

## Assessing Ecosystem Health in Moreton Bay and its River Estuaries

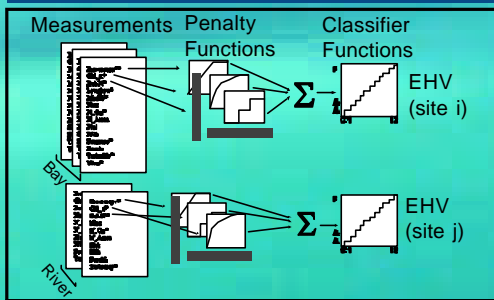


The Moreton Bay catchment currently supports approximately two million people and is the most populated catchment in Queensland. Moreton Bay supports large seagrass meadows with dugong and turtle populations, but there are increasing human pressures affecting the waterways. Environmental protection measures are being implemented by councils and industry including sewage plant upgrades, stormwater controls, and wastewater treatment. The ecosystem health of Moreton Bay and its major river estuaries is being monitored by a team of scientists from Queensland Environmental Protection Agency, The University of Queensland, CSIRO and Queensland Health through the Ecosystem Health Monitoring Program (EHMP). This program aims to evaluate the effectiveness of the various environmental protection strategies to restore and protect SE Queensland waterways. Direct measures of ecosystem health (e.g., toxic algal blooms, seagrass loss/recovery) are being assessed. In addition, ecosystem health indicators which relate to the key processes, anthropogenic impacts and critical habitats as depicted on the conceptual model are assessed. These indicators incorporate measurements of water quality, sediment features and biological indicators monitored in a rigorous spatial and statistical program.

Since 1998, a report card has been presented each year to evaluate improvements or declines in ecosystem health across the Moreton region. Generation of this report card has been based on integration of a range of physical, chemical and biological indicators of ecosystem health. The 2000 report card integrates ecosystem health indicators from up to 150 sites using a numerical ranking system to weight the parameters according to their ecological significance. This analysis enables mapping of ecosystem health throughout the river estuaries and the bay.



Current conceptual model of Moreton Bay and river estuaries



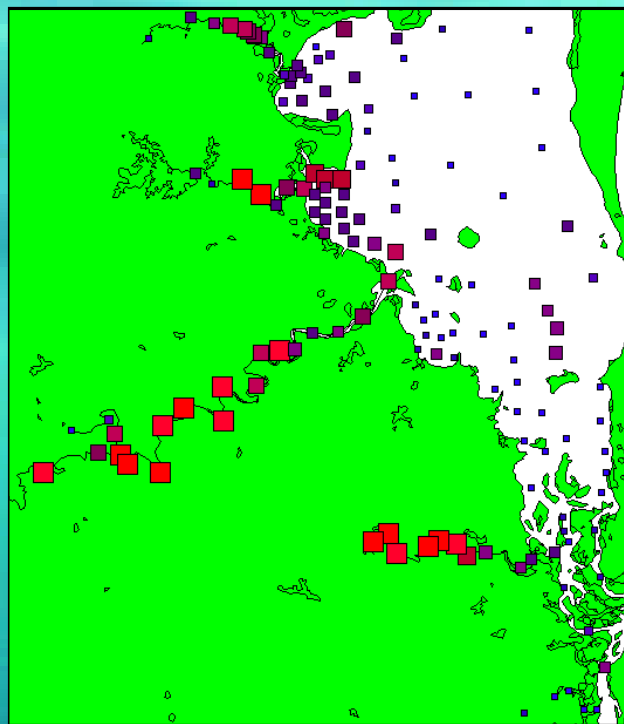
Ecosystem Health Evaluation Scheme

### Ecosystem Health Evaluation

Identify conceptual model attributes into a) direct measures and b) indicators of ecosystem health

Penalty functions assigned to each attribute with direct measures having a higher weighting than indicators

Classifier functions (culmination of penalty weightings) result in letter marking scheme from A (excellent) to F (fail)



Map of Ecosystem Health in bay and rivers (large red boxes = highly degraded)

### Direct Measures of Ecosystem Health

- outbreaks of the toxic cyanobacteria *Lyngbya*
- seagrass loss or recovery
- occurrence of tumours in the sea turtle population
- occurrence of nuisance macroalgae such as sea lettuce (*Ulva* sp.)

