Making the connection between healthy waterways and healthy catchments

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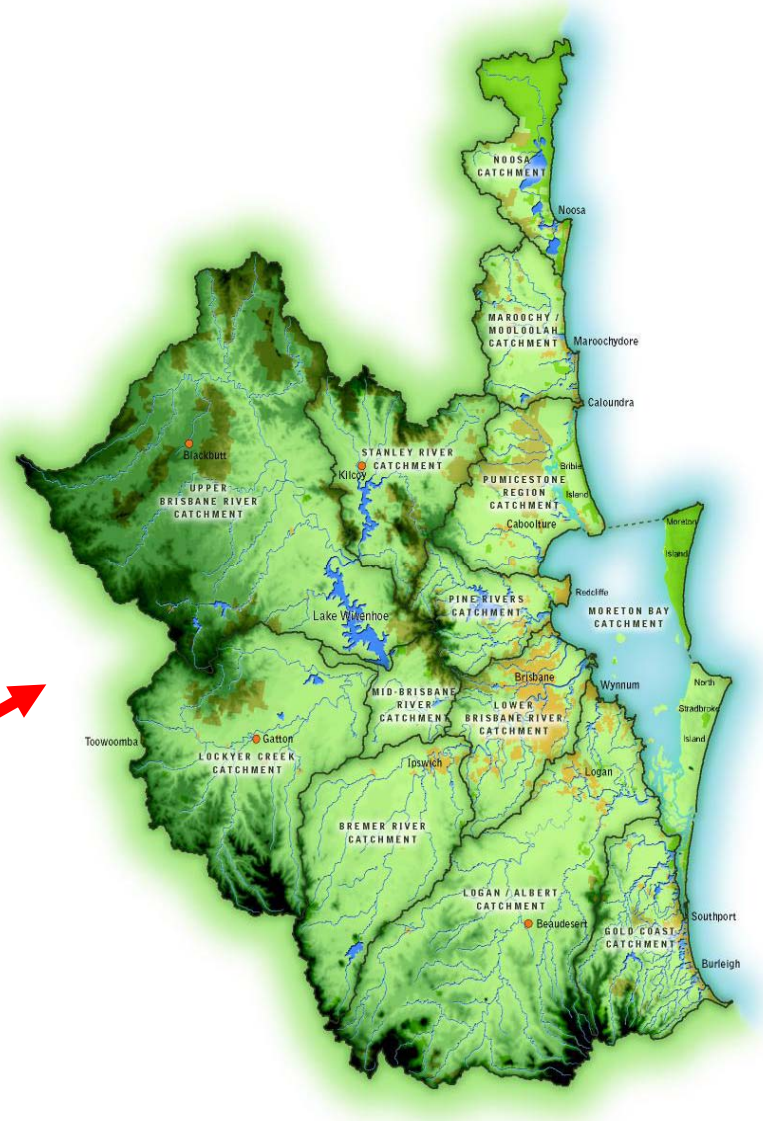
Moreton Bay Waterways and Catchments Partnership

Outline

- Background to the study region: Moreton Bay catchment in eastern Australia - rapidly expanding population
- Development of partnership (science, managers, policy makers) to deal with issues affecting coastal waterways
- Development of science and monitoring program
- Communication with stakeholders
- Implementation of actions

Background to the study region

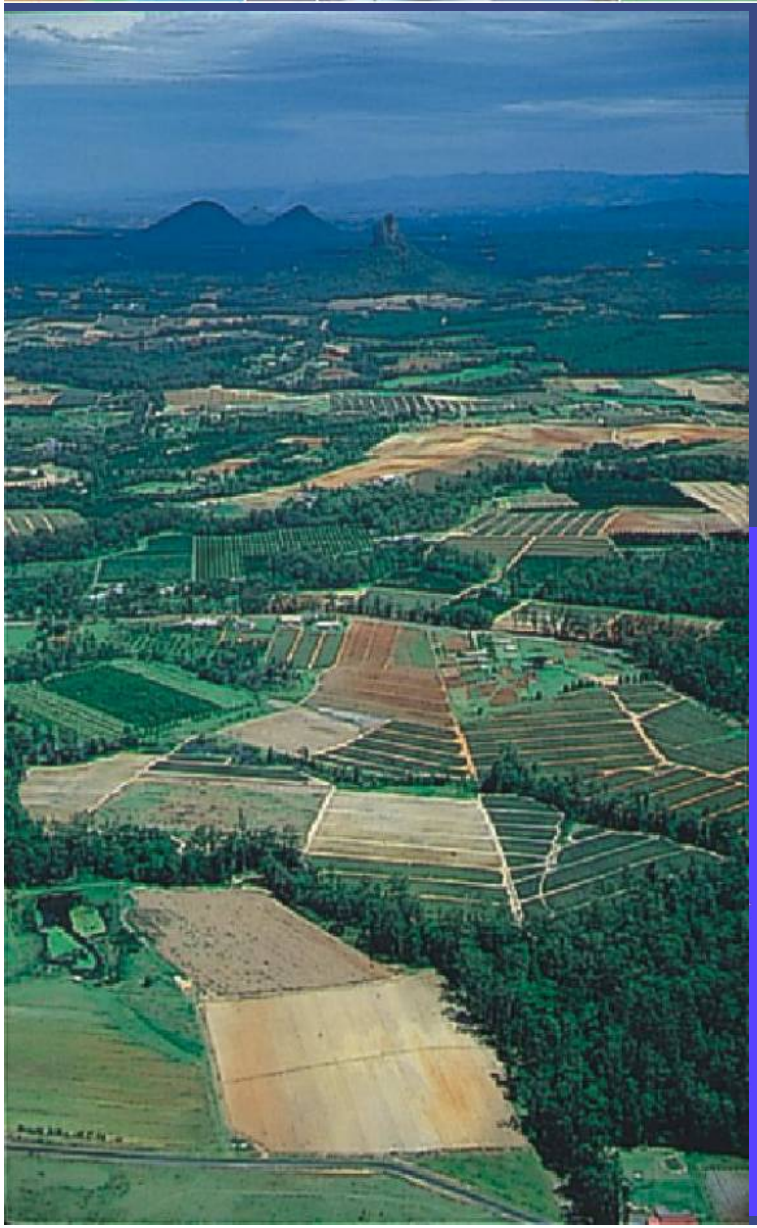
- 15 major catchments
- 22,672 km^2
- 19 local government areas
- Population 2.5 m
- Fastest growing region in Australia



Importance of the region's waterways:

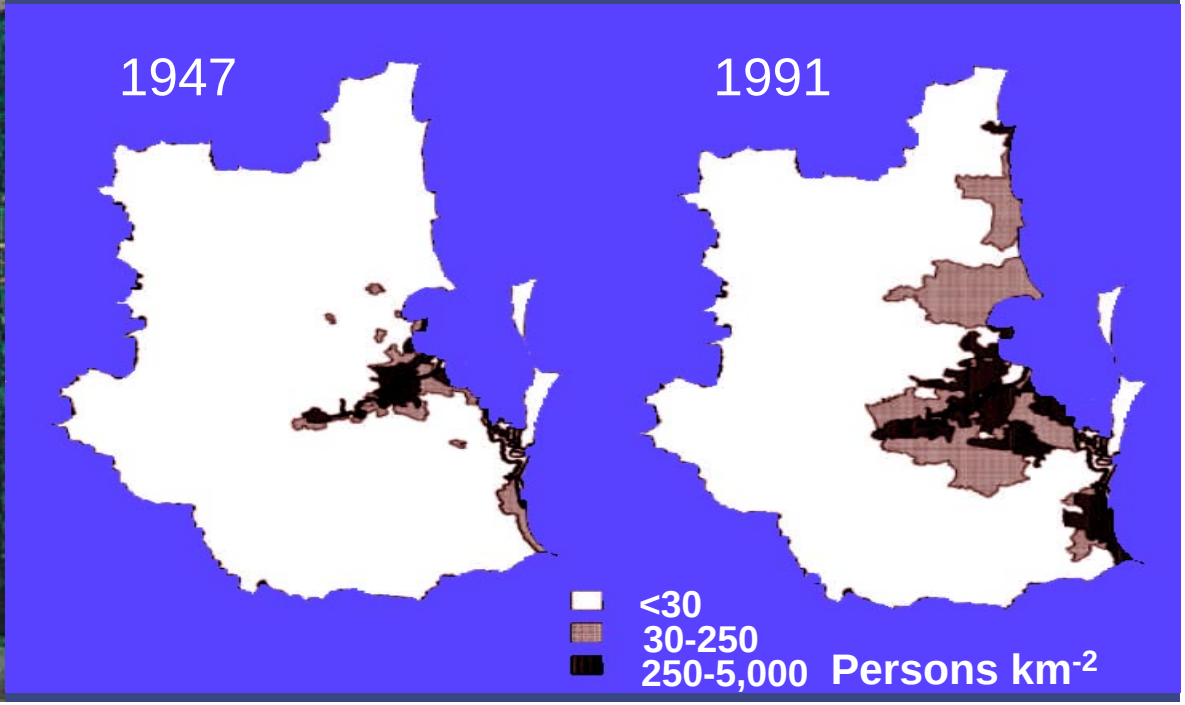
- High conservation significance (Ramsar)
- Major commercial and recreational fisheries
- Water supply (urban and rural)
- Recreation & transport

The human footprint:

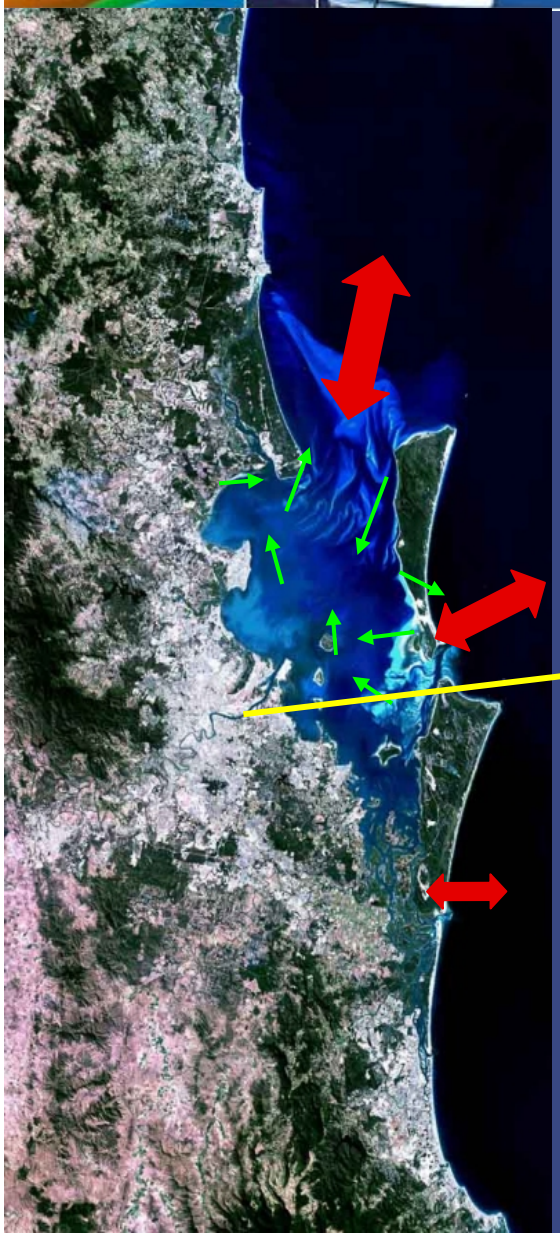


Since European settlement:

- 20% of original vegetation remains - less adjacent to streams
- Altered hydrology - dams & weirs
- Declining water quality (nutrients & sediment)
- Declines in aquatic diversity



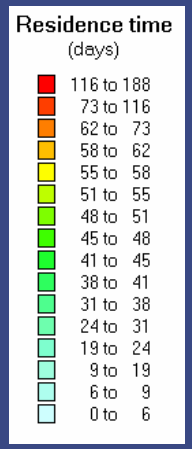
Catchments drain into Moreton Bay

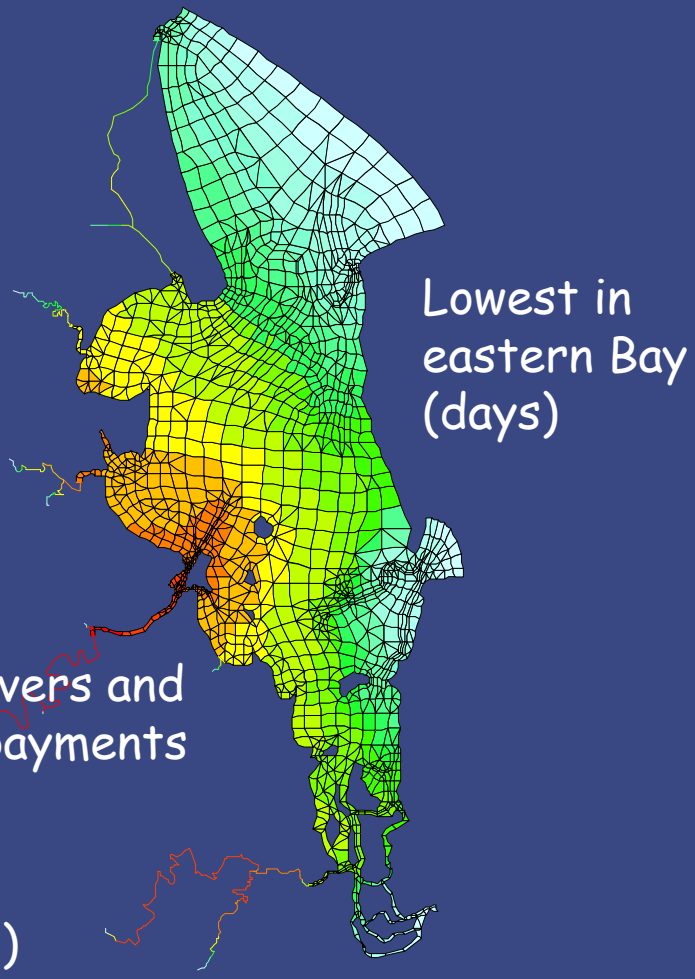


Catchment to Bay Ratio: 14:1

Brisbane River

Residence Time





Lowest in eastern Bay (days)

Highest in rivers and western embayments (months)

Abal *et al.* (2005)

Key drivers for change

- Fast growing population
- Security of water supply (quantity and quality)
- Concerns about industry viability - tourism, fishing and agriculture.
- Increasing community expectations about improving water quality and ecosystem health

Recognition - cheaper to protect than to restore ...

