



CARING
FOR
OUR
COUNTRY



CATCHMENT TO REEF:

**Adaptive water management using water
quality improvement plans**

John Reghenzani

Terrain NRM

**With generous assistance from Peter Bradley (Terrain NRM),
David Haynes (GBRMPA), Frederieke Kroon (CSIRO) and
Louise Hateley (Terrain NRM)**

Outline

- **The Terrain Region**
- **Terrain NRM**
- **Water quality improvement plans (Douglas, Barron and Tully)**
- **Catchment to reef**
- **Reef Rescue**
- **Some Reef Rescue examples**



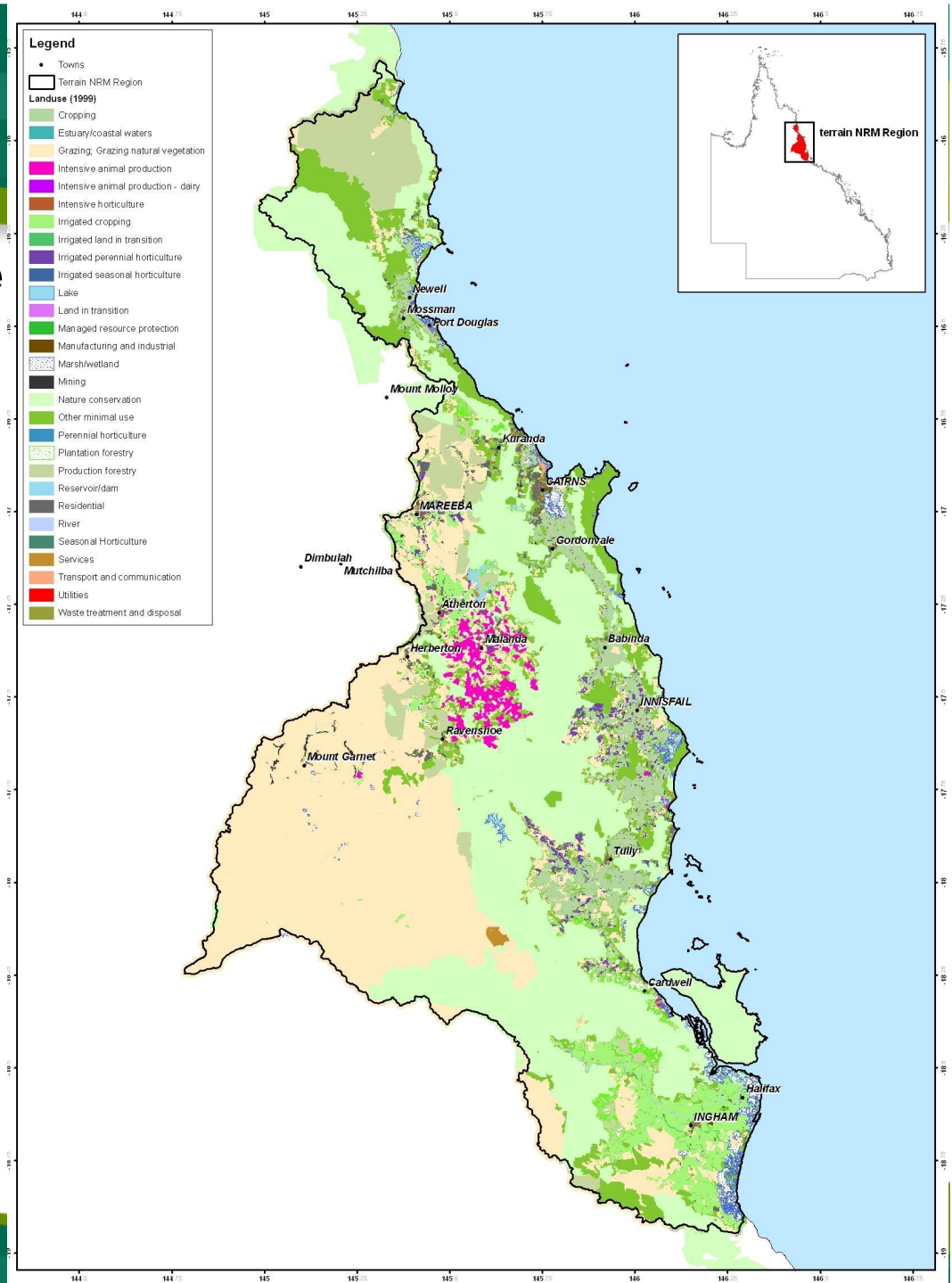
Terrain NRM Region



- Wet Tropics NRM region covers approx 2.2M ha
- Seven diverse catchments:
 - Daintree-Mossman,
 - Barron plus the Trinity Inlet
 - Mulgrave,
 - Russell,
 - Johnstone,
 - Tully-Murray and
 - Herbert
- Unique region in Australia - climate, spectacular scenery, biological diversity, economic productivity, social and cultural values
- Includes 91 % of Queensland Wet Tropics World Heritage Area; substantial areas of the Great Barrier Reef World Heritage Area and Great Barrier Reef Marine Park, National Parks and State Forests

