Geophysical Research Abstracts
Vol. 21, EGU2019-17117, 2019
EGU General Assembly 2019

Metal, sulfate and nitrogen leaching from forest soils containing sulfide-bearing minerals

Tiina Maileena Nieminen (1), Ari Laurén (2), and Liisa Ukonmaanaho (1)

(1) Natural Resources Institute Finland Luke, Helsinki, Finland (liisa.ukonmaanaho@luke.fi), (2) University of Eastern Finland, Helsinki, Finland (ari.lauren@uef.fi)

Soils containing sediments dominated by metal sulfides cause high acidity and release of heavy metals, when excavated or drained, as the aeration of these sediments causes formation of sulfuric acid. These soils include so called acid sulfate soils as well as their metamorphic equivalents, such as sulfide rich black shales, which pose a very similar risk of acidity and metal release to environment. Leaching of acidity and heavy metals can kill tree seedlings and animals such as fish, contaminate water, and corrode concrete and steel. Less attention has been paid on release of eutrophying nutrients, such as nitrogen, although sulfide-bearing sediments are typically rich in carbon and nitrogen and present a potentially high microbiological activity.
Metal (iron, zinc, manganese, copper, nickel, cadmium), sulfate and nitrogen (ammonium and nitrate) concentrations in drainage water from four forested peatland catchments underlain by black shale bedrock were monitored during 8-year-period, and they show higher values compared to reference catchments. Almost half of the peatland area in Finland, roughly 4.5 million hectares, has been drained for forestry purposes. Since most of these drainage operations were carried out between 1960s and 1980s, the first generation tree stands are currently reaching their maturity for final felling. Therefore, the environmental risks of forest management operations related to final harvesting and site regeneration on peatlands should be in control. The potentially harmful impacts of peatland forest management on watersheds may be strongly aggravated in the presence of sulfidic material. In our study, three of the monitoring sites underlain by black shale were clear-cut in second monitoring year and one was left as control. Correspondingly, three reference sites underlain by felsic bedrock were clear-cut and one left intact to serve as a control. Tree harvesting was followed by site preparation (mounding) and seedling establishment at the third monitoring year. Sulfate and nitrogen concentrations were increased by the management operations but no clear impact on metal concentrations was observed.