Formation of the Partnership

3 levels of government

- Local councils (6; 19)
- State Government agencies (6)
- plus Federal funding

Strong research support

- 3 Universities
- CSIRO
- 3 Cooperative Research Centres

Community & industry advisory groups (>40)

- indigenous
- conservation
- catchment & landcare
- commercial industry
- rural industry

Developing a common vision:

"South-east Queensland's catchments and waterways will, by 2020, be healthy living ecosystems supporting the livelihoods and lifestyles of people in South-east Queensland and will be managed in collaboration between community, government and industry."

Achieving the vision:

Set values that reflect the vision

- numerous workshops with stakeholders

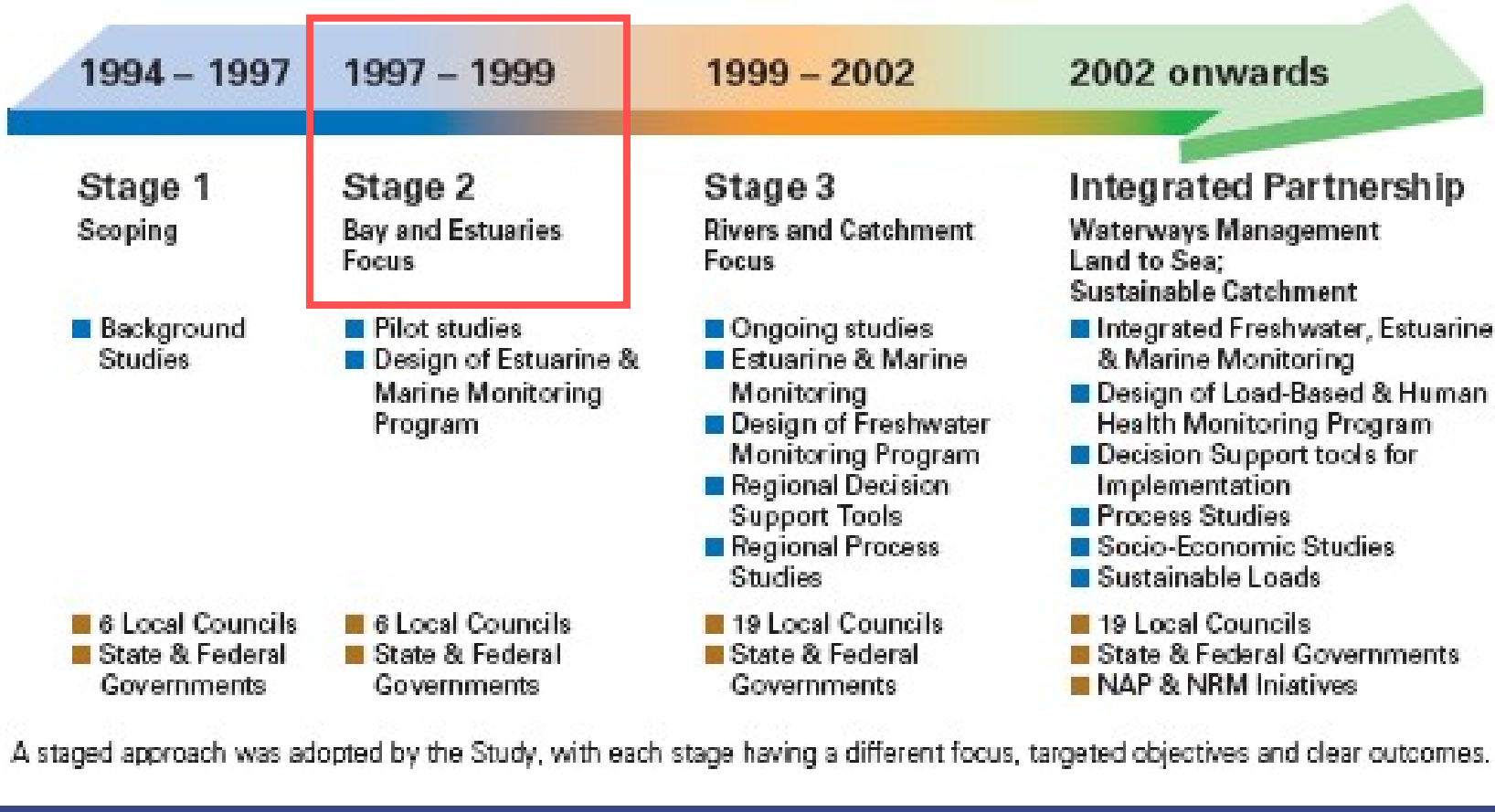
Measurable water quality or ecosystem health objectives that protect the values

- underpinned by sound science

Management actions to achieve these objectives

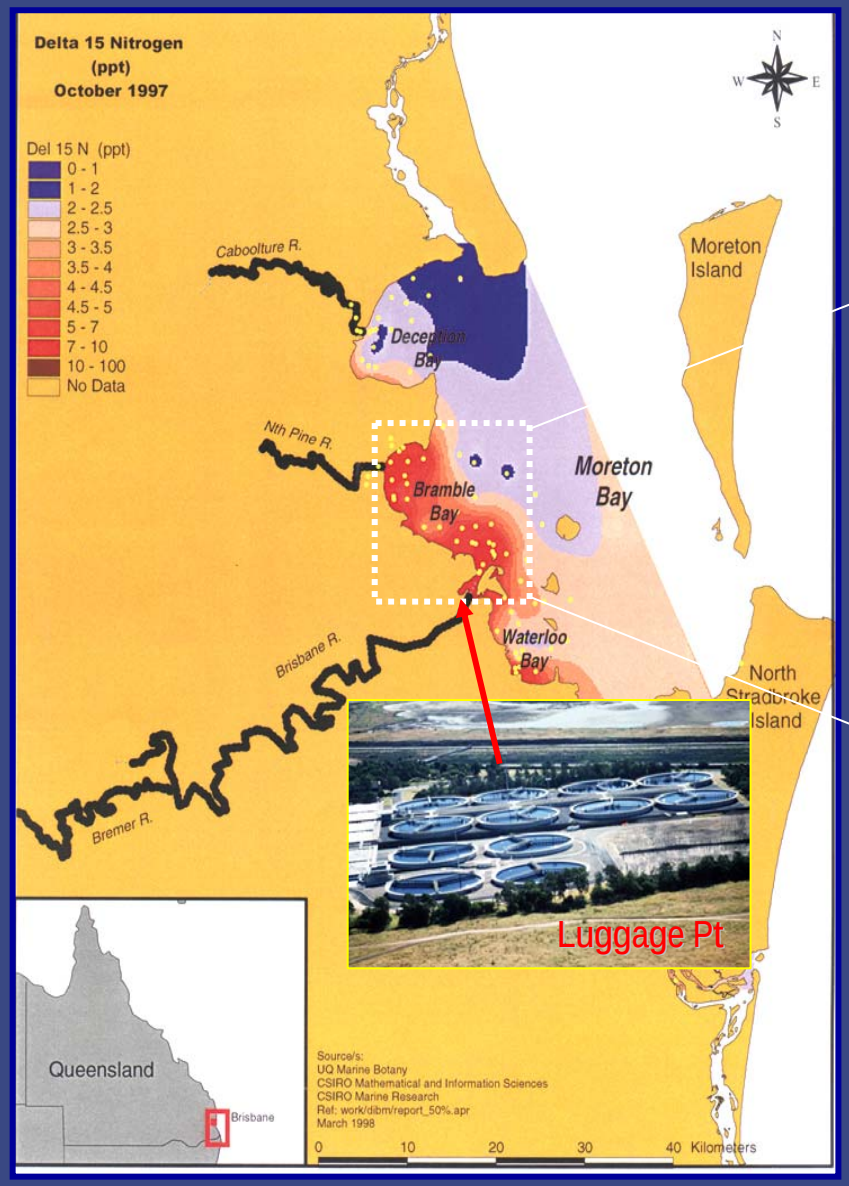
- working with policy makers

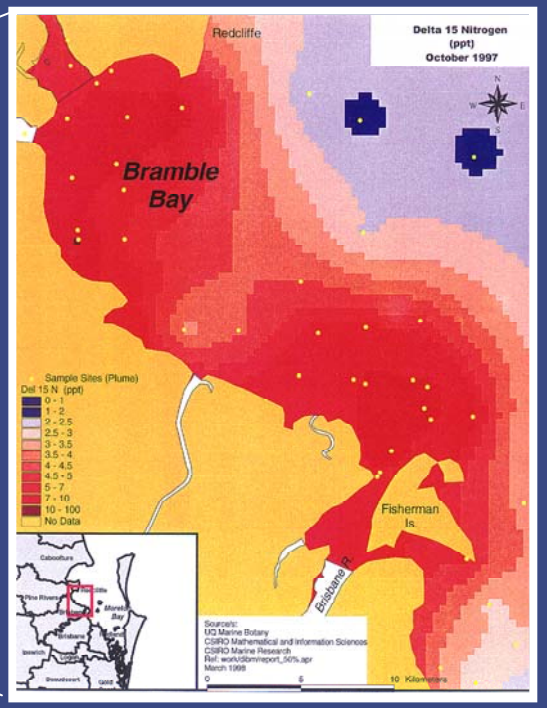
A staged approach: Stage 2- Moreton Bay



A staged approach was adopted by the Study, with each stage having a different focus, targeted objectives and clear outcomes.

Sewage Plume Mapping (using $\delta^{15}N$)

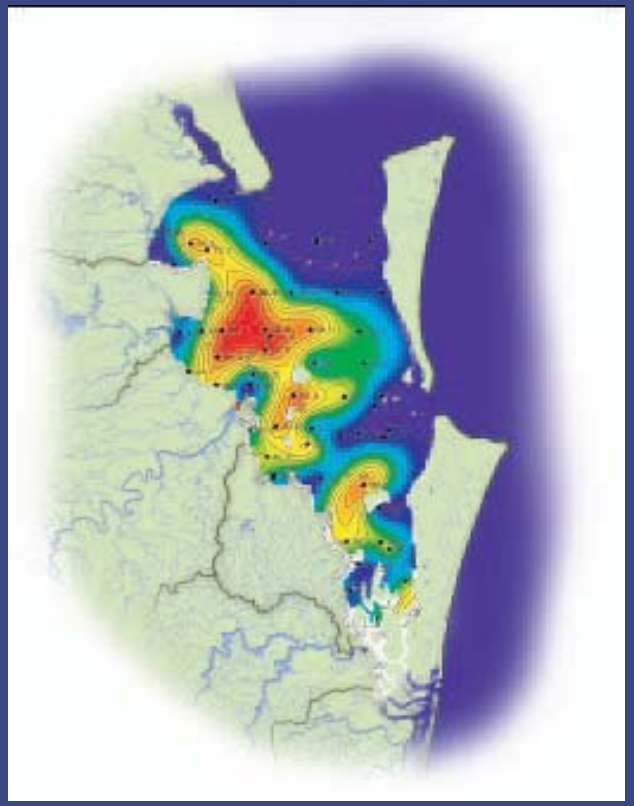




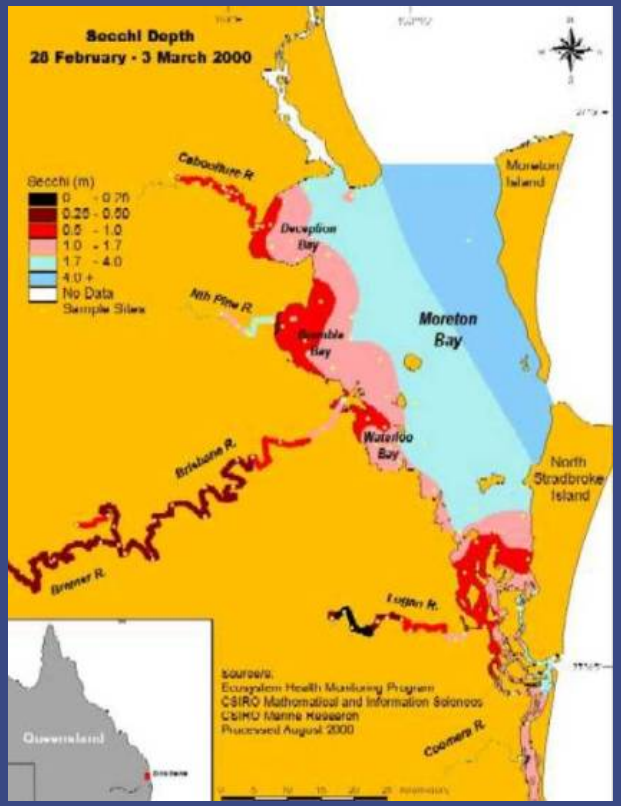
Marine Botany, University of Queensland
CSIRO Mathematical and Information Sciences
CSIRO Marine Research

