Proceedings of a workshop held in Babinda, Queensland, Australia, 25–26 September 1997

Edited by David Haynes, Dominica Kellaway and Kim Davis



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The Babinda Wetlands Workshop would not have taken place without the efforts of Sheriden Morris and the Morris family. Sheriden has achieved more towards the protection of the Great Barrier Reef and its associated environments over the last three years than most will accomplish in a life-time.

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COVER PHOTOGRAPHS Barretts Lagoon (Murray River Catchment Area), March 1997 Cleared *Melaleuca* wetland adjacent to Barretts Lagoon, April 1997



GREAT BARRIER REEF

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FOREWORD

Wetlands along the Queensland coast adjacent to the Great Barrier Reef World Heritage Area have declined significantly since the 1950s. For example, on the Burdekin River floodplain, approximately 80% of ephemeral wetlands have been lost. Along the coast from Cairns to Ingham, 70% of the *Melaleuca* wetlands and a significant area of sedgelands have been lost. Riparian areas in coastal lowland zones are in poor or very poor condition.

Preservation of our remaining wetlands and reinstatement of degraded wetlands is one of the most important environment priorities we have today. Wetlands are vital for the protection of the Great Barrier Reef as they ameliorate the impacts of run-off from catchment uplands. Coastal wetlands disperse and slow the velocity of run-off and this allows entrained sediments, nutrients and toxicants to settle out before they enter the Great Barrier Reef lagoon. Wetlands are also intrinsically valuable in their own right. They are vitally important habitat areas for a diversity of wildlife which includes a number of endangered species as well as commercially important species of fish and invertebrates.

Protection of wetlands is regulated by the *Water Resources (Watercourse Protection) Amendment Regulation 1995* which is administered by the Queensland Department of Natural Resources. Other legislation associated with wetland protection includes the *Fisheries Act 1994* (Queensland Department of Primary Industries); *Nature Conservation Act 1992* (Queensland Department of Environment); *Coastal Protection and Management Act 1995* (Queensland Department of Environment); and the Local Government (Planning and Environment) Act 1990 (Department of Local Government and Planning).

Legislation in itself is not sufficient to protect substantial portions of Queensland's coastal wetlands. It is time that a new cooperative relationship between the three tiers of Government, land holders and other interest groups and stakeholders was forged, aimed at protecting and preserving the remaining wetlands and rehabilitating and re-establishing wetlands where possible.

The Babinda workshop was the first of its kind in north Queensland. It was designed to bring interest groups, stakeholders, landowners, the scientific community and government agencies together to discuss perspectives and possibilities for cooperation to enter into a new, enlightened era of wetland management and preservation. It is hoped that the Babinda workshop may be a catalyst for establishing a cooperative cross-sectoral approach to the important issue of wetlands protection, and ultimately ensure the future of the Great Barrier Reef.

In Whail

Ian McPhail Chairperson Great Barrier Reef Marine Park Authority

CONTENTS

FOREWORD	iii
Program for workshop	viii
The Babinda Statement of Intent	
R. Humphries	1
SESSION ONE – OPENING ADDRESSES TO THE WETLANDS WORKSHOP	
The Importance of Wetlands to the Great Barrier Reef World Heritage Area Dr Ian McPhail	7
Wetlands – A National Approach	
Senator Ian Macdonald	9
The Department of Natural Resources' Approach to Wetlands The Hon. Howard Hobbs	13
The Department of Environment's Approach to Wetlands Lindsay Delzoppo	
SESSION TWO - CONTRIBUTED PAPERS AND PRESENTATIONS	
Local Government Perspective on Wetland Conservation M. Berwick	21
CANEGROWERS' Position on Water Quality and Wetlands H. Bonanno	24
A Primary Industry Perspective on ESD – Achieving Equitable Reform for the Common Interest M. Breen	29
Agricultural Contaminants in Sediments of Hinchinbrook Channel and Missionary Bay, North Queensland G.I. Brunskill	
Local Knowledge – Some Anecdotal Evidence of Change B. Bulling	37
Towards Sustainable Use of Australia's Wetlands – A National Overview B.I. Churchill	40

Drainage Waterway Management in North Queensland – A Fisheries Perspective A. Clarke	54
Tropical Queensland Seagrasses R. Coles	61
Coastal Wetlands – Position Comment C. Crossland	62
Wetlands Preservation – Southern RMRAC View S. DePinto	63
Importance of the Northern Wetlands J. Doohan	65
Indigenous Interests in the Murray River Wetlands – An Outsider's Perspective P. Fisk	67
Reef Tourism and Wetlands E. Green	75
The Ecological Benefits of Wetland Protection E. Hegerl	77
Spatial and Temporal Distribution of Wetland and Riparian Zones and Opportunities for their Management in Catchments Adjacent to the	
Great Barrier Reef Marine Park A.K.L. Johnson, S.P. Ebert and A.E. Murray	82
Tourism Advisory Group and Wetlands G. Lee	102
The Importance, Status and Management of Seagrass Systems Adjacent to the Great Barrier Reef – Community Interest Groups can help Maintain Seagrass and Fisheries Production	
W. Lee Long Coastal Freshwater Wetlands of North Queensland – Imperatives for their	103
Conservation G.P. Lukacs	105
Wetland Destruction J. Tager	114

No Native Plants = No Habitat = Poor Water Quality = No Fish V. Veitch	116
Wetland Preservation – RMRAC Views	
B. Whiteman	118
Wetland Protection – RMRAC Views	
C. Wood	
Australia's Wetlands – Learning to Love our Stinking Swamps: A Nationa	l Overview
P. Wright	

Program for workshop 'Protection of Wetlands Adjacent to the Great Barrier Reef' held in Babinda, Queensland, Australia, 25–26 September 1997

DAI		
8.00	Registration	
8.30	Field trip	Host: Sheriden Morris
2.00	Afternoon tea	
2.45	Welcome – The importance of wetlands to the	Dr Ian McPhail
	Great Barrier Reef World Heritage Area	
3.00	Wetlands – A national approach	Senator the Hon. Ian
		Macdonald
3.15	The Department of Natural Resources' approach	Hon. Howard Hobbs
	to wetlands	
3.30	The Department of Environment's approach to	Lindsay Delzoppo
	wetlands	
3.45	Panel discussion – integrating the management of	Dr Ian McPhail,
	wetlands adjacent to the Great Barrier Reef	Senator Ian Macdonald,
		Hon. Howard Hobbs,
		Lindsay Delzoppo
5.00	Local knowledge: some anecdotal evidence of	Blue Bulling
	change	
	Social function	
DAY 2		
8.30	The ecological benefits of wetland protection and	Eddie Hegerl
	discussion	
9.15		
	The extent of the loss of wetlands adjacent to the	Andrew Johnson
10.00	The extent of the loss of wetlands adjacent to the Great Barrier Reef and discussion	Andrew Johnson
10.00	The extent of the loss of wetlands adjacent to the Great Barrier Reef and discussion Morning tea	Andrew Johnson
10.00 10.30	The extent of the loss of wetlands adjacent to the Great Barrier Reef and discussion Morning tea Wetland protection – we all have an equal	Andrew Johnson Representatives from
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10.00 10.30 12.30 1.30 5.00	The extent of the loss of wetlands adjacent to the Great Barrier Reef and discussion Morning tea Wetland protection – we all have an equal responsibility Lunch Discussion - focusing on cooperation to achieve real and workable solutions Summary of, and commitment to, outcomes	Andrew Johnson Representatives from QCFO, Sunfish, RMRACs, Conservationists, CANEGROWERS, Tourism interests, Indigenous interests, local government Selena Ham Dr Ian McPhail

The Babinda Statement of Intent

R. Humphries

Great Barrier Reef Marine Park Authority, PO Box 1379, Townsville Qld 4810

Preamble

A cross-sectoral workshop addressing management issues relating to wetlands adjacent to the Great Barrier Reef was held in Babinda, north Queensland, 25–26 September 1997. The workshop was sponsored by the Great Barrier Reef Marine Park Authority.

The non-government participants included representatives from:

The Queensland CANEGROWERS, Sunfish, the Australian Conservation Foundation, the Queensland Commercial Fishermen's Organisation, the Girringun Reference Group, the Mackay CANEGROWERS, the Babinda CANEGROWERS, the North Queensland Conservation Council, World Wildlife Fund, the Regional Organisation of Councils, the Queensland Conservation Council, the Cairns and Far North Queensland Environment Centre, the Banana Growers, the Australian Coral Reef Society, the Association of Marine Park Tourism Operators, the Pro Guides Association, the Australian Marine Conservation Society, the Wildlife Preservation Society of Queensland, the Great Barrier Reef Marine Park Authority Tourism Advisory Group, Reef 2005 and the Gladstone, Port Douglas, Cairns, Mackay, Whitsundays, Townsville, Hinchinbrook, Cooktown and Capricornia Regional Marine Resource Advisory Committees (RMRACs).

Government and institutional representatives included:

Senator the Hon. Ian Macdonald, The Hon. Howard Hobbs, Dr Ian McPhail and Great Barrier Reef Marine Park Authority staff, Commonwealth Scientific and Industrial Research Organisation, Wet Tropics Management Authority, Queensland Department of Environment, Aboriginal and Torres Strait Islander Commission, Queensland Department of Natural Resources, Australian Institute of Marine Science, Environment Australia, James Cook University and the Queensland Department of Primary Industries.

The diverse range of opinion represented at the workshop presented a considerable challenge in terms of establishing a consensus on the question of the future of the remaining wetlands adjacent to the Great Barrier Reef and the associated issues of water quality and fish habitat.

The final session focused on a range of possible initiatives. What follows below is a record of the outcome in the form of *The Babinda Statement of Intent*, based on what was recorded by the facilitator, and a compilation of the broadly agreed motions put forward by a number of delegates. It is apparent from subsequent discussions that while on most points there is consensus, some issues remain to be resolved.

Therefore, in recognition of this and in order to maintain the considerable momentum generated by the workshop, the Authority presents the following statement of intent to participants for your consideration and feedback.

Please note, that following discussions with the CANEGROWERS, the Marine Park Authority has received their comments. At their request we have included these, as on a number of points the CANEGROWERS feel that the Authority's record does not accurately reflect what was agreed at the workshop. Their comments are in square brackets following the particular point in question.

It is hoped that similarly to the CANEGROWERS, all participants will provide their comments to the Authority by the middle of November to enable a summary of delegate's

comments regarding *The Babinda Statement of Intent* to be included in the published proceedings of the workshop. In this way the statement becomes:

- (a) a vehicle for a better understanding of the range of opinions regarding wetland protection;
- (b) a focal point for ongoing debate and discussion of this important issue; and
- (c) a mechanism which may facilitate ongoing contact and cooperation amongst participants on the issue of wetlands protection.

The Authority hopes that *The Babinda Statement of Intent* will, over time, yield consensus amongst all participants on a plan of action designed to protect and enhance the remaining wetlands adjacent to the Great Barrier Reef World Heritage Area.

The Babinda Statement of Intent

The following statement is a representative summary of recorded motions, broadly agreed statements and other points of agreement expressed by participants in the final plenary session of the workshop in regard to THE PROTECTION OF THE REMAINING WETLANDS ADJACENT TO THE GREAT BARRIER REEF WORLD HERITAGE AREA:

- That the remaining wetlands must be preserved. [The CANEGROWERS recognise the values of all remaining wetlands.]
- That all pre-emptive clearing should cease as a practice. [Pre-emptive clearing should not be an advantage in the granting of cane assignment – land suitability will be based on the land in its uncleared state.]
- 3. That drainage design and associated works be modified to incorporate fisheries habitat values.
- 4. That the Commonwealth Government should be lobbied to introduce a 150% tax rebate for on-farm works that are beneficial (to wetlands), such as a combination of watercourse stabilisation, restoration or maintenance of riparian strips and wetlands and the establishment of artificial wetlands and lagoons.
- 5. That local governments should be lobbied to reduce rate charges on land within properties identified by Queensland Department of Environment and Queensland Department of Primary Industries (Fisheries) that remain unproductive for the landholder but are of benefit to the wider community.
- 6. That the workshop request the Great Barrier Reef Marine Park Authority (in partnership with Environment Australia, the Queensland Department of Environment, the Queensland Department of Natural Resources and the Queensland Department of Primary Industries) conduct one- to two-day workshops with each Local Government and relevant regional stakeholder organisations adjacent to the Great Barrier Reef and that these workshops be individually tailored to each area and seek the following outcomes:
 - an assessment of the area of wetlands existing prior to European settlement and the amount lost since that time;
 - an understanding of the values of wetlands to fisheries and related ecosystems,
 - the consequences of wetlands loss;
 - evaluation of the threats to wetlands;
 - a strategy for the restoration of wetlands;
 - recipes and formulas for the conversion of drainage systems to healthy habitats;

- model local laws which local governments could adopt to halt the further loss of wetlands and to address the management of degraded systems; [The CANEGROWERS do not believe that there was agreement on the concept of 'model local laws'.]
- funding opportunities to resource local governments to undertake community education and remedial work.
- 7. A process is required to further resolve outstanding issues and that such a process should be in place before the end of 1997 and should involve the Great Barrier Reef Marine Park Authority and the other stakeholders.
- 8. Finally, it was acknowledged that there are a wide range of human activities which degrade wetlands including urban development, industrial development, port works and reclamation, aquaculture and stormwater run-off.

SESSION ONE – OPENING ADDRESSES TO THE WETLANDS WORKSHOP

The Importance of Wetlands to the Great Barrier Reef World Heritage Area

Dr Ian McPhail

Chairperson, Great Barrier Reef Marine Park Authority, PO Box 1379, Townsville Qld 4810

I'd like to officially welcome everyone here, in particular Senator Ian Macdonald, Parliamentary Secretary to the Commonwealth Minister for the Environment, Senator Robert Hill, and Mr Howard Hobbs, the state Minister for Natural Resources. I think we are particularly honoured to have both these senior members of the Federal and State Governments present here today and we look forward to their participation this afternoon. I think it's very important that their being here recognises the issue that we are dealing with: how do we provide for prosperous and growing rural industries while at the same time protecting not only the Great Barrier Reef in the general sense but protecting the industries that are based on the Great Barrier Reef – such as the inshore fisheries, for both commercial and recreational use, and also of course the natural features of the inshore area which are a tourist attraction in themselves? So it's how we balance out the needs of the upstream industries with the downstream industries as well as, of course, the intrinsic value of the Great Barrier Reef as a World Heritage Area, that we hope to resolve.

It's also very gratifying to myself and my colleagues from the Marine Park Authority that so many people from so many different interests have come to this workshop. I am delighted to welcome the Chairs of our RMRACs (our Regional Marine Resource Advisory Committees) that are advisory committees to the Authority; and we have the Chairs from as far north as Port Douglas to Mackay in the south.

We also have a wide range of people representing other interests: conservation interests, agricultural interests, and could I in particular express my appreciation to Harry Bonanno for his attendance this afternoon. Harry has had a number of consuming issues to deal with recently and it is an indication of the importance of this issue that Harry has been able to make the time to participate in this workshop.

I really look towards this as being a constructive, positive approach to talking through issues related to the maintenance of wetlands while at the same time being sensitive to the concerns of both upstream and downstream industries and also sensitive to the broad environmental concerns related to the Great Barrier Reef.

The Great Barrier Reef Marine Park Authority is in an interesting position in that we have an obligation under our legislation to protect the Great Barrier Reef. The Marine Park Authority is vested with that responsibility but because we live in a parliamentary democracy the Authority is responsible to the Commonwealth Minister for the Environment. The Authority also operates in an unique partnership arrangement with the Queensland State Government and I think it's important to stress that the Authority has a senior appointee from the Queensland Government. The Queensland Government is invited to nominate not less than one third of the number of members of the Great Barrier Reef Consultative Committee.

The day-to-day management of the Great Barrier Reef is carried out by the Queensland Government and it is a partnership arrangement which has worked, and is working, well on the water – but it becomes more difficult when we move upstream. The Authority's statutory rights end at the low water mark. Now if somebody wants to develop a plant producing toxic materials and pump waste materials through a straight pipe into the Great Barrier Reef Marine Park, our legislation would allow us to do something about that. But our legislation doesn't allow our intervention, or it would be particularly difficult, when we are talking about diffuse sources of pollution. In a sense that is also a healthy thing as it requires us to work very closely with the Queensland authorities and the Queensland industries in the management of the land. Because what you do to the land is what you do to the water. I spent seven interesting but difficult years as a Commissioner at the Murray-Darling Basin Commission where in fact that hard lesson had been learnt. And that also what you do to the land can sometimes come back and bite you very severely, illustrated by the penalties of salinisation, water logging and broken down irrigation infrastructure and so on that are being dealt with in the Murray-Darling Basin. I lived in Adelaide for 18 years. I had to drink water which of course came down from the Murray River and we were always very grateful in Adelaide because we knew the water had passed through several towns on its way to us. But even though I draw on that example, I think it does underline the reality that a marine area is dependent to a very large extent on the way in which land is managed.

Australia as a whole has a relatively healthy marine environment but not because we are necessarily particularly good managers. It has a relatively healthy marine environment because we don't have the population around the Australian coast that other countries have. But Australia on the other hand has gone to some considerable lengths in recent years to coordinate and cooperate with the States to start developing not only strong coastal programs but also programs such as 'Landcare' that are as significant for the health of the marine environment as any other program. Programs, such as in South Australia and other States, designed to manage the clearance of native vegetation so as to avoid riparian loss, gully erosion and all those other problems of over clearance. It is those programs and the Governments that are just as important for the health of the marine environment, as those concerned with what happens right on the coastline. So it's bringing all of those programs and the Commonwealth Government and the State Governments together, to coordinate and to have them working effectively so the downstream effects of land use are minimised.

We are here today in particular because we are interested in the issue of coastal wetlands. People have given me notes with a certain anatomical approach to them – they describe the wetlands, I think very accurately, as the kidneys of the natural system. The wetlands are the filters. The wetlands are nature's way of removing, if you like, non-flood levels of silt, of nutrients, of other contaminants in the water. Now that of course was part of the natural environmental scheme prior to European use. We can now imagine the pressure that has been put on those wetlands. They have been used as rubbish dumps – most evident around metropolitan areas. You will find that they have been seen as wasteland and it's always a very difficult thesis to make that 'your swamp is my wetland'. Swamps are seen as untidy. They are seen as places where large mosquitoes grow. They are seen as places that are wasted land which should therefore be converted into much more productive uses.

What we have, however, discovered is that in fact those wetlands are of major economic value to us. And it's maintaining the economic value of those wetlands (that is, the way in which they help maintain the health of that natural system upon which the marine based industries depend) that I think we would see now a common need to remove wetlands from the 'must clean up' list and recognise their function in the maintenance of the natural system. And it is very important for the Authority that we are able to cooperate closely with other Commonwealth agencies and with the State Government in ensuring that programs are in place; or when developments are being effected, that those developments are done in such a way that they meet the economic objective, that is, supporting the farming industry but at the same time not affecting the natural system by removing those filters from it.

This is a great opportunity for everybody who has an interest in the protection of wetlands. There is also the interest in economic use of those lands and the sea. At the conclusion of the workshop we will hopefully have arrived at a strong common view about the value of the wetlands and a commitment to their protection.

8

Wetlands – A National Approach

Senator Ian Macdonald

Parliamentary Secretary to the Commonwealth Minister for the Environment, Suncorp Plaza, 61 Sturt Street, Townsville Qld 4810

It gives me great pleasure to be here today at the workshop on water quality and wetlands. It is most encouraging to be surrounded by such a wide range of participants, each having a specific interest in the conservation and long-term sustainable management of the region's, and Australia's, wetlands and waterways.

In my presentation today, I will discuss wetlands and water quality from a broad, national perspective, providing you with the latest advice on a number of positive steps that the Commonwealth Government is taking to develop a national approach to wetlands conservation and management; initiatives that will increase the level of community understanding and stakeholder involvement in wetland and waterway management and rehabilitation.

In the past year, the Commonwealth has further improved its commitment to the International Convention on Wetlands, otherwise known as the Ramsar Convention, and has adopted and launched the *Wetlands Policy for the Commonwealth Government of Australia*. Before going into detail on these national and international trends, I would like to spend some time touching on some of the important issues in this very rich and beautiful region of Australia.

The location chosen for this workshop was no mistake. The Wet Tropics bioregion, of which the Babinda–Tully area is the heart, is riddled with wetlands of high ecological value. This precious strip of coast contains no less than 29 wetlands of national significance; all of which are listed in the latest edition of *A Directory of Important Wetlands in Australia*. More than half of these wetlands are located within a 60-kilometre radius of Babinda.

The major occurrence of these wetlands is on the littoral shores, the alluvial and colluvial backplains, floodplains, overflow channels, stream deltas of the lowlands, and the permanent fast flowing streams and their tributaries. Providing further challenges for wetland managers in this region is the fact that the coastal regions are subject to a strong maritime influence and high levels of humidity. The climate is characterised by an intense wet season between December and April, with a moderate dry season between August and December.

Perhaps the most important and, from a management perspective, complex, of all wetlands in the Wet Tropics is the Port of Cairns and Trinity Inlet. This nationally important wetland satisfies the criteria for listing as a Ramsar site and as a Shorebird Reserve Network site. It is recognised for its ability to support vast populations of shorebirds and waders as well as a breeding and feeding area for fish and prawns. This is a good example of where sound management can incorporate a number of uses and establish systems to protect the ecological qualities.

I understand that the Queensland Government is proposing to declare the Port of Cairns as a marine habitat under the *Marine Protection Act 1982*. In conjunction with its status as both a fish and wetland habitat under State legislation, and together with the Trinity Inlet Management Plan, this move recognises the significance of the wetland as a valuable resource and will aim to balance development needs with conservation objectives.

As the impact of human interaction and development over the years becomes increasingly evident, it is critical that we intensify our research and monitoring programs to increase our overall understanding of wetlands, and other marine and coastal ecosystems generally. As our

society continues to recognise and adopt principles of integrated catchment management, it is more important than ever, particularly in the biodiversity rich Wet Tropics, to fully appreciate the fragile nature of wetland ecosystems, and the significant relationship between the on-shore aquatic systems, including wetlands, waterways, catchments, and complex marine systems such as the Great Barrier Reef.

There is no doubt in any of our minds as to the environmental, heritage, tourism and commercial significance of the Great Barrier Reef. Indeed, the Great Barrier Reef is one of Australia's, if not the world's, most prized natural assets. As you are all no doubt aware, 1997 is the International Year of the Reef and I, for one, am positive that greater attention will be placed on the protection of coral systems in Australia and around the world.

A little recognised fact is that coral reefs, by definition, qualify as wetlands. Although the Great Barrier Reef is not listed as a wetland under the Ramsar Convention, it easily satisfies the criteria and is already being managed in accordance with the Ramsar Convention's and the Commonwealth Wetlands Policy's wise use guidelines for wetlands management. This management approach is supported by a legislative framework in which conservation is the dominant theme.

The Great Barrier Reef is not a National Park as such, but a multiple-use protected area. Subsequently, the Great Barrier Reef Marine Park Authority has been established to manage the reef to provide for its protection, wise use, understanding and overall enjoyment. In recognition of its natural heritage characteristics, in 1981 the Reef was nominated for, and added to, the World Heritage List. The wise use management of the Reef is exemplary of a firm and lasting commitment from the Commonwealth and Queensland Governments to share resources and responsibilities to achieve positive conservation outcomes.

Zoning of activities in the Great Barrier Reef has been achieved in a cooperative and consultative manner and has resulted in a modern management style which exemplifies the Commonwealth's commitment to raising the profile of ALL wetlands, and at the same time accommodating a wide range of uses. Zoning plans are subject to regular revision and the Commonwealth and Queensland Governments recognise that active community involvement is an essential component of this management style.

From a national, and indeed international perspective, Australia is at the forefront of protecting and better managing its wetlands. Since signing on to the Ramsar Convention in 1971, Australia has identified a total of 49 wetland sites which are considered to be of international importance and are now listed under the Ramsar Convention. It is also worth noting that, with great honour, Australia was chosen to host the Sixth Conference of Contracting Parties to the Ramsar Convention, held in Brisbane in March 1996. Among other things, the Ramsar Convention directs Contracting Parties to develop national policies to implement and direct the adoption of wise use management principles for all of its wetlands; a challenge that the Commonwealth welcomes and is actively pursuing.

After months of development, followed by broad-ranging consultation, Senator the Hon. Robert Hill launched the Wetlands Policy of the Commonwealth Government of Australia to coincide with the inaugural World Wetlands Day in February 1997. This policy was well received by a wide range of stakeholders. The Commonwealth is now focused on developing an implementation plan to complement and deliver on the strategies outlined in the Commonwealth's Policy.

Another important means by which we will be supporting the objectives of the Commonwealth Policy is through the development of partnership agreements with each of the State and Territory Governments for delivery of the Natural Heritage Trust. In relation to wetlands, we

10

will be encouraging those State and Territory Governments without wetlands policies in place for their own jurisdictions, to follow the lead set by the Commonwealth and those States who have wetland policies, so that we can work towards a national approach to the wise use of wetlands.

Also, the National Wetlands Program, administered by Environment Australia, has been established to complement the National Rivercare Initiative of the Natural Heritage Trust. The National Wetlands Program provides funding to communities and State bodies to promote the conservation of Australia's wetlands. One method by which this is achieved is by actively encouraging the development and implementation of wise use management practices by both government and non-government sectors.

Projects currently being funded as part of the National Wetlands Program include the development and/or revision of management plans for Ramsar sites, preparation of nomination documents for highly significant wetlands to be recognised as Ramsar sites, research and monitoring, development of a national inventory, updating the existing *Directory* of *Important Wetlands in Australia*, and broad-ranging community education programs. It is worth noting that the launching of the Natural Heritage Trust marks the first time that the Commonwealth has provided grants to the community for environmental projects.

I look forward with anticipation to the outcomes of the Natural Heritage Trust, not only for improved wetlands management, but in other areas such as vegetation, and the better use of our coastal resources through the Coasts and Clean Seas Initiative, which was launched recently.

The Coasts and Clean Seas Initiative will provide funding through the Natural Heritage Trust for the conservation, sustainable use and repair of Australia's coastal and marine environments. This unique program will focus on protecting the marine environment from negative impacts of human activity by tackling pollution problems, and addressing threats to biodiversity and habitat. This initiative will provide Australians with an opportunity to conserve our precious coasts and seas and prevent further degradation.

Last but not least, declining water quality is regarded as one of the most serious issues affecting our marine and coastal environments. In Australia today there is a growing awareness that water is a precious and finite resource which must be managed in a sustainable way. Waterwatch Australia, also administered by Environment Australia, provides a national framework for community-based water quality monitoring programs.

Since its inception in 1993, Waterwatch has expanded to all States and Territories. The number of monitoring groups has increased from about 200 operating in 16 catchments to 1150 in 86 catchments. Across Australia, data is collected by groups using nationally adopted protocols. This data includes temperature, acidity, turbidity, reactive phosphorus and nitrogen. The data is planned for inclusion in the National Database Program which will provide a system for collating, analysing and developing management responses at the catchment level. It will also be possible to merge information at both the State and National levels.

It is estimated that more than 50 000 Australians are participating in the program at nearly 4000 sites. Waterwatch is operating in every major metropolitan centre as well as in the rural areas. This program continues to create links between urban and rural dwellers leading to greater cooperation in catchment management.

In closing today, I would like to stress the importance of building partnerships and reinforcing existing links between the three tiers of government, conservation groups, industry, primary producers, and the community to achieve better environmental outcomes. There is a diverse

range of interest in wetlands, from tourism through to irrigation for food and fibre crops, that all compete for the same valuable resources. Increasingly, governments need to be aware of these stakeholder needs when making decisions that may impact on the long-term sustainability of wetlands. Management plans for wetlands and waterways must be developed to acknowledge these interests while integrating wise use management principles and objectives.

Thank you again for the opportunity to speak with you today. I am confident that the strategies contained within the Commonwealth's Wetlands Policy will be delivered in the most effective, equitable and transparent manner possible. I trust you will continue to enjoy your time at this workshop and find it a useful opportunity to learn about the region's coastal wetlands and waterways, the Great Barrier Reef, as well as the issues that are driving State, national and international policy development for the protection and sustainable management of wetlands and water quality.

The Department of Natural Resources' Approach to Wetlands

The Hon. Howard Hobbs

Minister for Natural Resources, PO Box 456, Brisbane Albert Street Qld 4002

It's been said many times, but it's worth saying again, that the Great Barrier Reef is a national and an international treasure. As the lead agency for natural resource management in Queensland, my Department acknowledges the significant contribution it can make through its role in land, water and vegetation management, in maintaining and enhancing the values of the reef.

While the focus of this workshop is on wetlands and their management, I would, at the outset, like to take this opportunity to discuss the broader aspects of land and water resource management as they might impact on the reef, and to outline some of the initiatives being driven by my Department.

The overall management of river catchments that run to the waters of the reef can have significant effects on the health and stability of the reef lagoon and of the reef itself, although how much in relative terms we are all still progressively learning. My Department, through a number of programs and initiatives, has a commitment to the sustainable use of our land and water resources while ensuring that downstream and marine impacts are minimised. These programs include:

- the integrated catchment management strategy
- the Downstream Effects of Agricultural Practices committee
- floodplain management policies
- the water allocation and management planning process
- Landcare
- Waterwatch
- the impact assessment and management of water infrastructure projects.

Wetlands, as one component of these catchment systems, have a unique and significant role to play in the health and productivity of our estuarine and marine ecosystems. They are often the final recipients of the water flowing down our river and creek systems and across our floodplains. However, many of the factors which influence the condition of these wetlands are complex and are interrelated. For example, changes in flow regimes will not only affect freshwater discharges, but also the nature, amount and rate of transport of sediment. Through the water allocation and managing planning process – such as is currently occurring in the Barron River system – flow needs for wetland health are being considered as part of the environmental flow requirements.

As you know the Queensland Government is committed to the economic development of Queensland through the sustainable development, use and management of its land, water and vegetation resources. The challenge we all face is how to make sure our development is sustainable.

While I share management responsibility for wetlands with my colleague Brian Littleproud, the Minister for Environment, my focus is on freshwater. However, a number of the wider activities of my Department can have a significant impact on both freshwater and tidal wetlands. The Department of Environment has been driving the initiative of developing a 'Strategy for the Conservation and Management of Queensland's Wetlands' to which my Department has had input. I understand this emerging strategy is to be the subject of the presentation by the Department of Environment at this workshop.

It is generally acknowledged that the long history of development of north Queensland, in particular of the sugar industry, is a significant issue for the management of wetlands of the wet tropics. I think it would be fair to acknowledge that much of this development was undertaken during a time when we did not fully appreciate the value of our wetlands. While these impacts may not always have been positive, the sugar industry in particular has recognised this and is now seeking better ways of managing its impacts.

The industry has been going through considerable expansion over the past decade and the market for sugar is such that it is anticipated this trend will continue. However, an opportunity now exists for us to plan and manage this expansion to minimise its impacts. One way this is being achieved is through the ten Sugar Industry Infrastructure Package (SIIP) projects in the coastal zone announced in November 1993. Through this initiative, expansion in the sugar industry is being planned and managed to ensure it is sustainable and environmentally sound.

I should stress that these SIIP projects are industry promoted projects that are jointly funded by the Federal and State Governments and industry. Projects can only proceed if the necessary environmental approvals administered by the Department of Environment and Environment Australia are obtained. Additionally, they require that industry sponsors are able to meet capital contribution requirements and that water boards are formed to exercise statutory oversight of their implementation. Unfortunately the commitments in the SIIP projects in promoting sustainability have been misunderstood by some in the community.

I would submit that sugar industry expansion is sure to occur regardless of the SIIP, and that this expansion may not necessarily follow a comprehensive planning approach. However, the SIIP offers additional management controls as part of exercising State and Federal responsibilities applying to these sponsored development projects. While responsibility for administering the Government interests in the SIIP rests with my Department, the projects are, fundamentally, industry promoted projects. Importantly, as I said, the environmental approval rests with the environment agencies.

You might also be aware that a review committee consisting of industry, State and Federal government representatives has been established to oversee the process of negotiation with prospective project sponsors and proponents. An environmental working group for the package has also been established to deal with environmental planning issues relevant to the projects. Representatives of industry and State and Federal governments are involved. There has been strong collaboration between the industry project sponsors, my Department and the Departments of Environment and Primary Industries on these projects.

I reiterate that all approved projects are subject to environmental impact assessment processes, and no work can commence on these projects until approval is given by the Department of Environment and its Commonwealth counterpart, Environment Australia.

Several SIIP projects, particularly those involving additional transport infrastructure through the extension of cane rail, have already been completed. However, a number of projects, particularly in the wet tropics, are still undergoing assessment. No work has commenced on the water management phase of the Riversdale–Murray Valley project at Tully, the Herbert project at Ingham, or the Russell–Mulgrave proposal at Babinda.

As with all SIIP projects, environmental impact assessment processes are being used to identify potential impacts. Environmental management plans, which also require endorsement by both State and Federal environment management agencies, will detail management requirements. The impact assessment process is comprehensive and involves many stages. I am advised, for instance, that the sponsors of the Riversdale–Murray Valley project are currently preparing a

further supplementary report to address outstanding issues that emerged from the initial impact assessment study.

Discussions are continuing with local councils regarding planning control of activities on the flood plains. Deeds of agreement to protect critical habitat areas are being extended, and local boards in the area now require all applications for new assignments to be accompanied by a farm development plan prepared with input from the Department of Environment, the Department of Primary Industries (Fisheries), Bureau of Sugar Experiment Stations as well as my Department. Without this coordinated effort I would suggest that outcomes would be far less certain than they now are.

I am also advised that there are some significant concerns with the Herbert (Ingham) Water Management project. Concerns with impacts on fish habitat areas and wetlands will need to be satisfactorily resolved before the project can proceed. I am confident however, that phase one of the Russell–Mulgrave project will be given final approval in the near future.

I believe that the participation by the various State and Federal departments in collaboration with the sugar industry in the SIIP process provides a model for managing development while ensuring important wetland and other values are sustained. I will continue to support coordinated and planned approaches to the management and development of our natural resources and I would emphasise that it is a communal effort in which we are all involved.

I trust this workshop will further advance the productive and useful discussion and debate on the issues associated with achieving ecologically sustainable development in north Queensland.

The Department of Environment's Approach to Wetlands

Lindsay Delzoppo

Representing the Hon. Brian Littleproud, Minister for the Environment, PO Box 155, Brisbane Albert Street Qld 4002

Ian McPhail mentioned that the Great Barrier Reef Marine Park Authority is in a strange position in that they have the major responsibility of managing the Great Barrier Reef and its uses and yet they have very little, or no, control over what happens on the land. Yet that is probably one of the major potential causes for damage. So I'd like to reassure Ian that the State of Queensland does take the responsibility for managing the environmental effects of activities on the land in Queensland very seriously. That involves not only being policemen but working with communities, and I think this sort of function is an answer to that.

The Department of Environment has a lead role – in a sense – it is a beaurocratic term but it means that we have responsibility for coordinating the efforts of a number of government agencies in the management of wetlands, something we do take seriously. One of our goals, one of the visions we have, is to try and create a system whereby we have no further loss or degradation of natural wetlands. It's a high, lofty ideal which we would love to work with you and others to achieve.

One of the things about Queensland is that it has an amazing array of wetlands, an amazing diversity of wetlands. This is due to its incredible rainy climates. The Minister mentioned that he's never seen stormwater and yet there's a place about two or three kilometres down the road here that's been known to get 10 metres of rainfall a year. It shows the variation of climates that we deal with in Queensland, and consequently the range of associated habitats.

The Senator referred earlier to the publication of the directory of important wetlands in Australia. I understand that many, about 46, of the important wetlands mentioned in that document are located adjacent to the Great Barrier Reef Marine Park – which shows how profound the relationship between the wetlands and the Great Barrier Reef is.

