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Watershed-Level Optimization of BMP Selection for Cost-Effective Pollutant Load Reduction

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Abstract:

Green Bay is impaired by phosphorus and sediment loading from the Lower Fox River (LFR), which leads to algae growth, oxygen depletion, and water clarity problems. As part of an integrated watershed approach demonstration project sponsored by the U.S. Environmental Protection Agency (EPA), The Cadmus Group, Inc. (Cadmus) designed a watershed-level optimization framework for determining the optimal combinations of agricultural best management practices (BMPs) for restoring water quality in the basin. Site-specific BMP costs were used in conjunction with estimated load reductions associated with the BMPs to identify the most cost-effective combinations of BMP scenarios that achieve the greatest phosphorus load reduction. The optimization analysis was conducted using the Soil & Water Assessment Tool (SWAT) in conjunction with a site-specific Optimization Model (OptiMod).

Impact Statement:

The optimal scenario of agricultural BMPs in the basin results in an estimated 21% phosphorus load reduction (50,000 kg/yr). The cost of implementing the optimal scenario of BMPs is \$6.9 million per year, or about \$138 per kilogram of phosphorus reduced from agricultural nonpoint sources. Potential point source facility upgrades in the basin results in an estimated 19% phosphorus load reduction (45,045 kg/yr). Total estimated cost associated with point source facility upgrades is \$10.8 million a year or about \$240 per kilogram of phosphorus reduced from point sources.

Applying an equal phosphorus reduction target to both point sources and nonpoint sources in the LFR Basin may not be the most cost-effective strategy, as agricultural BMPs have the potential to achieve the greatest phosphorus load reductions at the lowest cost. Cadmus is working with EPA Region 5 and Wisconsin Department of Natural Resources on a total maximum daily load (TMDL) to address the impairments. To support the development of the TMDL implementation plan, Cadmus is refining OptiMod to also evaluate urban stormwater BMPs and point source facility upgrades.

Category: Watershed Assessment and Restoration

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