Environment Protection Authority

EPA South Australia

Update on acid sulfate soil research program in the Lower Lakes

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Presentation to CLLMM Long Term Planning Reference Group

because the environment matters

Presentation outline

- Background
- What we know at present
- Management questions
- Conceptual model of key uncertainties
- Research program outline and management structure

Background

- Acid sulfate soils found in the Lower Lakes by CSIRO in 2007
- Follow up research undertaken in several areas (e.g. soils, risk assessment, contaminant mobilisation, pH modelling)
- Management strategies implemented (pumping, revegetation, liming) or proposed (seawater)

What we know at present

- Widespread sulfidic (potential to go acid) and sulfuric (gone acid) sediments around the lakes (CSIRO research)

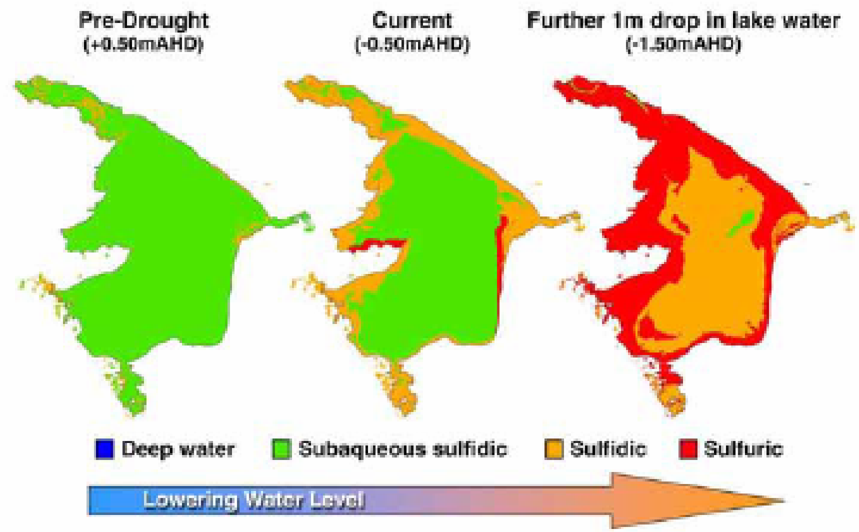
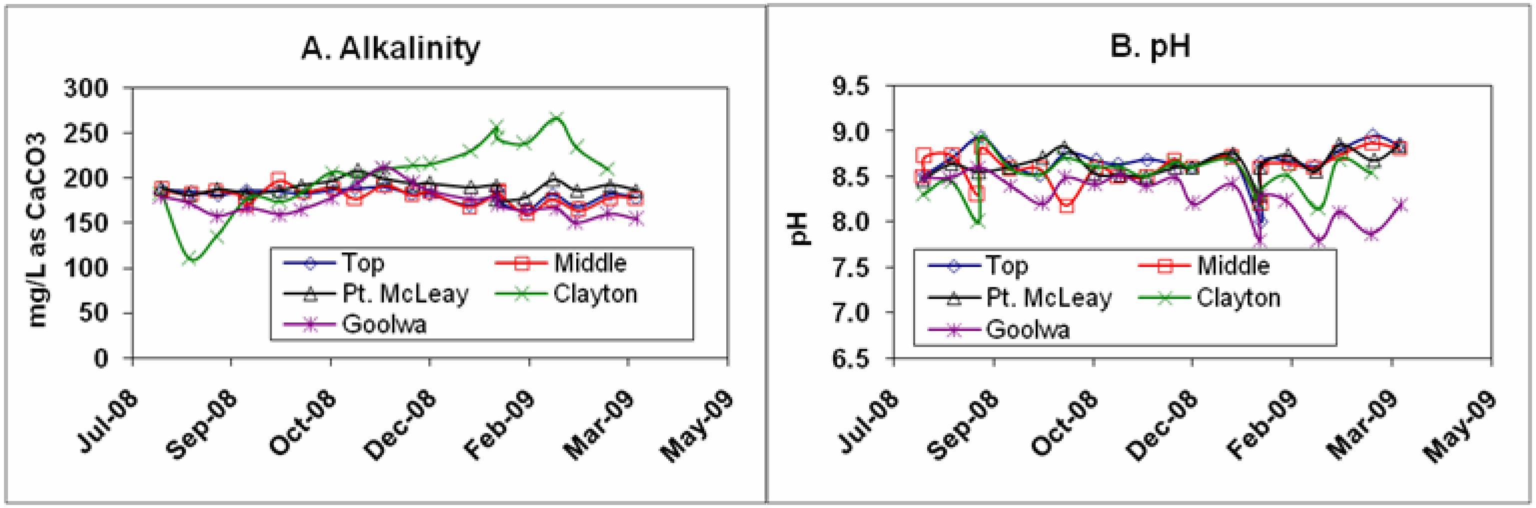


Figure 42. Predictive scenario maps depicting changes in ASS materials at different water levels in Lake Albert (+0.5 m AHD, 0.5 m AHD and 1.5 m AHD).

