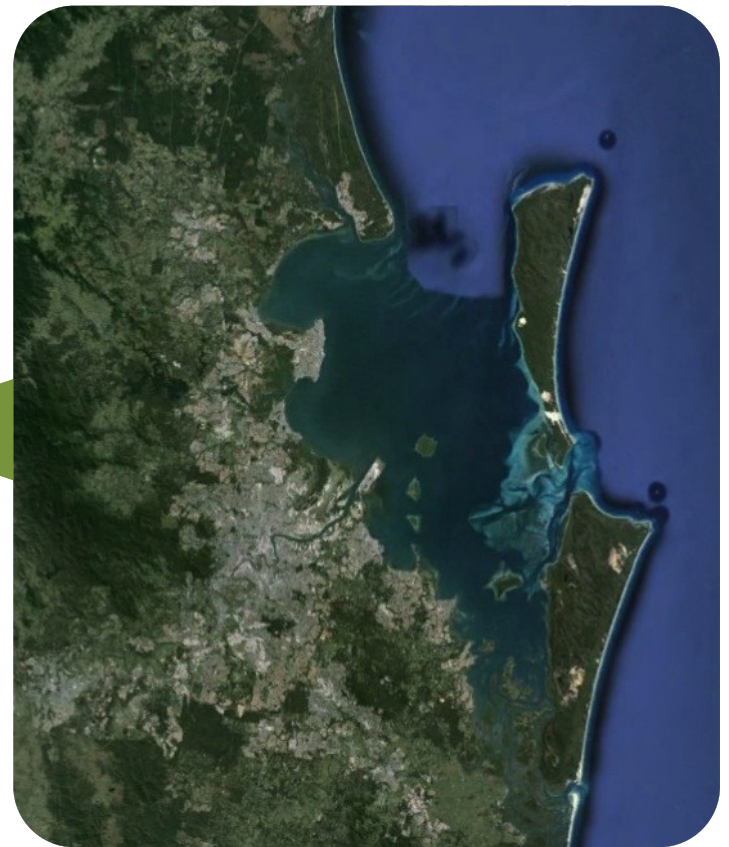


Moreton Bay Australia




Ecosystem Health
Monitoring Program

Moreton Bay

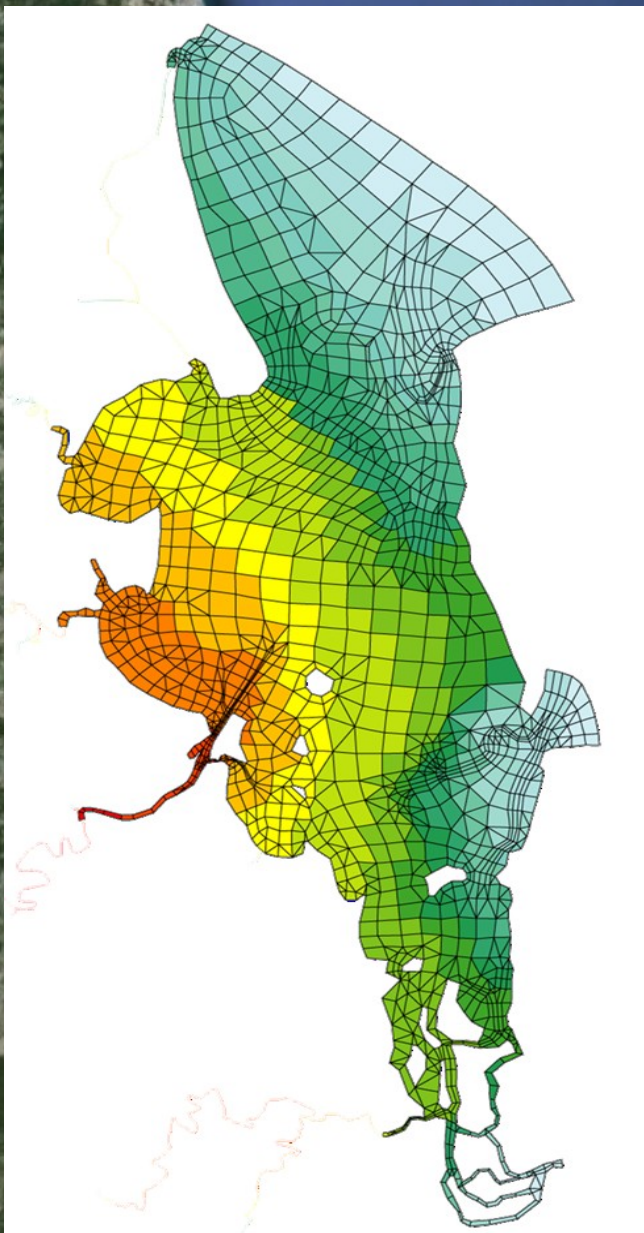


Google earth

Image Landsat
Data SIO, NOAA, U.S. Navy, NGA, GEBCO



20 mi



Residence Time (d)

116-188	
73-116	
62-73	
58-62	
55-58	
51-55	
48-51	
45-48	
41-45	
38-41	
31-38	
24-31	
19-24	
9-19	
6-9	
0-6	



