This study aimed to identify which parameters in wetland soil and water are important regulators for removing nitrogen and producing greenhouse gases. This was carried out by using soil from four riparian wetlands, with different water and soil characteristics.

In the conclusion we found:

- Higher source of nitrogen will not increase the rate of removing nitrogen compounds.
- Nitrate removal capacity and GHG production was found to be limited by the amount and the quality of organic matter in the soil.
- The bacteria activity under no oxygen condition seems also to be regulated by the quality of the water.
- Dissimilatory nitrate reduction to ammonium (DNRA) was occurring beside denitrification.

The results we found in this study could help to achieve a better restoration of wetlands in the future. In order to have better nitrogen removal with low greenhouse gas emissions from the wetlands.

For more information please visit my webpage:
https://www.ifm.liu.se/edu/biology/master_projects/2012/student-thesis-presentati/lind-linus/

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Identifying factors influencing denitrification and greenhouse gas production in riparian wetland soils.

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Supervisors: Carl C. Hoffmann and

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A riparian wetland is the area between land and water in the landscape and the place where groundwater is discharged to streams and rivers. Wetland soils are very effective to remove nitrogen compounds from surface and groundwater.

How? Specialized bacteria use nitrogen instead of oxygen to breath and as a biproduct it releases laughing gas to the atmosphere.

Problems? The last decades have resulted in an increased use of nitrogen fertilizer and many wetlands have been drained. Nitrogen leaches to the surface and groundwater. This causes several environmental problems, such as lack of oxygen and algae blooms in surrounding waters.

Solution: These valuable wetlands services have been attempted to be used. Therefore have restoration of wetlands been encouraged.

But: Under same favorable conditions are greenhouse gases (GHG) released.

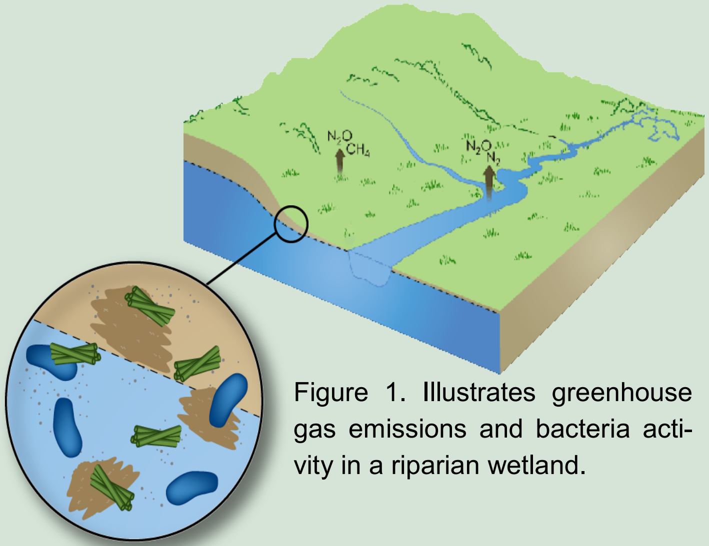

Figure 1. Illustrates greenhouse gas emissions and bacteria activity in a riparian wetland.

