



ASSAY

A NEWSLETTER ABOUT ACID SULPHATE SOILS

No.7 September 1995

There has been a tremendous response to ASSAY since it was relaunched in July. There are now almost 1000 people on the mailing list, indicating the widening interest in acid sulphate soils and their management. If you are not already a subscriber, details are on the final page. Since July the Acid Sulphate Soils Management Advisory Committee (ASSMAC) has met once, at Taree, and ASSMAC's technical committee has met twice, at Wollongbar and Gosford. The Richmond-Tweed ASS Local Action Committee has met twice, the Manning ASS Local Advisory Committee has formed and there have been ASS awareness seminars at Camden Haven, Wyong, West Gosford and Port Stephens. Acid sulphate soils are definitely on the agenda in NSW. If you would like an awareness seminar or field day organised in your area, contact ASS information officer Rebecca Lines-Kelly on 066 261 319.

ASS map launches

The July launch of NSW's acid sulphate soils maps and guidelines through a series of ten public meetings along the NSW coast was very successful. Feedback from participants was that the meetings were well organised, professionally presented and highly informative. ASSMAC is now looking to follow up the launch with practical workshops for local government, state agencies, catchment committees and farmer organisations.

Map orders

The Department of Land and Water Conservation received 81 orders for a total of 785 ASS maps following the launch meetings. More than half the orders were from private individuals, the remainder from state government agencies, statutory authorities and local government. So far 65% of orders have been filled and DLWC hopes to have all maps out soon. For more information on ASS maps ring 02 228 6315.

Queensland ASS mapping

Queensland Department of Primary Industries has received funding from the National Landcare Program and the sugarcane industry to map acid sulphate soils from the NSW border to Bundaberg. The three year mapping program begins in November and will build on the NSW experience, particularly NSW's sampling and testing procedures. Bernie Powell, principal soil scientist with QDPI's Resource Assessment and Planning branch, says the mapping team will sample most intensively in areas under most pressure from development. For more information, ring Bernie Powell on 07 3896 9398 or Col Ahern on 07 3896 9510.

National ASS strategy

The Standing Committee on Agriculture and Resource Management (comprising the directors-general of all state and federal agriculture departments and natural resource management agencies) has endorsed the establishment of a working group to develop a national acid sulphate soils strategy for Australia. The working group will include two nominees from SCARM, (including the Chair from ASSMAC) and nominees from the Standing Committees of the Australian and New Zealand Environment and Conservation Council (ANZECC) and the Management Committee on Forestry Fisheries and Aquaculture (MCFFA).

ASSLAC for Manning catchment

Manning catchment fishers and farmers have formed an acid sulphate soils local action committee. The committee comprises TCM chairman Bruce Cowan, landowners Don Schmitzer, Lloyd Gill, Peter Neal and John Hogg, Ian Crisp (representing oyster farmers), Ron McDermott (Wallis Lakes Fish Cooperative), Ian Angus (Taree City Council) and Geoff Foster (DLWC). In August the new committee joined ASSMAC's field tour of John Hogg's ASS-affected land at Cooperook (near

Taree) and Peter Neal's shallow drainage system on his low-lying dairy farm on North Oxley Island near Taree. The committee hopes to undertake some trials into treatment of ASS-scalded land.

ASS training module

Gosford soil conservationist Algis Sutas has developed a one day training module on awareness and understanding of acid sulphate soils. The module includes a morning of theory, and an afternoon of field site visits for hands-on training. Algis and the module are available on a consultancy basis wherever there are acid sulphate soils. Cost depends on travel and preparation required. For more information ring Algis on 043 243 844.

Field guide progress

ASSMAC's technical committee is finalising its manual on ASS testing methods. The manual will detail standard tests for ASS both in the field and the laboratory. Details about its availability will be publicised in the December issue of ASSAY.

David Dent tour

More than 300 people attended lectures by ASS researchers David Dent and Ben Wilson in Queensland last month. Organised by the Queensland branch of the Australian Society of Soil Science Inc and QDPI's Resource Management Institute, the lecture tour covered Cairns, Townsville, Mackay, Rockhampton, Bundaberg and Brisbane; participants included representatives of the fishing and cane industries, state government agencies, local government and consultants. The lectures were the first exposure to the issue for many people so have helped spread ASS awareness throughout Queensland.

ASS in soil technology course

ASSMAC member and technical committee chairman Ian White will lecture on ASS at the Soil Science Society's training course on soil technology and applied soil science at the University of Sydney this month. It will be the first time ASS have been included in the course.