So what is the role of our Department then? As I said earlier, we are the lead agency for wetlands in Queensland. We work with other government departments and Queensland government agencies are currently looking towards a joint strategy which will not only use the rules and regulations of legislation such as the Environmental Protection Act and Nature Conservation Act, but adopt a broad holistic view that would produce better outcomes. If you just use the letter of the law, as all of us know, things often fall through the cracks. When land holders, local government and government agencies work together those cracks are more easily filled and more cooperative outcomes achieved. Under that strategy, action programs will be arranged and set out for each government agency and others to deliver in an appropriate length of time.

When this draft strategy on Wetland Management in Queensland was first being written, there was a review of the government legislation that effects wetlands. There were about 26 pieces of legislation that had an impact on wetlands. They weren't necessarily designed specifically for wetlands but they all have potential to impact indirectly on the ecology and the wellbeing of wetlands. Legislation that is absolutely silent on environmental matters is a problem that we deal with often. If the senior beaurocrat, or a middle-age beaurocrat in my case, makes a decision that takes into account environmental matters, you run the risk of pushing the law more than it warrants. It becomes a review, an appeal in court , and you're put in an ambiguous position. Perhaps a more holistic approach will help us get around this problem.

The Fisheries Act is one of the few pieces of legislation in Queensland that specifically deals with the protection of wetlands. While this focuses on production there is the benefit that in protecting the habitat for the primary production of prawns, fish and other things, it also protects the habitat for ecological purposes – the outcome is better water quality, food resources and enhanced tourist potential; in effect a win–win situation.

Under the Nature Conservation Act, we're responsible for managing something like 100 National Parks in my area north of Cardwell. Today, while we were showing off some of our parks' beautiful attributes I noticed that Sheriden Morris wasn't particularly impressed when we went out to an area of lush national park with our cameras only to see that our on-ground rangers had burnt much of the place to a shrivel. Nonetheless, such action is an important part of the effort involved in managing the diversity of a place like that – because our protected areas are a small part of the State, we have to put in a fair bit of effort to maintain that diversity. Such effort includes fire management, the removal of weeds, and such.

We also manage Marine Parks under the Marine Parks Act. Under the Nature Conservation Act there are opportunities for us to deal with private land and work with people. There have been lots of studies around which have shown that National Parks on their own are often not enough to maintain a healthy, dynamic ecosystem, that there is a real need for us to work closely with landholders and to try to come to some arrangement with them. To work closely with landowners is to achieve a much better environmental outcome.

Today we visited Wyvuri Swamp which, although of high ecological value, there is only 5% of that swamp protected. After a lot of discussion with landholders I am very pleased to report that they have agreed to have a conservation agreement, a voluntary conservation agreement under the Nature Conservation Act, over a large part of the land, thereby enhancing the ecology and the protection of both the national park and the environmental values of the area as a whole. That is a really positive outcome. We need to work closely at working those things around further. One of the difficulties is that while a dollar is a dollar for a farmer, it's just as true that a lost dollar is a lost dollar to a farmer. If we are to ask people, who are involved in primary production and often heavily in debt, to make some sort of sacrifice for our environmental acts, for community good, we as a community have to work out ways of giving them some recompense or acknowledgment. In this workshop we will need to work out how to accomplish our objectives in a fair as well as accurate way, which is not easy. We deal a lot with conservation agreements yet we don't have a big pot of gold and it is very hard to map those things out that are fair to the primary producer, who will be relied on to get the better environmental outcome for the community, and I am sure that will come a number of times later on in the discussion.

The Environmental Protection Act was introduced in the last couple of years. I feel it has had a positive impact on water quality and wetlands and, for example, Trinity Inlet. By using the Environmental Protection Act (State legislation) we've been able to work very closely with local governments, Cairns City Council in this case. There has been a great deal of improvement in the discharge quality in the sewage treatment plants and a detectable increase in water quality in that area. That's a sign of local government really realising that if they want tourism and don't want to limit population growth, they need to do something about it – they need to protect those special places, like Trinity Inlet. Another example is seen with Douglas Shire Council who have introduced tertiary treatment to their sewage treatment plant and maximising the step which seems to be getting rid of wastewater to land. These are the sort of things that help the Great Barrier Reef and they're pushed by the local people who are paying more than they otherwise would have to do, in their rates, to have that benefit that we all gain by. I think again you need to acknowledge that people do make those commitments or sacrifices.

Another example in recent years is seen with sugar mills. They've done an amazing job in the last five years, in increasing their environmental performance and putting in safety practices, so that if something goes wrong, it won't go in the creeks or down the drain. It is really astonishing what they've done and the money they've committed – in the order of five to ten million dollars per mill in some cases – to improve their performance over the last few years. Now that is big, that's from their shareholders and local farmers.

Finally, I would like to mention the Coastal Protection and Management Act which was passed a couple of years ago. In the next month, two months, I'm optimistic that there will be a planning exercise started here. There will be one south from Cardwell and one from Cardwell north to the Bloomfield River. It will be a planning exercise to look at planning along the coast to try to avoid some of the mistakes that perhaps were made in the past. We have places like Flying Fish Point, where people have developed in an erosion prone area or on a wetland area that is inappropriate. So we're hoping that that planning exercise will start very shortly and will support local incomes. I think the last thing we need is to have the feeling that people in Canberra or Brisbane are deciding these things, imposing on local people. This planning exercise will be done through a local community group, with local people directing the scope. I am optimistic that this should be starting soon. I hope that our Minister will be able to commence this in the next month or so. This will encourage local involvement. Any effected landholder will be contacted directly and be given a chance to discuss, involving them in the decision making as opposed to being told the decision and asked to comment on it, which is a very different thing indeed.

There was mention made earlier to Wetlands Strategy, or draft Wetlands Strategy. It's at a draft stage and hasn't yet been adopted by Government, but it indicates the high ideals we are aiming towards:

- To avoid the forever loss or degradation of natural wetlands. We all support this in principle but realise that it is a high ideal.
- To base the management use of natural wetlands on the principles of ecologically sustainable development and integrated catchment management. Again, the local people, through catchment management exercises, need to be involved in the decision making.
- To development community awareness and respect for values and benefits of wetlands.

Finally I would just like to thank you again for inviting us here. On behalf of the Minister, I'd like to say that I hope Senator Hill and I can offer you some help here. There are some Environment Department staff here and I hope we can offer something in the workshop and I wish everyone every success in the next couple of days.

SESSION TWO CONTRIBUTED PAPERS AND PRESENTATIONS

Local Government Perspective on Wetland Conservation

M. Berwick

Mayor, Douglas Shire Council, PO Box 357, Mossman Qld 4873

I will try and address the questions that have been put before us. The first one is the interest in wetlands. Local government is the key player in wetlands conservation and this can be achieved through both regional and local initiatives.

At a regional level, local government have been part of a Regional Environment Strategy, part of the FNQ2010 Regional Plan, and it has mapped all of the significant wetlands, established mechanisms for their protection, but lacks any real teeth in terms of statutory controls. However, the Regional Environment Strategy has been developed; it's just been completed and it is going to be on public display in the not too distant future. I hope everybody reads it carefully and makes their comments on it.

At another level, North Queensland Joint Board, for which I am chairman, is involved in quite a few programs that are either directly or indirectly of benefit to wetlands. Sue Visor is the acting Chief Executive Officer; Colin Creighton has unfortunately left us for a bigger and better job. Sue will be developing a vegetation policy with all the member councils. We are in the process of developing catchment rehabilitation plans. The Joint Board runs the Wet Tropics tree planting scheme which is now to be funded under the National Heritage Trust and we were the group that initiated the Community Rainforest Reforestation Program.

However, I don't believe that there's a great deal of awareness at the local government level of the need to protect wetlands. I think it's generally poorly understood, is seldom discussed and is not high on the list of priorities with the local government agenda. There are some future commitments in terms of vegetation protection. Cairns City has vegetation and protection laws although I do not know how well they work. Today the Douglas Shire's interim vegetation protection laws come into place with some commitment to develop some permanent laws. I understand Cardwell has a number of policies to do with wetland protection – they don't look as if they work terribly well from what Ross Dignam has said and I've yet to be convinced that our vegetation laws will work well; it will depend on how well they are enforced.

Other issues in which Councils have some involvement in wetland protection include tertiary treatment of sewerage – our Shire has just agreed to go ahead with tertiary treatment of sewerage and irrigation. Cairns City is looking at it but I don't know of any other councils that are. There is the Regional Waste Management Strategy, which is under way at the moment. The Douglas Shire's dump, for example, is in the mangroves. I am embarrassed about it, but it's true, and a lot of others are in the mangroves too. I feel that local governments are deficient in their understanding of, or attempt at understanding, the off-site cumulative impacts of development and growth, such as water extraction for urban and agricultural growth, sewage discharge, waste disposal, urban run-off, low land drainage, over-fishing etc. And that is probably the big issue that we are all facing. Hopefully, the regional plan will start to address that but I'm not aware of any effective implementation strategy of that plan. I hope that does come into place and it's important that you people look at it, study it and make comment on it.

There is real willingness to cooperate – I would like to read out a resolution in a moment, and I think we can put that back to local government. I'd be happy to carry that back to the Regional Organisation of Councils to see if they're prepared to support it and also test the commitment of State and Federal Governments to assist local government in terms of resources, expertise and so on to try to produce some better land use management practices.

It's fairly clear that good land use management practices require a mix of education, incentives and regulation. CSIRO in their studies have shown that none of those things work on their own and unless you're committed to all three, you won't have effective vegetation management policy. Councils are really the key, in my view, to making land use management systems work. Even if State and Federal Government required them to work, if you don't get the cooperation of local councils or they resist them I can tell you they won't work. So local councils must be involved. They probably have to be the body at the end of the day who implements these things and if they're not philosophically on board it won't work. Our powers are quite extensive, for example, local laws. I'm not aware of any State or Federal Government ever implementing vegetation protection policies. Local governments do it around Australia with mixed success. They're a fairly new innovation to north Queensland and I'm not yet convinced to how well they're going to work. They are quite capable of working well but it depends on the commitment and understanding of the local government that's implementing them.

Local government is the principle body who manages land use through it's planning schemes. The planning schemes can have quite extensive powers if local governments choose to put them in there. When the regional plan is in place all local government plans will be required to comply with the regional plan. And before the Minister approves the local government planning scheme he will make sure that it complies with the regional plan. That is another reason to make sure that the regional plan is a workable document that is capable of being implemented to produce real outcomes. I'll give you an example. Local governments could define vegetation clearance or drainage as a development that requires the consent of council. This is a very powerful tool to implement and a very effective means to manage land use. If you combine that with local laws, zoning powers, and if you add to that education incentives we can do it. But local governments have to be better informed than they are now.

A good example of local government working on environmental regulations is the Environmental Protection Act. Now that was a requirement of State government for local government to implement it. We complained fairly strongly that they made us implement it and gave us no resources to do it and that's fairly typical. However, we've done it and speaking for my Shire, we've done it well. All businesses now that discharge waste are on a register, they all have to have management plans; they put in sumps, no longer does the stuff go down the drain as it used to. Not many businesses knew the differences between the stormwater drain and a sewer – the level of understanding was very poor. Our local government predicted dire consequences in terms of business viability when this was enforced. We went through a process of calling public meetings, we got all the businesses into a room and said we have to do this, we're going to charge you a fee. That fee is going to cover the cost of us inspecting your premises and you're going to have to comply with these regulations. Surprise, surprise, all of industry said that's not a problem, we understand that we've got to stop tipping stuff down the gutter. What we want local government to do is to implement the law equitably. We did that, we made sure that our inspection fees/registration fees only covered the costs of us to go out and inspect the sites and we justified that to our community and they have accepted it. There have been no problems, they are all starting to comply. It has been a major success that's quietly gone through.

That is just an example of what local government can do with a little help from State and Federal Government. We can do with more in terms of resources.

I'd like to put forward a resolution today and I'd like it to be a part of a number of resolutions: 'That this conference request that the Great Barrier Reef Marine Park Authority in partnership with Environment Australia, the Queensland Department of Environment and the Queensland Department of Natural Resources conduct and run a two-day workshop with each local government in the wet tropics region individually tailored to each area seeking the following outcomes: Local Government Perspective on Wetland Conservation

- 1. an assessment of the area of wetland existing prior to European settlement and the amount lost since that time, in each local government area;
- 2. an understanding of the values of wetlands and fisheries and related ecosystems;
- 3. the consequences of wetlands loss;
- 4. evaluation of the threat to wetlands;
- 5. a strategy for the restoration of wetlands;
- 6. recipes and formulas for conversion of drainage systems to healthy habitats;
- 7. model local laws which local governments could adopt to halt further loss of wetlands and to address the management of degraded systems; and
- 8. funding opportunities to resource local governments to undertake community education and remedial measures.'

CANEGROWERS' Position on Water Quality and Wetlands

H. Bonanno

Chairman, CANEGROWERS, GPO Box 1032, Brisbane Qld 4001

I'm pleased to be here today to have an opportunity to speak on behalf of the sugar industry. The sugar industry is a high profile industry and as such it's a prime target for a lot of criticism. That won't dismay us. I'm very proud of the industry and I think that most of you already are, or should be, very proud of the sugar industry we have in Australia. We earn something like two billion dollars per annum and that's not to be taken lightly. Not many industries in Australia earn that much money. Actually it's the highest earning rural industry in Oueensland, and it's about the fifth largest industry in Australia as far as earning capability. Certainly our farmers as well are proud of what we do and are very efficient producers. They produce without any subsidy from anyone, without any compensation from anyone and no tariff from now on either. And yet other industries around the world are protected. In Australia there are substantial industries that are protected, yet we get most of the criticism. I hear now they say user pays should be spread all around. I say all beneficiaries should pay. And the people that benefit are the general community in Australia and Queensland. You should all be contributing towards it if there are any real problems. It's easy to say that users should pay, the beneficiaries should pay. And most of Australia is the beneficiary to the sugar industry. We've always worked within the laws of the land, whatever they are. We have not transgressed any laws that I know of but anyone who does should be adequately punished. We work within our communities and we hold our heads high within our communities; we are part of these communities. We are trying to meet the community expectations. If we don't, we want to hear about it and discuss it in a reasonable and rational way. A rational way doesn't appear to be to have about 80 people here and about three or four cane growers. It was the most inappropriate time you could have picked to hold this particular meeting. That won't stop us, we'll have our say and I'm pleased to.

I don't run the sugar industry; I'm chairman of it; I'm not without influence. But the industry runs in a democratic way. We work within the laws of the land and we work within the programs we have set out and we plan where we're going. There's nothing that is done ad hoc and I get rather dismayed when we're accused of all the irrational things we might do. They might appear to be irrational on the surface to some people who haven't scratched deep enough to find out why it was really done that way. The industry has expanded some 20% in the last 10 years. I make no apology for that. Our governments, both State and Federal, say, get out there and earn an income. You won't buy anything if you don't earn money and we are one of the industries that earn money for this country. So it's easy to knock industries but it's better if you look on the good side and show what the industry has done for Australia.

We don't necessarily want to expand. If we're asked to, we will. Unless there's some good reason why we shouldn't, we will continue to expand. The main constraint is now milling capacity. We can't mill the cane quickly enough to get it off the land for the farmers at a reasonable price. So there's a major constraint and unless the rural market price increases you'll probably see no expansion and the losers then will be the rural cities and towns of Queensland. The farmers will also lose. It's given a lot of people the opportunity to be farmers and strangely enough there are a lot of people who want to be farmers. I don't know whatever for. It gives you a permanent job; you get criticised for everything that goes wrong with the whole country and yet you're working probably twice as long as most other people but you have a permanent job for life. You either go bankrupt or leave the farm, whatever comes first I suppose, but you keep on going. It must be what people really want in this country and we welcome people into the industry.

CANEGROWERS recognise that wetlands are an invaluable resource. Wetlands support a diversity of wildlife including migratory bird species, are an important part of the natural hydrological cycle, provide water passage and storage and may contribute to the recharge of aquifers. In addition, wetlands remove nutrients and intercept sediment. Wetlands also provide essential water sources for agricultural, urban and industrial uses and vital breeding, nursery and harvest sites for edible fish and crustaceans.

I think we all agree on the benefits of wetlands. All cane growers recognise that they farm in the shadow of an Australian icon, the Great Barrier Reef. And only through the long term and careful management of the land and all of its resources will we maintain our quality of life and that of future generations. We have to manage carefully where we're going in the future.

However, CANEGROWERS also recognise that environmental issues transcend farm boundaries. Environmental impacts may be accumulative and are often realised far from the impact source. Clever management of our natural resource and protection of the environment can not be insured by cane growers alone. There are other rural industries and there is real effluent produced by many cities along the Queensland coast. CANEGROWERS recognise that the protection of wetlands and the rest of the environment will require a clever and strategic approach involving many stakeholders.

The sugar industry extends over 500 000 hectares of land and even though it is strategically placed along our coastline, it is not the major cultivator of the Queensland lands. However, the Queensland sugar industry is Queensland's largest income earner, as I said earlier. The sugar industry is the first, and as far as I know the only, rural industry in northern Queensland to have a comprehensive and independent audit of its industry undertaken. We did that voluntarily. I stress that the audit was undertaken by independent consultants, Gutteridge Haskins and Davey Pty Ltd, who consulted with all stakeholders including the Great Barrier Reef Marine Park Authority. Copies of the audit have been placed in all public libraries in cane growing regions and dispatched to the majority of stakeholders for comment. It's not a secret document.

It is clear from the document that CANEGROWERS have many environmental issues that need to be addressed. To this end, we have developed an Environmental Management Strategy. This strategy covers four areas:

- 1. improved agriculture practices to reduce off-farm impacts and ensure the efficient and sustainable use of all of our natural resources;
- 2. to achieve a balance between cane growing and the protection of natural systems ;
- 3. for responsible and appropriate use, storage and disposal of dangerous goods and wastes; and
- 4. increasing the level of communication to ensure that partnership exists among different organisations to develop programs directed at maintaining a profitable, sustainable, environmentally aware cane growing industry.

CANEGROWERS is prepared to work with various stakeholders for improved outputs. I'll give you that undertaking. There are a lot of issues where there must be consultation. CANEGROWERS is now developing a 'whole of industry' approach to all of the recommendations in the audit for the Environmental Management Strategy. A meeting is planned and a working group from the CRC for Sustainable Sugar Production is addressing outstanding issues from our guidelines for sustainable cane growing. CANEGROWERS are consulting with the Department of Environment and will ultimately seek the Department of Environment's endorsement of these guidelines.

CANEGROWERS Environment Manager, Jennifer Marohasy, is keen to include all genuinely interested groups in the development of action plans to achieve the many outcomes listed in our Environment Management Plan.

The time has come for all stakeholders to begin working together through consultative processes. CANEGROWERS believes we have shown leadership in this area. The Tully–Murray Water Management Scheme, which is part of the sugar infrastructure package, provides for the construction of lagoons, provisions of silt traps to reduce off-farm impacts, conservation of heritage areas along rivers and streams and the replanting of some riparian areas. The scheme will also complement fish restocking societies in their efforts to boost fish numbers for recreation and commercial fishing. Furthermore this package includes a comprehensive nutrient and sediment monitoring program to ensure that the aims of this scheme are realised.

CANEGROWERS is committed to working with all genuinely interested parties. An outline of CANEGROWERS' Environmental Management Strategy was presented to the Downstream Effects of Agricultural Production (DEAP committee) meeting in late August 1997. The intention was to force links and to ensure compatibility between CANEGROWERS' environment initiatives and those of other organisations. One of the key issues identified in the DEAP 1995–1998 Strategic Plan is the need to:

locate sampling sites so that rural land-use practices (e.g. grazing, dairying, other intensive animal industries, cropping, horticulture, cane) are represented and linked to water quality and the biological health of river catchments.

Recommendation number 2 item 4 of the Gutteridge, Haskins and Davey audit recommends Increase monitoring to water quality in local creeks and waterways in order to determine cane growing effects on nitrification, sedimentation, turbidity and salinity of water resources.

Cane growers are involved through landcare groups and are independently monitoring water quality through Waterwatch. There is obviously a need to establish an appropriate balance between these types of rapid qualitative water quality monitoring projects and slower more expensive quantitative monitoring of the sort being undertaken by a variety of agencies. All of the published information suggests that, in terms of off-farm impacts, cane growing is relatively friendly. Indeed, measurements of sediment loss from fields with green cane trash blankets indicate that levels are similar to natural level of erosion measured in undisturbed rainforest at approximately five tonnes per hectare annual average loss. Under our previous cultivations the losses ranged from 70 tonne to 500 tonnes per hectare, so that's totality brought down to a minimilistic level.

I'd like to see the long-term water quality trend for north Queensland creeks and rivers. Water quality has probably improved dramatically over the last decade with the move to green cane harvesting and trash blanketing. Over 60% of north Queensland cane production is now being harvested green. Some northern areas are close to 100% green cane harvesting. Many cane growers feel that the community is generally always treating them as the bad guys. They never recognise the many positive issues coming from primary producers. What about acknowledging the considerable contribution of primary producers to sustainable agriculture, and the fostering of biodiversity? The Decade of Landcare evaluation report estimates that individual primary producers spend nearly \$300 million a year protecting and rehabilitating the rural environment, an average of around \$2500 per grower.

In fact the evaluation report of a Decade of Landcare reports that farmers spends \$4 on the rural environment for every \$1 of Federal or State Government funding. The choice of accelerated tax reduction through a tax rebate would encourage growers to engage in property management growing. I recommend that to you. The National Farmers Federation have been

26

calling for the eligibility details for claiming deduction rebates, or credits to be made available to our country's primary producers urgently. We are still waiting an outcome.

I commend the Department of Environment's draft strategy for the conservation and management of Queensland's wetlands. This document recognises that wetlands on leasehold and freehold land are managed by private land holders who produce goods and services in an increasingly competitive market. The Department of Environment document recognises that these wetlands makes a significant contribution to wildlife abundance and wealth, particularly in times of drought. The document also recognises the importance of artificial wetlands and indicates that these storages can be managed for their primary productive purpose while providing habitat and recreation values.

I ask the government Ministers and representatives here today to assist cane growers in a practical way by putting in place a mechanism which provides a 150% tax deduction for construction of wetlands and lagoons on cane farms. Incentives for farm management and environmental protection are building blocks in which we have major encouragement for more sustainable production within a sustainable environment.

CANEGROWERS recognise that while the adoption of green cane harvesting and trash blanketing has been a massive step towards sustainable cane growing, the construction of lagoon wetlands and silt traps will significantly reduce the potential for off-farm impacts. In order to comprehensively reduce that loss, growers need to consider better riparian management in some areas. However, there must be a mechanism to reimburse growers for positive environmental actions such as revegetating riparian zones and undertaking tree planting.

Instead, growers are hearing that with the new Integrated Planning Bill the situation will not improve and there will remain a big question about Vegetation Protection Orders, and more specifically, if compensation is payable if an Order is placed on cane land. Community groups cannot continue to point the finger at cane growers and then expect cane growers to be positive towards broader environmental objectives. The cost of environmental initiatives must be borne by all stakeholders and the broader Australian community. In all cases, the beneficiaries should pay. The general community is a major beneficiary and the Government, on behalf of the community, must accept a reasonable responsibility for contributing to a successful overall result.

We would like broad support for an industry wide project to address these issues. Our Environment Manager, Jennifer Marohasy, is keen to hear from groups with a real interest in supporting projects that look at the practical revegetation of degraded areas along waterways. Several initiatives from the sugar industry in this area were not supported through the National Heritage Trust process this year. However, one project that is likely to be funded involves the development of a mangrove nursery and the revegetation of river banks in the Moreton district. Cane growers in this region are planning to plant 10 000 mangrove trees to stabilise tidal sections of river bank.

At the same time, CANEGROWERS are fighting a continual battle with the many species of water weed, in particular species of ponded pasture, that are choking creeks, gullies, dams, and wetlands. Many of these species, including *Hymenachne*, were deliberately introduced by scientists for the grazing industry. *Hymenachne* has become established in the Tully–Murray area and is spreading through the wetlands. *Hymenachne* tends to stagnate water and reduce oxygen levels where it has become established.

I was horrified to read recently that there might be an end to the State Government's six-year ban on the introduction of new ponded pastures in north Queensland. And that this would

27

result in the introduction of new ponded pasture species from overseas. CANEGROWERS in this area, as well as the Burdekin and Mackay districts, will not be pleased to hear this. A Mackay cane grower recently told me he has to spray creeks, gullies and dams up to eight times a year for control of weeds like *Hymenachne* which were deliberately introduced for the grazing industry.

CANEGROWERS recognises that environmental issues transcend farm and administrative boundaries, that to maintain the quality of our environment there will need to be an appropriate mix of existing and new on-farm initiatives, as well as research, development, monitoring, extension, education and communication amongst all stakeholders. An increasing number of cane growers are developing farm plans and through Catchment Management Plans are considering planning needs to be a voluntary exercise with the farmer having a commitment to keeping to the plan and maintaining it as a living program of farm management.

CANEGROWERS recognises we have not yet solved all our problems, but we are prepared to work with the various stakeholders to maintain our quality of life and that of future generations. I invite you all to the Sugar Environment Forum being planned for 24–25 March 1998 in Mackay. The Forum will enable all interested groups to gain insight into the value of the cane industry and the daily tasks that growers carry out to produce sugar, while making efficient and sustainable use of a range of natural resources.

A cooperative and practically based program will achieve the best result in this difficult area and we as an industry have been, and will continue to be, cooperative for the benefit of our environment and our sugar industry.

I think the one comment that I haven't been able to get straightened out yet was in connection with the amount of mercury we have put into the Herbert River area in the last 40 years. The best assessment that I've been able to get (and it's not accurate and I don't want to say I've got it right) is 26 000 kilograms (not tonnes).

We are not an ad hoc industry; we believe in planning and we are happy to work with you in planning.

A Primary Industry Perspective on ESD – Achieving Equitable Reform for the Common Interest

M. Breen

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Introduction

There are three dams in the Burnett River, with a new one on the way. Industrial and agricultural pollution makes its way to the river by point-source and leaching effects. Diversion of estuarine flows from the northern bank of the river in the 1960s has modified a once extensive saltmarsh wetland into mangrove forest. In the 1960s, the Burnett River supported around 30 full-time fishermen. In little more than 20 years it has become so degraded that it now supports no more than one full-time, and a handful of part-time, fishermen. Local fishermen have not seen a 'Burnett River' salmon in the Burnett River for many years. This is representative of many of Queensland's major rivers, particularly in northern and central regions. Consequently, loss of wetland habitat, degradation of water quality and modification of water flows are very serious issues for the fishing industry.

The Queensland Commercial Fishermen's Organisation's (QCFO) State Environment Committee has a policy which outlines the QCFO's position in relation to environmental issues, including wetland protection and water quality (attached). However, QCFO believe that there is a more pressing problem which needs to be addressed before we can hope to achieve equitable reform of coastal zone primary industries for the common good.

QCFO believe that the economic, social and environmental goals inherent in ESD can be achieved only through a clear, and certain process of cross-sectoral dialogue. Process should be regarded as a tool, rather than an end. Process is the alternative to the divisive binary model of conflict resolution. The direct involvement of working men and women in the decision-making process ensures acceptance of the outcome. Lessons learned in Queensland fisheries management may help to establish such a process. The alternative is alienation, political intervention and lose–lose outcomes.

Legislative and Institutional Issues

In Queensland, the 'coastal zone' is managed in part by all three levels of government (federal, state and local) by a range of agencies with various jurisdictions. There are at least four state agencies with jurisdiction (QDNR, QDoE, QDPI, QDoT), at least three federal agencies (Environment Australia, the Great Barrier Reef Marine Park Authority (to low water mark)), and of course, local governments. In the far north, there is also the Wet Tropics Management Authority.

In 1991, there were in excess of 50 separate pieces of resource legislation controlling activities in the coastal zone. This figure has since increased with the introduction of the *Nature Conservation Act* 1992, the *Fisheries Act* 1994 and *Fisheries Regulation* 1995, the *Environmental Protection Act* 1994, the *Coastal Protection and Management Act* 1995 etc.

This complexity reflects the inability of command economy institutional arrangements to deliver the communities long-standing wish to have balanced resource management. It is symptomatic of poor inter-agency coordination and bureaucratic segregation of the boundaries of natural systems.

Ad hoc planning hinders progress toward achieving ESD and almost always results in political resolution. The current workshop proceedings is an interesting case in point. QCFO were initially led to believe that the workshop was a low-key event revolving around a discussion on the issue of wetland protection. However, far from being low-key, the event was considerably large involving some 29 interest groups.

The purpose of the workshop was never clear. The groups invited to attend the workshop were not representative of coastal zone user-groups (CANEGROWERS were the only agricultural sector present). The workshop proceeded without an objective and/or goal. The agenda was changed several times at the last minute. There was a serious breakdown in communication between key players.

During the workshop there was a last minute change to the agenda which led to the development of an 'agreement' on main points. The 'agreement' made at the workshop has subsequently been modified as there is not even consensus about the record of the meeting (GBRMPA draft *Babinda Statement of Intent*). In order to 'maintain the momentum created by the successful workshop', GBRMPA are now referring to the agreement as *The Babinda Statement of Intent*. Capitalising on 'the momentum' when there is not consensus, is clearly a political motive. This workshop was 'ad hocery' at its finest. Consequently, the outcome is unclear.

Under current institutional arrangements win-win outcomes are very rarely achieved, therefore it is understandable that concerned parties want to take every opportunity to 'capitalise on the momentum'. However, binary politics have not worked to resolve these issues effectively in the past, and will not successfully take us into the future.

Consequently, QCFO believe there is a critical and urgent need for legislative and institutional reform in some key natural resource jurisdictions in Australia. ESD is not incorporated in many key pieces of resource legislation, including the 23-year old *Great Barrier Reef Marine Park Act* 1975 and the Queensland *Marine Parks Act* 1982. It might be argued that the 1995 amendment to the Great Barrier Reef Marine Park Act went some way to incorporating ESD as it makes reference to the 'Precautionary Principle'. However, proper application of ESD requires holistic incorporation of all principles, rather than picking and choosing elements from the whole to suit the particular agenda.

In order to address these issues in an effective way, what is needed is a planning process which has clear direction and well-defined goals, and a timeframe for progress which allows businesses to adjust and plan for their future.

Certainty in Planning – Meeting the Goals of Business and ESD

In order for reef-dependent businesses and other businesses capable of influencing marinehabitat (e.g. canegrowers, grazing, aquaculture etc.) to invest with confidence and to provide employment, certainty in planning is required as a matter of urgency. What is needed is a clear, well sign-posted and progressive program of manager/user/interest group interaction.

Successful conflict management reduces the need for political intervention, and optimises the opportunity for the best outcome in terms of achieving ESD (it is often forgotten that economic and social considerations are integral to ESD). Successful planning results from industry having confidence and equal partnership in negotiation processes.

Coordinating agencies can have a dramatic influence on the level of industry confidence in the process. Last minute changes to the agenda do not bring the outcome forward. Inevitably, the process goes political.

30

Lessons that QCFO have learned in fisheries planning and management can be applied to other resource sectors, such as grazing and cane growing. At first, industry is only lightly regulated - all that is needed is a permit/authority which are usually readily available. High profits often encourage more entry into new or developing resources. Over-exploitation and/or reduction in productivity increases pressure on under-utilised or less-developed resources. Continuing increases in investment in gear, plant and equipment and advances in technology lead to the escalation of pressures on the resource, and the realisation of potential conflict between sectors/interests.

The usual response by government/bureaucracy is to restrict entry, introduce new controls, increase regulations and add disincentives to resource exploitation. The results are not always successful in reducing conflict or achieving ESD. Almost always, the result for industry is an increase in pressure to utilise resources (and/or cut costs) to achieve a profit. The goals of economic efficiency and ecological integrity are therefore inextricably linked, but the relationship is complex. Process offers a way through the complexity.

Accommodating the Concerns of Business

Resource Industries have actively participated in the environment debate in Australia for well over a decade. Industry generally is aware of the issues and of the importance of ESD, the 'precautionary principle' and the concept of 'inter-generational equity', although there is always room for progress. However, there are few exceptions to the observation that most resource sectors have progressed without achieving the desired balance between conservation and utilisation. A contemporary example is the dugong-net fishing issue.

QCFO contend that this general failure to achieve a balance is a result of an imbalance in the process of negotiation/consultation/discussion between managers, users and interest groups. The conflict is usually triggered by concern over the sustainability of the resource and an absence of concern about the peculiar characteristics of the industry which relies on it. The tendency therefore is for the focus to be on ecological/environmental/habitat issues, rather than economics, or the practical operational side of a business, or a combination.

There are many examples of ESD negotiations being conducted in the absence of information about the businesses which use the resource. There is an imbalance from the outset of negotiations which is inevitably reflected in the outcome. The imbalance results from considering ecological issues in isolation from economic and social issues. This is something which business understands, but which the conservation movement, particularly in Queensland, has failed to grasp.

The advisory and consultative framework established by the Queensland *Fisheries Act* 1994 goes considerably toward restoring balance in resource decision-making and offers a degree of certainty in business planning. The framework should be considered as an alternative model to deliver sustainable reform in other jurisdictions such as environmental protection and conservation agencies.

Conclusion

The Babinda workshop presented an opportunity for parties to mutually agree on a process of genuine consultation to which each interest could claim some ownership. However, from the outset, this required a clear understanding of the 'problem' and clearly stated goals and objectives.

The workshop agreed on the need for 'preservation of wetlands' and to 'stop pre-emptive clearing'. Yet, not surprisingly, this has not been achieved. Voting for a moratorium on clearing would have also failed and taken us back to the placard movement of early 1980s.

What could have been achieved was agreement on a process of consultation toward a mutually shared goal which would meet the needs of all interests. From the point of view of industry, this requires an understanding of the steps in the consultation process, and an understanding of industries' needs.

If there is general agreement that ESD can be achieved more readily and more efficiently if there is a move away from ad hoc planning, then the question must be asked why any management agency charged with the responsibility of protecting the environment would not wish to pursue the establishment of a more rigorous and transparent planning process.
Attachment 1: Extract from QCFO Environment Policy

Following is an abridged version of QCFO's environment policy as it relates to wetland and water quality issues.

The Queensland Commercial Fishermen's State Council (QCFSC) was established in 1976 to promote and develop Queensland's commercial fishing industry and to organise fishermen with a view to fostering, protecting and advancing their interests.

In 1987, in response to ongoing concerns that environmental degradation was threatening the long-term sustainability of the industry, QCFSC established a State Environment Committee (SEC).

The establishment of this committee was in a sense the initial realisation that the sustainability of the industry was more dependent on the maintenance of fish habitat than it was on the capacity for management techniques to facilitate the sustainable harvesting of target species.

The economic viability of continued commercial harvesting of fish resources is dependent on a properly functioning environment, as very little manipulation can be undertaken to enhance fish production. Consequently, it is the industry's belief that if the marine environment is destroyed so to is the future of the industry. Managing fish habitats is essential for sustaining commercial and recreational fisheries.

The State Environment committee operates within the following terms of reference:

- assess environmental issues from a local, regional and State-wide industry perspective;
- acquire and disseminate information regarding the marine environment and its management to members of the Queensland Commercial Fishermen's Organisation (QCFO);
- identify action required by QCFO to address environmental issues likely to impact on fisheries.

The primary aim of this policy document is to inform industry members, governments and the general community of the industry's views on the means of addressing major environmental issues facing the commercial fishing industry.

Policy formulation is an ongoing proactive process, and thereby modifications to this policy will be and are undertaken as required.

1.2 HABITAT

1.2.1 FISHERIES HABITAT

QCFO recognises the following fish habitats as being particularly sensitive: reefs, seagrasses, mangroves and saltmarshes. QCFO is concerned at the continuing loss and degradation of these habitats. Of particular concern is the cumulative loss of habitats arising from many small, seemingly insignificant decisions i.e. the tyranny of small decisions as referred to in the 'Injured Coastline' Report.

QCFO recognises the pivotal role estuaries play in the maintenance of commercial fish populations and is concerned with the degraded state of many estuaries. Accordingly, QCFO believes there is a strong need for estuary rehabilitation and improved estuary management.

QCFO is also concerned with the impoverished state of inland river systems and believes there is a need to rehabilitate habitats within these rivers.

