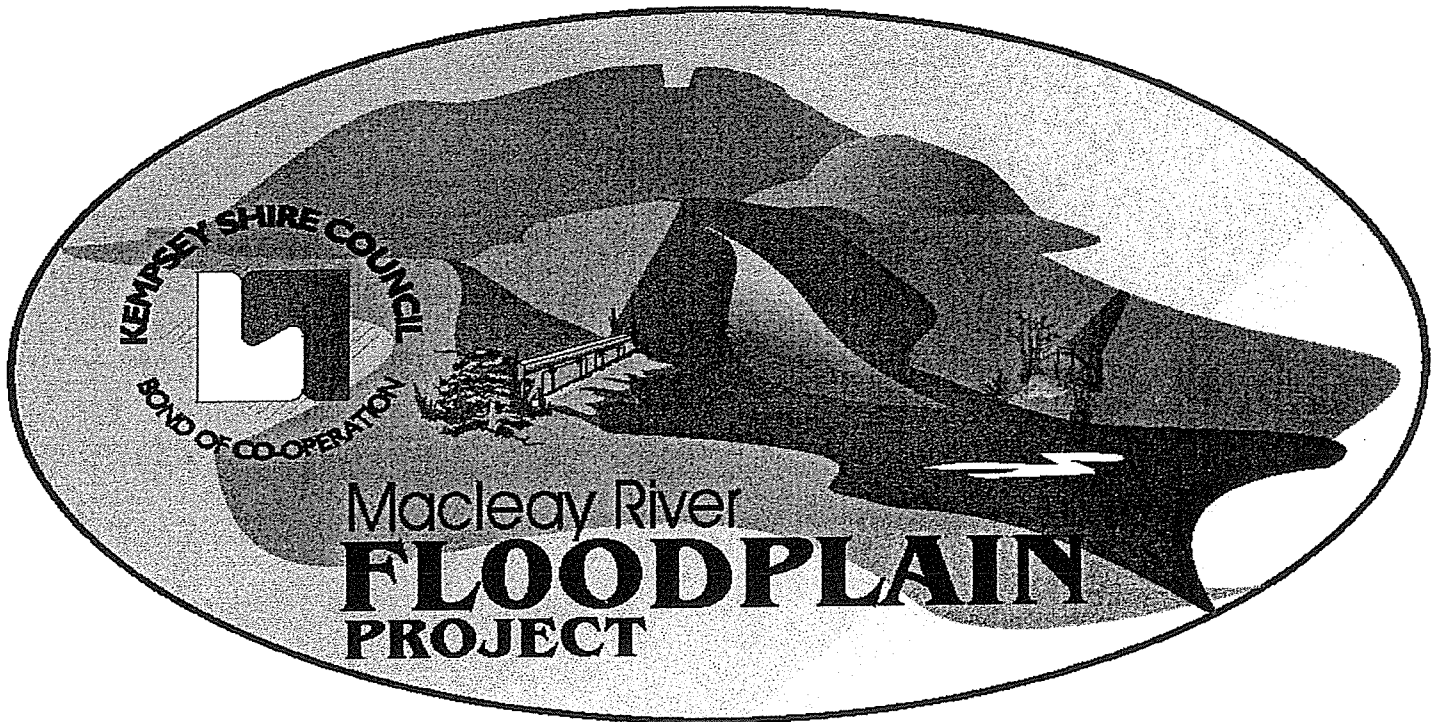


Macleay River Floodplain Project



Prepared by
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Introduction:

This document has been developed to provide an overview of the management, function and status of the Macleay River Floodplain Project (MRFP).

The Macleay River catchment (Figure.1) located on the mid north coast of NSW, has a catchment area of approximately 11500km². The Macleay catchment is the second largest on the mid north coast of NSW. The upper catchment landform is dominated by deformed Devonian to Permian sedimentary rock. The lower catchment (excluding the floodplain) landform is dominated by Carboniferous to Triassic granite intrusions.

