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RRRD009: Runoff nitrogen generation rates from pasture legumes - an enhancement to reef catchment modelling

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Australian Government
Department of the Environment, Water, Heritage and the Arts
Department of Agriculture, Fisheries and Forestry





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Summary of Issue

To determine if broad-scale pasture legume plantings, particularly of leucaena and butterfly pea, represent a risk to reef water quality by increasing loads of nitrogen in runoff waters compared to grass only pastures.



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Project objectives

- 1) To determine loads and Event Mean Concentrations (EMC) of nitrogen in runoff waters from three pasture land uses
 - 1) buffel grass only
 - 2) grass + leucaena
 - 3) grass + butterfly peaAnd to compare and contrast them to loads and EMCs from virgin brigalow scrub.
- 2) To refine pre-European estimations of nitrogen loads and EMCs from virgin brigalow scrub using historical long-term Brigalow Catchment Study (BCS) data
- 3) To develop an understanding of the biophysical interaction of nitrogen in these systems by investigating seasonal trends in nitrogen levels in both soil and plants



Approach

The Brigalow Catchment Study – a paired, calibrated catchment study

Land use comparison using four calibrated catchments

- Brigalow scrub
- Cropping – butterfly pea ley
- Grazed buffel grass pasture
- Grazed leucaena pasture

Key site for measuring

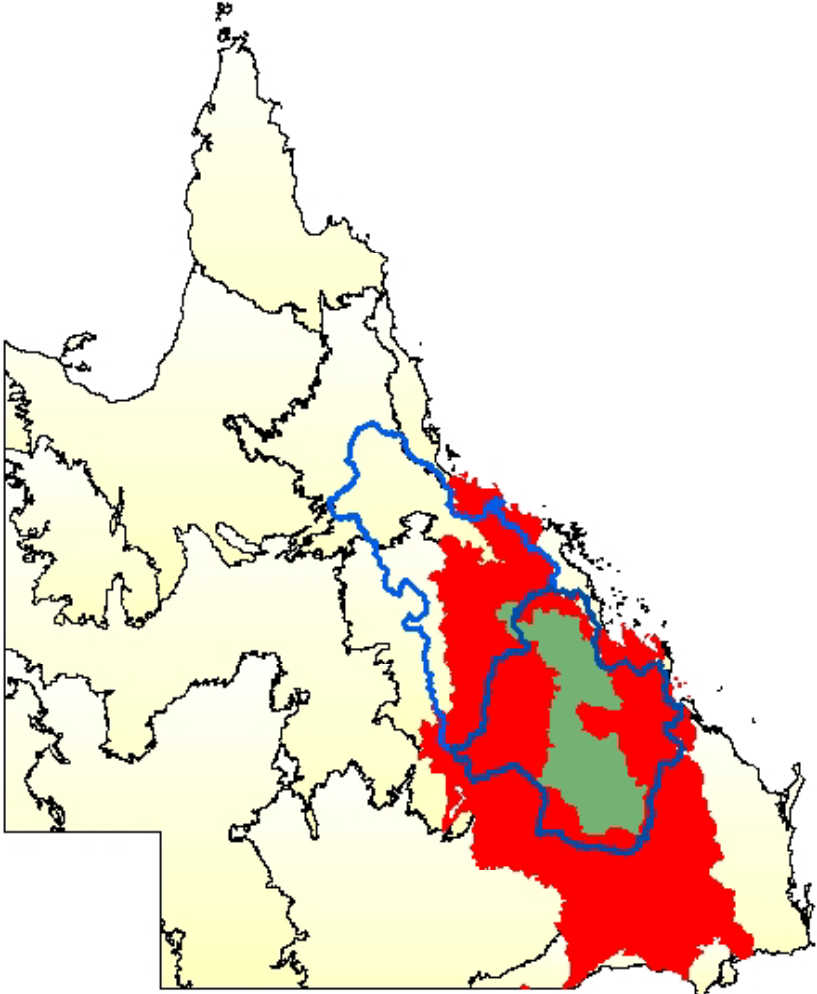
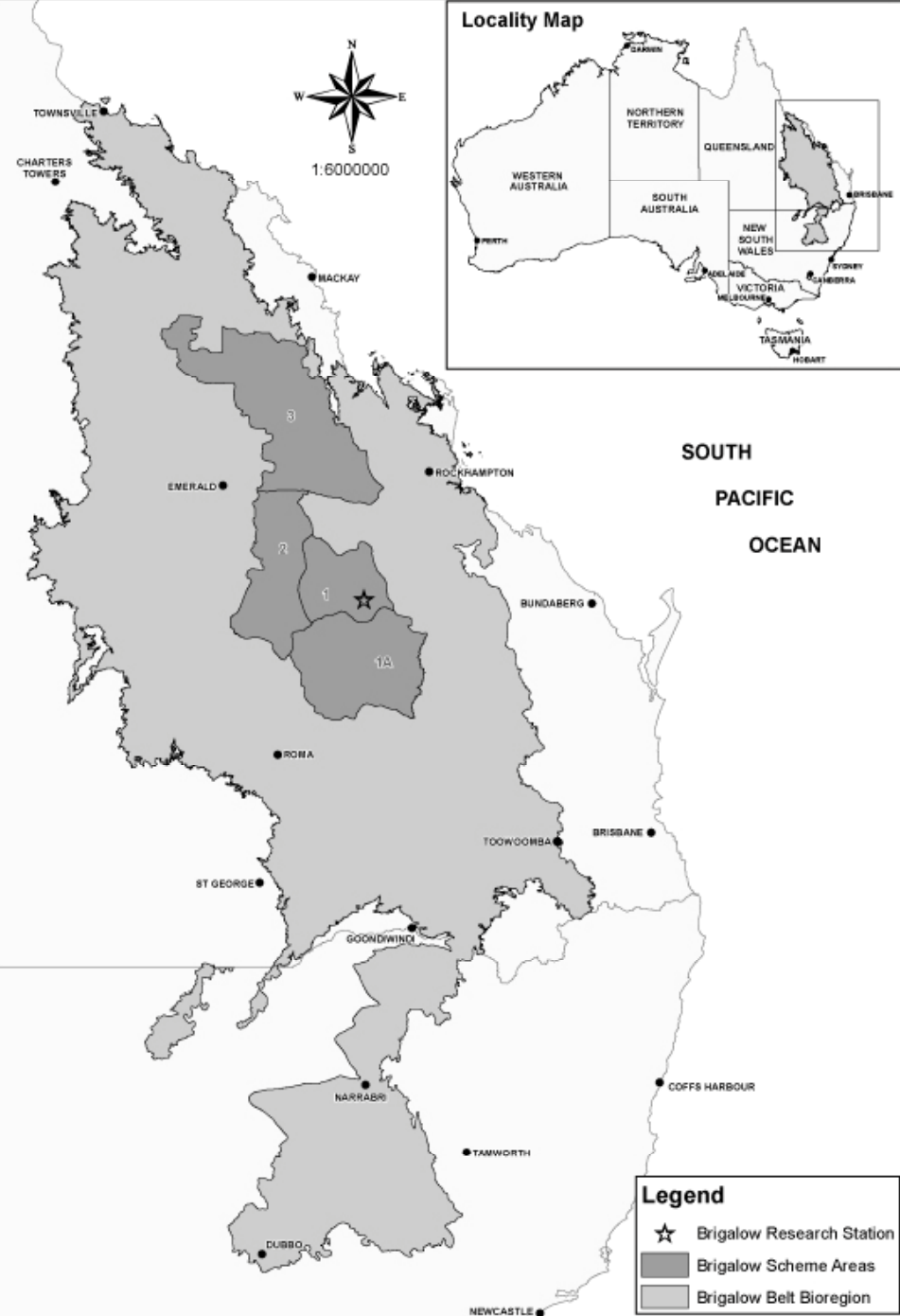
- Hydrology and water quality
- Productivity
- Soil fertility

