



ASSAY

A NEWSLETTER ABOUT ACID SULFATE SOILS

No 35. July 2003

Help for managing scalds

A brochure explaining acid sulfate soil (ASS) scalds and their management is now available. The booklet is written by Southern Cross University PhD student Mark Rosicky, and contains sections on ASS scald formation, contributing factors, what can be done about ASS scalds, visual indicators of ASS related scalding and revegetation techniques for ASS scalds.

The brochure is designed to translate Mark's PhD on Best Management Practices for the revegetation of ASS scalds, into straightforward language for the general public and landowners who manage backswamp country. Mark will be applying his research to scald rehabilitation as part of an Environmental Services Scheme project on a Tuckean Swamp property.

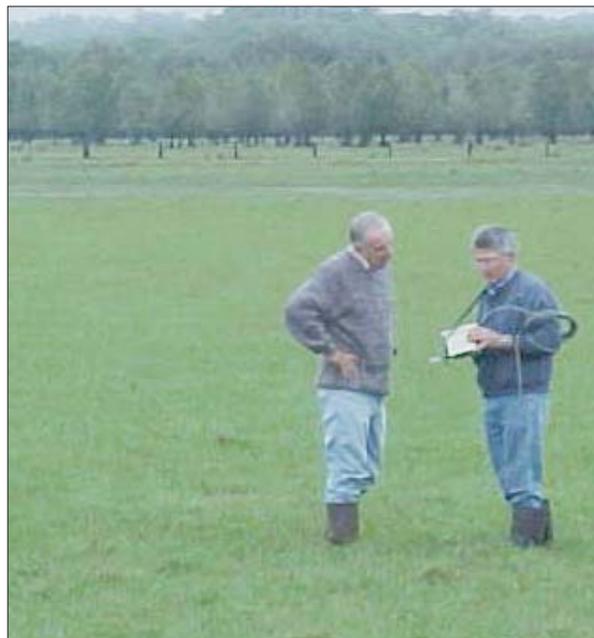
The brochures are available through offices of NSW Agriculture and local councils. Also available are posters and PowerPoint displays. For more information contact Mark Rosicky, 0418 495 714, mrosic10@scu.edu.au

From dust bowl to productive pasture

Russell Yerbury is one farmer who knows a thing or two about managing acid sulfate soil scalds. With assistance from Kempsey Shire Council's Ron Kemsley and Tim Morris, and collaboration with Mark Rosicky and Carol Rose from NSW Agriculture, Russell has made significant inroads into researching and rehabilitating scalded areas on his property. Scalded areas are now look-

ing much healthier, with a thick mat of predominantly water couch (*Paspalum distichum*) thriving in ponded paddocks following good wet season rains.

The scald had been caused by over drainage, acidification and fire removing the peat layers over the soil. Russell's soil was literally blowing away when he purchased the property in the early 1990's. Strategic ponding of fresh water created the environment where water couch (*Paspalum distichum*) recolonised the shallowest (10-15cm) area. This occurred rapidly, presumably from resilient seed stock. Spike rush (*Eleocharis* sp.) colonised deeper areas (15-50 cm).



Water couch has successfully reestablished on previously scalded areas. (Tim Morris)

The installation of a gravel weir on the Seven Oaks drain and the use of weirs and dropboards have allowed Russell to manipulate water levels across scald areas. Russell's subsequent observations, scald research and pasture trials demonstrate the benefits of the thick cover of vegetation. Vegetation is a key factor in reducing surface acidity and reducing the export of acid from these areas under most conditions. Measurements of water quality after substantial rainfall that followed a long dry spell found water pH to remain fairly stable.

With dry conditions in the Macleay this year Russell has been able to make silage from dry water couch areas where equipment could get into paddocks. Water couch is an excellent fodder with feed test results showing easy digestion and high levels of protein and energy.

It is early days for Carol Rose's pasture trials. Aiming to look at growth curves and feed quality of water couch versus couch, the initial water height and pH data has confirmed Russell's previous observations.

