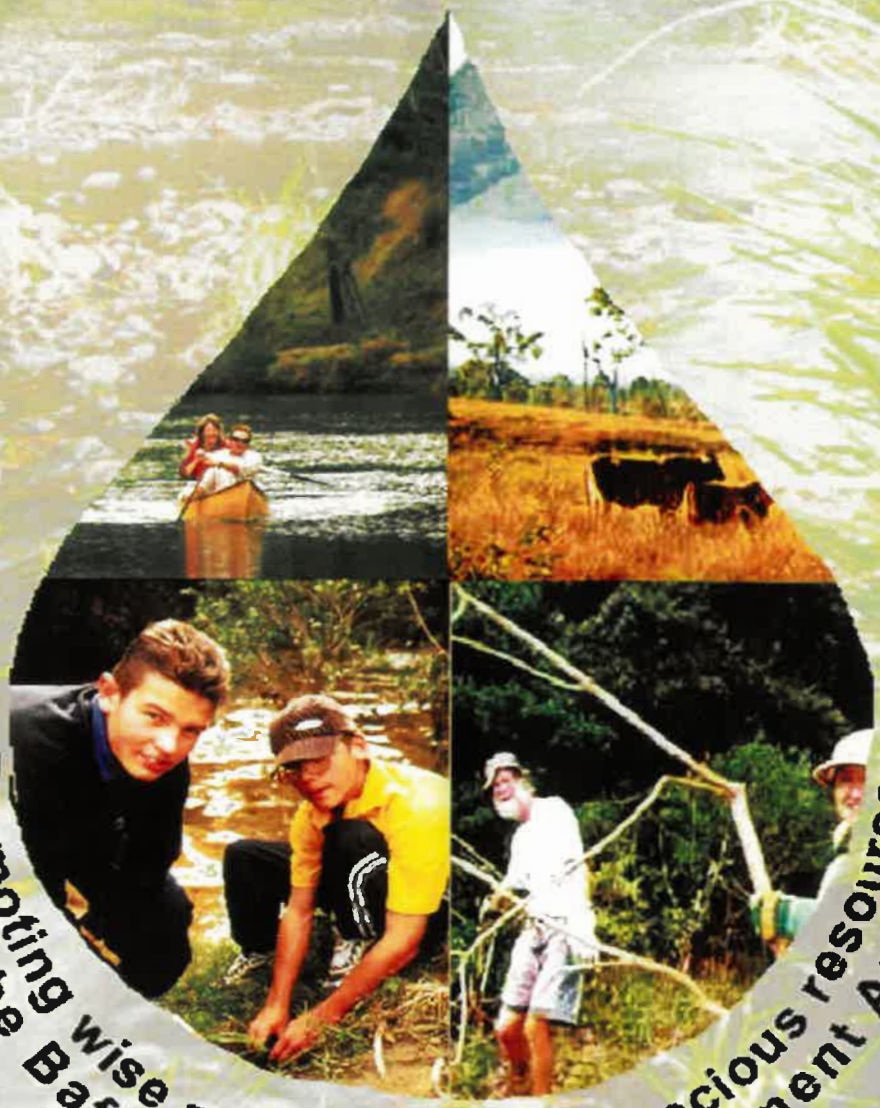
THE BAFFLE CREEK CATCHMENT STRATEGY

A Strategy for the Baffle Creek catchment and associated catchments



Promoting wise management of precious resources in the Baffle Catchment Management Area

PRODUCED BY THE BAFFLE CREEK CATCHMENT MANAGEMENT GROUP INC.

The Baffle Creek Catchment Strategy

Baffle Creek Catchment Management Group Inc.

Integrated Catchment Management for the Baffle Catchment.

Members of the BCCMG would like to acknowledge the contribution made by the following in the development of this strategy.

Department of Natural Resources and Mines
Department of Primary Industries
Environmental Protection Authority
Queensland Parks and Wildlife Service
Miriam Vale Shire Council
Widebay 2020
Department of Local Government and Planning
Industry and Special Interest Groups
Natural Heritage Trust
Southern Pacific Petroleum N.L.

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	Rod Coleridge
	Bernie Scott

The Baffle Creek Catchment Management Group is advisory and has no powers to direct anyone to implement actions contained in this document; nor can it invent legislation or prescribe by-laws. The Catchment concept is one of influence, establishing networks, and taking on responsibility to work together for a common good.

The Baffle Creek Catchment Strategy may sometimes be in conflict with the legislative and statutory processes of Government including the Integrated Planning Act.
Where ever such conflict occurs the relevant legislative processes would obviously take precedent.

EXECUTIVE SUMMARY

All organisms need water to survive, therefore our riverine ecosystems are the most crucial on the planet. Daily, we see increasing water supply demands and intensive land use that, in some cases, cannot be avoided. However, with knowledge, sensible planning and co-operation, we can minimise the impact on our environment. Confronted with these facts, a group of concerned citizens initiated the formation of the Baffle Creek Catchment Management Group (BCCMG) in early 1997, in order to develop a management strategy for the Baffle Creek Catchment.
The process to develop this Strategy has involved a collaborative effort among Stakeholders in the Baffle Catchment. These stakeholders have identified the need to manage our natural resources in a sustainable manner.

Section 1.2.2 outlines the BCCMG'S objectives. They highlight the need for us all to share the use of, and above all, the responsibility of managing, the resources in our care.
Section 3 of the Strategy illustrates the diversity and uniqueness of our Catchment and the very high Natural and Cultural Heritage values placed on our area - not only locally but state and nation wide.

Seven major themes emerged from workshops involving: community and Landcare groups, all levels of government, dairy farmers, graziers, professional and amateur fishermen, timber workers, town residents, fruit and vegetable growers, small land holders, recreational creek users and volunteers implementing educational programs. These themes are:
1. Land Resource Issues
2. Water Issues
3. Estuary and Marine Issues
4. Nature Conservation and Biodiversity Issues
5. Weeds and Pests
6. Economic, Social and Cultural Development
7. Information and Communication

For each of these themes, strategies have been identified and categorised under the following headings:
1. Research
2. Extension and Communication
3. Planning and Implementation
4. Monitoring and Reporting
5. Resourcing

The amalgamation of these themes into the strategy, and the direction they give in terms of setting goals, provides essential guidelines for the effective and sustainable utilisation of our natural resources.

Section 5 outlines strategic actions - the focus being on desired outcomes for the catchment and prioritisation for achieving them. The BCCMG determined levels of priority for each strategy action by: qualitatively assessing the importance of the proposed actions in relation to Integrated Catchment Management, and the desire to achieve long-term results.

This strategy is a living and dynamic document that is open-ended incorporating regular review and updating as issues and priorities change.
The release of this "Living" document highlights the fact that everyone can play a role - we don't have to be a professional or an educated minority. Our catchment's health depends on ordinary citizens who have a committed approach to understanding the value of our natural assets and the need to work together to manage them in a sustainable manner.
This process is not easy. It can be brought into focus by the fact that we humans are the only species who are able to travel everywhere on this planet. This then means that we also have the capacity to do good or ill everywhere.

It is up to us to choose wisely!
Greg Realf (Chair BCCMG) Jan 2001

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1.0 INTRODUCTION -WHAT IS INTEGRATED CATCHMENT MANAGEMENT?

1.1. QUEENSLAND CONTEXT

Integrated Catchment Management (ICM) is a philosophy that encourages a coordinated approach to the management of natural resources in Queensland. Its overall purpose is to integrate the management of land, water and related biological resources in order to achieve their sustainable and balanced use.

ICM involves the voluntary actions of stakeholders including government, rural landholders, industry, fisheries and urban dwellers that incorporate the goals of achieving and maintaining a healthy catchment for future generations.

The implementation of ICM in Queensland is being guided by the *State Integrated Catchment Management Policy*.

1.2 BAFFLE CREEK CATCHMENT CONTEXT

1.2.1 FORMATION OF THE BAFFLE CREEK CATCHMENT MANAGEMENT GROUP

Many residents of the Baffle Creek Catchment recognise the importance of protecting this unique river system for future generations.
With this in mind a group of like-minded individuals held meetings seeking community support for the formation of a Baffle Creek Catchment Management Group.
Those who attended included interested parties from various local industries (graziers, dairy farmers, fruit and vegetable growers, timber cutters and professional fisherman), recreational users (anglers etc), local government (Miriam Vale Shire Council), State Government Departments (Environment, Primary Industries and Natural Resources and Mines), land care/management and environmental groups (Miriam Vale Rural Science and Landcare, Agnes Water Landcare) and other local residents and landholders.
(Other parties to join the Group since that time have included representatives from tree crop and mining industries, the indigenous community and Burnett Shire Council)
Due to such wide-ranging community attendance and support, a committee was formed and a set of initial objectives put forward.
On the 2nd May 1997, the Baffle Creek Catchment Management Group (BCCMG) became incorporated and the following objectives were formalised into a constitution.

1.2.2 THE BAFFLE CREEK CATCHMENT MANAGEMENT GROUP OBJECTIVES:

1. To be the Catchment Co-ordinating Committee for the Baffle Basin Catchment under the Queensland Integrated Catchment Strategy.
2. To foster co-ordination between landholders, community action groups and Government agencies in their land, water and vegetation management activities.
3. To actively promote community understanding of and participation in, a co-ordinated basin-wide approach to ecologically, economically and socially sustainable development.
4. To promote the value of a co-ordinated Catchment wide approach for managing these resources
5. To identify and prioritise inter-related land and water resources issues in the Catchment, identify solutions, and agree on actions through the public and Government participation.
6. To provide a forum for community and Government discussions on catchment management issues for resolving conflict demands on natural resources and while recognising the existing future and economic needs and commitments of the river system.
7. Whilst recognising the existing and future social and economic needs and commitments of the river system, ensure that the Baffle Basin waterways and catchments are retained in their relatively pristine states in order to preserve their environmental values and to provide baseline information for the possible rehabilitation of disturbed catchments in the region and elsewhere in Queensland.

1.2.3 ROLE OF THE BAFFLE CREEK CATCHMENT MANAGEMENT GROUP

Since incorporation, the BCCMG Inc. is now recognised as the co-ordinator of community activities involving sustainable management of the Baffle Catchment. The Group provides a forum to bring individuals and interest groups together to discuss the various social, environmental and economic issues affecting the Catchment. These issues are considered by the Group, often with input from guest speakers. The Group also receives input, and networks with several other similar neighbouring groups.
A major output of this role has been the development of a Catchment Strategy in conjunction with stakeholder groups and the wider community.

1.2.4 BAFFLE CREEK CATCHMENT MANAGEMENT GROUP PROJECTS TO DATE AND OTHER RESEARCH

The major project of the BCCMG since it's inception has been the development of this Catchment Strategy. The BCCMG however, has already began to implement the Strategy through various projects including:

- Identifying priority issues for landuse management within the catchment via the development of the strategy. This process included extensive community and stakeholder consultation and input ensuring identification of natural resource management issues for the Baffle Catchment Management Area and identifying a planning process to address these.
- Facilitated community awareness programs and involvement in activities via field days, public displays, information sessions and forums and other activities. This has resulted in increased public awareness of natural resource management issues, ICM principles and of BCCMG activities, enhancing public participation in and support for these. It has also has allowed open communication and information exchange between those involved in natural resource management, while also increasing their knowledge base
- Gaining support from industry with sponsorship for various projects and events. Again, this has increased awareness of ICM and BCCMG activities and aided in making ICM a whole of community responsibility.
- Conducting water quality and catchment management programs in schools over two years within the Waterwatch program. This activity has increased awareness and knowledge of catchment processes in the youth of the catchment and initiated further environmental education in schools.
- Initiating of monitoring programs for water quality and seagrass distribution which provide baseline information on these parameters and monitors the effects of various activities within the catchment.
- Participation and input into various strategies and planning studies ensuring catchment management issues relating to the Baffle catchment are incorporated and addressed in other planning studies.
- Facilitating clean up days and tree planting days, stimulating community awareness, involvement and ownership of the local environment.
- Receiving Natural Heritage Trust funding for " Implementation of the Baffle Creek Catchment Strategy – Baseline Data Collection" which includes the production of a State of the Rivers report and Sites of Significance assessment for the Baffle Catchment Management Area in order to provide sound baseline information for future catchment activities.

There have been several research projects and reports relating to the Baffle Catchment released in recent times, which have been referenced below. Recommendations from these reports have been incorporated into the strategy where appropriate. Findings of this research will also play a major role in the implementation of the strategy and the development of action plans. Recent research includes:

- *Land Resources of the Kolan and Miriam Vale Shire* (in prep) Donnollan, T.E., Wetherall, T.R. and Griffiths S.R Department of Natural Resources and Mines, Land Resource Bulletin. This report outlines land resources and their capabilities survey for this area. Land systems for the area were mapped at 1: 250 000. Land Systems are areas throughout which there is a recurring pattern of geology, topography, soils and vegetation. Within each land system component land units were described in terms of soils, landform attributes and vegetation. The report also identifies land capability classes and outlines limitations that affect the use of the land. The information outlined in this report is aimed at assisting in
  "planning and development of strategies to assist strategic and regional planning, resource management, environmental impact assessment, development control, infrastructure planning and nature conservation for all forms of government and catchment." management groups. It will assist

Landcare groups in developing suitable management strategies to reduce degradation, salinity and erosion."

- *Status of Wetlands on the Wide Bay – Burnett Coast* (2001) Wide Bay Burnett Conservation Council. This report is a survey of freshwater wetlands in the coastal region between the Seventeen Seventy peninsula and the north bank of the Burrum River. The aim of the project was to identify remaining wetlands and assess present condition with aim to preserve or re-instate their valuable functions. It also aims to *"provide a sound information base for the conservation, repair and long-term ecological sustainable use of wetlands."*

- *Queensland Coastal Wetland Resources Round Hill Head to Tin Can Inlet* (2000) Bruinsma, C. & Danaher, K. Department of Primary Industries. This report documents and maps the coastal wetland resources of the area between Round Hill Head and Tin Can Inlet. It documents levels of existing disturbance to and protection of the wetlands, examines existing recreational and commercial fisheries and evaluates the conservation values of the wetlands in relation to fisheries productivity and as habitat for important and/or threatened species. This research aims to *"provide a baseline dataset for Fish Habitat Area (FHA) declaration, Ramsar site nomination and continued monitoring of these important fish habitats."*

- *Monitoring Coastal Processes on Rules Beach Miriam Vale Shire* (2000) Wide Bay – Burnett Conservation Council. This project aimed to study the beach dynamics of the Rules Beach area with reference to a range of parameters both natural and human related. This report presents the results of a 19 month monitoring program of Rules Beach and provides data interpretation and recommendations for the future management of this area.

- *A Fisheries Resource Assessment of the Baffle Creek System in the Wide Bay – Burnett Region of Queensland (1996)* Lupton, C. & Heidenreich, M. Department of Primary Industries. This 18 month study examined 13 estuarine and 17 riverine sites within the catchment, compiling fauna and flora inventories, habitat descriptions, water chemistry data, bottom sediment classifications and river bottom profiles. Results of the study indicated high fish and crustacean species diversity *"indicative of a river that is unregulated and has good water quality combined with undisturbed fisheries habitats."* The study acknowledges that the *"biodiversity and environmental integrity of Baffle Creek must be maintained and protected to ensure future fisheries productivity."*
  Conclusions of the study include the recommendations of a declared Fish Habitat Area, the maintenance of the catchments relatively pristine state to provide baseline information with respect to other disturbed catchments and use of extension strategies employed in ICM.

2.0 METHODOLGY

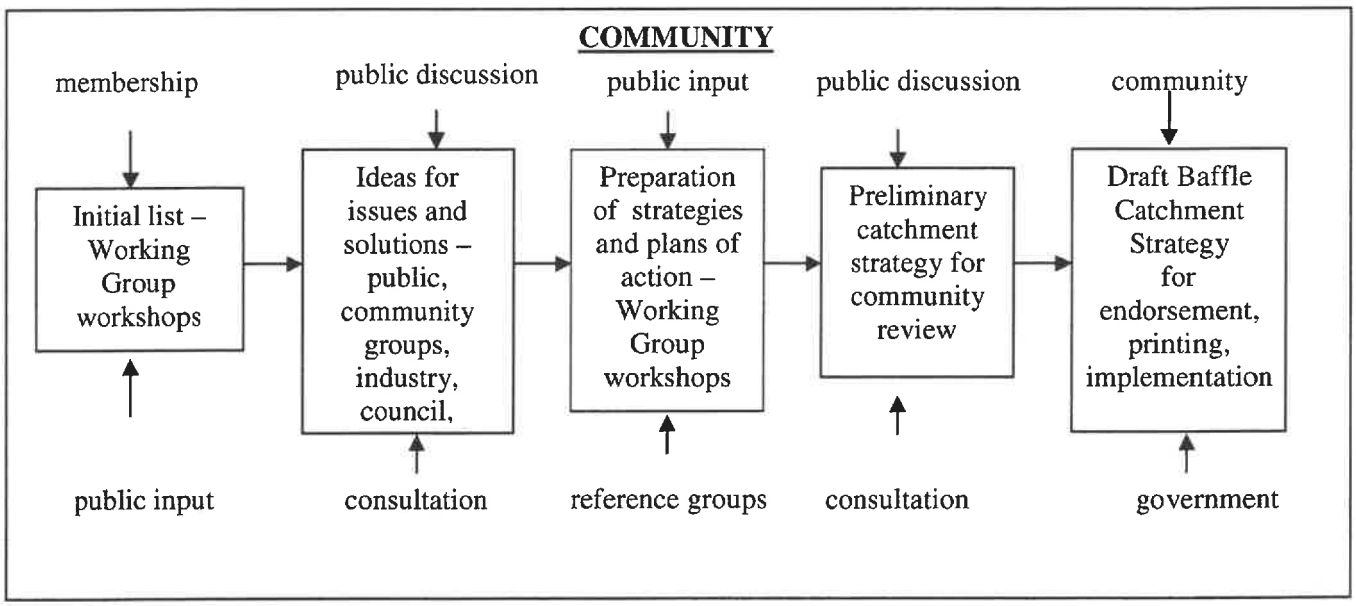
2.1 PURPOSE OF STRATEGY

The purpose of the Baffle Creek Catchment Strategy is to provide a broad assessment of priority natural resource issues in the catchment and outline recommended actions to address theses. A key role of the BCCMG as the co-ordinator of community activities involving sustainable management of the Baffle Catchment was to develop a catchment strategy with input from community, industry and government which address complex catchment issues.

2.2 DEVELOPMENT OF STRATEGY

The community and relevant stakeholders of the Baffle Catchment recognized the need for a catchment strategy for the Baffle Catchment Management Area because of it's near pristine condition, it's high priority as a "benchmark" catchment and increasing pressure on the catchment. Development of the Strategy began in 1998 with a call for members to form a working committee to oversee the process. From here many public workshops and forums were held at several stages of the process to identify issues and develop actions to address these issues. The entire process took three years with extensive community and stakeholder consultation and input.

Table 1 - Process Used to Develop Catchment Strategy



The above process led to the development of seven "themes", which succinctly grouped together the major issues identified. These themes are the basis for the structure of the overview, the proposed strategies and also ideas for the future, which are listed in Appendix A. The seven themes are as follows:

1. Land Resource Issues
2. Water issues
3. Estuarine & Marine Issues
4. Nature Conservation & Biodiversity Issues
5. Weeds & Pests
6. Economic, Social & Cultural Development
7. Information & Communication

2.3 RELATIONSHIP TO OTHER STRATEGIES

The development of this strategy has taken into account other planning studies (such as those previously outlined) or strategies that already exist which relate to the Baffle Catchment or areas within it.

This strategy lies between several layers of planning documents from Property Plans at the property level to regional plans such as Regional Growth Management Plans (Wide Bay 2020) and the Burnett/Mary Regional Strategy and will provide a linkage between these levels. The integration and use of existing strategies, planning documents and studies will enable this Catchment Strategy at a regional level, to achieve the best outcome for the catchment. This Strategy and those listed in Table 2 are intrinsically linked to each other. Implementation of these strategies, planning documents and studies and those of this Strategy reliant on each other.

This Strategy highlights specific actions that work towards the implementation of other strategies such as the Regional Growth Management Framework (Wide Bay 2020) and the Burnett/Mary Regional Strategy. For example the Regional Growth Management Framework outlines policy actions relating to the Baffle Catchment, including Policy Action 7.1(c) :
"Whilst recognising the existing and future social and economic needs and commitments of the river system, ensure Baffle Creek and its catchment is retained in its relative pristine state in order to preserve its environmental values and to provide baseline information for the possible rehabilitation of disturbed catchments in the region and elsewhere in Queensland." (Wide bay 2020 1998).
The Great Barrier Reef Catchment Water Quality Action Plan (Great Barrier Reef Marine Park Authority 2001) outlines targets for improved water quality discharged from the Baffle Catchment. Actions outlined in this Strategy address broader policy actions such as these.

Implementation of this strategy will also focus on actions such as encouraging local authorities to adopt the ICM philosophy practice with reference to the strategic actions outlined in this document in their planning schemes under the *Integrated Planning Act*.

Integration and cooperation across all levels of planning is a fundamental element of integrated catchment management and works to achieve the best outcomes possible for the catchment. The Strategy Working Group, which reflected these principles, was comprised of a diverse array of community members and stakeholders who primarily took a local focus in regards to the catchment and representatives from various government departments such as NR &M, DPI, EPA, QPWS and DCILGPS who play a major role in various relevant regional strategies.

Table 2 – Links between other strategies, planning and resource studies and the Baffle Creek Catchment Strategy

National Level	**REGULATORY PLANNING** • *Great Barrier Reef Marine Park Act 1975* • *Australian Heritage Commission Act 1975* • *Environmental Protection and Biodiversity Conservation Act 1999* • *Native Title Act 1993* **NRM AND BIODIVERSITY AND CONSERVATION PLANNING** • Managing Natural Resources in Rural Australia for a Sustainable Future - A Discussion Paper (AFFA 1999) • Environmental Indicators for National State of the Environment Reporting-Series (CRC Soil and Land Management 1999) • National Strategy for the Ecological Sustainable Development • Inter-governmental Agreement on the Environment • The Convention on the Conservation of Migratory Species of Wild Animals (the Bonn Convention) • The China-Australia Migratory Bird Agreement (CAMBA) • The Japan-Australia Migratory Bird Agreement (JAMBA) • Endangered Species Program • National Weeds Strategy • National Reserve System Program • National Wetlands Program • National Strategy for Property Management Planning

	• National Strategy for the conservation of Australian Species and Ecological Communities threatened with extinction • National Waterwatch Strategy • Landcare Priorities • Bushcare Priorities • Rivercare Priorities **RESOURCE ALLOCATION** • National Water Quality Management Strategy • Action Plan for Australian Agriculture • Fisheries Action Program • Farm Forestry Program
State Level	**REGULATORY PLANNING** *Integrated Planning Act 1997* *Water Act 2000* *Land Act 1994* *Nature Conservation Act 1992* *Cultural Record (Landscapes and Queensland and Queensland Estate) Act 1987* *Queensland Heritage Act 1992* *Vegetation Management Act 1999* *Native Title Act (Qld) 1993* *Forestry Act 1959* *Rural Lands Protection Act 1985* *Fisheries Act 1994* *Petroleum Act 1923* *Coastal Protection and Management Act 1995* *Environmental Protection Act 1994* *Marine Parks Act 1982* *Mineral Resources Act 1989* *Soil Conservation Act 1986* **NRM AND BIODIVERSITY AND CONSERVATION PLANNING** • Queensland's Weeds and Pest Animal Strategy DRAFT (DNR 1999) • The Conservation status of Queensland Bioregional Ecosystems (Sattler and Williams 1999) • State of the Environment Queensland (EPA 1999) • Declared Fish Habitat Areas in QLD • Fish Habitat Management Operational Policy • Condition of River Catchment in QLD • Strategy for the Conservation and Management of Queensland Wetlands • Draft Coastal Management Plan • Qld National Parks Master Plan • Great Barrier Reef Catchment Water Quality Action Plan (GBRMPA 2001) • Queensland Forest Practices System (in progress) **RESOURCE ALLOCATION** • Testing the Waters - A report on the Quality of Queensland's Waters (EPA/DNR 1999) • State Water Conservation Strategy • Code of Practice for Sustainable Fruit and Vegetable Production (1998) • Good Agricultural Land - Land Planning Guidelines • State Planning Policy 1/92 • Sustainable Cane Growing in QLD (1998) • The Environmental Code of Practice for Agriculture (1998)

Regional Level	**GROWTH MANAGEMENT AND ECONOMIC DEVELOPMENT** • Wide Bay 2020 Regional Growth Management Framework **NRM AND BIODIVERSITY CONSERVATION PLANNING** • Burnett/Mary/Baffle Regional Strategy • Resource Allocation • SEQ Regional Forestry Agreement • DNR Regional Infrastructure Development Studies of Proposed Dams • Curtis Coast Study (DEH/ Gladstone Port Authority 1994) • Great Sandy Regional Management plan • Regional Air Quality Strategy • Great Barrier Reef Marine Park Authority management plans • Regional Indigenous Land Strategy • Wide Bay Burnett Regional Coastal Management Plan • Coastal Wide Bay Regional Vegetation Management Plan • National Action Plan for Salinity and Water Quality. • Queensland Coastal Wetland Resources • Status of Wetlands on the Wide Bay – Burnett Coast • Sustainability Report for the Gladstone Region **RESOURCE ALLOCATION** • Overview of Water Resources and Related Issues (GAWB 1992)
Catchment Level	**REGULATORY PLANNING** • Local Government Planning Schemes **NRM AND BIODIVERSITY PLANNING** • Protected Areas in the Agnes Water/1770 Area-Draft Management Plan (DEH 1998) • Draft Local Tree Clearing Guidelines for Miriam Vale Shire • Miriam Vale Shire Pest Management Plan • Land Resources of the Kolan and Miriam Vale Shires • A Fisheries Resource Assessment of the Baffle Creek System **RESOURCE ALLOCATION** • Baffle Creek - Recommendations For Processing New Applications For Water Entitlements.

