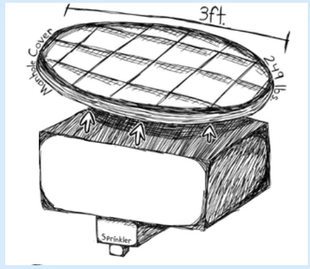
Preventative Methods of Phosphorus Mitigation in Runoff Directed Towards the Indian River Lagoon, Brevard County, FL

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Background

For years the Indian River Lagoon (IRL) has experienced harmful algal blooms caused by eutrophication (Sellner et al. 2003). When storm water washes away fertilizers with high phosphorus and nitrogen content into storm drains those chemicals flow into the lagoon. This leads to multiple issues for the lagoon and Florida. The micro algae *Aumbera lagunensis*, also known as brown tide, feeds on phosphorus and nitrogen. When excess nutrients enter the lagoon, it contributes to these blooms. When *A. lagunensis* blooms it can block sunlight which causes dead zones in water that kill seaweed and other species crucial for the ecosystem. Aluminum sulfate (alum) has been used to treat phosphorus in bodies of water (Pilgrim, K. M., & Brezonik, P. L. 2005). This experiment explores utilizing preventative methods to create a phosphorus limited environment for the brown algae species A. lagunensis by treating phosphorus levels in runoff water before it reaches the IRL. The experiment will test the efficacy of a phosphorus mitigation system that would theoretically be placed in storm drains to treat runoff pollution. The system will be tested in the simulated environment of a golf course for specific control.

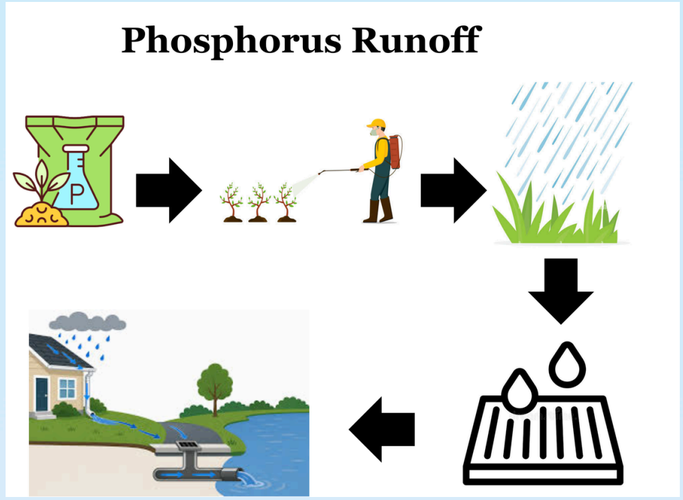


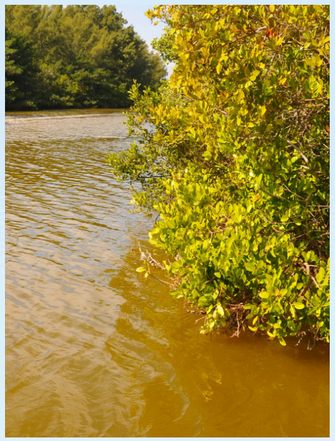
Phosphorus Mitigation System

References

Kevin G Sellner, Gregory J Doucette, Gary J Kirkpatrick, Harmful algal blooms: causes, impacts and detection, Journal of Industrial Microbiology and Biotechnology, Volume 30, Issue 7, 1 July 2003, Pages 383–406, https://doi.org/10.1007/s10295-003-0074-9

Pilgrim, K. M., & Brezonik, P. L. (2005). Treatment of Lake Inflows with Alum for Phosphorus Removal. Lake and Reservoir Management, 21(1), 1–9. https://doi.org/10.1080/07438140509354407







Methods & Materials

The experiment will test the alum treatment and a control over three-time variables; 30 minutes, 120 minutes, and 300 minutes. Three replicates will be run concurrently at each time variable. Tests will be run in a 10-gallon aquarium. Each aquarium will contain 10 liters of simulated runoff water. To simulate the runoff water, we have pulled from data that represents the phosphorus usage of golf courses. Osmocote will be used to create the phosphorus pollutant. An aerator will be used to simulate oxygenation as in storm drains. The tanks will also contain a glass container with water, for displacement to meet the minimum water height requirement for the storm drains. The tanks will also contain a glass container with water, for displacement to meet the minimum water height requirement for the aerators. 400 milligrams of aluminum sulfate will be weighed out as the treatment dosage maintaining a 8mg to 1mL ratio, as current literature suggests. The alum will be added and then the timer started. After replicates have run their respective time, five liters of water will be collected, and the displacement containers will be removed to allow for a wider runoff-to-lagoon water ratio. 15 Liters of Lagoon water will be poured into the tanks and sit for 30 minutes for controls and the treatment group at each time variable. Phosphorus levels will be tested at three points in the treatment group and twice in the control group. The initial phosphorus level of simulated runoff water, phosphorus level of treated water after run time in the treatment group, and phosphorus level of combined lagoon water and runoff after the additional 30 minutes. We will compare the results of the phosphorus levels across each group and each time variable.



Expected Results

The focal group will yield lower phosphorus levels then the control and will have a higher efficacy at the 120 minute variable.