CONSTRUCTION, OPTIMIZATION, AND COST-BENEFIT ANALYSIS OF FLOATING AQUATIC TREATMENT WETLANDS FOR PHYTOREMEDIATION PRE-TREATMENT OF MUNICIPAL LANDFILL LEACHATE EMPLOYING SALINE-TOLERANT PLANTS

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Leachate treatment is a cost-intensive process for most municipal landfills because it carries excessively high concentrations of ammonia, metals, and other dissolved solids which can disrupt the function of contemporary water treatment plants. To compensate for potential disruption, wastewater treatment plants require payment based on the volume and concentration of multiple substances in leachate. Some of the substances are: chemical oxygen demand, ammonium, phosphate, nitrate, and nitrite.

Dr. Ashley Danley-Thomson's lab at the U.A. Whitaker College of Engineering at Florida Gulf Coast University tested the ability of multiple native Florida, saline-tolerant plant species to survive in leachate. After a few species (mangrove spider lily, giant leather fern, white mangrove, red mangrove, and black mangrove among others) were identified to survive in leachate and remove some contaminants, those species were suspended in dilutions of 25%, 50%, 75%, and 100% concentrations of leachate to test their ability to survive in it without soil and to treat it. Different floating wetland designs were also tested to determine the most efficient design for reduction of chemical oxygen demand, ammonium, phosphate, nitrate, and nitrite in the leachate.

Once trials were conducted to examine the efficiency of different plants and designs to treat leachate, a cost-benefit analysis was done to determine the extent to which floating wetlands could be used to minimize costs for municipal landfills. The analysis determined some plant species which were more efficient at removing chemical oxygen demand and some which were more efficient at removing ammonium. The appropriate species for optimal removal depends on initial concentrations within the target leachate and the specific contaminant regulations which must be met for treatment. Other factors may be used to optimize the system including aeration and pH adjustment.

PRESENTER BIO: Austin Wise is a senior at Florida Gulf Coast University studying Environmental Engineering. From Punta Gorda, Florida, Austin spends as much time as possible outside, especially in or near the water. His affinity for the outdoors is what drives his passion academically and what will continue to drive him professionally.