Sediments in Moreton Bay and seagrass loss

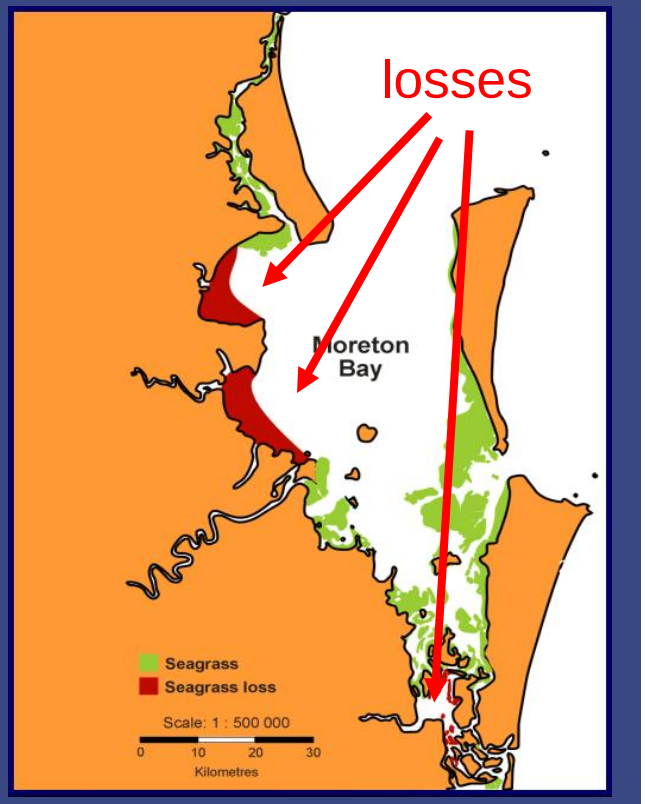
Sediments in the Bay



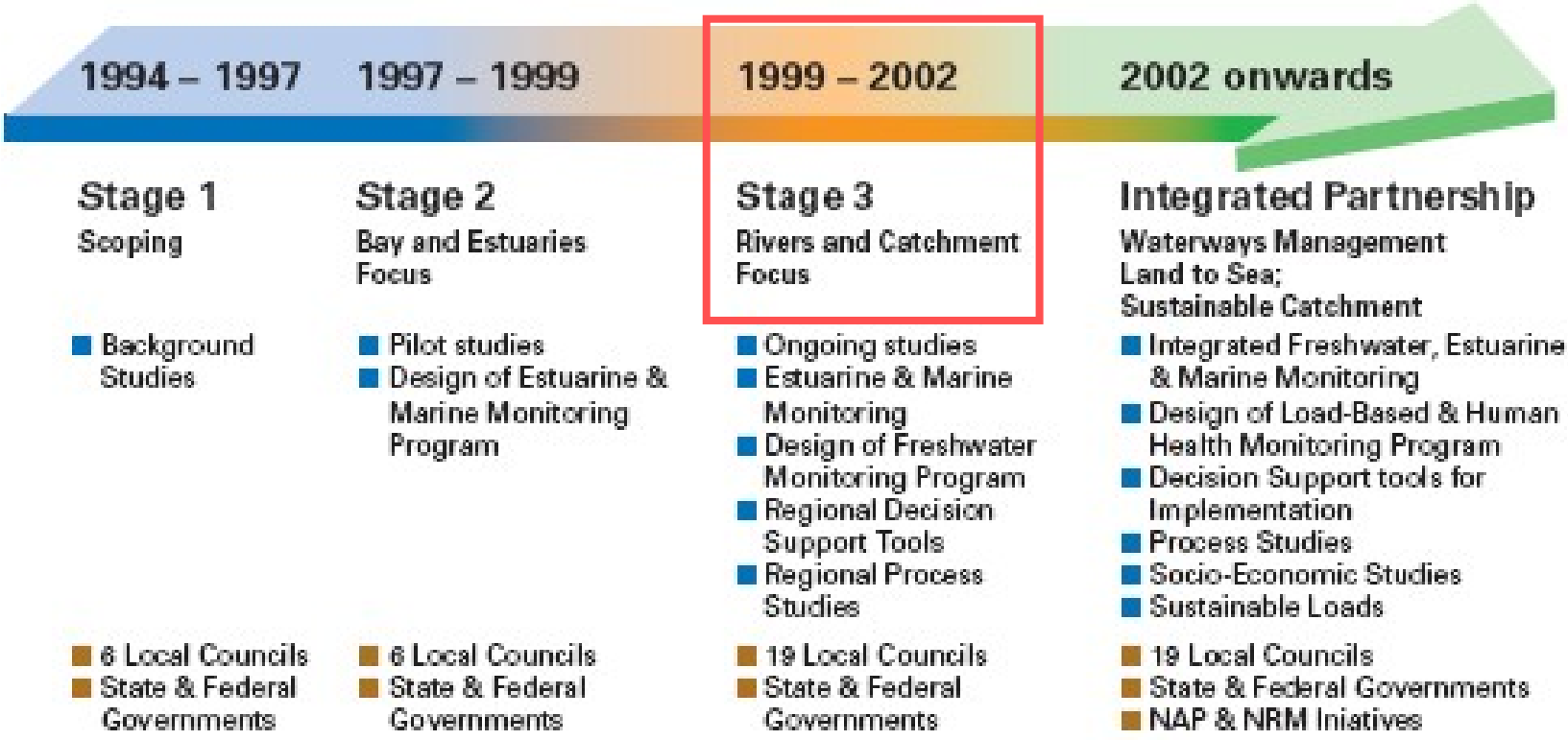
Turbidity



Seagrass distribution

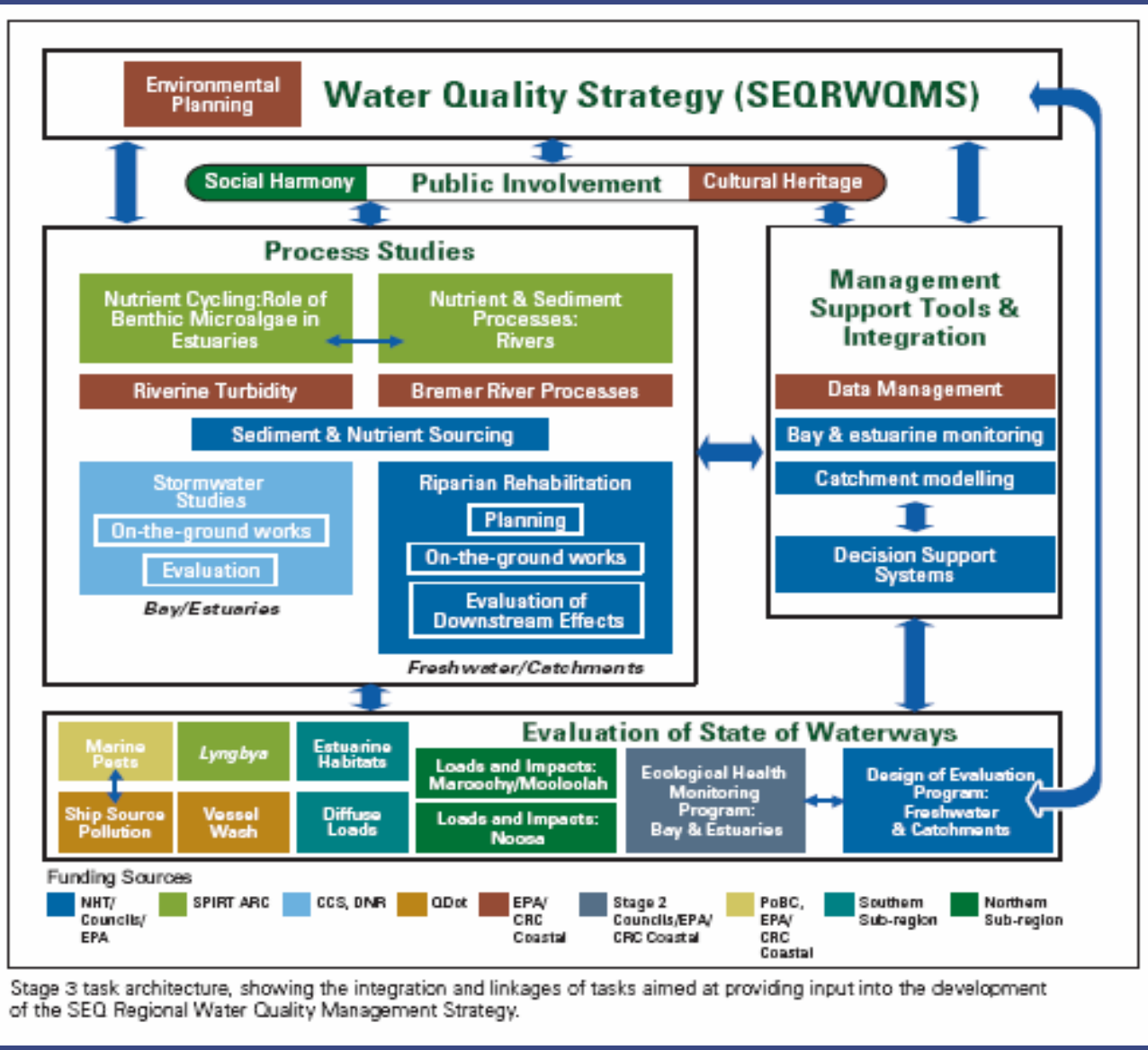


A staged approach: Stage 3- catchments



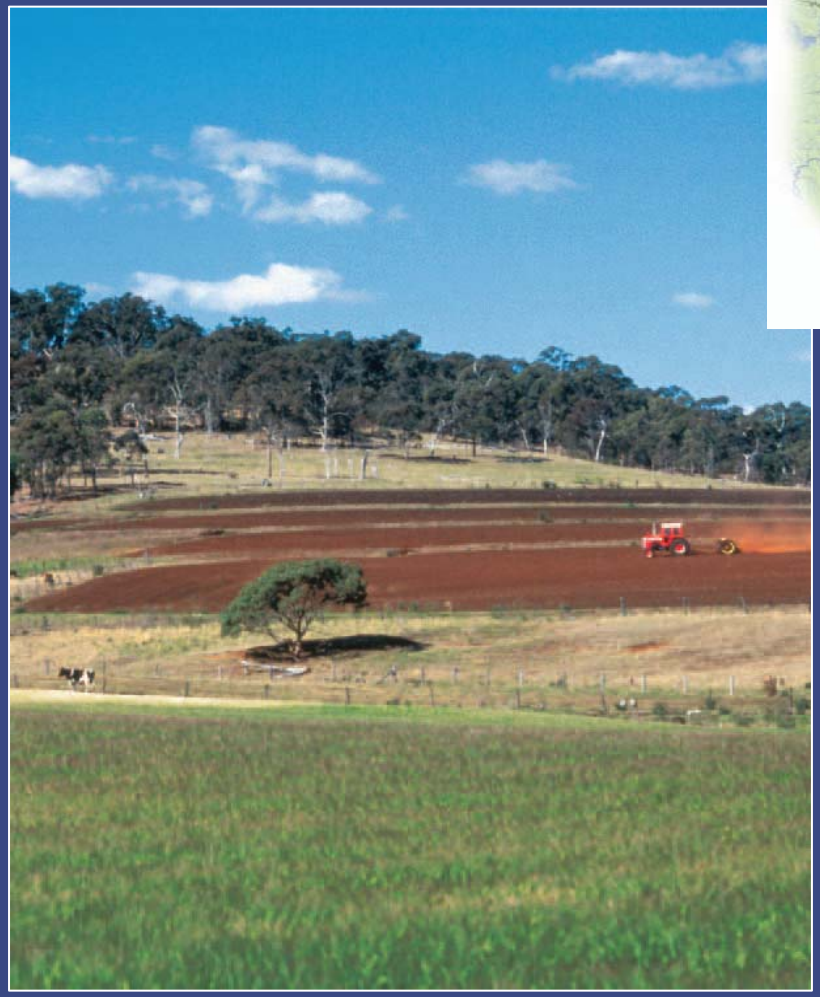
A staged approach was adopted by the Study, with each stage having a different focus, targeted objectives and clear outcomes.

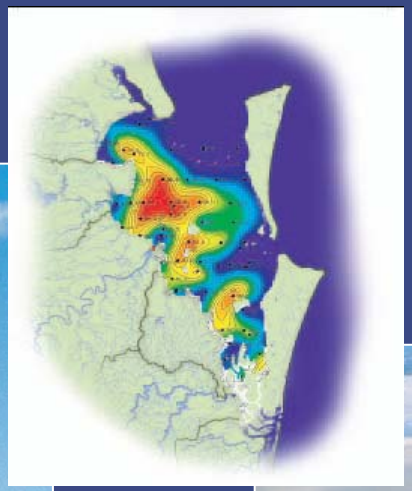
Stage 3 Scientific Tasks



Stage 3 task architecture, showing the integration and linkages of tasks aimed at providing input into the development of the SEQ Regional Water Quality Management Strategy.

Sources of sediment in Moreton Bay

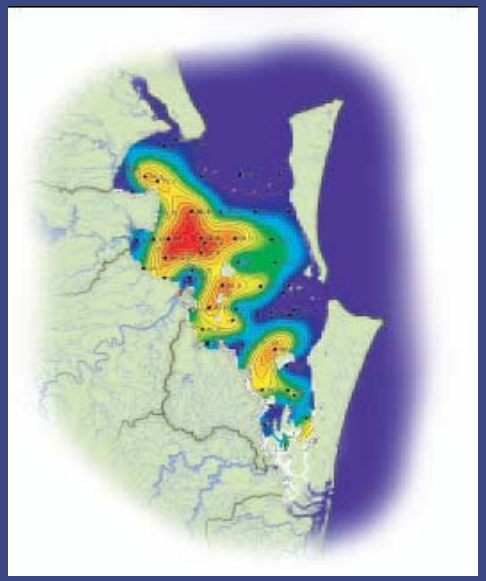


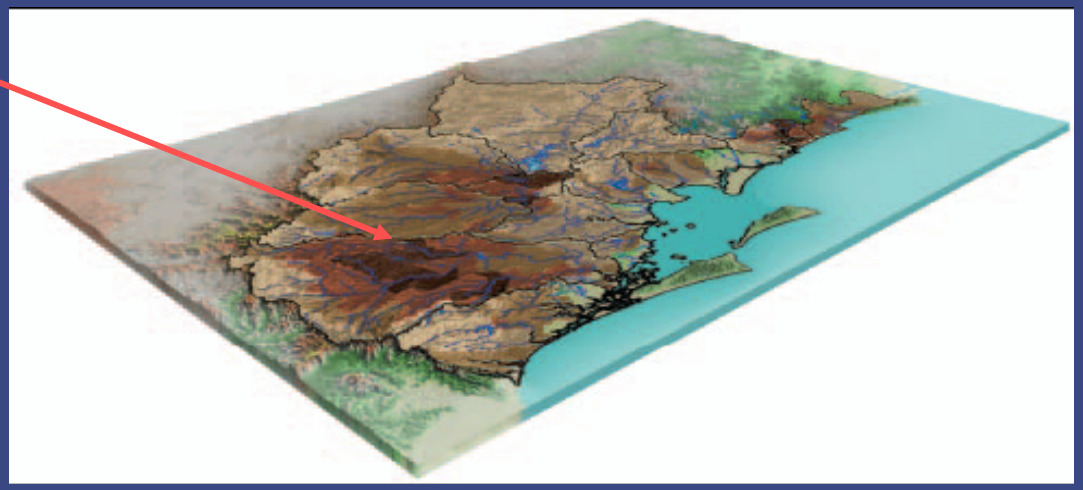


- Where does it come from?
- What are the processes that generate it?

