Community capacity building to manage acid sulfate soils in NSW and the role of soil scientists.

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Abstract
This paper describes the process of building the capacity of community organisations and individuals to better manage acid sulfate soils (ASS) in NSW and outlines the role of soil scientists within this process. The general principles of community capacity building programs are outlined in relation to NSW's acid sulfate soil management strategy. Soil scientists were just one group among many that needed to be involved in the development and evaluation of new management practices. The coordination of local government and community projects with research and extension through the state and federal programs has provided a sound basis for on-going management of the soils. However, there is a need for long term commitment by all levels of government to sustain the community's capacity to manage acid sulfate soil landscapes.

Key Words
Acid sulfate soils, communication, community capacity building

Introduction
More than 60% of coastal floodplain backswamps in NSW have been drained for agricultural and urban development over the last 120 years. The expansion of drainage has been driven by two major factors ie the desire of the community to convert wet swampy lands into more productive agricultural land and to mitigate the adverse effects of major floods on property. Floodplain drainage has increased the rate that both surface waters and ground waters enter coastal estuaries. Enhance drainage rates has increased the degree of aeration of sulfidic marine sediments that underlie large areas of coastal floodplains. These changes have increased the oxidation and mobility of stored acidity causing adverse impacts on estuarine ecology, infrastructure and agriculture.

Impacts of drainage from floodplain backswamps with acid sulfate soils were recognised by the community soon after drainage was introduced. Reports of alum affected land were made in newspaper and government reports in the 1920s. Soil scientist Pat Walker recognised the presence of 'catclays' in northern NSW at Grafton in1960 and Kempsey in 1963 (Walker, 1960; Walker, 1963). He warned that excessive drainage could lead to "undue soil aeration" which would aggravate the acidic conditions in the swamps (Walker, 1963). However this warning was not recognised by the broader community possibly until the late 1980's. There was also little follow on research into acid sulfate soils until the late 1980's. Although the presence of acid sulfate soils were recognised by a few, these soils were not managed by many.

Crisis response and community capacity building
Community capacity building programs are often initiated in response to a crisis and have been applied to a diverse range of issues related to health, education, crime prevention and environment (Human Resources Development Canada, 1999). Community capacity building is a self-help strategy for addressing a recognised community problem. It assumes the community has assets and strengths which can be mobilised and that those most affected need to be engaged in problem solving and developing solutions. Some of the underlying principles of community capacity building programs are listed in Table 1. These may prove ineffective if conflicting groups maintain ideological positions rather than participate in partnerships to pursue agreed solutions. Soil scientists may comprise just one of the community resources that are required to be activated to address a community problem.

Table 1. Community capacity building principles.

Principles
1. Existing strengths and abilities within the community need to be activated
2. Dialogue between stakeholders needs to be established to shape a shared vision
3. A common language needs to be used for communication
4. Partnerships need to be established to identify needs and make decisions
5. Actions need to be managed adaptively with shared control
6. Emergent leadership needs to be fostered
7. Self-sustaining systems need to be established

Community capacity to manage impacts from acid sulfate soils

Whilst the presence ASS has been recognised by individual farmers and soil scientists for decades, major community concern about the impact of ASS drainage only developed in Australia after a large fish kill on the Tweed River in 1987. This event initiated a process of community capacity building which has resulted in significant changes in how ASS are managed.

In NSW the capacity building process was led and coordinated through the Acid Sulfate Soil Management Advisory Committee (ASSMAC) which included representation from fishing, farming, conservation, local government, state government agencies and universities. The ASSMAC's strategy to manage ASS employed community capacity building principles in the way it operated. The strategy included the activities shown in Table 2.

Table 2. ASSMAC's strategies and selected outcomes.

Community capacity building strategies for Acid sulfate soils	Outcomes
1. Identification of sources of problem	Acid sulfate soil risk maps, assessment methods, soil testing methods
2. Increasing awareness of the problem across community groups	ASSAY newsletter, media stories, information booklets, posters.
3. Building knowledge and understanding to manage the causes and impacts of problem	Long term cooperative research Extension and technical workshops ASS management plans
4. Facilitating changes in behaviour and practices which mitigate the impacts of the problem	Planning maps and development controls Floodplain management partnerships Demonstration projects Cooperative research and extension

During the 1997-2002 period ASSMAC directed $3.4 million towards projects to improve the management of ASS. The federal Coastal Acid Sulfate Soils Program also provided $2.6 million for remediation projects. Coastal communities in NSW have developed numerous partnerships to implement changes to drainage infrastructure and operation. Local action groups now operate in all major river floodplains. They have depended on State and Federal funding to implement planning and works projects.

Projects conducted by these action groups have usually involved monitored field trials, developed in consultation with landholders, to evaluate management techniques. Most of these projects attempted to reduce adverse downstream impacts of acidic drainage by a combination of

- Reducing seepage of shallow acid groundwater into drains. This has been achieved by reducing drain depth and length, raising drain water levels to reduce the hydraulic gradient towards the drain using weirs and floodgate opening.
- Reducing acidity in surface runoff by restoring wetlands and revegetating scalds.
- Neutralising acidity by liming drain banks and exposed acidic surface soils,
- Diluting drain acidity through floodgate opening. Floodgate opening also enables fish to passage to avoid acidity.