Contrasting systems



Moreton Bay – Natural Values



Moreton Bay – Cultural Values



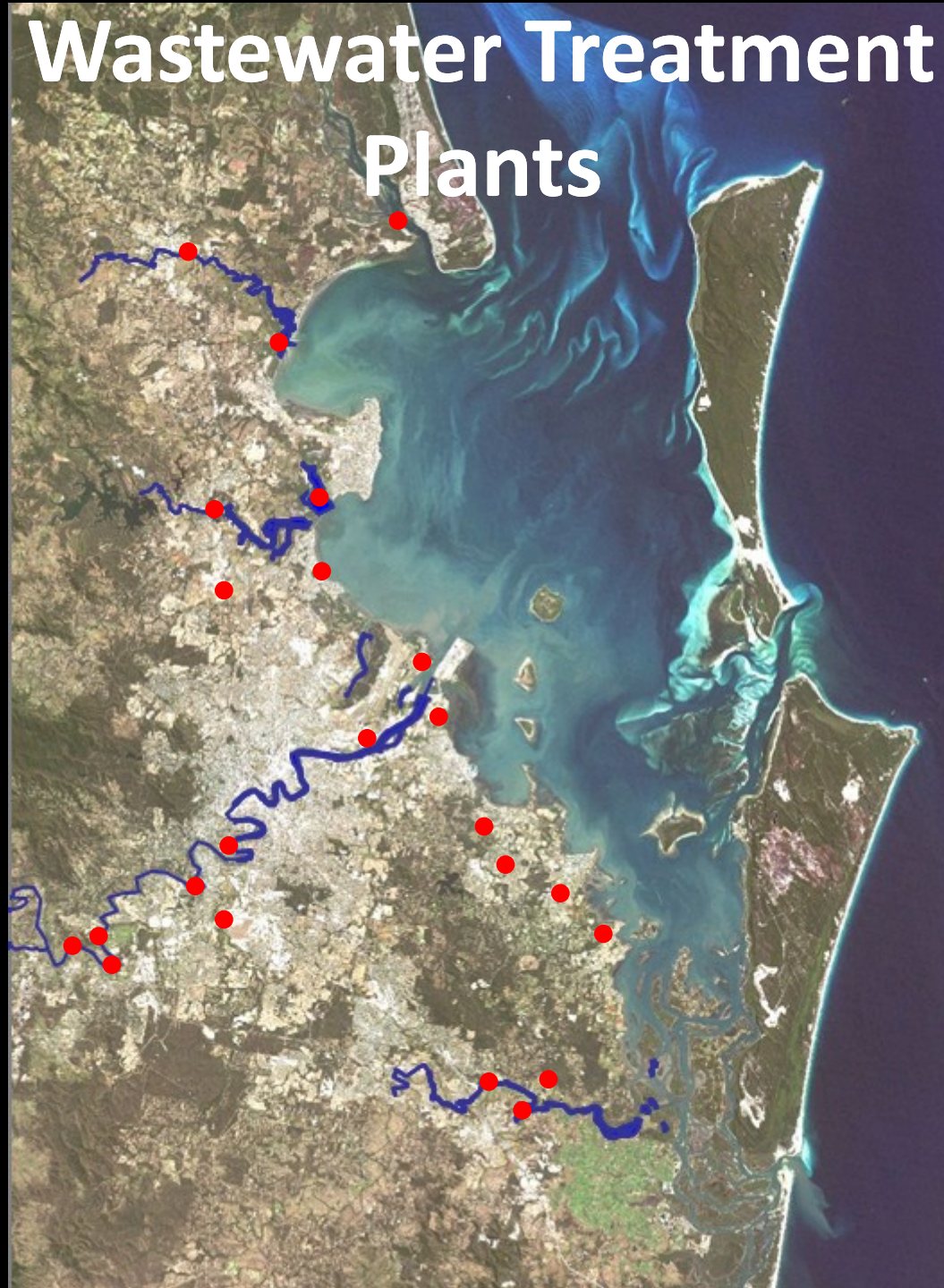
Moreton Bay – Economic Values



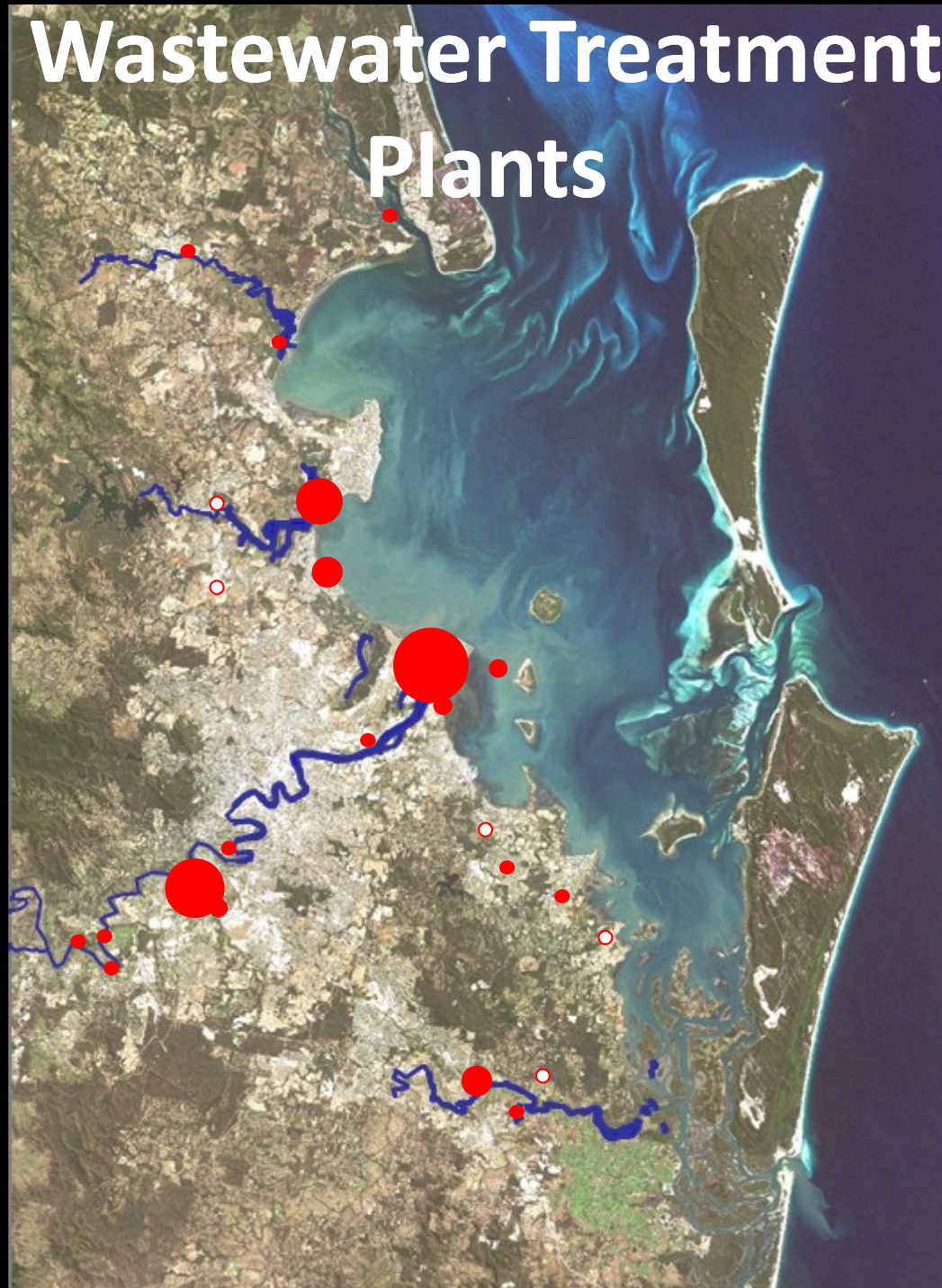
Moreton Bay – Key Threats



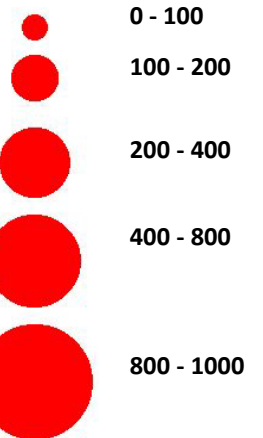
Wastewater Treatment Plants



Wastewater Treatment Plants



Total Nitrogen
(tonnes/yr)



**Residence
Time (d)**

116-188



73-116



62-73



58-62



55-58



51-55



48-51



45-48



41-45



38-41



31-38



24-31



19-24



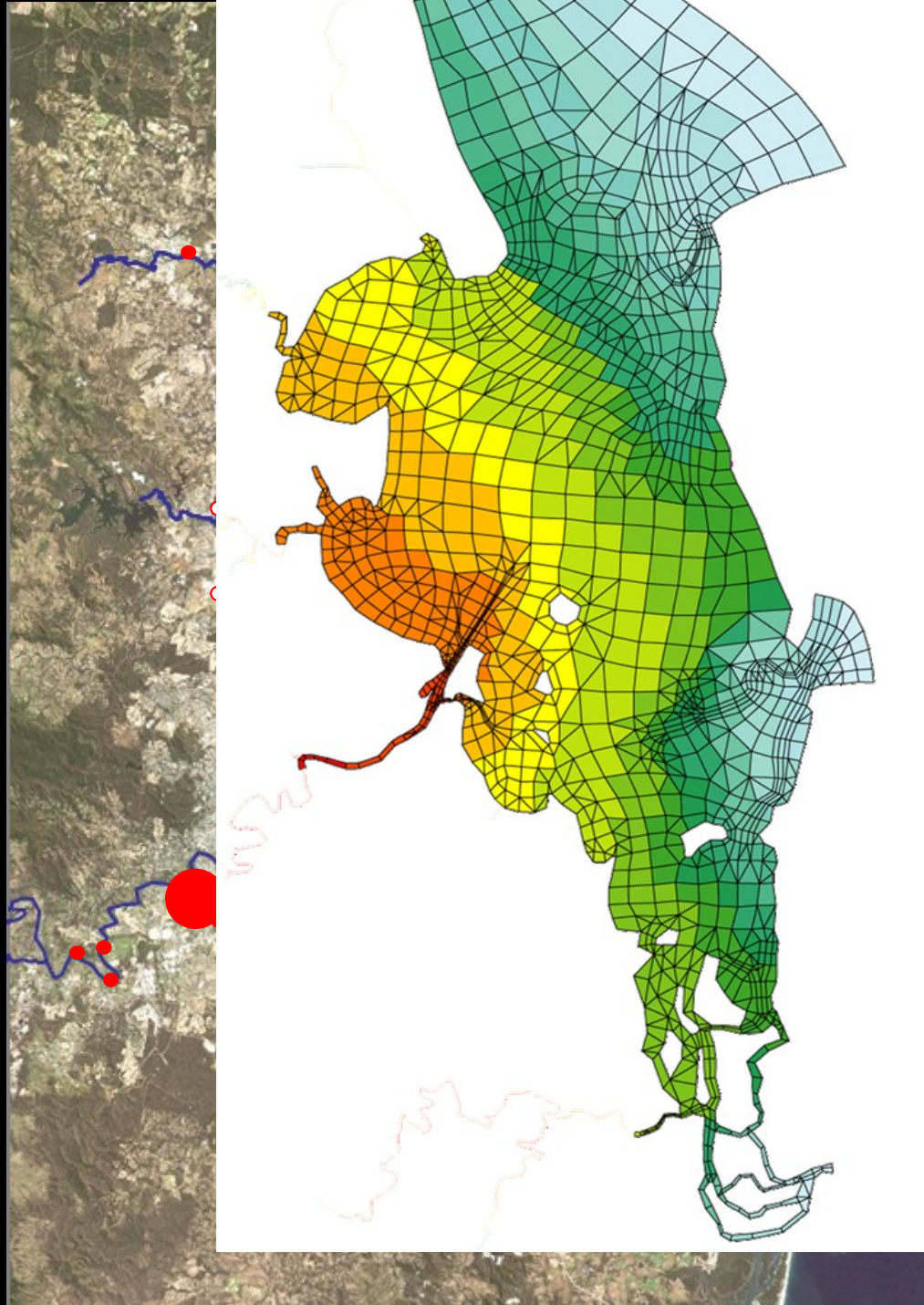
9-19



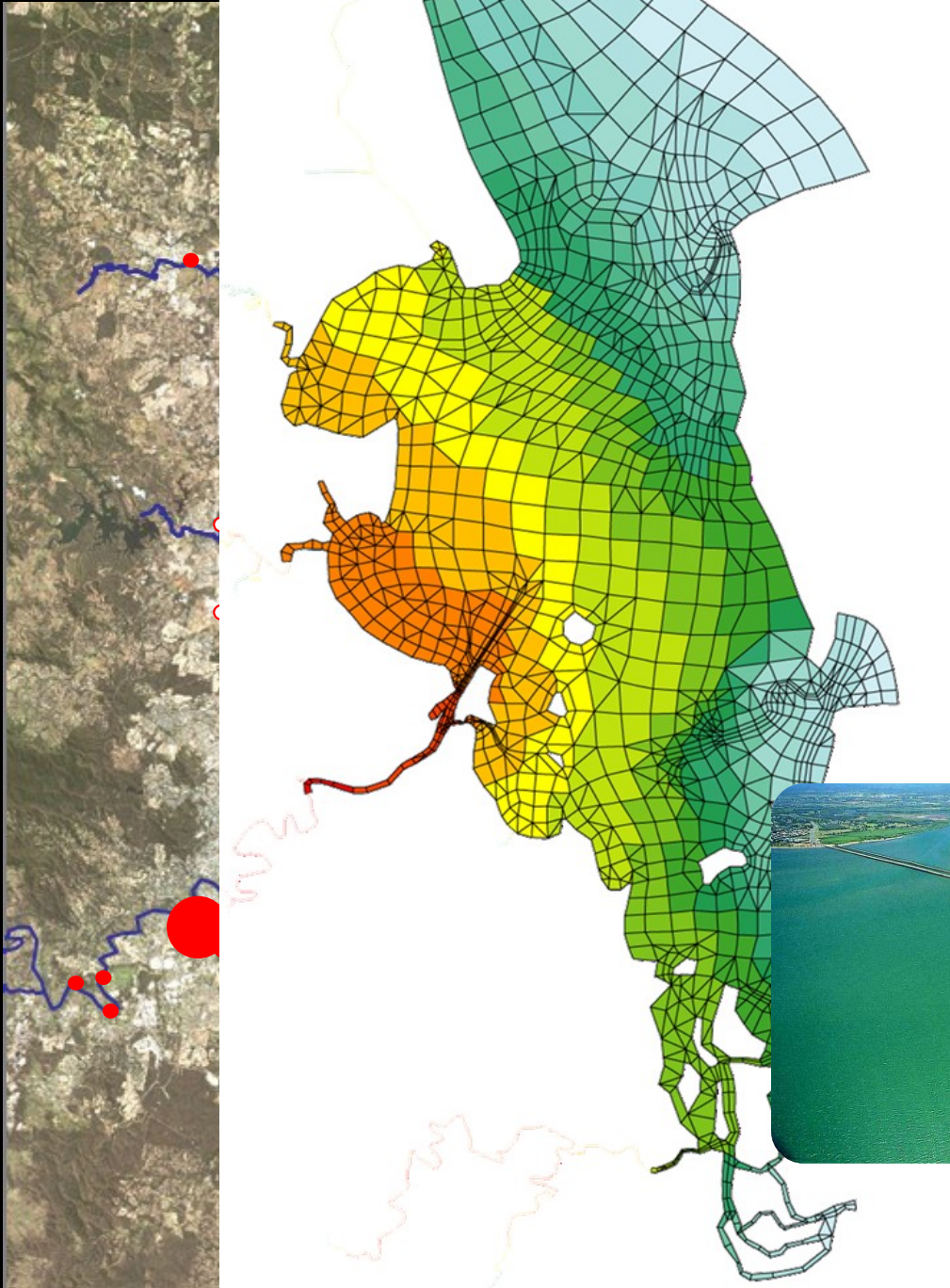
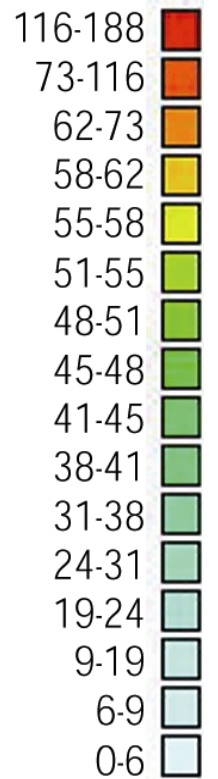
6-9



