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Influence of ditch management on nutrient and pesticide fate and transport

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Agricultural drainage ditches are prominent in the landscape of the Midwestern United States. Dredging of drainage ditches is periodically necessary to ensure that agricultural fields are drained adequately. The objective of this research was to quantify the potential impacts of dredging on nutrient transport within these fluvial systems. Ditch bed material was collected from ditches before and after dredging and placed in a fluvarium (stream simulator). Water with high levels of soluble phosphorus (SP) or nitrogen (N) flowed over the sediments for approximately 120 hrs, and then contaminant free water flowed over the sediments for 24 hrs. Water samples were collected periodically, and nutrient concentrations were compared between the pre-dredge and dredged ditch bed materials. Ditch bed materials collected prior to dredging were better able to remove SP, ammonium-N (NH_4-N) and nitrate-N (NO_3-N) from the water column than the ditch bed materials collected after dredging. Nutrient uptake rates appeared to be greater for the pre-dredge bed material, while nutrient uptake lengths were longer for the dredged bed materials. Pedogenic removal of iron (Fe) from the bed materials during prolonged wet periods appears to have decreased their ability to adsorb SP from the water column. Nitrification decreased after dredging, most likely due to the removal of the benthic flora responsible for this process. Monitoring of this ditch upstream and downstream of the dredging activity occurred in the two years before and the two years after dredging. In the first year after dredging, there was a removal of SP and total P (TP) in the dredged region of the ditch. This is demonstrated by a decrease in the mass loss of SP (12 kg) and TP (5 kg) when comparing data from the

monitoring site upstream of the dredging activity to that of the downstream monitoring site. To minimize the associated risks to water quality, resource managers should dredge ditches when nutrient loads are expected to be low and work with producers to minimize fertilizer applications during and immediately after dredging.