For more information on the ponded pasture trials contact Carol Rose at carol.rose@agric.nsw.gov.au

Action in the Macleay

Ron Kemsley's experience with scald remediation in the Macleay River catchment highlights the importance of manipulating water levels in drains and backswamps. Ron is employed by Kempsey Shire Council as Floodplain Manager. With a number of years of trials and effort with local landholders, there are now some promising signs for managing acid sulfate soil issues in the Macleay catchment.

Acid sulfate scalds are one such issue. The use of weirs and dropboards to provide seasonal inundation has shown considerable success across a number of sites. Trials on some sites using mulch and lime showed minimal improvement when compared with rewetting following inundation.

Ron is now fielding requests from more

landholders wanting to replicate the success of trials on McCuddens and Scotts Drain. The sight of cattle grazing knee deep in water couch and silage cut off previously scalded paddocks, is evidence for other graziers of the benefits of the seasonal rewetting of these areas.

'Every major wetland on the Macleay has a remediation project in action' explains Ron. 'There has been a big change in people's attitudes and this is mostly due to having people like myself on the ground, communicating with landholders and demonstrating the benefits of management changes. We still have a lot to learn, and it seems that every day I have another question to answer.'

Ron does stress that success on one site does not automatically translate to another site. 'For scald remediation we need to take into account individual site characteristics, like drainage, site elevation, soil conductivity, soil type, whether any topsoil is left and also how the land is used. Rewetting of these low-lying areas may not always be the best option.'

For background to remediation of acid sulfate soil scalds in the Macleay catchment, see stories in ASSAY 15, 16, and 24.



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Is rewetting the best option ?

In some cases, rewetting of backswamps is not an option, and trial work related to the Clybucca Hotspots project points to stock exclusion as the other main management tool for scald remediation in this catchment. In some cases soil disturbance to create ridges and furrows, and the application of lime and mulch has also shown success.

There are also concerns about the spread of *Melaleuca quinquenervia* (see ASSAY 34) as a result of changes in water levels at some sites.

The common thread to all the scald remediation work is the need to assess each site prior to considering a change in water levels or any other management practice. There is the potential for greater oxidation of acid sulfate soils and increased export of acid into waterways where inappropriate management of water levels is used.

Snow in the Macleay valley?

One of the features of winter on the Lower Macleay floodplain of the NSW mid north coast is the widespread appearance of white salt encrustations on exposed ground. The appearance of salt is associated with a period of high evaporation due to low rainfall, dry westerly winds and occasional frosts. At certain times the concentration of the salt has reached such levels that it has been referred to as Macleay snow.

The salt can also coat plant stems, particularly dead smartweed, up to 30 centimetres from the ground surface, form dense encrustations on exposed paperbark roots and cement cow manure on surface scalds. The salt may be visually interesting but it also indicates the presence of underlying acid sulfate soils. This salt is potentially critical to our understanding of acid environments as it appears to be a storehouse of acid. When 0.2 grams of salt is added to 200 mL of tap water the pH can drop from 7.2 to 4.4 in a matter of seconds.

Ground water within acid sulfate soils contains pyrite oxidation products and metal

ions released from the soil matrix due to its reactions with sulfuric acid. In areas of high evaporation, capillary action draws the acid soil water solution to the surface where the water evaporates, concentrating the sulfates and metal ions in solution, which then crystallise as salts on low lying areas. Further concentration can occur when morning dews dissolve the salts which then recrystallise in the afternoon as the dew evaporates.

Initial chemical analysis of salt specimens identified sulfate as the major component along with the presence of magnesium, aluminium and sodium. Rob Fitzpatrick at CSIRO used powder x-ray diffraction (XRD) to further analyse the salt efflorescences. He identified co-dominant epsomite ($\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$) and tamarugite [$(\text{NaAl}(\text{SO}_4)_2 \cdot 6\text{H}_2\text{O})$], with subdominant hexahydrite ($\text{MgSO}_4 \cdot 6\text{H}_2\text{O}$) as the major salts present together with minor amounts of halite (NaCl) and gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$).

A greater understanding of these salts is required. They are good indicators of the biogeochemical processes operating in acid sulfate soil environments and contribute to acid water runoff events and the expansion of saline acid scalds.

