



# ASSAY

A NEWSLETTER ABOUT ACID SULPHATE SOILS

No 17. March 1998

## NSW Agriculture Minister inspects ASS projects.

The NSW Minister for Agriculture, Land and Water Conservation, Richard Amery, visited the Tweed Valley on March 20 to present letters of merit to cane farmers Robert Hawken and Robert Quirk. The two farmers were honoured for their work in developing laser-levelling minimum tillage techniques and lime applications to improve water pH in farm drains.

Mr Amery paid tribute to the farmers for pioneering practical methods for effectively managing acid sulfate soil on sugarcane farms to benefit the environment and farm productivity.

Cane farmers, Robert Quirk and Robert Hawken have developed laser-levelling, minimum tillage techniques and lime applications to improve water pH in farm drains.

"As well as developing a working model which has been of interest to Australian and overseas scientists, you have also worked hard to educate and encourage other farmers in trialing and adopting new technologies," Mr Amery said.

Mr Amery also presented a \$12,000 cheque to Tweed Shire Mayor, Max Boyd for the Cudgen

Catchment Committee. A further \$18,000 will be given to the committee next year as part of a NSW Acid Soil Action Program. The two-year trial of lime and mulch rehabilitate areas near Cudgen Lake.

## Acid Soil Action project funding

Submissions for the next round of ASSMAC projects for the NSW Government's Acid Soil Action program close on May 31, 1998.

A preliminary application form will be available from April 17 from the ASA Coordinator Greg Fenton. ASSMAC Chairperson, John Williams, said that a total of 21 projects for ASS rehabilitation, research and education were funded in 1997/98.

The NSW Government has allocated \$2.1 million over three years for the acid sulfate soil component of its Acid Soil Action program. Funded projects include such things as a trail on a tea tree plantation to measure transpiration rates on watertables, a study of drain drop board structures, education workshops for oyster growers, excavator operators, council and government agency staff; council for on-grounds works, acid scald treatments and development of ASS management plans. The



NSW Agriculture Minister, Mr Amery presents letters of appreciation to Tweed cane farmers Robert Quirk and Robert Hawken.

program also paid for updating of all of NSW's ASS risk maps.

This year special emphasis will be placed on funding rehabilitation projects. For advice on how to prepare a project please telephone Greg Fenton. Application forms will be available on electronic or printed format. Telephone (02) 69381906 or email: [greg.fenton@agric.nsw.gov.nsw](mailto:greg.fenton@agric.nsw.gov.nsw).

### **Port Stephens acid test**

ASSMAC Technical Committee chairperson Ian White has visited Anna Bay with Port Stephens Council to design a study which will assess the impact of acid leachate flowing from drains in Anna Bay.

The NSW Government has allocated \$17,800 towards the project through its Acid Soil Action program. The Department of Land and Water Conservation, NSW Fisheries and the University of NSW recently surveyed the acid levels in the drainage system. "We now need to quantify the impact of ASS leachate on tidal areas which support fishing and oyster production," Ian says.

Woodwood Clyde Pty Ltd is mapping Anna Bay as part of a council flood study. For further information telephone Council's David Bonjer on 02 498 00251.

### **Excavator workshops**

More than 20 drainage excavators who do drain maintenance work on cane farms in the Tweed valley and in the Clarence valley recently attended workshops to learn best management techniques for drain maintenance.

Workshops covered ASS field identification, lime use, drain clearing techniques, legal responsibilities, and excavator bucket design.

Clarence River Country Council engineer Kate Browning said the workshop helped her to better understand how to protect water quality by minimising the amount of material removed from drains during weed clearing.

After a similar excavator workshop in Port Macquarie, David Pensinni from Hastings Council said he has had numerous calls from landowners requesting information on ASS. "Following the workshop the excavator operators have been explaining ASS issues to landowners when called on site, and they will not do any drainage or exca-

vation work without council consent," he said. The workshops have been coordinated by ASS information Officer Jon Woodworth with assistance from the cane industry and local councils. The information officer is funded by the Federal Government's Natural Heritage Trust

### **ASS New Faces**

- Scott Henderson has started work in a newly created position based with NSW Agriculture at Kempsey as the ASS Project Officer for mid north coast catchments.

