SECTION 1
INTRODUCTION

1.01 INTRODUCTION

This report summarizes the methods and results of the Lake Wingra Watershed Management Plan commissioned by the City of Madison (City) and the Friends of Lake Wingra (FOLW) to develop a Lake Wingra Watershed Management Plan. More information regarding the FOLW is included in Section 1.05. Figure 1.01-1 shows the location of the study area. The Lake Wingra watershed is predominantly a fully developed urban watershed home to diverse land uses including the UW-Madison Arboretum that surrounds much of the lake. Table 1.01-1 provides important Lake Wingra facts.

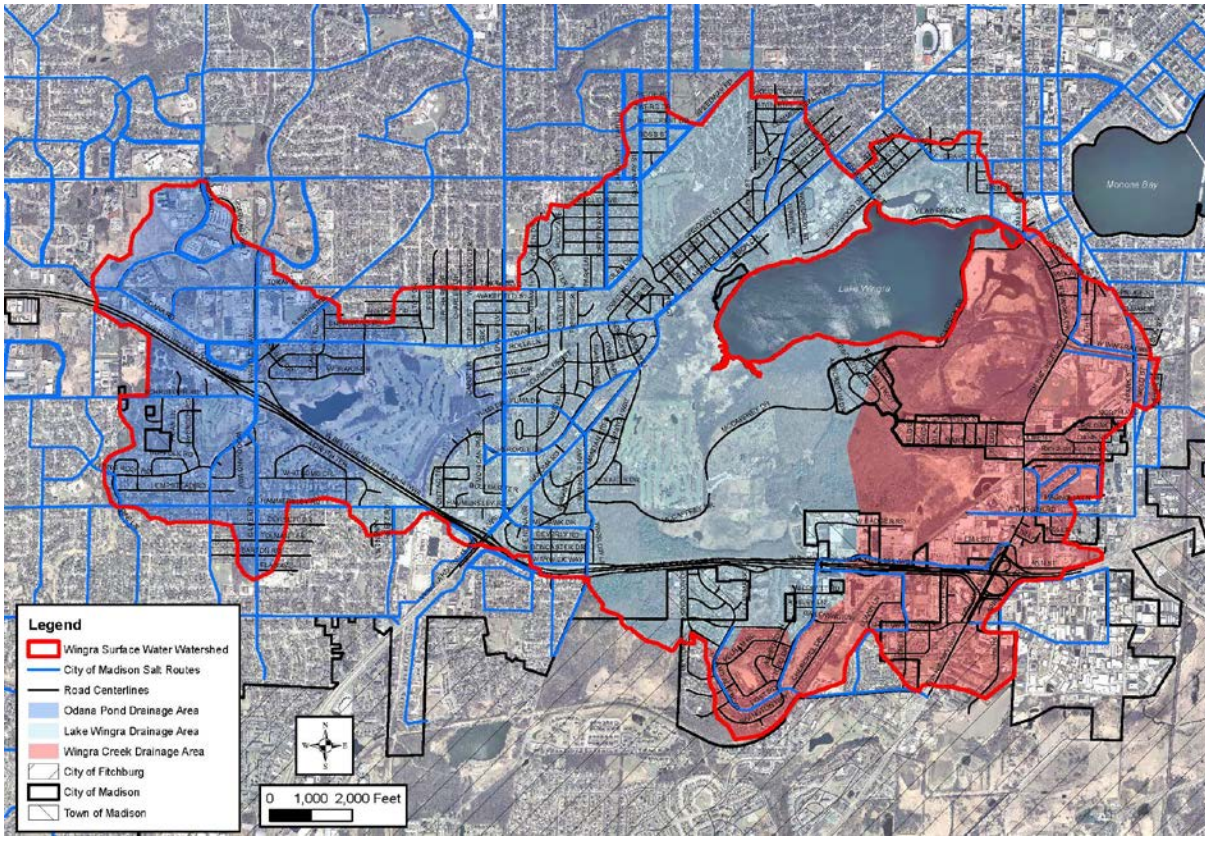

Figure 1.01-1 Lake Wingra Watershed Plan Study Area

Parameter	Fact
Lake Surface Area	339 acres
Maximum Depth	14 feet
Average Depth	7 feet
Lake Volume	103 million cubic feet (2,363 ac-ft)
Total Phosphorus Concentration: Long-Term Median (1996-2007)	0.056 mg/L
Secchi Visibility: Long-Term Median (1996-2007)	2.0 feet
Watershed Draining To Lake	3,636 acres (5.68 sq. mi.)
Common Fish Species	Bluegill, Largemouth Bass, Muskellunge, Common Carp
WDNR Designation	303(d) Listed Impaired Water for Phosphorus and PCBs

