

Is the acidification of Perth's groundwater microbially driven?

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Background: Perth's water table has been falling as a result of recent climate change and increased groundwater use. As a result, buried organic sediments (peat of former lake beds) are exposed to atmospheric oxygen resulting in oxidation of sulphide minerals and the generation of sulphuric acid. This has resulted in the acidification of the shallow groundwater in areas north of the city, rendering the water unsuitable for use as borewater and threatening the environment and buried infrastructure.

The chemical processes that lead to the formation of acid sulphate soils (ASS) are essentially the same as those responsible for acid mine drainage (AMD) in the mining industry, although the onset and progress of acidification can be much more rapid. Mine waters are known to contain significant populations of chemolithotrophic bacteria able to mediate sulphide oxidation at low oxygen concentrations, so promoting AMD in near anoxic conditions. To date, there has been no research into the possible role of chemolithotrophic bacteria in the oxidation processes leading to the formation of ASS and acidification of the groundwater. Such research is needed in the prediction of the extent and rates of future groundwater acidification.

Aims: This project aims to use culture-independent (molecular) methods to assess the extent of microbial involvement in the acidification of Perth's groundwater. Terminal restriction fragment length polymorphism (T-RFLP) will be used to assess the microbial population diversity in these acid ground waters. An understanding of the microbial action on acid sulphate soils will be the first step in ameliorating this significant environmental problem.