

# Human impacts on the tidal wetlands of Southern Moreton Bay

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## Abstract

Urban expansion in south-east Queensland poses a major threat to the tidal wetlands of Southern Moreton Bay. Significant features of the area and useful information sources are summarized. Conservation issues and the environmental impacts associated with urbanization are discussed, and reference is made to educational use of such areas.

## The resource

Southern Moreton Bay is a 200sq.km area in south-east Queensland where land and sea merge to form a mosaic of unspoiled islands, sandbars, tidal flats and narrow, winding waterways (Fig. 1). The city of Brisbane lies to the north-west and the popular holiday resort area of the Gold Coast lies immediately to the south.

It has been defined as the area of islands and waters of Moreton Bay lying between the northern tip of Macleay Island and the Nerang River bridge (Curgenvén & Outridge 1982). Macleay, Russell, Lamb and Karraggarra Islands at the northern end of this area are largely terrestrial, although their shorelines are partly lined with narrow mangrove fringes. Most of the islands to the south are predominantly covered with mangroves and tidal marshes. Southern Moreton Bay is up to 10.5km wide at its northern end and 46km long.

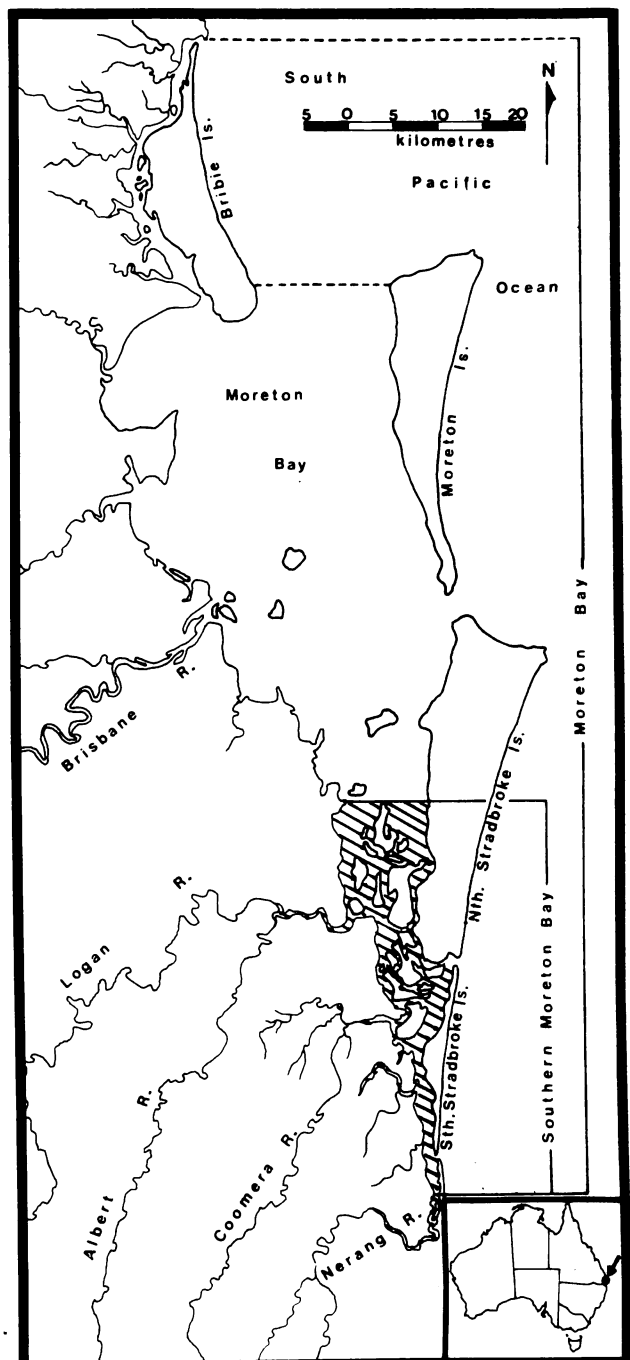
The sheltered waterways of Southern Moreton Bay provide the most important area in south-eastern Queensland for recreational boating and fishing. Thus Southern Moreton Bay not only provides a major recreational resource, but also a potentially sustainable economic resource of considerable value to the community, because of the substantial financial outlays associated with this form of recreation (Curgenvén & Shanco 1982; Driml & McBride 1982).

The tidal wetlands of Southern Moreton Bay are regarded as a natural resource of national and international conservation significance (Arthington & Hegerl, in press). They provide a very important stop-over point for at least 23 species of trans-equatorial migratory wading birds which are the subject of an international conservation agreement between the governments of Australia and Japan.