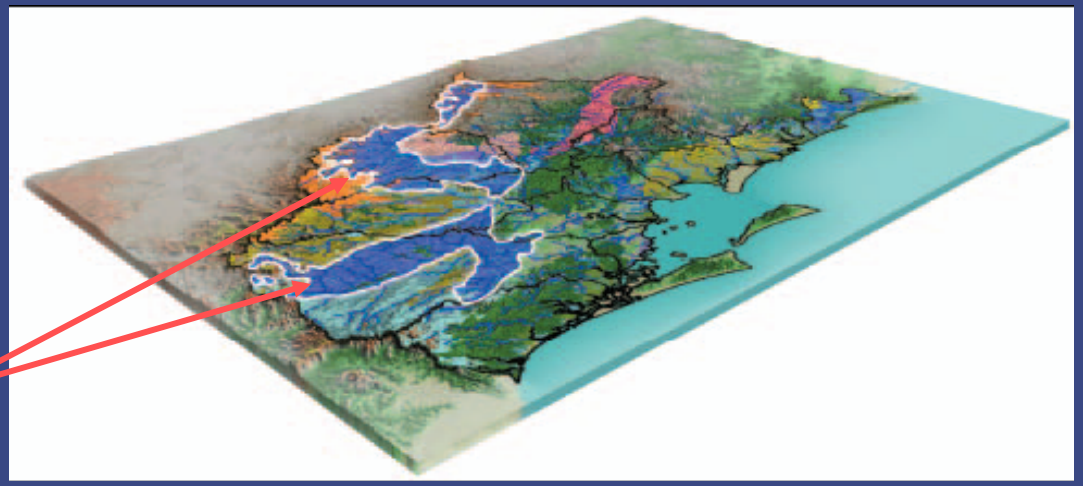
Source of sediment in Moreton Bay

Modelling suggests 70% sediment in Bay comes from <30% catchment area





Tracer study confirms that most sediment comes from soils on Marburg formation rocks



Caitcheon & Howes (2005)

Dominant processes generating sediment?

Hillslope erosion

Key issue in steeper pasture and intensively cropped floodplain

Solutions:

- promote ground cover
- maintain soil structure
- trap eroded sediments

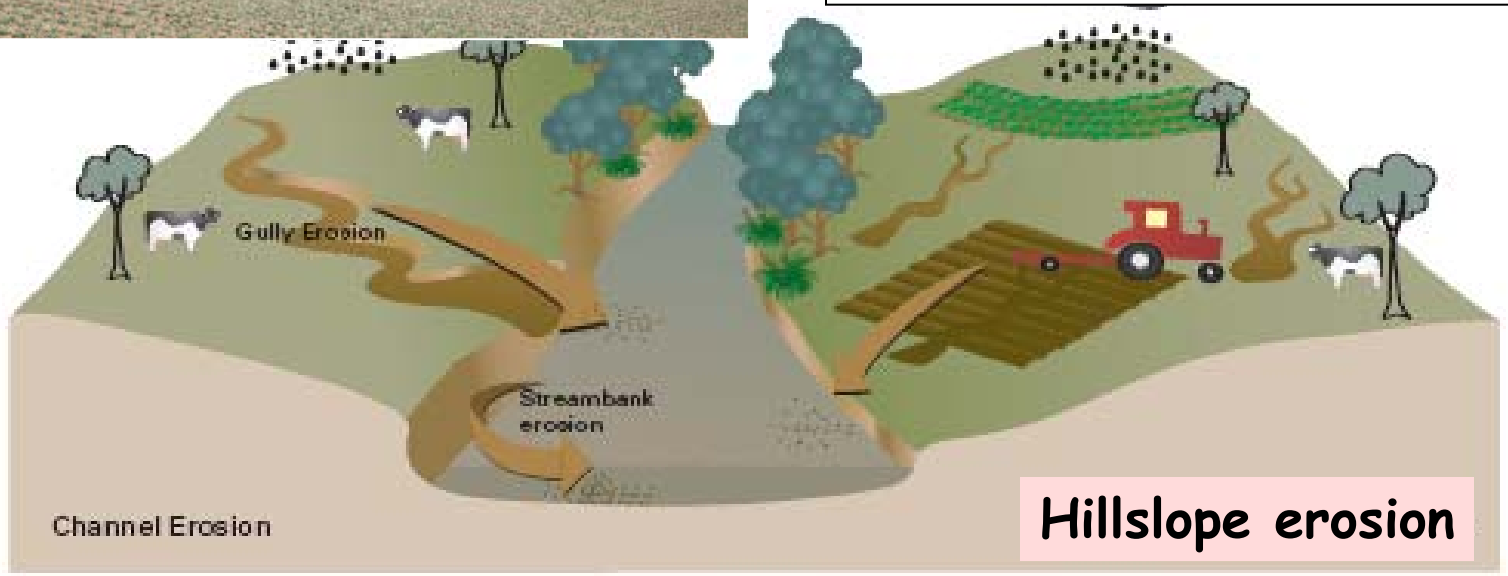


Illustration of channel and hillslope erosion processes. Channel erosion includes gully and streambank erosion and hillslope erosion includes sheetwash and rill (shallow [<20 cm] channel) erosion.

Dominant processes generating sediment?

Channel erosion

Promoted by high stream energy, riparian vegetation clearing, and floodplain degradation

Solutions:

- protect riparian vegetation
- re-establish riparian vegetation
- control stock access

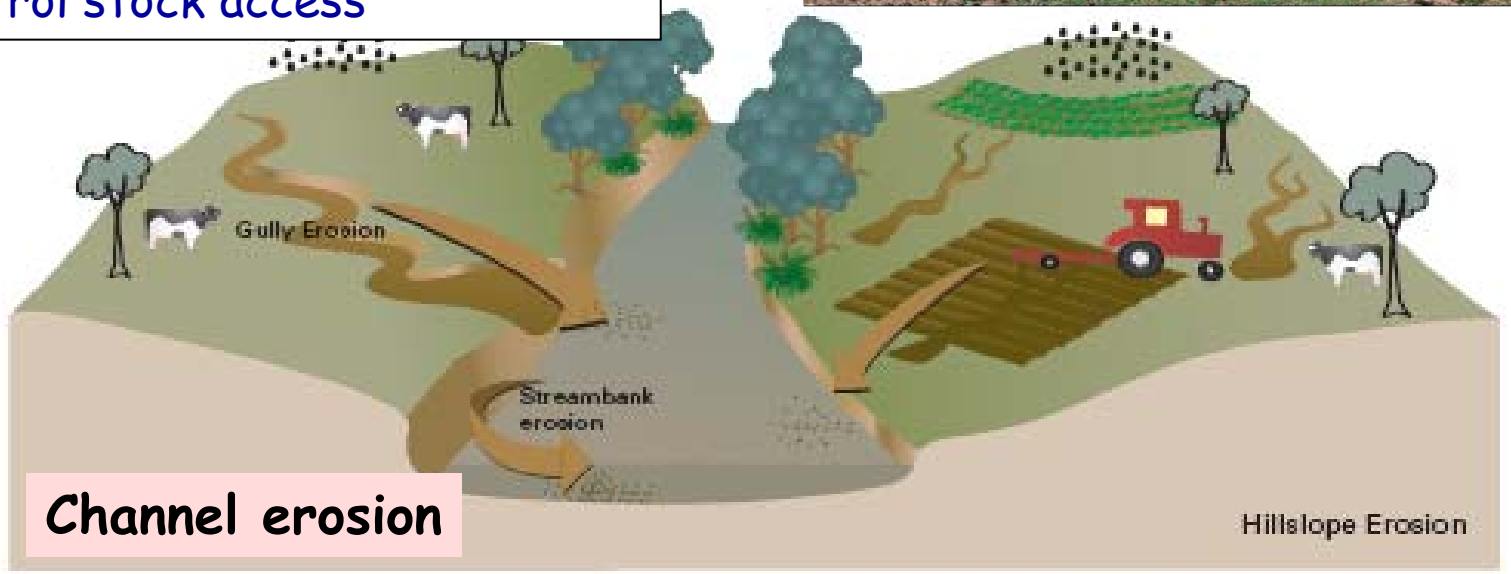
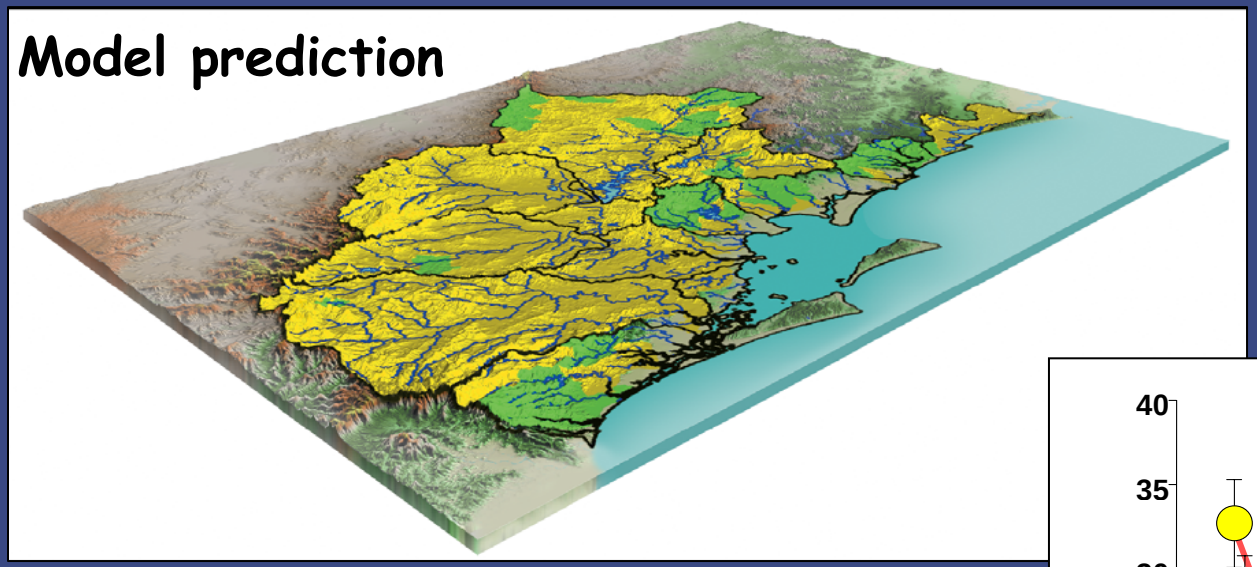


Illustration of channel and hillslope erosion processes. Channel erosion includes gully and streambank erosion and hillslope erosion includes sheetwash and rill (shallow [<20 cm] channel) erosion.

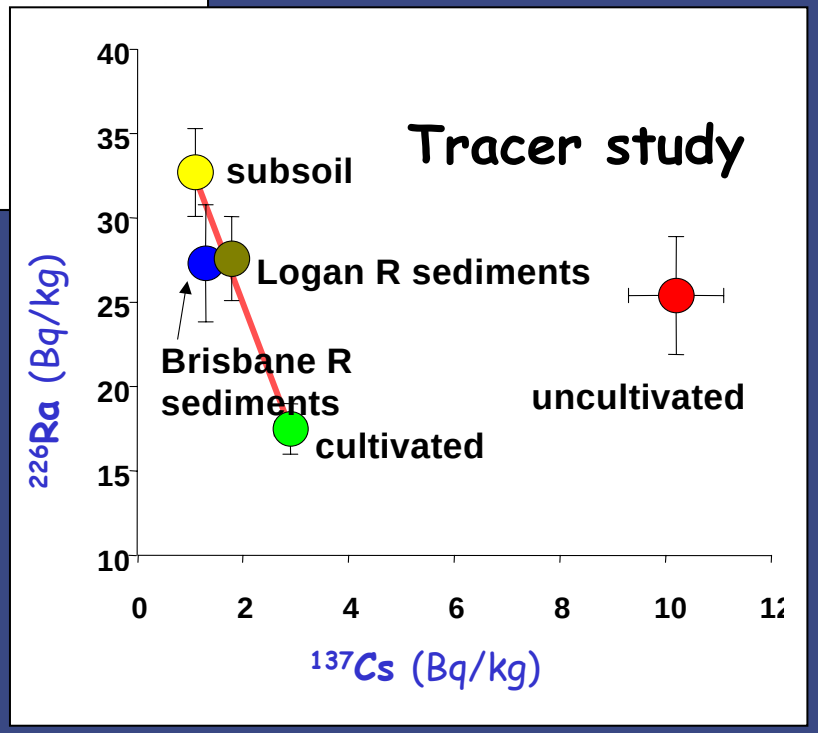
Channel erosion dominates in the region

Model prediction



Hillslope:channel erosion ratio

- 0-1 (channel erosion dominates)
- 1-10 (hillslope erosion dominates)