QCFO wishes to see mechanisms put into place that identifies and maps fish habitats, fully protects critical habitats from dredging, reclamation and pollution, adopts the principle of 'no net loss' when unavoidable loss is to take place and provides for the restoration of habitats damaged by illegal activities or failed development.

QCFO believes that moves should be made to identify areas of lost habitat with a view to restoring these areas.

QCFO recognises that in some parts of the country habitat loss has been significantly great as to create the need for a major government rehabilitation program.

QCFO believes the most extensive habitat problems result from:

- agricultural and grazing practices (e.g. ponded pastures sedimentation and nutrient overloading);
- floodplain management (e.g. acid soils, flood mitigation, flow regulations weirs and dams);
- industrial and urban development.

1.2.2 POLLUTION / WATER QUALITY

QCFO is concerned that where fish stocks are in decline or contaminated as a result of pollution this has been wrongly attributed to commercial over-fishing. QCFO firmly believes that these problems should be addressed at their source and not directed at commercial fishing effort.

QCFO is concerned about water pollution due to the potential for habitat loss, toxicity to aquatic life and the contamination of seafood products. QCFO supports moves to clean production in manufacturing and processing industries and also supports initiatives for closed looping in such industries.

QCFO believes that greater attention needs to be paid to non-point source pollution such as urban and agricultural run-off, and its impact on aquatic ecosystems. Mechanisms for controlling such run-off need to be devised and implemented as soon as possible.

QCFO believes that control of water quality is best achieved by a judicious mix of tight discharge standards and water quality criteria. QCFO accepts that national criteria are desirable, however, regard must be given to naturally occurring background levels of various substances.

34

QCFO is totally opposed to the disposal of substances into the aquatic environment which are non-biodegradable or may accumulate in aquatic organisms.

QCFO is concerned over the use of maximum residue limits (MRLs) and maximum permitted concentrations (MRCs) for environmental monitoring purposes and believes residue limits that identify and trigger control action before a public risk is created are needed as a matter of urgency.

Funding for the monitoring of residues in seafood products should be the responsibility of those parties who produce and sell the substances involved.

QCFO supports continued research into alternative treatment and disposal options for sewage. Further, QCFO is opposed to the discharge of industrial waste into sewerage systems.

1.3 MANAGEMENT

QCFO actively supports the guiding principles of Ecologically Sustainable Development (ESD). Accordingly, QCFO believes that decision-making processes employed in resource management should effectively integrate both long- and short-term economic, environmental, social and equity consideration.

1.3.3 LAND USE PLANNING AND MANAGEMENT

QCFO recognises that the health of waterways and the nearshore zone is closely dependent on the activities undertaken in river and groundwater catchments.

QCFO believes that good land use planning is imperative to ensure that fish habitats and water quality are maintained e.g. buffer zones.

Accordingly, QCFO believes that proposals to rezone the use of land which have the potential to affect aquatic systems should be subject to the EIA process.

QCFO believes that total integrated catchment management is essential for ensuring the integrity of fish habitats and the maintenance of water quality and therefore, supports the active participation of fisheries agencies/industry in total integrated catchment management.

For a copy of QCFO's Environment Policy, please contact:

Environment Officer QCFO State Office PO Box 392 CLAYFIELD QLD 4011 Ph: (07) 3262 6855

Agricultural Contaminants in Sediments of Hinchinbrook Channel and Missionary Bay, North Queensland

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Over 500 surface sediment samples from within the Herbert River estuary to the continental shelf slope have been analysed for major and trace elements. These data indicates that many trace elements are found in high concentrations in the riverine mud trapped in the mangroves and shallow mudbanks of Hinchinbrook Channel and Missionary Bay, compared to middle and outer Great Barrier Reef lagoon sediments. For some elements (lead, nickel, copper), this appears to be a natural consequence of elemental enrichment in weathering products of granite and basalts in the catchment, whereas these elements are present in very low concentrations in the skeletal carbonate sands of the middle and outer Lagoon. Sediment cores from mangrove mudbanks in Hinchinbrook Channel and Missionary Bay, dated by radiochemical methods, indicate that there has been little or no change in rates of supply of these elements over the last 150 years. In proportion to aluminium (a non-contaminant and abundant granite weathering product), these elements are delivered from the catchment to the Great Barrier Reef lagoon coastal embayments at natural supply rates.

Some other elements (cadmium, uranium, mercury, arsenic) are enhanced above pre-1900 background concentrations in surface sediments of the mangroves and mudbanks of Hinchinbrook Channel and Missionary Bay. Concentrations of cadmium and mercury are enhanced above natural background by factors of 2–5, and the dated sediment core profiles show that this increase in supply rate happened after 1900, mostly after 1950. This history of increased supply of cadmium and mercury to coastal Great Barrier Reef sediments was compared to the known usage history of phosphatic fertilisers (enriched in cadmium, uranium and arsenic), and to the usage of organomercurial fungicides (Shirtan) on sugar cane land in the Herbert River lowlands. Less than 0.1% of the accumulated reservoir of these contaminant elements in the caneland soils could account for the observed coastal sediment enhancement of cadmium and mercury, via river transport of caneland soils to Hinchinbrook Channel and Missionary Bay over the last 50 years.

Wetlands, freshwater swamps, riparian vegetation, mangrove deltas, tidal creeks, and shallow mudbanks are natural traps for riverine sediments and their associated agricultural contaminants. Disturbance to these natural sediment traps is likely to result in increased delivery of sediment, nutrients, and contaminants to the Great Barrier Reef Iagoon.

Acknowledgments

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Local Knowledge – Some Anecdotal Evidence of Change

B. Bulling

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I have lived in this region for more than 20 years; I have travelled extensively within Australia and have been fortunate to have experienced living in many other countries. This region is unique and still has the potential to remain the best place on earth. Many who live here do so because they prefer the life style associated with natural values. There are some who still take it all for granted – they do so in blissful ignorance of the alternatives.

There are multitudes of thoughts and words which have come to mind when thinking about how to best express the passion which most people I know harbour for this region and its environment. This passion is often honed and focused when one is overseas or stuck in Sydney or Melbourne traffic. I can recall many such moments particularly while travelling overseas, and have developed a great sense of gratitude that this is my country and this is where I live.

I, like many others who appreciate and understand that what we have is a unique and rapidly diminishing national and international treasure, accept a responsibility to seek recognition that all is not well in paradise and the prognosis is dismal. I believe many of us share a genuine empathy with our environment and experience equally powerful passions as traditional aboriginals describe.

We who are making representations here do not suggest that all commercial fishermen, farmers, miners, tourism operators and property developers be burnt at the stake or boiled in oil; in fact, most of us are those people or work in occupations supported by them. However, we can see the inevitable outcome of not responding to the need which exists to avoid squandering a very real and infinitely valuable resource that is a major factor in the diversity of Australia and the Australian way of life.

I heard statistics quoted on a reputable TV program last month that we are clearing more vegetation pro rata than is being cleared in the Amazon. Australia has a history of environmental disasters and in the 200 years we've been here the list of casualties is well known and would be impressive if they were a management target.

The following words are not all my own – they are from a letter many of you will already have, or will soon get, from the Cairns RMRAC. These words are from a group of people who represent a broad cross-section of the community and who have taken time and made an effort to understand the issue before firing a shot.

The pace and extent of coastal development has overtaken the ability of current management structures to achieve intended outcomes. Management structures have evolved in large numbers, they have failed to integrate and interact in a way which effectively deals with the escalating demand for development of new areas which when modified for intended use have an impact on the environment. There are many areas which are managed well if that management is measured on the basis of local on site impacts. There is, however, currently no really effective management of the cumulative effect of all these situations.

If you were to take a snap shot of the far north Queensland coast 200 miles out to sea and 200 miles inland you would observe an increasing number of activities which ultimately and cumulatively impact on the marine environment. The managers of the marine environment are in many cases not linked or influential within agencies which manage these activities. If there is to be a long-term sustainable and acceptable outcome regarding the environment generally,

and the marine environment specifically, then there needs to be an audit of current management arrangements.

For example, there is little point in the Marine Park Authority creating protected habitat areas for important and endangered species if they have little, or no, influence on activities elsewhere which have potentially disastrous consequences down stream. We lose count of the number of times we've heard in response to questions, suggestions and concerns 'the legislation won't allow it'; 'that's not our Department's responsibility'; 'the lawyers would have a ball with that'; 'the system won't allow it'; 'it's simply not possible'; and so on.

There is need for a common sense overhaul of the system to provide practical, effective, dynamic and equitable management in an environment free of political and personal expediency. This need is critical if environmental values, which are being compromised daily, are to be considered in a big picture audit of goals for long term outcomes and management arrangements to achieve them. Managers must have clear goal posts out front and operate without politically or personally motivated deviations. There is no shortage of environmental outcomes precedenting these sentiments.

We are already seeing speculative clearing of vegetation, particularly wetlands, as the need for controls is debated. Stop fiddling and attend to the fire!

We now have enough knowledge to know how little we know to support the escalating modification of important and sensitive areas which will prove to be a more valuable resource than anything they may irreversibly become in the very short term.

The following is a brief summary of the action which was called for from the Marine Park Authority in response to concerns relating to matters within the Marine Park by RMRACs and in some measure lead to the recently released plans of management. They seem to fit this scenario equally well.

- 1. Level the development curve in critical areas by appropriate effective action until such time as the following task is completed (moratorium on some activities in some areas).
- 2. Assess the impact of current levels of exploitation (this has not been possible in most areas because of continuously increasing pressure). Stabilise and take a look at a situation other than a growth curve.
- 3. Set goalposts that is, identify values and balances to be maintained in the region and subregions together with associated appropriate future levels of exploitation and timing to maintain these values. Consider a future for all the critters, fish and plants that don't get to vote but which are vital to maintaining an acceptable outcome by any measure future generations may judge us.
- 4. Develop equitable management strategies and effective capability to achieve these goals from in front of development within a structure which continuously monitors performance and has the ability and the will to respond dynamically to requirements.

Remember we've only been here for 200 years and only had D9 bulldozers for around 40. What then is your vision for the next 200 years? When you extrapolate current levels of development, it's scary.

Above all, there must be a clear understanding that ecological natural resources are absolutely finite. There are limits to levels of exploitation which must be observed in order to achieve long term outcomes. Degradation following excessive and/or inappropriate exploitation may take

38

longer than one political term to become evident. Perhaps even longer after the activity responsible has been abandoned.

Surely now we must take heed of the lessons in our short history and demonstrate that we really are not raving lunatics who will squander assets which, it is my unshakable belief, can be a great and uniquely sustainable source of wealth and pride to this country and its diversity. Values which cannot be revisited are at stake here – they are no longer esoteric; they are crystallised in my mind as a result of the threat. I, and many others like me, believe it is essential to prioritise and take stock of the situation; take a long and hard look at where we are heading and what being an Australian will mean to future generations. Will Australia offer the diversity of environments and culture to attract visitors and for Australians to make lifestyle or incountry getaway choices we have today, and if not, will it be problem? Or will it indeed be *the* problem...?

Towards Sustainable Use of Australia's Wetlands – A National Overview

B.J. Churchill

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Introduction

Australia is the driest continent in the world. Despite this fact, Australia is laden with a rich diversity of natural habitats including a vast number of wetland ecosystems. As the world's largest island continent, our coastline is riddled with coral systems, mangrove forests, lagoons and saltmarshes, many of which qualify as wetlands. At present, more than 750 wetlands in Australia are listed in *A Directory of Important Wetlands in Australia* (2nd ed., 1996). In the last 200 years, more than half of Australia's wetlands have been degraded or lost.

In Australia, major responsibility for management and conservation of wetlands rests with the relevant State or Territory government and, in some cases, local authorities. The obvious exception is that where wetlands exist on Commonwealth land, the Commonwealth has responsibility for management. The Commonwealth's interest in wetlands extends to the international level as, in February 1971, Australia became a Contracting Party to the Convention on Wetlands (the Ramsar Convention).

By signing the Ramsar Convention, Australia has undertaken to ensure the ecological characteristics of its Ramsar wetlands are protected through wise management, to look after all wetlands wherever possible, and to work towards the development of a national approach to wetlands conservation. To reinforce these principles, the Commonwealth continues to build on partnerships with State, Territory and local governments. Through the Natural Heritage Trust, Environment Australia administers the National Wetlands Program which assists governments and the community to realise positive environmental outcomes for Australia's wetlands.

The Ramsar Convention

The Ramsar Convention, officially the Convention on Wetlands of International Importance Especially as Waterfowl Habitat, has the broad aim of halting the worldwide loss of wetlands and to conserve, through wise use and management, those that remain. To help achieve this aim, the Ramsar Convention directs Contracting Parties to develop national policies to implement and direct the adoption of wise use management principles for all its wetlands.²

Wise use management of wetlands involves 'their sustainable utilisation for the benefit of mankind in a way compatible with the maintenance of the natural properties of the ecosystem'.³ In achieving wise use management of wetlands it is important to recognise the wide range of activities associated with wetlands and to develop a national approach to sustainable use.

Contracting Parties to the Ramsar Convention are encouraged to register internationally important wetland sites on a list maintained by the Ramsar Bureau, the administrative body for the Ramsar Convention. Ramsar sites are nominated as internationally important based on ecology, botany, zoology, limnology or hydrology. Once Ramsar sites are designated there is an expectation that the special ecological characteristics for which they are recognised will be conserved and, where possible, enhanced.

² Pursuant to Article 3 of the Ramsar Convention.

¹ Environment Australia is the environment program of the Federal Department of the Environment.

³ Davis, T. J. (ed.) 1993. Towards the Wise Use of Wetlands. Wise Use Project. Ramsar Convention Bureau. Gland, Switzerland.

In the last 25 years, Australia has nominated 49 Ramsar sites (refer to attachment 1). Although primary responsibility for Ramsar sites rests with the State and Territory Governments, the Commonwealth plays an active role in protecting Ramsar sites principally by providing funding – particularly via the National Wetlands Program and Waterwatch Australia – for the development of management plans for these sites. Environment Australia also participates on a number of steering groups guiding the development of such plans.

Meetings of the Conference of Contracting Parties to the Ramsar Convention are held every three years. In March 1996, Australia hosted the 6th Meeting in Brisbane. The next meeting will be held in San José, Costa Rica in May 1999.

A National Approach

To assist in the long-term sustainable management of wetlands and, through this, upholding Australia's obligations to the Ramsar Convention, the Commonwealth Government adopted and launched the *Wetlands Policy of the Commonwealth Government of Australia* in February 1997. The Commonwealth Wetlands Policy contains six strategies including:

- managing wetlands on Commonwealth lands and waters;
- implementing Commonwealth policies and legislation and delivering Commonwealth programs;
- involving the Australian people in wetlands management;
- working in partnership with State/Territory and Local Government;
- ensuring a sound scientific basis for policy and management; and
- international actions.

Environment Australia, with input from other Commonwealth agencies is currently developing an implementation plan to realise these policy strategies.

Consistent with a national approach, Australia's States and Territories are developing and implementing their own wetlands policies. New South Wales and Western Australia have already launched wetlands policies, while Queensland, South Australia and Tasmania are at various stages of developing drafts. The Commonwealth is working with State and Territory agencies to ensure that, where possible, the State wetlands policies complement both the Ramsar Convention and the Commonwealth wetlands policy.

The ANZECC Wetlands and Migratory Shorebirds Taskforce

The Australian and New Zealand Environment and Conservation Council (ANZECC) is a forum of State and Territory Environment Ministers. At its meeting in October 1997, ANZECC established the Wetlands and Migratory Shorebirds Taskforce.

The Taskforce combines the former ANZECC Wetlands Network and the ANZECC Migratory Birds and Migratory Species Network. The Taskforce has representation from each State and Territory, New Zealand and the Murray-Darling Basin Commission and is convened by Environment Australia. The current membership of the Taskforce is listed in attachment 2.

The Terms of Reference for the ANZECC Wetlands and Migratory Shorebirds Taskforce will be determined at its first meeting in February 1998. The role of the Taskforce is to assist in upholding Australia's obligations to the Ramsar Convention and related international agreements. This is achieved through actions such as: providing advice to Environment Australia on how the Ramsar Convention is implemented within each jurisdiction; contributing to Australia's national report for Ramsar Convention meetings; and preparing nomination documents for new Ramsar sites.

The National Wetlands Program

The National Wetlands Program is administered by Environment Australia to address Australia's international and national responsibilities for wetlands protection. The National Wetlands Program, through the Natural Heritage Trust,⁴ has a budget of \$14 million over five years. The broad aims of the National Wetlands Program are to work cooperatively with relevant stakeholders towards improved knowledge of wetlands systems, and to encourage the adoption of wise use principles in wetlands management.

As part of the Natural Heritage Trust, partnership agreements with detailed goals and objectives for each program, including the National Wetlands Program, have been signed by State and Territory Premiers and Chief Ministers, and the Commonwealth, represented by the Prime Minister. For the National Wetlands Program, each State and Territory has specified and agreed to a range of broad principles and objectives related to the protection of wetlands.

Projects being funded as part of the 1997–98 National Wetlands Program include: developing and/or revising management plans for Ramsar sites; preparing nomination documents for new Ramsar sites; and compiling the 3rd edition of *A Directory of Important Wetlands in Australia*. Also being funded are projects related to research and monitoring, development of a national inventory, and community education. A complete table of projects being funded under the 1997–98 National Wetlands Program is attached as presented in attachment 3.

A Directory of Important Wetlands in Australia

Recommendation C.1.5 of the Conference of Contracting Parties to the Ramsar Convention suggests that comprehensive national policies would benefit the wise use of wetlands, and that such policies should be based on a nationwide inventory of wetlands and of their resources to aid the formulation and implementation of national wetland policies.

In response to this, Environment Australia coordinates the ongoing revision of *A Directory of Important Wetlands in Australia*, which is now in its second edition. The *Directory* is revised every three years to coincide with the meetings of the Ramsar Convention. State and Territory Governments are encouraged to update their chapters and in many cases are supported through the National Wetlands Program.

The *Directory* identifies wetlands of national importance, and also includes Ramsar sites. The criteria for determining nationally important wetlands have been modelled on the Ramsar Convention criteria, with modification for Australian conditions. For reference purposes, the Interim Biogeographic Regionalisation of Australia (IBRA) has been adopted. The criteria are as follows.

- 1. It is a good example of a wetland type occurring within a biogeographic region in Australia.
- 2. It is a wetland which plays an important ecological or hydrological role in the natural functioning of a major wetland system/complex.
- 3. It is a wetland which is important as the habitat for animal taxa at a vulnerable stage in their life cycles, or provides a refuge when adverse conditions such as drought, prevail.
- 4. The wetland supports 1% or more of the national populations of any native plant or animal taxa.

⁴ The Natural Heritage Trust is being funded by the sale of one-third of Telstra and has a total budget of \$1.25 billion dollars over five years.

- 5. The wetland supports native plant or animal taxa or communities which are considered endangered or vulnerable at the national level.
- 6. The wetland is of outstanding historical or cultural significance.

The 3rd edition of the Directory is currently being compiled by Environment Australia. A number of State and Territory nature conservation agencies have received funding to undertake inventory work that will be used to update existing information as well as nominate new wetlands for inclusion. It is envisaged that the next edition of the Directory will be available in electronic format as a searchable database.

Migratory Shorebirds

Australia is signatory to three international agreements relating to migratory birds: the Japan– Australia Migratory Bird Agreement (JAMBA); the China–Australia Migratory Bird Agreement (CAMBA) and the Convention on the Conservation of Migratory Species of Wild Animals (the Bonn Convention).

Under these agreements, the contracting parties have agreed to encourage the conservation of migratory shorebirds by establishing joint research projects and exchanging information. To protect migratory birds and their habitats, the parties have agreed to establish sanctuaries and other facilities, and monitor frequency and numbers of migratory shorebirds within their jurisdiction. In particular, the parties have agreed to seek ways to prevent damage to migratory birds, and to take necessary measures to control the importation of animals and plants which are hazardous to the preservation of migratory birds or which could disturb significant habitat.

The East Asian-Australasian Shorebird Reserve Network is an international chain of sites recognised as important migratory shorebird habitat that are protected under relevant legislation and/or agreements. Since its establishment in March 1996, the Shorebird Reserve Network has expanded to include 19 sites across eight different countries within the East Asian-Australasian region. Within Australia, Shorebird Reserve Network sites are typically located within Ramsar sites, thus highlighting the importance of wetland areas as critical habitat for migratory shorebirds. A number of projects being sponsored by the National Wetlands Program will identify new areas to be proposed for inclusion in the Network.

Waterwatch Australia

Wetland health and the health of our waterways have become of increasing concern to the Australian people. To address this concern Waterwatch Australia was initiated by the Commonwealth Government and is presently administered by Environment Australia through the Natural Heritage Trust. Waterwatch Australia coordinates and supports the monitoring of waterways by the community to facilitate actions that address water quality issues. The program operates on the basis that monitoring of waterways will better equip local communities with the skills, knowledge and impetus to take an active role in managing their land and water.

Following its inception in 1993, Waterwatch was quickly adopted by governments and communities and is now operating in every State and Territory through ACT Waterwatch; Streamwatch NSW; Waterwatch SA; Ribbons of Blue WA; Waterwatch Victoria; Waterwatch Tasmania; Waterwatch Queensland; and Waterwatch NT. The number of monitoring groups has increased from about 200 operating in 16 catchments to more than 1500 groups in over 100 catchments.

Protection of wetlands adjacent to the Great Barrier Reef

Across Australia data is collected by groups using nationally adopted protocols. The number of Waterwatch monitoring sites is estimated to be 4000. Using a range of biological, physical and chemical indicators, communities gather information about the patterns and changes in their waterways. From this they gain an understanding of the environmental problems in their catchments and become motivated to take action to address these problems.

Commonwealth Environment Legislation

A number of existing Commonwealth statutes apply to the protection of internationally important wetlands. The *Environment Protection (Impact of Proposals) Act 1974* is triggered when a Commonwealth decision, such as foreign investment or funding approvals, is likely to result in the deterioration of the ecological characteristics of a given Ramsar site. Also relevant is the *Endangered Species Protection Act 1992* that aims to protect a wide range of listed species that may occur at Ramsar sites.

The Commonwealth is currently reviewing its environmental legislation. At this stage it is unclear whether existing legislation will be covered under one or more statutes: a suggested approach is to develop a piece of legislation for each major component of the federal environment portfolio (i.e. environment protection, biodiversity and heritage).

Biodiversity conservation legislation, for example, would encompass existing legislation such as the *Endangered Species Protection Act* 1992 and the *National Parks and Wildlife Conservation Act* 1975, and incorporate obligations to international treaties including the Ramsar Convention, the Bonn Convention, and international agreements such as JAMBA and CAMBA. The new legislation would also seek to integrate the objectives of relevant programs under the Natural Heritage Trust, including the National Wetlands Program.

Conclusion

As the impact of human interaction and development over the years becomes increasingly evident, it is critical that we improve our understanding of the problems facing wetlands and waterways, and the ecosystems they support. As Australians continue to recognise and adopt principles of integrated catchment management, it is increasingly important to appreciate the fragile nature of wetlands and to make the link between on-shore aquatic systems, and marine systems such as the Great Barrier Reef Marine Park.

There is a diverse range of interest in wetlands, from tourism to agricultural irrigation, that all compete for the same valuable resources. Increasingly, governments need to be aware of these stakeholder needs when making decisions that may impact on the long-term sustainability of wetlands. Management strategies for wetlands and waterways are gradually being developed to acknowledge these interests while integrating wise use management principles and objectives. Fostering partnerships between governments, conservation groups, industry, primary producers and the community is a critical step towards achieving better environmental outcomes for wetlands.

Attachment 1



WETLANDS DESIGNATED BY AUSTRALIA TO THE LIST OF WETLANDS OF INTERNATIONAL IMPORTANCE (THE RAMSAR CONVENTION ON WETLANDS)





Lo	cation Site	Hectares
1.	Cobourg Peninsula Aboriginal Land & Wildlife Sanctuary	220 700
2.	Kakadu National Park Stage I (including wetlands components of Stage III)	683 000
3.	Moulting Lagoon	4 580
4.	Logan Lagoon Conservation Area	2 320
5.	Sea Elephant Conservation Reserve	1 730
6.	Pittwater-Orielton Lagoon	2 920
7.	Apsley Marshes	940
8.	East-Coast Cape Barren Island Lagoons	4 230
9.	Flood Plain Lower Ringarooma River	1 650
10.	Jocks Lagoon	70
11.	Northwestern Corner of Lake Crescent	520
12.	Little Waterhouse Lake	90
13.	Corner Inlet	51 500
14	. Barmah Forest	28 500
15	Gunbower Forest	19 450
16	. Hattah-Kulkyne Lakes	1 018
17.	. Kerang Wetlands	9 172
18	. Port Phillip Bay (Western Shoreline) & Bellarine Peninsula	7 000
19	Western Port	52 325
20	. Western District Lakes	30 182
21	. Gippsland Lakes	43 046
22	. Lake Albacutya	10 700
23	. Towra Point Nature Reserve	281
24	. Kooragang Nature Reserve	2 206
25	. Coorong and Lakes Alexandrina and Albert	140 500

26. Bool and Hacks Lagoon	3 200
27. Coongie Lakes	1 980 000
28. Macquarie Marshes Nature Reserve	18 143
29. 'Riverland'	30 600
30. Kakadu National Park Stage II	692 940
31. Ord River Floodplain	102 000
32. Lakes Argyle and Kununurra	150 000
33. Roebuck Bay	55 000
34. Eighty-mile Beach	125 000
35. Forrestdale and Thomsons Lakes	754
36. Peel-Yalgorup System	21 000
37. Lake Toolibin	437
38. Vasse-Wonnerup System	740
39. Lake Warden System	2 300
40. Hosnie's Spring	<1
41. Moreton Bay	113 314
42. Bowling Green Bay	35 500
43. Currawinya Lakes	151 300
44. Shoalwater and Corio Bays	239 100
45. Ginini Flats Subalpine Bog Complex	125
46. Pulu Keeling National Park	122
47. Little Llangothlin Lagoon	258
48. Blue Lake	320
49. Lake Pinaroo	800
TOTAL AREA	5 041 584

41 584

Attachment 2

ANZECC Wetlands and Migratory Shorebirds Taskforce

COMMONWEALTH

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NB: At the time this paper was being prepared, the Murray-Darling Basin Commission (MDBC) were in the process of identifying a Taskforce representative. For general inquiries to the MDBC, phone (02) 6279 0100.

Attachment 3

NATURAL HERITAGE TRUST PROJECTS BEING FUNDED UNDER THE NATIONAL WETLANDS PROGRAM (1997–98)

NWPNational Wetlands ProgramNRINational Rivercare InitiativeNVINational Vegetation Initiative ('Bushcare')NUPNational Lease Preserve

NLP National Landcare Program

MD2001 Murray–Darling 2001

QUEENSLAND

State Partnership Projects Funding Program Project description (proponent) Title NWP Management Planning Produce site specific management plans for 97-98 migratory shorebird habitats within Moreton Bay \$39 092 and Public Education for 98-99 Migratory Shorebird Roost and (Department of Environment) \$47 789 Feeding Sites in Moreton Bay Obtain suitable information to base a nomination 97-98 NWP Gulf of Carpentaria Shorebird for Gulf of Carpentaria to become a marine park, \$24 290 Surveys Ramsar site and Shorebird Reserve Network site 98-99 \$44 500 (Department of Environment) 99-00 \$44 500 97-98 NVI, Develop a regional land management strategy Brigalow Belt North -(Department of Environment) \$20 000 NWP Biodiversity Strategy 97-98 NLP, NRI, Lake Eyre Basin Catchment Integrated catchment management strategy \$10 000 NWP through community consultation and cross Management Regional border framework (LEB Steering Group through Initiative (Queensland Department of Natural Resources & SA DEHAA) component)

Community Projects

Title	Project description (proponent)	Funding	Program
Tarradarrapin Creek Wetlands	General inventory and management plan of	97–98	NWP
Planning & Management	Tarradarrapin Creek wetlands (Birkdale	\$2750	
Project	Progress Assoc. Inc.)		
Ingham Tyto Wetlands	Restoration of a degraded wetland through	97–98	NVI, NWP
	management program (Hinchinbrook Shire	\$15 000	
	Council)		1

NEW SOUTH WALES

Title	Project description (proponent)	Funding	Program
Survey of Wetlands of Northwestern NSW	Map wetlands of northwestern NSW at 1:250 000 scale and identify management options for their conservation (National Parks and Wildlife Service)	97–98 \$44 943	NWP
Wetland Inventory for the Northern Tablelands	Map data for all wetlands in the North. Tablelands, incorporate into GIS, identify wetlands for 3rd edn of the Directory (Department of Land and Water Conservation)	97–98 \$40 000	NWP
Updating the Directory of Important Wetlands	Review the NSW chapter of the Directory (NPWS)	97–98 \$15 000 98–99 \$15 000	NWP
NSW Wetland Action Plan Workshop	To support a workshop to develop a NSW Wetland Action Plan (DLWC)	97–98 \$9900	NWP

Protection of wetlands adjacent to the Great Barrier Reef

NSW Wetland Rehabilitation -	Employ a project officer to increase awareness of	97–98	NWP
Review, Workshops and paper	wetland rehabilitation (NSW Fisheries)	\$13 936	
Lachlan Floodplain Wetlands	Develop a water management plan for the	97–98	NWP &
Adaptive Water Management	Lachlan Floodplain by conducting a	\$52 325	MD2001
Framework	comprehensive assessment of wetland water		
	needs for the valley and providing baseline		•
	ecological information for the ongoing		
	assessment of wetland health (DLWC)		

Community Projects

Title	Project description (proponent)	Funding	Program
Production of Frogfacts	Production and publication of five new Frogfacts	97–98	NWP
Leaflets	information sheets (Frog and Tadpole Study	\$5350	
	Group of NSW Inc.)		
Seaham Swamp Wetland	Develop an interpretation station overlooking	97–98	NWP
Interpretation Station	Seaham Swamp Reserve (Seaham Swamp	\$27 500	
	Landcare Group Wetlands Centre)		
Wetland Site Interpretations	Update interpretive signs/sculptures around the	97–98	NWP
for Education and Impaired	Shortland Wetlands Centre and provide for	\$10 990	
Visitors	visually impaired persons (Shortland Wetlands		
	Centre)		
Rehabilitation of Littoral	Restore the degraded wetland by controlling	97–98	NWP
Wetland and Establishment of	feral animals, removing weeds and constructing	\$14 937	
Walkway	a walkway to minimise human impacts. Involve		
	the local community/schools in these actions		
	(Redhead Landcare)		
Five Islands Wetland	To protect the integrity and biodiversity of Five	97–98	NWP
Management and	Islands Wetland by involving the community in	\$10 945	
Conservation Study	on-ground and education activities. Prepare		
	planning documents for the construction of		
	interpretive materials (Five Islands Wetland		
	Landcare Group)		•
Development of Wetland	Develop and implement management plans for 6	97–98	NWP
Management Plans with	wetlands and educational packages to inform the	\$15 400	
Community Consultation	community of wetland values (Hawkesbury-		
	Nepean Catchment Trust)		

VICTORIA

State Partnership Projects

Title	Project Description (Proponent)	Funding	Program
Management Strategies for	Management guidelines setting out management	97–98	NWP
Victorian Ramsar Wetlands	principles for Vic Ramsar sites and plans for	\$60 000	
	integrated management of each site (Parks		
	Victoria)		
Documentation of the	Preparation of nomination and site designation	97–98	NWP
Natimuk-Douglas Wetlands as	documentation. Includes a management plan	\$21 800	
a new Ramsar site in Victoria	which is to be integrated with the current		
	management framework for existing Ramsar		
	sites project (Department of Natural Resources		
	and Environment)		
Nomination of Two Victorian	Prepare nomination documentation for two sites	97–98	NWP
Ramsar sites to the Shorebird	in Port Phillip Bay to be added to the Shorebird	\$9600	
Reserve Network	Reserve Network (DNRE)		
Documentation of the	Nomination of new Ramsar site (DNRE &	97–98	NWP
Edithvale-Seaford Wetlands as	Melbourne Water Corporation)	\$5900	
a new Ramsar site in Victoria			

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Important Rivers and Streams	Assessment of wetlands in category of	97–98	NWP
in Victoria	'permanent rivers and streams and seasonal and	\$50 000	
	irregular rivers and streams' for the Directory of		
	Important Wetlands in Australia (DNRE)		
Management Planning and	Planning and management activities on and	97–98	NWP
Works - Ramsar and Related	adjacent to Western Districts Lakes Ramsar	\$12 000	
Wetlands	wetlands (Parks Victoria)		

Community Projects

Title	Project Description (Proponent)	Funding	Program
Community Awareness Geelong Ramsar wetlands	Integrated catchment approach to best practice management of Ramsar wetlands (City of	97–98 \$44 750	NWP
	Greater Geelong)		

TASMANIA

State Partnership Projects			
Title	Project description (proponent)	Funding	Program
Protection of Threatened	Establish an inventory of coastal resources,	97–98	NWP
Nesting and Migratory	produce a technical manual which identifies	\$49 000	
Shorebirds in Tasmania	sensitive coastal areas and establish a coastal		
	network with a management plan and raise		
	awareness (Department of Environment and		
	Land Management)		
Tasmanian Peatland Survey	Assist in understanding how peatland systems	97–98	NWP
	function and contribute to their sustainable	\$50 000	
	management (DELM)		
Development of Tasmanian	Produce a draft Wetlands Policy for Tasmania	97–98	NWP
Wetlands Policy	and arrange all necessary negotiations and	\$45 000	
	consultations through preparation and approval		
· · · · · · · · · · · · · · · · · · ·	stages (DELM)		

Community Projects

Title	Project Description (Proponent)	Funding	Program
Seymour Wetlands	Conserve and maintain the natural integrity of	97–98	NWP
Conservation Project	Seymour Swamp through protection and	\$6300	
	progressive rehabilitation (East Coast Regional		
	Development Organisation)		
Protection and Care of	Prevent further damage to the marshland by:	97–98	NWP
Clear Lagoon	replacing fencing, removing rubbish/weeds,	\$6000	
	circulating a pamphlet, and erecting a notice		
	(Birds Tasmania)		1
Huonville Wetland Project	Continue developing the wetland educational	97–98	NWP
	area near the school, develop resources and	\$7000	
	curriculum which utilise the wetland, and		
	continue promoting environmental awareness in		
	the school and local community (Huonville		
	Primary School Landcare Group)		1
Maintaining Water Quality in	Construct a wetland on the tributary to Coffee	97–98	NWP
Coffee Creek	Creek to filter out effluents, improving water	\$5500	
	quality in Coffee Creek and thereby North West		
	Bay (Huntingfield Coffee Creek Landcare		i
	Group)		
Dover School Farm Wetlands	Rehabilitate a degraded wetlands area and	97–98	NWP
Restoration Project	inform and demonstrate responsible water and	\$19500	
	soil management practices to students and the		
	community in Dover (Dover District High School		
	Farm Management Committee Inc.)		