3.0 BAFFLE CATCHMENT OVERVIEW

3.0.1 INTRODUCTION

Baffle Creek is a small coastal river system draining land seaward from the Many Peaks Range, between the Burnett (Bundaberg) and Port Curtis (Gladstone) regions at the northern extremity of South East Queensland, entering the Pacific Ocean between the Latitudes 24 deg. 10' S and 24 deg. 45'S.

Baffle Creek is 117 kilometres long with a tidal reach of 35 kilometres which ceases at approximately Essendeen Bridge on Hills Road, and its Catchment covers an area of some 2, 934 square kilometres, with a mean annual discharge of 533 000 megalitres. (See Appendix C Maps: Baffle Creek Strategy Area - Drainage).

Baffle Creek has been identified as a river system which is sufficiently unaffected by regulation (dams and other flow-control structures), to serve as a river by which other coastal rivers can be judged (Wide Bay 2020 1998)

This role as a hydrological and ecological "benchmark" brings statewide importance to its catchment management.

The significance of Baffle Creek and its importance in terms of natural heritage has been identified in several reports and planning documents (Lupton C.J. & Heinedreich 1996), (Widebay2020 1998). The National Land and Water Resources Audit, in partnership with several other agencies, has identified the mouth of Baffle Creek and other associated catchments of the Baffle Basin as the only near pristine (the highest classification given in this audit) estuaries in southeast Queensland. The Baffle estuary being the southern most near pristine estuary in Queensland. A near pristine estuary is defined as an estuary with:

- A high proportion of natural vegetation cover within the catchment,
- Minimal changes to hydrology in the catchment,
- No changes to tidal regime,
- Minimal disturbance form catchment land use,
- Minimal changes to floodplain and estuary ecology,
- Low impact human use of the estuary,
- Minimal impacts from pests and weeds.

(National Land and Water Resources Audit 2001)

The major tributaries of the estuarine section of the Baffle include Royal Gully, Murray's, Bottle, Duck, Captains, Oyster, and Euleilah Creeks. Tributaries of the riverine section of the Baffle include Lagoon, Three-Mile, House, Colosseum, Granite and Island Creeks.

The BCCMG's area of concern and area of interest for this Strategy, also includes the isolated catchments of adjacent creeks which drain to the sea including, Broadwater/Deepwater Creek system; Round Hill Creek and others draining to Bustard Bay; and Worthington, Sandy and other creeks draining north to Rodd's Bay, as far west as Colosseum Inlet.

The Baffle and associated catchments described make up the Baffle Catchment Management Area or Baffle Basin. Communities in the area include: Agnes Water, Berajondo, Blackman's Gap, Boaga, Bororen, Captain Creek, Colosseum, Deepwater, Foreshores, Lowmead, Miriam Vale, Mount Maria, Rosedale, Rules Beach, Seventeen Seventy, Turkey Beach, Wartburg, Winfield, and associated localities. (See Appendix C Maps – Baffle Creek Strategy Area – Drainage).

Local Government areas that cover the Baffle Creek Catchment Management Area are that of the Miriam Vale Shire and the Burnett Shire. Most of the Baffle Creek Catchment Management Area is in the Miriam Vale Shire and most of the Miriam Vale Shire is in the catchment management area. Much of the background data for the Miriam Vale Shire therefore relates to the Baffle Catchment.

The catchment has a relatively small human population. According to preliminary data from the Australian Bureau of Statistics, the estimated resident population of Miriam Vale Shire as at 7 August 2001 was 4,914. This shows growth was at 5.0% per annum between 1998 and 1999 compared with 3.7% per annum in 1997-98. It is assumed that net migration accounted for around 85% of the population increase while natural increase (births minus deaths) accounted for the remaining percentage (DCILGPS 2000).
Population projection statistics predict that Miriam Vale Shire is expected to increase to between 5,800 and 5,980 by 2006 and to between 7,520 and 7,990 persons by 2016 (DCILGPS 2000).

The Baffle Catchment is not intensively developed, and scenic natural or rural landscapes predominate. Mountains and foothills provide backdrops to undulating valleys, meandering waterways, coastal plains and a varied coastline - sheltered and mangrove-lined in the north, and sandy surf beaches and rocky headlands elsewhere.

Grazing, forestry, fishing and tourism are the principle industries. Coastal areas contain extensive rural residential acreages. Built-up areas are mainly in the small coastal resorts of Agnes Water, Seventeen Seventy and Turkey Beach, and in the rural service centres of Miriam Vale, Bororen, Lowmead and Rosedale, along the state infrastructure corridor which passes through the west of the catchment.

The extent of arable land, the supply of surface and underground freshwater, and mineral reserves are modest by regional standards. The catchment does have extensive and productive grazing lands devoted to beef and dairy production as well as and native and plantation forests producing timber. The coastal section, including Great Barrier Reef waters, support recreational and commercial fishing.

The catchment's natural and cultural heritage value is very high to the local community, the state and the nation. The natural heritage includes the last major free flowing coastal river system in southern Queensland (Baffle Creek); a large proportion of land devoted to national parks, state forests and timber reserves; large coastal wetland areas with Fish Habitat Areas; internationally important turtle nesting beaches; waterways and riparian lands of high biological diversity and scenic, unpolluted beaches.

The estuary of Baffle Creek is a declared Fish Habitat Area and not included in the Great Barrier Reef Marine Park. Planning is in progress to develop and declare the Northern Section of the Great Sandy Marine Park. The western boundary of the proposed marine park generally follows the Highest Astronomical Tide (HAT) along the coast south from and including the mouth of Baffle Creek between the Town of Seventeen Seventy and Bundaberg.

Notable cultural heritage values of the catchment includes European heritage such as the site of the second landing by Captain James Cook on the east coast of Australia; type localities of botanical collections and historic pioneer sites, and Indigenous cultural heritage such as tangible and non-tangible Aboriginal sites.

3.1 THEME 1 - LAND RESOURCE ISSUES

3.1.1 CLIMATE

The area experiences mildly sub tropical weather with average summer temperatures ranging from 22-28 degrees Celsius and winter average temperatures from 13-21 degrees Celsius. The average annual humidity is 78% with high evaporation rates experienced in the area.

The mean annual rainfall in the Catchment Area is generally in the range of 1100 to 1200 millimetres. Rainfall is seasonal with generally wet summers and dry winters. The extremes are greater if rainfall is considered on a water year such as September to August rather than the calendar year that splits the wet season. The impact of the occasional cyclone also has an impact on the average rainfall.
Rainfall is erratic as is expected in a "desert" latitude.Much of the rainfall is delivered in storms with a wide variation in the amounts received over fairly short distances. However these large individual event differences average out over time with the long term (100 year) averages in the area generally being within 5%. There is no recognised long term rainfall pattern. The average rainfall over the past 27 years (1975-2001, 941mm/a) is significantly less than the long term average (1896-2001,1093mm/a). It is difficult to establish which figure could be constructed to represent "normal" for this area. Dry periods are common (5 months without effective rainfall, average once every 3 years) and can be prolonged (17months without effective rainfall, 1902-1903). These prolonged dry periods require acknowledgement when planning water supplies. These long dry periods can result in zero surface flow into the streams of the catchment of Baffle Creek. This erratic rainfall pattern needs to be reflected in any future environmental flow determination.

The distribution and amount of rainfall that falls in the catchment has a significant impact on a broad range of activities such as agricultural production, water quality and fisheries.

Table 3 - Baffle Catchment Area Hydrological Statistics

Station number period	**Rosedale 039084 1896-2001 24° 38'S 151° 55'E 45m AHD**			**Baffle Creek at Roadview and Mimdale G S 134001A & 134001 B composite 1969-2001 24° 30' 56"S 151° 44' 8"E 24° 30' 54"S 151° 44' 8" E**		
Month	**Rainfall (mm)**			**Stream discharge (ML)**		
	max	**mean**	**min**	**max**	**mean**	**min**
Jan	1 321	202	6	234 362	46 323	9
Feb	840	181	7	797 722	61 943	0
Mar	526	127	0	281 194	35 057	139
Apr	399	69	0	317 017	22 642	8
May	349	63	0	305 883	22 970	6
Jun	319	54	0	67 070	7 435	7
Jul	295	49	0	107 625	10 663	13
Aug	121	32	0	19 538	2 254	0
Sep	198	36	0	45 206	3 768	0
Oct	359	69	0	49 661	3 906	0
Nov	327	86	0	73220	12 815	0
Dec	631	124	0	368 967	24 174	25
Annual	2275	1093	366	1 114749	249 832	9 756

(DNR&M 2002)

3.1.2 SOIL

No detailed studies of the land resources have been undertaken in the Baffle Creek Catchment. Ellis and Whitaker (1976) described the geology of the Bundaberg sheet area, which contains the Baffle Creek Catchment at 1:250 000 scale. Soils have been mapped in the Atlas of Australian Soils, sheet 4 at 1:2 000 000 by Isabell et al (1967). The soils described on this sheet have been summarised in the Miriam Vale

Shire Handbook (Van Rosendal 1971). The Coastal Burnett Land Management Manual (Glanville et al 1991) provides a map of the land resources of the area (1:500 000), identifies agricultural management units and summaries land management requirements for sustainable production.

Land system mapping at 1:250 000 has now been completed in the area (Donnollan et al in prep). Fifty land systems of areas throughout which there is a recurring pattern of geology, topography, soils and vegetation have been identified. Within each land system, 364 component land units have been described in terms of soil, landform attributes and vegetation. A land systems map as well as a land capability map has been produced.

The wide range of soils, which occur throughout the area, are closely related to geology and landform. The soils of the hills and mountains are usually shallow with abundant rock outcrop and surface stone. Acid sulphate soils are present along Baffle Creek and estuaries of other creeks especially on areas <5m Australian Height Datum (above sea level). Therefore there needs to be the appropiate awareness of acid sulphate soils in land use management. This management should be addressed through soil mapping, landuse controls and best management practices.

Much of the remainder of the area is occupied by sodic duplex soils with high levels of sodium and magnesium. Deep sands, red brown and yellow duplex and gradational soils are also present throughout the area. A map showing the broad geological subdivisions of the area is presented in *Appendix C Maps: Baffle Creek Strategy Area - Geological Subdivisions*. The soils associated with these geology types are presented in Table 4.

Table 4 - Major and minor soils of the six geological subdivisions of the Miriam Vale Shire

Land system subdivision	Major soils	Minor soils	Comments
Alluvial landscapes	Uniform coarse textured soil (Tenosols and Podosols). Non cracking clays and gradational soils (Dermosols). Sodic duplex soils (Sodosols and Kurosols). Acid sulfate soils (Hydrosols). Cracking clays (Vertosols).	Massive gradational soils (Kandosols). Seasonally or permanently wet soils (Hydrosols).	Tenosols and Podosols are common soils on the Coastal dunes and sand plains and adjacent lands of the Coastal Alluvial Plains. A wide range of soils occurs on the alluvial areas of the rivers and creeks. Fine textured surface Dermosols and Sodosols are common soils on the alluvial plains south of Agnes Water. Acid sulphate soils occur on the low coastal lands and estuaries
Basic and intermediate intrusive and extrusive igneous rocks	Non-cracking clays and gradational soils with fine textured surfaces (Dermosols and Ferrosols). Cracking clays (Vertosols). Non-sodic and sodic duplex soils (Chromosols).	Sodic duplex soils (Sodosols).	
Acid to intermediate volcanic rocks	Gradational soils and non-cracking clays (Dermosols). Sodic duplex soils (Sodosols and Kurosols). Coarse to medium textured soils over rock (Tenosols).	Non-sodic duplex soils (Chromosols). Massive gradational soils (Kandosols).	The shallow Tenosols are usually found on the upper slopes and crests of the country of higher relief.
Acid to intermediate igneous rocks	Sodic duplex soils (Sodosols and Chromosols). Coarse textured soils over rock (Tenosols). Gradational soils (Dermosols).	Cracking clays (Vertosols). Non-sodic duplex soils (Chromosols).	The coarse textured soils (Tenosols) are usually found on land systems with higher relief except for the country around Miriam Vale, which has low relief.
Sedimentary rocks	Sodic duplex soils (Sodosols and Kurosols). Non-cracking clays and gradational soils (Dermosols). Uniform medium textured soils over rock (Tenosols).	Non-sodic duplex soils (Chromosols). Seasonally wet gradational and duplex soils (Hydrosols).	The shallow Tenosols are usually stony and are found on crests and upper slopes.
Metamorphic rocks	Sodic duplex soils (Sodosols and	Gradational soils and non-	

	Chromosols). Uniform medium textured soils over rock.	cracking clays.	

(Donnollan et al in prep)

A number of forms of land degradation have occurred throughout the catchment. Salinity outbreaks have occurred in areas west of Bororen and Miriam Vale on the lower slopes and flats below the pediments of the mountains and hills in the west where drainage is impaired. There is also salinity to the northeast of Bororen. Other salinity outbreaks on lower slopes and drainage lines have been identified in the Fingerboard area and a small area north of Matchbox range.

Degradation by erosion has occurred on sloping and relatively flat lands especially in lower concave areas and drainage lines. The clearing of steep lands, overgrazing and the concentration of water by roads and other infrastructure are the main factors influencing this degradation. The most severe erosion has occurred on the sodic duplex soils where clearing has exposed the subsoils, which are extremely susceptible to erosion. Areas with acid sulphate soils will need to remain undisturbed to prevent degradation of the surrounding land and water.

3.1.3 TOPOGRAPHY

The shire is characterized by coastal ranges running north-south along the western boundary of the shire (Many Peaks and Bobby Range) with smaller ranges running parallel closer to the coast, resulting in extensive low lying valleys. The main topographic feature of the area is in the form of coastal deposits including alluvial, sand dunes coastal sand rock and rocky headlands, results of past igneous activity (Miriam Vale Shire Council 1999). Indicators of this activity include rock types of volcanic breccia, ignimbrites, intermediate to acid flows, acid tuff and minor sandstones. The entire sequence of rocks appear to have been terrestrially deposited in the early to mid Triassic. Most outcrops in the vicinity of Agnes Water display the massive highly fractured nature of rock of high strength with an estimated unconfirmed compression strength in the range 20 to 100Mpa.
Some weathering of the rock mass extends to a limited depth. Based on observations in the cuttings along the roads in the area and in some quarries near Agnes Water, the weathering extends to only several metres depth with only a discolouration of the fracture below that depth. At the surface the rock has a residual weathered soil cover of approximately 0.5m to 1.0m depth. Sloping surfaces are covered with a layer of rock scree with an undercover of residual gravelly clay. This clay lies on the top of moderately weathered rock.(Sourcexxxx)

3.1.4 LANDUSE

Early periods of squatting in the area began in the late 1800's, which led to speculation in pastoral land with selections.

In 1880 a rail link was established between Brisbane and Gladstone leading to several railway stations becoming established in the area. In the early years of European settlement, land settlement was restricted to the open forest country (Speargrass). Progressively more arable land was bought. Areas of undulating land between the various mountain ranges were used for sheep stations, but due to problems encountered with Speargrass affecting the sheep's coat, cattle grazing became more popular. Closer land settlement at the turn of the century led to the development of a more intensive land use, including dairying in the Miriam Vale Shire. During the Great Depression tobacco became a valuable district crop with it grown along the north coast rail line. The coastal lowlands, excluding alluvial soils, had very low fertility which were not extensively cropped until fertiliser became available.

Beef cattle has become more prolific in the area as dairying declined. Other landuses in the catchment include mining, timber plantations, small cropping, macadamia plantations, aquaculture and tourism. (See Appendix C Maps: Baffle Creek Strategy Area- Land Uses.)

Table 5 - Tenure of the Miriam Vale Shire (March 2001)

	Tenure	Area (hectares)	% Of Total Area of Miriam Vale Shire
FH	Freehold	265 813	73%
NP	National Park	20 531	5.7%
SF	State Forest	34 527	9.5%
TR	Timber Reserve	9 697	2.7%
	Road Reserve	10 089	2.8%
	Misc. Tenure (includes some Lands Lease)		6.3%

(Source: Digital Cadastral Database, Dept. of Natural Resources and Mines, March 2001)

Miriam Vale Shire has an area of approximately 41,636 hectares of lease hold land covered by secondary lease. This secondary lease covers areas of State Forest, Timber Reserves, Road Reserves and Housing lease land.

Extensive rural residential subdivision has already occurred in the area, with many of these subdivisions adjacent to National Parks. This issue has the potential to isolate the National Park estate from other remnant areas. Although at present, occupancy rates are low (10%), an increase in the resident population may also lead to problems with land degradation, weeds, fire hazards and feral animals (Wide Bay 2020 1998). These factors place high importance on catchment management in the context of a relatively non-modified area facing rapidly increasing demands. The potential for uptake of these rural residential subdivisions supports the need for appropriate planning and development to prevent degradation of water quality and loss of natural values of the catchment.

Intensive grazing, mining, aquaculture and several other industries as well as urban development can have a significant impact on sustainable land management and water quality. Uncontrolled discharge of effluent from such industries has the potential to contaminate surface and groundwater supplies.

Land management practices such as grazing, clearing of timber and the introduction of improved pastures, can and in some areas of Australia has, resulted in degradation of the land and changes to the local biodiversity.

Urban development and the spread of exotic weed and pest species including garden plants and exotic animal species may have linkages. The agricultural industry has also contributed to the spread of exotic weed species with the import of contaminated pasture seed and fodder supplies. The grazing industry can also contribute to riparian vegetation decline and streambank stability.

The extent of existing subdivisions in the catchment may change the predominant landuse from grazing to residential which may strongly effect pest management and the ability to ensure best practice grazing management.

With increasing numbers of timber and carbon credit plantations developing in the catchment, it is important to recognise the effects this industry may have including, (but not limited to), the loss of native biodiversity, effects from pesticide use, changes to the landscape etc. The same concern for catchment degradation applies for the aquaculture industry[1] in the catchment, which may result in effluent runoff into the catchment and water quality decline etc.

[1] The aquaculture industry is regulated with a number of State Agencies and Councils involved in the approval process. Any uncontrolled discharge from an aquaculture facility is illegal.

Minor land uses such as mining, aquaculture, waste disposal, and infrastructure construction add to the diversity of issues.

Table 6 - Agricultural Census Data - Miriam Vale Shire 1995/96

	Miriam Vale Amount	% Of Total Agriculture	QLD for 1997 % Of Total Agriculture
Total Fruit - Gross Value of Production (GVP)	$2 234 053	15.69	7.94
Total Crops (Excluding Pasture & Grass) - GVP	$6 054 311	42.52	61.02
Total Crops - GVP	$6 073 402	42.66	61.81
Total L/Stock Slaughter - GVP	$6 203 563	43.57	28.43
Total Livestock Products	$1 960 467	13.77	9.77
Total Agriculture - GVP	$14 237 432		

(ABS 1996 Agricultural Census Data)

3.1.5 ISSUES

At present the major land resource management issues in the Baffle Catchment Management Area arise from the principal land uses:

- beef grazing,
- dairying,
- small cropping,
- forestry, including plantations,
- fisheries including aquaculture,
- conservation and heritage protection,
- population increase,
- rural residential development, and
- urban development.

Present and potential issues considered together include:

- soil erosion and potential for acid sulphate soils,
- salinisation,
- vegetation retention and management,
- streambank protection and rehabilitation,
- floodplain management and planning and
- impact of land uses on water and aquatic habitat.

Land resource management affects water quality and biodiversity protection, so land management strategies, which protect these, are considered in these sections.

3.1.6 DESIRED OUTCOMES

1. The production and availability of resources and information to guide decision making and facilitation of sustainable resource management.
2. Increased community awareness and understandingof sustainable land use practices.
3. Sustainable resource management that invovles all stakeholders in natural resource management, with a high level of integration between stakeholders.
4. The enhancement and protection of the natural environment for the benefit of all the community.
5. The identification and protection of sensitive areas and restoration of significant sensitive/degraded areas.
6. Land management which achieves productivity of pasture without degrading riparian buffers and other vegetation kept for catchment care and conservation.
7. Industries which enhance and diversify rural businesses, while improving catchment protection, landscape diversity and nature conservation.

3.2 THEME 2 - WATER ISSUES

The catchment is not a static environment. Sediment transport is a natural occurence, any artifical changes in one area can lead to erosion downstream. Major changes have occurred in recent geological times, Baffle Creek is the remains of a much larger catchment which existed about 18000 years ago when the sea level was 130 to 140 metres lower (Australia: State of the Environment 1996, CSIRO; section 2.17). At this time the Baffle joined with what is now Deepwater Creek and flowed eastwards passing just south of Lady Musgrave Island. The rising sea level split the catchments with the more readily visible changes being in the Deepwater area. The present coastal sand dunes are of the Halocene Period (last 10,000 years) and have effectively dammed off the Broadwater/ Deepwater drainage area, leaving a low lying wetland behind the dunes. Here about 18 square kilometres becomes inundated for long periods after prolonged heavy rainfall events. The windblown sand (about 0.2mm diameter) contains freshwater, however abstraction is difficult due to the sand particle size and coffee rock layers that have formed in the dunes. Behind the dunes recent alluvial deposits have formed and any water in the underlying bedrock, just metres from the surface is saline. On the Baffle itself , the rising sea level has resulted in the long esturine section between the Baffle mouth and the area known as Essendeen Bridge.

The Baffle Creek Catchment lies between two highly regulated river systems, the Burnett River and the associated Kolan River to the south and the Boyne River to the north. The catchment provides a valuable natural refuge for terrestrial aquatic and marine fauna impacted on by water resource development. Of particular significance is the length of stream uninterrupted on by artificial barriers and the relatively minor changes to natural flows at present, which is reflected in the relatively current healthy state of fish populations particularly freshwater species (Lupton C.J. & Heidenreich M.J. 1996).

3.2.1 GROUNDWATER

Extraction of groundwater in the catchment is generally limited to flows up to 6 litres per second - with Miriam Vale and Bororen using this resource for potable water supply. Groundwater supplies along the coastal dune systems near Agnes Water and Seventeen Seventy are limited. This resource would be threatened by sand mining and overuse from residential and tourism development. Saltwater intrusion may occur through overpumping of this water resource. Further development of this area is likely to be restricted unless alternative water supplies are provided (DPI 1993).

3.2.2 SURFACE WATER

The topography and geology of the area lends itself to creating complex and variable flooding characteristics (Miriam Vale Shire Council 1999).

Mean annual discharge from the Baffle Catchment Area is estimated to be 750 000 megalitres per year, of which approximately 533 000 megalitres per annum is provided by Baffle Creek. There is only one stream gauging station in the Baffle Creek Catchment at Mimdale, 55.7 kilometres upstream. Records have been kept at this station since 1969.

There has been little development of surface water resources in the catchment area. It is estimated, however, that a growth in demand will lead to a demand of 7,400ML in 2010. As almost all surface water supplies are unregulated it is therefore difficult to determine the yield of the resource and the adequacy of the supply to meet increase in demand. It is believed that existing supplies are sufficient to meet low growth in demand for surface water (Gladstone Area Water Board 1999).

There is potential for large scale irrigation along some areas of Baffle Creek, however in order to protect the integrity of the system, draft recommendations were made by the Department of Natural Resources and Mines after a review of existing policy. The recommendations were made after reviewing past present and future water use issues. These draft recommendations will guide future policy and guidelines for the issuing of new licences on the creek and for future management of the water resource (Dwyer 1998).

3.2.3 (A) DOMESTIC WATER SUPPLY

Domestic water supply in the shire is largely dependent on rainwater, some augmented from dams, creeks and underground supplies. Agnes Water, Miriam Vale and Bororen all have a reticulated water supply. Some properties at Rosedale rely on an old Queensland Railway supply from Bottle Creek .This resource is now locally managed. There are no retriculated supplies at Lowmead or Turkey Beach. 1770 has a small retriculated supply that serves the Council's caravan park.

Agnes Water has had reticulated water supply since 1992. The supply relies on fresh water from the coastal dune sands just south of Agnes Water along Springs Road. Water in the underlying Agnes Water Volcanics formation is saline. The present supply is drawn from 2 open trenches and a number of small bores along the western side of the dunes adjacent to Reedy Creek.