Source: 2014 State of the Lakes Annual Report, Clean Lakes Alliance

Table 1.01-1 Lake Wingra Parameters and Facts

The lake suffers from degraded surface water quality and decreased spring flow that affect the lake ecosystem and recreational use of the lake environs. This plan seeks to increase infiltration and decrease total phosphorus (TP) and chloride inputs to Lake Wingra by identifying the contributing factors to each, analyzing alternatives to do so, and providing an implementation plan backed by social marketing principles to foster behavior change in the watershed. The plan has as its inspiration the Friends of Lake Wingra's 2009 *Lake Wingra; A Vision for the Future* document (http://www.lakewingra.org/wp-content/uploads/2014/03/wingravision.pdf).

Impacts of strategies to meet the infiltration, phosphorus, and chloride goals for the project may work at cross purposes with each other but also provide synergistic opportunities. For example, increasing infiltration in the watershed may increase chloride inputs via groundwater to the lake. However, reducing chloride usage may allow more infiltration to occur. In this case, a potential strategy to reduce chlorides in the Odana Pond watershed may allow more infiltration to occur in the MG&E Infiltration Facility located in the Odana Golf Course. This plan seeks to identify these issues and take advantage of these synergistic opportunities.

1.02 SCOPE OF STUDY

The following is a summary of key elements included in the plan. Strand has been assisted by UW-Madison Professor Brett Shaw, the City's Social Marketing Consultant, to align the project with social science methods.

A. Steering Team and Issue Team Meetings

Thirteen Steering Team Meetings were held approximately every six weeks during the course of this project to obtain input from project stakeholders. Three Issue Team Meetings were held during the course of the project as needed. Meeting summaries are included in Appendix A.

B. Identification of Critical Actions

Analysis was completed for the following parameters to estimate existing levels, analyze critical actions (alternatives/strategies) for improvement seeking to meet identified goals, estimate costs of the alternatives/strategies, and provide a prioritized implementation plan. From this analysis, a pilot project plan for one critical action (leaf bagging related to TP) was developed after consideration of identified critical actions for each of the three parameters.

1. Chlorides (Section 2)
2. Infiltration (Section 3)
3. Total Phosphorus (Section 4)

C. Stakeholder Engagement

A summary of stakeholder engagement efforts is included in Section 5 of this report including the following scope items.

1. Identify/Interact With Target Audiences–Identify, communicate with, and interact with target audiences, and identify those responsible for critical actions.
2. Develop Social Marketing Strategy–Identify potential behavior change strategies, develop written strategy for engagement with those responsible for critical actions, and develop a framework for a social marketing pilot project.
3. Implementation Plan–Using the Social Marketing Strategy, provide engagement activities with those responsible for critical actions to understand techniques most likely to be effective in creating behavior change. From these activities, provide an implementation plan for plan components including a roles and responsibilities memorandum.

D. Draft and Final Plan

A draft and final plan was submitted to the City documenting the results of the plan. An implementation plan is included as Section 6 of this report.

E. Final Report Presentation

Upon completion of the plan, a final presentation was given on the plan.

F. Social Marketing Strategies (Pilot Project)

A leaf bagging pilot project has been created and will be managed and tracked as part of this plan.

G. Grant Application

An Urban Nonpoint Source and Stormwater Grant Application was submitted for an “early success” project identified in the plan.

1.03 LOCATION OF STUDY AREA

The location of the Lake Wingra Watershed Management Plan study area, which is in the Lower Rock River Basin, is shown in Figure 1.03-1.

