the creek system is very different to its pre-European state, however the system still provides important habitat for frogs and birds. The threatened Australian Painted Snipe has recently been observed in the brick pits open water area (Chris Marshall *pers. comm.* 2012). The fish assemblages are unknown, though the lagoons may be habitat for catfish. The channelised section of the creek is mostly populated with the exotic pest species, Mosquito Fish.

The Lagoon – The ephemeral wetland, situated near The Lagoon village 13 km south of Bathurst on the Lagoon Road to Chifley Dam, fills periodically once or twice a decade. Once filled the water tends to remain in the system for approximately one year, after which it subsides and the wetland returns to a terrestrial landscape that is grazed by livestock (Chris Marshall *pers. comm.*, 2011). The Lagoon is visited by threatened and migratory bird species

including the Japanese Snipe (Chris Marshall, *pers. comm.* 2011) and the Black-tailed Godwit (Mjadwesch 2011b).

Swamps, swampy meadows

Swamps and swampy meadows are fed from precipitation, overland surface runoff, through-flow from the surface soils and groundwater. In their various states of intactness they are likely to occur (as described for the Montane Peatland and Swamps EEC) in the upper catchments, particularly where rainfall is high, valley slope is gentle and valley floors relatively broad. A number of swampy meadows have been identified on the INFFER database and are listed in the Issues Paper. Degraded forms are still evident close to the urban environment with Hawthornden Creek (within the Boundary Road Reserve) featuring characteristic organic deposits - though now only observed in the exposed gully wall.

In the contemporary agricultural and urban landscapes the swampy meadow, once a common landform, is now relatively rare in its natural state and pressures from current land use practices continue to threaten those remaining (Mactaggart *et al.* 2006).

Groundwater contribution to aquatic biodiversity

Groundwater is another aquatic resource little recognised in the Bathurst Region despite its importance in maintaining biodiversity and ecosystem functions. Groundwater plays a role in sustaining some terrestrial ecosystems, contributes to stream flow and it is essential for the survival of some groundwater dependent ecosystems such as karst systems and spring-fed wetlands and swamps (Hatton & Evans 1998). Most of the spring-fed ecosystems in the Bathurst Region have been modified since European settlement with any functionally intact examples likely to be in ungrazed or uncultivated areas such as NSW State Forest and conservation reserves. Groundwater saturated soils and small pools that these systems may exhibit provide habitat for a suite of plant and animal species that are often dissimilar to those found in neighbouring terrestrial communities.

3.2.5. Urban environment

Some of the key assets in the urban environment of Bathurst and the surrounding villages are outlined below according to biodiversity themes.

Native vegetation and riparian corridors

There are significant remnant native vegetation and riparian corridors threading through Bathurst City from the highest point at Mount Panorama to the lowlands of the Macquarie River and lower reaches of the urban waterways. These assets are particularly significant as some of the remnant woodland areas, small wooded patches and isolated trees that exist in south and west Bathurst comprise the Box-Gum Woodland EEC. The main vegetation links follow the urban waterways from Mount Panorama to the Macquarie River. The quality of the linkage along these waterways varies; however, elements within these aquatic systems often provide habitat stepping stones along these linear corridors. Raglan Creek and its tributaries also network through the urban environment, though the value of these tributaries for biodiversity varies considerably.

Backyard gardens and streetscape

Urban gardens, parks and street trees constitute a large proportion of the urban land use and contribute to biodiversity and urban sustainability (Ghosh 2010). For example, ponds can enhance biodiversity, clotheslines reduce domestic energy usage, vegetable patches could in some cases lower the carbon footprint and on-site composting reduces the amount of waste in landfill sites and consequent methane production. Further trees in backyards and the

streetscape contribute to carbon dioxide emissions reductions, carbon storage as biomass and other beneficial ecological functions.

A recent survey of local residents conducted by BRC (2010) indicated that around 60% of plant species in urban backyards is exotic with the remaining 40% being native. The structure of the vegetation was typically a combination of trees, shrubs, understorey, groundcover and leaf litter. However, less than 25% of yards were made up of this structured vegetation.

3.2.6. Conservation assets

Conservation areas are biodiversity assets in their own right and like a Russian Doll contained within them are more biodiversity assets. Some of these assets have been recorded and mostly describe the vegetation communities, fauna and flora species, threatened, rare or regionally significant species. The other biodiversity attributes are rarely commented on.

Biodiversity assets within the following conservation areas are summarised in **Appendix B**.

- Abercrombie Karst Conservation Reserve
- Copperhanna Nature Reserve
- Eusdale Nature Reserve
- Wambool Nature Reserve
- Winburndale Nature Reserve
- Boundary Road Reserve

Other notable areas with significant conservation value in the Bathurst Region include Brooke Moore, Mount Rankin, Tarana Mount, Sir Joseph Banks and Wattle Flat Heritage Land Reserves, Peel Common and the Travelling Stock Reserves. These areas have added ecosystem services asset value in that they are publically accessible.

3.2.7. INFFER

A number of natural assets in the CW and Lachlan Catchments were identified by the local community in 2009. The assets have since been collated, the level of their significance and current threat determined and a resilience analysis performed. This information has formed the basis of the CMA's planning processes and review of the resource condition targets outlined in the Central West Catchment Action Plan (CAP).

The assets listed in the INFFER database fall into the broad themes of water, wetlands, land, vegetation and biodiversity. However, for this report only those located in the Bathurst region and relevant to biodiversity are included below according to sub-ordinate categories:

- Threatened flora and fauna species – Bathurst Copper butterfly and two flora species;
- EECs – Box-Gum Woodland, Tablelands Basalt Forest;
- Fauna – significant fauna populations;
- Aquatic systems – riverine environments, floodplains and riverine wetlands, dams, swampy meadows;
- Vegetation – woodland remnants, natural grasslands;
- Conservation reserves; and
- Land – significant soil landscapes.

3.3. Ecosystem process and functional assets

3.3.1. Natural ecosystem processes

Within ecosystems organisms are networked together via complex food chains and webs, where all materials are recycled in space and time at variable rates in response to a range of environmental variables. The major cycles include the water, carbon and nutrient cycles. In stark contrast energy flow from the sun, once captured by photosynthesis, thereafter flows through an ecosystem via food chains and webs, dissipating but never to be recycled as such. Low vegetation cover and poor land management strategies can lead to landscape overheating and subsequently this can have deleterious consequences for the ecosystem. Land degradation is almost always accompanied by increasingly malfunctioning ecosystems. In the pre-European landscape the major ecosystem cycles were semi-closed, hence low level resource leakages could occur (e.g. baseline rates of erosion, nutrients leaching through to rivers and creeks and slow water seepage through the landscape providing baseline creek flows well into drought periods). Soil carbon levels have been estimated to have been between 4-6%. Systems in equilibrium would have been more-or-less the norm with pools of soil nutrients and soil carbon being used at more or less the same rate as they were being replaced. Increasing soil carbon enables a concomitant exponential increase in the soil water holding capacity of a landscape. Goldney *et al* (2007) assessed ecosystem function in the Bathurst 1:100,000 map sheet to be malfunctioning and worsening across the landscape.

Patches of vegetation and other obstructions serve an important function in many landscapes as they capture and retain limited resources such as rainwater, organic matter, and soil sediments and nutrients blowing or flowing across their surfaces (Tongway & Ludwig 1997). These surface obstructions are typically vegetation patches of various types and sizes, for example, clumps of grass, shrub thickets and groves of trees, but obstructions may also include logs, rocks, ant and termite mounds, and soil banks or cracks and pits. Landscapes with high cover of obstructions are conserving or highly functional systems, whereas landscapes with few obstructions are leaky or dysfunctional (Ludwig *et al.* 2002). The natural ecosystem processes that occur at all spatial scales across the Bathurst Region are essential assets and are often not recognised or measured.

3.3.2. Ecosystem services assets

'The human economy is a wholly owned subsidiary of the economy of nature'
Paul Ehrlich (2009)

The term 'ecosystem service' refers to the benefits human populations derive directly or indirectly from ecosystems. Economists have recently attempted to place a monetary value on ecosystem service, with the rivers, wetlands and floodplains of the Murray Darling Basin estimated to provide \$187 billion in annual ecosystem services, about 20% of Australia's annual GNP (Steffen 2009). The Bathurst Region is of course embedded within the MDB. Examples of ecosystem services values include benefits derived from provisioning services (food, fibre, firewood, forestry products, genetic resources, biochemical, natural medicines, ornamental resources, freshwater), regulating services (air quality regulation, climate regulation, water regulation and purification, erosion control, disease regulation, pest regulation, carbon dioxide in the atmosphere, flood and drought regulation), supporting services (soil formation, nutrient cycling, water cycling, protecting our crops from pests, pollinating many of them, and primary production via photosynthesis) and cultural services (cultural diversity and heritage, recreation and ecotourism, spiritual, religious, aesthetics and other non-material benefits, knowledge systems, inspirational values, educational values).

Agricultural lands, in particular, provide and rely on important ecosystem services. However, agricultural production and intensification has often contributed to its degradation. Detrimental impacts on ecosystem services can include a reduction in water quality (increased sediment movement through the landscape, eutrophication of waterways from nutrient loading, chemical pollution); alteration of natural flows in rivers and streams; clearing of vegetation; weed invasion; increased demand for surface and groundwater for irrigation, stock and domestic purposes and modification of the visual amenity of the landscape.

Aquatic ecosystem health

Human health and aquatic ecosystem health are inextricably linked. Humans directly rely on clean water as well as deriving intrinsic psychological benefits from aesthetic values and a 'sense of place' from healthy waterways (Boulton *et al.* 2004). The Bathurst Region benefits from relatively healthy aquatic ecosystems compared with many Australian streams polluted from urban and rural contaminants as they provide water resources for drinking, industry, agriculture and sanitation. Clean water, pleasing visual riparian amenities and healthy functioning ecosystems also benefit recreational fishing, boating, swimming and camping activities. The intrinsic value of healthy aquatic ecosystems is they provide a diversity of habitats for many aquatic and semi-aquatic plants, fish, amphibians and invertebrates. However, over the years changes to water quality, flow regimes, and the physical structure of the major Macquarie and Campbells Rivers and other streams have led to widespread modification of the biotic communities and ecological functioning of the aquatic ecosystems. The degradation of rivers and streams threaten the ecosystem services they provide.

Urban environment

The ecological health of urban areas is important for human welfare and the long-term sustainability of both human habitat and global biodiversity. Urban ecosystems are a hybrid of natural and man-made elements whose interactions are affected not only by the natural environment, but also culture, personal behaviour, politics, economics and social organisation. Urban ecosystems can no longer be considered as a separate entity to the environment as they have direct and indirect impacts on the immediate and wider environments. Many of the environmental problems faced today (e.g. global warming, water and air pollution) can be traced back to urban areas and lifestyle choices (The Global Development Research Center 2011).

A greater understanding and sympathy for nature can be gained from the personal experiences of individuals predisposed to it. Conversely, lack of exposure to nature can result in hostile or indifferent attitudes and in favouring development over conservation (Jay & Stolte 2011). Urban residents are key participants in and deciders of national policy; thus, it is important that they learn about and understand the significance of ecological processes and the needs of healthy ecosystems in the areas where they live (Jay & Stolte 2011).

Bathurst City, villages and rural settlements are dependent on the ecosystems beyond the built environment, but they also benefit from internal urban terrestrial and aquatic ecosystems. Some direct ecosystem services in the urban environments may include:

- Air filtering – smoke particles, dust from roads, air pollutants;
- Water quality improvement through biofiltration of sediments and nutrients, the reduction of nitrogen concentrations to downstream waterways;
- Micro-climate regulation – lowering summer temperatures through shading, evaporation and evapotranspiration and reducing wind speed in winter;
- Noise reduction and visual buffers from roadways or commercial centres;

- Recreational, cultural and aesthetic values from backyard plantings, treed streetscapes, parks and gardens;
- Wastewater treatment works - Biological processes at the wastewater treatment works are harnessed to reduce phosphorous and remove nitrogen in the water. Microbial biodiversity is also important in consuming biodegradable soluble organic contaminants and binding much of the less soluble fractions into floc;
- Reduction in flood peaks through infiltration and retention of rainwater and floodwater in urban catchments; and
- Reduction in sediments, pollutants and nutrients being moved through urban waterways.

Special places in the natural environment

The Bathurst region is rich with places of high scenic and amenity value, areas of bushland accessible for nature appreciation, bushwalking or picnicking, varied habitat for bird-watching enthusiasts, a river to walk along or kayak down, streams and dams to fish, and beautiful spots to relax and reconnect with nature. Special places are personal, they give us a sense of place and the number of places is limitless as they can simply be expressed as a view - a panoramic picture at sunset or the backdrop of mountains behind a verdant valley. To encapsulate these places in its entirety is of course unrealistic, however, some of the iconic, publically accessible special places need to be recorded so their protection can be afforded. This list can be developed over the years with additional contributions from the wider community.

Within the former Bathurst City LGA

- Macquarie River (fishing, passive recreation, bike riding, bird-watching)
- Raglan Creek channel and old brick pits site (bird-watching)
- Boundary Road Reserve (bushwalking, mountain bike riding, fauna and bird-watching, nature appreciation)
- Brooke Moore conservation area (native flora)
- Mount Panorama precinct (bushwalking, kangaroo/wallaby and bird-watching, nature and view appreciation including landscape vistas)
- Sir Joseph Banks Nature Reserve

Nature reserves (NR), conservation areas and high quality bushland

- Nature reserves for bushwalking and bird-watching include: Abercrombie Karst Conservation area, Copperhannia NR, Wambool NR, Winburndale NR, Eusdale NR
- Sunny Corner State Forest
- Mount Tarana Crown Land Reserve
- Conservation areas and reserves for bushwalking and bird-watching include: Peel Common, Mount Rankin Conservation Reserve, Trunkey Creek bushland adjacent to sportsground, Mulgunnia Creek resting reserve (Trunkey Creek),
- Vittoria State Forest (bushwalking, bird-watching)
- Wattle Flat racecourse bushland area (bushwalking, bird-watching)
- Hill End racecourse bushland area (bushwalking, bird-watching)
- Napoleon Reef Council controlled bushland (bushwalking, bird-watching)
- Turners Plot Flora and Fauna Reserve (Disneyland), Yetholme (bushwalking, bird-watching)

Riverine and aquatic areas

- Oakey Creek, Turon River, Sofala (camping, fishing, bushwalking, bird-watching)
- Bridle Track sites from Bathurst to Hill End (camping, fishing, bushwalking, bird-watching, scenic vistas)
- Turon River, Crudine (camping, fishing, bird-watching)
- Chifley Dam precinct (fishing, boating, camping)
- The Lagoon when the depression is filled with water (bird-watching)

4. THREATS TO BIODIVERSITY

The biodiversity crisis

“The present distribution of biological diversity and wildlife in the world has been the outcome of about 600 million years of recorded evolution, geological and climatic shifts during that time and the properties of species (e.g. dispersal, persistence) and ecological systems (e.g. size, diversity). These have been modified by exponentially increasing impacts of human actions during the past 100 000 years or so. It is therefore one of the major ecological characteristics of the modern world, that biological realms, evolved over hundreds of millions of years and uniquely distinct, have been subjected to exponentially accelerating homogenisation, compressed into ever-shrinking time-spans and according to constantly changing sets of principles, rules and processes. Many of the systems which have been created are thus in various stages of co-adaptation, (...)for example what we call “natural (e.g. the Dingo in Australia). Young systems had no time to evolve balances and they are, so we define and fear, unstable and ‘unsustainable’”. The dilemma we encounter in trying to comprehend the significance and meaning of this biodiversity or ‘bioshift’ (invasion, extinction, alienation, homogenisation) more or less describes our present biodiversity crisis within the environmental crisis. Biodiversity loss is only but one aspect of that crisis and much of it is about values, about time frames and what we’d like to call ‘stability’. Quite possibly, from a functional point of view, the least significant one”.

Dr Johannes Bauer, O'Connell

4.1. Introduction

The world has failed to meet the Convention on Biological Diversity’s 2010 target to reduce the rate of loss of biodiversity, with the vast majority of nations falling far short (Spellerberg & McNeely 2010). It has been found that trends in species population, size, their risk of extinction, extend of habitat and the composition of plant and animal communities all show continuing declines. Worse, states Spellerberg and McNeely (2010), are the increasing pressures on all aspects of biodiversity – levels of resource consumption, the number of invasive alien species, over-exploitation of many species and the impacts of climate change – and Australia is no exception. The 2011 Australian State of the Environment Report (DSEWPC 2011) states that ‘despite promising investment by all jurisdictions in addressing the main pressures on biodiversity, pressures are not being substantially reduced, nor is the decline in biodiversity being arrested or reversed.

Some threats are recognised in the legislation and become the focus of threat abatement, while others continue to manifest unabated due to the nature of the threat, the prolonged impacts of historic disturbances to the landscape and the pressures brought about by the increased demand on natural resources. The Issues Paper covered some of these threats including the key threatening processes listed under the TSC, FM and EPBC Acts that occur or have potential to occur in the Bathurst Region. It also provided an extensive list of threats that can affect the native fauna, flora and vegetation communities and covers the impacts of

the threatening processes most significant in the region in more detail. Threats to vertebrate fauna within the Bathurst 1:100,000 mapsheet are also described by Goldney *et al* (2007). To provide a contextual background to this document, some of these threats are summarised in this section. Expanding on these, this section provides additional threats that relate to EECs and aquatic ecosystems and highlights local issues that also can impact adversely on biodiversity in the Bathurst Region.

Threats such as clearing, erosion and the introduction of exotic plants and animals are legacy issues of past activities and vary in their impacts on biodiversity in time and space. A threat with a significant and increasing trend towards potentially impacting on biodiversity is population growth. Its associated settlement and development patterns and densities, increased pressure on natural resource use and waste production are current issues facing BRC.

In addition, key ecological concepts such as disturbance, resilience and thresholds (which are pivotal in our understanding of how ecosystems behave following disturbances and on-going threats) are described briefly. The current thinking towards biodiversity management is edging away from the simple elemental/species approach to the more complex ecosystems-based approach. This type of management aligns with the strategic frameworks of the CMA Catchment Action Plans.

4.2. Loss of ecosystem function

Biodiversity is strongly related to functional integrity where functional integrity is the intactness of soil and native vegetation patterns and the processes that maintain these patterns. That is, landscapes with high functional integrity should maintain biodiversity, and altered, less functional landscapes may lose some biodiversity (Ludwig *et al.* 2004). Land degradation in the Bathurst Region has resulted in the loss of landscape functional integrity, which is the intactness of natural vegetation and soil structural patterns and the processes that maintain these patterns. This loss of landscape functional integrity, including the shelter and food provided by vegetation, is a likely cause of known extinctions and reported declines in native herbaceous plants, small mammals and granivorous birds.

4.3. Key threatening processes

The following key threatening processes are general in nature and are broadly applicable across landscapes and most are also applicable across regions.

Key threatening processes listed under the TSC Act are:

- Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands
- Anthropogenic climate change
- Bushrock removal
- Clearing of native vegetation
- Competition and grazing by the feral European rabbit
- Competition from feral honey bees
- High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition
- Herbivory and environmental degradation caused by feral deer
- Infection of frogs by amphibian chytrid causing the disease chytridiomycosis
- Invasion of native plant communities by exotic perennial grasses

- Loss of hollow-bearing trees
- Predation by the European red fox
- Predation by the feral cat
- Predation by plague minnow or mosquito fish
- Predation, habitat degradation, competition and disease transmission by feral pigs
- Removal of dead wood and dead trees

Key threatening processes listed under the FM Act are:

- Hook and line fishing in areas important for the survival of threatened fish species
- Human-caused climate change
- The introduction of fish to fresh waters within a river catchment outside their natural range
- The removal of large woody debris from NSW rivers and streams
- The degradation of native riparian vegetation along New South Wales water courses
- Installation and operation of instream structures and other mechanisms that alter natural flow regimes of rivers and streams

Key threatening processes listed under the EPBC Act are:

- Competition and land degradation by rabbits
- Infection of amphibians with chytrid fungus resulting in chytridiomycosis
- Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants
- Loss of terrestrial climatic habitat caused by anthropogenic emissions of greenhouse gases
- Predation by European red fox
- Predation by feral cats
- Predation, Habitat Degradation, Competition and Disease Transmission by Feral Pigs

Climate change

In January 2002 hundreds of flying foxes died in a heatwave in northern NSW, with tens of thousands reportedly dying in Australia during heatwaves since 1994 (Welbergen *et al.* 2008). These extreme events could have severe implications on flying fox populations and on other wildlife species and ecosystems with the real risk of driving some to extinction. There is mounting evidence to suggest that these extreme events and other climatic changes are likely to increase as a result of climate change.

Climate change is already having a significant impact on migratory species with birds starting to arrive and breed earlier and some long-distance migrants beginning to decline due to climate change. Future predictions point to many more declines, extinctions and a total reshuffle of ecosystems as they stand today (Convention of Migratory Species 2011).

Understanding the potential impacts of climate change is the first step in improving our capacity to deal with it (DECCW 2010). In response to this DECCW and the Climate Change Research Centre at the University of New South Wales have developed climate projections for NSW and these were used to assess the likely impacts of future climate change on a number of biophysical parameters. Of relevance to the Western Region, which includes the Bathurst Region, are parameters such as biodiversity, soils, stream flow and run-

off, and flooding risk. The projected climate change impacts that were determined for the Western Region and reported in the 'NSW Climate Impact Profile' (DECCW 2010) are :

- By 2050, the climate is predicted to be hotter and is also likely to be drier, with storms increasing in frequency and intensity;
 - Average minimum and average maximum temperatures for the central tablelands area of the Western Region are likely to rise by 1.5 - 2.0°C and 1.5 – 3.0°C respectively;
 - Evaporation is likely to increase throughout the year - particularly in spring;
 - Rainfall is likely to increase substantially in summer and decrease in winter;
 - The impact of the El Niño-Southern Oscillation (ENSO) is likely to become more extreme. It is projected that the ENSO years will continue to be drier than average, but also become hotter and therefore leading to more extreme impacts. La Niña years are likely to continue to be wetter than average, but will also become warmer.
- Run-off and stream flow are likely to increase in summer and autumn but decrease in winter and spring;
- Plant cover is likely to decline on the drier central western slopes and plains but is likely to be enhanced on the warmer tablelands. Sheet, rill and gully erosion are likely to worsen on the western slopes and plains but gully erosion is likely to ease on the most vulnerable soils on the tablelands. Soil acidification is expected to lessen on the tablelands and slopes;
- The likelihood of flooding from urban streams is expected to increase; and
- Widespread changes in natural ecosystems are likely. The biological communities most vulnerable to species loss are those of rivers and wetlands, and smaller woodland communities already under substantial threat.

4.4. Threats to the EECs in the Bathurst Region

Recognised threats to the EECs in the Bathurst Region are outlined below.

Box-Gum Woodland

- Clearing for agriculture, forestry, infrastructure, residential development and clear zones around buildings in fire prone areas;
- 'Tidying up' forest debris on agricultural and rural residential land;
- High intensity grazing by livestock preventing the establishment of upper and mid-storey species and the modification of the groundcover layer's species composition, structure and biomass;
- Slashing in the built environment and around infrastructure in the rural environment;
- Decline in the health and integrity of the woodland due to many different causes ranging from fires, increased insect attack, ringbarking by horses, browsing by rabbits, weed invasion from pines, deterioration of soil condition, nutrient loading, chemical drift, root disturbance due to cultivation practices;
- Threats to the health and integrity of the woodland in the urban environment include the removal of isolated trees for residential development, groundcover slashing (and the consequent impacts), pruning, alteration of the groundcover species composition, loss of recruitments and fragmentation;
- Lack of connectivity across the landscape and poor ecosystem function (poor carbon, nutrient and water cycles);

- Degradation of the woodland ecosystem due to weed invasion and the loss of connectivity in the landscape; and
- Disturbance during road works.

Tableland Basalt Forest

- The threats to the Box-Gum Woodland similarly apply to the Tableland Basalt Forest, though it has a far greater restriction in terms of its distribution in the Bathurst Region;
- Unique to the Box-Gum Woodland and the Tablelands Basalt Forest is they both occur on Mount Panorama, which expose parts of the population to the threats of ground disturbance, regular slashing, vandalism, wood collection, weed invasion by shrubs and groundcover species, high levels of trafficking and erosion. The impacts are lack of recruitment, decline in tree health, loss of structural and compositional integrity of the ecosystems and contraction of remnant size in some areas; and
- Tablelands Basalt Forest EEC, if it is determined to occur in the Winburndale Nature Reserve, maybe threatened in the future by fires and weeds.

Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland

- Generally threats to this EEC are common to the threats for the other woodland/forest EECs; however, they all occur outside the former Bathurst City LGA.

Montane Peatlands and Swamps

- Lack of recognition to what they are, where they occur and why they are important;
- They are threatened by grazing, trampling and soil disturbance caused by feral pigs, deer, horses and domestic livestock;
- Farming practices that destroy the hydrology and geomorphology of the swamps including swamp draining, diversion channels, dam construction and road crossings;
- Cultivation, spraying or burning of sedges, rushes and tussock grasses to encourage more 'desirable' pasture species or crops;
- Nutrient and sediment loading from surrounding hillsides;
- Invasion of weed species and the colonisation by species favouring a drier environment if the hydrology has been altered;
- Climate change is an unknown threat to these ecosystems;
- Groundwater harvesting; and
- Downstream channel incision, bed lowering and migrating head cuts.

4.5. Threats and impacts on aquatic ecosystems

The general findings compromising the condition of waterways in the Bathurst Region include:

- Loss of geomorphic complexity;
- Loss of ecosystem function (poor carbon, nutrient and water cycles);
- Bank, bed and bar instability;
- Sediment flux and smothering of streambed biota;
- Riparian vegetation disturbance;
- Dominance of willows in some areas;

- Exotic plant infestation of the understorey vegetation;
- Absence or restricted distribution of upperstorey native species;
- Low abundance of freshwater native plants;
- Low native species diversity in the riparian vegetation understorey;
- Diminished value of the river systems acting as wildlife corridors;
- Significant bank erosion in some areas;
- Medium to high deposits of silt and sand in some waterways;
- Eutrophication in urban and farmland areas;
- Loss of swampy meadow/chain-of-ponds systems;
- Gullyng, bed lowering and sedimentation; and
- Threat to groundwater dependent ecosystems (springs, seeps, baseflow for streams etc.) due to channel incision, groundwater harvesting and altered recharge.

4.6. Threats from local issues

The threats from local issues (excluding those listed as key threatening processes or threatening to EECs) are diverse and extend across the whole Bathurst Region and impact on biodiversity directly (e.g. weeds invasion) or indirectly (e.g. change in water flows in the Macquarie River due to extraction and/or release of water).

Some general threats of significance include:

- *Pressures from population growth* - increase in water demand and resource use as well as increased pressure from land conversion (see other associated threats and impacts below);
- *Urban residential development* - the density of residential development with the greatest impact on biodiversity is debatable. Urban consolidation is considered a preferred solution for its ability to reduce transport emissions; to protect regional water quality and ecologically sensitive areas, and to foster better social interactions. However, the potential of low and medium-density residential developments with larger gardens as better places for producing on-site local food, promoting efficient water consumption, and enhancing biodiversity and ecological functions has been well established. Further, large gardens were more likely to contain particular features that are important for urban ecological functioning such as tall trees, mature shrubs, areas of un-mown grass, vegetable patches, ponds and composting sites (Ghosh 2010). Recognised pressures on the terrestrial and aquatic environment from urban residential development include:
 - Land conversion from agriculture to residential
 - Loss of remnant vegetation (upper, mid-storey and groundcover layer)
 - Simplification of the environment (loss of fauna habitat)
 - Backyard water consumption
 - Introduction of potentially invasive plant species and pest species (e.g. Cotoneaster, cats, goldfish)
 - Urban runoff contributing to nutrient, sediment and pollutants into waterways
 - Increase natural resource use
 - Increase in water demand to water filtration plant and water release from sewage treatment works
 - Alteration of catchment hydrology - increase in stormwater runoff;

- *Rural residential development in inappropriate locations in relation to areas of high biodiversity value* - areas outside existing villages and rural settlements can impact on native remnant vegetation (clearing, introduction of exotic species, modification of groundcover), groundwater quality from septs and quantity from water extraction, increased pressure on native fauna from domestic pets etc.;
- *Residential developments and other activities impacting on areas of high conservation value* - areas not protected in the local planning instruments (activities involved with agriculture, mining, utility providers);
- *Lack of biodiversity knowledge or data on biodiversity assets* that should be protected in the local planning instruments;
- *Developments approved without due consideration of all the environmental impacts* that are likely to occur as a result of the development;
- *Community ignorance, lack of motivation or lack of incentive* - some inappropriate actions can threaten biodiversity, e.g. firewood collection, illegal fishing, four-wheel driving causing erosion, high water consumption etc.;
- *Disturbance to biodiversity along roadways* - mechanical injury to vegetation, tree removal and pruning, spread of weed propagules and the inappropriate location of works depots and stockpile sites;
- *Lack of forward planning for the management of native fauna species* threatened by controversy (e.g. Grey-headed Flying Fox, urban possum populations);
- *Lack of integrated planning for the management of biodiversity in key areas* - areas requiring pest or weed control, rehabilitation, protection or enhancement;
- *River regulation and extraction* is on-going and has the potential to increase the impacts on biodiversity as population grows;
- *Limited resources to undertake environmental work* for the protection and enhancement of biodiversity - includes financial assistance, human resources, plant/machinery, and knowledge;
- *Exotic pests, weeds, invasive species and pathogens* - invasive species modify ecosystems by establishing more successfully than native species and altering biotic interactions or ecosystem processes, or by preventing the re-establishment of native species. Note, however, that while exotic species can result in the extinction of native species introductions can also be beneficial in terms of food and fibre production;
- *Genetically modified organisms* - e.g. plants, microbes and animals are increasingly being used as a means of increasing agricultural production (Vadakattu & Watson 2004). However, there are risks that could be associated with the natural environment and some of these risks have been outlined in the 2003 NSW SoE (NSW OEH 2003). These include: increased herbicide residues in water, soil and food from their wider use on herbicide-resistant crops, escape of genetically modified organisms into the natural environment, transfer of altered genes to non-target organisms through natural gene exchange processes and the possible changes to the gut flora of wild herbivores;
- *Environmental education* - the decline in the number of key personnel with local knowledge involved in environmental management with the loss of the Environmental Studies Unit from the Bathurst Campus of CSU in 2000 and the associated courses, staff and a significant but small postgraduate student body; and
- *Ineffective partnering between parties to manage biodiversity* - e.g. weed management plans not implemented, pest species not controlled, community groups lacking financial and leadership support.

5. BIODIVERSITY DATA AND DATA GAPS

The Issues Paper detailed the *mapping* resources available for a number of biodiversity assets and landscape features including vegetation type, fauna, River Styles®, wetlands, key fish habitat, landscapes and land capability. Many of these were reviewed in terms of their quality, positional and attribute accuracy and usefulness in assessing biodiversity assets. Data resources, additional to those described in the Issues Paper, that are available in a number of formats, such as web sites, survey reports, government or agency databases and research documents are presented in **Appendix C**. As an aid to accessing more detailed information contained within these data sets a reference list along with their relevant web addresses are also provided.

5.1. Data gaps

This section identifies key gaps in biodiversity data particular to the Bathurst Region. The gaps in biodiversity related data could conceivably be an infinite record if every aspect of biodiversity is considered with every possible permutation of data format, scale and application. By prudent necessity the approach was taken to focus on the data gaps considered necessary for future biodiversity management by BRC.

First, a summary of data gaps as identified in the Issues Paper is provided followed by an additional set recognised as being important in the context of the BMP.

Summary of data gaps identified in the Issues Paper

- Current assessments are based on existing mapping, which does not generally completely align with LGA boundaries. There is a need to develop and maintain good mapping resources that detail vegetation, habitat, and flora and fauna resources for the Bathurst Region;
- Native grasslands are largely unmapped, and no condition ranking has been developed;
- Data are often not available in an accessible form; there is a need to convert report based hard data relating to occurrence of flora, fauna and vegetation communities to spatial data to determine current status and distribution of species;
- There is currently no inventory of public lands in Bathurst Region that includes a risk analysis matrix that can be used to prioritise rehabilitation activities; and
- No mechanisms in place to include and/or capture the knowledge held by members of the local Wiradjuri nation.

Additional data gaps

- Ecosystem condition and conservation value of BRC controlled lands (this data gap has been addressed in the BMP);
- The distribution of EECs on BRC controlled lands including road reserves;
- The distribution of EECs across the whole Bathurst Region;
- A consolidated database of areas with high or very high conservation value and with significant biodiversity assets across the whole Bathurst Region;
- Areas of BRC controlled land of poor or very poor biodiversity conservation value that could be reviewed for land use change or disposal;
- BRC controlled lands or freehold land parcels with high or potentially high conservation value that could be secured for conservation purposes;
- Local studies that address habitat and distribution of threatened or declining species in the Bathurst Region (e.g. Koalas);

- Biodiversity assets and threats to these assets on roads where BRC is the regulatory authority. The BRC Roadside Vegetation Management Guidelines has classified vegetation into high, medium and low conservation value road reserves. Other biodiversity assets such as EECs and threatened species are not recognised;
- Biodiversity assets on BRC's facilities other than roads (e.g. water storage dams, water filtration plant);
- An understanding of the Flying-fox ecology in the Bathurst Region;
- Areas within the former Bathurst City LGA with a high proportion of native grasses and forbs that should be subject to a change in slashing practices;
- Fauna, flora and threatened species present in areas of high or very high conservation value on BRC controlled land;
- Gaps in the biodiversity-related education resource material available to BRC;
- Understanding of Wiradjuri Country and their understanding of ecology and natural history;
- Understanding the causes of community disinterest, lack of awareness or knowledge of biodiversity; and
- The community's attitudes towards continued growth and the impacts on biodiversity.

PART C:

BIODIVERSITY CONDITION ASSESSMENT

6. INTRODUCTION

One of the key components of the BMP was to provide an assessment on BRC controlled land within the Bathurst Region. As a land owner, manager and developer BRC plays a key role in biodiversity management with responsibilities in ensuring adequate care of its land in its control. These lands include roads, recreation and other reserves as well as operational and development lands both in the urban and rural landscape. Currently these lands are managed for a number of outcomes and include environmentally-related objectives. Land management is currently tailored to the function of the land use and requires input from the planning, engineering and environmental departments of Council. As expected, the focus for land management is not always founded on biodiversity principles of conservation or enhancement. It would be unrealistic to expect it to be of prime importance or even to be relevant if, for example, the land is a small parcel of operational land (e.g. pump site) or its key function is for community service (e.g. city car park, library, aquatic facility and the stately high maintenance area of Kings Parade). However, there are a significant number of land parcels with the potential for biodiversity conservation and enhancement and for improving conservation linkages across landscapes.

Biodiversity assets and the condition of these resources on Council controlled land are largely unknown. While a number of studies have been undertaken in the Bathurst Region that work towards addressing these issues, they are not integrated and specific to biodiversity (refer **Appendix D** for an outline of some relevant regional studies). Further, the Issues Paper identified that there are data gaps in our knowledge of land, water and biodiversity assets and vegetation of high conservation value.

The aim of this biodiversity condition assessment is to reduce the knowledge gap by providing a biodiversity assessment of the parcels of Council controlled land. This has been achieved by rating the ecosystem condition of each parcel of land and rating its value for biodiversity conservation. No flora and fauna studies as such were carried out in conducting each assessment.

Results from this condition assessment are essentially a biodiversity audit that provides the benchmark for future studies and the foundation for land use planning and development. They also form the basis for developing some site-specific strategies, recommendations and actions that are presented more fully in **Parts D and E** of the Plan.

6.1. Guiding principles for the condition assessment

The condition assessment has been developed in consideration of a number of guiding principles that ensures the delivery of relevant and meaningful outcomes. The condition assessment was designed to:

- Rate *ecosystem condition* in parcels of land with a multiplicity of land uses and in a likely range of conditions from near natural to highly degraded;
- Rate each parcel of land based on its intrinsic *conservation* and ecosystem processes and services values;
- Identify the key threatening processes operating at each parcel of land as a means of developing strategies to manage these processes;
- Provide a benchmark against which future monitoring programs are likely to detect change;
- Enable sites to be compared;

- Utilise a rapid-assessment methodology that is simple to use, repeatable and comes with supporting explanatory notes enabling consistent future monitoring by different users;
- Integrate both species and ecosystem process perspectives into the assessment process; and
- Be applicable to urban and rural parcels of land.

7. METHODS

7.1. Developing the assessment protocol

The use of rapid condition assessment methods utilising pro forma or datasheets is common practice when evaluating condition or conservation value of remnant vegetation – particularly in the rural or non-built environment (e.g. the field protocol for benchmarking woodlands and forests in the ‘Benchmarking Biodiversity Values Project’ developed by NSW DECCW (n.d.), Victorian Department of Sustainability and Environment’s ‘Habitat Hectares’ (DSE 2004) and the computer-based Biodiversity Incentive Tool (BIT) also developed by NSW DECCW (refer Biobrokers Pty Ltd (2011)). The BIT was given due consideration as it is currently widely used by local governments. It is also a standardised way of undertaking biodiversity assessments aligned to the OEH’s ‘Biometric’ (Gibbons *et al.* 2008), which is a terrestrial biodiversity tool for the NSW Property Vegetation Planning System.

After due consideration we determined that the BIT and a number of other assessment protocols developed for biodiversity and remnant vegetation condition assessments, while useful for what they were designed for, were not wholly suited to this project. Some of their key shortcomings (not specific to any protocol) related to the following factors:

- Incapacity to accommodate for both terrestrial and aquatic ecosystems;
- Failure to assess and provide a relative condition/conservation rating system on parcels of land with a multiplicity of land uses and function from low flow piped drainage reserves, formal parks, stockpile sites on road reserves to high conservation woodland reserves;
- The methods were mostly too time-consuming to undertake given the requirement for this project to assess hundreds of land parcels in a relatively short space of time;
- Intrinsic complexity; and
- Limitations of attributes – particularly relating to ecosystem processes and function and acknowledging ecosystem services.

To meet the needs of the condition assessment as guided by the principles set out above a project-specific rapid assessment pro forma/datasheet was developed and is presented in **Appendix E** along with supporting explanatory notes.

7.2. Allocating land parcels to a datasheet

One of the greatest challenges in undertaking the condition assessment was the large number of land parcels requiring assessment. Within the whole Bathurst Region there are around 760 sites from Hill End to Trunkey Creek which are owned or controlled by BRC. Some parcels stand alone (e.g. Centennial Park), while others are grouped together to form a unified area, such as Jaques Park that comprises 24 parcels. However, there are some groups of parcels that are not necessarily unified and although geographically ‘neighbours’ their land use, environmental characteristics or even their past, current or future management may be significantly different to warrant different assessments. One datasheet per land parcel would have been unwieldy and grouping unlike neighbours grossly ineffective, therefore steps were

taken to effectively and efficiently reduce the number of individual assessments. These steps include the following:

- First, BRC excluded 124 parcels from the assessment process. These parcels included the library, car parks, sewer pump stations, buildings, childcare centres, airport buildings, driveways etc.;
- The remaining land parcels were arranged according to 'suburb' as contained within BRC's GIS system. These include areas such as Abercrombie, Bathurst, Kelso, South Bathurst, Raglan, Sofala, Trunkey Creek etc.;
- Within a 'suburb' land parcels were grouped together and assigned to one datasheet if their relevant characteristics (land use, management, vegetation, etc.) were relatively similar (e.g. road reserves);
- Where no discernible similarities were present each parcel was allocated a separate datasheet;
- Adjoining land parcels with *dissimilar* characteristics were assigned into a different datasheet either on their own or in combination with similar though geographically distant parcels;
- At times adjoining land parcels with similar characteristics were placed into different suburbs within the GIS system. In these cases the land parcels were assessed on the one datasheet despite being from different suburban categories (e.g. Boundary Road Reserve contained within both Robin Hill and Mitchell suburbs); and
- There were many instances where the time taken to determine groupings or separations was potentially longer than the time taken to undertake an assessment. So there are many datasheets where there is no apparent logic to the allocation of parcels i.e. similar land parcels have been grouped in some areas whereas in other areas similar parcels may have been assigned to a separate datasheet. This is only a logistical consequence to undertaking the assessment and does not affect the assessment outcome.

7.3. Assessment process

7.3.1. Assessment period and recent climate

The assessments were undertaken in September 2011 following above average rainfall for Bathurst in the preceding summer and early autumn seasons. Prior to these good rainfall events the Bathurst Region was experiencing a prolonged drought. Climate data from the Bureau of Meteorology (2011) also showed that from mid-autumn to mid-winter the recorded rainfall was less than average, though this picked up by the end of winter. However, with rainfall well exceeding evaporation during the cooler months the soil moisture deficit would not have been great.

7.3.2. Desktop and in-field assessments

The high number of land parcels necessitated the need for a number of assessment strategies to be employed so as to cover all land parcels in the urban and rural areas. Good local knowledge of the area allowed for a reliable desktop assessment to be undertaken for most sites in the former Bathurst Region - particularly as one or both of the authors were involved in the Bathurst Vegetation (VMP) and Urban Waterways Management Plans (UWMP). The use of remote sensing data supported the desktop assessments where necessary (e.g. to help identify land parcels). Further, some land parcels were visited to verify key aspects, such as whether or not the site was a Box-Gum Woodland EEC or non-threatened eucalypt woodland.

All parcels outside the former Bathurst Region were visited except for the forested crown land at Mount Tarana, which is not readily accessible and as both authors had recently driven through the NSW State Forest administered forest just west of this parcel, it was considered unnecessary to expend many hours visiting this site.

7.3.3. Data collection

The pro forma was used to record data for each land parcel or group of parcels in accordance with the guidelines set out in **Appendix E**. The pro forma has the flexibility to assess terrestrial and aquatic ecosystems as well as a combination of both. The key ecosystem condition attributes cover upper and midstorey vegetation, groundcover vegetation, terrestrial and aquatic habitat, water quality and geomorphic and hydrologic characteristics. Components of these attributes address such elements as endemism, vegetation structure and connectivity in the landscape, composition and health. Attributes for conservation value address the values of vegetation, habitat, ecosystem services and other conservation elements, ecosystem processes and function.

For land parcels that are highly modified or degraded and it was known at the outset that all the attributes would score very poorly, only a partial assessment was undertaken. That is only a site description and summary condition and conservation ratings were recorded. Examples include playing fields with mown exotic grasses, sites with buildings/infrastructure surrounded by very poor vegetation structure (e.g. Rural Fire Service stations), low endemism or cover (some playgrounds, low flow drainage lines, road reserves) or sites where biodiversity enhancement is excluded due to other values taking precedence (e.g. Kings Parade).

7.3.4. Limitations

The land parcels are not necessarily homogeneous and this creates problems during the assessment process. Parcels may have vastly different condition or conservation ratings, for example a playing field with very poor biodiversity value adjacent to high value remnant bushland (e.g. Trunkey Creek oval). During the condition assessment one drainage reserve in Kelso was split into sub-parcels (a) and (b) to accommodate for an engineered section with a low flow pipe and another section with an open channel with significantly higher conservation value. This is an ideal approach to take; however, it was not continued due to time constraints and problems with condition/conservation value mapping. It is recommended that for key areas warranting future investigation this approach is further investigated.

Parcels are rated relative to each other and given an ordinal score ranging from 0 (very poor/highly degraded), 1 (poor, degraded), 2 (moderate), 3 (good) to 4 (very good/near natural). With only five categories and a very wide variation in land condition and conservation value, assigning an appropriate rating is not to be taken as an exact science. An analogy would be to categorise the whole of Bathurst's population into five health categories. Some people may be easy to categorise, especially at the extremes of health, but for the middle-ground group some could fit into one or two categories – a big band of health condition has to be squeezed into each category. Creating more categories, in fact does not solve the problem, but makes it worse by increasing error, assessment time and unnecessary and meaningless detail.

8. RESULTS

8.1. Presentation of results

The information from the datasheets has been used to guide the development of some strategies, recommendations and actions (refer Parts D and E) either as site-specific management recommendations or for more general, strategic application.

The overall ecosystem condition and conservation value of each parcel has been mapped - the scale of which is too large to be presented in its entirety for the whole Bathurst Region and even for just the former Bathurst City LGA without losing important detail. Therefore, the mapped layers have been divided into sections and are presented in **Appendix F**.

It needs to be noted that no direct comparison should be made between results from the UWMP urban waterways condition ratings and those from this study, as the condition attributes, and therefore the basis for the overall rating, were different. Also the UWMP concentrates on the riparian zone with the sample being a relatively homogeneous section of stream, whereas the biodiversity assessment may include a parcel of land with a heterogeneous stream section and a portion of a terrestrial ecosystem.

8.2. Key findings

This particular study resulted in a number of key findings about ecosystem condition, conservation value, ecosystem assets, conservation linkages and threats to biodiversity.

8.2.1. Ecosystem condition

These findings only relate to Council controlled land within the former Bathurst City LGA unless otherwise stated.

The qualification of the ratings for ecosystem condition and conservation value and how these relate to the general characteristics of the vegetation and ecosystem are described in **Appendix E**.

- The assessment of ecosystem condition included terrestrial and aquatic vegetation, ecosystem processes as well as the habitat value provided for fauna and flora. Ecosystem condition in the majority of parcels was rated as being **very poor to poor** with the cleared or prior grassland areas of Kelso, Raglan, the Macquarie River floodplain and Llanarth being the most degraded.
 - The degraded parcels of land cover urban drainage and road reserves, urban parks, parcels with amenity facilities, playing fields, access roads, agricultural land as well as operational land in the Mount Panorama precinct;
 - Factors contributing to *very poor* or *poor* ecosystem condition ratings are varied and occur in a number of permutations across sites. Some of the key factors include: loss of remnant vegetation, modification of the ground layer, mechanical alteration of the land parcel, replacement of the original vegetation with exotic species, change in the local hydrology, loss of vegetation structure, removal of habitat complexity and the lack of interconnectedness in the wider landscape. Important ecosystem processes assessed as malfunctioning included the carbon, water and nutrient cycles; and
 - Parcels rated as *poor* generally had some attribute or attributes which improved its value over sites with *very poor* status. Examples include groundcover with a moderate to high proportion of endemic species (though probably lacking good structural, species or habitat diversity), native tree replantings (not necessarily indigenous or with native midstorey or ground cover species) and the presence

of isolated remnant trees and aquatic vegetation (with a considerable loss of integrity).

- Parcels rated as being in ***moderate ecosystem condition*** tend to include areas with remnant vegetation (though often with a degraded mid and understorey), areas of derived grasslands or areas replanted with native vegetation. Parcels may also include waterways that have riparian vegetation and aquatic habitat features of *good/moderate* value, though is compromised by factors such the presence of weeds or the remainder of the parcel being in poor condition. Areas in *moderate* condition include, for example, Blayney Road Reserve, open space areas and parks adjacent to the Macquarie River, McPhillamy Park on Mount Panorama, Jaques Park along Hawthornden Creek, Hector Park and Booth Street Reserve.
- Areas of ***good ecosystem condition*** are restricted to parcels or portions of parcels with good quality vegetation remnants and are located in the upper hillslopes inside Mount Panorama racetrack and in the Sir Joseph Banks, Boundary Road Reserve and Brooke Moore Oval Reserve. The area of good quality native vegetation on Council controlled land is relatively small in the former Bathurst City LGA.
- There are no areas that are rated as having ***very good ecosystem condition*** in the former Bathurst City LGA.

8.2.2. Conservation value

These findings only relate to Council controlled land within the former Bathurst City LGA unless otherwise stated.

- The conservation value of Council controlled land is mostly ***very poor to poor*** and these include parcels of land similar to those with *very poor* to *poor* ecosystem condition.
 - Raglan and Kelso, in particular, lack areas with adequate conservation value on Council controlled land. Each of these areas lies in areas where most of the woodlands and grasslands have had over two hundred years of disturbance through grazing, orcharding and urbanisation. Significant gullyng of drainage lines has further compounded the land use impacts. As a consequence native species have been largely replaced by exotic groundcover species and ecosystems rendered dysfunctional. Urban development was and is continuing to be built on a very poor conservation base; and
 - The suburbs of Llanarth and Abercrombie to the north-west of the Bathurst City also lack areas of conservation value – except for parcels adjacent to the Macquarie River. Clearing of vegetation for agriculture, including groundcover species, has resulted in a *poor* conservation base for urban development as for Kelso and Raglan.
- There are a number of parcels of Council controlled land rated as having ***moderate conservation value***.
 - The majority of these run from the Mount Panorama precinct and thread northwards through the suburbs of Mitchell, West Bathurst, Windradyne and along Sawpit Creek. These parcels contain remnant stands of the Box-Gum Woodland and Tablelands Basalt EECs or are Box-Gum Woodland Derived Grasslands (albeit degraded in terms of structure, species composition or disturbance impact). Remnant vegetation linkages to the Macquarie River are truncated at Llanarth;
 - Other parcels given a *moderate* conservation value adjoin or comprise a section of an urban waterway or Macquarie River. These waterways, although they may not be in *good* condition within the parcel, are important conservation

- linkages in the urban landscape. In other cases the waterways may be in *good* condition, while the surrounding terrestrial landscape devalues the parcel's overall conservation rating; and
- Some of the parcels that include waterways systems have *moderate* conservation values as a result of rehabilitation works. Prior to works, some of the waterways were heavily infested with willows and other exotic plants, gullied and were geomorphically unstable. In time their relative conservation value would be expected to improve.
 - The areas with **good conservation value** (Boundary Road Reserve, Sir Joseph Banks Reserve, Brooke Moore Reserve, Hector Park and the proposed Bike Park between Vale and College Roads) look proportionally quite large compared with the other land parcels. However, while the parcels tend to contain remnant patches of vegetation that could be rated as being *good* or *very good*, there are other areas within the parcel that devalue the overall condition rating. All these parcels (except along the Macquarie River) contain significant remnants of the Box-Gum Woodland EEC or the locally restricted White Box (within the Box-Gum Woodland EEC) and the Tablelands Basalt Forest EEC with good groundcover composition.
 - In Hector Park the groundcover vegetation has been compromised due to slashing and weeds, though the overall conservation rating is *good* due to the inclusion of the Jordan Creek pool-riffle rehabilitation area;
 - The Macquarie River between Hereford Street and the railway bridge was given a *good* conservation rating because of its regional significance for biodiversity, ecosystem function and ecosystem services values and conservation linkages. Its overall conservation rating was devalued due to the degradation of the riparian zone. On-going rehabilitation works could improve the status over time; and
 - Ecosystem function and processes as well as some ecosystem services provided by the diversity of living things make a positive contribution to the conservation value in parcels with a *good* overall conservation value.
 - The urban area of Bathurst is devoid of parcels with **very good conservation value**, but as stated above there are patches *within* parcels that rate very highly and these are around Mount Panorama, Boundary Road Reserve and Brooke Moore Oval.

It was not unusual for the conservation rating of a given parcel to be different to the condition rating by either having a higher or lower value. As examples, the condition of the woodland in Sulman/Reid Park (south and west of Mount Panorama) has been compromised as a result of ground disturbance, clearing, significant weed invasion and lack of recruitments at the top of the Mount. Its overall condition was given a *moderate* rating. However, the presence of the Box-Gum Woodland and the possible Basalt Tableland Forest EECs, the locally restricted White Box and portions of the parcel with high value woodland comprising native grasses and forbs renders this parcel with a *good* conservation rating. Far less commonly, on the other hand, are parcels with a condition rating higher than a conservation rating and these tend to be areas planted with native species (not necessarily indigenous) for the purpose of amenity rather than conservation.

Ecosystem services, and therefore conservation value, may also be provided by non-native biodiversity and artificial landscapes. For example in Machattie Park the trees and gardens are of cultural heritage significance, they provide the setting for recreation, are valued aesthetically, provide temperature regulation, shade and shelter for park users, habitat for urban wildlife such as possums and the duck ponds are enjoyed by visiting families.

8.2.3. Villages and rural areas

Vegetation condition, conservation value and the key threats and impacts on Council controlled land in the villages, rural settlements and outlying areas are outlined below.

Peel village

Peel village²⁰ has a repository of land with ***very good ecosystem condition and conservation value*** and some of the land parcels controlled by Council contain significant biodiversity assets. The biodiversity value is enhanced due to the connectivity with other patches of bushland in the area. Conservation and vegetation condition outcomes have the potential to be improved in some areas with varying degrees of management input. The threats to vegetation condition include a general lack of awareness of the significance these parcels have for biodiversity by Council and possibly the wider community and the risk this could pose through inadvertent damage caused by road works operations (e.g. stockpiling material, road drainage) and other activities. Grazing and the impacts from a decommissioned quarry are continuing to devalue the vegetation condition and conservation value on other land parcels controlled by Council.

Wattle Flat

The racecourse site is surrounded by a dry sclerophyll forest/open forest of ***very good conservation value*** and it is the only parcel of land controlled by Council in the village with such significance. The forest is rated as being *very good* in terms of its condition, conservation value and connectivity to surrounding bushland, though is compromised by the land use and land management around the racetrack and golf course. The area set aside for recreation has been partially cleared, is regularly slashed and appears to be periodically burnt. There also appears to be some dumping of land fill with weed propagules present. As a result many exotic grasses and forbs have germinated and threaten the integrity of the site.

Sofala

Sofala has had a long history of land disturbance through colonisation, agriculture and gold mining and this is evident by the invasion of garden escapes, agricultural and environmental weeds, mullock heaps and diggings around the village and outlying areas. Noxious weeds present on Council controlled land include St. Johns Wort, Blackberry, Serrated Tussock and willows. Around the village the parcels in the control of Council tend to have ***very poor to poor conservation values***; whereas the Turon River reserves (upstream of the village and at the Oakey Creek campground) were assessed to have ***moderate to good ecosystem condition and conservation values***. The riparian zone is under constant threat from exotic trees, particularly in the village, the community's desire for the River Sheoaks to be 'managed' for flood control and groundcover weeds.

Turon River reserves, Crudine

The adjoining Turon River reserves near Turondale have ***moderate/good conservation values*** primarily due to the asset of the riverine ecosystem. However, the conservation value and the overall ecosystem condition rating of both the aquatic and terrestrial ecosystems in each reserve have been significantly compromised from both past pressures and on-going threats. The structure of the vegetation has been modified with the woodland being historically cleared or partially cleared, the fringing River Sheoak forest is degraded and showing signs of some dieback and a general lack of new recruitments, and the midstorey woodland vegetation is mostly devoid of native species. The ground layer shows a

²⁰ Peel is still zoned 'Rural Land' and is not yet a village, though is grouped as a village in the BMP

significant loss of structural and compositional integrity with the grasses and forbs being predominately exotic and through disturbance from vehicular movement and ground clearing around camp sites. The reserves are popular for camping and recreation and weed invasion and the dumping of rubbish are likely to cause on-going threats in the area under the current management regime.

Hill End

The most significant biodiversity asset on Council controlled land in the Hill End district is the Scribbly Gum (*E. rossii*) - Red Stringybark (*E. macrorhyncha*) open forest located within the old racecourse and showground site. This area has been rated with a **very good conservation value and ecosystem condition** primarily due to the structural and compositional integrity of the vegetation. Notwithstanding, the area is threatened by localised sheet, rill and gully erosion along the old racetrack and unsealed roads.

Perthville and Georges Plains

Council controlled lands in these villages, which include a small park, pump sites, sportsground, Rural Fire Service shed and vacant land, have **very poor conservation value and ecosystem condition** ratings. The parcels are mostly small, disconnected from remnant vegetation and are generally devoid of native vegetation.

Trunkey Creek

Trunkey Creek has some **good ecosystem condition and conservation value** vegetation on Council controlled land that includes a forested reserve adjacent to the sportsground complex, a Box-Gum Woodland EEC on a road reserve to the south of Trunkey Creek and a reserve to the north of the village on Mulgunnia Creek with a patch of Box-Gum Woodland EEC in the valley floor as well as an Apple Box/Ribbon Gum community. These patches have good connectivity to other areas of bushland in the area. The road reserve site is under threat from the stockpiling of material from road works and possibly for powerline clearing. There are other small parcels of land within the urban footprint that are highly disturbed and offer very little towards biodiversity conservation.

Fosters Valley

The land parcels in this valley, situated between Trunkey Creek and Rockley, include a stockpile site in a **very poor conservation value** road reserve and a de-used road reserve, which has been incorporated into the adjoining farmland and is cropped and grazed.

Rockley

A significant threat to biodiversity on Council controlled land in the Rockley village is the invasion of exotic weed species. The Box-Gum Woodland EEC on the eastern hillside of Pipers Creek has a dense layer of exotic shrub and groundcover species that suppress the growth and establishment of native flora species. Coupled with this is the loss of native riparian vegetation, replacement of native floodplain vegetation with ornamental species and the modification of the natural creek hydrology with a weir structure. However, the weir provides habitat for a small local platypus population. The habitat complexity of Pipers Creek and the presence of an EEC provide some value; however, with the other modifications and continuing threats the **ecosystem condition and conservation value is moderate**.

The sportsground complex is the other significant area of Council controlled land and it is devoid of native vegetation with the original woodland/open forest being replaced by exotic trees and groundcover species. Other small parcels of land within the village have **very poor**

ecosystem condition and conservation value ratings due its urban land use and amenity buildings.

Napoleon Reef

The cover of remnant vegetation around Napoleon Reef is relatively high compared to the extensively cleared agricultural land west towards Bathurst and BRC controls a significant proportion of **good ecosystem condition and conservation value** vegetation contained within an elongated strip running from Walang Drive to Napoleon Reef Road. Clearing of the upperstorey for transmission lines creates a linear disturbance in this remnant and constitutes the most visual impact in the area. There is also evidence of eucalypt regrowth to suggest a past history of clearing. Other threats are not as pronounced, though are likely to include, for example, firewood collection and predation by exotic pests.

Mount Tarana

Mount Tarana is on a parcel of land controlled by Council and has a **very good ecosystem condition** rating and is of **very good conservation value** due to its intactness and very good vegetation condition. It has some linkages to significant native forests under the control of NSW State Forests. It is likely to be a harbour for some exotic pest species as it adjoins farmland and is difficult to access and therefore undertake pest control.

Chifley Dam

Chifley Dam offers the Bathurst Region a very significant ecosystem service in the storage of reasonably high quality water. However, this has come at a cost to the environment with the alteration of natural water flows, the flooding and disturbance of the Campbells River upstream of the spillway and a barrier to fish passage. Other threats to biodiversity include hillslope and gully erosion and the movement of sediment and nutrient into the dam and the bloom of cyanobacteria that can result from high levels of phosphorous build-up. Grazing and the presence of pest and weed species both on land and in the water (e.g. foxes, cats, rabbits, redfin, St Johns Wort) further reduce the vegetation and conservation value of the area. The overall **ecosystem condition and conservation value is moderate** and assets include vegetation communities comprising the Box Gum Woodland EEC and the aquatic habitat of the riverine and dam ecosystems.

Winburndale Dam

Winburndale Dam provides water storage for Bathurst City and in this respect contributes to the ecosystem services it provides. Similarly to Chifley Dam, it has come at an environmental cost. The woodland and forest ecosystem in the precinct are rated as having a **good ecosystem condition** and **very good conservation value** attributable to the structural and compositional integrity of the vegetation communities, the high functioning of ecosystem processes and favourable fauna habitat. Weeds (Radiata Pines, gorse), the occasional uncontrolled fire and feral animals (pigs, foxes and cats) pose continued threats on the biodiversity in the area. The dam wall poses a barrier to the passage of native fish, though has benefits in restricting the upstream migration of European Carp.