0-6



**Residence
Time (d)**



Comprehensive Response

1994 – 1997

1997 – 1999

1999 – 2002

2002 – 2005

2005 – 2008

2009 onwards

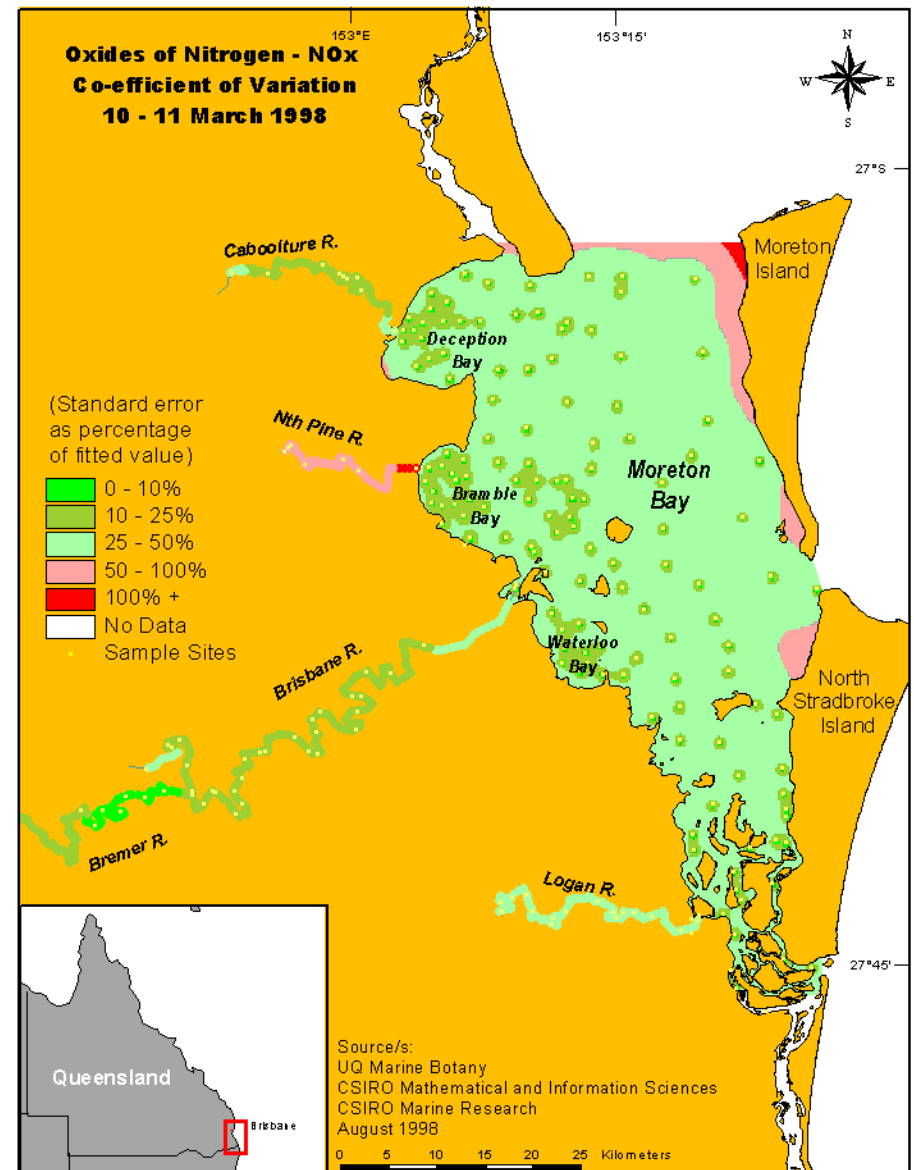
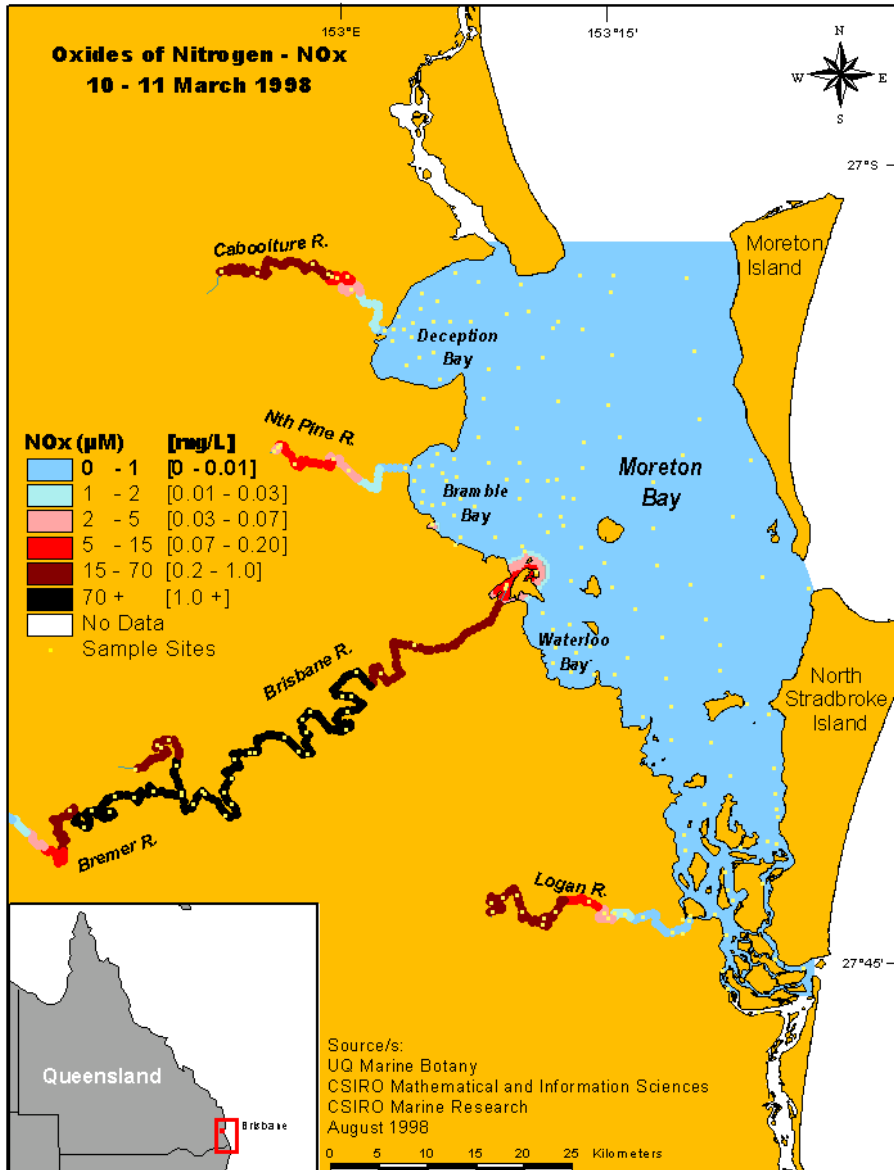
Stage 1	Stage 2	Stage 3	Integrated Partnership	Integrated Partnership	Integrated Partnership
Scoping	Bay and Estuaries Focus	Rivers and Catchment Focus	Land to Sea; Adaptive Waterways Management Framework	Healthy Catchments; Healthy Waterways	Whole-of-Water Cycle Management; Healthy Country and Water Sensitive Cities
<ul style="list-style-type: none"> Background Studies 	<ul style="list-style-type: none"> Pilot studies Design of Estuarine & Marine Monitoring Program 	<ul style="list-style-type: none"> Ongoing studies Estuarine & Marine Monitoring Program Design of Freshwater Monitoring Program Regional Decision Support Tools Regional Process Studies 	<ul style="list-style-type: none"> Integrated Freshwater, Estuarine & Marine Monitoring Programs Design of Load-Based and Human Health Monitoring Program Decision Support Tools for Implementation Process Studies Socio-Economic Studies Sustainable Loads 	<ul style="list-style-type: none"> Integrated Ambient (Freshwater, Estuarine Marine) & Event-Based Monitoring Programs Decision Support Tools used for management scenarios Process Studies underpinning Strategy development Sustainable Loads 	<ul style="list-style-type: none"> Integrated Waterways Health Accounting Framework Management Strategy Evaluation Framework (Environmental, Social, Economic, Institutional) Integrated Decision Support Tools Interactive Data Integration System
<ul style="list-style-type: none"> 6 Local Councils State & Federal Governments 	<ul style="list-style-type: none"> 6 Local Councils State & Federal Governments 	<ul style="list-style-type: none"> 19 Local Councils State & Federal Governments 	<ul style="list-style-type: none"> 19 Local Councils State & Federal Governments NRM Initiatives 	<ul style="list-style-type: none"> 19 Local Councils State & Federal Governments NRM Initiatives Water Initiatives 	<ul style="list-style-type: none"> 10 Local Councils State & Federal Governments NRM Initiatives Water Initiatives

