



# ASSAY

A NEWSLETTER ABOUT ACID SULFATE SOILS

No 32. September 2002

## Community participation in the Acid Sulfate Soil Program (ASSPRO)

The Acid Sulfate Soil Management Advisory Committee (ASSMAC) has allocated \$172,000 in 2002/03 to fund projects that will assist industry, community and government to reduce the effects of Acid Sulfate Soil (ASS) run-off on our water ways and environment.

Community groups, industry, government and individuals are invited to apply for ASSPRO funds for projects that will lead to better management of acid sulfate soils.

### Applications close Friday 1st November 2002

Application forms are available from, and completed applications to be sent to:

**The Project Coordinator, Acid Soil Action  
Wagga Wagga Agricultural Institute  
PMB, WAGGA WAGGA  
NSW 2650**

**Telephone: 02 6938 1906,**

**Fax: 02 6938 1809,**

**e-mail [greg.fenton@agric.nsw.gov.au](mailto:greg.fenton@agric.nsw.gov.au)**

The ASSPRO program will provide funding in four key areas:

1. ASS stakeholder education and awareness;
2. Seed funding that will lead to better on-ground ASS management;
3. Industry and community involvement in ASS management;
4. Research and development of ways to control formation and/or discharge of acid into waterways.

ASSMAC has indicated that they will fund projects that:

- increase industry and community knowledge, skills and awareness of ASS,
- enhance skills in communication, planning, technical understanding or management of ASS,
- assist communities to implement practical measures that produce sound environmental outcomes
- assist communities to produce assessments and plans to improve the management of ASS at sub catchment levels
- provide new information on the social, economic and environmental aspects of ASS management
- integrate and extend information from research and technology projects,
- add value to demonstrations or research projects involving ASS projects already funded from other sources.

**For more information, contact these  
ASSMAC members:**

John Williams (Chairperson) 02-6626 1340

Scott Henderson (Project Officer) 02-65626244

Chrisy Collins (Project Officer) 02-6626 1355

Professor Ian White (University) 02-6249 0660

Don Buckley (Local Govt) 02-6672 0430



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## Conferences and workshops

### **5th International Acid Sulfate Soils Conference**

The 5th International Acid Sulfate Soils Conference was held from 26 to 30 August at the Twin Towns Services Club in Tweed Heads. Approximately 240 delegates from all over the world attended the conference. The conference ran over five days, and included 2 one-day field trips to Pimpama (south-east Queensland), and McLeod's Creek and the Tuckean (northern NSW).

Conference sessions were on: Characteristics of Acid Sulfate Soils; Planning, Legislation and Regulation; Communication and Education and Management of Acid Sulfate Soils. Thanks to all who attended the conference.

The next issue of Assay will be a special theme issue dedicated to the conference, with a longer report-back on the conference, and short articles on selected papers. Don't miss it! For more information, contact: Dr Ben Macdonald (02) 6672 2280 or look on the website: <http://www.out.at/acidsoil>

## Taking ASS to the masses

Community radio station 88.9 FM Richmond Valley Radio based at Coraki, northern NSW, is helping raise awareness of ASS within the general community. To do this, the station has received funding from ASSPRO to develop 40 different radio announcements.

The announcements take the form of short informal interviews with a variety of stakeholders on different aspects of ASS. Representatives from state and local government, universities, conservation groups, fishing industry and landowners have been interviewed. The announcements will receive airplay on 88.9FM. The station covers most of the Richmond Catchment, and the announcements will be distributed free to other stations throughout coastal NSW.

"This project is one of the first to raise awareness of acid sulfate soils to the general public", says Far North Coast Acid Sulfate Soil Project Officer, Chrisy Collins. The general community is often dismissed as a difficult stakeholder group to target. However, Chrisy says "By using this medium and the relaxed manner in which radio announcer Roger Wood approaches the subject, the project will be an effective way to target the general community".

Meanwhile Roger Wood and wife Robyne, are enjoying interviewing stakeholders and editing the announcements. "We have learnt a lot doing this project. We now have a greater understanding of how far-reaching the issue is, and how it affects everyone in the community", says Robyne.



Roger and Robyn Wood outside 88.9FM

## Churchill Scholarship For Robert Quirk

In 2002, Robert Quirk, a cane farmer from McLeod's Creek on the Tweed River, received a Churchill Fellowship. He spent over 7 weeks in the USA, the Netherlands and China, and attended a number of conferences and meetings on ASS, salinity, and water quality.

