

# EVALUATION OF A BIOCHAR ENHANCED CONSTRUCTED TREATMENT WETLAND FOR THE REMOVAL OF CONTAMINANTS FROM AGRICULTURAL WASTEWATER

Stefanie Gugolz and Valentine Nzengung

---

AFFILIATION: UGA Dept. of Geology

REFERENCE: *Proceedings of the 2017 Georgia Water Resources Conference*, held April 19-20, 2007, at the University of Georgia

---

Nutrient-rich wastewater runoff from concentrated animal feeding operations (CAFO's) is one of the largest sources of contamination of surface waters in the US. This study evaluated biochar as a media in vegetated constructed treatment wetlands (CTWs) for treatment of CAFO wastewater. A wood biochar, pyrolyzed at 500°C was characterized for its adsorption of ammonia (NH<sub>3</sub>), nitrate (NO<sub>3</sub>) and phosphate (PO<sub>4</sub><sup>3-</sup>). A greenhouse experiment was conducted with four 140 L simulated constructed wetland tanks as follows: R1 – 100% biochar planted with cattails, soft rush, parrots feather and knotweed; R2 - 50% biochar, 50% pea gravel and plants; R3 - 100% biochar and no plants; and R4 - pea gravel and plants. Diluted swine waste was applied to each tank and the influent and effluent were analyzed for total solids (TS), PO<sub>4</sub><sup>3-</sup>, chemical oxygen demand (COD), total Kjeldahl nitrogen (TKN), NH<sub>4</sub><sup>+</sup>-N, NO<sub>3</sub><sup>-</sup>-N and total minerals (Al, B, Ca, Cu, Fe, K, Mg, Mn, Na, P, S, Zn). Plant growth was monitored. Diluted swine wastewater (2x) used in test 1 resulted in the death of all of the plants in R4, ~ half in R2, and only a few in R1. Follow-up 2nd and 3rd tests were conducted using the more dilute wastewater. Overall, there were no statistical differences between the mass of pollutants removed by R1 and R2, but for almost all parameters they outperformed R3 and R4. Cattail growth was the greatest in R1 and the least in R4. These findings show that incorporation of biochar into the substrate of constructed wetlands media can significantly increase their treatment of agricultural wastewater. Additional studies using other types of biochar could yield even better results.

*Program reference: 3.1.4*