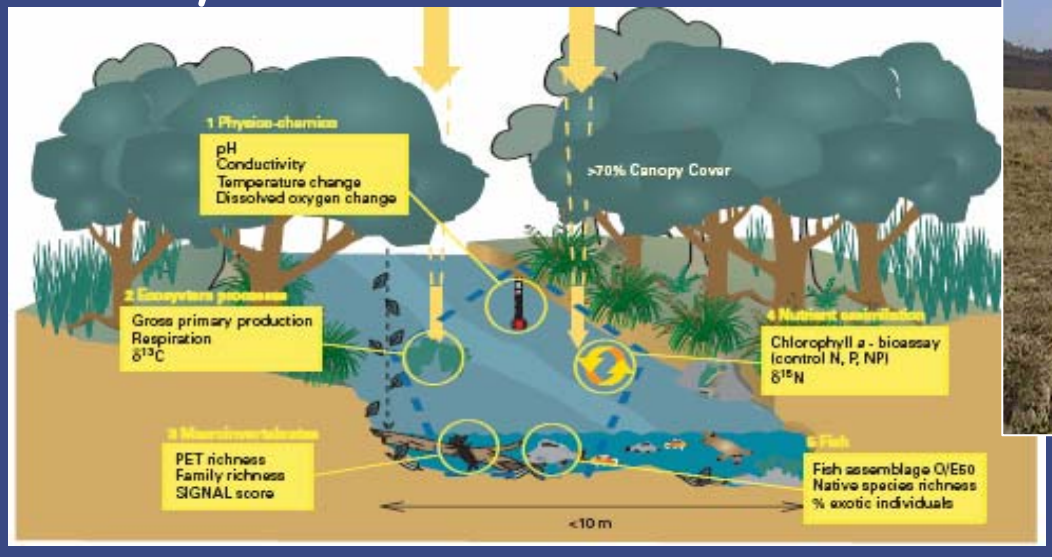
- Channel erosion is source of most sediments delivered to the lower Brisbane & Logan Rivers
- Other source is cultivated surface soils

Caitcheon & Howes (2005)

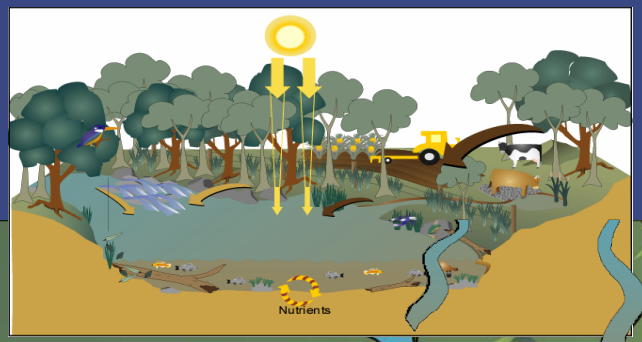
Degraded riparian lands

About 50% of the 48,000 km of streams in SEQ has poor riparian condition

Riparian condition also has a large influence on stream ecosystem health



Recommendations for riparian management



High flow events

Riparian rehab. for:
- filtering sediments & nutrients
- stabilisation
- altering water flows

Streams are dry most times of the year

Permanent flowing streams

Canopy cover > 70%

Riparian rehab. for:
- stream health
- stabilisation
- wildlife corridor
- habitat protection

Riparian rehab. for:
- stabilisation
- wildlife corridor
- habitat protection

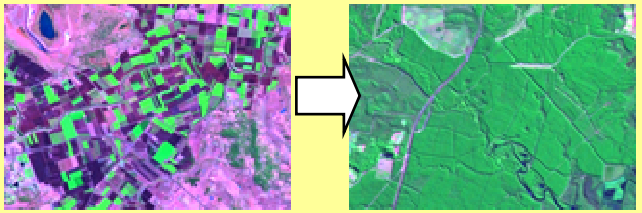
SQIDS/Wetland

Using Decision Support Software

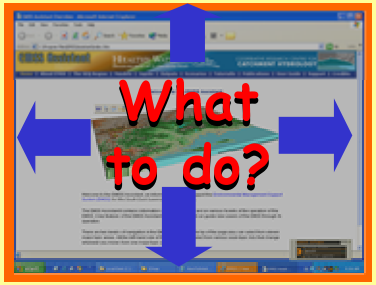
EMSS

- Synthesise process understanding of the system (links catchment to water)
- Facilitates decision making process to select actions to best protect waterways

Land use and land management change



Wastewater Treatment (city)



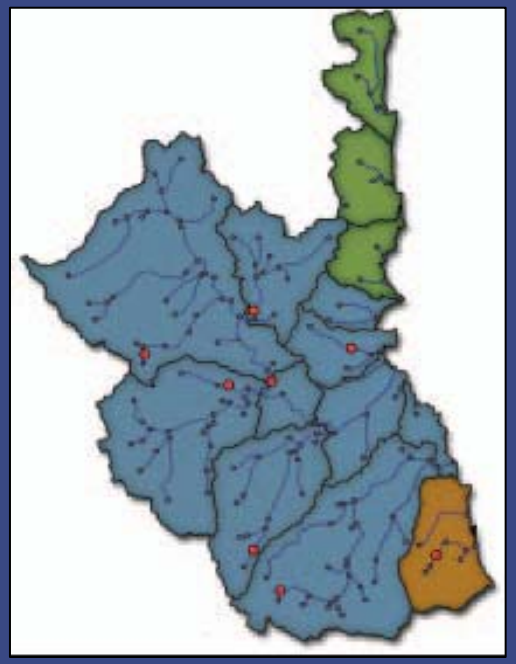
Wastewater treatment (industrial)

Stream bank re-vegetation

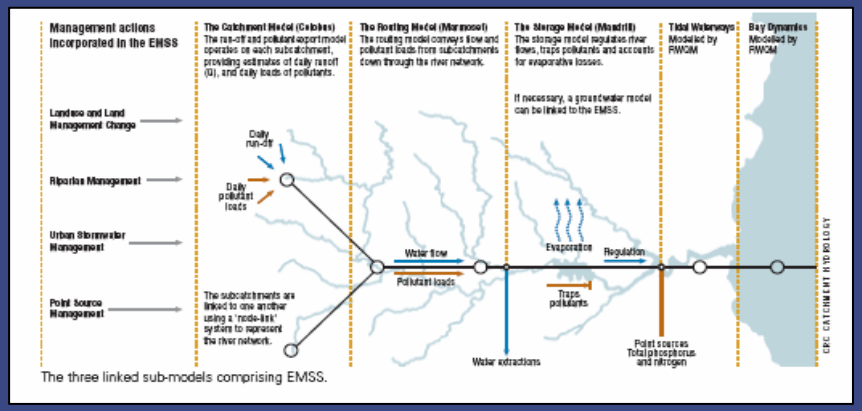
Environmental Management Support System

Using Decision Support Software

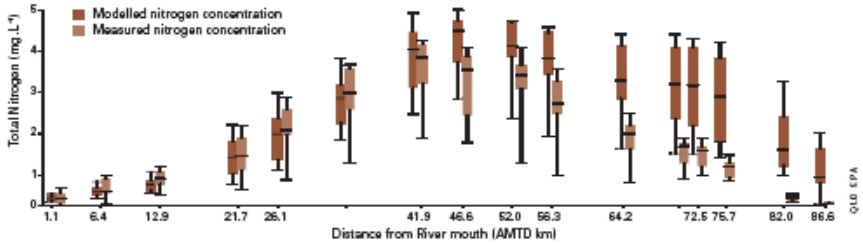
EMSS



Receiving Water Quality Model



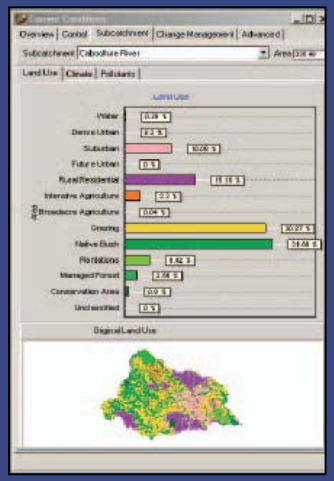
The three linked sub-models comprising EMSS.



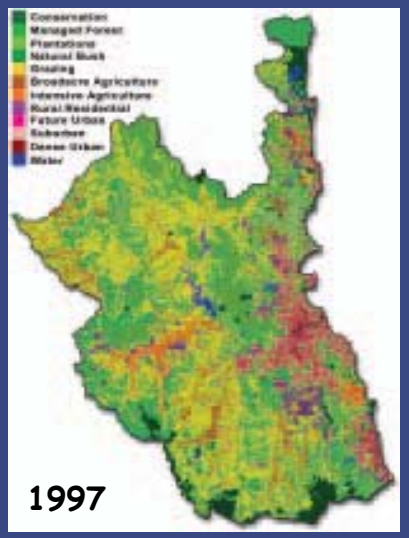
Example of Receiving Water Quality Model Calibration – Brisbane River.

Vertessey & McAlister (2005)

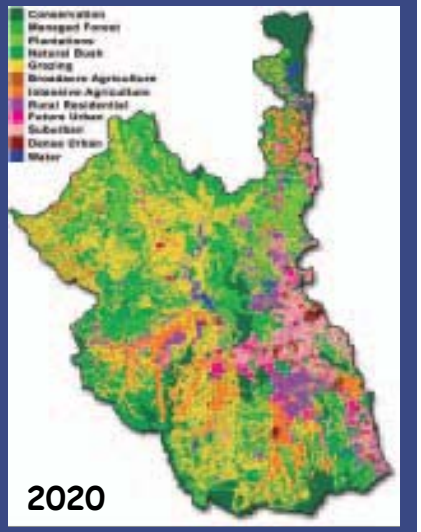
Scenario testing



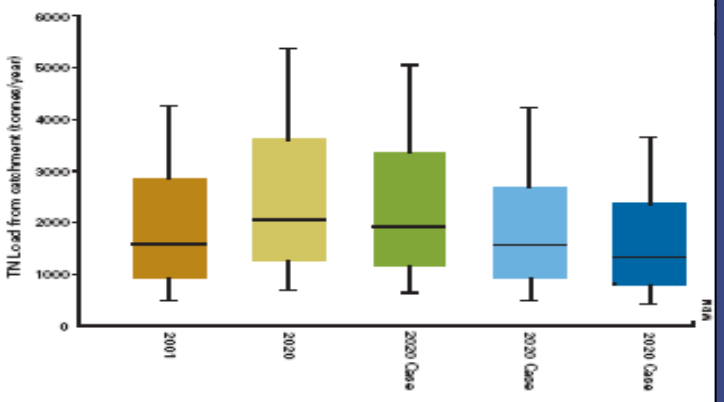
Past



Present



Future



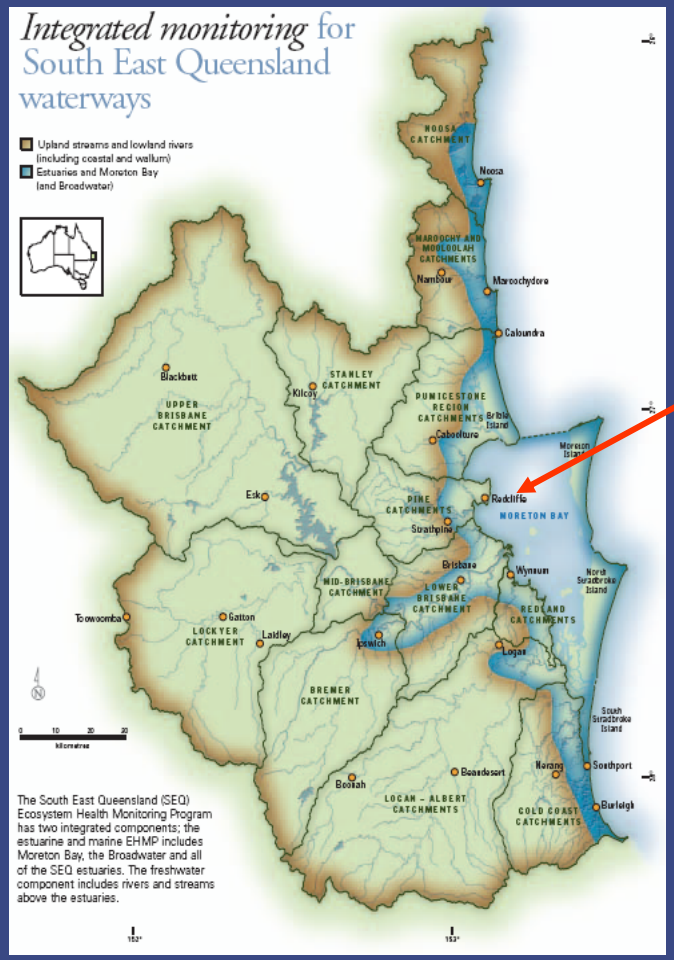
Predicted total N load to Moreton Bay

- Current TN loads
- 2020 "do nothing" scenario
- 2020 achieve objectives for future urban land
- 2020 achieve objectives for future urban land + SQID retrofit
- 2020 achieve objectives for future urban land + SQID retrofit + riparian management

Vertessey & McAlister (2005)

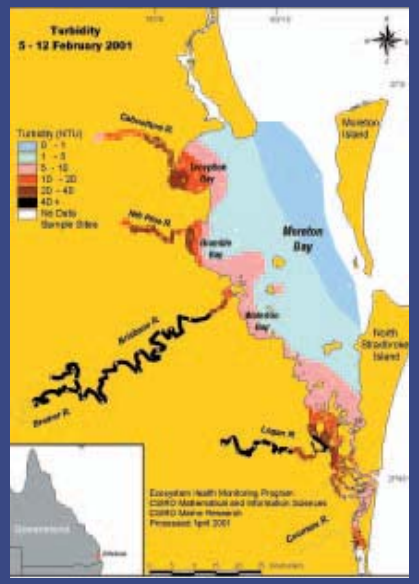
Ecosystem Health Monitoring Program

Assess effectiveness of environmental protection measures (e.g. stormwater controls, STP upgrades, riparian vegetation)