Miriam Vale and Bororen have had a retriculated water supply for over 20 years. Baffle Creek is the main source for Miriam Vale with an annual allocation of 72.7ML (16 million gallons) through an Order in Council (State Government). The creek water is mixed with up to 10% bore water from a bore near the end of Thornes Road, there are also emergency bores located near House Creek. The bore water in the area is unacceptable for long term use without expensive treatment due to high conductivity, hardness, iron and manganese. A natural waterhole on Baffle Creek imediately upstream of the confluence with Three Mile Creek forms a reservoir for the Miriam Vale supply. Bororen receives its water from three bores adjacent to Lagoon Creek, while 1770 relies on a small open trench and temporary bores.

The retriculated supplies are of limited capacity due to environmental constraints on local sources. These environmental restrictions on local water sources are the major constraint on all future development in the area and needs to be taken into account when considering funding for town water supplies for the area. Desalinisation is not a financial proposition yet. A supply from Awoonga dam (Gladstone Area Water Board) has been considered, but is not possible unless funded by State Government or others outside the area.

3.2.3 (B) IRRIGATION WATER SUPPLIES

There is no large scale irrigation in the Baffle catchment such as that around Bundaberg which was founded on abundant groundwater and good quality agricultural land. Irrigation is limited to a few properties generally with gravel beds close to creeks, much of the bedrock contains brackish to saline water.

With increased population and diverse activities in the area over the last 10 years there is a growing demand for irrigation supplies, storage generally being in the form of on-farm dams. It is suggested that there could be a greater demand for on-farm water if any large storage was constructed in the area, however in all cases drainage studies should be undertaken before considering irrigation to avoid any long term soil degradation consequences.

3.2.4 FUTURE WATER DEMAND

Future demand for water and possible competition for water are issues that will have an impact on the catchment with future demand for urban water supply depending on the rate of development of the coastal areas.

Sufficient land has been or is proposed to be developed in the coastal areas to accommodate up to 16, 500 people. One of the critical issues is the availability of an adequate water supply. Demand for urban water supplies for 2010 is projected at being between 420ML per year to 3,100ML per year depending on growth levels (GAWB 1999). It is believed that future industrial demand for water will remain at zero (GAWB 1999).

Although there is potential for large-scale irrigation this scenario would seem unlikely due to the unregulated nature of surface water supplies. Demand for surface water supplies for irrigation in 2010 ranges from the low growth scenario of 7,400ML per year to the high growth scenario of 9,100ML per annum. The high growth scenario is based on the scenario of an increase of small crop growers servicing an increased market due to urban growth (GAWB 1999).

Demand for groundwater supplies is anticipated to grow somewhere between 700 and 5,100ML per annum by the year 2010.

3.2.5 ISSUES

Water supply issues are driven by the erratic rainfall pattern common at this latitude and the absence of suitable aquifers. These combine to limit freshwater supplies and make surface water storages essential to provide reliable water supplies for the local communities..

Water supply issues include:

- water storage structures and their impacts,
- water reticulation in expanding urban areas,
- water allocations for irrigation,
- impacts of water extraction on natural pools and stream structures (such as riffles),
- limited knowledge of environmental flow needs of the catchment and the maintenance of such flows,
- identification of groundwater sources and it's management
- potential demands of future industries and urban growth,
- water re-use possibilities,
- salt water intrusion(very minor in this area)and
- the lack of a Water Resource Plan for the catchment, which prevents effective future planning of environmental flow and consumptive development needs.

There are a number of good dam sites on Baffle Creek and its major tributaries. A dam near Lowmead was considered in the 1970's for a proposed mine at Monto. Two sites existed, one is no longer possible due to railway realignment. The remaining Lowmead is at AMTD 56.6km, 2km upstream of Gorge road. At this point the bed level is at about 6m AHD. A dam with a FSL of 20m AHD to 25m AHD would give a reliable yield in the order of 60,000ML/a to 80,000 ML/a and has the potential to provide all urban water for the Shire, irrigation supplies and water requirements outside the catchment. The site allows for a relatively low cost dam. The resultant lake would extend upstream to a point near the Fingerboard Road bridge. It would have significant economic impact on the area. The site has been considered by the Gladstone Area Water Board for augmentation of the Gladstone supply to cater for major industrial development in the Gladstone area.

The proposal was examined and concluded that such a dam did not present the best option for the region in the next 25-50 years (GAWB 2000).

Wide Bay 2020 Regional Growth Management Framework adopted by all levels of government includes a policy action that related to Baffle Creek and its catchment being a "special place and should be managed accordingly. This Policy Action 7.1a reads
"Whilst recognising the existing and future social and economic needs and commitments of the river system, ensure Baffle Creek and its catchment is retained in its relative pristine state in order to preserve its environmental values, and to provide baseline information for the possible rehabilitation of disturbed catchments in the region and elsewhere in Queensland" (Wide Bay 2020 1998).

It is recognised that this environmental constraint has significant economic, planning and developmental impacts on the area. The benefit of retaining Baffle Creek in it's near pristine state extends to the wider community. This benefit needs to be acknowledged when considering funding for infrastructure in the area.

Water quality issues centre on the good current condition of natural waters and the need and desire within the community to maintain water quality standards.

Water quality issues (present and potential) include:

- accelerated sediment transport due to human activities,
- contamination of ground and surface water,

- industrial effluent discharge, treatment and re-use,
- provision of water, sewerage and refuse disposal infrastructure to expanding urban areas, and generally
- the protection of catchments and waters of high natural heritage value.

3.2.6 DESIRED OUTCOMES

1. The determination and maintenance of environmental flow requirements.
2. The identification of impacts and their sources.
3. The best water quality achievable under natural catchment conditions.
4. Agreed targets for groundwater, stream water, wetlands and estuaries and the restoration to agreed standards where decreases in water quality have been identified.
5. Sustainable land uses and water managment to protect water quality and aquatic ecosystems.
6. Effective protection measures for water resources in all development activities in the catchments.
7. Continual improvement in community awareness of standards, importance and protection measures.
8. Commitment and co-operation among community, government and industry in the pursuit of water quality standards.
9. Management of water resources to provide for consumptive use consistent with maintaining or improving the environmenal values of the catchment.

3.3 THEME 3 - ESTUARINE AND MARINE ISSUES

3.3.1 COASTAL, ESTUARINE AND MARINE ENVIRONMENT[1]

The coastline of the area consists of long sandy beaches between Baffle Creek and Bustard Head and the tidal mudflats and mangroves of the coastline and islands in the north of the greater catchment area.
The coastline is also adjacent to the southernmost extension of the Great Barrier Reef, the most prominent sections of reef in this area being Lady Elliot Island and the reefs and islands of the Bunker Group, including Lady Musgrave Island, Hoskyn Island and the Fairfax Islands, which are located between 70km and 80km east of Round Hill Head (Miriam Vale Shire Council 1999).

Due to the presence of the Great Barrier Reef to the east of Round Hill Head, the coastline is the northern most surf beach along the Queensland coast. Wave energy along the coast is highest around the Agnes Water area and decreases to the south due to the protecting influence of Fraser Island.
Erosion prone areas and control districts are gazetted along the coastline of the shire with widths ranging from 0-400 metres inland from seaward toe to frontal dunes (Miriam Vale Shire Council 1999).

The existence of the Mackay Capricorn section within the Great Barrier Reef Marine Park, adjacent to the catchment, has many implications, as the catchment will have an impact on these areas. The Mackay Capricorn Marine Park section covers from the northern end of the catchment to 24 30' (approx. 2.5 kms north of the mouth of Baffle). This park extends out offshore past the Bunker Group and Swains Reef where it adjoins the Great Barrier Reef Marine Park (southern boundary 24 30').

Marine Parks are established over tidal lands and waters to protect and conserve special areas while allowing for planned use of marine resources. Marine Parks protect a range of habitats including mangrove wetlands, seagrass beds, mudflats, sandbanks, beaches, rocky outcrops and fringing reefs (EPA 2001(a) website).

The mouth of Baffle Creek and other associated catchments of the Baffle Basin are identified as the only near pristine (the highest classification given in this audit) estuaries in southeast Queensland. The Baffle Estuary is the southern most near pristine estuary in Queensland (National Land and Water Resources Audit, 2001).

[1] Coastal zone management is also being examined at the state and regional level by the Environmental Protection Agency's (EPA) *State Coastal Management Plan* and *Wide Bay Regional Coastal Management Plan* (in preparation). The Great Barrier Reef Marine Park Authority administers marine issues within the Marine Park and also advises on the management of adjoining catchments

The Great Barrier Reef Marine Park Authority (GBRMPA), in the Great Barrier Reef Catchments Water Quality Action Plan released in 2001, has identified the Baffle Catchment as being in the medium to high-risk category for risk to inshore Reef from river discharge from the Great Barrier Reef catchments. GBRMPA have determined the increase in sediment, nitrogen and phosphorus discharge from the Baffle Catchment between 1850 and 2001. They have also set targets for the reduction in these exports for 2011 in order to improve the quality of water draining into the Reef (Great Barrier Reef Marine Park Authority, 2001). It is obvious from a planning perspective more baseline and monitoring data needs to be captured as this report appears to be in conflict with the general overall view of the catchment's near pristine nature.

The Rodd's Bay Dugong sanctuary is a significant area to be considered in catchment management issues, as a portion of it is in the Baffle Catchment Management Area. A system of dugong sanctuaries or protection areas have been established by the Commonwealth and State governments as a key strategy to help recover dugong numbers in the southern Great Barrier Reef. A two-tiered system of 'A' and 'B' sanctuaries has been established with restrictions on mesh netting being greater in 'A' than 'B'. Rodd's Bay sanctuary is a 'B' sanctuary (Great Barrier Reef Marine Park Authority 1999).

Substantial parts of the coastline are important sea turtle rookeries. This issue is covered more in the *Nature Conservation and Biodiversity* theme.

Increasing development within the catchment will focus mainly on the scenic coastline. Therefore impacts of residential and tourism development and anthropogenic impacts (recreational use, domestic animals, rubbish dumping, urban runoff) are issues that will have a major effect coastal and estuarine environments.

3.3.2 FISHERIES

A number of declared Fish Habitat Areas exist in the greater Baffle Catchment Area and are located in the protected coastal area between Round Hill Head and Wild Cattle Island. The area between Rodd's Peninsula and Wild Cattle Island is important for mangrove communities, which provides habitat for fish and mud crab. The sandier area between Rodd's Peninsula and Round Hill Head supports a wider range of mangrove (Miriam Vale Shire Council 1999).

There is also a declared Fish Habitat Area (FHA) A, over approximately 2000 ha of tidal habitat within Baffle, Oyster and Bottle Creeks. FHA's are an increased management level over more general state-wide protection of marine plants (seagrass, mangrove, saltcouch, samphire and other vegetation on tidal lands) under the *Fisheries Act 1994*. They are declared by regulation. Fish Habitats Areas are important for protecting the habitat resources for fish and other fauna by preserving important areas such as shallow sandbanks, seagrass beds and mangrove areas in a relatively undisturbed state. These areas provide essential breeding grounds for fish and prawn stocks and habitat for marine mammals, marine reptiles, marine waders and crustaceans (Miriam Vale Shire Council 1999). As such these refuges are important for recreational and commercial fishing.

An 18-month study from Jan 1993 - June 1994 published in *A Fisheries Resource Assessment of the Baffle Creek System in the Wide Bay – Burnett Region of Queensland,* (Lupton, C. & Heidenreich, M., Department of Primary Industries), examined 13 estuarine sites and 17 Riverine sites in the Baffle Creek Catchment. The study compiled the following data from each site: fauna and flora inventories, habitat descriptions, water chemistry data, bottom sediment classifications and river bottom profiles.
In the estuarine areas of Baffle Creek, a total of 77 fish and 10 crustacean species were sampled, while 25 fish and 6 crustacean species were recorded in the freshwater riverine areas.
The diversity is indicative of a river that has good water quality with relatively undisturbed fisheries habitats (Lupton and Heindreich 1996).

3.3.3 ISSUES

Major estuarine issues identified are:

- impacts of upstream and surrounding catchment management practices affecting silt loads and nutrient inflows,
- effluent disposal from a developing aquaculture industry,
- maintenance of natural flow regimes and the potential influence of future dams and current barriers (weirs, roads, culverts etc),

- management of foreshore erosion[2];
- protection of fishery habitat, including mangrove, seagrass and nursery habitats[3],
- lack of data relating to fish catches, fish stocks and other marine issues,
- sustainability of fish and crustacean harvesting and the effects of commercial and recreational fishing practices and
- catch-sharing issues and the economic benefits of the fishery[4].

Major marine and coastal issues include[5]:
- beach protection,
- tourist, recreational and fishing access and impact,
- increasing coastal development,
- fish habitat and fish stock protection and enhancement,
- turtle conservation and
- protection of marine environments from pollution.

3.3.4 DESIRED OUTCOMES

1. Estuarine and marine ecosystems of the Baffle protected by relevant planning processes involving appropriate community input.
2. Fishery sustainability protected by participatory planning, management and regulatory processes.
3. Estuarine and marine environments protected from contamination by unnatural sediment flow and human pollutants.
4. Beaches, foredunes and turtle nest sites protected from destruction and degradation.
5. Fish Habitat Areas, including seagrass beds protected from destruction and degradation.
6. Baffle Creek estuarine and marine ecosystems protected from incursion by undesirable and exotic biota.
7. Adequate environmental flows maintained to all streams, wetlands and estuaries.
8. Increased community and stakeholder awareness of issues relevant to the health and sustainability of the Baffle system.
9. Increased community and stakeholder participation in research, monitoring and evaluation activities relevant to the sustainability of the Baffle system.
10. High standard of environmental monitoring of impacting industries (e.g. aquaculture).

3.4 THEME 4 - NATURE CONSERVATION AND BIODIVERSITY ISSUES

Nature conservation is essential to a healthy catchment and is already an important land use in the catchment. Existing protected areas include terrestrial and marine national parks, multiple use reserves, state forest and timber reserves, declared Fish Habitat Areas and a dugong sanctuary. Some conservation areas have National Estate or World Heritage status. All combine to provide an economically important recreational and ecotourism resource.

Biodiversity refers to the variety of communities, native plants, animals and microorganisms, the genes they contain and the ecosystems they form. Four levels of biodiversity are recognised in the Queensland *Nature Conservation Act 1992*:

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[2] Coastal erosion is a natural phenomenon (Wide Bay Burnett Conservation Council; 2000) which severely affects the mouth of Baffle Creek

[3] Fish Habitats in the tidal waters of the Baffle Basin are protected by the management requirements for Fish Habitat Areas (FHA), as designated in the *Fisheries Act 1994* and administered by the Queensland Fisheries Service (QFS) of DPI

[4] Ways to ensure sustainable fish harvesting and equitable catch-sharing are dealt with by DPI (QFS). There are separate opportunities for community consultation on these issues in the Department's fisheries management planning process

[5] Marine issues are included because catchments affect the coastal waters about their mouths; and lands draining directly to the sea are included in the Catchment Management Area. Baffle Creek and other streams of the area discharge into Great Barrier Reef waters, most of which are within the Great Barrier Reef Marine Park and World Heritage Area

(a) regional diversity- the diversity of the landscape components of a region, and the functional relationships that affect environmental conditions within ecosystems;

(b) ecosystem diversity, - the diversity of the different types of communities formed by living organisms and the relations between them;

(c) species diversity - the diversity of species (both plant and animal); and

(d) genetic diversity- the diversity of genes within each species.

From a biodiversity perspective, Baffle Creek catchment is characterised by:

- a high overall retention rate of remnant vegetation
- landscape diversity, from elevated ranges composed of igneous and metamorphic outcrops of late Palaeozoic / early Mesozoic age to coastal lowlands with extensive areas of tidal and non-tidal wetlands
- a wide range of vegetation types and dependent flora and fauna species.

Of the catchment's total area of 367 967 ha, protected tenure[6] accounts for - National Parks 22 962 ha, State Forests 24 919 ha, and other reserves 1 950ha. Remnant vegetation on freehold and other tenures, as well as *protected tenures*, plays a critical role in supporting the catchment's fauna and flora.

Conservation by private landholders, eg. through formalised arrangements such as Land for Wildlife (see Table 7 for Land for Wildlife registrations and associated data) agreements and Nature Refuges, have significant potential for improving the conservation of Baffle Creek's biodiversity. For areas of biodiversity significance (see Appendix C Maps- Baffle Creek Catchment - Areas of Biodiversity Significance).

Table 7 - Land for Wildlife Registrations and Associated Data in the Miriam Vale Shire/Baffle Creek Catchment[7]

(This data relates to areas under the Land for Wildlife program only)

Total Area of Registered Properties	681.1 ha
Total Area of Regional Ecosystems Types in the 'Of Concern' and 'Endangered' Categories	218.1 ha
Total Area of Retained Habitat	518.8 ha
Total Area of Habitat under Restoration	41.8 ha
Total Area being Actively Managed for Nature Conservation	560.6 ha
Number of Landholders Registered a "Working Towards Land For Wildlife"	0
Total No. of Landholders Registered	28

(Source: Wide Bay Burnett Land for Wildlife Registrations as of 13th August 2001)

Off park conservation has mainly been a by-product of relatively low impact land use, which has retained forest cover, wetlands and foreshore vegetation on land of low agricultural or pastoral productivity. Floodplain wetlands and riparian vegetation, particularly the gallery rainforest, are major contributors to the biodiversity of the landscape.

3.4.1 VEGETATION

The greater Baffle catchment area can roughly be divided into two sections, namely a complex coastal lowlands (varying from one to twenty kilometres wide) and the foothills and coastal ranges region. The area also is significant in the fact that it represents the transition between two climate zones.

[6] National Parks, State Forests (particularly *Forest Reserves)* and *other reserves* (including road/camping/water reserves)

[7] There have been no registrations to date in the Miriam Vale Shire that are not in the Baffle Creek Catchment Management Area and none in the Baffle Creek Catchment Management Area that are not in the Miriam Vale Shire

The coastal area has been identified as a Coastal Key Area by (Stanton and Morgan 1977), which means it is an area for long-term preservation for regional biodiversity. Saltmarshes, freshwater swamps, coastal sand dunes, near pristine estuarine systems and large areas of undeveloped hill country of eucalypt forest and woodland exist in this area. Mangroves occur on the tidal mudflats, estuaries and riverbanks (Wide Bay 2020).

Dune vegetation occupies the coastal sand with grassy to layered eucalypt forest occupying the stable sandy area behind the dunes. Mixed herblands on the foredunes include *Ipomoea pes-caprae* and *Canavalia rosea,* (Ulm and Lilley 1999).

Strand forests exist on the humic sands with wet and dry heathland vegetation communities, [comprising a number of species including banksia (*Banksia* sp.), paperbark (*Melaleuca* sp.) and grass trees (*Xanthorrhoea* sp.)] also occurring in other poorly drained sand environments.

Beach ridges support tall open paperbark forests, dominated by *Melaleuca leucandendra* and *M. dealbata* in conjunction with communities of cabbage tree palms (*Livistonia australis)* (Ulm and Lilley 1999).

Blue gum *(Eucalyptus tereticornis)* forest is common on river alluvia with riverine closed forest found on the richer alluvia (Miriam Vale Shire Council 1999).

The lush lowland subtropical rainforests found in Eurimbula National Park, grow on poor sandy soils, is an important ecological area for two reasons. The first being the fact that due to the dependence of the plant communities on the groundwater, any disturbance will degrade the system and the second is that the area contains the only significant community of Alexandra palm swamp and associated rainforest types in a lowland area in southern Queensland. Deepwater National Park is also significant in that the communities it contains are poorly represented elsewhere.

The foothills and coastal ranges are of granitic or metamorphic origin with isolated basalt. Hoop pine (*Araucaria cunninghamii*) forests occur on isolated basalt or locally enriched soils on the ranges (Miriam Vale Shire Council 1999). The Many Peaks range has a vine and sclerophyll forest, which is defined as an Important Area of Vegetation (Stanton and Morgan 1977).

Baffle Creek Catchment has a remnant vegetation retention rate of 62%[8]. The vegetation types are described as regional ecosystems *(RE's),* (Sattler & Williams, 1999). RE's are ascribed a biodiversity status by the Environmental Protection Agency. This status reflects the *rarity value* and risk(s) posed by threatening processes. Under the *Vegetation Management Act 1999 RE's* are also accorded a status based on remnant extent. While both measures provide an index of scarcity, it should be noted that they are not the same. Queensland Herbarium 1:100 000 scale mapping of remnant vegetation identifies the following Regional Ecosystems within the catchment of Baffle Creek. Biodiversity Status - Endangered, Of Concern and Not of Concern, is the status recognised by the Environmental Protection Agency (See Appendix A - Biodiversity Status of Regional Ecosystems in the Baffle Creek Catchment Area).

The *Vegetation Management Act 1999* also has implications in terms of vegetation retention and the protection of biodiversity. The Vegetation Management Act is aimed at maintaining 30% of significant vegetation on a bioregional basis. It sets out to achieve the protection of biodiversity among other things.

Due to clearing in the area, introduced plants have become established and the range of some natives (e.g. grasses) has become extended. This clearing may have resulted in minor and severe cases of land degradation.

Land clearing has been linked to such things as loss of biodiversity, erosion, and decline in water quality etc. In other states land clearing of deep-rooted vegetation has been linked to the development of dryland salinity.

[8] Draft analysis of *rem99* vegetation mapping of Queensland - Qld Herbarium.

3.4.2 FLORA AND FAUNA

Biodiversity at the species level can be considered in terms of overall numbers (richness) and distribution (species density patterns, levels of endemism etc.). It can also be viewed in terms of known conservation status viz.: common, rare, vulnerable or endangered. Current understanding of species level biodiversity patterns in the catchment of Baffle Creek is sketchy and mainly relates to surveys conducted on State lands. There is some knowledge of the so-called r forms of lifehighe (vertebrates and vascular plants) but very little is known about species at the lower evolutionary scale (invertebrates, non-vascular plants, microbes, etc). Unfortunately, it is at the lower end that much of the species diversity is concentrated.

The table in *Appendix B – Rare and Threatened Species in the Miriam Vale/Baffle Creek Area* details records of species from the catchment area, scheduled under the *Nature Conservation (Wildlife) Regulation 1994* and extracted from *Wildnet* - the EPA-maintained database of wildlife records.

The presence of the fauna in the area will depend on the maintenance of the existing environment; poorly planned development and unsuitable land care practices may pose as potential threats to the native fauna.

The beach areas south of Round Hill Head are major nesting sites for turtles along the eastern coast of Queensland. Over the last decade there has been an obvious decline in numbers of Leatherback (*Dermochelys coriacea*) and Loggerhead (*Caretta caretta)* turtles. The importance of protecting these nesting sites is therefore obvious. Threats to the sites include future incompatible development, recreational use of four wheel drives (considered in the Economic, Social and Cultural section) and fox predation (considered in the Weeds and Pests theme) (Miriam Vale Shire Council 1999).

3.4.3 ISSUES

Because of a lack of information on species, and a lack of understanding of land and water management outcomes for biodiversity and conservation, issues are not well documented in this chapter. The major issue is therefore the knowledge gap.

Many issues dealt with in other chapters have a nature and biodiversity conservation aspect:

- clearing,
- erosion and runoff,
- pollution control,
- water management,
- fire management,
- fisheries,
- ecotourism,
- beach protection,
- wetland protection,
- weed and pest control,
- economic development,
- the regional and state significance of the catchment management area's natural heritage, and
- limited research on species and ecology.

3.4.4 DESIRED OUTCOMES

1. A Comprehensive, Adequate and Representative (CAR) reserve system.
2. The adoption and integration of biodiversity conservation practices with other landuses on public and private lands.
3. The retention, maintenance and revitalisation of vegetated corridors and buffers strategically placed throughout the catchments, linking reserves.
4. Community involvement in nature conservation.

5. Community involvement in species recovery plans and local component plans for the most endangered species or ecosystems.
6. Strong links between industry and conservation, and management of both together.
7. Assessment of the conservation needs of our waterways.
8. Incorporation of conservation needs in the planning and retention of vegetation.
9. The development of a custodial ethos by land managers and owners and other natural resource users i.e. the appreciation by landowners/managers of their responsibility for land management.
10. The ecological, economic and socially sustainable use and enjoyment of the catchments biodiversity and other natural resources.

3.5 THEME 5 - WEEDS AND PESTS

There are two basic weed threats: loss of productivity, and environmental degradation. The Baffle Basin is subject to a number of weed and pest animal species that must be controlled in order to maintain and enhance the relatively pristine nature of the catchment. The potential for the rapid spread of weeds and pest animals within the catchment is high due to its complex drainage pattern, low population, increasing visitation from other areas, and lack of awareness of the appropriate control measures for these species. There is a potential for other weeds and pests to become established.

