ASSAY

A NEWSLETTER ABOUT ACID SULPHATE SOILS

No.9 March 1996

This issue of ASSAY includes a brochure announcing the second national conference on acid sulfate soils (2NCASS for short) at Coffs Harbour on 5-6 September. This is a week earlier than originally announced, but the date and venue are now finalised. The conference theme is ASS management and we would like to see everyone interested or involved in this issue at the conference. Australia is very active in environmental management of these soils but there is still a lot to be learned. To those readers receiving ASSAY for the first time, welcome. If you would like to receive future or past issues, subscription details are on page 4.

National ASS group

A national acid sulfate soils working group has been formed to develop a national strategy on ASS for the Standing Committee on Agriculture and Resource Management (SCARM). The group meets for the first time on 26 April in Brisbane.

Group members are John Williams, NSW Agriculture, and Bernie Powell, Queensland Dept of Natural Resources (both representing SCARM); John Finnigan, CSIRO, and John Gilmour, Qld Dept of Environment (representing the Australian and NZ Environment Conservation Council); Duncan Leadbitter, Oceanwatch (Australian Seafood Industry Council); Jeff Champion, farmer (National Farmers Federation); Rob Williams, NSW Fisheries (Ministerial Council on Forestry, Fisheries and Aquaculture); and Ian White, who will be the group's technical advisor.

Minister's visit

NSW Agriculture Minister Richard Amery visited the Richmond and Tweed catchments as the guest of the Richmond-Tweed ASS Local Action Committee on 22 February. Mr Amery visited Cudgen Lake, Tanglewood and McLeods Creek on the Tweed, and the Tuckean swamp in the Richmond. His visit followed that of the NSW Fisheries Minister, Bob Martin, to Wollongbar on 14 February to announce the link between acid sulfate soils and red spot disease in fish (see article next page).

Tea tree guidelines

Guidelines for the management of ASS in tea tree plantations were released in February. Chairman of the Australian Tea Tree Industry Association Bill McGilvray launched the guidelines together with ASSMAC chairman John Williams, and EPA acting regional manager Graeme Budd at an information morning at Bungawalbyn, near Lismore. The four page guidelines have been designed to be photocopied and distributed widely. For copies of the guidelines, ring ATTIA on 066 212 221, fax 066 222 282.

Local action guidelines

ASSMAC chairman John Williams has prepared guidelines for operation of local action committees for improved management of acid sulfate soils. The guidelines are designed to encourage formation of local committees to help manage acid sulfate soils in each catchment. To obtain a copy contact John Williams on 066 261 340, fax 066 281 744.

Analytical guidelines

Guidelines for ASS laboratory and field analytical methods and interpretation are currently in preparation for publication next month. The guidelines will come as hole-punched A4 sheets and will include a data card to return in case of updates. ASS information officer Rebecca Lines-Kelly will send out copies on request.

RTA guidelines

The Roads and Traffic Authority (RTA) has released its guidelines for the management of ASS. The guidelines provide detailed procedures for effective management of ASS. They cost $20 and are available from RTA's Environment Community Impact branch. Contact Marta Cassidy 02 218 6252 fax 02 218 6970.

ASS colour booklet

A 24 page colour booklet explaining acid sulfate soils to the general community is now available. The booklet is the initiative of ASSMAC member Duncan Leadbitter of Oceanwatch who obtained funding from the Department of the Environment, Sport and Territories' Commonwealth Coastal Action Program. The booklet is written by Jes Sammut and Rebecca Lines-Kelly. Copies are available from Rebecca Lines-Kelly.

Wet and dry PASS analysis

Queensland Dept of Natural Resources soil scientist Col Ahern has compared analysis of wet and dry potential acid sulfate soils to see whether drying the soil samples affects pyrite levels. Dry soil samples are more convenient for laboratories to use, but there has been concern that oven drying will oxidise the iron sulfide or pyrite in the soil. Col and his team of Angus McElnea and Dennis Baker have found that quick drying at a high temperature to kill the

bacteria is an effective method of preparing samples for analysis, and does not affect the pyrite levels significantly. Col will deliver a paper on his findings at the Australian and New Zealand National Soils Conference in Melbourne, 1-4 July 1996. Ring him on 07 3896 9510 for a copy of the paper.

EUS study completed

The ACIAR-funded study into epizootic ulcerative syndrome (EUS), also known as red spot disease, has been successfully completed. Led by Dick Callinan from NSW Fisheries, the study involved collaborative research with Jes Sammut (UNSW) and Graeme Fraser (NSW Agriculture) together with Mike Melville (UNSW), Ian White (CSIRO), Ian Willett (ACIAR) and B. Cribb.

