

Part A: The method – aquatic biodiversity assessment and mapping method (AquaBAMM)

1 Introduction

This AquaBAMM document is divided into three parts for ease of reading. *Part A The method – aquatic biodiversity assessment and mapping method (AquaBAMM)* provides an overview of the statutory and planning instruments, a review of the scientific literature on aquatic conservation value assessments and documents the AquaBAMM method in detail, including its Criteria, Indicators and Measures, and the calculation tool used to assimilate the raw datasets. *Part B The Aquatic Conservation Assessment (ACA) product – trial application of AquaBAMM in the Burnett River Catchment* details the results and outcomes of the trial application of the AquaBAMM in the Burnett River catchment (south-eastern Queensland) resulting in an Aquatic Conservation Assessment (ACA) for the riverine wetlands of that catchment. *Part C Appendices and Maps* includes the three expert panel reports on the aquatic and riparian flora, aquatic fauna and riverine ecology of the Burnett River catchment, several associated map outputs and technical documents relating to the development of the AquaBAMM Excel and Access database platforms.

1.1 Policy framework

There is increasing concern worldwide for the loss of aquatic ecosystems and associated biodiversity (e.g. Georges & Cottingham 2002; Saunders *et al.* 2002; Cullen 2003), particularly for riverine landscapes (Dunn 2004). Many of Australia's rivers have been adversely impacted since European settlement with widespread degradation now evident. The nation's limited water resources are increasingly in high demand, with continued growth in Australia's population and irrigated agriculture and predicted climate changes keeping water on the national agenda.

Several national and State water policies aim to protect intact systems of high ecological value and redress the trends of degradation of rivers and their associated ecosystems. The national goal for provision of water for ecosystems is to "sustain and where necessary restore ecological processes and biodiversity of water dependent ecosystems" (ARMCANZ and ANZECC 1996). The National Water Initiative of the Australian Government, which aims to "ensure the health of river and groundwater systems", was agreed to by the Council of Australian Governments (except Western Australia and Tasmania) and this agreement commits the signatory governments to identify, protect and manage high conservation value river catchments and their associated aquatic-dependent ecosystems. Similarly, the Queensland *Water Act 2000* aims to provide for "the sustainable management of water and other resources ..." and goes on to define sustainable management to include "protecting water, watercourses, lakes, springs, aquifers, natural ecosystems and other resources from degradation and, if practicable, reversing degradation that has occurred". The Queensland *Environmental Protection (Water) Policy 1997* aims to provide a framework for:

- identifying environmental values for Queensland waters;
- deciding and stating water quality guidelines and objectives to enhance or protect the environmental values;

- making consistent and equitable decisions about Queensland waters that promote efficient use of resources and best practice environmental management; and
- involving the community through consultation and education, and promoting community responsibility.

The most recent legislation for protecting Queensland rivers is the *Wild Rivers Act 2005*. The Act's purpose is to "preserve the natural values of rivers that have all, or almost all, of their natural values intact" by "establishing a framework that includes the declaration of wild river areas ...". This purpose will be achieved by:

- providing for the regulation of particular activities and taking of natural resources in a wild river and its catchment to preserve the wild river's natural values;
- having a precautionary approach to minimise adverse effects on known natural values and reduce the possibility of adversely affecting poorly understood ecological functions;
- treating a wild river and its catchment as a single entity, linking the condition of the river to the health of the catchment;
- considering the effect of individual activities and taking of natural resources on a wild river's natural values;
- considering the cumulative effect of activities and taking of natural resources affecting a wild river area when further activities or taking are proposed; and
- if a wild river crosses a State border, working with the other State to encourage preservation of the wild river's natural values in the other State.

All of these legislative and policy mechanisms provide the framework for protecting and enhancing Queensland's aquatic biodiversity and ecological processes. Implicit within these planning instruments is the need for understanding of aquatic ecosystems for informed decision making. For example, scientific information about a river catchment's ecology and high conservation value areas, and their spatial extent, is a necessary precursor to declaring wild rivers under the Act.

With most wild rivers legislation in Australia there is a priority on protection of undamaged rivers in near pristine condition (Georges & Cottingham 2002; Cullen 2003; Dunn 2004). However, despite this priority, many ecological values remain in disturbed river systems (Dunn 2004). In practice, many strategies for protecting rivers in Australia are applied in an ad hoc fashion based on 'wild rivers' concepts or coincidentally associated with landscapes or terrestrial protection in national parks or other reserves (Nevill 2003; Dunn 2004). As a result, significant values of waterways remain unprotected or only partially protected.