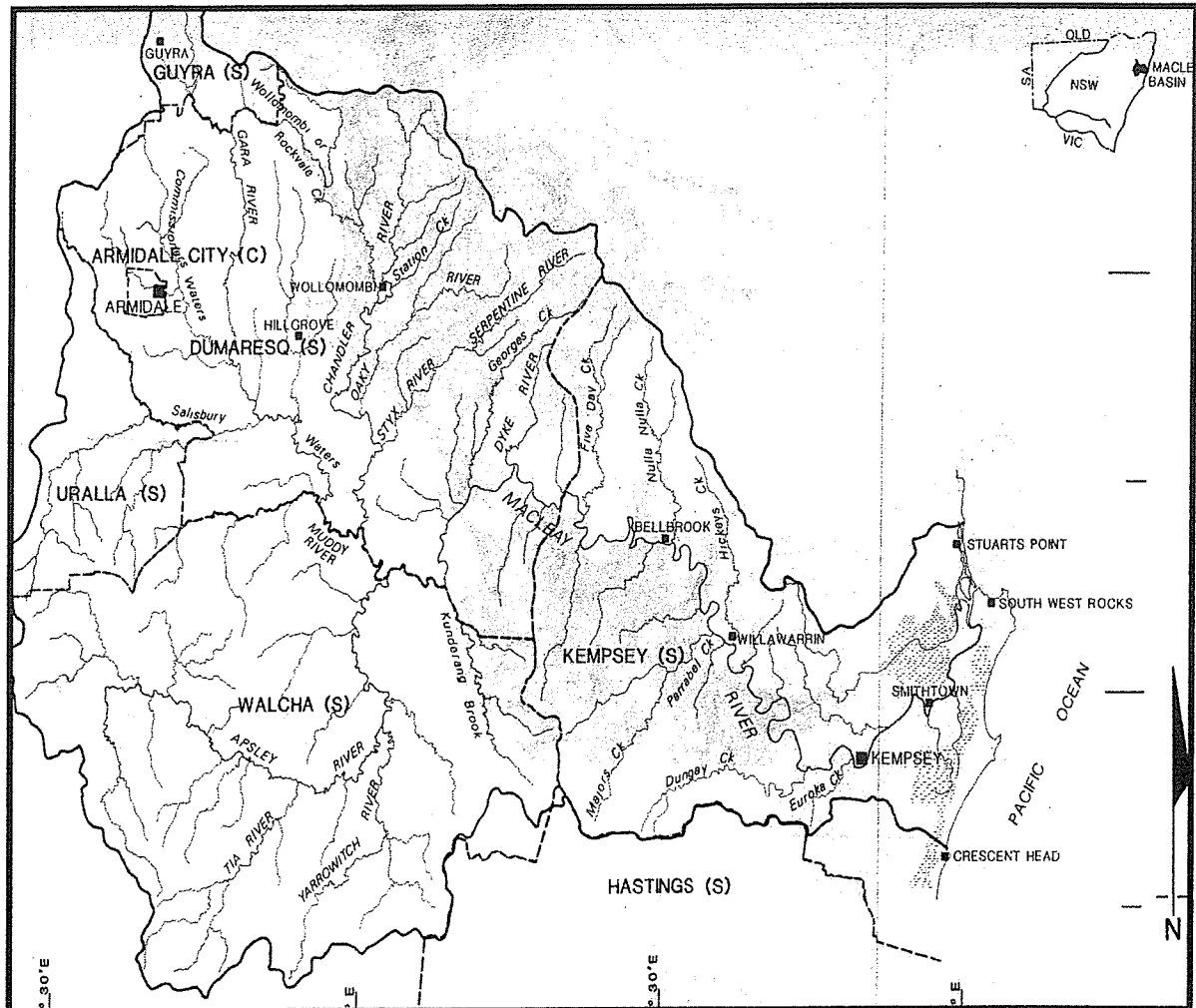


Figure.1. Macleay River Catchment

The floodplain landform is predominately fluvial and swamp deposits overlying earlier estuarine deposits. The floodplain is approximately 6% of the catchment (400km²) with approximately 310km² underlain with acid sulfate soils (Figure.2.). Since the turn of the last century the Macleay floodplain has been extensively modified to accommodate anthropocentric practices. The floodplain is now serviced by 37.7 km of rock wall protection, 34.4 km of constructed levees, 180 structures supporting 382 floodgates with 138 km of constructed drains.

Acid Sulfate Soils

Acid Sulfate Soils (ASS) or 'catclays' were first identified in the Macleay by Dr Pat Walker in 1960. Underlying the entire floodplain from Kempsey to South West Rocks are extensive estuarine deposits, including potential and actual acid sulfate soils