ASS remediation at Berry

Landowners and government agencies met in Nowra in July to plan a remediation trial on drained dairy lands at Berry on the Shoalhaven River. The meeting included dairy farmers, Shoalhaven City Council, NSW EPA, NSW Agriculture, DLWC, Shoalhaven Starches, CSIRO and University of Wollongong. It is planned to reduce acid output to Shoalhaven River by raising drain water levels. The group is seeking funding for the project. For more information contact Andrew Nethery, NSW EPA Wollongong, on 042 268 100.

ASS and extractive industries

Representatives of ASSMAC's technical committee met with the Extractive Industries Group of the NSW Minerals Council in August to discuss best practices for extraction and dredging operations in ASS areas. The group has asked the technical committee to draft best management practices for consideration by the Council.

Maria River report

A report prepared by Scott Johnston on the effects of ASS on the water quality in the Maria River estuary near Port Macquarie has now been released. This work was prepared for Ocean Watch, NSW Dept of Public Works, DLWC, Hastings Council, Kempsey Shire Council and the Commercial Fishing Advisory Council (CFAC). A project summary of the report is available from Rebecca Lines-Kelly 066 261 319. Further information about the project can be obtained from David Pensini at Hastings Council 065 832 099.

ASS expert system

ASS researcher David Dent and CSIRO's Greg Bowman are currently working on a computer-based expert system for assessment of acid sulphate soils. The system will comprise several modules: identifying the presence of ASS (IDENTIKIT); quantifying the problem (ASSES); and managing the problem. Of these, only IDENTIKIT is near completion. The ASSMAC technical committee has been asked to comment on the methodology in the expert system.

Thesis on ASS in sugarcane soils

Ben Wilson, former graduate student at the University of NSW, and now at the Dept of Soil Science, University of Adelaide, has submitted his PhD thesis 'Soil and hydrological relations to drainage from sugarcane on acid sulphate soils'. The thesis details the relationship between soil, watertable depth, rainfall and evapotranspiration and acid export. The thesis estimates that during the period 1992-94 approximately 2,600 tonnes of sulphuric acid were exported through drainage into the Tweed River.

Acid-tolerant water plants

Acid-tolerant waterplants have been found to be good indicators of strongly acidic conditions (pH<4) in the artificial drainage systems of the far north coast of NSW. Jesmond Sammut, Mike Melville and Ian White found that a South African waterlily (*Nymphaea caerulea* ssp. *zanzibarensis*) was prolific at pHs less than 4 and often occurred in very dense stands at pHs less than 2.5. The native waterlily (*Nymphaea gigantea*) also tolerated strongly acidic conditions but was less common than the introduced waterlily as it is less competitive. Similarly, spikerushes (*Eleocharis* spp) are also common in acidified areas and stands of spikerushes trap sediments and debris, causing obstruction to flows and drain maintenance problems. These waterplants are not only tolerant of the high acidity but also of monomeric aluminium concentrations that are generally very toxic to other waterplants. Ironically, these and other acid-tolerant waterplants, along with clear water conditions, give the impression of good water quality to most people. Jes, Mike and Ian have shown that the acid-tolerant waterplants can supersaturate the water with dissolved oxygen (>220% saturation) under clear water conditions and possibly reduce wind-shear driven mixing of the water layers. The waterplants also lock up nutrients which contribute to very high biological oxygen demand when floodwaters destroy the waterplant communities.

Indicator plants

A book on indicator plants for acid and saline conditions will be published next year. The working title is *Plants in acid and saline waters in coastal New South Wales*. The planned book will cover 50 or so plant and benthic algal species typical of the saline and acid estuarine environments in NSW, and will include detailed articles on saline and acidic environments and plant responses. The information will apply to southern Queensland and other similar state environments. Authors are Geoff Sainty and Surrey Jacobs (authors of the book *Australian Water Plants*), soil scientist Ian Kelly, and ASS researcher Jes Sammut.

Measuring toxic aluminium

Assessing the likely toxicity of aluminium is an important issue for managing ASS. Most commercial laboratories filter water samples and soil extracts through a 0.45 micron filter to remove all particles, measure total aluminium and report it as 'total soluble aluminium'. According to ASS researcher Richard Bush work in QDPI and University of Queensland has shown that there are two fundamental problems with this approach.

First, 0.45 micron filters do not sufficiently stop particles of alumino-silicate, so the total soluble aluminium is overestimated. Recent research by Neil Menzies et al at the University of Queensland has shown that a 0.025 micron filter at least is required.

