UNSW SYDNEY Australia's Global University

School of Civil and Environmental Engineering

Engineering Solutions for the Management and Remediation of Coastal acid Sulfate Soils

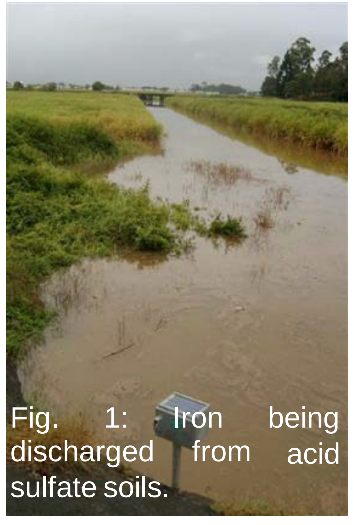


Fig. 1: Iron being discharged from acid sulfate soils.

The problem of coastal acid sulfate soils

Many coastal floodplains around the world formed around 10 000 years ago when sea levels were about 1 m higher than today. During their formation, under shallow estuarine conditions, large quantities of the iron sulfide mineral pyrite (FeS_2) were produced in the soils. The drainage of these coastal areas for agricultural purposes has resulted in the enhanced oxidation of pyrite and the production of sulfuric acid (hence the name acid sulfate soil). This acidity dissolves metals, like aluminium and iron, in the soil and when it rains the acidity and metals are washed into drains (Figure 1) and eventually adjacent rivers, often resulting in catastrophic environmental effects (Figure 2). The goal of our research is to identify land management practices that can stop the transport of metals from acid sulfate soils and maintain the profitability of local agricultural activities.

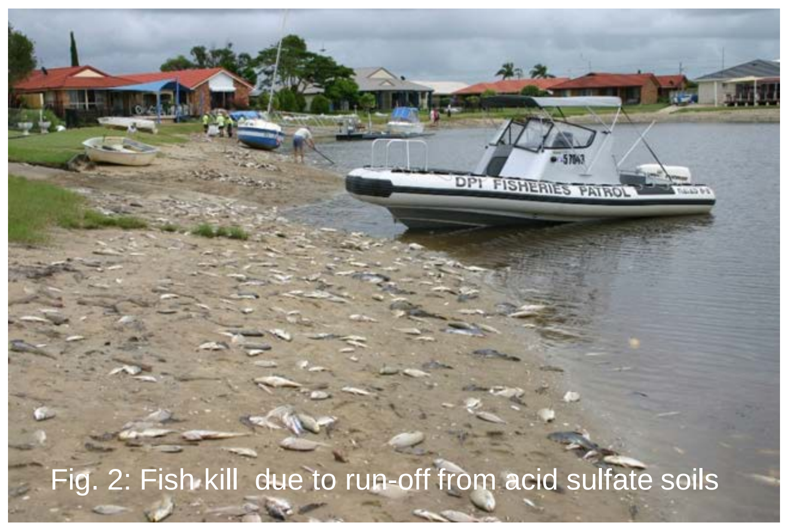
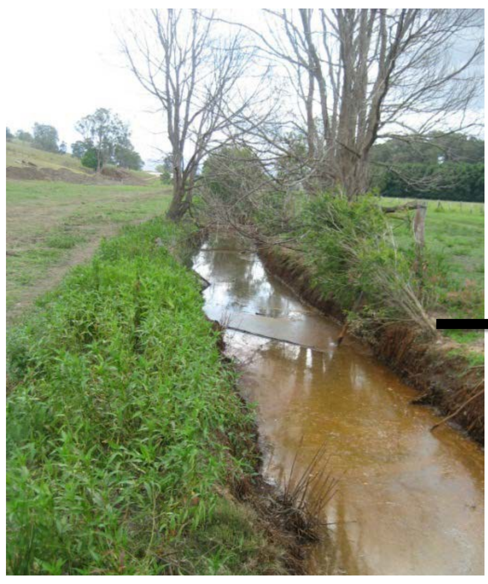


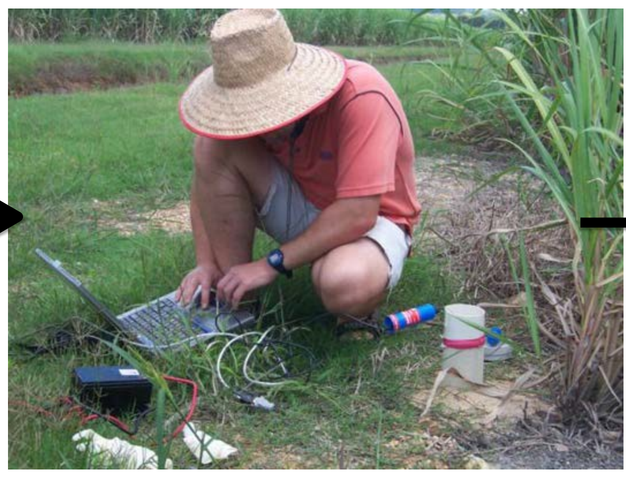
Fig. 2: Fish kill due to run-off from acid sulfate soils