From Fitzpatrick et al. 2008, CSIRO Land and Water Science Report 46/08

What we know at present

- Alkalinity (acid neutralising capacity) and pH levels in the main lake areas have remained OK during lake level decline

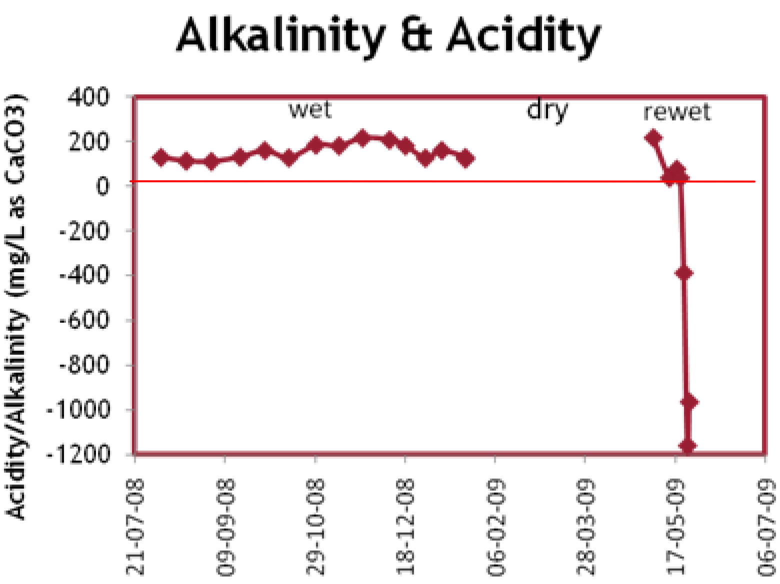


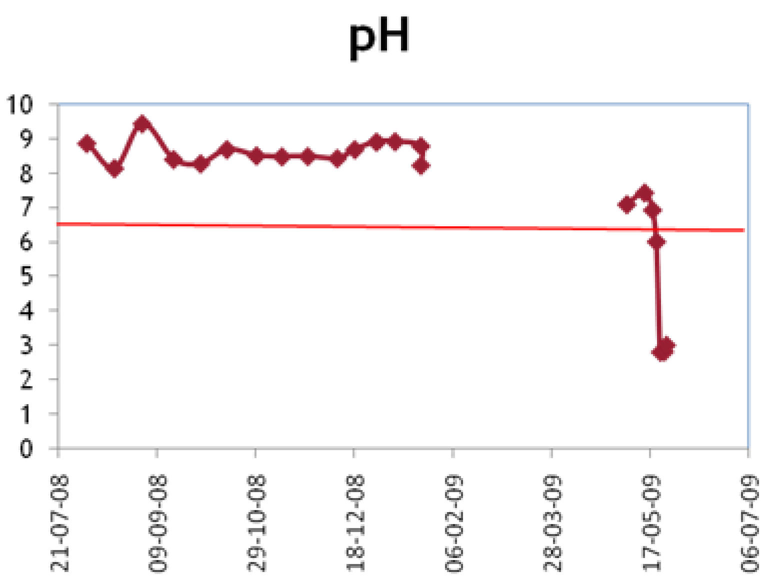
What we know at present

- <u>But</u> localised water quality impacts now occurring in areas which substantially dried and rewet (e.g. Currency, Finniss)

