



## **Sustainable Water Supplies in Uppsala, Sweden?**

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**Abstract:** This is a description of a transdisciplinary three-day project with upper secondary school students around ecosystem services and sustainability. Uppsala (200 000 inhabitants) gets its municipal water from wells in the esker that dominates the landscape in and around the town. This esker was formed by glacial melt water around 11 000 BP, at the end of the latest glaciation and was lifted above sea level by post-glacial land rise from 6000 BP.

To keep up the water table in the esker, water from river Fyris is pumped up and infiltrated in the esker. The river is also the recipient of wastewater downstream of the town, and the river runs out into Lake Mälaren that in its turn spills out into the Baltic Sea through Stockholm.

The esker and river can thus be a central topic to work around, in Biology and Geography in upper secondary school, concerning recent and future water supplies, quaternary geology, limnology and landscape history.

The fieldwork is carried out during three days in a period of three subsequent weeks.

1. One day is used to examine the water quality in the river above the town, organisms, pH, levels of nitrogen and phosphorous, conductivity and turbidity. Then the direction of the water is followed, first up to the infiltration dams on the esker, and then along the esker to the wells in the town. The formation of the esker and other traces in the landscape from the latest glaciation is also studied, as well as the historical use of the esker as a road and as a source of gravel and sand. The tap water that comes from the wells is finally tested in school in the same way as in the river.

2. The second day is used to follow the wastewater from households to the sewage plant, where the staff presents the plant. The water quality is tested in the same way as above in the outlet from the plant to the river.

3. The third day consists of a limnological excursion on the lake outside the mouth of the river where plankton and other organisms are studied, as well as water chemistry, oxygen and eutrophication conditions. The contribution from Lake Mälaren on the water quality in the Baltic Sea is also studied and discussed.

At the end of the project the students write a report concerning the formation of the esker and the landscape history of the area as well as water quality issues. A central topic in the report is how is the 'municipal borrowing' of water from the river is affecting the surrounding ecosystems. This leads to a final discussion around ecosystem services and the sustainability in the use of the water from the river and the use of the esker as a way of preparing the municipal water.