

The conservation of urban marine/estuarine wetlands-conflicts and resolutions

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ABSTRACT

Australia's population and major cities are concentrated along the coastal fringes, mostly on estuaries. As these cities developed, extensive clearing of estuarine/marine wetlands occurred and often all that remains today are isolated stands of wetlands. Their importance is discussed in terms of how these remnants function in the estuarine ecosystem. In addition, they have aesthetic, recreational and educational values. To illustrate these values, the wetlands of Bicentennial Park and Newington at Homebush Bay on the Parramatta River in Sydney are used. These wetlands, which are adjacent to the Sydney Olympic Site, have been well studied since the 1980s and probably are the best-studied urban wetlands in New South Wales.

Key words: Wetland, urban, estuarine, conflict

Introduction

Australia's population and major cities are concentrated along the coastal fringes, most being located in estuaries or protected bays. These sites were originally selected for settlement as they allowed the development of ports and associated shipping. Subsequently, the development of cities around these ports resulted in the extensive clearing of marine/estuarine wetland habitats from the foreshores, estuaries and bays (Bucher and Saenger 1991). For example, in the Homebush Bay area on the Parramatta River, there has been a 25% reduction in the area occupied by mangroves and a 60% decline in the saltmarsh areas over the past 60 years (Burchett and Pulkownik 1996, and these are figures by Clarke and Benson 1988) and even greater losses may have occurred prior to that, because in the 1800s some of the area was used to create ponds where salt was harvested (Meredith 1844; <http://www.oca.nsw.gov.au/ecology/detail.cfm?ObjectID=83&SectionID=ecohistory> for a detailed history of the area). In many cases all that remains today are small, scattered remnants of wetlands, including areas of saltmarsh and mangroves, coastal lakes and lagoons (Adam *et al.* 1988; Williams and Meehan *in press*; Williams *pers.com.*)¹. These remnants vary in the amount of degradation, often with bund walls restricting tidal flows, and impacted by pollutants being carried down creeks draining the catchment. Although clearing of large wetlands is largely controlled by legislation (e.g. international where the wetlands have been recognised as important feeding grounds for migratory birds and have been designated as RAMSAR sites ('Convention on Wetlands of International Importance Especially as Waterfowl Habitat' 1971), federal and state), many of these smaller remnant wetlands are protected only by legislation at the local council level. Although the value of large stands of marine/estuarine wetlands has been well documented, both ecologically and economically (Clough

et al. 1997; Ellison and Farnsworth 2000; Hogarth 1999; Kathireson and Bingham 2001), we know little about the importance of remnants wetlands in estuarine function.

The remnants are often just isolated pockets of wetlands scattered along the estuarine foreshores, so the question arises as to whether they are connected to each other in a functional way, or does each stand represent a discrete community? If they are important, what steps can be taken to restore them and protect them (Chapman and Underwood 1997a)? We do know that these remnant wetlands are important feeding grounds for wading birds and migratory species (Kent and Day 1983; Taylor 1996). Even small remnants are important nurseries for many species of fish, crustaceans and commercial species (Gibbs 2003; Lincoln Smith *et al.* 1996). Species composition of wetlands varies along the estuary and is influenced by salinity regimes (Hutchings and Recher 1982) and recruitment may come from nearby areas of wetlands (Chapman and Underwood 1997a). They also stabilise river banks and trap sediments (Alongi 2002). While no detailed studies have been carried out on the productivity of these remnants, extensive studies have been carried out on larger stands of wetlands (Duarte and Cebrian 1996; Hutchings and Saenger 1987; Field 1998), which clearly indicate how productive they are. We do know that isolated remnants contain a variety of species, some of which may be abundant (Berents 1996; Burchett and Pulkownik 1996; Burchett *et al.* 1998; Chapman 1998; Chapman and Underwood 1997b, Chapman *et al.* 1997; Hutchings 1983; Hutchings and Recher 1974; Hutchings *et al.* 1977) suggesting that they may be critical for estuarine function (Adam 1990; Alongi 2002). Finally, urban wetlands contribute aesthetic, recreational and educational values. These values can be illustrated by the wetlands of Bicentennial Park and Newington at Homebush Bay on the Parramatta River in Sydney.

¹NSW Fisheries are in the process of trying to reconcile earlier distributions of marine wetlands in NSW with current distributions using GIS techniques to compare these two data sets.