The establishment of frameworks of freshwater protected areas is advocated nationally (e.g. Georges & Cottingham 2002; Cullen 2003; Blanch & Hankinson 2003; Nevill & Phillips 2004; Kingsford *et al.* 2005) and internationally (e.g. Saunders *et al.* 2002). However, in spite of explicit international and national commitments (Convention on Biological Diversity 1992), action on establishing systems of representative protected areas in freshwater environments in Australia has been limited (Georges & Cottingham 2002; Nevill & Phillips 2004) or slow to progress.

Representative protected areas are an accepted component of terrestrial and marine biodiversity conservation programs, both in Australia and around the world (Dunn 2003; Nevill & Phillips 2004). Commonwealth and State legislation seeks to protect many terrestrial features in secure parks and reserves such as forests and grasslands (Dunn

2004). In contrast, protected areas for riverine systems are a new concept with little available theoretical basis for their design (Koehn 2003; Saunders *et al.* 2002) and are one partial solution to habitat degradation with few such areas having been created specifically for fresh waters (Saunders *et al.* 2002). A limited exception to these generalisations is legislated Fish Habitat Areas (FHA) in Queensland, which has usually meant protection of breeding or juvenile fish feeding grounds in marine and estuarine environments intended to achieve fisheries sustainability (McKinnon 2003). Excluding estuarine and marine environments, few, if any, fish habitat areas in Queensland (Nevill 2003) or New South Wales (Blanch & Hankinson 2003) have been listed under the respective state legislation.

Typically, these protection mechanisms are being implemented by natural resource management (NRM) government agencies, regional bodies and other community groups with little or no conservation information or pre-assessment to determine the significant ecological areas within river catchments. To implement a wild rivers policy or freshwater protected areas network or on-ground protection works, there is a need to develop nationally accepted, or at least State accepted, assessment protocols for identifying conservation value across a range of spatial scales (Georges & Cottingham 2002; Kingsford *et al.* 2005) and ecosystems (floodplains, rivers, wetlands, estuaries).

Given the identified need for scientific information and for the protection of freshwater ecosystems of high ecological value, an Aquatic Conservation Assessment (ACA) using the AquaBAMM, or a similar assessment, fulfils a necessary step in conserving Australia's freshwater ecosystems.

1.2 AquaBAMM application to statutory and planning instruments

Aquatic Conservation Assessments (ACA) using the AquaBAMM provide decision support that allows informed decision making with respect to conservation or ecological values of natural aquatic ecosystems from a non-social and non-economic perspective. The Planning Guidelines (Part D) from Bennett *et al.* (2002) provide a detailed synopsis of the current instruments for planning waterway protection in the Australian context. The authors state that protection and conservation require an integrated approach of instruments acting at different geographic scales (from river reach to catchment) because of the multifaceted nature of the issue. Dunn (2000) suggests that no one instrument will effectively protect ecological values of waterways, and a combination of instruments would need to be considered.

In the Queensland planning framework, a number of natural resource management stakeholders are using elements of non-legislative and legislative planning instruments for protecting ecological values of waterways (Table 3). Assessment using the AquaBAMM is one part of the planning framework required to implement protection or restoration mechanisms of conservation areas on waterways. The information contained in, and the results of, assessments using the AquaBAMM will inform decision makers on the conservation values of wetlands within a study area. Consequently, assessments using AquaBAMM either directly or indirectly links to various strategies, natural resource management groups, Environmental Protection Agency initiatives and legislative pieces at a State and Commonwealth level. These links are summarised in Figure 1. Quite deliberately, an Aquatic Conservation Assessment (ACA) using the AquaBAMM is a non-social, non-economic assessment of ecological or conservation values of aquatic systems (Figure 2). However, output from ACA could be integrated or used to inform a secondary process or another assessment. For example, specific outputs from an ACA could inform the broader triple-bottom-line Environmental Values process, under the Environmental Protection (Water) Policy, about high ecological or conservation value areas for a catchment.

