



Environmental Science Graduate Program Seminar Series

Ultrasound as a source water reservoir management strategy to control cyanobacteria blooms

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Abstract

Cyanobacteria blooms, commonly referred to as harmful algal blooms (HABs), are an issue that negatively impact lakes and reservoirs around the world. HABs can have detrimental health effects on both people and animals and can degrade local ecosystems. To mitigate these negative impacts of HABs, different treatment methods have been implemented, such as ultrasound. Ultrasound produces sonication which is the application of sound waves to achieve a particular chemical or physical effect. Studies investigating the application of ultrasound at high power show that ultrasound can: collapse gas vesicles in cells using buoyancy as an evaluation tool for gas vesicle collapse; break filamentous cyanobacteria; inhibit growth; reduce cell concentrations; inactivate cells; reduce photosynthetic activity; and increase sedimentation rates. However, there is limited knowledge on the effects and treatment mechanisms of ultrasound applied at low power, which is primarily used in lakes and reservoirs. The goal of this work is to elucidate how ultrasound may be affecting cyanobacteria using a common ultrasonic system deployed in the field. A potential mechanism that could be occurring when HABs are exposed to ultrasound is sonoporation, which is the formation of temporary pores in the cell membrane. In order to test if sonoporation is occurring container studies will be performed, in which cyanobacteria cells will be stained with fluoroprobes, exposed to a commonly used ultrasonic unit in the field, and ran on a flow cytometer to examine the cells fluorescence. The results obtained from this work will help those using ultrasonic systems make more informed decisions and optimize the effectiveness of their systems.