

INFOS for WINgra Best Management Plan (WIN-BMP)

Project Description

The proposed project will extend the study Yahara lakes, Mendota, Monona, Waubesa, and Kegona, of the current Integrated Nowcasting and Forecasting Operation System (INFOS) project to include Lake Wingra. The Lake Wingra Watershed is approximately 3,500 acres and is primarily located within the City of Madison but also includes lands of City of Fitchburg and Town of Madison. Lake Wingra receives approximately 34% of its inputs due to surface runoff from the highly urbanized watershed (UW-IES, 1999). Lake Wingra itself is a small, shallow eutrophic body of water that is considered to experience degraded water and habitat quality due to watershed inputs and in-situ lake conditions.

The degradation of Lake Wingra water and habitat quality has also resulted from increases in the amount of surface runoff inflow and decreases in amount of groundwater inflow. Considerable effort has been made to reduce the input of sediment and phosphorus to Lake Wingra. Most notable has been the renovation and expansion of stormwater management practices in the UW-Arboretum. For the most part this work has been opportunistic, focusing on installations on public lands downstream in the watershed. Further gains can be made by considering major sediment and phosphorus sources that are not being treated. Field investigations that focus on sediment and phosphorus "hotspots," sites would be critical to further identify the locations of persistent erosion of soils with significant phosphorus concentrations. Potential hotspots include unstable channels, large eroding greenspaces, and soils that are disturbed by snow-removal operations.

In-lake management practices provide additional opportunities for improving water and habitat quality in Lake Wingra. When storm water enters a lake system during storm periods, suspended storm water sediment loading and transport is important to overall lake water quality. In addition, wind-induced sediment resuspension from the benthic substrate can be of great concern. It is recognized that aquatic macrophytes serve as the foundation of a healthy lake system as they hold lake bottom sediments, absorb nutrients, and provide refuge for wildlife. From the past efforts we also learn that the role of carp plays a significant role in sediment resuspension. Carp is a bottom feeder that can stir up bottom sediments and uproot macrophytes, leading to the turbid water phases. As nutrients are transported into the lake system an increasing phosphorus flux can promote eutrophic waters and provide growth of algae. The phosphorus cycle can undergo transformations of inorganic phosphorus to organic phosphorus or vice versa. This change in chemical composition describes the production of the system and is responsible for shifts in phytoplankton production versus clear water phases. To date our understanding of complex interactions of physical, chemical, and biological processes in Lake Wingra is still quite limited, which somehow impedes our ability to provide or evaluate effective strategies to improve water clarity.

Objective

The goals of the proposed project are to identify the most promising opportunities for improving water and habitat quality in Lake Wingra and assess the associated costs and benefits. The project will consider both watershed and in-lake issues.

Technical Approach

Watershed Component

1. Identify the most significant sources of sediment and phosphorus to Lake Wingra.
2. Evaluate the role of the source loading to water quality in Lake Wingra.

Lake Component

1. Evaluate the importance of sediment resuspension due to carp and wind.
2. Investigate vegetation effects on sediment resuspension.
3. Develop a predict lake hydrodynamic and water quality model for providing possible locations for the growth of desired macrophytes.
4. If phosphorus is determined to be a primary factor controlling water quality, incorporate information on phosphorus chemistry, especially bioavailability, into assessments of the impacts of phosphorus loading from the watershed and from in-lake sediment resuspension, and the benefits of reducing phosphorus loadings.

Duration

The duration of the project is two years, starting from November 1, 2011 to October 31, 2013.