Features

- **Diverse land use from intensive agriculture (bananas/sugar cane/) to extensive grazing**
- **Mean annual rainfall of 1,580mm is triple the long term Aust average (472mm)**
- **Seasonal rainfall from rain depressions and cyclones during the summer wet season**
- **Soils have low cation exchange capacity and are porous**
- **Natural lands are dominant**



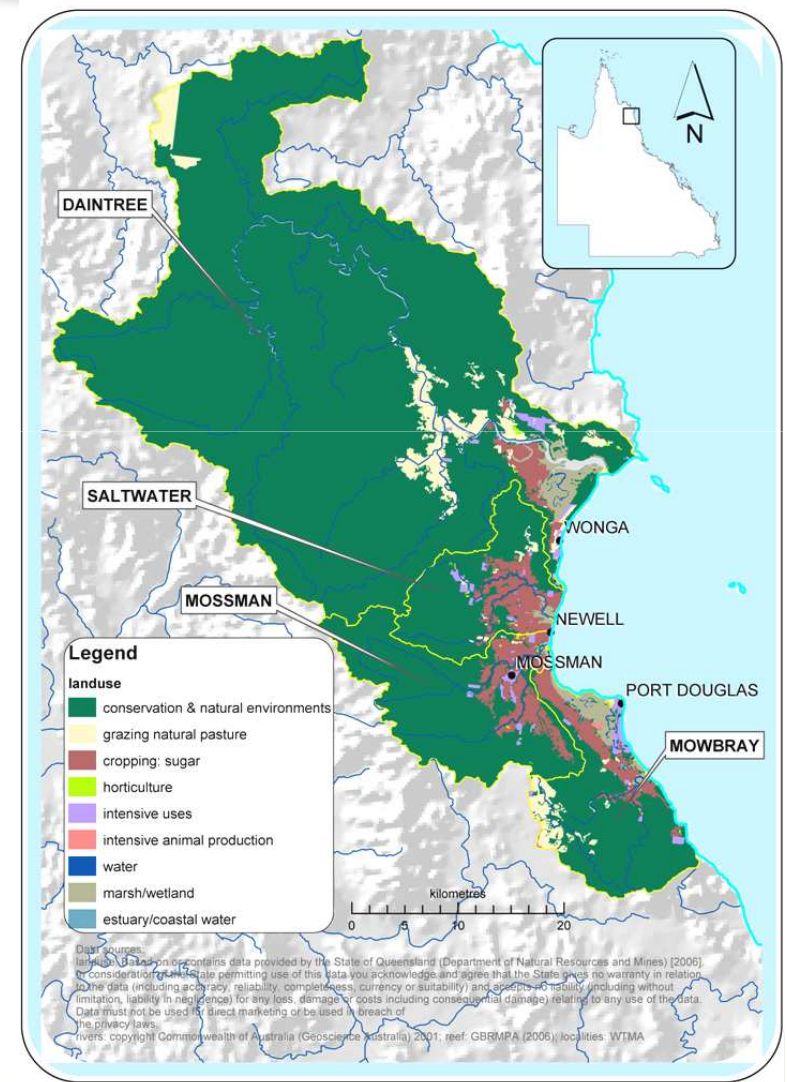
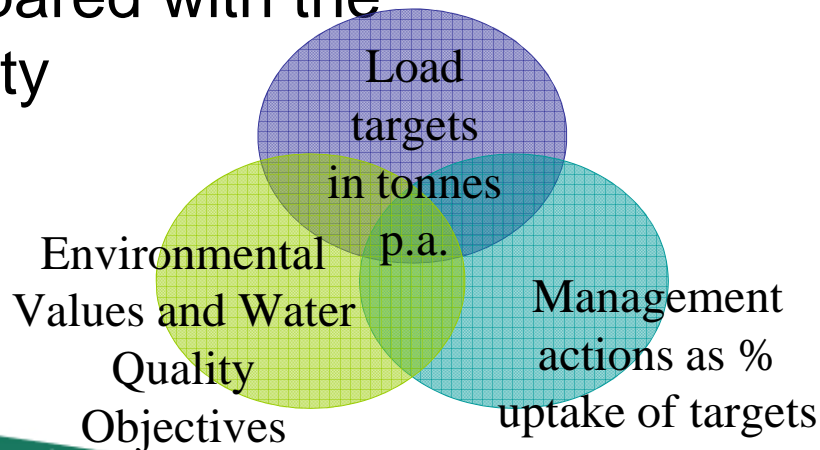
Terrain NRM



- Terrain NRM is the Natural Resource Management body for the Wet Tropics in Far North Queensland
- We are an Australian not-for-profit company with international reach
- We build regional consensus on targets and actions to secure the health of water, biodiversity, soil, river, climate, traditional owner and community assets
- Our program of activities include:
 - Sustainable industries
 - Water quality and management
 - Integrated pest management
 - Landscape and catchment rehabilitation
 - Regional carbon aggregation and trading
 - Biodiversity in tropical ecosystems
 - Traditional owner land and sea management

Douglas

- Pollutants of concern identified
 - Suspended solids
 - Total nitrogen
 - Total phosphorus
- Targets and actions established
- Plan prepared with the community



Douglas Targets

Terrain NRM

DEW

Great Barrier Reef Marine Park Authority

NRW

Load targets
in tonnes p.a.