Scott's two-year position is funded under the NSW Government's Acid Soil Action program. He will answer technical enquires and help coordinate an inter-departmental team to address priority ASS issues in mid north coast region. A graduate of Southern Cross University's Coastal Management School, Scott, worked on the Tuckean swamp project as part of his degree.

- A Department of Land and Water Conservation (DLWC) soil surveyor, Mitch Tulau has been appointed to a Federal Government Natural Heritage Trust funded position as the Strategic ASS Planner for the North coast.

He will identify priority areas requiring rehabilitation, as well as undertaking ASS surveys, investigations and analysis. DLWC's Glen Atkinson says that Mitch will make sure that ASS issues are integrated in new policies such as the Water Reform. The two-year position was previously occupied by Stuart Naylor

- The Acid Soil Action program is also funding a Mark Rosicky, to undertake a three-year PhD project investigating revegetation of ASS scalds. Mark has completed a degree at Southern Cross University's Coastal Management School and will be based at SCU.

### **Clarence River projects**

The Clarence River County Council (CRCC) has appointed Alan Cibilic, an agricultural entomologist, former teacher, and community facilitator, to a new position as floodplain project manager, based in Grafton.

Alan will oversee a number of projects including an environmental audit of floodgates and drains to identify floodgated systems that would benefit from

restoring tidal flows.

Department of Land & Water Conservation of ficers Peter Haskins and Toong Chin helped in the development of a \$30,000 management plan for Roberts Creek on Woodford Island to reintroduce river water to the main creek and modify side drains to protect crops, stock and natural habitat. "As cane is grown in the area we intend to proceed with caution to ensure paddocks are not affected by salt," Alan said. (Consultants Resource Design & Management from Coffs Harbour investigated and prepared the management strategy).

Alan is also working on plans of management for Everlasting Swamp and Alamy Creek, with another four projects on the drawing board. Funding for the current projects has come from CRCC, and grants from the Federal Governments Natural Heritage Trust and the State Department of Land & Water Conservation (Floodplain Management Program & NSW Wetlands Program).

For further information telephone Allan on 02 6642 3277; fax 02 6642 3108 or email: crcc@nor.com.au

## Prawn Farm Environmental Strategy

The Australian Prawn Farmers Association (APFA) has drafted an Environmental Code of

Practice for constructing prawn ponds and assessing ASS impacts.

Australian Prawn Farmers Association Executive Officer, Liz Evans, recently held an information day at Yamba's Tru Blu Prawn Farm for agency staff and council officers. She says Clarence River has five established prawn farms which occupy 120 ha of land. A new Strategic Plan will help the industry to expand in NSW and double the area of prawn farm aquaculture on the Clarence River.

The expansion will increase the sustainable annual production of farmed tiger prawns to more than the current eastern king prawn catch off NSW coast (750tonne).

Liz says prawns will not thrive in low pH water and prawn ponds ideally should be sited on land with pH >6. Where existing prawn ponds have been dug in ASS areas, lime is spread at 2tonne/ha or more to raise the pH.

She says that the removal of restrictions to develop prawn farms on prime agricultural land in NSW and Qld will enable better site selection and prevent further disturbance of ASS. For further information telephone Liz on 02 66554638, or email primac@midcoast.com.au

## Fish Kills

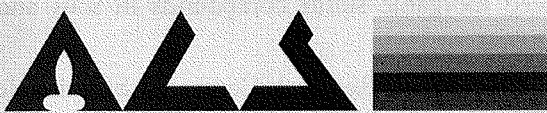
NSW Fisheries keeps a database of all reported fish kills in NSW and needs the public to report any fish kills to their local NSW Fisheries office, or to the Environmental Protection Agency (EPA) pollution hotline on 131555.