Robert has been involved in ASS management and remediation for many years. He has put into place many proactive management practices on his property, and has worked in close collaboration with leading Australian ASS researchers, such as Professor Mike Melville and Professor Ian White.

Robert found that, in many respects, the Australian approach to ASS management is unique, and Australia is a world leader in ASS research. The Australian approach to ASS differs considerably to that applied overseas because of natural differences in the soils, and their environmental setting.

The trialing of various laser-levelling techniques has led to practical, cost-effective ways of dealing with ASS. As well as new agronomic methods for better managing ASS, various active and passive acidity neutralisation techniques are being trialed. This research, and its practical application, has sparked interest from water quality and agricultural organisations, in Australia and overseas.

Another interesting, but disturbing, result of the trip was the discovery that up until now, the problem was thought to only exist in areas that were less than 5m above sea level. Robert discovered this is incorrect. During his US visit, he learned that the problem extended far beyond that level. When a jet airport was constructed in Virginia, ASS had been found up to 50m above sea level. This potentially has major significance, and indicates that management of broadacre ASS has many aspects in common with acid mine drainage sites.

Robert has been able to bring together representatives from the around the world to work more closely to solve the ASS problem through the expertise, credibility and independence of the Australian research on

his property at McLeod's creek. Robert believes that each country has a part to play in managing ASS, and that by working together as colleagues, the solutions to problems such as land and water degradation will be discovered. Robert has raised the awareness of the ASS problem to the international water resources community and has firmly placed this important issue on the international agenda. Contact Robert Quirk at 04

## Websites

### DLWC ASS Website

The Department of Land and Water Conservation has a new ASS website. This up to date and referenced site includes topics:

- a background history of drainage in NSW;
- an accessible explanation of the chemistry of ASS oxidation;
- discussion of the effects and economic impacts of ASS oxidation;
- information and links to order Risk Maps;
- information and results from the Drain Network Mapping; and
- information on the DLWC Hot Spot Remediation Program.

The Hot Spot reports are also available on-line, and a link is provided to enable access to current water quality from the seven Stage 1 hot spots. A range of technical papers are available on-line, and links are provided to a range of related sites. The new web site is at: [www.dlwc.nsw.gov.au/care/soil/ass/index.html](http://www.dlwc.nsw.gov.au/care/soil/ass/index.html)

### GIS website for the Tweed

The website provides an overview of activities and organisations involved with rehabilitation and management of coastal ASS in Australia. This site consists of two components: 1) an Electronic Content Management System and 2) a Geographic Decision Support System which links a geographic interface with a database of research data. The system creates graphs and tables automatically from the research data, simply by clicking on a monitoring site(s) of interest.

<http://www.cassdirectory.org/>

### **National CASS website**

The National CASSP web site is live at <http://www.ea.gov.au/coasts/cass/index.html>. The web site is a response to the need for information on national coastal acid sulfate soils issues. Water quality problems associated with these soils have traditionally been recognised as a NSW and Queensland problem. With the January 2000 release of the National Strategy for the Management of Coastal Acid Sulfate Soils, other states and the Northern Territory have begun dialogue on the problems faced by coastal acid sulfate soils at a national level.

The national web site is not an exhaustive collection of re-written information on ASS. It is a central information portal by which a person can search for information on specific coastal acid sulfate soils issues. The layout mirrors the objectives of the National Strategy for the Management of Coastal Acid Sulfate Soils. The website was the initiative of Environment Australia and NSW Agriculture.

### **Environmental Impacts on Fish Habitat Resources**

There is increasing awareness of the effects of habitat and water quality impacts on the productivity of fishery resources. Most fish species spend a significant part of their lives in estuaries and fresh water areas. Coastal floodplains are areas where the demand for space for developments is at its peak. This is also the area that is most productive for many agricultural industries and is most sought after as a place to live and work. The coast has always been a magnet to the Australian population.

Development has resulted in significant impacts on what is a poorly understood and undervalued natural environment. Wetlands and riparian buffer areas adjacent to creek lines serve a wide range of functions for the environment and the community. Their productivity has been rated at over \$10 000 per hectare per annum. In most cases, the return from development cannot match the natural value if left in their natural state. Unfortunately, in most developed areas of the Queensland coast, these highly productive

areas for fishery and other natural systems have been the most heavily impacted.

