ABSTRACT

THE EFFECTS OF URBANIZATION ON BAIRD CREEK, GREEN BAY, WISCONSIN

Jessie C. Fink

The Baird Creek watershed in Green Bay, Wisconsin, is rapidly changing from agricultural to urban land use between Northview Road and Interstate 43. To assess how urbanization is impacting the aquatic ecosystem of Baird Creek and to assist the City of Green Bay and the Baird Creek Preservation Foundation in making informed land management decisions within the watershed, this project established the following research questions: (1) Do differences exist in the water quality of the agricultural and urbanizing tributaries of Baird Creek? (2) Has the channel morphology of Baird Creek and its tributaries changed in response to hydrologic alterations in the urbanizing watershed? (3) Is the L-THIA watershed development assessment tool a viable model for assessing the impact of future development in the Baird Creek watershed?

Land use, percent impervious cover, and current construction activity were first assessed for the subwatersheds of Baird Creek. Storm event and low-flow sampling was conducted from April to December 2004 at three locations on Baird Creek: an agricultural tributary, a tributary transitioning to urban land use, and the main channel downstream of the confluence. Water samples were analyzed for total suspended solids (TSS), total phosphorus, and total dissolved phosphorus. Continuous temperature, pH, dissolved oxygen, turbidity, conductance, and depth data were recorded at each location. A relationship was established between turbidity measurements and TSS concentrations, which were used as a surrogate for sediment. Changes in channel morphology were assessed at twelve sites previously measured in 2002. Finally, data from water quality sampling and projected future land use was used to evaluate the L-THIA watershed assessment model as a tool to predict changes in pollutant export due to development.

Overall, the study found that urbanization is adversely impacting Baird Creek. Statistical analysis showed that event concentrations of sediment and total phosphorus were significantly higher on the urbanizing tributary than the agricultural branch. Also, although the urbanizing portion of the watershed comprised only 18.5% of the total land area, it contributed 60-70% of the total sediment load during a period of summer storm events. The channel morphology assessment showed that the cross-sectional area and bankfull width of sites located on urbanizing tributaries increased dramatically between the 2002 and 2004 surveys, but fewer impacts were seen at the sites downstream on the main channel. Finally, an evaluation of the L-THIA model as a potential development assessment tool indicated that care must be taken to fully understand the hydrological processes being modeled in order to avoid underestimating impacts of development.