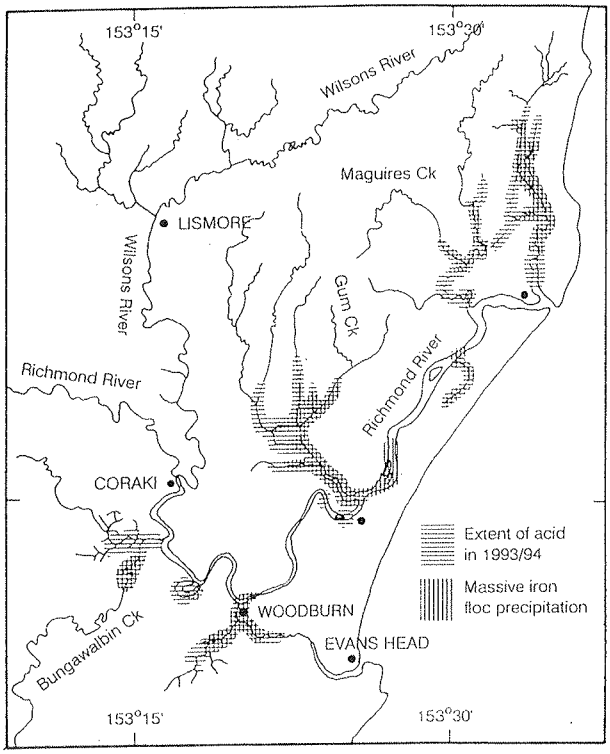
The study began in 1993 to test the hypothesis that acid-induced skin damage in fish increased susceptibility to EUS. Detailed soil, water quality and fish pathology studies have shown that exposure to acidified water increases the susceptibility of estuarine fish to infection by the *Aphanomyces* fungus that causes ulceration in fish. The principal mechanism of ulceration is fungal invasion of skin damaged by the acid and aluminium. This was also demonstrated experimentally by Jes and Dick.

The work also showed that acid/aluminium induced gill damage was the main cause of fish kills during acid events. At most monitored kills in 1993 and 1994 oxygen levels were not lethal to fish. Aluminium toxicity was Ph dependent and controlled by the species of aluminium present. However, at pH <3.4 hydronium alone could cause gill and skin damage in fish (hydronium is the type of acid formed). Lethal degenerative changes in fish gills could occur from less than 10 minutes exposure to pH3 to 3.4, depending on aluminium concentration. Other factors, such as iron and hydrogen sulfide, were also suggested to play a role in fish health decline. Dick, Jes and Graeme stress, however, that acidification is not the only trigger for EUS outbreaks. There may be other causes of skin damage in fish or changes to fungal density which may initiate the disease. Similarly, not all fish kills are caused by acid. The Philippine, Indonesian and Indian components of the ACIAR-funded study will be completed later this year.

The project generated other outcomes, including:

- development of a fungal count method
- descriptions of the processes of estuarine acidification
- recognition of the magnitude of acid in the lower Richmond River
- data on the spatial and temporal character of acid events in Tuckean
- water chemistry of acid sulfate soil drainage waters
- mapping of acid and iron precipitation events on the lower Richmond River
- estimates of acid, aluminium and iron loads in drainage waters
- an inventory of acid-tolerant waterplants
- identification of stratification problems in drains and tidal waters
- identification of appropriate water quality methods for sulfide/sulfate affected waters
- identification of impacts on frog reproduction
- identification of habitat degradation issues
- identification of acid barriers to fish migration and recruitment
- ultrastructural descriptions of fish skin and gills

Papers from this study have been previously listed in ASSAY and several more detailed studies are in press.



Above: The lower Richmond River showing the minimum extent of acid and iron floc precipitation in 1993 and 1994 mapped by Sammut, White and Melville (in press). Note that over 100km of small drains and creeks that were also affected are not shown.

Cudgen Lake restoration

Several community groups have joined together to restore Cudgen Lake near Kingscliff as a prawn, oyster and fish habitat. Lake waters have been acidified by acid drainage from disturbed ASS in the lake's catchment area. Richmond-Tweed ASS Local Action Committee (RTASSLAC) has proposed that the lake be restored over four years as a community project. The project is supported by Tweed Shire Council, Tweed TCM Committee, Tweed Estuarine Management Advisory Committee, the Clean-up Australia campaign and ASSMAC. More information about the project is available from Don Buckley, Director, environment and community services at Tweed Shire Council, 066 720 430, fax 066 720 429.

