REVERSING THE TREND

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INTRODUCTION

Globally, the destruction and degradation of wetlands have been matters of increasing concern for several decades (Maltby 1986, Williams 1990). The response has been the adoption of a variety of measures to slow the rate of habitat loss and increase the protection of remaining natural wetlands.

Nevertheless, it has also been acknowledged that complete cessation of wetland destruction is an almost impossible dream; there will be circumstances where the economic or social benefits of development will be perceived as outweighing the loss of environmental values associated with a particular wetland. The concept of wetland mitigation has therefore been promoted, whereby development is permitted on condition that other areas of wetland are either rehabilitated or are created.

Mitigation may either be part of a general policy (as in the 'no net loss' concept in the USA) or be a matter to be taken into consideration by planning authorities on a case by case basis (as is allowed for in State Environmental Planning Policy No.14 (Coastal Wetlands) in NSW).

Holding the line against further wetland loss is clearly essential, but many existing wetlands are degraded with increased sedimentation, modified hydrology, changed water quality and invasion by feral plants and animals all impairing wetland function. There is an urgent need to develop mechanisms to promote the rehabilitation of all wetlands. Although much work will be required within the wetlands themselves, their long term, sustainable management will require a catchment approach.

Creation of new wetlands may be a component of mitigation requirements, but there is now enormous interest in the potential of wetland systems as a component of water quality control measures, in which wetlands can be used to improve the quality of stormwater or sewage effluent. Wetlands have performed these functions throughout history, sometimes by design, but perhaps more often as an accidental consequence of the siting of discharges. It is much more recently that the advantages, in some circumstances, of wetlands over traditional engineering solutions have been widely accepted and opportunities to design wetlands to maximise waste water assimilation have been realised. There is, properly, a reluctance by consent and licensing authorities to permit more natural wetlands to be used for waste water assimilation, with the consequence that artificial wetlands are now being created for this purpose in many locations.
While there was, in western cultures, for many years a prevailing 'wetlands are wastelands' philosophy, paradoxically wetlands have been highly regarded as components of designed landscapes (as, in the Sydney context for example, at Centennial Park). There are therefore many opportunities, for aesthetic reasons, to incorporate existing wetlands or to create new ones, in urban design.

Although there is an extensive literature on wetland management (see for example Payne 1992, USDA SCS 1992), there is little material available that is directly relevant to Australian conditions. The purpose of organising the seminar 'Reversing the Trend' was to provide an opportunity for addressing some of the issues involved with wetland restoration, rehabilitation, creation and management within an Australian context, and to provide a forum for the exchange of ideas and information.

WHAT IS A WETLAND?

At a gathering of wetland ecologists and managers it might seem strange to pose the question, 'What is a wetland?', but it is important to recognise the diversity of those ecosystems which are included under the umbrella term 'wetland'.

There is no universal agreement as to the definition of wetland. Dugan (1993) estimates that there are more than fifty definitions currently employed around the world. In the present context we can consider two definitions recently adopted by the Department of Planning.

For the purpose of Schedule 3 of the Regulations to the Environmental Planning and Assessment Act wetlands are defined as:

> 'natural wetlands include marshes, mangroves, backwaters, billabongs, swamps, sedgelands, wet meadows or wet heathlands which form a shallow water body (up to two metres in depth) when inundated cyclically, intermittently or permanently with fresh, brackish or salt water, and where the inundation determines the type and productivity of the plant and animal communities' (DoP 1994a).

While for the Lower South Coast Regional Environmental Plan (DoP 1994b), the even broader definition is:

> 'Wetland means an area of land subject to permanent or periodic inundation and which generally displays hydrophytic characteristics or an area of land capable of regenerating vegetation to fulfil that criteria'.

The term 'wetland' therefore covers a disparate range of ecosystems with very different properties. Although we can accept that all wetlands are important and deserving protection, we would also recognise that, other than being included within the definition of wetland, a mangrove and an alpine peat swamp have little in common either in terms of biota or ecosystem functions.

Appropriate management regimes differ between wetland types, as does our ability to rehabilitate or recreate wetland types. This is an important message to convey to planners, decision-makers and the public. There is a danger that too frequent use of the term 'wetland' without qualification might give an overly optimistic view of our current ability to address problems with all types of wetland. It also tends to create an impression that all wetlands are equal. This becomes important when questions of mitigation are to be addressed. If an area of wetland is to be lost, is it appropriate to specify that in mitigation another area of wetland will be recreated? Should mitigation be with like wetland type - in which case in Australia it would only be an option for those few wetland types where there is a reasonable chance of success. If replacement of like with like cannot be guaranteed, is replacement with another type of wetland appropriate, and if so should it be on an equal area basis or should a greater area of common wetland types be created in compensation for loss of rarer types; is maintenance of net function more important than maintaining area? There are no absolute, preordained answers to these questions, but they are certainly matters which require debate in order to develop consistent policies.