Environmental Values
and Water Quality
Objectives

Management actions as %
uptake of targets

Terrain NRM

Environmental Protection Authority

Cairns Regional Council

DEW

Industrial groups

Great Barrier Reef Marine Park Authority

Terrain NRM

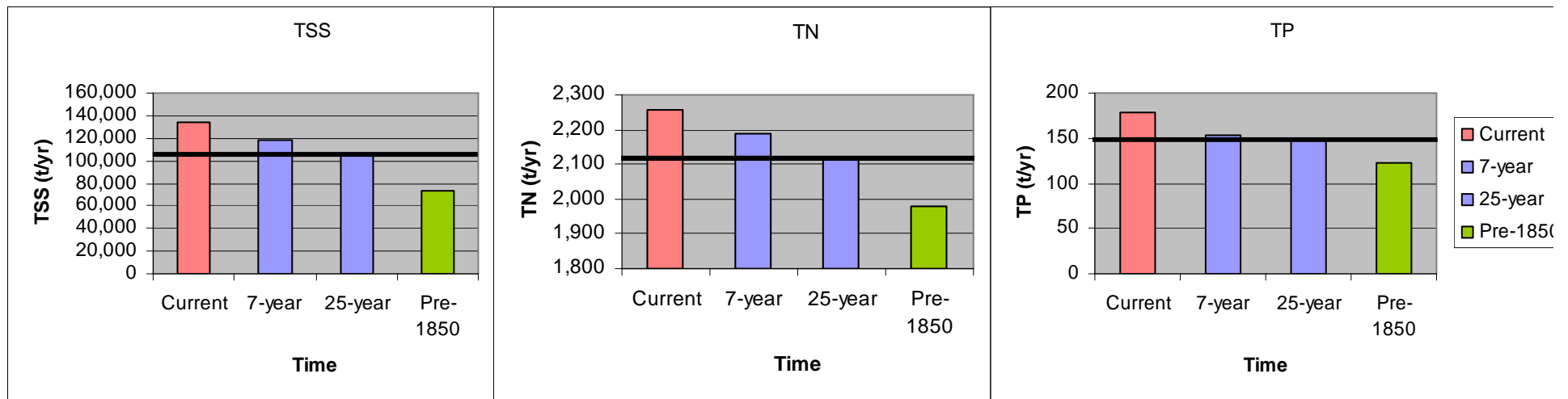
Industrial groups

Cairns Regional Council

Department of Primary Industry

Douglas model outputs

Model run management scenarios used for total suspended solids, total nitrogen and total phosphorus load target setting



Running the various management action scenarios indicates at year 25 the community will have achieved approximately half the desired reductions to pre 1850 loads.

Douglas WQIP Strategies

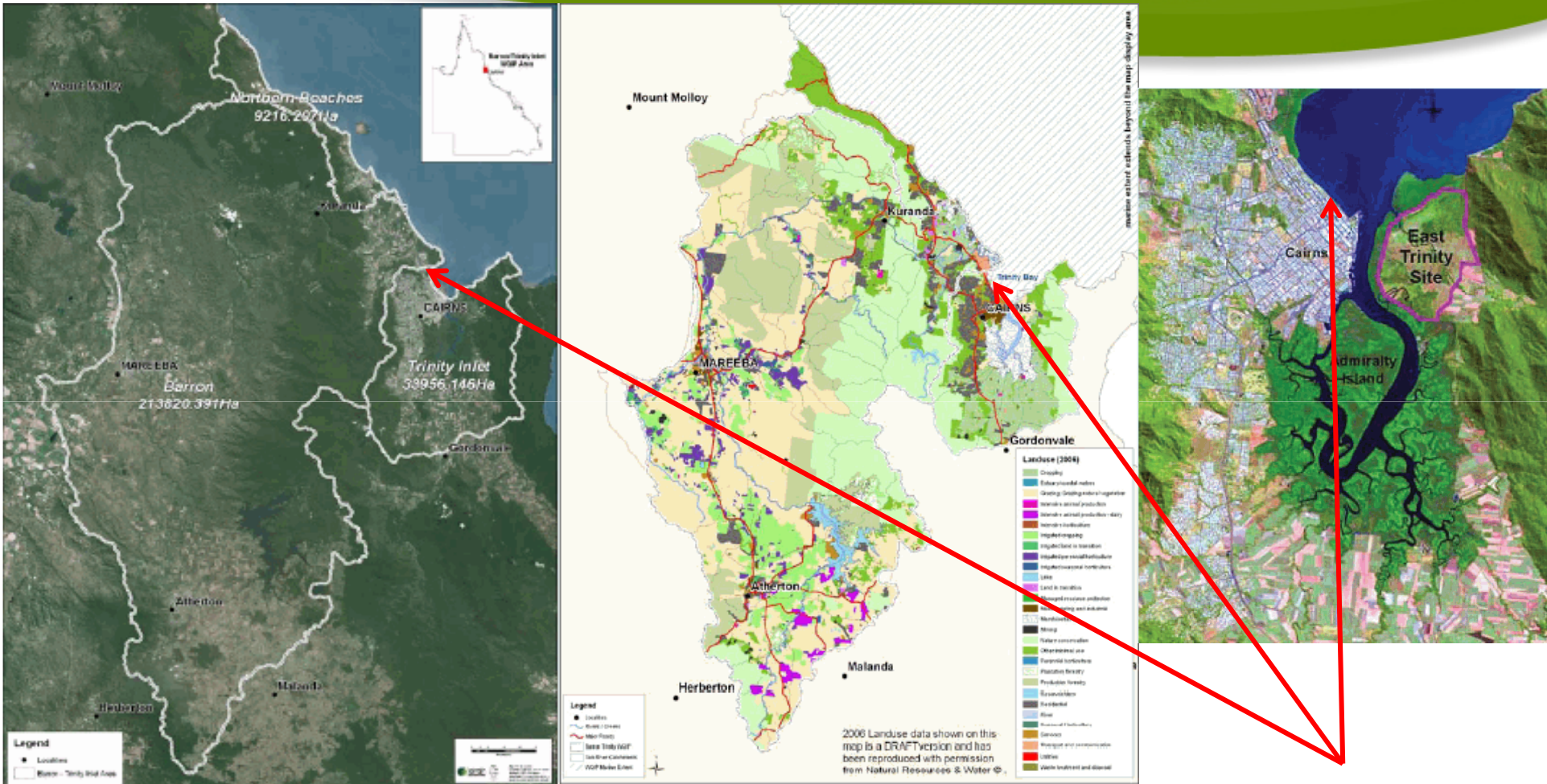
- A** Fertiliser management strategy
- B** Cane drain management strategy
- C** Grazing management strategy
- D** Riparian restoration and improving wetland functionality
- E** Licensed/regulated sources and activities, including sewerage treatment plant upgrades and implement
- F** Erosion control and storm water management development guidelines
- G** Monitoring, evaluation and reporting (loads, effectiveness and uptake of Best Management Practices)