8.2.4. Linkages

Connectivity with remnant vegetation or riparian linkages in the rural areas has been addressed in the section above. These points relate more specifically to the former Bathurst City LGA.

- There is some linkage of the Box-Gum Woodland EEC on Council controlled land running through the urban landscape. The condition of the vegetation is rated

mainly poor to moderate due to a general lack of structural integrity of the woodlands (e.g. only isolated trees remaining, lack of mixed ages classes of the eucalypts, slashing of the groundcover, habitat loss) and poor species composition (e.g. high proportion of exotic species in the shrub or groundcover layers, amenity planting of exotic species or non-endemic natives). Areas on Council controlled land comprising the Box-Gum Woodland in good condition are confined to Mount Panorama, Boundary Road Reserves and the Brooke Moore Oval conservation area.

- The remnants are fragmented into small patches such as isolated trees in parks and reserves to larger patches with some significant understorey. Importantly, however, these linkages are supported by other remnants of the EEC on land not controlled by Council both within the urban, peri-urban and rural landscapes. Again these remnants tend to run from the Mount Panorama precinct to Windradyne with connections to the wider rural landscape along drainage lines and road reserves.
- Conservation linkages include other patches of remnant vegetation that are not Box-Gum Woodland EECs and these are inclusive of many different types of vegetation communities. For example, at the top of the Mount there are remnants of a Ribbon Gum (*E. viminalis*)/Apple Box (*E. bridgesiana*) woodland; the riparian zone offers significant conservation linkages in terms of its riparian and instream vegetation and habitat features; and the extensive plantings of native and exotic vegetation throughout the whole urban and peri-urban area provides some conservation value - albeit very poor in some places.
- Many of these conservation linkages addressed above have been identified in the VMP and the UWMP.

8.2.5. Key council land assets

The complete list of biodiversity assets on Council controlled land (across the whole Bathurst Region) that takes an inclusive approach recognising species, ecosystem processes and ecosystem services, would be beyond listing. Therefore the assets have been specifically restricted to include only significant ecosystems and these are as follows:

- Riparian ecosystems
 - Macquarie River ecosystem from White Rock to Jubilee Park on Council controlled land
 - Lower Sawpit Creek riparian zone and its tributary to Colville Street (between the Mitchell Highway and the Macquarie River)
 - Vale Creek riparian ecosystem – lower reaches and at Perthville
 - Jordan Creek riparian ecosystem at Hector Park
 - Hawthornden Creek – Boundary Road Reserve, between Havannah and Bant Street and Morcom's Reserve
 - Raglan Creek on the Macquarie River floodplain
 - Raglan Creek below Illumba Way to detention basin
 - Raglan Creek opposite the Scots School
 - Piper's Creek, Rockley village
 - Turon River (alongside Oakey Creek camping area and to the west of the village alongside parcel No. 39177)
 - Trunkey Creek district, Trunkey village (Parcel Nos. 249466, 24947) and Mulgunnia Creek (Parcel No. 39805)
 - Campbells River and Chifley Dam precinct
 - Winburndale Rivulet and Winburndale Dam precinct

- (Excludes low conservation value low flow piped channels, concrete drains, dry deep gully in Sofala, culverts, degraded and highly degraded engineered channels).
- Box-Gum Woodland EECs
 - Booth Street Reserve and surrounds
 - Sawpit Creek tributary, Llanarth
 - Brooke Moore Oval and surrounds
 - Blayney Road Common and Vietnam Veterans Park
 - Boundary Road Reserve and surrounds
 - Sulman and Reid Parks, Light Car Club track etc, Mount Panorama and surrounds
 - Area to the east of the waste management centre and south of College Road
 - Peel – reserve bounded by Church Street and Peel Road (old quarry site)-portion with Box-Gum Woodland (Parcel No. 29715), parcels on the corner of Peel Road and road leading into the village - Box Gum Woodland (Parcel Nos. 29716, 37606)
 - Sofala - Oakey Creek campground hillslopes (Parcel No. 39496)
 - Sally's Flat (Parcel No. 34210)
 - Turon River Reserve (Parcel No. 38388)
 - Chifley Dam precinct
 - Trunkey Creek road reserve (Parcel No. 39810)
 - White Box (as part of Box Gum Woodland EEC) between Barry Gurdon Drive and Mountain Straight (Parcel No. 16678)
- Box-Gum Woodland EECs (derived grasslands)
 - East of Citigate (Parcel No. 12080, 12081)
 - South of the old picture theatre site (Parcel No. 12046)
 - Parts of Sulman and Reid Parks
 - Inside track at the top of the Mount (Parcel Nos. 88139, 42645, 23206, 16665, 12068)
 - The old 'dip' site inside the racetrack (Parcel No. 12073)
- Possible presence of the Tablelands Basalt Forest EEC
 - Crest and upper slopes of Mount Panorama (Sulman and Reid Parks and inside the track)
 - Sir Joseph Banks Reserve
- High value woodland and forest ecosystems (urban and rural areas)
 - Peel - open forests in old quarry site and road reserve on the eastern side of the entrance into the village (Parcel No. 37605) (the latter does not refer to the Peel Common which is not controlled by Council)
 - Wattle Flat racecourse (Parcel Nos. 39158, 39157)
 - Oakey Creek camping area - River Sheoak riparian forest (Parcel No. 39496)
 - Turon River Reserves - River Sheoak riparian forest, (Parcel Nos. 39807, 38388)
 - Mount Tarana crown reserve (Parcel No. 38422)
 - Napoleon Reef (Parcel Nos. 29160, 29159)

- Trunkey Creek road reserve - Box Gum Woodland EEC and Apple Box-Ribbon Gum woodland (Mulgunnia Recreational Reserve) (Parcel No. 39805)
- Trunkey Creek sports ground forested reserve (Parcel No. 42721)
- Winburndale Dam (Parcel No. 28143)
- Ponds and dams important for water birds and aquatic fauna – water filtration plant (Parcel No. 27591), sewerage treatment plant (Parcel Nos. 16561-15563), Council pound (Parcel No. 20089), dam at McDiarmid Reserve (Parcel No. 23248), dam below waste management centre, upper Raglan Creek dam below Mars Petcare (Parcel No. 21890), Chifley Dam, Winburndale Dam
- Derived native grasslands

8.2.6. Key threats, land management issues and their impacts on BRC controlled land

There are a number of threats that impact on vegetation condition or the conservation value of Council controlled land. Some of these threats are from past actions, such as clearing, and have had long-term impacts on the condition and conservation value of the vegetation – at times exceeding ecological and geomorphic thresholds requiring significant resources to be rehabilitated.

Threats can also fluctuate in their intensity of impact and depend on land management practices both now and in the future (e.g. slashing, grazing, point-source pollution), population dynamics (e.g. increase/decrease in pest and weed abundance) and seasonal conditions (e.g. sediment and nutrient flux along drainage lines). In addition, the longevity of the impact can have deleterious consequences for ecosystem sustainability with unabated pressure causing long-term ecological dysfunction and a possible change to an alternate stable state when an ecological threshold has been crossed. An example may be continued grazing preventing upperstorey recruitment and the gradual conversion of a grassy-woodland into a grassland with predominantly exotic species.

Again there are other threats which have to be managed with some insight into ecological functioning, as the threat may also provide some ecological function. For example weeds in erosion gullies provide some bed and bank stability as well as tapping into deep nutrient sources unavailable to most grasses. While native species are preferred, the presence of groundcover vegetation, whether exotic or native is vital in these systems to prevent further degradation and in some cases provides a critical role in self-repair. Further, over time, these weed species may become less prevalent through natural selection processes. Another example may be the eradication of the European Rabbit. Although a particularly destructive species on the vegetation it provides a valuable food source for native predators (e.g. eagles) and pest foxes and cats. An absence or very low density of rabbits is likely to prey-switch foxes and cats to native species.

The threats to biodiversity are often a combination of impacts from past activities and more contemporary issues and as a consequence are very complex in time and space. It is not the intent of this report to expand on the analysis further other than to make the reader aware of its interrelatedness. The threats presented below are straightforward and are given with a list of causal impacts. The inherent complexities of these threats known to occur in the Bathurst Region underpin the development of some strategies and recommendations presented in Part D of the Plan.

Historic clearing

Historic clearing for agriculture, buildings and infrastructure changed the status of biodiversity in the Bathurst region forever and has probably been the most significant

pressure on our natural resources since European settlement. Clearing has resulted in the loss or alteration of vegetation communities, vegetation structure, species diversity, habitat and ecosystem processes. There have been further changes in catchment hydrology and the geomorphic processes of erosion and sedimentation. Most of the remaining remnant native woodland and forests within the Bathurst Region are regrowth following one or more clearing events associated with agriculture or 19th Century mining or both. Regrowth woodland is often in forest formation, and both woodland and forest often exhibit homogenous habitat.

Pests and weeds

There has been the introduction intentionally or otherwise of many animals that have subsequently become pest species. Significant examples are the domesticated farm animals and pets (e.g. feral pigs, cats, deer, European Carp, pigeons, Honey Bee), animals for sport and/or food (e.g. foxes, rabbits, trout, redfin), stowaways (e.g. mice, rats, Indian Myna, fruit fly) and controllers of other pests (Mosquito Fish). There are also native species that can under some circumstances threaten biodiversity values through grazing pressure, competitive exclusion or vectors of weeds (e.g. Noisy Miner, currawong, kangaroos). Some of the threats from pests would have been more significant in the past (e.g. rabbits causing extensive burrowing and vegetation loss), while other threats are less visually obvious (e.g. loss of small native animal species by fox and cat predation).

There are a significant number of plants which have reached weed status and continue to threaten biodiversity values in the Bathurst Region. Garden escapes, some classed as noxious, that have invaded terrestrial and aquatic ecosystems in the urban and per-urban areas of Bathurst include the commonly occurring African boxthorn, willows, poplars, privet, hawthorn, blackberry, sweet briar, Paterson's Curse and plums. Agricultural and environmental weeds such as Serrated Tussock, African Lovegrass, Chilean Needle Grass and exotic pastures grasses (e.g. Phalaris) are prevalent in many land parcels and can in some patches out-compete the native species. Pasture grass and forb species, commercial crops and orchards have also replaced native vegetation in some areas.

The use of exotic trees, most commonly willows, has been extensively used for erosion control in riparian zones and attitudes towards their use and function in the landscape is controversial. They are classed as 'Weeds of National Significance' and have been extensively removed in the Bathurst Region with some adverse impacts, most notably bed and bank erosion and some fauna habitat loss. Changes in best-practice tree removal and more effective rehabilitation methods can greatly influence the biodiversity outcomes. The threats and impacts of willows, therefore, can have varying effects on the status of biodiversity. In general, willows are a threat to biodiversity, but indiscriminate rapid removal without a well planned simultaneous replanting program can also be a threat.

Added to the threat of pests and weeds is the failure of management plans that address these issues to be implemented or adopted across land tenures. This can be seen with the incursion of weeds spreading from its source to neighbouring properties (e.g. Radiata Pine from pine plantations).

The TSC, FM and EPBC Acts have listed a number of these pests and weeds in their schedules and they include the competition and grazing by the feral European rabbit; competition from feral honey bees; herbivory and environmental degradation caused by feral deer (possible occurrence of Red Fallow Deer in low numbers around the forest of Mount Tarana, Johannes Bauer, *pers comm.* 2012); invasion of native plant communities by exotic perennial grasses (Serrated Tussock, African Lovegrass); predation by the European red fox,

feral cat and Mosquito Fish, and the predation, habitat degradation, competition and disease transmission by feral pigs as key threatening processes.

Erosion

Extensive land clearing, heavy grazing pressure from stock and rabbits, droughts and floods and mechanical disturbances have contributed to localised erosion and the reduced geomorphic resilience in the landscape – particularly on the erodible soils of the granite Batholith in the Bathurst Basin. The threats have resulted in widespread sheet, rill and gully erosion of the hillslopes and drainage lines with the consequent voluminous loss of topsoil, gullying in creeks and swampy meadows/valley fill systems, the loss of sediment and nutrients from their source and the continual flux of this material downstream. These impacts cause secondary threats to aquatic ecosystems by smothering habitat, reducing habitat complexity and causing eutrophication of waterways. It also reduces the resilience and productivity of terrestrial vegetation, changes the hydrological status of catchments by lowering water tables and increasing runoff and disconnecting streams from their floodplains.

Governing land use

There are land parcels controlled by Council that are primarily used for recreational, amenity or operational purposes and have had no consideration given to biodiversity values during land development and operation. In many cases it would not be feasible or desirable to change the primary function to accommodate for biodiversity, but in other areas there may be scope to make improvements within the existing land use constraints. Examples of these types of lands include sporting ovals, ornamental parks and gardens, narrow access roads, operational lands around Mount Panorama, aquatic centre, playgrounds and amenity areas. The impacts of the governing land use may involve whole or part of a particular land parcel and is most often a result of past activities. With rapid urban expansion and land development, in combination with little if any provision for biodiversity outcomes, these threats continue.

Other activities associated with the land use may cause unnecessary impacts, which you might expect at recreational areas, such as trafficking, vandalism, illegal fishing, littering, firewood collection, lighting of fires, erosion from pedestrian tracks, dumping of garden refuse etc.

Residential growth and development

Residential growth in the Bathurst Region is on-going and land is continually being developed to service the demand for housing and infrastructure. Growth is a 'big-picture' threat and has many attending impacts on the environment and our natural resource base - both in the current timeframe and in the future. The assessment process did not attempt to evaluate future impacts of growth developed on Council controlled land across the Bathurst Region, rather it provided baseline information on the current ecosystem condition and conservation value in the future growth area around Sawpit Creek. However it can be assumed, regardless of the type of development, that there will be, for example, a change in catchment hydrology, modification of vegetation structure and composition and change in water quality. Growth may also provide an opportunity for the enhancement of ecosystems in the Sawpit Creek area following an investment of funds and the active enhancement of the Box Gum Woodlands and riparian zone.

Slashing of groundcover grasses and forbs

Slashing is widespread across the urban and peri-urban landscapes. All accessible land controlled by Council is slashed, except for conservation reserves and areas designated no-

mow zones in drainage lines (though even some of those zones are being slashed). Slashing is being undertaken across vegetation types from high maintenance ornamental parks and gardens to Box-Gum Woodlands with native understorey grasses and forbs. Retaining some good quality groundcover patches in the Box-Gum Woodlands would elevate its vegetation condition and conservation value considerably.

Slashing is a current land management issue that has a number of possible deleterious effects on ecosystem function and integrity. Some of the impacts of slashing are listed below:

- Reduces biodiversity function by compromising the ability of the groundcover to trap water and nutrient; thereby creating a leaky system with the consequent dysfunction of the water, nutrient and carbon cycles and overall lowering of ecosystem productivity;
- Reduces the resilience of the grasses as the root mass decreases as above-ground mass decreases;
- Compromises the onset of flowering and seed-set, which limits the establishment and density of grasses and forbs;
- Facilitates the elimination of vertebrate species that are seed dependent - including threatened species;
- The simplification of groundcover structure and the removal of flowering parts of the plants reduces fauna habitat;
- Regular slashing can damage newly established and beneficial mid and overstorey species preventing their successful recruitment; and
- May encourage the growth of weeds, particularly the less desirable, quick-growing exotic annual species due to the reduced resilience of the native grasses (mowing increases light penetration to the soil, reduces grass competition and reduces root mass and onset of flowering of native grasses). Weeds, particularly exotic grasses such as *Phalaris* can also increase the fuel loading in fire risk areas, and therefore in a negative loop requiring an increased need to slash.

Firewood collection

The critical habitat value of bushland can be threatened by the illegal taking of firewood. Standing and fallen dead timber are one of the great missing elements across our landscape resulting in major regional species decline and losses (Lindenmayer *et al.* 2010). The availability of timber so close to the urban centre of Bathurst, and most particularly around the Mount Panorama precinct during ‘race week’, makes the threat more critical. This is a big legacy issue and probably will re-emerge with rising fuel costs and growing population.

Fire

Controlled fires have been carried out in Boundary Road Reserve in accordance with the Boundary Road Reserve Fire Management Plan (Mjadwesch 2003) as a means of protecting the assets within the Reserve, fuel loads are managed and environmental values are maintained or enhanced. Due to difficulties with encroaching urbanisation relating to smoke and potential complaints, slashing has been substituted for fire in reducing fuel loads.

Apart from a few, quickly extinguished, small fires deliberately lit around Bathurst, there does not appear to be much evidence of fires on council controlled land. Fires lit too frequently can negatively impact on both native animal and plant communities. The fire interval being too great or all together absent (for example the Brooke Moore Oval Reserve) also has implications for floristic composition and structure of the plant community.

Alteration of natural flow regimes

There are a number of structures that alter natural flow regimes in the Bathurst Region. In the rural area the most significant instream structures are the Chifley and Winburndale Dams. Other factors controlling flow include levees along the Macquarie River and Raglan Creek and small levees constructed by farmers along Vale Creek. The altered flow regimes directly affect floodplain land controlled by Council within Bathurst City. The alteration of flows disconnects the river to the floodplain and ceases the input of sediments, nutrients and organic matter to areas within the levee. Mostly the floodplain land inside the levee has diminished biodiversity value or is covered with landfill, so the cessation of natural processes is probably of little consequence in the contemporary landscape.

The past channelisation of Raglan Creek across the floodplain and the diversion of Vale Creek upstream of the railway bridge have significantly altered the flow regimes of these creek systems into the Macquarie River. These aspects have been covered more fully in the UWMP.

Water is extracted from Vale Creek for agriculture and for the demands of Georges Plains and Perthville communities. Bathurst City's water supply is sourced from Chifley Dam via the Macquarie River and Winburndale Dam via a pipeline. Water is also extracted from the dams on land not controlled by Council for the purposes of agriculture and industry.

Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands is listed in the TSC and FM Acts as a key threatening process.

Barriers to fish passage

Blocks to fish passage are a legacy from past road construction practices and flood control in the urban creeks in the former Bathurst City LGA. For example Hawthornden Creek on Vale Road, Sawpit Creek on Ophir Road and Jordan Creek on Durham Street have concrete culverts that act as barriers to fish under normal flow regimes. Also the two major water storage facilities, Chifley Dam, Winburndale Dam and the Water Treatment Plant weir are barriers to fish passage.

Anthropogenic induced climate change

It is difficult to separate climatic events attributable to anthropogenic induced climate change to the El Niño/La Niña cycles and other planetary causes. However, protracted droughts, intense storms, temperature variations from expected and a change in seasonal rainfall patterns, whatever the cause, has implications for biodiversity. Many of these impacts are not readily understood, for example, the effects of warmer soils on microbial activity and some impacts are speculative (e.g. change in migration behaviour, heat stress on fauna). However, we can reason that droughts and higher temperatures could slow the rate of native trees and shrub recruitment, floods can induce streambed and bank erosion causing modification and damage to riparian ecosystems, and a change in rainfall seasonality could influence groundcover species composition.

Most notable was the impact of the recent protracted drought on the health of trees in the urban landscape. The severe water stress caused dieback, canopy thinning and death, which can have a cumulative effect of reducing fauna habitat and reducing the ecosystem services the trees provide (e.g. microclimate regulation, visual amenity, cultural values etc).

Management options to address specific threats on land controlled by Council are addressed in Section 11.

PART D:

STRATEGIC FRAMEWORK

9. INTRODUCTION

BRC is in a position to respond to pressures and threats on biodiversity through strategic biodiversity management within its direct sphere of influence and across agriculture and other sectors through facilitation and leadership. The BMP has been developed for BRC to assist with future planning, monitoring and management of biodiversity in the Bathurst Region. It will be used to support Council in developing policies, inform strategic planning decisions and assessing development applications and defining a program of on-ground actions for BRC and the community to work towards. It is the ultimate vision that with the implementation of the BMP and biodiversity being managed on many fronts by those who share in the responsibility of its management, that the visions expressed below could be realised. By managing biodiversity Council are creating opportunities for enhanced community wellbeing, prosperity and connection to the natural world.

Ecologically sustainable development and biodiversity conservation are regarded as core business for local councils and with increasing pressures on natural resources and biodiversity assets, heightened public awareness and growing community sentiment these issues have become more critical for councils to administer. In particular, pressures on biodiversity are likely to increase given the population of Bathurst over the next 25 years is projected to reach 50,000. Notable impacts on biodiversity will likely occur with any on-going shift in land use from agriculture to residential both in the former Bathurst City LGA and in the rural villages and settlements and failure to address land degrading processes across the rural sector (including factors related to species declines and/or the extent and condition of native vegetation and associated habitat quality). Residential expansion modifies landscapes by altering the natural catchment hydrology (alteration of water flows in the Macquarie River through greater water demand from Chifley Dam, greater water release from the Sewage Treatment Works and stormwater outlets); changing the vegetation composition of the landscape; compromising fauna habitats and impacting on species diversity, and contributing to the loading of sediments, nutrients and waste product into local streams and rivers.

In concert with these urbanisation impacts are the 'constants' that threaten biodiversity across the Bathurst Region. Many of these are the direct result of European settlement including clearing, gully erosion, farming, grazing and the introduction and invasion of an almost immeasurable number of pests and weeds. The currency of such threats is still valid. For example, remnant vegetation is still removed for fencelines, roadways, in fire hazard prevention zones and building sites and the cumulative impact can be significant. BRC is also presented with new challenges as ecosystems face the uncertain impacts of climate change with predicted adverse changes in rainfall, temperature, a likely increase in the frequency of storm events, floods, droughts and the incidence of fire.

VISION

"Sheoaks humming with cicadas, spreading dappled light over meandering stretches of clear freshwater streams; native grasses and shrubs gathered to the edges tickling the ripples encouraging and giving protection to the abundance of aquatic life below; to glimpse a platypus in its inquisitiveness and solitude, a water rat noisily diving for crustaceans, fish plentiful and all secure in their natural habitat"

A local flyfisher girl and artist

What we see or what we hope to see as part of a vision statement for Bathurst Region's biodiversity in 2036 is very much determined by individual taste and perceptions. To corral the collective visions of the community into a short visionary statement is bound to turn it into a number of words which are merely placatory, as well as running the risk of being unimaginative or simply boring. Words or phrases such as 'sustainability', 'striving towards', 'intrinsic value of biodiversity', 'ecosystem services', 'community well-being' and 'ecosystem function' tend to go in the visionary mix. As readers we tend to gloss over these words, even though the intent of the vision may be quite valid in keeping our actions focused and true. It is a given that while this Plan has been developed in context with other local, regional, state, federal and global biodiversity related frameworks, the vision statement for how biodiversity is visually expressed in the Bathurst Region in the future would adopt these very same words or phrases expressed above. What a constructed vision statement lacks, however, is a sense of place, an expression of what we 'see' - what we see that is important to us as individuals, as community members and as producers of commodities from the land. We value biodiversity for what it is (its intrinsic value), but also for what it provides for our well-being, and ultimately because it literally underwrites Bathurst's future sustainability. Some personal visions were canvassed from the community to put some spirit into why it is important to manage the complexity of biodiversity for generations to come.

The year 2036

The year 2036 aligns with the Bathurst 2036 Community Strategic Plan (CSP). It is a high level, community driven, long-term integrated planning and reporting framework that aims to inform the community about the major directions and programs Council is undertaking in shaping the future of the Bathurst Region. The CSP will be revised at the commencement of each new term of Council with scope to engage with the community to address biodiversity issues and a **vision for biodiversity in 2036**.

Community visions for 2036

Imagine taking to the skies in a helicopter in 2036 and flying over the Bathurst Region exactly 200 years after Charles Darwin's historic summer horseback visit to Bathurst that subsequently resulted in some rather unflattering observations from the great man himself. In hindsight, we can interpret his observations as visual clues about significant adverse impacts that were beginning to appear in the regional environment so soon after European settlement commenced in 2015. What Darwin 'saw', in effect a dust bowl, is not the vision that any one has in mind as to how we would like the Bathurst landscape to look and function like in 2036. What however might we 'see' in 25 years-time, what visual clues will point to an improvement in local and regional biodiversity after many of the policies and actions suggested in this report have begun to be implemented, supported by ongoing outcomes from complementary studies such as biodiversity issues (Applied Ecology Pty Ltd 2010), vegetation planning (Mactaggart 2003), threatened species (Mjadwesch 2011a) and urban waterways (Mactaggart *et al.* 2010) to name just a

few of the roadmaps available to us. Such a flight (Darwin in a helicopter!) would enable us to test the health of the environment, check the equivalent of its pulse, blood pressure, skin and eye colour, very much like a first visit to a General Practitioner. Both well-being and sickness express themselves through visual external symptoms – this is true for humans and true for ecosystems and biodiversity. To dig deeper into the Bathurst Region's health would require specialist input and on ground surveys, but for the moment visual clues will do.

In spite of an extended drought period, now more frequently occurring, there is no dust in the air (in stark contrast to what Darwin observed in 1836), most paddocks have near 100% ground cover, even those being prepared for cropping. Weed infestations appears to be limited and native grasses are beginning to again dominate some grazing land, with natural plant successions being manipulated by clever farmers managing their stock and land much better - good for the bottom line and good for the environment and biodiversity. Stock numbers seem to be much lower than in previous droughts as landholders destock to ensure sustainable outcomes. A recent localised storm south of Bathurst in granite country has initiated freshes in a number of Campbells River tributaries, one or two unexpectedly running clear, but most still muddy and leaking resources. The rebuilding of resilience in the landscape is demonstrated visually by the observation of the clear running streams in granite country and elsewhere, consistent with an improving freshwater ecology and a healthier catchment. A closer flyover of those sub-catchments now facilitating sediment-free creek freshes, indicate more productive grasslands and healthier remnant native vegetation where farmers have initiated a range of restoration strategies aimed at functional repair in terrestrial and riparian landscapes, rebuilding soil health and the critical organic carbon component, thereby minimising nutrient losses and closing the local water cycle. Some incised creeks have been repaired resulting in creek beds and their adjacent floodplains now better able to capture silt and sediment due to a range of water slowing improvements including the return of reed beds. A number of swampy meadows in these landscapes have been restored along cut and fill landscapes that until recently were also incisions in the landscape. As we fly low along a reed bed dominated creek-line, we disturb reed warblers and a nesting Latham's Snipe, in spite of drought conditions, the first record of these species in this particular sub catchment. That is cause for celebration.

As we fly over the Millah Murrah area north of Bathurst, one property stands out in the drought, in spite of being bypassed by the recent storm event. It still has a tinge of green, healthy box woodland remnants, parts regenerating in response to appropriate stock management, are scattered across the larger than normal property. An extensive swampy meadow system has been restored and the localised sub-catchment is still very green indicating significant water retention in this area. A small tributary to the Millah Murrah Creek still runs at about one ML/day presumably a result of stored water in soils with higher than usual organic carbon, gradually seeping out into the catchment stream – good for the bottom line, biodiversity and flood mitigation. This property still has no need to destock, demonstrating as it has significant resilience in the midst of drought. A major woodland direct seeding program initiated possibly 2-3 years earlier and based on the latest research and practice, is flourishing along a 500m x 50m wide strip that links other woodland areas as well as providing an important windbreak, with both dominant tree species and understorey species present, as well as critical bacteria and mycorrhiza that were inoculated at the time of seeding.

Gaining altitude, the view of the broader landscape reveals one where significant restoration initiatives are progressing, albeit piecemeal and somewhat patchy in nature, where self-evidently there exists a momentum towards improving biodiversity values based on ecosystem repair, and consequently the unfolding of a visually pleasing landscape with greater resilience. When viewed from a landscape perspective, the

outcome is successional towards the creation of an anthropomorphic biome. The developing patterns in the landscape are: farm conservation lands centred on remnant forest and woodlands with limited grazing, sustainable grazing lands increasingly dominated by native grasses and herbs, and intensive production lands in valley floors and floodplains. Greater connectivity in the landscape has come about by increasing native remnant areas through regeneration along their margins or through ecological plantings, linking remnants primarily via restored creeks and streams and via the creation of significant expanses of habitat-corridor woodland-forest simulations along some stream lines, as windbreaks or as boundary markers. Fencing out of streams, rivers and farm dams, the latter now often demonstrating significant habitat upgrading, guards against stock damage, but ongoing stock access remains part of hands on management strategies. Evidence of many examples of micro-management of habitat can be seen in the landscape designed to increase habitat heterogeneity and overall species diversity, including the use of nest boxes to combat an ongoing shortage of tree hollows, forest and woodland ground-log supplementation, habitat thinning to create micro and macro succession and greater habitat heterogeneity, as well as intentional targeted plantings to value add to available plant and animal resources.

Flying in over Bathurst City in 2036, now approaching 52,000 people, housing density is much higher than in 2012. The urban creeks have been substantially restored and are important woodland corridors linking the heart of Bathurst with bushland remnants within the city boundaries such as on Mount Panorama and in the surrounding agricultural lands. Imaginatively landscaped areas in and around housing and in once vacant areas are readily visible and dominated by native plant species - not necessarily local in their origin. Linked native vegetation plantings have been established between domestic housing, streetscapes, parks and focal recreational areas such as Mount Panorama, urban waterways and the Macquarie River, as envisaged in past urban vegetation and waterways plans. Mount Panorama is a showcase of optimal integration of its ongoing use as a national racing track icon with nature conservation including the conservation of important eucalypt woodlands. The City's web of native vegetation plantings links seamlessly with that in surrounding agricultural land and nearby existing and new small rural subdivisions. (David Goldney)

As a keen birder my vision for the Bathurst regional biodiversity has an unashamedly personal bias towards these amazing creatures. I am acutely aware that the presence or absence of particular bird species and the trends in their populations, informs us of the health of the almost unknowable complexity of our landscape and biodiversity. To me they are touchstones, alerting me to the magic and beauty of the natural world. I see the biggest legacy of the Council 2012 Biodiversity Plan being the widespread respectful connection that the Bathurst regional community will have with the natural world. I see that community being positively led by its Council, highly motivated to protect and improve biodiversity and inspired by the diverse and extensive biodiversity work of its own Council. My desire to approach these matters as an impatient optimist leads me to believe that my grandchildren may well be smiling and celebrating our generation's contributions to this ongoing and difficult task when they judge our efforts in twenty years time.

A local bird-watcher

I'm sure from a Rahamim perspective we would like to see the Bathurst region grow into an environmentally, culturally, and socially diverse and integrated community that can value and support a healthy country and a happy spirit. Rahamim would like to see a better understanding of the earth, living within the limits of the earth's resources, respect for the dignity and humanity of all people and be able to experience the spiritual depths of the natural environment - human diversity. I suppose biodiversity underpins all of those values and our future depends on it.

Rahamim Ecological Learning
Community

Bathurst region will have its catchment and waterways repopulated with native trees and shrubs supporting a wide range of aquatic and terrestrial flora and fauna, stabilising banks and improving water quality. Forested areas are maintained and restored particularly on hilltops and with greater connectivity between them providing enrichment to our agricultural lands.

In the urban areas there is greater appreciation of our native vegetation and birdlife in backyards and on public lands and many come to enjoy the flourishing natural beauty and our unique flora and fauna around the Mount, Boundary Road and other nature reserves. Our streetscapes would be well treed (with native and introduced species) providing shade and amenity for residents as well as attractive to those transiting our town and where there are open grassed areas, native species will be used and reduced mowing will allow better soil coverage and urban drainage will encourage absorption and natural watering.

BRC Councillor

Biodiversity

You can tell when life is free to express in all it's forms
 There is a tangible energy
 Those who sit still enough can hear it
 Touch it
 Smell it
 Feel it.
 Can you hear the voices of those who cannot speak?
 The crackle of Earth, the whisper of wind
 The laughter of water as it bends closer to the core

You can tell when life is choked
 There is a tangible sadness
 Those who sit still enough can hear it
 It tears at them or nips at their soul with a longing for realised potential

Humans
 With all our mastery and adaptability
 And desperate clinging to visions of simplicity
 Perhaps it is easier for many to sit in the stagnant peace of stifled life force
 Than the perfectly coordinated anarchy of wilderness
 No inconvenience from the messiness of nature
 So much more predictable
 Straight lines

Still...
 It makes me smile
 All our efforts amount to little really
 She is still there
 Everywhere
 All the time

Thank God.

Local naturalist

9.1. A shared responsibility in biodiversity management

Managing²¹ biodiversity in the Bathurst Region is a shared responsibility and BRC is just one cog in a very large wheel. Each participating organisation, body or individual involved in biodiversity and natural resource management is tackling particular issues from their own perspective. Such responses are governed by their charter or purpose, resource capability, knowledge base, their world view and inherent spirituality, as well as various pressures they might be responding to. As such, biodiversity management is multi-faceted and at any point in time there may be many small 'management cogs' spinning, which mesh with slightly bigger cogs, with or without direct BRC input. With foresight, facilitation and strategic planning each cog can help to implement the community's journey towards achieving a shared vision as to what the Bathurst Region might look and function like in 2036 and beyond, including the optimisation of its biodiversity values. Each cog, no matter how small,

²¹ Management, for the purpose of this section refers generically to any activity that leads to the overall betterment of the biodiversity status in the region. Thus management can relate to on-ground works for restoration or rehabilitation, actions that ensure conservation and protection, direct management initiatives, research, education or monitoring and in some cases relying on natural processes alone.

has its place and can include responsibilities ranging from high-level governmental statutory planning to on-ground action at the paddock level by an individual.

The 'biodiversity management' net is cast wide to encompass the 'wider community' and this large assemblage is inclusive of government (at all levels), statutory bodies, community organisations and individuals. These groups and individuals tend to morph over time with new or altered bodies entering the system and as groups disengage, voids are continually created. The direction that biodiversity management is likely to head will also change over time as various groups and the management decisions they undertake shift to meet the challenges they are presented with. Such changes will likely reflect the current and projected pressures on biodiversity and the limitations posed by resource shortfalls, knowledge gaps or even lack of motivation. The groups and organisations outlined below do not cover all that may be represented in the Bathurst Region, though the list demonstrates the spectrum and diversity of the players working towards the overarching goal of managing biodiversity.

Federal and State Government

All tiers of government are responsible for managing biodiversity and for the federal and state governments this is largely directed through their relevant government agencies. The federal Department of Sustainability Environment Water Populations and Communities (SEWPAC) is responsible for administering the EPBC Act and in partnership with the Department of Agriculture, Fisheries and Forestry they administer the 'Caring for our Country' initiative delivering funds for environmental works, education and monitoring.

The NSW state government agencies²² responsible for biodiversity management include:

- The Office of Environment and Heritage (OEH) administers the Environmental Trust (empowered under the *Environmental Trust Act, 1998*), *Catchment Management Authorities Act, 2003*; *Crown Lands Act, 1989*; Part 7 Division 2 of the *Fisheries Management Act 1994*; *Native Vegetation Act, 2003*; *Nature Conservation Trust Act, 2001*; *Protection of the Environment Operations Act, 1997*; *Soil Conservation Act, 1938*; *Threatened Species Conservation Act, 1995* and the *Threatened Species Legislation Amendment Act, 2004*. OEH also plays a pivotal role as an environmental regulator, a manager of national parks and develops and leads policy and reform in environmental regulation, sustainability, biodiversity and native vegetation. Along with its former incarnations, OEH has a considerable pool of scientists and land managers, a number domiciled within the Bathurst Region, an enviable track record in natural resource research and management as well as significant input into the provisions of the range of resources needed to make informed planning choices;
- NSW Office of Water (NOW) is responsible for the management of the State's surface water and groundwater resources. NOW reports to the NSW Government for water policy and the administration of the *Water Management Act 2000* and the *Water Act 1912*;
- Department of Primary Industries (DPI) administers the *Fisheries Management Act, 1994* and the *Noxious Weeds Act, 1993* and is most responsible for the management of biodiversity by undertaking educational programs, regulation and research through its fisheries division; and
- NSW Planning and Infrastructure is responsible for the protection of areas with high environmental value through planning policy and legislation. The department administers a number of legislative and policy instruments including the

²² The environmental agency structure is likely to significantly change sometime in the near future

Environmental Planning and Assessment Act, 1979 and State Environmental Planning Policies (SEPPs).

Local Government

Local government can achieve considerable natural resource and biodiversity outcomes in its varied roles and areas of responsibility (DEWHA 2009; LGSA of NSW 2011). It is 'at the coal face' with close links to the community and consequently has different roles and functions to play from other tiers of government. The roles and responsibilities of local government in biodiversity management have been covered in the Issues Paper and hence in this section only a brief outline is provided.

Responsibilities towards biodiversity management have been given a legal framework through the provisions of the *Local Government Act, 1993* (LG Act) and objectives of the *Environmental Planning and Assessment Act, 1979* (EP&A Act). Under the LG Act Councils are bound to 'properly manage, develop, protect, restore, enhance and conserve the environment of the area for which it is responsible in a manner which is consistent with and promotes the principles of Ecologically Sustainable Development (ESD)'. These responsibilities are reinforced in the objectives of the (EP&A Act) where Councils are responsible for:

- The preparation of Environmental Planning Instruments (EPI), in particular Local Environmental Plans (LEP) and Development Control Plans (DCP), which establish the bases for future development and environmental conservation of the local area; and
- The assessment and determination of applications for development consent and the assessment of applications for activities under Part 4 of the EP&A Act.

Roles for local government in managing and protecting natural resources and biodiversity have been identified by the Lachlan CMA as part of their partnering initiative. The roles, grouped according to their responsibilities and field of influence, are:

1. Statutory (strategic) land use planner and development controller
2. Environmental regulator
3. Operator of major infrastructure and facilities
4. Land owner, manager and developer
5. Community leader and facilitator
6. Member of regional and local partnerships

The Issues Paper framed the review of BRC's response to natural resource management and capacity to implement actions according to these defined roles. The six key roles also form the basis for the development of the strategic framework, which includes a number of objectives and their underlying strategies and recommendations (refer Section 11.5).

Statutory bodies

A number of statutory bodies are involved in natural resource management and their roles are distinct and varied. Some important examples are given below to illustrate the contribution these bodies make towards biodiversity management in the region.

- Catchment Management Authorities CMA (Lachlan and Central West) have a primary role to set regional targets and to prepare regional strategies for natural resource management. They are statutory authorities and engage the community in addressing natural resource issues within their catchment of responsibility. Key functions include natural resource management planning and investment, on-ground

works, community education and support and assessment of Property Vegetation Plans;

- Environmental Trust is an independent statutory body established by the NSW government that supports environmental projects that do not receive funds from the usual government sources. The Trust's main responsibility is to make and supervise the expenditure of grants to, for example, encourage and support restoration and rehabilitation projects, promote research into environmental problems, promote environmental education, fund environmental community groups and to fund the purchase of water entitlements for environmental flows and restoring or rehabilitating major wetlands;
- Nature Conservation Trust focuses its efforts on private land conservation by purchasing rural land, improving its conservation value then selling it with a conservation covenant; and
- Livestock Health and Pest Authority's core areas of responsibility relevant to biodiversity are pest animal and insect control and administering the travelling stock reserves.

Research and educational institutions

The role of Universities and research organisations in providing the knowledge base for the ongoing conservation of biodiversity in the Central West and within the Bathurst Region should not be underestimated. Such inputs occur or have occurred through the establishment of school and or departments focused on environmental education and research. The benefits to the regional community in respect to addressing environmental issues include local and international conferences held in the area, the considerable output of individual researchers, the publishing of learned and popular articles, media interaction, long-term research and monitoring capability and community education. Also the establishment of a number of local and regional environmental consultants trained at Charles Sturt University (CSU) or the University of Sydney, Orange Campus (when the latter was operational) providing speakers for numerous service clubs and the facilitation of public addresses and debates.

Further, Universities such as CSU (and its former incarnations), Australian National University, University of Sydney, Newcastle University, University of New England and others have been involved in biodiversity or natural resource education and research in the Bathurst or Central West region for a number of decades. The long-standing involvement in research and education has left an important legacy that ultimately improves our understanding of our local natural environment. TAFE run courses into conservation and land management and also works towards improving the knowledge base of the regional community in areas of natural resource management. The advent of the Flannery Centre (opening in May 2012), will add an exciting new chapter in biodiversity education within the Bathurst Region as well as facilitating many of the needed community skills required in journeying towards improved natural resource management in the Bathurst and wider region.

The Federal Government funds a Cooperative Research Centre (CRC) program that operates through cooperative arrangements between the tertiary education sector, industry, CSIRO, private research organisations and trusts and government agencies, as well as a range of other supporting groups. No CRC other the Antarctic CRC is devoted wholly or partly to mainstream biodiversity issues. However the following CRCs are relevant to the appropriate management of biodiversity within Australia: Forestry, Plant Biosecurity, Future Farm Industries, Invasive Animals, Bushfires, Contamination Assessment and Remediation of the Environment, and Greenhouse Technologies. Each CRC is wedded to best practice research outcomes as well as developing an exceptional suite of education material suitable for all tiers of society including local councils.

Miscellaneous institutions such as the Australian Museum (a private trust), other state –based Museums, the British Museum and a range of museums within Europe, the Library of NSW, various local and regional Historical Societies including Bathurst Historical Society, the Museum of Australia, to name but a few, have valuable records about natural history and the history of biodiversity within the Bathurst Region. Much of the information held in such institutions remains untapped and unrecognised although it likely is the key to important insights about the history of biodiversity within the Bathurst area.

CSIRO is Australia’s leading research and development organisation. There are a number of groups that pursue biodiversity related matters including: Plant Industries, Food Futures, Sustainable Agriculture, Ecosystem Sciences, Atmospheric Research, Land and Water, Water for a Healthy Country, Climate Adaptation and Biodiversity. Much of their core research relevant to biodiversity issues is filtered through to councils via CMAs and government agencies but by no means all.

Conservation and natural resource management organisations

Through funding support, engaging the community in on-ground activities, project implementation, education, and actively conserving areas of high biodiversity value a number of conservation organisations make significant contributions to biodiversity enhancement and protection in the Bathurst region. These organisations include Australian Plant Society, Greening Australia, Planet Ark, Nature Conservation Trust, Birds Australia, Conservation Volunteers Australia, Nature Conservation Council of NSW and the Central West Environment Council (as umbrella organisation for environment groups, field naturalist societies and individuals).

Further, there are organisations and farmer’s networks that also address the management of the natural resources through education, on-ground projects and funding. These include National Farmers Federation, Ecological Australia Organisation, Landcare, Stipa Native Grasses Association Inc. and grazing schools (e.g. Prograze® and Cell Grazing).

There are also a number of national and state-based conservation groups, animal welfare groups and lobbyists that seek to influence policy, public opinion and biodiversity-related outcomes across Australia. To name a few these include: Greenpeace, World Wildlife Fund, Australian Conservation Foundation, Forestry Alliance, Nature Conservation Council, WIRES and similar organisations, RSCPA, the International Humane Society and the Australian Society for Kangaroos. Most of the latter groups have members who live within the Bathurst Region and through them retain a watching brief regarding environmental matters.

Environmental community groups

Environmental community groups have grown in popularity over the years with the advent of the Landcare movement - spawning many groups in the region in that time. A number of organisations remain active entities in the urban and rural communities and they include Greening Bathurst and the Boundary Road Reserve Landcare Group. Another group is the Bathurst Community Climate Action Network (BCCAN), though despite their primary focus on climate change and energy efficiency measures they also have a broad conservation interest. A relative recent addition to local action and debate about sustainability matters, is the Rahamim Ecological Learning Centre (Patron the Governor of NSW), operated by the Sisters of Mercy, a Catholic order, with over a century of service in Bathurst.

Other groups have disbanded; the latter in brackets between around 1980 to as recently as 2010 (Bathurst Field Naturalists Society, Bathurst Conservation Group, Bathurst Action Committee to Secure Unified Planning, Macquarie Rivercare); although they have left

significant legacies following years of on-ground works, the delivery of education to members, the uptake of knowledge and skills and the influence on regional environmental management (e.g. Saltram Creek and Chifley Dam Backwaters Landcare Groups). Landcare and other community groups have now become essential contributors to the development of detailed single regional plans required for the devolvement of funds from the federal and state governments. These groups, in partnership with Indigenous people, academics and scientists, environmental groups, industry, local government and state/territory, national agencies and the community are important in providing communication links, experience, opinion, planning support and cost-effective programs for on-ground works.

In addition, the increased participation by the local schools undertaking environmental projects and monitoring (e.g. Streamwatch, tree planting and propagation) have also contributed to the shared responsibility in biodiversity management.

Landholders and individuals

At a proportion of nearly 95%, by far the largest area of the Bathurst Region is owned and managed by rural landholders. The impact of their management, the legacies of past management and land use modification as well as their responses to protecting, enhancing and conserving biodiversity significantly contributes to the current and future status of regional biodiversity. It is likely that the most important gains and losses in biodiversity within the Bathurst Region are in the hands of landholders operating large and small holdings.

The individual is perhaps the most important element in the whole area of shared biodiversity responsibility. Individuals are responsible for their own behaviour and actions, receptivity to knowledge, resource consumption and compliance to biodiversity-relevant regulations. Individuals can, for example, refrain from driving a 4-wheel drive across environmentally sensitive areas; volunteer their time for community restoration activities, report pollution incidences to OEH, become involved in a conservation organisation, be responsible with garden refuse and are able to improve habitats in their home gardens, small lot or farm. Council's role in this context is as community leader and facilitator in assisting landholders and individuals in protecting, enhancing and conserving biodiversity.

Indigenous groups

Indigenous groups include local Wiradjuri groups, the local Aboriginal Land Council including their ownership of various land parcels including the former Sir Joseph Banks Nature Reserve.

9.2. Community contribution

The development of the BMP, both the contextual background and the strategic framework, and its successful implementation is, in part, driven by the community through direct and indirect engagement in biodiversity management. The support of the community is more likely to be gained if their collective visions for the Bathurst Region, values, issues and management suggestions have been expressed in the BMP. Opportunities for community participation have been facilitated during the course of the BMP development. The avenues for community participation and consultation are briefly described below.

Steering committee

The concept of the steering committee and its intended role was a BRC initiative and was set down in the terms of engagement. At critical stages in the BMP development, it was intended that the steering committee convene with BRC and the consultants to discuss its

content and proposed developments as well as to contribute to its development with constructive advice and suggestions. The committee comprised members from OEH, CWCMA, BRC planning and environment and key community leaders from Greening Bathurst and Boundary Road Landcare.

Public Forum

A public forum meeting was held in the Council Chambers on 30 November 2011 from 6.15 pm to 8 pm. This meeting was open to the general public with notices being put in the Western Advocate and invitations sent to key community groups and individuals. The purpose of the meeting was for the consultants to give a presentation on the BMP and to give the general community the opportunity of asking questions and to express their views. The meeting was attended by members of the public, councillors, council staff, Central West CMA and representatives of the Bathurst Orange Dubbo Alliance.

Informal consultation

Informal consultation, usually on a face-to-face basis or over the telephone, was instrumental in canvassing key members of the public and government agency personnel on issues dealing with specifics of biodiversity management.

9.3. Legislation, policy and planning principles

The protection and enhancement of biodiversity at all tiers of governance from the global to the local scale is, in some measure, afforded through the provisions contained in a number of relevant and overarching policy, statutory and strategy documents and planning instruments. Local government holds some of the responsibility of biodiversity management (see Section 9.1) and with the adoption and implementation of the BMP can make important contributions in realizing the goals and targets set within these overarching biodiversity legislative, policy and planning frameworks (see Part E – meeting catchment action plan targets). The objectives and strategies of the BMP have been developed to be consistent with the charter of these statutory documents and planning instruments and the goals, objectives and targets they contain have been used to guide the development process. **Appendix D** provides a compendium of these documents and instruments listed with their relevant goals, objectives and/or targets. Reference should also be made to Table 4 in the Issues Paper, which summarises key state legislation applicable to Local Government, outlines Council's responsibilities under the various Acts and provides an analysis of BRC's response to each of these responsibilities. This analysis provides insight into some of the management gaps in BRC's response to the various legislative instruments.

The list in Appendix D is not exhaustive as there are many others that are framed to directly or indirectly help maintain or enhance biodiversity. The list has been organised into the following subheadings:

- Global strategies
- National policy, strategies and plans
- Commonwealth legislation
- NSW State and regional policies and strategies
- NSW state legislation
- Local policy, strategies and plans

9.4. Guiding principles

Managing and enhancing biodiversity and biodiversity values, encompasses almost all areas of natural resource knowledge, understandings and management including waterways, air, terrestrial ecosystems, the soil environment, urban landscapes, farmlands and even our backyards. Management needs to respond to the spectrum of contemporary issues as well as the legacies of past land uses and their impacts and the consequent devaluing of biodiversity assets. Further, biodiversity management bridges different tiers of government from the global, generalist view, to the local and more specific perspective. To keep biodiversity management targeted a number of principles, which include the BMP project objectives, have been provided to guide the development of the strategic framework. In addition a number of other principles are presented, which are intended as a guide for the next level of management, planning or on-ground action undertaken during the implementation phase of the BMP in the ensuing decades. These sets of guiding principles are described below in regard to strategic biodiversity management planning and restoration within the Bathurst Region:

The objectives, strategies actions and recommendations in the BMP if implemented will:

- Assist BRC with future planning, monitoring and management of biodiversity;
- Improve the integration of biodiversity conservation with land use planning instruments and the development assessment process;
- Protect and enhance the biodiversity of natural areas on land under Council care and control;
- Influence the protection and enhancement of biodiversity on land not in the care and control of Council;
- Identify priority conservation areas and biodiversity values to be maintained and restored across all land tenures;
- Provide strategies to improve community awareness as well as encourage and support community participation in biodiversity conservation;
- Integrate guidance offered by national, state and regional targets, including the Central West Catchment Action Plan, the Lachlan Catchment Action Plan, the NSW State Plan, the NSW Biodiversity Strategy 2010-2015 and Australia's Biodiversity Conservation Strategy 2010-2030 with BMP outcomes;
- Improve and upgrade biodiversity knowledge and data management within the Bathurst Region;
- Provide consistency with the legislative and policy goals, objectives and targets relevant for biodiversity management and regulation in the Bathurst Region;
- Provide implementation outcomes emphasising the importance of ecosystem services (e.g. resource preservation of food and fibre, and water and air quality etc), and ecosystem function and ecocentric perspectives (e.g. valuing biodiversity for reasons of moral obligation);
- Enhance biodiversity values whilst not overriding the governing land use of an area;
- Manage biodiversity within short, medium and long-term timeframes over a projected period of 25 years (to 2036);
- Comply with the principles of Ecologically Sustainable Development to ensure the effective integration of economic, social and environmental considerations in decision making processes;
- Recognise existing or potential conservation linkages with other land not owned or controlled by Council in the Bathurst Region;

- Enhance effective conservation of biodiversity at the landscape scale by developing linkages across public and private land tenures where possible;
- Build natural resilience in Bathurst Region ecosystems to buffer against threats from external sources, impacts and pressures (e.g. key threatening processes including climate change²³); and
- Acknowledge and respect the culture, values, innovations, practices and knowledge of Indigenous peoples.

The major guiding principles for biodiversity management, presented below, are based on contemporary ecology and resource management theory and practice:

- Inappropriate landform recognition and goal-setting can lead to inappropriate restoration outcomes;
- It is more cost-effective to conserve and enhance existing natural habitats now than to rehabilitate them later, or worse attempt to recreate such systems in green-fields once irretrievably lost;
- The precautionary principle needs to be applied when employing adaptive management approaches using new science and practical experience;
- Conservation outcomes depend on knowledge and understanding of species, populations, their habitats and ecosystems, their relationship with each other, including humans, the climate, geology and geomorphology in time and space (i.e. a bio-historic perspective is needed);
- Biodiversity cannot be preserved but only conserved;
- The conservation of biodiversity within a human-dominated cultural landscape now requires day-to-day human management rather than relying solely on natural processes. A hands-off approach, whilst sometimes called for when natural processes are self-repairing and/or self-maintaining, more often than not will in the long term lead to conservation losses in human-dominated landscapes;
- The lag phases often characteristic of species declines and losses are due to past clearing dynamics and patterns, land degradation and threatening processes and such that further species losses are likely inevitable, no matter how successful the Bathurst Region conservation outcomes;
- It is not possible or desirable to conserve or recreate a pre-1788 landscape. Rather the realisation that humans are creating an anthropogenic biome, a cultural landscape, that can be optimised for biodiversity and production outcomes, one nevertheless, containing many of the pre-settlement biodiversity values;
- The pre-European landscape managed by indigenous people was not static in relation to biodiversity values but was likely in a quasi-equilibrium state and was itself a derived and managed state;
- The current Bathurst Region is in a state of dis-equilibrium and is leaking resources (malfunctioning) at every scale, including the loss of biodiversity;
- Any vision for the future of biodiversity within the Bathurst Region must address underlying issues of soil loss, land degradation, and the repair of dysfunctional ecosystem cycles;

²³ Many strategies and recommendations that help the community **adapt** to climate change impacts are covered under non-climate change specific strategies and recommendations. This is largely due to the likelihood that climate change impacts will threaten biodiversity and in a positive feedback mechanism the management of ecosystems to build resilience can lessen the impacts of climate change on biodiversity.

- Amenity plantings are an important consideration since humans like to live in landscapes that are visually pleasing, however, amenity plantings do not always equate to habitat improvement nor contribute meaningfully to the repair of landscape function;
- Ultimately it is important to develop a vision of a future Bathurst landscape that works for biodiversity (including humans) and provides the resources that we need to lead fulfilling lives;
- Conservation is best undertaken within a species natural habitat and added to through restorative action, linked across the landscape and cognisant of habitat area thresholds;
- Focus should be on the processes and habitats that have sustained species, the value of existing landscape elements, rather than on the species and elements themselves;
- Building ecosystem resilience, protecting natural assets, increasing the area of available habitats and improving ecological connectivity are key objectives in integrating assets and processes; and
- The values of biodiversity (intrinsic and ecosystem function and services), social (public safety, visual amenity, recreation), economic (production agriculture, forestry and fisheries, land development for housing etc) and services (roads, infrastructure) require consideration.

9.5. Overarching objectives, strategies and actions

The strategic framework has been organised into the key roles of Council with a hierarchical approach being taken to structure the framework. The top level is set with a number of **objectives** for each key role, the next level lists a number of **strategies** designed to meet each objective and these are further supported by recommendations - many of which are considered **actions** and have been identified accordingly.

The objectives and strategies have been developed, in part, to respond directly or indirectly to the threats to biodiversity in the Bathurst Region (refer Section 5) and to fill the necessary gaps in data, knowledge, understanding and resources necessary to assist BRC and its partners manage biodiversity in the Bathurst Region (refer Section 6). Other objectives and strategies have been developed with consideration to such factors as creating opportunities, preventive action, building community capacity and education.

In Part E of the Plan (Implementation, Monitoring and Review) the actions have been prioritised against a number of project-specific criteria to help establish priority ratings from very high to low. Further explanation of the prioritisation process is provided in that part of the Plan. It is intended that the strategies (and their associated recommendations and actions) both within and across *objectives* and within and across *roles* would be implemented over a long period of time; thus the strategic framework should be viewed as an integrative and adaptive tool for biodiversity management.

Note: The presentation of the objectives/strategies has been organised with some separation of detail to allow conciseness within the report. It is imperative that to avoid misinterpretation or to lose important information that all components be read. The components are as follows:

1. Section 11.5.1 provides a brief overview of each role of Council and presents key directions for biodiversity management within each role.
2. Section 11.5.2 presents the objectives and their associated strategies and actions in tabular format (there is also cross-referencing to other linked strategies).
3. **Appendix G** presents the objectives and strategies, also in tabular format, along with

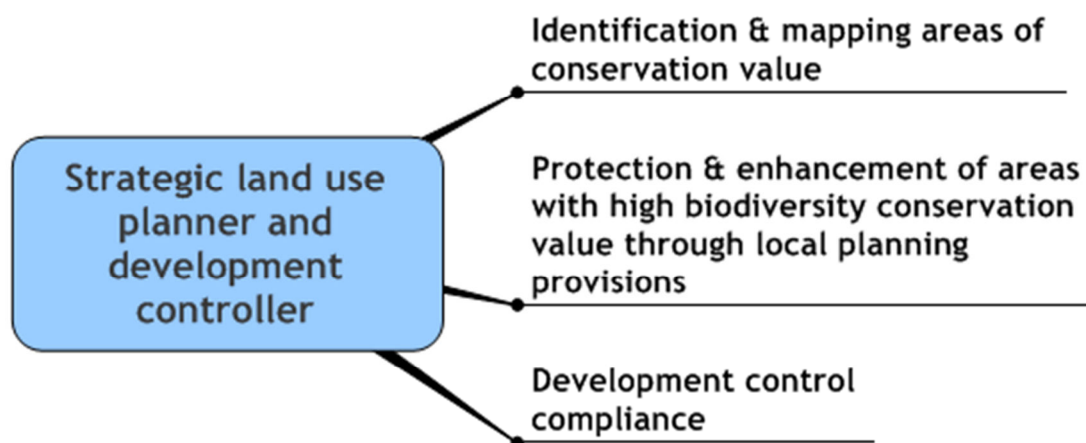
details about specific recommendations.

4. Section 12 describes all the parcels of land controlled by Council coupled with relevant site-specific strategies, recommendations and actions.

9.5.1. Key directions for biodiversity management

Council as a strategic land use planner and development controller

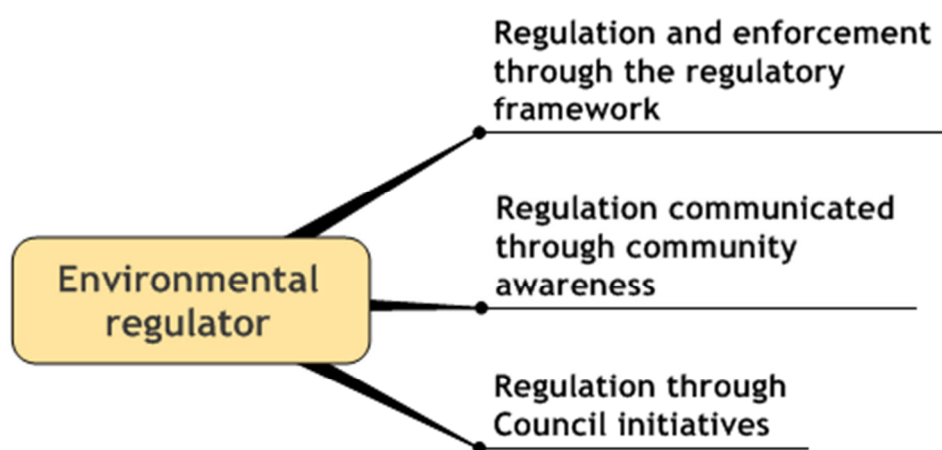
BRC can and does influence natural resource management on both private and public land through strategic planning of settlements to avoid environmentally sensitive areas and controlling development to protect environmental assets. Council also has a clear legislative mandate to protect the natural environment through planning processes. As Council owned or controlled land comprises a very small portion of the overall area of the Bathurst Region, especially in the rural areas, its role in planning and development control is critically important in increasing its spatial area of influence. The key directions for action are illustrated below and these form the basis for five targeted objectives and their associated strategies and actions (Table 1).