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Protection of wetlands adjacent to the Great Barrier Reef

Wetlands Reconstruction and Tree Establishment - Houston Farm	Establish 16 ha of native vegetation including a wetland area to be created on existing marsh, making use of drainage from intensive irrigation area (Coal Valley Landcare Group)	97–98 \$9000	NWP
Conservation Strategy and Management of Tasmania's Shorebirds	Develop an inventory of coastal birds including migratory waders along the north and east coast of Tasmania. Develop a coastal strategy with management options for their protection (Birds Tasmania)	97–98 \$25000	NWP
Hawley Wetlands Waterbird Reserve	Restoration of wetlands and improvement of water quality (Houghton Pty Ltd)	97–98 \$2800	NWP

SOUTH AUSTRALIA State Partnership Projects

State I arthership 110 cets			
Title	Project description (proponent)	Funding	Program
Coorong & Lower Lakes	Management planning for Coorong etc. Ramsar	97–98	NWP
Ramsar Management Plan	Site (Department of Environment, Heritage and	\$75000	
C C	Aboriginal Affairs)		
Management Planning for SA	Management planning and inventory on mound	97–98	NWP
Mound Springs	springs - includes data update (DEHAA)	\$30000	
Wetlands Waterlink	Community awareness & some wetland rehab	97–98	NVI,
	component. Wetlands chain Bool Lagoon to the	\$20 000	NLP &
	Coorong (DEHAA & DPI)	L	NWP
Lake Eyre Basin Catchment	Integrated catchment management strategy	97–98	NVI,
Management Regional	through community consultation and cross	\$10 000	NLP, NRI,
Initiative (SA Component)	border framework (LEB Steering Group through		NWP
	DEHAA & Qld DENR)		
Catchment Coordinator, Lake	Coordinator for above project (DEHAA & Qld	97-98	NLP &
Eyre Basin Steering Group	DENR)	\$10 000	NWP
SA Wise Wetland Management	SA Wetlands policy basis, wetlands assessments,	97–98	NWP
Program	regional strategies & three year action plan on	\$60 000	1
-	wetlands (DENR)		

Community Projects

Title	Project Description (Proponent)	Funding	Program
Managing the Watervalley	Survey native vegetation, carry out pilot project	97–98	NWP
Wetlands for Wildlife	to revegetate and restore wetlands, and develop	\$36 690	
	a management plan (Wetlands and Wildlife)		
Regeneration at Rush Lagoon	Fencing of remnant veg at wetland frequented	97–98	NŴP
	by high conservation status waterbirds (Timber	\$4580	
	Creek Landcare Group)		
Big Swamp Wetland	Wetland study, monitor water quality and	97–98	NWP
Conservation & Management	ecology protection and planting native veg,	\$4670	
Project	community awareness on health catchment		
	management (Big Swamp Landcare Group)		
Strategic Wetland	Assessment of wetland in the MDB of SA,	97-98	MD2001 &
Management in River Murray	prepare action plans, implement actions at key	\$15 500	NWP
Local Action Planning Areas	wetlands, community involvement (Wetland		
	Care Australia in partnership with SA Riverine		
	Local Action Planning Associations & Murray		
1	Bridge District Council)		

WESTERN AUSTRALIA

State Partnership Projects

Title	Project Description (Proponent)	Funding	Program
Rowles Lagoon - Management	Preparation of a management plan for the	97–98	NWP
of a National Asset	Rowles Lagoon system. Rowles Lagoon is listed	\$59 500	
	in the Directory (Conservation and Land		
	Management)		

Towards Sustainable Use of Australia's Wetlands - A National Overview

Nomination of additional	Develop a number of specific proposals for	9798	NWP
Ramsar wetlands in WA	additional wetlands to be listed. Nominations to be forwarded prior to next Ramsar Conference in May 1999 (CALM)	\$48 645	
Sustainable Management of Pilbara Wetlands	Categorise wetlands in the Pilbara region and identify wetlands of significance (Waters and	97–98 \$40 000	NWP
	Rivers Commission)	<i>Q10 000</i>	
Development of wetland	Employ a project officer to encourage the	97–98	NRI/
management plans: facilitation	development of wetland management plans.	\$20 000	NWP
and support	Produce guidelines for the development of		
	wetland management plans (Waters and Rivers		
	Commission)		

Community Projects

Title	Project Description (Proponent)	Funding	Program
Saunders Spring Fencing	Construct a 1.7 km fence to enclose the wetland	97–98	NWP
Project	and exclude cattle (Broome Botanical Society	\$3160	
,	Inc.)		
Wetland Rehabilitation - City	Regenerate the fringing vegetation of three	97–98	NWP
of Cockburn	important wetlands (Wetlands Conservation	\$21 000	
	Society Inc.)		
Cleaning up Wagin's Lakes -	Develop a plan to rehabilitate a chain of 6 lakes	97–98	NWP
developing a community plan	(Bojanning Aboriginal Corporation)	\$6860	
WA South Coast Wetland	Fence 10 km around wetlands and wetland	9798	NWP
Fencing Program	corridors (APACE Green Skills)	\$6800	,

NORTHERN TERRITORY State Partnership Projects

Title	Project Description (Proponent)	Funding	Program
A Management Strategy and	Survey the coast to develop an atlas of coastal	97–98	NWP
Protected Areas System for	sites and identify those with wildlife values i.e.	\$40 000	
Coastal Wildlife	shorebird sites. Develop a management strategy		1
	for protecting important sites and species &		
	involve the local community in management		
	(Parks and Wildlife Commission)		
Biological Inventory of the	Conduct a biological survey of the Arafura	97–98	NWP
Arafura Swamp and	Swamp and catchment in conjunction with the	\$50 000	
Catchment	traditional custodians (P&WC)	9899	
		\$50 000	
Monitoring System for the	Support draft catchment man plan prepared by	97-98	NWP &
Mary River Catchment	Mary River Task Force and design systems to	\$20 000	NLP
Management Plan	monitor wetland health and rehabilitation of		
Ĭ	degraded wetlands		

Community Projects

Title	Project Description (Proponent)	Funding	Program
Darwin & West Wetland	Involve community consultations by the Wetland	97–98	NWP
Management Planning	Officer to facilitate management planning west	\$35 000	
Consultation Cost	of Darwin (Caring for Country Northern Land		
	Council)		
Arnhem Land Wetland	Involve community consultations by the Wetland	97–98	NWP
Management Planning	Officer to facilitate management planning in the	\$15 000	
Consultation Cost	Arnhem Land Region (Caring for Country NLC)		

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Drainage Waterway Management in North Queensland – A Fisheries Perspective

A. Clarke

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Introduction

Regardless of size, all waterways can contribute to fisheries productivity by providing spawning, nursery and feeding grounds and fisheries dispersal routes. This paper discusses the various habitat requirements of commercially and recreationally targeted fish species utilising north Queensland's waterways, including waterways modified for drainage purposes.¹ It has as its basic premise the concept that floodplain management can incorporate fisheries' requirements, even when a catchment's hydrological characteristics have been largely modified, without compromising other stakeholders' interests. For an equitable sharing of natural resources to occur, however, all stakeholders must work towards incorporating fisheries habitat requirements into drainage waterway design and management where ever possible.²

Economic Value of Queensland Fisheries

The commercial fishing sector is the fifth largest primary producer in Queensland and is valued at around \$400 million annually.³ The industry directly employs 6000 people with another 2000 employed through fisheries' product marketing (Williams 1997). The value of the commercial fishery between Bowen and Tully alone has been estimated at over \$26 million annually (13 000 tonnes) (Ludescher 1997).

Recreational fishing also plays an important economic role. Using the Bowen to Tully area as a representative example of north Queensland's recreational fishing activity, 75% of boats launched in this area go fishing and catch an average 7.4 fish per day (Ludescher 1997). On a statewide scale, Queensland's recreational fishers are estimated to spend about \$400 million on fishing each year, own approximately \$450 million worth of fishing equipment and boats and their annual catch is estimated to be worth \$50 million in commercial value (Williams 1997).

At the same time, declines in the resource have become apparent, particularly in coral trout, some mackerel species and barramundi (Ludescher 1997; Williams 1997). Loss of habitat is a likely contributing factor. Freshwater and brackish habitats have suffered up to 60% loss in some north Queensland catchments since settlement (Russell 1986) and in the lower catchment, many tidal habitats have been systematically bunded and reclaimed. When it is considered that a significant proportion of targeted species utilise fresh, brackish and tidal areas and that estuaries, in particular, operate to support 75% of Queensland's commercial and recreational fish species for at least part of their life cycle (Couchman et al. 1996) then such losses must be of concern to fisheries sustainablity.

Waterways - Fisheries Requirements

Fish Migration

For many of Queensland's commercially and recreationally targeted fish species, survival to maturity is highly contingent on food and habitat availability, predation rates, disease and luck (Russell 1986). To overcome the enormous odds of surviving to adulthood, many species release

¹A brief description of well known north Queensland's commercially and recreationally targeted fish species and their links with estuarine and freshwater waterways and wetlands is included as attachment 1. ²Detailed waterway designs are not included in this document but references to appropriate design and maintenance techniques are provided in attachment 2.

³ Market values are included.

large numbers of eggs during spawning times. Whilst the timing of spawning events is in itself a contributing factor to survival, a small increase in survival of fertilised eggs often means a large increase in recruitment into the fishery (Ludescher 1997). Simple measures such as protecting and enhancing access to fisheries' nursery and development areas, therefore, can make significant contributions to adult populations of targeted species.

Conversely, a small decrease in survival at the juvenile stage can be detrimental to the fishery. Weirs, dams, pipes, bund walls, flood and tide gates all act to inhibit access of fish to breeding, nursery, adult, tidal and freshwater habitats and then adversely affect regional fisheries productivity. High velocity flows can also inhibit fish movement. Velocities of over one metre per second can act as an effective barrier to fish migration (Hogan et al. 1994). Increased velocities can be caused by narrowing structures, removal of snags, straightening or removing the 'roughness' from channels, or dredging in the lower catchment. The unnaturally rapid drainage of nursery swamps via agricultural drains, before juveniles have grown and moved into adjacent rivers, will also serve to reduce fish migration necessary to sustain local productivity.

Fisheries Habitat Variety

Distinctive larval, juvenile and adult life strategies of many fish species often requires specific habitats. Juvenile and adult habitats may be separated by large distances and vary markedly in physico-chemical characteristics i.e. depths, salinities and substrates. The successful maturation of fish species is dependent on the availability **and** accessibility of all relevant habitat types.

Waterways should comprise of a variety of habitats to variously provide shelter, feeding and/or spawning sites for all fish species likely to utilise the waterway. Shelter can take many forms, either as overhanging vegetation, snags, rocks, sand banks weed beds or deep holes. Other forms of habitat, in particular bends, meanders and riffles, not only provide a variety of shelter types but also act to slow water velocity, and can thereby assist fish access as well as acting to reduce erosion and sedimentation.

Examples of habitat diversity required for specific times in the life cycle of important fish species include the clear, shallow, fast flowing, rocky pools as spawning sites of sooty grunter; mangrove lined estuaries as nursery sites for barramundi, grunter, banana prawns, mangrove jacks, crabs and mullet, and; brackish and freshwater lagoons connected by waterways as juvenile and grow out areas for barramundi, mangrove jack, sooty grunter, eels and jungle perch.

Food Sources

A variety of habitat is not only important for shelter, nursery and spawning sites, but provides suitable conditions for hunting and grazing. Fisheries food sources such as algae, molluscs, smaller forage fishes and crustaceans also require specific environments. Freshwater areas are often the site of high plankton productivity; essential food for many larval and juvenile freshwater species. The high primary and secondary productivities in downstream estuarine mangrove systems and shallow water seagrass beds supports complex food webs, that in turn support many commercial and recreational fish species. Even the availability of fruits, leaves and roots from aquatic and riparian vegetation can contribute to fisheries productivity by providing a source of energy to the lower food chain.

Water Quality

Acceptable water quality is a critical requirement for fisheries productivity. Most fish species in this region require an aquatic environment where oxygen levels are greater that five ppm, pH levels generally between 5.5 and 8, and an aquatic medium relatively free of pollutants. As critical levels for each of these parameters are approached, the level of fisheries productivity tends to fall (Russell pers. comm. 1997).

Protection of wetlands adjacent to the Great Barrier Reef

Water quality is largely influenced by storm water run-off. Storm water can carry a number of pollutants and other chemicals that in turn affect fisheries productivity. Fertilisers in solution can increase nutrient loadings within waterways that may encourage algal blooms. These blooms can in turn deplete oxygen levels (Raisin and Mitchell 1995) and lead to fish avoidance or death. Pesticides and herbicides can affect the health and reproduction of aquatic fauna and flora. Excess sediments can clog waterways, increase turbidity and have direct and indirect impacts on instream biota (Clarke et al. 1996).

In low lying areas of where drainage patterns have been modified the disturbance of acid sulphate soils can severely effect water quality. Storm water flowing through oxidised acid sulfate soils can leach sulfuric acid into nearby drainage waterways. The resulting lowered pHs release toxic levels of aluminium and heavy metals (if present) into solution. Acid leachate can lead to the fish disease 'red spot' or epizootic ulcerative syndrome (EUS), a potentially fatal fish disease (Sammut et al. 1995).

Waterway (riparian) vegetation plays a critical role in the maintenance of water quality. Stream bank and aquatic vegetation serves to trap waterborne sediments and filter nutrients (Boto et al. 1978) as well as providing shade to regulate temperature, physical structure to stabilise banks and channels, leaf litter for invertebrate (insect) production and oxygen for the healthy functioning of fisheries habitat. In order to successfully manage drainage waterways' water quality, stakeholders' recognition of the downstream effects of certain activities e.g. that drainage practices having a large role in the control of acid sulfate effects on fisheries and clearing riparian vegetation removing an important buffer for fisheries resources, will assist in the retention and enhancement of fish habitats.

Habitat Management – Fisheries' Requirements

To support and protect Queensland's fishing industries, coastal planning processes must take into account the fact that drainage waterways play a major role in fisheries productivity. Fortunately, the protection of these areas can occur without compromising drainage requirements and may in fact provide desirable features within the flood plain landscape. To protect the productivity of north Queensland's fish stocks, however, all coastal waterways' stakeholders should undertake the following commitments:

- 1. Incorporate into waterway design and modification the following features:
 - fishways at fish barriers
 - provision of a diversity of, and access to, fisheries' habitats suitable to endemic fish populations
 - stormwater and discharge controls
 - appropriate riparian zones.
- 2. Identify and protect existing wetlands on the basis of their current or potential contributions to fisheries productivity.
- 3. Identify and manage acid sulfate soils.
- 4. Develop acceptable options to draining wetlands as solutions to residual drainage problems.
- 5. Rehabilitate degraded waterways and wetlands as a matter of urgency, particularly freshwater areas, not only for fisheries' benefit, but as retention basins to mitigate coastal flooding and recharge areas for groundwater.

Acknowledgments

I wish to thank Mr John Russell and Dr John Beumer for criticising early drafts of this manuscript.

References

- Boto, K.G. and W.J. Patrick Jr 1978. Wetland Functions and Values: The State of our understanding, *In* Proceedings of the National Symposium on Wetlands.
- Clarke, A., L. Johns, W. Richards and R. Coles 1996. Cairns Drainage Waterway Management Report. Northern Fisheries Centre. Queensland DPI, Cairns.
- Couchman, D., D. Mayer and J. Beumer 1996. Departmental Procedures for Permit Applications and Approvals for Marine Plants.
- Hogan, A. and P. Graham 1994. Tully-Murray Floodplain Fish Distributions and Fish Habitat. Freshwater Fisheries and Aquaculture Centre, DPI Walkamin.
- Ludescher, C M. 1997. Fisheries Resources between Bowen and Tully: an Inventory. Prepared for the Townsville Zonal Advisory Committee and the Queensland Fisheries Management Authority.
- Raisin, G.W. and D.S. Mitchell 1995. Diffuse Pollution and the Use of Wetlands for Ameliorating Water Quality in the Australian Context.
- Russell, D.J. 1986. Review of Juvenile Barramundi (*Lates calcarifer*) Wild stocks in Australia, *In* Proceedings of an International Workshop held at Darwin NT Australia.
- Russell, D.J. and P.W. Hales 1995. Stream Habitat and Fisheries Resources in the Johnstone River Catchment. QDPI Information Series Q193056.
- Sammut, J., M.D. Melville, R.B. Callinan and G.C. Fraser 1995. Estuarine Acidification: Impacts on Aquatic Biota of Draining Acid Sulfate Soils. Australian Geographic Studies 33(1): 89– 100.
- Swales, S. 1982. Environmental Effects of River Channel Works Used in Land Drainage Improvement. Journal of Environmental Management 14: 103–126.
- Williams, L.E. (ed.) 1997. Queensland's Fisheries Resources: Current Condition and Recent Trends 1988–1995. Queensland DPI.
- Watson R.A., R.G. Coles and W.J. Lee Long 1993. Simulation Estimates of Annual Yield and Landed Value for Commercial Penaeid Prawns from a Tropical Seagrass habitat, North Queensland, Australia. Aust. J. Mar. Freshwater Res. 44: 211–219.

Attachment 1. Important Commercial and Recreational Fish Species that Utilise Estuarine and Freshwater Areas

Barramundi (Lates calcarifer)

Barramundi migrate as juveniles upstream into fresh water from around July to November. Adults spawn along the coast line generally during the wet season. Breeding is usually timed to allow juveniles to move upstream into nursery swamps that form during the wet season. Barramundi start life as males and at around 85 cm in length change to females. This species are ambush predators and prefer slow moving, murky waters and aquatic features where they can lay in wait.

Mackerel (Scomberomorus commerson)

The larvae and juveniles of this species inhabitat inshore and estuarine areas. They feed at these stages first on plankton then smaller prey fish. They then move inshore to river mouths and beaches and feed on fish.

Blue salmon (Eleutheronema tetradactylum)

The juvenile and adult blue salmon inhabit estuarine and coastal waters. As adults these fish are carnivores feeding on prawns and fish etc.

King salmon (Polydactylus sheridani)

King salmon are bottom feeders and prefer the lower reaches of tidal waterways as well as tidal flats.

Mangrove Jack (Lutjanus argentimiculatus)

Juveniles of this species inhabit estuaries and have been found 130 km upstream. This species is thought to spawn offshore.

Grunter, barred (Pomadasys kaakan), spotted (Pomadasys argenteus)

Both these species inhabit mangrove lined waterways and coastal flats as adults and juveniles. It is believed that grunter aggregate to spawn in channels through coastal sand banks at the mouths of rivers(Garrett 1997 pers. comm.).

Red emperor (*Lutjanus sebae*)

Red emperor juveniles are sometimes found in mangrove areas (Ludescher 1997)

Finger mark perch (Lutjanus johnii)

Finger mark perch inhabit coastal waters as well as rocky coastal reefs.

Shark

Whaler sharks are the main shark fishery in north Queensland. Shallow seagrass and mangrove lined waters are critical nursery and pupping habitats. The abundance of the food source in these area is the likely reason for their presence in these areas.

Mullet (Mugilidae)

Larval mullet move from the plankton stage to settle out in mangroves. Sea mullet (*Mugil cephalus*) juveniles move up stream into freshwaters. Other mullet such as stay in estuaries and coastal waters. Mullet adults spawn at sea or in estuaries.

Mud crab (Scylla serrata)

Mud crab larvae spend approximately 3 weeks in the plankton and then move inshore as megalopa. Adults lie and grow in estuaries.

58

Banana prawns (Peneaus mergiuensis), leader prawns (Peneaus monodon)

These species settle out in mangrove as juveniles and will remain there until monsoonal rains flush them offshore. Leader prawns have been found in the upper tidal limits of creeks.

Tiger prawns (*Peneaus esculentus* and *P. semisulcatus*), **king prawns** (*Peneaus latisulcatus* and *P. longistylus*)

Tiger prawns and king prawns settle out in seagrass as juveniles. The value to the tiger prawn fishery of the Trinity Inlet seagrass beds alone was calculated in 1993 at \$1.2 million annually (Watson et al. 1993).

Jungle perch (Kuhlia rupestris)

Jungle perch migrate into upper tidal areas to spawn. Waterways will therefore interfere with the life cycle requirements of this species, as well as other fish species e.g. barramundi, mangrove jack and mullet.

Sooty grunter (*Hephaestus fuligosus*)

This species can withstand wide range of temperatures, pH's and short-term turbidities. They spawn in summer when water levels start to rise through the effect of monsoon rains. Sooty grunter require rocky, shallow, fast flowing, clear freshwater pools to spawn.

Prey fish (bait fish)

Fish that form the diet of commercially and recreationally targeted fish species, for example mullets, gudgeons, herrings, sardines, pony fish, bony bream etc. are as important to fisheries productivity as the targeted fish themselves. Whilst some of the smaller drainage waterways may not appear to provide habitat for larger commercial and recreational fishes, they often support significant populations of the fish species upon which the larger predators feed. For this reason it is vital that even the smallest of waterways is also protected and managed for its fisheries values.

Attachment 2. Relevant Rehabilitation Documents

Adams, M.A. and I.W. Whyte 1990. Fish Habitat Enhancement: A Manual for Freshwater, Estuarine and Marine Habitats. Prepared for the Government of Canada. Department of Fisheries and Oceans.

Clarke, A., L. Johns, W. Richards and R. Coles 1996. Cairns Drainage Waterway Management Report. Northern Fisheries Centre, Queensland DPI, Cairns.

Clarke, A. and L. Johns 1997. Cairns Waterway and Wetland Rehabilitation Guide. Northern Fisheries Centre, Queensland DPI, Cairns.

Ellis, M.M. 1986. Erosion silt as a factor in aquatic environments. Ecology 10: 29-42.

Environmental Best Management Practices: Erosion and Sediment Control 1994. Brisbane City Council, Brisbane.

Erosion Treatment for Urban Creeks : Guidelines for selecting remedial works 1996. Brisbane City Council, Brisbane.

Hogan, A. and P. Graham 1994. Tully–Murray Floodplain Fish Distributions and Fish Habitat. Freshwater Fisheries and Aquaculture Centre, DPI Walkamin.

Integrated Maintenance Manual for Waterways, Wetlands and Open Drains 1997. Planning Section, Planning and Development Branch, Dept of Works.

Newbury, R.W. 1993. River rehabilitation with soft engineering, pp. 89–90 *In* Ecology and Management of Riparian Zones in Australia. LWRRD Corporation Occasional Paper series No. 05/93.

Nunnally, N.R. 1978. Stream renovation: an alternative to channelisation. Environment Management 2(5): 403–411.

Riley, S.J. and M. Abood 1995. Impact on water quality of gross pollutants, *In* the proceedings from 'Planning for Creative Stormwater Management', Sydney, September 1995.

Sydney Coastal Councils 1992. Stormwater Pollution Control Code for Local Government. Prepared for Sydney Coastal Councils by members of the Sydney Coastal Councils.

Urban Stream Rehabilitation Principles and Guidelines 1996. Brisbane City Council. Report prepared under National Landcare Program.

Tropical Queensland Seagrasses

R. Coles

Queensland Department of Primary Industries, Northern Fisheries Centre, PO Box 5396, Cairns Qld 4870

The importance of seagrass meadows as structural components of coastal ecosystems has been recognised during the past 20 years. This has resulted in more interest in the environment being focused on the biology and ecology of seagrasses. These marine angiosperms are important for stabilising coastal sediments; providing food and shelter for a diverse range of organisms; as a nursery ground for many prawn and fish of commercial importance; and for nutrient trapping and recycling.

Seagrasses are unique amongst flowering plants in that they can live entirely immersed in seawater. Several species are found at depths of down to 50 metres but tropical species are most common in depths less than 10 metres below mean sea level. Adaptation to a marine environment imposes major constraints on morphology and structure. The restriction to seawater may have also influenced their geographic distribution and speciation.

Seagrass meadows in northern Queensland play a critical ecological role as a support for commercial species of penaeid prawns and fish. Seagrasses are also essential food for dugong and green sea turtles. Coastal seagrasses are also important nutrient and sediment sinks, and play important roles in maintaining sediment stability and water clarity. The growth of seagrasses depends on several factors including the availability of light, nutrients and water temperature. Activities that lead to a change in these factors such as turbidity from dredging or run-off from agriculture, could potentially have a negative impact on seagrass growth and distribution. Seagrasses show measurable growth responses to changes in ambient water quality conditions and can therefore be used as effective ecological indicators of environmental impact.

Tropical seagrass meadows vary seasonally and between years. The potential for widespread seagrass loss has been well documented. The causes of loss can be natural such as cyclones and floods, or due to human influences such as dredging, agricultural run-off, industrial run-off or oil spills. Destruction or loss of seagrasses has been reported from most parts of the world, often from natural causes e.g. 'wasting disease' or high energy storms. More commonly destruction has resulted from human activities, e.g. as a consequence of eutrophication or land reclamation and changes in land use. Anthropogenic impacts on seagrass meadows are continuing to destroy or degrade coastal ecosystems and decrease their yield of natural resources. It is important to document seagrass species diversity and distribution and to identify areas requiring conservation measures to prevent significant areas and species being lost.

Coastal Wetlands – Position Comment

Tropical Queensland Seagrasses

C. Crossland

R. Coles

lost

Australian Coral Reef Society) c/= CRC Reef Research Centre, James Cook University, Townsviller Qlan Q 4811

The Australian Coral Reef Society is philosophically opposed to further alignation of coastal of wetlandsoMangroves, coastal swamps and wetland marshes are critical habitats: Aesthetically or coastal wetlands are important ecosystems for unique biotal maintenance of biodiversity and habitat for migratory / transmigratory birds: Importantly they fulfill a number of natural control functions: greatly influencing coastal water quality including the following server a sector sector

- Wetlands are natural 'kidneys' filtering and cleaning waters of multients and chemicals and cleaning waters.
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In tropidal Queensland, coastal wetlands have a key role in ensuring of water quality in the mono-Great Bartier Reef. The alienation allowed a solution of wetlands that the solution of the Queensland of the Research o

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Demand for transformation of any area of coastal wetland must only be met where there is clear and agreed evidence of significant socioeconomic benefit to the Australian community as a whole, and appropriate safeguards put in place to ameliorate resultant coastal pollution. A second place of a second brusses are place to ameliorate resultant coastal pollution brusses are not all common brusses ar

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Aesthetics, biodiversity and international convention (Ramsar) issues aside, our best technologies cannot meet the function of wetlands as coastal buffers and water treatment facilities.

The 50 00 bottares of wetland in north Queenslawsivh DARMR anti-htio2g-choits verses of wetland in north Queenslawsivh DARMR anti-htio2g-choits verse and NOT occur expansion is cruel and outrageous. Development and expansion of industry should NOT occur at any price. We are all dependent on the natural environment for survival and so we must not strive 3 strive 0454 blQ tyth show gravitational Web (south and final strive 0454) blQ tyth and gravitational Web (south and so we must stop thinking only of today and plan very carefully for very little we have left. We all must stop thinking only of today and plan very carefully for

I am representing and expressing the views and concerns of Marine Resource Advisory vornomot Committees and concerned citizens from Townsville to Gladstone. I have had to compile many views. Marine biologististand/scientists etc/restuary/to/theorean/wetland/and/marine/nc/ environment/and/and/scientists/etc/restuary/to/theorean/wetland/and/marine/nc/ representation/scientists/marine/specialists/and/scientific/ environment/and/all/decision/mark/rs/multi-face-their decision/munity/groups/stich as RMRAGs etc: scientists/marine/specialists/and/scientific/ marine/areas/and/they/must/be/withih/very/strict parameters/solad/scientific/ scientific/ scienti

A very tends of the country loss of the country loss of the country to the again of the country to the again again of the councils and shiles are continuously reclaiming welland, creeks, gullies, salt panareas for the housing, industry and farming as is happening here. They should be prosecuted for failure to the abide by legislation protecting wetland and ripariant egetation. If this destruction to this very the valuable wetland is not stopped immediately, the Haughton fishing industry alone will be very ad seriously affected, as is happening on a regular basis around the coastline. We must not forget that up to 85% of fish and marine creatures offshore are inshore dependent. I call on QCFO to stand up and be counted. Their focus regarding this matter is not good enough.

So too the tourist industry. We must remember that once a wetland has been destroyed it is gone forever, gone for all eternity. We must let this sink deeply into our subconscious, especially in those of our decision makers, because if you don't care what happens to our precious wetlands you should step down and let someone who does care take your place.

In our area off Mackay alone, bund walls and ponded pastures are common place and most of these were constructed approximately 40 years ago. About 99% of these structures are illegal. One ponded pasture alone is 21 km long and has destroyed many hundreds of hectares of very relevant nurseries. In the past 40 years I have seen this area go from a fisherman's paradise to almost total desolation. It was the home of barra, sand grubba, all of unbelievable quantity and quality. Prawns and crabs were plentiful – go there today and you're lucky to catch a feed. All this within 40 years.

A few days ago I received a letter from the Planning and Environment Manager of the Port Authority. It reads 'The tourist query: Where are all the fish gone?' At the Gladstone Port Authority open day, tourists commented that they were not catching any fish either off the beach or up the rivers. As fishing was one of their prime reasons for staying in Gladstone, they said that they would consider going somewhere else next year. Not a statement pleasing to the promotion of the area. Even one of our own members, who I will not identify, told me that he could not get a bite at his secret fishing spot which is normally certain to produce fish. He asked to what do we attribute this drop off.

Let's assess the facts: tourism, fishing and recreational fishing complement each other in a big way. These very important industries must be protected and this can only be achieved by maintaining the ecological integrity of our Great Barrier Reef Marine Park. As I see these three industries to be most important to Queensland and Australia in the very near future and in the long term we should urgently help and encourage our beef producers and farmers along our coastline to remove all dams and ponded pastures and the like from all nursery areas and creeks and to build their dams well away from these very sensitive nursery areas. In the gulf country, ponds dry up in the dry season – this happens almost everywhere dams and ponded pastures are constructed but more especially in tropical north Australia.

Protection of wetlands adjacent to the Great Barrier Reef

The 50 000 hectares of wetland in north Queensland that is currently being destroyed for cane expansion is cruel and outrageous. Development and expansion of industry should NOT occur at any price. We are all dependent on the natural environment for survival and so we must strive to protect these special areas, not destroy them. It all comes down to protecting what very little we have left. We all must stop thinking only of today and plan very carefully for tomorrow.

In conclusion, ladies and gentlemen, I wish to very strongly protest on behalf of the people I represent against any further destruction of these priceless wetlands that are adjacent to and play a very important role in protecting our Great Barrier Reef Marine Park and all of its creatures. I beg all politicians and decision makers to LISTEN to the community and be advised by Great Barrier Reef Marine Park specialists and act on their advice. Today I call on every Australian to stand up and be counted and if they truly love this country to fight against any further destruction to wetland and marine environment areas. I want to remind all politicians that the young generation of voters DO care about environmental protection of the Park for themselves and their children. So be warned, if the Government won't listen to us now you can be sure that our voices will be heard through the ballot polls. We vote and we care.

Importance of the Northern Wetlands

J. Doohan

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We have, we believe, lost around 60% of our coastal marine and freshwater wetlands since 1951 and while there was some small justification in the early years for this loss due to ignorance of their importance, this is not now the case. However, the destruction is still going on and with increased efficiency. I would ask the question. In light of our present knowledge of the critical importance of these wetlands, why is this being allowed to continue?

We have a combined fishing industry with an economic value to this State equal or greater than the sugar industry, yet that industry and other upstream industries, such as the agriculture and mining industries are impacting hugely on our fishery. Never mind the piddling developments such as the Williams development in Cardwell, or the canal and urban developments along the coastal areas. While these are bad enough and need to be urgently addressed, they pale into insignificance alongside the destruction being wrought by agricultural interests.

If we look at some of the wetland areas being cleared between Ingham and Cairns, we see the remaining creek and river riparian strips being cleared of rainforest. The wetland filled in and destroyed, rivers straightened and de-snagged, deep drains dug through these areas for drainage, rain forest destroyed and *Melaleuca* forests pushed and destroyed. All to allow more marginal cane land to be utilised for short-term gain. Even the farmers acknowledge that these areas are marginal at best.

The whole coastal strip from the border to the Cape is sitting on a time bomb, and that time bomb is acid sulphate. We do not know in Queensland for sure the exact areas where these acid sulphate areas are. But in the northern wetlands in the strip between Ingham and Cairns, acid sulphate areas abound. We need an urgent assessment of specific acid sulphate areas and that should be done through detailed mapping of the whole coastal strip. It is or has been done in New South Wales where they have recognised the destructive potential of acid sulphate for years. I believe there was a mapping program in Queensland from the border to Bundaberg. Whether this is ongoing I do not know but I would suggest that if it is not, it should be.

One tonne of iron sulfides can produce about 1.5 tonnes of sulphuric acid when oxidised. I would hate to guess the tonnage of iron sulfides in the northern wetland region. The other thing we should realise is that this is an ongoing problem. It is probably second only to nuclear waste as to its time frame. It is believed it may take hundreds of years to dissipate, and it is hugely costly to rectify.

It is recommended that drainage be not more than 1 metre deep and be in the form of spoon drains. In the Murray–Tully region the drains I saw were in excess of two metres deep and had a 1 to 1 batter, a classical vehicle for transporting sulfuric acid in huge quantities to the downstream areas.

Sunfish North Queensland has had diseased fish from the Hinchinbrook area, suffering from red spot lesions, analysed in New South Wales. These fish were suffering from red spot disease and it was consistent with contact with acid sulfate run off. It appears that the affects of the drainage of these wetlands are already being felt in these regions.

We mustn't lose sight of the impact that upstream industries are presently having on the Great Barrier Reef. We are already running untold tonnes of sulfuric acid, pesticides, fertilisers and other nutrients into the Reef lagoon. This will certainly have a big impact on the wellbeing of the reef, and if this happens, it will become a national concernivitivall the serious concerns that will will entail.

. Poolari -

We are in an unique position - we've heard about the economy of a whole range of tourist is and activities and also the cane farmers. We don't gain from product sale and we don't get any money from subsidies. All we do is pay and pay very very dearly for everything we do. We are we a very major player in the Australian economy. With that payment our members have some who very high expectations. Ours are a social community value based on recreational fishing or the use Everybody in the community does that. So I'll put it in perspective for you, and all due respective of to previous speakers who have come up with figures. They have been totally and grossly underestimating the value of recreational fishing. Last year 882 000 people went fishing in Queensland, They're locals. In this area alone from Mackay to Cairns, 171,000 people went was a with fishing last year. This generated over 5000 jobs in the area and was worth \$160 million locally produ \$1.4 billion for the Queensland economy. That's more than the sugar cane industry is worth inclusion Queensland. We're now worth in excess of \$4 billion nationally, twice what the cane industry's and worth. So let's get things in perspective when we're talking about what's worth what. สารทั้งรักษ์ ใหญ่สมบาทหาวาย และการ (และน้ำสุดสินและสินและการมักฎวยใจ รวมสนไม้คาทสา Working out initiatives, compensation planning, all takes time. We're been going down this track for 20 years and we still haven't done anything. The CRC for Sustainable Sugar a stabulation and Production's Research station has the answers; Ross Digman (local cane grower) has the analysis of the statement of the state answers; why are we playing around forming more committees and doing more things that we dealer aren't necessary. We don't want any more talking or delaying factics, we need action in the automatic form of total protection of our wetland and we want it now and the State Government needs to use get that message. There's an election coming up next year. As somebody talked about = who's many taking the fish? Each fish produces millions of eggs. If they've got nowhere to lay them and the fish have nowhere to grow, no sanctuaries, no natural areas, then it's not much point. Take and said away our wetlands and you've got nowhere for them to live. Take away your house and go and sol live in the open'if you want to. What we've done here is we've generated some great things and the

around the north. Senator Macdonald would be very-pleased torbuy another computer to put replies them all in because that's what you're going to need by the time you've finished here. If you doubt come out of this meeting with more than three resolutions and action plans then you've wasted of the my time and you've wasted everybody else's time here. Our collective message to the resolution politicians, both State and Federal, should be DO IT NOW, not later and to the more determined by the

No one has the right of the might to destroy an industry with the economic and social value of anO the fishing industry. The general public is saying, 'Belcareful for you know not what you do.' Loove Sunfish is saying? (ENOUGH IS ENOUGH! Science group to a solid it in the destruction of a public articles. Discrete and the solid real of the solid solid solid science of the solid sol

It is recommended that disting to be normore that in metre does and be make form of speen order is the solar genically mean the draine asservate in every of two matree deep and bud of metric structure associations are recompositively surfaric acid in huge quantities to the data.