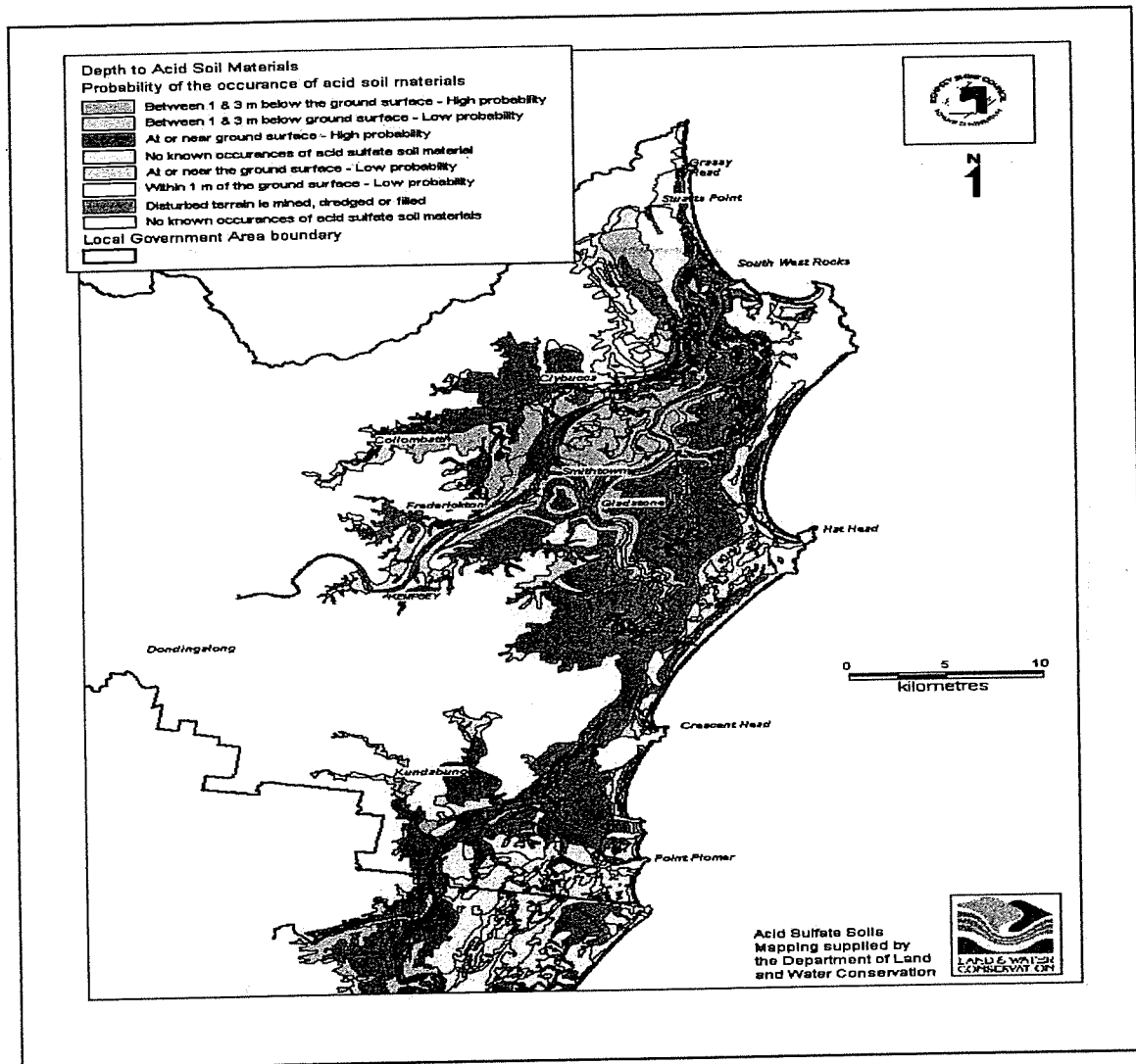


Figure.2 Acid sulfate soil landscapes in the lower Macleay Floodplain

It is now being recognized that the over drainage of floodplain landscapes results in a number of adverse environmental impacts including, lowering of groundwater and subsequent exposure of the acid sulfate soil sediments. As a result soil iron and aluminium becomes soluble in toxic quantities (to aquatic organisms) with the precipitation and/or flocculation of these minerals affecting water quality, by reducing oxygen levels within the water column and through suffocation of aquatic flora and fauna. In addition, poor land productivity within the some areas of floodplain can be directly attributed to over drainage and subsequent changes to vegetation species as well as the development of ASS scalded areas.

The DLWC Hotspot Program has identified six (6) areas within the Macleay Floodplain as ASS Priority Management Areas. These priority areas have strategic importance with respect to the management estuarine and floodplain areas and ambient water quality

Background

Until the flood of 1893 the Macleay River reached the sea at Grassy Head, 3km north of Stuarts Point. Since that time the entrance has been at South West Rocks (refer map), although floodwaters may also drain to the ocean via Korogoro Creek Cut, Ryan's Cut, Big Hill Cut, Killick Creek Cut and South West Rocks Creek

In August 1949, the Macleay River caused major flooding in Kempsey and the lower Macleay floodplain. At least six people lost their lives, 35 houses were completely washed away and 300 left uninhabitable, 2000 people were made homeless. It was estimated at the time that property damage totalling £2.5 million pounds had occurred (approx. \$200 million in current values).