WHAT WE DO

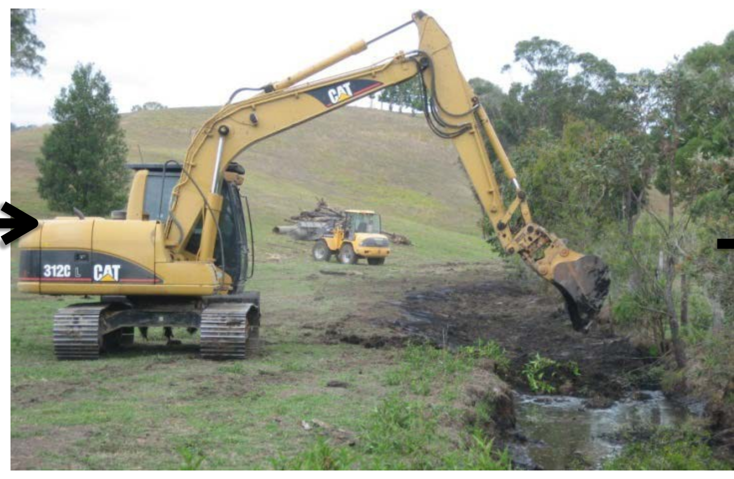
Problematic acid sulfate soil area



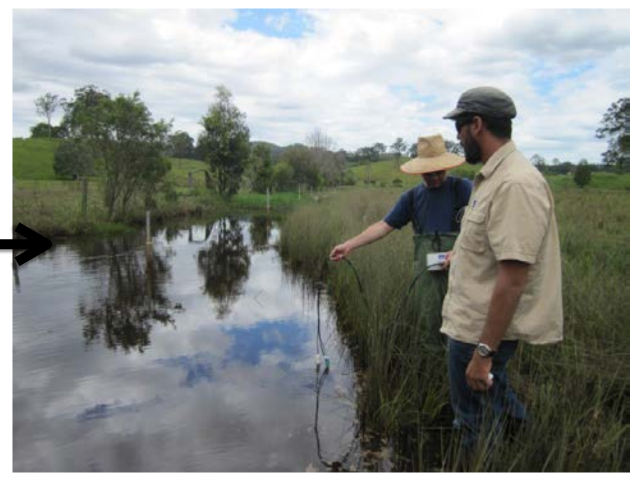
Geochemical field investigations



Changes to land/drainage systems



Remediated section of drain



OUR PARTNERS

NSW Canegrowers' Association

NSW Milling Co-operative

Tweed Shire Council

Australian Nuclear Science & Technology Organisation

Australian Synchrotron

Pacific Northwest National Laboratory (USA)

Centre Européen de Recherche et d'Enseignement des Géosciences de l'Environnement (France)

Our NSW Canegrower partners

SELECTED RECENT PROJECTS

Exploiting natural processes to effectively remediate acidified coastal environments, ARC LP110100480.

Reducing export of acid sulfate soil products (particularly iron, aluminium, phosphorus, and organic carbon) as contaminants to coastal waters, ARC LP0455697

Australian Government
Australian Research Council

SELECTED RECENT PUBLICATIONS

Kinsela AS, AM Jones, MW Bligh, AN Pham, RN Collins, JJ Harrison, K Wilsher, TE Payne and TD Waite (2016) Influence of dissolved silicate on rates of Fe(II) oxidation. Environ. Sci. Technol. 50:11663-11671.

Jones AM, Y Xue, AS Kinsela, K Wilcken and RN Collins (2016) Donnan membrane speciation of Al, Fe, trace metals and REEs in coastal lowland acid sulfate soil-impacted drainage waters. Sci. Total Environ. 547:104-113.

Collins RN, KM Rosso, AL Rose, CJ Glover and TD Waite (2016) An in situ XAS study of ferric iron hydrolysis and precipitation in the presence of perchlorate, nitrate, chloride and sulfate. Geochim. Cosmochim. Acta 177:150-169.

Yvanes-Giuliani Y, D Fink, J Rose, TD Waite and RN Collins (2016) Isotopically exchangeable aluminium in coastal lowland acid sulfate soils. Sci. Total Environ. 542:129-135.

Jones AM, PJ Griffin, RN Collins and TD Waite (2014) Ferrous iron oxidation under acidic conditions. Effect of ferric oxide surfaces. Geochim. Cosmochim. Acta 145:1-12.

Stroud JL, A Low, RN Collins and M Manefield (2014) Metal(loid) bioaccessibility dictates microbial community composition in acid sulfate soil horizons and sulfidic drain sediments. Environ. Sci. Technol. 48:8514-8521.

Boland DD, RN Collins, CJ Miller, CJ Glover and TD Waite (2014) Effect of solution and solid-phase conditions on the Fe(II)-accelerated transformation of ferrihydrite to lepidocrocite and goethite. Environ. Sci. Technol. 48:5477-5485.

Yvanes-Giuliani Y, TD Waite and RN Collins (2014) Exchangeable and secondary mineral reactive pools of aluminium in coastal lowland acid sulfate soils. Sci. Total Environ. 485-486:232-240.

新南威尔士大学火炬创新园区
Torch Innovation Precinct at UNSW

More information contact: Professor David Waite(d.waite@unsw.edu.au);
Dr Richard Collins (richard.collins@unsw.edu.au)