Recreational fishers have become more aware of the impact of this type of habitat loss over the last 2 decades. To better focus on the key issues that impact on fishery resources, Sunfish Queensland developed a Top Ten Environmental Impacts on Fishery Resources. The aim of this initiative is to educate and focus attention of the community on the issues that most affect fishery resources and to encourage action at a local level to achieve on-ground outcomes that will allow the fishery to recover some of its lost productivity. Issues such as acid sulfate runoff, the restoration of previously degraded coastal wetlands, reduction in the volumes of gross pollution that enter our waterways and the identification of areas that are unsuitable for development are a few of the long-term outcomes that Sunfish hope to achieve.

Sunfish Queensland believes that "the sustainability of this State's fishing resources is the responsibility of every individual". Sunfish involves itself in a wide range of forums from national summits on salinity and water quality to small on-ground projects such as running fishing competitions for noxious fish to raise community awareness and encourage involvement in these issues. Sustainable environmental values are imperative to the recreational fishing experience. It is no longer good enough to rely on "the authorities". Waterways belong to all of us; we must all treat and respect them as our own..

Contact: Vern Veitch, (07) 4771 6087 or [sunfish@modemss.brisnet.org.au](mailto:sunfish@modemss.brisnet.org.au)



## Land Care talks make it easier for others

AFTER three years' Jones Island Land Care group has successfully negotiated a management agreement for Acid Sulfate Soils (ASS) with government and community interests.

NSW Agriculture Project Officer Acid Sulfate Soils, Scott Henderson at Kempsey, said, "this comes at a time when farming efficiencies are critical, especially for those continuing in dairy farming after deregulation."

In successfully negotiating their agreement the group created a model for other landholder groups in the Manning River Valley around Taree to follow. The development of the management plan was funded by a \$20,000 grant from ASSPRO, a sub program of the Acid Soil Action program run by NSW Agriculture.

Mr Graeme Drury, Chairman of Jones' Island Landcare, said, "The consultations went for three years, which highlights the complexities of the decision making process.

"It was a matter of scientific theory, legislation and practical agricultural experience coming together during consultation to achieve a workable plan. At the end of the day, we finished up with what we really wanted - to continue farming the land and to have drains free of any obstruction, including weeds and mangroves," he said.

In recent years Jones Island was included on the Greater Taree City Council's Local Environmental Plan ASS Planning Maps. This meant landholders had to develop an overall plan for any works, especially drainage.

Landholders raised legitimate concerns about the restrictions on cleaning and removal of mangroves from drains, and the impact on agricultural productivity. On Jones Island, unlike many other areas, existing drains are shallow and service only individual properties.

At other locations, problems are not as straightforward. At nearby Moto, properties inherit water quality problems from a large catchment, and this water is drained through a deeper, more complex system.

The successful negotiations for a Jones Island Drainage Management Agreement involved the Department of Land and Water Conservation, NSW Fisheries, Road Transport Authority, oyster growers, recreational and commercial fishers, and the Greater Taree City Council.

The agreement allows removal of mangroves from drains, including those in front of flood-gates. In return, landholders have undertaken to adopt 'best practice' management (BMP).

BMP includes fencing vulnerable mangrove stands to prevent livestock damage, and improve bank stability. In other instances, replacing mature mangroves with other native riparian vegetation, such as sheoaks, will assist in limiting mangrove germination and maintain a vegetative canopy for fish habitat.

Contact Scott Henderson Ph (02) 6562 6244. Email [scott.henderson@agric.nsw.gov.au](mailto:scott.henderson@agric.nsw.gov.au)

## Acid Sulfate Soils in WA

Acid sulfate soils are becoming very topical in WA. Groundwater bores near Stirling, on the Swan Coastal Plain, were found to be contaminated with arsenic, associated with acid sulfate soils. Drains dug in the salinised WA wheatbelt areas have also been found to be highly acidic. Contact Dr Steve Appleyard for information; [Steve.Appleyard@wrc.wa.gov.au](mailto:Steve.Appleyard@wrc.wa.gov.au)

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## Queensland Acid Sulfate Soils Technical Manual

The Queensland Government, the Queensland Acid Sulfate Soils Management Advisory Committee (QASSMAC), and other stakeholders are currently developing the Queensland Acid Sulfate Soils Technical Manual.