Following the 1949 (1 in 90 year recurrence) and 1950 (1 in 80 year occurrence) floods there was increased pressure to provide some protection for the major towns in the floodplain and the Lower Macleay rural areas. A commission of enquiry under the head of the Conservation Authority, Mr CK Jacka, made a recommendation that led to the formation and development of the Lower Macleay Flood Mitigation Scheme.

Today Kempsey is protected from flooding up to a 1 in 10-year level and most of the downstream rural areas to a 1 in 2.5 year level. The catchment has a comprehensive computerised flood warning system

Macleay River Floodplain Project (MRFP)

KEMPSEY SHIRE COUNCIL set up the Macleay River Floodplain Project (MRFP) in January 2000 with assistance from NSW Fisheries and Department of Land & Water Conservation. The MRFP is an initiative of Council in partnership with state agencies to address environmental issues pertaining to floodplain management.

The MRFP is a positive development and an exciting move towards solving and managing environmental problems associated with the Macleay River Floodplain.

The objectives

The objective of the MRFP is to establish a *consensus* approach to improving the overall environmental condition and water quality of the Macleay River floodplain. Initially, the MRFP has focused on priority areas identified within the Macleay Floodplain Management Plan, Macleay Wetland Management Plan, Upper Belmore Floodplain Management Strategy and the DLWC ASS Hotspot Report.

Fundamentally, stakeholders connected to or associated with particular flood mitigation systems are formed into landholder management groups to actively manage floodgates (in non-flood periods) to address a wide range of environmental considerations, including and ground and surface water management.

Consensus Management

Consensus management is based on majority opinion supported with sound technical advice. Basically it involves identifying issues of concern and addressing those issues and considerations on a group/area basis. That is, all members of the Management group will have the opportunity and indeed are encouraged to contribute and actively participate in the management and operation of the floodgates and drains within their common drainage network.

Project Funding

Initial seed funding was provided by NSW Fisheries to help Council engage a Part-time Project Officer to commence and develop the project. The Project Officers initial priorities were to source and apply for funding grants from various agencies to enhance and supplement the initial funds provided by NSW Fisheries. Funding has been successfully obtained to develop management plans and commence on-ground rehabilitation projects (refer table 1.). To-date funding grants have been submitted to the Natural Heritage Trust, Coastal Acid Sulfate Soils Program and Acid Sulfate Soils Program.

A steering committee has been formed with representation from KSC Councilors, local & state government agencies, dairy farmers, beef producers, fish and oyster industry, environmental representatives to oversee the works program developed by the Project Officer. The Project Officer provides on-going progress reports on current and proposed projects as well as other relevant information to the steering committee every second month.

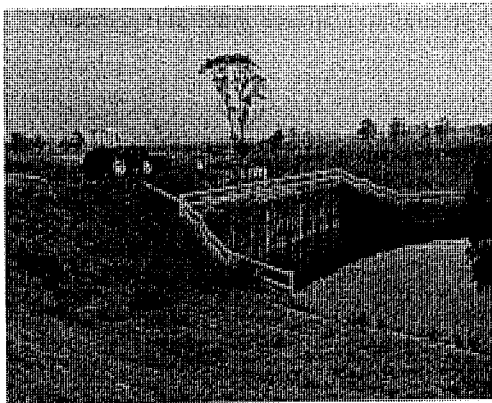
Natural Heritage Trust (NHT) Funding:

The MRFP successfully applied for funds to further develop the MRFP. "*The Implementation of Land & Water Management Strategies for the Lower Macleay River Floodplain*" has provided for funding to employ on a full-time basis and extend the Project Officers engagement for at least 12 months (2000 – 2001) with a further allocation of funds for an additional 12 month (2001- 2002) period. The projects objectives are to develop improved land productivity & water quality projects through the implementation of adaptive Management Plans for high priority floodgated drainage networks. Funding has also been provided to develop a number of smaller on-ground projects and to assist in the development of a Internet Web page and a communication strategy to disseminate water quality data captured by KSC telemetry units.

Coastal Acid Sulfate Soils Program (CASSP) Funding:

The MRFP successfully applied for funds from CASSP to develop and implement on-ground works to address poor water quality emanating from the Frogmore / Darkwater and Scott's Drain / Killick Creek systems.

The **Frogmore / Darkwater project** is primarily active management of a large floodgate structure (Union Floodgates) to facilitate improved tidal flushing and increase fish passage and habitat. The fundamentals of the project are to have one of the nine flood gates permanently opened (in non-flood periods) to allow water from the Belmore River to migrate within the system. There is approximately 14 km of constructed flood mitigation and pasture drains serviced by the Union gate structure.