Fertiliser and drain strategies

Fertiliser usage / N loss	<p>“Making the change that matter” project has provided:</p> <ul style="list-style-type: none"> •Increase in legume planting (400ha) •Increase in number of soil assays 	Mossman Ag Services Landholders DAFF (Federal)
	Eco-accreditation of sugar project	Terrain NRM Steering committee Better Sugar Initiative
	Increase in the number of sub-surface fertiliser applicators	Landholders Mossman Ag Services Reef Rescue
Drain	<p>Cane drain remediation project:</p> <ul style="list-style-type: none"> •Survey •On-ground works (deep to spoon drains) •Water quality event monitoring 	Terrain NRM Mossman Ag Services Landholders NRM (State) Cairns Regional Council

Barron and Trinity Inlet



Satellite image and land use of the Barron catchment

You are here

Barron and Trinity Inlet Plan

Barron Trinity Inlet WQIP

Water Quality Improvement Plan for the catchments of the Barron River and Trinity Inlet

October 2009



Fiona Barron and David Haynes



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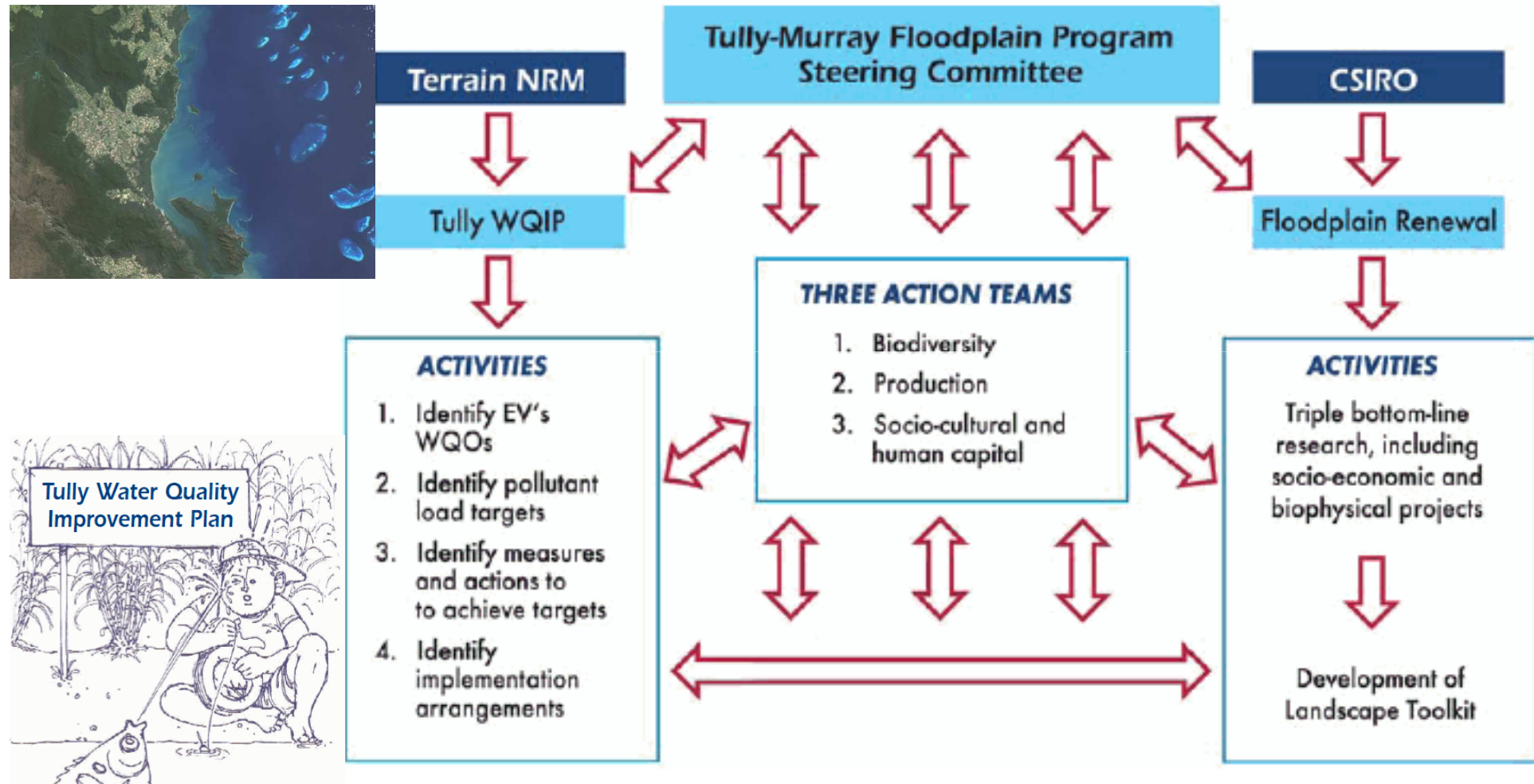
Plan outlines 30 time based actions for:

