Groundwater Pathways for Nutrient Transport from Agricultural Land to the Great Barrier Reef

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The World Heritage listed Great Barrier Reef (GBR) off the northeast coast of Australia is the largest reef in the world. Unfortunately, agricultural production in GBR catchments over the past 150 years has contributed to a decline in water quality entering the GBR lagoon. Riverine discharge has been identified as the single largest source of nutrients to inshore areas of the GBR lagoon. However, the contribution of groundwater discharge to nutrient concentrations in rivers and streams in GBR catchments is currently uncertain. One of the GBR catchments of particular interest is the Lower Burdekin catchment. In this catchment, the predominant crop grown is sugarcane and there are ongoing concerns related to soil and water management. A significant body of research has been undertaken in this catchment, focusing mostly on paddock scale monitoring and modeling. In addition to this, a regional scale modeling toolkit has been developed which aims to support decision making for water management by addressing local groundwater management issues including: declining groundwater quality, rising water tables and increased discharge of poor quality groundwater to the environment. In recent years, there has been a significant increase in the monitoring of groundwater nutrient concentrations underlying agricultural land in the Lower Burdekin, including a program of voluntary monitoring by cane-growers where 962 samples were taken over a 12-month period. Around 40% of the groundwater samples from this voluntary monitoring program contained nitrate at concentrations > 5mg nitrate-N/L, the fate of this nitrogen remains unclear. Some preliminary research has been conducted in the Lower Burdekin into nitrogen transport both from aquifers directly to the marine environment and from aquifers to surface water. This research has identified the need to better define; **I)** groundwater flow paths to the marine environment and the possible role of preferential flow paths **ii)** spatial and temporal variations in redox conditions in these environments and the processes that underlie them. Further research, incorporating isotopic analyses and geochemical modeling, is required to better understand the processes occurring and to improve estimates of nutrient fluxes to the GBR via groundwater.