Wetland Hydrology and Nutrient Model Development

Why

The need to effectively understand how investment can be prioritised in wetlands management and constructed treatment systems to improve water quality in the Great Barrier Reef (GBR) region is essential. Natural wetlands and constructed wetland treatment systems can play a crucial role in the health and resilience of the Great Barrier Reef ecosystem. They act as filters by removing and processing excess nutrients and pollutants from the water that flows into the reef. Hydrological models which simulate these water quality functions can play a critical role in assisting with prioritising investments at the catchment scale, the wetland scale, and in the detailed design of wetlands for nutrient removal.

Previous assessments of the performance of wetland systems in water quality improvement and their cost-effectiveness have been largely based on modelling from wetlands in climates significantly different to tropical and sub-tropical zones. A new model, or suite of models, is required that will help improve with the simulation of how wetlands can be configured, constructed, and/or restored in the catchments of the GBR to achieve water quality outcomes.

What

This project is focused on developing a wetland model and platform that is specifically configured for the characteristics of hydrology, ecology and water quality that are found in Queensland, primarily the GBR catchments, to demonstrate with confidence the role of wetlands in water quality improvement.

Pictorial conceptual models, such as that shown in Figure 1, are being used with the latest research findings and data and other sources to develop a reference wetland model that can answer the following questions:

1. What are the changes in nitrogen concentrations and loads along wetland systems?
2. What are the key components and processes that are responsible for nitrogen reductions within a wetland and how may these be optimised?
3. What drives variability in a wetland's performance in respect to nitrogen reduction?
4. What are the influences of wetlands on carbon sequestration and other possible co-benefits and how important are other constituents such as phosphorus, carbon and dissolved oxygen in terms of wetland function for nitrogen removal?
5. Under what conditions will wetlands remove nitrogen, phosphorus and carbon and when may these conditions compromise the ability to achieve this?
6. How will surface and subsurface water and constituent contributions interact with wetland systems and processes, and can the model be used to help resolve the fluxes between them?

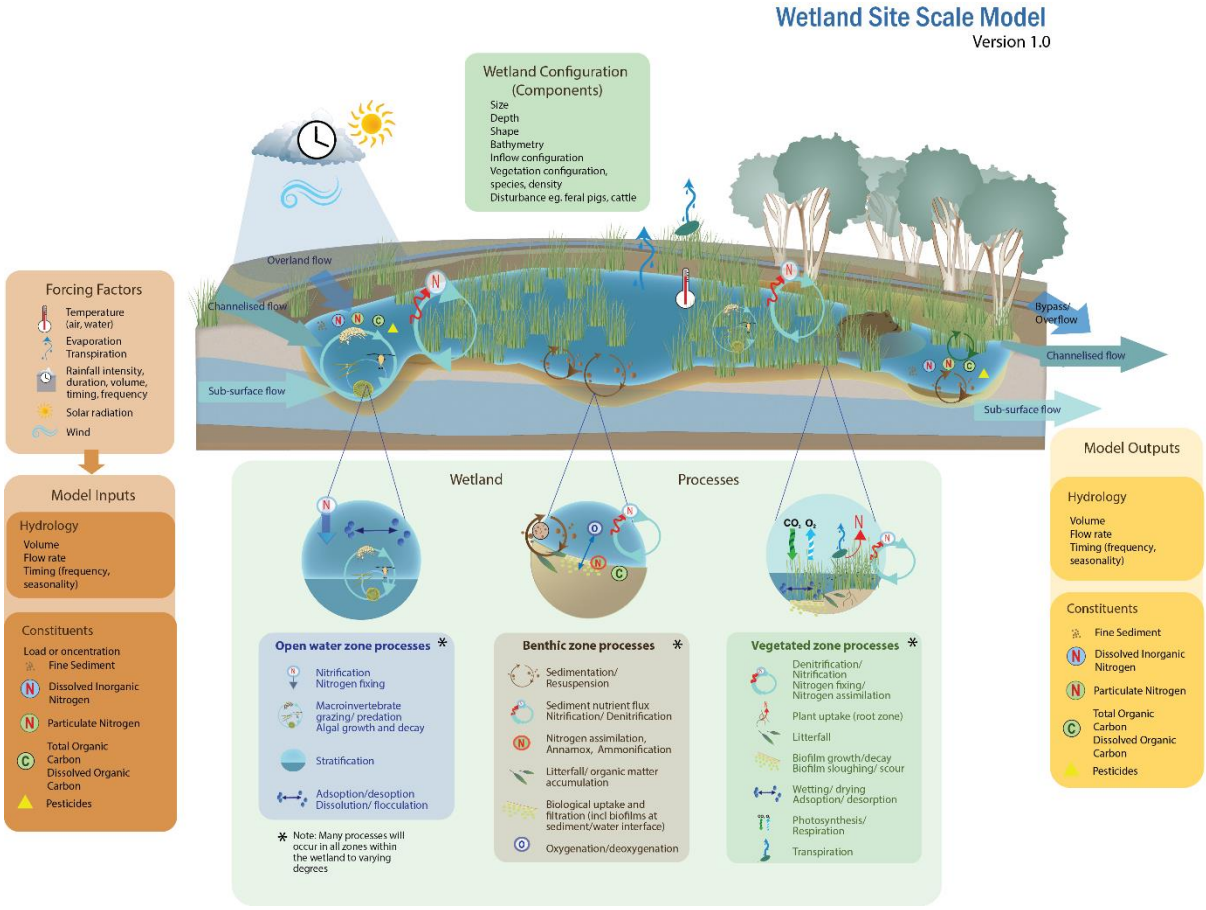

Figure 1. Wetland conceptual model (DES Wetlands)

Who

This project is being sponsored by the Great Barrier Reef Foundation, in association with and the Queensland Wetlands Program (Qld Department of Environment and Science). The project team consortium is being led by Alluvium Consulting, in collaboration with Flow Matters, Griffith University, James Cook University, and university of Western Australia to deliver the new wetland modelling tools.

When

Work has commenced on the project, with the initial models being developed over the next year with delivery of completed working models and associated documentation by early 2025.

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