Craig Copeland says that extremely acidic leachate "slugs" (pH < 3) from acid sulfate soils can kill fish after only minutes of exposure. Aluminium released from clays by acid leachate can also destroy the gills of fish, even at pH 5. ASS can contribute to low levels of dissolved oxygen in waterways which can also kill fish. However, not all fish kills are caused by ASS.

"If people see dead fish they should report the incident. The data collected about fish kills will help us assess which catchments need urgent water quality improvements.

NSW Fisheries and EPA have distributed a protocol for reporting fish kills to all coastal

councils in NSW For further information, telephone Craig Copeland on 0266 862018 or email: copeland@fisheries.nsw.gov.au



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## ASS Workshop in India

Shrimp farmers, researchers and government officers from across India recently participated in an ASS workshop for shrimp farming funded by the ACIAR Fisheries Program. Acid leachate from ASS has caused poor shrimp productivity and increased pond management costs in Asia leading to major socio-economic impacts and widespread pond abandonment.

Jes Sammut (UNSW) and Dr C.V. Mohan (College of Fisheries, University of Agricultural Sciences, Bangalore) coordinated the workshop in Mangalore, India. It included a field trip to ponds in Kodi, Karanataka plus ASS identification, sampling, assessment and management methods.

The Workshop participants will initiate new research projects to link with current and proposed research by UNSW, NSW Fisheries and Australian National University in Indonesia and Australia.

After the workshop, Jes Sammut undertook a five day lecture tour of West Bengal to discuss the most recent findings from ACIAR and FRDC-funded ASS projects, and to develop further research

collaboration between India and Australia. Contact Jes Sammut on J.sammutgunsw.edu.au for further information.

## Kinchela Creek levee - Kempsey

Kempsey Shire Council has voted in favour of a \$500,000 plan to raise the Kinchela Creek flood levees by 20-40 cm.

Council engineer Mike Dutton says the plan was developed because of concern about fish kills and poor water quality in Belmore and Kinchella creeks. "We will open floodgates less often to give flood protection for rural homes and pastures and during dry times will raise water levels to reduce acid leachate in swamps," he said.

Water quality monitors will measure drain pH temperature and dissolved oxygen levels, as well as collecting samples of iron, aluminium. Council will also develop detailed management plans for swamp and wetland areas within the catchment. For further information telephone Mike Dutton on 02 65626077 or email: kempmdgmicoast.com.au.

## Chromium reduction in inorganic sulphur compounds

Leigh Sullivan from Southern Cross University says the chromium reduction method may prove to be a quick, reliable and low-cost method for estimating reduced inorganic sulfur compounds in soils and sediments.

A Cooperative Research Centre for Sustainable Tourism project recently examined the utility of the chromium reduction procedure for assessing Australian ASS. This method is widely used overseas to determine reduced inorganic sulphur compounds (eg pyrite, acid volatile sulphides and elemental sulphur). "Chromium reduction is very specific to reduced inorganic sulphur compounds and is not measurably affected by sulphur from either organic matter or sulfates - a big advantage over other methods."

The chromium reduction method is based on the decomposition of reduced inorganic sulphur to H<sub>2</sub>S by a hot acidic CrCl<sub>2</sub> solution: the evolved H<sub>2</sub>S is trapped in a zinc acetate solution as ZnS and the ZnS quantity analysed by iodometric titration. The method can be made specific for pyritic sulfur by suitable pretreatments. For further information telephone Leigh Sullivan on (02) 66203742 Fax:(02) 66212669 or Email: lsullivan@scu.edu.au.

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## Seawater neutralisation of ASS

The ASSMAC Technical Committee (ASSMACTC) recently debated the issue of seawater use to neutralise acidity for urban developments in ASS.

This has become an issue in canal developments where developers own sea water until project completion. Some consultants say the environment copes with natural acid outflows and therefore should cope with development outflows to saltwater.

Committee member Bernie Powell says there is a moral argument about the use of seawater which is common property. The bicarbonate in seawater is needed by marine organisms such as prawns.