Estuarine and marine EHMP
- Designed stage 2
- Implemented Stage 3

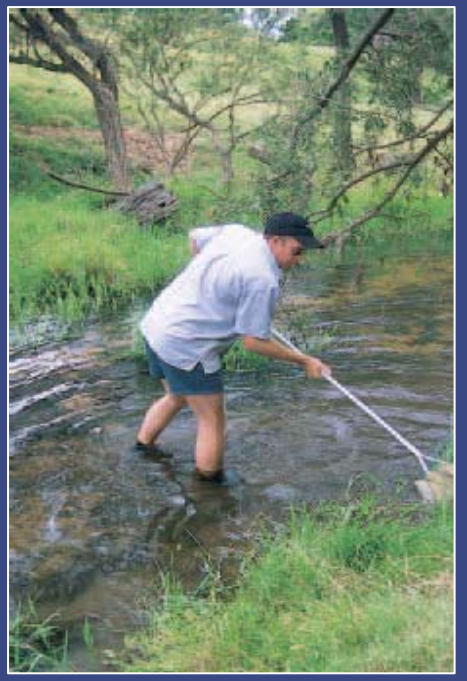
260 sites (sampled monthly)



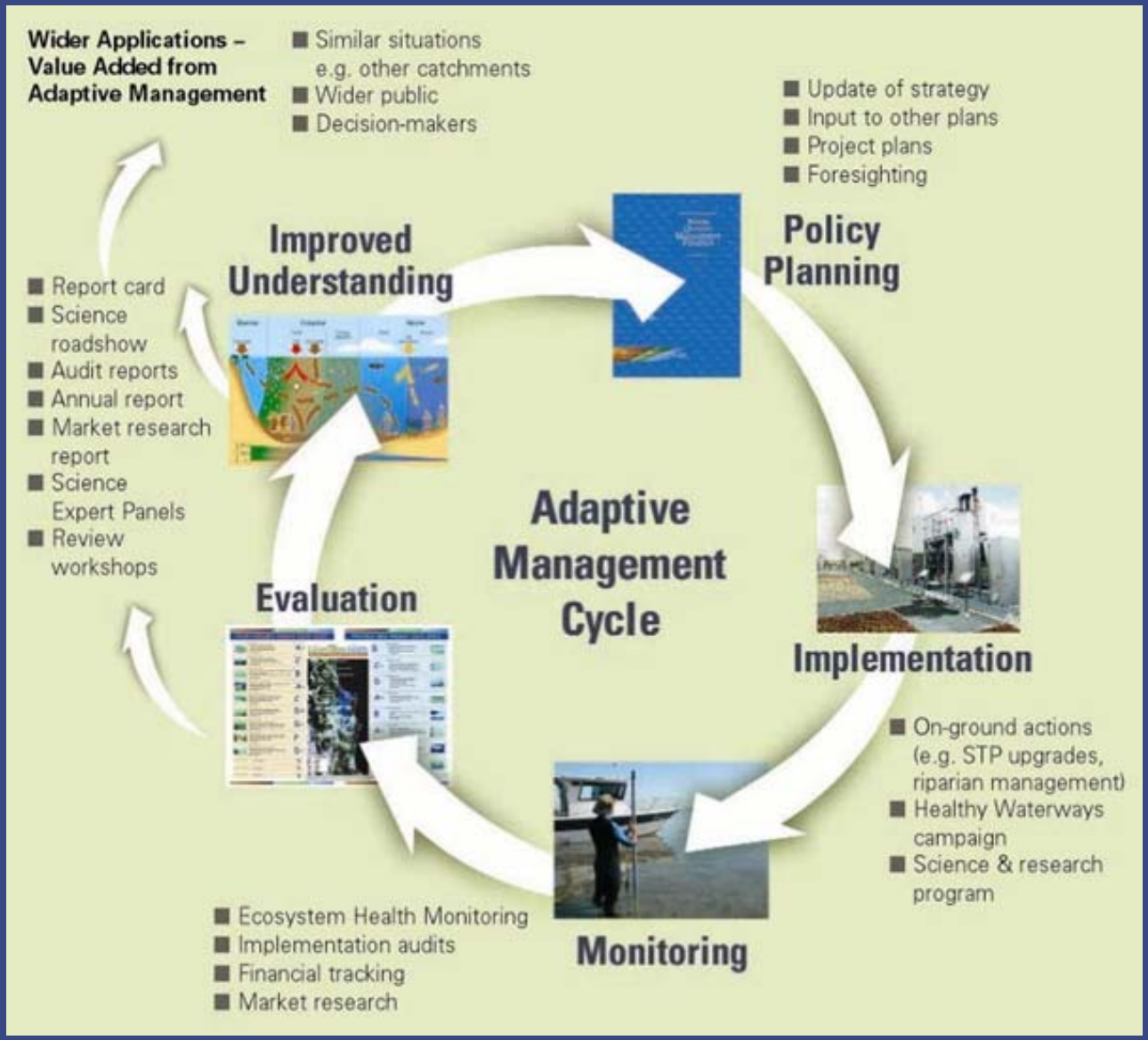
Ecosystem Health Monitoring Program

Freshwater EHMP
- Designed stage 3 ; Implemented 2002

120 freshwater sites (sampled 2x/yr)

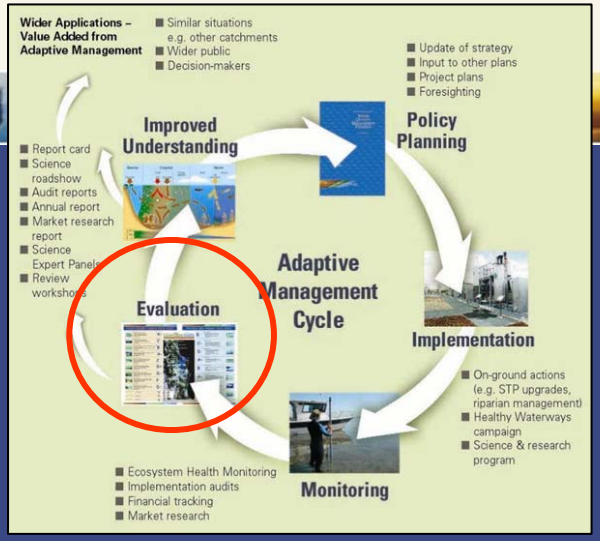


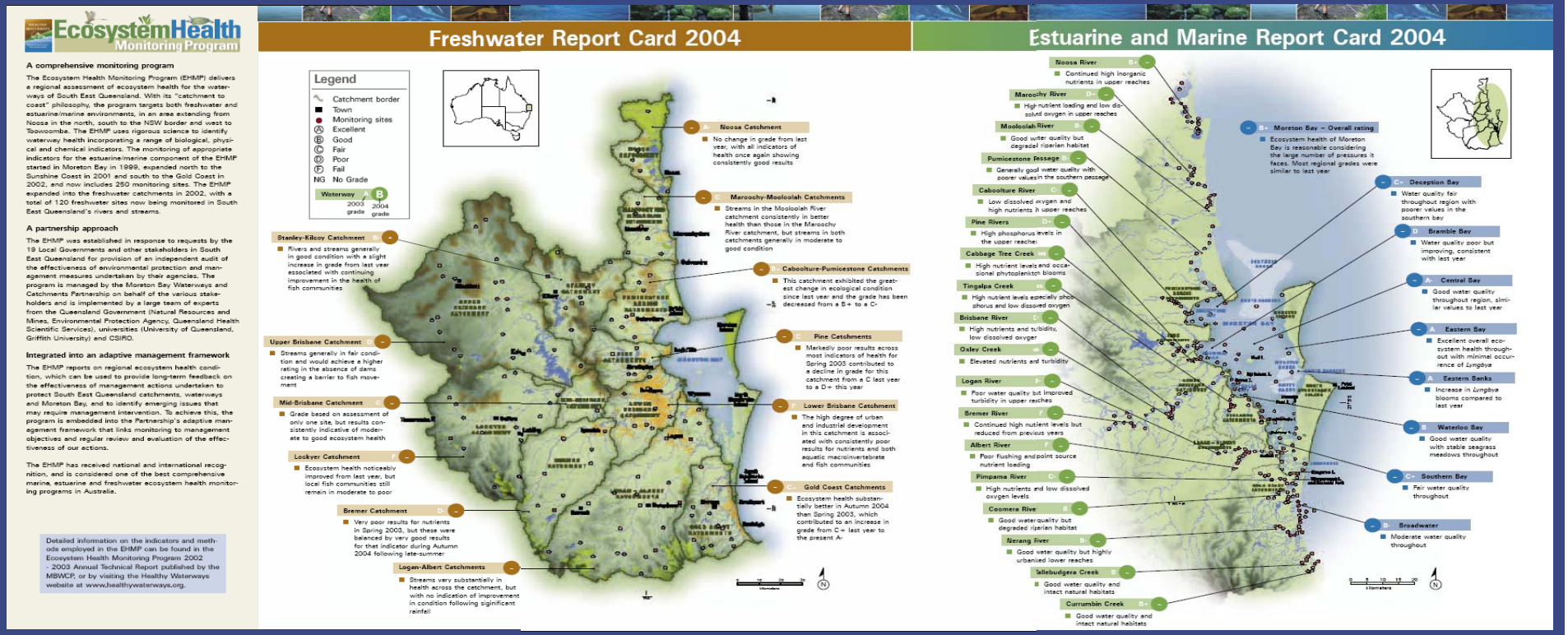
Adaptive management framework



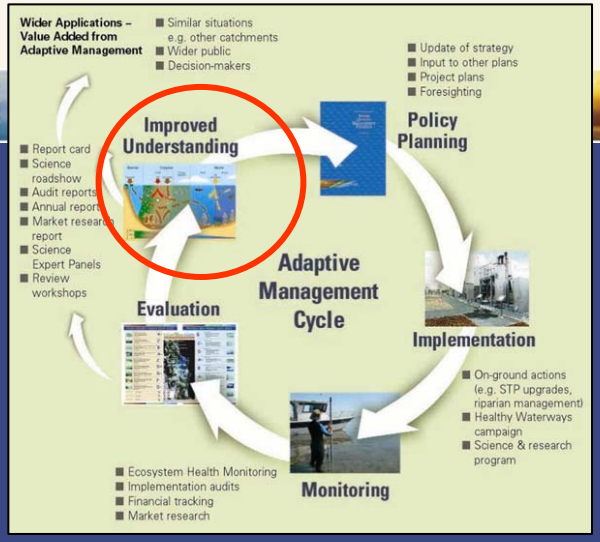
- ongoing knowledge acquisition
- critical role of monitoring
- continuous improvement in the identification and implementation of management.
- effective communication of knowledge for policy/planning

