Riparian Soils in Future Climates- Developing a model for soil temperature:

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The temperature of riparian soils has been identified as a major influence on the chemistry of runoff water passing though these soils. But how will these riparian soil temperatures change in the future as the globe warms and precipitation patterns change? To answer that question, we need a way to predict riparian soil temperatures. An improved model for upslope soil temperatures has recently been developed. This project will seek to do the same for riparian soil temperatures using extensive observations of riparian soil temperatures (hourly) from both natural sites and sites subjected to snow manipulaitons.

Degerö Mire Hydrology

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The Degerö mire has been studied for almost a century. Most recently the focus has been on biogeochemistry. Fundamental questions remain about the basic hydrology of the mire. This project will employ classic hydrometric techniques, together with analysis of existing water chemistry data to try to estimate the residence time and pathways of water across this mire.

Where does stream begin?

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It seems like a simple question, but there is currently no clear view of how far up into a catchment the stream network extends at high flows, and how the extent of that network varies over the course of a year. This project will collect original field data from the Krycklan Catchment in the spring of 2014 near Vindeln, in Västerbotten. A distributed model of runoff generation will be used to quantify the variability of the stream network.

Evasion of Mercury from Wetlands- ?

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Stefan Osterwalder. Basel University

Current estimates of how much mercury has accumulated in the surface of peatlands suggests that it will take many decades for reductions in mercury deposition to lead to reductions in the mercury in runoff waters. But that is based on the assumption that mercury does not evade from peatlands back to the atmosphere. A doctoral student is quantifying evasion from wetlands using both chamber measruements and Relaxed Eddy Accumulation to estimate this evasion. There is room for two students to work with that student (Stefan Osterwalder) during the spring and summer of 2014. The study site is the Degerö Mire near Vindeln, in Västerbotten.

Snow, Soil water and Runoff- 30 years of the water balance.

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How has a clear cut affected the water balance of a catchment? Detailed micrometeorological measurements from the Norunda ICOS site may provide a clue. These data have been collected to look at greenhouse gas balances, but also contain a trove of hydrological information that are underexploited.

Groundwater Contamination in an Ethiopian Irrigation Project

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Irrigation as a tool in development is complicated. One unwanted side-effect of irrigation is raising of the groundwater table which can make quality of drinking water from wells more vulnerable to contamination. The Koga Irrigation study in Ethiopia provides an opportunity to study this. The project would require financial support in the form of an MFS

Surface Water Residence Time: How does it affect water quality

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A recent breakthrough in the use of GIS has made it possible to estimate the residence time of surface water upstream of any point in Sweden. This project will explore how this residence time has influenced water quality, with a focus on comparing long-term time series from catchments with different residence times.

Stream metabolism during Spring Flood – gas exchange

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Streams are alive! The gas exchange from the stream surface is an important part of the metabolic balance Tracer experiments will be conducted in the Krycklan Catchment in conjunction with other studies to define the gas evasion properties of the stream. This would involve three weeks of field work in the spring of 2014 near Vindeln, in Västerbotten

Hyporheic zone Extent

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The Hyporheic Zone is an important site of biogeochemical transformation in many watercourses. The extent of the hyporheic zone has not been investigated under Swedish condition. Tracer experiments could be conducted in the Krycklan Catchment in conjunction with other studies to define the extent of this riparian zone. This would involve three weeks of field work in the spring of 2014 near Vindeln, in Västerbotten

Carbon Cycling in the Riparian Zone – Mineralization and Export

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The “aquatic conduit” of C export from the terrestrial landscape has been identified as a key factor in estimating the ability to sequester carbon in soils. The carbon mineralized in organic rich, riparian soils and exported to streams as CO2 has recently been recognized as a new, and possibly very large component of the aquatic conduit. Field measurements of the CO2 in the near stream zone can be used to create an estimate of this important new component of the carbon cycle. Data exists to be analyzed and evaluated. One question is whether enough C exists in the riparian zone to support the large estimates of C exported from this zone.

Adding the Aquatic Conduit to Sweden's Carbon Balance

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The aquatic conduit through which terrestrial carbon leaves the soil in runoff and returns to the atmosphere is not currently included in the reporting of national carbon balances under the UN Climate Convention even though it can have a significant impact on this balance. This project will:

1) be the first quantification of the inorganic and organic carbon (dissolved and/or particulate) export from soils along the aquatic conduit in Sweden.

2) assign this export to different soils (e.g. forest land, wetlands) as required by the Kyoto reporting procedures for national carbon accounting.

3)predict changes in the relative importance of the aquatic conduit given predicted changes in climate

4) contribute to SLU’s standing as the leading national source of knowledge, data and reporting on the carbon balance of forests.

Where are the soils in Sweden that are vulnerable to forestry impacts

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There is a great variability in the sensitivity of soils to acidification and nutrient loss. Recent advances in identifying these soils have made it possible to identify these soils at the landscape scale using a GIS overlay of all 500,000 headwater catchments in Sweden. This project will identify the most sensitive catchment to see if there are patterns in forest site characteristics that will make it relatively easy to protect the most sensitive soils

Clear-cut effects on the water balance.

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How does forest cover effect the water balance? This remains one of hydrology's great puzzles because of the variability of forest-water interactions in space and time. Three decades of detailed runoff data and snow profiles from the Svartberget Research Station provide a unique opportunity to define the role of forest on snow accumulation and the associated spring runoff.

A Recent Study on the hydrological effect of a clear cut found that while open areas accumulate ca 30% more snow than forest, the extra snow did not show up in 2 out of 6 spring floods. This points to a large variability in the fate of snow. 30 years of reference plots studies in the Svartberget Long-Term Ecological Research site are a unique source of information on the relationship between snow and runoff. As the climate is expected to change, this will be of importance in understanding the complex set of influences on hydrology.