ASSMAC will tender for a review paper, covering the marine impacts of returning "spent" seawater to receiving waters, bicarbonate usage rates and legal issues. The research will also examine rehabilitation of drained agricultural areas by seawater flooding, in which acid is neutralised by the bicarbonate in salt water. For more information telephone Bernie Powell on (07) 38969398.

## Aerial photographs used to map drains

Aerial photographs may be used to help quantify ASS impacts within coastal river catchments as part of the NSW Government's Water Reform.

Environmental Planner with the Department of Land and Water Conservation at Kempsey, John Schmidt, says that he can determine drainage density through enhanced interpretation of aerial photographs.

"I will now compare the estimates of water qual-

ity coming from the drains based on the data from the aerial images compared with other water quality measurement methods. "The photographic technique is a fast, cheap way to survey large areas for impacts and will help agencies plan which areas need more resources to tackle ASS issues," John said. For further information telephone John Schmidt on (02) 65631212 or email: jawala@nui.net.au.

## Northern Territory update

The Northern Territory Department of Lands, Planning and Environment is currently drafting guidelines for the reclamation of land in coastal areas. The Northern Territory has extensive stands of estuarine mangroves with potential acid sulfate soils (ASS).

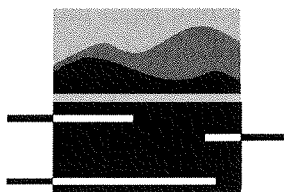
Lynne Powell from the Department's Environment Protection Division says there is increasing pressure to develop estuarine areas for residential, industrial and other waterfront use.

She says that water quality monitoring is occurring as part of Environmental Impact Assessment conditions at one new estate development.

"Two tonnes of lime were recently applied to impounded water at the estate to neutralise acidic water produced from exposed mangrove mud," she said. The Department's Land Resources Division has started an ASS risk mapping project for the Darwin Region.

- The East Arm Port development in Darwin Harbour was the overall winner of a Case Earth Awards for its management of potential ASS.

For further information telephone Lynne on (08) 89244049 or email lynne.powell@nt.gov.au.



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## QLD Main Roads ASS policy

A Queensland Main Roads (QMR) Department material and surfacing chemist Gary Bannerman is developing an ASS guideline for his department.

The QMR is constructing an eight-lane upgrade of the Pacific Motorway between Beenleigh and the Gold Coast. At the Coomera River Bridge engineers recently surveyed ASS sand deposits to 16 metres depth. Rather than using normal drilling methods, a pile driver was used to position the piles to reduce disturbance of ASS. Garry hopes to base the QMR guidelines on the NSW Roads and Traffic Authority's 1995 Internal Policy for road works on ASS.

For further information please telephone Garry Bannerman on 07 38343057.

## Mackay ASS claims

The Mackay Marine Resources Advisory Committee has claimed that flood mitigation banks at Vines Creek in North Mackay have been built with ASS.

Committee Chairman, Serge De Pinto, said in a newspaper report that the levy banks should be capped with top soil and grassed to prevent acid leaching into waterways. Mr De Pinto said a soil sample revealed a pH of 1.9 which "indicates a very serious acid problem". Fish kills have previously been reported in the area.

The Mackay Mercury newspaper also reports that local wetlands are being filled with ASS material. (Mackay Mercury January 7, 1998)

## Olympics site needs lime

The NSW Environment Protection Agency is meeting with the Olympic Authority to establish management options for Acid Sulfate Soils on the Olympics site at Homebush Bay.

ASSMAC Technical Committee members Ian White and Bruce Blunden have also met with consultants for the project, and key state agency staff to develop ways to remediate the site.

Ian says that incorporation of lime is difficult on the site as some ASS is mixed with other contaminated soils. He says that long term monitoring will be required

For further information please telephone Ian White on 026 2490660.

## ASS "peatering" out

Peat plays an important role in swamps by fixing aluminium maintaining plant cover and reducing transpiration on ASS.