What we know at present

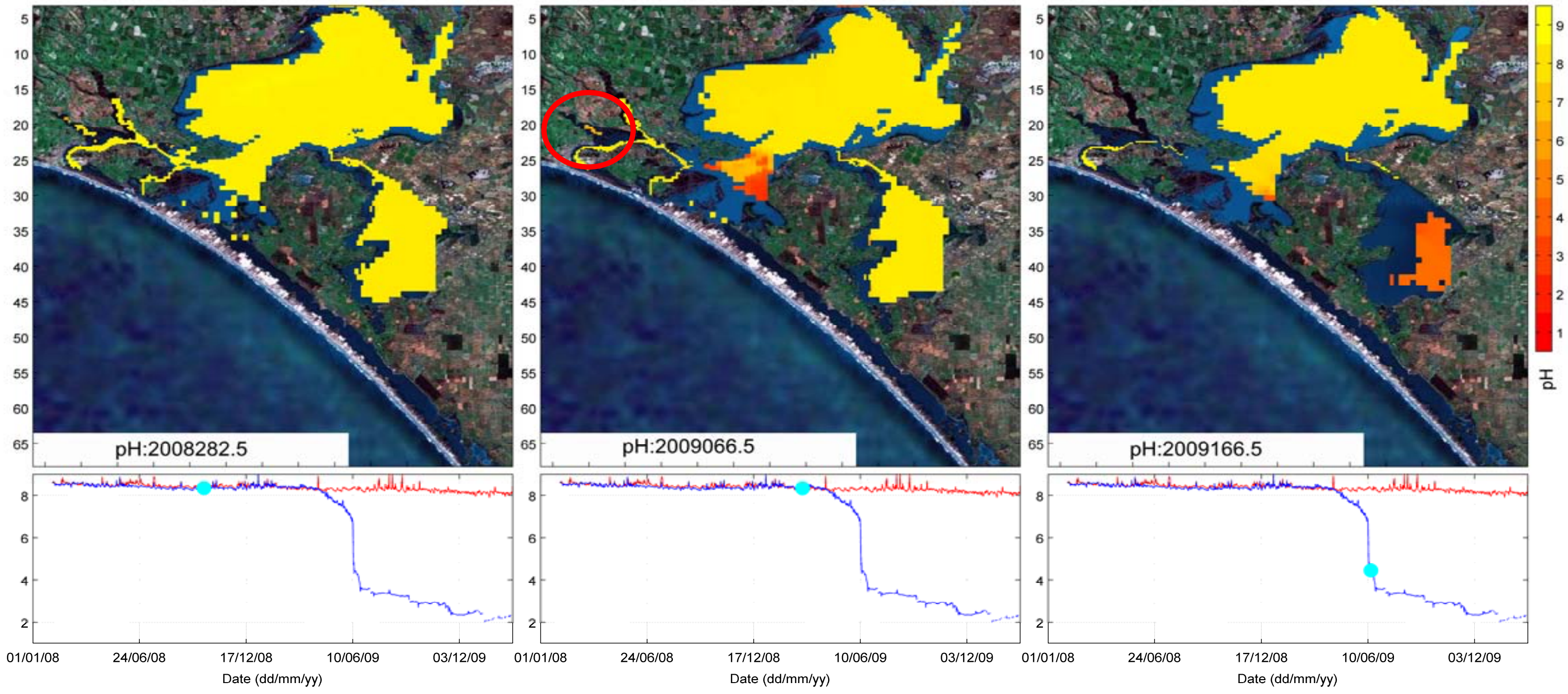
- Alkalinity and pH declines during rewetting of lower Currency Creek region sediments (large exceedances of ANZECC guidelines for pH and metals)





What we know at present

- Geochemical model has proved useful in predicting high risk areas (despite large uncertainties)



What we know at present

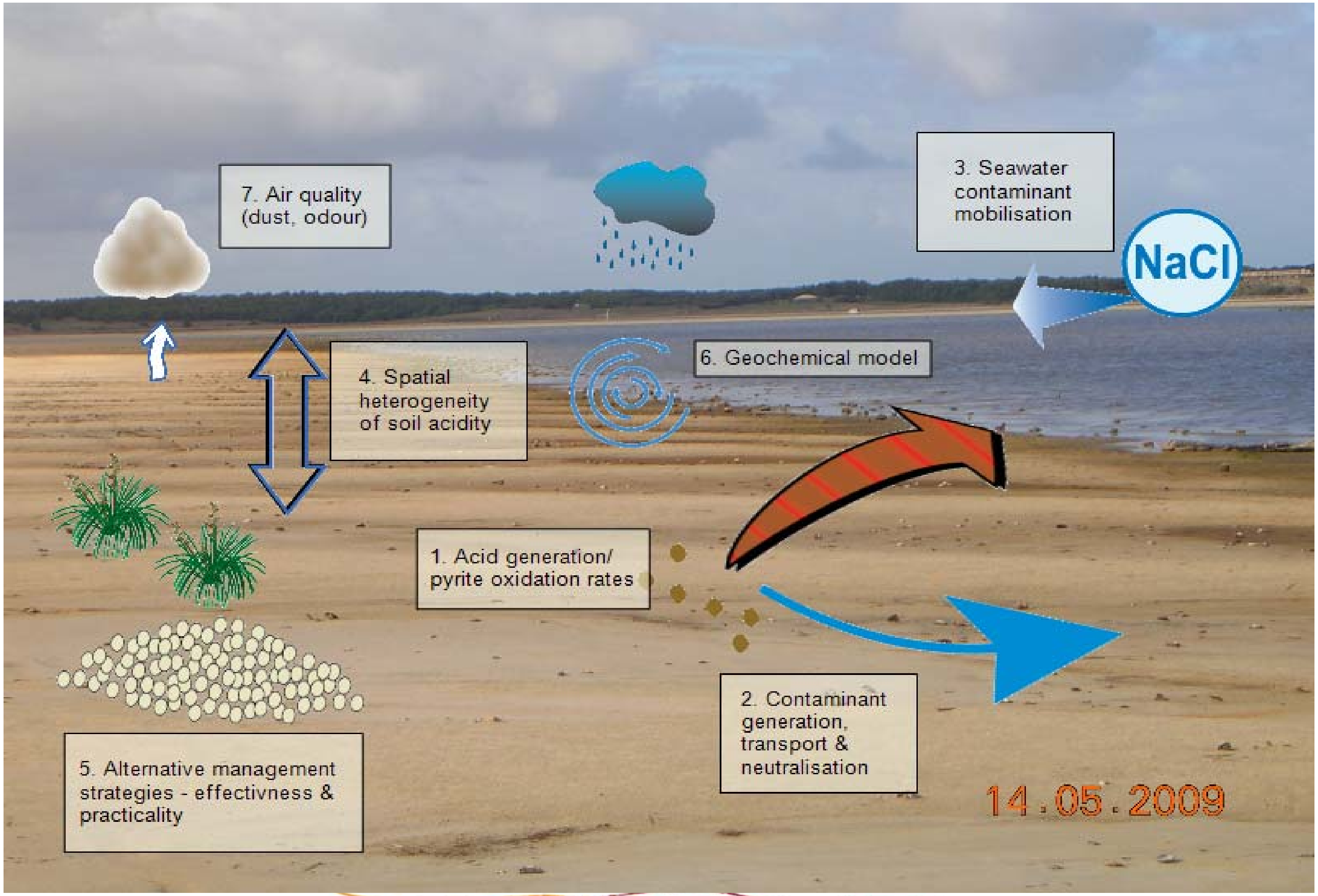
- Rain water quality and preliminary dust results