- A. Nutrients** (STP's, education, nutrient management plans & practice change)
- B. Pesticide** (practice change, training, alt products, infrastructure & drain use)
- C. Sediment** (practice change, buffers, regional works)
- D. Urban** (best practice planning & design)
- E. Acid sulfate** (mapping & management)
- F. Monitoring and evaluation** (rural & urban)
- G. Research** (modeling, N fixation, review)
- H. Policy and planning** (implementation, coordination of effort)

Tully WQIP – science based

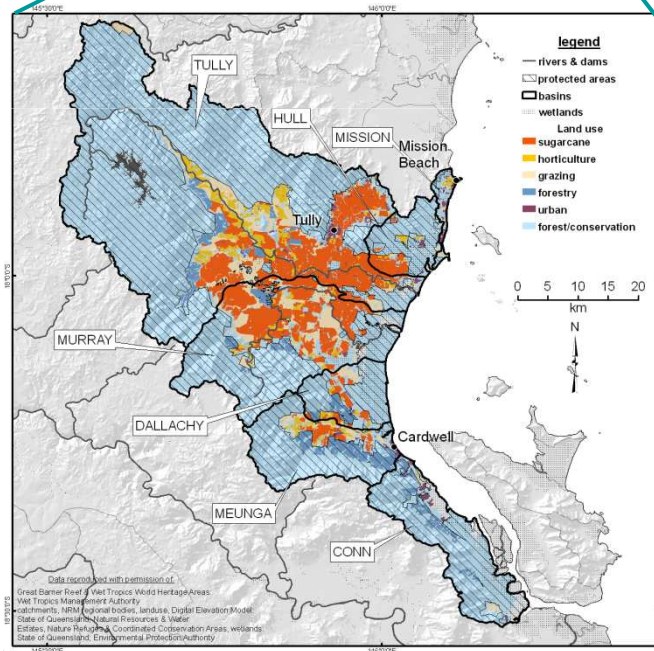
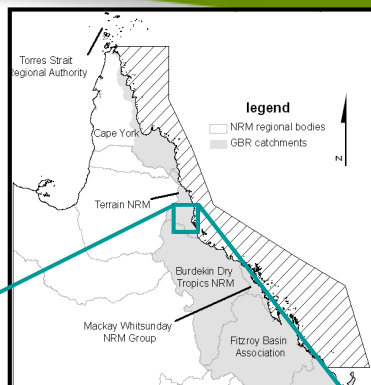
1. Establish pollutant load targets for end-of-catchment to achieve water quality improvement in the GBR lagoon
 - key pollutants and critical sources were identified through a series of studies on water quality monitoring and modelling
2. Estimate cost-effectiveness of management practices change in current land uses to achieve these pollutant load targets
 - economic and environmental effects of changes in land uses and land management for water quality improvement
3. Support WQIP development, and transition from development to implementation
 - planning frameworks and processes for water quality management were evaluated