For more information contact Tim Morris at Kempsey Council, tim.morris@kempsey.nsw.gov.au or Rob Fitzpatrick, Rob.Fitzpatrick@csiro.au

River health in NSW

The Healthy Rivers Commission in NSW has recently released the findings of two independent Public Inquiries. *Oysters, - a review of the relationship between healthy oysters and healthy rivers*, and, *North Coast rivers - covering rivers and catchments from Karuah, north to the Tweed*.

To obtain a copy of either report contact the Healthy Rivers Commission on 9231 2977 or 1 800 818 369, or have a look at the website www.hrc.nsw.gov.au

Low soil acidity a surprise

Soil testing from the Moruya district on the NSW south coast has revealed a much lower than expected level of acidity (total actual acidity - TAA) in a soil where the sulfidic layer is about 1.5m deep. Situated at Mullenderee on the northern floodplain of the Moruya River, the site was the scene of an acid sulfate soils workshop held last year (see ASSAY 31).

The maximum TAA level in the profile peaked at only 12 mol H⁺/tonne (in the layer above the jarositic horizon), despite the sub-soil having 0.8% oxidisable sulfur (in a shelly band at a depth of 1.6 - 1.7m). This contrasts with much higher levels elsewhere in the district, near Coila Creek to the south (maximum 55 mol H⁺/tonne) and near Mogo to the north (maximum 51 mol H⁺/tonne). There are no deep drains in the Moruya district, yet acid water problems are still experienced. Much higher TAA levels (over 200 mol H⁺/tonne) were found recently on the Shoalhaven flood plain, an area with a long history of drainage and many floodgates.

The Mullenderee soil also has very high salinity, and was once exposed to flooding by king tides. At the top of the sulfide layer the soil contained 4300 mg/kg chloride and 3600 mg/kg sulfate.

Despite high salinity the soil has been successfully pasture improved. A network of shallow drains (0.3 - 0.5 metre deep) and low mounded areas between has allowed the rain to leach salt out of the upper profile. Some minor iron-staining along the drains is apparent but only in sections of the main collector drain. Most of the minor lateral drains have salt-tolerant species (palatable to livestock) growing along them, flanked on either side by couch on the higher ground. After a few years kikuyu and clover take over from the couch and were seen on nearby mounds constructed some years earlier.

No lime is used, and the topsoil pH at the test profile (now mounted at Eurobodalla Council) is 4.7 (in calcium chloride). The low TAA suggests that the water entering the

shallow drains is likely to be saline but not highly acidic.

For more information contact Roy Lawrie of NSW Agriculture, (02) 4633 8327, or Paula Pollock of Eurobodalla Shire Council, (02) 4474 1037.

Wetland Action workshops

I recently attended a workshop at Yarrahapinni Ecology Centre, one in a series of five wetland management workshops held by Wetland Care Australia along the NSW north coast.

Speakers covered a range of topics from management of fish habitat on-farm to managing backswamps for improved grazing and water quality. Advice on management options and where and how to access assistance, was also provided.

The field days associated with the workshops were the highlight, with passionate presentations about the history of the catchments and the on-ground works currently being undertaken.



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**CONTACT: Enquiries Officer - Kerrie Gray
Phone 02 6626 1103 Fax 02 6626 1133**

Tuckean fire observations

A fire in the Tuckean Swamp on the NSW north coast has raised some issues regarding fire management in areas of acid sulfate soils. Garry Owers, a local landholder, has been observing the fire and the approach used to combat it. The fire started in December of 2002, rekindled following a lightning strike in the Tuckean Nature Reserve, and eventually covered all acid sulfate soil areas containing stands of broad leaved paperbark.

Fire fighting efforts consisted of grading control lines and control burning with approximately 75% of the burnt area resulting from control burning. Grading of control lines resulted in the removal of all organic matter and soil up to a depth of 200 mm, around the entire perimeter. This resulted in the exposure of acid sulfate soils, created a bare eroding surface, encouraged weed invasion and the graded spoil mound effectively changed the surface hydrology by damming and flooding dry paddocks following rainfall.

