



Are Woodchip Bioreactors a Phosphorus Source or Sink?

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Ana Paula Sanchez Bustamente Bailon, the first author of this study, (left) adjusts a control structure to make sure water is routed correctly into a bioreactor and (right) assesses different kinds of woodchips for use in a bioreactor. Photos by Laura Christianson/UIUC.

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Denitrifying woodchip bioreactors are an efficient conservation drainage practice that clean nitrate from tile drainage water. These relatively passive treatment systems continue to gain traction around the world, but all wood contains phosphorus, which can leach out of a bioreactor's woodchips. The magnitude and extent of this possible nutrient tradeoff (that is, nitrate removal versus phosphorus contribution) is relatively underexplored. Some bioreactors have even shown some small ability to remove phosphorus from water. So, are woodchip bioreactors a source of phosphorus to surface waters? Or do they provide some phosphorus treatment?

A research team monitored 10 full-size bioreactors in Illinois for a total of 23 site-years, including more than 1900 sets of paired bioreactor inflow/outflow samples. The bioreactors provided net removal of dissolved phosphorus in 15 of the 23 site-years, and the median annual removal efficiency was 12%. Bioreactors removed the most dissolved phosphorus when inflow phosphorus concentrations were high and when the bioreactors were younger.

The researchers concluded that bioreactors often provide a small benefit for dissolved phosphorus removal from tile drainage, but this benefit is neither large enough nor consistent enough to consider woodchip bioreactors a phosphorus treatment practice at this time.

Adapted from

Bailon, A. P. S.-B., Margenot, A., Cooke, R. A. C., & Christianson, L. E. (2024).

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