Tully WQIP - Framework



Planning, research and engagement framework

Tully background issues



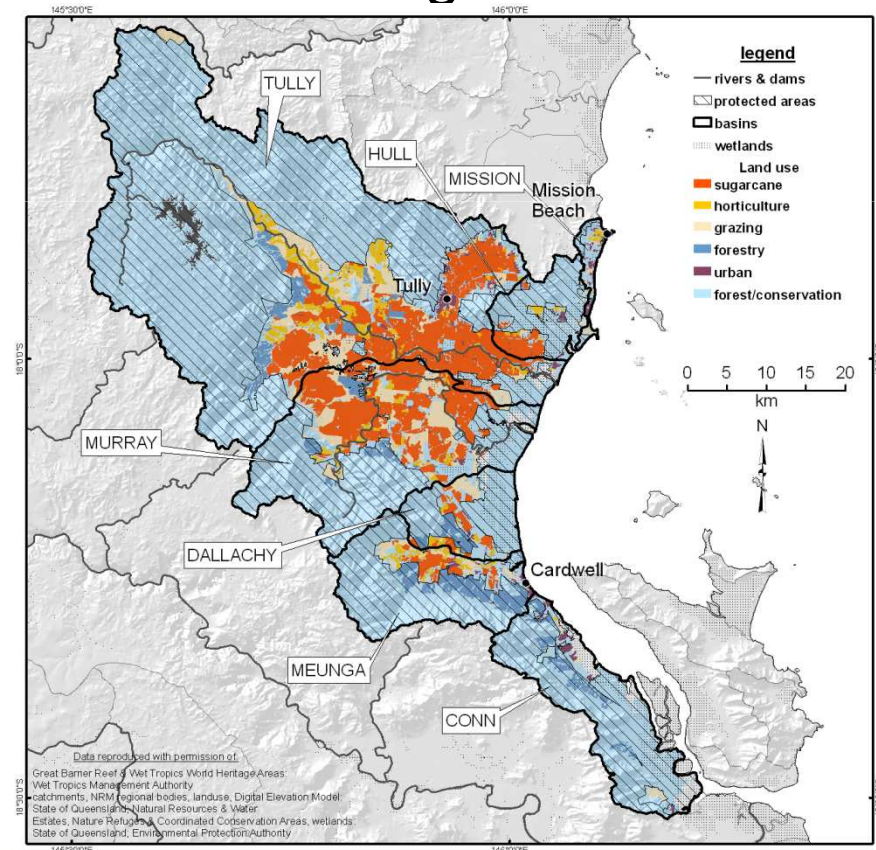
- Coastal ecosystem degradation evident off Tully basin
- High risk catchment (Reef Plan)
 - Biophysical
 - high rainfall and near-coastal, steep topography
 - fertilised land use on coastal floodplain
 - removal of wetlands/ floodplain vegetation (~80%)
 - drainage systems in coastal floodplains
 - Social
 - >90% income from agricultural production
 - Development
 - Urbanisation
- Land-based run-off from agricultural sources

Loads (Brodie <i>et al.</i> 2009)	TSS 1000 t yr ⁻¹	DIN t yr ⁻¹	PSII kg yr ⁻¹
Total	170	900	1,580
Natural	33 (19%)	244 (27%)	0 (0%)
Anthropogenic	137 (81%)	656 (73%)	1,580 (100%)

Tully - sources of DIN loads

- Use catchment model ('SedNet/ Annex') to identify main sources of DIN
- Almost 85% of total DIN loads derived from sugarcane and horticulture farms

	Area (ha)	Area (%)	DIN (%)
Total	271,000	100%	100%
Forest	198,200	71.1	9.0
Sugarcane	36,700	13.2	76.6
Banana	7,900	2.8	8.0
Forestry	10,300	3.7	1.7
Grazing	14,900	5.3	3.8
Urban	3,000	1.1	0.9



¹ Armour *et al.* 2009. Marine and Freshwater Research.

Tully – reducing DIN loads

- Use catchment model ('SedNet/ Annex') to estimate DIN reductions ¹
- Fertiliser management scenarios examined for sugarcane
 - Bureau of Sugar Experimentation Stations '6 Easy Steps'
 - CSIRO 'N replacement'
 - Terrain NRM 'N fixation'