(**Note: High biodiversity conservation value (HBCV) is the generic phrase used in this section to include areas assessed as being of high or very high conservation value or ecosystem condition rating (according to the BMP condition assessment) or areas that have been identified as containing significant biodiversity assets as reported in this Plan or recognised independently of this Plan)

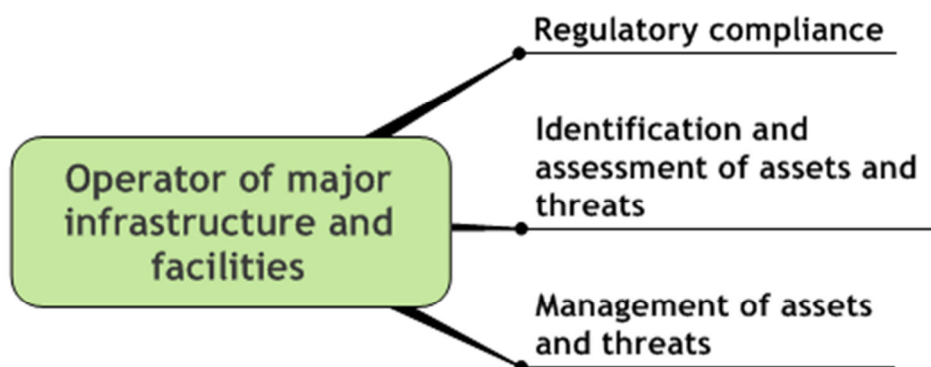
Council as an environmental regulator

Ecologically sustainable development is core business for BRC and as an environmental regulator it has certain responsibilities and capacities to protect biodiversity assets and the natural resources that biodiversity is dependent on. Those responsibilities are defined under a number of acts and regulations. Responsibilities within these instruments empower Council to enforce controls. The key directions for regulation are illustrated below and these form the basis for three targeted objectives and their associated strategies and actions (Table 2).



Council as an operator of major infrastructure and facilities

As a regional council governing an area of 3,820 square kilometres, BRC plays a significant role as an operator of roads and the road reserves. These road reserves are a rich repository of biodiversity and importantly often provide the only linkages in an otherwise cleared or fragmented landscape. Council's operation of water and waste facilities also has a significant influence on biodiversity with the consequent modification of the environment which biodiversity is dependent upon. Human society is heavily reliant on the services these major infrastructures and facilities provide and Council is responsible for maintaining these services while managing biodiversity and minimising threats that impact on the environment. The key regulatory directions that Council can adopt to manage biodiversity and minimise threats are illustrated below and these form the basis for three targeted objectives and their associated strategies and actions (Table 3).



Council as a manager of community and operational land

Council is the manager of over 700 parcels of community and operational land spread across the whole Bathurst Region (as discussed in Part C of this Plan). The large majority of these land parcels are concentrated in the former Bathurst City LGA, with the remainder situated in the rural villages and outlying rural areas. The land parcels are either owned by Council or are publically owned (e.g. Crown land) and managed by Council. In terms of management the land tenure is not always relevant. The purpose of the land, whether community or operational; however may influence management as a community park, playing field, or open space requires different consideration to operational land that includes, for example, drainage reserves, retention basins, cemetery, pump sites, water reservoirs, Mount Panorama precinct, pound and the old saleyards site.

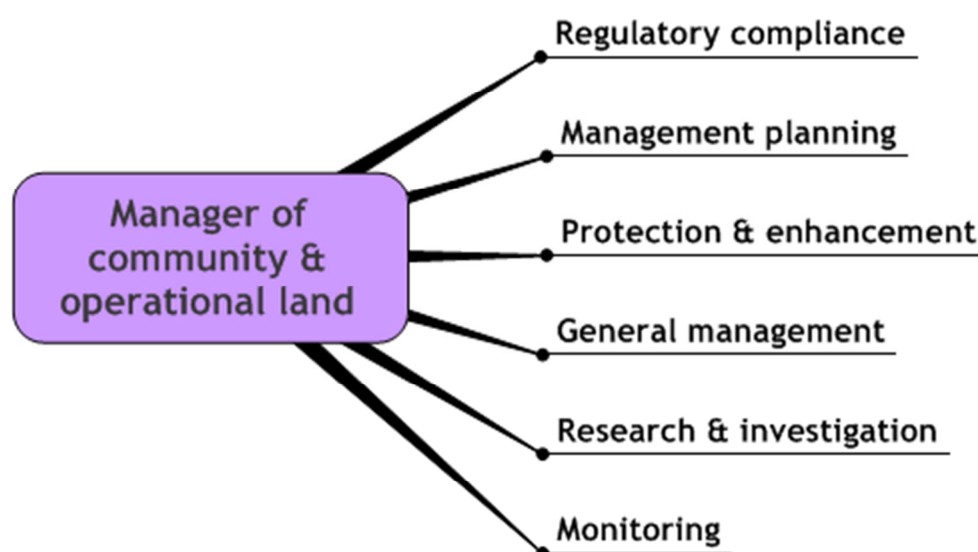
Although the land area managed by Council as a proportion of the whole Bathurst Region is relatively small, how Council manages community and operational land is important for a

number of reasons. First, Council's role in managing the land it is directly responsible for is perhaps the most visually obvious to the general community. Secondly, the majority of residents live in the former Bathurst City LGA and it is important to bring 'nature' back to these urban communities – to keep people connected to the very resource that supports them as a form of passive education. Thirdly, Council has a responsibility as community leader to manage its land in accordance with best management practices for biodiversity management – again this has value in community education.

A key challenge in managing community and operational land is balancing the values of biodiversity with other values, such as culture, recreation, aesthetics and operational function. It is unrealistic to expect sporting fields and cultural parks like Kings Parade to be managed for biodiversity as a high priority. However, biodiversity management can be improved judiciously, for example, through environmentally appropriate integrated pest management or fertiliser application.

Note: Supporting Council's role as a manager of community and operational land each parcel or group of parcels (as per Condition Assessment) is given specific management guidelines based on the strategies and actions. As stated in the box above it is recommended that this section be reviewed by the reader in conjunction with Section 12.

The key directions that Council can adopt to manage biodiversity on land it owns and controls are illustrated below and these form the basis for six targeted objectives and their associated strategies and actions (Table 4).

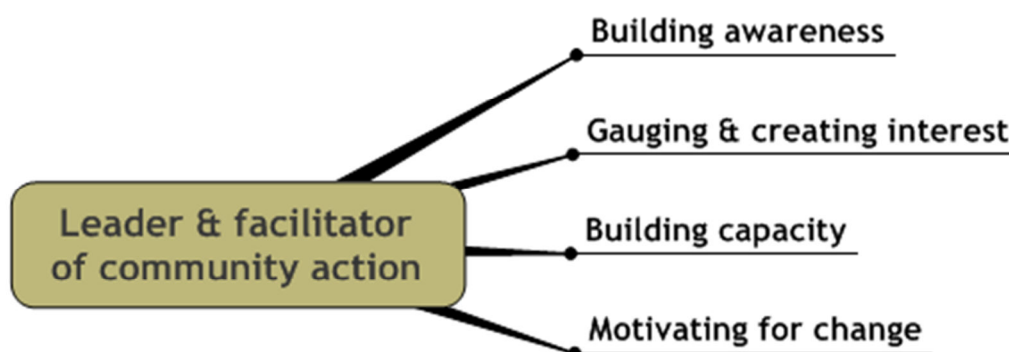


Council as a community leader and facilitator of community action

Council does not have direct responsibilities for the vast majority of land in the Bathurst Region. However, in its role as community leader and facilitator it does have the capacity to influence biodiversity management indirectly through education, community support and facilitation. Creating communities that live, work and play in a region with protected and enhanced natural ecosystems requires that individuals and organisations have to be aware, interested, knowledgeable and skilled and motivated to make sustainable choices.

The formidable task of managing all of biodiversity and the land, water and air, which it is dependent on, is the shared responsibility of the whole community. In the Bathurst Region the community is primarily locally and regionally based, though for the true expression of responsibility the community has to be viewed as global (e.g. in respect to resource demand,

population growth and climate change). The engagement of the local and regional community has in effect the benefits of covering the whole region regardless of land tenure. The key directions that Council can adopt as a leader and facilitator of community action are illustrated below and these form the basis for four targeted objectives and their associated strategies and actions (Table 5).



Council as a member of regional and local partnerships

The strength of biodiversity management is often realised with the collaboration of different players working towards a common goal or set of goals. The players in a partnership should have attributes that are complementary to allow for mutually beneficial outcomes – in this case – biodiversity outcomes. The central player in the BMP is BRC and over many years Council has fostered and is continuing to maintain partnerships with state and federal government, statutory authorities, special interest groups and individuals etc. With sound partnerships in natural resource management BRC can affect significant changes for the protection, enhancement and conservation of biodiversity across the whole Bathurst Region.

The key directions that Council can adopt as a member of regional and local partnerships are illustrated below and these form the basis for seven targeted objectives and their associated strategies and actions (Table 6).

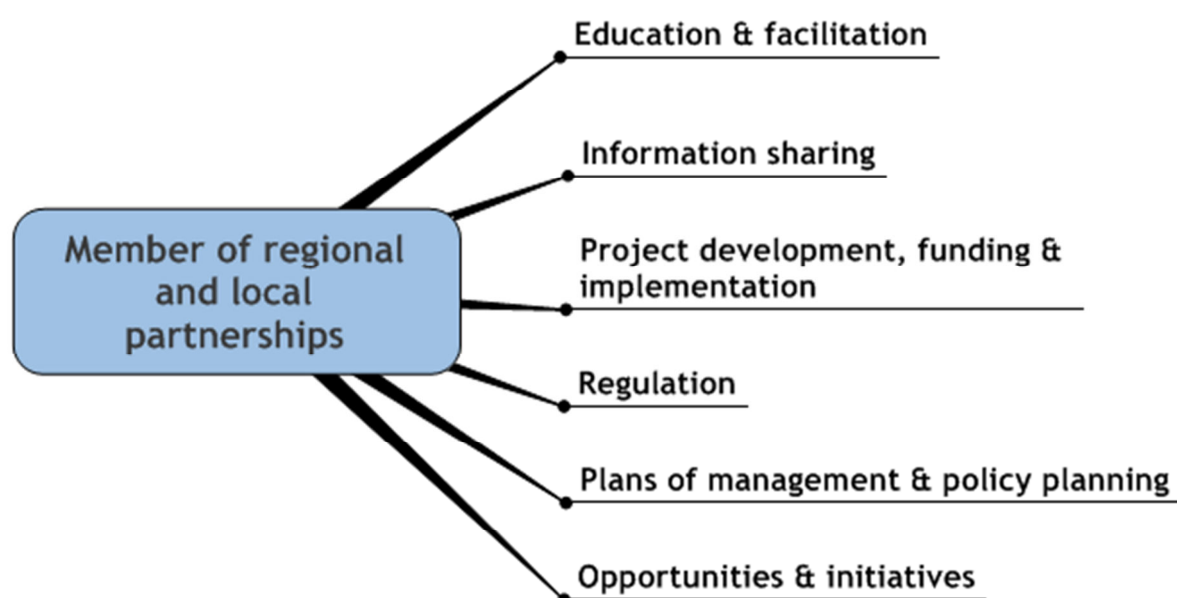


Table 1. Council as a strategic land use planner and development controller (C)

Objectives	Strategies (see further detail in Appendix G)	Actions	Links
Obj 1: Areas of high biodiversity conservation value or significant biodiversity assets on <i>Council controlled land</i> are identified and mapped	(SC1) Integrate and map areas of high biodiversity conservation value and significant biodiversity assets (as derived from the BMP condition assessment) into Council's GIS and database system	(AC1) Map BMP ecosystem condition and conservation value assessment ratings and biodiversity assets into BRC's GIS and database system	SC8, SC9
		(AC2) Map BGW and Tablelands Basalt Forest EECs and their derived grasslands that are on Council owned or controlled land according to their ecosystem condition rating	SC8, SC9, SM5
Obj 2: Areas or biodiversity assets of significant conservation value across the whole Bathurst Region are identified and mapped	(SC2) Advocate for EECs to be mapped across the Bathurst Region	(AC3) Advocate for EECs to be mapped across the whole Bathurst Region	SC9, SP3
	(SC3) Maintain and continually update the comprehensive threatened species database for the Bathurst Region	(AC4) Continue to update the threatened species database for the Bathurst Region	SP3
	(SC4) Identify, map and consolidate mapped areas of high/very high conservation value and significant biodiversity assets across the whole Bathurst Region	(AC5) Advocate for OEH to improve mapped areas of high/very high conservation value and significant biodiversity assets across the whole Bathurst Region	SP3
		(AC6) BRC to incorporate information it has or gains into database/GIS	SC8,9,
		(AC7) Build on site-specific information and increase the resolution for the 'Environmentally Sensitive Area' map overlays	SC12, SP3
	(SC5) Identify and map critical areas in the landscape for wildlife corridors, vegetation linkages and conservation areas	(AC8) Advocate for OEH to map critical areas in the landscape for wildlife corridors, vegetation linkages and conservation areas	SC9, SP3
Obj 3: Key land parcels reviewed for their biodiversity value for future land use change, disposal or public ownership considerations	(SC6) Review council controlled land parcels that have poor or very poor biodiversity conservation value for future land use change, disposal or public ownership consideration	(AC9) Strategy as direct action	
	(SC7) Identify and review Council owned or freehold land parcels of high or potentially high biodiversity conservation value or that may be significant for habitat linkage for future land use change, disposal or public ownership consideration	(AC10) Strategy as direct action	SP8
Obj 4: Areas of high biodiversity conservation value or significant biodiversity assets across the whole Bathurst Region protected and enhanced through local planning instruments	(SC8) Make provisions and standards in the LEP/DCP for the protection and enhancement of biodiversity	(AC11) Strategy as direct action	SC10,12, SR3
	(SC9) Pre-plan developments in key settlement areas before rezoning according to provisions and standards in the LEP/DCP that aim to enhance and protect biodiversity	(AC12) Strategy as direct action	SC2,4,5
	(SC10) Commission a locally specific koala study that supports assessments when SEPP 44 does not protect Koala habitat in the Bathurst Region	(AC13) Strategy as direct action	
	(SC11) Maintain the use of existing provisions and standards or strategy	No specific actions - see recommendations	

	objectives and recommendations in the local planning instruments that effectively protect, enhance and manage high biodiversity conservation areas	Appendix G	
Obj 5: Council developments and associated works activities to comply with environmental legislation, policies and strategies to protect biodiversity	(SC12) Ensure all Council developments and associated works activities comply with relevant legislation, policies and strategies	No specific actions - see recommendations Appendix G	SR1
	(SC13) Ensure a rigorous assessment of developments and activities under the EPBC, TSC and FM Acts and Part 4 of the EP&A Act with Council as the consent authority	No specific actions - see recommendations Appendix G	SR1

Table 2. Council as an environmental regulator (R)

Objectives	Strategies (see further detail in Appendix G)	Actions	Links
Obj 6: Biodiversity is protected through the regulatory framework	(SR1) Regulate and enforce controls within the legislative framework to protect biodiversity	No specific actions - see recommendations Appendix G	SC2,4,5,13; SR4; SO9, SM3,5,6,8,9,10; SL8,19
	(SR2) Inform development proponents of their legal responsibilities in regards to protecting migratory and threatened species, populations or ecological communities or their habitats in the EPBC, TSC and FM Acts	No specific actions - see recommendations Appendix G	
	(SR3) Enforce provisions and development control standards in existing, new and amended environmental planning instruments	No specific actions - see recommendations Appendix G	SC8
Obj 7: Regulations that aim to protect biodiversity are communicated through community awareness initiatives	(SR4) Suitably inform community of key environmental messages/regulations at campsites, recreational and open space areas on Council controlled land	(AR1) Develop a program that suitably informs the wider community of key environmental messages/regulations at campsites, recreational and open space areas on Council controlled land	SL8
Obj 8: Biodiversity is protected through Council initiated regulation and incentives	(SR5) Continue with existing initiatives and incentives and develop new ones that aim to protect biodiversity and its environment	(AR2) Continue or expand on existing regulatory initiatives	SL19

Table 3. Council as an operator of major infrastructure and facilities (O)

Objectives	Strategies (see further detail in Appendix G)	Actions	links
Obj 9: The operation of Council's infrastructure and facilities complies with legislative, regulatory and planning requirements for the enhancement, protection and conservation of biodiversity	(SO1) Council to comply with existing regulatory and legal responsibilities as a roads authority	No targeted action	SM20, SL7
	(SO2) Council to comply with existing regulatory and legal responsibilities in operating its infrastructure and facilities (excluding roads) for biodiversity outcomes	No targeted action	SC13, SM13,18, 19,20; SP7
Obj 10: The biodiversity assets of major infrastructure and facilities	(SO3) Undertake a comprehensive roadside survey of roadside biodiversity and threats	(AO1) Undertake a comprehensive roadside survey of high and medium conservation	

operated by Council and the threats to these assets are identified and assessed		roadside vegetation and identify threats	
	(SO4) Build a register of biodiversity assets on infrastructure and facilities other than roads	(AO2) Strategy as direct action	
	(SO5) Identify all road crossings which are a threat to fish passage	(AO3) Strategy as direct action	SP3, UWMP S21
Obj 11: Major infrastructure and facilities operated by Council are managed to protect, enhance and conserve biodiversity	(SO6) Develop biodiversity management plan/s for the protection, enhancement and linkage of native vegetation along rural roads	(AO4) Strategy as direct action	SO3, SM18
	(SO7) Develop projects to enhance, protect or conserve biodiversity at Council's infrastructure and facilities	(AO5) Develop a program that aims to identify threatened species, populations, their habitats and EECs on Council's facilities and give consideration to threat abatement, habitat enhancement or re-introductions	SP4
		(AO6) Install, fix and maintain gross pollution traps (GPTs) in key areas identified through investigation	UWMP S9
		(AO7) Develop biodiversity management plans for the water storage dams operated by Council	
		(AO8) Construct fishways at barrier to provide adequate fish passage, decommission redundant or major barriers and redesign fish friendly road crossings	SO5, SP3
		(AO9) Enhance Box-Gum Woodland connectivity along roads by rehabilitating key areas or gaps in connectivity	SO3
		(AO10) Undertake new water saving projects and build on existing ones (e.g. upgrade of water reticulation and irrigation systems and Water Filtration Plant)	
		(AO11) Review the pipeline route from Winburndale Dam with the view that the pipe may need to be replaced in sections and pre-plan for optimising biodiversity outcomes	
	(SO8) Seek funding to support project development and implementation to enhance, protect or conserve biodiversity at Council's infrastructure and facilities	(AO12) Strategy as direct action	
	(SO9) Develop and maintain practices that meet the NSW Water Quality and River Flow Objectives	No specific actions - see recommendations Appendix G	SC8, SR1, SO5, SO10, UWMP objectives 2 & 3
	(SO10) Manage major infrastructure and facilities for the enhancement and protection of biodiversity	No specific actions - see recommendations Appendix G	SO9, VMP S14, S18,

			W18 VMP obj 5, 7, 8 UWMP S6
	(SO11) Implement BRC's Roadside Vegetation Management Guidelines to equip on-ground works staff with knowledge and skills to mitigate against operational activities	(AO13) Implement BRC's Roadside Vegetation Management Guidelines through training programs for Council work's crews to improve their knowledge and skills to mitigate against operational activities	
	(SO12) Develop monitoring programs to ensure the on-going management of biodiversity is effective on Council operated infrastructure and facilities	(AO14) Strategy as direct action	

Table 4. Council as a manager of community and operational land (M)

Objectives	Strategies (see further detail in Appendix G)	Actions	Links
Obj 12: Biodiversity protected and enhanced through regulatory compliance	(SM1) Council to comply with its existing regulatory and legal responsibilities as land owner and controller	No targeted action	SC12; Obj 15 strategies SM12, SP
Obj 13: Biodiversity managed and integrated with other land use values through planned management	(SM2) Review existing and relevant BRC management plans to update and where necessary include natural resource management and biodiversity issues	(AM1) Strategy as direct action	
	(SM3) Develop site specific plans of management for the Macquarie River in areas controlled by Council	(AM2) Strategy as direct action	SL4
	(SM4) Develop a wetlands concept plan for the Raglan Creek Floodplain complex	(AM3) Strategy as direct action	
	(SM5) Develop a master plan for the protection, enhancement and linkage of the Box-Gum woodland EEC in the former Bathurst City LGA	(AM4) Strategy as direct action	VMP RV14
	(SM6) Undertake a biodiversity survey and develop a management plan for lower Sawpit Creek prior to urban development	(AM5) Strategy as direct action	
	(SM7) Develop a Grey-headed Flying Fox management plan	(AM6) Strategy as direct action	SM25
	(SM8) Develop biodiversity management plans for the protection, enhancement, conservation and linkage of native vegetation in the villages	(AM7) Strategy as direct action	SM18, SP7
	(SM9) Develop a biodiversity management plan for the Mount Panorama precinct	(AM8) Strategy as direct action	SM18, SP4,7 VMP RV8-13
	(S10) Develop specific biodiversity management plans for areas identified as having high or very high ecosystem condition/conservation value	(AM9) Strategy as direct action	SM18, SP4
	(SM11) Develop concept and/or management plan/s for the enhancement of poorly utilised Council controlled lands for biodiversity conservation and nature-based tourism/recreation	(AM10) Strategy as direct action	SP7
	(SM12) Develop a weed and pest management plan for Council owned and controlled land	(AM11) Strategy as direct action	SL4, SP3, SP4, SP7
Obj 14: Biodiversity protected	(SM13) Implement biodiversity management plans developed for community and	(AM12) Implement biodiversity management	SC7, SM4,

and enhanced with the implementation of management plans and the undertaking of on-ground works	operation land and undertake on-ground works as recommended	recommendations for the Macquarie River in areas controlled by Council	SL4, SP3, SP7
		(AM13) Implement the recommendations provided in the proposed Raglan Creek wetlands concept plan	SC7, SM4, SL4, SP3, SP7
		(AM14) Implement rehabilitation or restoration works of the Box-Gum Woodlands in the former Bathurst City LGA as recommended in the proposed master plan	SC8, SM6, SL4; VMP RV14
		(AM15) Implement recommendations from the proposed lower Sawpit Creek study into on-ground actions and BRC's planning provisions	SC8, SM8, SL4
		(AM16) Implement recommendations identified in the proposed biodiversity management plans in the rural villages	SO3, SO6
		(AM17) Implement restoration works along roadways to improve biodiversity conservation as recommended in the proposed roadside vegetation biodiversity management plan	SM9, SM14, SP7
		(AM18) Implement strategies, recommendations or actions in the proposed Mount Panorama precinct biodiversity management plan	SM9, SP4
		(AM19) Implement recommendations given in the proposed biodiversity management plan for areas of recreational usage	SL2, SL8, SP8
		(AM20) Implement recommendations for the enhancement of poorly utilised areas in Council control for nature-based tourism/recreation	SM12, SP4, SP11
		(AM21) Implement weed and pest control measures as prioritised and recommended in the proposed weed and pest management plan for Council owned and controlled land	SM12, SP7, SP10
		(AM22) Implement recommendations provided in the 2012 BRC Pest Bird Management Plan	
	(SM14) Undertake planting programs and on-ground works to improve biodiversity outcomes in the urban and peri-urban environment as identified in existing management/landscape plans	(AM23) Implement Stage 2 of the Urban Drainage Reserves Revegetation Landscape Plan	
		(AM24) Develop a planting program within the urban/peri-urban environment that enhances biodiversity to include road reserves, buffer	VMP themes & strategies & UWMP

		zones in industrial areas and housing estates, parks, open space reserves, drainage reserves and operational land	strategies
	(SM15) Maintain revegetation and rehabilitation areas on Council owned or controlled land	No targeted action	
	(SM16) Implement the Urban Waterways Management Plan	No targeted action	
	(SM17) Seek funding opportunities to assist with the implementation of rehabilitation, restoration and conservation projects	No targeted action	SP4, SP8
Obj 15: Biodiversity protected and enhanced through the adoption of best management practices	(SM18) Ensure prescribed burns used as an environmental management tool or fire hazard reduction burns adopt best management practices	No targeted action	SL2, SP3
	(SM19) Enhance the extent, resilience and diversity of native grasses on Council owned or controlled land	(AM25) Identify areas where a change in groundcover management can be undertaken to improve biodiversity and ecosystem function	SM3, 4, 5 6, 8 & 9 VMP RV2
	(SM20) Undertake training days for council on-ground staff and machinery operators to ensure the protection of biodiversity	(AM26) Strategy as direct action	
	(SM22) Maintain or enhance non-native vegetation for the improvement of habitat, ecosystem function, ecosystem services or cultural conservation values in the built environment	No targeted action	VMP14
	(SM23) Review and enforce grazing management policy for Council controlled land leased for grazing	(AM27) Review and enforce BRCs 'Land Management Guidelines – Leasing, 2004' for Council owned or controlled land leased for grazing	VMP RV1, RV12, RV13; UWMP S1, S8
		(AM28) Strategy as direct action	SC1, SP3
Obj 16: Biodiversity assets and the threats to these assets on Council owned and controlled land known and understood through research and investigation	(SM24) Undertake fauna, flora and threatened species studies in areas identified in the condition assessment as having high/very high ecosystem condition/conservation value	(AM29) Undertake an urban possum study	SM7, SL2, SL5
	(SM25) Undertake specific fauna, flora and threatened species studies to assist with the development of management guidelines		
Obj 17: Ecosystem condition and biodiversity conservation value on land owned or controlled by Council to be evaluated through on-going monitoring program	(SM26) Undertake on-going assessments to evaluate ecosystem condition and biodiversity conservation on targeted land parcels owned or controlled by Council	(AM30) Develop an on-going assessment program to evaluate ecosystem condition and biodiversity conservation on targeted land parcels owned or controlled by Council	
	(S27) Monitor biodiversity protection or enhancement projects on Council owned or controlled land and evaluate and report their effectiveness for multiple outcomes	(AM31) Strategy as direct action	

Table 5. Council as community leader and facilitator of community action (L)

Objectives	Strategies (see further detail in Appendix G)	Actions	Links
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Obj 18: The community is aware of biodiversity values and issues through education, training and facilitation	(SL1) Undertake an audit of relevant biodiversity related educational resource material available to BRC and identify gaps	(AL1) Strategy as direct action	SP1
	(SL2) Build on existing biodiversity related resource material and initiate the development of new resources to fill gaps	(AL2) Strategy as direct action	SM18, SP4, SP10
		(AL3) Prepare educational resource material derived from the BMP	
	(SL3) Develop an overarching educational program that seeks to increase community awareness of biodiversity and natural resource related issues	(AL4) Strategy as direct action	SP1
	(SL4) Integrate biodiversity education with Council environmental and biodiversity enhancement projects	No targeted action	SL2, SM13,14,15,19
	(SL5) Facilitate and provide leadership on issues that threaten biodiversity or the function of ecosystem processes	(AL5) Develop an educational strategy to deal with the controversies relating to competing values of biodiversity conservation and other interests	SM7, SP1
		(AL6) Develop a program that directs Council to communicate directly to individuals, groups or individuals within groups that may knowingly or unwittingly contravene best practice for the protection of biodiversity	SP5
	(SL6) Implement age-appropriate biodiversity-related educational programs that target early childhood through to young adult	(AL7) Strategy as direct action	SP1
	(SL7) Implement programs that inform and educate BRC's Councillors and key Council staff on biodiversity values, threats and current issues	(AL8) Strategy as direct action	
	(SL8) Install information boards to improve community awareness of biodiversity issues	(AL9) Strategy as direct action	SR4
	(SL9) Lobby CSU to maintain a teaching -research environmental section within the Central West Catchment	(AL10) Strategy as direct action	
Obj 19: The level of community interest in matters relating to biodiversity is understood and the level of interest improved	(SL10) Continue to inform the community of the status of biodiversity in the Bathurst Region	No targeted action	
	(SL11) Provide opportunities for the community to develop a greater understanding of Wiradjuri Country	(AL11) Strategy as direct action	SP4
	(SL12) Develop methods and partner with other agencies to identify the underlying causes of a lack of awareness, interest, knowledge or motivation towards biodiversity	(AL12) Strategy as direct action	SP1
	(SL13) Establish what is required for the community to engage in biodiversity-related projects or to shift needed behavioural change	(AL13) Strategy as direct action	SP1
	(SL14) Identify community responses to continued growth and development from the perspective of impacts on natural resources, including biodiversity, at the next review of the BRC land use strategies	(AL14) Identify community responses to continued growth and development from the perspective of impacts on natural resources	SP4

Obj 20: The community has the capacity to engage in biodiversity related initiatives	(SL15) Continue to support existing community groups participating in natural resource management and facilitate the formation and effective operation of new groups	including biodiversity No targeted action	SP1, SP4
	(SL16) Develop education and training programs to provide opportunities for the community to gain knowledge and develop skills in biodiversity management	(AL15) Strategy as direct action	SP1, SP4
	(SL17) Facilitate the local Wiradjuri to increase their engagement in biodiversity management and knowledge sharing	No targeted action	SP4
Obj 21: Biodiversity outcomes are achieved through motivational incentives	(SL18) Provide incentives to benefit regional biodiversity and improve biodiversity education	(AL16) Develop and provide incentives to benefit regional biodiversity and improve biodiversity education	SP4
	(SL19) Influence behavioural change for biodiversity protection with the development of initiatives outside the regulatory framework	(AL17) Influence behavioural change for biodiversity protection with the development of non-regulatory initiatives	
	(SL20) Identify funding opportunities for environmental educational programs	(AL18) Strategy as direct action	SP4

Table 6. Council as a member of regional and local partnerships (P)

Objectives	Strategies (see further detail in Appendix G)	Actions	Links
Obj 22: Biodiversity education and the facilitation of information relating to biodiversity issues are made available to the wider community through regional and local partnerships	(SP1) Build or maintain partnerships for the development and facilitation of educational material, programs and initiatives to the community	(AP1) Continue the alliance with Orange City Council for the shared employment of the Community Engagement Officer	SL2, SL4, SL6, SL12
	(SP2) Council to support educational institutions and environmental organisations with <i>their</i> delivery of environmental education	No specific actions - see recommendations Appendix G	
Obj 23: Information and data resources are created, expanded upon and shared in the interests of protecting and enhancing regional biodiversity	(SP3) Access and reciprocate resource material to allow for informed management of regional biodiversity	(AP2) Develop a program to plan and assist with the creation, access and reciprocation of resource material to allow for informed management of regional biodiversity	SC3,4,5, SM12,13,18,24
Obj 24: Regionally-based biodiversity projects are successfully developed, funded and implemented through the fostering of strong partnerships	(SP4) Maintain or foster new partnerships for the successful development, funding and implementation of biodiversity protection and enhancement projects	(AP3) Identify opportunities for biodiversity management through regional and local partnerships	SL11, SL15
		(AP4) Initiate the development of a regionally-based, or local government - based biodiversity management plan in partnership with other agencies	
Obj 25: Regulatory compliance for biodiversity-related issues are achieved through regional and local partnerships with BRC	(SP5) Build or maintain partnerships to enforce regulations that impact on biodiversity	No specific actions - see recommendations Appendix G	SR4, SR5, SL19

Obj 26: Management plans and policies that are the responsibility of BRC and other parties are developed collaboratively to protect or enhance biodiversity	(SP6) Develop a strategy to address population growth and regional sustainability issues with national, state and regional partners	(AP5) Strategy as direct action	SL14
	(SP7) Maintain or foster new collaborative partnerships for the development of biodiversity management plans or Memorandum of Understandings across land tenures or areas of responsibility	No targeted action	SM4, SM5, SM9, SM11
Obj 27: Opportunities for biodiversity management are fostered through regional and local partnerships	(SP8) Develop nature-based tourist opportunities that ensure the protection of biodiversity and enhances nature appreciation	(AP6) Strategy as direct action	

10. SITE-SPECIFIC MANAGEMENT

This section provides site-specific guidance for biodiversity management on Council owned or controlled land (Council controlled land) and is an extension of the condition assessment (Part C) and strategy tables (refer Tables 1 - 6 and **Appendix G**) to help facilitate management by BRC and the community. Further, as a general principle, conservation, protection and enhancements efforts should be focused in areas where the conservation value is assessed to be higher than the condition value. In addition, applicable strategies from the Bathurst Vegetation Management Plan and the Urban Waterways Management Plan have also been included to ensure some degree of integration between planning documents.

The area where Council controlled land is located has been mapped into 'suburbs' and includes areas in the former Bathurst City LGA, rural villages and the outlying rural environment. Each area has been given an identifier (ID) (see Tables 8 - 27) and these correspond to specific condition assessment datasheets. That is, each datasheet from the assessment has been presented to BRC in digital format and the ID forms the prefix to the file name. The datasheets are not required to interpret the site-specific management tables.


It has been found that the areas are not necessarily homogeneous in terms of land use, character and ecosystem condition or conservation value with some areas showing considerable variation. Some contain both terrestrial and aquatic landscapes, others may contain Box-Gum Woodland in an otherwise degraded landscape, while other areas may accommodate both operational land and conservation. In this regard, the suggestions given below should be used as a guide only, with all major management decisions requiring a site analysis that recognises its various attributes.

The key to the management tables is presented in Table 7 and the site-specific suggestions for biodiversity management are given in Tables 8-23.

Table 7. Key to site-specific management tables

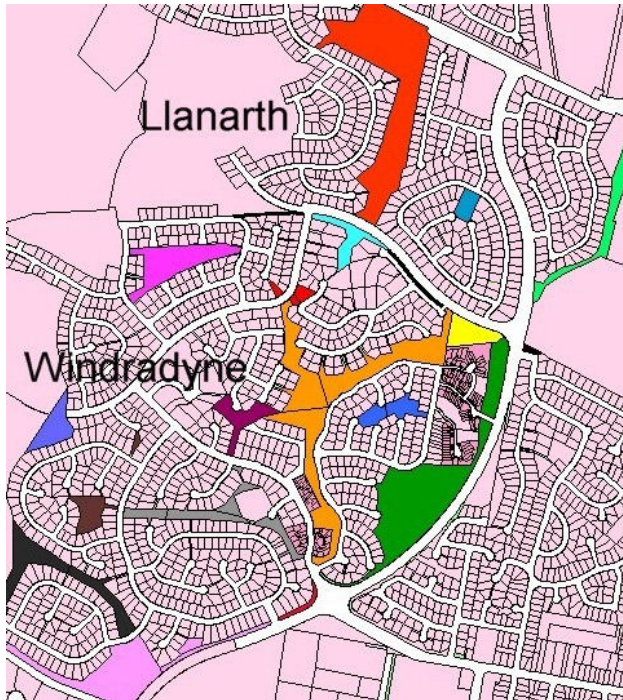
Table heading	Heading explanation			
ID	Area identifier - with the prefix letter denoting the 'suburb'. The ID relates directly to the identifier on the digital datasheets presented to BRC			
Description	A brief description of location and land use and noteworthy points relating to vegetation type, conservation assets, threats and impacts are provided			
Suggested strategies, recommendations and actions	Outlines site-specific management strategies, recommendations and actions			
Cond.	Highlights overall ecosystem condition rating of the area			
Cons.	Highlights overall conservation value rating of the area			
<i>Ecosystem condition and conservation value rating</i>				
Very poor	Poor	Moderate	Good	Very good
0	1	2	3	4

Table 8. Abercrombie and Eglinton suburbs

				
ID	Description	Suggested strategies, recommendations and actions	Cond	Cons
A1	Abercrombie Dve/Eglinton Rd, road reserve, cycleway/pedestrian path. Amenity plantings of native and exotic trees	Road reserve on Eglinton Road Strategies SM14 Action AM23 Cycleway area refer to VMP Strategy P10	■	■
A2	O'Keefe Park, Macquarie River riparian zone. Part of major riparian corridor. Willow removal near bridge and more recently upstream. Significant tree, shrub, grass and forb weeds, streambank erosion and erosion from vehicle tracks	Strategies SC5, SM3, SM13, SM27, SL4, SP3 Actions AC7, AM2, AM12 VMP Strategies W1, W3, P7	■	■
A3	River View Park, urban playground. Very low visual amenity, ecological and conservation value	VMP Strategies P10, P11	■	■
A4	Macquarie River northern bank, Eglinton. Part of major riparian corridor. General absence of native riparian vegetation, infested with willows and exotic shrubs, forbs and grasses, some sections trees are absent. Grazing by horses on floodplain.	Strategies SC5, SM3, SM27, SL4, SP3 Actions AC7, AM2, AM12 VMP Strategies W1, W2, W3	■	■
A5	Macquarie River – southern bank, Eglinton Bridge to Jubilee Park. Part of major riparian corridor, cycleway/pedestrian path. Floodplain replanted with River Oak and eucalypts. Dense cover of exotic grasses.	Strategies SC5, SM3, SM27, SL4, SP3 Actions AC7, AM2, AM12 VMP Strategy W3	■	■
SM1	Jubilee Park. Part of major riparian corridor. Recent clearing of willows, Robinias and other exotic trees and shrubs along riparian zone and floodplain. Exotic grasses and forbs provide dense groundcover. Replanted with native species (trees, shrubs and groundcover). Scattered remnant River	Strategies SC5, SM3, SM15, SM27, SL4, SP3 Actions AC7, AM2, AM12 VMP Strategy W3	■	■

	Sheoak retained. Severe bank and bed erosion from Sawpit Creek on floodplain. Area now fenced off and threats from vehicle access mitigated. Regeneration of exotic trees occurring			
E1	Eglinton oval, tennis courts, amenity building and surrounding open space. Isolated yellow box present – possibly planted. Trees offer shade and visual amenity. Area regularly slashed	Strategies SM5, SM13, SM19 Actions AM4, AM14, AM25 VMP Strategies P10, P11	■	■
E2	Eglinton walkways. Amenity planting of native and exotic trees. Constraints: Public safety and the need to avoid visual barriers that may provide screening for antisocial behaviour	Strategies SM5, SM13 Actions AM4, AM14 VMP Strategies P10, P11	■	■


Table 9. Llanarth and Windradyne suburbs

				
ID	Description	Suggested strategies, recommendations and actions	Cond	Cons
L1	Darwin Drive drainage reserve. Past clearing of remnant vegetation. Revegetation program commenced in November 2011 as per Urban Drainage Reserve Revegetation Landscape Plan	Strategies SM14, SM15, SM19, SM20, SL4 Actions AM23, AM25, AM26; VMP Strategies RV2,	■	■

		RV14		
L2	Lorimer Street open space. Groundcover comprises predominately exotic grasses.	VMP Strategies P10, P11	■	■
L3	Open grassed drainage line with low flow pipe below Bradwardine Road to Eglinton Road. Small dam below Bradwardine Road covered in dock though at times contains water. Revegetation program commenced in November 2011 as per Urban Drainage Reserve Revegetation Landscape Plan	Strategies SM14, SM15, SM19, SM20, SL4 Actions AM23, AM25, AM26	■	■
W1	Miller Park. Replanted Yellow Box and other native trees. Pedestrian access and open space	Strategies SM5, SM13, SM14, SM19, SM20 Actions AM4, AM14, AM24, AM25, AM26 VMP Strategies P10, P11, RV14	■	■
W2	Everden Road open space. Degraded Box-Gum Woodland. Some exotic plantings, garden escapes and exotic grasses and forbs. Lack of recruitments.	Strategies SC2, SM5, SM19 Actions AC3, AM4, AM25	■	■
W3	Booth Street open space. Box-Gum Woodland. Significant linkage of EEC through urban landscape. Midstorey and regenerating trees absent. Some native grasses in groundcover	Strategies SC2, SM1, SM5, SM19, SL4, SL5 Actions AC3, AM4, AM25, AL4 VMP Strategies RV2, RV14, P10, P11	■	■
W4	Everden Road, road reserves. Exotic groundcover grasses. Grasses provide some protection against surface erosion.	VMP Strategies S7, S8	■	■
W5	Colville Street open spaces includes mature eucalypts and exotic shrubs	Strategies SM5, SM13 Actions AM4, AM14 VMP strategies P10, P11, RV14	■	■
W6	Booth Street open space corner of Everden and Bradwardine Roads. Box-Gum Woodland. Scattered Yellow Box. Groundcover comprises mainly exotic grasses.	Strategies SM5, SM13 Actions AM4, AM14 VMP Strategies RV2, RV14	■	■
W7	Wilkinson Park. Isolated Yellow Box. Degraded Box-Gum Woodland. Widely scattered amenity plantings of native trees	Strategies SM5, SM13, SM14 Action AM4, AM14, AM24	■	■
W8	Walmer Park, oval and road reserves. Scattered Yellow Box. Key stepping stones of EEC through urban landscape. Native groundcover patchy and tending to be under Yellow Box. Amenity plantings of exotic trees along road reserve. Oval and surrounds groundcover comprises exotic grasses and forbs. Groundcover slashed and sheet and rill erosion evident in areas under box trees due to vehicular tracks.	NE corner below the sports oval: Strategies SC2, SM1, SM5, SM13, SM14, SM19, SM20 Action AC3, AM4, AM14, AM24, AM25, AM26 VMP Strategies RV2, RV14 Road reserve: VMP Strategies S1, S2, S7, S8, S10, S18	■	■
W9	Suttor Street open space linking to Booth Street reserve. Absence of upper and midstorey vegetation. Dominated by exotic grasses.	Strategies SM5, SM13 Actions AM4, AM14	■	■
W10	Windradyne open spaces and playground	VMP Strategies P10, P11	■	■
W11	No. 8 Reservoir. Planted Yellow Box currently semi-mature. Groundcover a mix of native and exotic	Strategies SC2, SM1, SM5, SM13, SM14, SM19, SM20,	■	■

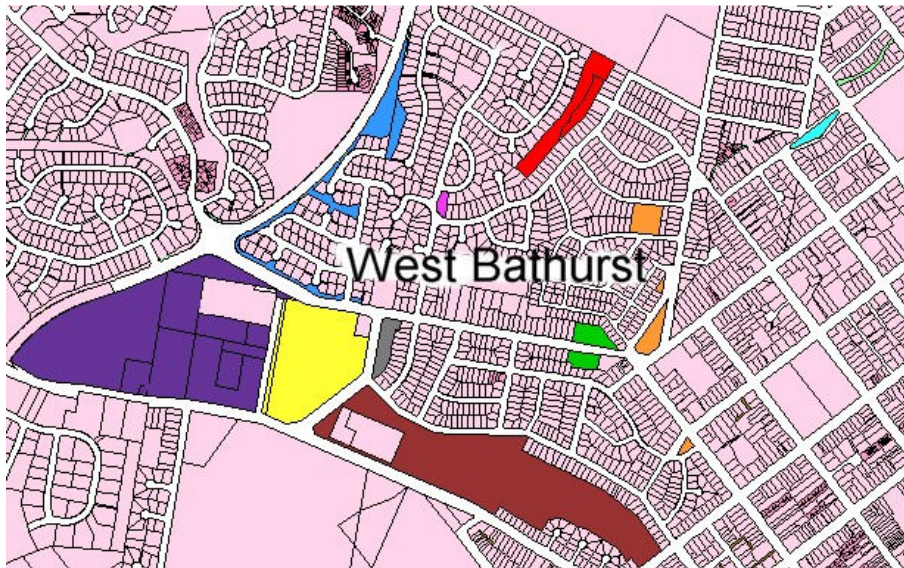
	grasses in a patchy distribution.	SL4, SL5; Actions AC3, AM4, AM14, AM24, AM25, AM26, AL5		
W12	Road reserve on the corner of Suttor Street and Bradwardine Road. Plantings of native trees	VMP Strategies S7, S8	■	■
W13	Open space at the end of Colville Street. Urban stormwater runoff along channelised drainage line. Sedges, rushes and grasses in open drain slashed. Box-Gum Woodland. Isolated Blakely's Red Gum present.	Strategies SM5, SM13, SM6, SL5 Actions AM4, AM14, AM5, AL5 UWMP strategy refer Site S19, VMP Strategy RV14	■	■
W14	Richardson Street low flow pipe drainage reserve. Widely scattered amenity plantings of native and exotic trees and shrubs. Groundcover slashed. Significant alteration to overland flows.	Strategy SM15	■	■
W15	Retention basin and road reserve along the Mitchell Highway and the Bradwardine Road extension. Amenity plantings of exotic and native species along the Mitchell Highway bund.	Strategy SM15 VMP Strategy G19	■	■

Table 10. Sawpit Creek 'suburb'

	ID	Description	Suggested strategies, recommendations and actions	Cond	Cons
	SC1	Parcel of land on Ophir Road currently private property and used as a truck and heavy machinery business. Amenity plantings of native and exotic trees. Proposed land development for housing	Strategies SC8, SC9, SC13, SM6 Actions AC10, AC11, AM5	■	■
	SC2	Land parcel currently used for grazing and cropping. Groundcover dependent on season and agricultural enterprise. Deeply gullied tributary with highly erodible banks and bed, sediment deposits in the lower reach of the gully supports instream vegetation. Ephemeral pool in lower reach. Widely scattered Yellow Box on gully banks. Willows and African Boxthorn at confluence with Sawpit Creek. Sawpit Creek dominated with willows. Contains shallow and deep pools and vegetated sediment bars. Bed and bank erosion. Land to be developed for housing.	Strategies SC2, SC8, SC9, SC13, SM1, SM6, SM16, SO9, SO10, SP3 Actions AC3, AC10, AC11, AM5 UWMP strategies refer Sites S36, S38 VMP Strategies RV14, W12	■	■
	SC3	Proposed housing development site off Colville Street. Adjoins Sawpit Ck Sawpit ck system of very high conservation value for its significant terrestrial and aquatic corridor/linkage and presence of the Box-Gum Woodland EEC. Important amenity value (visual buffer b/w rural and urban interface), sediment & nutrient trapping. Threats include urban development not sensitive to biodiversity outcomes, erosion from hillslopes, bank and bed instability, sediment and nutrient loading into waterways, African boxthorn and other weeds, rabbits, past history of grazing, current land use –farming. Willow removal along Sawpit Creek has improved the riparian condition status	Strategies SC2, SC8, SC9, SC13, SM1, SM6, SM16, SO9, SO10, SP3 Actions AC3, AC10, AC11, AM5 UWMP strategies refer Site S39 VMP Strategies RV14, W12	■	■
	SC4	Land parcel below the Mitchell Highway adjacent to Sawpit Creek. Conservation values include the Box-Gum Woodland EEC and the linkages provided by the creek	Strategies SC2, SC8, SC9, SC13, SM6, SO9, SO10, SP3	■	■

	and tributaries, especially the Colville Street tributary. Parcel contains small dams with good aquatic qualities. Significant past gullyng has reduced the ecosystem functioning of the creek and floodplain. Eight Schauburger Sills were installed in the creek in 2010 to reduce bed and bank erosion. Another significant threat is the presence of weeds. Proposed area for urban development, though currently farmed.	Actions AC3, AC10, AC11, AM5 UWMP strategies refer Sites S14, S15 VMP Strategies RV14, W12		
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Table 11. West Bathurst suburb

				
ID	Description	Suggested strategies, specific recommendations and actions	Cond	Cons
WB1	Road reserves, public open space along Bradwardine Road and Suttor Street. Includes Hawkins Street reserve. Box-Gum Woodland EEC with scattered remnant Yellow Box. No regeneration of Yellow Box. Some areas treeless. Mix of native and exotic groundcover grasses and forbs.	Strategies SC2, SO10, SM1, SM5, SM19, SM20 Actions AC3, AM4, AM25, AM26 VMP Strategy S8	■	■
WB2	Edgell reserve. Very high proportion of exotic trees, shrubs, grasses and forbs in reserve – both ornamental plantings and weeds. Drainage line gullied and infested with weeds (e.g. willows & privet).	Strategies SM16, SL4, SP4 UWMP Strategies S9, S12, S16, S17, S19 VMP Strategies P10, P11, W21	■	■
WB3	Osborne Street Park open space. Amenity plantings of native and exotic trees.	No action required	■	■

















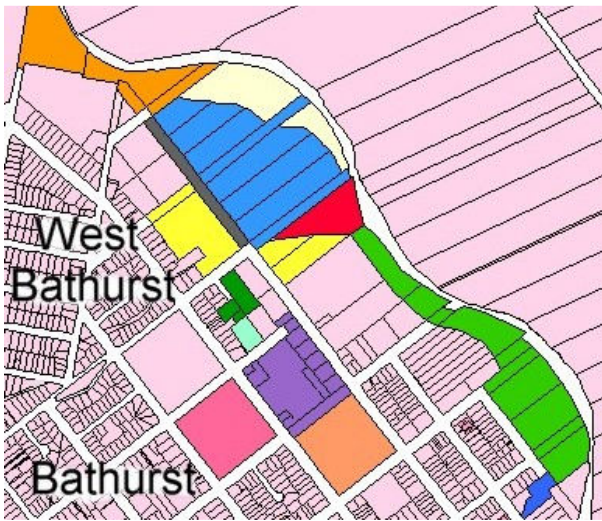










WB4	Mitre Street and White Street parks (open space, play equipment, tennis courts). Scattered Yellow Box, Blakelys Red Gum and other native and exotic trees. Groundcover comprises mostly exotic grasses.	Strategies SC2, SM5 Actions AM3, AM4 VMP Strategies P10, P11, RV14		
WB5	Chifley Park. Ornamental park/open space garden.	No action required		
WB6	Low flow pipe drainage reserve. Complete loss of original vegetation. Some amenity plantings in Durham Street section.	No action required		
WB7	Water reservoirs on Suttor Street. Northern side - amenity plantings of eucalypts and high proportion of bareground due to trafficking. Southern reservoir parcel includes isolated Yellow Box (likely remnant), groundcover grasses are predominately native.	No action required, area needs to remain clear		
WB8	Brooke Moore Oval. Fenced conservation area. Significant patch of Box-Gum Woodland EEC. Dominance of native species in groundcover. Areas not excluded are slashed (oval and road reserves). Amenity plantings along Mitchell Highway and along cemetery road.	Strategies SC2, SM1, SM5, SM15, SM18, SM19, SM20, SL4, SP3 Actions AM3, AM4, AM25, AM26		
WB9	Open space opposite Brooke Moore oval on Alexander Street. Box-Gum Woodland EEC. Quality of site reduced due to the slashing of groundcover grasses (high proportion of native species), the presence of weeds and the resultant surface erosion. Absence of mid-storey species.	Strategies SC2, SM1, SM5, SM14, SM19, SM20, SL4 Actions AM3, AM4, AM24, AM25, AM26		
WB10	Cemetery and adjacent road reserves. Some widely scattered Yellow Box and small open patch on Suttor St. Box-Gum Woodland EEC. Cemetery area mostly planted with exotic trees & shrubs. Lack of Yellow Box recruitment.	Strategies SC2, SM5, SM13 Actions AM3, AM4, AM14 VMP Strategies P10, P11, RV14		
WB11	Hector Park, Jordan Creek. Box-Gum Woodland EEC occurring in patches and as isolated and scattered trees. Groundcover slashed (native and exotic grasses and forbs). Jordan Creek deeply gullied with lower section restored with engineered pool-riffle system. Instream aquatic vegetation dense and relatively diverse. Very good aquatic habitat with permanent pools. Replanted riparian vegetation. Slashing encroaching onto streambank. Some amenity plantings along Mitchell Highway opposite gaol.	Strategies SC2, SM1, SM5, SM14, SM19, SL4 Action AM3, AM4, AM24, AM25 UWMP Strategies refer Site J14 VMP Strategies P10, P11, RV14, W21		

Table 12. West Bathurst and Bathurst suburbs

				
ID	Description	Suggested strategies, specific recommendations and actions	Cond	Cons
WB12	Macquarie River frontage. Pedestrian and cycle path runs through land parcels. Willows and exotic trees and shrubs have invaded riverbank and parts of the floodplain. Currently being suppressed by grazing horses in fenced area.	Strategies SM3, SM13, SM27, SL4, SP4 Actions AM2, AM12, AM30		
WB13	Sewerage Treatment Works. Amenity planting of native and exotic trees. Ponds provide habitat for some aquatic birds. Diversity of microbes and their activity are critical in the sewerage treatment process.	Strategy SO10		
WB14	Off river artificial wetlands. Fill taken for levee bank has created a wetland area densely vegetated with instream wetland plants. Some regeneration of willows and River Sheoak.	Strategies SO10, SM3, SM12, SM15 Action AM11 Remove regenerating willow saplings on an on-going basis		
WB15	Roadway adjacent to sewerage treatment works also used for pedestrian and cycle access. Amenity planting of native trees.	Strategy SO10 VMP Strategies P10, P11		
WB16	Floodplain – buffer for sewerage treatment works. Horse grazing and agricultural land use. Complete removal of original vegetation	Strategy SM23 Action AM28		















WB17	PCYC surrounds and the Lions Club Shed. Small patch of planted eucalypts (immature) and wattles. Groundcover of predominately exotic grasses slashed. Lions shed vegetation an ornamental garden.	VMP Strategies P10, P11		
WB18	Bridge Club open space surrounding building planted with Tasmanian Blue Gums.	Strategy SO10		
B1	Victoria Park. Public park, open space and playground with amenity plantings. Older plantings mostly exotic trees. Playground area native trees and groundcover species. Groundcover slashed. Moderate slope and lack of groundcover features induces water run off.	VMP Strategy P5		
B2	Netball and tennis court complex. High cover of buildings and impervious materials. Area surrounding courts with slashed groundcover of exotic grasses and forbs. Amenity planting of exotic trees and eucalypts.	Strategy SM14 Action AM24 VMP Strategies P10, P11		
B3	Council works depot. Parcel mostly concrete and buildings. Includes vegetated buffer area. Planted with native and exotic trees and tall shrubs. Groundcover slashed.	Strategy SM14 Action AM24 VMP Strategies S7, S8		
B4	Macquarie River between Stanley street and sewerage treatment works along riparian zone, levee and floodplain. Extensive weed invasion along levee and stream bank. Exotic plantings in dog park and in old nursery site. Dumping of rubbish and fill in old nursery site. Original remnant veg cleared and willows removed. Some willow regeneration. Isolated River Sheoak.	Strategies SO10, SM3, SM13, SM27, SL4, SP4 Actions AM2, AM12, AM30		
B5	Lower Jordan Creek. Deeply incised stream densely vegetated with exotic trees and shrubs. Instream vegetation mostly absent due to shading. Bed and banks very unstable. Water quality impacted by urban runoff and litter.	Strategy SM16 UWMP strategies refer Site J9		

Table 13. Bathurst suburb – parks and drainage reserves


				
ID	Description	Suggested strategies, specific recommendations and actions	Cond	Cons
B6	George Park. Ovals, playground and amenity facilities. Amenity plantings of exotic trees and a few eucalypts (including isolated Yellow Box). Outside ovals grasses include some native species.	Strategies SM5, SM14 Actions AM4, AM24 VMP Strategies P10, P11	■	■
B7	Centennial Park. Recreational park and open space. Scattered trees exotic and non-indigenous native.	VMP Strategy P4	■	■
B8	Machattie Park. Ornamental plantings. 'Duck pond' frequented by Black Ducks. Heritage conservation value and visual amenity very high contributing to ecosystem services of vegetation.	Strategy SM25 Action AM28	■	■
B9	Kings Parade. High maintenance ornamental park. Amenity and conservation values of plantings very high – contributing to ecosystem services. Biodiversity conservation value very poor.	No action required	■	■
B10	Jordan Creek piped underground. Drainage reserve grassed	Strategy 14; Action AM24	■	■
B11	Jordan Creek open concrete channel	Strategy SM16; UWMP strategies refer Site J2	■	■

Table 14. Bathurst 'suburb'

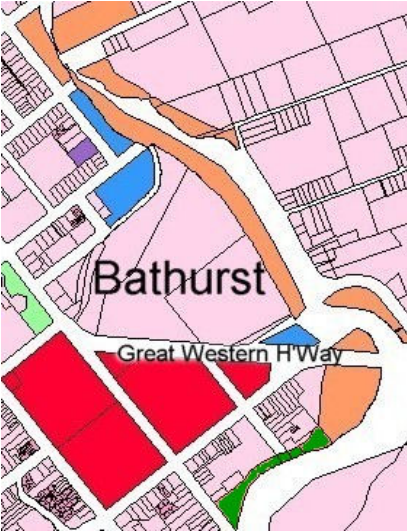












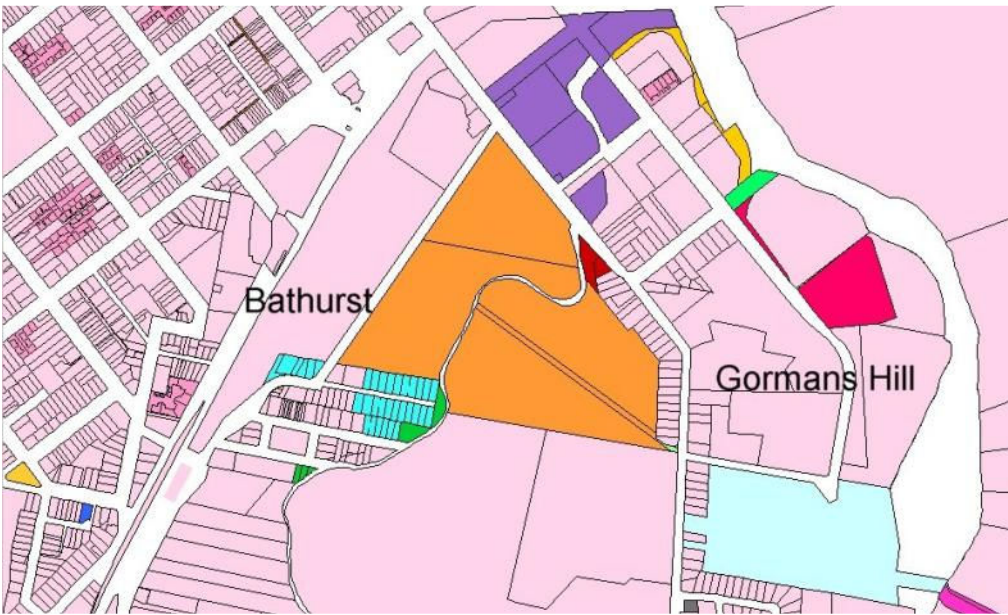
	ID	Description	Suggested strategies, recommendations and actions	Cond	Cons
	B12	Macquarie River Park. Historic clearing of River Sheoak and colonisation of willows. Willows removed and River Oaks regenerating to form an open woodland between Evans and the Hereford Street bridges. Upstream of Dennison Bridge the river Oaks are sparsely distributed or absent. The groundcover grasses are slashed to the river bank. Exotic grasses and forbs on the floodplain. Edge of stream vegetated with reeds and sedges.	Strategies SM3, SL4 Action AM2 VMP Strategies W5, W6, W8		
	B13	Macquarie River. Levee on the floodplain. River bank densely vegetated with exotic trees, shrubs and groundcover species	Strategies SM3, SM13, SM27, SL4, SP3 Actions AM2, AM12 VMP Strategies W1, W3		
	B14	Bicentennial, Macquarie and Cousens Parks. Passive recreation and playground areas. Ornamental plantings. Lawn areas predominately exotic grasses/clover. Amenity value (aesthetics and microclimate modification) of the vegetation is high providing some ecosystem services	Refer VMP P10, P11		
	B15	Alan Morse Park, sports ground, Carrington Park and Quota Park. High degree of modification with the removal of the original vegetation and planting of mostly exotic species (except for scattered mature Yellow Box around sports ground where connectivity to other yellow box is poor).	Protect Yellow Box in sportsground complex		
	B16	Haymarket Reserve. High maintenance ornamental park.	No action required		
	B17	Aquatic centre vacant land. Original vegetation removed.	No action required		

Table 15. Bathurst and Gormans Hill ‘suburbs’