ASKING QUESTIONS - WHY, WHAT, HOW?

There is no doubt that some wetland species are very robust in the face of disturbance (either from natural or human causes) and have considerable powers of dispersal and regeneration. As a result, there are many examples of wetland systems which have been created incidentally to some other purpose or which have been heavily disturbed but which have naturally recovered, if not to the same wetland type, at least to some sort of wetland (an outstanding example would be the Norfolk Broads in eastern England - George 1992).

A management policy of simply allowing wetlands to develop or change without direct management would therefore be an option. However, it is unlikely to be acceptable for two reasons.

1. There may be features of wetlands (be they species or processes) whose survival we might wish to ensure. This could not be guaranteed under the lottery of non-interventionist management. However, the question is whether we have sufficient knowledge to guarantee our desired result through management.

2. Regulatory authorities seek instant solutions. A condition of consent may

be that a certain wetland type exist on a site within a short period, while the 'natural' processes of colonisation and development may occur unpredicatably over decades. (There could be considerable debate over the appropriateness of the expectations of planning and regulatory authorities).

However, if we are to enter into actively designing and implementing outcomes we need to give much more attention to answering a number of questions.

Why?

What are the objectives of a proposal? This may seem to be an obvious and unnecessary question but frequently the objectives are either not, or are very poorly, articulated.

It is important to make objectives clear for a number of reasons. If the objectives are undefined the worth of a proposal cannot be assessed. Without objectives the success of a project cannot be measured. If objectives are not well-explained, different groups may make different assumptions leading to conflicts over management in the future.

The importance of defining objectives so as to properly monitor success has been extensively discussed by Zedler (1988a, b, 1991, 1993, Langis *et al.* 1991, Gibson *et al.* 1994). In the case of a number of mitigation and rehabilitation projects involving coastal saltmarshes in California there was, at a superficial level, success in that the result was areas of saltmarsh plants in an intertidal habitat. However, as Zedler's work shows, it is not necessarily true that a saltmarsh is a saltmarsh is a saltmarsh. As habitats for endangered species, and in terms of nitrogen pools and vegetation structure, the created marshes were not equivalent to natural marshes and thus in terms of replacement of fully equivalent functional ecosystems could not be regarded as successful.

The question of future conflicts over management may arise with wetlands created for waste water assimilation. Such wetlands may have multiple functions, providing habitat for a range of opportunist colonists and having aesthetic value. However, maintenance of the waste assimilation function may demand drastic management including substantial vegetation removal and replacement. Unless the primacy of the waste assimilation function is clearly established and understood there may well be objections, particularly from local residents, when management is required some years in the future.

What?

What types of wetlands are we dealing with? How do the particular features of those wetland types restrict the options for management?

In the case of many wetland types in Australia, there are so few quantitative data available that there is a very flimsy basis for predicting the results of various management regimes.

How ? Do we have the technical knowledge to manage wetlands?

The knowledge base on which wetlands can be managed varies with wetland type and management purpose.

If the aim is to provide sustainable populations of some particular rare species then we would have a very uncertain basis for action. Very few species have been subject to detailed autecological study.

If the object is to construct a wetland for waste water assimilation then there is a large, and rapidly growing, literature from which to seek guidance.

In general terms, there is considerable information on the effects of manipulation of water levels on the local distribution and abundance of wetland species (Payne 1992, Froend *et al.* 1993). This will provide broad guidelines to assist management, although the detailed management prescription is likely to require fine tuning to meet the management objectives for each particular site.

In the Australian context, it is important to recognize the experimental nature of wetland management and to ensure full documentation of properly designed monitoring programmes so that in the future

we may be able to predict the outcome of management with much greater certain.

DISCUSSION

The seminar is timely in view of the increasing expectations of the role that wetlands can play in the landscape.

We have much to learn, and not all experiments will be successful, but unless we take action now the decline and degradation of wetland resources will continue.