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Vectors is a second processing of the opstream industries are presently faming on the Cirear Perm 1 — Constants another membra usual connect software and, portfoldes, fortheory and other is the test of bacan. This will conside back only inspace on the webbies get. Indigenous Interests in the Murray River Wetlands + An Outsider's Perspective in doum or and ideologies of the Green movement and the pragmatic production and economic development position of rural producers. That is, some will hold similar views as environmentalists and keif. Aboriginal Corporation, Girringun Reference Group, Cardwell Qld 4849 mie weiv & zeerqxe lliw emoz

Many of these positions relate to quality of life issues, economics and weivary Q bns, noity up of the of the community. For the indigenous people of the Murray catchment, wetlands management Girringun has been asked to describe, indigenous values and interests, in wetlands and I have at chosen to look at the wetlands of the Murray River catchment as a case study for elaborating on this theme. The Legal Interests of Indigenous People

There are three distinct components to indigenous interests in wetlands recognised in this relimid were largely excluded from the activities of the European settlers until recent ornes. The paper:

- community values (these being aspects which are widely valued and often the subject of the remained largely off private property when the settlers 'took up' the lar, (source) to a settle settlers 'took up' the lar, (source) to a settle sett
- urban settlement. In this process, wetlands were often left in Crown branvtragorgaliti suitan another.
- cultural heritage values.

Cultural heritage values encompasses two inter-related elements. The first is straditional or si fl culture' which relates to the social and cultural make-up of the Aboriginal society before testage European settlement This becomes something distinctly different when recognised as part of que contemporary culture; that is a spects which have survived the influences of European 200 doidw occupation and settlement take on a different meaning and will be valued according to going shill contempoliary standards! The second elementate Aboriginal historical values which are vio lls important in demonstrating the specific experience of Aboriginal people in the years that up-159 b followed the invasion of Europeans of their land up until the present day.

It is not intended to expand on what Native Title means in this context, suffice to say that once This paper gives a brief butline of each of these components as they relate to the traditionality and owners of the Murray River catchment. It is necessarily only an overview but reference is made q to the literature on these matters for those who wish to read the background information used and allowed the same consideration and due process. to derive this summary.

In describing these aspects offindigenous values from the perspective of an outsider, and houtbud underlying theme emerges which should be emphasised. Assuming indigenous values are to 1995 be accommodated in deliberations about wetland management, it is essential that we start from " a basic understanding of where indigenous people come from and of how/they/may value/29/019

wetlands. As outsiders we need to expand the normal framework of our value system to allow Cultural heritage research in the Murstgobig zuonagibniito avitage research in the Murstgobig zuonagibniito avitage research in the Murstgobig zuonagibniito avitage avitage research in the Murstgobig zuonagibniito avitage cultural and historical value along the river and adjoining wetlands. These include Thus/the wetlands of the Murray River eatchment are used to describe indigenous values and issues' here and to derive some fundamental conclusions which may be applicable to us and an and who lived and died af these locations and the associatore with a sociatore and lived and died af these locations and the associatore and the associatore and lived and died af the social and the association and the association and the association as a social and the association as a sociation and the association as a sociation as a sociati as a protected from destruction. A recent survey of the Murray River and Kenneav area documented 47 sites which were deemed important enough to be protected testific which were Record Act (Crothers 1997).

The Aboriginal people living in the Murray River catchment are part of the local rural Community: Like others they will value recreational opportunities? scenic amenity? fisheriesi of T resourcestand the benefits of economic development. In these respects they are not differented ad and any given group of Aboriginal people will include a similar diversity of views as found in m the wider community of Cardwell of Tully However, when compared with a non-indigenous of community their marginal economic and social position suggests they will have a greater need o for economic development and employment but this is balanced by a deeper appreciation for this nature and its resources. They will have a greater percentage of their community who are active fishers and who regularly exploit natural resources in the surrounding lands and in this sense

share much with the recreational fishers. They have variously absorbed and adopted both the ideologies of the Green movement and the pragmatic production and economic development position of rural producers. That is, some will hold similar views as environmentalists and some will express a view similar to the farmers.

Many of these positions relate to quality of life issues, economics and the day-to-day activities of the community. For the indigenous people of the Murray catchment, wetlands management is as much a debate about social impacts as it is for anyone else living in this area.

The Legal Interests of Indigenous People

Similar to the history of the traditional owners themselves, the wetlands of the coastal plain were largely excluded from the activities of the European settlers until recent times. The wetlands of the Murray River presented physically constrained lands which commonly remained largely off private property when the settlers 'took up' the lands for agriculture and urban settlement. In this process, wetlands were often left in Crown tenures of one sort or another.

It is precisely in these lands and tenures that the common law rights of indigenous people has greatest potential for continuing existence and it is over these areas that Native Title applications will often be placed. In the Murray River catchment there are marine wetlands which occur on Unallocated State Lands (USL) and which are almost certain to contain Native Title property. Other wetlands occur on esplanade, reserve, National Park and Forestry tenures – all of which are potentially Native Title areas although the determination process will be less clear-cut than on the USL lands.

It is not intended to expand on what Native Title means in this context, suffice to say that once an application is accepted by the Tribunal the applicants have recognised legal standing to participate in many decisions concerning that land. Once a favourable determination is reached the Native Title holders have the same rights as any other property holders and must be allowed the same consideration and due process.

Cultural heritage legislation also provides legal mechanisms for indigenous people to influence decisions about relevant wetlands. Sites listed under the *Cultural Record (Landscapes Queensland and Queensland Estate) Act 1987* are protected and grave sites, in particular, have the strongest protection under this Act.

Cultural heritage research in the Murray River area has identified numerous sites of traditional cultural and historical value along the river and adjoining wetlands. These include archaeological material sites, 'story' sites and camps which have been continuously used since before European settlement. These camp sites were commonly used by generations of people who lived and died at these locations and the associated burial grounds can be legally protected from destruction. A recent survey of the Murray River and Kennedy area documented 47 sites which were deemed important enough to be protected under the Cultural Record Act (Crothers 1997).

The implications of this are clear – indigenous interests in the Murray River wetlands will often be legally protected and indigenous people will have every right to assert their authority in matters which may affect these interests. Whether or not you accept the moral argument in favour of indigenous land rights and whether or not they [indigenous people] attend a conference at Babinda is largely irrelevant to this aspect of their 'interest' in wetlands. Their 'interest' is a legal right and something which, if asserted, cannot be ignored.
Traditional Culture and Wetlands: Then and Now

The Murray catchment occupies one part of the broader Dyribal language area (Dixon 1972) and encompasses much of the Girramaygan 'tribal'/clan territory. These people are part of the north-east Queensland 'rainforest people' – a distinct cultural grouping of Aborigines whose way of life and cultural activities set them apart from other Australian peoples. Distinguishing characteristics include high population densities, more sedentary existence, extensive use of poisonous plants for food, an extremely diverse material culture and a unique duelling contest to settle disputes (Horsfall and Fuary 1988).

In traditional culture, the entire landscape is known and owned. Ownership is set out in the oral traditions of the people where the mythical stories of 'Dreamtime' characters connect people with places and establish a complex and dynamic framework for regulating social and political relationships amongst the land owners. Many of these 'Dreamtime' stories are still known by the Elders and they continue the tradition of passing these on to the younger members of the family. For example, Pedley (1994) documented 39 sites along a 5.5 km stretch of the Murray River of which over 30 were significant because they embodied an aspect of a traditional story. These stories travel across whole landscapes, leaving specific sites or features which 'contain' certain aspects of the story. An example of the latter is a metre high rock which the Elders asked the Department of Main Roads to move out of the path of the highway just north of Cardwell. To their credit, they did and the locals can still reflect on this remnant of 'traditional culture'.

In this sense, all remnant forests have cultural value as integral to the cultural landscape that embodies cultural identity; that is, natural ecosystems are also 'traditional ecosystems'.

A fundamental cornerstone of this value is knowledge of the connection between groups or individual people and particular areas of land. Many of the traditional families in the Murray catchment still know where their specific 'country' lies and this includes many locations in the Murray River wetlands. The knowledge may not comprehensively link all families and all places as in former times but is nevertheless diverse and extensive. In this contemporary knowledge of traditional territory there are tribal boundaries, landscape stories of the different tribes, localities which certain families can 'speak for' and specific sites which are important to particular individuals for a variety of reasons.

As the outline of their history below will indicate, the Girramaygan people managed to resist the total destruction of their culture and way of life more successfully than most. There are still Elders who know the language and many of the sites and stories in the landscape. There are also younger people coming through who have picked up the task of carrying and transmitting their traditional culture into the future. Families continue the practice of naming family members after a sacred place or traditional story from within their 'country' (Pedley 1994). Story sites are recognised and places important to their history are part of the general community knowledge particularly in natural areas where people continue to fish, collect materials and use for one reason or another. The language is struggling but is currently subject to a tenacious revival.

In this contemporary cultural activity, the wetland remnants become an essential part of a general and ongoing attempt to maintain culture as a lived experience. It is the traditional knowledge that provides meaning to a place and it is the natural ecosystems and resources found there that provides the context for practicing and transmitting that knowledge. A cleared and modified area of land may be within traditional country but it has lost much of its cultural meaning.

Protection of wetlands adjacent to the Great Barrier Reef

Related to this day-to-day oral tradition and culture as a lived experience, there is a growing formal database of specific sites and stories and documented oral histories. In Girramaygan country, the Elders have an enviable record of recording their sites and stories with visiting researchers (see Bird 1991; Crothers 1997; Dixon 1972, 1976, 1981; Pedley 1994; Pentecost 1994).

For example, there is considerable material evidence of the traditional occupation and use still to be found today, such as tangible items like stone axe heads, shell middens, sacred trees and earth ovens which are often unearthed in the clearing and ploughing of fields in and around wetlands. Many ceremonial sites ('brun' sites), the semi-permanent camps and rock shelters (some with paintings) have been mapped and remain important to today's people (see for example Bird 1992; Crothers 1997; Pedley 1994; Pentecost 1994).

In a recent archaeological survey of parts of the Murray River and nearby Kennedy Valley a total of 50 sites of importance were identified and documented and these included sites of traditional cultural value (e.g. ceremonial grounds, camps, middens, rock shelters) and sites of importance to post-contact history (burials, historical camps, massacre sites) (Crothers 1997).

In the Murray River map of cultural values, there is a clear concentration of these along river banks and/or around wetlands. The reason for this is twofold: wetlands are among the last natural areas to be destroyed and these ecosystems are resource rich areas, providing an ongoing focus for contemporary use as hunting, gathering and camping areas.

As concentrated areas of cultural value in a context where the traditional people are actively asserting their interests to regain and develop what has been extensively lost, the few remaining wetlands are precious. As these last areas are continually reduced and lost the relative value of those that remain steadily increases.

The Historical Value of the Murray River Wetlands

To traditional cultural values must be added another layer of significance and meaning based on historical value. These will be sites and localities where crucial stages in the post-contact history of the traditional people were played out. In the region this may include urban areas or buildings but in the wetlands most historical values can be classed as one of three types: massacre sites, burial sites and camp/settlements. These values are discussed briefly and in tracing out where they fit into the local history another perspective comes into focus which illuminates the crucial role of wetlands in the survival of Girramaygan people and culture.

Following the establishment of Cardwell in 1865, farmers and graziers moved into the area and 'took up' the best available lands. In the earliest days this was a process violently 'dispersing' all Aboriginal people who occupied the lands in a war of dispossession and exclusive occupation. In the years between 1865 and approximately 1872, the written history of the new settlers records the resistance of the Aboriginal people and violence of the settlers and Native Police (Jones 1961; Loos 1982). The written history becomes largely silent on these matters after the 1870s (see for example, Jones 1961) as the colonial authorities publicly prohibited the violent dispossession and illegal retribution of attacks on property. However, more thorough research (Loos 1982), and the oral history of their descendants (L. Crothers pers. comm.; P. Pentecost pers. comm.) clearly indicates that the violence did not stop until much later, and probably continued sporadically until the early 1900s.

Massacre sites mark the locations of war time losses. They are memorials and reminders of the tumultuous events which began the historical processes of dispossession and marginalisation. There are over a dozen massacre sites documented along the Murray River (Crothers 1997; Pedley 1994).

Thus by the turn of the century almost all of the best lands were occupied in the Murray River area and the Girramaygan people were living on the fringes of the new settlements where they suffered the aftermath of war. The entire Aboriginal population had become refugees and subject to diseases, famine and depression that normally follow war. The Dyribal speaking people suffered heavily and it is estimated that by the early 1900s the local population of traditional owners was reduced to less than 20% of the pre-contact population (Dixon 1972).

In the decades which followed, the indigenous history of the Murray River area mirrors the experience of many other Aboriginal people in Queensland. Two major influences can be identified as common to many. The first is exclusion and marginalisation – the traditional people were pushed off to the sideline of social and economic activity where they became 'invisible'. They were not recognised as Australian citizens and were not given any power to participate in public life. Except where they were used as cheap labour in the rural industries, the traditional people effectively dropped out of sight and became cloaked in official and public silence. For example, historical accounts such as Jones (1961) barely mention Aboriginal people from the early 1900s on – they were no longer a problem for the European settlement of the Cardwell area and apparently could be totally ignored. This 'invisibility' continues to be a major factor up to the present day.

The second major influence was the development of government policy and actions which instituted comprehensive and destructive controls over almost all facets of life for the traditional people. In 1897 the Queensland government passed *The Aboriginal Protection and Restriction on the Sale of Opium Act* which instituted many forms of regulatory controls and allowed government to forcible remove adults and children from their home and family. This Act was not repealed until 1939 when it was replaced by other legislation which continued the process of control and cultural assimilation. A major component of this control was the development of the Missions. For many of the Murray River people this meant transportation first to the Hull River Mission, then Palm Island and/or Yarrabah.

At Wongaling Beach there is a monument on the site of the Hull River Mission which perhaps best represents the historical position of the traditional owners by what it does not say. In an area where thousands of Dyribal speaking people lost their lives to violence and disease, and at a site where hundreds were incarcerated and large numbers killed in the 1918 cyclone, is a memorial to the two European missionaries who (also) died in this cyclone.

The original dispossession initiated a course of events which repeated the injustice over the years up until very recent times. Aboriginal people were not even recognised as Australian citizens until the referendum in 1967. In 1963 the Girramaygan people still did not legally own any of their traditional country (Koch 1996) and adults and children were still forcibly removed from families until the early 1970s. It was only in the mid-1970s that a concerted effort was made to change discriminatory policy and provide the necessary funds and autonomy required to address the results of this history.

This historical outline is a history of victims but the mountain rainforests and wetlands are associated with another history which runs concurrently. This other history is the story of resistance and strength; the history of a people who in spite of overwhelming odds managed to stay on their traditional lands and keep their traditional culture alive. People who, contrary to popular perceptions, never 'disappeared' but remained on the traditional land and continued their relationship with the land.

Following the overt violence, the Girramaygan were allowed, and/or were forced, to 'come in' to work on farms as cheap labour in the new agricultural, timber and mining industries. During these decades the Girramaygan people lived on the traditional lands in camps (many of which were pre-European camp sites) and workers' settlements located on nearby Crown lands and

Protection of wetlands adjacent to the Great Barrier Reef

'down the creek' at the edge of towns and on farms. It is these camps sites and associated burial grounds that are now recognised for their historical and cultural heritage values. In the Murray River catchment many of these are within or alongside wetlands where destructive agricultural land uses had not penetrated.

In this history of survival it is the rugged terrain and characteristics of the natural environment that provide a crucial ingredient. The swamps and wetlands of the coastal plain and the mountain rainforests provided refuge for the Aboriginal people which prolonged their armed resistance (Loos 1982) and provided the shelter, food and materials needed to maintain themselves in camps on the edge of white settlements and farms. Dixon (1981) saw the rugged terrain of the country as a crucial factor in their continued existence on the traditional lands, attributing this to a situation where 'most of the forest had not been cleared'. This fact should be emphasised in understanding the historical value of contemporary wetlands.

Thus the 'camp sites' recorded in the recent surveys (Crothers 1997; Pedly 1994) which are scattered along creeks and swamps of the coast are more than just former camps – they are also former refuge sites, loaded with a much deeper meaning which tells the story of survival. It is here that the language and traditional stories were kept alive and it is here that generations managed to live and die on their traditional country. Importantly these camps also tell the story of Aboriginal people's participation in the economy and settlement of European people.

This history is perhaps best illustrated by the Dyribnan family who came out of their rainforest camp in the 1940s and whose older members could not even speak English. This also serves to illustrate that in the Murray–Tully area we are not talking about something which is dead and gone when reference is made to traditional and historical cultural values.

Conclusions

(a) Indigenous people will often be a major interest group in wetlands

As the example of the Murray River demonstrates, indigenous people may have significant cultural heritage, environmental, land use and legal interests at stake in these ecosystems. Given the particular elements of their relationship to wetlands it is inappropriate to categorise the traditional owners as simply 'interests' or even 'stakeholders' – they are much more than this. However, the inclusion of indigenous people in wetland management must begin from a position far removed and behind that of other recognised interests who attended the Babinda conference. To begin this process of inclusion it would be useful to start with an acceptance of the basic position presented by indigenous people at a recent media event. At this event they asked for recognition and respect – they want recognition of their rich and ongoing traditional culture, recognition of their historical experience and how it relates to their contemporary position and they want recognition of their property rights. With recognition should come respect.

(b) There is a concurrence of views between indigenous people and other interest groups

Aboriginal people are part of the same rural community as everyone else. They will want to protect wetlands as it is the ecology and species of these areas which 'contain' the social and community attributes they value. They will commonly use these areas for fishing, hunting and foraging for their traditional foods and materials and will want to continue these practices. Aboriginal people like most others in the rural communities, are also interested in economic development and employment. Their views will reflect the diversity found in the collection of people who attended the Babinda conference but their particular cultural perspective will determine how they weigh up the relative balance of priorities in any given situation. They are the same but different.

(c) The special interests of indigenous people

Aboriginal people's specific relationship to a given wetland will result in a distinctly individual assessment of value. Specific cultural sites will have their own weighing when assessed in relation to threat; different story places have a relative value within tradition systems of knowledge and in contemporary times some areas will be negotiable while others will be seen as highly important and deserving strict protection. Value will also vary with the level of knowledge about certain areas, the importance of certain individuals in the community and the historical meaning associated with a site.

This inherent variability is similar to how we value cultural heritage and like us, cultural value is a dynamic and often negotiated thing which comes from both documented attributes and how the particular area is experienced. Cultural and community value for all of us comes, in part, from how that quality plays a role in the life of the individuals or groups. The particular indigenous spin to this is in the specifics of what a site/area represents or contains and in the requirement for indigenous people themselves to have the power to decide what is of value.

(d) Indigenous interests will often be a legal interest

As discussed above, wetlands will often be areas where native title continues to exist. This places a particular importance and weight to indigenous interests when assessing how management and ownership questions are to be resolved. Native title is legally defendable property under Australian law; native title holders in this situation are not just another stakeholder amongst the collection of public interest groups associated with these lands.

(e) There is an important distinction between formal and informal knowledge

The landscape of the Murray catchment was all traditional land and presents an all encompassing context for cultural meaning. However, when translating this broad based value system into the specifics of a particular wetland it becomes a statement that all natural areas have some cultural value. As noted above, cultural heritage value is also not just 'things' but is something which is lived/experienced and subject to continuous development and definition. Management decisions, however, are made in the corporate world which demands precision and formality. The uneasy relationship between these two systems of knowledge is a recurrent influence running through many public debates on environmental, cultural heritage and social impacts.

The transformation of knowledge that occurs when an Elder's words are recorded as certain stories and sites, leads to a distinctly different understanding of cultural value. A set of dots in a GIS database abstracts this knowledge further from its source and should not be given excessive weigh when deciding management issues. The formal and informal systems are associated, but different, systems of knowledge and we should allow for both to play a role.

(f) Equitable participation by indigenous people in wetland management should start with a fundamental shift in perspective by outsiders

Assuming indigenous people wish to participate in wetland management issues and have the means to do so, progressing their role in this issue is going to take time as the traditional people have to come from a very different and tumultuous history. We will have to give them the space to find their own, probably very different position on wetlands. For outsiders, this requires patience and an element of trust and a sympathetic understanding of where indigenous people are coming from.

Protection of wetlands adjacent to the Great Barrier Reef

For example, I was recently startled to hear from a 35 year old friend, stories of his early childhood when he lived in one of the camps down by the river. He talked of the old man who sang dirty songs in language and occasionally sang and chanted all night to keep the malevolent spirits away. A traditional cremation of one of their people remains clear in his memory because the burning corpse, strapped up in the foetal position, suddenly moved and thrust a burning leg out perpendicular from the fire. This is a very different childhood to that of us outsiders and the personal experience of indigenous people will frame how they become involved in management issues such as the protection and use of wetlands.

I recommend an honest examination of the local history of occupation and land use for those who wish to understand. It is easily accessible to us who rely on the written word and more importantly, it is also our history.

References and Further Reading

- Bird, M. 1992. A Preliminary Cultural Heritage Survey of the Wet Tropics World Heritage Area, Ingham District. Report for Hinchinbrook Aboriginal and Torres Strait Islander Housing Cooperative Society and Wet Tropics Management Authority.
- Crothers, L. 1997. Towards an Assessment of the Effects of Agriculture on Archaeological Sites that are Located on the Floodplains of the Tully–Murray and Kennedy Valleys of North East Queensland. Dept of Anthropology and Archaeology, James Cook University, Townsville.
- Dixon,R.M.W. 1972. The Dyribal Language of North Queensland. Cambridge University Press, Cambridge.
- Dixon R.M.W. 1976. Tribes, languages and other boundaries in northeast Queensland, pp 207–238. *In* N. Peterson (ed.) Tribes and Boundaries in Australia., Australian Institute of Aboriginal Studies, Canberra.
- Dixon, R.M.W. 1981. Searching for Aboriginal Languages: Memoirs of a Field Worker. University of Queensland Press, St Lucia, Brisbane.
- Horsfall, N. and M. Fuary 1988. The cultural heritage values of Aboriginal archaeological sites and associated themes in and adjacent to the area nominated for World Heritage listing in the Wet Tropics Region of Northeast Queensland. Unpublished report to the State of Queensland. Cultural Heritage Branch, Department of Environment and Heritage.
- Johnstone, R.A. 1903–05. Spinifex and Wattle: Reminiscences of Pioneering in North Queensland. The Queenslander, Brisbane.
- Jones, D. 1961. The Cardwell Shire Story. Jacaranda Press, Brisbane.
- Koch, G. 1996. Prologue to Dixon R.M.W. Dyribal Song Poetry. University of Queensland Press, Brisbane.
- Loos, N. 1982. Invasion and Resistance: Aboriginal–European Relations on the North Queensland Frontier 1861–1897. Australian National University Press, Canberra.
- Lumholtz, C. 1980. Amongst Cannibals. Caliban Books for Australian National University, Canberra.
- Pedley, H. 1994. A Preliminary Aboriginal Cultural Heritage Site Survey of the Wet Tropics World Heritage Area, Murray Upper District. A report for Girramay and Jirrbal people of Jumbun Community. Murray Upper and the Wet Tropics Management Agency.
- Pentecost, P. M. 1994. Relocation of Aboriginal Walking Tracks and Cultural Sites on Girramay Tribal Land, North Queensland. Report to CAMU and Jumbun Aboriginal Communities. Wet Tropics Management Authority and Aboriginal and Torres Strait Islander Commission.

Reef Tourism and Wetlands

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I'm an employed representative of the marine tourism industry and would like to thank you for the invitation to voice the requirements of that industry for the future of wetlands: it's all about economic and environmental sustainability. Recently, the majority of operators in north Queensland initiated the [Reef Tourism] 2005 project. It researched the economic, environmental and management issues surrounding our industry and trialled development options in all of those spheres. Our interest in wetlands is that we make our living by giving visitors the opportunity to experience the natural environment. Internationally, many competing reef experiences are coming on the market. The strength of our product is the reputation of the Great Barrier Reef not only as the largest reef system but also as the most pristine. There's no doubt about it, we have the most pristine reef system inch for inch in the world. I'm not a scientist so I can't state in scientific terminology the cause or link between wetlands and reefs but I've lived on boats for many years in what we used to call swamps and I've seen the role played by those wetlands as the nursery for the fish and as a filter between the land and the sea.

A large number of the world's reefs are going down the tube. It has to do with population pressures and lack of understanding of the impacts on reefs. We're lucky in north Queensland, our population is not at all level with other countries and our scientists are reputed to lead the world in understanding the reef environment, so we probably should listen to them. Let's not re-invent wheels as it's a waste of time. Recent surveys that have been undertaken with visitors show that 70% of the tourists stated that their primary reason for visiting the north is to experience the Great Barrier Reef. Our economic development in the north, in Cairns in particular, is inextricably linked with protecting that reef. If we lose it we can kiss goodbye to half the employment for a lot of your kids. We must ensure that the environmental integrity of that reef is maintained or basically you can kiss goodbye to reef tourism, you can kiss goodbye to probably the largest harbour development in the north.

One of the tasks undertaken by the Reef Tourism project (there are about 17 tasks) was to address our environmental concerns and to research ways to help develop integrated development processes between the relevant land based agencies so as to provide for effective management of the impact of onshore development and land based infrastructure. I think it's accepted that all the water that's on the land (all the chemicals) ends up in the sea. Our findings from several consultants, a lot of industry consultation and a lot of consultation with natural resource management is that a combined and sustained intergovernmental and community approach is required. So I'm really pleased to see that representatives from all the different groups that effect this are here today.

The recommendations that came from that task were that the marine tourism industry will need to continue to be able to state its case to influence the agricultural and scientific developers and government departments to ensure commitment and resources are directed to help those people upstream of us who can impact on the marine environment, and to find workable solutions which allow economics and environment to coexist. I was a farmer many years ago. I am not going to change things on my farm unless in the long term it's beneficial. That's something that's been pointed out today. At the end of the day I can pay my tax, I can pay my bills every month. We've got to have a solution that is economically viable for those people who we are trying get to change their practices.

In the invitation to attend this speaker-based conference, it said in no uncertain terms to stick to the guidelines. I've spoken of marine tourism interests and issues in protecting the wetlands.

Protection of wetlands adjacent to the Great Barrier Reef

As to the future commitment and willingness of the marine tourism industry to cooperate with other interests, please take as a given that the steering committee that employs me is made up of the largest operators through to the smallest operators in north Queensland, and the fact that we have three executive officers from the marine tourism industry statewide, two of the heads of regional associations in marine tourism industry are here today. This is crucial to what we do. We believe that a combined approach between those who make their livelihood around the wetlands, those who are tasked with the management of natural resources, the local community are going to produce a sustainable outcome.

The Ecological Benefits of Wetland Protection

E. Hegerl

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I've had the opportunity to observe for a rather long period that one of the real problems we have in marine conservation in Australia is that people become very accustomed to what's in their backyard. Often you start thinking that because what you see everyday around you is so common that that's the way the whole world is. In the summer of 1980 at Caringal anchorage, after a hard day of mangrove work I was thinking it would be really nice to start dinner and stuck my head out of the cabin and said 'Oh that's a nice sunset' so I took this photo and I thought 'Oh there are a lot of birds today', so I got up and took the binoculars and wrote down Caringal sand bank No. 1: 6500 eastern curlews; 6000 bar-tailed godwitt. A year later I had a visitor who was producing his first book in Australia, summarising what we know about these migratory wading birds that fly to Australia from the Northern Hemisphere. When he asked if we had any waders in Moreton Bay, I said 'Yeah, waders are common in Moreton Bay. Let me show you this photo I took', and I pulled out my notebook and photo and showed him that. His response was 'Do you realise that that site you were looking at and thought that they were so common and unimportant, is the single, roosting site in eastern Australia for migratory wading birds. It is also the single most important site, for a larger number of Eastern Curlews are roosting on that bank than at any other site in Australia, and in addition to that what you saw that day was one-third of the world's population of Eastern Curlews'. That day I became aware that you really have to look at what's in your backyard and see if it is something special. We really think quite frequently that it isn't.

I have became involved with inter-tidal wetlands studies quite inadvertently. I started the society for people interested in marine conservation. The first members were mostly a bunch of Oueensland university biologists and CSIRO buffs who were all working on the Great Barrier Reef and we were interested in coral reefs and fish. Local community groups, fishing clubs, progress associations kept coming to us and saying 'Hey all these mangrove areas are being destroyed, because of these State Housing developments in south-east Queensland, and all the mangroves are going, so can you tell us if they're important?' There were no other studies of mangroves in Australia; nothing was known about our mangroves. So we put together a group and decided to learn about mangrove ecology. There was a lot of activity going on at that time to produce interest and concern - people living on waterways, a lot of industrial development involving filling in of mangrove areas. We had a lot of mangrove destruction for industry, for airport sites, for port development and for playing fields and particularly for garbage dumps and sewage treatment plants. Virtually all the coastal cities had sewage treatment plants. So we were given the opportunity to study tidal wetlands right along the eastern Australian coastline. We did resource inventory studies at more than 50 sites between Port Phillip Bay in Victoria and the Daintree River. Often we'd work with fishing clubs and conservation groups locally to survey the mangroves. As a result we had a team of about a dozen people who were developing a lot of expertise in identifying the plants and animals in mangroves. Due to these resource surveys and understanding what the threats were, to tidal wetlands, the Australian National Parks Service asked us to do a three-year baseline survey of the Kakadu National Park, where there are hundreds of square kilometres of tidal wetlands. That was particularly interesting because the north is so different from the east coast. The only large wet mangrove forests outside the wet tropics in Cape York are in the Kakadu flood plains where you have forests 30 kilometres long.

Solutions for marine conservation issues, like the problems of shipping, fisheries on the high seas, pollution control, will only come at the international level. So we were going to international meetings and in particular the real conservation union, the IUCN, the global forum where governments and non-government organisations, and other national and

Protection of wetlands adjacent to the Great Barrier Reef

international organisations, get together to discuss the world's environmental problems. A lot of the environmental treaties have come out of these sort of IUCN relations. I was fortunate that at those meetings they were looking for someone to head up a team that would look at the global status of the world's mangrove forest and produce a document on what the threats to mangrove forests were. Over a period of about three years, I was invited to a lot of countries, mainly in South East Asia, and was chairing a group of about 15 people who had a very broad knowledge of the world's mangroves. They had worked in just about every country with mangroves and there are over a hundred countries around the world in the tropics that have mangrove forests. We produced a report of the global status in which we revealed – and we were not totally aware of it until we got all the information together – that really the world's mangroves are under the same degree of threat and for many of the same reasons, as the world's tropical rainforests. They are logged heavily, primarily for woodchip and also for timber products and a great variety of uses like charcoal production. Basically most of the world's mangrove forests are being degraded at a very rapid rate. There are wood chipping operations in Sabah [in Malaysia] and you have them throughout Indonesia and in many other countries. However, it is ironic that while governments have pushed these big mangrove destruction or woodchipping projects they create far less employment for the local communities and in fact they destroy the livelihoods of so many of the people in developing countries who are totally dependent, either as subsistence labour for a commercial fishery or for harvesting produce of the mangroves. In particular in South East Asia, you have extreme poverty that's resulting in many of the coastal communities who no longer have these resources.

Around Australia we have very extensive mangrove forests. Australia also has very extensive tidal marshes, salt marshes; very hypersaline areas where the tides comes in and because of heat and evaporation, leaves a lot of salt behind and it becomes too salty for mangrove forests. So there are very extensive areas of salt marshes, in fact more salt marshes than there are mangrove forests. And at a lower level on that tidal slope, where it has been more regularly inundated, you get mangrove forests developing. The other part of tidal wetlands that are an equally important part of the whole system are these tidal flats – they can be sand flats, they can be mud flats and sometime they have seagrass beds. Only in the wet tropics of Australia, do we have a totally different situation. We don't have salt marshes, what we have are wall-towall mangrove forests because you either have the mangroves going right up and merging with the rainforests or with the Melaleuca forests, or sometimes you have sedge moss in between, feeding fresh water into the mangrove forest. In terms of area, Australia is the third wealthiest country in the world in mangroves, despite our efforts in destroying them. Only Indonesia and Brazil have more mangroves. We have about one-sixteenth of the world's resources, about 1100 square kilometres; and Queensland's got the good ones - we have more than anyone else. The Northern Territory doesn't do too badly either. At the rate they are being destroyed in other countries, particularly in Indonesia, before long we will be number one, if we preserve our mangroves. Queensland mangrove forests are very extensive but they are at their tallest in the Wet Tropics because of the high rainfall and the freshwater floods. The only other place we've got those tall mangroves is around Kakadu. What you have here in Queensland is really quite unique, it's very different from Kakadu. As you go north along the east Australian coastline you get more and more mangrove species, so throughout the Wet Tropics we get from about 24 to 36 species up the top and in the Cape York there are actually a few more. But mangroves are at their best in the world's tropics, particularly where there is a lot of water.

Mangrove forests, because they are wet, are pretty productive places. What you have are plants that produce a lot of leaves, fruit, twigs and branches and they produce them very fast and then they drop down and are carried out to the tidal flats. Sometimes they stay in the mangrove areas, sometimes the leaves are carried offshore. This is one of the ways the system is important and I'll show you another one later – how mangrove leaves become really important to fish.

The leaves are broken down by bacteria and protozoa and fungi and if you get a really wellrotted mangrove leaf, it has a sort of slimy feel to it. They're all the goodies and a lot of those organisms that do the breaking down are the basis of the food web for a lot of our prawns and other organisms. Those leaf particles are broken down into smaller and smaller bits, they can go through the gut of one animal and come out the other end and may be consumed by another animal. The smaller animals are eaten by bigger animals and we have a food web in which our commercially and recreationally important fish, crab and prawn stocks are substantially mangrove dependent, or tidal wetland dependent, because in many cases, like tiger prawns, they rely on seagrass species.

Now in the wet tropics there are big mangroves and it is interesting if you look for the one example where you don't have a high freshwater flow in the 120 tidal wetlands in the wet tropics. At Trinity Inlet the mangroves are not as big, the reason being that even though you've got a good rainfall there it doesn't have a high freshwater flow. It only ever has a few little streams running into a big basin and it's got a lot of mangroves, but the biggest mangroves you get are barely over 20 metres. A lot of the mangroves here in the wet tropics are 20–35 metres and that is a result of high freshwater flows in through the mangrove areas. When people down south, from Victoria and Sydney see north Queensland mangroves they say, 'Wow, that's a mangrove?', because they don't have the mangroves like we do in their backyard.

In our studies of mangroves, we've found numerous species. The very first I ever heard about Australian mangroves was in a lecture by a Sydney Professor of Zoology, who didn't like mosquitos and sandflies and kept out of mangroves. It was about 1965 and he said very emphatically that mangroves are very depauperate places; they are so hot and stressful that they don't support any fauna and if you read the consulting reports through this time most of the environmental consultants of Australia would say he must have been right as there are hardly any fauna. There is a species list of about 10 animals. I suggest to you that the reason for that is that they simply can't find them and they can't identify them. A lot of the fauna in mangrove forests are hard to see, can move pretty fast, live down holes. They live down crab holes; you get fish in crab holes, you get worms in crab holes, you get molluscs in crab holes, you get all sorts of things in crab holes. A lot is under the surface and unless you dig and sieve you don't find them. It takes time and it's hard work, you get muddy, you wreck your white shoes. Another part of the fauna in mangrove forests is log fauna which lives inside the rotting logs. The mangrove tree falls over, everyone says 'Hey feed time, let's get into it'. You'll find an enormous variety of species inside rotting logs, breaking the logs down, helping to make that type of organic matter available to other organisms.

At Fraser Island in 1968 we kept finding mangroves with holes in them. We were doing surveys in the daytime and weren't finding what was causing the holes. So we started doing night-time surveys and found there are all sorts of animals we could see. They were up in the trees eating the mangrove leaves. There are crabs doing it. The crabs are shredders and they are really important. Not only do they pick up the leaves and take them down to their burrows and line their burrows with them, pack lunch for tomorrow and the day after, they shred the leaf and break particles up and that allows little fibres to get into the system and become food for prawns and crabs, fish, algae and protozoa that are breaking down those little blighters. They are really important in that whole food web. Not only are they important at this end where they are breaking up the leaves, but the faeces from the crab, the larvae of these things float around in the water and they are eaten by fish. Crabs are really important in the tidal wetlands system and they are major decomposers. There are all sorts of species and they climb around on the top of most branches. There are also a few other things; there are quite a few reptiles – geckos and skinks – that live in mangrove trees.

