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Transport and transformation of nitrate in a Danish riparian wetland

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Riparian wetlands have been intensively studied during the past 30 years but these areas still function as a “black box” with regards to removal of nitrogen input from surrounding areas. Riparian wetlands may constitute a small area relatively to the surrounding catchment, but since they act as an interface between the surrounding area and the stream, they may have a large influence on the quality of water entering the stream.
The present case study investigates the riparian lowland surrounding a small headwater stream in Fensholt, Eastern Jutland, Denmark. The riparian lowland covers an area of 25 ha and receives drain water from the surrounding areas, which are dominated by agriculture. The total catchment covers an area of 194 ha. Drain pipes from surrounding agricultural fields conduct water, either directly to the stream, or are cut off in the hillslope where they irrigate the lowland. Nitrate from the irrigating drain water is effectively removed by denitrification as it infiltrates the peat sediments of the riparian lowland. A controlling factor for removal of nitrate thus becomes the infiltration capacity of the lowland sediments relative to the hydraulic loading rate from the drain outlets. When the infiltration capacity is exceeded, drain water may flow as surface water and bypass the lowland sediments. Parts of the lowland itself is also drained by tile drains, further adding to the complexity of the hydrology. The transport and transformation of nitrate in the riparian lowland is investigated by measurements of water levels, soil chemistry and water chemistry in four subareas of the lowland each located at a major drain Outlet. The four subareas are selected to represent different settings of geology, topography, drain flow magnitude, and infiltration area – all influencing the infiltration capacity for drain water.