as to the occurrence of bogs and swamps. These might include paper bark trees, couch grasses and rushes. Soil materials may include sticky grey to bluish grey sediments (possibly streaked with orange or yellow) and gooey black sediments (MBOs) that may have formed at the bottom of drains or similar wet areas. Surface scalds may occur where the topsoil is acidic.

Once the soils have become AASS the evidence is often much clearer – but it is often much harder to correct the problem. Obvious indicators may include:

- Soil with materials that typically include orange material or prominent yellow mottles;
- Testing with field pH indicators will typically reveal pH of below 4;
- Rotten egg gas smell from freshly exposed soils.
- Water in drains and creeks may change colour due to increased levels of iron or aluminium that become more soluble at lower pHs. This can be characterised by:
- crystal clear waters, high in aluminium that can cause soil particles to drop to the bottom of the creek or drain;
- blue green or milky white water – caused by aluminium flocculants depending on the pH of the water;
- yellowish brown water containing high levels of iron that often deposits on the bottom or banks of a creek or drain leaving reddish brown deposits (iron staining);
- reddish brown colouration caused by the flocculation of iron.

LINKS AND OTHER INFO

For detailed information on planning requirements see *Tasmanian Acid Sulfate Soil Management Guidelines*. Maps identifying the predicted distribution of ASS are available on the web at www.thelist.tas.gov.au.

Additional information is available through the Land Conservation Branch of DPIPWE (03 6336 5441 or http://www.dpipwe.tas.gov.au/inter.nsf/ThemeNodes/EKOE-4ZG66F?open).

A wide variety of information has been published on the web by most other State and Territory agencies. A national strategy for the Management of Coastal Acid Sulfate Soils has been developed and is downloadable as a pdf document from www.environment.gov.au/coasts/cass/index.html

The information provided in this leaflet is intended for general information only. For more information on planning requirements in ASS affected areas and specific guidance on the management of ASS please contact either your local authority or DPIPWE.

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Tasmania
Explore the possibilities

Acid Sulfate Soils

in Agricultural & Aquacultural Environments

CARING FOR OUR COUNTRY

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Department of Primary Industries, Parks, Water and the Environment

Tasmania

WHAT ARE ACID SULFATE SOILS?

Acid sulfate soils (ASS) are naturally occurring soils that contain iron sulfides usually in the form of iron pyrite. Two forms of acid sulfate soil occur – those in which the pyrite remains in a reducing environment (saturated with water and described as potential acid sulfate soils or PASS) and those in which the pyrite has been oxidised through exposure to the air resulting in the formation of sulfuric acid (actual acid sulfate soils or AASS).

WHY ARE THEY A PROBLEM?

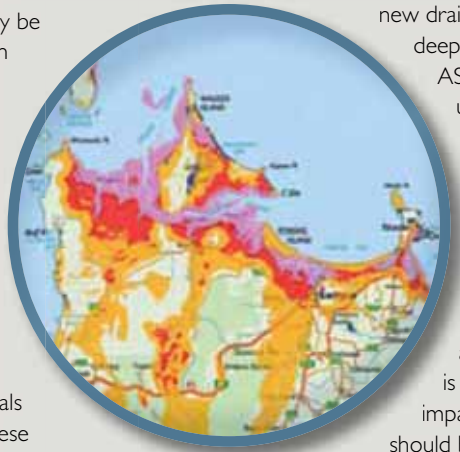
In their natural waterlogged state PASS are harmless as the acidity remains locked up in the soil and pHs may typically be 6.5 to 7.5 or even higher. When disturbed, usually through excavation or drainage, oxidation of the pyrite occurs leading to the formation and release of sulfuric acid. The release of significant quantities of acid can rapidly lower pH values of soil and drainage water to pH 2 or less. Such acid conditions can result in a range of environmental, engineering, infrastructure and health related impacts.

WHERE DO THEY OCCUR?

Acid sulfate soils form naturally where sulfate rich materials mix with materials containing iron and organic matter. These conditions are often found in coastal landscapes. In Tasmania ASS often occur in coastal environments at elevations below 20 m AHD (above sea level) and are typically associated with dark organic rich sediments and peats found in tidal zones, estuaries, swamps and wetlands. Recent investigations by DPIPWE have also revealed the presence of ASS associated with inland lagoons and swamps. Around Tasmania significant areas of ASS are known to occur across the north coast including Mella Swamp, Tamar Estuary, Waterhouse, King and Flinders Islands and parts of the east coast including St Helens, Moulting Lagoon and Swansea. Additional areas of sub-aqueous sediments, those occurring below the low water mark, likely to contain sulfides occur in the Tamar estuary, Georges Bay, Pitt Water, Orielton lagoon, Blackmans Bay, Derwent Estuary and Macquarie Harbour.

ACTIVITIES THAT CAN LEAD TO DISTURBANCE OF PASS

The past 10 years has seen a gradual intensification of agricultural and aquacultural activity in the coastal zone in Tasmania. Recent work by DPIPWE has enabled greater certainty when predicting just where acid sulfate soils might occur. Land managers, developers and the public in general should be aware of the risks of exposing PASS, how to recognise ASS materials and how to best manage these materials.



On agricultural land the main risks come from draining or cultivating PASS soils. This drainage may come about through a need to expand grazing areas by installation of new drains (including 'hump and hollow') or deepening existing drains that then intersect ASS materials. Prior to any work being undertaken consideration should be given to the possibility of ASS occurring in the vicinity of the work. Even if drains do not intersect ASS materials they may draw down groundwater to such a level that ASS can become oxidised. If PASS are present then consideration should be given to avoiding the materials completely. If this is not possible then options for minimising impact, or neutralising acid generation should be considered. Depending on the nature of the disturbance the following aspects of ASS management will need to be addressed:

- Exposure of ASS in drains;
- Water quality
- Neutralisation of acid drainage water
- Draw down of ground water in adjacent areas leading to exposure of ASS sediments;
- Management of ASS materials excavated from ditches.

Increased levels of acidity can lead to acid scalds in paddocks, reduced productivity and poorer water quality for irrigation and livestock.

For the aquacultural industry the risks mainly come from land based activities that lead to acidification of drainage water or disturbance of monosulfidic black oozes (MBOs - organic sludges enriched in iron monosulfides commonly found in drainage canals and natural tributaries). Impacts include:

- Acid water and iron toxicity causing lesions and disease in fish;
- Oxidation of sulfides leading to reduced levels of oxygen in water resulting in fish stress;
- Increases in heavy metals and other toxic compounds;

In estuarine environments aquaculture infrastructure upstream of an AASS source may be affected through tidal movement of acid and toxins.

Additional concerns for aquaculture are impacts from dredging of PASS sediments and MBOs and the management of dredged material that could release significant amounts of acid as it dries and oxidises.

The presence of ASS is hardest to identify prior to any disturbance occurring (PASS). Vegetation cover may give clues