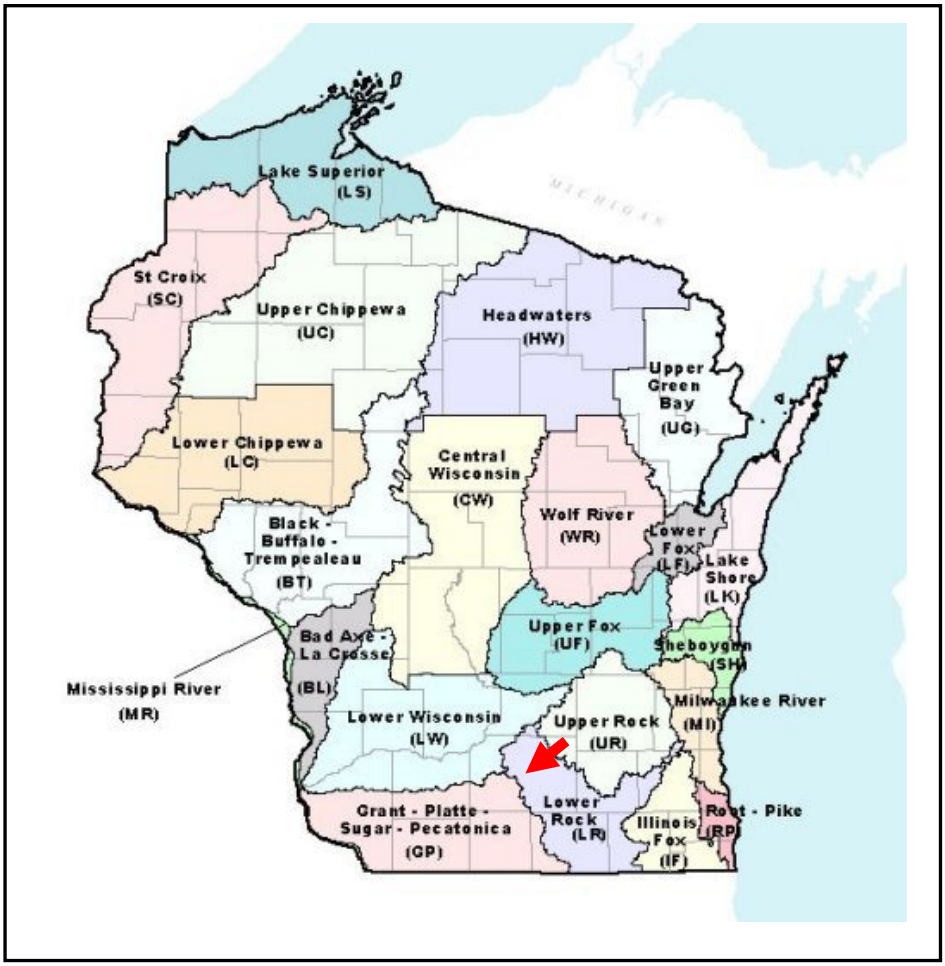

Figure 1.03-1 Study Area Location Relative to Wisconsin Department of Natural Resources Basins

1.04 PREVIOUS STUDIES

The following reports and plans are applicable to portions of the Lake Wingra Watershed Management Plan planning area and were reviewed as part of this study.

Wingra Watershed: A Model for Green Infrastructure Design and Implementation, Edgewood College Student Report, Fall 2013.

Monroe Street and Wingra Park: Design for Healthy Neighborhoods and Lakes, UW-Madison Student Report, May 2013

UW-Madison Curtis Prairie Stormwater Plan, WI DOA/DSF and UW-Madison, Strand Associates, Inc.®, November 2012.

Vilas Park & Lake Wingra Shoreline Vision, Edgewood College Student Report, July 2012

Adopting Green Infrastructure Strategies for The Lake Wingra Watershed, Edgewood College Student Project, 2011.

Groundwater Status Report Prepared for Friends of Lake Wingra, Edgewood College Student Project, August 2011.

UW-Madison Arboretum-Curtis and Coyote Ponds Stormwater Management Plan, WI DOA/DSF and UW-Madison, Strand Associates, Inc.®, March 2011.

Lake Wingra; a Vision for the Future, Friends of Lake Wingra, 2009.

Road Salt Management and Chloride Dynamics of An Urban Lake, UW-Madison Student Project, 2009.

UW-Madison Stormwater Quality Management Plan, WI DOA/DSF Project No. 06A1B, Strand Associates, Inc.®, September 2008.

Arbor Hills Greenway Stormwater Infiltration Design, UW-Madison Student Project, 2008.

Lake Wingra Dam Investigation and Analysis, City of Madison, Strand Associates, Inc.®, November 2006.

Monroe Street Commercial District Plan, Dudgeon-Monroe and Vilas Neighborhood Associations and the Monroe Street Merchants Association in collaboration with Planning and Design Institute, Inc. and Business Districts, Inc., November 2006

UW-Madison Arboretum Stormwater Management Plan, WI UW-Madison, September 2006.

UW-Madison Arboretum Facility Stormwater Management Plan, UW-Madison, July 2006.

Hydrologic Modeling for the Lake Wingra Watershed: Ho Nee Um Pond and Wingra Park Subwatersheds, UW-Madison Student Project*, 2004.*

Lake Wingra Watershed Management Plan–Storm Water, Friends of Lake Wingra, August 2003

Monthly and Annual Water Budgets of Lake Wingra, Madison, Wisconsin, 1972-1977, United States Geological Survey, Water Resources Division, October 1979.

Road Salt Report, Public Health Madison and Dane County, Annual Publication.

1.05 FRIENDS OF LAKE WINGRA

The Friends of Lake Wingra was formed in 1998 with an interest in improving the health of Lake Wingra through coordinated watershed management and by engaging the watershed community in stewardship of the lake and its watershed.