Scenario	DIN (%)
Current	0
6 Easy Steps'	-23
N-replacement	-45
N-fixation	-66

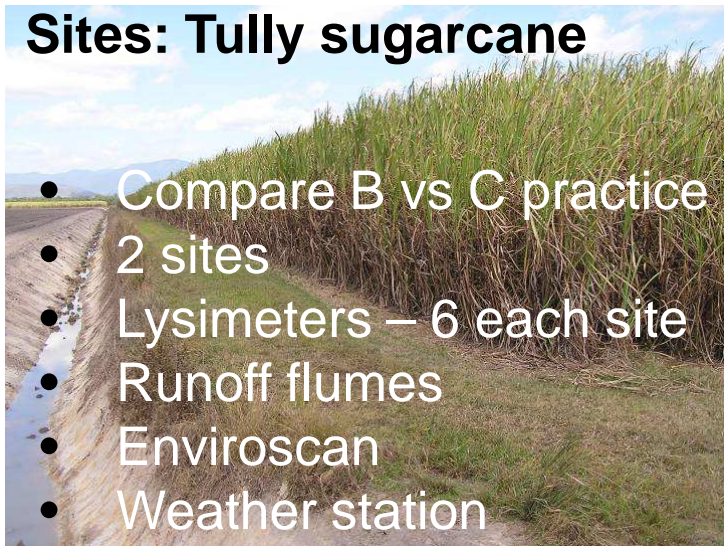


Catchment to Reef

Integrated Monitoring, Modelling and Reporting Program

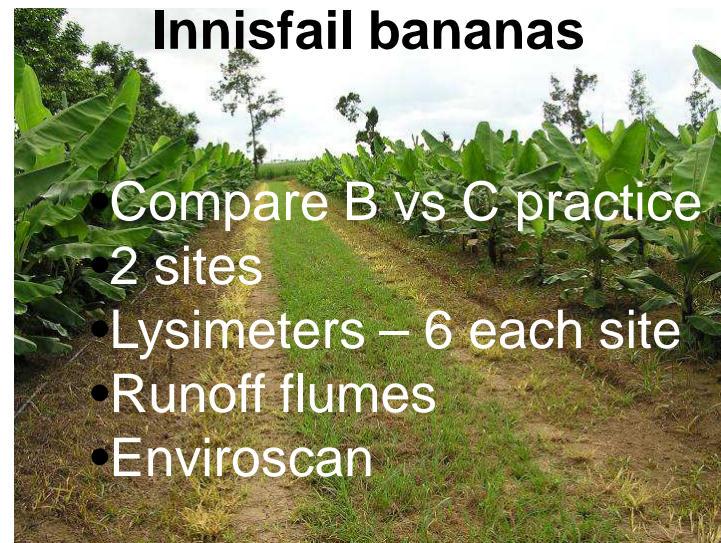
- Water quality parameters - sediment, nutrient, pesticide
- Soil description, profile analyses, BD, changes in mineral N with legume,
- Yield and other agronomic performance
- Monitoring and modelling

Sites: Tully sugarcane



- Compare B vs C practice
- 2 sites
- Lysimeters – 6 each site
- Runoff flumes
- Enviroscan
- Weather station

Innisfail bananas



- Compare B vs C practice
- 2 sites
- Lysimeters – 6 each site
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Reef Rescue – Terrain Region

Total budget \$6.8million in 2008-09 and \$4.2million in 2009-10:

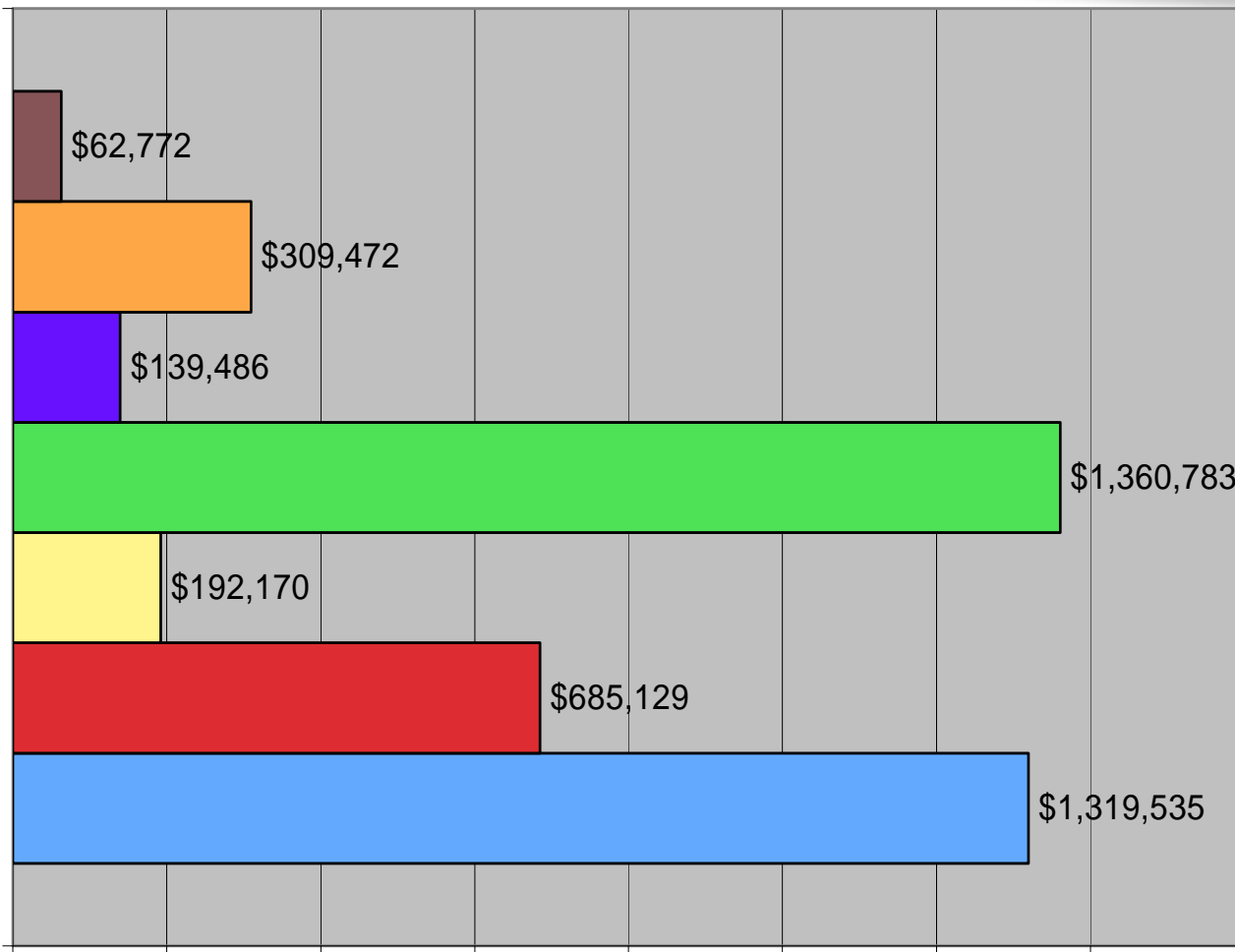
- Water quality improvement incentive grants to farmers
- Extension services and training
- Catchment repair work
- Feral pig control