Survey results

Thank you to the 80 plus people who answered the survey in the December issue of ASSAY. You represent an 8% response which I am told is not bad for a survey! Respondents included government agencies (35%), consultants (24%), local government (19%), farmers (7.5%), fishermen (4%) and assorted others. Generally,

demand is for practical, hands-on information about ASS, and help in assessing the ASS risk for planning purposes. The five most popular survey topics are:

- recognising ASS in the landscape
- recognising and treating acid water
- assessing environmental impact statements on ASS
- treating ASS with lime
- assessing development applications for ASS land

Most respondents want information as printed material, so we are currently preparing a range of leaflets.

ASS advisory workshop

More than 30 farm advisory officers, including NSW Agriculture agronomists, NSW Sugar Milling Co-operative agronomists and extension officers, and Land and Water Conservation officers attended an advisory workshop in the Macleay catchment in February.

The workshop was organised by ASS information officer Rebecca Lines-Kelly, ASS resource officer Stuart Naylor and EPA programs officer Bruce Blunden to look at broadacre ASS management techniques for farmers. There is little known about this subject, so discussion and networking were the order of the day.

At the first site participants looked at soil pits to see what the iron sulfide or PASS layer looked like *in situ*. Salinity officer Fiona Macdonald from Deniliquin showed how to put in a test well to measure the watertable. At the second site landowner Russell Yerbury showed his ponded pastures, previously an ASS scald, and NSW irrigation officers Gary Creighton and Graeme Robertson spoke on drainage design to prevent oxidation of potential ASS.

At the third site Charlie and Colin Ball showed participants through their swamp pastures which they use for grazing in wet and dry times. The family has owned the land for the past 130 years and have accepted that swamp soils are better wet than dry. They refused to allow flood mitigation drains on their land and keep the water table high by installing earth weirs along their natural drainage line. They have also introduced a simple board weir to pond a scalded patch on land they bought. NSW Agriculture research agronomist Terry Launders spoke on pastures suitable for wetland grazing.

Several draft information packages were prepared for the workshop and are currently being amended for publication in April. The information includes:

- Pastures and crop management on acid sulfate soils (Terry Launders)
- Draining coastal pastures (information sheet)
- Treating acid water (information sheet)
- Using lime to neutralise acid sulfate soils (information sheet)
- Drainage of land in potential acid sulfate soil areas (Gary Creighton and Graeme Robertson)
- Monitoring watertables on acid sulfate soils (Fiona Macdonald)
- The Macleay River floodplain, land use and acid sulfate soils (Stuart Naylor)

Contact Rebecca Lines-Kelly to obtain copies of these documents.

Wet pastures

One possible technique for broadacre management of low-lying PASS land is encouragement of pastures which will survive in waterlogged areas. Native swamp pasture species identified at the Macleay field day are *Paspalum distichum* (saltwater couch) and *Pseudoraphis paradoxa* (slender mudgrass). Analysis of the *Paspalum* gave a crude protein level of 19.6%, digestible dry matter of 70.5% and metabolisable energy of 10.6MJ/kg, which make it a very high value grazing pasture.

A recent field day near Sackville on the Hawkesbury River showed a productive pasture of maku lotus and fescue growing on low-lying alluvial soil overlying PASS. The soil was acid and high in aluminium, and previous attempts to grow other pasture species had been unsuccessful. For more information, contact NSW Agriculture agronomist Hugh Allan 045 770 629 fax 045 770 650.

Drain liming trials

Research by CSIRO and the University of New South Wales on McLeods Creek, Tweed River, has shown that many acid outflow events are generated close to drains. This suggests that treatment of drains may be an effective means of controlling acid outflow. As a preliminary trial, cane farmer Robert Hawken limed a drain, leaving two others unlimed as controls. After 18 months, water in the limed drain has a pH of 5.5 compared with 3.5 in the unlimed drain.

Because of the high cost of lime to farmers, researchers Ian White and Mike Melville now want to determine whether liming drains is effective in all situations, and will start a full trial in August.

The Tweed River Management Plan Advisory Committee will provide $80,000 for the trial, along with another $40,000 to dredge the sand spits at each end of Stotts Island. The committee hopes that removal of the spits will provide better tidal exchange in the river and dilute acid water from drains. The committee's money comes from Tweed River dredging royalties.

Lower Manning field day

Thirty landholders attended a field day on acid sulfate soils at Coopernook on the Lansdowne River near Taree on 7 March. The field day followed a meeting at which farmers expressed concern about the Greater Taree City Council's LEP requiring development applications for any drainage works, including drain clearing. Each application costs $100 and the landowners, many of them beef graziers, say they cannot afford this. At the field day, organised by NSW Agriculture agronomist Dave McCoy, DLWC soil surveyors Stuart Naylor and Trevor Flewin spoke about the formation of ASS, their effect on the environment and how they were mapped in the Manning catchment. The landowners then moved to a nearby paddock to watch a hole being augured in low-lying soil; they saw 30cm of alluvial topsoil, followed by 50cm of recently re-wet previously oxidised pyrite, followed by unoxidised pyrite. The landowners plan to negotiate with council over the LEP requirements.