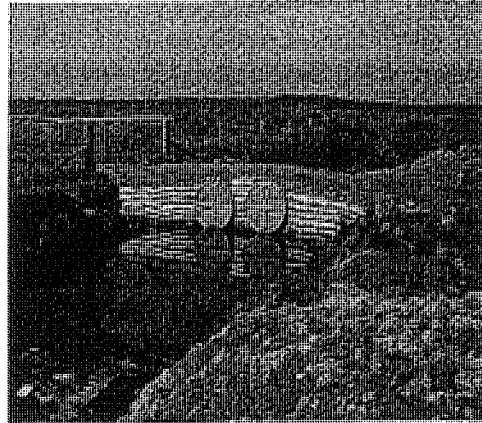
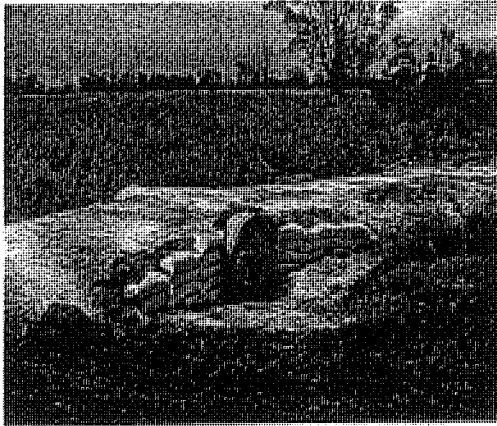


Union Floodgates retrofitted for landholder management



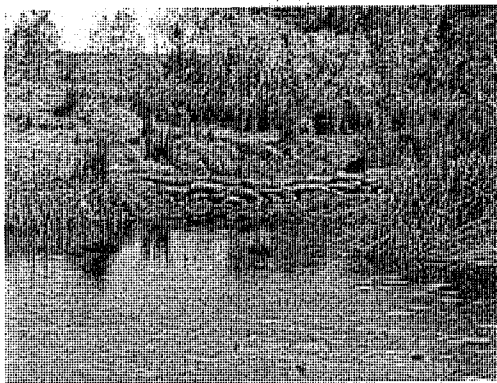
Aerial photo of the Frogmore / Darkwater system

To accommodate the increased water volumes in the system (after opening the gates) smaller in-system structures have to be positioned within low points in the drain levee to avoid undesirable flooding of pastures.



Typical in-system structures positioned within the drainage network to accommodate increase water levels.

These smaller structures are usually single (sometimes multiple) celled flap gates with drop board provisions. Before these smaller in-system structures were positioned, all identified low points within the drain banks were sand bagged. A landholder working bee was conducted to fill and position the sand bags.



After sand bagging has been completed a trial opening (choosing a mid range tide, preferably with high tides in day light hours) of the gates will occur with landholders positioned throughout the system to identify the level that the water had reached as a result of that particular tidal event.

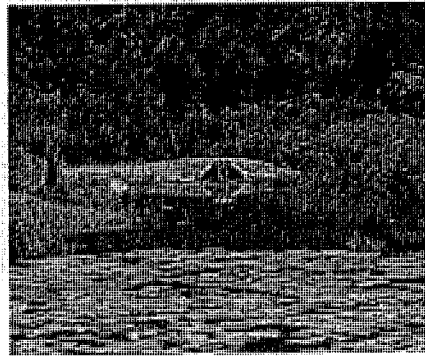
An adaptive Management Plan (the plan operates on an ongoing basis, however it may be reviewed annually or at signatures requests) for the system has been developed through consultation with connecting landholders, Council and relevant state agencies, based on the results obtained and observed from the trial openings. The trials are an important component in developing management options for the system, because it provides for landholders to develop a degree of confidence, in what would happen as a result of the gates being opened for prolonged periods in non-flood periods.

Outcomes to-date

A third trial occurred (late January 2002) after all the in-systems structures were positioned at selected pipe invert levels (many if not all structures physically raised the invert of the arterial drainage network). These levels were identified (in consultation with landholders) as the most appropriate to effectively manage drain and immediate ground water, whilst maintaining the systems flood mitigation integrity.

A mobile telemetry water quality monitor has been positioned within Frogmore Drain during the entire on ground works program. This monitor sends water quality parameters (pH, DO, EC, Temp., level) every 15 minutes to a central computer unit in Council. This data will be provided on a web page currently being developed by Council.

The third trial was conducted over a 14 day period that included a 2m tidal level. This was an excellent opportunity to identify probable maximum water levels that could be expected to be reached (given normal conditions) behind the Union Floodgates as a result of having one gate opened.



Two-metre tide influence on water level in Darkwater Drain with one gate opened.