The wetlands of Bicentennial Park and Newington at Homebush Bay

The Australian Museum in the 1980s and 1990s was involved in a large number of faunal studies in the area, which became the site for the Sydney Olympics (Berents 1996; Cogger 1996; Taylor 1996). Subsequently, these faunal studies were continued by workers at the University of Sydney (Barnes and Chapman 1998, 2001; Chapman and Underwood 1997a,b and refs therein; Chapman *et al.* 1997; Lindegarh *et al.* 1999). Detailed studies by Clarke and Benson (1988) and Kachla (1992) document the changes to the saltmarsh plant communities and Burchett and Pulkownik (1996) document them for the mangroves, and together they provide a detailed description of the current wetland plant communities.

In the centre of Sydney, the wetlands of Homebush Bay, surrounded by dense urban populations, contain a rich and diverse terrestrial and marine fauna in the remnant wetlands and woodlands. In part, the richness can be attributed to the presence of the Newington Armaments facility, where people had been excluded for decades and there were control programmes for feral animals. Adjacent to Newington, Bicentennial Park consists of extensive habitats of mangroves, saltmarsh, fresh water swamps and mowed areas. Board walks and cycle trails were built through the wetlands and around their margins. Throughout the year, large numbers of people use this park for recreation, bird watching, exercising and many of the local schools make extensive use of its Education Centre. Nearby areas are heavily urbanised, with high density residential areas being developed at Mariners Cove. The publicity for these developments highlights nearby Bicentennial Park and access to its open spaces as contributing to a new way of "living". Many of the people using the Park are new migrants and these wetlands may be the first that they have seen.

The large number of information boards and the Education Centre hopefully ensures information relating to their importance being readily available. Direct contact is achieved by walking along the mangrove board walks where crabs can be seen foraging on the surface of the mud, and a range of birds can be observed using the area. Bird hides have been installed around the freshwater swamps to facilitate observation. The Park also has a detailed web site and there are future plans to upgrade it, enabling school children, in particular, to have virtual access to these wetlands. All these activities tend to dispel the view that wetlands are "nasty smelly places" not worthy of conservation. While such a view is hopefully diminishing, it was a very prevalent one until recently. In the past, many wetlands were drained and filled with garbage and subsequently developed as playing fields, parks, roads or used for other infrastructure. As commonly seen in many urban wetlands, trail bike tracks through the saltmarsh are common, and typically a large amount of garbage is trapped within them. This garbage may have been dumped in the saltmarsh or else washed into the neighbouring river through storm water drains and deposited at extreme high tide in the

marsh. Much of this rubbish is plastic, and it will not break down, and feeding birds may get entangled in it. Also the presence of rubbish sends the wrong signal to the general public and may encourage more people to deposit their rubbish at the same site. This suggests that a sector of the population has not yet taken on board the value of wetlands as the interface of land and sea, either at Bicentennial Park or in other urban wetlands.

A film, shown regularly at the Education Centre, documents the development of Bicentennial Park from an area which had been extensively filled by the local Council which used it as a garbage tip for many years, to the present day of being a Park. This was only achieved by removing much of the fill, restoring original levels to allow tidal flushing, which encouraged the mangroves to propagate and regenerate in previous backwaters. Dredging created various ponds, which provide habitat for wading birds. This recovery work was initiated in 1983 and the Park was opened in 1988, although the restoration of the habitats is an ongoing process. In part, the boundaries of the wetlands have been restored to those which existed at the time of European settlement (Clarke and Benson 1988). The value of the wetlands in Bicentennial Park and Newington has been recognised internationally with their declaration as a RAMSAR site, as it is an important feeding ground for many migratory birds as they move from their breeding areas in northern areas to their wintering southern sites (Straw 1996).

While Bicentennial Park illustrates the values of wetlands, what are the conflicts?

Australians enjoy living on or near the waterfront and are willing to pay high prices for the privilege. They will weed their adjacent mud flat or sandy shore to ensure that no mangrove seedlings survive to obscure their view. Many of these waterfront properties in Sydney were originally wetlands, both mangrove and saltmarsh, cleared for residential and industrial developments. For example, the foreshores of the inner Sydney suburbs of Rozelle and Balmain were lined with wetlands (Tench 1789, 1793), but now they are sort after real estate. As Australia's population becomes more affluent and leisure-orientated, our estuaries are increasingly being used for recreational boating, which encourages the development of marinas and boat ramps to moor or launch the boats (Saenger 1996). Another potential conflict is the expansion of some ports, for example the expansion of the port of Gladstone in Queensland resulted in a large area of mangrove reclamation (see Fig 1 in Duke *et al.* 2000 and http://www.coastal.crc.org.au/port_curtis/). Water frontage is a limited resource and there are increasing demands on it. The community needs to recognise that wetlands provide habitat for a wide variety of organisms, many of which are restricted to this habitat (Kathiresan and Bingham 2001). Loss of wetlands will result in the local extinction of these species and have resultant ecological impacts (Alongi 2002).



