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Abstract
The Clybucca wetlands are located on the Macleay River floodplain on the New South Wales mid-north coast. Historically they comprised an extensive network of freshwater backswamps that were abundant with aquatic life. Large-scale drainage works completed during the 1960s and 1970s resulted in significant changes to the low-lying backswamp areas. An extensive network of deep drains and one-way floodgate infrastructure mitigated flood impacts and improved agricultural productivity but resulted in the oxidation of underlying acid sulfate soils and a loss of wetland biodiversity. Regular highly acidic discharge and low dissolved oxygen

including fish kills and oyster mortality.

Rehabilitation of low-lying acid sulfate soil affected coastal floodplains requires careful consideration of a range of processes and factors including; overall floodplain drainage, the sources, fate and transport of poor water quality in downstream waterways, adjacent floodplain land uses and tenure, remediation options, constructability and maintenance, and long-term land management. In recent years, the opportunity to rehabilitate some of the worst acid affected floodplain areas has presented itself.

Extensive field investigations were completed to understand overall floodplain hydrology, drainage connectivity, and identify the sources of poor water quality. Detailed survey and monitoring data were collated assess rehabilitation strategies. Using the model, a number of remediation options were assessed to determine the optimum rehabilitation strategy, including: freshwater options that resulted in wetland rehabilitation while maintaining current floodplain land uses, tidal options that would result in extensive development of coastal wetlands across the floodplain, and sea level rise options. Into the far-future, as sea level rise impacts reduce drainage across the floodplain, conversion to a connected tidal ecosystem, or natural large scale backswamp system, would have the greatest environmental benefit to the broader estuary.

Keywords: Floodplain, wetland, habitat, rehabilitation, water quality, hydrodynamics.

1. Introduction

Assessing coastal wetland rehabilitation: Clybucca wetlands
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Table 1 Management options developed and assessed for the Clybucca wetlands complex

Management option	Freshwater/tidal	Description

seek to restore the natural floodplain hydrology preventing the export of poor quality water and encouraging wetland habitat. Tidal options are able to provide different benefits through neutralisation of acidic water in addition to increased wetland habitat creation, albeit estuarine habitat. Note, further consideration will be required for changes from the existing freshwater ecology to estuarine ecology.

3.1 Management option 2: Shallow freshwater on low-lying wetland areas

Overall, the optimised design for management option 2 successfully promotes an increase in inundation depth, extent, and frequency on wetland management areas (Figure 5 top). Modelling indicated that there would be a minor increase in

The recommended management options have been outlined in a way that would allow for their implementation considering the current and future nature of the floodplain. Immediate and short-term options (1 and 2) can be implemented with limited impacts on existing floodplain land uses. Option 4 could be implemented in two stages. Stage 4a could be implemented simultaneously with option 2. As the characteristics of the floodplain begin to change and shift in the future, option 4b could be implemented. Option 6 considered the far-future nature of the floodplain. Modelling indicated that under sea level rise there would be reduced drainage, particularly for the low-lying floodplain. In this scenario when current land uses no longer become feasible the largest benefit to the floodplain in terms of environmental values could be achieved through fully opening the Menarcobrinni floodgates and creating an estuarine wetland ecosystem.

5. Summary

For many years, water quality within the Macleay River estuary has been significantly impacted by runoff from degraded backswamps including the Clybucca floodplain. Historically, remediation of the floodplain has been conducted on a farm scale, however, for the first time, catchment wide remediation of the Clybucca floodplain has been made possible due to acquisition of the majority of the worst acid sulfate soil affected low-lying land by one landowner.

This study has shown through detailed numerical modelling based on extensive datasets, that there are several management options which consider existing and future floodplain conditions and allow for remediation of the Clybucca wetland complex. Considering inundation, drainage and saltwater intrusion across the floodplain, these options provide pathway forward for large scale remediation of the Clybucca wetlands to improve water quality and create wetland habitat.

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7. References

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