Case Study:
Lower Herbert River Catchment, North Qld
Great Barrier Reef Marine Park...
A World Heritage Area

Sources of diffuse pollution:
• Soil erosion from grazing
• Overuse/misuse of fertilisers & chemicals by cropping industries
Catchment area
10,000 km²

Study area
WATER QUALITY ISSUES

- Effect of excess N from land uses on water quality

  N (sugarcane) → surface water → groundwater

  N introduced into River during low flow
MISSING LINK....

→ Interaction of groundwater & surface water
WHAT IS...

• The contribution of N from groundwater to surface waters or vice versa?

• The significance of river-groundwater interactions on the transport of N through the Lower catchment?

• What are the implications of these interactions for land use/management & water policy in this area?
ENVIRONMENTAL TRACERS

• N as a tracer
  – Water resource interaction
  – Relationships between land use & management on water quality outcomes

• Other tracers
RADON...AN INTERESTING TRACER

238U

AQUIFER (host rock)

groundwater

234Pa

234Th

230Th

226Ra

222Rn

Decay half life 3.8 days
RIVER-AQUIFER INTERACTIONS

\( ^{238}\text{U} \rightarrow ^{222}\text{Rn} \)

\( ^{222}\text{Rn} \) loss to atmosphere

\( ^{222}\text{Rn} \) in groundwater
Radon along the Lower Herbert River

- Tributaries not related to direct groundwater inflow to the stream
Radon along the Lower Herbert River

222Rn (Bq/L)

Tributaries

Groundwater discharge

Tributary

Upstream → Downstream
SCIENCE FOR DECISION MAKERS
LOWER RICHMOND CASE STUDY
LOWE R RICHMOND
CATCHMENT COMPONENTS

Basalt Upland
Alstonville Plateau

Coastal Wetland
Tuckean Swamp

Estuary
Tuckean Broadwater
ALSTONVILLE PLATEAU

• High-value irrigated horticulture
• Regional population growth
• Significant rainforest remnants and aquatic ecosystems
• Limited water storage options
• Water quality issues
• Stressed water systems
ALSTONVILLE PLATEAU
GROUNDWATER-FED STREAMS
TUCKEAN SWAMP

• Coastal wetland ecosystem
• Highly modified hydrology
• Acid sulfate soil hotspot
TUCKEAN SWAMP
DISCHARGE OF ACID WATERS

Floodgate Workshop, 2002
TUCKEAN SWAMP - DRAIN pH
TUCKEAN SWAMP – EM31 SURVEY
CONCLUSIONS

• Surface water and groundwater are… water
• Aquifers and rivers assumed to be connected unless proven otherwise
• Connectivity is important for both water quantity and water quality issues
• Great challenges and opportunities for water managers and policy makers
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