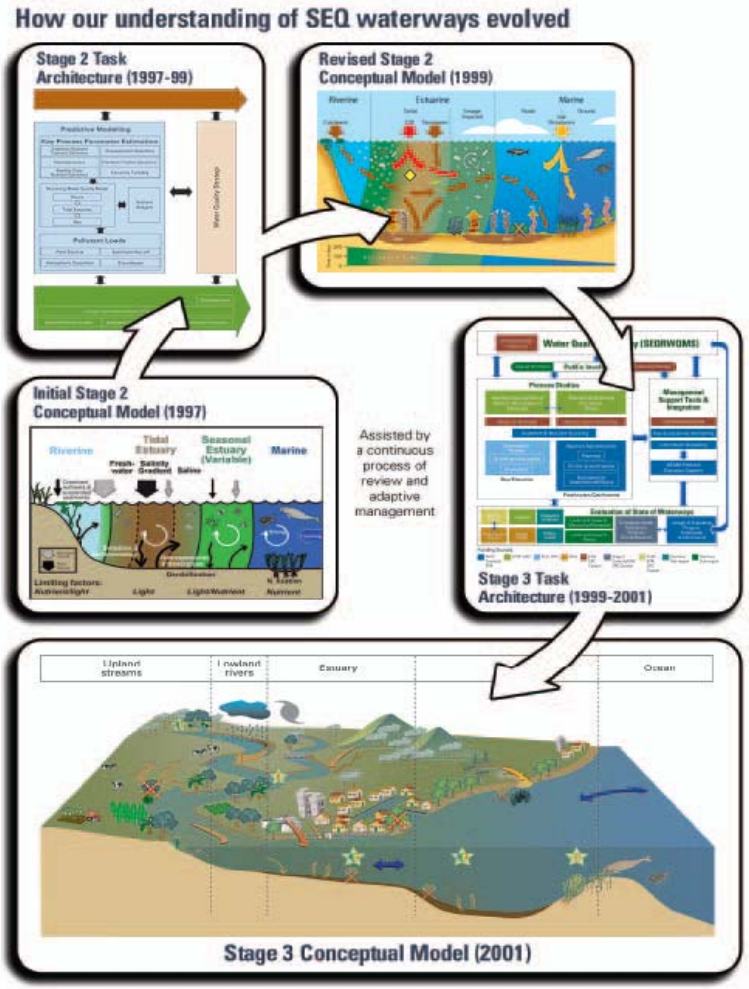
Report cards on progress





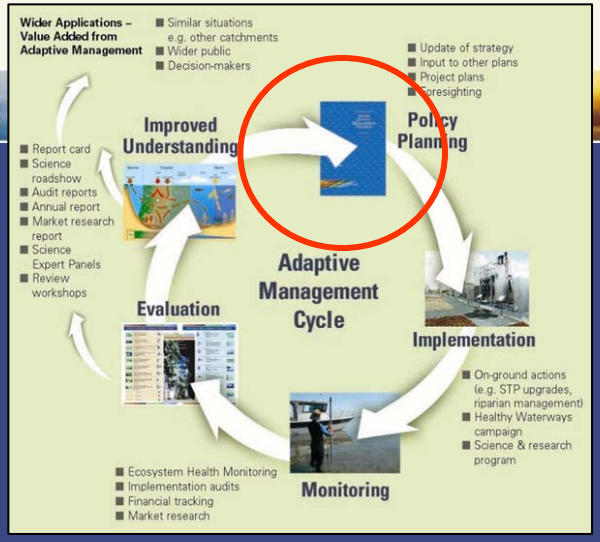
Improvement of understanding

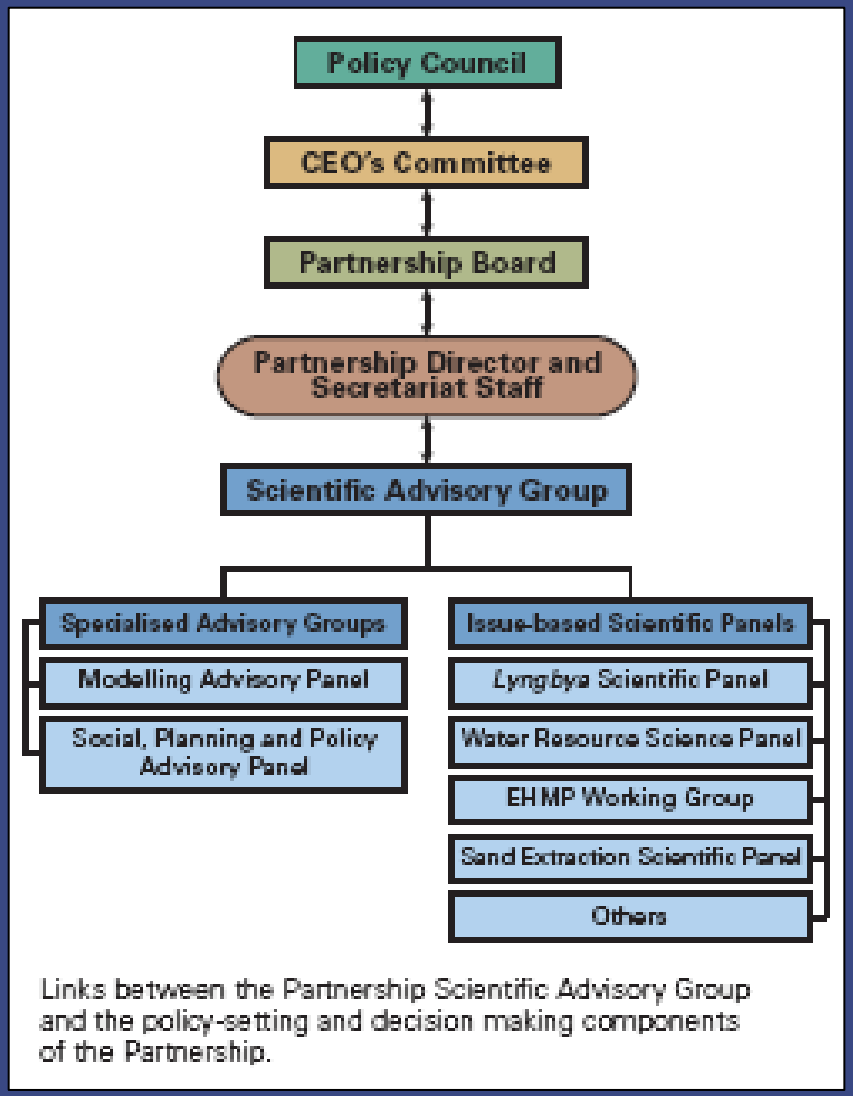




Continual refinement and testing of conceptual models

Links to policy

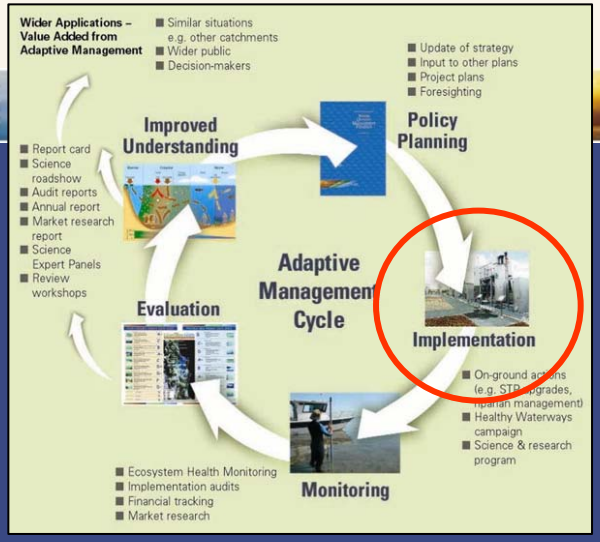




Links between the Partnership Scientific Advisory Group and the policy-setting and decision making components of the Partnership.

Strong link between science and policy makers

Targeted management actions



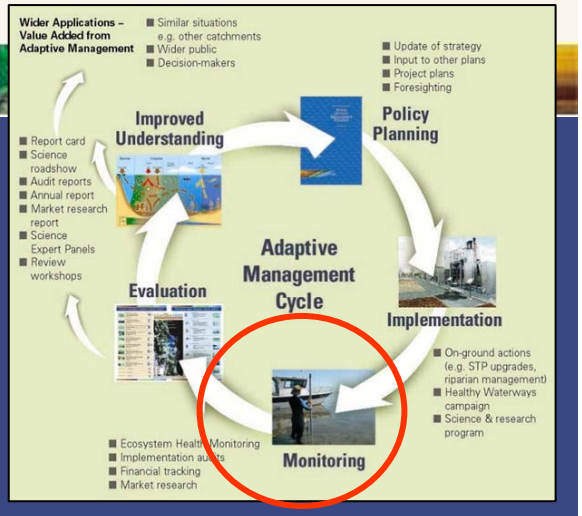
Sewage Treatment Plant upgrades

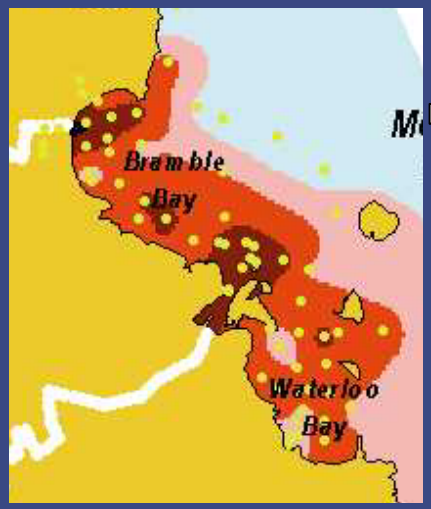
Stormwater Quality Improvement Devices

Riparian Rehabilitation

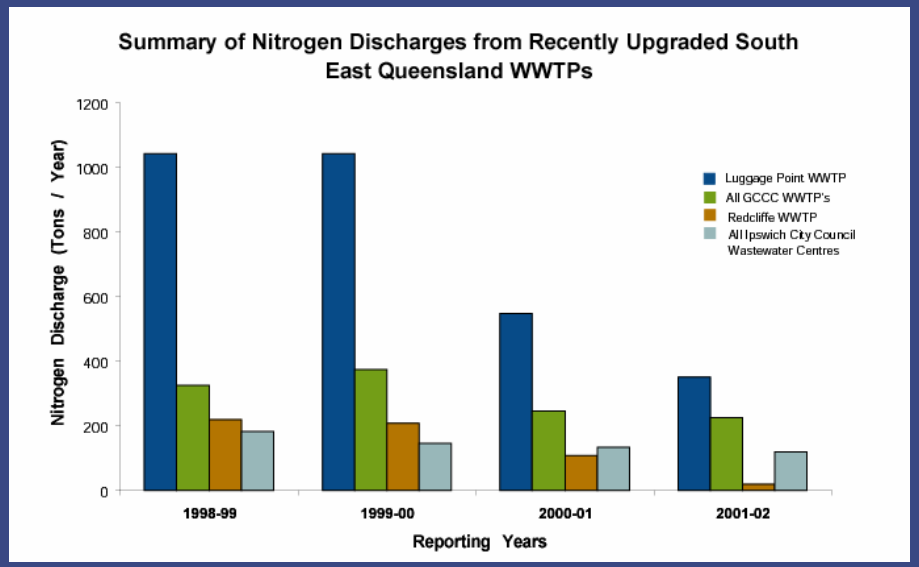
Effectiveness of management actions

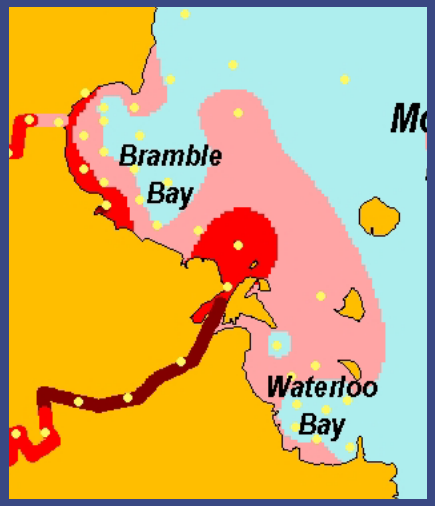
~$500M commitment by local government to reduce wastewater





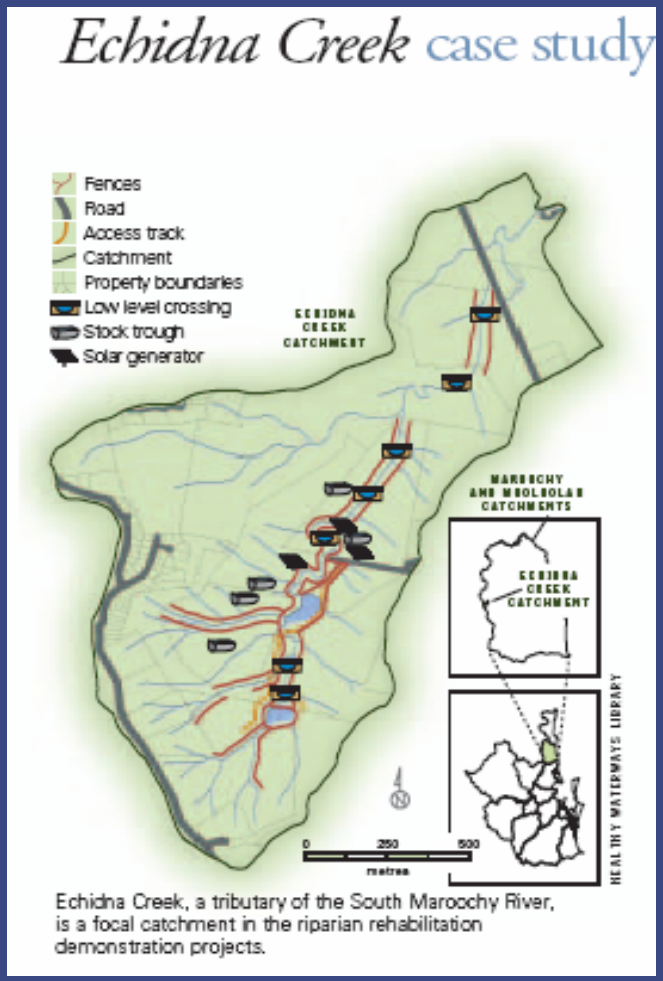
$\delta^{15}N$ Sewage Plume 1998 (summer)



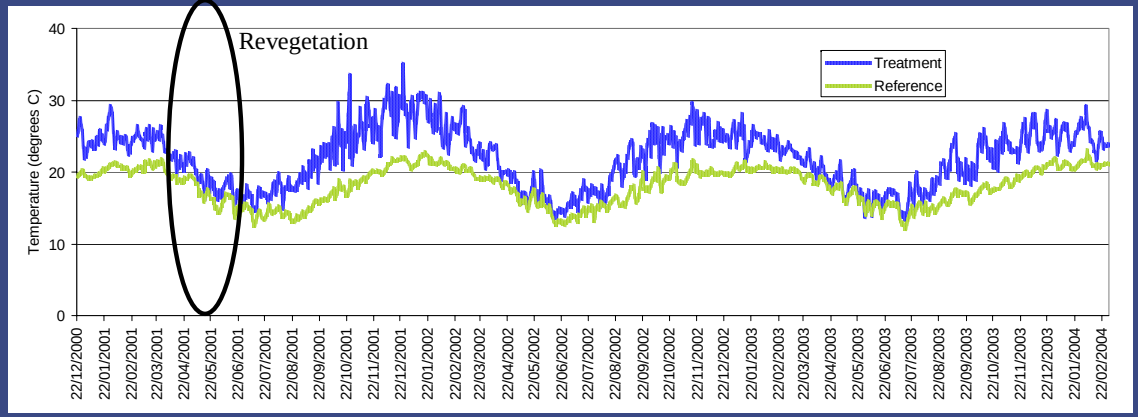


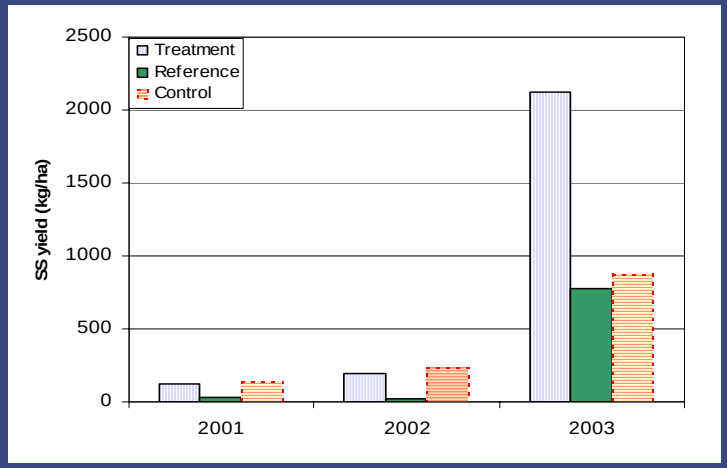
$\delta^{15}N$ Sewage Plume 2001 (summer)

