Streambank rehabilitation for Tuggerah Lakes catchment - A strategic approach to estuarine health

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ABSTRACT

Wyong Council has undertaken a relatively unique strategic approach in developing streambank rehabilitation plans for the tributary creeks entering Tuggerah Lakes estuary. The estuary, situated on the Central Coast of NSW, is under significant pressure from nutrient and sediment inflows from its catchment. The five major streams entering Tuggerah Lakes are subject to varying degrees of streambank erosion and riparian vegetation degradation due to the adjacent land uses of agriculture and the increasing pressure of urban development around the fringe of the lakes and the coastal plain. Each plan provides a prioritised program of works based on a unique comprehensive assessment and ranking criteria incorporating the principles of sustainability with implementation being assisted by a comprehensive database and GIS system. Council is now implementing these works under its Estuary Management Program assisted by funding from the Federal Government's Caring for Our Country grant program. The paper provides a methodology for the strategic approach, problems encountered and lessons learnt through both the planning and implementation phases. Examples of works being undertaken are given to indicate the strategic intent, the underlying approach and how the principles of sustainability are incorporated.

INTRODUCTION

Wyong Council has undertaken a relatively unique strategic approach in developing streambank rehabilitation plans for the tributary creeks entering Tuggerah Lakes estuary. The estuary, situated on the Central Coast of NSW, is comprised of three shallow coastal lagoons, Tuggerah Lake, Budgewoi Lake and Lake Munmorah. The three lakes occupy an area of 70 km^2, are interconnected and open to the sea at The Entrance via a small channel. The Lakes' catchment covers an area of 670 km^2. The Lakes and their tributaries are important to the regional community for their broad values, including residential amenity, aquatic and riparian habitat, tourism, recreation, fisheries and water supply. There are five streams entering Tuggerah Lakes, the major watercourses being Wyong River and Ourimbah Creek (approximately 85% of the estuary's catchment and utilised for water supply to the Gosford/Wyong region), as well as Saltwater Creek, Tumbi Creek and the Wallarah/Spring Creek system.

BACKGROUND

Prior to the development of the Stream Rehabilitation Plans, Wyong Shire Council had prepared or commissioned a host of studies on the major tributaries entering Tuggerah Lakes. For example, a number of previous unconnected studies had been undertaken for Wyong River and Ourimbah Creek systems, with the aim of contributing to the management and rehabilitation of discrete parts of the creek systems. These studies included:

- Bank management studies focussed on erosion issues,
- Catchment management and creek management studies which focussed on the overall management of a particular reach of river. These studies often took the form of Rivercare Plans developed under the NSW Department of Environment and Climate Change's Rivercare program,
- Broader regional studies, including vegetation mapping and valley studies, and
- Specific site surveys (such as vegetation studies) and catchment and estuary water quality monitoring programs undertaken by Wyong Shire Council.

In addition, Council had also undertaken a range of specific works on sections of the watercourses. These included a set of bed control structures along the lower reach of Tumbi Creek, however, these were not installed correctly which resulted in increased bank erosion around the structures.

In the water supply catchment of Wyong River and Ourimbah Creeks, Council already had a program of streambank rehabilitation underway for some fifteen years. Council's Catchment Officer has been working with local rural landholders and Landcare groups on more than fifty localised riparian revegetation and bank stabilisation projects.

While a large amount of information was available, each study had taken a different form or targeted a different aspect of streambank management, and as such, the information

was not cohesive and did not easily direct Council's overall management actions in terms of streambanks. In addition, there were shortfalls and information gaps which further impeded Council's ability to manage streams effectively. For example, the Rivercare plans included options for management such as re-vegetation or bank stabilisation, but the plans provided no information on the cause of the problems. In such instances it can sometimes be difficult to justify the actions.

The condition of the streams entering the estuary is also an issue for a number of regional organisations, including Wyong Shire Council. In this regard, Council's main planning document is the Tuggerah Lakes Estuary Management Plan (Dickinson et al., 2006) that highlights the streams as important links between the Lakes' catchments and the lakes themselves in terms of their ecological, economic and social values. These values span a broad range of issues including recreational and commercial fishing, water supply for town and agricultural uses, recreational amenity, aquatic and riparian habitat and water quality functions. Consequently, recommended actions within the Estuary Management Plan are centred around the streams and the catchments as well as works within and around the lakes.

Water quality Issues, such as lake eutrophication, are reported in the Tuggerah Lakes Estuary Process Study (Roberts, 2001) which indicated that, although sedimentation in the lakes was low, nutrient concentrations within the sediments are significant and available for plant and algal growth. The Lakes are currently considered at a medium nutrient status although they have been eutrophic in the past. The Tuggerah Lakes Estuary Management Study (Roberts and Dickinson, 2005) identified the most significant issues included increased nutrient and sediment loads from urban and agricultural development and subsequent erosion of creek banks. Whilst nutrient and sediment loads to the lakes from streambank erosion are important as a driver for lake water quality, the streambanks and associated riparian zones are also important natural assets in terms of ecological, recreational and water supply functions.