By comparison, existing tracks and excavator tracks made three months previous, although subject to intense fire remained green and unburnt. Neither surface or ground fires burnt across these lines. The reason may be that compression of the soil by vehicles removes air spaces, forces moisture to the surface and reduces oxidisation. This effect has been observed previously during dry periods when lush green grass appears in wheel tracks. Compression of the soil also provides a firm surface for vehicle use, which is another requirement for control lines. A protocol for wildfire suppression in acid sulfate soils needs to be developed and may include, rapid attack using all available means, minimisation of the burn area and the use of existing control lines with new control lines established using only soil compression.

For more information, contact Garry Owers, (02) 6683 4065 gowers10@dodo.com.au

Macleay wetlands report

The Macleay Wetlands Report produced by the North Coast Environment Council is now available on CD-ROM.

For more information, contact Terry Parkinson on (02) 6569 0771.

Wetland funding opportunities in NSW

If you own or manage wetland areas on your property, you may be interested in finding out what opportunities exist for funding the protection, regeneration or management of these areas. The following programs are current, though closing dates may vary, and some may have already closed for this year. Funding ranges from \$500 to \$30,000 per project

State Wetlands Action Group

www.dlwc.nsw.gov/care/wetlands/swac

Freshwater Fish Habitat Grant

www.fisheries.nsw.gov.au

Envirofund 1800 065 823

Threatened Species Grants 1800 032 551

Mitre 10 Junior Landcare 1800 151 105

Bunyip Swamp plan

NSW Agriculture has contracted Wetland Care Australia to produce a plan of management for the Bunyip Swamp wetland on the Grafton Agricultural Research Station. Funded by an Environmental Trust grant, Wetland Care Australia will examine hydrology, vegetation and management issues of the wetland.

'From this management plan we will receive recommendations that will mesh into the environmental management system (EMS) being developed for this station' says station manager, Phil Armstrong. 'We are looking at all the environmental issues on the property and striving to continually improve our management. The wetland plan is part of this process and will build upon one produced in the 1970's.'

FFFX - wetland restoration

A new project is underway, working with sugar cane, grazing and tea tree farmers from the Clarence, Richmond and Macleay catchments of the NSW north coast. Wetland Care Australia is offering assistance to farming communities to reduce acid drainage whilst restoring areas of wetlands. Wetland rehabilitation is to be promoted as a key management tool for reducing acid drainage to estuaries.

Landholders will be provided with advice, technical support, examples of rehabilitation work sites and favourable publicity. The ultimate aim of the project is to see the redesign of existing drainage schemes, rehabilitation of marginal agricultural land to wetlands, establishment of riparian vegetation along drains and wetlands, and the installation of water control structures to control 'first flush' runoff containing pollutants.

For more information contact Cassie Burns, (02) 6681 6169
cassieburns@wetlandcare.com.au

Constructed wetlands for improved water quality

With a great majority of coastal floodplain areas once covered by wetlands and substantial areas now occupied by agriculture, it is no surprise to see farmers constructing or enhancing wetlands on their properties to recreate some of the natural features that they provide.

North Queensland cane farmer Ross Digman is somewhat of a pioneer in the construction of wetlands on the Tully floodplain in north Queensland. Investing his own money in wetlands on neighbouring properties as well as his own, he has been motivated by a desire to improve aquatic habitat. A keen fisherman, Ross has seen the decline in fish habitat in his catchment. The three wetland lagoons on Ross's farm are on the main drainage line, and consequently all run-off from his farm is filtered to some degree.

This helps reduce the sediment load from stormwater, and protects existing wetland areas from silting up. His property has benefited from the addition of the excavated soil to paddocks raising their level, allowing existing drains to be filled and headlands eliminated.

From an acid sulfate soil management viewpoint these activities would be regarded as at least controversial. Although Ross's property lies outside areas of known acid sulfate soil, precautions are taken. 'Before we start excavating' explains Ross, 'we take core samples to the full depth of the proposed lagoon, and the samples are tested before approval is given to commence works. Water quality in the created lagoons compares more than favourably with natural lagoons in the area.'

