

Acid sulfate soils along the coast of northern Sweden

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Acid sulfate soils (AS-soils) are formed when sulfidic sediments are exposed to air, and they may affect nearby watercourses negatively by lowering the water pH and releasing high concentrations of metals such as nickel. The occurrence of AS-soils and sulfidic sediments in the coastlands of northernmost Sweden was documented to better understand which streams that may be, or have already been, negatively affected by AS-soils.

In situ measurements of pH were conducted to identify AS-soils in the field. Complementary laboratory pH measurements on field samples were done in order to examine whether some of the reduced sediments exhibited potentially acid characteristics when oxidised over a longer period of time (weeks). Chosen samples were analysed for sulfur (S), carbon (C), metals and other elements by IPC-OES and ICP-MS.

Both AS-soils and sulfidic sediments can often be recognised in the field. The studied AS-soils are often characterised by pH levels <4.0 and vertical soil fissures covered by rust, which sometimes are associated with the yellow mineral jarosite. The sulfidic sediments in northern Sweden are often characterised by a distinct black colour and a neutral pH which after incubation in the laboratory drops to values below pH 4.

AS-soils and sulfidic sediments can be found in areas with clay and silt that have been uplifted above the sea level during the past 5 000 years due to land upheaval. AS-soils are mainly formed at sites where the groundwater level has been artificially lowered by man-made ditches. Reduced sulfidic sediments in untouched wetlands that are not exposed to air will successively be covered by layers of peat, which inhibits the development of AS-soils.

The low soil pH conditions have caused leaching of certain elements, e.g. nickel (Ni), cobalt (Co) and cadmium (Cd), from the studied AS-soils. These elements may have reached surrounding waters, and there is a correlation between drainage areas with a high proportion of AS-soils and negatively affected streams.