				
ID	Description	Suggested strategies, recommendations and actions	Cond	Cons
B18	Open space area between the old gas works and Vale Creek. Riparian area bounded by levees. Historic creek realignment at this point, channelised drain leading into creek, abundance of exotic trees and shrubs in drain. Loss of original riparian vegetation, riparian weeds (instream, floodplain and banks), sediment mobilisation.	Strategies SM16, SP4 UWMP strategies and actions refer Sites V14, V15	■	■
B19	Policeman's Paddock, Proctor Park and a section of Vale Creek. Open space and playing fields. Playing fields and open space covered in exotic grasses/forbs that are regularly slashed. Most of the invaded willows and exotic trees and shrubs along Vale Creek have been removed leaving scattered planted eucalypts. Some exotic vegetation still remains near Gormans Hill Road. Where willows have been removed the streambank vegetation is densely covered in exotic grasses and forbs. Instream vegetation comprises native reeds and sedges. Instream habitat consists of shallow and deep pools and sediment bars. Sediment mobile bed and banks unstable.	Playing fields no action required Vale Creek riparian zone Strategies SM16, SL4, SP4 UWMP Action refer Site V24	■	■
B20	Pye Street Parcels. Modified sedgeland/grassland. Vacant land	Strategy SC6 Action AC9	■	■





















B21	Beresford Street parcels. Vacant parcels adjoin Vale Creek. Terrestrial condition of the vegetation is very poor with upperstorey vegetation removed. Riparian zone with instream vegetation and shallow pools and sediment bars.	Strategy SM16 UWMP Strategies refer Site V23		
B22	Milltown Park near Chifley's cottage. Open space and playground area. Amenity plantings of Prunus.	VMP Strategies P10, P11		
B23	Chifley cottage	No action required		
GH1	Small cleared parcels near Vale creek along Gormans Hill Road– includes levee bank.	Strategy SO10		
GH2	Riparian zone adjacent to Macquarie river Open space, riparian zone buffer, concrete and earthen levee. Vegetation includes exotic trees, shrubs and groundcover species.	Strategies SO10, SM3, SM13, SP4 Actions AM2, AM12		
GH3	Designated narrow road reserve to river. Absence of upper and midstorey layers. High proportion of exotic groundcover species.	Riparian zone only Strategies SO10, SM3, SM13, SP4 Actions AM2, AM12		
GH4	Reserve near Macquarie River. Absence of upper and Midstorey layers. High proportion of exotic groundcover species.	Strategy SC6 Action AC9		
GH5	Water Filtration Plant, Gormans Hill. When ponds full there is potential habitat for birds. Widely scattered amenity plantings. New practices of retreating water means the ponds are likely to be dry for longer periods	Strategies SO9, SO10, SM3, SP4 Action AO11		
GH6	Access reserve between Macquarie River and White Rock Road. Groundcover comprises exotic grasses.	Strategy SC6 Action AC8		
GH7	Gormans Hill Park	VMP Strategies P10, P11		

Table 16. South Bathurst 'suburb'


	ID	Description	Suggested strategies, recommendations and actions	Cond	Cons
	SB1	Morcoms Reserve (Hawthornden Ck drainage reserve). Revegetated with native plantings (indigenous and other). Instream vegetation patchy. Bed and bank instability and sediment mobilisation	UWMP strategies and actions refer Site H35	■	■
	SB2	Pound, Vale Road – buildings and open space around facility. Grazing of goats would preclude the successful establishment of trees/shrubs	No action required	■	■
	SB3	Decommissioned saleyards settlement ponds. Large artificially created pond, duck habitat. High levels of nutrients in pond. Banks vegetated with exotic weeds. Disconnection of pond from surrounding landscape except during very high flood events.	Strategies SO10, SM12, SM13, Actions AM11, AM21, SM15 Enhance settlement pond and immediate surrounds as wetland habitat. Replant banks with native tree, shrub and groundcover species	■	■
	SB4	Decommissioned saleyards site. Planted with exotic trees exotic groundcover in patches. Exotic groundcover species emerging through cracks in concrete.	Strategy SC6 Action AC9	■	■
	SB5	Part of old saleyards complex – now disused as stock holding paddock on Vale Ck floodplain. Legacy of high nutrient loading from saleyards, holding stock and manure dumping. Vale Ck exhibits some bank and bed erosion. Good instream vegetation and deep pools.	Strategies SC6, SL4, SP4 Action AC9 Reduce nutrient loading into Vale Creek from any agricultural activities on the floodplain For riparian zone - UWMP strategies and actions refer Site 20	■	■
	SB6	Saleyards carpark now decommissioned and is used as a general purpose carpark, road reserve	No action required	■	■

Table 17. South Bathurst 'suburb'

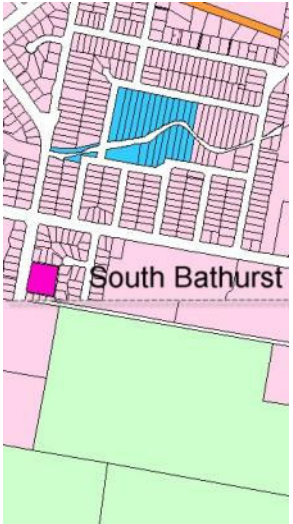








	ID	Description	Suggested strategies, recommendations and actions	Cond	Cons
	SB8	Low flow pipe from Prospect Street. Amenity plantings with native and exotic trees and shrubs.	Strategy SO10		
	SB9	Jaques Park. Open space for passive recreation and playground, Hawthornden Creek drainage reserve. Ornamental plantings of exotics and along the riparian zone there is the replanting of native tree, shrub and groundcover species. Groundcover slashed with riparian buffer not slashed. Instream vegetation densely covered with sedges and rushes. Some bed and bank instability	Strategies SL4, SL15, SP4 UWMP strategies and action refer Sites H36, H37 Park area refer VMP strategies P10, P11		
	SB10	Urban park, College Road. Widely scattered amenity plantings of eucalypts with predominately native grass understorey.	Strategies SM5 Action AM4 VMP Strategies P10, P11		
	SB11	Agricultural land between Vale and College Roads. Agriculture – history of cultivation. Gully erosion in Vale Creek tributary. Scattered Apple box and Box thorn in gully.	Strategy SC6 Action AC9 Vale Creek drainage line - UWMP strategies refer Site V10		

Table 18. Robin Hill 'suburb'








	ID	Description	Suggested strategies, recommendations and actions	Cond	Cons
	RH1	Corporation Avenue buffer zone between industrial and residential areas. Replanting of native eucalypts. Remnant Apple Box. Groundcover comprises mainly exotic grasses and forbs. Yellow Box/Blakelys Red Gum cleared. (Yellow Box in close proximity)	Strategies SM5, SM14, SM15 Actions AM4, AM24 VMP strategies S8, S9, S11		
	RH2	Boundary Rd/ Links Place detention basin on Jordan Creek. Remnant mature Yellow box as well as Apple Box. Box-Gum Woodland EEC	Strategies SC2, SM16; Action AC3 UWMP strategies and actions refer Site J7		
	RH3	McDiarmid Reserve, open space/drainage line. Area contains small dam fringed with reeds. Isolated Yellow, Apple Box, and willows - lack of box-gum recruitments. Drainage line is invaded by weeds.	Strategies SC2, SM16; Action AC3 UWMP strategies and actions refer Site J7		

Table 19. South Bathurst – Mount Panorama ‘suburbs’

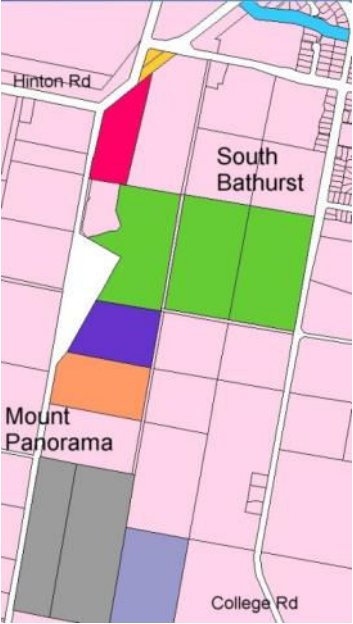
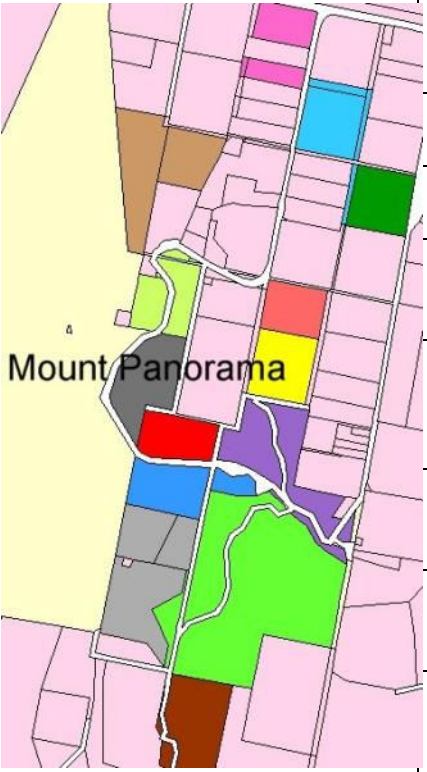
	ID	Description	Suggested strategies, recommendations and actions	Cond	Cons
	SB12	Hawthornden Creek drainage reserve between Havannah St and College Rd. Provides significant ecosystem services for water quality and sediment trapping. Replanted native species in riparian zone. Instream vegetation densely covered in sedges and rushes.	Strategies SL4, SP4 UWMP strategies and action refer Sites H36, H37	■	■
	SB13	College Road, Mt Panorama camping during race week. High proportion of native grasses, scattered Yellow Box/Blakely's Red gum on boundary, cleared of box-gum woodland, periodic slashing, grading of tracks, erosion from tracks and bare ground. Gully vegetated with willows, blackberries and exotic grasses	Strategies SC2, SM1, SM5, SM9, SM13, SM16, SM19 Actions AC3, AM4, AM8, AM14, AM25 UWMP strategies and action refer Site V9	■	■
	SB14	Block between Conrod Straight and College Rd. Degraded Box-Gum Woodland EEC with isolated mature Yellow Box. Exotic pasture grasses with some native species. Grazed.	Strategies SM5, SM23 Actions AM4, AM27	■	■
	MP1	Open spaces near entrance to Mount Panorama track.	No action required	■	■
	MP2	National Motor Racing Museum, other buildings and open space. Box-Gum Woodland in open space area near Citigate. Amenity planting of native trees near museum.	Strategies SC2, SM1, SM5, SM19 Actions AC3, AM4, AM25	■	■
	MP3	Old Picture theatre. Stockpile site for council building and construction materials etc. High proportion of weeds including African Boxthorn and Phalaris. Bareground from vehicle tracks. Radiata pine on eastern boundary	Strategies SM5, SM12 Actions AM4, AM11	■	■
	MP4	Area to the south of the old picture theatre. Groundcover comprises a high proportion of native grasses. Serrated Tussock present. Small dam with <i>Ottelia ovalifolia</i> , turtles, frogs and fringed with rushes. Derived Grassy Box-Gum Woodland EEC- scattered Yellow Box on boundary.	Strategies SC2, SM1, SM5, SM12, SM19 Actions AC3, AM4, AM11, AM25	■	■
	MP5	Adjacent to Conrod Straight. Has had a history of cultivation	Strategy SM5 Actions AM4	■	■

Table 20. Mitchell and Mount Panorama ‘suburbs’

	ID	Description	Suggested strategies, recommendations actions	Cond	Cons
	M1	Blayney Common. Box-Gum Woodland EEC. Significant invasion of exotic weeds the main threat. Other threats include rabbits, illegal firewood collection, dumping of rubbish and garden refuse, continuing erosion threat (gully bank, sheet).	Strategies SC2, SR4, SM1, SM5, SM13, SM16, SP7, SP4 Actions AC3, AR1, AM4, AM14, AP4, AP6 UWMP Strategies and actions refer Site J3	■	■
	M2	Vietnam Veterans Park. Box-Gum Woodland EEC. Native grasses regularly slashed. Native replantings and picnic area.	Strategies SC2, SR4, SM1, SM5, SM19, SL5, SP4; Actions AC3, AR1, AM4, AM25, AM6	■	■
	M3	Water reservoir in the corner of Blayney Common.	No action required	■	■
	M4	Boundary Road Reserve decommissioned quarry. Remnant Box-Gum Woodland EEC. Replantings of native vegetation.	Strategies SC2, SP4 Action AC3	■	■
	M5	Water reservoirs on Boundary Road. Box-Gum Woodland EEC, slashed groundcover.	Strategies SC2, SM5 Actions AC3, AM4	■	■
	M6	Boundary Rd Reserve conservation area. Box-Gum Woodland EEC. Woodland and Hawthornden Creek restoration projects. Threats include weeds, pests (foxes, rabbits), vandalism, gully erosion and erosion from walking tracks.	Strategies SC2, SR4, SM5, SM16, SL4, SL15, SP4 Actions AC3, AR1, AM4 UWMP action refer Sites H29, H30	■	■
	M7	Archery Club site. Box-Gum Woodland. Ribbon Gums along Hawthornden Creek. Slashing of groundcover around amenities and archery field, sheet erosion in bareground areas and along tracks, significant gully erosion, sediment and nutrient flux, sediment loading from roadway and gully walls and sediment loss instream from streambed erosion.	Strategies SC2, SM5, SM12, SM17, SL4, SP4 Actions AC3, AM4, AM11, UWMP strategies and action refer Sites H1	■	■
	M8	Disused road Reserve off Boundary Road. Grassland with scattered Yellow Box. Comprises Box-Gum Woodland.	Strategies SM5, SM12 Action AM4	■	■
	MP6	Hinton Road camping area during race-week Box-gum woodland along Hawthornden Creek. Area grazed by sheep. Past clearing of Box-Gum Woodland. Radiata pines, sheet and rill erosion, incision of drainage line, gully along Hawthornden Creek. Recent installation of Schauberger Sills and bank revetment along Hawthornden Creek.	Strategies SR4, SM5, SM12, SM19, SM20, SM23 Actions SR1, AM4, AM11, AM25, AM26, AM27	■	■
	MP7	Pit Straight amenities – grandstand, sealed and grassed areas	No action required	■	■

Table 21. Mount Panorama inside track

	ID	Description	Suggested strategies, recommendations and actions	Cond	Cons
	MP8	Grassy vacant blocks off Hinton Road near 'Hells Corner'	Strategies SM5, SM9, SM13 Actions AM4, AM8, AM14, AM18	■	■
	MP9	Grassed area inside the track. Competitor's camping area during race events	Strategies SM9, SM19 Actions AM8, AM18, AM25 Protect and maintain newly planted trees	■	■
	MP10	'The Dip'. Buffer area for car race events. Degraded Box-Gum Woodland. Predominately native grass cover. Periodically slashed.	Strategies SC2, SM5, SM9, SM13, SM19 Actions AC3, AM4, AM8, AM14, AM18, AM25	■	■
	MP11	Decommissioned orchard. Dominance of exotic grasses and forbs and Prunus spp. regenerating	Strategies SC6, SM9, SM12, SM13 Actions SC8, AM8, AM11, AM18, AM21	■	■
	MP12	Inside track. Grassy open woodland. Box-Gum Woodland EEC. High proportion of native grasses. Small dam in incised drainage line. Exotic trees and shrubs in drainage line.	Strategies SC2, SM1, SM5, SM9, SM12, SM13 Actions AC3, AM4, AM8, AM11, AM18, AM21	■	■
	MP13	Inside track at the top of the Mount. Box-Gum Woodland EEC. High proportion of native grasses in groundcover. Some erosion and weed invasion.	Strategies SC2, SM1, SM5, SM9, SM12, SM16, SM26, SP4 Actions AC3, AM4, AM8, AM11, AM30 UWMP Strategy S1	■	■
	MP14	Inside Brock's Skyline. Derived grassy Box-Gum Woodland EEC. High proportion of native grasses. Isolated Yellow Box	Strategies, SC2, SM1, SM5, SM9, SM13, SM26, SP4 Actions AC3, AM4, AM8, AM18, AM30	■	■
	MP15	Inside track – Possible Tablelands Basalt Forest EEC. High proportion of native grasses and forbs. Exotic shrubs, grasses (Serrated Tussock) and forbs	Strategies SC2, SM1, SM9, SM12, SP4 Actions AC3, AM8, AM11	■	■
	MP16	Reid Park. Box-Gum Woodland and Tablelands Basalt Forest EECs. High proportion of native grasses. Outside track is periodically slashed and high trafficking during raceweek.	Strategies SC2, SR4, SM1, SM5, SM9, SM19, SM26, SL4, SL5, SP4, SP7 Actions AC3, AR1, AO5, AM4, AM8, AM25, AM30, AL5, AL6	■	■
	MP17	Between gun club and Mountain Straight. Box-Gum Woodland EEC. High proportion of native grasses. Exotic forbs patchy.	Strategies SC2, SR4, SM1, SM5, SM16, SM23, SM26 Actions AC3, AR1, AM4, AM27, AM30 UWMP Strategies and action refer Site H14	■	■











MP18	South and west of Mount Panorama, including Sulman Park. Land uses include gun clubs, BMX track, amenities, camping ground and conservation. Vegetation condition variable. Box-Gum Woodlands and possibly Tablelands Basalt Forest EECs. Locally restricted occurrence of White Box. Weeds - exotic shrub and forb invasion in patches. Native grasses common.	Strategies SC2, SR4, SM1, SM5, SM12, SM13, SM16, SM18, SM19, SM20, SM23, SM26, SL4, SL5, SL8, SP4, SP7, SP4 Actions AC3, AR1, AO5, AM4, AM11, AM21, AM25, AM26, AM27, AM30, AL5, AL6, AL9, AP6 UWMP Strategies and action refer Site H10, 11, 12, 14, 27, 28		
MP19	Southern side of Mount Panorama. Apple Box woodland. High cover of native grasses.	Strategies SM9, SM12, SM18 Actions AM8, AM11		
MP20	McPhillamy Park. Box-Gum Woodland EEC. Regular slashing of groundcover. High level of trafficking, particularly during race-week. No recruitments of eucalypts.	Strategies SC3, SR4, SM1, SM5, SM9, SM13, SM19, SM20, SM26, SP4, SP5, SP7, Actions AC3, AR1, AM4, AM8, AM18, AM21, AM23, AM26, AM30		
MP21	Sir Joseph Banks Nature Reserve (now controlled by Bathurst Aboriginal Land Council - included because of its significant conservation value in the Mount Panorama precinct and proximity to Council controlled land). Possible Tablelands Basalt Forest EEC with Ribbon Gum/Apple Box woodlands. Woodland area comprises high proportion of native groundcover species. Exotic forbs patchy in Apple Box woodland on the eastern side.	Strategies SC2, SM1, SM9, SM12, SM13, SM18, SL11, SL17, SP4, SP7 Actions AC3, AM8, AM11, AM18, AM21, AL11, AP6		
MP22	Western side of Waste Management Centre. Widely scattered Apple Box. Abundant cover of native and exotic grasses.	Strategies SM5, SM9 Actions AM4, AM8		

Table 22. Mount Panorama – Orton Park

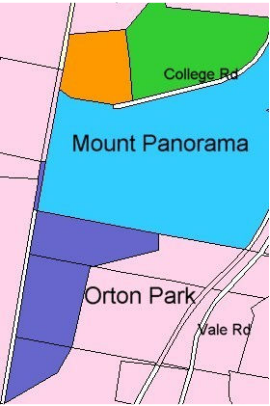

	ID	Description	Suggested strategies, recommendations and actions	Cond	Cons
	MP23	Rehabilitated quarry. Used by Light Car Club for race track. Box-Gum Woodland EEC. Sheet and rill erosion.	Strategies SC2, SM1, SM5, SL5, SP7 Actions AC3, AM4, AL5, AL6	■	■
	MP24	Mostly cleared grassy hermland. Patch of degraded Box-Gum Woodland on top of hill. Heavy grazing by kangaroos and rabbits. Invasion of exotic forbs and shrubs (Prunus, blackberry, Sweet Briar)	Strategies SC2, SM1, SM5, SM12, SM23, Actions AC3, AM4, AM11, AM27	■	■
	MP25	Proposed site for bike park. Box-Gum Woodland EEC. Cleared areas densely vegetated with exotic forbs. Woodland areas comprise predominately native grasses. Invasion of exotic shrubs.	Strategies SC2, SM12, SM16 Actions AC3, AM11, UWMP strategies refer Site V21	■	■
	OP1	Grazing land. Derived grassy Box-Gum Woodland. Patches of remnant vegetation	Strategies SC2, SC6, SM5, SM23, AM27 Actions AC3, AC8, AM4,	■	■

Table 23. Kelso (Raglan Creek Floodplain)

	ID	Description	Suggested strategies, recommendations and actions	Cond	Cons
	K1	Macquarie River floodplain along Hereford Street. BRC resumed floodplain land. Football field and amenities. Slashed groundcover.	No action required	■	■
	K2	Macquarie River floodplain. BMX track, BRC resumed floodplain land.	Strategy SC6; Action AC8	■	■
	K3	Raglan Creek floodplain. Grazing by horses. Absence of wetland plants and floodplain heavily grazed. High cover of horse manure.	Strategies SC6, SM16 SM23 Actions AC8, AM27, UWMP Actions refer Site R36	■	■
	K4	Learmonth Park and Raglan Creek. Sporting ovals. High density of aquatic vegetation in Raglan Creek. High ecosystem services to improving water quality from Kelso.	Strategy SM16 UWMP action refer Site 46	■	■
	K5	Berry Park. Ornamental plantings in park. Riverbank highly degraded and bank stabilised with rock gabions. Some colonisation with River Oak	Strategies SM3, SM13, Actions AM2, AM12	■	■
	K6	Raglan Creek levee bank	Strategy SO10	■	■
	K7	Open channel near St. Pats. Slashing within channel reduces conservation value	Strategy SM16 UWMP refer Site R49, strategies S9, S16	■	■

	K8	Raglan Creek, Lee Street. Dense cover of instream native vegetation	Strategy SM16 UWMP refer Site R45, strategies S9, S16	■	■
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Table 24. Kelso 'suburb'

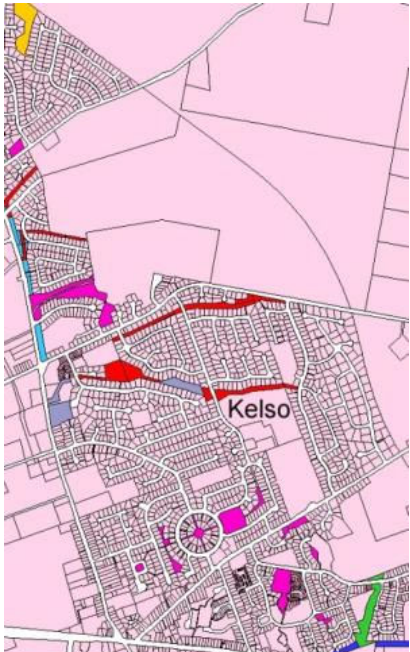
	ID	Description	Suggested strategies, recommendations, actions	Cond	Cons
	K9	Colonial Circuit Park and reserve. Cleared site.	VMP Strategies P10, P11	■	■
	K10	Drainage reserves. Open grassed channels with low flow pipes	Strategies SM14, SM15, SM16; Action AM23 UWMP strategies & actions refer Site R3	■	■
	K11	Road reserves. Mostly slashed grass with ornamental exotic plantings along footpath around drainage line and eucalypts near Marsden Lane	Strategy SM14 Action AM24 VMP Strategy S9	■	■
	K12	Drainage reserves with open channels. Densely vegetated with sedges and rushes providing good habitat for frogs.	Strategy SM16 UWMP strategies S9, S17	■	■
	K13	Kelso open spaces	Strategy SM14 Action AM24	■	■
	K14	Drainage reserve. Open grassed channels with low flow pipe	Strategy SM16 UWMP strategy refer Site R29	■	■
	K15	Drainage reserve. Open channel. Abundance of exotic trees, shrubs, forbs and grasses in riparian zone – including willows and boxthorn - upstream section densely covered in sedges and rushes. Water quality impacted by willows, litter and urban runoff	Strategy SM16 UWMP strategy refer Site RS30 and R31	■	■

Table 25. Kelso 'suburb' – O'Connell Road


	ID	Description	Suggested strategies, recommendations, actions	Cond	Cons
	K16	Alec Lamberton Park sporting oval	No action required	■	■
	K17	Vegetated buffer zone. Lack of community structure, close plantings and low ecological function	Strategies SM14, SM15 Action AM24	■	■
	K18	Raglan Creek reserve on O'Connell Road. Recent revegetation program along creek. Past history of gullyng and grazing. BGW EEC. Aquatic vegetation recovering with stock removal.	Strategies SC2, SM5, SM15, SM16, SL4, SP4 Actions AC3, AM4, UWMP strategies and action refer Site R42	■	■

Table 26. Raglan 'suburb'

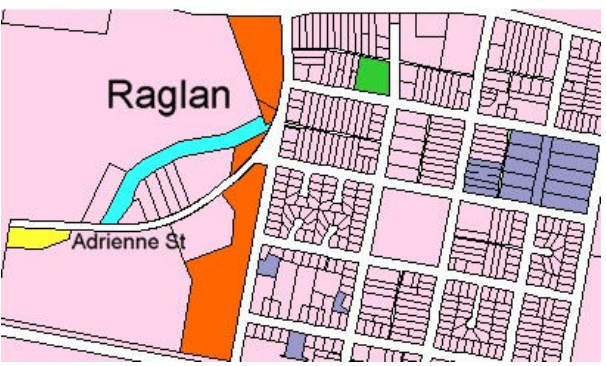










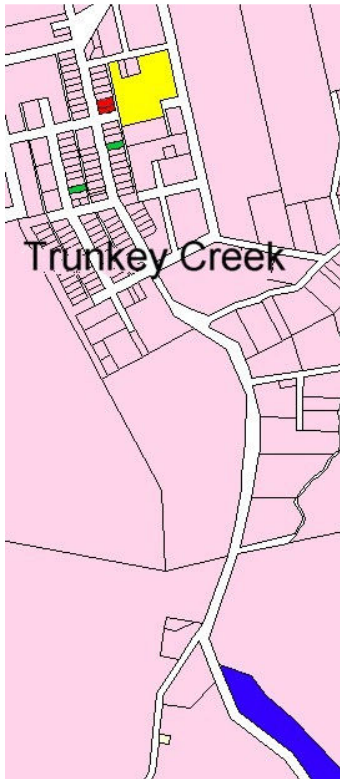
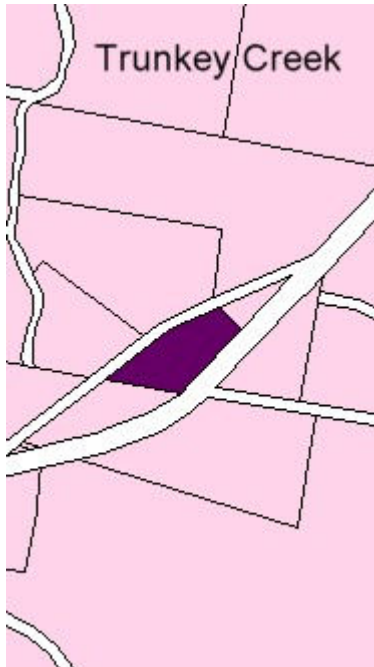
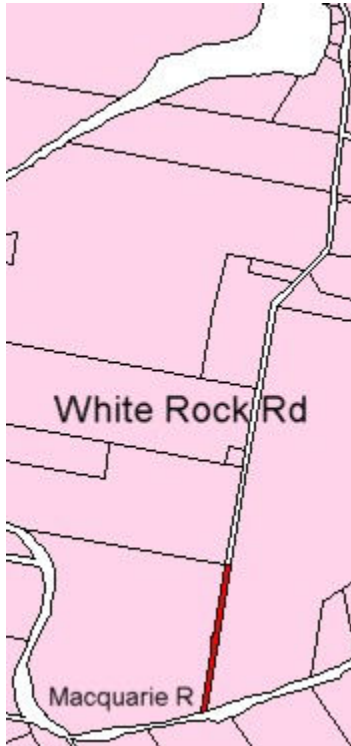
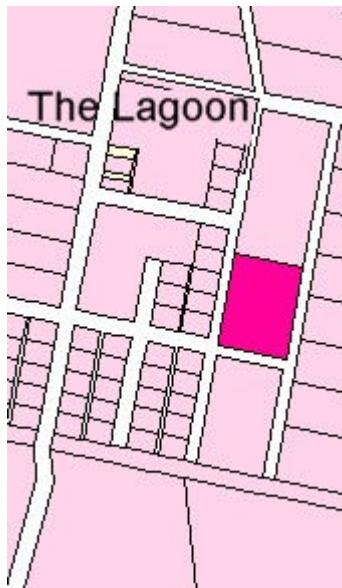
















	ID	Description	Suggested strategies, recommendations and actions	Cond	Cons
	R1	Elmo Lavis Park. Open space/passive recreation area. Grassy woodland with amenity planting of eucalypts	Strategies SM14, SM19 Actions AM24, AM25	■	■
	R2	Adrienne Street drainage reserve. Open channel with low flow pipe. Replanting of native species in riparian zone. Moderately dense cover of grasses in channel	Strategy SM16 UWMP action refer Site R43	■	■
	R3	Open area at the end of Adrienne Street. Dominated with exotic grasses.	Strategy SC6 Action AC8	■	■
	R4	Christie Street Drainage Reserve	No action required	■	■
	R5	Mostly treeless open spaces, drainage reserves and playing fields	Strategy SM14 Action AM24	■	■

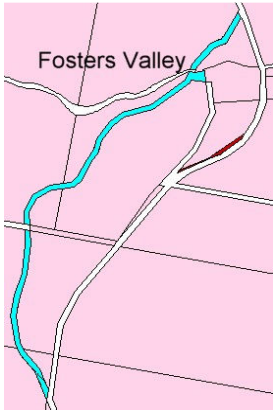

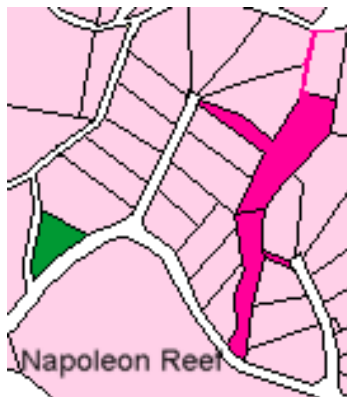
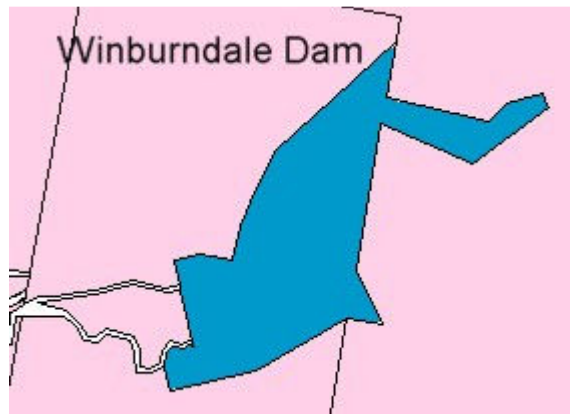
Table 27. Villages and rural areas

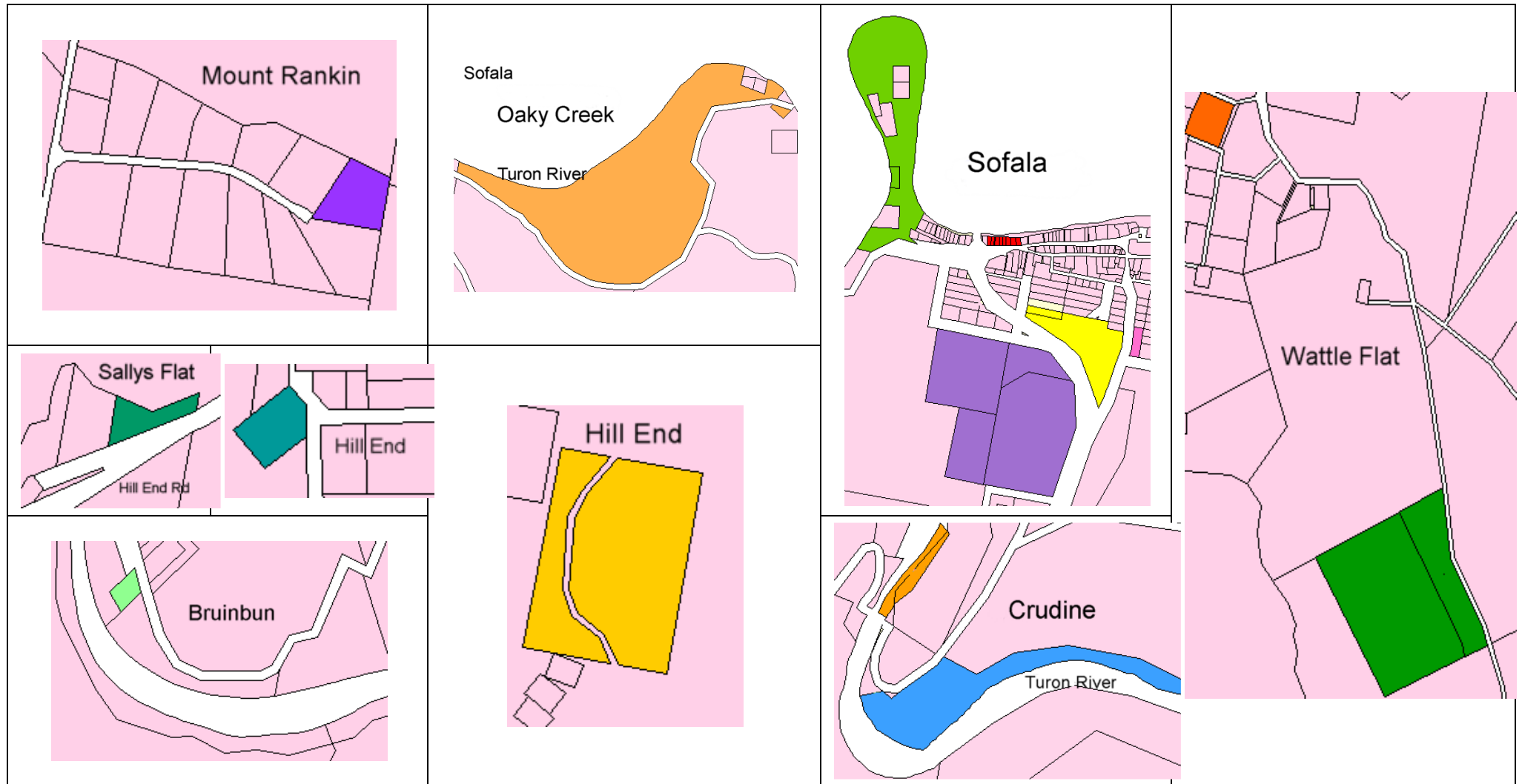
ID		Description	Suggested strategies, recommendations and actions	Cond	Cons
Perthville					
PV1		Park near Vale Creek. Eucalypts and exotic trees. Exotic grasses and forbs on creek bank. Some Phragmites in channel.	Strategy SM16 UWMP strategies and action refer Site V16	■	■
PV2		Pump sites	No action required	■	■
PV3		Brian Booth Reserve. Pony Club and oval. Complete removal of remnant vegetation and plantings of Radiata Pine. Groundcover slashed.	Strategy SM14 Action AM24 - Develop a planting program in accordance with the strategies outlined in the VMP for parks and public reserves	■	■
Georges Plains					
GP		Vacant land near cemetery and church and also includes Rural Fire Station	Maintain vacant land area by slashing to prevent the potential spread of Radiata Pine	■	■
Rockley					
RK1		Peppers Creek and hillslope. Box-Gum Woodland EEC significantly compromised due to the dense cover of weeds including ivy, poplars, privet, willows, deciduous trees. Weir poor habitat for platypus. Some Typha and willows present along stream edge. Stream downstream of weir densely vegetated with weeds	Strategies SC2, SM8, SM13, SM17, SM25, SM26, SL4 Actions AC3, AM7, AM16, AM21 Adopt applicable UWMP strategies; Any weed management strategy should consider potential erosion due to the slope of the hill	■	■
RK2		Rockley Park alongside Peppers Creek. Amenity planting of exotic trees. Streambank slashed and lacks riparian vegetation structure, complexity and native species	Strategies SM8, SM13 Actions AM7, AM16	■	■
RK3		Rockley sports ground. Remnant vegetation cleared and groundcover comprises predominately exotic grasses and forbs. Amenity planting of exotic trees.	Strategies SM8, SL4, SP4 Action AM7	■	■



















RK4	Urban parcels. Rural Fire Service shed and old shop and backyard	No action required		
Peel				
P1	Parcels adjacent to church yard, Wellington Street. Box-Gum Woodland EEC. Groundcover herbage grazed. Absence of shrubs, sub-shrubs and regenerating trees due to grazing. Adjacent ungrazed church yard contains rich diversity of native grasses, forbs and sub-shrubs	Strategies SC2, SM8, SM13, SM23 Actions AC3, AM7, AM16, AM27		
P2	Corner parcel between Peel Road and road leading into the village. High value Box-Gum Woodland EEC. Structural and compositional diversity of vegetation community. Presence of some weeds, artificial drain, prior disturbance with dam construction and small cleared area compromises condition. Small dam provides habitat for frogs and macroinvertebrates. Small size threatens self-sustainability -current links with Crown land opposite with very high/high conservation value	Strategies SC2, SM8, SM10, SM12, SM13, SM24, SP7 Actions AC3, AM7, AM9, AM11, AM16, AM21, AM28 Need for barrier along drain to prevent spread of weed propagules.		
P3	Sofala Road reserve. Eucalypt open forest comprising good structural and compositional integrity. Erosion in areas disturbed and from the construction of the road cutting and vehicular trafficking.	Strategies SC2, SM10, SM8, SM24 Actions AC3, AM7, AM9, AM28 Restrict vehicular access		
P4	Peel quarry and surrounding bushland. Box-Gum Woodland on lower slopes. Quarry site highly disturbed and contains small dam. Upper slopes eucalypt forest. Bushland comprises good structural and compositional integrity. Weeds & erosion in quarry area	Strategies SC2, SC8, SR4, SM10, SM11, SM12, SM24, SP7 Actions AC3, AR1, AM7, AM9, AM10, AM11, AM28, AP6 Fully assess weed and erosion status; rehabilitate quarry site		













				
ID	Description	Suggested strategies, recommendations and actions	Cond	Cons
Trunkey Creek				
TC1	Arthur Street Park. Passive recreation, picnic area. Adjoins Trunkey Creek. Eucalypts and Silver Wattle in riparian zone. Abundance of weeds including Blackberries, Phalaris, Box-elder Maples. Channel incision in creek.	Strategies SM8, SM12, SM13, SL4 Actions AM7, AM11, AM16, AM21		
TC2	Vacant land, shed. Cleared and slashed	Strategy SC6; Action AC8		
TC3	Sportsground and recreational area including an area of significant very high value bushland	Strategies SC4, SM8, SM10, SM11, SM12, SM13, SM24, SL4 Actions AC5, AM7, AM9, AM10, AM11, AM16, AM21, AM28		
TC4	Road reserve. Box-Gum Woodland EEC. Stockpile site, dumping of timber and road fill within bushland from roads authority or utilities company. Access road through reserve	Strategies SC2, SR4, SO1, SO3, SO6, SO12, SM8, SM13, SM20, SM26, SP7; Actions AC3, AR1, AO1, AO4, AM7,		

		AM16,		
TC5	Mulgunnia Creek reserve. Box-Gum Woodland on lower slopes. Apple Box and Ribbon Gum on upper slopes. Significant weed infestation including willows, blackberries and garden escapes. Prior valley fill (Mulgunnia Creek) with significant incision.	Strategies SC2, SM10, SM11, SM12, SM13, SM18, SM23, SM24, SM26, Actions AC3, AM9, AM10, AM11, AM21, AM27, AM28, AM29,		
White Rock				
WR1	Cleared with history of cropping and grazing. Subject of a current restoration project to connect Box-Gum Woodland remnants to Macquarie River	Strategy SM15		
The Lagoon				
TL1	Site cleared of original Box-Gum Woodland. Currently used for grazing. Few scattered exotic trees on site. Groundcover comprises native and exotic grasses and forbs.	Strategy SC6 Action AC9		
TL2	Chifley Dam precinct. Presence of Box-Gum Woodlands	Strategies SR4, SO7, SO9, SM12, SM13, SM18, SM23, SL5, SL8, Actions AR1, AO7, AM11, AM21, AM27, AL6, AL9, SP7		

					
ID	Description	Suggested strategies, recommendations and actions		Cond	Cons
Fosters Valley					
FV1	Old road reserve. Original Box-Gum Woodland and riparian corridor completely cleared and converted to cultivated and grazed farmland. Some willows in the creek.	Strategy SC6, Action AC8		■	■
FV2	Road reserve and stock pile site. Absence of native vegetation	No action required		■	■
Mount Tarana					
T1	Tarana forest (Mount Tarana 1277m). Very high conservation area on crown land comprising open forest of <i>E. macrorhyncha</i> , <i>E. rossii</i> , <i>E. dalrympleana</i> and <i>E. dives</i> .	Strategies SC4, SP7, SP9 Actions AC5, AP6		■	■
Napoleon Reef					
NR1	Cleared site. Site regenerating following excavation and removal of vegetation and fill. (borrow pit?). Abundant native shrub colonisers and excavated area with low density of grasses	Strategy SC6 Action AC8		■	■
NR2	Timbered areas with cleared corridors for transmission lines. Eucalypt open forest comprising largely of regrowth. Diversity of vegetation community composition and structure with many native shrubs, sub-shrubs, grasses and forbs.	Strategies SC4, SM8, SM13, SM24, SL2, SP7 Actions AC5, AM7, AM16, AM28		■	■
Winburndale Dam					
WD1	Winburndale Dam and surrounding area. High conservation eucalypt forest/woodland much of it as regrowth. Dam has aquatic macrophytes along edge and inflow area. Threats from weeds, pests and fire escapes from neighbouring pine plantations. Habitat for threatened species such as Powerful Owl and <i>Galaxias olidus</i>	Strategies SC1, SC4, SC5, SO2, SO4, SO7, SO8, SO9, SM12, SM13, SP7SP9 Actions AC1, AC5, AO5, AO7, AO12, AO13, AM11, AM21, AP8		■	■



ID	Description	Suggested strategies, recommendations and actions	Cond	Cons
Mount Rankin				
MR1	Community land adjacent to Saltram Creek tributary. Gullied creek. Some pools fringed with sedges. Willows and blackberries in stream.	Strategies SC6, SM12, SM13, Actions AC8, AM11, AM21; Manage stream according to UWMP strategies S8, S11, S12, S16, S17		
Wattle Flat				
WF1	Racecourse and surrounding natural bushland. Very high condition and conservation value forest surrounding partially cleared and slashed racecourse and incorporated golf course. Threats include slashing, minor erosion from tracks, dumping of fill contaminated with weed propagules, intentional burning in golf course area and firewood collection. Forested area remaining in stable condition.	Strategies SC4, SR4, SM10, SM12, SM13, SM18, SM19, SM24, SL2, SP7 Actions AC5, AR1, AM9, AM11, AM21,		
WF2	Decommissioned tennis courts. Site modified from past land use and comprises exotic grasses (Phalaris, Cocksfoot) and native species. Upperstorey cleared except for Yellow Box on boundary. Planting of pines along fenceline	Strategy SC6 Action AC8		
Sofala				
S1	Turon River riparian land, Hill End Road. Past history of mining and evidence of surface disturbance, clearing of original vegetation, weeds including noxious species (Serrated Tussock, Blackberry). River Sheoak fringing forest along river. Loss of groundcover in places.	Strategies SR4, SM8, SM11, SM12, SM13, SM17, SM18, SP7 Actions AR1, AM7, AM10, AM11, AM21, AP6		
S2	Joyce Pearce Memorial Park, Sofala Village. Recreational and amenity park. Original vegetation cleared. Ornamental plantings of Robinia (suckering). Groundcover weeds.	Strategies SM12, SM13 Actions AM11, AM21		
S3	Sofala showground. Removal of original vegetation and replaced with native and exotic amenity plantings. Some isolated remnant eucalypt. Groundcover slashed.	Strategy SM19 Action AM23		
S4	Vacant block. Adjacent to an incised drainage line. Very steep slope. High proportion of weed species and erosion active on slope and drainage line.	Strategies SC6, SM8, SM12, SM13 Actions AC8, AM7, AM11, AM21		
S5	Eastern side of Sofala Road. Steep hill. Vegetation stabilising hillslope. Groundcover weeds common. Erosion from vehicular tracks. Patch of eucalypts (likely planted) with understorey of wattles. Native grasses common.	Strategies SC6, SM8, SM12, SM13 Actions AC8, AM7, AM11, AM21		
S6	Oakey Creek campground along the Turon River. A diverse site in terms of landform and vegetation communities. Riparian zone fringed with River Sheoak. Good Sheoak regeneration along river. Box-Gum Woodland EEC. Threats from camping land use, slashing, weeds including willows, Serrated Tussock, St Johns Wort, 4-wheel drive induced erosion, firewood collection, bankside clearing, gullyng on hillsides. High value fauna habitat.	Strategies SC2, SR4, SM11, SM12, SM13, SL8, SP7 Actions AC3, AR1, AM10, AM11, AM21, AP6		

Sallys Flat				
SF1	Original woodland mostly cleared with a patch of Box-Gum Woodland EEC remaining as scattered remnants and regrowth. Groundcover comprises native and exotic grasses and forbs and is likely grazed. The boundary of the parcel is unclear given the cadastre map, aerial and alignment of fences. Valley fill incised and erosion is active.	Strategies SC2, SC6, SM19 Actions AC3, AC8, AM23		
Hill End				
HE1	Vacant block, English Street. Regenerating <i>E. mannifera</i> open forest/woodland. Colonising Cassinia and <i>A. dealbata</i> . Abundant groundcover weeds. Hawthorn, blackberry and St Johns Wort threaten biodiversity of the site and neighbouring areas.	Strategy SM12 Action AM11		
HE2	Hill End racecourse site. <i>E. rossii</i> - <i>E. macrorhyncha</i> sub-dominant woodland/forest. Good structural and compositional integrity of the shrub and groundcover layers. Past activities and road and track construction have caused significant localised sheet and deep rill erosion. Evidence of rabbits - foxes highly likely.	Strategies SC4, SM8, SM12, SM13, SM18, SM24, SP7, Actions AC5, AM7, AM11, AM16, AM21, AM28, AP6 On-ground management needs to address erosion		
Bruinbun				
BB1	Vacant block alongside Bridle Track to the north of Monaghans Bluff. High proportion of exotic forbs and grasses including noxious species: St Johns Wort & Serrated Tussock	Strategies AC6, SM12 Actions AC9, AM11		
Crudine				
C1	Turon River Reserve, Turondale Road. River Sheoak fringing forest along Turon River. Weeds and the dumping of rubbish threaten biodiversity and amenity. Firewood collection. Groundcover weeds outcompete with native species and limit Sheoak regeneration on the floodplain. Tree of Heaven present and widespread in the district. Vehicular trafficking has created localised erosion.	Strategies SR4, SM11, SM12, SM13, SL8, SP7, Actions AR1, AM10, AM11, AM19, AM21, AP6		
C2	Turon River Reserve, Turondale Road. River Sheoak fringing forest along Turon River. Box-Gum Woodland on hillslope. Weeds and the dumping of rubbish threaten biodiversity and amenity. Firewood collection. Weeds include significant species such as cactus, Blackberry and St Johns Wort	Strategies SR4, SM11, SM12, SM13, SL8, SP7, Actions AR1, AM10, AM11, AM19, AM21, AP6		

PART E:

IMPLEMENTATION, MONITORING EVALUATION AND REPORTING

11. IMPLEMENTATION

The implementation of the BMP is a step up from its platform as a planning document to one that delivers outcomes for biodiversity conservation, protection and enhancement within the Bathurst Region over the next 25 years. The principle driver in directing that implementation will be BRC, though it is recognised that the wider community, either as an autonomous group/individual or in functioning partnerships, will be inextricably involved in the adoption and undertaking of the strategies, actions and recommendations as outlined in this document. Further, it is recognised that the implementation phase is likely to continue for a number of decades - to at least its projected 25 year timeframe, before it is inevitably replaced with its successor. Of course, biodiversity management will continue beyond that time since biodiversity will most likely then be even more highly valued as a provider of essential ecosystem services that underwrite our social and economic well-being.

The success of the BMP implementation phase will depend on the human resources best able to manage its implementation, the risks involved (e.g. lack of community motivation, lack of funding), degree of stakeholder engagement and the effectiveness of the monitoring, evaluation processes and subsequent feedback into ongoing action. Implementation is further dependent on resources being made available by the elected Councillors through the Council management plan process – particularly where significant costs are involved in implementing many actions (even those given a high or very high priority).

There are other Council plans that are successfully implemented through collaborative arrangements with community-based reference groups and this practice could provide a good working model for the BMP.

Facilitating the visions penned by members of the Bathurst community, including one of the authors (DG) is aspirational and will be a valiant task requiring the efforts of many individuals and organisations in managing and caring for our biodiversity both directly or indirectly.

With strong links to other local and regional natural resource planning documents the implementation of the BMP will also make a contribution towards the targets set by the CW and Lachlan CMAs in their respective Catchment Action Plans (CAPs) (CW CMA 2011; Lachlan CMA 2006).

11.1. Setting priorities

The core objectives set out in this plan can only be achieved if the underlying strategies, recommendations and actions derived from these are implemented. As an aid to the implementation process, to ensure valuable resources are wisely utilised and biodiversity benefits maximised, actions have been prioritised against four criteria. The criteria necessary to cover the complexity of actions consider risks, costings, ease of implementation and benefits to the community and the environment. These criteria, their rating score and the rationale are set out in Table 28.

Table 28. The criteria used to evaluate priority rating

No.	Criterion	Rating score	Rationale
1	Risk, timeliness	0. Nil 1. Low 2. Moderate 3. High	If actions do not proceed there is a risk of: <ul style="list-style-type: none"> Rehabilitation implementation being exponentially more difficult and costs considerably elevated in the future; Biodiversity being threatened (e.g. from urban expansion, pollution, erosion, increasing degradation);

			<ul style="list-style-type: none"> Threats to public safety, social or economic well-being (e.g. flying fox feeding and roosting) Opportunities being lost (e.g. land use planning, integrating community needs and conservation); Undesirable outcomes may result (e.g. weed infestation).
2	Benefit-cost/ community participation	0. Nil 1. Low 2. Moderate 3. High	Actions with a high benefit to cost ratio or that have a high level of community involvement may take priority
3	Ease of implementation	1. Low 2. Moderate 3. High	Actions not constrained by logistical problems, lack of information or uncertainties should be given higher priority ranking than those that are more problematic.
4	Planning/order of precedence	0. Nil 1. Low 2. Moderate 3. High	Actions that involve forward planning, planned management or proceed other actions should be given priority; Actions provide information or resources that underpin management decisions for planning, regulation, on-ground activities etc

The rating of each action followed the procedure outlined below and are presented in Section 13.3.

1. An indicative cost (refer Section 13.2) was estimated as being low (L), moderately low (ML), Moderate (M), high (H), or very high (VH);
2. A rating score of 0, 1, 2 or 3 was given to each criterion;
3. The rating scores for applicable criteria were averaged to give an overall priority rating score of very high (VH), high (H), medium (M) and low (L) where:
 - **VH** – rating score (2.5 – 3.0) aim for immediate implementation (<2 yrs)
 - **H** – rating score (1.75 - 2.25) for short-term implementation (2-5 yrs)
 - **M** – rating score (1.0 - 1.5) for medium-term implementation (5-10 yrs)
 - **L** – rating score (0.25 – 0.75) for long-term implementation (>10 yrs)

11.2. Costs of implementation

The costs of implementing actions and recommendations are borne by BRC through their core business and special budgetary allocations, by land holders, the community through in-kind support and with contributions sourced from external funds and other government and non-government agencies. Implementing actions or recommendations may require a one-off lump sum payment or it may require on-going expenditure for capital works or maintenance over a number of years. There are also instances, such as adopting recommendations through various planning processes, which do not require specific funds. Further, the costs of implementing long-term actions are subject to inflationary trends and are difficult to project. As well, costing actions at this strategic level of planning can lead to grossly inaccurate estimates, which can lead to poor decision outcomes. For these reasons and to allow the costs of implementing works to be compared for the setting of priorities, indicative costs have been categorised into five groups (Table 29).

Table 29. Indicative implementation cost categories

Low (L)	Moderately low (ML)	Moderate (M)	high (H)	Very high (VH)
(\$) <5,000	(\$) 5,001 – 20,000	(\$) 20,001 - 100,000	(\$) 100,001 – 500,000	(\$) >500,000

11.3. Prioritised actions

Actions from the strategic framework (refer Section 11.5) have been listed according to Council's roles and have been assigned an indicative cost, scored according to the criteria and given a priority rating (Table 30).

Table 30. Prioritisation rating of actions

Action identifier	Cost (L, ML, M H, VH)	Criterion number and rating score (1, 2, or 3)				Priority rating (VH, H, M, L)
		1	2	3	4	
Council as a strategic land use planner and development controller						
Action AC1: Map BMP ecosystem condition and conservation value assessment ratings and biodiversity assets into BRC's GIS and database system	L	2	3	3	3	VH
Action AC2: Map BGW and Tablelands Basalt Forest EECs and their derived grasslands that are on Council owned or controlled land and record according to their current ecosystem condition rating	ML	3	3	3	3	VH
Action AC3: Advocate for EECs to be mapped across the whole Bathurst Region	H	3	2	2	3	H
Action AC4: Continue to update the threatened species database for the Bathurst Region	ML	3	2	3	3	VH
Action AC5: Advocate for OEH to improve mapped areas of high/very high conservation value and significant biodiversity assets across the whole Bathurst Region	M	3	3	2	3	VH
Action AC6: BRC to incorporate information it has or gains into database/GIS	ML	2	2	3	3	VH
Action AC7: Build on site-specific information and increase the resolution for the 'Environmentally Sensitive Area' map overlays	M	3	3	2	3	VH
Action AC8: Advocate for OEH to map critical areas in the landscape for wildlife corridors, vegetation linkages and conservation areas	M	2	2	2	3	H
Action AC9: Review council controlled land parcels that have very low biodiversity conservation value for future land use change, disposal or public ownership consideration	L	1	2	3	3	H
Action AC10: Identify and review Council owned or freehold land parcels of high or potentially high biodiversity conservation value or that may be significant for habitat linkage for future land use change, disposal or public ownership consideration in order to secure its protection	L	2	2	2	3	H
Action AC11: Make provisions and standards in the LEP/DCP for the protection and enhancement of biodiversity	ML	3	3	3	3	VH
Action AC12: Pre-plan developments in key settlement areas before rezoning according to provisions and standards in the LEP/DCP that aim to enhance and protect biodiversity	ML	3	3	3	3	VH
Action AC13: Commission a locally specific koala study that supports assessments when SEPP 44 does not protect Koala habitat in the Bathurst Region	M	3	3	3	3	VH

Council as an environmental regulator						
Action AR1: Develop a program that suitably informs the wider community of key environmental messages/regulations at campsites, recreational and open space areas on Council controlled land	ML	2	1	3	1	H
Action AR2: Continue or expand on existing regulatory initiatives and incentives	ML	3	2	3	1	H
Council as an operator of major infrastructure and facilities						
Action AO1: Undertake a comprehensive roadside survey of high and medium conservation roadside vegetation and identify threats	ML	3	3	3	3	VH
Action AO2: Build a register of biodiversity assets on infrastructure and facilities other than roads	ML	2	2	3	1	H
Action AO3: Identify all road crossings which are a threat to fish passage	ML	2	3	3	3	VH
Action AO4: Develop biodiversity management plan/s for the protection, enhancement and linkage of native vegetation along rural roads	ML	2	3	3	3	H
Action AO5: Develop a program that aims to identify threatened species, populations, their habitats and EECs on Council's facilities and give consideration to threat abatement, habitat enhancement or re-introductions	ML	3	3	2	3	VH
Action AO6: Install, fix and maintain gross pollution traps (GPTs) in key areas identified through investigation	M	3	3	3	1	VH
Action AO7: Develop biodiversity management plans for the water storage dams operated by Council	M	2	2	2	3	H
Action AO8: Construct fishways at barriers to provide adequate fish passage, decommission redundant or major barriers and redesign fish friendly road crossings	H	2	2	1	0	M
Action AO9: Enhance Box-Gum Woodland connectivity along roads by rehabilitating key areas or gaps in connectivity	M	1	2	2	0	M
Action AO10: Undertake new water saving projects and build on existing ones (e.g. upgrade of water reticulation and irrigation systems and Water Filtration Plant)	VH	2	2	1	1	M
Action AO11: Review the pipeline route from Winburndale Dam with the view that the pipe may need to be replaced in sections and pre-plan for optimising biodiversity outcomes	M	3	2	2	3	VH
Action AO12: Seek funding to support project development and implementation to enhance, protect or conserve biodiversity at Council's infrastructure and facilities	L	3	3	3	3	VH
Action AO13: Implement BRC's Roadside Vegetation Management Guidelines through training programs for Council work's crews to improve their knowledge and skills to mitigate against operational activities	L	3	3	3	3	VH
Action AO14: Develop monitoring programs to ensure the on-going management of biodiversity is effective on Council operated infrastructure and facilities	ML	2	2	3	3	VH

<i>Council as a manager of community and operational land</i>						
Action AM1: Review existing and relevant BRC management plans to update and where necessary include natural resource management and biodiversity issues	M	3	3	3	3	VH
Action AM2: Develop site specific landscape plans/management plans for the Macquarie River in areas controlled by Council	ML	3	3	2	3	VH
Action AM3: Develop a wetlands concept plan for the Raglan Creek Floodplain complex	ML	3	3	2	3	VH
Action AM4: Develop a master plan for the protection, enhancement and linkage of the Box-Gum woodland EEC in the former Bathurst City LGA	ML	3	3	2	3	VH
Action AM5: Undertake a biodiversity survey and develop a management plan for lower Sawpit Creek prior to urban development	ML	3	3	2	3	VH
Action AM6: Develop a Grey-headed Flying Fox management plan	ML	3	3	2	3	VH
Action AM7: Develop biodiversity management plans for the protection, enhancement, conservation and linkage of native vegetation in the villages	ML	2	2	2	3	H
Action AM8: Develop a biodiversity management plan for the Mount Panorama precinct	ML	3	3	2	3	VH
Action AM9: Develop specific biodiversity management plans for areas identified as having high or very high ecosystem condition/conservation value	ML	2	2	2	2	H
Action AM10: Develop concept and/or management plan/s for the enhancement of poorly utilised Council controlled lands for biodiversity conservation and nature-based tourism/recreation	ML	1	1	2	2	M
Action AM11: Develop a weed and pest management plan for Council owned and controlled land	ML	3	3	2	3	VH
Action AM12: Implement biodiversity management recommendations for the Macquarie River in areas controlled by Council	H	2	2	1	0	M
Action AM13: Implement the recommendations provided in the proposed Raglan Creek wetlands concept plan	M	3	3	2	0	H
Action AM14: Implement rehabilitation or restoration works of the Box-Gum Woodlands in the former Bathurst City LGA as recommended in the proposed master plan	M	2	3	2	0	H
Action AM15: Implement recommendations from the proposed lower Sawpit Creek study into on-ground actions and BRC's planning provisions	M	3	3	2	1	H
Action AM16: Implement recommendations identified in the proposed biodiversity management plans in the rural villages	M	2	2	2	0	M
Action AM17: Implement restoration works along roadways to improve biodiversity conservation as recommended in the proposed roadside vegetation biodiversity management plan	H	2	2	2	0	M
Action AM18: Implement strategies, recommendations or actions in the proposed Mt Panorama precinct management plan	M	3	3	2	1	H

Action AM19: Implement recommendations given in the proposed biodiversity management plan for areas of recreational usage	M	2	2	1	0	M
Action AM20: Implement recommendations for the enhancement of poorly utilised areas in Council control for nature-based tourism/recreation	H	2	2	1	0	M
Action AM21: Implement weed and pest control measures as prioritised and recommended in the proposed weed and pest management plan for Council owned and controlled land	H	3	3	1	0	H
Action AM22: Implement recommendations provided in the 2012 BRC Pest Bird Management Plan	M	2	3	2	0	H
Action AM23: Implement Stage 2 of the Urban Drainage Reserves Revegetation Landscape Plan	M	2	3	3	0	H
Action AM24: Develop a planting program within the urban/peri-urban environment that enhances biodiversity to include road reserves, buffer zones in industrial areas and housing estates, parks, open space reserves, drainage reserves and operational land	M	1	2	2	3	H
Action AM25: Identify areas where a change in groundcover management can be undertaken to improve biodiversity and ecosystem function	L	2	3	3	3	VH
Action AM26: Undertake training days for council on-ground staff and machinery operators to ensure the protection of biodiversity	ML	2	3	3	2	VH
Action AM27: Review and enforce BRCs 'Land Management Guidelines – Leasing, 2004' for Council owned or controlled land leased for grazing	L	2	3	3	3	VH
Action AM28: Undertake fauna, flora and threatened species studies in areas identified in the condition assessment as having high/very high ecosystem condition/conservation value	M	2	1	2	1	M
Action AM29: Undertake an urban possum study	ML	1	1	2	2	M
Action AM30: Develop an on-going assessment program to evaluate ecosystem condition and biodiversity conservation on targeted land parcels owned or controlled by Council	L	2	3	3	3	VH
Action AM31: Monitor biodiversity protection or enhancement projects on Council owned or controlled land and evaluate and report their effectiveness for multiple outcomes	ML	1	3	3	2	H
<i>Council as a community leader and facilitator of community action</i>						
Action AL1: Undertake an audit of relevant biodiversity related educational resource material available to BRC and identify gaps	L	2	2	3	3	VH
Action AL2: Build on existing biodiversity related resource material and initiate the development of new resources to fill gaps	M	2	3	2	0	H
Action AL3: Prepare educational resource material derived from the BMP	ML	3	3	3	2	VH

Action AL4: Develop an overarching educational program that seeks to increase community awareness of biodiversity and natural resource related issues	L	2	2	2	2	H
Action AL5: Develop an educational strategy to deal with the controversies relating to competing values of biodiversity conservation and other interests	ML	3	3	3	3	VH
Action AL6: Develop a program that directs Council to communicate directly to individuals, groups or individuals within groups that may knowingly or unwittingly contravene best practice for the protection of biodiversity	L	3	2	2	2	H
Action AL7: Implement age-appropriate biodiversity-related educational programs that target early childhood through to young adult	L	1	2	2	1	M
Action AL8: Implement programs that inform and educate BRC's Councillors and key Council staff on biodiversity values, threats and current issues	L	3	3	3	1	VH
Action AL9: Install information boards to improve community awareness of biodiversity issues	ML	1	2	2	1	M
Action AL10: Lobby CSU to maintain a teaching research environmental section within the Central West Catchment	L	1	1	2	1	M
Action AL11: Provide opportunities for the community to develop a greater understanding of Wiradjuri Country	L	1	1	3	1	M
Action AL12: Develop methods and partner with other agencies to identify the underlying causes of a lack of awareness, interest, knowledge or motivation towards biodiversity	L	1	1	2	2	M
Action AL13: Establish what is required for the community to engage in biodiversity-related projects or to shift behavioural change	L	1	1	2	2	M
Action AL14: Community responses to continued growth and development from the perspective of impacts on natural resources including biodiversity identified at the next review of the BRC land use strategies	L	1	3	2	3	H
Action AL15: Develop education and training programs to provide opportunities for the community to gain knowledge and develop skills in biodiversity management	ML	1	1	2	3	H
Action AL16: Develop and provide incentives to benefit regional biodiversity and improve biodiversity education	M	2	1	3	2	H
Action AL17: Influence behavioural change for biodiversity protection with the development of non-regulatory initiatives	L	2	1	3	1	M
Action AL18: Identify funding opportunities for environmental educational programs	L	3	3	3	3	VH

<i>Council as a member of regional and local partnerships</i>						
Action AP1: Continue the alliance with Orange City Council for the shared employment of the Community Engagement Officer	M	3	3	3	1	VH
Action AP2: Develop a program to plan and assist with the creation, access and reciprocation of resource material to allow for informed management of regional biodiversity	L	3	3	3	2	VH
Action AP3: Identify opportunities for biodiversity management through regional and local partnerships	ML	2	3	2	2	H
Action AP4: Initiate the development of a regionally-based, or local government - based biodiversity management plan in partnership with other agencies	M	1	1	2	2	M
Action AP5: Develop a strategy to address population growth and regional sustainability issues with national, state and regional partners	M	3	3	2	3	VH
Action AP6: Develop nature-based tourist opportunities that ensure the protection of biodiversity and enhances nature appreciation	M	1	1	2	2	M

11.4. Monitoring and evaluation

The on-going process of monitoring the status of biodiversity and evaluating it against how it is managed in the Bathurst Region requires a multi-pronged approach that includes the following practices:

1. Evaluate the BMP to determine its overall performance in achieving its objectives and being accepted and implemented by BRC and the wider community (refer Section 11.4.1);
2. Monitor actions undertaken as recommendations in the BMP to evaluate the effectiveness of their implementation (refer Section 11.4.2);
3. Monitor the ecosystem condition and conservation value of BRC controlled land to evaluate threats, the appropriateness of management practices and biodiversity conservation, protection and enhancement programs (refer Section 11.4.3);
4. Evaluate the directional trend of the regional biodiversity status as it is conserved, protected or enhanced through BMP implementation using a set of key performance indicators (refer Section 11.4.4).