Curgenvén & Outridge (1982) gave the area of Southern Moreton Bay mangroves as 6950ha., which in 1978 was 52% of the total mangrove resource remaining between the Queensland-New South Wales border and the Noosa River. They found that there were 2870ha. of saltmarshes, which was 40% of the total remaining in the same region. While turbid waters have prevented an accurate assessment of the area of seagrass beds, they are also extensive, particularly around the northern islands and mainland shoreline.

There are little published data on the mangroves of the area, although Dowling (1979) provided a field key and generalized account of Moreton Bay mangroves and Elsol & Dowling (1978) delineated mangrove and saltmarsh distribution on a 1:100,000 scale vegetation map. Olsen (1979) presented a brief description of Fish

Figure 1: Location Map of Southern Moreton Bay.



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Habitat Reserves of Southern Moreton Bay, and maps indicating their boundaries, as well as the boundaries of Wetland Reserves and Fish Sanctuaries are shown in Department of Harbours & Marine (1986). These reserves only protect unalienated Crown land, and much of the tidal wetlands within these boundaries are, in fact, leasehold and, in some cases, freehold land.

Some additional sources of data on Southern Moreton Bay are listed in Appendix 1.

### The threats

The northward expansion of Gold Coast urbanization has resulted in the replacement of the formerly extensive mangrove forests of the Nerang River by Australia's largest system of man-made waterways. Urbanization of the Angler's Paradise and Paradise Point areas, and more recently, the Hope Island area have resulted in additional losses. Within the Broadwater, mangroves have been cleared from Andys, Griffin, and Ephraim islands. Further north, relatively minor mangrove destruction has occurred in the Jacobs Well and Steiglitz areas.

The conservation of the tidal wetlands of Southern Moreton Bay first emerged as a public issue on January 28, 1968 with the announcement of a State Government plan to allow the construction of "Alberta City" on Coomera Island. The proposal was to become "the Gold Coast's biggest single development of real estate" and when completed would house 25,000 people in an area of more than 10sq.km. The project would include a 917m airstrip, 1000 homes with golf course frontages, and 3000 homes with "deep-water frontage" on man-made canals.

The Australian Littoral Society and the Wildlife Preservation Society strongly opposed the project on environmental grounds and it was eventually abandoned. Most of the tidal wetlands which had been threatened by this project became the Coomera Island Wetland Reserve on November 19, 1983 after a fifteen year campaign by those organizations to have the area protected.

While there were proposals for real-estate development of Woogoompah Island and other sites in Southern Moreton Bay during the early 1970s, a combination of public opposition to the proposals and lack of adequate economic demand prevented any additional large-scale urbanization.

Public concern at the unplanned nature of coastal development in Queensland, particularly in the south-east of the state, led to a number of important planning studies by government agencies. Between 1974 and 1976 four government-sponsored studies examined land-use options in Southern Moreton Bay, either as a special report or as part of a larger study. They were: The 1974 Report of the Working Committee on Long Term Planning between Jumpinpin Bar and the Nerang River Bridge; the 1974 Moreton Region Non-Urban Land Suitability Study; the 1975 Coastal Management Investigation; and the 1976 Moreton Region Growth Strategy Investigation.

The findings and recommendations from these reports which relate to the conservation of Southern Moreton Bay have been discussed by Stock & Hegerl (1982). There was a strong consensus among planners that the best possible use of the area was for conservation and recreation, rather than urbanization. Unfortunately the Queensland Government has not adopted the conservation strategy put forward in the

Interdepartmental Committee for Coastal Management studies, so many of the alienated tidal wetlands, and even some of the reserves, are now threatened by new development proposals.

Guidelines for the protection and management of estuaries and estuarine wetlands have been provided by A.M.S.A. (1977). The production and amenity values of mangrove ecosystems, and the global threats to this resource have been reviewed by Saenger, *et al.* (1983). Hegerl (1982) reviewed mangrove management problems in Australia, and Westman (1975) has discussed environmental problems common to both American and Australian canal-estate projects.

*The major threat to the tidal wetlands of Southern Moreton Bay arises from the southward expansion of urbanization associated with the greater Brisbane area and the continued northward expansion of the Gold Coast.* Unless government agencies reserve the wetlands for public use and conservation, their filling and conversion to dry land and canal-estate housing developments would seem inevitable.