### Indicators of Ecosystem Health

- the extent of sewage plumes using  $\delta^{15}N$  signatures of macroalgae and mangroves
- phytoplankton biomass and growth
- nutrient flux between the sediment and water column
- levels of suspended solids in the water column
- water column nutrient concentrations



# Moreton Bay 2000 Report Card

## Nth Deception Bay **D-**

- no improvement
- *Lyngbya* outbreak
- declining seagrass

## Sth Deception Bay **D**

- no seagrass recovery
- high turbidity

## Bramble Bay **F**

- sewage inputs
- high nutrients and turbidity
- *Ulva* blooms
- historical seagrass loss
- high sediment nutrient fluxes

## Waterloo Bay **C+**

- some coral
- stable seagrass beds
- stormwater control

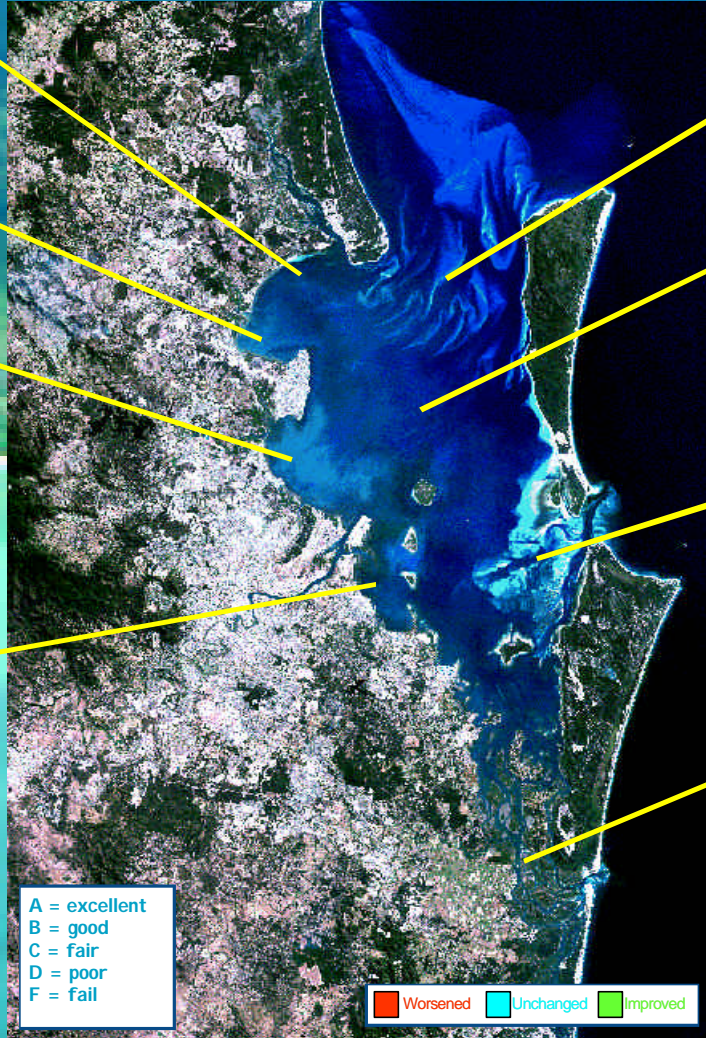
### Dugongs

- 7 deaths in Moreton Bay since June 1999

### Turtles

- >10 000 in Moreton Bay
- Green Turtle Fibropapilloma Disease causing tumours:

70% affected in Southern Bay



## **A** Northern Bay

- well-flushed by oceanic water
- intact denitrification

## **B** Central Bay

- high sediment nutrients
- muddy sediments
- relatively good water quality

## **B-** Eastern Banks

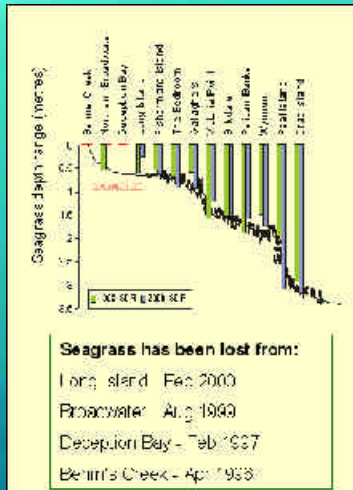
- well flushed by oceanic water
- extensive seagrass beds supporting turtles and dugongs
- *Lyngbya*

## **C-** Southern Bay

- extensive mangrove forests
- sewage inputs
- seagrass losses
- lack of mangrove recovery from hail damage



Elevated nutrients occur in the river estuaries.