I am enthusiastic about the potential for wetland rehabilitation and for the creation of artificial wetlands for specific purposes (provided that creation does not involve the loss of non-wetland habitat of conservation value). I would approach the concept of mitigation with more caution for several reasons. Firstly, acceptance of mitigation may encourage an attitude where developers will ask "where will I mitigate?" rather than "how can I modify my proposal so as to avoid damaging a wetland at all?" Mitigation could become an easy excuse for destroying natural wetlands. Secondly, I would argue that not enough is known about the success of mitigation. There has been inadequate documentation and monitoring of most mitigation exercises. In the future this constraint may be removed but for the present mitigation is a gamble. However, at present it is clearly impossible to guarantee like for like replacement - it is certainly possible to recreate *Phragmites* or *Typha* swamps, it appears likely that recreation of some mangrove communities is also possible, but the chances of recreating saltmarsh or *Sphagnum* swamp would be slim. If mitigation is to be permitted then there needs to be very careful formulation of policy, rather than the matter being addressed through *ad hoc* decisions.

The term mitigation has undergone subtle changes of meaning in recent years. In the current context it has been defined as 'measures taken to reduce adverse impacts. A regulatory approach that, in effect, permits conversion of habitat in return for compensation in the form of enhancement, restoration or creation of other habitat' (NRC 1994).

Renner (1994) regards the use of 'mitigation' by wetland scientists as inaccurate, pointing out that the original meaning of the word is 'to make less' or 'to make less severe'. Mitigate does not mean 'to create, construct, restore or enhance wetlands.' He argues that we should only talk of mitigating impacts, not wetlands. 'The act of "furnishing an equivalent" or "making amends for destroyed wetlands"... should properly be termed "wetland compensation"', and he points out that 'if "mitigation" is generally perceived to mean "wetland creation or restoration" then it becomes difficult to adequately pursue the primary steps of impact mitigation such as impact avoidance because attention is immediately focused only on the final option of compensation.'

Renner (1994) goes on to offer his own definitions:

> 'Mitigation *n.* the act of making less. Wetland mitigation *n.* the act of making less wetland; usually performed inadvertently by developers or purposely by consultants striving to prevent the former.'

While these views should not deter us from attempting to rehabilitate and manage as much of our legacy of degraded wetlands as possible, we should give them careful consideration whenever mitigation is proposed.

REFERENCES

Department of Planning (1994a). *EIS Report. Review of amendments to Schedule 3 of the Environmental Planning and Assessment Regulation 1980*. Department of Planning, Sydney.

Department of Planning (1994b). *Lower South Coast Regional Environmental Plan No. 2.* Department of Planning, Sydney.

Dugan, P. (1993). *Wetlands in danger.* Mitchell Beazley/IUCN, London.

Froend, R. M., Farrell, R. C., Wilkins, C. F., Wilson, C. C. & McComb, A. J. (1993). *The effect of altered water*

regimes on wetland plants. Wetlands of the Swan Coastal Plain Vol. 4. EPA & Water Authority of W.A., Perth.

George, M. (1992). *The land use, ecology and conservation of Broadland.* Packard Publishing, Chichester.

Gibson, K. O., Zedler, J. B. & Langis, R. (1994). Limited response of cordgrass (*Spartina foliosa)* to soil amendment in a constricted marsh. *Ecological Applications* **4:** 757-767.

Lagis, R., Zalejio, M. & Zedler, J. B. (1991). Nitrogen assessments in a constructed and a natural salt marsh of San Diego Bay. *Ecological Applications* **1**: 40-51.

Maltby, E. (1986). *Waterlogged wealth. Why waste the world's wet places.* Earthscan, London.

National Research Council (1994). *Restoring and protecting marine habitat. The role of engineering and technology.* National Academy Press, Washington.

Payne, N. F. (1992). *Techniques for wildlife habitat management of wetlands.* McGraw Hill, New York.

Renner, J. (1994). Letter to the Editor. *Bulletin Society of Wetland Scientists* **II (5)**: 5.

United States Dept. of Agriculture Soil Conservation Service (1992). *Engineering field handbook. Part 650, Chapter 13. Wetland restoration, enhancement or creation.* USDA, Washington.

Williams, M. (Ed.) (1990). *Wetlands: a threatened landscape.* Basil Blackwell, Oxford.

Zedler, J. B. (1988a). Salt marsh restoration: lessons for California. pp. 123-138. In: Cairns, J. (Ed.) *Rehabilitating damaged ecosystems. Vol. 1.* CRC Press, Boca Raton.

Zedler, J. B. (1988b). Salt marsh restoration: can we do it? pp. 317-325. In: Wilson, E.O. (Ed.) *Biodiversity.* National Academy Press, New York.

Zedler, J. B. (1991). The challenge of protecting endangered species habitat along the Southern California coast. *Coastal Management* **19:** 35-53.

Zedler, J. B. (1993). Canopy architecture of natural and planted cordgrass marshes: selecting habitat evaluation criteria. *Ecological Applications* **3:** 123-138.