Design and Implementation of Baseline Monitoring Program

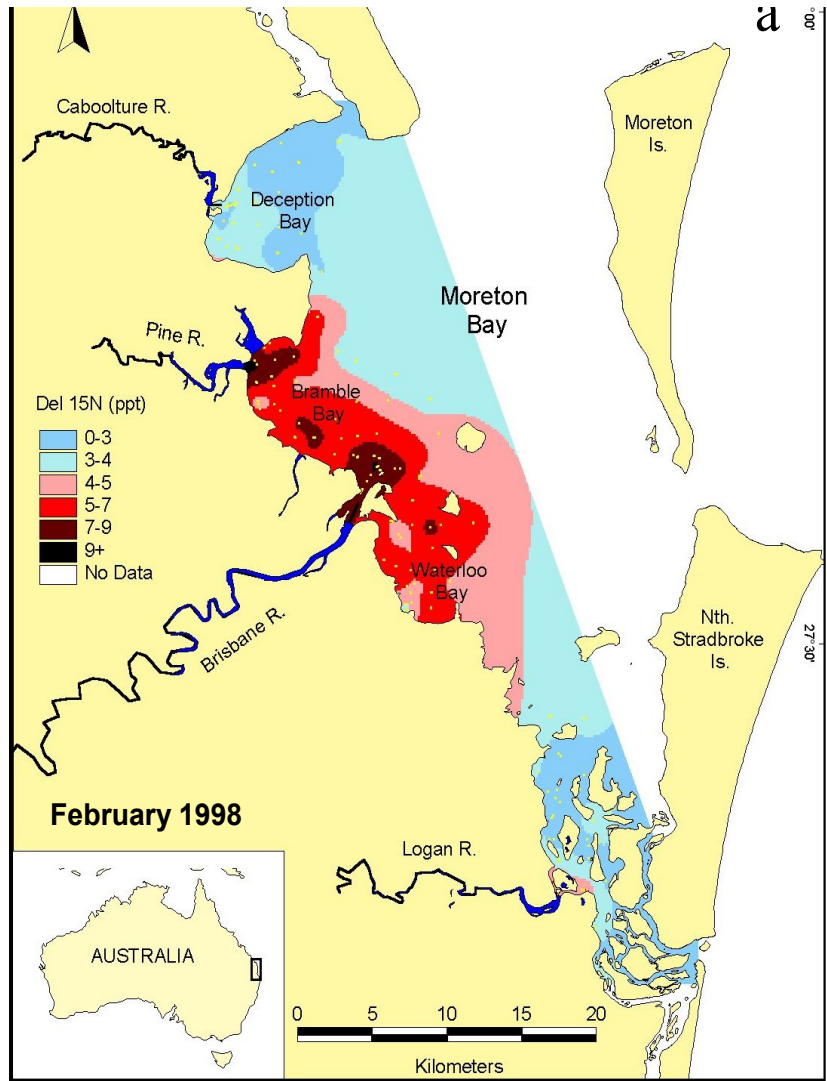
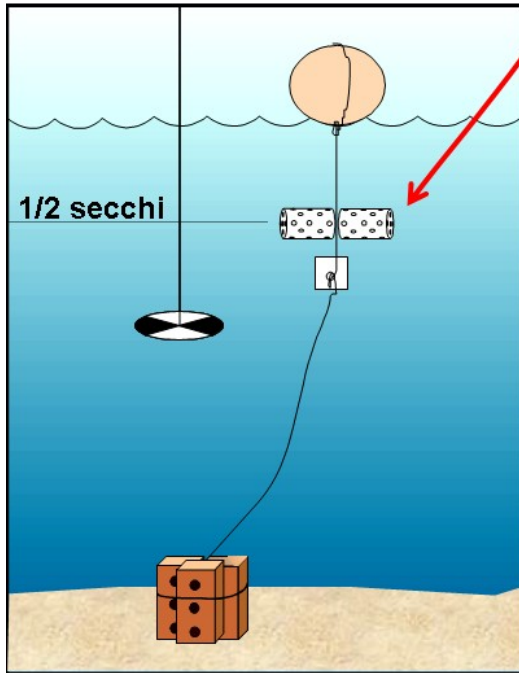
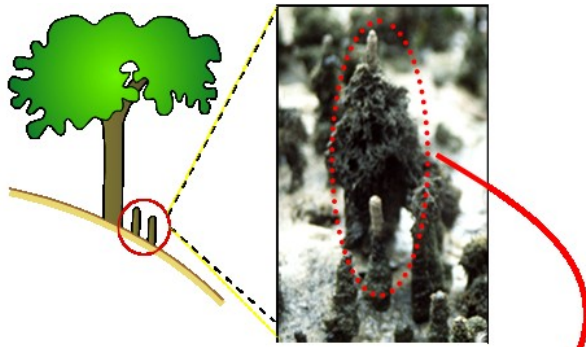
Objectives

- Develop ecological health indicators
- Design sampling strategy
- Use spatial statistics to evaluate sampling strategy

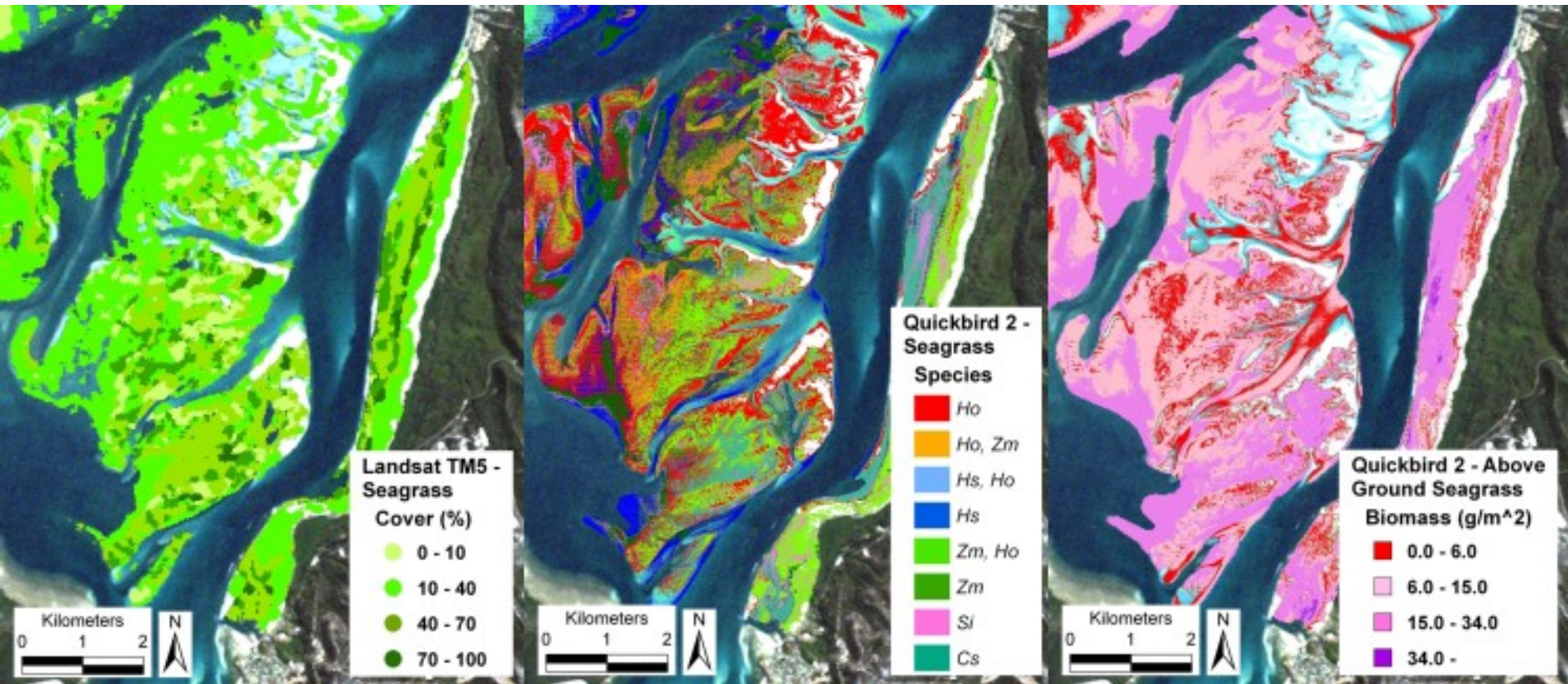
Sampling Design and Efficiency



Novel Targeted Techniques



Novel Targeted Techniques



Extensive and Continuous Communication

DIBM • Monitoring 1
Design and Implementation
Issue No. 1, January 1993

DIBM • Monitoring 2
Design and Implementation of Baseline Monitoring
Issue No. 2, February 1993

DIBM • Monitoring 3
Design and Implementation of Baseline Monitoring
Issue No. 3, April 1993

DIBM • Monitoring 4
Design and Implementation of Baseline Monitoring
Issue No. 4, October 1993

DIBM • Monitoring 5
Design and Implementation of Baseline Monitoring
Issue No. 5, October 1993

DIBM • Monitoring 6
Design and Implementation of Baseline Monitoring
Issue No. 6, November 1993

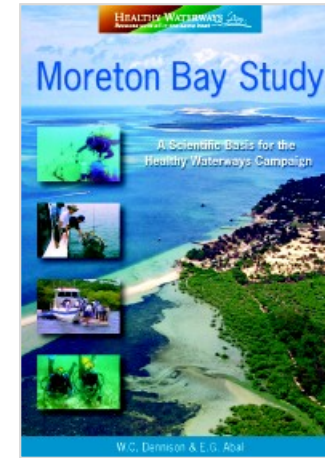
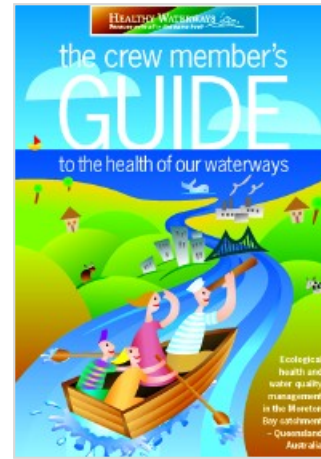
Moreton Region Rivers

Moreton Bay's ecological health is influenced by the water quality of its rivers and estuaries. In turn, the water quality of these waterways is linked to their catchment characteristics. Increase in urban population and subsequent increase in wastewater discharges, increased catchment development as well as long water residence times as the city grows are regarded as the main causes of decline in water quality in the river estuaries.