11.4.1. BMP evaluation

The BMP has been developed according to the current status of biodiversity in the Bathurst Region, the current level of knowledge and understanding of biodiversity related issues, the structure of other natural resource planning documents, the regulatory and legal framework, current land use and the rate of resource use, and contemporary community expectations. Not surprisingly these factors are destined to change over the years and will markedly influence the validity or **appropriateness** of some aspects of the BMP. The document will also lose currency as strategies and actions are implemented. Evaluating the **efficiency** of BMP implementation process will determine what worked well and what did not; what could be done in the future and what course of action should be taken in the future to improve efficiency. For these reasons the BMP should be regarded as a dynamic resource that is periodically evaluated, adapted and improved upon to accommodate for changed circumstances and requirements. The objective review of the **effectiveness** of the BMP in achieving desired outcomes against the objectives is evaluated from the monitoring of performance indicators. Ultimately the plan will be judged on a measure of community well-being and its confidence that biodiversity is being effectively managed by Council.

The evaluation process needs to be governed by a number of considerations that keep the process focused (NSW DECC 2009). These are:

- *Purpose of the evaluation* - for the BMP there can be multiple purposes and the monitoring of performance indicators provided in Section 11.4.4 provides the necessary information to fulfil the purposes. The following reasons for an evaluation include:
 - To improve or refine the BMP;
 - To provide accountability to BRC staff, Councillors, BOD Alliance and to the CW CMA; and
 - To measure progress against BMP objectives.
- *Determining the scope of the evaluation* - whether the evaluation includes the overall performance of the BMP or key elements within it;
- *Key issues to be evaluated*, examples could include:

- Appropriateness of the objectives, strategies and actions over time given changes in higher level planning natural resource targets, change in knowledge etc.;
- Efficiency of implementation - are there better ways of implementing programs that can achieve the desired objective; and
- Effectiveness of objectives, strategies and actions in delivering expectations.
- *The availability of human and monetary resources* to undertake the evaluation process.
 - Working in long-term partnerships with other agencies such as BOD Alliance and the CWCMA can assist in the process of evaluating the BMP.
- *Stages of evaluation*
 - The expectations of what is likely to be achieved are governed by the stage of BMP implementation. A trend analysis of the performance indicator measurements may provide meaningful information throughout the various stages of implementation.
- *Timing of the evaluation*

The BMP is expected to be a long-running plan, which may be supporting recommendations and actions for many years to come. The periods between evaluations would be expected to lengthen as the BMP 'matures'. The critical time would be in the first five years where yearly evaluations are recommended.

11.4.2. Monitoring and evaluating actions

Attempting to develop a monitoring program that examines the BMP objectives, strategies, actions and recommendations over the life-time of the Plan is well beyond the scope of the BMP and the resource capacity of BRC. However, a number of guiding principles can assist in the development of future monitoring program and these are:

- The benefit gained from monitoring has to justify the resource input (time and cost);
- Existing monitoring programs should be reviewed and, where relevant, duplication reduced and cost-effectiveness increased;
- Monitoring should only be done if it is necessary. Monitoring for the sake of it is a waste of resources (e.g. monitoring a land parcel for its biodiversity value when the land use and management is unlikely to change e.g. sports oval);
- Monitoring should be appropriately timed to allow for observable changes to manifest; whilst being conducted in a short enough time period to detect undesirable trends and for the data to still be useful;
- The purpose of the monitoring program needs to be clear (e.g. to observe changes in vegetation composition, to assess community attitudes following involvement in community-based restoration projects, to record changes in species assemblages (fauna and flora) following the control of pests/weeds or to rate the progress of EEC mapping);
- The monitoring program needs to be flexible to allow for changes (e.g. extreme climatic conditions such as floods, drought, heavy frosts, heatwaves; land ownership change, unexpected trends in restoration - streambank erosion following willow removal; the abandonment of a community interest group);
- Monitoring should lead to the next stage, if necessary, for example, doing nothing, embarking on additional restoration works, continuing with weed control, re-establishing partnerships or changing an approach to community education - thus conforming to adaptive management principles;

- Monitoring should have a degree of robustness in keeping with its cost-benefit. That is data should be collected consistently, measures should be easy to understand and use, and measures should be reliable, comparable and verifiable;
- Involving the local community in monitoring is a means of providing valuable educational opportunities, increasing public commitment to environmental programs and in reducing the cost burden to BRC. Monitoring programs could include Streamwatch, farmer-initiated soil monitoring, bird-watching and local flora studies;
- Some monitoring programs may be suitable for honours or post-graduate research programs, thereby providing BRC with a cost-effective option;
- Careful interpretation of data is required as measurement trends may change over time as programs are implemented. For example, as weeds are controlled over the ensuing decades, the area being actively managed may decrease. However, a decrease in the area being managed may be interpreted as poor implementation success rather than the more meaningful interpretation of the success of previous control measures;
- Choose appropriate performance indicators for monitoring. As an example, for instream restoration works along a degraded, incised creek it would be expected that there should be sediment accumulation, improved bank and bed stability, colonisation of the bed with grasses, reed and rushes. Monitoring for riparian upperstorey recruitment may not adequately monitor the success of the project; and
- The information derived from the indicators can be further enhanced. This may require time-series data to analyse trends (e.g. increase in macroinvertebrate assemblages following riparian restoration works), using baseline data as a reference point (ecosystem condition rating pre and post change in management) or comparing measured results to standards (e.g. ANZECC guidelines for water quality).

11.4.3. Monitoring ecosystem condition and conservation value on BRC controlled land

The methodology developed specifically for the BMP condition assessment provides important baseline data for on-going monitoring programs. The key indicators of ecosystem function, terrestrial and aquatic vegetation condition, habitat value and ecosystem service values are attributes on the condition assessment pro forma (**Appendix E**). These indicators allow for changes over time to be compared and with repeated surveys trends can be established and management practices and restoration works evaluated. An adaptive approach will ensure relevance in the face of future unknowns, such as the prevalence of protracted droughts, purpose of monitoring, land management changes, restoration outcomes, fire, change in threats and impacts and possible changes in land tenure. A number of factors are outlined below that support a cost-effective approach to maximising the benefits of monitoring in the future.

- *Monitoring indicators* - use the existing pro forma developed for the BMP condition assessment and be familiar with the supporting notes and rating guidelines (refer **Appendix E**);
- *Monitoring ecosystem processes and function* -functional integrity is essential for self-sustaining and self-recovering ecosystems. Ecosystem process attributes in the pro forma need to be monitored and the reasoning understood. Refer to the seminal work by Tongway and Ludwig (2010);
- *Repeatability and comparative analysis* - for time-sequenced comparisons retain sites as per BMP (see Section 12);
- *Site exclusions in future monitoring programs:*

- Sites may be excluded for some or all future monitoring cycles;
- Sites of very low or low conservation value or which have been identified for uses other than biodiversity (e.g. Kings Parade, areas around RFS sheds in villages and rural settlements, pump sites, and water reservoirs in confined areas);
- Sites with some biodiversity value, though any enhancement to biodiversity would only be of minor benefit (e.g. plantings in playground parks, pedestrian access ways, car parks and around works depots).
- *Sites recommended for inclusion in future monitoring programs:*
 - Areas identified in the BMP assessment as having very high or high ecosystem condition/conservation value;
 - Riparian areas - urban waterways particularly Sawpit Creek and tributaries, Jordan Creek at Hector Park, Hawthornden Creek in Boundary Road Reserve and Jaques Park, and lower Vale Creek (waterways with low flow pipes only if biodiversity enhancement programs have been implemented), Macquarie River, Turon River at Sofala and Crudine, Peppers Creek at Rockley and Trunkey Creek at Trunkey;
 - Water storage precincts of Winburndale Dam and Chifley Dam;
 - Mount Panorama/Boundary Road Reserve/Blayney Common precinct;
 - Areas with the presence of Box-Gum Woodland or Tableland Basalt Forest EECs;
 - Areas where restoration or biodiversity enhancement programs have been implemented or are planned to be implemented; and
 - Areas where a change in management has been adopted to enhance biodiversity (e.g. areas where groundcover is managed, grazing regime changed, weeds or pests managed).
- *Monitoring frequency* - being prescriptive about the monitoring frequency across sites may not yield the most cost effective and beneficial outcome. It may be plausible if all sites were, for example, degraded remnant vegetation under restoration; however the sites are very diverse in respect to how they are managed and their land use, size, function, condition and value for biodiversity. Recommendations that can be considered are:
 - Sites where the 'threat trend' and 'condition trend' have been noted in the previous assessment/s as 'worsening' or 'reducing in function' respectively (as per pro forma) - (1 year monitoring cycle);
 - Sites where the 'threat trend' and 'condition trend' have been noted as 'improving' or 'increasing in function' respectively - (~2 year monitoring cycle);
 - Sites where restoration works or change in management for biodiversity enhancement has taken place- (1 year monitoring cycle);
 - Sites assessed to have high or very high conservation values that have stable threat status and stable function - (~5 year monitoring cycle);
 - Sites where impacts from nature-based tourism is likely to increase - (1 year monitoring cycle);
 - Sites where either or both the ecosystem condition or conservation value have declined since the previous monitoring event - (1 year monitoring cycle);
 - Sites where significant impacts have arisen or are likely to have arisen as a result of flood, fire, drought, vandalism, stock grazing - (1 year monitoring cycle);

- Sites where there is significant public interest, for example, McPhillamy/Sulman/Reid Parks on Mount Panorama, Macquarie River riparian areas - (1 year monitoring cycle); and
- To detect impacts from climate change may require a considerable lag time. To validate climate change as the likely key threat may be difficult to unpick from all the other likely causes. The relatively small size of the sites, lack of suitable controls etc, limit any climate change assessment and therefore is beyond the scope of the BMP.
- *Timing of monitoring programs*
 - Some sites may need to be monitored prior to the implementation of restoration or biodiversity enhancement programs. This may be unscheduled in the predetermined monitoring cycle.

Seasonal variances or the time of year the assessments are undertaken should not significantly influence the results. However the observer and interpreter of the results need to be mindful of seasonal variations in groundcover abundance and species composition, and the prevailing climatic conditions at the time of monitoring.

11.4.4. Trend analysis using performance indicators

A number of key performance indicators have been developed to specifically monitor the directional trend of biodiversity over time as a consequence of management implemented through the adoption of the BMP. The indicators encapsulate the essential criteria of being specific, measurable, achievable, relevant and timely. The suite of indicators should be regarded as being flexible to accommodate for changes in our response to biodiversity issues in the future. The key performance indicators are listed below:

- The biodiversity condition rating (including attributes such as vegetation, terrestrial and aquatic habitat quality and ecosystem processes and function) of Council controlled lands in the urban and rural environments which have moderate, high or very high conservation value is *improved*;
- Area of land of high biodiversity conservation value in the BRC Region protected through LEP zoning, minimum lot size standard or other appropriate planning mechanisms is *increased*;
- Area of land of high biodiversity conservation value protected through the National Parks Estate, Council Reserve System and/or private conservation covenants on title is *increased*;
- Length of roadside vegetation mapped to vegetation community level and assessed for biodiversity conservation is *increased*;
- Biodiversity condition rating of roadside vegetation which has moderate, high or very high conservation value is *maintained or improved*;
- The connectivity of remnant vegetation within road reserves and through Bathurst City (e.g. Mount Panorama precinct and Macquarie River riparian zone and tributaries) is *maintained or improved*;
- Extant populations of listed threatened species in the Bathurst Region (using a targeted subset of threatened species) are *stable or expanding*;
- Woodland bird species abundance and diversity *maintained or improved*;
- Wetland bird species abundance and diversity *maintained or improved*;
- Area of EEC in moderate to high condition, of patch size >10 ha, mapped and protected through zoning, National Parks Estate, Council Reserve system or private conservation is *increased*;

- Urban and non-urban waterways condition is *improved*;
- Community understanding and engagement in biodiversity conservation is *improved*;
- Level of funding directed to biodiversity conservation (external and internal) is *increased*; and
- Area of native vegetation removed as a consequence of development approvals and Council's own activities (either through direct reduction or offsets) is *reduced*.

11.5. Reporting

Reporting of the BMP will communicate its progress and some of the key evaluation findings for reasons of accountability (to funding agencies and internally within BRC), to demonstrate links to catchment targets, to allow for adaptive management decision making and to inform the wider community of biodiversity-related issues in the Bathurst Region.

Evaluation reporting addresses the standards of appropriateness, efficiency and effectiveness, which are underpinned by the monitoring of the performance indicators. Reporting should also include funding status, that is, internal and external funds spent on BMP implementation during the reporting period, anticipated expenditure in the ensuing reporting period and additional funds required. There is also an educational opportunity to report the successful outcomes and key biodiversity findings of the BMP to BRC councillors, community reference groups, as well as to the wider community through the local media or through BRC generated community outlets such as on the BRC website, rates notice newsletters etc.

A number of reporting mediums are available to BRC and these include internal council reports, State of the Environment Reports for the Bathurst Region, local media, Council's community information outlets (e.g. BRC website, rates notices) and resource materials that can be generated specifically for BMP reporting purposes. In addition, evaluation and funding reporting can be directed to funding bodies, the BOD Alliance and key community reference groups (e.g. VMP reference group and the Bathurst Regional Natural Resource Management Reference Group).

The timing of the reporting process is governed by the type, purpose or function of the report and who it is directed to. The content of the report and by what means the BMP is reported can be guided by the simple matrix presented in Table 31.

Table 31. Reporting matrix

	Evaluation	Funding	Education
BRC annual reports	✓	✓	
BRC Councillor's monthly briefing	✓	✓	✓
BRC SoE	✓		
Local media			✓
BRC community outlets			✓
Educational resource material			✓
BOD Alliance	✓	✓	
Funding bodies	✓		
CMA convened Local government reference groups	✓	✓	✓
Key community reference group/s	✓	✓	✓
2036 Community Strategic Plan	Reporting of biodiversity objectives in BMP		

11.6. Funding strategy

Much of this BMP will be achieved through existing Council core business programs involving, for example, sewerage treatment, waste management, road management and planning. There remain, however, a large number of conservation and restoration projects that require funding and the competition this creates has meant that the successful apportionment of funds needs to be targeted. This is achieved through strong links to the larger scale natural resource planning frameworks of the Lachlan and Central West Catchment Action Plans. Further, the devolvement of funds from federal or state government sources is available for application directly or is often directed through the CMAs to priority issues identified in the action plans or to their own targets and priorities. Therefore, a nexus between these funding bodies is important for the funding success of the BMP. Accordingly, the BMP objectives and strategies have been developed to link to larger scale natural resource planning frameworks, and the links to the Lachlan and Central West Catchment Action Plans are outlined in Table 32.

The new CMA CAP structure, which will take effect in the 2012/2014 financial year, may change how funds are devolved. It is likely the funding will be directed towards highly targeted, multi-beneficial programs that contribute to the CAP targets - this may even be just within a single targeted catchment to undertake riparian restoration with multiple outcomes. The targeting of areas is based on catchment-wide priorities determined from the best information and current knowledge available to the CMAs. Funding is also offered through general expressions of interest. The implementation of the funded programs will contribute to the CAP targets and also the NSW Catchment Action Targets and the national Caring for our Country priorities.

Table 32. Contribution of BMP to catchment targets

Catchment target	BMP strategy links
Central West Catchment	
Land theme	
Management target: <ul style="list-style-type: none"> (L1): By 2021, 9-40% of priority soil landscape systems are being actively managed to maintain good condition or managed to improve condition to be in an ecologically functional and productive alternate state 	SM (16, 19)
Priority actions: <ul style="list-style-type: none"> Erosion control works appropriate for the Bathurst/Raglan granite soils 	SM16
Water theme	
Management targets <ul style="list-style-type: none"> (W1): By 2021, 1-5% of priority river reaches are actively managed to maintain a good condition stable state 	SM (3, 12, 13)
<ul style="list-style-type: none"> (W2): By 2021, 10-35% of priority wetlands are actively managed to maintain a good condition stable state 	SM (4, 13, 16)
<ul style="list-style-type: none"> (W3): By 2021, there is an improvement in the ability to manage identified priority groundwater dependent ecosystems 	SC4
<ul style="list-style-type: none"> (W4): By 2021: there is an increase in projects contributing to use, efficiency, movement, connectivity and water quality 	SO9, SM16
Priority actions: <ul style="list-style-type: none"> Bed and bank stabilisation 	SM16
<ul style="list-style-type: none"> Rehabilitation of habitat 	SM (3, 12, 13)
<ul style="list-style-type: none"> Revegetation/regeneration of riparian, floodplain and groundwater dependent ecosystems 	SM (3, 12, 13, 16)

– Manage threatening processes e.g. fish barriers, salinity	SO5, SO9
– All water sharing plans* contributing to management of priority river reaches and groundwater dependent ecosystems	
– Manage hydrological regime for ecological outcomes	SO9, SM16
– Manage total grazing pressure	SM19
– Priority groundwater dependent ecosystems and groundwater sources identified and resilience analysis complete	-
– Reduced run-off and increase infiltration	SM16
– Manage point source and diffuse source pollution	SR1, SM16
– Multiple beneficial use including water reuse and recycling	SC8, SO9
– Improve water use efficiency	SL19
– Improve connectivity of water flow laterally, longitudinally and vertically	SM16
Biodiversity	
<i>Management targets:</i> <ul style="list-style-type: none"> • (B1): By 2021, 8-16% of priority vegetation communities are being actively managed to achieve a good condition stable state, increase net extent, and where possible, increase connectivity 	SC (1, 2, 4, 5, 7, 8, 9, 11, 12; SM (3, 5, 8, 9, 10, 12, 13, 14, 15, 16, 25)
<ul style="list-style-type: none"> • (B2): By 2021, increase the number of management interventions coordinated to improve habitat of native flora and fauna including threatened species to achieve stable state 	As above including: SC3, SC10, SM7
<i>Priority actions:</i> <ul style="list-style-type: none"> – Reinstate natural fire regimes for dry sclerophyll forest 	SM18
– Revegetation and regeneration to improve structural and floristic diversity	SM (13, 14, 15, 19)
– Manage threatening processes, e.g. invasive species	SM18
– Manage total grazing pressure	SM19
– Habitat re rehabilitation and improvement	SM (13, 14, 15, 19)
– Improve shape, size and connectivity of remnant vegetation patches	SM (5, 8)
– Implement recovery actions of high priority threatened species in Priority Action Statement 2	SO7, SP4
– Contribute to National Reserve System goal of greater than 15% area managed for conservation per bioregion (CAR reserve system)	SC4
Community theme	
<i>Management targets:</i> <ul style="list-style-type: none"> • (C1): Increase the number of natural resource management projects that provide opportunities for social and economic wellbeing 	SL4
<ul style="list-style-type: none"> • (C2): Increase the number of community members participating in awareness raising and capacity building activities 	SL (3, 4, 5, 6, 7, 12, 13, 15, 16, 17)
<i>Priority actions:</i>	
– Aboriginal involvement in natural resource management	SL17, SP4
– Protection of cultural values and knowledge	SL11, SL17
– Developing sustainable partnerships and networks	SP4, SP7
– Leadership, mentoring and peer support programs	SL (15, 16, 17)
– Leveraging funding for incentive programs	SL (18, 20), SP4
– Education and training opportunities	SM20, SL (1, 2, 3, 4, 5, 6, 7, 10)
– Provide support for groups, land managers and natural resource management industry	SP4

Lachlan Catchment	
Biodiversity and native vegetation theme	
Management targets: <ul style="list-style-type: none"> By 2016 there is: <ul style="list-style-type: none"> 20,000 hectares of terrestrial native vegetation managed for biodiversity conservation in perpetuity 	SC (1, 2, 4)
<ul style="list-style-type: none"> 100,000 hectares of terrestrial native vegetation are actively managed for biodiversity conservation through management agreements 	SC7
<ul style="list-style-type: none"> 20,000 hectares of native vegetation established through revegetation using local endemic species 	SM (13, 14)
<ul style="list-style-type: none"> 5,000 kilometres of corridor habitat is established and/or protected 	SO7
<ul style="list-style-type: none"> Ten Councils within the catchment have prepared and are implementing local biodiversity strategies 	✓
<ul style="list-style-type: none"> All regional and local land use strategies and environmental planning instruments incorporate provisions which support the protection of environmental assets for the sustainability of the landscape and its native flora and fauna 	SC (8, 9, 11)
<ul style="list-style-type: none"> Twenty Councils are managing roadside reserves in line with Roadside Vegetation Management Plans 	✓ also SO6
<ul style="list-style-type: none"> The highest priority terrestrial and aquatic threatened flora and fauna species, endangered populations and significant species will be managed for conservation 	SC (2, 3), SO3, SM (5, 13)
<ul style="list-style-type: none"> Maintain and improve the populations and diversity of 25 threatened flora and fauna species, and/or endangered populations 	SC (2, 3, 10)
<ul style="list-style-type: none"> Identify and implement actions to increase the recovery of significant terrestrial and aquatic populations 	SM (5, 13), SO7
<ul style="list-style-type: none"> An Integrated Weed Management Strategy will be developed and priority actions identified in the strategy will be implemented 	SM12
<ul style="list-style-type: none"> An integrated Pest Animal Management Plan will be completed and populations of priority environmental pest animals will be controlled and suppressed 	SM12
Water and aquatic ecosystems	
Management targets: <ul style="list-style-type: none"> By 2016: <ul style="list-style-type: none"> 10,000 ML of water is delivered more efficiently for the benefit of riverine ecosystems and for identified Aboriginal cultural purposes 	SC8, SO (9, 10)
<ul style="list-style-type: none"> Modify and/or manage 15 structures that are barriers to instream migration of native aquatic fauna to extend the connectivity or priority stream lengths 	SO (5, 7)
<ul style="list-style-type: none"> Ten Councils have adopted and are implementing an Integrated Water Cycle Management Plan 	SO9
<ul style="list-style-type: none"> Complete and implement a water use efficiency strategy in cooperation with water users 	SO9
<ul style="list-style-type: none"> Manage eight nationally significant wetlands and five regionally significant wetlands for improved biodiversity conservation 	SC7, SM (4, 13)
<ul style="list-style-type: none"> Implement activities identified within existing and future floodplain management plans identified as providing environmental benefits 	Existing Bathurst, Sofala & Georges Plains Floodplain Management Plans; SM16
<ul style="list-style-type: none"> Improve instream habitat at 80 sites 	SM16
People and community	
<ul style="list-style-type: none"> There is an increase in community awareness, knowledge and skills in relation to sustainable NRM 	SL (3, 4, 5, 6, 7)

- Increase the number and diversity of individuals, groups and networks engaged in and adopting sustainable NRM practices.	SP (4, 7)
- Maintain and increase the number of individuals, groups and networks investing in mutually beneficial partnerships that achieve NRM outcomes.	SP (4, 7)
- Systems are in place to support the community to achieve sustainable NRM.	SP4
- There is an increase in involvement of Aboriginal people in sustainable NRM within the Catchment.	SL17
- Establish thirty partnerships between Aboriginal communities, Lachlan CMA and land managers that identify, protect, manage and/or maintain landscapes culturally significant to Aboriginal people.	SL17

*Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources is currently being drafted

The opportunity and success in sourcing external funds, as stated above, is largely determined on the demonstrated links to natural resource management targets and priorities governed by the funding bodies. The need for funding for the implementation of the BMP will be a constant for many years and it is impossible to predict the funding situation beyond the immediate and short-term. Therefore, the remainder of this section focuses on current external funding grants and the types of actions that are applicable (Table 33).

Table 33. Funding opportunities for BMP actions

Action type	Funding opportunity
Biodiversity enhancement on privately managed land (actions for linkages with BRC as community facilitator)	Environmental Stewardship (Caring for our Country)
Biodiversity asset protection, conservation, restoration and enhancement; community education, capacity building and engagement (a number of actions apply across BRC roles as leader and as regional and local partner)	Open Call Grants (Caring for our Country)
Biodiversity management through local partnerships (e.g. AP4)	Community action grants (Caring for our Country)
Increasing Wiradjuri involvement in biodiversity management (e.g. AL11)	Indigenous programs (Caring for our Country)
Conservation activities for local landcare groups (action for BRC as local partner)	Landcare (Caring for our Country)
Recent grants included community and local government environmental education (a number of actions with BRC as community leader); protection of biodiversity assets (number of actions with BRC as land use planner); research (e.g. AM6 - flying foxes, AM28 - urban possums); community and local government restoration and rehabilitation (a number of actions with BRC as operator of infrastructure and as a land manager)	Environmental Trust Grants
Actions linked to CAP targets	CW CMA yearly incentive funding
Actions that protect, restore and manage biodiversity on public and private land (a number of actions apply across BRC roles as planner, operator of facilities, land manager, leader & partner)	Biodiversity Fund (available for the next six years)
Actions requiring functional understanding for restoration works/research	Universities, ARC type grants

Additional funds may be listed on GrantsLINK website
<http://grantslink.gov.au/grant-categories/environment-and-nature>

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Personal Communication

- Garry Germon (2012) Senior Threatened Species Officer, NSW Environment Protection Authority, Dubbo.
- Dr Colin Bower (2012) Principal Consultant Botanist, FloraSearch, Orange.
- Dr Michael Braby (2011) Senior Curator of Entomology, Museum and Art Gallery of the Northern Territory, Darwin, NT.
- Chris Marshall (2012) Chair of Boundary Road Reserve Landcare Group and bird watcher, Bathurst.

Appendix A.

BIODIVERSITY ISSUES PAPER EXECUTIVE SUMMARY

Biodiversity Issues Paper Executive Summary

Project Background

Bathurst Regional Council (BRC) has identified a need to develop a comprehensive Biodiversity Management Plan (BMP) which would assist Council with future planning, monitoring and management of biodiversity. The purpose of the Issues Paper is to identify the matters that Council will need to consider in the development of a comprehensive BMP. This was completed through a process of reviewing legislation shortfalls, potential actions that facilitate conservation of biodiversity within Council's core business activities, Council's current performance of these actions, existing biodiversity assets and means of assessing their distribution, threats and recovery strategies, and Council's capacity to implement remedial actions as part of their normal operations. This information was distilled to provide a clear iteration of Council's performance, responsibilities and field of influence in relation to biodiversity management within the LGA.

Bathurst Regional Council was formed in 2004 following the amalgamation of Bathurst City Council and Evans Shire Council, and includes 3,822 km² of land. A number of mountains in the east of the LGA stand taller than 1200m above sea level, while elevations in Bathurst city range from 635m AHD near the Macquarie River to 879m AHD around Mount Panorama. The result for the LGA is a diverse set of geological conditions which have led to the development of a broad range of vegetation communities, each with a particular suite of flora and fauna. Of this, 61% has been identified as bushfire prone.

Five major rivers drain the LGA into two discrete catchments. The Abercrombie River drains the southern part of the region to the Lachlan River, while the Campbells, Fish and Turon Rivers join the Macquarie River and drain northwest in the Central West catchment. Despite their current degraded condition, these rivers and their tributaries provide important habitat resources for a range of flora and fauna.

The Legislative Framework

Local governments have a major role in protecting biodiversity through long term strategic planning and regulation of development, and monitoring the environment through State of the Environment reporting. Routine council activities, such as waste collection and recycling, street cleaning, control of companion animals, noxious weeds and regulating pollution, are also important in protecting biodiversity.

Local government operations are required to conform to a tier of legislative regulations that protect and conserve biodiversity resources. These include national legislation, such as the *Environmental Protection & Biodiversity Conservation Act 1999* (EPBC Act), the National Strategy for Ecologically Sustainable Development, and agreements reached by the Council of Australian Governments (Section 3.2). State legislation (Section 3.4) that protects biodiversity includes the *Local Government Act 1993*, *Environmental Planning & Assessment Act 1979*, *Threatened Species Conservation Act 1995* (TSC Act), *Fisheries Management Act 1994* (FM Act), *Native Vegetation Act 2003*, *Catchment Management Authorities Act 2003*, *Noxious Weeds Act 1993*, *Water Management Act 2000*, *Contaminated Lands Management Act 2008*, *Protection of the Environment Operations Act 1997*, *Rural Fires Act 1997* (RF Act) and the *Roads Act 1993*. As well, specific national and state biodiversity conservation strategies (Section 3.3), and state and regional plans and policies (Section 3.5) are important instruments that regulate how local governments implement biodiversity conservation. Council's core functions are best encapsulated by the Local Government Charter (Section 3.1). Biodiversity management at a local scale needs to be considered and understood in the context of Council's field of influence (Section 4).

Local Government and Biodiversity Conservation

Local Governments face a number of challenges in the stewardship of natural resources, including deficiencies in technical and professional resources and skills in some sectors; unclear lines of responsibility among the government players; changing legislative frameworks and associated costs; and under-resourcing generally at both the local and at state agency level. The main factors identified that reduce the effectiveness of local governments in natural resource management (NRM) are lack of funding and resources, reliance on external funding, limited political support within councils, and limited expertise and skills in NRM. Other factors that influence the success of biodiversity conservation include lack of appropriate planning instruments, and lack of “ownership” at a local level. Projects that generate the best results are fully and enthusiastically supported by both the local community and local council.

For Bathurst Regional Council (BRC) key issues are the lack of up to date planning instruments such as the Local Environment Plan (LEP) and Development Control Plan (DCP). While these are currently under review, this is proving a lengthy process for the LEP, in particular. It is through these instruments that BRC is best able to influence the conservation of biodiversity. A great deal of the remaining native vegetation in the Bathurst Local Government Area (LGA) is owned and managed by state agencies such as DECCW, or is in private ownership. Effective biodiversity conservation must, therefore, include natural resources retained on private land. In addition to appropriate strategic planning instruments, this can be achieved through partnerships with other agencies, such as Central West and Lachlan Catchment Management Authorities (CMAs), and by offering incentives to landholders to encourage and support biodiversity conservation projects on their land. This is an important component of the mechanisms through which vital habitat linkages can be established and maintained. Establishment of these linkages is the real key to successfully developing a sustainable biodiversity conservation program.

BRC’S Responsibilities and Field Of Influence

As part of an integrated approach to NRM between local government and the Catchment Management Authority, Lachlan CMA have developed a NRM Delivery Plan which utilises four key themes to focus the development and implementation of an adequately resourced strategic environmental program. Of these key themes, the biodiversity theme encapsulates the key elements of biodiversity conservation management, and aims to enhance and conserve the natural ecological processes, and the abundance and diversity of native species found in the region. These are grouped according to local government responsibilities and field of influence in relation to biodiversity management within the LGA, including its function as a:

1. Statutory Land Use Planner and Development Controller
2. Environmental Regulator
3. Operator of Infrastructure and Facilities
4. Land owner, manager and developer
5. Community leader and facilitator
6. Member of regional and local partnerships

The delivery plan identified that councils have a significant role in each of these areas, and can contribute to effective biodiversity management through the considered implementation

of a range of activities. Exemplary actions on Council's own land have the capacity to provide a positive influence in the wider business and residential communities.

A range of council activities that can enhance biodiversity conservation have been identified, and reviewed to determine whether BRC, or another government agency, are currently implementing these (Section 4.6). This process provides a review of BRC's current performance as an advocate for biodiversity conservation in the LGA. Determining potential activities that are appropriate for BRC to be undertaking as part of a biodiversity management strategy was completed through a review of the Lachlan CMA's NRM delivery plan, and further informed by an Expert Panel of local scientists, conservationists and farmers, with additional input from BRC staff.

Key aspects identified under BRC's role as a statutory land use planner and development controller include the preparation of legislative instruments that regulate development, including use of Environmental Protection Zones, water sensitive urban design, and other strategies which can be implemented through the LEP and DCP. Understanding of the extent and value of biodiversity assets in the LGA can be achieved through consolidation of mapping resources, and integration with information currently available as hard data. It is important that biodiversity is managed locally within a regional framework through compliance with regional NRM plans and strategies. BRC is currently implementing major changes to its LEP and DCP, which will address much of the statutory shortfall identified; however, there are still a number of activities that could be undertaken to improve council's overall performance in this area (Section 4.6.1).

As an environmental regulator, BRC has specific responsibilities under a number of acts to regulate water and air pollution control as well as waste management. It is important to note that many actions relating to environmental regulation and protection are undertaken by other government agencies, and are not appropriate for consideration as a council activity. Council activities relevant to this role include regulation of bush rock and firewood collection, tree protection, monitoring of development sites to ensure compliance, and community education regarding the rationale for an environmental regulatory program. It was determined that there are a number of activities that could be undertaken to improve council's overall performance in this area (Section 4.6.2).

As an owner and operator of infrastructure and facilities, BRC has specific responsibilities to operate within Environmental Protection Licensing regulations where required, and to observe due diligence responsibilities for avoiding pollution and environmental degradation. Main areas of focus for Council include the operation of infrastructure and facilities in accordance with regulatory requirements, implementation of a code of practice that mitigates negative biodiversity impacts, and staff training in biodiversity conservation and best practice techniques to manage negative impacts. Overall, BRC perform well in this area, although there are opportunities to improve this performance (Section 4.6.3).

In their role as land owner, manager and developer, BRC has specific responsibilities to take adequate care of Council owned or managed land, including roads, recreation and other reserves, and operational and development lands. As a landholder, Council is viewed by the community as a role model. Actions to support this role include gaining a better understanding of biodiversity resources on Council land, and improving the management of these through NRM projects that involve a range of community groups and educational organisations, use of best practice techniques by Council's on ground staff, development of specific plans of management for BRC's bushland reserves, and implementation of the priority actions outlined in the Urban Waterways Management Plan. There are a large number of activities that could be undertaken to improve Council's overall performance in this area (Section 4.6.4).

BRC has the potential to play a strong role as community leader and facilitator of community action. This can be achieved through encouraging community involvement in NRM decision making, Council support for community based environmental groups, including indigenous people in conservation planning and projects, community education about the role of urban biodiversity and how to reduce negative impacts at a household level. From this review it is apparent that BRC recognises the importance of this role, but there are still a large number of activities that could be undertaken to improve Council's overall performance in this area (Section 4.6.5).

BRC has the potential to fulfil a strong role as a partner with other regional organizations and government agencies in implementing effective biodiversity management. Council currently achieves this through membership of organisations including Bathurst-Orange-Dubbo Sustainability Alliance and the Salinity & Water Quality Alliance. Improvements in performance in this role can be achieved by expanding relationships with DECCW and Central West and Lachlan CMAs, as well as local schools, TAFE, community groups and individuals to improve NRM activities on private land (Section 4.6.6).

Biodiversity Resources in Bathurst LGA

Gaining a clear picture of biodiversity in Bathurst LGA is complicated by inadequate surveys and mapping, and differences in how biodiversity assets are described, categorized and mapped. Mapping may be based on 1:100 000 mapsheets, Central West subcatchment, bioregion, or other methods. Vegetation mapping is currently under review by Royal Botanic Gardens Trust and DECCW for the Central West catchment. This will replace inadequate, poorly resolved, and outdated descriptions and estimates of vegetation communities in the LGA. Other forms of mapping include distribution of vertebrates and Broad Habitat Types (BHTs), which has been completed at the 1:100 000 mapsheet scale. Each of these mapsheets cover 2,500 km², and the Bathurst mapsheet includes around half of the Bathurst Regional LGA. The remainder of the LGA is included in 5 other mapsheets.

Bathurst LGA is home to 11 threatened species of plants, of which 7 are classified as vulnerable, and 4 endangered. *Zieria obcordata* has been recorded at several locations around the Rocks and north to Crackerjack Rock, while Aromatic Peppercreese has been recorded at two locations near Perthville. *Eucalyptus pulverulenta* has been recorded between Perthville and Cow Flat, Capertee Stringybark from several locations in Winburndale Nature Reserve, and Robertson's Peppermint an outlying record from near Sunny Corner. As well, there are 72 species of animals listed as threatened under State and Federal legislation including the TSC Act, FM Act, and EPBC Act. Of these, 55 species are classified as vulnerable, 15 endangered, one critically endangered, and one presumed extinct. A number of these have a limited distribution in Bathurst LGA, including the Purple Copper Butterfly, Green and Golden Bell Frog, Pink tailed Legless Lizard, Glossy Black Cockatoo, Barking Owl, Masked Owl, Spotted tailed Quoll, Large Eared Pied Bat, and the Eastern Bentwing Bat.

There are two Endangered Ecological Communities (EECs) listed as threatened under the TSC Act and one EEC protected under the EPBC Act in the Bathurst LGA. Of the three EECs, the White Box Yellow Box Blakely's Red Gum Woodland has the greatest extant reserves in the Bathurst region. This community is highly degraded across much of its range, but even remnants in poor condition are given conservation status under NSW legislation. The other EECs, Natural Temperate Grassland of the Southern Tablelands (NSW and ACT) and Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions, have limited potential ranges in the LGA.

A recent analysis of vertebrate diversity recorded from a range of BHTs for the Central West catchment has provided a broad estimate of their current condition in Bathurst LGA. From

this it is apparent that vast tracts of land in the Bathurst region, and across the Central West, have been cleared. Native vegetation is poorly conserved, with representative reserves for many vegetation types at or below 10% conserved. The obvious effect for vertebrate fauna is significant reduction in the availability of habitat, and this is reflected across the range of faunal groups examined. Degradation of extant native vegetation continues and the range of threatening processes is increasing; few of these impacts are seriously targeted in management plans for the region. Listing of threatened species and EECs does little to ensure the safety of that vegetation or habitat, with degrading processes (salinity, erosion, soil acidification, weed infestation, feral animal invasion, fire, clearing, pasture improvement, etc) on adjoining lands impacting these areas largely unchecked.

There are several focal centres for threatened species in Bathurst LGA, but care must be taken that conservation efforts are not just concentrated on these; in most cases, this land is not managed by BRC. It is important not to confuse presence with abundance –presence can indicate a single random sighting of a species that is under serious threat. Despite the fact that only 13% of vertebrate species are listed under TSC Act, 67% of species are in decline in the region, including reptiles and mammals, and with woodland birds particularly affected. Key habitat thresholds have been identified as 10-30% of the landscape, with disproportionate losses of vertebrate species from this point onwards. The Bathurst region has reached this stage, and is liable to experience multiple species extirpations, if these are not already occurring.

Due to extensive clearing throughout the LGA areas of unimpacted vegetation are now separated by expanses of open paddocks, subjected to grazing or cropping, or urbanized areas and industrial areas including mining and quarrying. Effective conservation now relies on establishing and maintaining a system of reserves (national parks, conservation reserves, private conservation areas, etc) where biodiversity resources are retained. The connectivity of remaining vegetation (both formal reserves and privately owned) is a critical component of biodiversity conservation. Appropriate levels of connectivity has implications for population dispersal, exchange of genetic material and conservation of genetic diversity and the ability of animals to migrate in response to prevailing weather conditions and/or climate change.

DECCW used a range of proximity based and non-proximity based variables to develop a habitat conservation matrix for the Central West catchment. They identified areas that formed conservation connectivity corridors that also link and enhance areas of high conservation value vegetation. Several areas were identified in Bathurst LGA as having high conservation value vegetation and significance for connectivity within a larger landscape matrix. Additional focal areas of conservation significance in the catchment were identified, and given the highest prioritisation for rehabilitation. Two focal areas were located in Bathurst LGA: one around Sewells Creek, and one in riparian lands around the Turon and Macquarie Rivers.

The condition of the Macquarie River and other major streams in the Bathurst region is highly degraded. Willows dominate much of the river, and are actively replacing Casuarinas and Ribbon Gums in the riparian zone. Exotic pasture grasses and herbs have almost completely displaced native species in the understorey. Few native wetland plants remain, and there have been significant losses of native flora and fauna, as well as loss of connectivity with adjoining bushland areas. River stability has decreased, and there is increasing potential for blockage of streams and floodplain stripping, especially in the Campbells River. Erosion is ongoing, with major erosion points being sheet and rill erosion in the Upper Macquarie catchment, and gully erosion in first and second order streams in the Fish and Campbells River catchments.

The Urban Waterways Management Plan (UWMP) provided a condition assessment for urban streams, and revealed that most of the six creeks surveyed were in poor to degraded condition overall, with no reaches in very good condition. Short reaches on Jordan, Hawthornden and Sawpit Creeks were in good condition, but in most cases there were reaches nearby in highly degraded condition. Removal of native vegetation and establishment of weeds, channel modification and erosion, and degraded water quality through stormwater discharge were identified as the main impacts for many reaches, with additional impacts from land use in upper catchment areas affecting the downstream environment also cited as significant degrading processes.

Threats to Biodiversity

Key threatening processes (KTPs) are the things that threaten the survival and development of species, populations or ecological communities. They are listed variously under the TSC Act, FM Act and EPBC Act if they have been determined to adversely affect threatened species, populations or ecological communities or could cause species, populations or ecological communities that are not threatened to become threatened, and include pest animals, weeds, diseases, and habitat loss/change.

There is some duplication of KTPs under the three acts, with an overall total of 25 KTPs known to be impacting biodiversity resources in Bathurst LGA, and another 6 potentially impacting. In general, each KTP has a Threat Abatement Plan (TAP), which lists threat abatement strategies. The role for BRC in management of these KTPs is primarily by example through good management on Council managed lands and development control through the DCP; a secondary function for Council is to advise private landholders of impacts and management issues, and to act as a referral point to direct land managers to relevant statutory bodies that can provide information, funding, or practical support for management.

A review of the KTPs for each group of threatened flora and fauna in Bathurst LGA provided a summary list of threatening processes that potentially impact these and other species in the same floristic or faunal group. Addressing these should be one of the main focuses of the BMP. Threatening processes were identified for native vegetation communities, trees, and shrubs and groundcovers. Birds, frogs, bats, marsupials, reptiles and invertebrates were key faunal groups assessed for threatening processes.

Most of the threatening and degrading processes in the Bathurst region are being experienced across the Central West catchment, and throughout many parts of rural and regional Australia. Having identified the main threatening processes for biodiversity in groups of organisms in Bathurst LGA, these threats were grouped into categories and explored in more detail (Section 7.3), acknowledging that many processes impact more than one group of organisms. Main threatening processes in Bathurst LGA include:

- Vegetation clearing and habitat degradation, leading to soil degradation and loss
- Riparian and instream habitat degradation and alterations to hydrology
- Invasive species, including feral animals, exotic plants, diseases and pathogens
- Urbanization and pollution, and inappropriate fire regimes

Issues, Challenges and Gaps in Knowledge

Identifying key issues, challenges and gaps in knowledge is fundamental to the development of a focused Biodiversity Management Plan. Sections of the main report present an extensive review of legislation, Council's roles and responsibilities, biodiversity resources in the LGA, threats to these resources, and potential actions for managing those threats. This has allowed important issues and challenges for biodiversity management by BRC to be identified, along

with relevant gaps in current knowledge. Any function that is not being adequately addressed is clearly an issue, and therefore a challenge, to BRC's biodiversity management. Council's performance was reviewed for each of the six functional areas previously outlined. For potential activities that will facilitate better biodiversity management, but not currently undertaken by BRC, an assessment was made of Council's capacity to implement them, based on the requirement for changed practices, additional funding, and liaison with other organisations.

Key issues, challenges and gaps in knowledge affecting biodiversity management by BRC reviewed for the six functional roles can be briefly summarised as follows:

Issues relating to funding and resources for biodiversity projects

- Responsibilities versus funding allocations. Local government are formally delegated obligations by higher levels of government and informally through the expectations of the community, but are not allocated revenue to allow for effective implementation of biodiversity conservation.
- Inconsistent funding. Funding sources available for biodiversity management are often discontinuous. BRC have received significant funding from the Central West CMA in the past. The Federal government has largely moved away from the regional distribution of funding for natural resource management, thus funding for riparian rehabilitation, for example, has virtually ceased.
- BRC funding for conservation. At this point in time there is no legislative trigger to directly fund conservation activities in Bathurst LGA. This has resulted in limited capacity to seek a specific environmental management allocation in each annual budget; an annual allocation for the implementation of the VMP is not specifically for biodiversity projects, or even native vegetation, and is limited to the Bathurst City area. Main sources of internal funding within BRC for environmental conservation projects are statutory requirements and community pressure.
- Community involvement Without good community support, the potential for successful implementation of conservation projects is limited. Community education is required to achieve the fundamental changes in thinking and lifestyle that are required to make biodiversity conservation part of peoples' daily lives. Volunteer labour and donations are a major resource for the management of biodiversity at the local level – many ongoing projects are dependent on volunteer support, including Macquarie Rivercare (now merged with Greening Bathurst), Boundary Rd Reserve Landcare, South Bathurst Bushcare and other groups.

Issues relating to land tenure

- Conservation on private land. In Bathurst LGA, a large percentage of the remaining native vegetation reserves are on private land. BRC has little control over what happens on private land unless an activity requiring consent is planned.
- Conservation on land held by other government authorities. Most remaining native vegetation is owned and managed by authorities other than BRC, eg. in state forests, national parks and conservation reserves. Again, BRC has little control over how effectively this land is managed.
- Conservation issues outside council's responsibilities or area of influence. The local government charter directs councils to act as good leaders and stewards in the LGA through leadership by example. For many matters relating to biodiversity management this is the only avenue for council to deal with threats to biodiversity. In leading by example in areas under its operational control, BRC can demonstrate its commitment to effective management of biodiversity in the LGA.

Issues relating to planning and development control

- DAs “inherited” from Evans Shire Council and Bathurst City Council. Many of the existing property developments were given approval under one of the previously existing local councils (now merged to form BRC). In many cases there were few conditions of consent, and those conditions imposed generally did not relate to environmental issues.
- Other legacies from Evans Shire and Bathurst City Councils. Many rural properties have dwelling entitlements, although many of these have not been taken up. Today, a large number of these entitlements are in areas where there are potential conflicts with biodiversity conservation requirements.
- Death by 1000 cuts. Current policies lack the capacity to measure the cumulative impacts of small losses under current planning policies. It is unclear whether these will be addressed in the new LEP. The impacts of cumulative development need to be quantified and monitored for effective biodiversity conservation.
- Rapid population growth. Current population growth rate for the LGA is estimated to be around 1.2% per year and Council is actively seeking to increase growth through programs such as “evocities”. Unless managed well the ongoing population growth in the region is a major issue for biodiversity conservation.
- Rural lifestyle residential development. Bathurst LGA has seen a rapid growth in rural lifestyle developments, with increasing numbers of dwelling on small blocks (5-10ha). Direct impacts of construction of a dwelling in a rural setting are quite easy to measure; however, there are indirect impacts such as the impacts of domestic pets, sewage, motorbikes, firewood collection, noise and light pollution, and other pollution. The challenge is to quantify and regulate these to reduce their impacts on biodiversity. In some cases, improvements have been made to degraded rural blocks through this type of development.
- Quality of REFs, EIAs, EISs, SEEs provided to BRC. Quality and veracity of the information provided in environmental impact assessment instruments submitted in support of development applications vary widely. Decisions may, therefore, be based on flawed or incomplete information.
- Strategic planning – getting it right. Main issues for BRC are rehabilitation of past impacts through inappropriate land use practices, and effective management of the progress of development. BRC has limited access to reliable biodiversity data to inform decision making processes.
- Lot size: one size does not fit all. Poor land management can directly impact on biodiversity conservation at any lot size, however in practice smaller lot sizes tend to increase pressures on biodiversity.

Linking with other government authorities

- Management of pest species. BRC’s primary functions in management of pest plants and animals are as leaders by example, and by acting as a referral point for information and support from other government agencies, including I&I (DPI), DECCW, UMCC, all of which provide free information and advice for landholders to achieve better land management of problems including weeds, feral animals, diseases and plague species such as locusts.
- Prioritisation for allocating funding and other resources. Bathurst has added issues relating to division of management at State government level. For example, most of the LGA is in the Central West catchment, managed by Central West CMA, except for a comparatively small section in the south of the LGA which falls into the Lachlan catchment, and is managed by the Lachlan CMA. Funding from federal and

state allocations may be distributed through these agencies, although most of the NRM funding available is currently distributed through Caring for Our Country grants administered by the Federal government.

- Need for effective partnerships with Central West and Lachlan CMAs. The CMAs provide a good deal of the biodiversity conservation information to private landholders through property vegetation plans and property water plans. As well, they are instrumental in the implementation of plans for the improvement of regional connectivity corridors developed by DECCW. BRC need to work locally within a regional conservation paradigm to achieve the best possible outcomes.
- Bushfire management. RFS and hazard reduction burns need to be conducted in accordance with DECCW guidelines, RF Act and BRC Open Burning Policy. BRC should explore ways to improve biodiversity management with relevant organisations.
- Linking with CAP targets. Funding allocations are often directly linked to achieving CAP targets; however, these targets are generalised across the whole catchment. BRC needs to compete with other councils and agencies for funding under each allocation. Specific targets under each Catchment Theme for each LGA in the CMA area would streamline this process, and establish a prioritised approach across the catchment. Projects that directly address these targets will have better access to funding as well as meeting the need to work locally to achieve bioregional and regional outcomes. New CAP targets are currently under review by the Natural Resources Advisory Council, and are due to be released by Central West CMA in the near future.

Issues relating directly to biodiversity management

- Inadequate mapping of vegetation at a local scale. Vegetation in Bathurst LGA has been mapped at a bioregional scale by DECCW, with additional ad hoc local scale mapping related to other projects. In many cases the information from local scale mapping is not available publicly. As a result, it is difficult to get a clear picture of where local remnants of high conservation value vegetation are located. DECCW, in partnership with the Botanic Gardens Trust, are currently completing the ground truthing for fine scale mapping within the bioregion.
- Climate change. The global scientific consensus is that there will be irreversible changes in the natural environment as a result of climate change. Enhancing ecosystem resilience is the most appropriate way to improve nature's capacity to deal with these changes. One way to do this is by improving connectivity between larger habitat reserves so that species can move from one area to another in response to the changing climatic conditions. BRC needs to work collaboratively with DECCW and Central West CMA to identify priority areas for attention.
- Regionally rare species and regionally significant vegetation. This includes species that are secure in other parts of the country but are limited in their distribution locally, or under threat through changes to land use. Conservation of these species needs to be incorporated into management strategies to prevent them becoming locally extirpated.
- Vegetation Management Plan (VMP). A VMP for the whole of the LGA is required to ensure good vegetation management of rural reserves as well as urban vegetation.
- Management plans for animal species. Specific issues include the need for a kangaroo management plan, koala management plan, and better management of grey-headed flying foxes. Other than through strategic planning and development control, BRC's sphere of influence only applies to Council owned and managed land; however, under SEPP44 a koala management plan and core habitat MP can be

developed for the whole LGA. A fauna management plan is currently being developed for Mount Panorama and adjoining lands.

- Management of waterways and riparian lands. Most of the rivers and streams, and accompanying riparian lands, are on private property in the Bathurst region, creating challenges for their effective management. The rivers and streams bear little resemblance to what they were like before European settlement. The UWMP provided prioritised rehabilitation strategies for urban streams, while the SWMP addresses some of the key impacts from urban stormwater discharge to streams. Issues for management of urban waterways are primarily related to funding availability.
- Erosion. Erosion has led to major channel incision, with consequent impacts on surrounding riparian and terrestrial areas, including lack of hydraulic connectivity and changes to the local water table, loss of topsoil, etc. As the regulatory authority for all non scheduled premises, BRC can inform the management of development sites, road construction, and similar activities, as well as control erosion and rehabilitate streams on Council managed lands.
- Don't just focus on listed KTPs. Carp are not listed as a key threatening process. This highlights the need to address issues that are a problem locally rather than just those issues that are considered important at a state or federal level.
- Management of willow removal. Large scale willow treatment needs to conform to best practice management techniques, and be staged in conjunction with a revegetation plan to minimise the impacts on the stream ecosystems at a reach scale.
- Management of stormwater quality. Quality of stormwater can be improved through a range of options, including surface and subsurface treatment wetlands, or by improving the health of riparian and instream vegetation to utilise natural processes. Road maintenance practices can impact positively on water quality through the implementation of roadside management guidelines (developed recently for Bathurst LGA). Many of the actions identified in the Integrated Water Cycle Management Plan (IWCMP) address issues with stormwater quality, and these are gradually being implemented in the LGA.
- Lack of suitable indicators for monitoring biodiversity status over time. For effective biodiversity conservation, suitable indicators are required in order to understand changes in biodiversity resources over time. It is imperative that the rates of losses and/or gains are understood. While the development of indicator mechanisms may be outside Council's area of responsibility, BRC needs to source possible indicators from other agencies and organisations (eg. DECCW, CMAs, LGSA).

Gaps in Knowledge

Gaps in knowledge limit Council's capacity to make informed decisions. In some cases, dealing with a challenge will require gathering and interpreting further information to address the gaps in current knowledge for BRC. Key knowledge gaps were identified, and assessment was made of BRC's capacity to address this gap. For the Bathurst LGA, the following are identified as important knowledge gaps:

- Current assessments are based on existing mapping, which does not generally completely align with LGA boundaries. There is a need to develop and maintain good mapping resources that detail vegetation, habitat, and flora and fauna resources for the Bathurst LGA.
- Native grasslands are largely unmapped, and no condition ranking has been developed.

- Data is often not available in an accessible form; there is a need to convert report based hard data relating to occurrence of flora, fauna and vegetation communities to spatial data to determine current status and distribution of species.
- There is currently no inventory of public lands in Bathurst LGA that includes a risk analysis matrix that can be used to prioritise rehabilitation activities (similar to the one prepared for Central West CMA).
- The level of restoration effort required at a given site at a given point in time could be determined with consistency through a “maintain or improve” test (similar to the one prepared for Goulburn-Mulwaree Shire).
- No mechanisms in place to include and/or capture the knowledge held by members of the local Wiradjiri nation.