Water quality incentive funding. In 2008-09 147 projects were funded through three complementary funds:

- Reef Rescue \$2.85million in grants
- National Landcare Program \$182,000
- Joint wetland repair with sister region \$90,000

**In 2009-10 113 projects were funded through Reef Rescue (\$2.43million in grants), only one third of applicants were funded
Producers contributed in excess of 50% of total project costs**

Reef Rescue 1 target issues



Many projects addressed multiple targets – nutrients main focus

- Nutrient, sediment and pesticide
- Sediment and pesticide
- Nutrient and pesticide
- Nutrient and sediment
- Pesticide only
- Sediment only
- Nutrient only

RR example – s-surface fert



“...with the switch to a sub surface fertiliser application method, we are adopting more accurate placement of fertiliser and this results in less fertiliser applied and reduced fertiliser run off.”

Cane farmers are placing fertiliser underground, using GPS, wider rows and minimum tillage. All cane is cut green and trash conserved.

RR example – bananas



Under tree micro-sprinklers with automatic fertigation in bananas applies the correct amount of water and fertiliser – reducing the loss of nutrients

RR example – drain repair



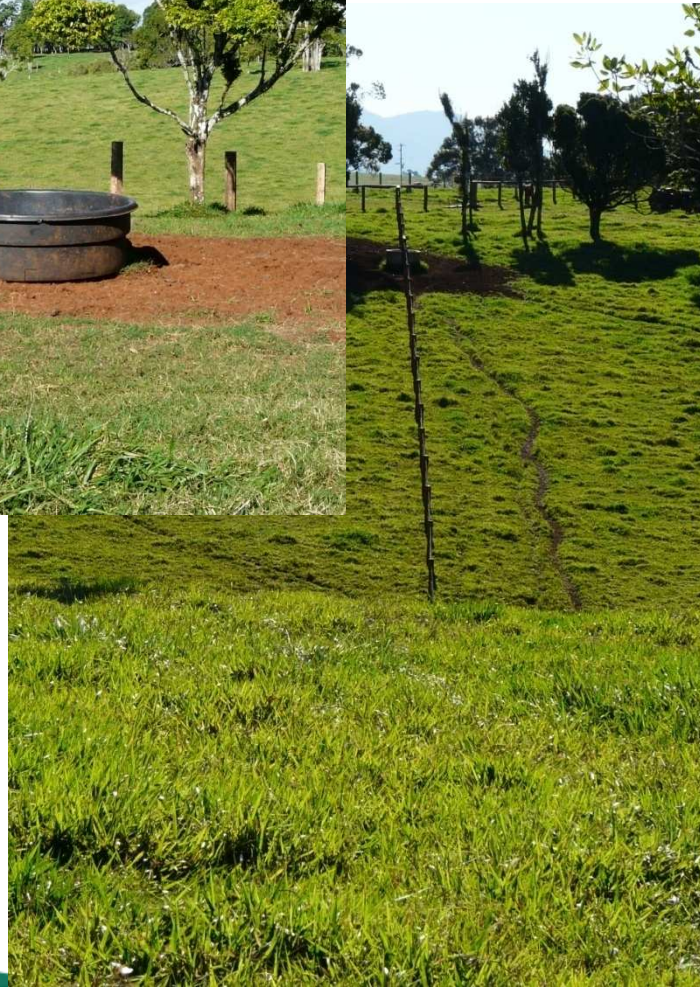
Major bank repairs to protect headland, and revegetation with locally occurring native species reduces erosion and loss of soil

RR example – hooded sprayer



- Switch away from residual herbicides
- Adjustable height as cane grows for accurate placement
- Adjustable width along boom for increasing row widths to minimise compaction
- Directional sprays controlled from cab for accurate placement of herbicide
- Four hoods to minimise in-field traffic

RR example – cell grazing



“This project permits regular rotation of stock...before paddocks come under stress, to ensure all pastures have enough time to fully regenerate without chemical fertilisers or weedicides”

RR example – contour banks

Soils in the multi-cropping lands of the Atherton Tablelands are at risk from erosion without erosion prevention structures like contour banks.



RR example – catchment repair



- Major weed clearing by bulldozer to remove Cucumber Tree on Mulgrave River, Gordonvale
- Revegetation links two areas of previous riparian revegetation
- 55ha adjoining cane land and including rehabilitation of sand mining sites

Thank you

More information on Terrain NRM can be obtained from our web site

- www.terrain.org.au

Or from John Reghenzani, Manager Sustainable Industries Unit

- johnr@terrain.org.au
- **0439 670 893**