The Technical Manual aims to provide information and guidance on appropriate legislative and sampling requirements for disturbances where ASS are involved. Appropriate management and treatment options, guidance on environmental management plans, and examples of industry best practice will also be outlined. It is anticipated that the Manual will be used by the development, agricultural, fisheries, extractive and waste management industries, land managers from local and state government, conservation groups and other community organisations.

The Queensland Acid Sulfate Soils Technical Manual will be progressively developed, and the first chapter to be released will be the Soil Management Guidelines. Upon completion, the Queensland Acid Sulfate Soils Technical Manual will document:

- appropriate legislative and policy requirements associated with disturbance of ASS. This includes a description of the level of information proponents should provide to land managers as legislative requirements, and of issues that land managers should consider when making decisions about disturbing ASS;

- appropriate procedures to determine whether ASS are present on or adjacent to the land associated with the disturbance or drainage, and appropriate sampling intensities;

- standardised routine laboratory procedures to quantitatively assess the existing and potential acidity from the oxidation of ASS;

- appropriate techniques to avoid and minimise the disturbance of ASS and to mitigate any potential on-site and off-site environmental impacts, if disturbance is to occur;

- appropriate techniques to manage and monitor the on-site and off-site environmental impacts on surface water quality, if distur-

bance of ASS is to occur;

- appropriate techniques to minimise disturbance of groundwater, quantify the extent of disturbance of groundwater, and to monitor the on-site and off-site environmental impacts, if groundwater disturbance is to occur;

- recommendations for environmental management plans for the construction and operational phases of the disturbance;

- recommended remediation strategies for degraded disturbed sites to ensure that sustainable outcomes are achieved;

- examples of best practice for both urban and state infrastructure development, and for development and production in the agricultural, aquaculture and extractive industries; and

- provide examples of best practice for smaller scale disturbances associated with the provision of infrastructure, basement excavations, swimming pool excavations and drainage.

For more information, please contact  
Kristie Watling, (07) 3896 9229  
[kristie.watling@nrm.qld.gov.au](mailto:kristie.watling@nrm.qld.gov.au)



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**CONTACT: Enquiries Officer - Kerrie Gray**  
Phone 02 6626 1103 Fax 02 6626 1133  
Email. [Kerrie.gray@agric.nsw.gov.au](mailto:Kerrie.gray@agric.nsw.gov.au)

## Environmental Services Scheme Update

Traditionally, landholders have produced agricultural commodities such as livestock and grain, and earned an income from selling these products into the market. But there are other services that landholders can provide which are also valuable to the community. These include reducing the mobilisation of salt or acid sulfate soil products, enhancing biodiversity, reducing soil loss, improving water quality and reducing greenhouse gases. None of these 'environmental services' give an income.

Our long term aim is to develop ways to open up new income streams for landholders by forming markets for the environmental services produced on their farms. If landholders can receive an income for providing these services, they will be able to balance the management of their properties to produce agricultural commodities and provide environmental services.

Through the Environmental Services Scheme, we will be working with a number of landholders to identify how activities that provide environmental services can be incorporated within their operations alongside existing production activities. In this way, we will be aiming to test some of the basic arrangements required to establish environmental services markets in a real life situation.

Expressions of interest were called from interested farmers in NSW to participate in the scheme in June and July. DLWC after widespread publicity received 144 applications with 19 from the North Coast.

The selection of successful landholders will be based on a range of criteria including as an essential criterion, that the proposed works are in an acid sulfate soil priority area. The land management changes which the ESS would like to implement and subsequently measure include environmental plantings of native species; commercial plantings of native or non-native trees; regeneration of native vegetation, and the use of engineering works such as drain modification and finally the re-introduction of natural wetting and drying or tidal

cycles within fresh or saltwater areas. These land management changes will then be assessed against the impact of reduced acid runoff; reduction in greenhouse gases; enhancement of biodiversity; reduction in soil loss; and improvement in water quality.

Selected landholders will then be asked to bid on the amount they wish to receive as an annual payment to implement and maintain these agreed land use changes. Bids could take into account, costs involved in implementing the changes as well as maintenance costs and any income foregone or received. Final bids will be submitted in November with properties being selected in December. It is anticipated contracts will run for a period of 3 to 5 years.