•20 tanks tested
•pH and metals levels indicate no health concerns
•Dust pH neutral (6-7)

Management questions

- **What is the risk level?** - what is the current and likely future extent of soil and lake acidification and what is the timing and speed of the acidification processes?
- **What is the best management option?** - how effective are the various management options (seawater, bio-remediation, limestone) in mitigating against the impacts of acid leaching into the lakes on the scale that we expect? Are they practical and how much would be required? What are the impacts and costs? What future is then possible for the lakes after use of this technique?
- **Uncertainties** are too great at present to have confidence in different management options

Research program to reduce key uncertainties

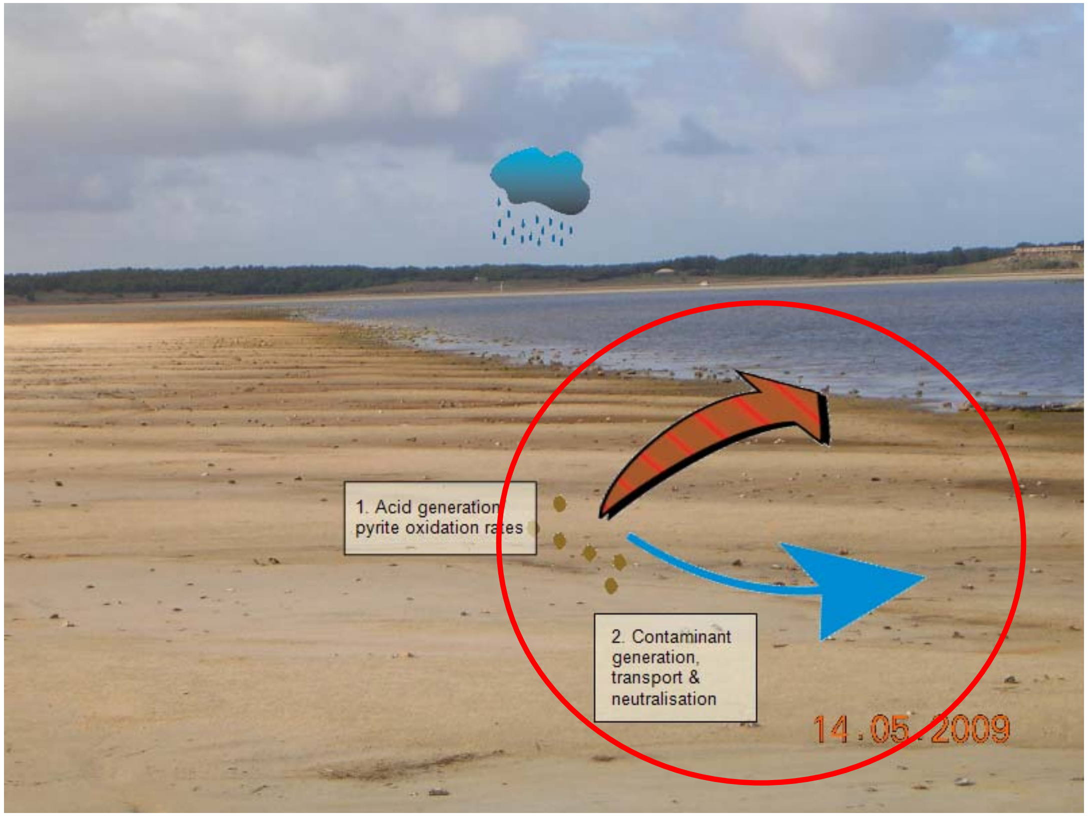


1. Acid generation rates

The acid generation rates (oxidation rates of pyrite) have not been measured for the Lower Lakes sediments. This information is needed for improving the geochemical model and scoping of alternative remediation options (e.g. liming rates).

