Tuckean Swamp Project
OPTIONS STUDY

Tuckean Swamp Options Study: What did it find?

Current State: The extensive man-made drainage network of the Tuckean floodplain, designed to support agriculture has also had unintended environmental impacts, including the production of acidic discharge from the drainage of acid sulfate soils (ASS), as well as 'blackwater' (low-oxygen water) runoff into the broader estuary. The Tuckean floodplain has been identified as one of the worst acid sulfate soil affected areas NSW. While some limited tidal flushing was introduced into the system in 2002 to improve surface water quality (through three (3) sluice gates in the barrage), few other strategies have been implemented that have resulted in long-term improvements in floodplain water quality. Subsequently, poor water quality from the Tuckean region continues to be an ongoing issue for the Richmond River.

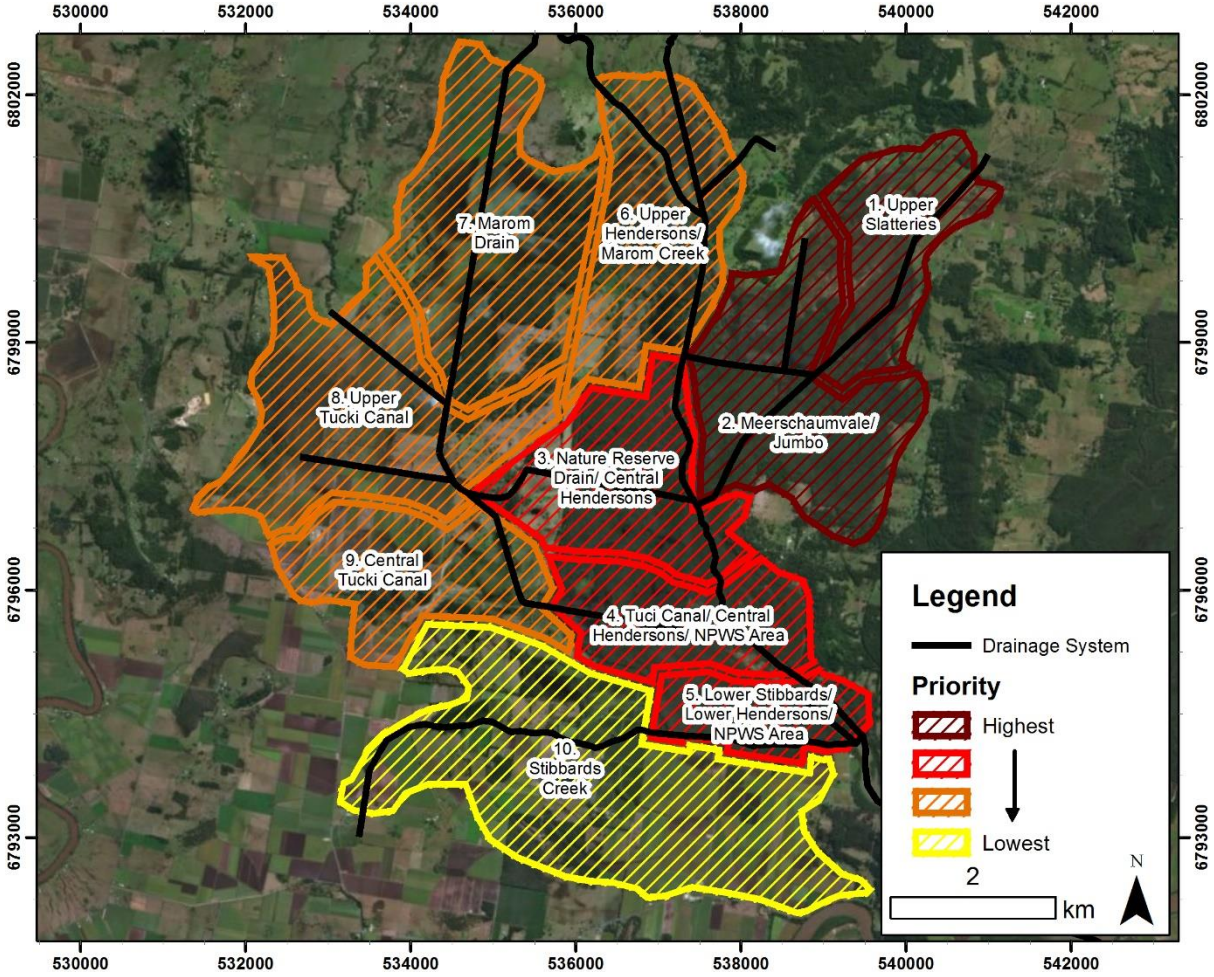
Why: The aim of Tuckean Swamp Options Study was to investigate the feasibility and quantify the impact of a range of management options, not only in terms of water quality, but also the potential impact on floodplain inundation, drainage and saltwater intrusion. The study used extensive data of the floodplain and drainage network to address this aim.

How: Based on the data collected and existing information from previous studies, a detailed baseline model of the Tuckean Swamp floodplain was developed. The model was constructed to represent the floodplain as it exists today and collected data was input into the model and used to replicate the present day conditions (often referred to as the "Base Case"). Once the existing Base Case was verified, modifications were made within the model and allowed Water Research Labs (UNSW) to test "what if" scenarios of different management options.

