Passage of Microorganisms In Septic Tank Effluents Through Mound Sand In a Controlled Laboratory Environment

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Project funding provided by the Wisconsin Department of Natural Resources

Introduction

Pristine groundwater is a greatly treasured Wisconsin resource. Protection of this resource in part relies on removal of organisms from anthropogenic activities that are likely to contaminate ground water. While there is a fairly large literature on the passage of microbes through soil, the specific question of the passage of organisms from relatively clean wastewater effluents through mound sand has received little attention. The basic question to be answered by the research described in this report is: "Do microorganisms suspended in wastewaters from private onsite wastewater treatment systems pass through mound sand in laboratory scale column experiments" This is a complex, multi-faceted question that could be answered with many approaches. The intent of this report is to capture all experimental data with minimal interpretation and discussion.

Experimental Design

As water passes through a mound sand matrix, organisms are removed in three ways, filtration, adsorption or die-off. These mechanisms of removal are complex. Filtration relies on depth, preferential flow paths, saturation, biofilms, surface matting, temperature, flow rate, and dosing frequency. Adsorption depends on microbial flora, surface matting, cation concentration, temperature and pH. Die-off depends on microbial predation, temperature, saturation, drying, organic matrix, microbe multiplication and time. This leads to the following list of experimental variables which could be evaluated.

- Depth
- Saturation
- Time
- Dosing rate
- pH
- Cation concentration
- Dosing schedule
- Temperature
- Dosing effluent quality

This list yields thousands of possible experimental variable combinations. In order to reduce the number of variables to a manageable number, we chose to standardize them as follows.

- Depth: Columns were prepared in a variety of depths from 12 inches to 60 inches (see table 5. below)