Major weeds already present in the catchment include Giant Rats Tail Grass (GRT) and Cats Claw Creeper, while Parthenium, Rubber Vine and Groundsel Bush need to be monitored closely to avoid them getting out of control. Pest animals in the catchment include dingoes, foxes, rabbits, pigs and feral cats. Fox predation has a significant impact on the viable nesting of many species of turtles in the region. Other potential threats include insect pests such as grasshoppers, fire ants etc. See Tables 8 and 9 for classification of weeds that exist the area.

Table 8 - Declared Weeds & Environmental Weeds that threaten the Baffle Catchment[9]

DECLARD WEEDS	PROBABLE ENVIRONMENTAL WEEDS
Giant Rat's Tail Grass *(Sporobolus pyramidalis & S. natalensis)*	African lovegrass *(Eragrostis curvula)*
Parthenium *(Parthenium hysterophorus)*	Balloon or Heart seed vine *(Cardiospermum grandiflorum)*
Groundsel bush *(Baccaris halimifolia)*	Blue Heliotrope *(Heliotropium amplexicaule)*
Rubber Vine *(Cryptostegia grandiflora)*	Broad Leaf Pepper Tree *(Schinus terebinthifolius)*
Mother of Millions *(Bryophyllum tubiflorum & B. daigremontianum x tubiflorum)*	Camphor laurel *(Cinnamomum camphora)*
Noogoora burr *(Xanthium pungens)*	Cat's Claw Creeper *(Macfadyena ungius-cati)*
Milkweed *(Euphorbia heterophylla)*	Chinese celtis *(Celtis sinesis)*
Honey Locust *(Gleditsia triacanthos)*	Climbing Asparagus *(Asparagus plumosus & A. africanus)*
Annual Ragweed *(Ambrosia artemisiifolia)*	Creeping Lantana *(Lantana montevidensis)*
Prickly Pear *(Opuntia species except O.ficus-indica)*	Easter Cassia *(Senna pendula var. glabrata)*
Water Hyacinth *(Eichhornia crassipes)*	Lantana *(Lantana camara)*
Water Lettuce *(Pistia stratiotes)*	Leucaena *(Leucaena leucocephala)*
Salvinia	Mother of Millions Live Leaf or

[9] This list is not conclusive

(Salvinia molesta)	Resurrection Plant *(Bryophyllum pinnatum)*
	Singapore Daisy *(Sphagneticola trilobata)*
	Tecoma or Yellow bells *(tecoma stans)*
	Thunbergia *(Thunbergia grandiflora)*
	Wait-a-While *(Caesalpinia decapetala)*

Source: (pers. comm. Helen Haapakoski, Department of Natural Resources and Mines 2001)

Table 9 - Priority Weeds of the Miriam Vale Shire[10]

WEED	PRIORITY
Giant Rat's Tail Grass *(Sporobolus pyramidalis & S. natalensis)*	1
Parthenium *(Parthenium hysterophorus)*	2
Groundsel bush *(Baccaris halimifolia)*	3
Noogoora burr *(Xanthium pungens)*	3
Rubber Vine *(Cryptostegia grandiflora)*	4
Mother of Millions *(Bryophyllum tubiflorum & B. daigremontianum x tubiflorum)*	5
Snake Weed *(Stachytarpheta spp.)*	5
Common Sensitive Plant *(Mimosa pudica)*	6
Cotton Bush *(Gomphocarpus physocarpus)*	7
Devils Fig *(Solanum hispidum)*	8

(MVSC 1997-1998)

No weed or pest problem is unique to the Baffle Basin, and research results gained elsewhere can be used, while identifying specific needs eg. biological control agents able to prosper under local conditions. In no area of natural resource management is collaboration and teamwork more important, and achievable. Key participants are landholders, industry groups, Councils, NR & M, DPI, QPWS and Landcare and Catchment Management community groups working together and with researchers such as the GRTG Project team and planners such as the SEQ Pest Advisory Forum.

Weeds and pests pose great threats economically, environemtnally and socially. Economically weeds seriously effect agricultural production, tourism etc. The pose a mjor threat to biodiversity and affect the scenic amenity and recreational use of the cathcment.

3.5.1 ISSUES

An overarching issue is the Baffle's status as a benchmark river system due to the absence of any major water infrastructure, and its consequent 'natural' ecological processes and flow characteristics. Therefore weed and pest animal control measures within the Baffle Basin should be at a level consistent with maintaining its relatively pristine nature.

Other issues include:

[10] As identified by the Miriam Vale Shire Council

- cultural heritage - weeds are degrading some of the nation's first botanical collection sites at Round Hill Head.
- fox predation on vulnerable turtle species and endangered loggerhead turtles

Each weed and pest animal species has its own issues to be addressed, but general issues centre on:
- research and knowledge for management,
- education and awareness of land managers and
- control or eradication techniques, work and resourcing.

3.5.2 DESIRED OUTCOMES

1. Major weeds and pests (and potentail weeds and pests) in the catchment identified, and community-owned plans formulated for their control.
2. Infestations of potentially invasive and damaging weeds avoided through preventative measures, or contained at an early stage.
3. Serious environmental weeds controlled, concentrating first on strategic places of high conservation value.
4. Research results and guidelines applied as they emerge.
5. Well organized and unified alliances working together.
6. A catchment-wide map showing the occurrence and severity of the priority weeds, in conjunction with the vegetation planning in Theme 4 and the conservation values identified by work recommended where weed trouble spots coincide with high value (for catchment care, production or conservation) and where new weeds are establishing with potential to spread are priority sites for action.
7. Community, industry and government both locally and in the region, aware of weed and pest issues, possess appropriate skills and equipment, and involved in on-ground work.
8. Landholders and other land managers in the catchment accept their responsibility toward 'containment' (this word is specific – their responsibilities are broader), and guard against complacency borne of familiarity. Likewise, landholders and Councils in the Baffle Basin need priority resourcing to contain the weed, including financial assistance.
9. Beaches free of foxes to ensure viable nesting populations of turtles.

3.6 THEME 6 - ECONOMIC, SOCIAL AND CULTURAL DEVELOPMENT

When considering Natural Resource Management issues it is important to realise that they are not in isolation of economics. The principles of *Integrated Catchment Management* focus on a balance between environmental, social and economic issues. The economy at all levels relies on the sustainability of the industries and forces that drive it.

Although there is strong population growth with the estimated resident population of Miriam Vale Shire as at 15 August 2001 being 4,947, showing growth was at 4.0% per annum between 1999 and 2001, economic growth in most of the Baffle Catchment Management Area could benefit from new initiatives and injection of external assistance. Many strategies in this chapter promote appropriate, community-driven development, to enhance the community's capacity to develop sustainable industry and look after its resources and heritage, and to avoid reliance on unsustainable resource use and depletion.

3.6.1 ECONOMIC STATUS OF CATCHMENT

From sheep to cattle, timber to sugar - Baffle Creek played a vital role in the early days of the "Discovery Coast" and hinterland.

Today, the economic well-being and livelihood of many local people continues to be based on primary industry - with grazing in particular playing an important role in the region, with beef cattle being the predominant type of grazing. However, grazing in the area has declined over the last 40 years due to urban expansion, semi rural development and the increase in other industries.

Mining interest in the Catchment Area is primarily concerned with mineral and silica sands and several mining leases exist. A significant oil shale deposit exists near Lowmead. The development of this deposit will depend on future economic circumstances and world oil supplies. It is considered that the resource is unlikely to be developed for some time. Mining leases exist over Makowata (shale oil deposit near Lowmead) and over Middle Island.

Timber-getting and saw-milling, small-cropping and commercial fishing are all prominent along Baffle Creek and its tributaries - and still play a significant part in the economy of the area today.

Other new primary industries to emerge in recent times include ostrich and deer farming, alternate farming, aquaculture and timber plantations. It is expected that timber plantations will become a significant industry in the area in the future. Many of these industries are dependent upon Baffle Creek in some way - whether for the obvious such as fishing and timber or for water for livestock and irrigation for crops.

One of the fastest growing industries in recent times is tourism. As more and more people visit and become aware of the attractions of Baffle Creek and the "Discovery Coast", the word has quickly spread and tourist numbers have grown. Baffle Creek is also an extremely popular destination for recreational fishers and campers who contribute to the well being of the local economy. Service and construction industries are also becoming established as the population centres of the Baffle grow.

Intensive production techniques, including cattle feedlots, timber plantations, aquaculture sites and macadamia nut plantations exist in the catchment, and concerns have been raised about the potential impacts of these industries including the potential for nutrient and chemical run off. Mining proposals including mineral sands at Agnes Water, Middle Island and Hummock Hill Island: and a proposed shale oil project at Lowmead may also have effects (Wide Bay 2020). Due to the floodplain nature of the area, future mining may likely lead to changes to the natural flow of the watercourses.

Therefore it is evident that established industries may need to reassess land management methods and any future new establishments or expansions need to be carefully planned factoring in all issues, in order to limit the negative effects on the catchment.

Problems arising may include low community capacity to establish enterprises and invest in community development without external funding or structured co-operatives.
Cottage, home based and smallholding based economic initiatives need special consideration, as these appear likely to bring environmentally sustainable social and economic development, but often have modest financial backing.

The collation of values and goals gives an indication of the overall vision for socio-economic development. It suggests a catchment community relying on its natural resources, and its natural and cultural heritage, using these sustainably (without loss of 'naturalness') for the benefit of present and future generations, in terms of quality lifestyle or visitor experience as much as economic prosperity.

There is a lack of desire evident within the catchment community for intense economic development. Primary industries and tourism appear favoured, with little desire to attract large-scale secondary industry. There is a consciousness of the regional status of the catchment's natural heritage, and a sense of custodianship of something special by many residents.

Table 10 - Employment by Industry

Industry	Miriam Vale Shire %
Agriculture, Forestry and Fishing	23.63
Mining	0.46
Manufacturing	5.95
Electricity, Gas and Water Supply	0.99
Construction	10.44
Wholesale Trade	3.28
Retail Trade	7.70

Accommodation, Cafes and Restaurants	6.63
Transport and Storage	6.78
Communication Services	0.99
Finance and Insurance	0.91
Property and Business Services	6.17
Government Admin. And Defence	6.10
Education	7.47
Cultural and Recreational Services	3.13
Health and Community Services	1.37
Personal and other Services	1.91
Non-classifiable Economic units	1.68
Not States	4.42

(population of Miriam Vale Shire as at 30 June 1999 was 4,557)
(Source: ABS 1996 Census of Population and Housing)

3.6.2 CULTURAL HERITAGE

Cultural heritage places can be defined as areas or places of cultural heritage significance such as areas or places of aesthetic, architectural, historical, scientific, social or technological significance to present and future generations. They can be part of the character of an area or an individual place (Environmental Protection Agency 2001(b)).

There is much archaeological evidence that suggests the coastal area of the Baffle Basin has had long established Aboriginal occupation. Identified archaeological sites occur around Round Hill Head and headlands adjacent to the coastline near Agnes Water. Evidence found includes scarred trees, axe grinding grooves, quarry sites and middens of local shellfish remains (Ulm and Lilley 1999).

Much of the Baffle Creek Catchment Management Area was dominated by the Meerooni tribe of Aborigines. The Meerooni hunting ground extended from the mouth of Baffle Creek along the coast north of Rodd's Bay where it met the Toolooa tribe, and inland to the Many Peaks range of mountains. The tribe's southern coastal boundary at Baffle Creek met the territory of the Dulule tribe, while part of the southern inland hunting ground was bounded by the Waarba tribe on Kolan River (Growcott & Taylor, date unknown).

At the beginning of white settlement it is estimated that the population of the Meerooni was about 1000. The Meerooni existence depended on the foods and materials supplied by nature and no doubt had an intimate knowledge of the area (Growcott & Taylor, date unknown). Baffle Creek, with its various tributaries, lagoons and variety of wildlife and plant life would no doubt have played a significant role in their everyday lives.

A study of the area entitled "The Archaeology of the Southern Curtis Coast" identified that the area has significant archaeological potential with surveys of the area undertaken as part of the Gooreng Gooreng Cultural Heritage Project (Ulm and Lilley 1999). This study identifies 79 Aboriginal cultural places in the area of study. The most common archaeological evidence of Aboriginal activity was exhibited through low-density shell middens, with larger middens containing stone and glass artefacts also found. The pattern of distribution suggests the possibility that exploitation of resources along estuary margins was preferable to that of open coasts.

The study also highlights the fact that the area has the potential for major residential, tourist and heavy industrial growth and that the development and adoption of effective management plans to deal with cultural heritage sites is necessary.

Currently, there is a native title claim over this area, which is part of the Port Curtis Coral Coast Claim. This claim is a combined claim of four Traditional Owner groups. The main Traditional Owner Group for this area is the Gooreng Gooreng/Gurang (pers comm. 2001, Sel Appo, Gurang Land Council).

Captain James Cook first landed on Queensland soil at Round Hill Head on 24th May 1770, where botanist Sir Joseph Banks collected many botanic samples for study from the area. Cook and the men of the H.M.S. Endeavour were the first to acknowledge the areas native inhabitants when they wrote about their stay in Bustard Bay in 1770 (Growcott & Taylor, date unknown). At present there is a monument marking this landing and several tourist ventures use the historical significance of the area as a marketing feature. However there is scope to interpret the historical significance of the area further for the tourist market.

European settlement initially occurred in the north of Miriam Vale shire around 1846 mainly as a convict colony and to provide labour and a market for Moreton Bay squatters. The Rosedale area was settled in 1853 when James Little occupied land adjacent to Baffle Creek. This area is identified locally as the Rosedale Cattle Station. In 1856 a Mr. Chauvel selected an area of land around the present town of Miriam Vale and named the homestead "Miriam" after his wife.
Large tracts of country in the area become unavailable for occupation due to squatting which led to speculation in pastoral land. Well known early selections in the area include Miriam Vale, Taunton, Eurimbula, Toweran, Wadeleigh and Turkey Stations.

A rail link was established between Brisbane and Gladstone in 1880 resulting in the railway sidings of Inveragh, Bororen, Miriam Vale, Colosseum, Makowata, Korenan, Lowmead, Berajondo and Rosedale. This has led to establishment of variable landuses and industries in the area over the years including sheep, dairying, tobacco, grazing and tourism (Miriam Vale Shire Council 1999).

3.6.3 ISSUES

Economic and Social Issues. The major consideration is how to increase opportunities for the catchment area's workforce and youth, which will be of long-term benefit, while protecting:

- the lifestyles valued by catchment residents,
- quality visitor experience, and
- the natural assets needed for the future.

The socio-economic profile shows relatively:

- low median weekly income ($200-299),
- high unemployment (23.6%),
- transient population (37% in the same address 5 years previously) and
- high population growth.

Cultural Issues include:

- possible impact from increased growth and tourism in the area on cultural heritage sites,
- conservation and maintenance of cultural heritage,
- involvement of relevant communities in the management of cultural heritage places,
- natural and cultural assets and
- development of arts and culture in the community.

3.6.4 DESIRED OUTCOMES

1. An ecologically sustainable environment which provides an acceptable level of economic opportunities and social activities for residents and visitors.
2. An understanding by all catchment residents that a healthy and sustainable economy is dependent upon a healthy environment.
3. Industries which are consistent with the values held by the catchment community, and offer true long-term benefits are encouraged, while developments which have the potential to degrade natural resources are treated cautiously, particularly when the likely effects of the development are unsure.
4. All stakeholders accept the principle of inter-generational equity, where decisions made today should not reduce the choices available to future generations.
5. Protection, enhancement and greater awareness of cultural heritage.

3.7 THEME 7 - INFORMATION AND COMMUNICATION

Effective catchment management requires open and honest communication between all stakeholders, and access to all relevant sources of information required to make intelligent decisions. The Baffle Basin is home to a relatively dispersed population, making communications and information dissemination more difficult. It is essential therefore, that an effective communication plan for the area is developed and implemented.

The major information issue is the lack of baseline data on almost any aspect of the natural environment, natural resources and existing or potential industries. These information gaps have been obvious in the preparation of this strategy, and ideas to increase information are offered throughout the work.

Complementing this is a need to increase information transfer between government agencies, private sector industries and the community. Public consultation and informed public debate on resource management is increasing, and is an important part of decision making. A major issue regarding this approach is the fact that there appears to be a relatively low level of awareness in the community as to the full scope of what catchment management and natural resource management actually entails. There does appear however, a large amount of support for planning for the future and community involvement in this process

3.7.1 ISSUES

A number of factors, such as a relatively sparse population, have led to the catchment area retaining most of its natural heritage. In turn, these same factors have led to a lack of information, and sometimes poor communication. The results of this include:

- a virtual gap in regional planning, funding and administration (between "southeast" and "central" Queensland),
- a landscape not conducive to intensive development (e.g. limited floodplain agricultural land, historically treacherous Port of Baffle) and
- by result, a small, scattered population with few hubs of information and communication facilities.

Communication issues derive from the physical constraints and social reasons. Frequent travel is discouraged by:

- low population density,
- unsealed roads,
- limited public transport,
- relative isolation,
- modest mean incomes and
- distant major service centres.

The lifestyle offered by the catchment area is more conducive to sedentary self-sufficiency and isolation than ready communication and mixing. Advanced technology and development in infrastructure may overcome these issues.

3.7.2 DESIRED OUTCOMES

1. An information and communication strategy that maximizes appreciation, understanding and protection of the natural environment, and achieves long-term community benefit from the natural and community resources.
2. Management of the resources in the catchment is undertaken by a well-informed, energetic community, able to participate in constructive debate on catchment issues through the use of both accumulated local knowledge and new sources of information that encourage research and monitoring programs.
3. A catchment community with effective channels of two-way communication with local government, State government agencies, resource management authorities and community natural resource management groups.
4. Community consultation methods that utilize an active, engaging approach rather than passive calls for input.

4.0 PROPOSED STRATEGIES

4.0.1 METHODOLOGY FOR PRIORITISING STRATEGY ACTION

From workshops held involving community, industry and government, to develop the catchment strategy, priority issues were identified and classified into seven major themes;
1. Land Resource Issues
2. Water Issues
3. Estuarine and Marine Issues
4. Nature Conservation and Biodiversity Issues
5. Weeds and Pests
6. Economic, Social and Cultural Development
7. Information and Communication

For each of these themes strategies have been identified and categorised under the following headings;
1. Research
2. Extension and Communication
3. Planning and Implementation
4. Monitoring and Reporting
5. Resourcing (where necessary)

The Strategy Working Committee determined levels of priority for each of the strategy actions by qualitatively assessing the importance of each proposed action to Integrated Catchment Management and the achievement of long-term results.

"High Priority" actions are those actions that are essential for an integrated approach for implementation of the catchment strategy, i.e. these are actions that logically need to be completed to provide sound basis for many of the other actions. Most of these actions will require long-term financial commitment and planning to allow for planning for on-ground actions and funding opportunities as soon as possible. These actions are also based on what the community and stakeholders see as high priority issues for the catchment that need to be addressed.

"Medium Priority" actions need to be addressed as appropriate.

"Low priority" actions are those that are considered to be able to be built in to catchment management planning as normal procedures.

"Ongoing Priority" will apply to those actions that need continuous works and funding for implementation.

Strategies may have combined priorities (eg some ongoing priorities can be identified as having a high, medium or low priority)

4.0.2 RESPONSIBILITY OF IMPLEMENTING STRATEGIC ACTIONS

Responsibility or contributing to implementing the strategies have also been outlined in this strategy,[11] Having said this, implementation will be subject to funding and limited to financial situations of the outlined bodies and based on their priorities in their operational plans on an annual basis.

The Baffle Creek Catchment Management Group is responsible for the coordination and/or implementation of many of the strategic actions. The BCCMG is made up of a diverse range of stakeholders and representatives from various government agencies who provide a support mechanism for the Group. They also are responsible for communicating information back to their representative bodies and sectors. Therefore a primary role of the BCCMG is to provide an information exchange between the wider community and these relevant groups and agencies.

[11] Where EPA is referenced it refers to both the Environmental Protection Agency and Queensland Parks and Wildlife Service.

4.1 THEME 1 - LAND RESOURCE ISSUES

4.1.1 GOALS

1. To maintain the land resources - soils, vegetation and landform– by sustainable use or protection as appropriate.
2. To rehabilitate degraded land – eroded gullies, construction sites, overstocked areas.
3. To protect water quality and aquatic ecosystems from unsustainable land uses.
4. To avoid land uses that have and adverse impacts.
5. To have strong community, industry and government commitment and partnerships in the management of land resources.
6. To have an effective planning framework in place.

4.1.2 VALUES

- The high natural heritage value of the catchments, as highlighted by regional planning studies and local community consultation.
- The productivity of the catchments under sustainable land uses.
- Their integrity as functioning physical systems and ecosystems.
- The prosperity and lifestyle provided by the land resources in the catchments.

4.1.3 BARRIERS

- Lack of agreement between stakeholders on issues, priorities and responsibilities.
- Competing with other priorities of government and the community.
- Small population base and a lack of resources limiting community capacity to effect change.
- Lack of understanding of the environmental and economic consequences of natural resource mismanagement.
- Short term, individual or single generation economic gain.
- Large costs associated with adopting new practices and no mechanism for consumers to share these costs.
- Short term planning, management and funding horizons for government, industry and individuals.

4.1.4 DESIRED OUTCOMES

1. The production and availability of resources and information to guide decision making and facilitation of sustainable resource management.
2. Increased community awareness and undertanding of sustainable land use practices.
3. Sustainable resource managment that invovles all stakeholders in of natural resource managment , with a high level of integration between stakeholders.
4. The enhancement and protection of the natural environment for the benefit of all the community.
5. The identification and protection of sensitive areas and the restoration of significant sensitive/degraded areas.
6. Land management which achieves productivity of pasture without degrading riparian buffers and other vegetation kept for catchment care and conservation.
7. Industries which enhance and diversify rural businesses and catchment incomes, while improving catchment protection, landscape diversity and nature conservation.

4.1.5 STRATEGY ACTIONS - LAND RESOURCE ISSUES

STRATEGIC ACTION	DESIRED OUTCOME	PRIORITY	RESPONSIBILTY	CONTRIBUTORS
RESEARCH				
• Develop a Land Resource Inventory through the of mapping physical attributes of the catchment including (but not limited to) – soils (including acid sulphate soils) – topography – vegetation cover – water resources (surface and ground) – landuse. • Incorporate information on degraded and sensitive areas, such as wetlands, riparian zone, salinity risks etc into the Land Resource Inventory.	1 1	High	Currently being addressed by NR &M	DPI, EPA
• Identify priority issues for landuse management within the catchment.	1, 4, 6	High	Completed within the strategy	BCCMG, NR&M, DPI, EPA, MVSC, QPWS, WB2020, Landcare Groups, Industry, Community
• Encourage ongoing research into the development of new landuse technologies/processes for improving land management practices.	1, 4, 6	Ongoing	BCCMG, DPI	NR&M (Natural Resources Science), CRC's (Coastal Zone)
EXTENSION AND COMMUNICATION				
• Compile an information manual from existing information for landholders including best management guidelines and relevant fact sheets supplied by various bodies.	1, 2, 6	Low	BCCMG	DPI, EPA, NR&M (Natural Resource Sciences)
• Facilitate community awareness programs and involvement in activities such as field days, trial sites etc.	2	Ongoing	BCCMG, Landcare Groups	Local Govt., DPI, EPA, NR&M
• Organise and facilitate meetings and workshops with relevant stakeholders to implement measures that address the priorities identified relating to sustainable land management.	3	Ongoing	BCCMG, Landcare Groups, DPI	Industry Groups, NR&M
• Enhance the community's knowledge and understanding of sound environmental management and land management.	2, 5, 6	Ongoing	BCCMG, Landcare Groups	Local Govt., DPI, EPA, NR&M
• Promote greater collaboration between local government, state government, community groups, industry, research organisations and landholders to achieve improved resource management.	3	Ongoing	BCCMG	Landcare Groups, DPI, NR&M
• Enhance the community's knowledge and of sound fire management for rural productivity, ecosystem function, biodiversity, conservation and public safety	2, 5, 6	Ongoing	Rural Fire Brigade	Local Govt., EPA Dept of Emergency Services BCCMG
• Foster input from the community early in the planning and impact assessment process of new development, and continue close liaison throughout the project.	3, 7	Ongoing	BCCMG	Local Govt., NR&M
• Promote catchment management within urban environments.	2, 5	Ongoing	BCCMG	NR&M

STRATEGIC ACTION	DESIRED OUTCOME	PRIORITY	RESPONSIBILTY	CONTRIBUTORS
• Support diversification and sustainable resource use to promote economic prosperity.	2, 6	Ongoing	BCCMG	DPI, Tourism and Development Boards Dept. of State Development Local Govt.
PLANNING AND IMPLEMENTATION				
• Protect sensitive riparian sites by targeting funding for stock control methods and watering facilities in appropriate areas, whilst considering productive and sustainable use of these areas (eg weed control, fire management). Encourage and support participating landholders in the management of stock in riparian zones.	1, 4, 5, 6	Medium	BCCMG	EPA, WWF, Private Industry, NHT
• Encourage the establishment of appropriate buffers along major waterways to assist protection of environmental values and fauna habitat corridors.	4, 5	Medium	BCCMG	EPA, DPI
• Develop management guidelines for degraded land and risk areas, as well as promoting the rehabilitation of degraded areas.	1, 4, 5	High	BCCMG	DPI
• Adopt best management practices to avoid natural resource degradation.	6	Ongoing	Landholders Local govt.	BCCMG
• Promote Property Management Planning as a cornerstone of improved community-based natural resource and biodiversity management.	1, 6	Ongoing	BCCMG, DPI	EPA
• Encourage preparation and integration of fire management for all land in property planning.	6	Medium	Rural Fire Brigade	Local Govt., EPA, Dept of Emergency Services BCCMG
• Ensure catchment protection is a priority consideration in the planning and construction of infrastructure and facilities.	4, 5, 7	High	BCCMG, Local Govt.,	DPI
• Encourage local governments to ensure ICM concepts and principles be considered in IPA planning schemes.	4, 5	High	BCCMG	Local Govt., DLGP
• Incorporate best practice catchment protection into forestry operations to ensure long-term sustainability.	7	High	Forestry Operators, DPI	BCCMG
• Support development and adoption of best practice management (productivity and environmental management) by the aquaculture industry and reflect best practice in local and State government development approvals.	4, 5, 7	Ongoing	Industry, BCCMG	DPI, EPA, Local Govt., Aquaculture Assoc., aquaculture operators
MONITORING AND REPORTING				
• Monitor the progress of on-ground works completed in the catchment.	1, 3	Medium	BCCMG	
• Establish a process to identify the needs of the community in adopting changes toward sustainable natural resource management, especially in those areas that have not reported any change.	1, 2	Low	BCCMG	
• Establish an integrated approach to monitoring programmes (including monitoring for areas that may involve future	4, 5	High	BCCMG	Local Govt., DPI, EPA

STRATEGIC ACTION	DESIRED OUTCOME	PRIORITY	RESPONSIBILTY	CONTRIBUTORS
environmental degradation) to ensure that data is relevant to objectives and strategies and is available to all stakeholders in suitable format.				
RESOURCING				
• Encourage voluntary sponsorship by industry to facilitate and implement ICM and NRM principles at a community level.	3, 7	Ongoing	BCCMG	DPI, NR&M

4.2 THEME 2 -WATER ISSUES

4.2.1 GOALS

1. To maintain the natural resources, natural heritage, ecological functioning and productivity of the catchments and their waterways by protecting the supply and quality of all waters.
2. To prevent the degradation of water bodies and aquifers, and to rehabilitate degraded ones.
3. To have strong community, landholders, industry and government commitment and partnerships in the management of water resources.
4. To ensure all communties within the catchment have access to a reliable adequate water supply.