Comparison of seagrass depth ranges 1998/99 vs 2000.



The sewage plume from the river estuaries extends into Moreton Bay.



Seagrass loss due to *Lyngbya majuscula* (toxic cyanobacterium) outbreak at Amity and Moreton Banks.

# River Estuary 2000 Report Card

## Noosa River

A-

## Maroochy River

C+

## Mooloolah River

B

## Pumicestone Passage

B-

## Caboolture River

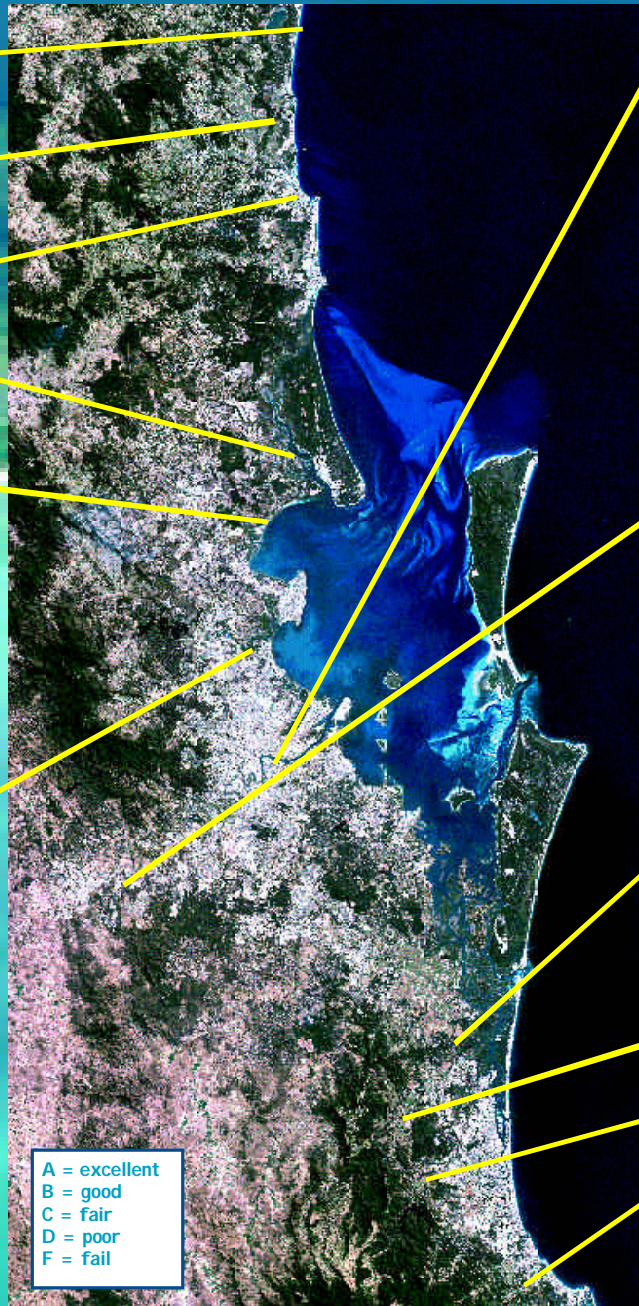
C

- high phytoplankton biomass
- high capacity for algal blooms
- high level of nutrient processing by phytoplankton

## Pine Rivers

D

- some biological processing of nutrients
- high phytoplankton biomass
- toxicants in sediments
- sewage and stormwater inputs
- urbanised and industrial catchment



## Brisbane River

- consistently high turbidity
- low phytoplankton biomass
- high sediment and nutrient loads
- large mangrove clearance
- large sewage and stormwater inputs
- highly urbanised catchment

## Bremer River

- extremely high nutrients and turbidity
- high phytoplankton biomass
- light limited phytoplankton
- highly degraded riparian vegetation