"Dredge and fill" reclamation projects not only eliminate the areas directly covered by dredging spoil, but also impact on adjacent areas in a number of ways. American examples suggest that for each hectare of newly created land, it will be necessary to dredge three hectares of surrounding waters (Odum, 1970). While marine invertebrates may fairly rapidly recolonize shallow sand or mud banks, if the adjacent areas are excavated to depths below the euphotic zone, recolonization by light-requiring benthos and the organisms which they support may be prevented. As this type of development features "deepwater frontages" to provide for recreational boating, low water depths in excess of two metres would normally be created. In addition, silt pollution associated with the dredging operations may destroy adjacent seagrass beds, leading to the loss of the extensive fauna which they support. Repeated dredging is likely to be necessary to maintain navigational channels.

Another consequence of canal estates and associated dredging of deeper navigation channels is to alter the tidal prism of the adjacent waters (Gutteridge, Haskins & Davey 1975). This can substantially change current patterns and velocities and produce erosion or accretion in surrounding areas to the detriment of the remaining tidal wetlands, or perhaps, other waterfront real-estate. The tidal range may be increased, with tidal penetration into previously uninundated areas and the low tides exposing vulnerable seagrass beds for longer periods.

Urbanization and, in particular, canal estate developments are likely to strongly modify both the quantity and quality of freshwater inputs into surrounding wetlands. When combined with alterations to the frequency and duration of tidal inundation, these modifications may induce environmental stress in formerly healthy mangrove systems resulting in either rapid or gradual mortality.

Stressed mangroves seem very vulnerable to *Phytophthora* fungus infestation. Pegg & Forresberg (1981) studied the *Phytophthora* fungus infestation which had contributed to mortality of approximately 70% of the *Avicennia marina* trees growing near the mouths of the Calliope River and Auckland Creek. It was concluded that the trees had become vulnerable to the fungus infestation because of the stress induced by large-scale disturbance to the mangrove ecosystems in

the Gladstone area. Severe *Phytophthora* infestations have also been observed by the present author in the vicinity of the Brisbane airport development and adjacent to a major reclamation project in the mangroves of western peninsular Malaysia.

Urban development leads to *diminished water quality* in a number of ways. Stormwater runoff is likely to carry heavy silt loads and non-point source pollutants from vehicles, domestic pets, and garden chemical use. Domestic garbage is frequently dumped into waterways or nearby wetlands. Garages and light industrial development may also be sited on the reclaimed land and lead to additional pollution.

Waterfront development places humans in closer proximity to saltmarsh mosquito and "sandfly" (i.e. biting midge) populations and increases demand for biting insect control. The alterations to adjacent wetlands caused by the unintentional environmental "side effects" of the development may substantially exacerbate the biting insect problem. In addition, the sandy beaches of many south-east Queensland canal-estates have actually created optimal breeding habitat for biting midges.

Insect control measures involve direct application of pesticides in the urban areas (generally "ground fogging"), or aerial or ground application of pesticides over breeding sites. Environmental impacts depend on the type of pesticides used, application rate, and on-site conditions at the time of application and immediately afterwards (such as wind strength, temperature, tidal conditions and rain).

While urbanization and associated pollution represent the major threats to the tidal wetlands of Southern Moreton Bay, management efforts are necessary to minimize *the impacts associated with recreational usage*. These include erosion to wetland shorelines from boat wash, disturbance to birds and other fauna, human faecal pollution, and over-collecting of fish, crustaceans and molluscs.

As tidal wetlands are being increasingly used by environmental educators, great care needs to be taken to minimize habitat damage and ensure that over-collecting does not occur. While little is known about the educational carrying capacity of tidal wetlands, the subject has been discussed by Shine *et al.*, (1973) and the Australian Littoral Society (1978).

Trampling damage to both flora and fauna is likely to be the most serious problem in inter-tidal areas used for teaching purposes. Soil compaction along frequently used pathways may even result in altered drainage patterns, with the potential for extending the adverse impacts of heavy usage well beyond the immediate trampled area.

Trampling damage can be avoided through the construction of boardwalks over sensitive inter-tidal areas, but this also needs to be done with care, in order to minimize the impact on areas which will then become the focus of teaching activities. Sheltered hides for the observation of birds and other wildlife can be built on platforms at selected sites along these boardwalks.

Southern Moreton Bay has the potential for greatly increased recreational and educational usage, as long as this is accompanied by appropriate increases in natural resource management activities.