4.2.2 VALUES

- The present water resource, which supports the high natural heritage value and biological productivity of the catchments, and their diverse ecosystems.
- The natural and commercial production, community prosperity, lifestyle and wellbeing provided by those water resources.
- The equitable sharing of the water resource among the community.

Water Quality values:

- The low levels of nutrients, heavy metals and algal content in the waters of Baffle Creek, and its extended base flow.
- The potable aquifers, and the surface and groundwaters suitable for domestic use and primary production.
- The diverse and productive riparian, aquatic, estuarine and marine ecosystems which are based on naturally good water quality.
- The primary production, prosperity, pleasure and recreation which they provide.
- The natural groundwater quality and regimes which support vegetation and replenish surface waters without adversely affecting surface water quality.

4.2.3 BARRIERS

- Lack of community awareness and acceptance of the Government Water Reform Agenda.
- Difference in opinion in the planning and regulations for sustainable use while allowing for environmental flows.
- Financing new technology and improved landuse practices to ensure good water quality.
- Reluctance of people to change current practices and a lack of awareness about the causes of water quality problems.

4.2.4 DESIRED OUTCOMES

1. The maintenance of environmental flow requirements.
2. The identification of impacts and their sources.
3. The best water quality achievable under natural catchment conditions.
4. Agreed targets for groundwater, stream water, wetlands and estuaries and the restoration to agreed standards where decreases in water quality have been identified.
5. Sustainable land uses and water management to protect water quality and aquatic ecosystems.
6. Effective protection measures for water resources in all development activities in the catchments.
7. Continual improvement in community awareness of standards, importance and protection measures.
8. Commitment and co-operation among community, government and industry in the pursuit of water quality standards.

9. Management of water resources to provide for consumptive use consistent with maintaining or improving the environmenal values of the cathcment.

4.2.5 STRATEGY ACTIONS - WATER ISSUES

STRATEGIC ACTION	DESIRED OUTCOME	PRIORITY	RESPONSIBILTY	CONTRIBUTORS
RESEARCH				
• Conduct State of the Rivers Survey, to provide baseline information of the Baffle Catchment Management Area for future planning.	2, 3	High	BCCMG, NR&M (Natural Resource Sciences)	BCCMG, NHT, Waterwatch-Port Curtis, Landcare Groups, Community
• Conduct a hydrological modelling study and develop a Water Resource Plan (WRP) for Baffle Creek to plan water use and environmental flow.	1, 4, 9	Low	NR&M responsibility under legislation, but not a priority in this catchment.	DPI, EPA
• Identify the environmental values of Baffle Creek and other significant waters within the catchment area and determine water quality objectives for these waters	4, 7, 8	High	BCCMG	Local Govt., EPA, Community
• Interview long time residents to gain antecdotal information about the river sysyem (eg. general flows, flood and drought periods etc)	2, 3	Low	BCCMG	
• Keep abreast of water conservation and re-use technology and maintain flexible policies and processes to adopt them, including state government guidelines.	5, 6, 9	Ongoing	Local Govt., BCCMG	DPI, NR&M
• Collate existing groundwater information and conduct a bore survey to determine and manage the groundwater resource. Identify recharge areas.	1, 2, 4, 9	High	NR&M function, but not a priority in this catchment	BCCMG
• Identify and register contaminated sites.	2,3	Ongoing	EPA	BCCMG, Community
EXTENSION AND COMMUNICATION				
• Promote and conduct water conservation and water quality awareness programs in the community, such as Waterwise and Waterwatch campaigns.	7, 8, 9	Ongoing -High	Local Govt., BCCMG	EPA, Waterwise, Waterwatch QLD, Waterwatch - Port Curtis, NR&M
• Promote the importance of riparian vegetation in maintianing water quality	3, 7, 8	Ongoing	BCCMG	Waterwatch- Port Curtis, NR&M
• Upgrade advisory services to promote the use of available water conservation techniques and technology, and encourage self-sufficiency in water supplies.	5, 7, 8, 9	Medium	Local Govt.	BCCMG, DPI
• Promote the use of types of waste disposal units, which assist in improving water quality and reducing water usage in rural and rural residential dwellings, and what options are available and approved.	6, 7, 8, 9	Ongoing	Local Govt., BCCMG	
• Conduct an awareness campaign on waste	7	Ongoing	Local Govt.	Waterwatch - Port Curtis

STRATEGIC ACTION	DESIRED OUTCOME	PRIORITY	RESPONSIBILTY	CONTRIBUTORS
disposal systems (e.g septic)				
• Incorporate litter and pollution awareness in campaigns.	7	Ongoing	Local Govt., BCCMG	DPI
• Encourage reduction of chemical use whenever possible by using alternatives such as integrated methods.	3, 5	Ongoing	BCCMG	DPI
• Conduct awareness campaigns to improve urban stormwater quality.	3, 6	Ongoing	BCCMG	Waterwatch -Port Curtis, Industry groups, Local govt.
PLANNING AND IMPLEMENTATION				
• Encourage all governments to adopt and maintain Wide Bay Regional Growth Management Framework recommendations, to manage water resources regionally with the aim of maintaining the Baffle as a relatively pristine river system. Support a Natural Rivers policy.	1, 3, 4, 5, 9	Ongoing	DLGP, BCCMG	DPI, NR&M
• Ensure appropriate impact assessments are undertaken for any proposed major water infrastructure (as defined under *the Integrated Planning Act 1997*) in the Baffle Catchment Management Area. • Assess the cumulative effect of small structures in the catchment.	2, 6	High	Local Govt.	DPI, BCCMG, NR&M, EPA, Community
• Encourage governments to manage water resources so that aquifers are able to maintain recharging and environmental flows to creeks and wetlands.	1, 4, 5, 9	Ongoing	BCCMG	NR&M
• Encourage development of Land and Water Management Plans by irrigators incorporating best practice water efficiencies and environmental management.	1, 5, 9	Medium	Statutory requirement for trading and new allocation under Water Act	DPI, BCCMG, Irrigators
• Encourage adoption of current water management recommendations (e.g. Dwyer (1998) until WRP is conducted.) • Carry out drainage study before adopting any irrigation plans.	1, 5, 9	Ongoing	BCCMG	NR&M
• Ensure future planning for supply of water resources incorporatesfish ladders and encourage fish ladders on existing structures.	2, 5, 9	Ongoing	Local Govt., DPI	BCCMG, NR&M Landcare groups, fishing groups
• Support the adoption of appropriate water conservation measures for settlements in the catchment.	3, 6, 9	Ongoing	Local Govt., BCCMG	EPA, NR&M
• Promote best practice in efficient water use and waste water treatment and reuse.	1, 2, 6	High	BCCMG	DPI, EPA
• Ensure high standards and encourage best technology in sewage treatment in the catchment.	2, 3	Ongoing	Local Govt., EPA	

STRATEGIC ACTION	DESIRED OUTCOME	PRIORITY	RESPONSIBILTY	CONTRIBUTORS
• Ensure use of stormwater management plans, including litter traps in subdivisions and towns, incorporating monitoring, to maintain good stormwater quality.	3, 6	Medium	Local govt.	EPA
• Ensure maintenance of environmental flows to support the ecological needs of Baffle Creek, its estuary and coastal waters.	1, 2	Low	BCCMG (legislative requirement when an area is declared and a water resource plan required)	
• Provide for collection for chemical containers.	3, 5,	Ongoing	Local govt.	EPA, Drummuster - Agricultural chemical industry
MONITORING AND REPORTING				
• Establish catchment-wide integrated, public and agency baseline monitoring of water quality based on water quality values and objectives	7, 8	Ongoing -High	BCCMG	BCCMG, NR&M, Community, Schools etc, Waterwatch-Port Curtis
• Monitor the influence that development is having on the natural environment of the Baffle Creek catchment	1, 2, 3	High	BCCMG	Local Govt., Industry, Community
• Review at regular intervals contingency plans for chemical spills, and prepare a local supplement for minor incidents.	2, 3,	Ongoing -High	Local Govt.	Dept of Emergency Services, DPI
• Monitor bore water quality and water levels in all areas.	2, 3, 4	Low	Local Govt. (urban areas)	Waterwatch - Port Curtis
RESOURCING				
• Promote the recognition of the regional, state and national importance of Baffle Creek catchment when considering the cost of maintaining its values.	1, 3, 5	Ongoing	BCCMG, all Government	Queensland Conservation Council
• Promote the adoption of subsidisation of costs of water in this catchment from regional, state and commonwealth revenue, based on the regional benefits to the community from the ecological values of the catchment.	1, 3, 5	Low	Local Govt., BCCMG	

4.3 THEME 3 -ESTUARINE AND MARINE ISSUES

4.3.1 GOALS

1. Maintenance of the present estuarine and marine environments and their ecology, biological diversity, production and recreational opportunities;
2. Improvement of any degraded areas within these environments; and
3. Integration of relevant local catchment management initiatives into the planning and management frameworks of the region's coastal zone.

4.3.2 VALUES

The system is valued for its productive and biologically diverse estuaries and inshore waters with natural flows, able to provide food, habitat, income, knowledge, recreation and inspiration.

4.3.3 BARRIERS

- Lack of coordination of on-ground activities.
- Lack of agreement between stakeholders on issues, priorities and responsibilities.
- Competing with other priorities of government and the community.
- Misinformation or lack of data on the status of estuarine and coastal areas and a lack of definitive knowledge on the issues affecting them.
- Small population base and a lack of resources limiting community capacity to effect change.
- Limited ability to control or manage external influences on estuarine and coastal systems.

4.3.4 DESIRED OUTCOMES

1. Estuarine and marine ecosystems of the Baffle protected by relevant planning processes involving appropriate community input.
2. Fishery sustainability protected by participatory planning, management and regulatory processes.
3. Estuarine and marine environments protected from contamination by unnatural sediment flow and human pollutants.
4. Beaches, foredunes and turtle nest sites protected from destruction and degradation.
5. Fish Habitat Areas, including seagrass beds protected from destruction and degradation.
6. Baffle Creek estuarine and marine ecosystems protected from incursion by undesirable and exotic biota.
7. Adequate environmental flows maintained to all streams, wetlands and estuaries.
8. Increased community and stakeholder awareness of issues relevant to the health and sustainability of the Baffle system
9. Increased community and stakeholder participation in research, monitoring and evaluation activities relevant to the sustainability of the Baffle system.
10. High standard of environmental monitoring of impacting industries (e.g. aquaculture).

4.3.5 STRATEGY ACTIONS - ESTUARINE AND MARINE ISSUES

STRATEGIC ACTION	DESIRED OUTCOME	PRIORITY	RESPONSIBILTY	CONTRIBUTORS
RESEARCH				
• Undertake an economic and environmental planning study of the Baffle estuary and associated areas in recognition of its increasing importance as a recreational	1, 2	High	BCCMG	DPI, EPA, Fishing groups, Tourism and Development Boards, Landcare Groups, Fishing Industry

STRATEGIC ACTION	DESIRED OUTCOME	PRIORITY	RESPONSIBILTY	CONTRIBUTORS
destination and fishery, to include economic, environmental and social issues associated with the resources af the estuary				
• Interpret seagrass data with water quality monitoring data, identify sources or causes of sediment, algal growth etc, and integrate results into estuary management.	1, 3, 9, 10	Ongoing	BCCMG	DPI
• Use available data (eg, Wide Bay Burnett Conservation Council Inc, 2000) to model potential dynamics of Baffle mouth and revise management plans.	1, 4	Low	BCCMG	EPA
• Encourage increased participation by commercial and amateur fishers in fisheries research activities.	2, 9	Ongoing	BCCMG, Fishing Groups	DPI
• Investigate the use of shallow-draft tourist boats to avoid excessive boat wash and the need for channel dredging.	3, 4, 5	Low	BCCMG	DPI, Tourism operators
• Identify, for future planning purposes, potential public boat ramp sites that will have minimum effects on Fish Habitat Areas or other areas of high conservation value.	1, 5	Low	BCCMG, Local Govt.	DPI, EPA Dept. of Transport
EXTENSION AND COMMUNICATION				
• Encourage community participation in the local 'Habitat Watch' and 'Fish Sense' programs.	2, 5, 9, 10	Ongoing	BCCMG	DPI, Fishing Groups
• Conduct fisher awareness campaigns, through promoting sustainable practice in fishing (net, line and spear), and improved awareness of noxious fish species.	2, 6	Ongoing	DPI, BCCMG,	Fishing Groups
• Improve public understanding and acceptance of legal commercial fishing activities, including an appreciation of its sustainability.	2, 8	Ongoing	DPI, BCCMG	Fishing Groups
• Encourage commercial and recreational fishers to contribute to fishing awareness and catchment management awareness programs.	2, 8, 9	Ongoing	BCCMG, Fishing Groups	DPI
• Promote research and log book programs and encourage 'catch-and-release' in fishing clubs and competitions.	2, 9	Ongoing	DPI, BCCMG, Fishing Groups	
• Target illegal fishing activities and encourage the use of the Fish Watch Hotline (1800 017 116) for reporting illegal activities.	2, 9	Ongoing	DPI	Community
• Install signage at rubbish bins and boat ramps to increase public awareness about litter.	3	Low	Local Govt.	BCCMG
• Conduct volunteer clean-up days with Clean Up Australia, targeting coastal habitats.	3	Ongoing	BCCMG, Landcare Groups, Fishing Groups	Community Groups, Community, Local Govt.
• Minimise beach, foredune and turtle nest damage by: – providing appropriate signage, – manage beach vehicle traffic to restrict driving to the lower beach, – encouraging the use of planned, established	4	Medium	EPA Local Govt. Local Govt. Local Govt.	BCCMG, Landcare Groups, Tourist Operators, Community

STRATEGIC ACTION	DESIRED OUTCOME	PRIORITY	RESPONSIBILTY	CONTRIBUTORS
tracks, – encouraging QPWS trained volunteer beach patrollers to take on an advisory role, and – closing beaches to night traffic during the turtle nesting season.				
• Encourage, through appropriate education and signage, boating practices that are non-damaging to stream banks, foreshore areas and fish habitats.	4, 5, 8	Low	BCCMG	DPI
PLANNING AND IMPLEMENTATION				
• Support implementation of policies in the State (and regional) Coastal Management Plans	1	Ongoing	BCCMG	EPA
• Encourage the use of community based catchment management in fisheries management.	1, 2, 5, 8	Medium	BCCMG	DPI, Fishing Groups
• Ensure planning schemes follow appropriate guidelines for development in and adjacent to sensitive estuarine and coastal areas and contain adequate development controls to protect the natural values of these areas.	1, 2, 3, 5	High	BCCMG, Local Govt.	DLGP, DPI, Community
• Support and encourage the appropriate advisory bodies e.g. the Wide Bay Burnett Zonal Advisory Committee (ZAC) to address fisheries management issues in Baffle Creek, and encourage public input into ZAC recommendations.	2	Ongoing	DPI, BCCMG, Fishing Groups	
• Encourage the understanding of research and recommendations that protect the Baffle Catchment's estuarine and marine environments and implement where appropriate. [e.g. Lupton and Heidenreich (1996); Bruinsma and Danaher (2000); and Great Barrier Reef Marine Park Management Plan.]	1, 3, 4, 5	Medium	BCCMG,	DPI, Fishing Groups
• Implement processes and mechanisms to protect foreshore vegetation, including minimising the loss of mangroves, the protection of young vegetation at popular fishing sites, and revegetation where needed in accordance with FHA guidelines.	1, 4, 5	High	DPI	Local Govt., EPA
• Encourage coastal dynamics modelling, as a tool in shire planning and coastal management plan implementation.	1, 7	Medium	BCCMG	EPA
• Encourage the development and implementation of appropriate processes and mechanisms to ensure the maintenance of environmental flows to all streams, wetlands and estuaries.	1, 7	High	BCCMG	
• Encourage and adopt management practices that minimise pesticide use in and adjacent to coastal wetlands and other waterways.	2, 3	Low	BCCMG	DPI, Landholders
• Ensure control of sediment flow into estuaries by:	3, 7	High	DNR&M EPA.	

STRATEGIC ACTION	DESIRED OUTCOME	PRIORITY	RESPONSIBILTY	CONTRIBUTORS
– avoiding clearing and excavation on steep slopes, – establishing vegetated buffers adjoining wetlands and waterways, – controlling sediment run-off from roads, – adopting sediment control measures recommended by the Australian Institution of Engineers. – Best practice, Regional Vegetation Management Plans, planning schemes.				
• Encourage use of the Wide Bay Coastal Management Plan and Australian Institution of Engineers guidelines to develop erosion and run-off control measures for building and excavation sites adjacent to foreshore and estuary banks.	1, 3, 4	Low	Local Govt.	
• Ensure no adverse impact from the placement of groynes on banks of waterways, etc.	1, 2, 4 5	Low	Dept of Transport.	DPI, EPA, Great Barrier Reef Marine Park Authority
• Ensure dredging spoil is managed in a sustainable manner that avoids estuarine and inshore sedimentation foreshore degradation caused by de-watering ponds.	1, 3, 4, 5	Ongoing	BCCMG	Dept of Transport EPA, DPI
• Ensure through appropriate planning, monitoring and control processes that wastewater and effluent is treated to appropriate standards before being released into the creek system.	1, 2, 3, 5	Ongoing	Local Govt.	DPI, Dept. of Transport
• Encourage recycling of all effluent and wastewater.	2, 3, 5	Ongoing -High	BCCMG	EPA, DLGP
• Encourage the continuation of establishing undeveloped foreshore buffer zones/nature strips wherever possible and only use these buffer strips as low-key visitor facilities.	1, 3, 4	High	BCCMG	DPI
• Conduct projects to relieve pressure on existing access points by beach protection works, alternative public foreshore areas, and revegetation projects.	1, 4	Medium	Local Govt.	EPA, Community
• Promote recognition of natural processes and maintaining vegetation when managing vehicular access and traffic on beach areas.	1, 4	Medium	BCCMG	
• Identify and maintain key fish habitats, and improve fish habitat where needed, in conjunction with Fish Habitat Area requirements.	2, 5	High	DPI	BCCMG, Fishing Groups
• Support the fisheries management planning and review process by providing the input necessary to address Baffle Creek fishery issues; and encourage public participation in the development of relevant plans for: Subtropical finfish; Mud crab; Blue swimmer crab; Freshwater fish; and Other relevant species.	2, 5	Ongoing	DPI, BCCMG	Community
• Ensure artificial reef proposals are adequately assessed for environmental purposes prior to	2, 5	Low	BCCMG	DPI, EPA

STRATEGIC ACTION	DESIRED OUTCOME	PRIORITY	RESPONSIBILTY	CONTRIBUTORS
approval, encouraging development only if they will increase fish populations within the whole system.				
• Ensure fuel facilities are designed to appropriate standards and have established spillage contingency plan and equipment in place where required.	2, 3, 5	Ongoing	BCCMG	EPA
• Provide effective waste disposal facilities at popular sites e.g. Broadwater mouth.	3	Medium	Users of the Facilities.	EPA
• Provide environmentally acceptable pump-out facilities at wharves and marinas, for moored boats.	3, 5	Medium	Users of the Facilities.	EPA
MONITORING AND REPORTING				
• Expand the Seagrass Watch monitoring project in the Baffle catchment, using field measurement and remote sensing to determine short and long-term trends. Supplement this with scientific data and historical anecdotal evidence to assess seagrass dynamics in terms of environmental and human influences.	1, 2, 5, 9	Medium	BCCMG	DPI
• Ensure adequate policing of fisheries activity in the catchment to control activities damaging to the fishery resource and habitat, through fishery inspector visits and self-policing by the fishing community.	2	Ongoing	DPI	Fishing Groups, Community
• Encourage participation by recreational fishers in community-based catch and effort monitoring of fishing, prawning and crabbing in the Baffle and associated systems.	9	Ongoing	BCCMG, Fishing Groups	DPI
• Undertake integrated collection/monitoring and analysis of fish stock and catch data.	2	Medium	BCCMG	Fishing Groups, Fishing Industry, University of Qld.
RESOURCING				
• Investigate the use of incentive schemes to assist and encourage landholders to undertake land, vegetation and water management practices that maintain and enhance estuarine and foreshore environments.	1, 8	Low	BCCMG	NR&M
• Encourage the implementation of a user-pays system to fund beach and foredune protection.	4	Medium	BCCMG	
• Encourage developers of adjoining land to fund beach and foredune protection.	4	High	BCCMG	Landcare groups

4.4 THEME 4 - NATURE CONSERVATION AND BIODIVERSITY ISSUES

4.4.1 GOALS

1. Maintain the natural resources, heritage and productivity of the catchments by protecting biodiversity.
2. To identify and acquire knowledge about natural heritage resources – species, ecosystems, processes - and use the knowledge for their maintenance and protection.
3. To restore degraded areas and enhance natural biodiversity.
4. To have strong community, industry and government commitment and partnerships in biodiversity conservation.

4.4.2 VALUES

Significant biological diversity within the catchment area includes

- Extensive natural vegetation cover.
- Variety of ecosystem types including mangrove and other marine ecosystems, floodplain wetlands, riparian vegetation including the heaths, shrublands, woodlands and forests and the significant gallery rainforests.
- Scenic landscapes and the coastal environment.
- The healthy condition of Baffle Creek and other waterways and wetlands.
- Diversity of wildlife.
- Significant national parks and other protected natural areas.
- Recreational and lifestyle opportunities.
- The economic values of natural resources including agricultural, fisheries, forestry and tourism.
- The ability to be a catchment benchmark for the Region and the State.

4.4.3 BARRIERS

- Economic rationalism:
  - short term, individual or single generation economic gain,
  - limited custodial ethos by some landholders.
- Underpricing and undervaluing of natural resources:
  - full cost recovery not sort; cross-subsidisation of inefficient use of some resources such as some irrigation practices,
  - unsustainable businesses and industries allowed to continue irrespective of the environmental costs.
- Underpricing of primary product -consumers unknowingly, unable or unwilling to pay the full production cost for commodities - i.e. the farm gate price for produce often does not allow or encourage sustainable production practices.
- Environmental and other costs not adequately (or not at all) factored into cost benefit - costs analysis of developments.
- Short term (< 5- 10 years) planning, management and funding horizons for government, industry and individuals.
- Implementing and managing change.
- Overcoming the inertia of government, industry and the individual.
- The immensity of implementing and managing the cognitive and social change required to integrate biodiversity conservation into most if not all land use planning and management practices.

