Name(s)	Project Number
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Project Title

Controlling Eutrophication Through Nitrate Reduction

Abstract

Objectives/Goals

My fourth year study of the Teichert Ponds, the storm water holding system for the City of Chico, shows they are filling in due to eutrophication caused by nutrient influx. I used three filter substrates to reduce the levels of nitrate, believing the calcium cation in the chalk and bone meal would act as a binding agent for the nitrate anion, thus reducing its conc. in solution, and subsequently reducing the rate of eutrophication. While activated carbon does not have a calcium cation, it is widely used as a filtering agent, so I tested it also.

Methods/Materials

I collected water from the inlet ditch where it enters the ponds. In the lab, I ran an initial nitrate test on this water for my control, and then tried to filter out nitrate using three different filter substrates, Activated Carbon (AC), Chalk, and Bone Meal, subjecting each to two different filtration methods, Rapid Filtration and Prolonged Filtration. In an attempt to determine the effective range of filtration for activated carbon, I tested my aquarium water for nitrate using the Prolonged Filtration process.

Results

Unfiltered pond water, my control, contained 1.0 ppm nitrate. Rapid Filtration was not effective in filtering out nitrates using any of the three filter substrates, AC, Chalk, Bone Meal, yielding 1.0 ppm nitrate, the same concentration as the pond water before filtering (the control) for all trials of each filter substrate. Prolonged Filtration using AC and chalk, yielded 0.0 ppm nitrate for all trials. Prolonged Filtration using bone meal yielded 0.5 ppm nitrate for all trials. Prolonged AC filtration of aquarium water, which had an initial nitrate concentration of 12.0 ppm, effectively reduced nitrate levels to 3.0 ppm.

Conclusions/Discussion

Prolonged Filtration, using AC and chalk, was the most effective way of binding and removing nitrates, reducing them from 1.0 to 0.0 ppm. Prolonged Filtration with bone meal was less effective, reducing them from 1.0 to 0.5 ppm. AC showed a large potential range for reducing nitrate levels, reducing them by 75% from 12 to 3 ppm in the aquarium water. The Rapid Filtration method was not effective in filtering out any nitrates as the levels were unchanged. If the City of Chico does not reduce the nitrate influx and slow the eutrophication of the Teichert Ponds, they risk losing their ability to use the ponds as a waste water holding facility, as they will fill in with vegetation.

Summary Statement

This experiment tests which filter substrate, AC, chalk, or bone meal, when coupled with rapid or prolonged filtration, is most effective in removing nitrates from pond water, thus reducing nutrient input and slowing eutrophication.

Help Received

My father drove and accompanied me to the ponds and helped me construct my board.