Contact Simon Proust, (02) 6653 0111

[sproust@dlwc.nsw.gov.au](mailto:sproust@dlwc.nsw.gov.au)

## Floodgates

### Maroochy Floodgate Update

A consortium of Maroochy Shire Council, DPI Fisheries, Cane Growers, SUNFISH, Queensland Seafood Industry Association, Maroochy Mooloolah Catchment Coordinating Association, BSES, EPA and DNR&M are each contributing to a CASSP funded project investigating the environmental benefits of modifying floodgates in cane farm drains in the Maroochy Catchment.

The impacts and benefits of modifications, physical and operational, to the selected floodgates are being monitored throughout the project.



Water quality sampling in the Maroochy River catchment

The project also aims to: ~ complete an audit of all floodgates in the catchment;~ develop a GIS for data storage and;~ prepare a State-wide set of guidelines for floodgate enhancement to improve fish passage and habitats and benefit primary industries.

This project has been underway for 18 months with data on water quality, habitat condition and the fish and crustacean species present being collected from eight cane-farm drains in the Maroochy River catchment.

Suitable paired sites were selected on the basis of local conditions (including drain size, location and soil type), with the assistance of Tony Blatch (BSES Extension Officer) and cane growers. At each pair of cane drains, one floodgate was modified and the other left as-is, to enable a comparison of the effects.

The new floodgates were installed into four drains on the 6th August 2002. Prior to this event, sampling for fish and crustacean abundances and water quality parameters were carried out bi-monthly for approximately 12 months between June 2001 and June 2002. Consequently, the project has one years data of water quality and fish / crustacean abundances prior to the floodgates being modified. Additionally, the Queensland Department of Natural Resources and Mines (DNRM) conducted soil coring around each drain in the project to determine depth and severity of any acid sulphate soil material.

It is proposed to continue sampling up to the end of the project so that a comparison can be made between the data collected before floodgate modification with that collected after floodgate modification. The results will show whether floodgate modification improved water quality in the drains and if there was any improvement to fish and crustacean passage.

Results to date only reflect data collected prior to floodgate modification. The results of the water quality monitoring show significant variation between drains. These are attributable to variations in acid sulphate soils at each site, floodgate efficiency and location of the drain in the Maroochy River.

Most drains in the study exhibited acceptable water quality throughout the years sampling, particularly those drains which had leaky floodgates, however three drains with non-leaky floodgates often contained water with pH's around 5. These drains also showed severe acidity after heavy rain events displaying pH values between the 3 and 4 mark.

Fish abundance and species numbers results are also varied between drains. In general sampling has captured more fish downstream of the floodgates than upstream, however two of the sites have more fish upstream. This is most probably due to the characteristics of the drain and the type of floodgate installed.

Most of the fish caught in the drains upstream of the floodgates were juveniles and included some mullet, small numbers of bream, yellow perchlets, pacific blue eyes and empire gudgeons. Numerous species of goby were also captured near leaky floodgates. Those floodgates without leaky gates generally contained few fish and those that were captured were fresh/brackish water species, including the introduced mosquito fish.

Contact Mathew Johnston, Queensland Fisheries (07) 3817 9554,

*Mathew.Johnston@dpi.qld.gov.au*

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## NSW Fisheries Floodgate Workshop

NSW Fisheries with funding support from NSW Agriculture, recently held a one day workshop to examine the different styles of floodgate and modifications available to land managers. The workshop brought together a range of over 50 attendees including agency staff, local government representatives, landholders, industry representatives, researchers, floodgate designers and manufacturers.

These included representatives from NSW Fisheries, NSW Agriculture, DLWC, NPWS, Queensland DPI, Sydney Olympic Park Authority, University of Wollongong, University of New South Wales, Wetland Care Australia, Manly Hydraulics Laboratory, Cane Growers Associations, NSW Sugar Milling Cooperative, NSW Local Shires, Macleay Acid Sulfate Soil Local Action Group, Rabbit Plastics, Australian Aqua Services, Waterman Australia, Batescrew and a large number of dedicated landholders.

A range of various floodgate designs were presented by the manufacturers or those land managers that had extensive experience in using a particular style. The advantages and disadvantages of each type was highlighted and then discussed by workshop participants. This teased out any particular situations where one type of floodgate may be more applicable than others, in addition to providing other relevant details such as the history of operational performance, costings, OH&S and maintenance issues.