2. Contaminant generation, transport and neutralisation dynamics

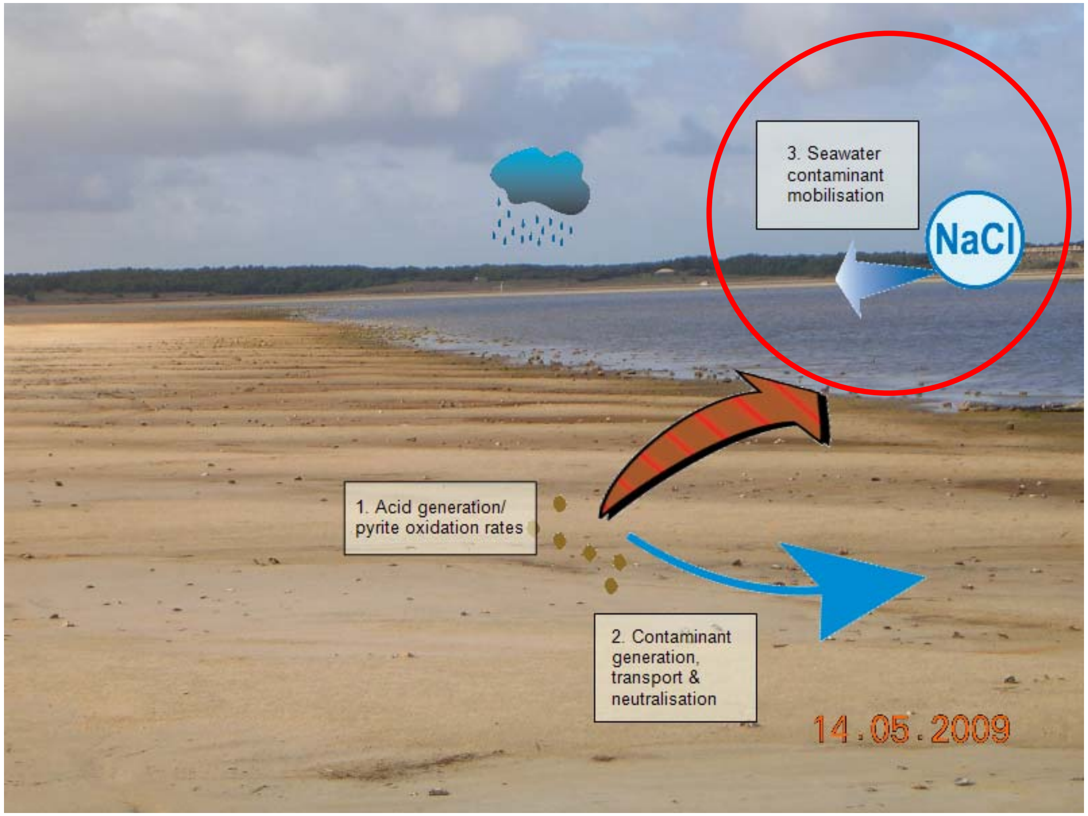
The *in situ* dynamics of the generation, transport and neutralisation of acidity and other contaminants (resulting from the pyrite oxidation process) are uncertain. These dynamics need to be linked to the lake water quality trends and integrated into the lake geochemical model.