Table 3 A summary list of potential users of assessments using the AquaBAMM, including their associated planning instruments and strategies and relevant legislation in Queensland

Potential AquaBAMM user	Planning instruments or strategies	Relevant legislation
Queensland Environmental Protection Agency	Environmental Values and Water Quality Objectives; Wetland mapping and protection; Development assessment (mining and coastal planning; petroleum and gas); Coastal management; and Leasehold lands review.	<i>Environmental Protection Act 1994</i> <i>Environmental Protection (Water) Policy 1997</i> <i>Coastal Zone</i> <i>Nature Conservation Act 1992</i> <i>Coastal Protection and Management Act 1995</i> <i>Forestry Act 1959</i>
Natural Resources and Water and other Queensland and Commonwealth government departments	Water Resource Plans and Resource Operations Plans; and Development assessment.	<i>Water Act 2000</i> <i>Wild Rivers Act 2005</i> <i>Vegetation Management Act 1999</i> <i>Environment Protection and Biodiversity Conservation Act 1999</i>
Local governments	IPA Plans; On-ground works; and Development assessment.	<i>Integrated Planning Act 1999</i>
Regional bodies, non-government organisations and water corporations	NRM Plans and Investment Strategies; On-ground works; and Priority setting.	

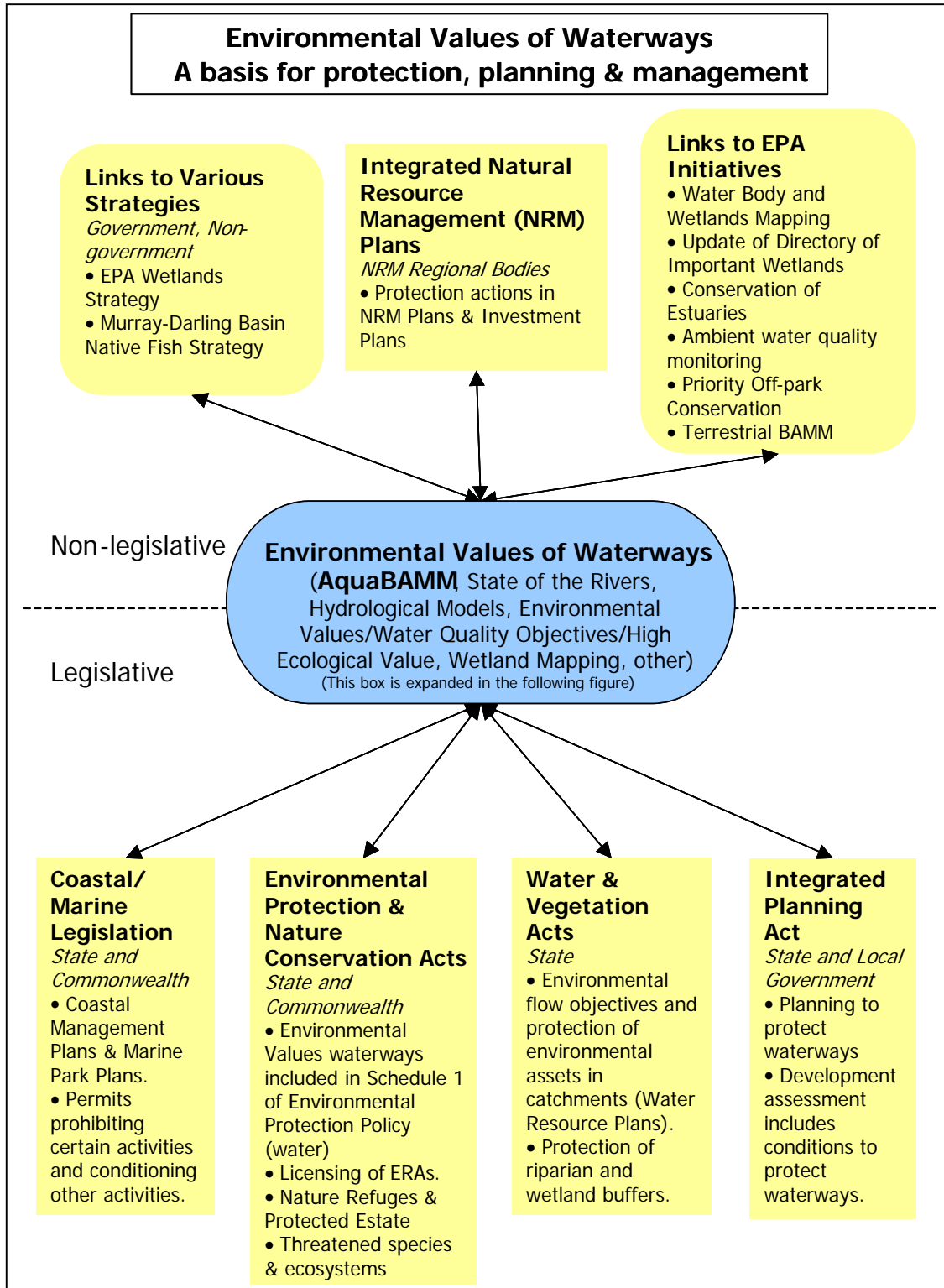


Figure 1 The planning framework in Queensland showing direct and indirect links between Aquatic Conservation Assessments (AquaBAMM) and non-legislative and legislative planning instruments (John Bennett pers com)