Councils, engineering groups and landholders have developed innovative ways of modifying floodgates, controlling drain water levels and applying liming materials. Floodgate opening techniques include automatic tidal gates, manual and automatic sluice gates, and winch gates.

Engaging soil scientists in the ASS problem

The skills of soil scientists were linked to the strategy as part of the capacity building process. Soil scientists contributed as team members through a wide variety of activities including long-term cooperative research with leading farmers; soil mapping; changing development controls and regulations; developing soil testing methods; producing management plans for existing development, new developments and for remediation projects; and participating in awareness, extension and training activities, and representation on ASSMAC. The main role of the soil scientists was to
(a) assess the size of the problem,
(b) to research the processes causing soil and water acidification, and
(c) to assess how these processes were being affected by changes in management practices.

The full extent of the ASS problem in NSW was not realised until the production of the acid sulfate soil risk maps (Naylor et. al., 1995). These maps have had a large impact on awareness of the problem as well as guiding development decisions. Soil scientist have also contributed to the development of several ASS guidelines eg Acid Sulfate Soils Manual (Stone et al., 1998, currently under revision) ASS laboratory analysis guidelines (Department Natural Resources, Mines and Energy, 2004) , drainage systems management guidelines (Johnston et al. 2003), and industry best management practice guidelines (eg Sugar, Dairy, Tea Tree).

Communicating to different community groups

The challenge facing soil scientists within the ASS community capacity building process was to communicate their knowledge so that it becomes part of a common knowledge of the community sector that have to manage a particular aspect of ASS. This requires development of a communication strategy to provide targeted messages to different groups, and selection of communication styles and language most suitable for that group. Soil scientists associated with ASS have had to participate in communication forums to developers, farmers, local government managers and councillors, excavators, fishers, schools, politicians, agency managers, consultants, extension officers, lawyers, judges as well as other scientists.

Criteria for evaluating the effectiveness of communication to community groups could include

(a) Re-communication of the information by the audience to further audiences eg leading farmers giving talks to other farmers
(b) Changes to industry guidelines, operating procedures or regulations eg drain maintenance protocols, development applications
(c) Changes in behaviour eg on ground implementation of guidelines.

Concluding comments

It is interesting to speculate why the community did not develop capacity and strategies to manage ASS impacts much earlier. Pat Walker gave a clear warning of the hazards in the early 1960's. It may be that the community in the late 1980's was farm more environmentally aware than in the 1960's, particularly in Northern NSW. This awareness may have added to the sense of community outrage after the 1987 fish kill. The community in the 1980's may have also been more prepared to accept that existing management practices needed to change than previous generations who were more orientated to expanding development.

Scientists like any community group initially become aware of an issue and then develop an understanding of it through investigations. Most scientist then publish their findings, mainly in peer reviewed journals or reports before moving on to new projects. However, as the ASS experience demonstrates, to change how the community manages an issue requires not only scientific understanding but that this understanding is developed with involvement of active community groups, including industry and catchment groups and individual landholders. It is these groups who change how they operate with support from scientists and facilitators.

Building self-sustaining management systems is possibly the most challenging community capacity building principle. This is particularly important for ASS management because the scale of the ASS problem is large and the risks are persistent. There is a need to educate the successive generations of new landholders, developers and managers about this issue. This requires long-term carriage of ASS capacity building strategies and development of sustainable incentive schemes. Since ASSMAC ceased operation

in 2003, ASS issues have been identified in regional catchment management plans for on-going management. Whilst local government has an important role in regulating developments on ASS and modifying the operation major drainage systems, government agencies remain the appropriate vehicle to sustain coordination and facilitation of the wider community capacity building process and to conduct further research. Awareness raising, participatory learning programs, training and education programs are all essential elements of a self-sustaining community capacity building strategy.

References

Department Natural Resources, Mines and Energy (2004) ASS laboratory methods guidelines. NatCAAS, ASSMAC, QASSMAC, QASSIT, SCU.

Human Resources Development Canada. (1999) The Community Development Handbook." Flo Frank and Anne Smith, Cat. MP 33-13/1999E.

Johnston SG, Kroon F, Slavich PG, Cibilic A and Bruce A. (2003) Restoring the balance. Guidelines for managing floodgates and drainage systems on coastal floodplains. NSW Agriculture. Wollongbar Agricultural Institute.

Stone Y, Ahern CR, Blunden B. (1998) 'Acid sulfate soils manual 1998." ASSMAC. Wollongbar Agricultural Institute.

Walker PH (1960) Soil investigations in the Alumy Creek-Great Marlow area, Grafton, NSW. CSIRO Aust Div. Soil Tech. Memo. No. 6/60.

Walker PH (1963) A reconnaissance of soils in the Kempsey District, NSW. CSIRO Soils and Landuse series no 44.