3. Seawater contaminant mobilisation

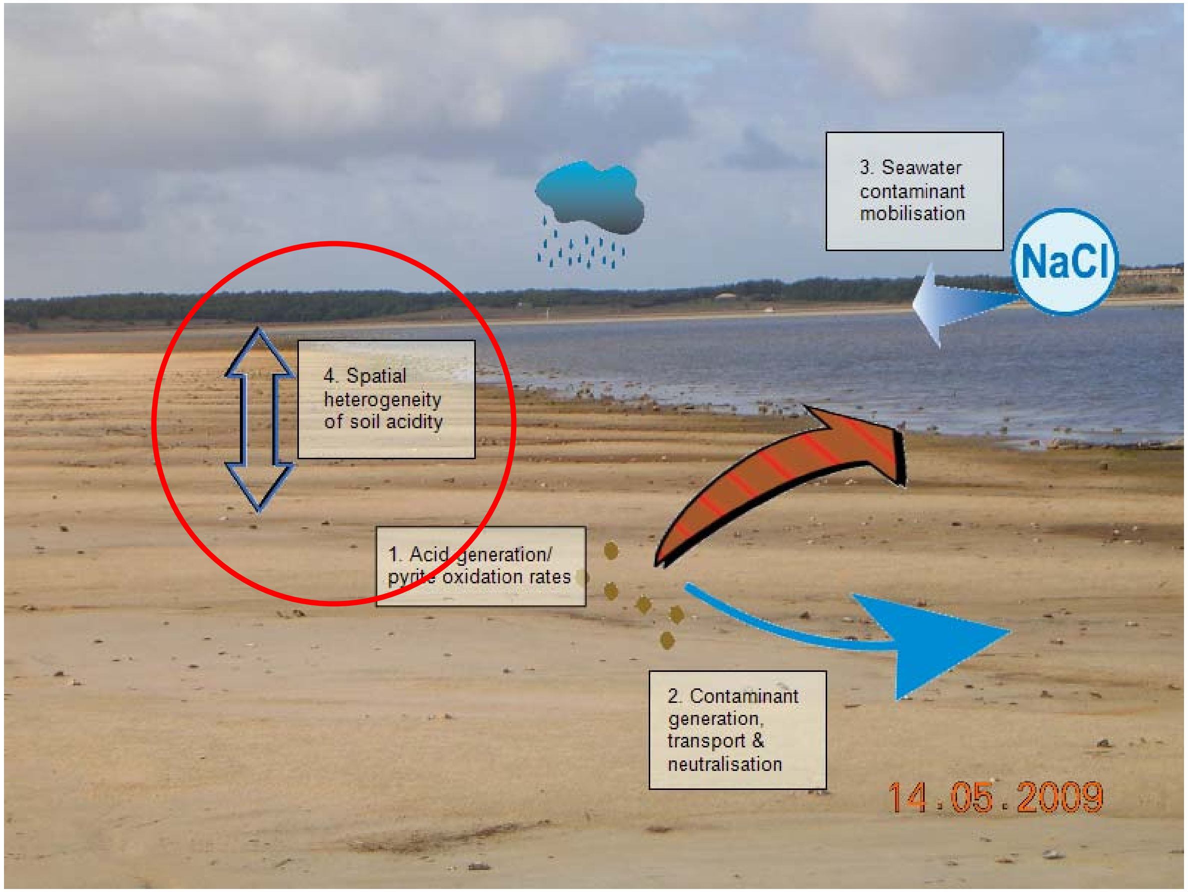
The potential for contaminant (acid, metals,

metalloids, nutrients) mobilisation and neutralisation if seawater is used instead of freshwater is uncertain. Changes to sulfur cycling with seawater also require research. Laboratory experiments and field inundation trials will be undertaken to address this risk.



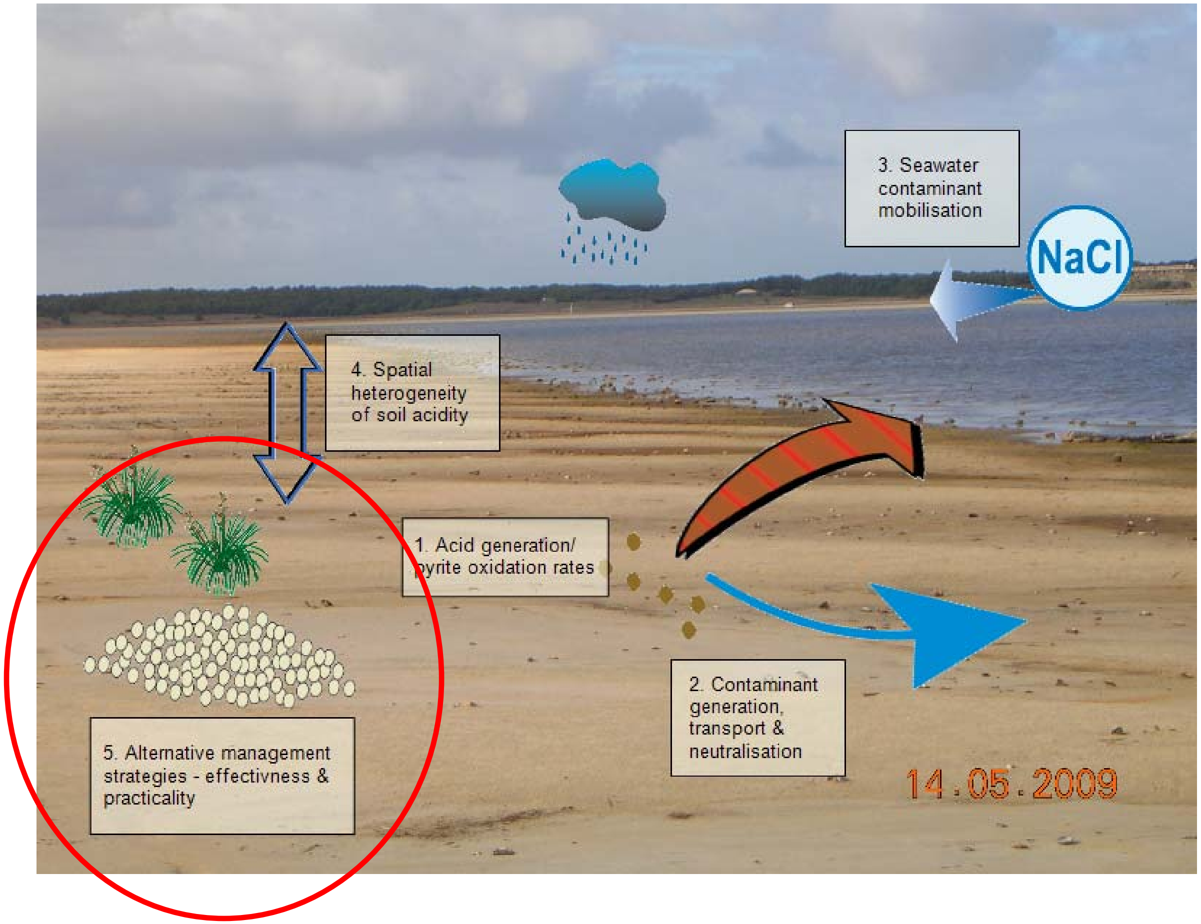
4. Spatial heterogeneity of soil acidity