Urban land management course

Acid sulfate soils are on the agenda at a training course on land management for urban development in Brisbane in April. Run by the Queensland branch of the Australian Society of Soil Science Inc, the three day course is aimed at urban planners, surveyors, developers, government policy makers, consultants, agricultural and environmental scientists, geographers and resource managers. For more information, contact Bernie Powell 07 3896 9398 or Graham Price 07 3867 2530.

Landcare award

Shoalhaven Starches P/L, a subsidiary of the Manildra Group, received a special commendation award in the business category of the NSW Landcare awards last year for their achievements in ASS management and rehabilitation. To reduce the damaging effect of ASS on aquatic life and improve water quality, Shoalhaven Starches commissioned a complete re-design of the drainage and irrigation system on their 1000 ha property near Nowra. Guided by a comprehensive program of soil inspections, they are filling in their deep drains and replacing them with shallow drains above the PASS layer. The aim is to reduce waterlogging in the rootzone, but stop the PASS layer drying out.

Shoalhaven research

Several students at the University of Wollongong are researching aspects of ASS in the Shoalhaven catchment to compile baseline ground and drainage water quality monitoring. Theses completed so far are:

ScottChapman, B.Eng. (1994) *Development of a strategy for the management of acid sulfate soils in Berry NSW*

Bart Sbeghen, M.Env. Science (hons) (1995) *Acid sulfate soils in Berry region, NSW: baseline studies and preliminary assessment of management options*

Scott Sharman, B. Env. Sci. (hons) (1995) *A study of acid sulfate soils found on agricultural land on the Broughton Creek floodplain, Berry NSW*

Joe Sullivan, B.Eng. (1995) *Development of an optimisation strategy for the management of acid sulfate soils in the Illawarra*

A thesis currently underway is continuing baseline monitoring and looking at technical and legal issues associated with construction of weirs in flood mitigation drains.

The Shoalhaven ASS group is seeking funding through the flood plain flood mitigation program for a PhD project on the effects of weirs in drains, and also hopes to look at floodgate modification.

Martin Blumenthal, NSW Agriculture research agronomist at Berry, is supervising a student's laboratory study on the effect of rising acid groundwater on pasture health, and NSW Agriculture soil scientist Roy Lawrie is supervising a student sampling floodplain soils. For more information on any of these projects, contact Andrew Nethery at EPA Wollongong on 042 268 100.

Masters candidate wanted

Queensland Dept of Natural Resources invites applications from honours students to take up a Masters degree by research. The successful candidate will be part of a project funded by the National Landcare Program called 'Risk mapping acid sulfate soils in SE Queensland'. Focus of the research will be pedology, soil geomorphology and developing techniques for defining acid sulfate soils, comparing sampling strategies and developing a field identification model. For more details, please contact Robin Thwaites on 07 3365 1689, email r.thwaites@mailbox.uq.oz.au, fax 07 3365 2965.

Ian White to ANU

ASS researcher Ian White leaves CSIRO on 1 July to take up the Jack Beale Chair of Water Resources in the Centre for Resource and Environmental Studies, Institute of Advanced Studies, Australian National University. The Centre uses both physical and social sciences to solve problems in managing the environment and is an ideal base for continuing research in ASS.

ASS on the internet

You can now exchange information about acid sulfate soils via the Landcare discussion group established on the internet. The discussion group is a joint venture between Primary Industries SA and the Co-operative Research Centre for Soil and Land Management. It is open to all interested people to discuss all aspects of land systems in southern Australia with a major focus on landcare and related issues. If discussion on ASS threatens to take over the group we will investigate starting a separate group. To subscribe, send a message to

landcare-request@waite.adelaide.edu.au

In the body of the text write

subscribe *your email address*

You will receive a reply from the group after which you can send messages to the following address:

landcare-list@waite.adelaide.edu.au

ASSAY will be sent out through this discussion group.

New ASS publications

Lin, C., Melville, M.D., White, I. & Hsu, Y.P. (1996)
Comparison of three methods for estimation of reduced sulphur content in estuarine sediments
Science of the Total Environment (in press)

Sammut, J., White, I. & Melville, M.D. (1996)
Acidification of an estuarine tributary in eastern Australia due to drainage of ASS
Marine and Freshwater Research (in press)

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Editor: Rebecca Lines-Kelly
acid sulfate soils information officer
Phone: 066 261 319
Fax 066 285 925
email: lineskr@agric.nsw.gov.au
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