Actions and Responses

It is important that the BMP to be prepared for BRC is clearly focused on where Council can actually make a difference. An understanding of impacts is the first step to developing a more comprehensive capacity to deal with them. The next step is to develop a course of action that is tailored to manage biodiversity conservation in the Bathurst LGA – a process which will be covered in the Biodiversity Management Plan. A discussion of possible actions and responses that will assist in addressing each of the impacts identified previously in this document is presented for the following:

- Strategic planning – key responses include rehabilitation of past degradation resulting from poor land management practices and inappropriate development, and management of future development. The new draft LEP and DCP will place tighter controls on what developments are permissible and where, and the actions for biodiversity conservation that are required as part of the development approval process.
- Land clearing and native vegetation degradation – an ecosystem can become degraded by removal of all or part of its constituent elements, resulting in simplification. Removal of stags, ground debris, rocks and leaf litter, etc, all remove complexity from vegetation communities and reduce resources available for a vast array of species. Recovery strategies include ensuring the retention of existing old growth trees, use of nest boxes to supplement the available habitat, education of landholders, management of regeneration practices, management of grazing pressures through fencing, stock rotation and exclusion, and reduction of grazing in TSRs.
- Aquatic systems – main actions include a reduction in ongoing pressures from a wide range of impacts on these systems, and management of habitat with a high degree of private ownership. Recovery strategies include development and implementation of catchment and landscape wide management plans, exclusion of stock and provision of offline watering points, revegetation, land manager education, management of weeds and other invasive species, erosion control and re-establishment of lateral hydraulic connectivity.
- Soil management – strategies include referral of landholders to relevant government agencies for information about the management of stocking rates to reduce the impact on soil structure, education of landholders in recognition and management of dryland salinity, habitat rehabilitation, and reduction in erosion through the establishment of vegetation cover in conjunction with conservation earthworks as appropriate.
- Bushfire management – currently managed through the Chifley Bushfire Risk Management Plan (BFRMP). A BFRMP should aim to protect, maintain and,

wherever possible, enhance the natural and cultural values of the area through the management of appropriate fire regimes.

- Flora – key actions focus on finer scale mapping, a range of public education initiatives, partnerships with state government agencies and volunteer groups, and better management through tighter legislative and development controls and improved Council practices.
- Fauna – key responses include a range of public education initiatives, quantification of losses within faunal groups through activities such as counts of roadkills, and in conjunction with NPWS, development of management plans for key species on council land, control of feral animals, conversion of report based data to spatial data, and improving wildlife corridors between larger reserves.
- Habitat connectivity – main responses include linking where possible to bioregional and catchment connectivity projects such as the Great Eastern Ranges Connectivity Corridor and the Western Woodlands Way, maintaining good core conservation reserves, and establishing local connectivity corridor priorities.
- Climate change – key actions include development of a Local Climate Change Action Plan, signing up to the Local Government and Shires Association Mayors Agreement on Climate Change, reduction of emissions from Council operations, and installation of renewable energy production at facilities.

Conclusions

Bathurst LGA has a lengthy history of land clearing for agriculture and other primary industries, and a resultant series of degrading impacts on the whole environment, including terrestrial, riparian and aquatic ecosystems. More recently, efforts have been directed towards revegetation as a means of ecosystem restoration, although this has not focused on the creation, maintenance or improvement of habitat corridors. While much of this needs to be located on private land, BRC has considerable opportunity to implement fairly simple actions, as part of conducting its core business activities that will promote better management of biodiversity in the LGA, both by example and through direct action.

This paper provides a thorough review of the legislative framework for biodiversity conservation, BRC's current performance and capacity to implement a range of proactive conservation activities and strategies, the nature and current condition of biodiversity resources in the LGA, and the various means currently used to assess this. By identifying the nature and extent of the issues and challenges for BRC in biodiversity management, this paper informs the development of a Biodiversity Management Plan (BMP) for the Region.

Appendix B.

**BIODIVERSITY ASSETS
IN CONSERVATION RESERVES**

Significant biodiversity assets in the conservation reserves of Bathurst Region

Appendix B1. Conservation areas located in the Bathurst Region and their significant biodiversity assets

Conservation area and attribute	Background and biodiversity assets
Winburndale Nature Reserve	
Area	10,718 ha
Presence within Bathurst Region	Majority within Bathurst Region
Significance	<ul style="list-style-type: none"> Regional and state significance - only area within the Central West (apart from Mount Canobolas State Conservation Area) that contains sub alpine (montane) vegetation associations which are poorly represented in the Central Tablelands (CT). Communities include Snow Gum (<i>Eucalyptus pauciflora</i>) and Mountain Gum (<i>E. dalrympleana</i>) with an understorey of Snow Grass (<i>Poa sieberana</i>). Also contain regionally significant Brown Barrel (<i>Eucalyptus fastigata</i>) communities and the Western Foothills (Slopes) Woodland which are inadequately conserved. Reserve contains broad representation of CT flora. Tablelands Basalt Forest EEC (possible) (moist forest communities located in sheltered valleys dominated with <i>E. viminalis</i> and <i>E. dalrympleana</i>) Threatened species - Flora - Capertee Stringybark (<i>Eucalyptus cannonii</i>) and <i>Derwentia blakelyi</i> Fauna – (Purple (Bathurst) Copper Butterfly); 7 birds (Glossy Black Cockatoo, Gang Gang Cockatoo, Barking Owl, Powerful Owl, Brown Treecreeper, Speckled Warbler and Diamond Firetail); 2 mammals (Yellow Bellied Glider and Squirrel Glider)
Vegetation type	Dry Open Woodlands (dominant), Moist Forests, Sub-Alpine Woodlands, Cliff Top Heaths and Shrubland, Black Cypress Pine Woodlands and River Oak Forests.
Flora species richness	288 species
Fauna species richness	180 species (14 introduced species - 5 birds and 9 mammals) 166 native species - birds (132), mammals (17), reptiles (13), amphibians
Wambool Nature Reserve	
Area	194 ha
Presence within Bathurst Region	Wholly present within Bathurst Region
Significance	<ul style="list-style-type: none"> Includes 48 species (17 genera) of orchid The woodlands in the reserve generally have a poor conservation status in NSW and are considered as being vulnerable and inadequately conserved. Two species of erect shrubs, <i>Olax stricta</i> and <i>Poranthera corymbosa</i> are considered rare
Vegetation type	Open to Low Open Woodland communities with a rich variety of flowering understorey shrubs and herbs. Dominant woodland community - Western (Inland) Scribbly Gum (<i>Eucalyptus rossi</i>) and Brittle Gum (<i>E. mannifera</i>). Subdominant - dominated by Long Leaved Box (Bundy) (<i>E.</i>

	<i>goniocalyx</i>), Scribbly Gum and Brittle Gum
Flora species richness	226 species, includes one regionally restricted species, Snowgrass (<i>Poa sieberiana</i> var <i>cyanophylla</i>), and one species considered to be at its geographical limit, Early Wattle (<i>Acacia genistifolia</i>).
Fauna species richness	29 native species– birds (16), mammals (9), reptiles (2) and amphibians (2)
Threatened species	No species listed under the TSC Act have been recorded in the reserve in Plan of Management, however records of Gang Gang Cockatoo and Diamond Firetail listed in BRC Threatened Species Database.
Copperhannia Nature Reserve	
Area	3,497 ha
Presence within Bathurst Region	Wholly within Bathurst Region
Significance	<ul style="list-style-type: none"> Vegetation communities considered to be vulnerable and inadequately conserved - Creekside Apple Box Woodlands, Low Altitude Dry Woodlands and Granite (Gully) Woodlands Number of floral species considered to have conservation significance A number of plants recorded with conservation significance; Threatened fauna species (Regent Honeyeater, Brown Treecreeper, Black-chinned Honey-eater, Hooded Robin and the Diamond Firetail)
Vegetation types	There are four broad vegetation types – Shrubby Dry Sclerophyll Forests, Sclerophyll Grassy Woodlands, Grassy Dry Sclerophyll Forests and the Swamp Sclerophyll Woodlands
Fauna species richness	81 species
Eusdale Nature Reserve	
Area	1,238 + 642 ha reserves adjoining Reserves important in providing a crucial linkage with other nearby protected areas such as Wambool Nature Reserve (5 kilometres west of the Reserves), Winburndale Nature Reserve (8 kilometres to the north) and Evans Crown Nature Reserve (5 kilometres to the east).
Presence within Bathurst Region	Wholly within Bathurst Region
Significance	<ul style="list-style-type: none"> Contain sub-alpine (montane) woodland vegetation, which is poorly represented in the Central Tablelands, - includes <i>E. pauciflora</i>, Broad-leaved Peppermint (<i>E. dives</i>) and <i>E. dalrympleana</i>, often with an understorey of <i>P. sieberiana</i>. Number of threatened species recorded and plant species of regional conservation significance
Vegetation type	Majority contain Dry Open Woodland
Flora species	168 native species
Fauna species richness	121 – 88 birds, 12 mammals, 14 reptiles, 6 amphibians
Threatened species	Powerful Owl, Gang Gang Cockatoo, Booroolong Frog, Bathurst Copper Butterfly

Boundary Road Reserve	
Area	38 ha
Presence within Bathurst Region	Wholly within Bathurst Region
Significance	No threatened plant species (as listed under the NSW TSCA 1995) were recorded during survey, however a number of species occurring in the reserve are significant locally, being unknown from the Bathurst 1:100 000 mapsheet, or otherwise poorly known in the region. These include <i>Pimelea glauca</i> , <i>Zornia dyctiocarpa</i> , <i>Swainsona monticola</i> , <i>Swainsona reticulata</i> , <i>Linum marginale</i> , <i>Eryngium rostratum</i> , <i>Goodenia paniculata</i> , <i>Mentha diemenica</i> * and <i>Thysanotus patersonii</i> .
Vegetation type	Box-Gum Woodland, Grassy Box-Gum Woodland dominated by <i>E. melliodora</i> and <i>E. blakelyi</i> and sub-dominated by <i>E. bridgesiana</i> . The fringing vegetation along Hawthornden Creek is dominated by <i>E. viminalis</i> . Groundcover is dominated by native grasses.
Flora species	221 of which about half include exotic species, particularly forbs
Fauna species richness	87 bird species
Threatened species	Regent Honey Eater, Speckled Warbler, Gang Gang Cockatoo, Little Eagle, Varied Sitella, White-browed Woodswallow

Sources:

Marshall C. (2010) Birds of the Boundary Road Landcare Reserve, unpublished report, Bathurst.

Mjadwesch R. (2008) Flora and fauna survey - Boundary Road Reserve, Bathurst. Mjadwesch Environmental Service Support.

NSW NPWS (2007) Copperhanna Nature Reserve Plan of Management.

NSW NPWS (2007) Wambo Nature Reserve.

NSW NPWS (2007) Winburndale Nature Reserve Plan of Management.

NSW NPWS (2010) Eusdale Nature Reserve Draft Plan of Management.

*The author (BM) has observed *Mentha diemenica* on Mount Panorama and Hen and Chicken Lane, Perthville

Note: A plan of management, and consequently a list of biodiversity assets, has not been prepared for the Abercrombie Karst Conservation Reserve at the time of BMP publication.

Appendix C.

BIODIVERSITY DATA

Biodiversity data

This biodiversity data appendix has been structured similarly to the biodiversity assets section with the structure following the outline below:

- Species data sources:
 - Flora and fauna
 - Threatened and migratory species
- Ecosystem data sources:
 - Endangered Ecological Communities (EEC) and critical habitat
 - Vegetation types
 - Aquatic ecosystems
 - Urban environment
 - Linkages
- Ecosystem processes data sources
 - Natural ecosystem processes
 - Ecosystem services
 - Hydro-geophysical data

Species data sources

Flora

- *Atlas of NSW Wildlife* - (online access). Database and mapped point locations of species can be searched specifically for the Bathurst Region. Search records can be across all years of record or restricted to years since 1980.
- *State Forests* – NSW State Forests for Plans of Management, fauna/flora surveys, mapping of softwood and hardwood plantations.
- *INFFER database* – (online access). There are no non-threatened flora species recorded in this database within the Bathurst Region.
- *Atlas of Living Australia BioMaps* – (online access). This is a web based system for accessing and analysing biodiversity distribution. It uses a map interface to access around 1 million records from museum databases around Australia. Searches can be targeted to species or based on regional boundaries (e.g. LGA, IBRA). Australia's natural history collections can also be accessed.
- *NSW FloraOnline (PlantNET)* – (online access). Plants (all taxa, threatened, rare or introduced) can be searched for a specified area of NSW (e.g. State Forests, National Parks, catchment management areas, IBRA, LGAs, botanical subdivision, designated radius from selected town) based on specimens lodged at the National Herbarium of New South Wales. Plant names and index searches can also be undertaken.
- *Algkey* - (online access). This is the first version of an interactive information and retrieval system to the freshwater algae recorded from Australia. ALGKEY will be useful as a first 'port-of-call' in your attempts to identify a freshwater algal specimen. Whilst the distribution data for each genus is only reported for Australian states and territories
- *Nature Reserves Plans of Management* - (online access)
 - Abercrombie Karst Conservation Area - Plan of Management not yet prepared

- Copperhannia Nature Reserve Plan of Management, 2007 (lists plants of conservation significance)
- Eusdale Nature Reserve Draft Plan of Management, 2010 (provides tally of native and exotic plant species recorded, identifies ROTAP species and species of high conservation value)
- Wambool Nature Reserve Plan of Management, 2007 (provides tally of number of native species (and orchids) recorded and lists regionally restricted and rare species)
- Winburndale Nature Reserve Plan of Management, 2007 (lists ROTAP species and species of conservation significance)
- *Flora of the Boundary Road Reserve* (online access)
 - Weed Management Strategy – describes the weed species in the reserve (Marshall 2008)
 - Flora and Fauna Survey (Mjadwesch 2008) – no threatened plant species (as listed under the NSW TSCA 1995) were recorded during survey, however a number of species were noted to be of local significance.
 - Flora and Fauna Survey (Fisher *et al.* 1997)
- *Peel Common Study*
 - Peel Common Management Plan (Cox & Windsor 1999)

Fauna data sources

- *Status of Vertebrate Fauna and Their Habitat in the Central West Catchment.* (Goldney *et al.* 2007)
- *Nature Reserve Plans of Management:*
 - Abercrombie Karst Conservation Area - Plan of Management not yet prepared
 - Copperhannia Nature Reserve Plan of Management (provides tally of fauna species and lists the common mammal species recorded)
 - Eusdale Nature Reserve Draft Plan of Management (provides tally of fauna species and lists the common mammal species recorded)
 - Wambool Nature Reserve Plan of Management (provides tally of fauna species recorded)
- *Atlas of NSW Wildlife* – (online access) database of fauna species for mammals, reptiles, amphibians, fish and invertebrates. The list appears to be an incomplete inventory of species known to occur in the Bathurst Region.
- *INFFER* – database and mapped locations of fauna assets in the Bathurst Region. This database is of very limited value in terms of fauna species assets.
- *Fauna of the Boundary Road Reserve (BRR)* - (online access).
 - A comprehensive bird study by Marshall (2010) describes bird habitat in the Reserve, bird movement through the Bathurst district, threatened species, introduced and native species observed in the reserve and species likely to occur in the area. It also highlights some of the bird species observed in the urban environment and regional landscape.
 - Flora and fauna surveys (Fisher *et al.* 1997; Mjadwesch 2008) provide species lists of fauna observed in the Reserve.
 - The distribution and abundance of birds in the Bathurst landscape (Fisher 1997).
- *Atlas of Living Australia BioMaps* – (online access) Atlas can be searched for fauna species including birds, fish, frogs, mammals, reptiles, insects and molluscs.

- *Birds Australia, Birddata* – (online access). Data from the Atlas of Australian Birds and the nest record scheme. The database can be searched by postcode to generate a bird list complete with mapped distribution of species across Australia if requested.
- *NSW Natural Resource Atlas* – (online access). Map and data access from NSW Government and other sources for mammals, invertebrates, fish and birds.
- *Barriers to fish passage* – (online access). Map of weirs in NSW (DPI). The data provided consists of a shapefile indicating the location of a subset of the weirs and other potential barriers to fish passage in NSW.
- *Fish species* – (online access). MDBA produce fish fact sheets describing the natural history and distribution of native fish species in the Murray Darling Basin. The distribution map in the fact sheet shows locations of recent and historic fish records.
- *Expected fish species by Catchment* – (online access). DPI- ‘Threatened and protected fish species records viewer’. This data set shows catchment boundaries for the purpose of creating broad scale divisions to locate expected fish species.
- *Fauna of the Mount Panorama Precinct* - Fauna Management Strategy (Kerle *et al.* 2012).
- *Birds of the Bathurst Region* - Chris Marshall - unpublished data. Sites include Wattle Flat Racecourse (2009, 2011), birds of Boundary Road Reserve (Marshall 2010), Cranstons Reserve, Turon Road (2011), Mount Rankin Reserve (2012), publically accessible areas of riparian forest (2011), Wattle Flat Heritage Lands (2012).

Threatened species

- *TSC Act* – Threatened species and populations listed in Schedules 1, 1A and 2 – available for Bathurst CMA sub-region
- *FM Act* – Threatened species and populations listed in Schedules 4, 4A and 5 – not location specific
- *EPBC Act* – Threatened and migratory species – not location specific
- *Atlas of NSW Wildlife* – database and mapped point locations of records. List appears to be an incomplete inventory of threatened fauna in the Bathurst Region
- *Bathurst Region Threatened Species Database* – This database by Mjadwesch (2011a,b) provides database and mapped point locations of records. This database is supported by a summary report, which describes data collection process, summarises results, provides some discussion and a preliminary interpretation of some of the data and lists the sources used to compile the database.
- *Nature Reserves Plans of Management*:
 - Abercrombie Karst Conservation Reserve
 - Lists threatened flora (present only in Winburndale NR) and fauna (present only in Copperhanna and Eusdale NR) as listed under the TSC and FM Acts.
- *Boundary Road Reserve*
 - Fauna and flora survey of Boundary Road Reserve (Mjadwesch 2008)
 - ‘Birds of Boundary Road Reserve’ lists threatened bird species observed in the reserve (Marshall 2010).
- *INFFER* – Provides point location for *Lipidium hyssopifolium*, *Zieria obcordata* and the Bathurst Copper butterfly

- *Threatened and protected fish species* – (NSW DPI) A ‘records viewer’ has been developed to provide public access to information regarding records and distribution of threatened and protected species of fish held by NSW I&I.

Ecosystem data

Endangered Ecological Communities (EEC) and critical habitat

Section 4.3.1 provides details on the EECs that occur in the Bathurst Region. The data resources available that have particular relevance to this region are:

- *State and federal listings in the legislation* – The TSC, FM and the EPBC Acts provide listings of EECs, Critically EECs and critical habitats
- *Mapping of the Box-Gum Woodlands EEC*
 - The Box-Gum Woodlands have an inferred relationship to the ‘Southern Tableland Grassy Woodlands’ as described and mapped in Keith (2004).
- *Mapping of Tableland Basalt Forest EEC*
 - The western occurrences of this EEC in the Upper Lachlan River Catchment correspond to ‘High altitude gum tall open-forest on fertile soils of the central tablelands’ (broad vegetation type 45) mapped by DEC (DEC 2006a) (NSW OEH 2011).
 - Tableland Basalt Forest belongs to the ‘Tableland Clay Grassy Woodlands’ vegetation class of Keith (2004).
- *Mapping of Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland EEC*
 - This EEC falls within the vegetation class of Subalpine Woodlands described and mapped by Keith (2004).
- *Mapping of Montane Peatlands and Swamps EEC*
 - ²⁴River Styles® mapping - includes the cut and fill river style
 - Predictive mapping – Valleys with less than 2 ML flood volume may be too dry to maintain swamps and greater than 360 ML may result in streams with defined channels (Mactaggart 2008). The estimation of flows for small to medium sized rural catchments is based on average rainfall, runoff coefficients and catchment area (Pilgrim 1987).

Vegetation types

- *Mapping of each Broad Vegetation Type* – Coarse-scale mapping covering the CW catchment (CW CMA 2009)
- *Mapping of existing and reconstructed vegetation of NSW*
 - Based on vegetation formations and classes of NSW (Keith 2004) - very broad scale mapping (1:2,000,000)
- *Mapping of reconstructed and extant native vegetation in the Central West and Lachlan Catchments* – (DEC 2006) Mapping by DEC (2006a, b)
- *Prioritisation of Investment in Vegetation and Biodiversity Conservation for the Central West Catchments* - (Barrott-Brown *et al.* 2009). Products of the process included:

²⁴ The River Styles® framework is a river characterisation process that allows interpretation of river form and behaviour from which appropriate management approaches can be formulated (Brierley & Fryirs 2003)

- Map showing probable location of high conservation value vegetation based on broad vegetation type (BVT)
- A conservation layer that highlights priorities for investment for conservation and/or condition improvement
- A restoration layer that highlights important areas for re-establishment of native vegetation
- Focal areas where investment could be undertaken within a restricted area in order to significantly increase the security, coverage and condition of native vegetation. Two focal areas were located in the Bathurst Region. One area is around the Turon and Macquarie Rivers in the north-west of the Bathurst Region and the other area to the south bordering Oberon Shire LGA is around Sewell's Creek. Only a small proportion of the Sewell's Creek focal area is contained within Bathurst Region.
- *Interim Prioritisation for Investment in Biodiversity Conservation in the Lachlan Catchment* (Taylor *et al* 2007). Products of the process included:
 - A set of focus areas where major investment could be undertaken within a restricted area in order to significantly increase the security, coverage and condition of native vegetation. A potential focus areas was identified for the upper catchment
 - A conservation layer that highlights priorities for investment for conservation and/or condition improvement
 - A restoration layer that highlights important areas for re-establishment of native vegetation
 - An area to focus on for improving connectivity of native vegetation
- *NSW Vegetation Classification and Assessment (NSWVCA) Project* (Royal Botanic Gardens and Domain Trust 2012)
- *Nature Reserves Plan of Management*
 - Abercrombie Karst Conservation Reserve Plan of Management yet to be produced
 - Copperhannia Nature Reserve Plan of Management (lists vegetation communities and significant communities)
 - Eusdale Nature Reserve Draft Plan of Management (vegetation community descriptions)
 - Wambool Nature Reserve Plan of Management (brief description of vegetation communities)
 - Winburndale Nature Reserve Plan of Management (vegetation community descriptions)
- NSW Spatial Data Catalogue <http://sdi.nsw.gov.au/GPT9/catalog/content/about.page>

Aquatic ecosystem data

- *River Styles*
 - River Styles Assessment – All named streams in the CW catchment, which includes streams in the Bathurst Region, were assessed and mapped according to their River Styles characteristics. Their geomorphic condition was also assessed to define priorities for river conservation and rehabilitation (GHD 2010).
 - Coarse-scale map of River Styles in the CW catchment (online access) (CW CMA 2009).

- *Condition assessment of Bathurst's urban waterways* – ‘Bathurst Urban Waterways Management Plan’ (Mactaggart *et al.* 2010).
 - The ecological, hydrologic and geomorphic condition assessment of six urban waterways lying within the boundary of the former Bathurst City LGA was undertaken and included Sawpit, Jordan, Hawthornden, Saltram, Raglan and Queen Charlotte Vale Creeks and their tributaries.
- *Ecological status and processes in the Upper Macquarie River Catchment* – ‘Ecological Status and Restoration of degraded riparian zones in the Upper Macquarie River Catchment (Windsor *et al.* 2004).
 - The project provides the understanding of the ecological status and processes operating in the riparian zones of the Upper Macquarie River Catchment waterways. The study area included the upper reaches of the Macquarie River, lower reaches of the Fish River and the Campbells River systems lying upstream of Bathurst in the Bathurst Region. The chapters relating to willows, which also draw on previous studies (see willow data below) may be outdated as their distribution and extent have been reduced significantly over the past decade due to active clearing by BRC and conservation and Landcare groups.
- *Willow distribution in the Upper Macquarie River Catchment* – A number of studies were undertaken to address the willow invasion and these are listed below (see comment above for current relevance):
 - ‘Macquarie and Campbells River Environmental Survey and Management Plan’ (Goldney & Cardale 2000);
 - ‘Willow Invasion in Riparian Zones in the Upper Macquarie Catchment: A Survey in the Central Tablelands of NSW’ (Schlimme 2001);
 - ‘Degradation of Riparian Systems and Invasiveness of Salix Species: A Case Study from the Campbells River Catchment on the Central Tablelands of NSW (Adams 2002).
- *Assessment of riverine health in the upper Macquarie catchments* – ‘An Assessment of Riverine Health in the Macquarie, Castlereagh and Bogan River Catchments’ (Baker & Raisin 2000).
 - The study assessed the status of riverine health using a snapshot approach comprising subjective analysis of key physical and biological riverine indicators at selected sites. The assessment covered the whole of the Bathurst Region and included the following sub-catchments: Campbells River, Fish River, Evans Plains Creek, Winburndale Rivulet, Macquarie above Burrendong and Turon/Crudine Rivers.
 - Some data may be outdated, such as recording the extent of willows along stream reaches, however much of the data is still relevant in the contemporary environment.
- *Riparian vegetation* - the flora of the Upper Macquarie riparian zones were described by Goldney *et al.* (2004) and Windsor *et al.* (2004) and both studies include a comprehensive list of trees, shrubs, grasses and forbs of the surveyed areas.
- *Riparian bird communities*– a study by Altmeier (2001) compared bird populations in three different riparian habitats in the Upper Macquarie River Catchment and Fisher (2000) identified bird species along the Macquarie River from Apex Park to Gorman Hill Road.

- *Vertebrate riparian fauna*- the vertebrate fauna of the Upper Macquarie riparian zones including species lists for frogs, fish, reptiles, mammals and birds (Goldney *et al.* 2004).
- *Macroinvertebrates of Bathurst's urban waterways* –macroinvertebrate assemblages in the urban waterways within the former Bathurst City LGA (Mactaggart & Goldney 2010).
- *Barriers to Fish Passage* - Department of Primary Industries (DPI) The data provided consists of a shapefile indicating the location of a subset of the weirs and other potential barriers to fish passage in NSW.
- *Key fish habitat for Bathurst LG* - (online access). Maps are compiled according to LGA boundaries and include most permanent and semi-permanent freshwater habitats including rivers, creeks, lakes, lagoons, billabongs, weir pools and impoundments up to the top of the bank. Small headwater creeks and gullies (known as first and second order streams), that only flow for a short period after rain, are generally excluded, as are farm dams constructed on such systems. This mapping was undertaken in 2007 to define and identify 'Key Fish Habitats' in NSW important for the sustainability of the recreational and commercial fishing industries, the maintenance of fish populations generally and the survival and recovery of threatened aquatic species.

Urban Environment

- *Bathurst's urban vegetation* - Bathurst Vegetation Management Plan (Mactaggart 2003).
- *Flora for Fauna* – An initiative of the Nursery and Garden Industry, supported by the Natural Heritage Trust and the Nursery Industry Levy, It provides information resources that encourages the public to play a part in supporting our unique native fauna in people's backyards.

Ecosystem processes data sources

Natural ecosystem processes

- *Hydro-geophysical data*
 - *Geology* – Bathurst Geological Mapsheet 1:250 000 S1/55-8 (Pogson and Watkins 1998).
 - *Soil Landscapes* – Soil Landscapes of the Bathurst 1:250 000 Sheet (Kovac *et al.* 1989).
- Rainfall
 - NSW Natural Resource Atlas – rainfall isopleths
 - Bureau of Meteorology – climatic averages
 - Bathurst District Technical Manual (Soil Conservation Service of NSW 1974)
- Landform
 - NSW Natural Resource Atlas – geology, soils, dryland salinity, satellite imagery, base maps
 - Mitchell Landscapes - (Mitchell 2002, 2003)
- *Land capability mapping* - class coarse-scale mapping for the CW catchment (CW CMA 2009).

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Useful links to websites

Reference	Web address
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Australia's Biodiversity Conservation Strategy 2010-2030	http://www.environment.gov.au/biodiversity/strategy/
Central West Catchment Action Plan 2006-2016, 2007	http://cw.cma.nsw.gov.au/AboutUs/cap.html
Central West Catchment Environmental Weeds Strategy, 2008	http://cw.cma.nsw.gov.au/
Convention of Biological Diversity, Strategic Plan for Biodiversity 2010-2020	http://www.cbd.int/sp/
Environmental Protection and Biodiversity Conservation Act, 1999	http://www.environment.gov.au/epbc/
Lachlan Catchment Action Plan 2006, 2007	http://www.lachlan.cma.nsw.gov.au/downloads/Catchment_Action_Plan/Lachlan_Catchment_Action_Plan_V9.pdf
Millennium Ecosystem Assessment - Ecosystems and human well-being: biodiversity synthesis, 2010	http://www.maweb.org/en/Synthesis.aspx
National Local Government Biodiversity Strategy	http://www.alga.asn.au/publications/Bio_diversity_strategy_Executive_summary.pdf
National Principles for the Provision of Water for Ecosystems, 1996	http://www.environment.gov.au/water/publications/environmental/ecosystems/pubs/water-provision.pdf
National Strategy for Ecologically Sustainable Development, 1992	http://www.environment.gov.au/about/esd/publications/strategy/index.html
National Strategy for the Conservation of Australia's Biological Diversity, 1996	http://www.environment.gov.au/biodiversity/publications/strategy/pubs/national-strategy-96.pdf
Native Fish Strategy for the Murray-Darling Basin 2003-2013	http://www2.mdbc.gov.au/__data/page/65/Fish-Strat_ful.pdf
NSW Salinity Strategy, 2000	http://www.environment.nsw.gov.au/salinity/government/nswstrategy.htm
NSW State Government Legislation	http://www.austlii.edu.au/au/legis/nsw/consol_act/
NSW State Groundwater Dependent Ecosystem Policy, 2002	http://www.water.nsw.gov.au/
NSW State Rivers and Estuaries Policy, 1993	http://www.water.nsw.gov.au/
NSW Water Quality and River Flow Objectives (Macquarie-Bogan Catchment)	http://www.environment.nsw.gov.au/ieo/MacquarieBogan/report-02.htm
NSW Wetlands Management Policy, 2010	http://www.environment.nsw.gov.au/resources/water/10039wetlandspolicy.pdf
State Environmental Planning Policy – 44 Koala Habitat Protection	http://www.austlii.edu.au/au/legis/nsw/consol_reg/seppn44hp603/
NSW Threatened Species Priority Action Statement (PAS)	http://www.environment.nsw.gov.au/resources/threatenedspecies/threatspecies07168.pdf

Appendix D.

POLICIES AND PLANNING INSTRUMENTS

Policy, legislation, strategy documents and planning instruments	Goals or objectives and/or key issues relevant to the BMP
Global strategies	
Bilateral migratory bird agreements	<ul style="list-style-type: none"> Japan-Australia Migratory Bird Agreement (JAMBA), China-Australia Migratory Bird Agreement (CAMBA) and the Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA) list terrestrial, water and shorebird species which migrate between Australia and the respective countries. The agreements require the parties to protect migratory birds.
Millennium Ecosystem Assessment - Ecosystems and human well-being: biodiversity synthesis, 2010	
United Nations Convention of Biological Diversity, Strategic Plan for Biodiversity 2011-2020	<ul style="list-style-type: none"> Australia is a signatory nation and is bound to develop and implement strategies that will ensure the conservation and sustainable use of its biological resources Objectives are: <ul style="list-style-type: none"> To address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society To reduce the direct pressures on biodiversity and promote sustainable use To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity To enhance the benefits to all from biodiversity and ecosystem services To enhance implementation through participatory planning, knowledge management and capacity building
National policy, strategy documents and planning instruments	
Australia's Biodiversity Conservation Strategy 2010-2030	<ul style="list-style-type: none"> Objectives are: <ul style="list-style-type: none"> To help stop the decline in Australia's biodiversity through the adoption of national priorities To engage all Australians in biodiversity conservation through mainstreaming biodiversity, increasing Indigenous engagement and enhancing strategic investments and partnerships To build ecosystem resilience in a changing climate by protecting diversity and maintaining and re-establishing ecosystem functions, reducing threats to biodiversity. To get measurable results through improving and sharing knowledge, delivering conservation initiatives efficiently and implementing robust national monitoring, reporting and evaluation.
National Strategy for the Conservation of Australia's Biological Diversity, 1996	<ul style="list-style-type: none"> The goal, supported by 35 objectives, is to protect biological diversity and maintain ecological process and systems
Australian Pest Animal Strategy	<ul style="list-style-type: none"> Objective is to address the undesirable impacts caused by exotic vertebrate animals that have become pests in Australia and to prevent the establishment of new exotic vertebrate pests
Wetlands Policy of the Commonwealth Government of Australia, 2010	<ul style="list-style-type: none"> Objectives are: <ul style="list-style-type: none"> To conserve Australia's wetlands particularly through the promotion of their ecological, cultural, economic and social values To manage wetlands in an ecologically sustainable way and within a framework of integrated catchment management To achieve informed community and private sector participation in the management of wetlands through appropriate mechanisms To raise community and visitor awareness of the values, benefits and range of types of wetlands
National Principles for the Provision of Water for Ecosystems, 1996	<ul style="list-style-type: none"> The goal for providing water for the environment is to sustain and where necessary restore ecological processes and biodiversity of water dependent ecosystems.
National Strategy for Ecologically Sustainable Development, 1992	<ul style="list-style-type: none"> Objectives are: <ul style="list-style-type: none"> To protect biological diversity and maintain essential ecological processes and life-support systems To develop effective mechanisms for minimising human, pest plant and animal impacts on ecological systems, expand habitats for native

Policy, legislation, strategy documents and planning instruments	Goals or objectives and/or key issues relevant to the BMP
	species of plants and animals, while maintaining a diverse and healthy economy
National Local Government Biodiversity Strategy, 1999	<ul style="list-style-type: none"> • Aims to encourage national local government agreement on methods of biodiversity management
Commonwealth legislation	
Environmental Protection and Biodiversity Conservation Act, 1999	<ul style="list-style-type: none"> • Objectives are: <ul style="list-style-type: none"> – To provide for the protection of the environment, especially those aspects of the environment that are matters of national environmental significance – To promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resources – To promote the conservation of biodiversity – To provide for the protection and conservation of heritage – To promote a co-operative approach to the protection and management of the environment involving governments, the community, land holders and indigenous peoples – To assist in the co-operative implementation of Australia's international environmental responsibilities – To recognise the role of indigenous people in the conservation and ecologically sustainable use of Australia's biodiversity – To promote the use of indigenous people's knowledge of biodiversity with the involvement of, and in co-operation with, the owners of the knowledge
NSW state legislation	
Catchment Management Authorities Act, 2003	<ul style="list-style-type: none"> • Objectives are: <ul style="list-style-type: none"> – To establish authorities for the purpose of devolving operational, investment and decision-making natural resource functions to catchment levels – To provide for proper natural resource planning at a catchment level – To ensure that decisions about natural resources take into account appropriate catchment issues – To require decisions taken at a catchment level to take into account State-wide standards and to involve the Natural Resources Commission in catchment planning where appropriate – To involve communities in each catchment in decision making and to make best use of catchment knowledge and expertise – To ensure the proper management of natural resources in the social, economic and environmental interests of the State – To apply sound scientific knowledge to achieve a fully functioning and productive landscape – To provide a framework for financial assistance and incentives to landholders in connection with natural resource management
Companion Animals Act, 1998	<ul style="list-style-type: none"> • Objective is to provide for the effective and responsible care and management of companion animals
Crown Lands Act, 1989	<ul style="list-style-type: none"> • Objectives are to ensure that Crown land is managed for the benefit of the community and in particular to provide for proper Crown land management, development and conservation.
Environmental Planning & Assessment Act, 1979	<ul style="list-style-type: none"> • In consideration of development applications the EP&A Act aims to encourage: <ul style="list-style-type: none"> – The proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment – The protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats; • In consideration of Ecologically sustainable development the EP&A Act aims to promote: <ul style="list-style-type: none"> – The sharing of the responsibility of environmental planning between the different levels of government in the State

Policy, legislation, strategy documents and planning instruments	Goals or objectives and/or key issues relevant to the BMP
Fisheries Management Act, 1994	<ul style="list-style-type: none"> Objectives are: <ul style="list-style-type: none"> To conserve fish stocks and key fish habitats To conserve threatened species, populations and ecological communities of fish and marine vegetation
Local Government Act, 1993	<ul style="list-style-type: none"> Objective is to guide councils in the carrying out of their functions roles and responsibilities; regulatory and enforcement powers; community services and utility management
Local Government Amendment (Planning and Reporting) Act 2009	<ul style="list-style-type: none"> There is a requirement for all councils in NSW to prepare a State of the Environment report
National Parks and Wildlife Act, 1974	<ul style="list-style-type: none"> Objectives are for the conservation of nature, including, but not limited to, the conservation of: <ul style="list-style-type: none"> Habitat, ecosystems and ecosystem processes, and Biological diversity at the community, species and genetic levels The conservation of nature (see Act for definition) The conservation of objects, places or features (including biological diversity) of cultural value within the landscape Fostering public appreciation, understanding and enjoyment of nature and cultural heritage and their conservation Providing for the management of land reserved under this Act
Native Vegetation Act, 2003	<ul style="list-style-type: none"> Objectives are: <ul style="list-style-type: none"> To promote the management of native vegetation on a regional basis To prevent broad scale clearing To protect high conservation value vegetation To improve existing native vegetation condition To encourage the revegetation and rehabilitation of land in accordance with ESD principles
Noxious Weeds Act, 1993	<ul style="list-style-type: none"> Objective is to reduce the negative impact of weeds on the economy, community and environment by establishing control mechanisms to prevent the establishment of significant new weeds, the spread and area of existing significant weeds, and to report & monitor the effectiveness of management strategies put in place under the Act
Protection of the Environment Operations Act, 1997	<ul style="list-style-type: none"> Objectives are: <ul style="list-style-type: none"> To protect, restore and enhance the quality of the environment in New South Wales, having regard to the need to maintain ecologically sustainable development To provide increased opportunities for public involvement and participation in environment protection To ensure that the community has access to relevant and meaningful information about pollution To reduce risks to human health and prevent the degradation of the environment
Rural Fires Act, 1997	<ul style="list-style-type: none"> The objectives are for: <ul style="list-style-type: none"> The prevention, mitigation and suppression of bush and other fires in local government areas (or parts of areas) and other parts of the State constituted as rural fire districts The co-ordination of bush fire fighting and bush fire prevention throughout the State The protection of persons from injury or death, and property from damage, arising from fires The protection of the environment by requiring certain activities referred to in paragraphs (a)–(c) to be carried out having regard to the principles of ecologically sustainable development described in section 6 (2) of the Protection of the Environment Administration Act 1991
Rural Lands Protection Act, 1998	<ul style="list-style-type: none"> Objectives are: <ul style="list-style-type: none"> To provide for the protection of rural lands To provide for the establishment & governance of the State Policy & State Management Councils of Livestock Health and Pest Authorities To regulate travelling stock reserves, stock watering places and the transportation of stock by vehicle

Policy, legislation, strategy documents and planning instruments	Goals or objectives and/or key issues relevant to the BMP
Soil Conservation Act, 1938	<ul style="list-style-type: none"> - To provide for the control of certain pests • Objective is to make provision for the conservation of soil resources and farm water resources for the mitigation of erosion
Threatened Species Conservation Act, 1995	<ul style="list-style-type: none"> • Objectives are: <ul style="list-style-type: none"> - To conserve biological diversity and promote ecologically sustainable development - To prevent the extinction and promote the recovery of threatened species, populations and ecological communities - To protect the critical habitat of those threatened species, populations and ecological communities that are endangered - To eliminate or manage certain processes that threaten the survival or evolutionary development of threatened species, populations and ecological communities - To ensure that the impact of any action affecting threatened species, populations and ecological communities is properly assessed - To encourage the conservation of threatened species, populations and ecological communities by the adoption of measures involving co-operative management
Water Management Act, 2000	<ul style="list-style-type: none"> • Objective is to provide for the sustainable and integrated management of the water sources of the State for the benefit of both present and future generations
NSW state and regional policies and strategies	
Aquatic Habitat Management & Fish Conservation Policy & Guidelines, 1999	<ul style="list-style-type: none"> • Objective is to improve the conservation and management of aquatic habitats in NSW
Bathurst, Orange, Dubbo Environmental Sustainability Action Plan, 2007	<ul style="list-style-type: none"> • Management principles are: <ul style="list-style-type: none"> - To integrate programs that foster behavioural change into all vegetation and biodiversity management actions across the community - To consider vegetation as a key indicator of catchment health and land use management - To protect and improve remnant native vegetation, wetlands and hollow-bearing trees; retain native shrubs and woody debris on the ground - To retain and improve wildlife corridors as key foci for council service areas and development control - To undertake control of feral predators, implement fire management strategies, weed and pollution control as part of vegetation and biodiversity management planning
Central West Catchment Environmental Weeds Strategy, 1998	<ul style="list-style-type: none"> • Main objective is to meet key CWCAP target of reducing the area in the catchment affected by environmental weeds by 50,000 ha
Destination 2036	<ul style="list-style-type: none"> • Over the next 10, 20 and 25 years, our population, technologies and economy are going to change dramatically. It is incumbent upon local government to consider what these changes will mean, both for our communities and for the councils that serve them. Destination 2036 provides a process and a forum for local government to explore these issues and to consider and develop structures and approaches to local government in NSW that will allow the sector to meet the needs and expectations of our communities of the future.
Draft NSW Biodiversity Strategy 2010-2015	<ul style="list-style-type: none"> • Objectives are: <ul style="list-style-type: none"> - To direct public sector support for conservation efforts on private land towards state-scale priorities - To direct public land conservation efforts towards state-scale priorities - To improve the on-ground delivery of incentive schemes through the adoption of a common approach to site-assessment - To use a cost-effective approach to prioritise threatened species for recovery - To use market-based mechanisms to complement the range of private land conservation programs - To use strategic mechanisms to assess, conserve and improve biodiversity values in land-use planning - To engage communities and develop partnerships that deliver conservation priorities - To actively and effectively manage the terrestrial reserve system and marine protected areas as part of a broader landscape - To protect and restore aquatic ecosystems

Policy, legislation, strategy documents and planning instruments	Goals or objectives and/or key issues relevant to the BMP
Lachlan Catchment Action Plan 2006, 2007	<ul style="list-style-type: none"> - To effectively manage and control threats through cooperative partnerships with key stakeholders - To support private primary producers to sustainably manage their resource through collaborative partnerships <ul style="list-style-type: none"> • Biodiversity and native vegetation targets include: <ul style="list-style-type: none"> - There is an increase in native vegetation extent and an improvement in native vegetation condition - There is an increase in the number of sustainable populations of a range of native fauna species - There is an increase in the recovery of threatened species, populations and ecological communities - There is a reduction in the impact of invasive species • Water and aquatic ecosystem targets <ul style="list-style-type: none"> - There is an improvement in the condition of riverine ecosystems - There is an improvement in the ability of groundwater systems to support groundwater dependent ecosystems and designated beneficial uses - There is an improvement in the condition of important wetlands and the extent of those wetlands is maintained • People and community targets <ul style="list-style-type: none"> - Natural resource decisions contribute to improving or maintaining economic sustainability and social well being - There is an increase in the capacity of natural resource managers to contribute to regionally relevant natural resource management
Native Fish Strategy for the Murray-Darling Basin 2003-2013	<ul style="list-style-type: none"> • Objectives are: <ul style="list-style-type: none"> - To repair and protect key components of aquatic and riparian habitats important for sustaining native fish populations - To rehabilitate and protect the natural functioning of wetlands and floodplain habitats for native fish; and revive the links between terrestrial ecosystems, wetlands and rivers - To improve key aspects of water quality that affect native fish - To modify flow regulation practices to facilitate native fish rehabilitation - To provide adequate passage for native fish throughout the Basin - To devise and implement recovery plans for threatened native fish species and communities - To create and implement management plans for all non-threatened native fish species and communities - To control and manage carp and other alien fish species effectively - To increase understanding of fish diseases and parasites, and to protect native fish from such threats
NSW Groundwater Dependent Ecosystems Policy, 2002	<ul style="list-style-type: none"> • Objectives is to protect our valuable ecosystems which rely on groundwater for survival so that, wherever possible, the ecological processes and biodiversity of these dependent ecosystems are maintained or restored, for the benefit of present and future generations
NSW DPI Biosecurity Strategy	<ul style="list-style-type: none"> • Aims to: <ul style="list-style-type: none"> - Prevent the entry of biosecurity threats into NSW - Contain and eradicate biosecurity threats before they become established and spread in NSW - Effectively manage biosecurity problems to minimise their impacts in NSW - Ensure cooperation between NSW DPI and other agencies, industry and the community to manage biosecurity threats and problems
NSW State Rivers and Estuaries Policy, 1993	<ul style="list-style-type: none"> • Objectives is to manage the rivers [and estuaries] of NSW in ways which slow, halt or reverse the overall rate of degradation in their systems, ensure the long-term sustainability of their essential biophysical functions, and maintain the beneficial use of these resources
NSW Water Quality and River Flow Objectives (Lachlan & Macquarie-Bogan Catchments)	<ul style="list-style-type: none"> • Objectives are: <ul style="list-style-type: none"> - To maintain or improve the ecological condition of waterbodies and their riparian zones over the long term - To protect natural water levels in pools of creeks and rivers and wetlands during periods of no flows - To protect natural low flows

Policy, legislation, strategy documents and planning instruments	Goals or objectives and/or key issues relevant to the BMP
	<ul style="list-style-type: none"> - To protect or restore a proportion of moderate flows ('freshes') and high flows - To maintain or restore the natural inundation patterns and distribution of floodwaters supporting natural wetland and floodplain ecosystems - To mimic the natural frequency, duration and seasonal nature of drying periods in naturally temporary waterways - To maintain or mimic natural flow variability in all streams - To maintain rates of rise and fall of river heights within natural bounds - To maintain groundwater within natural levels and variability, critical to surface flows and ecosystems - To minimise the impact of instream structures
NSW Wetlands Management Policy, 2010	<ul style="list-style-type: none"> • Objective is to provide for the protection, ecologically sustainable use and management of NSW wetlands
State Environmental Planning Policy – 44 Koala Habitat Protection	<ul style="list-style-type: none"> • Objective is to encourage the proper conservation and management of areas of natural vegetation that provide habitat for Koalas to ensure a permanent free-living population over their present range and reverse the current trend of Koala population decline
NSW Weirs Policy, 1997	<ul style="list-style-type: none"> • Objective is to halt and, where possible, reduce and remediate the environmental impact of weirs
NSW Salinity Strategy, 2000	<ul style="list-style-type: none"> • Objective is to slow down the rate of increase in salinity by protecting and managing our native vegetation
NSW Threatened Species Priority Action Statement (PAS), 2007	<p>Objectives are:</p> <ul style="list-style-type: none"> • Objectives are: <ul style="list-style-type: none"> - To move as many species as possible from threatened to non-threatened conservation status - To abate or eliminate the impacts of key threatening processes - To provide a comprehensive and strategic approach to threatened species recovery, by making a list of strategies and prioritised actions in the PAS readily available on the website - To involve stakeholders, including managers and decision makers at all levels, in working together to implement PAS actions
Local strategies and plans	
Bathurst Region Urban Strategy, 2007	<ul style="list-style-type: none"> • Objective is to provide a broad land use strategy to guide the future land management and development of the urban area and urban villages of the Bathurst Regional LGA
Bathurst Region Rural Strategy 2008	<ul style="list-style-type: none"> • Identify the economic, environmental and social opportunities for the management and development of the rural lands, villages and settlements of the Bathurst Regional LGA • Identify strategic responses for each opportunity including recommendations for the comprehensive LEP • Identify sustainable settlement and village growth opportunities
Bathurst Regional (Interim) Local Environmental Plan 2005	<ul style="list-style-type: none"> • Objective is to enhance the environmental qualities of the area
Bathurst Regional (Interim) Development Control Plan 2011	<ul style="list-style-type: none"> • The overarching objective is to allow detailed provisions to be made to control and guide development and subdivision within the Bathurst Regional LGA
Bathurst Structure Plan, 1996	<ul style="list-style-type: none"> • Key priority is to encourage ecologically sustainable development and the protection of urban biodiversity and vegetation resources (including aquatic biodiversity)
Bathurst Regional Council Urban Drainage Reserve Revegetation Landscape Plans, 2010	<ul style="list-style-type: none"> • Objectives are: <ul style="list-style-type: none"> - To improve aquatic habitat, riparian vegetation and water quality in urban stormwater creeks in Bathurst through the creation of the Urban Drainage Reserve Vegetation Link - To inspire an understanding of and commitment to sustainability through innovative on-ground works and community engagement - Engage in inclusive community collaboration and build long-term community capacity

Policy, legislation, strategy documents and planning instruments	Goals or objectives and/or key issues relevant to the BMP
Bathurst Urban Waterways Management Plan, 2010	<ul style="list-style-type: none"> Objective is to provide long-term strategies for the management and restoration of the Bathurst urban waterways
Bathurst Vegetation Management Plan, 2003	<ul style="list-style-type: none"> Objective is to provide the basis for long-term strategies for vegetation management of all land in the former Bathurst City LGA and particularly to land under the care and control of Council
Boundary Road Reserve Fire Management Plan, 2004	<ul style="list-style-type: none"> Objective is to ensure that assets within the Reserve are protected from fire, hazards within the Reserve are managed in accordance with objectives of a regional strategy and environmental values are maintained or enhanced
Boundary Road Reserve Management Plan,	<ul style="list-style-type: none"> Objective is to enhance the ecological values and provide some passive recreational opportunities in the Boundary Road Reserve
Stormwater Management Plan for the City of Bathurst, 2004	<ul style="list-style-type: none"> Objective is to improve the management of stormwater within the Bathurst City Council area, which will translate to an overall ecological, social and economical improvement of local waterways and catchment

Appendix E.

PRO FORMA AND EXPLANATORY NOTES

RAPID ASSESSMENT – ECOSYSTEM CONDITION & BIODIVERSITY CONSERVATION RATINGS

Site description					
Site description & location				Parcel Nos.	
Date:		Observers:		Photo:	Soil landscape
Landform:	plains (LP, GP, UP), rises (GR, UR, RR), low hills (UL, RL, SL), hills (UH, RH, SH)				
Ecosystem type:	terrestrial		aquatic	combination	
Terrestrial – use terrestrial ecosystem pro forma; aquatic – use aquatic ecosystem pro forma; combination – use both pro formas					

SUMMARY	Site ecosystem condition - 0 (v poor), 1 (poor), 2 (moderate), 3 (good), 4 (v good)					
	Terrestrial ecosystem condition		Aquatic ecosystem condition		Overall condition	
	Biodiversity conservation value - 0 (v poor), 1 (poor), 2 (moderate), 3 (good), 4 (v good)					
	Vegetation value	Habitat value	Conservation value	Ecosystem function	Ecosystem services	OVERALL VALUE
Notes:						

Land use, disturbance, threats & impacts					
Land use (historic/current/ projected in future):					
Disturbance:	undisturbed	little	moderate	considerable	major
Key threats (list current & potential future threats) e.g. feral animals, weeds, fire (intensity/frequency), clearing, change in catchment hydrology, KTPs					
Threat trend: Worsening Stable improving					
Key impacts: (list historic, current, projected future impacts) e.g. loss of veg structure, reduced spp diversity, reduced water infiltration, increased flood volume, floodplain disconnection, change in spp composition due to fires					

Ecosystem processes and function					
Obstructions retaining water & nutrients: ratings – 0 (nil); 1 (minor); 2 (moderate); 3 (major); 4 (very significant)					
veg patches – trees, shrubs, tussocks,		logs, sticks etc		rocks mounds	
reeds, grasses, mown herbage		instream veg		instream logs, trees, root mats	
Factors inducing loss of water & nutrients: ratings – 0 (very significant); 1 (major); 2 (moderate); 3 (minor); 4 (nil)					
streambank erosion		gullying		rill/sheet erosion bare soil	
channel incision		Slashing of groundcover			
Resilience:	Geomorphic:	high	medium	low	Ecological: high medium low
Threshold exceeded: y/n	Geomorphic		Ecological		Alternate stable state
Condition trend:	reducing function		stable function		increasing function
Ecosystem functioning 0 (very poor), 1 (poor), 2 (moderate), 3 (good), 4 (very good)					
Water cycle functioning			Carbon cycle functioning		
Nutrient cycle functioning			Energy interception		
Overall assessment – rating (0 very poor – 4 very good)					

Terrestrial ecosystems condition rating

Upperstorey vegetation					
Broad veg type/exotic:					
Structural formation:			Reconstructed veg class:		
EEC:					
Connectivity rating	0-cleared	1 sign fragmentation with inadequate stepping stones	2 intermediate frag with adequate stepping stones	3 low level of fragmentation	4 continuous
Connectivity (0-4)		Internal	external	Patch size: <1, 2-10, 11-50, 51-100, >100ha	
Succession stage:		n/a	mature	mixed	regrowth
Condition trend:		worsening	stable	improving	threshold exceeded & unstable
Condition assessment – rating (0 very poor – 4 very good)					
Sample no.	Structural integrity and vegetation health		Species composition	Regeneration of indigenous species	
1					
2					
3				Condition	

Midstorey vegetation					
Dominant type & abundance	sm tree/lge shrub		native	exotic	sub shrub
	absent	few	many	abundant	
	scattered	patchy	cover >30%	cover >30%	
Condition trend:		worsening	stable	improving	threshold exceeded & unstable
Condition assessment – rating (0 very poor – 4 very good)					
Sample no.	Structural integrity and vegetation health		Species composition	Regeneration of indigenous species	
1					
2					
3				Condition	

Groundcover vegetation					
Cover: 0 (nil), 1 (sparse), 2 (moderate), 3 (moderately dense), 4 (dense)					
Grasses	native	exotic	Forbs	native	exotic
Condition trend:		worsening	stable	improving	threshold exceeded & unstable
Condition assessment – rating (0 very poor– 4 very good)					
Sample no.	Structural integrity and vegetation health		Species composition	Regeneration of indigenous species	
1					
2					
3				Condition	

Terrestrial fauna habitat					
Cover: 0 (nil), 1 (sparse), 2 (moderate), 3 (moderately dense), 4 (dense)					
Bareground		Leaf litter	Cobbles/stones >20mm	Boulders >600mm	Logs
Habitat features of note: eg. Hollows, logs					
Functional plants of note: eg. koala food trees, <i>Bursaria spinosa</i>					
Condition trend:		Complexity-reducing, stable, increasing		Threats-reducing, stable, increasing	
Condition assessment – rating (0 very poor – 4 very good)					
Sample no.	Structural complexity of veg		Hollows/nesting resources	Habitat complexity /resources	
	Upper/mid	Ground			
1					
2					
3					Rating

Overall terrestrial condition rating 0 (v poor), 1 (poor), 2 (moderate), 3 (good), 4 (v good)

Aquatic ecosystems condition rating

Riparian corridor vegetation									
Broad veg type/exotic:									
Structural formation:					Reconstructed veg class:				
EEC:									
Midstorey layer: Dominant spp.					Abundance - v sparse, few, many, abundant				
Ground layer: Dominant life-forms					Endemism Low Med high				
Connectivity (0-4)		Internal		external		Patch size: <1, 2-10, 11-50, 51-100, >100ha			
Succession stage:		N/A		mature		mixed		regrowth	
								regeneration replanting	
Habitat complexity		very low		low		medium		high	
Condition trend: worsening stable improving threshold exceeded & alternate stable state									
Condition assessment – rating (0 very poor – 4 very good)									
Sample no.	Structural integrity and vegetation health			Species composition		Regen of indigenous spp.		Habitat complexity	
1									
2									
3								Condition	

Instream habitat									
Dominant instream veg type:									
Stream type		ephemeral		permanent		pool:rifle		channelised	
pool:sediment bars		deep pools		shallow pools		substrate sandy		substrate rocky	
Channel narrow		Channel broad		Overhanging veg		Little or no overhanging veg			
Condition trend: worsening stable improving threshold exceeded & unstable alternate stable state									
Condition assessment – rating (0 very poor – 4 very good)									
Sample no.	Structural integrity of veg		Veg species composition		Water quality		Habitat complexity		
1									
2									
3							Condition		

Hydrology									
Catchment land use (0 nil, 1 low, 2 med, 3 high, 4 very high)									
		urban		rural		native forest, woodland		pine forest	
Condition trend: worsening stable improving threshold exceeded & unstable alternate stable state									
Condition assessment – rating (0 very poor – 4 very good)									
Sample no.	Connect with floodplain			Hydrologic deviation from natural flows			Hydraulic deviation from natural flows		
1									
2									
3							Condition		

Geomorphology									
Stream character									
Condition trend: worsening stable improving threshold exceeded & unstable alternate stable state									
Condition assessment – rating (0 very poor – 4 very good)									
Sample no.	Deviation from natural character					Channel stability			
1									
2									
3						Condition			

Overall aquatic condition rating 0 (v poor), 1 (poor), 2 (moderate), 3 (good), 4 (v good)								
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Pro forma explanatory notes	
Site description	
Site description & location	Brief description of land parcel and location
Parcel Nos.	BRC parcel reference number
Date	Date of survey
Observers	Initials or name of those undertaking survey
Photo	Acknowledge if photo was taken
Soil landscape	Soil landscapes with reference to Kocav <i>et al</i> (1989). Use abbreviated notation, e.g. Ba (Bathurst), pa (Panorama), pm (Pine Mountain), pe (Pinnacle), ra (Raglan), mq (Macquarie), so (Sofala), wf (Wattle Flat), mk (Mookerawa)
Landform	Relief and modal slope class according to Speight (1998). Highlight relevant landform class Plains (level, gently undulating, undulating), rises (gently undulating, undulating, rolling), low hills (undulating, rolling, steep), hills (undulating, rolling, steep)
Ecosystem type	Highlight ecosystem type relevant to land parcel. If it is a terrestrial ecosystem use terrestrial sheet in pro forma (pg. 2), if aquatic use aquatic sheet (pg. 3) and if the parcel has a combination of ecosystem types both sheets to be filled in (pgs 2 & 3)
Summary of ecosystem condition and biodiversity conservation value	
Site ecosystem condition	The terrestrial and aquatic ecosystem condition ratings are derived at the end of the relevant pro forma sheets. If there is only one ecosystem type then the overall condition rating is the same. If the parcel has a combination of both ecosystem types then the overall condition rating is <i>deduced</i> from the two ratings, but not necessarily from calculating the average. For example, if a land parcel is largely terrestrial with a moderate rating (2) and has a small, concrete lined stream channel with an aquatic rating of very poor (0), then the overall condition would be deduced as 2. The average value of (1) would not truly represent the condition status of the land parcel.
Biodiversity conservation value	The biodiversity conservation value combines the attributes of vegetation, habitat and conservation value and ecosystem function and ecosystem services. The 'guiding tables' below assist the observer in rating these attributes. The overall value, similarly to the overall condition rating is based on an informed deduction.
Land use, disturbance, threats and impacts	
Land use	Record the current land uses including historic or future land uses if relevant
Disturbance	Highlight the appropriate disturbance level. More than one level can be highlighted if there is disturbance variability within the land parcel
Key threats and key impacts	Identify key threats and impacts to biodiversity. Note – a threat is what causes adverse impacts on biodiversity, while impacts are the effects of the threats. Some threats such as clearing maybe historic and as such are no longer threats, but have a consequent number of impacts, some of which maybe threats in themselves, e.g. clearing of native vegetation has the impact of vegetation. This maybe a new threat causing an erosion impact, which in itself may cause impacts of eutrophication. Listing threats and impacts does not have to be too prescriptive.
Threat trend	Highlight the appropriate trend direction. More than one type can be highlighted if there is trend variability within the land parcel. If there are many different trend types, select the trend direction that best describes the general trend.