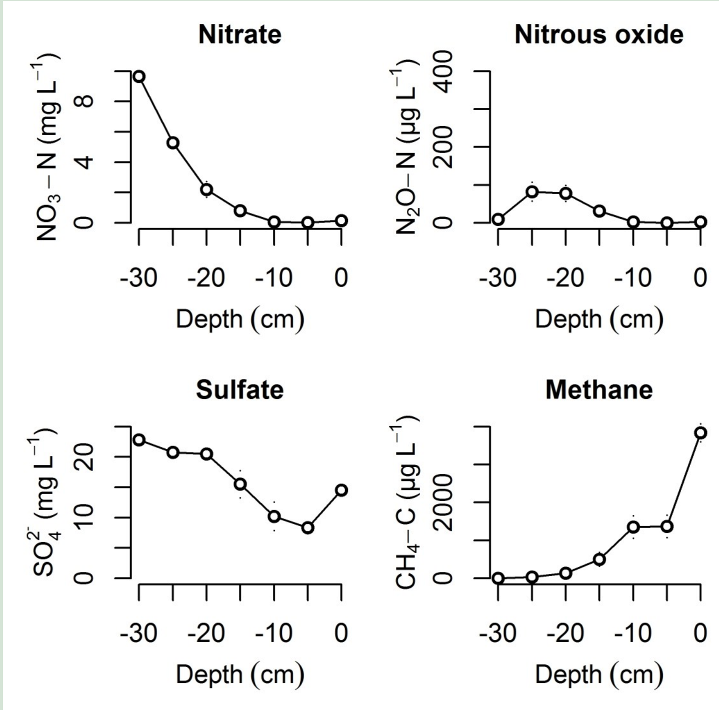

Figure 3. Symbols are representing mean values ± standard errors for the concentration of nitrate, nitrous oxide, sulfate and methane at the measuring points below soil surface, (7 values from -30 (inlet) to 0 (outlet)), at site Simested.

Our results showed that:

- The nitrate removal rate ranged from 38 ± 4 to 71 ± 7 mmol NO_3^--N m^{-2} d^{-1} .
- The highest nitrogen removal rate was found at the sites with higher organic matter content in the sediment.
- Nitrous oxide was used by the bacteria when the nitrate was depleted from the groundwater.
- The methane production was increasing with a decreasing nitate and sulfate concentration.

It is therefore very important to understand and identify which parameters are important for the nitrogen removal process and greenhouse gas production.

Experiment: We conducted an experiment where we brought intact soil cores from four riparian wetlands. We added nitrogen solution to the groundwater which was further pumped through the soil. We sampled the water at seven depths in the soil core during fifteen days. Greenhouse gases and nitrogen compounds were simultaneously studied, under in situ like condition regarding temperature, water flow and nitrogen load.

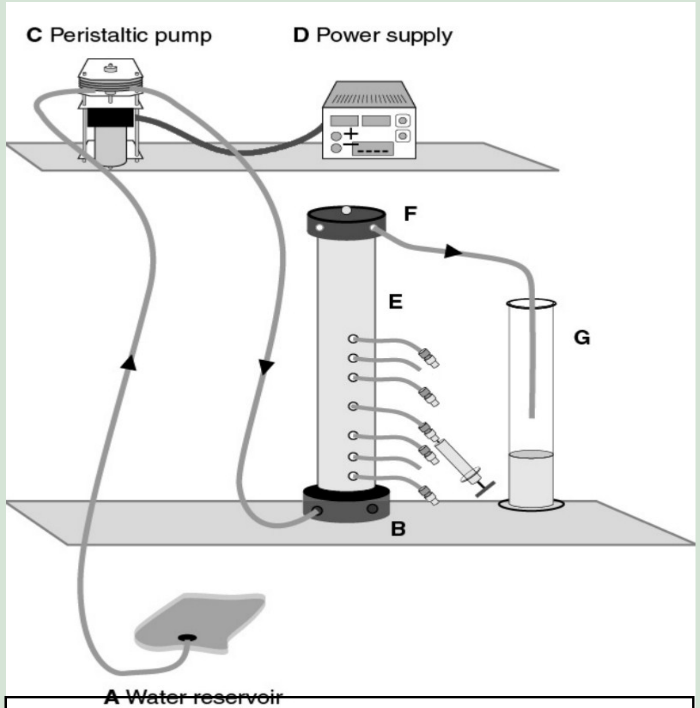

Figure 3. Experimental setup for the soil cores, continues water flow follows the arrows (A to G) driven by peristaltic pump (C) with power supply (D), components: A; water reservoir, E; soil core from B to F, G measuring glass.