River	Characteristics
Colindale	Small catchment with very steep to hilly topography, high phosphorus
Pinne	Small catchment with low to Pinne flow, high to hilly, steep slopes
Brickstone	Large catchment with low flow and low rainfall, steep slopes, high phosphorus, high water temperature, particularly during summer
Lower	Large catchment with low flow, high to hilly, steep slopes, high phosphorus, high water temperature, particularly during summer
Logan	Large catchment with low flow, high to hilly, steep slopes, high phosphorus, high water temperature, particularly during summer

These rivers directly influence the water quality and habitats of western and southern Moreton Bay and adjacent estuaries. Water quality in these areas is declining and an environmental warning sign such as sea grass loss, localized harmful algal blooms and increased loss of animal diversity near the river mouths are increasing.

	Colindale River	Pinne River	Brickstone River	Lower River	Logan River
Total length (km):	28	16	90	nd	31
Average Depth (m):	3	2.5	6.1	nd	5
Catchment (km ²):	363	948	2114	1858	3863



ECOLOGICAL HEALTH MONITORING PROGRAM

TECHNICAL TRAINING VIDEO

THE UNIVERSITY OF QUEENSLAND

Ecological health MONITORING PROGRAM

Issue # 1, January 1998

Overview

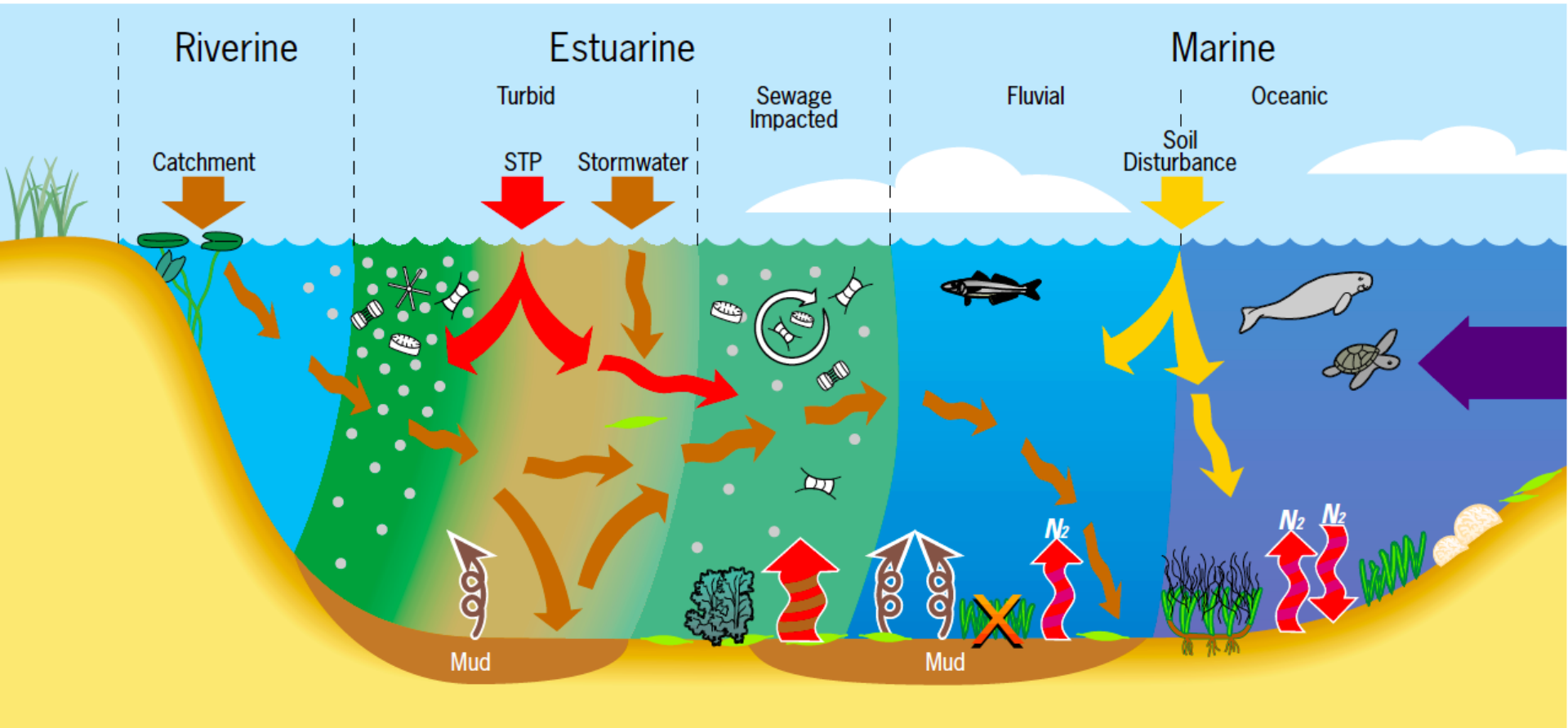
An Ecological Health Monitoring Program (EHMP) is one of the most important tools available for resource management. It provides an independent, objective assessment of the effectiveness of the management practices in environmental protection initiated by Brisbane City Council, Ipswich City Council, Gold Coast City Council, South East Queensland Council, Caboolture Shire Council, The Riverina Shire Council, Redbank Shire Council and Redland Shire Council. The program was developed by the Design and Implementation of Baseline Monitoring (DIBM) unit within the Brisbane Bay and Moreton Bay Wastewater Management Study (DIBM/BBMS). The EHMP is funded by Queensland Department of Environment and Heritage, CSIRO and The University of Queensland.

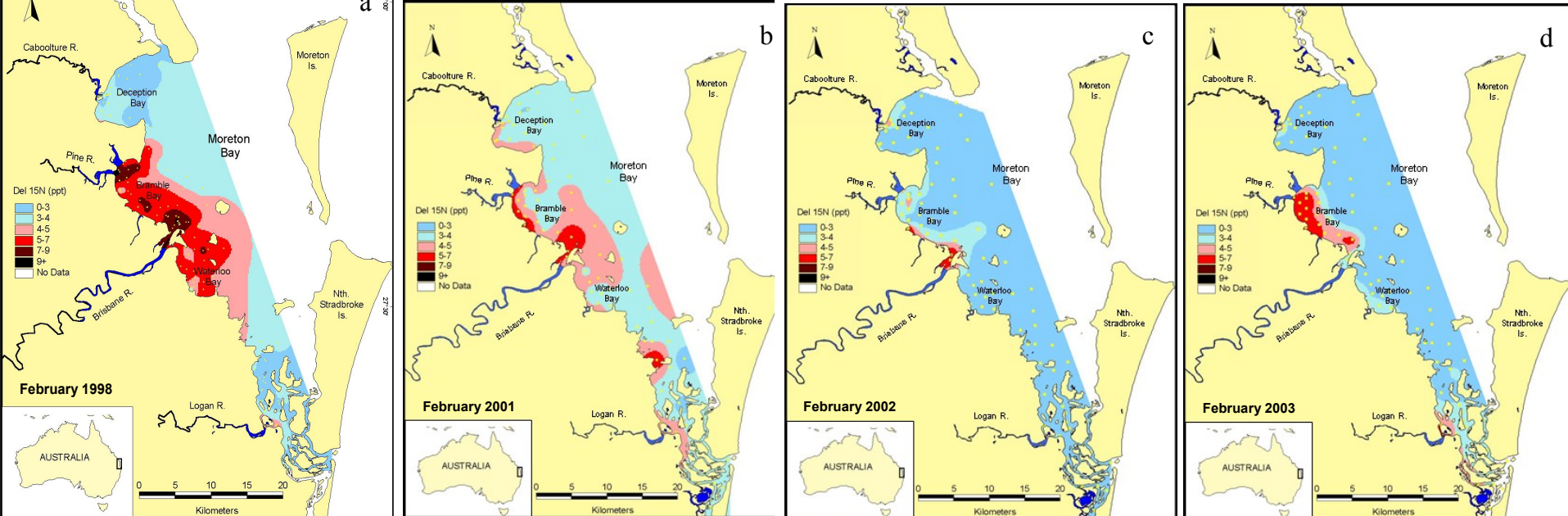
Increasing requirements for ecological monitoring of discharge into estuaries and marine waters. The monitoring program is based on a conceptual model that integrates our current scientific understanding of the waterways with necessary desired environmental values. Ecological health indicators based on key processes, values and indicators are used to monitor and assess the environmental quality and material progress. The EHMP is structured to provide regular review and reporting with quarterly data collection, bi-annual monitoring, and annual synthesis, long-term monitoring and integration (producing reports).

The program was developed by the Design and Implementation of Baseline Monitoring (DIBM) unit within the Brisbane Bay and Moreton Bay Wastewater Management Study (DIBM/BBMS). The EHMP is funded by Queensland Department of Environment and Heritage, CSIRO and The University of Queensland.