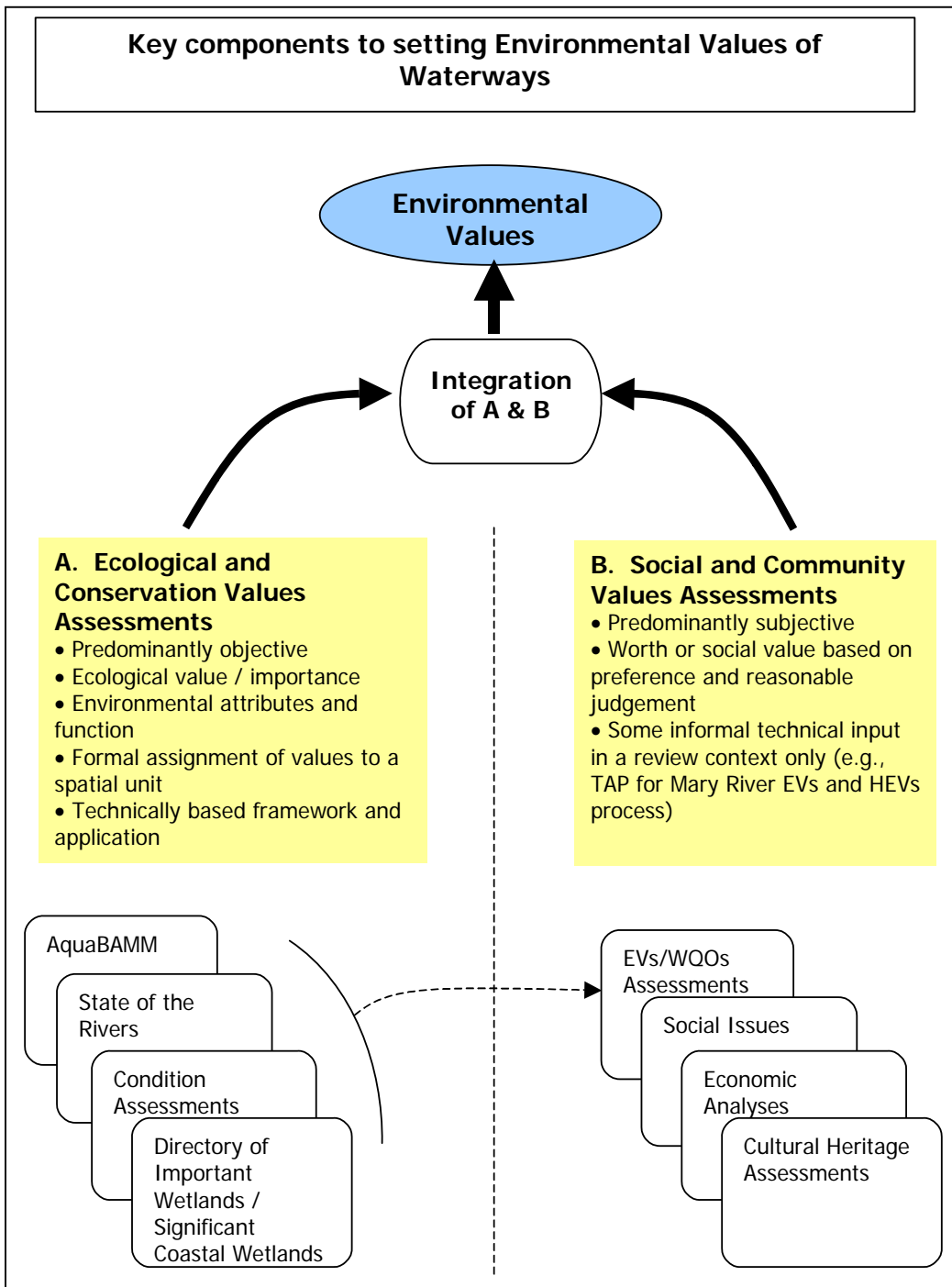


Figure 2 Conceptual framework for the ecological and conservation values assessments and social and community values. Assessment using the AquaBAMM (ACA) is a non-social, non-economic assessment of ecological values which can be integrated with other assessment types to inform decision making processes on environmental values of waterways