4.4.4 DESIRED OUTCOMES

1. A Comprehensive, Adequate and Representative (CAR) reserve system.
2. The adoption and integration of biodiversity conservation practices with other landuses on public and private lands.
3. The retention, maintenance and revitalisation of vegetated corridors and buffers strategically placed throughout the catchments, linking reserves.
4. Community involvement in nature conservation.
5. Community involvement in species recovery plans and local component plans for the most endangered species or ecosystems.
6. Strong links between industry and conservation, and management of both together.
7. Assessment of the conservation needs of our waterways.
8. Incorporation of conservation needs in the planning and retention of vegetation.
9. The development of a custodial ethos by land managers and owners and other natural resource users i.e. the appreciation by landowners/managers of their responsibility for land management.
10. The ecological, economic and socially sustainable use and enjoyment of the catchments biodiversity and other natural resources.

4.4.5 STRATEGY ACTIONS - NATURE CONSERVATION AND BIODIVERSITY ISSUES

STRATEGIC ACTION	DESIRED OUTCOME	PRIORITY	RESPONSIBILTY	CONTRIBUTORS
RESEARCH				
• Identify and map ecosystems, habitat and other features of conservation significance especially habitat for endangered/priority species (locally and regionally endangered), collate/map known information, and decide which species need local action. identify sites requiring priority actions. (e.g. dugong, sea turtle)	5, 7	High	EPA	BCCMG, Local Govt., Landcare Groups
• Conduct a reach-by-reach assessment of the environmental values and conservation needs of our waterways in conjunction with a State of the Rivers report and areas identified in above strategies.	7	High	BCCMG	EPA
• Identify and map *palustrine* (floodplain) and estuarine wetlands within the catchment and determine the ecological requirements (particularly hydrology) for their natural function.	7	High	DPI (has mapped estuarine.), EPA, Local Govt.	Wide By Conservation Council (completed freshwater wetland survey) Community
• Identify the most appropriate fire management needs of catchment ecosystems (vegetation and dependent wildlife) especially endangered species and ecosystems.	2, 9	Medium	Rural Fire Brigade, EPA (protected estate only)	EPA (in non-estate areas) BCCMG
• Establish an arboretum for rare or threatened local plants or food plants	5, 10	Low	BCCMG, Landcare Groups	Local Govt., DPI, EPA

STRATEGIC ACTION	DESIRED OUTCOME	PRIORITY	RESPONSIBILTY	CONTRIBUTORS
COMMUNICATION AND EDUCATION				
• Develop education & information exchange programs for landholders, land managers and the broader community which promotes: – the importance of strategic vegetation retention, appropriate techniques, and examples of why biodiversity is integral to sustainable production and development – the recognition given by other studies and management regimes which identify the conservation status given to the catchment and parts thereof – the appropriate use of pesticides and other chemicals – the ecological role of fire and the importance of mosaic burns across the landscape to maintain diversity – the scenic amenity and tourism value of vegetation and protect sites and trees of particular significance – reducing boat strikes on marine wildlife	2, 4, 5, 9 2, 9 2, 4, 9 2, 4, 9 6, 10 6	High	BCCMG, Landcare Groups Coast Care	Local Govt., DPI, EPA, NR&M
• Develop and strengthen links between the tourist industry, conservation and rural industry in catchment and shire planning and networking.	6	Ongoing	BCCMG, Landcare Groups	DLGP, Tourism & Development Boards, Local Govt., DPI, EPA, Tourist operators
PLANNING AND IMPLEMENTATION				
• Develop a vegetation and wetland biodiversity conservation plan.	2, 10	High	EPA	DNR&M BCCMG
• Ensure the reserve system within the catchment is Comprehensive, Adequate and Representative	1	Ongoing	EPA	
• Ensure government reserves are managed appropriately	2, 8, 9, 10	Ongoing - High	BCCMG, NR&M, EPA	Community
• Identify and encourage best practice vegetation retention and management guidelines.	8	Ongoing	EPA Land for Wildlife	CSIRO, DNR&M BCCMG
• Support landholders who want to implement livestock stock exclusion or low stocking rates in sensitive riparian areas (fencing, off-stream watering points)	2, 9	Medium	Greening Australia	WWF, DPI, EPA BCCMG
• Encourage the inclusion of biodiversity conservation in property management plans.	2, 4, 9	Ongoing	BCCMG	EPA
• Promote voluntary conservation agreements in priority areas while encouraging their establishment throughout the catchment.	1, 2, 3, 4	Ongoing - High	EPA, BCCMG	Land for Wildlife, Local Govt.
• Promote the important contribution ecotourism makes to biodiversity conservation and the need to cater for the needs of an ecologically sensitive ecotourism industry.	6	High	BCCMG	Eco-tourism operators, Dept of State Development, Tourism and Development Boards
• Promote Baffle Creek's potential status as a Natural River.	10	Ongoing -High	BCCMG	Queensland Conservation Council, Wilderness Society

STRATEGIC ACTION	DESIRED OUTCOME	PRIORITY	RESPONSIBILTY	CONTRIBUTORS
• Establish local action plans (recovery plans) for priority species which: – Involves the local communities, industry and government; publicise species and aims, collaborate with special interest groups and participate in coordinated wildlife projects. – Work in with the requirements of other management plans, locally, e.g. national park and coastal management plans. – Threats such as human effects, domestic animals and coastal development need to be addressed – Support a dugong sanctuary in Baffle Creek to complement Rodd's Bay and Hervey Bay, – Support a turtle sanctuary which protects marine waters adjacent to turtle breeding beaches; exclude (or impose speed limits) powered watercraft from this area during the breeding season.	2,4, 5, 9, 2, 10 2, 4, 9, 10 5, 10 5, 6, 10	Ongoing	BCCMG, Landcare Groups	DPI, EPA, Community
– Ensure use of turtle exclusion devices (TEDs) on fishing/trawler nets – Use fishing industry self-regulation to monitor nets while deployed. – Manage beach traffic, lights and foxes to protect marine turtles nesting.	6, 10 5 4, 10	Ongoing	EPA GBRMPA	
MONITORING AND REPORTING				
• Develop appropriate indicators to monitor the condition and trend of the catchment's regional ecosystems and biodiversity.	2, 7, 10	Medium	BCCMG	EPA, NR&M
• Survey landholders to identify information gaps/requirements, technical issues, extension and support, the provision of incentives and barriers to implementation.	2, 4, 5, 6, 9	Medium	BCCMG	EPA
RESOURCING				
• Support tax rebate, rate relief and other incentives schemes including award programs for long term nature conservation (e.g. nature refuges)	2, 8	Medium	BCCMG, Commonwealth Government	Local Govt., EPA
• Investigate community support for an environmental levy.	2, 5, 10	Low	BCCMG	Local Govt.

4.5 THEME 5 -WEEDS AND PESTS

4.5.1 GOALS

1. To eradicate weeds and pest animals where possible, and otherwise to control their spread and density.
2. To remove or minimise any effect weeds and pest animals have on the productivity, natural resource, natural heritage, and the biological diversity of the catchment.
3. To acquire knowledge about the weed and pest animal species and their effects, and use the knowledge for their management.
4. To have strong community, industry and government commitment and partnerships in the management of weeds and pest animals.

4.5.2 VALUES

The productivity, vegetation, natural and cultural heritage, and biological diversity of the catchment.

4.5.3 BARRIERS

- Lack of knowledge of appropriate management, including prevention and control options.
- Lack of knowledge of the potential of weeds to reduce economic production and degrade natural environments.
- Limited resources:
  - Little funding
  - No vehicle wash-down facilities
  - Low population/absentee owners.
- Large areas of land under State ownership (approx. 20% of catchment).
- Need for ongoing control works.
- Aversion to use of chemicals by many people.
- Belief that the spread of weeds is already beyond control.
- Relative isolation (could be an advantage as well).

4.5.4 DESIRED OUTCOMES

1. Major weeds and pests in the catchment identified, and community-owned plans formulated for their control.
2. Infestations of potentially invasive and damaging weeds avoided through preventative measures, or contained at an early stage.
3. Serious environmental weeds controlled, concentrating first on strategic places of high conservation value.
4. Research results and guidelines applied as they emerge.
5. Well organized and unified alliances working together.
6. A catchment-wide map showing the occurrence and severity of the priority weeds, in conjunction with mapping (research) projects outlined in Themes 1 and 4. (Especially showing sites where weed trouble spots coincide with high value (for catchment care, production or conservation) and where new weeds are establishing with potential to spread are priority sites for action).
7. Community, industry and government both locally and in the region, aware of weed and pest issues, possess appropriate skills and equipment, and involved in on-ground work.
8. Landholders and other land managers in the catchment accept their responsibility toward 'containment' (this word is specific – their responsibilities are broader), and guard against complacency borne of familiarity. Likewise, landholders and Councils in the Baffle Basin need priority resourcing to contain the weed, including financial assistance.

9. Beaches free of foxes to ensure viable nesting populations of turtles.

4.5.5 STRATEGY ACTIONS - WEEDS AND PESTS

STRATEGIC ACTION	DESIRED OUTCOME	PRIORITY	RESPONSIBILTY	CONTRIBUTORS
RESEARCH				
• Target strategic infestations in riparian, heritage and other key areas.	1, 2, 3, 6	High	Local Govt., BCCMG	DPI, EPA, NR&M
• Collate and maintain a list of existing and potential weeds that may infest the catchment.	1	High	BCCMG, Local Govt.	DPI, EPA, NR&M
• Map existing weeds in the catchment.	1, 2, 6	High	BCCMG	Local Govt., NR&M
• Collect benchmark data on uninfested as well as infested sites, to be used in the preparation of a catchment weeds map.	1, 6	High	BCCMG	EPA (protected estate only), NR&M
• Collaborate on research and adopt findings in management of weeds and pests.	4, 5	High	Local Govt., DPI, BCCMG	NR&M
• Collate existing research and identify research being undertaken elsewhere on species affecting the Baffle.	4, 7	Medium	BCCMG	NR&M
EXTENSION AND COMMUNICATION				
• Promote the awareness of weed identification kits and the assistance available from NR&M and the Queensland Herbarium in weed identification.	1, 7	Ongoing - High	BCCMG, Local Govt.	DPI, DNR&M
• Promote the availability of information on control methods, and the availability of assistance for on-ground works.	7	Ongoing -High	BCCMG, Local Govt.	DPI, DNR&M
• Promote availability of Council GRT (Giant Rat's Tail) control programme.	8	Ongoing	Local Govt., DPI BCCMG	
• Promote availability of NR&M and Local Government resources for declared pest animal control.	7, 8., 9	Ongoing	BCCMG, Local Govt.	DPI, DNR&M
• Increase awareness of new residents/urban dwellers etc about the detrimental effects of introducing and using weed and exotic species, as garden plants, in the catchment.	1, 5	Ongoing - High	BCCMG,	DPI, EPA, Landcare Groups, Real Estate Agents, DNR&M
• Highlight the importance of controlling environmental weeds and declared weeds and pests.	1, 2, 3, 8, 9	High	BCCMG, Local Govt.	DPI, DNR&M
• Support Burnett Pest Animal Control Program and implement resulting Burnett District Pest Management Plan and more specific local plans.	5, 7, 8	Ongoing	BCCMG, Local Govt.	DNR&M
• Promote weed control in the Baffle catchment consistent with its natural heritage value and maintenance of its near pristine classification.	7	Ongoing	BCCMG, Local Govt.	EPA, DNR&M
PLANNING AND IMPLEMENTATION				
• Undertake a strategic approach to control of infested areas.	2, 5	Ongoing - High	Local Govt.	Landholders
• Encourage maintenance of appropriate riparian zones and corridors in order to avoid weed infestation.	1, 2, 8	High	BCCMG	Local Govt., EPA, Landholders

STRATEGIC ACTION	DESIRED OUTCOME	PRIORITY	RESPONSIBILTY	CONTRIBUTORS
• Support agencies and community groups involved in weed and pest control ensure they are appropriately resourced.	5, 7	High	BCCMG	Local Govt., DNR&M
• Incorporate Cat's Claw control in riparian rainforest protection projects, and conduct public awareness.	3	Medium	BCCMG	Local Govt., EPA
• Implement Best Practice GRT Manual for control on affected land, establishment and maintenance of buffers, stock management and vehicle movement.	4, 7	High	DPI, BCCMG, Landholders	Local Govt.
• Encourage establishment of buffers around infested lands.	1, 2, 8	High	BCCMG, Local Govt.	
• Promote the careful use of chemicals ensuring produce quality and catchment cares are kept in mind.	7	Medium	Local Govt., Industry, BCCMG	DPI, Landholders
MONITORING AND REPORTING				
• Develop a quality control system for topsoil/sand supplies to stop the spread of infested material as considered necessary	1, 7, 8	Low	Local Govt.	
• Ensure trials and introductions are undertaken with appropriate supervision and monitoring, and pasture seed is pure. Develop a system of accountability and encourage responsibility for plant and seed introductions.	4, 7, 8	Medium	DPI Landholders	DNR&M BCCMG
• Monitor damage caused by rabbits and introduce appropriate biological controls.	1, 7	Low	EPA	BCCMG CSIRO, DNR&M
• Monitor the effectiveness of pest management plans at appropriate intervals, and revise as necessary.	1, 2, 4	High	Local Govt., BCCMG	EPA,DNR&M
RESOURCING				
• Develop strategies for landholders to access funding for the control of weeds.	5	High	DPI MVSC BSC DNR&M Greening Australia	BCCMG Community Groups
• Promote the significance of landholders actions in controlling weeds species to agencies and funding sources. • Develop sponsorship linkages with Transnational Corporations.	4, 3	Medium	BCCMG Landcare	Community, Tourism and Development Boards MVSC BSC
• Recognise and support landholders concerns in the control of weed and pest species.	4, 3,	Medium	DNR&M EPA QPWS MVSC BSC	BCCMG, Community Groups Landcare

4.6 THEME 6 - ECONOMIC, SOCIAL AND CULTURAL DEVELOPMENT

4.6.1 GOALS

1. To sustain the natural environment in supporting itself and the catchment community.
2. To preserve pristine environments in their natural state for all to enjoy and from which all can benefit.
3. To take responsibility for generations to come and consider long term effects of present and future uses.
4. To promote the concept and achievement of sustainability, and to ensure the catchment area is managed in a way that sustains the natural biological diversity.
5. To investigate all available options using a broad approach, to adopt all appropriate strategies and to bring awareness, for a happier & healthier society.
6. To have all stakeholders working together to achieve agreed goals and ambitions.
7. To have sustainable levels of population/industry development and tourism for the cathcment (this need not be static, but the restrictions on water sources will need to be considered).
8. To recognise the and conserve places of cultural heritage significance including both Indigenous and historic places
9. To develop land in a manner that acknowledges, respects and is informed by the stated significance of a place.

4.6.2 VALUES

Economic values lie in:

- natural resource industries - grazing, agriculture, fisheries, forestry;
- natural and cultural heritage dependent industries - tourism, eco-tourism and recreation; and
- service industries serving the resident and visitor populations.

The catchment values which support these industries are:

- our built facilities, eg. buildings, parks, roads, electricity grid, telephone, water and drainage, and other infrastructure;
- the natural values - the ecological systems, clean environment and water quality, scenic landscapes, natural vegetation and biological diversity;
- our national parks and other protected natural areas;
- the natural resources – agricultural (eg. soil, pasture), water, tourist attractions, minerals, fisheries, forests etc.; and
- our cultural heritage.

Social values include:

- the community's cohesion and energy;
- the low density of the human population and its distribution;
- the lifestyle;
- the coastal environment;
- the natural condition of Baffle Creek and other creeks and landscapes that enhance society; and
- our recreational pursuits and what the area offers to us for recreation.

As well as the direct links between the social values and natural values, the community's social wellbeing is also tied to the natural resources through economic prosperity.

4.6.3 BARRIERS

- Limited infrastructure currently available within the catchment (eg. Roads, water supply, telecommunications, community facilities, etc).

- Small local market means commodities and manufactured items have to be transported to larger markets.
- Relatively low and dispersed population hinders the development of effective social networks.
- Limited access to inventory cultural sites.

4.6.4 DESIRED OUTCOMES

1. An ecologically sustainable environment which provides an acceptable level of economic opportunities and social activities for residents and visitors.
2. An understanding by all catchment residents that a healthy and sustainable economy is dependent upon a healthy environment.
3. Industries which are consistent with the values held by the catchment community, and offer true long-term benefits are encouraged, while developments which have the potential to degrade natural resources are treated cautiously, particularly when the likely effects of the development are unsure.
4. All stakeholders (e.g.landholders, industry, community, town residents, local council and state government) accept the principle of inter-generational equity, where decisions made today should not reduce the choices available to future generations.
5. Protection, maintenance and greater awareness of cultural heritage.

4.6.5 STRATEGY ACTIONS - ECONOMIC, SOCIAL AND CULTURAL DEVELOPMENT

STRATEGIC ACTION	DESIRED OUTCOME	PRIORITY	RESPONSIBILTY	CONTRIBUTORS
RESEARCH				
• Conduct community consultation and biodiversity audits at the local sub-catchment level, to find out what needs to be protected and what the local communities want in development and environmental management.	1, 2	High	BCCMG	EPA
• Identify potential sectors for economic development.	2	High	Local Govt.	DPI, Dept of State Development
• Identify detrimental environmental, social and economic costs of extractive industries and ensure proponent meets the costs to the community.	1, 2	Medium	Local Govt. (with respect to planning) DNR&M	DPI BCCMG
EXTENSION AND COMMUNICATION				
• Promote participation in primary industries workshops using properties with best practice economic and environmental management to set examples.	3	Ongoing -High	BCCMG, Landcare Groups	DPI, NR&M
• Offer advice on information sources regarding land capability and sustainability information to landholders and prospective buyers.	2	High - Ongoing	BCCMG	DPI, NR&M
• Encourage value adding in the local economy to retain benefits of the natural resources.	3	High	BCCMG	Local Govt., DPI
• Recognise and promote the catchment as a recreational and biodiversity resource for Bundaberg and Gladstone, and use regional industry funding for projects in the catchment area.	1	Medium	Tourism and Development Boards	BCCMG
• Encourage locally owned tours, which protect the environment and provide a learning experience for visitors.	3	High	BCCMG Tourism and Development Boards	Community, tourist Operators, Local Tourist Groups

STRATEGIC ACTION	DESIRED OUTCOME	PRIORITY	RESPONSIBILTY	CONTRIBUTORS
• Promote public education of residents in: – the benefits of well managed ecotourism to the community, – their heritage, tourism assets and facilities; and – workforce training for development of a tourism skills base.	2	Low	BCCMG, Tourism and Development Boards, Local Tourism Groups	Tourist Operators
• Increase awareness of indigenous and multi-cultural heritage and its value in the catchment. Include this awareness in promotion and marketing.	2	High	Tourism and Development Boards, Local Tourist groups, BCCMG, Traditional Owners	Tourism Operators, Landcare Groups
PLANNING AND IMPLEMENTATION				
• Promote industry that brings diversity, is economically viable when all costs to the community are factored in, and does not compromise the catchment's resources and heritage.	3	Low	BCCMG	DPI
• Investigate the possibility of setting up a sustainable local industry assistance project, with a coordinating and investigating team using community development programs.	1, 2, 3	Low	BCCMG	Local Govt.
• Discourage infrastructure in areas of special conservation significance.	1, 2, 3	High	Local Govt.	DPI, EPA
• Promote Farmcare Code of Practice and regional strategies for air quality and noise management.	1, 2, 3	Medium	BCCMG	DPI
• Investigate potential for an Environmental Education Centre in the catchment and a TAFE or Agricultural College serving current and potential rural industries and ecotourism.	1, 2	Medium	BCCMG	Landcare Groups, Universities, Industry, Community Groups
• Promote a tourist industry which uses and maintains the natural attractions of the catchment, attracts an appropriate tourist clientele, operates at optimum capacity for sustainability (without degrading the environment) and integrates with other industries and the community	1,2, 3	Medium	BCCMG	Tourism and Development Boards, Tourist Groups, Tourist operators
• Prepare an Ecotourism Management Plan integrating tourism into local and regional planning, catchment management and existing industries	2, 3	Medium	BCCMG, Tourism and Development Boards	EPA, Tourist Groups, Tourist Operators,
• Promote an "ecotourism" theme in resort development and landscape planning of tourist infrastructure to preserve (or enhance) scenic amenity.	1, 2, 3	Low	BCCMG, Tourist Operators	Landcare Groups
• Promote the protection and enhancement of key ecotourism assets. Place facilities to leave the majority of key landscapes untouched.	1, 2, 3, 4	Low	BCCMG	Local Govt., EPA
• Encourage visitation to beachside communities by improving public facilities and beach access, to support local business	1, 2, 3, 4	Low	Community Groups Local Govt.	Industry BCCMG

STRATEGIC ACTION	DESIRED OUTCOME	PRIORITY	RESPONSIBILTY	CONTRIBUTORS
• Promote and support a farm stay tourist industry through planning and networking between the rural industry and the tourist industry. Establish a co-operative of farm-stays, guides and tour operators.	1, 3	Medium	BCCMG, Tourism and Development Boards, Tourist Groups	DPI, Tourist Operators, Landholders
• Ensure cultural heritage is thoroughly identified and carefully managed in environmental management plans and planning schemes in association with management plans, incorporating all needed information.	4	High	BCCMG, Local Govt., Traditional Owners	DLGP, EPA
• Recognise the role Traditional Owners will have in the conservation and management of cultural heritage places and work in conjunction with these.			BCCMG	EPA, Tradtional Owners
MONITORING AND REPORTING				
• Provide support for locally owned industries that retain benefits to the catchment community, use resources sustainably, and maintain lifestyles.	2, 3	Ongoing	BCCMG	
RESOURCING				
• Investigate the establishment of a development fund for sustainable community owned enterprises. Use co-operatives to allow small businesses to achieve economy of scale and efficiencies.	3	Low	BCCMG	DPI
• Recognise the link between natural and cultural heritage in this catchment area. Use its historical and cultural significance to attract funding for heritage management and sustainable tourist and community development.	2, 3	Medium	Community Groups, BCCMG	Community, Tourism and Development Boards
• Investigate the possibility of cooperative type ecotourism facilities run by community groups.	4, 5, 6	Medium	BCCMG, Community	

4.7 THEME 7 - INFORMATION AND COMMUNICATION

4.7.1 GOALS

1. To promote and bring awareness of the concept and achievement of sustainability, for a happier & healthier society.
2. To have all stakeholders (e.g.landholders, industry, community, town residents, local council and state government) working together to achieve common goals.
3. To improve community awareness and get the community involved and learning more about sustainable resource management ideals and outcomes.
4. To provide training in the concept and practice of strategic planning.
5. To use an inclusive, accountable decision-making process in natural resource management which provides:
   - equitable access to information;
   - equal participation by all stakeholder groups; and
   - decisions based on consultation.

4.7.2 VALUES

- Local knowledge accumulated from the past generations, experience and the perception gained by a community living close to the land.
- Understanding gained from modern research, external advice, and ideas from new arrivals.
- The opportunities offered by the knowledge, understanding and ideas, to create a community working with the natural values of the catchment for long term prosperity and catchment stewardship.
- The community's cohesion, energy and capacity for self help and self guidance; the existing social networks and groups being used for this, and the capacity to develop networks further within the catchment and the region.
- The information from elsewhere and the advisory services available which can be applied within the catchment management area.

4.7.3 BARRIERS

- A lack of baseline data over much of the catchment's resources.
- A relatively low and geographically dispersed population, making effective communication and information dissemination difficult. However technological advancement may help overcome this.

4.7.4 DESIRED OUTCOMES

1. An information and communication strategy that maximizes appreciation, understanding and protection of the natural environment, and achieves long-term community benefit from the natural and community resources.
2. Management of the resources in the catchment is undertaken by a well-informed, energetic community, able to participate in constructive debate on catchment issues through the use of both accumulated local knowledge and new sources of information.
3. A catchment community with effective channels of two-way communication with local government, State government agencies, resource management authorities and community natural resource management groups.
4. Community consultation methods that utilise an active, engaging approach rather than passive calls for input.
5. An active research and monitoring program aimed at identified information needs.