In cooperation with Alf Hogan from Queensland Fisheries, Ross has surveyed fish stocks in lagoons using an electro-fishing method. A total of 28 native species have been recorded in the constructed lagoons on Ross's and neighbours' properties.

Some of Ross's recommendations for the lagoons on the Murray-Tully floodplain include:

- aim for a minimum depth of 2.5 metres in the driest possible years.
- Aim for a minimum width of 35 metres.
- If incorporating an island, bear in mind the fact that the distance from the island to the lagoon bank should be sufficient to prevent over-growth by grasses.

International recognition for Estelle's research

Murwillumbah school student Estelle Weber achieved two prizes at the International Young Scientist Fair in the United States. She won first prize in the Soils and Agronomy category and second prize in the Environmental Science category.

Estelle represented Australia competing against 62 other countries, after receiving the Australian Young Scientist of the Year (2002) Award (see ASSAY 33).

Demonstrated improvements in the Tweed Valley

The ongoing work by the sugar industry, researchers and landholders in the Tweed River catchment of NSW appears to be paying off. Research has given land managers an understanding of the dynamics of acid sulphate soil and how these soils discharge acidity and metals into the waterways. This understanding has assisted the land managers in their efforts to modify their farming practices using best management practices for acid sulphate soils.

There is now a strong belief that these practices have made a significant difference to the amount of acidity being discharged from these landscapes.

The Tweed Valley has just finished one of the longest dry periods on record, broken in February-March this year with over 750mm of rain. If historical records are correct, this should have caused one of the largest discharges of acidity ever experienced in the Tweed Valley, with the resulting fish kills that are associated with these acid events. Fortunately this has not occurred.

When ASS research first began in the Tweed in the early 1990s the pH levels in McLeod's Creek were measured at levels as low as 2.6 with an occasional spike going as high as 5.6. During the 2 most recent years of continuous monitoring pH levels have been maintained in the range from 6-8pH with the occasional spike going below 5.6pH on only 2 occasions for a few days before the system recovered to above the 5.6pH line.

The containment of acidity in such a landscape is a world first. This has only been possible through the innovations in land management developed by science and agriculture working together. The results have seen the reduction of acid and acid products discharged (aluminium and iron) by 80% and an increase in productivity of 20-30%.

Acid discharges and low pressure systems?

Tweed River cane farmer, Robert Quirk, has a theory and would like to get some feedback from anyone interested in the timing of acid discharges into waterways. Do strong low pressure systems affect the way groundwater, and consequently acid, moves into waterways? Well according to Robert, there does seem to be evidence to support this theory.

- Land managers have observed drains that have been dry for weeks make water under low pressure events.
- The length of time it takes to pump out a farm after a rain event can vary from one to two days depending on the influence of a low or high pressure system.
- Fluctuations of between 100 and 200mm in water tables have been measured at McLeod's Creek. Similar unexplained fluctuations have been measured in the wheat growing areas of South Australia during dry periods.
- Following the 1954 flood (an extreme low pressure event) there was a clarification of the river which lasted for some months.
- Earlier this year the drought (longest in recorded history) ended with rainfall of over 750mm. The rainfall fell under the influence of high pressure systems and consequently there was very little acid discharged into the water ways and no major fish kills. This may also go part the way to explaining why all major fish kills in the Tweed have occurred after more than one peak in the flood (in 1987 there were 3 peaks) or perhaps it is more than one low pressure system moving across the valley causing the peaks ?

If indeed this relationship is proven correct then it could be invaluable to the oyster industry providing growers with a warning and the ability to move at least part of their crop.

For more information contact Robert Quirk on 6677 7227 or rgquirk@bigpond.com

News from Queensland

Progress on the Gold Coast

Stage one for rehabilitation works of the Kerkins Levee on the Pimpana River have been approved. These works involve the construction of a new levee upstream of the existing levee and include the installation of new flood flaps on Kerkins drain. These works have been delayed due to recent wet weather and are scheduled to commence in June 2003 weather permitting.