Another value of these tidal wetlands is that they really do support a lot of migratory wading birds that undertake transectorial migrations from the Northern Hemisphere. Some of them are

Protection of wetlands adjacent to the Great Barrier Reef

only as large as a 50 cent piece yet they fly up to 12 000 kilometres – sensibly they come to Australia to get away from the cold. While they are here they feed on the organisms, particularly on the sand flats and mud flats, sometimes amongst the mangroves. A few species will actually roost in mangrove trees but they are more often associated with the fringes of the mangroves than the mangroves themselves although the mangroves are an important source too. Another thing we have in the mangroves that really are of conservation significance are our raptors, our eagle-like birds. The white-bellied sea eagle, is a species which I believe is most vulnerable to human disturbance. If they're regularly disturbed in their nesting sites they seem to abandon them. Osprey and Brahminy kites are often very abundant in these tidal areas and dependent on the food but they are less vulnerable to human disturbance. We have been assessing the coastline to get some idea where they are and where they're going.

In May 1987 we mounted a fairly large survey, 10 people, two weeks. We carried out a study of the Murray River here, not the big Murray but the one you've got down the road north of Cardwell. It was a pretty intensive study – something like 140 person days of research. There are big mangroves in the Murray, 20–30 metre high forests which are very extensive due to the extremely high freshwater flow. There are also a lot of birds – in 1977–78 when we did the study, the brolgas were extremely abundant. There were lots of prawns in the marshes as well and they support barramundi. The barramundi spawn throughout the estuaries and their young move up, or the larvae move up, into the freshwater brackish areas. We did a lot of fish sampling, just big nets, we didn't have a beam trawl, but we sampled all the organisms on those tidal flats. Because we did the survey in May we don't have a clear perception of how important these tidal flats, which were at that time extremely rich in marine life, are to migratory birds. The Murray River was extremely rich in fish in 1978. Barramundi and huge mullet were extremely abundant. It is clearly a very important fish habitat with numerous species.

From Hull River right down to Meunga Creek at Cardwell there is more or less one continuous wetland. When it's all flooded, yes it is all joined up, but to say that we are just going to dump the water over the Tully and everything will be fine because it will stay a wetland is presumptuous – there is no proof the mangroves are going to survive; they need that flow down the Murray, if you want to keep the Murray River mangrove system.

Where we have mangrove forest with a dense, closed canopy, it is very similar to rainforest and in it you get a great many epiphytes on the mangrove trees. In the upstream areas, the mangrove forests merge with rainforests to produce a particular community which is quite rare, where you have some of the rainforest species merging with the mangroves. We have certain water here that is different to other areas of Australia and if you are trying to turn wetland areas into sugarcane, you suffer from the problem of acid sulphate soil. A good example is Cairns, Trinity Inlet – 1415 acres of mangrove forest was attempted to be turned into sugarcane field but because of the acid sulphate it didn't work. The result being that a lot of mangroves were lost for no purpose.

I have developed a tidal wetlands database of Queensland that has examples which illustrate that if mangroves are cut off from their freshwater supply source, they die, even though they may still be partly inundated. No re-colonisation occurs for a variety of reasons: mud lobsters form large burrows and the area is no longer properly inundated; ferns overgrow the areas and mangroves can't colonise. So don't think that if you destroy the mangrove forest in the Murray that you'll get much of it back. Another thing that happens by taking the main energy flow out of the system and diverting it somewhere else is that the mouth of the estuary can silt up, such as at the Shoalhaven River in New South Wales.

Throughout the world, the biggest impacts on mangrove forests are where they are being totally destroyed, filled in for another use. But the scale of individual impacts is interesting. We

are finding that mangroves are generally being destroyed, anywhere from 10 000 to half a million hectares of mangroves at a time. Diversion of freshwater from 1000 to 500 000 hectares – so diversion of freshwater is considered the second greatest threat to the world's wetlands, other than outrightly destroying them. It not only occurs from small-scale development but frequently it is on very large scales, like dams and things like that. So we know we can kill mangroves if you cut off the freshwater flow. You can talk about all the management plans in the world but unfortunately mangroves can't read and they will respond by dying.

Spatial and Temporal Distribution of Wetland and Riparian Zones and Opportunities for their Management in Catchments Adjacent to the Great Barrier Reef Marine Park

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Abstract

This paper reviews the role of riparian and wetland areas in ensuring ecosystem function and briefly assesses the status of riparian and wetland areas in catchments immediately adjacent to the Great Barrier Reef Marine Park. We also report in detail on the results of a study undertaken on the floodplain of the Herbert River catchment, that assessed both spatial and temporal changes in the area of riparian and wetland zones. We demonstrate that there has been significant reduction in the riparian and wetland area since European settlement and provide a range of measures to show that landscape diversity and quality have also declined. In response, we introduce and discuss a range of policy, planning and management options that can contribute to more sustainable resource management in coastal environments.

Introduction

The Great Barrier Reef Marine Park covers an area of approximately 350 000 km² and spans almost 2000 km of the east coast of Queensland. Fifteen catchment divisions, covering an area of approximately 375 000 km², drain directly into the Great Barrier Reef Marine Park (figure 1) (The Condition of River Catchments in Queensland: a broad overview of catchment management issues 1993). Since the mid-1980s, many coastal and catchment areas adjacent to the Great Barrier Reef Marine Park have experienced strong economic growth, underpinned predominantly by solid performance by their agricultural and tourist sectors (ABS 1995). While the long-term performance of these sectors will reflect the quality of their supporting natural resource base, current environmental trends suggest a decline in terrestrial and riverine systems, and on the adjacent marine environment (The Condition of River Catchments in Queensland: a broad overview of catchment management issues 1993; Arthington et al. 1997).

Many of the catchments adjoining the Great Barrier Reef Marine Park have been extensively cleared (Russell and Hales 1993; Sattler 1993) since European settlement. *Melaleuca* (paper-bark) wetlands once covered large areas of coastal floodplains which are now used for intensive agriculture (Tait 1994). Prior to clearing, these wetlands would have provided extensive buffer strips protecting coastal river systems, estuaries and shorelines. Clearing, notably for sugarcane cultivation, has left only remnants of this ecosystem (Russell et al. 1996). Riparian and wetland zones in many of these catchments are frequently narrow and sparsely vegetated and have been invaded by exotic weeds, particularly para grass (*Brachiaria mutica*) and *Hymenachne*, which suppress the process of natural revegetation (Johnson et al. 1997). It is likely that riparian and wetland zones in such poor condition have suffered a corresponding degradation of their intrinsic ecological values (Arthington et al. 1997).

The aim of this paper is first, to briefly outline the extent of change of riparian and wetland areas in catchments adjacent to the Great Barrier Reef Marine Park, and second to examine in detail, changes in space and time of riparian and wetland areas on the Herbert River floodplain. While the focus of the paper is not on impacts of these changes on terrestrial, riverine and marine environments per se, we discuss significant issues that are central to the maintenance and function of riverine and marine resources. In so doing, we hope that readers can make the obvious connection between land, water and marine resource management. We conclude by outlining both a broad policy and planning framework, and some simple management options, that provide



significant potential in addressing fundamental resource management challenges in the region.

Figure 1. Catchment areas draining into the Great Barrier Reef Marine Park

What Role for Riparian and Wetland Areas?

Riparian and wetland areas play an important role in maintaining the biological health of the aquatic and terrestrial ecosystems associated with watercourses (Raisin 1995). Wetlands, swamps,

Protection of Wetlands Adjacent to the Great Barrier Reef

billabongs and waterholes are important wildlife habitat areas and form an integral part of a hydrological regime. Changes to the hydrological regime of swamps and wetlands (e.g. drainage), alter both the habitat and the vegetation. Wetlands are important habitat for birds, amphibians and other wildlife. They are also important as nursery areas for several species of commercially important fish such as barramundi. Maintenance of these values is dependent upon annual flushing and recharge during wet season floods. Important ecological functions of riparian and wetland areas include (Bunn 1993; Campbell 1993; Catterall 1993; Cummins 1993):

- Assisting in maintaining bank stability. The roots of riparian plants bind stream bank materials and help to reduce slumping. This constrains the width of stream channels and may allow banks to become under-cut without collapsing, thus creating habitat for aquatic organisms (Bunn 1993). Clearing of riparian vegetation increases the chances of stream channels migrating (Barling and Moore 1994).
- Providing a filter strip to reduce sediment input into a watercourse. Riparian and wetland areas form a buffer between streams and surrounding systems which can filter nutrients, pesticides and suspended sediment in run-off water. The mechanisms of this filtering function are both physical and biological including deposition, vegetative uptake and conversion by micro-biological processes such as denitrification (Lowrance et al. 1984). In a similar manner, riparian and wetland areas can act as a sink for nutrients carried in solution via overland flow during floods. Clearing and draining riparian and wetland areas prevents water from being filtered as it enters stream systems or the marine environment.
- Creation of habitat for fish and other aquatic organisms. Riparian vegetation provides shade and reduces both light and heat reaching the stream (Arthington et al. 1997). Riparian shading also alters the wavelength of light reaching streams, filtering out much of the ultraviolet spectrum and favouring green in the visible spectrum. Water temperature increases in unshaded streams (Pearson and Penridge 1992), and this is frequently associated with a reduction in dissolved oxygen levels in the water and the progressive death of sensitive aquatic organisms. This can be particularly significant in north Queensland during the dry season when natural biological oxygen demand can be high (Arthington et al. 1997). An increase in water temperature at this time may eliminate some taxa from a stream (Pearson and Penridge 1992). In unshaded streams with dense growth of aquatic plants, trophic status may fluctuate between production and respiration depending on cloud cover; several overcast days in succession may result in anoxia in such streams (Bunn and Davies 1996; Bunn et al. 1997). Shade also renders fish less visible to predators such as birds and thus provides them with some protection (Koehn 1992). This may be especially important in streams with little structural in-stream cover. The deposition of leaf litter into the watercourse is a major component of the food chain. Riparian vegetation contributes woody debris which has an integral and often profound influence on stream morphology and ecological processes in most natural streams (O'Connor 1986). The surface of the wood also provides habitat for invertebrates (O'Connor 1991). This is particularly significant in large silty and sandy rivers where woody debris can be the major invertebrate habitat and is consequently also very important as feeding habitat and shelter for fish (Arthington et al. 1997).
- Provision of habitat for terrestrial birds, mammals, reptiles and amphibians and insects. Riparian and wetland areas may also act as critical refuges for the maintenance and replenishment of wildlife populations during times of drought or after fire (Catterall 1993). Riparian and wetland habitats provide important corridors for wildlife movement and dispersal, especially in catchments cleared for human use, where areas of riparian vegetation link bushland remnants (Catterall 1993). Remnant wetland habitats in the coastal lowlands of catchments, such as bulkuru sedge swamps in the Tully-Murray catchment, are important as nursery areas for silver barramundi (*Lates calcarifer*). Waterfowl species are also dependent upon these wetlands. Further clearing of riparian and wetland areas on the coastal lowlands should be examined carefully, considering the generally low agricultural suitability of these areas and their important functional and habitat roles. Tait (1994) suggested that these areas be

conserved and incorporated into farm drainage systems. In practice, however, there are few operational examples of such approaches.

 Benefits for agricultural systems. Benefits to agricultural production systems can also be gained from conserving and restoring riparian vegetation. Riparian zones, particularly riparian wetlands, play a key role in regulating the natural hydrological cycle, particularly in minimising flood peaks following heavy rainfall. They help reduce soil loss from bank erosion (Moss et al. 1996) and from run-off. Riparian areas also increase the abundance of beneficial insects in adjacent crops (Lowrance et al. 1985). Recent research has also clearly demonstrated that rat damage to sugarcane crops can be significantly minimised by establishing closed canopy vegetation in harbourage areas (riparian areas, drainage lines and hillsides). Shade trees impede grass and weed growth, providing a long-term solution to rat control (Tucker 1996; Brodie 1996).

Status of Riparian and Wetland Zones in Catchments Adjacent the Great Barrier Reef Marine Park

The status of riparian and wetland areas in catchments adjacent to the Great Barrier Reef Marine Park has been reviewed by a number of authors (e.g. Arthington and Hegerl 1988; The Condition of River Catchments in Queensland: a broad overview of catchment management issues 1993; Blackman et al. 1996). Accounts of these areas have increasingly confirmed their outstanding biological richness, diversity, geographical extent, and importance as habitat for a similarly rich and diverse biota. Of the 19 Queensland wetlands identified as having national importance (Blackman et al. 1996), 8 are located in areas immediately adjacent to or within the Great Barrier Reef Marine Park. Tables 1 and 2 provide summary information on the catchment areas that drain into the Great Barrier Reef Marine Park and include an overview of the dominant tenure, land use and disturbance patterns for wetland and riparian areas.

Table 1. Estimated extent of coastal wetland and riparian areas and their relative conservation	
significance in catchments adjacent the Great Barrier Reef Marine Park (Adapted from The	
Condition of River Catchments in Queensland: a broad overview of catchment management	nt
issues 1993; Blackman et al. 1996)	

Catchment	Catchment Area (km²)	Wetland Area (km²)	Significance
Curtis Coast	9 225	462	High
Fitzroy	142 645	1 329	High to Very High
Shoalwater Bay–Sarina	11 270	4 127	Very High to High
Pioneer-O'Connell	3 925	263	High
Proserpine	2 485	214	High to Very High
Don	3 985	110	High
Burdekin–Haughton	133 510	1 494	Very High to High
Ross-Black	2 890	719	Very High to High
Herbert	12 130	499	Very High to High
TullyMurray	2 825	504	Very High to High
Johnstone	2 330	116	Very High to High
Mulgrave–Russell	2 020	124	Very High to High
Barron	2 175	10	High
Mossman–Daintree	2 615	61	Very High
North-east Cape	43 300	8 376	Very High to High

Wetland areas adjacent to the Great Barrier Reef Marine Park are only partially protected from development and specific protection is frequently restricted to the coastal fringe via the *Fisheries Act 1994* or Marine Parks legislation. In most cases, existing wetland areas are in a sound

85

Protection of Wetlands Adjacent to the Great Barrier Reef

condition, however most are also threatened by competing uses and many protected wetlands are impacted upon by activities in surrounding areas. Protection for riparian areas is very poor and is almost solely confined to National Parks or Reserves. Accordingly, with the exception of areas in the vicinity of Shoalwater Bay, Townsville and north-east Cape York, substantial losses of riparian and wetland areas have occurred since European settlement.

The principle causes for this decline have been: the development of intensive agriculture, mainly sugarcane and horticulture production from Sarina to the Daintree River; urban and industrial development in Mackay, Townsville and Cairns; and the introduction of grazing systems based on the use of improved and ponded pasture (particularly in the southern catchments). Of these, clearing of wetland and riparian areas for sugarcane production has had the most profound impact, particularly on areas from the Burdekin to Mossman.

On the Wet Tropical Coast (Rollingstone to the Daintree River), expansion of agricultural industries has seen widespread destruction of riparian and wetland areas. In the Johnstone River catchment, the area of wetlands has decreased by approximately 60% since 1951 (Russell and Hales 1996). The most significant losses have been of freshwater wetlands, particularly *Melaleuca* communities. *Melaleuca* forests, notably those to the south of the Johnstone estuary have been reduced by approximately 78%. There have also been significant reductions in other wetland categories, including a 64% reduction in palm and pandanus dominated wetlands and a 55% reduction in freshwater reed swamps. Freshwater wetlands to the north and west of the confluence of the North and South Johnstone Rivers have also almost entirely disappeared during this period. In contrast, the area of mangrove patterns has remained almost stable. Of the riparian areas assessed, 72% of the coastal lowland zones were in poor or very poor condition (Russell and Hales 1996).

In the Tully–Murray catchment, less than 20% of land systems with a high suitability for agricultural production remain under native vegetation (Tait 1994). Large areas of freshwater wetland have been lost or degraded by clearing, draining and exotic weed invasion. The fish habitat values of remnant floodplain wetlands have been severely reduced as a consequence of agricultural drainage. Riparian vegetation of the Tully–Murray catchment has also been degraded due to clearing, erosion and exotic weed invasion. Infestation of watercourses with para grass has resulted in the prevention of establishment of riparian vegetation and a severe reduction in the value of aquatic habitat (Tait 1994). Similar phenomena are manifest in the Herbert, Russell-Mulgrave, Barron and Mossman-Daintree catchments, and from increasing expansion in the extent of the Burdekin River Irrigation Area (Congdon and Lukacs 1995). Unless limitations to the continued expansion of agriculture are imposed, these trends are unlikely to alter.

Catchments in the north-east of Cape York have, in comparison to the Wet Tropical Coast, remained largely undisturbed (The Condition of River Catchments in Queensland: a broad overview of catchment management issues 1993). Cattle grazing, exotic weeds, feral animals and mining activities have all had some impact on riparian and wetland areas. It is likely that these areas will remain in a sound condition in the short to medium term. However, increasing pressure from tourism and mining pose a significant threat to the regions riparian and wetland resources. Mining and tourism also represent a threat in the Shoalwater Bay area, which remains in outstanding condition following many years of management by the Australian military (The Condition of River Catchments in Queensland: a broad overview of catchment management issues 1993; Blackman et al. 1996).

While the current extent of riparian and wetland resources is well documented, the extent of wetland loss since European settlement is in general, poorly understood in most catchments adjacent to the Great Barrier Reef Marine Park. In the sections that follow, we report on a study conducted in the Herbert catchment that quantifies the distribution of coastal riparian and wetland areas since European settlement.

Catchment	Dominant Tenure		Dominant Land Use		Significant Disturbance/Threats	
	On site*	Surrounds*	On site	Surrounds	Current	Potential
Curtis Coast	LH, FH, WR,	MP, NP, LH, FH,	Fishing, grazing,	Recreation, fishing, grazing,	Few – minor	Tourism, mining, urban
	NP, FHR, MP	ML	conservation, recreation	industrial		
Fitzroy	LH, FH, Cons,	FH, NP, LH, MP	Fishing, grazing, transport,	Grazing, urban, transport,	Grazing, dams,	Weeds, tourism, mining
	NP, H&M, MP		conservation	fishing	agriculture, weeds,	
Shoalwater Bay-	Milit, LH, FHR,	Milit, MP, NP,	Military, fishing, grazing,	Recreation, fishing, grazing,	Minor, weeds	Weeds, tourism, mining,
Sarina	ML, NP, MP	ML, LH, FH	conservation,	agriculture,		fishing
Pioneer-O'Connell	LH, FH, WR, NP	MP, NP, LH, FH	Fishing, conservation,	Agriculture, recreation,	Minor, some clearing	Clearing for agriculture
· ·			recreation	fishing, urban		
Proserpine	LH, FH, WR, NP	MP, NP, LH, FH	Grazing, conservation,	Grazing, conservation,	Minor, weeds	Agriculture
•			recreation	agriculture		
Don	LH, FH	LH, FH, MP	Grazing	Grazing	Few – minor	Tourism
Burdekin-	NP, LH, FH,	BRIA, MP, NP,	Fishing, grazing,	Grazing, agriculture,	Agriculture, BRIA,	Agriculture, BRIA,
Haughton	FHR, NP, MP	LH, FH	conservation, recreation	conservation	weeds, dams	weeds, dams
Ross-Black	LH, FH, WSR	FH, MP, NP, LH	Grazing, conservation,	Grazing, agriculture,	Weeds, water	Weeds, water extraction,
			agriculture	conservation	extraction	urban
o Herbert	LH, FH, WR,	LH, FH, NP, SF,	Conservation, agriculture,	Fishing, agriculture,	Agriculture, weeds,	Agriculture, weeds, run-
ĩ	NP, FHR	MP	recreation	conservation, recreation	run-off and drainage	off and drainage
Tully–Murray	FH, NP, FHR,	NP, FH, NP, MP	Conservation, agriculture	Agriculture, conservation,	Agriculture, weeds,	Agriculture, weeds, run-
	Cons, LH			recreation	run-off and drainage	off and drainage
Johnstone	FH, AP, NP, LH	NP, FH, LH, MP	Conservation, agriculture	Agriculture, conservation,	Agriculture, weeds,	Agriculture, weeds, run-
				recreation	run-off and drainage	off and drainage
Mulgrave-Russell	FH, NP, FHR,	NP, FH, LH, MP	Conservation, agriculture,	Agriculture, conservation,	Agriculture, weeds,	Agriculture, weeds, run-
	LH, H&M		tourism	recreation, tourism	run-off and drainage	off and drainage
Barron	FH, LH	FH, MP, NP, LH	Fishing, recreation,	Fishing, tourism, urban,	Agriculture, run-off,	Agriculture, run-off,
			tourism	industrial	drainage, urban	drainage, urban
Mossman-Daintree	NP, FH, LH	MP, NP, LH, FH	Conservation, fishing,	Conservation, agriculture,	Agriculture, weeds,	Agriculture, tourism,
			tourism, agriculture	tourism, recreation, urban	run-off, drainage	urban, weeds
North-east Cape	IT, ML, LH, MP,	IT, ML, LH, MP,	Traditional, grazing,	Traditional, grazing, fishing,	Weeds, terals, mining,	Weeds, ferals, mining,
	FHR. NP	FHR. NP	conservation, mining	conservation, mining	tourism	tourism

Table 2. Tenure, land use and disturbance profiles for wetlands in catchments adjacent to the Great Barrier Reef Marine Park (Adapted from Blackman et al. 1996)

*LH – Leasehold, FH- Freehold, WR – Water Reserve, NP – National Park, FHR – Fish Habitat Reserve, MP – Marine Park, Cons – Conservation Tenure, H&M – Harbours and Marine, Milit – Military Use, SF – State Forest, AP – Commonwealth Action Pending, ML – Mining Lease, IT – Indigenous Peoples Tenure, BRIA – Burdekin River Irrigation Area

Spatial and Temporal Distribution of Riparian and Wetland Zones in the Herbert River Catchment

The Herbert River Catchment drains an area of approximately 10 000 km² to the Coral Sea and is the largest of the river systems located in Australia's sub-humid to humid tropical north east (lat. 15–19°S, long. 145–146°E) (figure 2). Large areas of the catchment remain under natural vegetation, although approximately 35 to 40% of the coastal lowland area has been cleared for crop production or improved pastures. Agricultural and pastoral activities are the largest users of land (in area) in the catchment. The catchment has two major population centres and a population of approximately 18 000 (1993 Census), of which 75% are located in the lower catchment.

Methods

Land cover of the lower Herbert River catchment was mapped from aerial photography acquired in 1943, 1961, 1970, 1977, 1988, 1992, 1993, 1994 and 1995. SPOT Panchromatic and MSS imagery were used to map land cover in 1996. Land cover boundaries were mapped onto a geo-referenced digital base. Classification drew heavily on previous vegetation (Tracey 1982; Perry 1995) and soil surveys (Wilson and Baker 1990; Heiner and Grundy 1994) in the region. Wetland areas were classified using the method of Blackman et al. (1992). Ground truthing of mapping units and mapped boundaries was conducted by vehicle and foot traverses. Classification of units and boundaries not inspected was undertaken by extrapolation from equivalent photographic units.

In addition to mapping observed land cover, an estimate of land cover prior to European settlement (early 1860s) was derived from observed relationships between remaining stands of native vegetation and the known distribution of soils, topography, relief, hydrology and rainfall. Although mapping was conducted for the entire Herbert catchment, this paper only reports on land cover on the coastal lowlands below an elevation of 13 m AHD (Australian Height Datum) i.e. the zone of seasonal inundation with direct influence on coastal wetlands and the adjacent marine environment.

A time series was developed to elucidate spatial and temporal change in land cover, with a focus on measurement of interaction within riparian and wetland areas. An analysis of floodplain landscape pattern, emphasising the dynamics of riparian and wetland areas. Tables 3 and 4 detail mathematically the analyses performed and figure 3 illustrates the derivation of 2 key spatial parameters. The usefulness of these measures and indices is as follows:

- Edge:area ratio quantifies the amount of irregularity in the shape of remnant stands of vegetation;
- The forest island dissection index, DI, compares the amount by which any one island is more dissected than another and, therefore, would have a greater edge to interior. Any index greater than 1 is a measure of such irregularity in comparison to an index of 1, which is circular in shape.
- Since 'edge effect' can influence vegetation composition and structure, total edge was calculated from individual edges measured for each island. The landscape dissection index (DL) measures the edge:area ratio and is cumulative for the entire landscape in which the island exists;
- The island distribution index (IDI) measures aggregation and is similar in logic to the nearest neighbour statistic. IDI emphasises the pattern of islands in the landscape. IDI = 1 in a randomly distributed population, < 1 in an aggregated population and approaches uniformity if the value is close to 2.1491, where islands would have maximum spacing, in which case they are regularly distributed in a hexagonal pattern;
- Diversity and Evenness indices compare changes in richness and landscape apportionment;
- Number and density of islands, and cover class as a % of total area, measure landscape pattern.



Figure 2. Location of the study area in the Herbert River catchment

- **Table 3.** Measurements and indices used to describe spatial patterns in riparian and wetlandszones in the Herbert River floodplain (adapted from Moss and Davis 1994; Medley et al.
 - 1995)

Description of individual riparian areas and wetlands

- Measurement of area (*a*) and measurement of edge (*p*)
- Edge-to-area ratio using island dissection index (DI)

Description of interactions between riparian and wetland areas

- Mean, median size of riparian areas and wetlands
- Nearest neighbour centroid-to-centroid distance r_c

Description of floodplain landscape pattern

- Landscape dissection index (DL) and distribution index (IDI) for land cover types
- Frequency of number of wetland and riparian areas
- Diversity and Evenness Indices to compare changes in richness and floodplain apportionment

Table 4. Equations used in quantifying landscape pattern and spatial relationships for land cover/use

Forest island dissection index

$$\mathrm{DI} = \frac{p}{\left(2\sqrt{\pi \ a}\right)}$$

(Equation 1)

(Equation 2)

(Equation 3)

where DI = forest island dissection index

p = island perimeter (metres)

a =total area of the forest island (ha)

a = island area (ha)

where DL = landscape dissection *p* = total perimeter (metres) (Source: Sharpe et al. 1981: 111)

Landscape dissection index

$$DL = \sum_{i=1}^{n} \frac{p}{\left(2\sqrt{\pi}\sum_{i=1}^{n}a\right)}$$

(Source: Sharpe et al. 1981: 111)

Island distribution index

 $IDI = 2\overline{r_c} (\lambda \pi)$

where IDI = island distribution index

 r_c = mean centroid-to-centroid distance from a forest island to its nearest neighbour (Fig.3) λ = density of forest islands (number per ha)

(Source: Bowen and Burgess 1981)

Shannon-Wiener Diversity Index

$H' = -\Sigma P_i \ln P_i$ (Equation 4) where P_i represents the proportion of total area in category *i* of each land cover/use type (*Source*: Medley et al. 1995)

Evenness Index $E = H' / \ln s$ where s = total number of land cover/use categories

(Equation 5)

(Source: Medley et al. 1995)



Figure 3. Diagrammatic representation of spatial parameters used in the derivation of landscape indices and measurements (Adapted from Moss and Davis 1994)

Results and Discussion

Description of Riparian and Wetland Areas

Figure 4 shows changes in space and time of key land cover classes on the lower Herbert floodplain since European settlement. It can be seen that prior to settlement, the area was dominated by grassland, lowland rainforest, mangrove and *Melaleuca* communities. However, by the 1940s significant losses of riparian (i.e. rainforest patterns) and wetland (i.e. *Melaleuca* dominated patterns; open water) areas had occurred and much of the native grassland had been converted either to grazing or sugarcane. Land cover remained relatively stable throughout the 1960s and early 1970s, however the period between 1977 and 1996 saw a rapid expansion in the area of sugarcane. The consequences of this expansion have resulted in a 60% decrease in the area of *Melaleuca* dominated patterns (40% decrease between 1943 and 1996) and a 50% decrease in the area of mangrove communities has remained relatively stable since 1943, while the area of sugarcane has increased by more than 30% between 1943 and 1996.





Protection of Wetlands Adjacent to the Great Barrier Reef

Figure 5 shows changes in the island dissection index (DI), an index of the ratio of edge:area for land cover units. DI for wetland and mangrove areas decreased (i.e. > area:edge) in the period between first European settlement and 1943 and remained relatively stable between 1943 and 1996. In contrast, DI for riparian areas increased (i.e. > edge:area) with time, indicating that riparian areas were increasingly becoming longer and thinner.



Figure 5. Mean and standard deviation of island dissection index (DI) for key land cover classes with time

Description of Floodplain Landscape Pattern

Data at this level showed that although the number of riparian and wetland islands remained relatively constant since European settlement (figure 6), mean island size for both land cover classes decreased significantly. Mean island size for riparian islands decreased from 128 ha presettlement to 28 ha in 1942 and 24 ha in 1996. Similarly, mean *Melaleuca* island size decreased from 135 ha pre-settlement to 82 ha in 1943, 46 ha in 1977 and 22 ha in 1996.



Figure 6. Changes in the number of islands for key land cover classes with time

Island Dissection indices (IDI) for riparian and wetland areas (figure 7) remain unchanged from pre-settlement to the 1970s, but decrease gradually after this, indicating a pattern of island aggregation. One might conclude this to be contradictory to previous results presented, however it is not unexpected given that in an ever increasing 'sea' of agricultural land, remnant areas tend to

occur as clusters. They appear aggregated or clumped, when land cover over the entire floodplain is considered, although as previously discussed, the mean size of each cluster is also decreasing. Similar results were also obtained from the Landscape Dissection Index (figure 8). The patterns observed in the IDI are supported by results obtained for measures of Diversity and Evenness, where a decline has occurred as the area of sugarcane has increased and the floodplain became less evenly apportioned (figure 9).



Figure 7. Changes in the Island Dissection Index Melaleuca and rainforest dominated patterns



Figure 8. Changes in Landscape Dissection Index (DL) with time

Given the results presented here, it is clear that unless a change in current land management practices occurs, then the area of riparian and wetland zones on the Herbert River floodplain will be reduced to a very low level. However, it could be argued that the individual area of remnant stands of riparian and wetland vegetation are already less than is required to perform as an effective and functional biological unit. Indeed, it could be argued that rehabilitation and restoration activities are required.



Protection of Wetlands Adjacent to the Great Barrier Reef

Figure 9. Measures of diversity and evenness for land cover on the Herbert River floodplain

In this paper we have made no attempt to evaluate the habitat status of remaining riparian and wetland areas on the floodplain. Results from the recent 'State of the Rivers' analysis conducted by Moller (1996) show that the condition of remaining riparian vegetation was poor to very poor and the condition of wetland habitat moderate to poor. The trends observed on the Herbert River floodplain are not unique. Similar trends are apparent in the Tully–Murray (Tait 1994), Johnstone (Russell and Hales 1996), Russell–Mulgrave, Mossman–Daintree and, to a lesser extent, Burdekin–Haughton catchments. In the section that follows we attempt to introduce and discuss a range of policy, planning and management options that can contribute to the sustainable use of floodplain resources.

Opportunities for Improvement in the Management of Wetland and Riparian Zones

In detailing the opportunities for improving natural resource management in catchment areas adjacent to the Great Barrier Reef Marine Park, it is instructive in the first instance to provide a broader framework for future development. In so doing it is possible to draw heavily from the landmark work of Young et al. (1996) and place it in the context of the riparian and wetland management.

In terms of a broad policy framework, we believe that it is incumbent on industry, government and the broader community to work towards ensuring that the following objectives are fulfilled:

- Riparian and wetland management in coastal regions is undertaken as a fundamental part of and necessary precondition for ecologically sustainable development and the implementation of the precautionary principle.
- Responsibility for riparian and wetland management is shared between government, community and industry in a transparent manner.
- Appropriate incentives are put in place to encourage the protection of riparian and wetland areas and to encourage their use only in ways which are ecologically sustainable.
- Appropriate mixes of incentives are developed and appropriate weighting given to motivational, voluntary, property-right, price-based, and regulatory instruments in ways which are context sensitive and responsive to local, regional and social characteristics.
- The Australian community as a whole as well as users and beneficiaries of riparian and wetland areas contribute towards the provision of incentives to industry (particularly the

sugar industry in the context of coastal Queensland), whose primary responsibility is for the protection of the environment.

For this framework to be implemented, it is essential that governments at all levels develop the necessary supporting institutional capacity. Accordingly, governments at all levels must develop structures that empower local communities and industries to protect and manage riparian zones and wetlands and provide access to instruments necessary for their operation. Conversely, governments must address problems where local initiatives fail or are incomplete and importantly, must give consistent signals to resource users and consumers about the importance of riparian and wetland areas within the broader context of ecologically sustainable development.

In order to overcome some of these problems, we suggest that the appropriate boundaries for government decision making on riparian and wetlands management are bioregional. However, local government and industry, whose boundaries are rarely consistent with bioregional boundaries, have close and identifiable ties with the community, and provide an appropriate base for implementation. Hence, riparian and wetland management needs to be integrated into decision making at all levels of government, community and industry. Furthermore, stakeholders must be involved in the establishment (where they don't already exist) and operation of relevant decision making and advisory bodies (e.g. ICM). Improved participation of local government in the cane assignment process is also necessary. This should be done through the appointment of a local government representative(s) to Local Assignment Boards (to be known as Cane Production Boards).

Stakeholders, particularly canegrowers, also have a responsibility to ensure that their own internal processes allow real opportunities for the involvement of those at a 'grassroots level'. There is potential for self-interest and local needs to dominate important resource management issues. Conflict within decision-making fora represents a major potential threat to improved practice. Visible monitoring and accountability mechanisms are therefore essential pre-requisites for increased community and industry involvement, as are the development of appropriate and effective conflict resolution and facilitation processes. This is especially the case for the operation of the cane assignment system. We believe that it is more efficient to build on and adapt existing 'administrative and institutional structures, where possible, to address management of riparian and wetland areas rather than to create new structures. Suggested improvements in the assignment process include (Johnson et al. 1996; Shrubsole 1997):

- reviewing the present referral process for cane assignment;
- establishing and applying locally based conflict resolution mechanisms before requiring the formal involvement of the Queensland Sugar Corporation or Sugar Tribunal. These mechanisms should be codified in new sugar industry legislation;
- local Boards should provide for the earlier consideration of environmental factors in the cane
 assignment process through existing mechanisms such as 'Continuous Crushing Agreements'
 and corporate policies. In so doing, Local Boards can reduce the perceived need for preemptive clearing by adjusting the timing of the assignment process. In the Herbert River
 district, for example, this would see the announcement of awards in the February–March
 period.

Motivational and voluntary incentives

Incentives aimed at increasing levels of knowledge and understanding or requiring voluntary action, are premised on the belief that environmentally responsible behaviour is far more likely to result when people have a basic knowledge of the issues at stake, and/or a commitment to the principles of ESD (Young et al. 1996). Motivational and voluntary incentives encourage all stakeholders to share information and contribute to improved management. Motivational and voluntary incentives have already been used in coastal catchments adjacent to the Great Barrier Reef Marine Park, and include activities such as ICM and the Herbert Resource Information

Centre (Johnson and Walker 1996). Hence motivational incentives must be a core mechanism for improved riparian and wetland management. Two examples of a potential application would include:

- The identification of agreed wetland and riparian areas in coastal catchments to underpin negotiated agreements between landholders, government and the broader community on buffer setback widths. This activity would preferably be embedded and implemented within a broader catchment planning exercise undertaken as a partnership between government, industry and the community. In evaluating catchment resource use alternatives, stakeholders should consider existing and projected patterns in resource use and land tenure, supply and demand relationships for outputs produced, resource availability, regional and national economic indicators, environmental impacts, and community goals and expectations. Importantly, any catchment plan must include a bio-regional approach to habitat protection (Johnson and Cramb 1992; Tait 1994); and
- The establishment of voluntary conservation agreements between landholders and government under the *Nature Conservation Act* 1992.

For motivational and voluntary incentives to succeed, it is crucial that both the content of the information presented and the method of transferring information is appropriate and well targeted.

Property-right incentives

Two alternative types of property right incentives - covenants or management agreements, which cannot be separated from a specific resource, and those like licences to use water, which can be moved from one location to another (Young et al. 1996) – are relevant in this context. Management agreements can be used to reimburse people for the costs of resource management which are not able to be recovered through normal market mechanisms. An example would be to encourage canegrowers to undertake specified management activity on private land adjacent to public conservation reserves or wetlands.