Water quality improved in the system during and for a period (approx. 5 weeks) after the trial occurred. The system usually produces pH & DO values at around 4 & <2mg/L. During the trial pH and DO values were recorded at around 6 & >4mg/L respectively.

The **Scott's Drain / Killick Creek project** has been developed to remediate saline / acid scalded areas and associated poor water quality within and emanating from a lowland region of the Macleay Floodplain, Upper Belmore River.



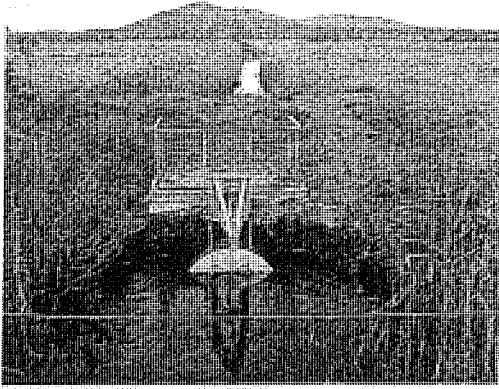
Acid saline scald in Upper Belmore (Scott's Drain) area.



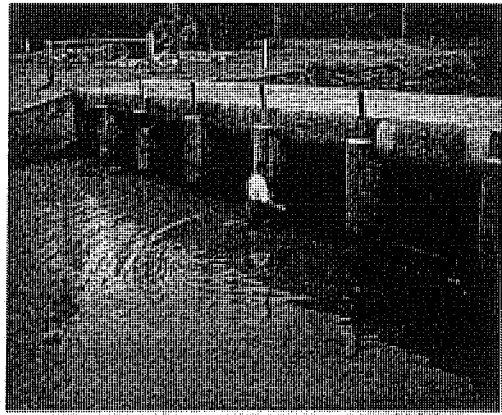
Scalded area inundate by intentional flooding

Saline water intrusion into a freshwater backswamp environment has resulted in the death of pasture grasses and fringe native wetland vegetation. The system drains north – south servicing the southern regions of the Belmore River floodplain.

The northern outlet (Scott's Drain) enters into the Belmore River approximately 14km upstream of the river mouth. The southern outlet (Killick Cut) a component of the mitigation network, enters into Killick Creek, Crescent Head.

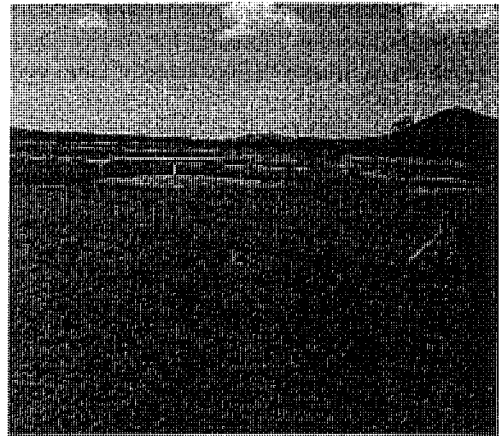
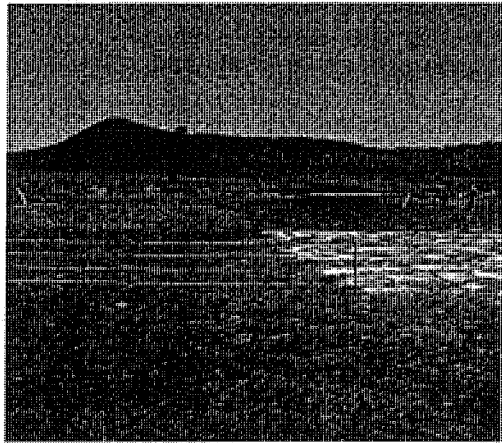


Scott's Drain (northern outlet) retrofitted for landholder management



Killick floodgates (southern outlet) active drop board management

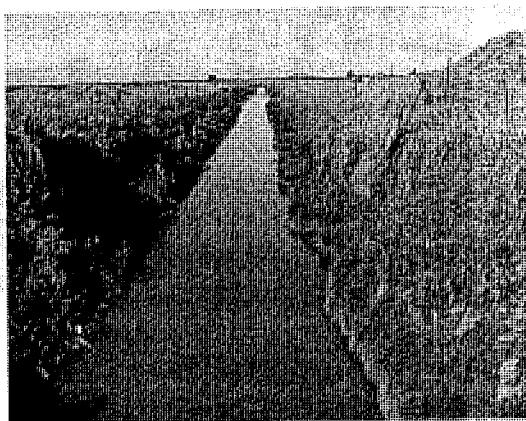
The projects methodologies to address the saline water and scalded landscape problems, are to attempt flushing of the area and the mitigation system with water from the Belmore River. Tidal head differences (7 hours) the two outlets provides for flushing of the northern component of the system with water from the Belmore River. Currently, methodologies for the revegetation of the scalded area are being developed, with support from Southern Cross University.