Stage two works are under design and require a lot of new approvals to be in place before works can begin. Stage two works will involve the removal of the old levee and associated flood gates, restoration of the upstream acid sulfate soil areas, reflooding the area with tidal waters and water quality monitoring. Funds for stage two works have been requested in Council's 2003/04 budget.

For more information contact Mark Ash, Gold Coast City Council, MASH@goldcoast.qld.gov.au

QASSIT update

The group of QASSITeers at the Department of Natural Resources and Mines, Indooroopilly has undergone some changes recently, and achieved a lot!

Earl Barry and Kylie Hey have left the green pastures of QASSIT-Earl is now teaching English in Japan, while Kylie is still with NR&M, but is now involved in training vegetation management officers. Phil Johnston has gone back to university to study teaching, but still pops in one day a week to help with assessing development applications for south-east Queensland. Since submitting his PhD, Angus McElnea has become a QASSITeer and is helping to write the 2003 Laboratory Methods Guidelines (see below).

For more information about QASSIT and activities in Queensland, please contact Kristie Watling, (07) 3896 9229, Email kristie.watling@nrm.qld.gov.au

2003 Lab methods guidelines

The 2003 Laboratory Methods Guidelines are currently being developed in a collaborative effort between the Queensland Acid Sulfate Soils Management Advisory Committee (QASSMAC) and the NSW Acid Sulfate Soils Management Advisory Committee (ASSMAC), with input from other states. The Queensland Acid Sulfate Soils Investigation Team (QASSIT) is coordinating the development of the guidelines. By adopting this coordinated approach, this will ensure a standard suite of laboratory methods to analyse acid sulfate soils that can be used across Australia. The National Committee on Acid Sulfate Soils (NatCASS) also endorses this combined approach to produce one guideline for all of Australia.

A small Editorial Committee (including Leigh Sullivan (Southern Cross University), Col Ahern and Angus McElnea (QASSIT)) is currently writing the guidelines. A larger Technical Committee is currently being established to provide comment on the guidelines.

The 2003 Laboratory Methods Guidelines chapter will include revised procedures for measuring actual acidity, estimating retained acidity (or 'less available' acidity) and measuring monosulfides (or 'acid volatile sulfides') in wet sediments will be included.

If you would like to be part of the Technical Committee, or if you are interested in being kept informed about the development of the guidelines, please contact Kristie Watling, (07) 3896 9229, Email kristie.watling@nrm.qld.gov.au

Sample exchange program

It is envisaged that a sample exchange program for laboratories will be implemented in the near future. QASSIT will be coordinating the sample exchange program. Laboratories interested in taking part in the program should contact Kristie Watling, QASSIT, (07) 3896 9229, kristie.watling@nrm.qld.gov.au

Managing ASS along the coast

The statewide acid sulfate soil scoping study is also progressing well. The aim of this project is to capture the status of ASS knowledge and existing hazard for the entire Queensland coastline (given that the coastline is approximately 9500 km, this is quite a tall ask!). This information is being collected on a local authority basis; to assist local authorities fulfil their objectives under the State Planning Policy 2/02. The 5 m and 20 m contour lines for each shire are the key information required. A continuous 5 m contour is now available from the Gold Coast to Gladstone. This information is unfortunately not available statewide, so in these areas, interpretation of geological mapping and previous soil mapping is being used to indicate ASS hazard.

In other news, development of the Queensland Acid Sulfate Soil Technical Manual is progressing, some QASSIT members have recently spent time in Normanton-Kurumba (Gulf of Carpentaria) conducting acid sulfate soil drilling and presentations at a local government engineers workshop, further work with the Lyngbya task group is continuing and an international student Jean-Vincent Canivet has just completed a 4-month study at the East Trinity site.

Soil management guidelines commended

The Soil Management Guidelines were released in November 2002 as a result of a collaborative project supported by the Natural Heritage Trust. The guidelines document best practice environmental management in relation to acid sulfate soils. Since release in November 2002, the Soil Management Guidelines have already attracted praise from many, including Dr Rob Fitzpatrick of CSIRO Land & Water.