Conservation covenants are particularly effective in protecting remnant vegetation or wetlands, and can be use to underpin approaches such as management agreements. The use of conservation covenants can also be linked to other incentives, for example, the local government rating systems (for rate relief purposes), to recognise the value of uncleared land. They have direct applicability to the Burdekin, Herbert and Tully–Murray catchments. Licence and permit systems are used where there is a need to link riparian and wetland management with an economic activity, for example, pollution permits and land clearing. In the design of licence systems, there is a need to place emphasis on the dependability of the licence to protect riparian and wetland areas in an efficient and equitable manner. Central to this must be the establishment of effective monitoring strategies that not only assess specific activities (e.g. cane assignment) but also general environmental performance.

Mechanisms are required which place more responsibility on developers and the sugar industry for determining the nature and extent of the serious environmental problems (e.g. acid sulphate soils) before review of an individual application. This may include developing and applying environmental impact assessment screening mechanisms that identify applicants who must more adequately consider farm management and environmental issues with the submission of their assignment applications (Shrubsole 1997).

Tradeable rights systems are frequently advocated by economists, but generally have a poor track record (Nelson 1977). The benefit of transferable property rights are more apparent in areas where equivalent units (e.g. water) can be traded than where units traded may not necessarily be equivalent (e.g. wetland preservation schemes). Tradeable rights have a role but should never be

seen as the sole solution. In virtually all cases, they need to be supported by an appropriate network of regulatory, financial and institutional measures (Young et al. 1996).

Regulatory incentives

Despite advocating motivational, social and market based incentives, there remains an important role for regulation, because acting alone, non-regulatory instruments are not always effective (Napier 1994). Regulations provide precautionary standards and an essential safety net to protect against the recalcitrant few not persuaded by other incentives. Each level of government needs to set such standards and no level of government should be able to undermine the standard set by another level of government, by a community or by industry itself. It is crucial that industry and the community be given the opportunity to contribute to the development of standards. As regulatory incentives provide protection against those who do not respond to other measure, they are particularly important when threats to riparian and wetland areas are likely to become irreversible, for example, in the case of land clearance on coastal floodplains.

Although some protection of riparian and wetland areas is currently afforded by planning controls embedded within the *Nature Conservation Act* 1992, *Coastal Protection* and *Management Act* 1995, *Fisheries Act* 1994 and *Local Government (Planning and Environment) Act* 1992, problems exist in areas subject to the provisions of the *Water Resources Act* 1989 or on land with freehold tenure. An increasing regulatory role for Local Government (e.g. through the invocation of planning controls if consent is required for subdivision, zone change and drainage development) provides some opportunity for improved riparian and wetland management. Some of these issues are presently being addressed in the draft planning schemes of Hinchinbrook, Cardwell and Johnstone Shires. However, for improved management to occur, greater integration between local and state government, industry and the community must be a priority.

Financial Considerations

A fundamental consideration in the development and implementation of any policy or instrument mix is both the private and public cost implications. The cost of controlling and preventing damaging processes in coastal areas should be borne primarily by those who cause these problems. However, the Australian community as a whole should take financial responsibility for protecting the natural environment when the costs of doing so cannot be recovered by the use of market mechanisms. Hence, all those who benefit from non-market dimensions of protecting the natural environment, whether directly and indirectly, should contribute to the cost of its maintenance (Young et al. 1996).

The tax system is an important area for reform, particularly when taxation incentives are recognised to be the most cost effective means of encouraging altruistic investments in resource conservation by the private sector (Davenport 1995). Another method of ensuring that users pay, is the imposition of levies and charges. These have the additional benefit of making users of riparian and wetland areas aware of the cost of their activities (Young et al. 1996). Acceptance of such levies is likely to be improved if the funds raised are clearly seen to be working towards resource management and protection, preferably by being placed in resource management funds administered by the local community. Opportunities also exist for the implementation of financial incentives for retention and management of high value habitat areas dedicated as Nature Refuges or Coordinated Conservation Areas. Finally, government acquisition of riparian and wetlands of regional, national and international importance remains as an option.

Conclusions

It is difficult to judge the rate at which the first settlers on the Herbert River floodplain cleared the native vegetation and thus began to fragment riparian and wetland areas. However, in summary, the evidence presented in this paper clearly demonstrates the following:

Protection of Wetlands Adjacent to the Great Barrier Reef

- a rapid decline in the area of riparian and wetland zones;
- a 60% decrease in the area of *Melaleuca* dominated patterns (including a 40% decrease since 1943);
- a 50% decrease in rainforest patterns;
- riparian areas becoming narrower;
- while the number of riparian and wetland islands remained constant, mean island area decreased significantly;
- aggregation of islands on the floodplain occurring since 1943;
- a significant decline in Diversity and Evenness measures; and
- a more uniform/less diverse landscape now exists when compared with historical patterns. These trends measured in the Herbert are not unique and are manifest in most catchments adjacent to the Great Barrier Reef Marine Park. In response to these trends we proposed a range of policy, planning and management options that can contribute to improved resource management.

It is clear that policy environment for natural resource management in coastal areas will continue to respond to changing political, economic, social and environmental considerations. While the manner in which riparian and wetland resources are managed will vary, public expectations for, and support of, effective management policies will remain. In this regard, the principles for ESD will likely form a general basis for the development of new, and hopefully improved initiatives in riparian and wetland management. The general trend of shifting management responsibilities to lower levels of government is likely to continue, although the extent will be guided by overriding state and federal government policies.

In this paper we have demonstrated that concerns relating to the decline in riparian and wetland resources in catchments adjacent to the Great Barrier Reef Marine Park are justified and requiring of further attention. Given that agricultural industries in these areas are, like most other Australian agricultural industries, operating in the context of an ever-increasing community expectation for the preservation of riparian and wetland areas, conflict over the use of these scarce resources is likely to grow in the future.

We have demonstrated that the magnitude of the tasks facing stakeholders in catchments adjacent to the Great Barrier Reef Marine Park, in terms of the way in which they manage riparian and wetland areas in the future, remain substantial. Accordingly, the challenge for these stakeholders, but especially landholders, is to embrace, rather than resist the inevitable trend toward greater public intervention in its affairs. The challenge facing government is to provide a stable environment in which locally relevant decision-making can occur and which is supported with appropriate and viable monitoring, cost-sharing and regulatory arrangements. Stakeholders in the region have the rare opportunity to have a significant say in their future directions. Agricultural industries in particular, need to develop their own policies and activities to guide their future developments within a wider context. In so doing, they must recognise that external pressures will evolve with time; hence planning must be a continuous activity rather than a singular exercise. Further, all stakeholders in partnership together, must develop a strategic view on where and how natural resources will be used. This view will be need to be based on the best available technical information and will occur at a regional, catchment and local level.

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References

ABS 1995. Queensland Statistical Yearbook 1995. ABS, Brisbane.

- Arthington, A.H. and E.J. Hegerl 1988. The distribution, conservation status and management problems of Queensland's athalassic and tidal wetlands, pp. 59–85, *In* A.J. McComb and P.S. Lake (eds). The Conservation of Australia's Wetlands. Surrey Beatty and Sons.
- Arthington, A.H., J.C. Marshall, G.E. Rayment, H.M. Hunter and S.E. Bunn 1997. Potential impact of sugarcane production on riparian and freshwater environments, pp. 381-402, *In* B.A.
 Keating and J.R. Wilson (eds). Intensive Sugarcane Production: Meeting the Challenges Beyond 2000. CAB International, Wallingford, UK.
- Barling, R.D. and I.D. Moore 1994. Role of buffer strips in management of waterway pollution a review. Environmental Management 18: 543–558.
- Blackman, J.G., A.V. Spain and L.A. Whitely 1992. Provisional Handbook for the Classification and Field Assessment of Queensland Wetlands and Deep Water Habitats. Queensland Department of Environment, Townsville.
- Blackman, J.G, T.W. Perry, G.I. Ford, S.A. Craven, S.J. Gardiner and R.J. DeLai 1996. A Directory of Important Wetlands in Australia, Section 1: Queensland. Australian Nature Conservation Agency, Canberra.
- Bowen, G.W. and R.L. Burgess 1981. Quantitative analysis of forest island pattern in selected Ohio landscapes. Oak Ridge National Laboratory. Environmental Science Division Publication No. 1719. Oak Ridge, Tennessee.
- Brodie, A. 1996. Trees for rat control, pp. 55-56, In K. Johnson (ed.). Management of Riparian Lands in the Wet Tropics Region: Integrating Policy and Research with Stakeholder Needs. Proceedings of a Workshop, Innisfail 1 June 1996. Johnstone River Catchment Management Association.
- Bunn, S.E. 1993. Riparian-stream linkages: Research needs for the protection of in-stream values. Australian Biologist 6: 46–51.
- Bunn, S.E. and P.M. Davies 1996. The influence of riparian vegetation on stream ecosystem health in the Wet Tropics, pp. 38-42, *In* K. Johnson (ed.). Management of Riparian Lands in the Wet Tropics Region: Integrating Policy and Research with Stakeholder Needs. Proceedings of a Workshop, Innisfail 1 June 1996. Johnstone River Catchment Management Association.
- Bunn, S.E., P.M. Davies and D.M. Kellaway 1997. Contributions of sugar cane and invasive pasture grass to the aquatic food web of a tropical lowland stream. Marine and Freshwater Research 48: 173–179.
- Campbell, I.C. 1993. Riparian stream linkages: an Australian perspective on in-stream issues, pp. 21–30, In S.E. Bunn, B.J. Pusey and P. Price (eds). Ecology and Management of Riparian Zones in Australia. Land and Water Resources Research and Development Corporation Occasional Paper Series No. 05/93, Canberra, Australia.
- Catterall, C.P. 1993. The importance of riparian zones to terrestrial wildlife, pp. 41–52, *In* S.E. Bunn, B.J. Pusey and P. Price (eds). Ecology and Management of Riparian Zones in Australia. Land and Water Resources Research and Development Corporation Occasional Paper Series No. 05/93, Canberra, Australia.
- Congdon, R.A. and G.P. Lukacs 1995. Limnology and Classification of Tropical Floodplain Wetlands, with Particular Reference to the Effects of Irrigation Drainage, Part 1: Effects of Irrigation Drainage. James Cook University, Australian Centre for Tropical Freshwater Research Report No. 95/12, Townsville, Australia.
- Cummins, K.W. 1993. Riparian stream linkages: In-stream issues, pp. 5-20, *In* S.E. Bunn, B.J. Pusey and P. Price (eds). Ecology and Management of Riparian Zones in Australia. Land and

Protection of Wetlands Adjacent to the Great Barrier Reef

Water Resources Research and Development Corporation Occasional Paper Series No 05/93, Canberra, Australia.

- Davenport, S. 1995. The role of income taxation in natural resources management. Review of Marketing and Agricultural Economics 63(1): 200–208.
- Heiner, I.J. and M.J. Grundy 1994. Land Resources of the Ravenshoe Mt Garnet Area North Queensland. Land Resources Bulletin QV94006. QDPI Land Use and Fisheries, Brisbane.
- Johnson, A.K.L. and R.A. Cramb 1992. An integrated approach to agricultural land evaluation, Report to the Land and Water Resources Research and Development Corporation on Developing Alternative Procedures in Land Evaluation. Volume 6: Implementation and application of the methodology. Department of Agriculture, University of Queensland, Brisbane.
- Johnson, A.K.L. and D.H. Walker 1996. Utilising GIS in the sugar industry: development of the Herbert Resource Information Centre, pp. 26-32, *In* Proceedings of the Australian Society of Sugar Cane Technologists, 1996 Conference. ASSCT, Brisbane.
- Johnson, A.K.L., D.A. Shrubsole and M.J. Merrin 1996. Integrated Catchment Management in northern Australia: from concept to implementation on the wet tropical coast of Queensland. Land Use Policy 13: 303–316.
- Johnson, A.K.L., G.T. McDonald, D.A. Shrubsole and D.H. Walker 1997. Sharing the land: the sugar industry as part of the wider landscape, pp. 361-380, *In* B.A. Keating and J.R. Wilson (eds). Intensive Sugarcane Production: Meeting the Challenges Beyond 2000. CAB International, Wallingford, UK.
- Koehn, J. 1992. Habitat: the essential component of fisheries management, pp. 5-20, *In* Freshwater Fisheries in Victoria: Today and Tomorrow Symposium, 11 Oct 1992, Melbourne. Victorian Department of Conservation and Natural Resources, Melbourne, Australia.
- Lowrance, R.R., R. Leonard and J. Sheridan 1985. Managing riparian ecosystems to control nonpoint pollution. Journal of Soil and Water Conservation 40: 87–91.
- Lowrance, R.R., R. Todd, J. Fail, O. Hendrickson, R. Leonard and L.E. Amussen 1984. Riparian forests as a nutrient filter in agricultural watersheds. Bioscience 34: 374–377.
- Medley, K.E., B.W. Okey, G.W. Barrett, M.F. Lucas and W.H. Renwick 1995. Landscape change with agricultural intensification in a rural watershed, southwestern Ohio, U.S.A. Landscape Ecology 10: 161–176.
- Moller, G. 1996. An Ecological and Physical Assessment of the Condition of Streams in the Herbert River Catchment. Queensland Department of Natural Resources, Brisbane.
- Moss, M.R. and L.S. Davis 1994. Measurement of spatial change in the forest component of the rural landscape of southern Ontario. Applied Geography 15: 214–231.
- Moss, A.J., J. Bennett, W. Poplawski, R. Shar and G. Moller 1996. Land use factors affecting the condition of rivers, estuaries and bays in southern Queensland, pp. 35-44, *In* H.M. Hunter, A.G. Eyles and G.E. Rayment (eds). Downstream Effects of Land Use. Department of Natural Resources, Brisbane, Australia.
- Napier, T.L. 1994. Regulatory Approaches for Soil and Water Conservation, pp. 189–202, In L.E. Swanson and F.B. Clearfield (eds). Agricultural Policy and the Environment: Iron Fist or Open Hand. Soil and Water Conservation Society, Ankeny, Iowa.
- Nelson, R.H. 1977. Zoning and Property Rights. MIT Press, Cambridge.
- O'Connor, N.A. 1986. Ecological role of wood in streams. Australian Society for Limnology Congress 25th, 9–12 May 1986, Lorne, Abstracts.
- O'Connor, N.A. 1991. The effects of habitat complexity on the macro-invertebrates colonising wood substrates in a lowland stream. Oecologia 85: 504–512.

- Pearson, R.G. and L.K. Penridge 1992. An Ecological Survey of Selected Rivers in Queensland with Particular Reference to the Effects of Sugar Mill Effluents. Report No. 92/02. Australian Centre for Tropical Freshwater Research, James Cook University, Townsville, Australia.
- Perry, T.W. 1995. Vegetation Patterns of the Herbert River Floodplain. Queensland Department of Primary Industries (unpublished), Townsville.
- Raisin, G. 1995. The use of small wetlands in catchment management for the control of diffuse agricultural pollution, pp. 245-254, *In* Proceedings, National Conference on Wetlands for Water Quality Control, James Cook University of North Queensland, 25–29 September 1995.
- Russell, D.J. and P.W. Hales 1996. Stream Habitat and Fisheries Resources of the Johnstone River Catchment. Northern Fisheries Centre, Department of Primary Industries, Cairns, Australia.
- Russell, D.J., P.W. Hales and S.A. Helmke 1996. Stream Habitat and Fish Resources in the Russell and Mulgrave Rivers Catchment. Queensland Department of Primary Industries, Northern Fisheries Centre Cairns, Information Series QI96008, Australia.
- Sattler, P.S. 1993. Riparian zone management in Queensland and the Northern Territory: policy and practice, pp. 157-171, *In* S.E. Bunn, B.J. Pusey and P. Price (eds). Ecology and Management of Riparian Zones in Australia. Land and Water Resources Research and Development Corporation Occasional Paper Series No. 05/93, Canberra, Australia.
- Sharpe, D.M., F.W. Stearns, R.L. Burgess and W.C. Johnson 1981. Spatio-temporal patterns of forest eco-systems in man dominated landscapes of the eastern United States, pp. 109-116, In S.P. Tjallingii and A.A. de Veer (eds). Perspectives in Landscape Ecology. Pudoc, Wageningen.
- Shrubsole, D.A. 1997. Assessing the Institutional Arrangements for Sugarcane Expansion and Environmental Management in the Herbert River District, Queensland, Australia. Report written for CSIRO as part of a Visiting Fellowship.
- Tait, J. 1994. Lowland Habitat Mapping and Management Recommendations: Tully–Murray catchments, Final Report. An ICM Initiative of the Queensland Department of Primary Industries, Cardwell Shire Catchment Coordinating Committee, Brisbane, Australia.
- The Condition of River Catchments in Queensland: a broad overview of catchment management issues 1993. Queensland Department of Primary Industries, Brisbane.
- Tracey, J. G. 1982 The Vegetation of the Humid Tropical Region of North Queensland. CSIRO, Australia.
- Tucker, N. 1996. Queensland Department of Environment and TREAT riparian rehabilitation projects – Johnstone catchment, pp. 54-55, *In* K. Johnson (ed.). Management of Riparian Lands in the Wet Tropics Region: Integrating Policy and Research with Stakeholder Needs. Proceedings of a Workshop, Innisfail 1 June 1996, Johnstone River Catchment Management Association.
- Wilson, P.R. and D.E. Baker 1990. Soils and agricultural land suitability of the Wet Tropical Coast of North Queensland: Ingham area. Land Resources Bulletin QV90001, Queensland Department of Primary Industries, Brisbane.
- Young, M.D., N. Gunningham, J. Elix, J. Lambert, B. Howard, P. Grabosky and E. McCrone 1996. Reimbursing the future: an evaluation of motivational, voluntary, price-based, propertyright and regulatory incentives for the conservation of biodiversity. Biodiversity Series Paper Number 9, Biodiversity Unit, Department of the Environment, Sport and Territories, Canberra.

Tourism Advisory Group and Wetlands

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Today I am wearing two hats. The first hat I'm wearing is that I chair an advisory group set up by the Great Barrier Reef Marine Park Authority to look at the best ways of handling marine tourism. We are an independent body. We are an allegiance to the Great Barrier Reef Marine Park Authority. We don't so much take direction from them as answer their questions; we will obey and supply what they want. We are an expertise based committee. Now that, in recent times, has got a bit of a bad name. We're practical expertise based. We're the people who are actually doing it; we're the operators that take the people out; we're the operators that take the fishermen out into the reef.

The other hat is with the Queensland Charter Vessel Association. I represent the whole lot of the commercial vessels that take people out to the reef. Our future is dependent on the future of this area here. What happens here is going to depend on what happens out there. Now because I'm out there I'm one of your neighbours and I'm very loathe to tell you how to suck eggs in your own backyard.

Let me finish by saying very quickly that what you do here is definitely going to have an effect on what we can do out there in the future. Marine tourism brings \$1 billion into this area, and it accounts for 1.5 million visitors through this whole area, so we need to be looked after. Final note, at dinner last night, I believe it was Ross Digman who made an offer. In all the years I've attended these things we have always decided that something needed to be done. Last night someone got up and said something that could be done. Good on ya mate.

The Importance, Status and Management of Seagrass Systems Adjacent to the Great Barrier Reef – Community Interest Groups can help Maintain Seagrass and Fisheries Production

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Seagrass meadows are common in sheltered bays, inlets and estuary mouths on the Queensland coast. The productive inshore meadows form valuable nursery habitat for juvenile tiger and endeavour prawns and a food chain of fish which support our recreational and commercial fisheries. In eastern Queensland and northern Australia, they are also the staple food of dugong (*Dugong dugon*) and a major feeding habitat for marine turtles. In our sheltered ports and bays, seagrasses are also important in retaining sediments and assimilating nutrient loads, helping to buffer the impacts of land run-off on coastal marine waters.

Recognising these values of seagrasses, the challenge is to search for ways to ensure the continued survival and productivity of seagrass wetlands along the Queensland coast. Seagrasses in deeper water and on reef platforms are also important to the ecology of the Great Barrier Reef region, but from a land run-off perspective a good first step is to address the total run-off impacts on the immediate shoreward seagrasses and fisheries resources.

To guarantee seagrass survival and productivity we currently believe that efforts at good catchment and land run-off management are going to be the lynch pin over the long-term. Most land-use management measures for other coastal wetlands, for in-stream water quality and for fisheries resources, also equate to good management for seagrasses because all the systems from catchments downstream to the coastal seagrasses are inter-linked.

Research and management issues specific to seagrasses relate to the degree of natural variability in seagrass systems. We need to know the levels of natural variability so that impacts from urban and agricultural run-off, coastal developments, port and harbour activities (dredging and point-source effluent discharge) can be assessed.

In order to comment with certainty on how large the risks are to seagrasses in this region, we need much better information on the scale of natural seasonal and year-to-year variations in seagrass abundance. There are natural catastrophic impacts which can cause large-scale losses of seagrasses in Queensland, but we suspect that the additional impacts from current land use (via sediment erosion, sewerage, nutrient and contaminant loads) on coastal systems might reduce the resilience of seagrasses to natural impacts and affect their ability to recover. We know that anthropogenic pressures and threats to seagrasses presently vary from extremely low (e.g. northern Cape York) to intermittently high (e.g. Trinity Inlet). Direct impacts from port and coastal development projects include dredging and point-source discharges of effluent. Controlling these impacts presents a challenge for coastal management agencies and port authorities to design sediment dredging, dumping and effluent discharges which have minimal-to-no impact on seagrasses and fisheries.

In the face of this set of impacts and threats it is necessary to monitor the level of impacts and status of seagrass and other wetland resources so that incremental increases in pressures on these habitats do not go un-noticed, or be mistaken as an inevitable. Our observations of seagrass systems and associated fisheries in other Indo-west Pacific countries have shown clearly how coastal environments have been exploited to meet priorities of immediate incomes and survival at the expense of the health of seagrass systems and the future productivity of coastal fisheries. Urgent destructive harvesting and abuse of coastal systems has left stretches of coastline devoid of their previously rich fisheries output. This is notwithstanding the loss of those other values of

seagrass meadows, such as support to dugongs and turtles and buffering the loads of sediments and nutrients into coastal waters.

Chronic and widespread scales of loss may not yet have necessarily happened in the Great Barrier Reef region, but there is concern that some localities in Queensland may need little further increases in pressure to result in prolonged loss of seagrasses and fisheries productivity. The threats are usually greater in localities with poor water circulation (e.g. parts of Trinity Inlet) and where conditions of poor water quality are prolonged.

Integrated Catchment Management and Landcare programs are possibly one of the best mediums for bringing a broad range of interest groups together in parallel to address downstream effects and coastal development impacts on seagrasses. All sectors on the land from private urban and agricultural land holders to local and state governments and corporations can participate in education and real changes in land-use practices which keep water quality high and the direct impacts on coastal seagrasses to a minimum. Checking the total incremental increase in pressures on coastal habitats is something which all groups must finally consider together and incorporate into Regional Management Plans. Seagrasses are a very low profile and rarely visible part of the coastal ecosystem, but this belies their central ecological role and economic importance to certain fisheries and other valued species. Most people rarely get to ever see seagrass meadows, so it can be difficult to portray to the community what seagrass systems are and why we should protect them. Demonstrating the status of seagrass resources, and measuring our success at maintaining the integrity of the ecosystems, is also expensive and difficult. We stress the need to educate all community groups well on what seagrasses and other coastal wetland habitats are and then to promote an understanding that what we do upstream and in ports, harbours and bays has cumulative effects on seagrass ecosystems in the coastal zone. Seagrasses are downstream of almost everyone, so all catchment management initiatives and good land-use practices which minimise soil erosion, un-natural nutrient loads, and other pollutants, can help the long-term survival of coastal seagrass systems and marine populations which depend on them.
Coastal Freshwater Wetlands of North Queensland – Imperatives for their Conservation

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Abstract

The freshwater wetlands of the north Queensland coast are an important part of the landscape mosaic. Their function and intrinsic worth are valuable community assets. In the past, poor management of these ecosystems has resulted in many becoming degraded or disappearing altogether. There is concern that some current planning and management practices still threaten their viability and, occasionally, their very existence. An overview of coastal freshwater wetlands in north Queensland is provided, together with a discussion of wetland functions, biological values and threatening processes. Recommendations for improved conservation and management through a catchment management approach is suggested. The need for greater understanding and awareness of wetlands through education and research is highlighted.

Introduction

On the north Queensland east coast (nominally Rockhampton to Bamaga), the mean annual rainfall ranges from in excess of 4000 mm (e.g. Tully/Babinda) to less than 1000 mm (e.g. Bowen). This variability in rainfall produces a disparate pattern of surface discharge, with the relatively small wet tropical catchments between Rollingstone and Daintree accounting for more than 16% of Queensland's mean annual river discharge, but the almost 140 000 km² Burdekin River catchment discharging less than 7% of the total (QDPI 1993). However, the mean annual discharge of the Burdekin River is an order of magnitude greater than any individual stream in the wet tropics (QDPI 1995).

These variable rainfall and discharge patterns produce a variety of coastal wetlands. Some freshwater wetlands simply require seasonal rainfall, others may require overbank flow, groundwater recharge or even tidal inundation. Stanton (1975) was the first to assess the complexity of Queensland's wetlands, identifying 142 different wetland aggregations across 24 classes, at the 1:1 000 000 map scale. Importantly, this wetland diversity (including the intertidal) occupies only 4.3% of the total land area of the state (E. Ross pers. comm.).

Stretching from the remnant coolibah (*Eucalyptus microtheca*) stands on the Fitzroy River floodplain near Rockhampton, to the Jardine River swamps at the tip of Cape York Peninsula, there are wetlands of national and international significance. For example, Bowling Green Bay National Park, located to the south of Townsville, is one of only two sites in the state listed under the Ramsar Convention. Although predominantly listed for the habitat values of its mangrove and intertidal zone for waterfowl, significant freshwater wetlands exist within, and immediately adjacent to (e.g. Cromarty wetlands), the declared area.

The need to manage this variety of wetlands has been recognised by both the State government, through its (proposed) Strategy for the Conservation and Management of Queensland's Wetlands (QDoE 1996), and by the Commonwealth government, through its Wetlands Policy (EA 1997). These documents promote a position of joint responsibility between governments and landholders for sustainable use and protection of the values and functions of wetlands. Nevertheless, threats to the integrity and viability of Queensland's wetlands remain, with several regions under considerable pressure (Arthington and Hegerl 1988; Lukacs and Pearson, in press).

In this paper, the functions and values of wetlands are briefly reiterated and specific threats to north Queensland's coastal wetlands are examined. Central to this workshop was the role that

Protection of Wetlands Adjacent to the Great Barrier Reef

wetlands may play in the management of catchment water quality (with respect to Great Barrier Reef waters), and a framework for their prospective use is suggested.

Functions and Values of Wetlands

Wetlands possess a range of functions and values in the landscape. The Wetland Evaluation Technique (WET) is used throughout the world as a generic method to define the functional value of wetlands in a region (Adamus et al. 1987; Marble 1992). Essentially, these functions are as follows:

Nutrient Removal and Transformation	In the short term, wetland vegetation can take up and store nutrients, but these are returned into the system once the plants die or defoliate. On a long-term basis, vegetation may remove nutrients through sedimentation of plant material, the provision of substrata for bacterial uptake (and subsequent sedimentation), and by providing the conditions for biochemical transformation/removal (e.g. denitrification, nitrogen fixation, ammonium volatilisation, phosphorus adsorption and precipitation).	
Sediment/Toxicant Retention	Through the deposition of sediment (and associated toxicants), contaminants can be removed temporarily or permanently by burial, chemical breakdown, and/or assimilation into plant and animal tissues.	
Shoreline Stabilisation	The binding of soil at the shoreline or water's edge by wetland plants increases the physical dissipation of erosive energy caused by waves, currents and tides in a basin or channel. Stabilisation protects adjacent lands from erosion and protects navigable channels from eroded sediments.	
Floodflow Alteration	Peak flows from run-off, surface flow and precipitation can be stored or delayed in wetlands, thereby decreasing flood-related damage. Wetlands located in the upper portion of catchments are most effective but even on floodplains, wetlands may desynchronise flow by soil capillary storage and the frictional roughness of vegetation.	
Groundwater Recharge	<i>er Recharge</i> Wetlands can hold surface water long enough to allow the water to percolate into the underlying sediments and/or bedrock aquifers. This water can then augment regional surface water streams and lakes. Accession to deeper groundwaters may contribute to water supply systems.	
Groundwater Discharge	Groundwater discharge areas often reflect the interaction between the water table and surface waters. These wetlands are a resource for many communities as they can provide water for domestic supply, irrigation, and grazing.	
Production Export	The production of organic material in a wetland and its downstream transport is an important element in food chains, particularly for primary consumers (e.g. fish and aquatic invertebrates).	

Wildlife Diversity/Abundance Wetlands support a wide diversity of unique aquatic, semi-aquatic and terrestrial species. From phytoplankton communities to crocodiles, the biota of wetlands are intrinsically linked to the processes within the wetland. The vegetation, in particular, contributes substantially to habitat complexity and the diversity of the dependent fauna.

Wildlife Diversity/Abundance Wetlat for Migration and Wintering specie

Wetlands are key sites for migratory and nomadic waterfowl species, as is recognised by the Ramsar Convention and international treaties (e.g. JAMBA, CAMBA). Many other species seasonally utilise wetlands as part of their lifecycle, for example, macropod species use the seasonal 'greening up' of wetlands as feed targets in the landscape.

Recreation

Increasingly, wetlands are the focus for tourism and leisure activities, such as fishing. In north Queensland, guided tours of wetland habitats are becoming more common (e.g. Hull River boat tours, the proposed Jacana Foundation at Cromarty wetlands), producing economic as well as educational benefits to the community.

Uniqueness/Heritage

The value of wetlands also relates to their inherent worth to the community. For example, Kakadu is readily identified by most Australians as a place of significant cultural value and is to be afforded appropriate protection. Similarly, some wetlands in local communities are regarded as cultural icons (e.g. Townsville Town Common, Trinity Inlet, Hinchinbrook Channel).

Threats to Wetlands

In the past, the draining, clearing and filling of north Queensland's coastal lowlands and wetlands, often for agriculture, has resulted in their significant loss in some regions (see Johnson, this volume). More recently, the proposed implementation of elements within the Sugar Industry Infrastructure Packages (SIIP) also threatens the integrity of coastal wetlands in north Queensland. For example, different sections of the Herbert Existing Cane Area Water Management Project (HECAWMP) propose mangrove clearing, deep drainage, and the truncation of watercourse meanders, as part of infrastructure development in the area (Queensland Department of Natural Resources 1997). The likely impacts on coastal wetlands and fish habitat of such proposals are overt and crude. More subtle threats to the region's wetlands, but which are also prevalent throughout Australia (Bunn et al. 1997), include:

Pollution Past changes in catchment land-use, together with the utilisation of synthetic agricultural chemicals and fertilisers, have been responsible for significant increases in nutrient and other contaminant loadings into the coastal waterways and wetlands of north Queensland (Moss et al. 1993; Bramley and Johnson 1996). The effects on wetland trophic states and processes largely remain unknown.

Exotic SpeciesThe introduction of aggressive pasture grasses (e.g. para grass, Hymenachne),
escaped biological control agents (e.g. cane toads) and aquarium species
(e.g. tilapia, water hyacinth), feral pigs, goats, cats, and the spread of
noxious weeds (e.g. rubbervine, salvinia) have all contributed to the
degradation of many north Queensland coastal wetlands.

Altered Hydrology Land-use changes, flow regulation and extraction, streambank stabilisation practices, groundwater abstraction, and drainage schemes each affect the natural water regimes upon which wetlands are dependent. For example, floodplain wetlands require a seasonal flooding regime commensurate with their biotic needs and to maintain their geomorphologies. Insufficient, ill-timed or oversupplied water will degrade these wetlands.

Grazing For decades many coastal wetlands have been used as 'fattening country' for western Queensland cattle prior to shipment for slaughter. Overgrazing and inappropriate clearing has resulted in the severe degradation of wetlands on some properties, whilst on others, sensitive (and sensible) grazing regimes have sustained wetlands of significant value (e.g. 'Cromarty').

Other issues which require management include recreation/tourism, inappropriate fire regimes, insect control and associated chemical use, mining and cropping (see Bunn et al. 1997)

The Use of Wetlands to Manage Catchment Water Quality

It has been proposed by several researchers (e.g. Whigham et al. 1988; Mitsch 1993; Hammer 1993) that a landscape approach to controlling non-point source pollution, utilising constructed and natural wetlands, may be feasible. It is seen by many as a viable method to augment land-based pollution control methods; however, in Australia there is little information on which to either design or model such a system. The vast majority of data which exists on the role of wetlands in improving water quality is based on constructed wetlands in temperate climates to polish sewerage treatment plant effluent or other point sources of effluent. In such situations, hydrological and biological control can be relatively easily achieved. In comparison, developing a system of wetlands to better manage catchment pollution in tropical and subtropical Australia, requires an approach which is more aware of regional opportunities and limitations.

Raisin and Mitchell (1996) have recently reviewed the role of natural wetlands in treating nonpoint sources of pollution in Australia and concluded there are insufficient data on wetland function to confidently promote their use in catchment management. Their own extensive research of a wetland which received non-point source agricultural run-off demonstrated that, depending on seasonal conditions and biotic responses, a net release of contaminants can occur from the site (Raisin and Mitchell 1995). However, Raisin and Mitchell concur with several overseas researchers, that given optimal conditions (for biota, hydrology and management), a landscape approach to using wetlands (constructed and natural) for improved water quality is likely to be worthwhile (G. Raisin pers. comm.).

There are also several issues associated with the legal framework for the use of wetlands in controlling non-point source pollution. The Queensland *Environmental Protection Act 1994*, through its Environmental Protection (Water) Policy (1997) fails to address non-point source pollution (other than urban stormwater) and the possible role of wetlands in catchment management. It does discuss proposed construction of artificial wetlands within natural wetlands, and incongruously allows for such construction, provided a series of issues are considered (e.g. preventing construction if the natural wetland is of local, regional or national importance – but using the inappropriate ANCA (1991) guidelines as criteria). Similarly, the (proposed) Strategy for the Conservation and Management of Queensland's Wetlands (QDoE 1996) emphasises the need to protect natural wetlands from the 'release of substances or non-indigenous species'; however, it does not prohibit the development of constructed wetlands within natural wetlands.

In contrast, the New South Wales government, through a comprehensive wetland management policy, openly discourages the siting of constructed wetlands in natural wetlands, and promotes a range of management principles which aim to minimise any further loss or degradation of wetlands and, where possible, restore degraded wetlands (NSWDLWC 1996). Perhaps the most useful integrated model is that of the United States Environmental Protection Agency (USEPA 1997) which explicitly prevents the use of natural wetlands for treating wastewaters (*Clean Water Act 1970*), and provides for non-point source pollution control through i) the protection and restoration of wetlands and riparian areas and ii) the promotion of the use of vegetated treatment systems (*Coastal Zone Act Reauthorization Amendments 1990*).

This comprehensive approach to catchment management benefits not just downstream environments, but also the 'en route' wetlands. The Queensland Government similarly needs to develop a catchment management framework that expressly protects and restores natural wetlands, and uses vegetation strips and constructed wetlands for non-point source pollution mitigation.

A Possible Approach

Essentially, wetlands cannot be expected to compensate for poor land management or insufficient use of best practice management in industry. This view has been reiterated by several other researchers (Olson 1993). However, independent of improvements to on-farm land management practices, wetlands can play an important part in a management strategy for catchment water quality.

A system of wetlands to manage non-point source pollution should be based on a clear delineation of the different roles and functions wetlands can possess. Hammer (1993) has proposed a hierarchical model of four wetland types, with each having a specific purpose in the catchment.

Natural are those areas wherein, at least periodically, the land supports predominantly hydrophytes and the substrate is predominantly untrained hydric soil or the substrate is non-soil and is saturated with water or covered by shallow water at some time during the growing season of each year. Natural wetlands have and continue to support wetlands flora and fauna.