Riparian rehabilitation experiments



temperature regimes





sediment yield


November 2001


February 2003

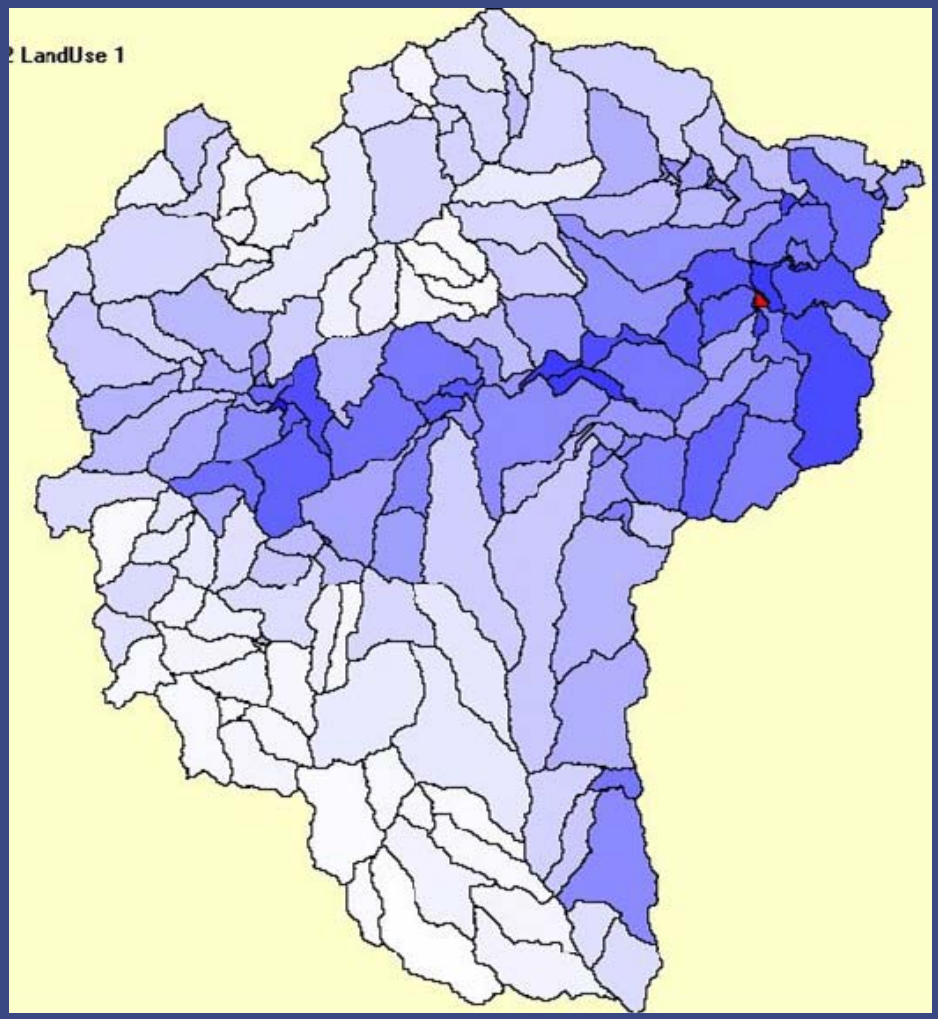

March 2004

The future

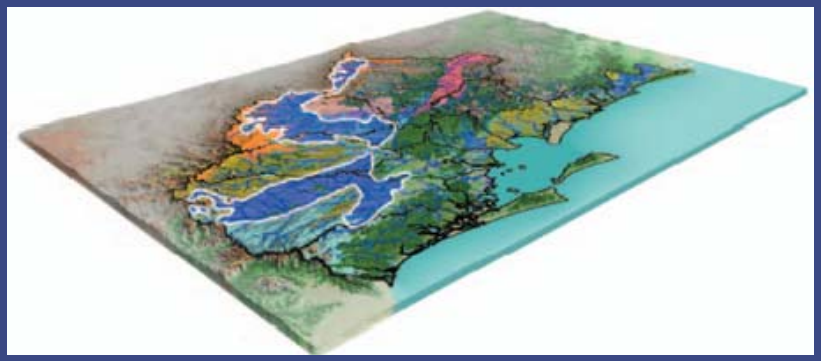
1994 – 1997	1997 – 1999	1999 – 2002	2002 onwards
Stage 1 Scoping	**Stage 2** Bay and Estuaries Focus	**Stage 3** Rivers and Catchment Focus	**Integrated Partnership** Waterways Management Land to Sea; Sustainable Catchment
■ Background Studies	■ Pilot studies ■ Design of Estuarine & Marine Monitoring Program	■ Ongoing studies ■ Estuarine & Marine Monitoring ■ Design of Freshwater Monitoring Program ■ Regional Decision Support Tools ■ Regional Process Studies	■ Integrated Freshwater, Estuarine & Marine Monitoring ■ Design of Load-Based & Human Health Monitoring Program ■ Decision Support tools for Implementation ■ Process Studies ■ Socio-Economic Studies ■ Sustainable Loads
■ 6 Local Councils ■ State & Federal Governments	■ 6 Local Councils ■ State & Federal Governments	■ 19 Local Councils ■ State & Federal Governments	■ 19 Local Councils ■ State & Federal Governments ■ NAP & NRM Iniatives

A staged approach was adopted by the Study, with each stage having a different focus, targeted objectives and clear outcomes.

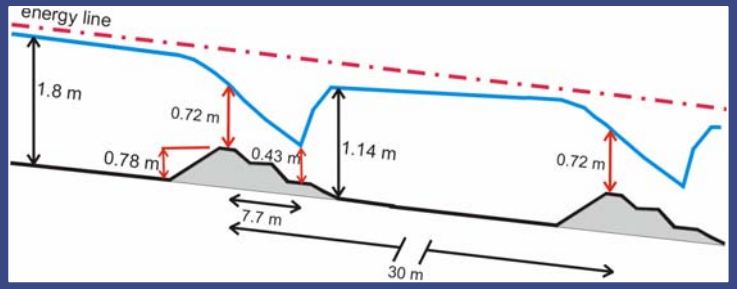
Subcatchment scale – 'priorities'



Ex. Lockyer Scoping Study
We can identify the areas which are exporting more sediment



What restoration is required?



channel/bank restoration?

riparian revegetation?

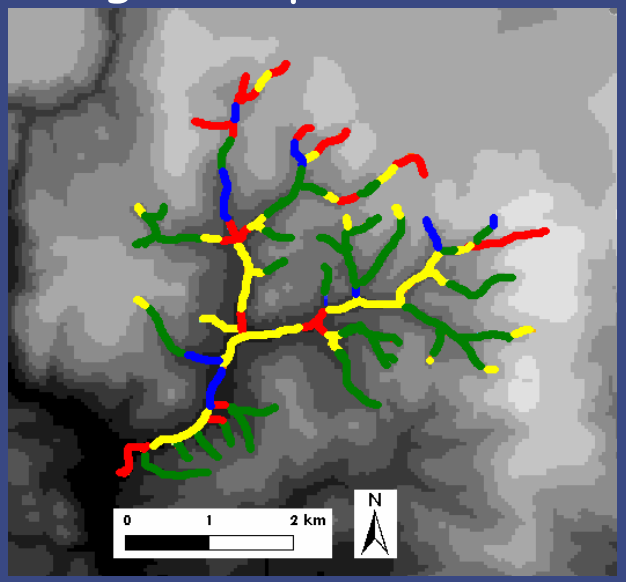
gully stabilization?

Also can provide this advice now

Where in the landscape?

are there priority areas?

- eg high sediment yield
- eg low riparian shade



What is the optimum size and spatial arrangement of restoration?

- eg one large continuous section or several small ones?

Cannot fully answer this

Summary - Key lessons

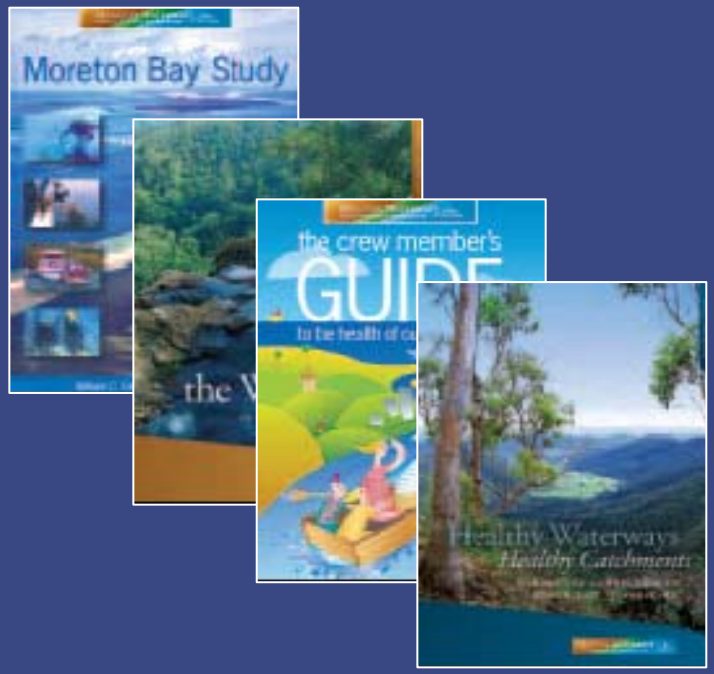
Common Vision

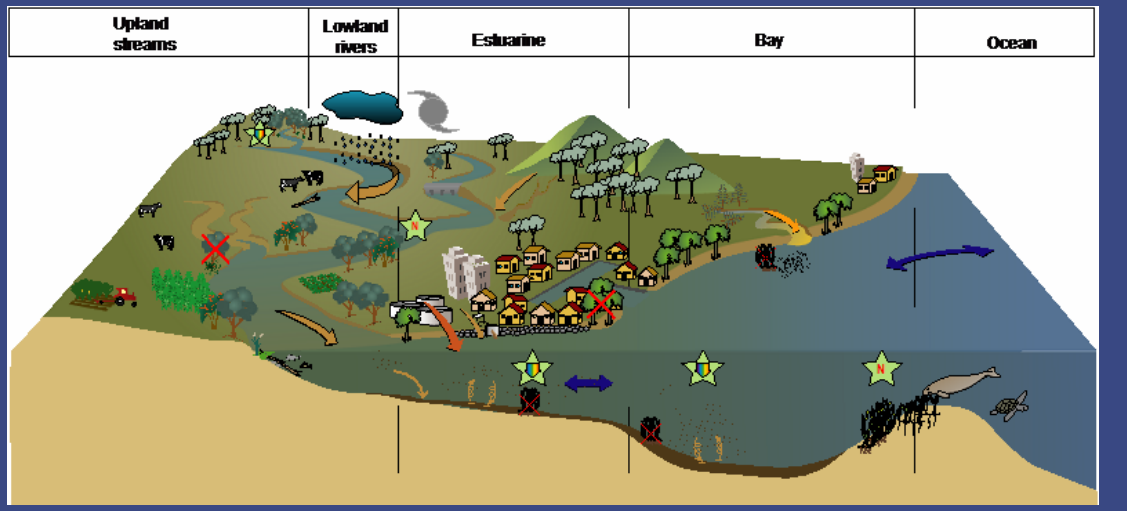
Committed Individuals

HEALTHY WATERWAYS

Because we're all in the same boat

Defensible science and effective communication





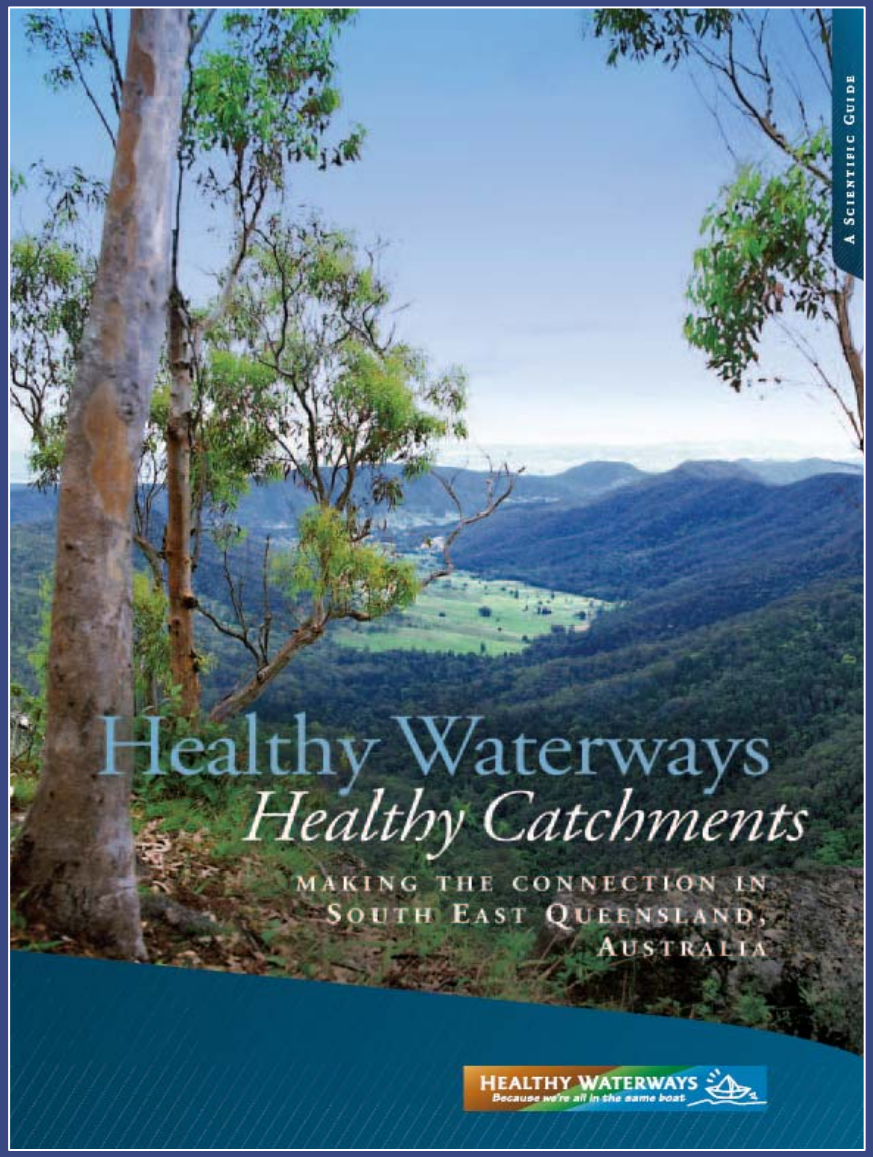
Science involvement in cultural celebration

Annual Riverfestival and International Riversymposium

'Managing rivers with climate change and expanding populations'
4th – 7th September 2006

www.riversymposium.com

Science book – 2005



Thankyou

Because we're all in the same boat

http://www.healthywaterways.org