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Maintaining and enhancing European biodiversity

# Riverine fish assemblages in the areas of acid sulphate soils in Western Finland



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### Introduction

Acid sulphate soils (ASS) were formed in the eutrophic coastal waters of the Baltic Sea 4000-8000 years ago as microbes reduced the sulphate contained in saline seawater into sulphide. Later these areas rose from the sea along with postglacial land uplift. Intensification of agricultural drainages has exposed sulphur-rich sediments to atmospheric oxygen to form sulphuric acid in the soil, which in turn dissolves the surrounding metals. This creates highly acidic and metal-containing runoff water, causing ecological degradation of water bodies especially along the western coast of Finland. This study about riverine fish in acidified rivers is part of the EU Life+ funded project CATERMASS (Climate Change Adaptation Tools for Environmental Risk Mitigation of Acid Sulphate Soils.

## Methods

Fish sampling in wadable river rapids was performed by electrofishing. Each sampling site (average area 133 m<sup>2</sup>) was fished once moving from downstream to upstream by a two member crew equipped with battery powered electrofishing gear and a hand net (Figure 3). Around 45 sites were sampled annually in 2010 - 2012 yielding a total of 136 electrofishing results. Additional electrofishing results (about 70) were collected from other sources. Electrofishing data were related to pH and some other water quality parameters. Additionally, recorded fish kills in rivers, lakes and estuaries in Western Finland were catalogued.



Figure 2. Density of four tolerant and four intolerent fish species in relation to average pH in the studied river or river section.



#### Results

Results indicated clear responses of riverine fish assemblages to acidity and toxic metal concentrations. Species richness declined along pH (Figure 1). Intolerant species, especially grayling (*Thymallus thymallus*), brown trout (*Salmo* trutta) bullhead (Cottus gobio) and minnow (Phoxinus phoxinus), were usually not found in rivers with average pH less than 6 (Figure 2). As an extreme case, River Vöyrinjoki with average pH of 4.5 was found fishless. Catalogued fish kills in Western Finland were found to concentrate in the acidified rivers.

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Photo: Mika Visur

Figure 3. Electrofishing in the River Laihianjoki, Western Finland.

#### Conclusions and recommendations



ASS based acidification was found to degrade riverine fish assemblages. For mitigation of this acidification problem, ground water in cultivated areas should be kept high enough to prevent oxygenation of ASS soils. This can be achieved by controlled subsurface drying. Besides, ditching and all other deep digging operations should be minimized in ASS soils. These measures may help to rehabilitate riverine fish assemblages and other biota, and enhance total biodiversity.

Figure 1. Species richness of fishes in relation to average pH in the studied river or river section.

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