Other regional initiatives include the Hunter Central Rivers Catchment Management Authority's (HCRCMA) Catchment Action Plan (CAP) and the NSW Department of Water and Energy's (DWE) Water Sharing Plans. Streambank condition is reflected in the priorities of the HCRCMA's Catchment Action Plan. The NSW Government Department of Water and Energy has gazetted Water Sharing Plans for Ourimbah Creek and Jilliby Jilliby Creek (a tributary of the Wyong River) and is currently preparing one for Wyong River. These will address some of the water loss and environmental flow issues, and in terms of overall stream management, will complement the comprehensive streambank rehabilitation program.

DEVELOPMENT OF STREAMBANK REHABILITATION PLANS

In the past, Council and State Government funds have been directed at various programs such as Rivercare, Landcare and other council activities resulting in successful rehabilitation of many sites throughout the Shire. For this work to continue in a more strategic manner, an overall Streambank Rehabilitation Plan for each major tributary entering Tuggerah Lakes was required. These include Wallarah and Spring Creeks, Wyong River, Ourimbah Creek, Tumbi Umbi Creek and Saltwater Creek. The preparation of Streambank Rehabilitation Plans was considered to help Council address the targets outlined in both the HCRCMA's Catchment Action Plan (CAP), and the Tuggerah Lakes Estuary Management Plan.

Initially a broad methodology was developed to guide the preparation of the plans. The methodology ensured that the objectives of each of the strategic plans were addressed, options for rehabilitation were broadly scoped and based on the causative factors, and a minimalist intervention approach was undertaken. This approach, together with a triple bottom line assessment of options was developed to ensure a more sustainable outcome for each Plan. Preparation of the Plan generally included the following elements:

- Identification of specific lengths of tributaries and stream orders considered relevant for the purpose of the Plans. Consultants that prepared the Plans were also asked to consider not only immediate streambanks but also riparian and catchment areas that were thought to influence the condition of the streambanks. In this regard, landuse within the adjoining catchment areas often provided an insight to the causes of streambank condition.

- Compilation and examination of previous work undertaken sighting regional, local and reach specific work by consultants, as well as the Rivercare plans prepared for local Landcare groups. This work provided the basis for the field work that was to follow.

- A field survey of the tributary or stream was undertaken for the purposes of ground truthing any existing studies, producing a photographic record and measurement of eroded banks or streambank sections in need of rehabilitation. The field survey was used to prepare a comprehensive written assessment of each creek/river which addressed:

    - the condition of the streambank in terms of vegetation (cover and type), bank and bed stability and tenure;

    - factors and/or processes directly influencing the observed condition (e.g. landuse, stormwater inlets, jettys, channel migration, etc);

    - sites warranting protection and conservation of existing high quality riparian vegetation;

    - sites in need of rehabilitation in terms of location, length and area or other appropriate descriptors , and

    - justification for the proposed rehabilitation in each case.

    - Consultation with stakeholders, including local environment groups operating in the area, such as rivercare or landcare groups as well as landholders.

- An options analysis (where rehabilitation is recommended) which clearly defines what options are available for rehabilitation based on the problems identified through a geomorphic analysis and conditions at each site including the tenure. Ideally, rehabilitation was considered that reduced the cause of degradation e.g. changes to landuse and this required the cooperation and involvement of landholders. These included both private landholders, Council or the State Government. The range of options for addressing issues was extensive as the

tributaries covered both urban and rural environments. Generally, a minimalist approach was undertaken where if an engineered option was presented (as opposed to bush regeneration); emphasis was placed on the least invasive soft-engineering or eco-engineered option. For example, the use of eco-logs, bank regrading (where applicable) and natural regeneration or revegetation were favoured above the use of rockwork or other hard-engineering options.

- Identification of the preferred option at each site based on the options analysis. Site information, including sections, plans, maps, photographs and references to studies, were placed into a comprehensive database and uploaded into Council's GIS system using aerial photographs. The information is continually updated providing a tool to track progress and facilitate the continual rollout of the works and rehabilitation program and to advise Council staff of work that had been completed or were proposed.

- The plans also include a ranking of individual sites in order of priority based on the reported condition, stream morphology, potential cost and effectiveness in achieving the multiple objectives.

Each plan now provides a prioritised program of management works based on a unique comprehensive assessment and ranking criteria incorporating the principles of sustainability. The Plans also include:

- Detailed sectional maps of the five watercourses (see example at Figure 1),

- Information on existing condition and a fluvial geomorphic assessment.