- **Scenario 1** investigates the impacts of reshaping, or 'swaling', major drains in the north-east section of the floodplain to raise bottom of the drain above the acidic soil layer.
- **Scenario 2** investigates the impacts of the installation of a weir structure at the end of Meerschaum Vale Drain to raise the long-term groundwater table and reduce acid drainage
- **Scenario 3** investigates three (3) alternative configurations to the existing sluice gates. (during dry periods only) to optimise tidal flushing and neutralisation of acidic discharges.
- **Scenario 4** investigates the impacts of hinging open the floodgates on the Barrage to show what would happen if the Barrage were not in place.
- **Scenario 5** investigates reflooding near Slatteries Drain to reduce acid discharge and rehabilitate wetland areas.
- **Scenario 6** assesses the impact hinging open the gates on the barrage and installing four (4) new one-way floodgate structures at the edge of the Tuckean Nature Reserve on Stibbards Creek, Tucki Canal, Stony Island Drain and Hendersons Drain to determine the impact of decentralising the Barrage floodgates to multiple upstream locations.

** It is important to note that the scenarios that involve hinging open the floodgates are ONLY included as a benchmark of the most EXTREME level of change to demonstrate that these options are LEAST feasible, these are not being considered as a feasible option for water quality improvement.

Priority Areas: To guide the development of the management strategies, it was necessary to divide the floodplain into **management sub-areas** and to prioritise which areas should be targeted to improve overall floodplain water quality. The Tuckean floodplain was divided into 10 major floodplain sub-sections representing major drainage areas. Based on the understanding of the floodplain drainage, topography and acid generation on the site, the sub-areas were ranked in order of priority for addressing ASS issues. The management sub-areas and prioritisation are shown below. The highest priority areas around Meerschaum Vale and Slatteries Drains, and in the lower Tuckean Nature Reserve are broadly consistent with the priority areas identified by previous studies.



Results: The model results for each scenario (listed above) were assessed to understand not only the potential water quality benefits, but also the impact on surrounding landholders relating to; Floodplain inundation, Drainage times and Saltwater intrusion.

The attached Executive Summary best describes the results of the modelled scenarios including charts and graphs to describe the changes to floodplain inundation, drainage times and saltwater intrusion. Each scenario has a different response across the Tuckean floodplain, all with both advantages and disadvantages that need to be carefully considered.

Further to the Executive Summary, the following tables summarise the overall understanding of the pros and cons of the different scenarios and also their costs relative to each other. These are indicative benefits and costs only.

Relative indicative Benefits of each Scenario

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6
	Reshaping Slatteries	Slatteries Weir	Sluice Gate Management	Open Barrage	Reshaping + Reflooding Slatteries	Open Barrage + Upstream Structures
Acid (Dry)	Very Low	Very Low	Moderate	High	Low	High
Metals (Dry)	Very Low	Very Low	Moderate	High	Low	High
Dissolved oxygen (Dry)	Minimal change	Minimal change	Low	High	Minimal change	High
Acid (Wet)	Moderate	Moderate	Minimal change	Low	Moderate	Low
Metals (Wet)	Moderate	Moderate	Minimal change	Low	Moderate	Low
Dissolved oxygen (Wet)	Low	Low	Minimal change	Low	Moderate	Low
Aquatic connectivity	Minimal change	Minimal change	Low	High	Minimal change	High
Fisheries nursery habitat	Minimal change	Minimal change	Low	High	Very Low	High
Terrestrial habitat - birds	Minimal change	Minimal change	Minimal change	Moderate	Low	Low
Fisheries production	Minimal change	Minimal change	Very Low	High	Minimal change	High
Nutrient reduction	Minimal change	Minimal change	Minimal change	Low	Low	Low
Increased groundwater levels	Low	Low	Minimal change	Moderate	Low	Moderate
Carbon sequestration	Minimal change	Minimal change	Very Low	High	Low	Moderate

Relative indicative Costs of each Scenario

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6
	Reshaping Slatteries	Slatteries Weir	Sluice Gate Management	Open Barrage	Reshaping + Reflooding Slatteries	Open Barrage + Upstream Structures
Community consultation	Moderate	Moderate	Moderate	Very High	Moderate	Very High
Asset management	Minimal change	Low	Low	High	Moderate	High
Public/Crown Land management (NPWS)	Minimal change	Minimal change	Very Low	High	Moderate	High
Acquisition/compensation	Low	Minimal change	Minimal change	Very High	High	Moderate
Environmental assessment	Low	Low	Very Low	Very High	High	Very High
Land use changes	Very Low	Minimal change	Minimal change	High	Moderate	Low
Habitat changes	Minimal change	Minimal change	Low	Very High	Moderate	Very High
Technical design	High	Moderate	Moderate	Moderate	Very High	Very High
On-ground works	Very High	High	Very Low	Low	Very High	Very High
Social	Low	Low	Very Low	High	Moderate	High
Impact management	Minimal change	Minimal change	Low	High	Minimal change	Moderate

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Please see the Executive Summary of the Report also attached, or download the full report at www.ozfish.org.au/tuckean.

What's Next:

To progress the project towards improving water quality in the Tuckean Swamp, the following actions will be required;

- Environmental change assessment.
- Cost-benefit analysis of preferred options
- Engineering design, costing and full life cycle maintenance of enhanced floodgate and levees of preferred options
- Specific landholder consultation on potentially affected lands