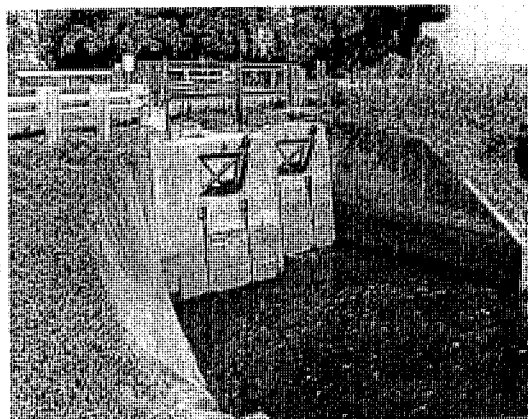
Trial plot positioned within scald to exclude cattle access. The image on the left shows the trial plot with sections of the plot with different treatments (i.e mulch, lime and no treatment)

Acid Sulfate Soils Program (ASSPRO) Funding:

The MRFP working with NSW Agriculture has successfully obtained funds from ASSPRO to investigate possible management options for the Rafferty's Drainage system.



Rafferty's Drain



Rafferty's Drain floodgate structure

Rafferty's Drain is infamous for the poor (often highly acidic) water emanating from connecting pastures and swampland environment. The Rafferty's Drain system is one of only a few currently active Drainage Union managed systems within the Macleay Floodplain. This project has the full support of the Drainage Union, who are looking for ways of better managing the system. That is, develop management strategies that are in-tune with environmental concerns while maintaining the systems flood mitigation integrity.

A consultant has been engaged to commence the feasibility study. A draft report is expected to be presented to the Drainage Union for comments in the immediate future.

The following table is a summary of floodplain projects currently underway or proposed for the Macleay & Upper Maria River floodplains.

Table.1. Summary presentation of floodplain projects.

Location	Project type	Fund Source	Comments
Fischer's No2 Drain Belmore River	Water level management	DLWC / Mr Fischer / KSC	
Clancy's Drain Macleay River	Floodgate management	NSW Fisheries / KSC	Active management plan
Marriott's Drain Macleay River	Floodgate management	NSW Fisheries	Active management plan
Maria 9a Drain Upper Maria River	Floodgate / wetland management	ASSPRO	Will be further developed under the Hotspot program
Maria 10a Drain Upper Maria River	Floodgate / wetland management	ASSPRO	Will be further developed under the Hotspot program
Rafferty's Drain	Floodgate / drainage management	ASSPRO	Feasibility study in possible management options
Triple S Ranch Belmore River	Floodgate management	MASSLAG	
Korogoro Creek	Floodgate management	NSW Fisheries	About to commence

The above table excludes on-ground projects developed and conducted in the Kinchela Creek and Belmore River areas by the Macleay Acid Sulfate Soils Local Action Group (MASSLAG) or a project currently being developed in the Swanpool wetland area by Wetland Australia. The table also omits all works and management plans development for the Yarrahappinni and Clybucca areas, as well as two proposed projects (Clybucca & Upper Maria River) as components of the DLWC hotspot priority area program.

All the aforementioned projects not included in the above table have been developed and implemented with assistance from the MRFP.

The MRFP has also been successful in obtaining ASSPRO funds to acquire a 'reed bucket' fitted with a hydraulic tilt mechanism for greater excavation precision and is in the process of developing 'best practice' guidelines (that will be adapted by Council) for drain management and maintenance within the Macleay Floodplain.

Other programs

The MRFP is also involved in working with community groups such as MASSLAG (Macleay Acid Sulfate Soils Local Action Group) to improve and increase awareness of the issues associated with floodplain and ASS landscapes.

The MRFP Steering Committee oversees and directs the works program formulated for the DLWC ASS Hotspot Program for the Collombatti / Clybucca and Upper Maria River areas.

The MRFP is actively assisting Council and the Coast & Estuary Management Committee in developing an Estuary Management Plan for Killick Creek, Crescent Head and Saltwater Lagoon, South West Rocks.