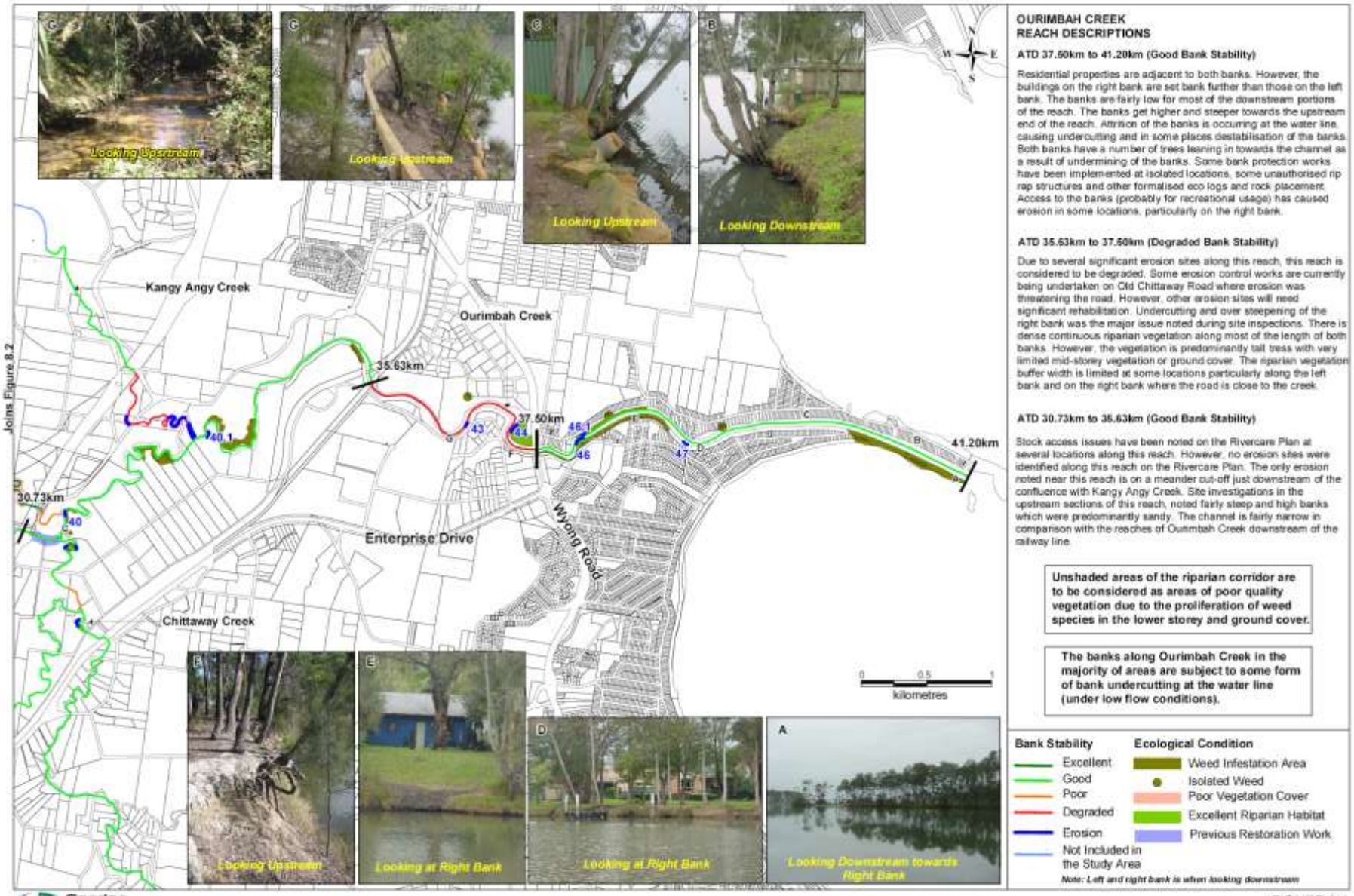
- Information on streambank management techniques including concept designs where appropriate.

PLAN IMPLEMENTATION

In 2008, Wyong Shire Council was awarded a grant of $20 million through the Federal Government's Caring for our Country program to implement the Tuggerah Lakes Estuary Management Plan. The Caring for our Country grant was awarded over 5 years and approx $2-3 million annually is directed to streambank rehabilitation works that were identified within the Streambank Rehabilitation Plans. Council also directs $1.5 million per year from a stormwater levy raised annually to implement the EMP along with a further $1 million raised through proceeds of tourist park operations. Consequently, Council will have spent $46 million on the implementation of the Tuggerah Lakes Estuary Management Plan.

Two examples of current or completed projects under the Estuary Management Plan are now given to highlight aspects of the methodology, its use, problems encountered and how they were resolved - basically the lessons learnt from start to finish.