The Friends of Lake Wingra mission, vision, and goals reflect the belief that sustaining the balance of a healthy lake ecosystem requires the participation and collaboration of many citizens, agencies and organizations. FOLW's approach to watershed protection therefore involves partnerships with numerous stakeholders who live, work, and play in the Lake Wingra watershed.

The Friends of Lake Wingra's goals are in the following areas.

- Citizen Stewardship–Grow present and future generations of watershed stewards.
- Integrated Watershed Management–Protect and improve the 'lake as a system' through innovative and coordinated management practices.
- Long-term monitoring and research–Ensure that the information needed to address the mission is available on an ongoing basis.
- Organizational Capacity and Resources–Build the internal capacity to achieve the mission.

Friends of Lake Wingra is currently engaged in a variety of projects aimed at improving the health of Lake Wingra. Our projects include both outreach to the watershed community and on-the-ground restoration and stewardship efforts.

The Friends of Lake Wingra could not work without the help of our friends and partners: dedicated volunteers, members, and organizations who contribute essential time and labor to the preservation and protection of Lake Wingra and the Wingra Watershed

To learn more about the Friends of Lake Wingra or to get involved in one of the Friends of Lake Wingra projects, please visit the FOLW website: **http://www.lakewingra.org**

1.06 DEFINITIONS AND ABBREVIATIONS

The following definitions and abbreviations are presented as an aid to the reader.

A. Definitions

Average Sediment Depth–The average depth of deposited sediment measured over the entire stormwater pond area.

Average Current Normal Pool Depth–The average depth of water measured over the entire stormwater pond area. This is the difference between the water surface and the top of sediment.

Average Current Total Pond Depth–The average depth of the stormwater pond if all deposited sediment were removed. This is the difference between the water surface and the existing bottom of the pond.

Control Structure–The manmade structure that controls the water released from a stormwater facility to the outfall.

Curve Number–The Soil Conservation Service has devised a method of computing runoff from an area based on a system of curve numbers. The curve number for an area of land is obtained by examining the land use and soil type of the land area.

Flume–The structure or channel upstream of the stormwater facility used to convey stormwater to the facility.

Forebay–The area of the pond near the inlet where heavy sediments are encouraged to settle out of the stormwater that enters a facility.

Outfall–The piping, channel, or other equipment downstream of the control structure used to transfer water out of the control structure to the surrounding environment.

Recurrence Interval–The probability that a given rainfall event will occur in a given year. For example, a 100-year rainfall event has a 1 percent chance of occurring in a given year (1/100 = 0.01 = 1 percent); a 5-year rainfall event has a 20 percent chance of occurring in a given year (1/5 = 0.20 = 20 percent).

Salt Route, No-Salt Route–The portion of a transportation system where the maintaining entity applies road salt for purposes of deicing. No-salt routes (i.e., Sand Routes) are the portion of a transportation system where the maintaining entity does not apply road salt, typically applying sand as an alternative.

Subbasin–The parts of a drainage basin that, when combined, create the entire drainage basin for a facility.

Time of Concentration (T_c)–"…the time for runoff to travel from the hydraulically most distant point of the watershed to a point of interest within the watershed," SCS, 1986.

Time Distribution of Rainfall–The amount of rainfall that has fallen during a storm event versus the amount of time that has elapsed during a storm event.

Weir–A wall or vertical plate spanning the control structure. When the water level of the pond reaches the top of the weir, water flows over the weir and out of the pond.

B. Abbreviations

BMP	best management practices
BOD	biochemical oxygen demand
CCC	Criteria for Continuous Concentration
CCL	Drinking Water Contaminant Candidate List
City	City of Madison
CTC	Chronic Toxicity Criterion
ft^3	cubic feet
ft^3/year	cubic feet per year

FOLW	Friends of Lake Wingra
GIS	geographical information system
GPS	global positioning system
HSG	Hydrologic Soils Group
HSG	Hydrologic Soils Group
Mgd	million gallons per day
MG&E	Madison Gas & Electric
MMSD	Madison Metropolitan Sewerage District
MS4	municipal separate storm sewer system
NOI	Notice of Intent
NOI	net present worth
NRCS	Natural Resources Conservation Service
P8	Program for Predicting Polluting Particle Passage Thru Pits, Puddles, and Ponds
SDWA	Safe Drinking Water Act
Strand	Strand Associates, Inc.®
T_c	time of concentration
TMDL	total maximum daily load
TP	total phosphorus
TSS	total suspended solids
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WDNR	Wisconsin Department of Natural Resources
WGNHS	Wisconsin Geological and Natural History Survey
WisDOT	Wisconsin Department of Transportation