The workshop also provided a tremendous opportunity to 'calibrate' floodgate stakeholders level of knowledge and understanding of floodgated systems. Combined with opportunities for networking with folks from a diverse range of backgrounds, the day was a great success. NSW Fisheries are compiling the findings of the workshop into a Proceedings document for all participants.

For further information, contact Simon Walsh of NSW Fisheries. (02) 6686 2018 or [Simon.Walsh@fisheries.nsw.gov.au](mailto:Simon.Walsh@fisheries.nsw.gov.au)

## Forestry trial

This is one of three sites which were selected to investigate the use of trees to reduce estuarine degradation from acid sulfate soil runoff water. Two sites were established at Tweed (Site 1) and Maria River (Site 2) to investigate various species for establishment of plantations in ASS. This site is situated on a property managed by Oceania Agriculture Ltd. All sites were identified as actual ASS. The main enterprise is the production of tea tree oil and cattle grazing. An existing drain is situated approximately 20 m from the western end of the trial area with a natural depression collecting water to the southwest through the trial area. There is a dirt road running along the northern side separating the site from a tea tree crop. It is suspected that *Melaleuca* species and Bracken fern originally dominated the original vegetation before it was cleared.

This experiment had two main aims:

### 1. Environmental

· To assess the ability of trees to minimise acid export through control of water movement via evapotranspiration;

### 2. Silvicultural

· To test suitable species for establishment in ASS; and To investigate some basic management practices including mounding and liming.

The trial site is split into two sections:

(a) silvicultural section- two treatments were applied viz. Plus and minus lime and with and without mounding; and,

(b) species trial - we planted (i) *Eucalyptus camaldulensis* (River red gum), two hybrids (based off *E. grandis* x *E. camaldulensis*), *E. robusta* (Swamp mahogany), *Acacia melanoxylon* (Blackwood), *Melaleuca quinquenervia* (Five veined paperbark), and *Casuarina glauca* (Swamp she-oak).

Summary results from the species trial for the first twelve months indicate that the survival of *Melaleuca quinquenervia* survival was poor due to frost during the winter of 2001. Survival of *Casuarina glauca* was also poor compared to the other species.

All eucalypt species grew well through the

summer period after establishment during the winter of 2001. The Melaleuca trees are still recovering from frost damage. Canopy closure is still at least 18 months away and weed control remains an issue during this time.

There is some indication that mounding and liming have no effect on the establishment of the trees but this information should be considered as preliminary at this stage. Further and more detailed analysis is underway following growth measurements undertaken in June 2002.

Below average rainfall caused a drop in the local water table during 2001. Initial measurements indicate the water table fell to nearly 1.7 from the ground surface inside and outside the plantation.

Contact: Geoff Heagney  
Northern Research, State Forests of NSW  
PO Box J19, Coffs Harbour 2450

## SA ASS Risk Mapping Project

The first progress report on the SA ASS risk mapping project (SA inventory of CASS Risk (Atlas). It's well worth a look.

[http://www.per.dw.csiro.au/research/agriculture/acid/CASSP\\_SA\\_RiskMapping\\_Progress\\_Report1.pdf](http://www.per.dw.csiro.au/research/agriculture/acid/CASSP_SA_RiskMapping_Progress_Report1.pdf)

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## Disappearance of 'Swan Pool' near Kempsey

The major open waterbody, from which Swan Pool derived its name, disappeared after being drained in 1931. The 'pool' has subsequently been invaded by rushes, drastically transforming one of the north coast's most diverse fish and bird wetland habitats.

The upper Kinchela Creek lost all tidal function due to the combined impacts of the construction of the 'Lock' and subsequent siltation and aquatic plant growth in the channel upstream.

NPWS is now being urged to adopt a medium term strategy (5-10 years) to reinstate the natural hydrology of the Swan Pool in co-operation with landholders, DLWC and Kempsey Shire Council. As part of the process, NPWS will explore with landholders, the potential to incorporate all the remaining wetland areas into the Hat Head National Park, which occupies a large part of the area.

NSW Fisheries is also being asked to consider funding a replacement for the 'Lock' with a new floodgate structure on Kinchela Drain #2. This will allow reinstatement of tidal flows into upper Kinchela Creek.