Second, total soluble aluminium includes both the toxic inorganic monomeric fraction and the non-toxic, organically complexed and inorganically complexed fractions. This measure does not reflect the likely aluminium toxicity because the proportion of toxic aluminium varies.

There are several colorimetric methods which discriminate inorganic from organically complexed aluminium. Neil Menzies has also shown that a simple, quick alternative to ultra-filtration is the use of lanthanum chloride to flocculate aluminosilicates and centrifugation to separate the particles. For further information about assessing aluminium in acid sulphate soil and drain waters, please contact Rebecca Lines-Kelly 066 261 319.

Monitoring acid water

ASS researchers Jes Sammut, Mike Melville and Ian White have identified several shortcomings in standard methods of measuring acid water.

pH probes that use a silver/silver chloride solution should not be used in acidified water as the solution reacts with sulphides, clogs the junction, and gives incorrect readings. Instead, double-junction probes using filling solutions that do not react with sulphides are recommended.

pH probes should be cleaned regularly in dilute hydrochloric acid (1%) to remove iron hydroxides and other contaminants that slow down probe response. In all cases, pH probes should be kept moist and clean between samples and should be regularly calibrated with freshly made pH4 and pH7 buffer solutions.

Dissolved oxygen probes require calibration and servicing when used in acid water. Iron and other contaminants can easily contaminate probe membranes, especially in submerged data loggers, causing misleading readings. Occasional simultaneous spot measurements should be made to account for drift in data logger probes.

Jes Sammut and Graeme Fraser tested several makes of dissolved oxygen probes in hydrogen sulphide-affected waters and found that negative error (up to 5 mg/L) and reduced probe sensitivity occurred. Hydrogen sulphide can be detected by smell or seen bubbling from bed sediments. An Eh probe can detect reducing conditions, a sign that hydrogen sulphide may also be present. University of NSW/CSIRO studies have found that hydrogen sulphide is common in the lower stratum of acidified waters and could cause problems for both probe and chemical methods of measuring dissolved oxygen. Modified Winkler titrations are recommended by Jes, Mike and Ian. The standard Winkler titration is affected by iron, and should not be used in acidified water as negative error can occur. Most water testing manuals offer modified versions of the Winkler titration that can overcome the problems of hydrogen sulphide and iron.

To obtain a copy of the EPA's *Environmental Guidelines: Assessing and managing acid sulphate soils*, ring the Pollution Line 131 555.

RECENT ASS PUBLICATIONS

Johnston, Scott (1995). The effects of acid sulphate soils on water quality in the Maria River Estuary, NSW. Hastings Council.

Lin, C, Melville, M., White I. & Wilson, B.P. (1995). Human and natural controls on the accumulation, acidification and drainage of pyritic sediments: Pearl River delta, China, and coastal New South Wales. *Australian Geographical Studies*, 33(1):77-88.

Palko, Jukka & Weppling, Kjell (1994). Lime requirement experiments in acid sulphate soils. *Acta Agriculturae Scandinavica*, Sect. B. Soil and Plant Sci. 1994:44, 149-156.

Sammut, J., White, I. & Melville, M.D. (1994). Stratification in acidified coastal floodplain drains. *Wetlands* (Australia) 13.

Sammut, J. Melville, M.D., Callinan, R.B. & Fraser, G.C. (1995). Estuarine acidification: Impacts on aquatic biota of draining acid sulphate soils. *Australian Geographical Studies*, 33(1):89-100.

Sammut, Jes & Melville, Mike (1995). Impacts of poor water quality on fish. In Brierly G.J. and Nagel F. (Eds) *Geomorphology and river health in New South Wales*. Proceedings of a conference held at Macquarie University, October 7 1994. Graduate School of the Environment, Macquarie University, Working Paper 9501.

Smith, Bob, Bush, Richard & Sammut, Jes (1995). *Acid sulphate soils in the Noosa River catchment*. Prepared by Centre for Coastal Management, Lismore, June 1995.

Sutas, Algis. (1994) Acid sulphate soils: test before you dig. Paper presented to 1994 Coastal Conference, Terrigal.

White, Ian & Sammut, Jes (1994). Acid sulphate coastal soils. *Bogong*, Vol 15 No 4.

ASSAY is published quarterly for the acid sulphate soils information and awareness program, and funded by the National Landcare Program.

Editor: Rebecca Lines-Kelly, acid sulphate soils information officer 066 261 319

Subscriptions: Jan Edwards, Wollongbar Agricultural Institute, Bruxner Highway, Wollongbar 2477, phone 066 261 345, fax 066 281 744.

e-mail: To receive ASSAY by e-mail send your e-mail address to lineskr@agric.nsw.gov.au