While detailed data on soil acidity has been collected by CSIRO from scattered locations, characterising the true spatial extent of sulfuric sediments and their development over time requires more soil sampling, data analysis and integration into GIS and the lake geochemical model.



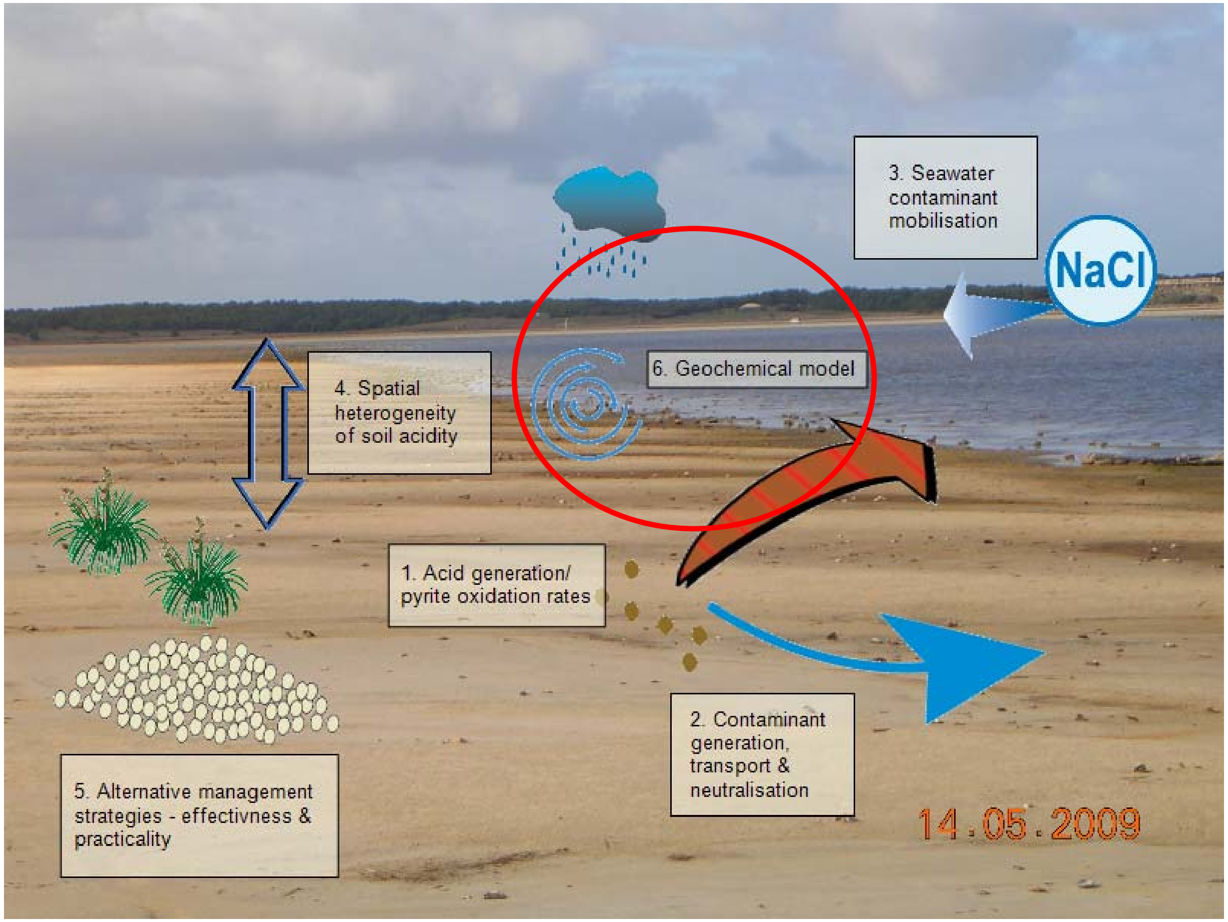
5. Alternative management stragies

The effectiveness and practicality of various alternative acid sulfate soil remediation techniques (e.g. soil and lake liming, reveg.) needs to be further researched and confirmed.



