Engineered Environmental Containment: Using Lemna minor L. to Reduce Nitrate Levels in Aquatic Environments

Wills, Aaron

Fertilizers containing nitrogen continue to be an integral aspect of the farming economy in the Midwest. Excess run-off of nitrates has become an environmental hazard. When the growth of algae increases, the dissolved oxygen is depleted which suffocates aquatic life. Previous research concluded Lemna minor L. was able to metabolize and lower the nitrate level in water. Instead of reverting back to the harmful nitrate containing fertilizers and chemicals that have been hurting the environment, a containment system allowing Lemna minor to grow, while containing reproduction, can result in a natural way to maintain safe levels of nitrates in water systems. The containment system uses PVC pipe with an innovative and unique anchoring system that adjusts to the ever changing environmental factors. The innovative anchoring system assists with holding the containment system in a single location within a body of water. Due to the ability to custom design any length of telescope and anchor, the containment system can be placed in any depth of water. In the first testing pond, the system reduced the nitrate levels from 4.9 mg/L to 0.1 mg/L. The pond maintained healthy levels of pH and dissolved oxygen and phosphate levels declined once the system was introduced into the pond, which was not thought to be true in testing. The containment system was tested in two different pond systems for a total of seven weeks. During the time of experimentation, the system demonstrated that it could maintain itself in a pond environment over long periods of time.

Awards Won:

Third Award of $1,000

International Council on Systems Engineering - INCOSE: Certificate of Honorable Mention