Ecosystem processes and function	
Obstructions retaining water & nutrients	Obstructions that retain water and nutrients as per Tongway and Ludwig (2010) Highlight appropriate obstructions that occur on the parcel of land and provide a rating value from 0 to 4. E.g. if a vegetation patch comprises trees, a good cover of tussocks and some logs then 'trees', 'tussocks' are highlighted and given say a 3 rating, then 'logs' is highlighted and rated 1. Mounds can include debris dams, contour banks, uneven ground layer etc (clarify if necessary)
Factors inducing loss of water & nutrients	Factors inducing loss of water and nutrients as per Tongway and Ludwig (2010) Highlight appropriate factors. These can be altered by typing in a new factor (e.g. slashing of groundcover can be replaced with grazing of groundcover and engineered drainage channel added)
Resilience	Highlight the appropriate component and corresponding level. Resilience is the ability of an ecosystem to resist disturbance impacts or to recover from a disturbance, e.g.: Geomorphic (high) – stable waterway bed and banks, hillsides no erosion and well covered with groundcover vegetation; (medium) – in between high and low; (low) – unstable waterway/gully bed and banks, hillsides with rill, sheet and probably gully erosion. Ecological (high) – vegetation in good condition, ecosystem processes functioning and water and nutrients retained, ecosystem complexity maintained (species, structure); (medium) – in between high and low; (low) – breakdown in ecosystem functions, ecosystem simplification, continuing loss of water and nutrients out of system.
Threshold exceeded	Enter yes or no to whether the geomorphic and ecological thresholds have been exceeded or highlight an alternate stable state if this has been reached. An alternate stable state is when the ecosystem has changed following threshold exceedance and it will never return to its original state without the input of resources. In its new state it is relatively stable e.g. cleared land where the original overstorey will not regenerate or regrow unless replanted as part of a rehabilitation program.
Condition trend	Highlight the appropriate trend direction. In some cases there maybe aspects that are improving, whilst other aspects may be worsening or remaining stable. More than one type can be highlighted if there is significant trend variability within the land parcel otherwise select the trend direction that best describes the general trend. Condition trend is time dependent. For this assessment the time period is considered to be short to medium-term (up to one to two decades).
Ecosystem function	Rate the ecosystem function attributes from 0 to 4. For heterogeneous parcels with vastly different ecosystems the ratings are a value deduced from both. Extra notes or separating the ecosystem ratings can be undertaken if necessary. 0 - Very poor functioning. Water, carbon and nutrient cycles open and ecosystem experiencing losses. Unsustainable, very low productivity, very low harnessing of radiant energy due to poor plant cover. 4 – Very good functioning. Water, carbon and nutrient cycles closed or leaky with ecosystems exhibiting resource retention. Sustainable, productive landscapes with very good harnessing of radiant energy into plant matter due to good vegetation community structure. 1-3 – these middle ratings are relative to 0 and 4.
Overall assessment rating	This rating is deduced from the ecosystem processes and function table. Again averaging the individual tallies may not give a true indication of the functioning of the ecosystem especially as some attributes are not rated by ordinal scores. The deduction process can be illustrated with the following example: a parcel of land densely covered in moribund Phalaris could provide a good obstruction for the retention of water and nutrients, and in its alternate stable state it may have stable function and be ecologically and geomorphically resilient to some disturbances (e.g. drought, grazing), though not resilient to other disturbances (e.g. regular burn-offs). However the water, nutrient and carbon cycles and energy interception may be poorly functioning due to the moribund nature of the grass. It can be deduced that the

	ecosystem is not in a very poor or very good functioning state and is probably not in a good state given water and nutrient cycles etc. Its resilience, geomorphic stability, and ability to prevent the loss of water and nutrients pushes it above a poor rating. Therefore it would likely be given a moderate rating. Note this assessment does not take into consideration species as it is the functional aspect of the vegetation that is the key not the species composition.
Terrestrial ecosystems	
Upperstorey vegetation attribute	
Broad vegetation type	Provide a brief description on the vegetation type, e.g. amenity plantings of exotic trees, Mountain Gum/Apple Box forest, predominantly grassland with widely scattered eucalypts and exotic trees, isolated Yellow Box with slashed groundcover grasses and forbs, replanting of native species not necessarily indigenous
Structural formation	As per Specht (1970) Forest, open forest, woodland, open woodland, grassland, herbland etc
Reconstructed vegetation class	As mapped by Keith (2004). Vegetation classes on Council controlled land include: Southern Tableland Grassy Woodland (ST grassy woodland) Temperate Montane Grasslands (Montane grasslands) Eastern Riverine Forests (Riverine forests) Southern Tableland Dry Sclerophyll Forests (Dry sclerophyll forest)
EEC	Indicate if the parcel contains an Endangered Ecological Community (EEC). The EECs known to occur on Council controlled land are the Box-Gum Woodland and the Tablelands Basalt Forest
Connectivity	Rate the internal and external connectivity from 0 (cleared), 1 (significant fragmentation with inadequate stepping stones), 2 (intermediate fragmentation with adequate stepping stones), 3 (low level of fragmentation), 4 (continuous)
Patch size	Highlight the appropriate patch size – relates to within land parcel
Succession stage	Highlight the appropriate succession stage. Mature (all upperstorey trees are mature or senescent), mixed (has a mix of age classes and includes seedlings or saplings), regrowth (germination or resprouting from epicormic shoots/lignotubers has occurred at about the same time following a disturbance event such as fire), regeneration (trees have regenerated over a period of time), replanting (trees planted on site)
Condition trend	Highlight the appropriate condition trend. Highlight more than one if necessary
Condition assessments (applicable for the terrestrial and aquatic ecosystem condition assessments)	Three sample sites are available for each condition attribute. If the site is homogeneous only one sample is required. Heterogeneous sites may require two or three samples. The condition for the upperstorey, midstorey, groundcover and fauna habitat attributes is <i>deduced</i> from the indicator ratings from one, two or three samples – indicators being structural integrity & health, species composition and regeneration of indigenous species etc. To assist with the rating of each indicator refer to rating guideline tables below.
Midstorey vegetation attribute	
Dominant type and abundance	Highlight appropriate type, abundance and distribution for large shrubs and small shrubs
Condition trend	Highlight the appropriate condition trend. Highlight more than one if necessary
Groundcover vegetation attribute	
Cover	Provide a cover score for native and exotic grasses and native and exotic forbs, e.g. grasses: native 3, exotic 1; forbs: native 2, exotic 3 Note: Cover is not compared with natural state it just reflects the current cover. How cover compares with natural state is addressed in the condition assessment under structural integrity
Condition trend	Highlight the appropriate condition trend. Highlight more than one if necessary

Terrestrial fauna habitat	
Cover	Provide a cover score for bareground, leaf litter, cobbles, boulders and logs
Habitat feature of note	e.g. aquatic habitats, abundance of shrubs, old growth trees with hollows
Fauna habitat - functional plants	For this assessment functional plants are those that perform a particular function such as providing shelter for ground dwelling animals, nest sites, hollows, flowers, fruit, specific resources (e.g. <i>Bursaria</i> for Copperwing Butterfly), foliage (e.g. for koalas, lerps, leaf eating beetles)
Condition trend	Highlight the appropriate complexity and threats values
Overall vegetation condition rating	The overall terrestrial ecosystem condition is deduced from the attribute condition ratings
Aquatic ecosystem condition rating	
Riparian corridor vegetation	If it is a site with a combination of terrestrial and aquatic ecosystems, this attribute may not need to be filled in if it is essentially the same as for the terrestrial description
Instream habitat	
Dominant instream vegetation type	Describe vegetation type – may include sedges and rushes, willows, River Sheoak
Stream type	Highlight appropriate stream characteristics. Add or delete characteristics if necessary
Condition trend	Highlight the appropriate trend
Condition assessments	Three sample sites are available for each condition attribute as for the terrestrial assessments. Again if vegetation health is not an issue it can be omitted. To assist with the rating of each indicator refer to the Rating Reference Guide in the tables below
Hydrology	
Catchment land use	Highlight the appropriate land use
Condition trend	Highlight the appropriate trend
Geomorphology	
Stream character	Describe the character of the stream and if possible its' likely pre-European settlement character. Stream maybe described as sinuous sand bed stream, engineered channel with low flow pipe, channelised stream, swampy meadow/valley fill, open concrete channel, gully
Condition trend	Highlight the appropriate trend
Overall vegetation condition rating	The overall aquatic ecosystem condition is deduced from the attribute condition ratings

References:

- Keith, D. A. (2004). Ocean shores to desert dunes: the native vegetation of New South Wales and the ACT. Hurstville, Department of Environment and Conservation.
- Kovac, M., B. Murphy, et al. (1989). Bathurst Soil Landscape Series S1 55-8. Sydney, Soil Conservation Service of New South Wales.
- Speight, J. G. (1998). Landform. Australian soil and land survey: field handbook. R. McDonald, R. F. Isbell, J. G. Speight, J. Walker and M. S. Hopkins. Canberra, CSIRO.
- Specht, R. L. (1970). Vegetation. The Australian environment. G. W. Leeper. Melbourne, CSIRO - Melbourne University Press: 44-67.
- Tongway, D. and J. A. Ludwig (2010). Restoring disturbed landscapes: Putting principles into practice. USA, Island Press.

RATING REFERENCE GUIDES

The Rating Reference Guide tables presented below are, as the name suggests, a guide only and it is expected that not all factors apply

BIODIVERSITY CONSERVATION VALUE RATING					
Vegetation value	Habitat value	Conservation value	Ecosystem function value	Ecosystem services value	Rating ¹
High quality terrestrial or aquatic vegetation/self regenerating/high resilience. Good structural integrity, vegetation health and species composition. In natural or near natural state; self sustaining (Overall vegetation condition rating - 4)	Very high complexity of habitat resources for fauna (providing quality food and shelter and instream complexity) and optimal environmental resources for the maintenance of the vegetation communities, very high habitat connectivity in landscape, no exotic species impacting on habitat (Terrestrial and instream habitat condition rating - 4)	Areas with the presence of threatened species, rare, declining or regionally significant fauna and flora, EEC or habitat for threatened species; Condition trend of ecosystem stable or improving. Woodland patch or population size etc relatively large. High quality vegetation. Areas may have regional or local conservation linkages, such as on rivers or other waterways or provide linkages in a extensively cleared landscape	Ecosystem processes functioning naturally, i.e. they retain and do not leak resources such as carbon, water and nutrients. High energy interception as a result of good vegetation cover and structure (Ecosystem function condition rating - 4)	The biological diversity, not necessarily the land in which the rating is based, provides a high level of goods (food, fibre), services (clean air, water, shade, wind protection, temperature regulation) and/or amenity & cultural values (recreation, hunting, fishing, aesthetics, heritage, meditation, connection with nature). May include exotic species.	4
Some disturbance/some resilience lost, some changes in structural integrity, low incidence of exotic species; self sustaining with regeneration strategies (Overall vegetation condition rating - 3)	Some loss of habitat resources from natural state e.g. loss of groundcover features, vegetation structure, groundcover complexity and density and instream features such as pools, bank undercuts, logs, instream vegetation. Relatively low incidence of exotic weeds Some loss of habitat connectivity or fragmentation (Terrestrial and instream habitat condition rating - 3)	Some loss of integrity of an EEC. Area may include conservation linkages, species or communities of significance, though the ecosystem is showing signs of degradation. Woodland patch or population size etc moderate to large. Condition trend of ecosystem stable or improving	Some loss of ecosystem functioning e.g. as a result of erosion, vegetation degradation, presence of vehicular tracks (Ecosystem function condition rating - 3)	Ecosystem services provided by the biodiversity are relatively good, but maybe compromised by weeds, declining vegetation condition, vandalism or habitat destruction. Services maybe multi-functional providing more than one benefit (e.g. temperature regulation in urban environment and visual amenity)	3
Some conservation value but with significant levels of disturbance; potential to regenerate or degrade depending on mgt (Overall vegetation condition rating - 2)	Simplification of habitat with losses in vegetation structure, absence of features such as logs, pools, hollow-bearing trees; water quality issues; weed invasion; moderate loss of habitat connectivity; (Terrestrial and instream habitat condition rating - 2)	Highly degraded EECs with potential for assisted natural regeneration, site is mainly grassy, overstorey exists with no substantial native understorey or native understorey but trees cleared. Condition trend of ecosystem stable or worsening	The ecosystem is showing signs of degradation with the loss of vegetation structure, reduction in groundcover density, erosion, lack of ecosystem resilience (trend towards exotic species, lack of recruitments) (Ecosystem function condition rating - 2)	The ecosystem services provided by the biodiversity in an area are moderate (e.g. water plants in drainage channel – aids in the filtering of sediment and nutrients, though if invaded by weeds the visual amenity may be compromised)	2
Degraded/sign resilience lost/no regeneration; trending to localised extinction (Overall vegetation condition rating - 1)	Some habitat features exist, however it may be limited to a small number of faunal groups or flora assemblages. Significant loss of habitat connectivity (Terrestrial and instream habitat condition rating - 1)	May have potential to provide habitat for significant species or population provided rehabilitation works are carried out. Woodland patch or population size very small. Condition trend of ecosystem worsening or stable in alternate state	Ecosystem significantly compromised (e.g. overstorey cleared, groundcover slashed or grazed, cultivation, sheet, rill & gully, disconnection of streams to floodplains, construction of levees. (Ecosystem function condition rating - 1)	The ecosystem service provided by the biodiversity is poor or limited (e.g. trees screening a water reservoir)	1

Highly degraded, very little or no remnant vegetation; requires high cost restoration strategies (Overall vegetation condition rating - 0)	Very limited resources available for a diversity of native fauna and flora, invasion of exotic species causing complete or almost complete displacement of available habitat; very significant loss of habitat connectivity (Terrestrial and instream habitat condition rating - 0)	No rare or threatened species or EECs present; high proportion of exotic weed species; ecosystem does not resemble natural state. No conservation linkages in the vicinity. Condition trend of ecosystem worsening or stable in alternate state	The ecosystem process and function of the original ecosystem have been severely limited or lost due to removal of remnant vegetation, erosion and ecosystem modification and engineered waterways (Ecosystem function condition rating - 0)	Biodiversity provides some ecosystem service despite how low. This rating is for areas that have a comparative value less than above. These areas may include turfed sporting fields. The turf and the soil organisms that support it have some ecosystem services, though is very limited.	0
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¹Ratings: 0 (very poor, very low value); 1 (poor, low value); 2 (moderate, moderate value); 3 (good, high value); 4 (very good, very high value)

Vegetation condition (terrestrial upperstorey, midstorey & groundcover, riparian corridor & instream)			
Structural integrity and health	Species composition	Regeneration of indigenous spp. Habitat complexity	Rating ¹
Residual - native vegetation structure, composition and regenerative capacity remain intact, with no significant disturbance; no changes in life-form or biomass/density of the communities compared to expected natural states for terrestrial & aquatic ecosystems	High proportion of indigenous vegetation with little or no exotics	Many age classes and many new recruitments	4
Modified – the structure, composition and regenerative capacity are intact, with some disturbance; some changes in life-form or reduction in biomass/density but structural integrity still present	Widespread occurrence, few exotic species	New recruitments common, mixed age classes present	3
Transformed – the structure, composition and regenerative capacity are significantly altered by disturbance; significant changes in either life-form or biomass/density	Mix of exotic and indigenous species	Few and widely scattered new recruitments, mainly old age classes	2
Replaced/managed – native vegetation has been replaced or mostly replaced by non-native vegetation, or in aquatic systems instream vegetation may be absent	Mostly exotic species	No regeneration of upperstorey species, some regeneration of groundcover grasses and forbs	1
Removed – native vegetation has been removed to leave non-vegetated or mostly non-vegetated land cover; instream veg absent. Dramatic change in life-form and structure from natural state, reduced biomass/density	Devoid of indigenous species	Only old or senescing vegetation and no new recruitments, groundcover moribund	0

¹Ratings: 0 (very poor, very degraded); 1 (poor, degraded); 2 (moderate); 3 (good); 4 (very good, near natural)

INSTREAM HABITAT RATING				
Structural integrity of the vegetation	Vegetation species composition	Water quality	Habitat complexity	Rating ¹
Streams with banks and edges vegetated with macrophytes, forbs, trees and/or shrubs. Vegetation in good health. Swamps and valley fills vegetated with an abundance of sedges, rushes and grasses and an absence of shrubs and trees in wetter habitats	High proportion of indigenous vegetation with little or no exotics	Algal blooms absent, low water clarity, No unnatural odours, water well oxygenated, no evidence of chemical pollution, no industry, septic tanks in catchment and roads absent or well buffered, oil cover very low or absent	Streams with high habitat complexity. Natural pool/riffle sequences, diversity of geomorphic units (undercut banks, benches, bars), snags if natural to system, substrate complexity (varying size substrate material - coarse to fines). Valleys or swampy meadows with good structural complexity of groundcover plants, micro-geomorphic units if natural to system	4
Some loss of structural intactness (change in life-form, standing biomass) due to disturbance – change in hydrology, grazing, sediment movement and/or vegetation communities showing some signs of impact (e.g. sediment smothering, desiccation due to change in hydrology, stock grazing/trampling), condition stable or improving	Widespread occurrence, few exotic species	Odour indistinct, water mostly oxygenated, minor chemical pollution likely due to waterway being in low density built environment, septic tanks absent or few and at a considerable distance from waterway, low surface oil cover	Some loss of habitat complexity or deviation from expected natural state. No artificial barriers to affect fish passage	3
Moderate loss of structural intactness and/or vegetation communities showing signs of impact. Condition stable or improving	Mix of indigenous and exotic species	Some odour, abundant decaying material in water from urban sources or exotic riparian vegetation, chemical pollution likely due to waterway being in the built environment, possibly septic tanks in catchment, moderate surface oils	Moderate habitat complexity or deviation from expected natural state. Downstream artificial barriers moderately affect fish passage. In streams coarse woody debris not of indigenous origin, loss of geomorphic features, instream bed mining, sediment layer over substrate patchy	2
Dramatic reduction in vegetation community structure from natural conditions. Vegetation severely impacted by land use pressures or change in environmental conditions	Mostly exotic species	Odour quite strong, water showing signs of stagnation, high surface oil cover	Poor habitat complexity, no coarse organic material, substrate of similar sized material, unstable substrate, major deviation from natural state, bank slumping, high sediment layer over substrate, most downstream artificial barriers affect fish passage	1
Absence of vegetation or no structural integrity of that remaining	Devoid of indigenous species	Odour strong, water stagnant, very high oil cover on water surface, sewer leaks or septic tanks in close proximity to waterway, prolific cover of algal blooms in summer	Homogeneity of substrate material, sediment flux, no snags or periphyton, blanket sediment layer over substrate, all downstream artificial barriers affect fish passage	0

¹Ratings: 0 (very poor, very degraded); 1 (poor, degraded); 2 (moderate); 3 (good); 4 (very good, near natural)

HYDROLOGY RATING			
Connection with floodplain	Hydrologic deviation from natural flows	Hydraulic deviation from natural flows	Rating ¹
Stream-floodplain connectivity natural for stream characterisation. Maintenance of natural water, nutrient and carbon cycles between hillslopes, floodplain and channel	No deviation from natural flows. Catchment condition, floodplain & tributary water storage & water cycles in near natural state, No artificial barriers that affect natural flows. Maintenance of natural water cycles	Streams - no deviation from natural flow mechanics. Characteristics variable according to stream type. Likely to have different surface flows, pools, deadzones, areas of turbulence etc. Swamps/valley fills - no deviation from natural flows; multiple flow pathways across valley floor, low flow velocity	4
Minor disruption of water, nutrient and carbon cycles between hillslopes, floodplain and channel Stream-floodplain connectivity sometimes hampered due to floodplain modification or assisted due to weirs Swamps/valley fills -some stream-floodplain connectivity, though somewhat restricted due to formation of discontinuous channels or gullies or altered vegetation assemblages	Some catchment modification, minor deviation from natural flows, some disruptions to water cycles	Streams - slight deviation from expected natural flows. Reduced channel roughness Swamps/valley fills - some areas of water may tend to flow along shallow, vegetated channels	3
Disruption of water, nutrient and carbon cycles between hillslopes, floodplain and channel Streams - floodwaters overtop floodplain only during periods of high floods Swamps/valley fills -poor stream-floodplain connectivity due to shallow, channel or gully, gently sloping vegetated banks, vegetated floodplain	Downstream artificial barriers are overtopped at least once/year Streams - flood peaks of higher magnitude & duration reduced compared to expected natural, some change in depth and periodicity of flow (reduced base-flows, little/no natural floodplain storage or more rapid water loss; increased number of small-moderate flow events) Swamps/valley fills - discontinuous channel, or shallow channel with some water flow over floodplain, modified catchment conditions (eg farm dams, removal of perennial veg)	Streams - moderate deviation from expected Swamps/valley fills - channel more defined and continuous, vegetation patchy or absent, possible physical obstructions, flow velocity increasing beyond natural	2
Major disruption of water, nutrient and carbon cycles between hillslopes, floodplains and channel Streams -floodwaters overtop floodplain only during periods of extremely high floods; floodplain barriers – levees Swamps/valley fills - Very poor stream-floodplain connectivity due to shallow, channel or gully, gently sloping banks, little vegetation on banks or floodplain	Significant change in depth and periodicity of flow due to altered flood hydrograph, presence of engineered structures that act to alter natural hydrology, no natural floodplain storage, marked water level fluctuations. Artificial barriers never overtopped during floods.	Streams - major deviation from expected Swamps/valley fills - well-defined channel, devoid of vegetation and obstructions, flow velocity high	1

<p>Complete breakdown of water, nutrient and carbon cycles between hillslopes, floodplains and channel</p> <p>Streams -complete stream disconnection with floodplain even during high flood events</p> <p>Swamps/valley fills -complete stream disconnection with floodplain, steep-sided banks with no appreciable vegetation</p>	<p>High magnitude/reduced duration flood peaks, significantly altered catchment conditions and water cycle; significantly reduced base flows & increased number of small-moderate flow events. At least one artificial barrier in basin downstream of this reach is not overtopped at least once/year. Major disruption to water cycle</p> <p>Streams - stormwater inflows, engineered structures that act as weirs, dams, increased frequency of bankfull floods</p> <p>Swamps/valley fills - channelised, no instream vegetation, dramatic change in velocity, depth and periodicity of flow</p>	<p>Streams - stream hydraulics dramatically different to natural system (change to riffle/pool features, significant reduced channel roughness, channel width to depth ratio altered, sediment slugs, sediment removal, instream obstructions -groynes, revetments, culverts - change in streambed material, change in channel alignment, channel straightening, water conveyancing & channel roughness, concrete channel, altered channel cross-section, instream engineered structures)</p> <p>Swamps/valley fills - as for streams, flow path along one deeply incised 'v'-shaped channel bed, very high flow velocity for system, reduced channel roughness, concrete channel</p>	0
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¹Ratings: 0 (very poor); 1 (poor); 2 (moderate); 3 (good); 4 (very good)

Hydrology – the distribution of water over the landscape; Hydraulics – the physical effects of the passage of water

GEOMORPHOLOGY RATING		
Deviation from natural character	Channel stability	Rating
No deviation from expected natural character or stream in natural stage in life-cycle	Bed and banks stable or in natural stage in life-cycle; no evidence of sediment movement; sides and/or floors of bank vegetated. No geomorphic thresholds exceeded, high geomorphic resilience (bed and banks). stability in width to depth ratio. Small volumes of sediment flux through system	4
Minor deviation from expected natural character	Limited erosion, some minor isolated erosion, no continuous damage to bank structure. (No geomorphic thresholds exceeded, good geomorphic resilience (bed and banks). Minor changes to width to depth ratio. Some sediment flux, minor bed erosion or accretion	3
Moderate deviation from expected natural character	Banks partly stabilised; evidence of some active erosion and some stabilisation, generally stable toe. Moderate resilience, geomorphic resilience not exceeded (bed and banks). Changes to the width to depth ratio from pre-European settlement condition. Moderate volumes of sediment deposited from upstream erosion or bed actively eroding	2
Major deviation from expected natural character	Extensive erosion, recent bank movement, unstable toe. Poor geomorphic resilience, thresholds possibly exceeded and condition worsening (bed and banks). Major changes in width to depth ratio. Streambed very unstable with erosion, sediment movement and deposition on a major scale	1
Significant alteration from original stream character. Channelised, aligned, gullied, engineered, piped, diverted, bank stabilisation, incised swampy meadows	Extreme active bank erosion. Evidence of sediment movement; sides and/or floors of erosion are relatively bare of vegetation, nick points, bank slumping. Geomorphic thresholds exceeded (bed and banks). Dramatic deviation from natural cycle, contemporary sediment slugs from upstream erosion, active bed lowering from substrate extraction, unnatural sediment flux; change in width to depth ratios	0

¹Ratings: 0 (very poor); 1 (poor); 2 (moderate); 3 (good); 4 (very good)

Appendix F.

CONDITION ASSESSMENT MAPS

Ecosystem condition of Council controlled land in the Bathurst Region

Conservation value of Council controlled land in the Bathurst Region

Appendix G.

STRATEGY TABLES

Council as a strategic land use planner and development controller (C)

Objective 1: Areas of high biodiversity conservation value or significant biodiversity assets on Council controlled land are identified and mapped

Strategy (SC1) Integrate and map areas of high biodiversity conservation value and significant biodiversity assets (as derived from the BMP condition assessment) into Council's GIS and database system

- Map BMP ecosystem condition and conservation value assessment ratings and biodiversity assets into BRC's GIS and database system (**Action AC1**)
 - Integrate the datasheets from the assessment and biodiversity (ecosystem) assets derived from the condition assessment (refer Part C of the BMP)
 - Inappropriate development or works procedures should be avoided in areas assessed to have moderate to very high ecosystem function or conservation value or significant biodiversity assets (Link with Strategy SC8, SC9)
- Map BGW and Tablelands Basalt Forest EECs and their derived grasslands that are on Council owned or controlled land and record according to their current ecosystem condition rating (**Action AC2**) (Link with Strategy SM5)
- The Box-Gum Woodland/Tableland Basalt Forest remnants contained within the land parcels to be mapped using remote sensing data and ground-truthed where necessary as they may not cover the whole parcel area e.g. Mount Panorama (Sulman and Reid Parks) that incorporate the cleared gun club area adjacent to Barry Gurdon Drive)
 - Update EEC mapping with changes to condition or distribution or communities listed as an EEC under the relevant Acts
 - Update mapping with changes to ecosystem condition over time

Objective 2: Areas or biodiversity assets of significant conservation value across the whole Bathurst Region are identified and mapped

Strategy (SC2) Advocate for EECs to be mapped across the Bathurst Region

- Advocate for EECs to be mapped across the whole Bathurst Region (**Action AC3**)
 - Areas may need to be prioritised such that areas likely to be subject to future development/landuse intensification are priority mapped. Also EECs within the former Bathurst City LGA priority mapped over rural areas - especially around the Mount Panorama precinct
 - Investigate the moist forest communities dominated with *E. viminalis* and *E. dalrympleana* located in sheltered valleys in the Winburndale NR to see if they comprise the Tablelands Basalt Forest EEC
 - Need to build on existing mapping data
 - Mapping of Montane Peatland and Swamps can be problematic – surrogate use of River Styles mapping and predictive modelling (using catchment area, slope, rainfall isohyets) may be necessary
 - Maintain currency by checking listings in the EPBC Act and Schedules 1, 1A, and 2 of the TSC Act
 - Vegetation surveys and ground-truthing are likely to be part of the identification process
 - Maintain the use of the current 'Environmentally Sensitive Area' mapping under DCP/LEP
 - Resource assistance with mapping, filling data gaps or accessing resource material
 - Link with Strategy SP3

Strategy (SC3) Maintain and continually update the comprehensive threatened species database for the Bathurst Region

- Continue to update the threatened species database for the Bathurst Region (**Action AC4**)
 - Include additional threatened species information from the BMP into database
 - Maintain and update regularly
- Seek better ecological understanding of threatened species data since site locations without ecological context and understanding can lead to deficient decision making
- In seeking to better understand threatened species presence in the Bathurst Region ensure that the following information is present in a database or other data source:
 - The most recent sighting date
 - Relative abundance of the species
 - Species distribution maps including distribution within the Bathurst Region, NSW and mainland
- Link with Strategy SP3

Strategy (SC4) Identify, map and consolidate mapped areas of high/very high conservation value and significant biodiversity assets across the whole Bathurst Region

- Advocate for OEH to improve mapped areas of high/very high conservation value and significant biodiversity assets across the whole Bathurst Region (**Action AC5**)
- BRC to incorporate information it has or gains into database/GIS (**Action AC6**)
 - Convert existing hard data to spatial data (GIS)
 - Incorporate the key biodiversity assets identified in the BMP for the Bathurst Region into the BRC database

- Identify biodiversity assets recognised by the wider community (link with Strategy SP3). Biodiversity assets to include, for example: conservation areas (nature reserves, crown reserves, national park, village commons, timbered road reserves, CMA Property Vegetation Plan offset areas and biodiversity investment areas); high conservation ecosystems (e.g. high quality riverine ecosystems, woodlands, forests, grasslands); significant habitat features (e.g. waterbodies for birds and platypus, groundwater dependent ecosystems from springs and seeps); significant habitat for threatened fauna and flora species; special 'natural' places of amenity, visual, spiritual or recreational value
- Build on the list of biodiversity assets with contributions from the wider community. Identify and map: native fish distribution and status and key fish habitat; culturally significant areas (indigenous and non-indigenous) when data becomes available from the CMA or undertake Aboriginal heritage study in partnership with OEH, 'Special areas' for culture and recreation; sites recorded in the INFFER database system; Land Capability Class VII & VIII – includes land unsuitable for grazing and cropping and is best left timbered; key Koala habitat (link with Strategies SC8, SC9)
- Implement a requirement that development applications need to provide vegetation data in a format that can be used to update vegetation mapping (link with Strategy SC12)
- Consolidate Lachlan and CW CMA priority areas identified by OEH
- Build on site-specific information and increase the resolution for the Environmentally Sensitive Area map overlay i.e. assess, ground-truth and increase resolution where appropriate (**Action AC7**). Environmentally Sensitive Area map overlays, including land, sensitive land resources, water, biodiversity and native vegetation, sensitive biodiversity and sensitive water resources.
- Continually update database and GIS when additional mapping resources are available and assets are recognised by the community
- Additional strategies that assist Council with mapping, filling data gaps or accessing resource material are addressed under Strategy SP3

Strategy (SC5) Identify and map critical areas in the landscape for wildlife corridors, vegetation linkages and conservation areas

- Advocate for OEH to map critical areas in the landscape for wildlife corridors, vegetation linkages and conservation areas (**Action AC8**)
 - Build on the wildlife corridor and vegetation linkage mapping undertaken by OEH
 - Identify and map critical areas that are relevant for BRC planning or biodiversity management requirements at a finer scale than what is presented in the OEH priority mapping
 - Key linkages may include EECs, threatened species habitat (e.g. Purple Copper Butterfly), riparian corridors, fish passage, connectivity between areas of HBCV and corridors within the urban landscape
 - Additional strategies that assist Council with mapping, filling data gaps or accessing resource material are addressed under Strategy SP3

Objective 3: Key land parcels reviewed for their biodiversity value for future land use change, disposal or public ownership considerations

Strategy (SC6) Review council controlled land parcels that have poor or very poor biodiversity conservation value for future land use change, disposal or public ownership consideration

- Review council controlled land parcels of very low biodiversity conservation value for future land use change, disposal or public ownership consideration (**Action AC9**)
- Land parcels owned or controlled by BRC of very low conservation value and ecosystem condition (according to the condition assessment) and land parcels that were *not* included in the condition assessment to be considered for disposal, or other options. Suggested land parcels that were assessed include:
 - Fosters Valley (Parcel Nos. 39797, 39798, 39799, 397800) – old road reserve now incorporated into cultivated paddock
 - Trunkey Creek (Parcel No. 29458) – small vacant block
 - Rockley Village (Parcel No. 30039)
 - Sofala Village (Parcel No. 88472)
 - Bruinbun (Parcel No. 38637)
 - Woodside Drive, Mount Rankin (Parcel No. 28318)
 - The Lagoon (Parcel No. 38676)
 - Pye Street, South Bathurst (Parcel Nos. 17700-17691, 17679-17684, 11621, 11622, 24632-24641, 24647-24643)
 - Gormans Hill (Parcel Nos 15635, 15636, 15637)
 - Saleyards complex (Parcel Nos 20091, 22652-22655, 22593, 22592)
 - College Road, agricultural land (Parcel Nos 22588-22590)

Strategy (SC7) Identify and review Council owned or freehold land parcels of high or potentially high biodiversity conservation value or that may be significant for habitat linkage for future land use change, disposal or public ownership consideration

- Identify and review land parcels of high or potentially high biodiversity conservation value or that may be significant for habitat linkage for future land use change, disposal or public ownership consideration in order to secure its protection (**Action AC10**)

- Council could act as broker to facilitate between private landholder and agency such as Nature Conservation Trust (link with Strategy SP4)
- Examples include:
 - HBCV on freehold land that is under threat of degradation and its protection and enhancement maybe guaranteed under public ownership or acquisition by the Nature Conservation Trust and secured with a legally binding conservation covenant. This option may be suitable, for example, the Raglan Creek wetland complex/brick pits
 - Areas that could be incorporated into significant landscape-scale habitat linkages on freehold land that can only be secured under public ownership
- Land parcels owned by Council that are of high or very high biodiversity conservation value that can be secured and managed in perpetuity for conservation in the public domain. This option would require informed community consultation and feedback
- Public ownership grants may need to be sought or land sales as identified in SC6 could reinvested in land acquisition for conservation

Objective 4: Areas of high biodiversity conservation value or significant biodiversity assets across the whole Bathurst Region protected and enhanced through local planning instruments

Strategy (SC8) Make provisions and standards in the LEP/DCP for the protection and enhancement of biodiversity

- Make provisions and standards in the LEP/DCP for the protection and enhancement of high biodiversity conservation value areas (**Action AC11**). Some recommendations are as follows:
- LEP/DCP to include biodiversity related aims and objectives, e.g. 'Aim to protect, enhance and manage areas of high biodiversity conservation value as a means to:
 - Protect the region's scenic quality and aboriginal cultural heritage
 - Protect and enhance terrestrial and aquatic ecosystems to improve or maintain regional biodiversity, ecosystem function and for the essential ecosystems services they provide
 - Enhance the resilience of landscapes to better adapt to climate change impacts
- When SEPP44 does not protect Koala habitat in the Bathurst Region (e.g. at Mount Rockley due to the absence of 'Feed Tree Species' as listed in Schedule 2 of the Provision) then BRC needs to include provisions in the LEP/DCP that refer to the tree species listed in the 'Recovery Plan for the Koala' (NSW DECC 2008) for the Bathurst region
 - Link with Strategy SC10, SC12
- Continue to pursue minimum lot size of 300 ha with attached dwelling entitlement as recommended in the Bathurst Region Rural Strategy, 2008 for private land in the general rural zone as a means of preventing cumulative loss of native vegetation and biodiversity
- For public land give consideration to the use of a relevant 'E Zone' or 'Recreation Zone'
- General considerations for development (particularly in unplanned rural localities or prior to zoning of new urban areas) should be given to the cumulative environmental impacts on the environment of the development and the potential of that development to impact on:
 - water quality of waterbodies
 - aquatic habitat
 - groundwater resources
 - soil resources
 - existing vegetation, native flora and fauna
 - habitat connectivity
- Zone objectives
 - Rural Zone Nos. 1 (a) 1(c), 1(d), 1(e), 1(f) – include objective to provide for the protection and conservation of areas of significance for nature conservation, of habitat for threatened species, populations and ecological communities and of other areas of native vegetation
 - Rural residential – include objective to protect environmentally sensitive areas, areas of conservation significance and HBCV
 - Residential Zone No. 2(a) – include the objective to provide for the protection and conservation of biodiversity
- Developments that require consent - include the carrying out of works in the Rural Zones for:
 - Clearing of native vegetation (trees, shrubs and predominately native ground herbage) for agriculture, infrastructure or the erection of buildings
 - Removal of riparian vegetation including exotic species – include that if undertaken with the authority of the OEHL using best management practices then consent not required
 - Activities that involve the dumping of waste material, contaminants or fill into gullies
 - Developments on land with an existing conservation agreement to ensure compatibility
- Developments without development consent for the purpose of bushfire hazard reduction applicable to Rural Zones 1(a), 1(b), 1(c), 1(d), 1(e), 1(f) – include provision so this applies only if undertaken in accordance with an approved bush fire hazard management plan and is in accordance with guidelines set out in the 'Guidelines for Ecologically Sustainable Fire Management (NSW NPWS 2004)
- Consider the appropriateness of some exempt and complying development on environmentally sensitive areas and areas of HBCV

- Include provisions in the LEP/DCP for riparian lands and waterways with the objective to protect and maintain water quality, channel stability, aquatic and riparian habitat and ecological processes in the riparian zone
- Adopt a no-net loss principle (i.e. any developments should not result in any net reduction in biodiversity)
- Within planning provisions set guidelines for development controls that are specific to the ecosystem condition and conservation value of the site. This may or may not be on Council controlled land, for example:
 - Cultural plantings are acceptable in some urban environments but should be avoided along all watercourses, urban and rural conservation areas, rural roads (except for main arterial roads in the peri-urban area).
 - Slashing of the groundcover allowable in urban areas and prohibited in areas of high conservation value or where groundcover assists in ecosystem function or ecosystem services (e.g. erosion control, trapping sediments along waterways)
 - Fire hazard reduction (frequency, seasonality and intensity)
 - Grazing, weed and feral animal control
 - Removal of dead trees and fallen timber
 - Permeable surface area proportion
 - Effective buffers around areas of HBCV and setbacks from waterways
 - Biodiversity revegetation requirements
- Urban development - incorporate sustainable design, technologies and applications. For example:
 - The conservation subdivision approach where subdivisions connect to natural areas.
 - Water sensitive urban design (WSUD) and development principles that allow sustainable solutions through appropriate storm-water management by improving quality; reducing run-off quantity; removing pollutants; and minimising infrastructure costs and potable water demand.
 - WSUD standards/provisions need to be specific to ensure consideration is given to salinity issues (salinity risk hazards) and potential waterlogging issues. Adoption of WSUD principles and what principles apply should be governed by a full site analysis. Reference should be made to the DECCW 'Bathurst Regional Council Hydrogeological Landscape (HGL) Project, 2011
 - Renewable energy or micro-power generation (e.g. photovoltaic panels, solar hot water, wind and combined heat and power) for carbon-neutral and sustainable residential developments.
- Development control of nearly all activities and works on freehold land and crown land (except national parks and state forests) through development consent powers
- Mount Panorama and environs (Interim DCP Section 8)
 - Strategic and land use objectives to include the enhancement, protection and conservation of biodiversity
- For new urban developments consider a change in DCP road standards regarding minimum road width that allows for additional tree plantings per allotment. This would need to be done on a case-by-case basis. Possible benefits could include improved microclimate conditions; an aid in the control of salinity; enhanced visual amenity and depending on the species and design can improve biodiversity values. Disadvantages include additional water usage and the greater 'footprint' required for the number of allotments
 - Bushfire protection - Protect areas of high biodiversity conservation value by controlling the type of developments permissible in bushfire prone areas. i.e. preclude urban and rural residential development where extensive clearing of native vegetation is required to provide the appropriate asset protection zones (protects biodiversity and minimises development in high bushfire risk areas). This may be difficult in existing village locations (link with Strategy SM18)

Strategy (SC9) Pre-plan developments in key settlement areas before rezoning according to provisions and standards in the LEP/DCP that aim to enhance and protect biodiversity

- Pre-plan developments in key settlement areas before rezoning according to provisions and standards in the LEP/DCP to protect high biodiversity conservation areas and to set aside areas for conservation linkages (**Action AC12**)
 - Continue with the practice of identifying and mapping existing remnant vegetation and areas of waterways protection. Historically BRC has tried to incorporate remnant veg within recreation areas (zoned) in order to increase the opportunity for connectivity and to not limit the recreational use of environmentally sensitive land.
 - Where appropriate consider 'E Zone' and/or 'Recreation Zone' for public land
- Additional consideration should be given to the identification and mapping of:
 - The upper drainage lines (these areas can include swampy meadows/Montane Peatlands and Swamps EECs). This mapping maybe inclusive of 1st or 2nd order streams. Relatively dry, low order, broad open valley floors are not necessarily of environmental significance and need not be mapped.
 - Biodiversity assets (including threatened species, EECs and their habitats, cultural areas for visual or recreational amenity, aquatic biodiversity including native fish habitat, biodiversity for ecosystem services for water quality, erosion control)
 - Swampy areas prone to waterlogging or ponding (often in valley floors associated with drainage lines, though maybe at the site of springs or seeps)
 - Areas with a high erosion hazard, such as sodic soils in drainage lines
 - Gullies or erosion areas where rehabilitation or stabilisation works are required to prevent further erosion or to reduce sediment movement downstream

- Identifying and mapping areas with invasive significant environmental weeds – especially if long-term control of these weeds is required by the developer (e.g. willows, blackberry, sweet briar, privet)
- Buffer areas around areas of HBCV
- Link with Strategy SC2, SC4, SC5

Strategy (SC10) Commission a locally specific koala study that supports assessments when SEPP 44 does not protect Koala habitat in the Bathurst Region

- Commission a Koala Management Plan for the Bathurst Region (as provided under SEPP 44) as feed tree species listed in SEPP 44 do not protect Koala habitat in the Bathurst Region (**Action AC13**)
- Objectives of the study should:
 - Provide critical review existing studies (e.g. Heather Price's honours thesis and Steven Cox's unpublished four year field work program)
 - Identify feed trees, populations and distribution and incorporate species in the Recovery Plan for the Koala, Bathurst region (Koala Management Area 5)
 - Map known and likely distribution
 - Provide recommendations for the protection of Koalas and their habitat in the Bathurst Region

Strategy (SC11) Maintain the use of existing provisions and standards or strategy objectives and recommendations in the local planning instruments that effectively protect, enhance and manage high biodiversity conservation areas

- Continually review provisions, standards, guidelines, recommendations in local planning instruments as knowledge is gained
- Continue to adopt Bathurst Regional (Interim) DCP, 2011, Section 9 standards
- Continue to pre-plan (or micro-plan) for rural residential and village development in new estates recognising existing remnant vegetation, waterways, habitat linkages (for additional standards refer Strategy SCx)
- Adopt UWMP recommendation for minimum width of the waterways drainage reserves to be 20m from each streambank (refer UWMP Strategies S2, S19)
- Implement the settlement strategy (per strategic objective in the Bathurst Region Rural Strategy, 2008) that includes the 'concentration of new living opportunities within and close to the existing villages and settlement areas' as it is recognised that a 'no-growth option' is not an option for BRC and it seeks to minimise impacts on agricultural lands, concentrates service provision and in terms of biodiversity it concentrates development in one area. Despite the villages generally being in or close to HBCV areas there is a risk that **unplanned** development scattered anywhere in the region could have a greater impact on biodiversity in the future.
- Achieve relevant objectives identified in the Urban Strategy 2007 by implementing actions as recommended. The relevant objectives include the following environmental issues: urban salinity, waterways, biodiversity/vegetation, bushfire protection and climate change.

Objective 5: Council developments and associated works activities to comply with environmental legislation, policies and strategies to protect biodiversity

Strategy (SC12) Ensure all Council developments and associated works activities comply with relevant legislation, policies and strategies

- BRC need to ensure that as a land developer it causes no significant adverse impacts to listed threatened species, populations or ecological community, their habitats and critical habitat as directed under the TSC and FM Acts. Also that developments or activities do not significantly impact on a matter protected by the EPBC Act
 - Activities may include the clearing native vegetation, changing the natural flow of water, or controlling weeds and other pests
- BRC to comply with State Environmental Planning Policy – 44 Koala Habitat Protection, until locally relevant provisions are included in the LEP/DCP
- Aquatic Habitat Management and Fish Conservation Policy and Guidelines. Assess development applications in relation to any impacts on aquatic habitat according to the guidelines
- Assessments of impacts to be scientifically rigorous, preferably based at the landscape-scale and need to consider the likely impacts of climate change
- Ensure assessors are suitably qualified and assessments are based on good quality data and mapping resources
- Developments need to ensure the environment/biodiversity is properly managed, protected, restored, enhanced and conserved in accordance with its responsibilities under the LG Act

Strategy (SC13) Ensure a rigorous assessment of developments and activities under the EPBC, TSC and FM Acts and Part 4 of the EP&A Act with Council as the consent authority

- Landscape-scale assessments are better able to assess the cumulative impacts of a number of smaller developments
- Ensure assessments are undertaken by suitably qualified personnel
- Consider the mandatory requirement of the 7-Part test of significance under the TSC Act for all development applications in rural lands

- Ensure the rigour of any Biobanking assessment or BioCertification scheme. Offsetting should be a last resort after all attempts to minimising impacts have been explored. Offsets must be comparable in the short to medium-term, i.e. new plantings do not equate to woodlands/forest of mixed age class
- Mandate offsets where developments are to be approved and can not be avoided
- Link with Strategy SR1, SR3

Council as an environmental regulator

Objective 6: Biodiversity is protected through the regulatory framework

Strategy (SR1) Regulate and enforce controls within the legislative framework to protect biodiversity

- **TSC and FM Acts** – Threatened species impact assessments as an integral part of environmental impact assessments under the EP&A Act (under Parts 4 of the EP&A Act)
 - BRC as the consent authority must regulate the application of the 7-Part test of significance for development applications to ensure the development does not significantly impact on threatened species, populations or ecological communities and their habitats (link with Strategy SC13)
 - Ensure development proponents comply with development conditions
- **Relevant key objectives addressed in Section 117 Ministerial Directions issued under the EP&A Act.** Recommendations for BRC to meet these objectives include:
 - **Conserve and manage environmental and indigenous heritage**
 - Areas recognised as being of high conservation value or of indigenous heritage value that are under threat should trigger the development of a site specific management plan, that has been developed in consultation with relevant stakeholders, and which forms the basis for a possible funding applications and future management. If more than one site is recognised a regional management plan should be considered for development. (link with Strategies SM3, SM5, SM6, SM8, SM9, SM10)
 - **Recreational vehicle areas**
 - Encourage community reporting of inappropriate vehicle usage in environmentally sensitive areas. i.e. areas of high biodiversity conservation value, areas with high erosion potential or erosion hazards, high heritage significance, known habitat for threatened species, where impacts on waterways degrade riparian or instream habitat, cause bed or bank erosion or water quality reduction (link with Strategy SR3, SL8, SL19)
 - Barricade off areas where vehicle access should be restricted
 - **Bushfire protection**
 - Ensure biodiversity assets on BRC controlled land are protected from unauthorised burns
- **Protection of the Environment Operations Act (POEO Act), 1997**

Where BRC is the regulatory authority - the Council compliance officer to regulate non-scheduled activities through notice and enforcement powers in the Bathurst Region. Including:

 - Prohibiting or regulating the discharge of specified substances into sewers or any specified class of sewers/stormwater
 - The issuing of environment protection notices for clean-up
 - Preventing, controlling, abating or mitigating pollution
 - Prohibiting or regulating aquatic activities if water quality is compromised
 - Maintain water quality testing in the Macquarie River (link with Strategy SO9)
 - Continue quality testing in Raglan Creek (link with Strategy SO9)
 - Cover your load penalties
 - Illegal dumping of garden refuse, land fill and other rubbish in areas that impact on biodiversity
 - Regulate or reduce the phosphate pollution into waterways
- **BRC's Trade Waste Policy**
 - Ensure the adequate reporting and inspections of premises with trade waste discharges
- **Local Government Act**
 - Control of activities on public land (Section 632 – Act contrary to notice), can prohibit firewood collection, entry of vehicles etc

Strategy (SR2) Inform development proponents of their legal responsibilities in regards to protecting migratory and threatened species, populations or ecological communities or their habitats in the EPBC, TSC and FM Acts

- BRC to inform proponents of their legal responsibilities according to the EPBC, TSC and FM Acts
- Recommend BRC display assessment documents for public information and comment and to provide facilities for the display/availability of such documents

Strategy (SR3) Enforce provisions and development control standards in existing, new and amended environmental planning instruments

- Existing provisions and standards include:
 - Tree preservation orders
 - Sediment and erosion control under BRC's 'Erosion and Sediment Control Guidelines for Building Sites' and 'Managing Urban Stormwater: Soils and Construction, 2004'
- Ensure rigorous environmental assessments in accordance with the Interim DCP, Section 9 'Environmental

Considerations'

- Enforce provisions in new environmental planning instruments (link with Strategy SC8)

Objective 7: Regulations that aim to protect biodiversity are communicated through community awareness initiatives

Strategy (SR4) Suitably inform community of key environmental messages/regulations at campsites, recreational and open space areas on Council controlled land

- Develop a program that suitably informs the wider community of key environmental messages/regulations at campsites, recreational and open space areas on Council controlled land (**Action AR1**)
- Ordinance signage - messages can relate to the following concepts:
 - Illegal dumping or garden refuse or household rubbish
 - Take rubbish home or dispose of responsibly
 - Trout stream regulations and information
 - Bushrock removal prohibited
 - The riding of motorbikes in conservation reserves
 - Notification of illegal access
 - Firewood collection (provision of wood for camp fires permissible in some areas, collection in other areas totally prohibited – site dependent)
 - No vehicles or motorbikes in some areas
 - No shooting or use of bows and arrows
 - Vehicle trafficking causing erosion
 - Restricted access of 4WD across streams (some areas)
 - Dogs – site dependent whether permissible or not
 - Camp fires – rules
 - Throwing cigarette butts out of car windows during periods of high fire danger
 - The wilful damage of the natural environment
- Notification that fines can apply
- Signs are not always effective so other strategies may need to be employed (link with Strategy SL8)

Objective 8: Biodiversity is protected through Council initiated regulation and incentives

Strategy (SR5) Continue with existing initiatives and incentives and develop new ones that aim to protect biodiversity and its environment

- Continue or expand on existing regulatory initiatives and incentives (**Action AR2**) such as:
 - 'Dob in a Dumper' program
 - Water restrictions on an on-needs basis (supported with community education program)
 - NetWaste program to continue and be promoted as a means of reducing the incidence of illegal dumping of green waste (with potential for the spread of weeds) and other recyclable materials in open space areas and contributing to landfill
 - Education for builders and contractors on best practice sediment and erosion control as per 'Erosion and Sediment Control Guidelines for Building Sites'
 - Water quality monitoring according to ANZECC guidelines on the Macquarie River in relation to EPA licenses
 - Bush rock removal and firewood collection on Council controlled land
 - Incentive programs, rate differentials, levies, developer contributions
 - Link with Strategy SL19

Council as an operator of major infrastructure and facilities

Objective 9: The operation of Council's infrastructure and facilities complies with legislative, regulatory and planning requirements for the enhancement, protection and conservation of biodiversity

Strategy (SO1) Council to comply with existing regulatory and legal responsibilities as a roads authority

- Regulatory environmental management plans (EMP) to include key strategies aimed at managing biodiversity and works need to comply with the EMP recommendations
- Undertake environmental self-assessment practices
- Adopt rigorous assessment procedures
- Ensure compliance with environmental legislation and regulations
 - Notification given to NSW Fisheries (DPI) of any proposed activity in accordance with provisions under the FM Act
 - Activities should do not impact on threatened species etc as listed under the TSC, FM and EPBC Acts
 - For bridges, roads, causeways and culverts -refer to and comply with the Aquatic Habitat Management and Fish Conservation Policy and Guidelines (NSW Department of Primary Industries 1999), Policy and Guidelines for Fish Friendly Waterways Crossings (NSW Department of Primary Industries) and Why

- Do Fish Need to Cross the Road? (Fairfull & Witheridge 2003)
- Meet regulatory requirements to achieve the state water quality and river flow objectives
- Sediment and erosion control in accordance with the 'Blue Book' Managing Urban Stormwater: Soils and Construction, Vol 1, 4th edition, Landcom
- Link with Strategy SM20, SL7

Strategy (SO2) Council to comply with existing regulatory and legal responsibilities in operating its infrastructure and facilities (excluding roads) for biodiversity outcomes

- Ensure management or development activities do not significantly impact on threatened species, population or ecological community and their habitats as listed under the TSC, FM and EPBC Acts
 - Undertake rigorous assessments (link with Strategy SC13)
 - Employ best practice work procedures (link with Strategy SM18, SM19, SM20)
- Continue to control environmental weeds - Noxious Weeds under the *Noxious Weeds Act, 1993*, Weeds of National Significance and national Environment Alert Weeds
 - Consult with Upper Macquarie County Council and their management plans (link with Strategies SM13, SP7)
- Comply with Aquatic Habitat Management and Fish Conservation Policy and Guidelines
 - Applies to Chifley Dam and Winburndale precincts, weirs and flood mitigation works (e.g. additional levee banks)
 - Guidelines also address threats from water pollution and water abstraction applicable to the water filtration plant and the sewage treatment plant
- Council to comply with its environmental protection licence agreements to maintain water quality exiting the source for its Sewage Treatment Plant and Waste Management Centre operations
- Council to continue to review its performance in regards to the criteria outlined in the 'Guidelines for Best Practice Management of Water Supply and Sewerage' under the LG Act
- Council to continue with the adoption of recommendations outlined in various strategy documents including:
 - The Integrated Water Cycle Management Plan
 - Stormwater Management Plan

Objective 10: The biodiversity assets of major infrastructure and facilities operated by Council and the threats to these assets are identified and assessed

Strategy (SO3) Undertake a comprehensive roadside survey of roadside biodiversity and threats

- Undertake a comprehensive roadside survey of high and medium conservation roadside vegetation and identify threats (**Action AO1**)
- Survey to build on existing BRC's Roadside Vegetation Management Guidelines
- Considerations for the survey include:
 - Survey becomes baseline survey for future monitoring
 - Mapping vegetation into Broad Vegetation Types
 - Map EECs and known or likely locations of threatened species or populations etc
 - Assessing and rating condition and conservation values of the vegetation (terrestrial and aquatic)
 - Incorporate findings from BMP condition assessment on land parcels on the road reserves (e.g. Trunkey Creek parcel No. 39805)
 - Identifying and mapping key gaps in vegetation linkages and possible sites suitable for stockpiles or works compounds
 - Provide some indication of connectivity in wider landscape
 - Identify key threats and rate significance against set criteria (e.g. status, intensity, periodicity, cascading influence)
 - Provide prioritised recommendations and guidelines for roadside management in specific areas

Strategy (SO4) Build a register of biodiversity assets on infrastructure and facilities other than roads

- Build a register of biodiversity assets on infrastructure and facilities other than roads (**Action AO2**)
 - Over time build a register of biodiversity assets that combine fauna and flora surveys derived from environmental studies, consultants, field naturalists, bird watchers etc. These studies can include bird surveys of the ponds in the Water Filtration Plant; water bodies at the Waste Management Centre and Sewerage Treatment Works; fauna and flora studies in the Mount Panorama racing precinct; environmental studies in the Chifley Dam precinct and threatened species listing for Winburndale Dam area compiled in the 1998 Evans Shire SoE.
 - Council operates a number of other facilities, such as the Aquatic Centre, car parks, sporting facilities, library and surrounds, plant and machinery depot etc. and infrastructure items (e.g. pumps, underground urban pipes) that are unlikely to support significant biodiversity assets

Strategy (SO5) Identify all road crossings which are a threat to fish passage

- Identify all road crossings which are a threat to fish passage (**Action AO3**)
- Be mindful that some road blockages may pond water providing favourable habitat for other species such as the Platypus. Any threat abatement needs to consider biodiversity at the landscape and ecosystem level.