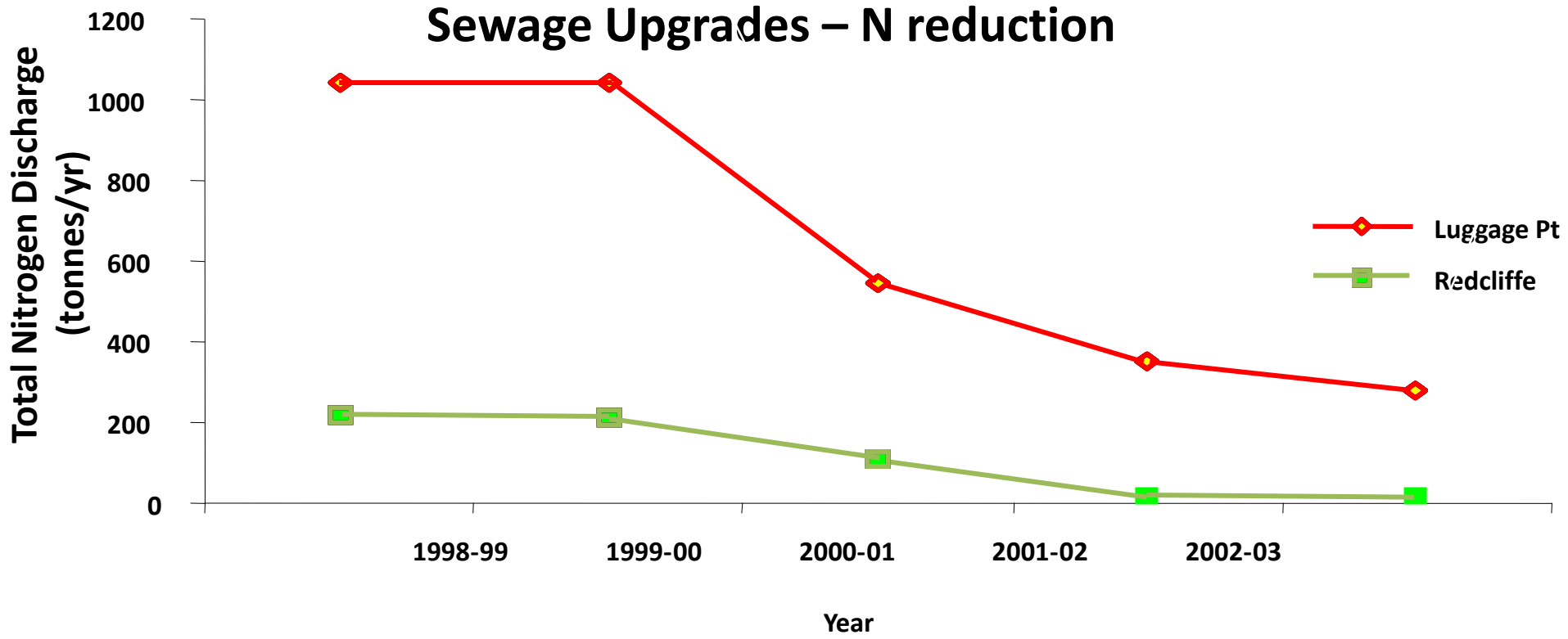
HEALTHY WATERWAYS
CSIRO
Queensland Department of Environment and Heritage
The University of Queensland

Solid Scientific Understanding



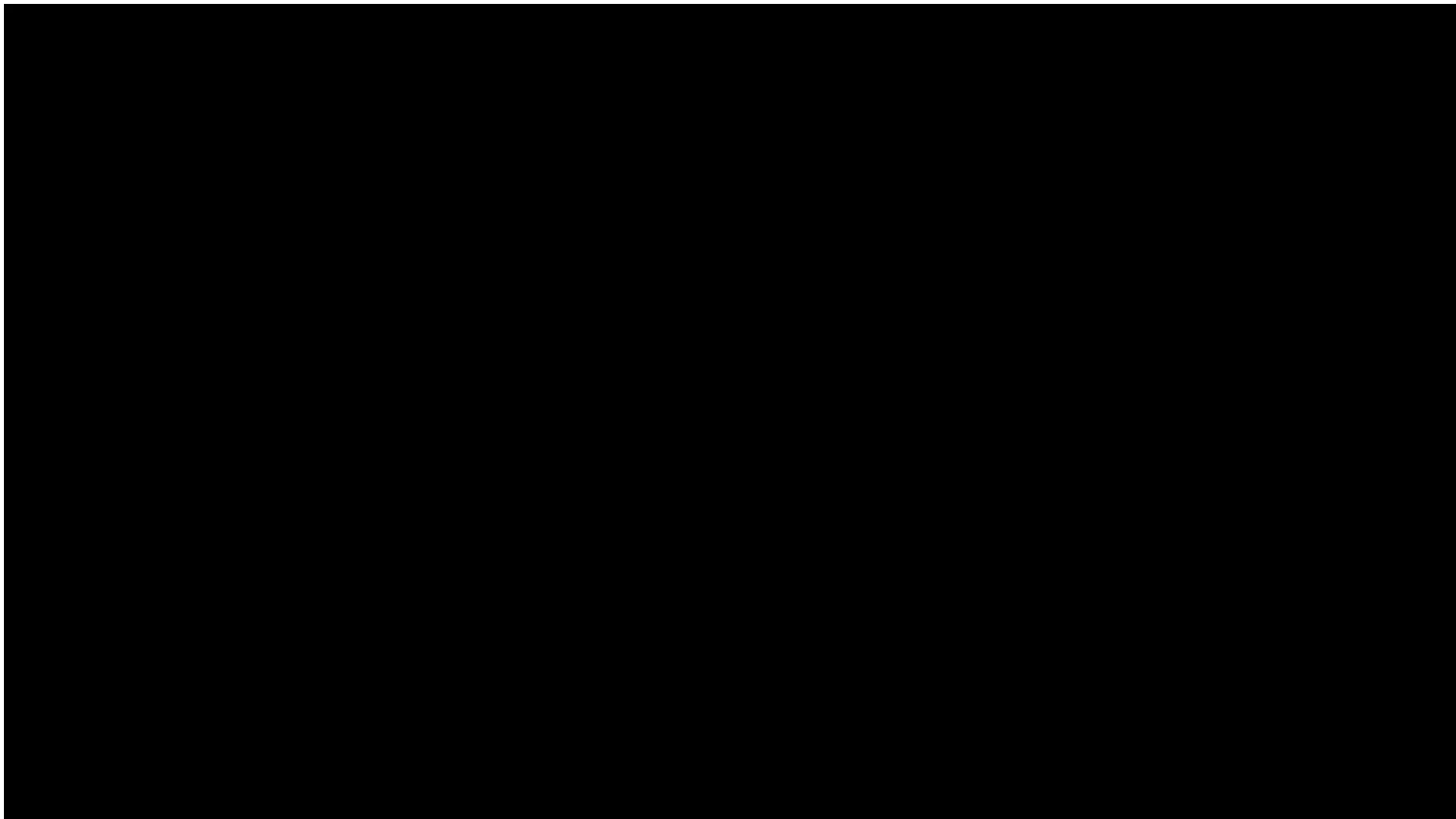


Sewage Upgrades – N reduction



HEALTHY WATERWAYS

Because we're all in the same boat



Objectives of the monitoring network

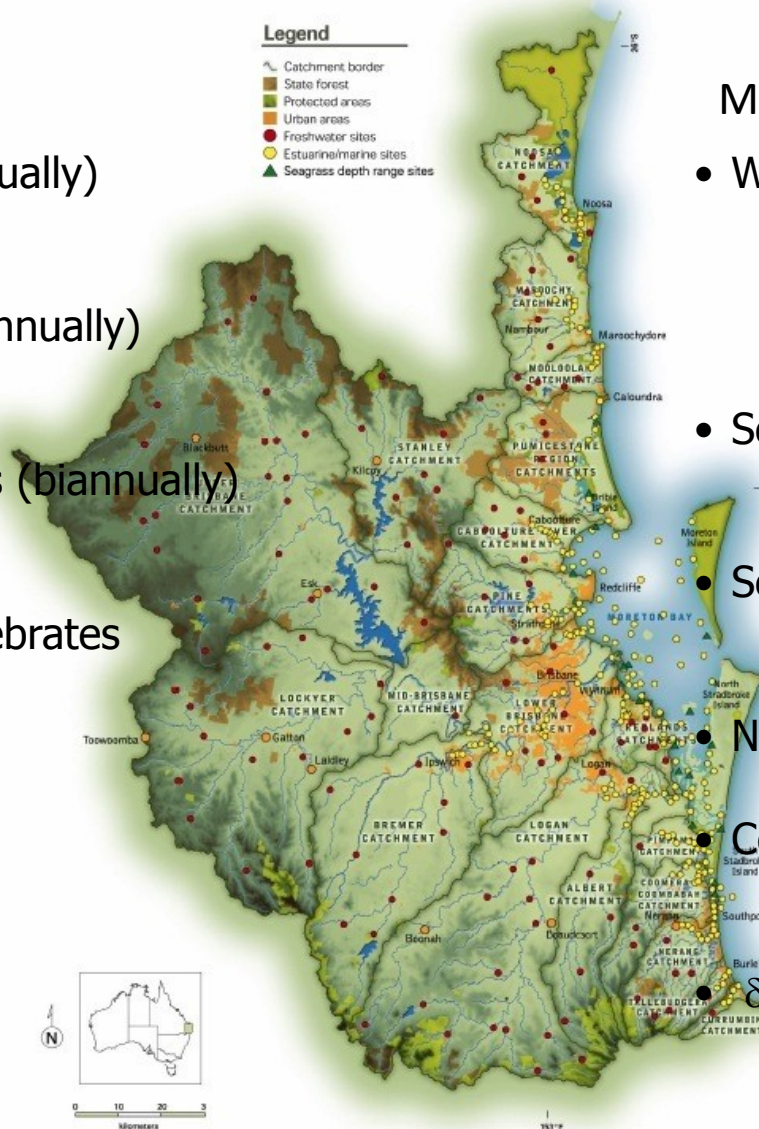
- Advise councils and land managers on areas of declining health,
- Report on the effects of different land uses
- Evaluate the effectiveness of management actions aimed at improving and protecting aquatic ecosystems
- Science underpins action



Monitoring network design

FRESHWATER

- Water Quality (biannually)
 - 135 sites
- Nutrient Cycling (biannually)
 - 135 sites
- Ecosystem Processes (biannually)
 - 135 sites
- Aquatic macroinvertebrates (biannually)
 - 135 sites
- Fish (biannually)
 - 135 sites