Many acid scald areas in drained, wetlands have been caused during droughts when fires have burnt away the peat covering. The NSW ASSMAC Technical

Committee has recommended to the Rural Fire Service that it educate farmers and landowners about the detrimental effect fire can have on peat. Peat fires are difficult to extinguish and can smoulder for months unless flooded. Large areas of the Tuckean

Swamp, on the Richmond River, as well as former tidal areas near Clybucca and other coastal wetlands have been degraded by swamp fires.

For further information please telephone Jon Woodworth on 02 66261344.

## Clybucca Works Completed

The Seven Oaks Drainage Union (SODU) near Kempsey has completed the installation of temporary water retention structures at 15 demonstration sites across five holdings to raise the watertables in badly affected ASS areas.

The project aims to test practical management options for increasing grazing productivity from wetland grasses especially in dry seasons. Benefits from the project include enhanced wetland habitat values and reduced frequency of acid water discharges into the Macleay River.

Two types of works were constructed. 'Ponding' involved filling in drain 'cutouts' along drain spoil heaps to enable water to be held on scalded areas. Low level 'sills' were also constructed across the Main Drain to raise water levels.

Most of the works had concrete pipes installed to enable water levels to be manipulated on a needs basis. Project Manager, Bob Smith reports that pipes are generally considered unnecessary provided neighbours have been involved in the initial design.

The project is the first to attempt a major rehabilitation of ASS in a large drainage union area (85 landholders). The project has demonstrated that at reasonable cost, landholders can implement water retention structures on their farms to improve the management of ASS drainage.

In-drain sills able to withstand flood flows cost in the vicinity of \$2,000 each

The project has been funded from Environmental Trusts, DLWC Floodplain Management Program, Macleay Catchment Management Committee and the Seven Oaks Landcare Group.

For further information contact Bob Smith on 02 6628 3472 or fax 02 66280653.

### **Seven Oaks Review**

Past overdrainage of the Seven Oaks Drainage Union area makes it one of the worst acid pollution sources in NSW. Landholders have co-operated over the past 5 years to implement ponding and drain management on individual farms. The success of these works has been limited by the continued lowering of the groundwater by the 21 cell floodgate structure at Clybucca.

Landholders are now seeking to install additional water management structures in the lower reaches of the Main Drain to prevent overdrainage. This will also significantly reduce the frequency of acid water discharges and hopefully minimise further acid generation. Landholders believe that better drainage management practices can produce major benefits to farmers, fishers and the wider community.

There is a strong linkage between the Seven Oaks Drainage Union project and the nearby Yarrhapinni Wetland Reserve Trust rehabilitation project. Both are on the Andersons Inlet. Without a substantial improvement in water quality from SODU, the benefits of rehabilitating the Yarrhapinni Wetland will be limited.

For further information contact Bob Smith on 02 6628 3472 or fax 02 6628 0653.

### **Review of All Hastings Floodgates**

A Feasibility Study involving a detailed assessment of all floodgated drains is underway in the Hastings.

The aim is to ascertain what is feasible in terms of management of surface and groundwater to improve drainage water quality.

Water management options will be developed in close co-operation with affected landholders and preliminary designs and costings prepared. The likely pros and cons of the installation of water management structures will be a component of the fea-

sibility study report.

Community and agency input and comment will be sought throughout the study and prior to communication of the findings. The feasibility study will provide a basis for funding and development approval to implement a works program.

For further information contact Bob Smith on 02 6628 3472 or fax 02 6628 0653.

### **Nambucca sewage an ASS treat**

Nambucca Shire Council plans to use sewage biosolids to rehabilitate degraded acid sulfate soils. Council is constructing an, \$8 million sewerage plant, and hopes to use effluent for rehabilitation of ASS when the plant opens in September.

Dr Robert Patterson of Lanfax Laboratories, Armidale, recently explained to councillors details of an \$18,000 trial proposed for a half hectare plot of agricultural pasture near the sewerage plant. Treatments include a control (nothing), biosolids, biosolids and lime and biosolids, lime and acid water. Dr Patterson says that 10 tonnes of biosolid has the wet equivalent to 80 kg of urea, with a pH range from 7 - 7.9. Acid sulfate soils have low PH (<4), low organic matter and poor nutrient storage capacity.