- Audit all bridges, culverts and causeways and identify any that are or are likely to be barriers to fish passage
 - Known fish barrier includes the Ophir Road bridge on Sawpit Creek (refer UWMP – Sawpit Creek subcatchment). This bridge has some heritage value and needs to be investigated before any action is undertaken
 - Investigate the heritage value of all the older bridges and other structures in the region
- Refer Strategy SP3; UWMP Strategy S21

Objective 11: Major infrastructure and facilities operated by Council are managed to protect, enhance and conserve biodiversity

Strategy (SO6) Develop biodiversity management plan/s for the protection, enhancement and linkage of native vegetation along rural roads

- Develop biodiversity plan/s of management for the protection, enhancement and linkage of native vegetation along rural roads (**Action AO4**)
 - Plan/s to incorporate findings from roadside study and BMP condition assessment (link with Strategy SO3)
 - Develop a fire management plan for rural roads using best management practices (link with Strategy SM18)
 - Restoring linkages should be founded on optimising ecosystem function. This also aids in the overall resilience of the natural landscape to projected climate change impacts, i.e. plant for community structure, species diversity, habitat (allow ample space for trees to mature into large trees); corridor to be as wide as possible within the constraints of clearways etc; add/retain habitat features such as fallen logs;
 - Linkages should also maintain clear zones. Or if key biodiversity assets or rehabilitation areas need protection consider the installation of guard rails
 - Seek external funds for the installation of guard rails to finance any additional costs to preserving biodiversity
 - Develop a prioritised strategy for rehabilitation of areas identified as having high or moderate conservation value
 - Where known animal crossing occurs highlight areas with signs and/or advised speed reduction signs

Strategy (SO7) Develop projects to enhance, protect or conserve biodiversity at Council's infrastructure and facilities

- Develop a program that aims to identify threatened species, populations, EECs and their habitats on Council's facilities and give consideration to threat abatement, habitat enhancement or re-introductions (e.g. introduction of the Green and Golden Bell Frog to the Winburndale Dam aquatic environment). (**Action AO5**)
 - Council would need to partner with other authorities (link with Strategy SP4)
- Install, fix and maintain gross pollution traps (GPTs) in key areas identified through investigation (Link with UWMP Strategy S9) (**Action AO6**)
- Develop biodiversity management plans for the water storage dams operated by Council (**Action AO7**)
 - E.g. Chifley Dam precinct and the Winburndale Dam and environs controlled by Council
 - Consideration needs to be given to the facilities' operational land use and the NSW Water Quality and River Flow Objectives
- Construct fishways at barriers identified in Strategy SO5 to provide adequate fish passage, decommission redundant or major barriers and redesign fish friendly road crossings (**Action AO8**) (Link with Strategy SO5, SP3)
- Enhance Box-Gum Woodland connectivity along roads by rehabilitating key areas or gaps in connectivity as identified in Strategy SO3 (**Action AO9**) (Link with SO3)
- Undertake new water saving projects and build on existing ones (e.g. upgrade of water reticulation and irrigation systems and Water Filtration Plant) (**Action AO10**)
- Review the pipeline route from Winburndale Dam with the view that the pipe may need to be replaced in sections and pre-plan for optimising biodiversity outcomes (**Action AO11**)
 - Identify risk areas and undertake appropriate fauna and flora surveys and threatened species assessments along any proposed route that may be impacted during works activities

Strategy (SO8) Seek funding to support project development and implementation to enhance, protect or conserve biodiversity at Council's infrastructure and facilities

- Seek funding to support project development and implementation to enhance, protect or conserve biodiversity at Council's infrastructure and facilities (**Action AO12**)
 - Seeking funds needs to be undertaken on a regular basis

Strategy (SO9) Develop and maintain practices that meet the NSW Water Quality and River Flow Objectives

- Practices need to adopt the water quality and river flow objectives outlined for the Macquarie-Bogan River catchment (Sewage Treatment Plant, Chifley Dam and Winburndale Dam and the Water Treatment Plant

- weir)
- Minimise the effects of weirs and other structures (link with SO5)
- Regulate water release from Chifley and Winburndale Dams, extraction at the Water Filtration Plant and release at the sewage treatment works to meet NSW Water Quality and River Flow Objectives
- Reduce water consumption from dams in the face of climate change or during drought periods
 - Water saving initiatives could include changed water pricing and restrictions
- Continue to implement the Integrated Water Cycle Management Plan
- Improve water quality and flow objectives with the implementation of initiatives such as water sensitive urban design (as appropriate) and stormwater management (e.g. detention basins) (link with SC8, SO10)
- Ensure BRC complies with the Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources
- Continue with water quality testing upstream and downstream of the sewage treatment works
- Continue water quality testing in Raglan Creek
- Use bio-indicators for the monitoring of water quality, e.g. aquatic macroinvertebrate studies in the Macquarie River and urban waterways. Build on existing aquatic macroinvertebrate study
- Link with Strategy SR1
- Link with UWMP Objectives 2 & 3

Strategy (SO10) Manage major infrastructure and facilities for the enhancement and protection of biodiversity

- Manage street/park trees and trees on other operational land
 - Maintenance activities – e.g. canopy pruning should be timed to avoid disturbance to nesting birds
 - Tree selection should consider habitat value, solar access, low weed status, visual amenity (refer VMP Strategy S14)
- Levee banks – maintain to prevent the spread of undesirable plant species and utilise for the development of walking tracks. Enhance with native groundcover species or small shrubs that do not compromise the structural integrity of the levee. Design any plantings with consideration to ease of maintenance.
- Retention/detention basins – enhance biodiversity values where appropriate (link with VMP W18)
 - e.g. do not undertake biodiversity enhancements on embankment or within basin. For enhancements that involve plantings: avoid medium to tall trees and keep to shrubs, sub-shrubs, grasses and forbs
 - Basins have to be managed for their intended purpose
- Low flow pipes - consider alternative options for stormwater management and their replacement with grassed open channels when they become in-effective due to sediment build-up etc (refer UWMP Strategy S6)
- Manage stormwater
 - Seal unsealed roads adjacent to waterway crossings to reduce sediment run-off
 - Regularly check and maintain GPTs and remove any rubbish collected upstream and downstream of the structure
 - Adopt Water Sensitive Urban Design principles where appropriate
 - (Link with SO9)
- Operational areas such as car parks, works depot, aquatic centre, sewage treatment works, waste management centre, water filtration plant etc., – enhance biodiversity values where possible (link with VMP S14, S18)

Strategy (SO11) Implement BRC's Roadside Vegetation Management Guidelines to equip on-ground works staff with knowledge and skills to mitigate against operational activities

- Implement BRC's Roadside Vegetation Management Guidelines through training programs for Council work's crews to improve their knowledge and skills to mitigate against operational activities (**Action AO13**). Training issues could include:
 - Guidelines in the Roadside Vegetation Management Guidelines
 - Correct pruning techniques to reduce injury to street trees and roadside vegetation
 - Table drain grading on gravel roads or rural roads to reduce impacts on roadside vegetation
 - Best management practice for controlling roadside weeds
 - Identification of the Box-Gum Woodland EEC
 - Slashing practices to avoid, where possible, areas of HBCV, regenerating native vegetation, areas prone to erosion, drainage lines, patches of good quality native groundcover vegetation. Also to retain unslashed patches, particularly where native grasses are present to enable seeding to occur and therefore providing resources for seed eating birds

Strategy (SO12) Develop monitoring programs to ensure the on-going management of biodiversity is effective on Council operated infrastructure and facilities

- Develop a monitoring programs to ensure the on-going management of biodiversity is effective on Council operated infrastructure and facilities (**Action AO14**)
 - Evaluate the uptake of recommendations, identify any new threats to biodiversity, and changes in ecosystem condition or conservation value either directly or indirectly related to Council's infrastructure or facility

Council as a manager of community and operational land

Objective 12: Biodiversity protected and enhanced through regulatory compliance

Strategy (SM1) Council to comply with its existing regulatory and legal responsibilities as land owner and controller

- Ensure management or development activities do not significantly impact on threatened species, population or ecological community and their habitats as listed under the TSC, FM and EPBC Acts
 - Undertake rigorous assessments (link with Strategy SC12)
 - Employ best practice work procedures for BRC staff and contractors, e.g. slashing practices in areas recognised as EECs such as Mount Panorama, Booth Street Reserve etc (link with Obj 15 strategies)
- Continue to control environmental weeds - Noxious Weeds under the *Noxious Weeds Act, 1993*, Weeds of National Significance and national Environment Alert Weeds (link with Strategy SM12)
 - Consult with Upper Macquarie County Council and their management plans for weed control on community and operation land (link with Strategy SP)
- Comply with Aquatic Habitat Management and Fish Conservation Policy and Guidelines
 - Guidelines also address threats from water pollution and water abstraction applicable to the Water Filtration Plant and the Sewage Treatment Plant
- Under the *Rural Lands Protection Act, 1998*, Council is obligated to control declared pest species on land they own or control (link with SM12)
- Comply with erosion and sediment control standards

Objective 13: Biodiversity managed and integrated with other land use values through planned management

Strategy (SM2) Review existing and relevant BRC plans of management to update and where necessary include natural resource management and biodiversity issues

- Review existing and relevant BRC management plans to update and where necessary include natural resource management and biodiversity issues (**Action AM1**)

Strategy (SM3) Develop site specific plans of management for the Macquarie River in areas controlled by Council

- Develop site specific plans of management for the Macquarie River in areas controlled by Council (**Action AM2**)
 - Includes the Macquarie River from White Rock to Jubilee Park
 - The river needs to be divided up into management zones as, for example, the river between Evans and the Hereford Street Bridge has different management requirements than the levee section upstream of the STW
 - Plans of management to integrate multiple objectives where applicable such as biodiversity protection and enhancement, consideration for ongoing management, weed and pest management, recreational usage and visual amenity
 - May require the development of landscape plans for plant selection and design, footpath/cycleway/ and other amenity or recreational infrastructure
 - Important to create functional riparian ecosystems with high ecological, geomorphic, hydraulic and hydrologic functioning rather than amenity plantings wherever possible
 - Identify location of existing River Sheoaks
 - Identify threats – weeds, illegal dumping of rubbish, stock access
 - Avoid slashing the streambank macrophyte vegetation to provide bank stability and habitat resources and to allow the regeneration of River Sheoaks
 - Determine the feasibility of managing each threat
 - Characterise river morphology and water flow characteristics and integrate into works procedures– i.e. give consideration to unstable cut banks and stream hydraulics
 - Plan for the on-ground works including timing, method of weed control,
 - Develop a community consultation strategy to facilitate with key community members and government agency representatives
 - Integrate with a educational program (link with Strategy SL4)
 - Weed and/or pest management need to adopt best management practices including willow management, bed and bank stabilisation practices and instream habitat protection, protection of Grey-headed Flying Fox roost sites
 - Include a monitoring and evaluation program at the initial planning phase

Strategy (SM4) Develop a wetlands concept plan for the Raglan Creek Floodplain complex

- Develop a wetlands management plan for the Raglan Creek floodplain complex (**Action AM3**)
 - Consideration should be given to passive recreation (nature walks, bird watching, wildlife photography), education (community and schools) and nature-based tourism
- Plan to scope brick pits, Simplot chain of lagoons, instream wetlands, partnerships with private land owners with consideration given to constraints and opportunities (link with Strategy SP4)

Strategy (SM5) Develop a master plan for the protection, enhancement and linkage of the Box-Gum woodland EEC in the former Bathurst City LGA

- Develop a master plan for the protection, enhancement and linkage of the Box-Gum woodland EEC in the former Bathurst City LGA (**Action AM4**)
 - Map existing trees and woodland patches and describe or assess their condition
 - Identify specific threats
 - Develop management and rehabilitation plan and proposed measures for improving linkages through the urban landscape from Mount Panorama to the Macquarie River and Queen Charlotte Vale Creek (Vale Creek)

Strategy (SM6) Undertake a biodiversity survey and develop a management plan for lower Sawpit Creek prior to urban development

- Undertake a biodiversity survey and develop a management plan for lower Sawpit Creek prior to urban development (**Action AM5**). Factors to consider include:
 - Refer UWMP Sawpit Creek subcatchment profile
 - Aquatic and terrestrial fauna and flora
 - Willow removal and revegetation
 - Threats
 - Streambank and streambed erosion mitigation measures (especially along Ophir Road)
 - Erosion and sediment control from surrounding landscape
 - Reducing the impacts of sediment/nutrient loading into the stream from the neighbouring farmland
 - Enhancing the existing pools and sediment bars for aquatic habitat
 - Opportunities for pedestrian/cycleways and other recreational opportunities
 - Managing the stream primarily for biodiversity and ecosystem services it provides

Strategy (SM7) Develop a Grey-headed Flying Fox management plan

- Develop a Grey-headed Flying Fox management plan (**Action AM6**)
 - Consideration needs to be given to the protection of the flying fox and their habitats. As well the plan needs to address safety issues and the negative impacts, perceived or otherwise, they cause. Also community perceptions, roost sites, population, threats to community assets including unlikely use of city parks as roosting areas (link with Strategy SM7, SM25)

Strategy (SM8) Develop biodiversity management plans for the protection, enhancement, conservation and linkage of native vegetation in the villages

- Develop biodiversity plans of management for the protection, enhancement, conservation and linkage of native vegetation in the rural villages (**Action AM7**)
 - Villages and rural settlements include: Perthville, Georges Plains, Trunkey Creek, Rockley, Wattle Flat, Sofala, Hill End, Peel and Yetholme
 - Refer Section 12 for site specific management recommendations
 - Consideration needs to be given to weed management (including commercial enterprises such as Radiata Pine and the European Olive, which can become invasive), the protection of key conservation areas, identifying threats, feral cat management, riparian enhancement, existing land use, recreational and visual amenity, public safety and on-going management constraints
 - Give consideration to the development of partnerships with other landholders including Lands Department for conservation linkages and land management (link with Strategy SP7)
 - Integrate a fire management plan using best management practices (link with Strategy SM18)
 - Management needs to be specific for each village or settlement as well as for each land parcel
 - After the development of the plans the actions/recommendations need to be prioritised for implementation

Strategy (SM9) Develop a biodiversity management plan for the Mount Panorama precinct

- Develop a biodiversity management plan for the Mount Panorama precinct (**Action AM8**)
 - Plan to include all Council owned and controlled land (community and operational)
 - Manage biodiversity in the context of all the other competing land uses
 - Develop strategies/recommendations to protect, enhance and conserve the Box-Gum Woodland and the Tablelands Basalt Forest EECs
 - Map the distribution and condition of the EECs
 - Refer to the BRC's Fauna Management Strategy for the Mount Panorama precinct (Kerle *et al.* 2012) and implement recommendations
 - 'Bring to the table' for discussion the motor-cross track on the south-western side of the Mount in the Box-Gum Woodland EEC and all other recreational pursuits to ensure community/operational needs are met and the natural environment is managed appropriately
 - Weeds, rabbits, foxes and other threats relating to direct disturbance need to be addressed
 - Weeds, which contribute to habitat resources for birds (e.g. African Boxthorn and Hawthorn), need to be removed and replaced with more appropriate species in a staged process
 - Define 'controlled-mow zones', particularly in areas where native trees and shrubs are regenerating, there is a high abundance or density of native groundcover, it is not required for recreation and is

presently under threat from erosion and undesirable vehicle access. Slashing frequency to coincide with major events, before seed-set in thistles and if possible post seed-set in native species.

- Develop a fire management plan using best management practices (link with Strategy SM18)
- Integrate into the plan a proposal for a walking track around the western and southern side of the Mount
- Partner with the Aboriginal Lands Council regarding the old Sir Joseph Banks reserve to integrate management and to access funds (link with Strategy SP4)
- Link with Strategy SP7 and VMP Strategies RV8-RV13

Strategy (SM10) Develop specific biodiversity management plans for areas identified as having high or very high ecosystem condition/conservation value

- Develop specific biodiversity management plans for areas identified as having high or very high ecosystem condition/conservation value (**Action AM9**)
 - Suggested areas (may not include the whole land parcel) are: Sofala Oakey Creek, Wattle Flat racecourse, Hill End racecourse, Peel Quarry and surrounding bushland, Trunkey Creek road reserve, Trunkey Creek sportsground bushland, Mount Tarana
 - Consider linkages to the wider landscape and possible biodiversity conservation works on land not owned or controlled by Council
 - Develop a fire management plan using best management practices (link with Strategy SM18)
 - Link with Strategy SP4

Strategy (SM11) Develop concept and/or management plan/s for the enhancement of poorly utilised Council controlled lands for biodiversity conservation and nature-based tourism/recreation

- Develop plan/s of management for the enhancement of poorly utilised areas in Council control for nature-based tourism and recreation (**Action AM10**).
 - Refer Section 12 for site specific recommendations
 - Enhance and protect the biodiversity in the area using best management practices
 - Plan for the minimisation of recreational impacts
 - For Crown reserves, under the *Crown Lands Act, 1989*, Council may initiate the preparation of a Plan of Management in consultation with the Department of Lands (link with SP7)
 - Land parcels could include (possibly included in its own management plan): Mount Panorama; Oakey Creek reserve, Sofala (Parcel Nos. 30514, 39496); Sofala on the Turon River for possible camping (Parcel Nos. 39177, 39806); Turon River reserves, Turondale Road (Parcel Nos 38388, 39807, 39808); Wattle Flat Racecourse (Parcel Nos. 39157, 39158); Hill End Racecourse (Parcel No. 39680); Peel (Parcel Nos. 37605, 29715), Tarana Mount (Parcel No. 38422), Trunkey Creek (Parcel Nos. 42721, 39805), Napoleon Reef (Parcel No. 29158, 29159, 29160) for passive bird-watching, bush walks and picnics.
 - Plans to consider weed management, stock exclusion or management, minimising impacts from recreational activities and other threats, recommendations to enhance and protect biodiversity while maintaining the recreational and amenity value of the area
 - When developing a fire management plan or when hazard reduction or prescribed burns are carried out or are considered warranted, ensure the adoption of the recommended fire frequency interval as per Guidelines for Ecologically Sustainable Fire Management (NSW NPWS 2004) and are in accordance with Rural Fire Service (RFS) guidelines.

Strategy (SM12) Develop a weed and pest management plan for Council owned and controlled land

- Develop weed and pest management plan/s for Council owned and controlled land (**Action AM11**)
- Issues to include:
 - Invading species can be targeted by controlling their dispersal into a site, controlling their establishment or subsequent spread or where weeds are already established control by physical or chemical means or by encouraging regrowth of native species
 - Care needs to taken to re-establish native or desirable species following or prior to weed removal as the gaps may be vulnerable to further invasions (e.g. following Serrated Tussock removal), may induce surface or stream erosion (e.g. willows) and the absence of the weed/s may reduce habitat resources to some fauna species (e.g. African Box Thorn and Hawthorn provide habitat for small birds)
 - Prioritise the control of weeds and pests and determine indicative costs and time-frames for implementation
 - Describe the rehabilitation procedure, especially for areas with staged weed removal (e.g. willows and other weeds that provide habitat resources for birds and flying foxes etc)
 - Remove all regenerating willows in rehabilitation areas or where they are colonising disturbed areas
 - Remove willows along waterways using best management practice and considering the staging of willow removal to reduce the threat of bed and bank erosion and habitat loss. Also timing tree removal to coincide with non-breeding seasons for nesting birds and roosting flying foxes. Also the method of removal to prevent fragmented vegetative parts becoming established downstream, to minimise the impacts of erosion and bank destabilisation and to retain trunks and branches for perching birds and roosting flying foxes. Consider leaving some dead or recently poisoned willows as free standing trees to decay naturally, minimise bank and bed disruption, provide habitat resources etc.
 - The judicious control of weeds may be necessary to prevent the removal of vegetation exposing soil to

- erosion (e.g. sheet, rill, gully and streambed and bank erosion), removing habitat or resources for native species (e.g. hawthorn for small native birds)
- Understand predator-prey dynamics before embarking on pest control as the control of one species in isolation may cause undesirable consequences with the increase in other species
- Develop vertebrate pest management plans and cooperative management programs for the Bathurst Region in partnerships with the Livestock Health and Pest Authority, Upper Macquarie County Council etc (link with Strategy SP7)
- Refer Section 12 of the BMP for land parcels requiring targeted weed and pest control

Objective 14: Biodiversity protected and enhanced with the implementation of management plans and the undertaking of on-ground works

Strategy (SM13) Implement biodiversity management plans developed for community and operation land and undertake on-ground works as recommended

- Projects include:
 - Implement biodiversity management recommendations for the Macquarie River in areas controlled by Council (**Action AM12**). Adopt a staged approach to on-ground works if necessary for environmental and economic reasons (link with Strategies SL4, SP3, SP4)
 - Implement the recommendations provided in the proposed Raglan Creek wetlands concept plan (**Action AM13**) (link with Strategies SC7, SM4, SL4, SP3, SP7)
 - Implement rehabilitation or restoration works of the Box-Gum Woodlands in the former Bathurst City LGA as recommended in the proposed master plan (**Action AM14**) (link with Strategies SC7, SM4, SL4, SP3, SP7)
 - Implement recommendations from the proposed lower Sawpit Creek study into on-ground actions and BRC's planning provisions (**Action AM15**) (link with Strategies SC8, SM6, SL4)
 - Implement recommendations identified in the proposed biodiversity management plans in the rural villages (**Action AM16**) (link with Strategies SC8, SM8, SL4)
 - Implement restoration works along roadways to improve biodiversity conservation as recommended in the proposed roadside vegetation biodiversity management plan (**Action AM17**) (link with Strategies SO3, SO6)
 - Implement strategies, recommendations or actions in the proposed Mount Panorama precinct biodiversity management plan (**Action AM18**) (link with Strategies SM9, SM14, SP7)
 - Implement recommendations given in the proposed biodiversity management plan for areas of recreational usage (**Action AM19**) (link with SM11, SP7)
 - Implement recommendations for the enhancement of poorly utilised areas in Council control for nature-based tourism/recreation (**Action AM20**) (link with SL2, SL8, SP7)
 - Implement weed and pest control measures as prioritised and recommended in the proposed weed and pest management plan for Council owned and controlled land (**Action AM21**) (link with SM12, SP7)
 - Implement recommendations provided in the 2012 Pest Bird Management Plan (**AM22**)
 - Continue to implement strategies, recommendations and actions in the UWMP
 - Continue to implement biodiversity related strategies, recommendations and actions in the VMP

Strategy (SM14) Undertake planting programs and on-ground works to improve biodiversity outcomes in the urban and peri-urban environment as identified in existing management/landscape plans

- Implement Stage 2 of the Urban Drainage Reserves Revegetation Landscape Plan including Cedar Drive, Mitchell Highway off Richardson Street, Boundary Road opposite the Golf Club, McDiarmid Reserve, the Kelso industrial area and O'Connell Road as per guidelines in the report (**Action AM23**)
- Develop a planting program within the urban/peri-urban environment that enhances biodiversity, to include road reserves, buffer zones in industrial areas and housing estates, parks, open space reserves, drainage reserves and operational land (**AM24**) (e.g. links with VMP themes and strategies and UWMP strategies)
- Biodiversity enhancement, plant selection, planting design and maintenance need to consider:
 - Existing land use and function
 - Functional diversity of plants (e.g. flowering shrubs over different seasons, seed producing grasses, plants for perching, nesting etc)
 - Habitat complexity (logs, long grass, trees, shrubs, forbs, nest sites)
 - Visual amenity (aesthetics, view protection or enhancement)
 - Environmental attributes (e.g. solar radiation, climate control)
 - Operational practicalities for maintenance (e.g. slashing, access and weed control)
 - Public safety – snakes (e.g. leave 'controlled mow zones' adjacent to fences), personal or property security (e.g. avoid inappropriate screening)
 - Existing plantings (e.g. competition for light and water and complementarity to type of plantings)
 - Regardless of potential threats due to climate change, in times of increased water security and user demand, planting high water dependent plants or those with a low tolerance to heat stress is no longer appropriate
 - Consider the possible integration of 'controlled mow zones' for improved ecosystem function, erosion control and habitat
 - Improve structural diversity with the planting of trees, shrubs, sub-shrubs, and/or groundcover species as per site-specific requirements
 - Maintenance activities such as pruning needs to be timed out of season of nesting birds and tree

flowering. Consider arboreal animals and if nesting sites likely to be impacted investigate alternatives such as nest boxes

Strategy (SM15) Maintain revegetation and rehabilitation areas on Council owned or controlled land

- Maintain revegetation and rehabilitation areas as part of Council's general operation of community and operation land including:
 - The urban drainage reserves of Marsden Lane, Rosemont Avenue, Laffing Waters, Darwin Drive and Ussher Crescent as per guidelines detailed in the Urban Drainage Reserve Revegetation Landscape Plans. Maintenance to include reserves revegetated in Stage 2 of the revegetation program once replanted.
 - Recent waterways plantings along Raglan Creek, Hawthornden Creek and Sawpit Creek
 - Future revegetation/rehabilitation areas

Strategy (SM16) Implement the Urban Waterways Management Plan

- Refer UWMP strategies, recommendations and actions

Strategy (SM17) Seek funding opportunities to assist with the implementation of rehabilitation, restoration and conservation projects

- Funding for projects identified in the BMP
- Implement the UWMP according to its implementation process. There are also recommendations within this Plan for strategies and actions of the UWMP to be implemented and these are recorded in the Site-specific management section (refer Section 12)
- Links with Strategies SP4

Objective 15: Biodiversity protected and enhanced through the adoption of best management practices

Strategy (SM18) Ensure prescribed burns used as an environmental management tool or fire hazard reduction burns adopt best management practices

- When developing a fire management plan or when hazard reduction or prescribed burns are carried out or are considered warranted, ensure the adoption of the guidelines as per 'Guidelines for Ecologically Sustainable Fire Management' (NSW NPWS 2004) and are in accordance with Rural Fire Service (RFS) guidelines i.e. consideration needs to be given to fire frequency intervals and area of burn etc
- There should be no adverse impact on threatened species, populations or their habitats and EECs as a result of the fire
- 'Ecological consequences of high frequency fires' is listed as a Key Threatening Process in the TSC Act
- The fire frequency intervals are to be used as a guide only as seasonal conditions may change fuel loading etc and therefore the optimal time to burn
- Protection of life and property should be ensured
- With the risk of climate change having the potential to increase the incidence and intensity of bushfires, fire management needs to be adaptive to this change in threat
- Foster regional partnerships with the RFS to ensure capacity to manage bushfires for community benefit including biodiversity outcomes (link with Strategy SP3)
- Educate for fire management to achieve positive outcomes for biodiversity (link with Strategy SL2)

Strategy (SM19) Enhance the extent, resilience and diversity of native grasses on Council owned or controlled land

- Identify areas where a change in groundcover management can be undertaken to improve biodiversity and ecosystem function (**Action AM25**)
- Adopt management practices to:
 - Avoid or manage the slashing of native grasses
 - Control vehicle access to avoid erosion
 - Manage weeds to reduce competition to resources
 - Schedule slashing to be undertaken post flowering and seed-set
 - Consider prescribed burns to enhance biodiversity in some areas
 - Avoid slashing groundcover in areas where there are newly regenerated native trees/shrubs or provide protection for new plants
- Link to Strategies SM3, 4, 5 6, 8 & 9 and VMP RV2

Strategy (SM20) Undertake training days for council on-ground staff and machinery operators to ensure the protection of biodiversity

- Undertake training days for council on-ground staff and machinery operators to ensure the protection of biodiversity (**Action AM26**). Topics could include:
 - Targeted training to key on-ground staff
 - Recognition of EECs and environmentally sensitive areas
 - Recognition of 'controlled mow zones' and slashing practice (waterways, native grass areas, areas of

- regenerating woodlands)
- Minimising injury to trees from mechanical damage
- Correct tree pruning
- Ground litter removal and tidy up (retain logs, branches etc along roadsides, woodlands and conservation areas)
- Willow removal and riparian restoration
- Remove rubbish or manage damage to reduce the incidence of repeat behaviour

Strategy (SM22) Maintain or enhance non-native vegetation for the improvement of habitat, ecosystem function, ecosystem services or cultural conservation values in the built environment

- Retain and manage non-native vegetation if it has positive values for ecosystem functioning, ecosystem services or has cultural significance (e.g. street trees, historic parks and gardens)
 - Install nest boxes (for birds and possums)
 - Adopt best management practices to ensure the health of street trees and vegetation in parks and open space areas (i.e. pruning, appropriate species selection, avoid mechanical injury etc) (link with VMP S14)

Strategy (SM23) Review and enforce grazing management policy for Council controlled land leased for grazing

- Review and enforce BRC's 'Land Management Guidelines – Leasing, 2004' for Council owned or controlled land leased for grazing (**Action AM27**)
 - Guidelines to also consider stock exclusion as a recommendation for areas of very high/high or potentially high conservation value
 - Include provisions for site specific recommendations, also consider alternative watering points if stock accessing streams
 - Manage horse grazing on the Raglan Creek and Macquarie River floodplain to reduce streambank erosion and nutrient loading into the waterways
 - Manage grazing in woodland areas to improve native plant regeneration, maintain high levels of groundcover and reduce the risk of erosion
 - Areas include Raglan Creek floodplain (Parcel Nos. 42723, 13340), Box-Gum woodland with White Box adjacent to Barry Gurdon Drive (Parcel No. 37061), Hinton Road (Parcel No. 11381), Peel (Parcel Nos. 29686, 29687), Macquarie River floodplain (Parcel Nos. 16158, 16560)
 - Link with VMP RV1, RV12, RV13; UWMP S1, S8

Objective 16: Biodiversity assets and the threats to these assets on Council owned and controlled land known and understood through research and investigation

Strategy (SM24) Undertake fauna, flora and threatened species studies in areas identified in the condition assessment as having high/very high ecosystem condition/conservation value

- Undertake fauna, flora and threatened species studies in areas identified in the condition assessment as having high/very high ecosystem condition/conservation value (**Action AM28**)
 - Studies to provide baseline data and an audit of biodiversity assets
 - Identify threats and impacts to the biodiversity assets
 - Include new data into the biodiversity database/register (link with Strategy SC1)
 - Link with Strategy SP3

Strategy (SM25) Undertake specific fauna, flora and threatened species studies to assist with the development of management guidelines and educational information

- Undertake an urban possum study (**AM29**)
 - Aspects to cover could include: population studies, threats, community perceptions, recommendations for nest box sites, suggestions for involvement with schools in making and erecting nest boxes (also for birds and bats)
 - Generate new knowledge or information that helps to facilitate solutions to managing native fauna in an urban landscape
- Link with SL2, SL4

Objective 17: Ecosystem condition and biodiversity conservation value on land owned or controlled by Council to be evaluated through on-going monitoring programs

Strategy (SM26) Undertake on-going assessments to evaluate ecosystem condition and biodiversity conservation on targeted land parcels owned or controlled by Council

- Develop an on-going assessment program to evaluate ecosystem condition and biodiversity conservation on targeted land parcels owned or controlled by Council (**Action AM30**)
 - Methods to follow condition assessment methodology adopted in the BMP using the project specific pro forma
 - Attributes to assess include: species composition, community structure, ecosystem function, habitat value, condition trend, resilience, delivery of ecosystem services (e.g. improved water quality, reduced erosion and sediment movement, improved visual amenity)

- The time intervals between assessments and the land parcels to be assessed should not be prescriptive and are governed by many factors including:
 - Change or proposed change in land use
 - Notable disturbance impacts
 - Assessments pre and post rehabilitation/restoration works
 - Significant seasonal variation
 - Assessing the impacts of known threats
 - Impacts from extreme weather events (floods, fire, drought)
 - Assessing changes from current land management practices (e.g. grazing, slashing)

Strategy (S27) Monitor biodiversity protection or enhancement projects on Council owned or controlled land and evaluate and report their effectiveness for multiple outcomes

- Monitor biodiversity protection or enhancement projects on Council owned or controlled land and evaluate their effectiveness for multiple outcomes (**Action AM**)
 - Evaluate the effectiveness in terms of ecosystem condition, conservation value, community perception and response, community engagement and benefits to neighbouring areas or reaches upstream/downstream of the project site
 - As well evaluate any negative impacts of the restoration perceived or otherwise (e.g. reduced water runoff into farm dams, perceived loss of amenity, noise from frogs, increase in kangaroo numbers)
 - Report the evaluation and give recommendations for on-going management and how to address negative impacts (e.g. through education or management)
 - Over a long-time period monitor for any affects from climate change impacts on ecosystem function or conservation value

Council as a community leader and facilitator of community action

Objective 18: The community is aware of biodiversity values and issues through education, training and facilitation

Strategy (SL1) Undertake an audit of relevant biodiversity related educational resource material available to BRC and identify gaps

- Undertake an audit of relevant biodiversity related educational resource material available to BRC and identify gaps (**Action AL1**).
- Existing resource material includes and can be sourced from:
 - BRC's Backyards for Wildlife booklet, Greening Bathurst/BRC Plant Selection Guide, Roadside Vegetation Management Guidelines, bi-annual environmental newsletter
 - BRC's weblinks to other environmental documents including VMP, UWMP, Biodiversity Issues Paper, Fauna Management Strategy for the Mount Panorama Precinct, Bathurst Region Urban and Rural Strategies, Bathurst Stormwater Management Plan, Bathurst Region (Interim) DCP
 - In partnership with other agencies and institutions generate a compendium of resources from other sources (link with Strategy SP1)

Strategy (SL2) Build on existing biodiversity related resource material and initiate the development of new resources to fill gaps

- Build on existing biodiversity related resource material and initiate the development of new resources to fill gaps (**Action AL2**)
- Resource material to fill gaps identified in Strategy SL1
- Note: Changing community values, beliefs, and norms will have no effect on behaviour if, for example, the public are aware of weeds impacting on biodiversity though without the full knowledge of what plant species are likely to be potential weeds they could inadvertently purchase and plant undesirable species. Therefore care needs to be taken when preparing resource material to ensure all bases are covered.
- Continue to promote and distribute the BRC's Backyard for Wildlife' booklet
- **Other options for educational resource material could include the following:**
- Information booklets and specific guidelines for good biodiversity management in the rural villages, rural residential areas and rural settlements. Information and guidelines could include:
 - Biodiversity assets in the villages; threats to biodiversity; description of surrounding vegetation; benefits of biodiversity; tips for improving habitat for native fauna;
 - Livestock grazing management to prevent overgrazing, erosion, horses ringbarking trees and the degradation of aquatic habitats
 - Responsible pet ownership with dos and don'ts
 - Threats to biodiversity of firewood collection and bushrock removal
 - Plants to avoid (e.g. invasive species such as Radiata Pine, Hawthorn, gorse, cotoneaster, olives if near bushland), plants to encourage and water-wise practices in the home and garden
 - Problems with the illegal dumping of garden refuse
 - Recycle, reuse and reduce consumables
- Descriptions on the eucalypts or vegetation types of the Central Tablelands/Bathurst Region

- Educational package targeted to real estate agents who sell properties in the rural areas
 - Advise on vegetation clearing legislation to avoid misinformation being given to prospective buyers about clearing, biodiversity values and ecosystem values
- Educational pamphlet to address the impacts of domestic animals and pets on native wildlife
 - Animals to include dogs, cats, deer, goats, aquarium fish, exotic birds
 - Could be distributed with the rates notice
 - Pamphlet to be supported by an educational program such as a media campaign and the continuation of the de-sexing and registration program for dogs and cats for low income earners
- Pamphlet addressing the likely impacts to biodiversity as a result of climate change
 - e.g. increased frequency and intensity of bushfires and the consequent repercussions
 - Heat stress on native plants and animals
 - Canopy thinning, dieback or death of trees and shrubs
 - Invasion of weed species in areas where ecosystem resilience is dropping as a result of climate change and/or lack of adaptive land management
 - Provide WIRES contact details for rescued heat stressed or fire injured animals such as Koalas
- Bird watcher's and angler's guide to the Bathurst Region
 - Booklet could be made available to residents and tourists
 - Provide sections on woodland, wetland, grassland birds etc and recommended places to visit
 - Native fish of the region, fish habitat, exotic species and good fishing guidelines for the protection of aquatic fauna and their habitat
- A nature-lover's guide to the Bathurst Region
 - Ideal for residents and tourists to gain an appreciation and therefore awareness of the biodiversity assets in the region
 - Highlight good bushwalking areas, tourist drives and biodiversity assets
 - List common bird, frog, mammal and reptile species
- Natural History of the Bathurst Region
- Bushfires information
 - Bush fire management using best management practices to protect and enhance biodiversity and to protect life and property (Link with Strategy SM18)
 - Relevance to biodiversity
 - Fire frequency interval and the detrimental effects to biodiversity of too frequent burns (change in species composition, encouraging fire tolerant species, loss of habitat etc)
 - Provide reference to the 'Guidelines for Ecologically Sustainable Fire Management'
 - Native grasses compared to exotics in terms of dry matter production
 - Likely changes as a result of climate change and how to prepare and adapt
- Pamphlet that guides the general public towards environmentally-sensitive behaviour
 - Threats to biodiversity for such actions as firewood collection, bushrock removal
- Information and educational resource material for off-road vehicles enthusiasts (link with Strategy SP7)
 - Brochures/booklet available to 4WD clubs and at tourist information centre
 - Information to provide suggestions for roads and tracks, camp sites, road access conditions and where access is denied, how to respect other users and practices to avoid causing erosion, wheel rutting and impacts to aquatic environments when creek crossing etc.
 - Other tips to include recommendations such as cleaning vehicles to reduce spread of weeds, removing rubbish, keeping to trout fishing regulations etc
 - Biodiversity information – nature-based sites for bushwalking, bird watching, fishing and camping
- Prepare educational resource material derived from the BMP (**Action AL3**)
 - Compile a standalone information booklet/s derived from the BMP. Also to be made available on BRC's website
 - Produce a summary version of the BMP (particularly the strategy tables) providing some contextual background and key objectives
- Link with Strategies SP1, SP4

Strategy (SL3) Develop an overarching educational program that seeks to increase community awareness of biodiversity and natural resource related issues

- Develop an overarching educational program that seeks to increase community awareness of biodiversity and natural resource related issues (**Action AL4**)
- Consider multiple avenues for building awareness including:
 - Passive education using resource material
 - A one day conference on biodiversity addressing management, conservation and appropriate restoration strategies and importantly to better gain a better understanding of holistic land management
 - Jointly facilitate tours of the Bathurst Region for a range of stakeholders aimed at better understanding biodiversity values, issues, restoration strategies and reading the landscape, etc.
 - Link with Strategy SP1
- Initiate the development of programs to equip education in the future

Strategy (SL4) Integrate biodiversity education with Council environmental and biodiversity enhancement projects

- Examples of Council environmental and biodiversity enhancement projects include:

- 'Controlled mow zones' -inform local residents of the significance behind this practice through community planting days or pamphlets
- Drainage line revegetation programs to involve the residents who live in the vicinity with support from the Community Engagement Officer
- For major works, such as Macquarie River restoration, facilitate with the community to ensure the best outcome is achieved for biodiversity, recreation, visual amenity. Involve key community members at the initial stages of restoration planning to discuss weed control and other operational matters
- Prior to prescribed burns notify local residents and take the opportunity of explaining the importance of fire frequency intervals on hazard reduction and biodiversity
- Change in slashing practice to retain native grass patches in open space areas – as above, take the opportunity of explaining to local residents the importance of keeping some areas unslashed
- Rehabilitation or planting sites offering opportunities for demonstration. Sites include: Raglan Creek (reviving Raglan Creek Sites); Boundary Road Reserve; Hector Park; Browning Street Reserve; Hawthornden Creek and Sawpit Creek instream structures; Urban Drainage Reserve Revegetation project
- Set an example for change through Council's own biodiversity management (policies, planning instruments, operations and collaboration with the wider community)
- Address any negative impacts that may arise as a result of restoration/rehabilitation works through facilitation and awareness
- Link with Strategies SL2, SM13, SM14, SM15, SM19

Strategy (SL5) Facilitate and provide leadership on issues that threaten biodiversity or the function of ecosystem processes

- Develop an educational strategy to deal with the controversies relating to competing values of biodiversity conservation and other interests (**Action AL5**)
- Facilitate with the community, for example, when a conflict arises between biodiversity and other values
 - Issues can include the Flying Fox (pest or pollinator), floods (destructive or resource for water, soil fertility, ecosystem function), kangaroos (pest or tourist attraction), frogs in urban creeks (deafening or divine), possums (noisy or nice), long grass/sedges/rushes in drainage line (snake habitat/flood problem or water filter). Also the rights of domestic cats owners and the impact of cats on the environment, bushfire control through regular burnoffs, swamp draining, removal of instream River Sheoak (e.g. Sofala), willows (link with SM7)
 - On-going issue with the flooding of lower Raglan Creek across playing fields and roads
- Partner with agencies to assist with facilitation and resource development (link with Strategy SP1)
- Develop a program that directs Council to communicate directly to individuals, groups or individuals within groups that may knowingly or unwittingly contravene best practice for the protection of biodiversity (**Action AL6**). These could include:
 - **Note: the inclusion in this list does not necessarily imply these group/individuals are undertaking inappropriate activities – it is a guide only
 - Firewood collection proprietors
 - Nurseries and landscapers (stocking or using unsuitable plant species or giving environmentally unsound plant selection advice, selling or using bushrocks etc)
 - Petshops (selling pets/aquatic plants that have the potential to threaten native wildlife or adversely impact on the environment if released or abandoned, selling traps that can drown platypuses)
 - Sporting or motor racing clubs (dirt rallying, motor-cross racing, sporting shooters, archers, fisherman)
 - Conduct at Chifley Dam - pollution release, illegal fishing practices, lighting of fires during fire ban
 - Link with SP5

Strategy (SL6) Implement age-appropriate biodiversity-related educational programs that target early childhood through to young adult

- Implement age-appropriate biodiversity-related educational programs that target early childhood through to young adult (**Action AL7**)
- Make contact with early childhood environmental education networks e.g. NSW Early Childhood Environmental Education Network
- Collaborate with early childhood and school educators in the creation of age appropriate resource material
- Delivery of resource material could also be directed to parents and carer's
- Develop partnerships with the local schools
- Encourage schools to undertake biodiversity-related activities such as:
 - Continue with existing programs between schools and Council if they are successful
 - Streamwatch activities in the waterways close to where some of the children live, e.g. South Bathurst schools could access Hawthornden Creek, West Bathurst – Jordan Creek, Kelso – Raglan Creek
 - Installing nest boxes and identifying the birds in school grounds
 - Have a feature animal to learn about each week – preferably one that lives in the region
 - Involve children in planting days or bushwalks
 - Link with Strategy SP1

Strategy (SL7) Implement programs that inform and educate BRC's Councillors and key Council staff on biodiversity values, threats and current issues

- Implement programs that inform and educate BRC's Councillors on biodiversity values, threats and current issues (**Action AL8**)
 - Continue to organise periodic field trips to enlighten on some biodiversity assets and to keep them informed on BRC projects, achievements and issues
 - Deliver appropriate resource material to keep Councillors informed on regional biodiversity, key environmental issues affecting biodiversity and Council's response to these issues

Strategy (SL8) Install information boards to improve community awareness of biodiversity issues

- Install information boards to improve community awareness of biodiversity issues in bushland reserves (**Action AL9**)
 - Identify and prioritise what signage and where to place them
 - Link with Strategy SR4

Strategy (SL9) Lobby CSU to maintain a teaching-research environmental section within the Central West Catchment

- Lobby CSU to maintain a teaching-research environmental section within the Central West Catchment (**Action AL10**)

Strategy (SL10) Continue to inform the community of the status of biodiversity in the Bathurst Region

- Through State of the Environment reporting, biodiversity section, incorporate the major findings of the BMP, update threatened species data, include key biodiversity assets (or their broad categories), report on biodiversity outcomes as a result of Plan implementation and include implemented actions in the Council's response
- Inform the community through regular channels such as reporting in the media, Council newsletters etc of major biodiversity issues

Strategy (SL11) Provide opportunities for the community to develop a greater understanding of Wiradjuri Country

- Provide opportunities for the community to develop a greater understanding of Wiradjuri Country (**Action AL11**)
 - Facilitate the setting up of a 'Gateway to Wiradjuri Country Centre' on Mount Panorama focussing on their culture and natural history understandings
 - Facilitate setting up of Wiradjuri tourist trails, song-lines etc within the Bathurst Region and where possible linked to the wider Wiradjuri Country
 - Facilitate the writing of a Wiradjuri understanding of natural history/ecology of the Bathurst Region
 - Utilise information derived from any Aboriginal heritage study undertaken in the future
 - Link with Strategy SP4

Objective 19: The level of community interest in matters relating to biodiversity is understood and the level of interest improved

Strategy (SL12) Develop methods and partner with other agencies to identify the underlying causes of lack of awareness, interest, knowledge or motivation towards biodiversity

- Develop methods and partner with other agencies to identify the underlying causes of a lack of awareness, interest, knowledge or motivation towards biodiversity (**Action AL12**)
 - Methods designed to monitor and evaluate the success of existing educational initiatives and to gauge the response of new educational programs
 - Target groups need to be defined – i.e. urban residents, rural residents, rural landholders, school children, village residents, occupiers of bush blocks, local business proprietors
 - Discontinue unsuccessful programs or initiatives and continue with those with positive outcomes
 - Continue the current practice of undertaking community surveys if deemed successful
- Council to work with other agencies to determine reasons for lack of interest in biodiversity issues
- Link with Strategy SP1

Strategy (SL13) Establish what is required for the community to engage in biodiversity-related projects or to shift needed behavioural change

- Establish what is required for the community to engage in biodiversity-related projects or to shift need behavioural change (**Action AL13**)
 - Council to partner with other agencies to find answers and solutions (link with Strategy SP1)
 - Tailor program/s for engagement to a specific target group
 - Balance cost/effort to benefit. Priority should be directed to those most willing to participate in biodiversity-related projects or to make changes to benefit biodiversity

Strategy (SL14) Identify community response to continued growth and development from the perspective of impacts on natural resources, including biodiversity, at the next review of the BRC land use strategies

- Identify community response to continued growth and development from the perspective of impacts on natural resources including biodiversity (**Action AL14**). Issues to address include:
 - Establish a community vision for growth and development for 2036
 - Develop initiatives which can identify the communities' response to growth and sustainability issues
 - Present balanced arguments between direct economic benefits and the costs on the environment (reduced area for agriculture, erosion risk, higher water demand, waste increase, pollution, cumulative loss of habitat etc)
 - Link with Strategy SP4

Objective 20: The community has the capacity to engage in biodiversity related initiatives

Strategy (SL15) Continue to support existing community groups participating in natural resource management and facilitate the formation and effective operation of new groups

- Continue to support and facilitate with existing 'environmental' community groups such as Greening Bathurst, Conservation Volunteers, Boundary Road Reserve Landcare Group, BCCAN, Jaques Park and Browning Street Reserve community groups
 - Provide support or offer advice for plans of management
 - Assist with the provision of resource materials
 - Collaborate on rehabilitation/restoration projects
 - Assist with funding support or partnering in funding submissions
- Foster and support newly initiated groups to help build capacity through education and the provision of resources and technical advice
- Partner with providers of education to help improve community knowledge
- Retain the Community Engagement Officer
- Link with Strategies SP1, SP4

Strategy (SL16) Develop education and training programs to provide opportunities for the community to gain knowledge and develop skills in biodiversity management

- Develop education and training programs to provide opportunities for the community to gain knowledge and develop skills in biodiversity management (**Action AL15**)
 - Programs can integrate with existing projects where the community become involved in tree planting, weed control and seed collecting etc
 - Partner with agencies to demonstrate best management practices for weed and pest control, bushland restoration/rehabilitation, waterways management threatened species/EEC protection
 - Set up demonstration sites and undertake periodic training days or workshops
 - Link with Strategy SP1, SP4

Strategy (SL17) Facilitate the local Wiradjuri to increase their engagement in biodiversity management and knowledge sharing

- Involve and engage with the local Wiradjuri in biodiversity management (link with Strategy SP4)

Objective 21: Biodiversity outcomes are achieved through motivational incentives

Strategy (SL18) Provide incentives to benefit regional biodiversity and improve biodiversity education

- Develop and provide incentives to benefit regional biodiversity and improve biodiversity education (**Action AL16**)
 - Provide a yearly prize for early childhood centres, primary schools and secondary schools in the Bathurst Region for the most outstanding contribution to a particular biodiversity target in a particular year
 - Provide an annual award to a citizen, community group or school etc for furthering biodiversity conservation within the Bathurst Region
 - Provide a yearly honours degree scholarship (to the value of \$7 500) for a university student or equivalent undertaking biodiversity research approved by BRC within the Bathurst Region
 - Provide incentives for sustainable natural resource management on private land
- Continue to financially support community groups such as the Boundary Road Landcare Group, Greening Bathurst for their operational activities
- Seek out landholders with significant bushland habitats and encourage them to participate in conservation programs
- Promote 'Land for Wildlife' initiative and other appropriate conservation covenants and agreements
- Build on the BRC's 'Backyard for Wildlife' initiative with a sign residents with can publically display on their fence that signifies their backyard has met certain wildlife habitat requirements
- Continue to sponsor National Tree Day
- Link Strategy SP4

Strategy (SL19) Influence behavioural change for biodiversity protection with the development of initiatives outside the regulatory framework

- Influence behavioural change for biodiversity protection with the development of non-regulatory initiatives

(Action AL17)

- Encourage the reporting to Council of inappropriate incidences. Council needs to act on these incident reports to prevent the dissuasion of people reporting and to prevent repeat offences (e.g. the dumping of rubbish in a particular area may increase the propensity for it to happen again)
- Create peer-pressure by making public acknowledgments to residents, community groups, farmers etc for actions that improve biodiversity outcomes – especially if against common practice (e.g. planting of native screening plants instead of *Chamaecyparis lawsoniana* -Lawsons Cypress; washing down driveways during times of water shortage)

Strategy (SL20) Identify funding opportunities for environmental educational programs

- Identify funding opportunities for environmental educational programs (**Action AL17**)
 - e.g. Environmental Trust – Environmental Education Grants Programs, CMA
 - Link with Strategy SP4

Council as a member of regional and local partnerships**Objective 22: Biodiversity education and the facilitation of information relating to biodiversity issues are made available to the wider community through regional and local partnerships****Strategy (SP1) Build or maintain partnerships for the development and facilitation of educational material, programs and initiatives to the community**

- Continue the alliance with Orange City Council for the shared employment of the Community Engagement Officer (**AP1**)
- Maintain partnerships with the Central West and Lachlan CMAs to develop educational programs focusing on natural resource management. (Link with strategy SL4)
- Develop partnership with other agencies for dealing with environmental controversies and misguided popular opinion (link with Strategy SL4)
- Partner with agencies to identify causes of lack of biodiversity awareness and to establish what is required to engage the community (link with Strategy SL12)
- Maintain partnerships with existing Landcare and other community groups and support new ones to help build local knowledge and skills in environmental management
- Aquatic biodiversity
 - Partner with NSW DPI-Fisheries, anglers clubs and petshop owners in the dissemination of educational material on the impacts of dumping live fish and other exotic aquatic fauna and flora; the illegality of introducing live fish into any public NSW waterway; the key native fish and their habitats in the region; and other carp control initiatives focused on collaboration (refer NSW Carp Control Plan). (Link with Strategy SL2)
- NSW OEH
 - Help prepare the community to adapt and prepare for climate change impacts, whilst protecting the environment wherever possible. This may include issues such as fire frequency intervals, building ecosystem resilience, developing water-wise gardens and reducing water consumption in an endeavour to maintain environmental flows, and improving non-renewable energy and fuel efficiency of Council per capita etc.
 - OEH, DPI-Fisheries and SEWPAC to help the community (individuals, developers, consultants, environmental groups etc) understand, have knowledge of and their legal responsibilities towards threatened species, EECs etc under the TSC, and FM and EPBC Acts.
 - Help the community with their regulatory responsibilities in relation to scheduled and non-scheduled activities listed under the PEO Act
- NSW Planning and Infrastructure
 - Help the community with their legal responsibilities in relation to the EP&A Act
- Local schools and other educational institutions (link with strategy SL6)

Strategy (SP2) Council to support educational institutions and environmental organisations with their delivery of environmental education

- Council to support educational institutions and environmental organisations in their delivery of environmental education. This may be achieved through a number of avenues such as:
 - Influencing or being involved in research studies and activities (adopting or utilising research findings, participating in subject area or research topic etc)
 - Providing funding support or resources
 - Being an advocate for educational initiatives
 - Providing job training opportunities
 - Providing graduate positions or programs
 - Partnering in the development of new educational facilities (such as the Flannery Centre)
 - Providing resources to schools, assist in environmental activities if required, help develop environmental education packages and help with incentive to encourage engagement

- Providing a number of scholarships to honours and post graduate students for students to cost effectively fill in gaps highlighted in this plan

Objective 23: Information and data resources are created, expanded upon and shared in the interests of protecting and enhancing regional biodiversity

Strategy (SP3) Access and reciprocate resource material to allow for informed management of regional biodiversity

- Develop a program to plan and assist with the creation, access and reciprocation of resource material to allow for informed management of regional biodiversity (**Action AP2**)
- Program needs to consider:
 - Priority setting - what is needed, when for, who is responsible for data collection/analysis/map development etc,
 - Data gaps (what is needed and by whom)
 - Archiving old material and retrieval methods
 - Identification of data sources (government agencies, consultants, consultant's reports, Roads and Maritime Services RMS, utilities authorities) and those requiring Council's resources (government agencies, consultants, developers, RMS, utilities authorities)
 - How is this information going to be available to the public, what is going to be available and in what format
- Partnerships to:
 - Help with the identification and mapping of biodiversity assets, stream type and condition according to the Riverstyles® framework, areas of HBCV (including threatened species, EECs etc), conservation linkages
 - Help facilitate the mapping of vegetation within Bathurst Region at 1:25 000/1:50 000 scale and Broad Habitat Types for faunal species
 - Help facilitate the mapping of the condition and conservation status of waterways in the Bathurst Region (utilise, for example, data and mapping information from the River Styles® assessments and from the 'Assessment of Riverine Health in the Macquarie, Castlereagh and Bogan River Catchments by Baker and Raisin 2000
 - Access information from naturalists, landholders etc with knowledge of fauna and flora, their distribution and abundance, and their historical reference
 - Identification of knowledge gaps
 - Help with the dissemination of resource material and collaboration for the development of the Regional State of the Environment report prepared by regional councils/consultant
 - Keep up to date with relevant research (universities, institutions, agencies)
 - Discuss climate change threats and impacts on biodiversity - OEH
 - Developing best management practices (e.g. for riparian weed control – willows and other species)
 - Keep informed of riparian issues and help identify fish barriers and with the design and construction of fishways - DPI-Fisheries
 - Keep up to date with regionally relevant biodiversity research both completed and in preparation by researchers from universities, government agencies, private individuals, field naturalists etc
 - Improve the regional understanding of bush fires, ecology and fire management - RFS, OEH
 - Build databases (including threatened species) - Bird watching groups, naturalists, Birds Australia, conservation groups, consultants
- Knowledge and experience of biodiversity management gained by BRC to be shared with Orange and Dubbo City Councils as part of the BOD Alliance
- Much of the information held in institutions such as museums, historical societies and libraries remains untapped and unrecognised although it likely is the key to important insights about the history of biodiversity within the Bathurst area and may warrant investigation
- Retain a watching brief on mining and or other developments that bypass BRC oversight (e.g. EISs) both for possible impacts on LGA biodiversity values and/or as a source of biodiversity data
- Identify local residents or landholders engaged in long term natural history/ecology studies

Objective 24: Regionally-based biodiversity projects are successfully developed, funded and implemented through the fostering of strong partnerships

Strategy (SP4) Maintain or foster new partnerships for the successful development, funding and implementation of biodiversity protection and enhancement projects

- Identify opportunities for biodiversity management through regional and local partnerships (**Action AP3**)
- Partnerships fostered for:
 - Advice, resources, funding (joint partners with BRC or BRC as recipient of funds), skills, collaboration, facilitation, lobbying, regional-scale projects, projects across land tenures
- Partnerships maintained or fostered with (for example):
 - Regional councils for the development of regional river enhancement programs
 - Central West and Lachlan CMAs (funding, works contracts, educational programs)
 - Vegetation Management Plan Reference Group
 - DPI-Fisheries (creating fish friendly road crossings, fishways, instream structures)

- Nature Conservation Trust (land purchase and conservation covenants for private land with HBCV, Raglan Creek wetlands)
- Aboriginal Lands Council (Wiradjuri initiated projects, conservation/education programs in the Sir Joseph Banks Reserve) (link with Strategy SL11)
- Bathurst Orange Dubbo (BOD) Alliance (Regional projects and the review and implementation of the Environmental Sustainability Action Plan)
- Central Region Organisation of Councils (CENTROC) (regional projects and, with the CWCMA, the delivery of sustainability learnings of the BOD Alliance to smaller councils in the region)
- Department of Lands (Crown Land management)
- OEH (Threatened species, EEC etc - threat abatement or habitat restoration, habitat linkage restoration, private and public lands)
- CSU (habitat restoration)
- Conservation groups, Landcare, community groups (e.g. Greening Bathurst, Boundary Road Reserve Landcare, Jaques Park community group)
- Opportunities include:
 - Opportunities for increasing the area in the region protected, enhanced and conserved for biodiversity through facilitation with the Nature Conservation Trust
 - Keep informed of recovery and threat abatement actions in the NSW Threatened Species Priorities Action Statement
 - Cat control measures – influence state and fed governments and develop vaccine – partnership for education
 - Collaborate with research institutions, OEH private landholders, investors etc, for threatened species reintroductions or specific conservation initiatives
 - Carbon sequestration and offset initiatives
 - Biobanking opportunities
 - Foster relationships with community groups for opportunities (e.g. Wattle Flat Racecourse Committee for the improved utilisation of the area (link with Strategies SM11))
 - Continue partnership with RSPCA to help fund community cat and dog de-sexing programs for low income earners
 - Council to keep abreast of potential areas for collaboration and biodiversity management opportunities with national and state-based conservation groups such as World Wildlife Foundation, Australian Conservation Federation, Forestry Alliance, Nature Conservation Council and the National Trust
 - CRCs and the CSIRO are open to offers by regional councils to work with them on specific topics or in relevant geographic areas where mutual benefits can be demonstrated to accrue
 - Partnerships to provide incentives for biodiversity management (link with Strategy SL18)
 - Develop partnerships that address the continued growth and development in the Bathurst Region in respect to biodiversity, sustainability, agriculture, water, socio-economics etc for the next review of the BRC Land use strategy (link with Strategy SL14)
- Link with Strategy SL15

Objective 25: Regulatory compliance for biodiversity-related issues are achieved through regional and local partnerships with BRC

Strategy (SP5) Build or maintain partnerships to enforce regulations that impact on biodiversity

- Regulatory compliance for biodiversity-related issues are assisted through partnerships with other agencies such as OEH and, Fisheries,
- Link with Strategies SR4, SR5, SL18

Objective 26: Management plans and policies that are the responsibility of BRC and other parties are developed collaboratively to protect or enhance biodiversity

Strategy (SP6) Develop a strategy to address population growth and regional sustainability issues with national, state and regional partners

- Develop a strategy to address population growth and regional sustainability issues with state and regional partners (**Action AP4**)
 - As part of the 'Bathurst 2036 Community Strategic Plan' review process and using the Community Engagement Strategy as a vehicle, BRC to consult with the community on issues of growth and sustainability and their visions for biodiversity.
 - Strengthen existing partnerships and foster new ones
 - Issues to cover could include, along with social and economic considerations, regional growth, population increase, resource use, resource limitations, growth ceiling, threats to natural resources including biodiversity and amenity, land use conversion, infrastructure including roads, allotment size, dwelling standards, housing density
 - Develop a community vision for what Bathurst region may look like in 50 years time from a diverse range of resident's perspectives - not just biodiversity-related
 - Refer vision statements - Section 10
 - Involve regional alliances with Orange, Lithgow, Oberon, Cabonne and Blayney
 - Link with Strategy SL14

Strategy (SP7) Maintain or foster new collaborative partnerships for the development of biodiversity management plans or Memorandum of Understandings across land tenures or areas of responsibility

- Partnerships can include:
 - CW and Lachlan CMAs – e.g. for regionally based weed and pest control
 - Upper Macquarie County Council – regionally based noxious weed control
 - Livestock Health and Pest Authority – regionally based pest control, management of stock reserves
 - CSU and the Flannery Centre – management of Hawthornden Creek and environs
 - Motor racing clubs, organisations and associated stakeholders – management of Mount Panorama precinct
 - Golf, Gun and Archery clubs – management of the Box-Gum Woodland EEC
 - Motor-cross racing club – management of the Tablelands Basalt Forest EEC
 - NSW Game Council – pest management, protection of biodiversity
 - Department of Lands – plans of management on Crown Lands
 - Roads and Maritime Services (RMS) - biodiversity protection for roadworks where Council is not the roads authority
 - Utilities companies - tree removal, pruning, removal of plant material, erosion on tracks
 - Rural Fire Service/OEH – prescription burns and bush fire hazard reduction burns adopting best management practices for the protection and enhancement of biodiversity
 - OEH and NSW State Forests – on-ground management of weeds, pests, fire etc between neighbours (e.g. OEH managed Winburndale Nature Reserve neighbouring BRC managed Winburndale Dam reserve)
 - NSW DPI for purposes of biosecurity - for the management of environmental weeds, protection of native fish populations and the control of non-native animals; managing environmental impacts that may arise from genetically modified organisms
 - BRC's neighbours
 - Wattle Flat racecourse committee – biodiversity management of racecourse and golf course
 - Individual rural landholders or structured and unstructured networks (e.g. Landcare, neighbour groups) – weed and pest control, riparian management
 - Industry, commercial enterprises – weed and pest control, riparian management, biodiversity enhancement, mine impacts (urban and rural)
 - Aboriginal Lands Council – weed and pest management and rehabilitation – Sir Joseph Banks Reserve
 - Roads and infrastructure authorities and utilities – weed and pest control, EEC and riparian management
 - Animal Welfare Groups and appropriate management of native
 - Raglan Creek landholders
 - Community groups and organisations – weed control, rehabilitation, biodiversity protection
 - Link with Strategy SM4, SM5, SM9, SM11

Objective 27: Opportunities for biodiversity management are fostered through regional and local partnerships

Strategy (SP8) Develop nature-based tourist opportunities that ensure the protection of biodiversity and enhances nature appreciation

- Develop nature-based tourist opportunities that ensure the protection of biodiversity and enhances nature appreciation (**Action AP5**). Suggestions include:
 - Develop a range of tourist trails for bushwalkers, road and off-road 4WD vehicles and cyclists. Link to others in the greater region
 - Trails can be based on geology and soils, fossil beds and museums, bird-watching areas, vegetation types etc
 - Develop a range of tourist trails based on early explorer and settler trails that are also linked to biodiversity and scenic values (e.g. Evans original trails, Cox's Road which is partly signposted in the Oberon and Lithgow areas) and the various incarnations of old roads (e.g. Lachlan, Bathurst)
 - Develop specific walking trails with NPWS that incorporate fire trails within the reserve system in Bathurst Region
 - Walking trails along the Macquarie River and other waterways. Facilitation with private landholders for areas on private land.
 - Trails around Mount Panorama
- Periodic monitoring of the trails would be advised to ensure biodiversity assets are not impacted
- Partnerships would need to be fostered with a number of groups:
 - Experts to assist with the development of the trails and educational packages
 - Tourism bodies (NSW Tourism, tourist information centres in the region ecotourism operations) to promote such concepts
 - Conservation groups and organisations to provide expertise and promote concept amongst members