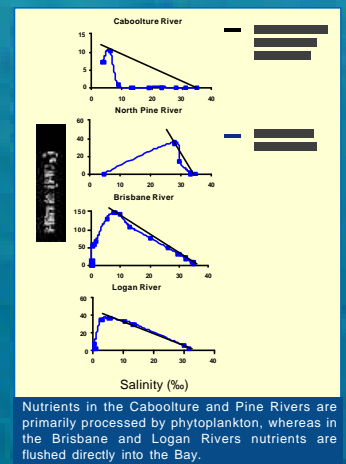
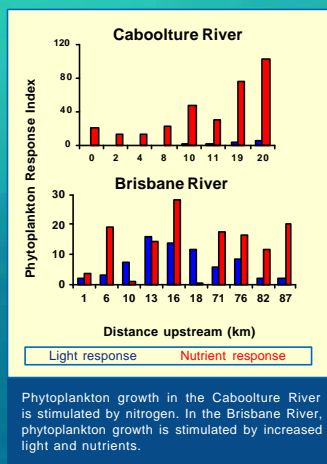
## Logan/Albert Rivers

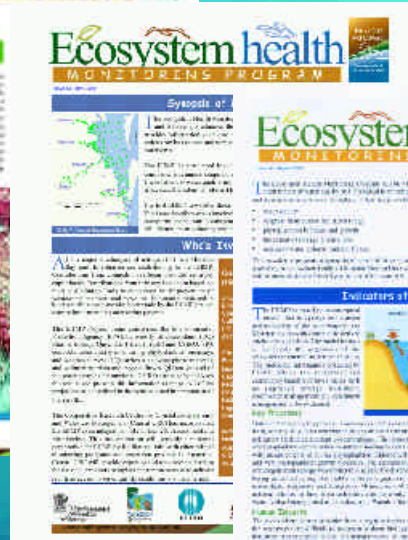
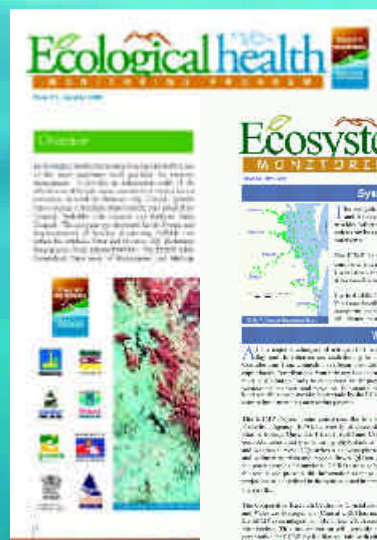
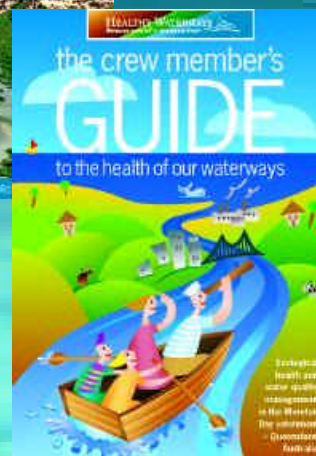
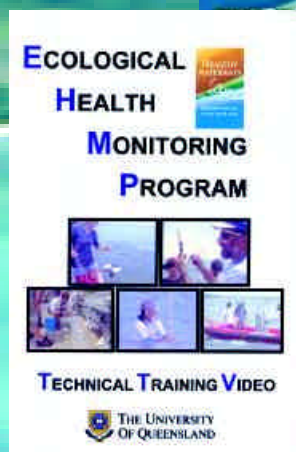
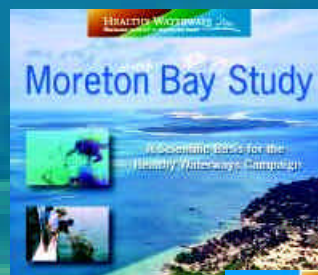
- sewage plume affecting Southern Bay
- further seagrass loss
- limited denitrification

## Coomera River

## Nerang River

## C+ Tweed River





For information on obtaining these publications please contact

SE QLD Regional Water Quality Management Strategy

Ph 61 7 3403 4206  
 Email: [mbs6@brisbane.qld.gov.au](mailto:mbs6@brisbane.qld.gov.au)  
<http://healthywaterways.env.qld.gov.au>

For further information please contact:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Email: [Angela.Grice@env.qld.gov.au](mailto:Angela.Grice@env.qld.gov.au)

Email: [Adrian.Jones@mailbox.uq.edu.au](mailto:Adrian.Jones@mailbox.uq.edu.au)

Layout & Design by  
 Adrian Jones, Ivan Holland &  
 Angela Grice