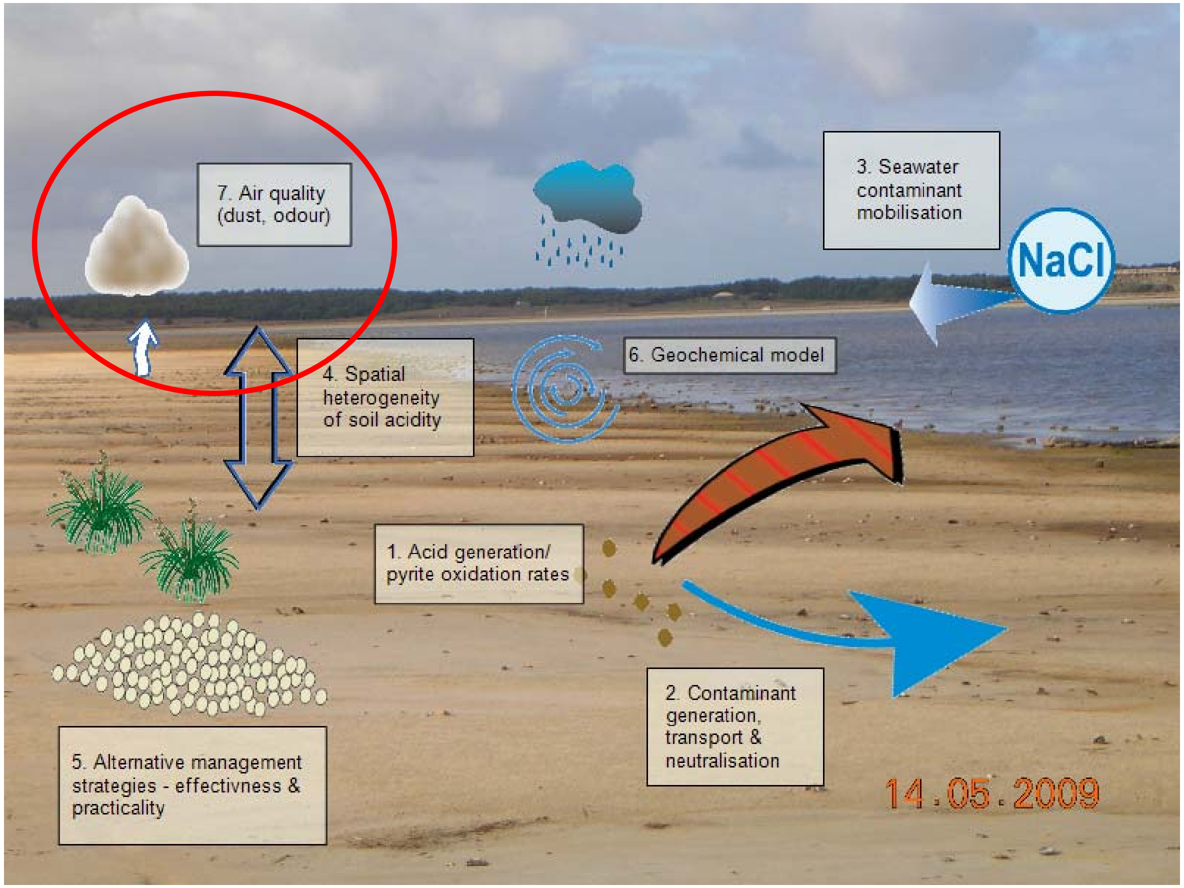
6. Geochemical model uncertainty

The framework and parameters used within the current geochemical model of lake geochemistry needs to be improved in order for the outputs to be used with more confidence.



7. Air quality

The air quality and potential health impacts from dust on the community needs to be better quantified. Also the potential for nuisance odour (e.g. H_2S gas) production as a result of potential seawater flooding needs research.



Research program management

- EPA and DEH managed project
- Reporting to CLLMM project steering committee (Chair Allan Holmes, CE DEH)
- Linking to seawater EIS project and funded by State Government
- Independent reviewers (Dr. John Cugley and others to be appointed) and scientific research committee to integrate and coordinate research
- Deliver results over next 3-6 months
- Assist in formulation of management options
- Communicate outputs to community through CLLMM project

Thank you

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