Impediments:

Funding for rehabilitation projects:

- a) Dollar for Dollar
Most of funding sources require funds sought to be match on a dollar for dollar basis. Usually this is the most restricting aspect of applying for funds to develop environmental programs. In the situation of the MRFP, KEMPSEY SHIRE COUNCIL is lead proponent and as such have to find funds from an ever decreasing budget. It is in the opinion of the author, that, the funding agencies seriously consider rethinking such criteria and provide for more case by case approach to providing funds, in particular to Councils that have restricted revenue source.
- b) Funding criteria
Another difficulty arises when attempting to source funds from individual programs that have specific requirements on what funds can or cannot be allocated for. The problem arises when, components of a rehabilitation program requires funding that can not be delivered through that particular funding program. For example, most funding agencies do not allow funds to be spent for any drain / floodgate maintenance or modification work undertaken. It is the experience of the author, that, although there is merit in restricted funds to certain activities, usually to achieve the desired outcomes for floodplain projects, some form of drain / floodgate maintenance is usually required. This situation is most evident in areas where privately owned or constructed drains are now in a state of disrepair and usually are inciting some form of mismanagement.

c) Long-term management

Its all very well to develop floodplain projects that address the management of these floodplain systems in the short term, however, greater consideration must be given to provide for funding for the long-term management of the various projects. There is really no point creating good will with landholders, spending tax payer monies, developing rehabilitation and management projects only to see it fail in the near future due to lack of funds.

Management Plans

- a) Despite a general understanding that the development of landholder based management plans are a positive way to actively manage problem areas, there is a feeling amongst some landholders that, these management plans are a way for authorities to relieve themselves of the responsibility and hand that responsibility onto landholders.
- b) An inherent problem associated with landholder based management plans arises when landholders who are signatures to the management plan either sell their property or for some other reason are unable to comply to the management plan. The problem arises when new owners do not want to comply or become involved within the management plan. The option of placing a caveat on landholdings connected to the management plan area has been debated, however, this is not a viable option as it is seen to be placing extra responsibility or incumbency attached to selling or purchasing properties identified within the management plan.

Long-term infrastructure maintenance

- a) Many projects that include the active management of large floodgated systems require the development and positioning of many smaller *in-system* structures to control water levels within the opened drainage network. Despite the fact that these smaller *in-system* structure have the capacity to improve land management and productivity (via pasture flooding in dry periods when water quality permits) many landholders and indeed Council view them a possible future liability. That is, who will be responsible to repair or maintain these smaller *in-system* structures perpetually.

Committees of Council

- a) Landholders who develop and adopt a management plan for a particular area may be formed and adopted by Council as s.377 committees of Council. Section.377 committees are covered by Voluntary Workers Personal Accident Insurance (taken out by Council) for any landholder signed on to and acting in accordance with the management plan. The problem or inequitable situation arises when problem areas or infrastructure that requires the development of management plans are privately owned. It has been the author experience that council cannot adopt s.377 committees if they are function on private property or privately owned (i.e drainage union) drains or floodgates.

Agency requirements

- a) In attempting to undertake many floodplain projects much frustration is achieved when dealing with the menagerie of local and state government consent requirements. This situation was evident when the MRFP in conjunction with NSW Agriculture attempted to conduct a 'best management' drain maintenance field day on two (2) local drainage systems. One system was a council managed system while the second was constructed and managed by a drainage union. The field day was able to proceed on the council owned and managed system under consent obtained via the LEP and Part V of the EP&A Act. Conversely, as the second site was private property consent was required from KSC (DA), NSW Fisheries (dredging & reclamation permit) and DLWC (Part 3 of the Rivers and Foreshore Improvement Act) thus, adding further expense and complications to the procedure.

Conclusion:

It has been well documented and spoken of, that, the floodplain environment and the systems that service it, have from time to time incited some form of environmental degradation, usually in form of poor water quality emanating into receiving systems.

Usually, the environmental concerns can be directly attributed to mitigation drains or lowland farming management. In many situation landholders have had little or absolutely nothing to do with the construction of drains that are connected to or servicing their properties and therefore feel they are not responsible to manage these systems accordingly.

The fact is that these systems exist and that it is generally understood that they incite, produce and transport poor water quality into receiving water bodies. The question then arises, what can be done to address the problem in both the short and long-terms?

Projects such as the Macleay River Floodplain Project and the Clarence River Floodplain Project are generally developed in the first instance to identify problems and attempt to formulate some form of remediation. They usually rely on the good will of farmers to actively manage floodgates and drainage networks to achieve desired community and environmental outcomes.

It is in the opinion of the author, that, most of the projects developed on the floodplain (ie floodgate management) are short-term management options to address water quality problems. It is unrealistic to expect landholders to perpetually manage floodgates and drains, in particular where no form of incentive or increases in land productively can be gained.

To truly come to terms with the long-term sustainable management of lowland drainage systems other options must be considered. It is unrealistic to expect landholders to perpetually manage these systems for the benefit of the broader community and local environment. In the opinion of the author, drain redesign (shallower and wider) is the first practical step, followed by some form of incentive to landholders to except changes to the hydraulic characteristic of site. However, every system is different and such measures must be based on a comprehensive understanding of how a given system will respond to any given event (drought / flood etc.).