4.7.5 STRATEGY ACTIONS - INFORMATION AND COMMUNICATION

STRATEGIC ACTION	DESIRED OUTCOME	PRIORITY	RESPONSIBILTY	CONTRIBUTORS
RESEARCH				
• Improve the community's ability to research and understand technical issues by inviting specialist advisors and providing training in research methods and technologies.	1, 5	High	BCCMG, Landcare Groups	DPI, Local Govt., EPA, Industry, Waterwatch - Port Curtis
• Ensure an adequate period of baseline data collection preceding major development projects.	4, 5	Medium	BCCMG	(whole of government under IPA legislation)
• Identify publicly owned data sources useful for natural resource and biodiversity management and make them available to the community, to increase awareness and identify knowledge gaps.	4, 5	High - Ongoing	BCCMG	DLGP, EPA, DNR&M
EXTENSION AND COMMUNICATION				
• Develop community consultation techniques to suit the independent nature of the community. Use community events to involve the community in natural resource and biodiversity management. Use industry sponsorship and government assistance to fund activities.	4	High	BCCMG	DPI, EPA
• Adopt appropriate community consultation methods and establish projects in which government and community work together on catchment management works.	3, 4	Ongoing	BCCMG	Local Govt., EPA, DNR&M
• Use BCCMG web site for information access by the public.	1, 2, 3	Ongoing	BCCMG	DPI, DLGP
• Encourage participation of community members who feel they have become alienated by decision-making processes.	3, 4	Low	BCCMG	Waterwatch - Port Curtis
• Use existing public and group gatherings to engage the community.	4	High	BCCMG	Waterwatch - Port Curtis
• Hold free and entertaining field days to advance awareness and attract wide community interest.	2, 4	High	BCCMG, Landcare Groups	Waterwatch - Port Curtis,
• Install community "Catchment Billboards" in each town for catchment news, and utilise community and school newsletters.	2, 4	Medium	BCCMG	Waterwatch - Port Curtis
• Increase youth involvement in catchment care and Landcare by: – music functions, – awards, – crediting volunteer work towards vocational training, and – involving the surf club and youth groups.	2, 4	Low	BCCMG, Landcare Groups, Landcare Australia	Waterwatch - Port Curtis
• Assign special BCCMG task groups to liaise with industry and research and prepare group comments on development proposals.	2, 4	Medium	BCCMG	
• Encourage Landcare groups to be involved in catchment management by providing	2, 4	High	BCCMG	Landcare Groups, DNR&M

STRATEGIC ACTION	DESIRED OUTCOME	PRIORITY	RESPONSIBILTY	CONTRIBUTORS
information, direction, and assistance with funding and opportunities for involvement.				
• Collaborate with Landcare volunteers on field activities, and with Miriam Vale Rural Science and Landcare to increase catchment management awareness in the local grazing industry.	2, 4, 5	High	BCCMG	Landcare Groups
• Foster collaboration and complementary functions of BCCMG and Councils in natural resource and biodiversity management. Promote the advantages the BCCMG offers to local government, e.g. funding, resources, knowledge, contacts, and facilitation of community consultation.	3, 4	Medium	BCCMG	Local Govt.
PLANNING AND IMPLEMENTATION				
• Improve the accessibility and uptake of rural industry advice and technical information by promoting government departments and industry group services. Collate a list of all sources.	3, 5	High	BCCMG, DPI	Landcare Groups
• Improve community understanding of major development proposals, by: – Facilitating the dissemination of accurate information – maintaining effective liaison with the community during and after construction	3, 4	Medium	BCCMG	DLGP, Local Govt.
• Encourage the inclusion of appropriate Catchment Strategy principles in local government planning schemes	2, 3	High	BCCMG	DLGP, Local Govt., DNR&M
• Strive for credibility, consistency and openness, to build trust with the community. Direct efforts to innovative, constructive solutions to natural resource and biodiversity management problems that benefit the catchment and all participants. Set the standard for other stakeholders.	1, 2, 3, 4	Medium	BCCMG	EPA
• Create a more fluid model of BCCMG sub-committee structure, which includes other community groups in community-based natural resource management.	3, 4	Medium	BCCMG	DNR&M
MONITORING AND REPORTING				
• Maintain and expand an advisory role in the management of the catchment by participating in local and regional resource management activities, publicising the positive activities of the group, and regularly re-evaluating group structure and activities.	1, 2, 3, 4	High	BCCMG	
• Maximise stakeholder representation by continuously evaluating representation and targeting membership drives towards underrepresented interest groups.	4	High - Ongoing	BCCMG	

STRATEGIC ACTION	DESIRED OUTCOME	PRIORITY	RESPONSIBILTY	CONTRIBUTORS
• Commission task groups to negotiate improvements to catchment management with proponents, rather than oppose operations	1, 2, 3	Low	BCCMG	
RESOURCING				
– Seek funding to employ an environmental officer in the catchment or the shires, and incorporate a catchment management role in the duties.	2, 5	Medium	Landholders Miriam vale	Landcare Groups, Community groups, Industry BCCMG
• Lobby for resources to employ a Catchment Wise officer to conduct catchment awareness programmes in the community, with industry and in schools.	1, 2	Low	BCCMG	Industry, schools
• Promote the regional and state significance of the catchment area to appropriate decision-makers and funding sources.	1	Low	BCCMG	Local Govt., DPI
• Develop sponsorships with industry to increase awareness of catchment management and biodiversity conservation. Direct sponsorships to field trips, monitoring equipment, school projects, and invited specialists.	2, 4	High	BCCMG, Landcare Groups	

5.0 IMPLEMENTATION OF BAFFLE CREEK CATHCMENT STRATEGY

5.1 IMPLEMENTATION OF CATCHMENT STRATEGY

This strategy has been designed to target high priority issues in the catchment and to encourage an integrated approach to management of the catchments natural resources. The expectation is that the strategy will lead to integrated actions for these issues and future funding opportunities for developing long term economic, social and environmental management within the catchment.

While this Catchment Strategy is not legally binding, it provides guidelines and recommended policies and action plans which all people who use and manage natural resources in the catchment are encouraged to adopt.

Implementation of this strategy will focus on -

- Encouraging local authorities to adopt the ICM philosophy practice in their planning schemes under the *Integrated Planning Act*
- The adoption of prioritised strategy actions in their annual operations plans, by district agencies of government or industry.
- Involving relevant industry groups, wider community and landholders in identifying high priority issues within the catchment and at a local level targeting those issues into onground works.

The Department of Natural Resources and Mines, Department of Primary Industries, Environmental Protection Authority and the Department of Information Economy, Department of Local Government and Planning have worked with the BCCMG in the development of this strategy. These agencies provided support and advice and will continue to do so with appropriate resource contributions and participation in relevant projects to implement the strategy.

5.1.1 DEVELOPMENT OF ACTION PLANS

Throughout the development of this strategy the Baffle Creek Catchment Management Group have undertaken several projects and educational programs for natural resource management. This has created the pathway for future direction and implementation of the strategy.
Future action plans will be develop as necessary based on the strategy actions and their level of priority. These action plans will be developed in conjunction with various stakeholder groups and interested parties.

Continued development of new project proposals will involve:

- Maintaining partnerships and linkages with other stakeholders and community such as local government, industry, industry groups, educational institutes, community groups, state agencies, landholders etc.
- Identify support and assistance from stakeholders and community, such as in-kind support, labour, monetary etc.
- Identify sources of funding.
- Determine linkages and networks with other strategies, programs, action plans.
- Use of new information, research and technologies.

5.1.2 PERFORMANCE INDICATORS

Performance indicators are used to evaluate progress of projects and assess whether desired outcomes and goals are being achieved. These indicators aid in evaluating long-term projects and the outcomes generated from those that are difficult to measure and evaluate.

The BCCMG will incorporate performance indicators into action plan development to focus programmes that address the issues identified and lead to long term achievement of the strategy's desired outcomes. These performance indicators developed under each of the project action plans will also enhance the review period of the catchment strategy by assessing the overall success and effectiveness of strategy actions.

5.2 BCCMG ROLE IN IMPLEMENTATION, MONITORING AND REPORTING

Overall implementation of the Strategy will be the responsibility of the BCCMG. Implementation of strategic actions will be based on prioritisation as outlined in the strategy and the availability of parameters and resources needed for project implementation.

The BCCMG will address this implementation on a sub-committee basis, where a sub-committee will be established and responsible for the implementation of strategic action/s - including project development, and monitoring and reporting of implementation of the strategic action/s as outlined. This sub-committee will seek funding opportunities and facilitate partnerships with stakeholders in the development of action plans to address the strategic actions.

The sub-committee will report, as appropriate to project timelines, to provide the BCCMG a report card on what actions are being implemented. This will enable updating and monitoring of the progress of the strategy. The BCCMG will also take an annual overview of the strategy to identify new and emerging issues that may impact on the strategy.

The BCCMG made up of stakeholder representatives whose responsibility is to report back on group activities and catchment management issues etc to their relevant representative bodies and sectors.

The BCCMG will undertake extension activities such as press releases, field days, workshops etc to involve the wider community and stakeholders and to report on the success and outcomes achieved from the implementation of the strategic actions. Reporting and communication plans will also be built into projects as they are developed to implement strategic actions.

5.3 EVALUATION AND REVIEW

This catchment strategy is designed as a living document that can undergo modification as new issues arise and circumstances change within the catchment.
During the annual overview, new and emerging issues, which impact on the strategy and its implementation, may be identified. The BCCMG will be responsible for remedial changes to incorporate these issues.

Major review of the document will take place at least every five years with input and feedback from major stakeholders being a an integral part of this review. This five-year review will also consider the effectiveness of the Strategy's goals, desired outcomes and action plans with results being incorporated into evolving the strategy for the next five years.

APPENDIX A -BIODIVERSITY STATUS OF REGIONAL ECOSYSTEMS IN THE BAFFLE CATCHMENT

Endangered

12.01.01	*Casuarina glauca* open forest on margins of marine clay plains.
12.02.02	Mixed microphyll/ notophyll vine forest on beach ridges.
12.03.01	Gallery vine forest (notophyll vine forest) on alluvial plains.
12.03.03	*Eucalyptus tereticornis* woodland to open forest on alluvial plains.

Of Concern

12.02.07	*Melaleuca quinquenervia* or *M. viridiflora* open forest to woodland on sand plains.
12.03.04	*Melaleuca quinquenervia*, *Eucalyptus robusta* open forest on or near coastal alluvial plains.
12.03.05	*Melaleuca quinquenervia* tall open forest near coastal alluvial plains.
12.03.08	Swamps with *Cyperus spp.*, *Schoenoplectus spp.* and *Eleocharis spp.*
12.03.12	*Eucalyptus umbra* or *E. exserta*, *Melaleuca viridiflora* on alluvial plains.
12.03.13	Closed heathland on seasonally waterlogged alluvial plains near coast.
12.03.14	*Banksia aemula* woodland on alluvial plains near coast.
12.03.15	*Corymbia intermedia*, *Syncarpia glomulifera* open forest on granite outwash.
12.05.05	*Eucalyptus acmenoides*, *Corymbia intermedia* woodland on remnant Tertiary surfaces. Deep red soils.
12.05.09	Sedgeland/ herbland in low lying areas on complex of remnant Tertiary surface and Tertiary sedimentary rocks.
12.09-10.03	*Eucalyptus moluccana* on sedimentary rocks.
12.09-10.07	*Eucalyptus crebra* woodland on sedimentary rocks.
12.09-10.10	*Melaleuca nodosa* low open forest on sedimentary rocks.
12.11.01	Simple notophyll vine forest often with abundant *Archontophoenix cunninghamiana* (" gully vine forest") on metamorphics ± interbedded volcanics.
12.11.12	Araucarian Complex microphyll vine forest on metamorphics ± interbedded volcanics; northern half of bioregion.
12.11.14	*Eucalyptus crebra, E. tereticornis* woodland on metamorphics ± interbedded volcanics.
12.11.17	*Eucalyptus acmenoides* open forest on metamorphics ± interbedded volcanics.
12.11.19	*Eucalyptus fibrosa* open forest on metamorphics ± interbedded volcanics.
12.11.21	*Allocasuarina leuhmannii, Melaleuca nervosa f. nervosa* woodland on metamorphics ±interbedded volcanics.
12.12.03	Mixed open forest with *Corymbia citriodora, Eucalyptus siderophloia* or *E. crebra* or *E. decolor, E. major* and/ or *E. longirostrata, E. acmenoides* on Mesozoic to Proterozoic igneous rocks.
12.12.04	*Eucalyptus acmenoides* ± *Syncarpia glomulifera* tall open forest on Mesozoic to Proterozoic igneous rocks, especially granite.
12.12.06	*Eucalyptus montivaga* tall open forest on Mesozoic to Proterozoic igneous rocks.
12.12.09	Shrubby woodland with Eucalyptus dura of rocky peaks on Mesozoic to Proterozoic igneous rocks.
12.12.10	Shrubland of rocky peaks on Mesozoic to Proterozoic igneous rocks.
12.12.12	*Eucalyptus tereticornis, E. crebra* or *E. siderophloia, Lophostemon suaveolens* open forest on granite.
12.12.19	Semi– evergreen vine thicket on Mesozoic to Proterozoic igneous rocks; north of bioregion.
12.12.21	*Corymbia intermedia, E. exserta* woodland on Mesozoic to Proterozoic igneous rocks.

12.12.22 *Eucalyptus decolor* , *E. acmenioides* open forest on Mesozoic to Proterozoic igneous rocks.

12.12.25 *Eucalyptus fibrosa* subsp. fibrosa tall woodland to open forest on Mesozoic to Proterozoic igneous rocks.

12.12.27 *Corymbia trachyphloia, Eucalyptus crebra* + *Callitris endlicheri* woodland on Mesozoic to Proterozoic igneous rocks.

12.12.28 *Eucalyptus moluccana* tall open forest on Mesozoic to Proterozoic igneous rocks.

Not of Concern

12.01.02 Saltpan vegetation including grassland and herbland on marine clay plains.

12.01.03 Mangrove shrubland to low closed forest on marine clay plains and estuaries.

12.02.09 *Banksia aemula* woodland on dunes and sand plains. Deeply leached soils.

12.02.11 *Corymbia spp., Eucalyptus spp., Acacia spp.* open forest to low closed forest on beach ridges in northern half of bioregion.

12.02.12 Closed heath on seasonally waterlogged sand plains.

12.02.14 Foredune complex.

12.02.15 Swamps with *Baumea spp., Juncus spp.* and *Lepironia articulata.*

12.03.06 *Melaleuca quinquenervia, Eucalyptus teriticornis, Lophostemon suaveolens* woodland on coastal alluvial plains.

12.03.07 *Eucalyptus tereticornis, Callistemon viminalis, Allocasuarina cunninghamiana* fringing forest.

12.05.01 Mixed forest with *Corymbia citriodora* on subcoastal remnant Tertiary surfaces. Deep red soils.

12.05.04 *Eucalyptus– Corymbia– Melaleuca* woodland on complex of remnant Tertiary surface and Tertiary sedimentary rocks.

12.05.07 *Corymbia citriodora, Eucalyptus acmenoides, E. fibrosa subsp. fibrosa* open forest on remnant Tertiary surfaces. Deep red soils.

12.05.10 *Banksia aemula* woodland on complex of remnant Tertiary surface and Tertiary sedimentary rocks.

12.09-10.02 *Corymbia citriodora– Eucalyptus crebra* open forest on sedimentary rocks.

12.09-10.19 *Eucalyptus fibrosa subsp. fibrosa* open forest on sedimentary rocks.

12.09-10.21 *Eucalyptus acmenoides* ± *Corymbia citriodora* open forest on sedimentary rocks.

12.11.06 *Corymbia citriodora, Eucalyptus crebra* open forest on metamorphics ± interbedded volcanics.

12.11.07 *Eucalyptus crebra* woodland on metamorphics ± interbedded volcanics.

12.11.18 *Eucalyptus moluccana* tall open forest on metamorphics ± interbedded volcanics.

12.12.05 *Corymbia citriodora*, Eucalyptus crebra open forest on Mesozoic to Proterozoic igneous rocks.

12.12.07 *Eucalyptus crebra* woodland on Mesozoic to Proterozoic igneous rocks.

12.12.11 *Eucalyptus acmenoides, Corymbia trachphloia* open forest on Mesozoic to Proterozoic igneous rocks.

12.12.13 Araucarian Complex microphyll to notophyll vine forest on Mesozoic to Proterozoic igneous rocks.

12.12.23 *Eucalyptus tereticornis* ± *E. eugenioides* woodland on crest, upper slopes and elevated valleys on Mesozoic to Proterozoic igneous rocks.

(Source: Qld Herbarium 2001)

APPENDIX B - RARE AND THREATENED SPECIES IN THE MIRIAM VALE/BAFFLE CREEK AREA

E - Endangered
V- Vulnerable
R- Rare

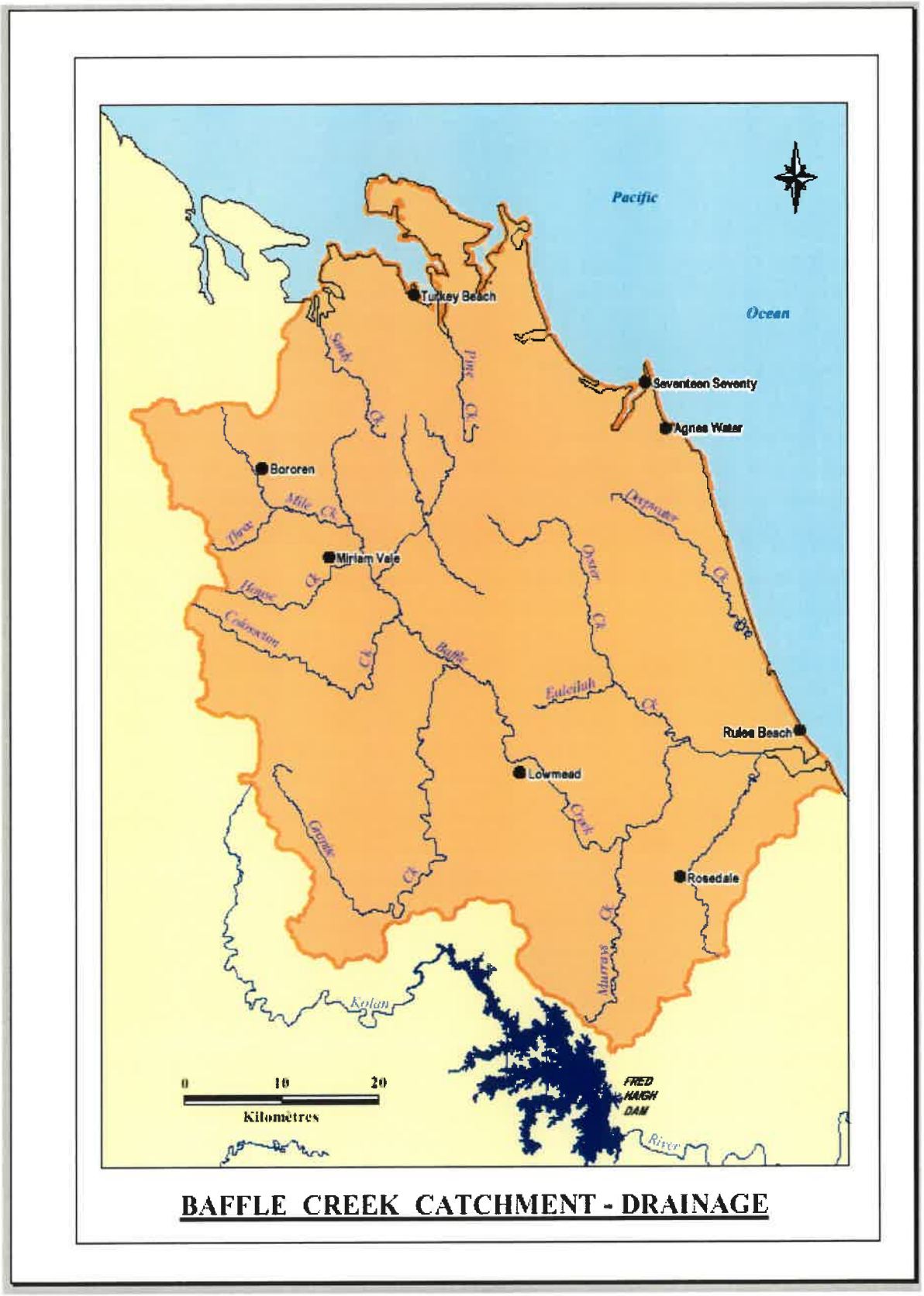
Kingdom	Class	Scientific Name	Common Name	Status
animals	amphibians	*Litoria pearsoniana*	cascade treefrog	E
animals	birds	*Accipiter novaehollandiae*	grey goshawk	R
animals	birds	*Erythrotriorchis radiatus*	red goshawk	E
animals	birds	*Lophoictinia isura*	square-tailed kite	R
animals	birds	*Esacus neglectus*	beach stone-curlew	V
animals	birds	*Calyptorhynchus lathami*	glossy black-cockatoo	V
animals	birds	*Ephippiorhynchus asiaticus*	black-necked stork	R
animals	birds	*Geophaps scripta scripta*	squatter pigeon (southern subspecies)	V
animals	birds	*Haematopus fuliginosus*	sooty oystercatcher	R
animals	birds	*Sterna albifrons*	little tern	E
animals	birds	*Melithreptus gularis*	black-chinned honeyeater	R
animals	birds	*Podargus ocellatus plumiferus*	plumed frogmouth	V
animals	birds	*Psephotus pulcherrimus*	paradise parrot	PE
animals	birds	*Numenius madagascariensis*	eastern curlew	R
animals	birds	*Ninox strenua*	powerful owl	V
animals	birds	*Turnix melanogaster*	black-breasted button-quail	V
animals	birds	*Tyto tenebricosa*	sooty owl	R
animals	mammals	*Macroderma gigas*	ghost bat	V
animals	mammals	*Potorous tridactylus tridactylus*	long-nosed potoroo	V
animals	mammals	*Kerivoula papuensis*	golden-tipped bat	R
animals	reptiles	*Caretta caretta*	loggerhead turtle	E
animals	reptiles	*Chelonia mydas*	green turtle	V
animals	reptiles	*Dermochelys coriacea*	leatherback turtle	E
animals	reptiles	*Phyllurus caudiannulatus*		R
plants	cycads	*Cycas megacarpa*		E
plants	ferns	*Lastreopsis silvestris*		R
plants	higher dicots	*Alyxia ilicifolia subsp. magnifolia*		R
plants	higher dicots	*Alyxia sharpei*		R
plants	higher dicots	*Parsonsia lenticellata*		R
plants	higher dicots	*Marsdenia paludicola*		V
plants	higher	*Acomis acoma*		R

	dicots			
plants	higher dicots	*Pratia podenzanae*		R
plants	higher dicots	*Dansiea elliptica*		R
plants	higher dicots	*Macropteranthes fitzalanii*		R
plants	higher dicots	*Phyllanthus brassii*		R
plants	higher dicots	*Phyllanthus sauropodoides*		R
plants	higher dicots	*Xylosma ovatum*		R
plants	higher dicots	*Argophyllum nullumense*		R
plants	higher dicots	*Acacia attenuata*		V
plants	higher dicots	*Choricarpia subargentea*		R
plants	higher dicots	*Eucalyptus decolor*		R
plants	higher dicots	*Kunzea flavescens*		R
plants	higher dicots	*Melaleuca cheelii*		R
plants	higher dicots	*Rhodamnia glabrescens*		R
plants	higher dicots	*Rhodamnia pauciovulata*		R
plants	higher dicots	*Xanthostemon oppositifolius*		V
plants	higher dicots	*Macadamia jansenii*		E
plants	higher dicots	*Persoonia amaliae*		R
plants	higher dicots	*Persoonia volcanica*		R
plants	higher dicots	*Medicosma elliptica*		V
plants	higher dicots	*Alectryon semicinereus*		R
plants	higher dicots	*Arytera dictyoneura*		R
plants	higher dicots	*Atalaya rigida*		R
plants	higher dicots	*Cupaniopsis shirleyana*		V
plants	higher dicots	*Quassia bidwillii*		V
plants	lower dicots	*Hernandia bivalvis*		R
plants	monocots	*Germainia capitata*		V

(Source: Wildnet, QPWS 2001)