Restored are areas that previously supported a natural wetland ecosystem but were modified or changed, eliminating typical flora and fauna, and used for other purposes. These areas have subsequently been altered to return to poorly drained soils and wetlands flora and fauna to enhance life support, flood control, recreational, educational, or other functional values.

Created formerly had well-drained soils supporting terrestrial flora and fauna but have been deliberately modified to establish the requisite hydrological conditions producing poorly drained soils and wetland flora and fauna to enhance life support, flood control, recreational, educational, or other functional values.

Constructed consist of former terrestrial environments that have been modified to create poorly drained soils and wetlands flora and fauna for the primary purpose of contaminant or pollutant removal from wastewater. Constructed wetlands are essentially wastewater treatment systems and are designed and operated as such, though many systems do support other functional values.

Protection of Wetlands Adjacent to the Great Barrier Reef

If the differences between these wetlands are recognised, a framework for their use in catchment management can be compiled. The following (table 1) is a suggested hierarchical wetland management strategy for the control of catchment non-point source pollution (after Hammer 1993). Four levels of pollution control are suggested, which relate to the type of wetland (e.g. natural, constructed, etc.), its place in a catchment, its role in water quality management, and its management requirements (e.g. maintenance).

	First Order Control	Second Order Control	Third Order Control	Fourth Order Control
Definition	Constructed wetlands designed and operated specifically for treating wastewater emanating from concentrated livestock areas, processing facilities, and in many cases, septic tanks serving the farm household.	Consists of nutrient/sediment treatment systems strategically located downstream from the first-order wetlands, at the lower end of grassed waterways and within intermittent stream courses throughout the individual farm.	Deploys nutrient/ sediment treatment systems, constructed wetlands/pond complexes, and restored or created wetlands at specific sites within a watershed that may include many individual farms.	Consist of larger wetlands in the lower reaches of an individual watershed that function primarily for hydrological buffering and life- support values in addition to limited water purification.
Catchment Location	Wastewater at the source. Often located within boundaries of an individual farm.	Less concentrated, aggregate wastewater from a variety of sources. Often located within a regional drainage scheme.	Buffer strips of riparian wetlands along permanent streams, small restored or created wetlands specific points in the upper reaches of the watershed.	Larger areas of restored or created wetlands at tributary stream intersections in the lower sections of the watershed.
Purpose	Principally designed for and operated for wastewater treatment.	Treatment but some ancillary benefits.	Function same as regional natural wetlands accomplishing water purification. Polishes run-off from a number of farms.	Hydrologic (flood) buffering, life support, and related beneficial values. Controls NPS from an entire watershed.
Requirements	Requires deliberate management and/or manipulation to maintain optimal treatment performance.	Requires deliberate management and/or manipulation to maintain optimal treatment performance.	Active management not needed and supports additional wetland functions.	Active management not needed and supports additional wetland functions.

Table 1. A hierarchical wetland management approach for non-point source pollution

This approach has already been adopted by the USEPA as part of their 'Nonpoint Source Pollution Control Program' (USEPA 1997). Within this program, 'Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters' are provided for:

- agricultural sources,
- forestry,
- urban areas,
- marinas and recreational boating,
- hydromodification (channelisation and channel modification, dams, and streambank and shoreline erosion),

- wetlands, riparian areas and vegetated treatment systems,
- monitoring and tracking techniques.

Specifically in relation to wetlands, the guidance measure formally recognises wetlands (both natural and constructed) as integral to the control of non-point source pollution. This extends to providing a legislative basis for the protection and restoration of natural wetlands and the construction of detention basins, wetlands and vegetated filter strips.

In Australia, the concern over non-point source pollution affecting Great Barrier Reef waters (see Mitchell et al. 1996) can only be met through the development of such a comprehensive strategy, with wetlands being a key component. Through the Federal Government's Coasts and Clean Seas program (developed from the Commonwealth Coastal Policy 1995), together with the provisions contained within the Queensland *Coastal Protection and Management Act 1995*, the development of such an integrated approach is possible (e.g. through the Regional Coastal Management Plans and Control Districts). The challenge which remains for Australia (and particularly Queensland) is to develop such a strategy.

Suggested Research

There is a need to better evaluate the effectiveness of using wetlands for non-point source pollution control, prior to implementing any collaborative program. For example, the proposed construction of detention basins and wetlands as part of the Murray–Riversdale SIIP (Tait 1995) is intended to provide for a variety of functions (e.g. water quality improvement, waterfowl and fish habitat, floodflow desynchronisation); however, there is little evidence to suggest that the outlined approach can achieve any or all of these goals. A comprehensive planning document which provides guidelines for wetland use at the catchment level, and is supported by research data, is urgently required.

The Land and Water Resources Research and Development Corporation (LWRRDC) has initiated a 'focus catchments' approach to catchment-scale adoption of research. That is, in catchments where there is a large volume of existing information, management processes, such as Adaptive Environmental Assessment and Management, are being trialed to enable catchment groups to implement and evaluate on-ground management strategies (LWRRDC 1996). The Herbert and Johnstone River catchments are two such focus catchments in Queensland.

It is suggested that a 'focus catchment' be utilised in the development of a pilot program for using wetlands in non-point source pollution control. Using such a catchment would provide a firm basis to evaluate different design criteria, catchment responses and management requirements, given the ready availability of data on landuses, fertiliser and contaminant loads, hydrology, etc. Intrinsic to the pilot program would be improved protection for natural wetlands, restoration of degraded wetlands, and the strategic construction of wetlands.

There are a number of possibilities for supporting such an initiative. For example, it could be a collaborative approach involving the Coastal and Marine Planning Program (e.g. design, strategic planning), the Coasts and Clean Seas program, Coastcare and Landcare (community implementation), the Queensland Government (legislation, infrastructure and implementation), the LWRRDC (evaluation), and the Great Barrier Reef Marine Park Authority (education and awareness). The existing Memorandum of Understanding (November 1995) between the three tiers of government on implementation of the Coastal Action Program, also allows for the development of Local Water Quality Management Planning (Schedule 6). Specific to this schedule is section 5.4: 'One project demonstrating the preparation and implementation of a local water quality management plan promoting optimal use will be undertaken in the areas adjacent to the

Great Barrier Reef Marine Park'. Such a demonstration project could be an integral part of a research program.

It is clear there are existing opportunities to trial a catchment approach to non-point source pollution control using wetlands. A carefully planned project which can demonstrate the effectiveness of different wetland types to provide a variety of functions within the catchment should be encouraged and supported.

References

- Adamus, P.R., E.J. Jr Clarain, R.D. Smith and R.E. Young 1987. Wetland Evaluation Technique (WET), Volume II: Methodology. U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, MS. Operational Draft Technical Report Y-87 and Federal Highway Administration (FHWA-IP-88-029).
- Arthington, A.H. and E.J. Hegerl 1988. The distribution, conservation status and management problems of Queensland's athalassic and tidal wetlands, *In* The Conservation of Australian Wetlands. A.J. McComb and P.S. Lake (eds). Surrey Beaty, Sydney.
- Australian Nature Conservation Agency 1991. A Directory of Important Wetlands in Australia. Usback and James (eds). Commonwealth Government of Australia. AGPS, Canberra.
- Bramley, R.G.V. and A.K.L. Johnson 1996. Land use impacts on nutrient loading in the Herbert River, In H. Hunter et al. (eds). Downstream Effects of Land Use. Developed from a National Conference on Downstream Effects of Land Use, held in Rockhampton, Queensland, Australia, from 26 to 28 April 1995. Department of Natural Resources, Brisbane, Queensland.
- Bunn, S.E., P.I. Boon, M.A. Brock and N.J. Schofield (eds) 1997. National Wetlands Research and Development Program Scoping Review. Land and Water Resources Research and Development Corporation, Canberra.
- Environment Australia 1997. Wetlands Policy of the Commonwealth Government of Australia. Biodiversity Group of Environment Australia, Canberra.
- Hammer, D.A. 1993. Designing constructed wetlands systems to treat agricultural non-point source pollution, *In* R.K. Olson (ed.). Created and Natural Wetlands for Controlling Nonpoint Source Pollution. USEPA Office of Research and Development and Office of Wetlands, Oceans and Watersheds, CRC Press.
- Lukacs, G.P. and R.G. Pearson (in press), Queensland's Wetlands, National Wetlands Research and Development Program Regional Scoping Review. Land and Water Resources Research and Development Corporation, Canberra.
- Land and Water Resources Research and Development Corporation 1996. Stakeholders Report 1996. Land and Water Resources Research and Development Corporation, Canberra.
- Marble, A.D. 1992. A Guide to Wetland Functional Design. Lewis Publishers, Boca Raton Florida USA.
- Mitchell, A.W., J.R. Reghenzani, H.M. Hunter and R.G.V. Bramley 1996. Water quality and nutrient fluxes from river systems draining to the Great Barrier Reef Marine Park, *In* H. Hunter et al. (eds). Downstream Effects of Land Use. Developed from a National Conference on Downstream Effects of Land Use, held in Rockhampton, Queensland, Australia, from 26 to 28 April 1995, Department of Natural Resources, Brisbane, Queensland.
- Mitsch, W.J. 1993. Landscape design and the role of created, restored and natural riparian wetlands in controlling non-point source pollution, *In* R.K. Olson (ed.). Created and Natural Wetlands for Controlling Nonpoint Source Pollution. USEPA Office of Research and Development and Office of Wetlands, Oceans and Watersheds, CRC Press.

- Moss, A.J., G.E. Rayment, N. Reilly and E.K. Best 1993. Sediment and nutrient exports from Queensland coastal catchments: A desk study. Environment Technical Report No. 5. Department of Environment and Heritage, Brisbane, Queensland.
- New South Wales Department of Land and Water Conservation 1996. New South Wales Wetland Management Policy. NSW Government, Sydney.
- Olson, R.K. (ed.) 1993. Created and Natural Wetlands for Controlling Nonpoint Source Pollution. USEPA Office of Research and Development and Office of Wetlands. Oceans and Watersheds, CRC Press.
- Queensland Department of Environment 1996. Discussion Paper, Proposed Strategy for the Conservation and Management of Queensland's wetlands. Queensland Government, Brisbane.
- Queensland Department of Natural Resources 1997. Herbert Existing Cane Area Water Management Project, Sugar Industry Infrastructure Package. Presentation to GBRMPA, Environment Australia and Queensland Department of Environment, Townsville May 1997.
- Queensland Department of Primary Industries 1993. State Water Conservation Strategy, A Discussion Paper. Water Resources group, Queensland Government, Brisbane, Queensland.
- Queensland Department of Primary Industries 1995. Overview of Water Resources and Related Issues: The Northern Wet Tropics Region. Water Resources group, Queensland Government, Brisbane, Queensland.
- Raisin, G.W. and D.S. Mitchell 1995. The use of wetlands for the control of non-point source pollution. Water Science and Technology 3: 177–86.
- Raisin, G.W. and D.S. Mitchell 1996. Diffuse pollution and the use of wetlands for ameliorating water quality in the Australian context, *In* H. Hunter et al. (eds). Downstream Effects of Land Use. Developed from a National Conference on Downstream Effects of Land Use, held in Rockhampton, Queensland, Australia, 26 to 28 April 1995. Department of Natural Resources, Brisbane, Queensland.
- Stanton, J.P. 1975. A preliminary assessment of wetlands in Queensland. Technical Memorandum 75/10. CSIRO Division of Land Use Research, Canberra.
- Tait, J. 1995. Lowland habitat mapping and management recommendations Tully–Murray catchments. Cardwell Shire Catchment Co-ordinating Committee. An ICM initiative of the Queensland Department of Primary Industries.
- Whigham, D.F., C. Chitterling and B. Palmer 1988. Impacts of freshwater wetlands on water quality: a landscape perspective. Environmental Management 12(5): 663–671.
- United States Environmental Protection Agency 1997. Nonpoint Source Pollution Control Program. USEPA Office of Water.

Wetland Destruction

J. Tager

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A lot of the impacts on wetlands have been made very clear. I'd like to repeat a few of them. There were studies done in 1993 and 1994 talking about the loss of wetlands; that half of the wetlands studied in the Tully–Murray area had oxygen so low that they couldn't support fish life; that fish diversity in all of those wetlands area were diminishing; that barramundi stocks were dropping; that in every wetland area studied, case levels were below 6. I think that there's fairly conclusive evidence that the wetlands are not only diminishing - 70% loss was the figure that Ross Digman gave yesterday - we also have the 80% loss that the World Wildlife Fund concluded for the loss of coastal lowland rainforest compounding the problem. We not only have those problems but we have the problem that the condition of the remaining wetlands is not very good either. The causes of wetland loss in Queensland extend across a lot of industries and a lot of government industries but in this area it can be attributed in large part to the cane industry, especially in recent times. It can be attributed to the expansion of the cane industry, to the assignment process, to local government and poor planning process, to the State Government for failing to integrate local government responsibility for freehold and leasehold land and it can be attributed to packages such as SIIP which encourage expansion, and agencies such as the Department of Natural Resources which, we think, have failed in their role by acting as promoters. They have both the role of promoting industry expansion as well as regulating it, and they have tended to promote more than regulate. As has been said times have changed in the sugar industry, but I would certainly like to acknowledge them: changing to green trash blanketing, the recent audit that was conducted by the industry recognised a lot of the environmental shortcomings of the industry and the development of some guidelines, although they are not followed very well at the moment. Clearly there is a beginning of awareness and recognition of some of the changes that have to take place.

But with wetlands I think we are facing a situation which is very urgent. We need to take immediate steps. It is our belief that we need to take substantial steps today in addressing the problems of wetland loss and wetland protection. We don't want to end up in a protracted political or media fight. We think that there is an opportunity to enter into negotiations, discussion and agreement with the sugar industry and we think we can make a substantial step today. I guess the question we have to ask is, is the industry willing to do that? Is the industry willing to come to the table today and discuss in substantive terms the kinds of issues that have been raised in the last few days? Are they willing to enter into voluntary agreements to protect wetlands, to protect areas of remaining areas of high conservation value (we know where the areas of high conservation values are), to protect biodiversity? To discuss Ross's proposal for 20c a tonne green levy or some other form of green levy that can be used for acquisition, rehabilitation, restoration or other uses. Are you willing to discuss the question of assignment and expansion? Finally I think it is really important to discuss, at a government level, the question of regulation and making sure that while regulation doesn't inflict on the industry, it's able to deal with those 2–3% mavericks who aren't willing to abide by voluntary agreements. We want to discuss incentives too because we recognise that this shouldn't be all on the shoulders of the sugar industry. Some of the incentives that Andrew Johnson mentioned we would fully support and others such as joint grants under Natural Heritage Trust, lobbying for rate rebates and other local government incentives and providing on-the-ground help, in terms of labour for things such as tree planting and providing technical and ecological expertise. I think that there are tremendous resources available, in the conservation movement, extremely willing to help with something they think would be productive and fruitful. I think that there's a real opportunity here today to begin a community based solution to an obviously well established problem, one that doesn't depend on government lobbying and government intervention. I don't think it's going to work if we don't get

Wetland Destruction

to that point today. And once again, I really want to ask, is the industry willing to talk at that level today and to make this whole workshop worthwhile in that kind of substantive fashion?

No Native Plants = No Habitat = Poor Water Quality = No Fish

V. Veitch

Sunfish, 4 Stagpole Street, West End Qld 4810

The environment necessary for the long-term health of our fish is under threat. This threat is coming from a number of sources including commercial, residential, industrial and rural development. Some of the threat is new and some of it is cumulative from ill considered development in times when perhaps we did not know any better.

However, as we approach the year 2000, we are becoming increasingly aware of the impact that this massive loss of native habitat is having on our environment. Sunfish North Queensland is specifically concerned about the loss of fish habitat and resultant reduction in water quality which will impact on our native fish.

Over the last 12 months we have seen or become aware of the following:

- SIIP proposal for the Herbert area which we believe will destroy critical fish habitat.
- SIIP proposal for the Tully–Murray region which will allow the development of a further 30 000 hectares of land for sugar planting. We believe that this will impact adversely on the fishery well beyond the immediate area.
- A small fish kill in Townsville as a result of poor tide gate management by the relevant authority. Only tilapia and some tarpon survived.
- A massive fish kill at Lagoon and Victoria Creeks from an unnatural cause yet to be determined.
- Outpour of untreated waste into natural waterways from a sugar mill between Giru and Brandon.
- The destruction of important ephemeral wetland for sugar planting between Ingham and Rollingstone and between Cardwell and Tully. This includes the clearing of riparian strips.
- The capture of an increasing number of fish in the Hinchinbrook region and adjacent critical feeder areas that appear to be diseased possibly as a result of acid sulphate run-off.
- A significant fish kill immediately downstream of a levee in the Burdekin River.
- The lifting of the moratorium on ponded pastures which will deny more habitat to fish.
- Yabulu untreated effluent overflow under licence into Halifax Bay.
- Numerous levies in the Burdekin River delta and other river systems for the benefit of rural
- industries which deny tidal flow and access for fish.

These incidents cannot be allowed to continue!

Sunfish North Queensland is not opposed to sustainable development in any sector of industry or the community. The key word is 'SUSTAINABLE'. The environment in north Queensland is an extremely valuable commodity. Individual industries are not able to make decisions on their impact from a holistic perspective and their pecuniary interest has the ability to influence decisions. Each area considers that its impact is minimal, but the combined impact is significant. Only government can control impacts from a neutral and a whole of community based perspective.

State and Federal Governments have recognised the importance of both the rainforest and the reef but have neglected the important wetland areas in the middle that join these precious resources. At the moment we are rapidly divorcing the rainforest from the reef in a way that is not sustainable. Most native fish spend a considerable and important part of their life cycle in wetlands well above dry season water levels. Without this wetland, their survival rate is decreased dramatically. Species dependent on these areas include barramundi, mangrove jack, jungle perch and tarpon. Respected fisheries biologists have recommended that 'the wetlands be left alone'.

Official government figures are reporting reduced catch of important commercial species and available recreational records are indicating a significant reduction in catch/effort ratios. This continued loss will not only impact adversely on our lifestyle in years to come but it will also harm us economically in the tourism industry. Already fishing tourists are driving past north Queensland on their way to the Northern Territory because of a well-advertised healthier fishery. This is costing Queensland millions of dollars in lost revenue.

It is time for Queensland to take stock of its resources and develop a coordinated approach to the management of our coastal plains that feed into the Great Barrier Reef lagoon. We are only now becoming aware of the adverse cumulative impacts of our ill-considered past actions. We must learn from this and repair the wrongs of the past and at the same time give greater consideration to the potential impacts of future land clearing and unnatural drainage modification.

State and Federal governments must come up with a plan for a coordinated approach for the management of this rich and rare resource. We need to look at the mistakes of our more developed areas and preserve what we have for the benefit of future generations.

We *must* manage our environment for the long term benefit of *all* Australians – not just a select few.

Wetland Preservation – RMRAC Views

B. Whiteman

Hinchinbrook Regional Marine Resource Advisory Committee, PO Box 14, Cardwell Qld 4816

Regional Marine Resource Advisory Committees (RMRACs) were established to advise the Great Barrier Reef Marine Park Authority and the appropriate agencies such as the Department of Environment, Department of Natural Resources etc. and to provide public information concerning the local marine and coastal management of our areas. The role of RMRACs is to facilitate communication between user groups and resource managers in the local community. Approximately half of the membership is comprised of user groups including the agricultural industry, commercial operators, recreational interests, conservation groups and the other half, various government agencies, local, state and commonwealth government departments.

Now in addressing the issues of water quality and wetland management it must be recognised that the interests of the various groups are extremely complex and in some cases literally miles apart. Bringing these various user groups to work together towards a common goal is an extremely difficult task. Not only is each user group strongly motivated by personal issues, for example in the case of the agricultural industry, many smaller properties see no option but to primarily focus on the economic survival of their families. They have little time or resources to consider the implications of their activities even on the neighbouring property let alone what might be happening 50 km out to sea. Even the various government departments seem unable to consider the big picture and coordinate their activities to work together to achieve a ecological sustainable common goal. A simple example is the infestation of the coastal wetland by the exotic grass Hymanachne. This plant has the potential to out-compete most native wetland plants and literally chokes to death wetlands, drains, creeks and other fish habitat areas. Hymanachne is also a serious threat to the sugar industry, especially on wet low land areas where it will out compete sugar cane. Now it seems almost ironic that Hymanachne was originally promoted to the cattle industry by the Department of Primary Industries. To the graziers of the upper Herbert River catchment, in the dry areas west of the Great Divide, 100 km from the coast, Hymanachne has really meant salvation. To many marginal grazing properties facing falling prices and reduced demand for beef, Hymanachne has substantially improved productivity and literally met the difference in economic survival for those people. And then at the other end it's almost understandable why a local sports fishing club who worked for months running raffles and other fund-raising activities for a wetland fish stocking program feels so frustrated by these pig-headed, ignorant so and so's who don't give a damn to the apparent damage they're doing to the coastal wetlands. So of course there's a lot of conflict there and I guess these opinions and comments, on the part of the sports fishing club, are relatively mild and iniquitous in our meetings compared to the discussions at some meetings attended by groups of commercial and recreational fishermen. But then even commercial and recreational fishermen can occasionally get together and reach common ground in their dealings with conservation groups.

Now the role of the RMRACs in facilitating communication between these various user groups is a very difficult task and even though we may not often reach unanimous agreement on issues, at least our members gain some understanding of different perspectives of how the other user groups feel. We do rely heavily on the technical briefings by various resource management staff that present the facts and the government position on a lot of these issues, and I guess one of the problems with anecdotal evidence is that it usually relies a fair bit on selective memory. People tend to remember the things that they want to remember, about how good the barramundi fishing was at a certain place etc. The Mission Beach RMRAC recently facilitated a special meeting to discuss the sugar industry expansion into the fish habitat wetlands and the Tully–Murray region. Invited guests represented a wide range of interest groups and it was a truly excellent meeting. And while it clearly demonstrated the widely differing and strong opinions of the various user groups the final outcome was agreement on a fundamental principle. There was unanimous support for the sugar industry's recognition for their responsibility for the environmental impact in development of the coastal plain and that meeting was a very small step in the right direction towards all user groups and resource managers working together towards common goals and I guess this workshop today is another step.

Those RMRAC members who donate their personal time and energy in attending these workshops and meetings to address these issues do so because we really believe that through positive communication we can achieve real outcomes.

Wetland Protection – RMRAC Views

C. Wood

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The Regional Marine Resource Advisory Committees (RMRACs) are here to assist with the management of the Great Barrier Reef Marine Park and the Great Barrier Reef World Heritage Area. Conservation interests, maintenance of biodiversity, ecologically sustainable commercial and recreational fishing and tourism are all part of the picture.

It appears to us that as far as coastal development goes you have the sugar industry, the grazing industry, the banana industry, urban expansion, sewage treatment plants, mariculture, canal estates and marinas – everybody pushing their barrow wanting their bit of coastal development, nobody appreciating that each time they fill in a wetland or use it for something else, that we're losing something from the Great Barrier Reef. This is what the RMRACs are all about, along with the Department of Environment and the Great Barrier Reef Marine Park Authority.

What we believe is that there's got to be room for everyone because we not only have a big sugar industry and grazing industry but also a very valuable tourism industry, commercial fishing and recreational fishing. We've all got a monetary interest in getting protection of wetlands up and running.

Some of the RMRAC members were somewhat disappointed yesterday when Ministers and representatives gave what I'll call a rose tinted view of this issue and promptly departed before we got down to the plain speaking and showing what really is happening out there. The current management system is breaking down. This was recognised at the April workshop of the RMRACs. One of the major initiatives which came out of the workshop is this very gathering here today. This was a RMRAC initiative. The Authority, to their credit, leapt in and organised it and everyone from the Great Barrier Reef Marine Park Authority and those associated with that should be congratulated.

At the same time as this was going on, the Townsville RMRAC put up a resolution basically about extending the moratorium which came up earlier this year for development in the Hinchinbrook Channel. Some of the specific points we made were that there should be a moratorium on further agriculture, mariculture developments, a moratorium on coastal developments including marinas and canal estates, sugar cane expansion and flood mitigation and drainage channel. We've heard 'moratorium' mentioned a few times today and yesterday, and that's a moratorium until we've got some decent planning processes in place. I support Andrew Johnson's (CSIRO) framework and it's a good framework in which to act. RMRACs are already providing a community consultation tool and we've been in existence for about three years now and despite the diversity of views, the RMRACs are successful in getting the people around the table talking and actually finding out that they do have common ground. That's a really positive example that I can give to the meeting for us to go forward to work through the issues so that we can get some decent planning. Part of that planning is preserving what we've got left in the way of wetlands and maybe looking at rehabilitating some others. Certainly just to avoid the confusion, I think it is true that it is very difficult to do that - it is very difficult to redo the original biodiversity of a virgin wetland compared to a rehabilitated one but that's not to say rehabilitating a wetland isn't a worthwhile exercise. As Anne Clarke said yesterday, we might have a lot of ugly looking drains but we can do small things to those drains to make them into fish habitat.

Australia's Wetlands – Learning to Love our Stinking Swamps: A National Overview¹

P. Wright

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It's late August and a flock of Red Knots is completing their 11 000 kilometre journey from the Arctic Circle. After flying across eastern Asia and down through the Indonesian archipelago, they head for the vast mass of wetlands at the southern end of the Gulf of Carpentaria.

These Red Knots are just some of the two million shorebirds from 71 species known to migrate to Australia. Protecting their habitat is no simple matter. Red Knots breed on the coast and islands off northern Siberia and Alaska so they need secure places there. When the Arctic winds howl, however, the Red Knots are far off in the relative warmth of Australia. On the intervening journey, wetlands in Japan, China, Taiwan, Thailand and New Guinea serve as way stations. If the birds cannot find shelter, rest and a sure source of food at every site, then they may never make it back to their breeding grounds.

Like most migratory waders, the Red Knots' first landfall in Australia is likely to be either Eighty Mile Beach or Roebuck Bay in Western Australia, or the south-east corner of the Gulf of Carpentaria. Some birds stay at these sites for the whole summer, but most use them as stop-overs only, before moving further south.

To help build up the body fat needed to power their flight back to the Arctic, the migratory waders head for the most productive ecosystems they can find – the wetlands. They have known about the productivity of Australia's wetlands for millennia. Humans, however are only just realising the immense value of these 'stinking swamps'.

A Community Asset

A recent study estimated the total value of the goods and services provided by the Earth's natural ecosystems as \$US33 million million ('The value of the world's ecosystem services and natural capital' by R. Costanza et al., *Nature* 387 (253), 1997). The most valuable terrestrial ecosystems, valued at \$US4.9 million million per year, were wetlands, comprising swamps/floodplains and tidal marsh/mangroves. Almost 80% of the economic value of these wetlands came from their role in controlling floods, providing protection from storms, and cycling nutrients and waste.

The treaty for protecting wetlands of international significance, the Ramsar Convention, includes marine waters down to six metres in its definition of wetlands. When estuaries, seagrass/algae beds and coral reefs were added, the Nature study estimated that wetlands provide up to 40% of the planet's goods and services.

A little closer to home, the value of wetlands as breeding and nursery areas for fish is increasingly acknowledged by the fishing industry. It has been estimated, for example, that every hectare of mangrove forest in Moreton Bay generates \$8380 worth of fish. Farmers and graziers are also realising the value of wetlands for controlling floods and keeping the rivers flowing during droughts. There are other less direct benefits to primary production. Along the Murray River, the ibis that roost in the red gum forests of Barmah and Gunbower perform a pest control service for the surrounding properties valued at \$675 000 per year.

¹ This paper was first published in *Habitat* 1997.

Undervalued, Under Threat

But for wetlands in the agricultural regions of Australia, we have realised their value too late. State of the Environment: Australia 1996 reports that 'the extent and condition of Australia's wetlands have deteriorated greatly since European settlement by draining, changes to water regimes and increase sediment and nutrient inputs'. One third of Victoria's natural wetlands are gone, as are 70% of some coastal wetland types in NSW and 70% of the wetlands on the Swan coastal plain around Perth. Drainage has reduced wetlands in south-east South Australia to just 11% of their former area and 63% of lowland wetlands in Tasmania are disturbed.

Wetlands are victims of gravity. Being at low points in the catchment means that all the land and water management problems upstream eventually show up in the wetlands. They have also had a public relations problem, being traditionally viewed as 'wastelands', breeding grounds for mosquitoes, or places to be 'reclaimed'. Being physically inaccessible to most people didn't help this image problem.

While the tide may be turning, it hasn't turned yet. Coastal wetlands are still being reclaimed for housing, excavated for marina developments, and in the longer term face the possibility of rising sea levels due to climate change. This is perhaps the greatest threat to the wetlands of the Great Barrier Reef, already suffering from unprecedented levels of nutrients flooding out from a poorly managed mainland. The spread of mosquito-borne diseases, such as Ross River fever, also raises the risk that wetlands will be filled in or sprayed with insecticide for perceived public health, convenience and tourism benefits.

Along the inland rivers, wetlands evolved with massive winter-spring floods, followed by very low flows in summer-autumn. This annual variation was important. In the dry periods plants died off, decomposed and returned nutrients to the soil, while big floods triggered a flush of invertebrate life and breeding by fish and waterbirds. Now dams and weirs have evened out the annual river flows, eliminating both the biggest floods and the droughts. As a result wetlands are getting both too much and too little water, at the wrong times of year.

When river flows are upset, wetlands become less productive, less diverse, and less effective in providing other environmental services. The whole river system suffers when less of its sediments and nutrients are being filtered out by wetlands.

In the high country there are quite different wetlands, ranging from wet heaths to peat bogs. Here at the top of the catchment, wetlands act as sponges. They help to maintain steady river flows by soaking up water in the wet period and slowly releasing it during the dry. They also provide habitat for threatened species of plant and animals, such as the Corroboree Frog, which are restricted to these unusual habitats. While some highland wetlands are threatened by trampling by stock or bushwalkers, Wingecarribee Swamp on the Southern Highlands near Sydney, faces a more catastrophic threat. It is being mined for peat moss used in the horticultural industry.

In the arid inland, the vast desert lakes such as Lake Eyre are the terminal points of vast catchments. While dry for much of the year, they generate a phenomenal flush of life when full. The remoteness of these places protects them from many outside threats, although it also makes them a focus in an otherwise inhospitable region. Both feral animals and tourists are attracted to these oases, and both bring problems. Others, such as Coongie Lakes, are threatened by oil and gas exploration and mining.

Can the Ramsar Convention help?

For these and many other threats, the Ramsar Convention (on Wetlands of International Importance) provides much less protection than it should. It was one of the earliest international

environment conventions, and broadly aims to promote the conservation, wise use and reservation in nature reserves of wetlands, not just those listed under the Convention.

Australia has a special relationship with the Ramsar Convention, being the first signatory to it and the site of the world's first Ramsar wetland (Coburg Peninsula in the Northern Territory). We also have the fourth largest area of Ramsar listed wetlands in the world (five million hectares) after Canada, Botswana and the Russian Federation.

Yet our wetlands, both Ramsar and others, are not in the condition they should be, and the convention is no magic bullet. The problem is that the Ramsar convention provides moral obligations only, not legally binding ones. Given the poor state of wetland conservation worldwide, the benchmark for developed countries like Australia is set very low.

While Australia is considered something of a leader in Ramsar circles, there are countries taking more innovative approaches, particularly by providing national legislative protection for wetlands. The South African Government is currently considering a Wetlands Conservation Bill to directly apply the Ramsar Convention by prohibiting detrimental activities in wetlands and controlling activities detrimental to their catchments. The United Kingdom lists all its Ramsar sites as 'Sites of Special Scientific Interest' under the Wildlife and Countryside Act.

The Importance of Management

• Of the 49 Ramsar listed wetlands around the country, less than ten are covered by plans of management. A few wetlands are indirectly affected by plans of management for the national parks, catchments or lakes that surround them, but these plans are not necessarily directed towards protecting the full range of wetland values. For most of the remainder, plans of management are 'in preparation' and have been for years.

As a result, many of these wetlands of international significance are continuing to suffer from rising saline ground water (e.g. Kerang wetlands in Victoria), by dredging and mining for sand and coral (Moreton Bay in Queensland) or from overgrazing (Eighty Mile Beach in Western Australia). Declaring the Ramsar sites is easy, managing them well is another matter entirely.

The importance of management was acknowledged at the Ramsar Conference at Kushiro, Japan in 1993. Guidelines on Management Planning for Ramsar Sites were adopted, and they spell out very clearly the format and range of issues which should be covered in a plans of management for wetlands. The Federal Government should be driving the preparation of these management plans, and ensuring they are implemented with vigour.

Safe Havens for International Travellers

While the Ramsar Convention seeks better management of all wetlands, it places particular emphasis on those of international importance. While Australia has a relatively area of wetlands on the list already, there are still more which qualify for listing.

During the summer period, 80% of the birds visiting Australia are found in three main regions: the north-west coast between Broome and Port Hedland, the coast between north-east Arnhem Land and the Gulf of Carpentaria, and the south-east coast between the Eyre Peninsula and Corner Inlet in Victoria. While a number of the major wetlands in these priority regions are Ramsar-listed, there are many notable exceptions: the south-east corner of the Gulf of Carpentaria, Arafura Swamp in North-east Arnhem Land, Port Hedland Saltworks, Clinton Conservation Park in St Vincents Gulf, Northern Spencer Gulf to name a few.

Protection of Wetlands Adjacent to the Great Barrier Reef

Outside this priority band, there are other wetlands which easily pass the international significance test: Lake Eyre in South Australia, where more than 100 000 shorebirds have been recorded at peak periods; Shark Bay, a World Heritage area whose wetlands support dugongs as well as waterbirds; and the Great Sandy Strait in Queensland, the complex of sand and mud flats, seagrass beds, mangroves, salt flats and salt marshes near Fraser Island.

At the Brisbane Conference of the Parties in 1996 another major initiative was launched: the East Asian-Australasian Flyway. It aims to provide safe passage for the two million shorebirds that migrate along east Asia and the western Pacific each year. By providing a network of shorebird reserves for the migrating flocks, the people of this sector of the globe can maintain natural patterns that have been in place for centuries.

An initial list of 23 sites were included on the network, and were nominated by the Ramsar countries in the region at that time: Australia, Japan, China United Kingdom, Philippines, Cambodia, Indonesia and New Zealand. The priority tasks for the future, are to encourage further countries in the region to become parties to the Ramsar Convention, and to fill in the gaps along the Flyway. Already there has been some success with Korea signing up in July 1997. We now have the responsibility to add more Australian sites to the Flyway list. Again, the south-east Gulf of Carpentaria is a top priority.

Keeping our Wetlands House in Order

The great value of the Ramsar Convention has been in recognising the importance of wetlands domestically as well as internationally. Not all our wetlands are of international importance, but they are vital parts of our environmental and economic infrastructure. The Directory of Important Wetlands (1996) identified over 24 million hectares of important wetlands in Australia, and by far the largest share falls in Queensland (47%). Next in line was South Australia (17%) and the Northern Territory (12%).

To date, none of these States or Territories have a wetlands policy. Only the Federal Government and NSW have adopted wetlands policies. These policies encourage protection, cooperation and better management of wetlands, but they do not require it. Problems like invasive weeds, nutrient pollution and inappropriate river flows cannot be dealt with on an ad hoc basis. They require the kind of considered, strategic and well coordinated response that State-wide policies within strong nationally consistent standards can bring.

Wetlands are superb indicators of the overall health of a region, and degraded wetlands are a sign that land and water management is unsustainable. As a result there are no quick fixes for our wetlands, but the rewards of tackling the problems on a catchment basis are immense. If we save our wetlands, then we will have saved our dry lands and our rivers too.

Priority Actions for Saving Australia's Wetlands

- Plans of management for all Ramsar sites and their catchments.
- Additional wetlands of international importance added to the Ramsar list.
- No further excisions of wetlands from the Ramsar list.
- A wetland policy for every State and Territory.
- Better representation of wetlands in the protected area system.
- Prevent mining and other damaging developments in wetlands of international importance.
- Community education to raise awareness of wetland values.