

**Improving Ammonia and Phosphorus Removal  
in Subsurface Flow Wetlands  
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**Margaret G. Forbes, Joe C. Yelderman, Jr., Tina Potterton, Adam  
Clapp, and Robert D. Doyle  
Baylor University Wastewater Research Program  
and  
Teresa D. Golden of University  
North Texas Chemistry Department**

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**Executive Summary**

The objective of the research was to improve the nitrogen and phosphorus removal capacity of subsurface flow wetlands. The research tested methods of increasing oxygen through passive aeration and intermittent loading and presented the following conclusions:

- All of the wetland treatment systems were effective in removing TSS and CBOD5.
- Passive aeration units generally had enhanced nitrification and the intermittent loading unit was most effective in nitrifying ammonia-nitrogen to nitrate-nitrogen.
- All of the newly constructed wetlands had good PO<sub>4</sub>-P removal, and the intermittently loaded unit produced the lowest dissolved phosphorus levels.
- The X-ray diffraction analyses suggest that the formation of calcium carbonate promotes the growth of the calcium phosphates on the surfaces of the of the expanded shale media, resulting in long-term, irreversible sequestration of phosphorus.
- The intermittent loading design was the most effective overall treatment system and deserves further investigation.

**Author's Recommendations**

There were no specific recommendations

**Were rule changes identified?**

None

**Is further researched needed?**

Additional research identified by the author:

The author stated that further investigation of intermittently loaded wetlands is warranted.

No further research was identified by TCEQ staff.