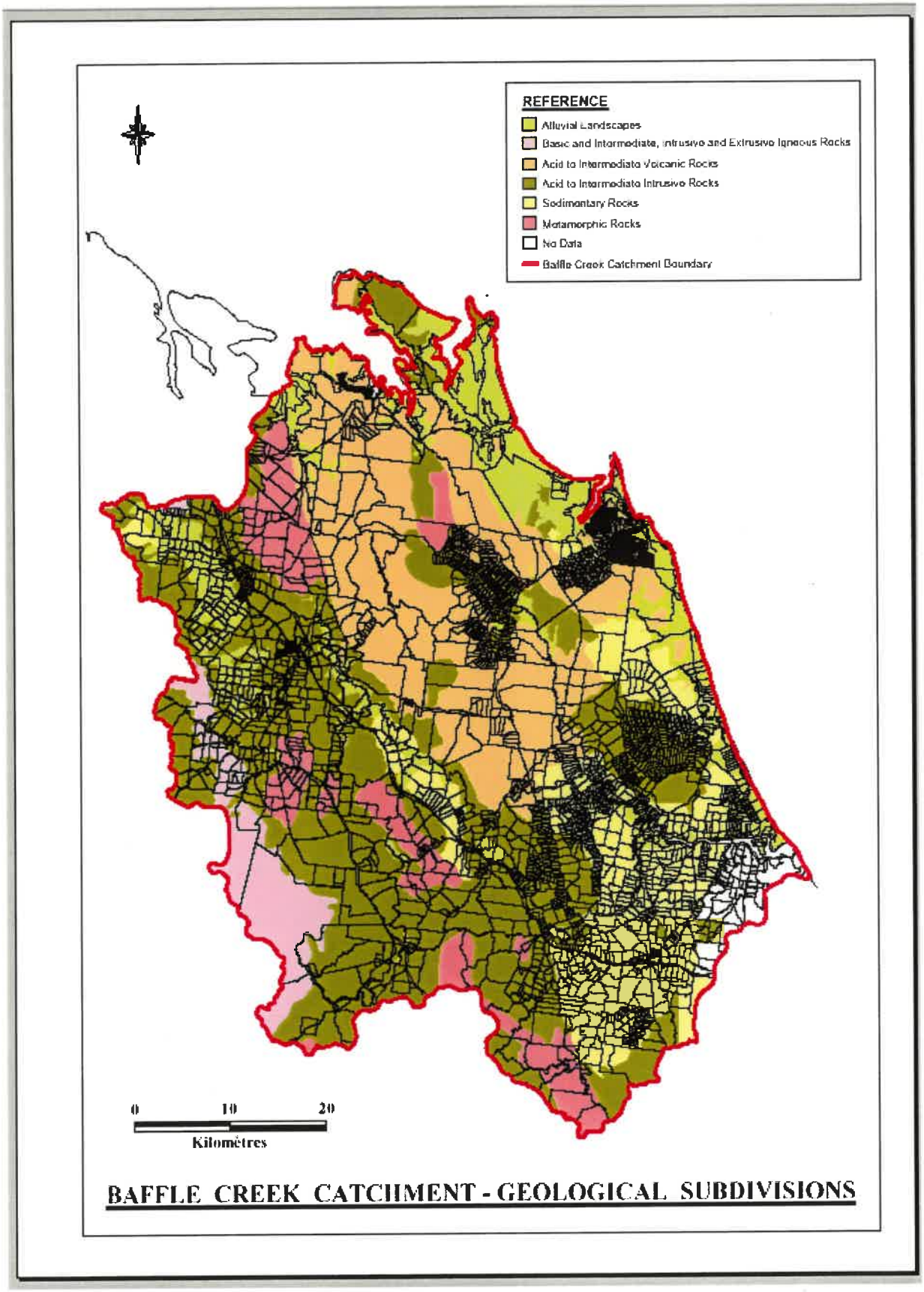
APPENDIX C - MAPS

BAFFLE CREEK STRATEGY AREA - DRAINAGE[12]



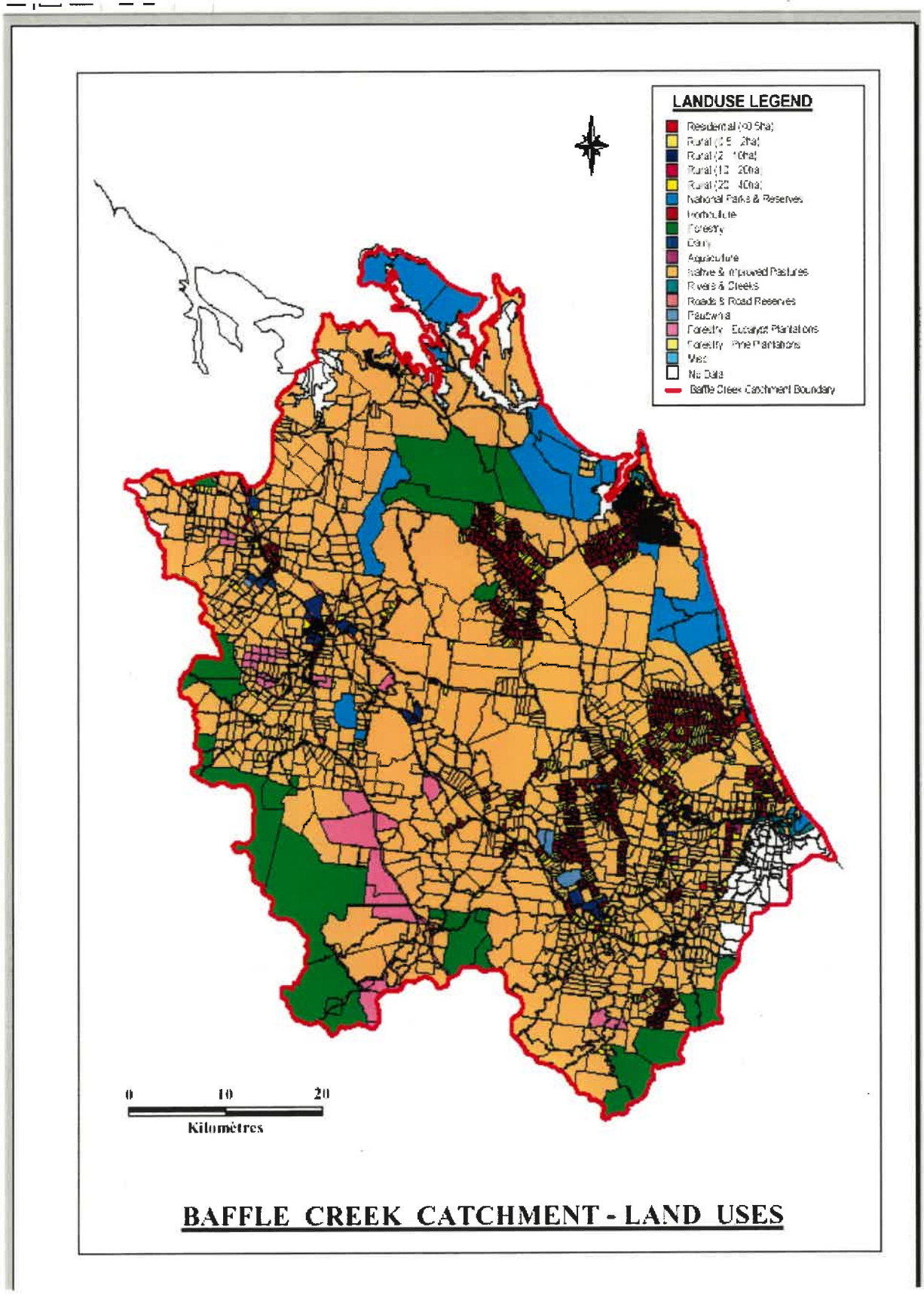
[12] Source: Department of Natural Resources and Mines, 2001.

BAFFLE CREEK STRATEGY AREA - GEOLOGICAL SUBDIVISIONS[13]



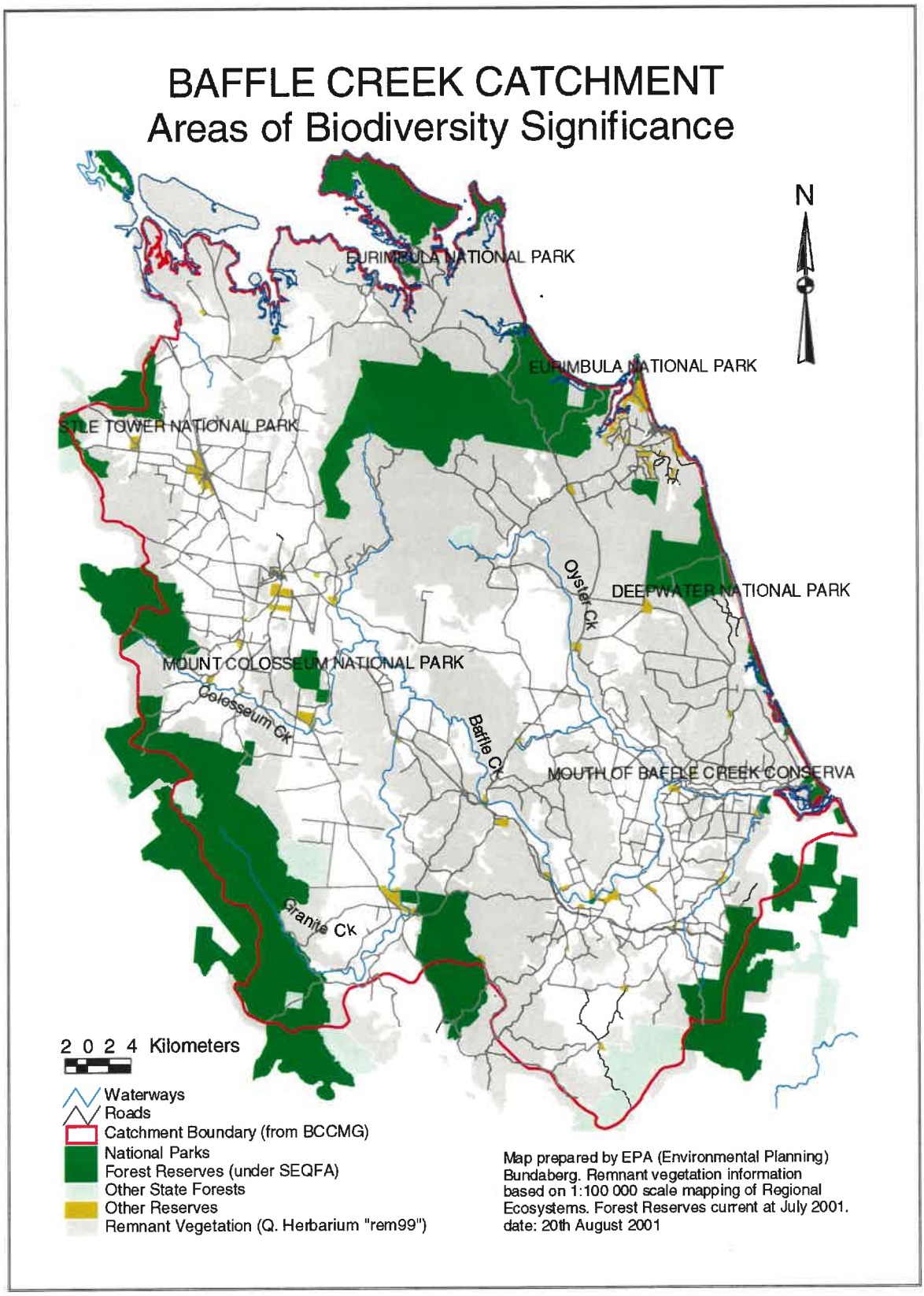
[13] Source: Department of Natural Resources and Mines, 2001.

BAFFLE CREEK STRATEGY AREA - LAND USES[14]



[14] Source: Department of Natural Resources and Mines, 2001.

BAFFLE CREEK CATCHMENT - AREAS OF BIODIVERSITY SIGNIFICANCE[15]



[15] Source: Environmental Protection Agency 2001.

KEY TO ABBREVIATIONS AND ACRONYMS

ABS	Australian Bureau of Statistics
AFFA	Commonwealth Dept. of Agriculture Forestry and Fisheries Australia
ANZECC	Australian & New Zealand Environmental & Conservation Council
AQIS	Australian Quarantine Inspection Service
AWWA	Australian Waste Water Association
BCCMG	Baffle Creek Catchment Management Group
BSC	Burnett Shire Council
BMP	Best Management Practice
BPA	Beach Protection Authority
CM	Catchment Management
CPI	Consumer Price Index
CQU	Central Queensland University
CRC	Cooperative Research Centres
CSIRO	Commonwealth Scientific Industry Research Organisation
DNR	Department of Natural Resources (now NR&M)
DPI	Department of Primary Industries
DEH	Department of Environment and Heritage (now EPA)
DCILGPS	Department of Information, Communication, Local Government, Planning and Sport (now DLGP)
DLGP	Department of Local Government and Planning (previously DCILGPS)
EIA/EIS	Environmental Impact Assessment/Statement
EPA	Environmental Protection Authority (previously DEH)
ESD	Ecologically Sustainable Development
GA	Greening Australia
GAWB	Gladstone Area Water Board
GBRMPA	Great Barrier Reef Marine Park Authority
GIS	Geographic Information System
IAS	Impact Assessment Study
ICM	Integrated Catchment Management
ID	Identification
IDAS	Integrated Development Assessment System
IPA	*Integrated Planning Act*
LCMC	Landcare and Catchment Management Council
LG	Local Government
LGA'S	Local Government Areas
LWMP	Land and Water Management Plans
MVRS&L	Miriam Vale Rural Science and Landcare
MVSC	Miriam Vale Shire Council
NHT	Natural Heritage Trust
NLWA	National Land and Water Audit
NP	National Park
NR&M	Department of Natural Resources and Mines (previously DNR)
NRM	Natural Resource Management
PMP	Property Management Planning
QFF	Queensland Farmers Federation
QGGA	Queensland Grain Growers Association
QFVGA	Queensland Fruit and Vegetable Growers Association
QPWS	Queensland Parks and Wildlife Service
RAP	Regional Assessment Panel
RFA	Regional Forestry Agreement
RSG	Regional Strategy Group
RID	Regional Infrastructure Development
SAP	State Assessment Panel
SE	Southeast
SF	State Forests
SOE	State of Environment Report
SPP	Southern Pacific Petroleum
STP	Sewage treatment plant
TAFE	Technical and Further Education
UQ	University of Queensland
VMP	Vegetation Management Plans
WAMP	Water Allocation and Management Plan
WB2020	Wide Bay 2020 Regional Growth Framework Study
WWF	World Wide Fund for Nature
ZAC	Zonal Advisory Committee (Qld Fish Management Authority)

GLOSSARY

Acid Sulphate Soils: soils or sediments containing iron sulfides (pyrite) that, when exposed to air, produce sulphuric acid. Commonly found at elevations less than 5m AHD e.g. on flood plains and low-lying coastal areas

Aquaculture: The commercial growing of marine or freshwater animals and plants in water.

Aquifer: Layer of rock, which holds water and allows water to percolate through it. Aquifers are generally the source of water for wells and springs

Arable land: Land that is, or has the potential to be, cultivated for crop production.

Areas of high nature conservation value: as defined in the *Vegetation Management Act*, 1999.

Arid Zone: Often arbitrarily defined as those areas receiving annual rainfall of less than 250mm in the south and 30mm in the north.

Benchmark: A point of reference against which change may be measured.

Best management practice: A concept conditional on management objectives, that is practices, which can subsequently be assessed in terms of how efficiently, and equitably they achieve the objectives. Best management practice relates to activities by managers at the property, regional, catchment, State, Territory and national levels.

Biodiversity (or Biological diversity): The variety of all life forms: the different plants, animals and micro-organisms, the genes they contain and the ecosystems they form. The term is often considered at three levels: genetic diversity, species diversity and ecosystem diversity.

Biodiversity (or Biological diversity): Means the variability among living organisms from all sources, including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part, and includes –

(a) diversity within species and between species; and
(b) diversity of ecosystems. *(Vegetation Management Act*, 1999*)*

Biological community: Any assemblage of populations of living organisms in a prescribed area or habitat.

Biological control: Controlling a pest by the use of its natural enemies.

Bioregion (or biogeographical region): An extensive region distinguished from adjacent regions by its broad physical and biological characteristics; generally, a system of related, interconnected ecosystems.

Biota: All the organisms at a particular locality.

Broadacre farms: Commercial farms producing relatively low-value crops, such as wool, sheep meat, beef and cereals, on large areas.

Carrying Capacity: The maximum population of a given organism that a particular environment can sustain. It implies a continuing yield without environmental damage.

Catchment: A region or drainage basin which collects all the rainwater that falls on it, apart from that removed by evaporation, directing it into a river, stream or watercourse.

Clearing: Removing vegetation, particularly trees and shrubs, from a landscape, often with the intention of replacing it with plants regarded to be more directly useful to humans.

Climate variability: The natural year-to-year and season-to-season variation of the climatic system.

Code of Practice: Sets of guidelines adopted by management agencies and industry organizations concerned with minimising the impact of primary industry operations on the environment (e.g. soil erosion) and on worker safety.

Compaction: The reduction in bulk volume of sediments and soils owing to the increased weight of overlying materials or the impact on the surface layers such as by machinery and livestock.

Conservation: The protection, maintenance, management, sustainable use, restoration and enhancement of the natural environment.

Conservation farming (or conservation tillage): Farming systems designed to reduce run-off so that water storage in the soil is maximised and soil erosion is reduced.

Contour banks: small banks cut into the soil, aligned close to the contour of the land and which convey water across the slope to a waterway or drain designed to resist erosion.

Degradation: A loss of capacity to provide for desired uses and values, either now or in the future. Severe degradation is that which would be considered to cause irreversible damage to the productive capacity of natural resources or significant costs to rehabilitate or restore productive values. Land degradation includes soil erosion, removal of top soil, soil fertility and structure decline, soil contamination including acidification, soil salinity, mass movement and destruction caused by animal and plant pests.

Development: The definition will be consistent with that being proposed under the Local Government development and planning legislation.

Development approval: An authorisation to carry out development under the applicable legislation.

Discharge: The volume of water that flows through a cross section of a stream.

Dryland Salinity: Soil salinity levels high enough to affect plant growth. It occurs as a result of natural soil forming processes or, in disturbed landscapes, through clearing or other activities that interfere with water and salinity balance and lead to shallow watertables. It is a hydrological response to the replacement of deep-rooted, perennial native vegetation with shallow rooted annuals, which use less water. As a consequence more rainfall enters the groundwater, causing watertables to rise. Where these rise to within 1-2m of the soil surface, salinisation occurs as a result of evapotranspiration and direct evaporation. Dryland salinity can result in both stream and soil salinity.

Ecologically Sustainable Development (ESD): Development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends.

Ecologically sustainable use: The use of a species or ecosystem within the capacity of the species, ecosystem and bioregion for renewal or regeneration.

Ecological Sustainability: The capacity of ecosystems to maintain their essential processes and functions and to retain their biological diversity without impoverishment.

Ecosystem: A community of plants and animals interacting with each other and the environment in which they live

Ecotone: A zone where two ecosystems overlap, and which supports species from both ecosystems as well as species found only in this zone.

Eco-tourism: Nature based tourism that involves education and interpretation of the natural environment and is managed for ecologically sustainability. The natural environment includes cultural components, and ecological sustainability involves an appropriate return to the local community and long term conservation of the resource.

Effluent: A discharge or emission of liquid or gas or other waste product.

Endangered regional ecosystem: means a regional ecosystem that is prescribed (according to the *Vegetation Management Act*, 1999) under a regulation and has either –

(a) less than 10% of its pre-clearing extent remaining; or

(b) 10% to 30% of its pre-clearing extent remaining and the remnant vegetation remaining is less than 10 000 ha.

Environmental indicator: Physical, chemical, biological or socio-economic measures that can be used to assess natural resources and environmental quality.

Equitable: Fair, impartial and just. In relation to resources and of sharing the costs associated with using them.

Estuary: The lowermost part of a river system that is a mixture of fresh water and sea water

Exotic species: an animal or plant that has been introduced into a region

Fauna: The entire animal life of a region

Fisheries resources: All stocks of fish in QLD including all or any of the varieties of marine or freshwater fishes and crustacean and marine animals (excluding crocodiles or fish protected under the Nature Conservation Act); and the immediate habitat upon which fish depend.

Flood plain: All areas of land, both urban and rural, subject to inundation from a watercourse during a flood event and likely to cause significant property or natural resource damage and/or be the subject of competing claims for the use of water.

Flora: The entire plant life of a region

Forest products: All forms of vegetable growth and material of vegetable origin whether living or dead and whether standing or fallen, and in relation to State Forests includes honey, native animal life and shelter, fossil remains, Aboriginal remains and artifacts, relics, water resources and quarry materials.

Forest resources: Forest products, landforms and landscape features, land and tourism or recreational opportunities within State Forest; and forest products and quarry material on all Crown lands.

Geographical information systems: A package of computer programs specifically designed to deal with data that are spatially related; a set of tools for collecting, storing, retrieving, manipulating, analysing and displaying mapped data from the real world.

Gleyed soil: Soil developed under poor drainage conditions, characterised by a lack of oxygen and the reduction of metal oxides to their metallic form. Gleyed soils have a gley (greyish, blueish or greenish coloured) mottle.

Grey water: Wastewater useable for a limited range of purposes, such as playing field irrigation or industrial cooling.

Groundwater: Water occurring below the surface of the landscape, at greater pressure than atmospheric, occupying cavities and spaces in regolith and bedrock. The upper surface of the groundwater is the watertable

Habitat: The living space of a species or community, providing a particular set of environmental conditions
Heritage: Those places, objects and indigenous languages that have aesthetic, historic, scientific or social significance or other special value for future generations as well as for the community today.

Indigenous species (or native species): Species that are native (i.e. occur naturally in) a region.

Integrated Catchment Management (ICM): A community-based approach to the management of natural resources focusing on the development of strategies to achieve the integrated management of land, water, forest, fishery and related biological resources within a river catchment.

Landcare: A community-based approach to the management of natural resources involving local people taking local action in their local area. Landcare encourages community interest and action through the formation of Landcare groups to access local problems, determine priorities and undertake action.

Land resources: All tenures of land and its soils, pastures and native vegetation including trees.

Minimum Tillage: A system of crop growing which uses the fewest possible tillage operations to prepare seedbed. Minimum tillage encourages the maintenance of soil structure and soil organic matter.

Natural resource users and holders: Holders and users of land, water, forest and fishery resources, including landholders, owners, occupiers, including all members of the public that use or hold rights to the possession of natural resources for industry, trade or other purpose. Holders include statutory, means land resources, water resources, forest resources and fishery resources.

Nutrients: Compounds required for growth by plants and other organisms. Major plant nutrients are phosphorus and nitrogen

Of concern regional ecosystem: means a regional ecosystem that is prescribed under a regulation and has either (*Vegetation Management Act*, 1989) and has either –

(a) 10% to 30% of its pre-clearing extent remaining; or
(b) more than 30% of its pre-clearing extent remaining and remnant vegetation remaining is less than 10 000 ha

Rare ecosystem: Defined as having an original extent of less than 1000 ha, or patch sizes generally less than 100 ha which in total occur only over a limited extent across the bioregion, or the total range of the regional ecosystem is generally less than 10000 ha. (Sattler & Williams, ed., 1999)

Remnant native vegetation: The term that is used for those small patches of native plant communities that still remain in the landscape. The patches can be of any size or shape. The term does not refer to native trees scattered in paddocks and urban parks or the introduced trees on timber plantations.

Riparian: Situated on or belonging to a waterway or waterway bank

River Improvement Trust: A body corporate established under the River Improvement Trust Act, to undertake and maintain river improvement works, and to control financial arrangements necessary to discharge these functions.

River Regulation: Flow modification of water in a river system. This may involve the creation of dams and weirs and diversions, and the control of flow to and from such storages.

Rural Industry: Comprises agriculture, forestry and fishing. The 'term' agriculture is used to include the breeding, keeping or cultivation of all kinds of animal or vegetable life except forest trees and marine life. 'Forestry' includes afforestation, harvesting and gathering of forest products. 'Fishing' includes the catching, gathering, breeding and cultivation of marine life from ocean, coastal and inland waters.

Salinisation: The accumulation of salts at the soil surface or in the main root zone, due usually to capillary rise of saline moisture from a shallow watertable. Soluble salt levels in the soil increase to the point where plant growth is affected.

Sclerophyll: Plants typically found in low rainfall areas that contain large amounts of a product called sclerenchyma, which prevents water loss from the leaves

Semi arid zone: Lands where rainfall is so low and unreliable that crops cannot be grown with any reliability.

Sodic Soil: Soil with a high percentage of sodium ions (in soluble or exchangeable form), exhibiting degraded soil behaviour such as dispersion when wet and crusting when dry.

Species: A group of plants, animals and micro-organisms that have a high degree of similarity and generally can interbreed only among themselves to produce fertile offspring, so that they maintain their 'separateness' from other such groups.

State Forests: Lands set apart and declared by the Governor in Council as State Forest for the permanent remnant reservation and management of such areas for the purpose of sustainable use of forest resources. For the purposes of this paper they include land set apart as Timber Reserves.

State Planning Policies: Used to guide local governments in the preparation of their planning schemes and in carrying out their planning functions. Policies are intended to be referred to in matters related to planning, land use and development.

Sustainability indicators: Quantitative attributes of rural industry production systems and the environment needed to estimate current status and trends in sustainability.

Sustainable use: The use of natural resources in accordance with ESD principles, and in particular the principle that decision making processes should effectively integrate both long and short term economic, environmental, social and equity considerations.

Water resources: Surface water in watercourses, lakes, springs, dams or weirs upstream of the tidal limit, groundwater and quarry materials within watercourses and includes waters outside a watercourse where so determined in an approved NRM plan.

Wetlands: Covers a variety of ecosystems that depend on shallow water for their distinctive plants and animals.

Woody weed: Shrubby plants (both native and exotic) that have increased in numbers and become a problem, particularly for pastoralists in parts of the arid and semi arid zones.

Zero Tillage: A production system in which there is no tillage at all. Zero tillage systems minimise soil disturbance to maintain as much crop residue cover as possible to conserve soil moisture and prevent erosion. Lon-term zero tillage also increases soil organic matter and improves soil quality and fertility. Zero or no-tillage systems are totally reliant on chemicals, such as herbicides, and are usually used instead of tillage to control weeds.

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