*In 1942 Swan Pool (far right) was still evident 11 years after the Lock was constructed but has now disappeared.*

The Final Report for the 'Swan Pool Drainage Management Project' prepared for Wetland Care Australia, is available from Bob Smith [bsmith@scu.edu.au](mailto:bsmith@scu.edu.au) Tel. 02 6628 3472

## Acid Sulfate Soils Of The Niger Delta, Nigeria

Worldwide, mangrove vegetation is located on potential acid sulfate soils (PASS). The Niger Delta, which has about one million hectares of mangrove vegetation is not exceptional. Acid sulfate soils (ASS) were first noticed in Nigeria barely six years after independence (Anderson, 1966) i.e. at a time when the nascent country was planning a major revolution in its agricultural, transportation, forestry, industrial and petroleum sectors. By mid 1970, the country has become a world leader in the exportation of agricultural and petroleum products.

Driven by early economic successes, development activities soon spread into the mangrove zone, an area with hitherto benign ASS. Several hectares of mangroves were cleared/dredged to ease marine transportation and to create accesses for resource exploitation, particularly petroleum and timber. This led to the exposure of hitherto anoxic or at best microaerophilic soils/sediments, and therefore triggered a series of oxidation reactions leading to the development of actual acid sulfate soils (AASS) conditions.

Despite the increasing scale of mangrove disturbance and consequential acidification, the environmental impacts have not been quantified nor recognized nationally. Impacts may not be significantly different from that of other countries, particularly Australia, which has similar soil and climatic conditions to the Niger Delta.

In other parts of the world, estuarine acidification has led to mortality of fish/aquatic biota, heavy metal pollution, degradation of water quality, corrosion of engineering structures just to mention a few. These impacts may also be valid for the Niger Delta where depletion of fisheries coincided with the advent of oil exploitation and resultant habitat destruction/modification. It is however clear that acidification has resulted in the killing of several hectares of mangroves (see Figs. 1 and 2) and perhaps associated biota.

There are clear indicators of the presence of both potential and actual ASS in the delta e.g. the presence of straw yellow ochre/jarosite on exposed spoils, acidic pH (<3), and low chloride-sulphate ratios etc.

In order to avert further damage arising from unsustainable use of wetland resources, the author has begun a study on anthropogenic factors affecting the Niger Delta mangroves, which may contribute to estuarine acidification. He is also looking at ways of preventing/minimizing further impacts through management and cost effective use of acid sulfate land.

Contact - Dr Elijah I. Ohimain at [ehimain@erml.net](mailto:ehimain@erml.net)

ERML, Lagos, Nigeria.



Figure 1: Mangrove dieback caused by acidification (aerial view)



Figure 2: Mangrove dieback caused by acidification

## Rafferty Rules

A detailed elevation survey carried out by DLWC for the Rafferty Drainage Management Project has highlighted the opportunity to fill a 3.6 km long drain and replace it with a shallow v-drain that can be maintained by slashing.

Chairman of the Rafferty Drainage, Bill Meehan said, "We thought we were doing the right thing in agreeing to Council deepening the drain in the early 1980's".

"The fact is that we got it wrong - the drain is too deep. I have lost valuable areas of water couch and the drain now collects acid groundwater which drains into the Macleay River".

Bill said, "I am hopeful that funding will be available to turn this area into a model drainage scheme where farmers and fishers can both benefit from the proposed drain redesign"

Landholders are currently finalising a 'Schedule of Works' for inclusion in the final report for submission to funding agencies.

Contact Bill Meehan (6567 4866) or Bob Smith (6628 3472) [bsmith@scu.edu.au](mailto:bsmith@scu.edu.au)



Bill Meehan examines the deep drain he'd like to see filled in and replaced with a shallow v- drain.

## Acid sulfate soils found inland

Evidence of acid sulfate soils had been found in inland Australia. Researcher Dr Robert Fitzpatrick from CSIRO Land and Water has found sulfidic sediments in wetlands in the Adelaide Hills. These ASS have been found in association with salinisation, and erosion.

Dr Richard Bush of DLWC and Assoc. Prof Leigh Sullivan of Southern Cross University, have also found monosulfides in inland areas. This research raises interesting questions about the origin of acid sulfate soils, and could have important implications for inland wetland rehabilitation. See the next issue of Assay (5th International Acid Sulfate Soils conference Issue) for a more detailed article on this fascinating research. For more information, contact Dr Fitzgerald at: CSIRO Land and Water, PBag 2, Glen Osmond, SA, 5064

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