ASSMAC Technical Committee chairperson Ian White says that sewage may help treat ASS degraded areas because it can generate the nutrient rich algal blooms required to reverse the sulfur cycle. Sulfuric acid from ASS can, however, release heavy metals from sewage collected from industrial areas.

For further information please contact Dr Patterson on 02 67751157 or Nambucca Shire Council's Bruce Redman on 02 65682555.

### **Ballina bypass on 25 m deep mud**

The Ballina Bypass is part of the NSW State Government's \$1.6 billion commitment to the 10 year Pacific Highway Reconstruction Program and includes a proposed six kilometres of highway embankment across an ASS floodplain.

The full bypass is estimated to cost of \$131 million, and will traverse in part highly compressible alluvial deposits up to 25 metres deep. Building the highway over such poor subgrades presents a number of engineering challenges.

NSW Roads and Traffic Authority (RTA)

recently exhibited an Environmental Impact Statement (EIS) for the bypass and an ASS Management Strategy has been developed to manage ASS and potential ASS.

The engineering concept design minimises the height of the embankment while still meeting the necessary design criteria. This will limit settlement of the embankment which has been predicted because of the underlying soft soils. This approach will limit the amount of ground heave which may threaten to expose potential ASS to possible oxidation.

Possible ground heave will be one of the parameters monitored at two trial embankments each about 50 metres by 70 metres in plan area and up to four metres high. The trials will provide data to augment and verify the extensive geotechnical investigations and analyses.

The Strategy will provide the basis for the development and implementation of an Acid Sulphate Soils Management Plan by the project contractor.

Project development work has been carried out for the RTA by Connell Wagner Pty Ltd of Sydney using Robert Carr and Associates of Newcastle as its geotechnical subconsultant.

Requests for further information on the project should be directed to the RTA's Pacific Highway Development Office in Grafton on (02) 66401000.

### **Ponded pasture review**

Four Australian ASS researchers, Ian White, Mike Melville, B. Wilson and Jes Sammut have published a paper Reducing acidic discharges from coastal wetlands in eastern Australia which advocates tidal reflooding as way to rehabilitate degraded ASS areas.

Ian White says that large areas of Australia's coastal lowlands underlain by Holocene sulfidic sediments have been drained for agriculture. Acid production ranges from 100 to 300 kg H<sub>2</sub>SO<sub>4</sub> per hectare per year and hundreds of tons can be discharged from a flood plain in a single flood. Generation and export of acidity is controlled by the water balance, the drain system and distribution of ASS. Evapotranspiration by plants plays a major role in oxidation during dry periods. In wet periods, upland discharges to floodplains dominate the water balance. Drain spacing and depth are the main factors in the export of acid into coastal streams. Amelioration requires an understanding of

the interaction between chemical and hydrological processes in the sulfidic landscapes. Redesign of drainage systems to manage surface waters and reduce drain density with the treatment of drains with lime offers promise for treating acidic discharge. Reflooding of drained, partially oxidized floodplains with freshwater may not be a panacea because of the large volumes of acid stored in the soil, a lack of labile organic matter in the sediments needed to reduce sulfate as well as irreversible changes in the soil due to oxidation. Tidal brackish water reflooding of unproductive acidified lowlands offers promise for rehabilitating wetlands. Sulfidic wetlands which are still undrained should remain so unless all acid discharge can be treated. For further information please contact Ian White on 02 62490660 or email: [ian.white@cres.anu.edu.au](mailto:ian.white@cres.anu.edu.au).

### **ASS Diary**

- Essential Oil Tea Tree Symposium Wednesday, August 5, Wollongbar Agricultural Institute. Bookings via Garry Baker 0266 261104.
- Deadline for funding submissions for Acid Soil Action - May 30.
- ASS Rehabilitation workshop - April 3, Sydney.
- ASSMAC meeting April 30 - Tweed Shire

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