

Laboratory investigation of flow and chemical behavior of woodchips to better understand performance of denitrifying bioreactors

Topic of the Master project

Microbial conversion of nitrate (NO_3^-) into gaseous nitrogen (N_2), also known as denitrification, is facilitated by high organic carbon contents and permanently saturated conditions. Denitrification in woodchip bioreactors has the ability to reduce the agricultural load of nitrate into the environment, addressing the rising problem of eutrophication of natural water bodies.

Bioreactor performance depends on many factors, including hydraulic loading rates, influent nitrate concentrations, and dissolved oxygen concentrations.

The residence time of water is one of the key factors controlling the efficiency of denitrification. When the residence time is too short, contact time with denitrifying bacteria can be insufficient for nitrate to be removed from inflowing water and microbial activity can lead to the production of greenhouse gases like carbon dioxide, nitrous oxide, and methane.

The aim of this work is to characterize the different chemical behavior of woodchips with different particle sizes and to investigate the effect of retention time on NO_3^- removal under different flow rates.

Requirements

The student should have basic knowledge in soil science and interest in working in a laboratory environment. Project will begin as soon as possible.

Contact

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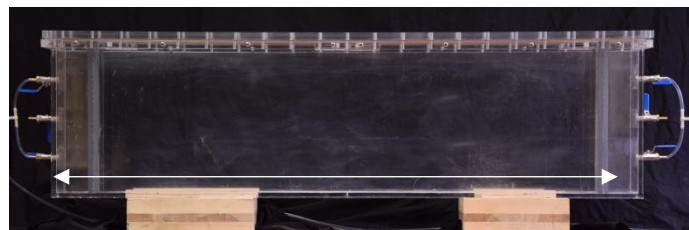
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Laboratory setups



Column (8,7 L) for characterization of woodchips properties



Experimental flume (50 L) for characterization of two-dimensional flow