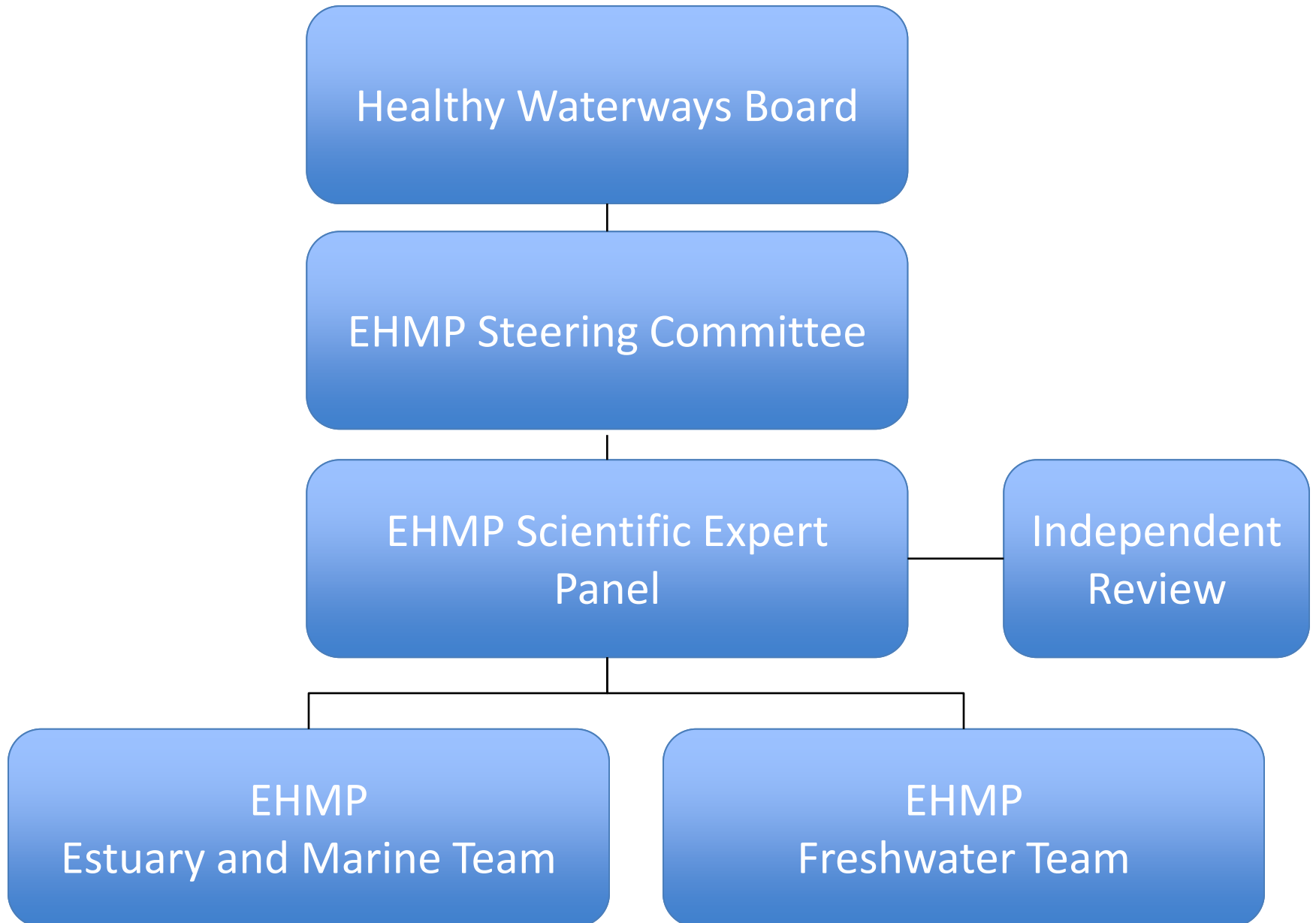
MARINE

- Water Quality (Monthly)
 - 18 estuaries (160 sites)
 - 9 bay regions (94 sites)
 - = 13,020 observation points
- Seagrass Depth Range (biannually)
 - 15 sites
- Seagrass Distribution (every 3 years)
 - Bay-wide
- Nutrient Mixing Plots (biannually)
- Coral Cover (annually)
 - 4 sites
- $\delta^{15}\text{N}$ mapping (annually)
 - 253 sites
- Riparian Assessment (annually)
 - 740 km

Operational model of how the sample collection, lab analysis, and data management are conducted

	Sample Collection	Sample Analysis	Data Storage	Data Analysis & Grading	Report Card Production
State Gov. Dept. 1	✓	✓	✓	✓	
State Gov. Dept. 2	✓	✓	✓	✓	
State Gov. Dept. 3		✓			
University 1	✓	✓			
University 2	✓	✓			
Healthy Waterways			✓		✓

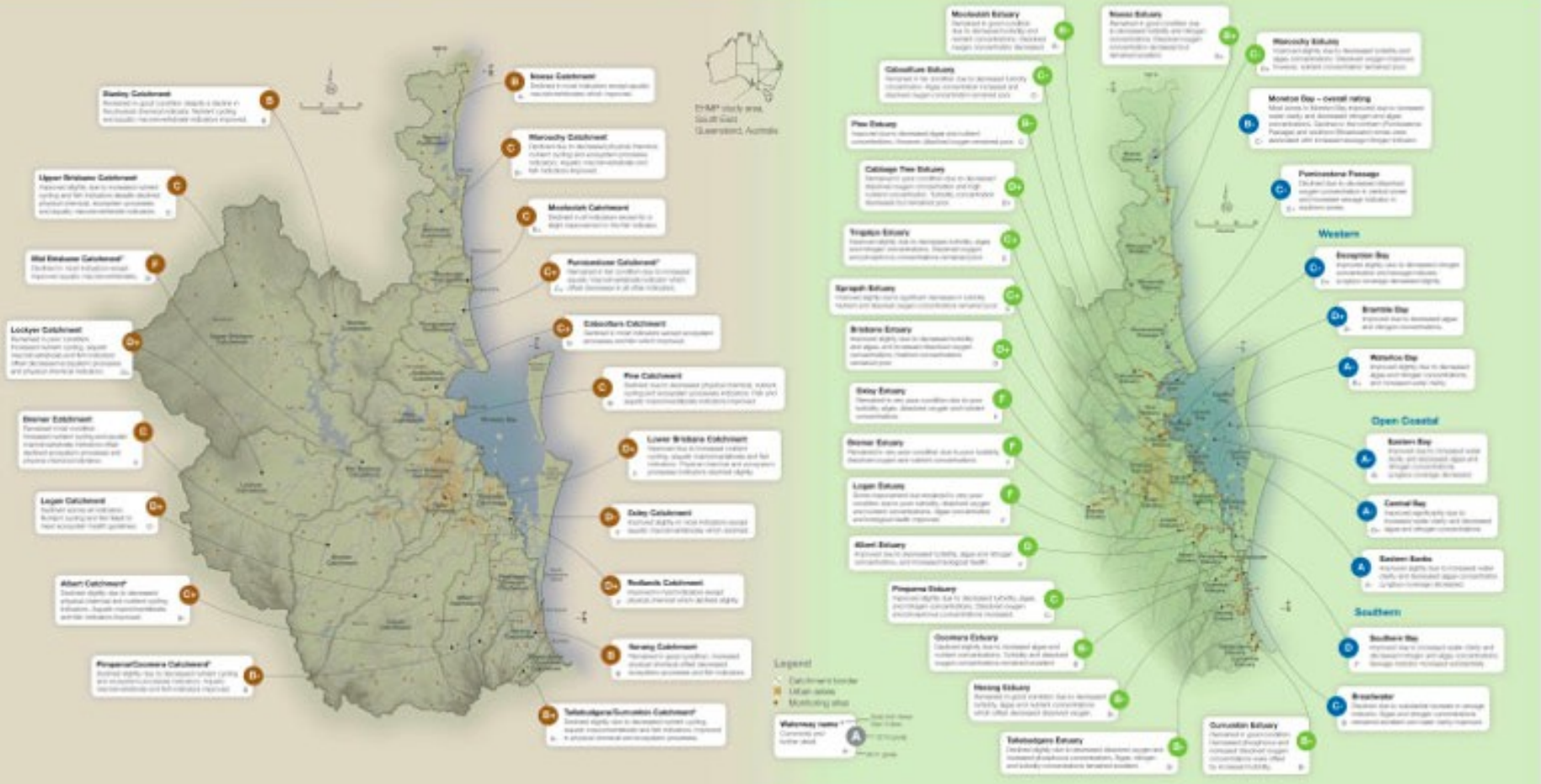
Report Card Review and Oversight



Annual Report Card

Freshwater Report Card 2012

Estuarine and Marine Report Card 2012



19 Freshwater Grades

28 Estuarine and Marine Grades

Business Model

- User pays system
- Municipalities charged on a per capita basis
- Industry charged on per ton N basis
- In-kind government support
- Fees and participation written into discharge license conditions



Governance and structure of the restoration effort

- **Municipalities and State Government responsible for restoration**
- **The Healthy Waterways Office delivers four key program to assist:**



1. Science and Innovation



2. Ecosystem Health Monitoring Program



3. Water by Design



4. Communication, Education and Motivation Program

Three biggest successes and challenges in sustaining the network(s)

