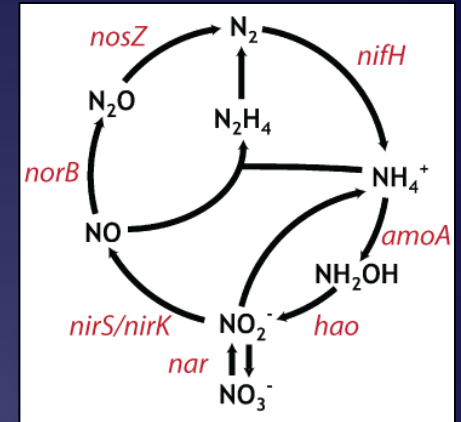


Natural Treatment of Septic Tank Effluent: *Distribution of Nitrogen-Transforming Bacteria in Infiltration Mound Systems*

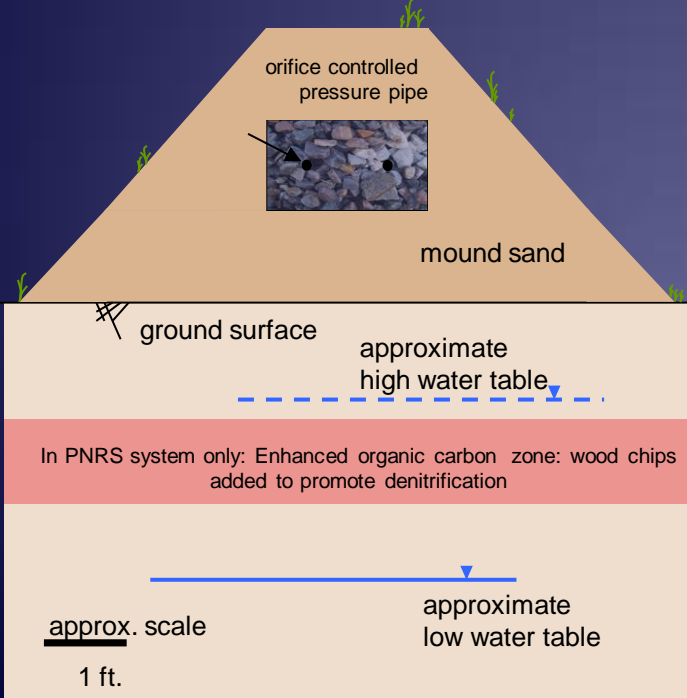
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Background: Infiltration mounds can be used to treat septic tank effluent, achieving both nitrogen removal and groundwater recharge. The microbial community in the soil is responsible for carrying out reactions to transform and remove nitrogen from the water as it percolates downward. Ammonia-oxidizing bacteria, which express the *amoA* gene, transform ammonia to nitrite as part of the nitrification process. Denitrifying bacteria, which express either the *nirS* or *nirK* gene, reduce nitrate to nitric oxide, which is later reduced to dinitrogen gas and removed from the system during the denitrification process.

Project goal: Determine the abundance and distribution of *amoA*, *nirS*, and *nirK* functional genes across the depth profile of infiltration mound soil cores, in order to use the functional genes as proxies for the microorganisms responsible for nitrogen cycling.



Infiltration Mound



Project Scope:

- Collect sub-samples of soil at various depths from soil cores obtained from two infiltration mounds
 - Septic Tank Effluent (STE) mound – sand atop natural soil
 - Passive Nitrogen Reduction System (PNRS) mound – includes enhanced organic carbon zone that uses wood chips mixed into soil to promote denitrification by adding carbon source
- Extract DNA from all soil sub-samples
- Use quantitative polymerase chain reaction (qPCR) to quantify:
 - *amoA* (ammonia oxidation)
 - *nirS* and *nirK* (denitrification)
 - 16s rDNA (bacterial abundance)

Results

Both Systems

- Exhibit a “biozone” – area in top 10 cm where the microbial community thrives and there are high amounts of nitrogen transformation
- Ammonia oxidizers are out-competed at 0 cm

STE mound

- Microbial community rebounds somewhat at the spodic horizon

PNRS mound

- The denitrification genes nirS and nirK increase drastically in the enhanced organic carbon zone – indicates that wood chips as a carbon source are successful in promoting denitrification

This study revealed that a complex community of microorganisms facilitates nitrogen transformation in infiltration mound systems. A complex system of variables such as moisture content, oxygen content, carbon content, and system hydrology control the dynamics of the microbial community, and more research including chemical nitrogen analysis will be conducted to better understand the system.