The Soil Management Guidelines are freely available at www.nrm.qld.gov.au/land/ass - just click on 'Publications and Products'.

East Trinity site

The East Trinity project is progressing very well, and at 16:15 on 19th February 2003, floodgate 4 on Hills Creek was raised-effectively commencing controlled tidal exchange in Hills Creek. The highly acidic water (pH 3) that has flowed from the Hills Creek peat swamp since February was brought under control in May (pH 5) using controlled daily tidal exchange augmented with a concerted hydrated lime treatment regime. The degree to which higher pH drainage water is maintained during future wet periods will demonstrate whether the May improvements are sustainable.

Looking for a challenging PhD with tropical scenery?

If this is you, then feel wanted! An opportunity exists for a PhD through James Cook University, Cairns in conjunction with The Departments of Natural Resources and Mines, and Primary Industries (Fisheries). The proposed PhD is titled 'Dispersal, bioavailability, Impact and retention of contaminants at the East Trinity site'.

For more information, please contact Bernd Lottemoser, (07) 4042 1137
Bernd.Lottemoser@jcu.edu.au

NSW Floodgate workshop

The Proceedings of the NSW Fisheries Floodgate Design & Modification Workshop held in August 2002 are now available online: http://www.fisheries.nsw.gov.au/conservation/aquahab/home_aquatic_habitats.htm

Clarence floodplain project

The latest Clarence Floodplain Project newsletter is well worth reading. There are interesting reviews of floodgate opening devices, and fish flaps in Swan Creek.

Go to www.crcc.nsw.gov.au/cfp.htm or contact Jeremy Challacombe on (02) 6642 3277

South Australian acid sulfate soil atlas

The completion of this Coastal Acid Sulfate Soil Program-funded work makes important resources available to natural resource managers at scales appropriate to their decision-making requirements:

- an inventory of acid sulfate soil risk in maps covering the entire SA coastline,
- a world wide web accessible database and map, and
- a set of acid sulfate soil planning policies at state and local government level

The assessment of likely acid sulfate soil distribution is based on detailed landform and vegetation mapping of 65 saltmarsh habitats (viewable as part of the web-based South Australia Atlas: <http://www.atlas.sa.gov.au/>

- go to Statewide/Natural Environments/Intertidal-Marine).

The following reports were produced:

- Review of Australian state acid sulfate soil planning approaches,
- Strategy for implementing policies on coastal acid sulfate soils in South Australia,
- Development guidelines and risk assessment criteria for coastal acid sulfate soils in South Australia, and
- Checklist for development in coastal acid sulfate soils in South Australia.

Planning SA is using this information as a basis for a whole of government policy approach.

A 12-page colour bulletin (January 2003 edition of Coastline: No 33), titled "A strategy for Implementing CPB Policies on Coastal Acid Sulfate Soils in South Australia", is available through the website

www.environment.sa.gov.au and the final and progress reports are available at: <http://www.clw.csiro.au/staff/FitzpatrickR/publications.html>

For more information, contact Richard Merry, (08) 8303 8422,

Richard.Merry@csiro.au

Assessing wetlands now easier

Assessing the health of wetlands on the north coast of New South Wales has become easier with the publication of wetland assessment manuals. The guides' author, Keith Bolton from Southern Cross University, says 'the guides are aimed at providing a scientific basis to assessing the health of a wetland, yet able to be used by school students'.

The guides are being presented to land management facilitators and landholders using hands-on workshops. Assessment includes looking at the general health of the vegetation and habitat, the diversity of plants and sampling the soil for indicators like peat layers and acid sulfate soils. Instructions are clearly set out in the guides, which are available for paperbark and fresh water wetlands.

For more information about the North Coast Wetlands assessment technique guides, contact Nik Davies, (02) 6620 3041, daviesn@scu.edu.au

ASSAY available via Email

This edition of ASSAY is the first to be provided in an Email format. If you would prefer to receive ASSAY this way instead of by post, please send an Email to christina.clay@agric.nsw.gov.au with 'Email ASSAY' text in the subject line.