Figure 1: Example of existing creek conditions including, erosion points, bank stability and the ecological condition of the banks / riparian vegetation.



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Ourimbah Creek Streambank Rehabilitation Plan

FIGURE 8.1
OURIMBAH CREEK EXISTING CONDITION

J2544/Figures and Appendices/Stage 2 Final - Oct 2008/Figure 8.1 - Ourimbah Ck Existing Condition.wor

SALTWATER CREEK

Saltwater Creek is a small highly modified (channelized) degraded creek of approximately 2.8 kilometres flowing through urban development on the southern fringe of Tuggerah Lake. Work began on the initial priority works in Saltwater Creek at a cost of $1.6 million. This work is being undertaken by contractors to Council.

Proposed works along various reaches of the stream included a range of designs intended to re-create a natural system – i.e. mimicking more natural channel meanders, providing stable channel cross-sections and creating appropriate riparian corridors etc. However past works in the area resulted in the stream being a series of flood detention basins. This led to changes being made to the priority works at the eleventh hour where, in this highly modified environment, decisions had to be more practical than envisaged during the planning phase. For example, one proposed constructed wetland within a detention basin was abandoned when an endangered ecological community (EEC) was found to be adjacent. This aspect did not come into consideration during the planning phase.

Additional work in the upper reaches saw the bush regeneration and revegetation of a 2km length of flood channel. This included the removal of significant large woody weeds; comprised of a pine forest and coral trees; and the creation of a vegetated corridor using local provenance plants. Here the options were limited by flood affectation and the potential increase of channel roughness leading to increased flood heights. Consequently, vegetation was limited to low growing species.

In the lower reaches of the creek, where severe erosion had occurred, significant works were required to stabilise the channel. Outside bends and culvert scour pools were generally stabilised with rock armouring and geotextiles.

As indicated earlier, these works were tendered for both the design and construction phases. The projects generally ran smoothly, works were completed to schedule and to design and this required less supervision by Council staff. However, the process resulted in little “value adding” from the contractor, a much higher cost (when compared to using day labour) and no internal capacity building.

WYONG RIVER

Wyong River is a much larger system of some 60 kilometres with the addition of a number of second order streams which are also included within the study. The River runs through mainly agricultural lands and the banks are often under private ownership.

The works in Saltwater Creek are applied to highly urbanised streams with predominantly channelized flow when compared to Wyong River where work is mainly in rural catchments. The work is fundamentally different and therefore required a different approach to implementation. Works associated with Saltwater Creek were better suited to regular project management procedure; while projects associated with Wyong River required landholder negotiation and approvals before design and implementation could proceed. This usually resulted in the landholder contributing to the works and the designs being done partly on site with the landholder.

Other useful strategies include:

- Engagement of a specialist nursery to assess local species at each site, collect seed, propagate and grow so as to supply local provenance tubestock.

- Co-ordinated and integrated use of Council civil construction and bush regeneration staff to undertake works instead of contractors.

- Project co-ordination group deciding on appropriate management option and undertaking design instead of relying on the Streambank Rehabilitation plans. This instils a more pragmatic approach to design and implementation.

- Involvement of Hunter Central Rivers Catchment Management Authority's Riparian Officers to assist with development of management options on difficult or contentious sites.

OTHER LESSONS

When the community are engaged with a project, there is often the expectation that all issues will be addressed and everything will be solved by the works. Tumbi Creek provided an insight for Council in that it will take some time for all the sediment that was lost from the banks and bed to reach the estuary so they can expect the mouth to block again before they see the benefits of the streambank rehabilitation works. This blocking has been the subject of dredging at the mouth of the creek and is required for navigation and flood mitigation purposes. This heightens the importance of community education so that all stakeholders can understand the basics of cause and effect in what amounts to a very complicated system.

Large programs, such as the implementation of the Estuary Management Plan, require extensive and skilled resources and experienced contractors. In reality there are very few companies able to do this kind of work both in design and implementation. Consequently, Council had to share the work across limited resources and even undertake some work in-house. This latter initiative provided the opportunity for significant capacity building across Council, especially in the area of on-site construction and supervision. In some instances it is difficult to foresee the kind of training the construction crews need as sometimes it isn't evident until they start doing the job.

CONCLUSION

Wyong Council has undertaken a relatively unique strategic approach in developing streambank rehabilitation plans for the tributary creeks entering Tuggerah Lakes estuary. Council trialled a methodology that was intended to produce more sustainable outcomes for the Shire through a broad multi-objective approach. Council, having moved through the process of using the Plans to schedule works; prepare detailed designs and environmental assessments; gain approvals; engage contractors and complete works; has encountered a range of unforseen issues. Resolution of these issues has provided a valuable learning experience and an insight into how the methodology could be improved or better managed in future.

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