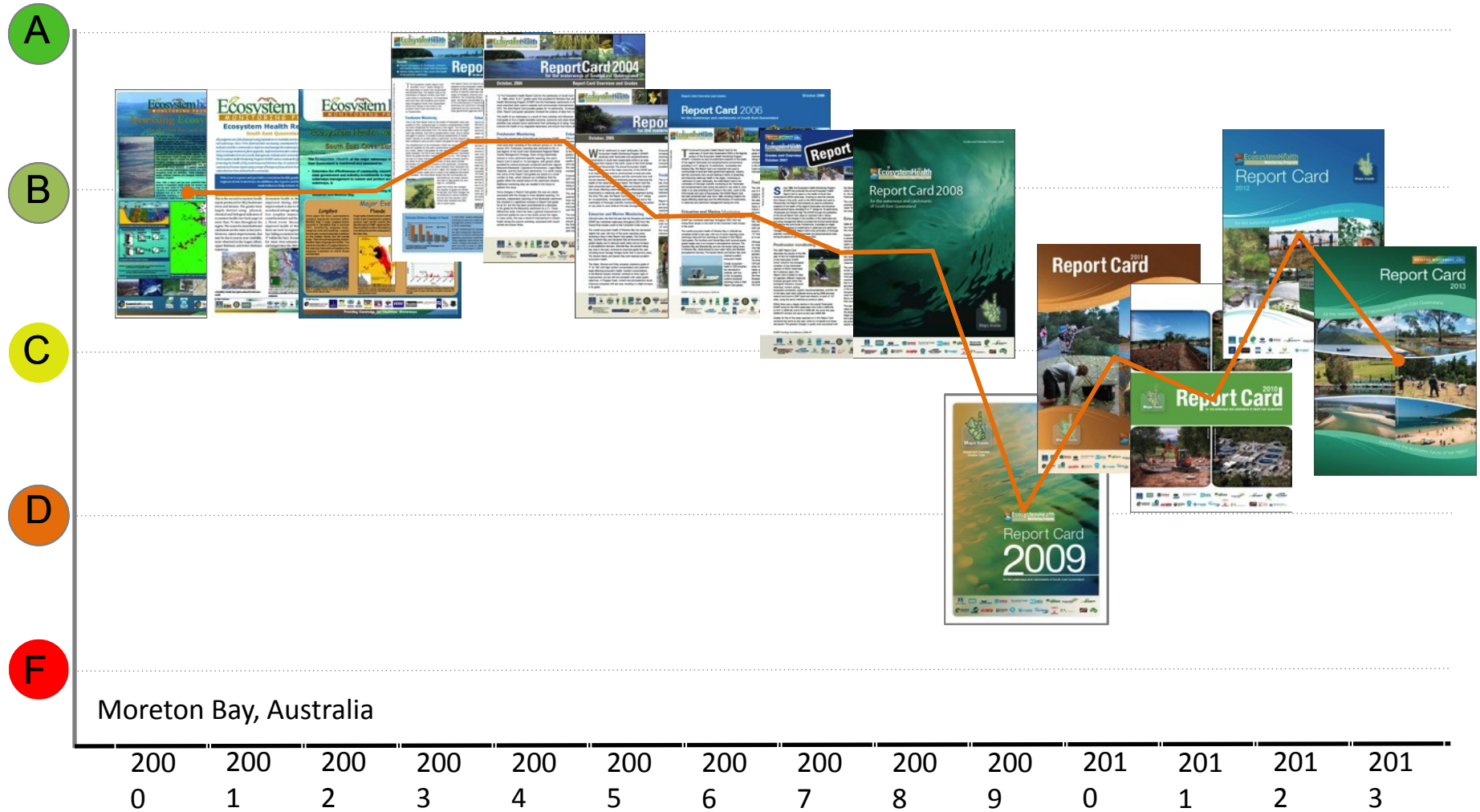
Successes

1. Sustainable funding model
2. Regular and effective communication
3. Strong science and continued research to evolve the program

Challenges

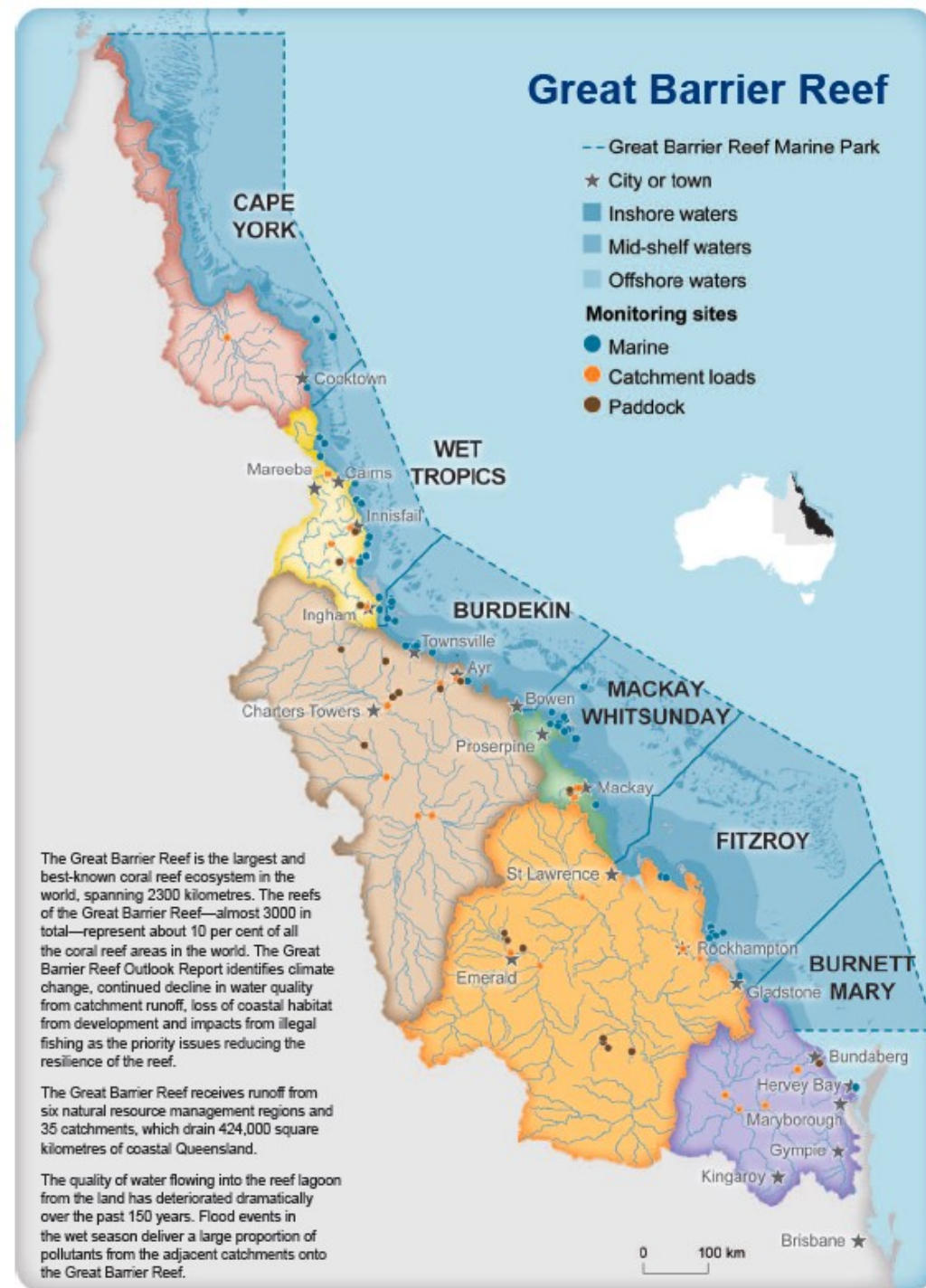
1. Report card fatigue
2. Lack of evolution of indicators
3. Variable climate overriding actions
4. Ownership of data

Report card fatigue



Paddock to Reef Integrated Monitoring, Modelling and Reporting Program

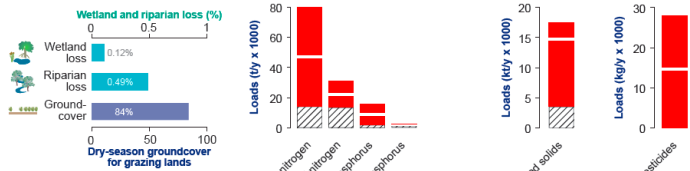
- Joint commitment of the Australian and Queensland Governments
- Primary focus is diffuse source pollution from broadscale land use.
- Pollution cannot be directly attributed to one point of dispersal, such as a pipe or waste outlet.



Paddock to Reef Report Card

Catchment results

Catchment results include wetland and riparian loss, groundcover and catchment loads. Confidence in catchment load estimates differs across regions due to varying levels of data availability.

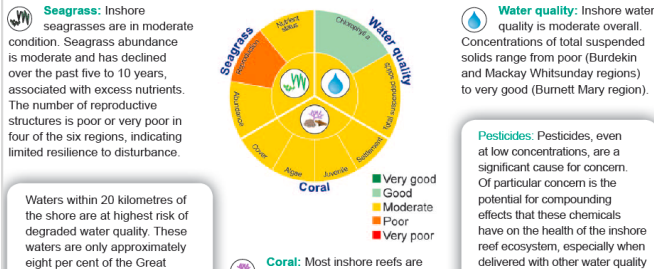


Pressure

- Wetland loss from 2007-2009 was 883 hectares (0.12% of total wetland area), with greater losses of 1.2% in smaller coastal catchments.

Marine results

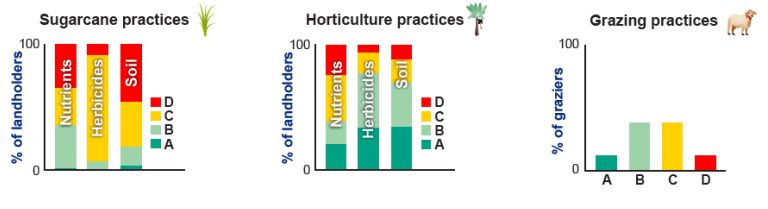
The effects of river discharge into the Great Barrier Reef are largely concentrated into inshore areas up to 20 kilometres from shore. Higher than average wet season rainfall in the Great Barrier Reef catchment occurred between 2007 and 2009, particularly in the Burdekin River catchment. Marine results for 2008–2009 are presented for seagrass, water quality and coral.



State

Land practice results

Adoption of improved management practices varies by industry and practice. The adoption of improved management practices for sugarcane and horticulture as at 2008–2009 is presented using the following framework: **A – Cutting-edge practices, B – Best practices, C – Common practices, D – Unacceptable practices.**



Response