Satellite sites in other reef catchments under rainfall simulation

The team

- Craig Thornton, DERM
- New appointee, DERM
- Stuart Buck, DEEDI
- Cindy McCartney, DEEDI

Geographic scope





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Outputs

- Calculated loads and EMCs of nitrogen in runoff water from 3 pasture types and virgin brigalow scrub
- Estimation of pre-European nitrogen loads in runoff
- Estimation of change in nitrogen loads with land development
- Determining of seasonal trends in plant and soil nitrogen



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Synergies – Reef Rescue & external

Paddock to Reef

- Fitzroy monitoring (grazing)-FBA
- Herbicide modelling & monitoring (cropping)-DERM (Shaw)
- Herbicide controlled environment study-DERM (Shaw)
- RainSim herbicide persistence-DERM (Cowie)

RR R&D

- Pesticide dynamics in the Great Barrier Reef catchment and lagoon: management practices (grazing, bananas and grain crops) and risk assessments-JCU (Brodie)
- Project 2: Tebuthiuron management in grazing lands-DERM (Thornton)
- Project 3 Pesticides prevalence and distribution in relation to croplands-DERM (Packett)





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Management Implications

If leguminous pasture plantings present a risk to reef water quality due to increased nitrogen in runoff,

- Seasonal periods of high risk may be identified
- Grazing strategies to manage plant growth and soil water and hence runoff may be developed
- “Hot spots” of high risk to water quality may be determined via data input to modelling, and targeted on-ground action may be taken





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End user engagement & delivery

- DERM - Fitzroy/Queensland Paddock to Reef Team workshops
- DEEDI - Central Queensland cropping sequence project
- DEEDI - Accelerated adoption of Leucaena project
- DEEDI - High output forages project
- Central Queensland Beef Research Committee
- Fitzroy Basin Association, CQ Beef
- Terrestrial Ecosystem Research Network
- Australian Centre for Ecological Analysis and Synthesis