## References

- Anon. *Moreton Region Non-Urban Land Suitability Study*. Part 1. Report Text. Technical Bulletin No. 11. Div. of Land Utilisation, Dept. Prim. Indust., Brisbane, 1974.
- Arthington, A.H., & Hegerl, E.J., The Distribution, Conservation Status and Management Problems of Queensland's Athalassic and Tidal Wetlands. Paper presented at World Wildlife Fund, Australia Workshop on Australia's Wetlands. Sydney, 25-26 February, 1986, in press.
- Australian Littoral Society. *An Investigation of Management Options for Towra Point, Botany Bay*. Aust. National Parks & Wildlife Service, Canberra, 1978.
- Australian Marine Sciences Association. Guidelines for the Protection and Management of Estuaries and Estuarine Wetlands. Aust. Marine Sciences Assn., 1977.
- Co-Ordinator General's Dept. *Moreton Region Growth Strategy Investigations*. 10 volumes. Co-Ordinator General's Dept., Brisbane, 1976.
- Curgenven, J., The History of European Settlement of Southern Moreton Bay. *Operculum* 5, 4. 1982. pp. 169-175.
- Curgenven, J., & Outridge, P., An Introduction to the Geographical and Recreational Features of Southern Moreton Bay. *Operculum* 5, 4. 1982. pp. 163-164.
- Curgenven, J., & Shanco, P., A Study of Recreational Boating in Southern Moreton Bay. *Operculum* 5, 4. 1982. pp. 181-193.
- Dept. of Harbours and Marine Qld. Aust. *Official Tide Tables for Queensland with Notes on Boating 1986*. Govt. Printer, Queensland, 1986.
- Dowling, R.M., (1979). The Mangrove Communities of Moreton Bay. In, *Northern Moreton Bay Symposium*. Eds. A. Bailey & N.C. Stevens. pp. 54-62. Royal Society of Queensland, Brisbane, 1979.
- Driml, S., & McBride, B., Economic Analysis of Recreational Boating in Southern Moreton Bay. *Operculum* 5, 4. 1982. pp. 194-198.
- Elsol, J.A. & Dowling, R.M., Moreton Region Vegetation Map Series: Beenleigh. Botany Branch, Queensland Department of Primary Industries, 1978.
- Gutteridge Haskins and Davey. *Coastal Management, Queensland-New South Wales Border to Northern Boundary of Noosa Shire*. Vol. 2. Wetlands and Aquatic Investigation. Co-Ordinator General's Dept., Queensland, 1975.
- Hegerl, E.J., Mangrove Management in Australia. In, *Mangrove Ecosystems in Australia*. Ed. B.F. Clough, pp. 275-288. ANU Press, Canberra, 1982.
- Hegerl, E.J. & Stock, E.C. Land Use and Land Tenure in the Southern Moreton Bay area. *Operculum* 5, 4. 1982. pp. 176-180.
- Kelley, R.A., & Baker, J., Geological Development of North and South Stradbroke Islands and Surrounds. In, *Focus on Stradbroke* Eds. R.J. Coleman, J. Covacevich & P. Davie. pp. 156-66. Boolarong Press, Brisbane, 1984.
- Odum, W.E., Insidious Alteration of the Estuarine Environment. *Transactions of the American Fisheries Society* 99. 1970. pp. 836-47.
- Olsen, H.F., Fish Habitat Reserves of Moreton Bay. In, *Northern Moreton Bay Symposium*. Eds. A. Bailey & N.C. Stevens. pp. 70-81. Royal Society of Queensland, Brisbane, 1979.

- Outridge, P., & Curgenvin, J., The Aborigines of the Moreton Bay District to 1900. *Operculum* 5, 4. 1982. pp. 165-168.
- Pegg, K.G., & Foresberg, L.I., *Phytophthora* in Queensland Mangroves. *Wetlands* 2, 1. 1981. pp. 2-3.
- Saenger, P., Hegerl, E.J. & Davie, J.D.S. (Eds.) Global Status of Mangrove Ecosystems. Commission on Ecology Papers No. 3. *The Environmentalist* 3, Suppl. No. 3 1983.
- Shine, R., Ellway, C.P., & Hegerl, E.J., A Biological Survey of the Lallebudgera Creek Estuary. *Operculum* 3, 5-6. 1973. pp. 59-83.
- Stock, E.C., & Hegerl, E.J., Recent Planning Studies and the Future Management of Southern Moreton Bay. *Operculum* 5, 4. 1982. pp. 199-203.
- Westman, W.E., Ecology of Canal Estates. *Search* 6. 1975. pp. 491-7.
- Working Committee on Long Term Planning of the Area between Jumpinpin Bar and the Nerang River Bridge. *The Report*. Government Printer, Brisbane, 1974.

## Appendix 1

### SOURCES OF ADDITIONAL DATA ON SOUTHERN MORETON BAY;

#### Quaternary geological development:

*Kelly & Baker, (1984)*

#### Aboriginal use:

*Outridge & Curgenvin, (1982)*

#### European history:

*Curgenvin, (1982)*

#### Present-day land use and land tenure:

*Hegerl & Stock, (1982)*