Student group counting the number of animals in a quadrat at Careel Bay, Pittwater- using the wetlands as a “classroom”
Photo: Peter Whalan

The value of urban wetlands

While it is now recognised that wetlands have an economic value that is self generating (Turner *et al* 1993; Ronnback 1999), it is difficult to put an actual dollar value on particular wetlands. For example, while fish landings have declined in some estuaries, it is difficult to equate this directly to losses of wetlands as many other factors must be considered. Some years ago Harry Recher and I tried to correlate fish landings with losses of wetlands in the Hawkesbury River, just north of Sydney. Fish landings available from NSW Fisheries for the area recorded which fish had been landed, but not where they had been caught. Talking to local fisherman it became clear that not all fish landings pass through the local fish co-op and, in addition, extensive amateur fishing occurs. This further complicated the analyses that eventually proved too difficult. For those fish species that use wetlands as nurseries, they are vital for the long-term viability of these fish in the area.

Urban wetlands also trap sediment and absorb much of the wash from boats. They also trap pollutants and plant matter and both macro and micro fauna help to breakdown this organic matter. Some of it is washed back into the estuary and contributes to the estuarine ecosystem (Alongi *et al.* 2001).

The question of the functionality of these small remnants has not been explored but probably depends upon the size of the remnant, its location within the estuary and the distance from neighbouring stands. In general, upstream wetlands have a less diverse fauna than those found further downstream where fully marine conditions occur (Hutchings and Recher 1982).

Degraded wetlands

Degraded wetlands, where tidal flushing is restricted by bund walls, may have ponding of water which encourages dense populations of mosquitoes that may cause a nuisance to nearby residential areas. This was occurring at Newington and Bicentennial Park and the remedial action taken by the Department of Defence and Bicentennial Park was to spray the wetlands. This killed all the mosquitoes in the short term, as well as the rest of the wetland fauna (Barnes and Chapman 1998). People tramping through the wetlands in order to spray the insecticide also caused additional ponding of water in their footprints and in the long-term facilitated the breeding of mosquitoes. Removal of bund walls and increasing levels of tidal flushing in the area has reduced the ponding of water and reduced the breeding habitat for the mosquitoes. Ongoing monitoring is in progress to investigate changes in the diversity of the benthic fauna (Barnes and Chapman 2001, Burchett *et al.* 1998). This is a far better solution than continual spraying by insecticides to control the mosquito population.

The recovery of degraded wetlands will also presumably be dependent on the proximity of healthy wetlands which can act as sources of potential recruits, as most of the wetland fauna has pelagic larvae (Chapman and Underwood 1997a). Similarly mangroves have propagules which are dispersed by water and certainly over the past few years mangroves have successfully colonised areas previously occupied by saltmarshes (Burchett and Pulkownik (1996).



Student group using urban wetlands (Careel Bay) as a classroom to plot the distribution and abundance of animals in relationship to the amount of plant cover. Photo: Peter Whalan.

Urban wetlands are worthy of being maintained and enhanced

Urban wetlands have an important role as an ecosystem at the sea/land interface, and as an educational and recreational resource for the region. They are worthy of being maintained and enhanced by removal of bund walls or similar structures that impede tidal flushing and also by improving the quality of freshwater inputs into the system. In addition, some active remediation may need to occur to remove weed encroachment from the terrestrial margins. Under normal circumstances the terrestrial and marine margins of the wetlands are highly mobile and fluctuate according to sedimentation patterns (Hutchings 2001). However, in the urban situation, the terrestrial margins are often fixed and the saltmarsh cannot expand landwards onto residential development. This is marked at Homebush Bay where mangroves are extending landwards encroaching on the saltmarsh (Burchett *et al.* 1998, 2000), largely in part due to development in the catchment and increased land run off. Consequently, it will be necessary to regularly remove some mangrove seedlings to maintain the saltmarsh communities.

While the public increasingly accepts the value of bush remnants in their suburb, I suspect we have a way to go in convincing the public of the value of their wetlands. It is therefore important to incorporate wetlands into nature reserves, and to resolve the responsibility of such areas, especially in New South Wales, as to whether such areas should be administered by National Parks and Wildlife Service, New South Wales State Fisheries, or the Marine Park Authority and to give the public access to several of them through board walks. Only once the public can experience wetlands first hand will they begin to appreciate the value of this habitat.

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