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## TMDL Development for Lake Michigan Beaches

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### Background

Over the last 30 years, waters in Illinois have been monitored for chemical, biological, and physical conditions. In some cases, the conditions of those rivers and lakes fall short of the need to support basic water quality use goals. These waters are deemed impaired since they cannot meet use expectations set for them under state and federal law. When this happens Total Maximum Daily Load (TMDL) reports are developed for impaired waters to determine the maximum amount of a pollutant a water body can receive and still meet water quality standards and support its designated uses. Designated uses include aquatic life, public water supply, swimming, recreation, fish consumption, and aesthetic quality.

TMDLs are done in stages to allow for public involvement and input. TMDL development in Illinois begins with data collection—water quality, point source discharge, precipitation, soils, geology, topography, and land use—within the specific watershed. All impaired water body segments within the watershed are identified, along with potential pollutants causing the impairment. Illinois Environmental Protection Agency (IEPA) determines the tools necessary to develop the TMDL. In most cases, computer models are used to simulate natural settings and calculate pollutant loads.

All of the beaches along Lake Michigan are included on the impaired waters listing for *Escherichia Coli* (*E. coli*), Mercury, and Polychlorinated biphenyls. The TMDL described in this fact sheet is to address the recreational use impairment by pathogenic bacteria (*E. coli* as the indicator).

### The Illinois Shoreline

Lake Michigan beaches and their coastal waters are a highly valued societal and ecological resource. These beaches are widely popular, highly used, and frequently monitored by stakeholders and local government to ensure that water quality conditions support safe and healthy recreation. There are 51 segments along the shoreline listed as impaired on Illinois' 303(d) list. For this TMDL, "shoreline segment" is at times used in place of "beach" because not all 51 segments are considered beaches as defined by the local management agencies and are therefore not regularly monitored. However, all Lake Michigan nearshore waters have a designated use for primary contact recreation (77 Ill. Adm. Code 820.400); therefore, IEPA assesses any shoreline segment with available monitoring data at the time of the assessment to determine if they are supporting its designated use. For the segments without swimming access, although they are not currently monitored regularly, there were historical data available that indicated a segment was not supporting the designated use. The 51 shoreline segments are addressed in three separate TMDL documents; one for Lake County, one for suburban Cook County, and one for Chicago. Lake County beaches are monitored by the Lake County Health Department. The beaches within Cook County are monitored by several different agencies, including: Glencoe Park District, Winnetka Park District, Kenilworth Public Works Department, Wilmette Park District, Evanston Health Department, and Chicago Park District. The maps accompanying this Fact Sheet show the location of each segment along the shoreline.

### The Concern

From May through September, the various organizations sample Lake Michigan beaches 4 to 7 days a week for bacteria. The Illinois Department of Public Health and the beach management authorities use these monitoring data to determine when to put swim bans in place at each managed beach. The IEPA uses the number and duration of swim bans to assess whether or not the beaches support designated uses for primary contact recreation. Within Illinois, Lake Michigan Beaches are found to be "not supporting" of primary contact use when, on average over a three-year period: (1) one or more beach closures occurred per year lasting less than a

week; or (2) less than one beach closure occurred per year, but the average closure duration was one week or greater.

### **Potential Pollutant Sources**

There are several potential sources of *E. coli* that are either generated in the drainage watershed and released to the impaired beaches or are directly deposited at each beach segment. The potential offsite sources of *E. coli* that are impacting the impaired beach segments include: partially treated effluent from sewage treatment plants; urban stormwater runoff impacted by illicit or failing sewer connections; pet, avian, and wildlife feces; and contaminated sediment. Potential sources generated on site include: direct deposition of feces from gulls, pets, and bathers and resuspended sand in the swash zone.

### **TMDL Development**

TMDLs must be written to meet applicable water quality criteria. In selecting a target for the TMDL at the beginning of the assessment, IEPA considered both the SSM and the GM (assuming a 30-day period) water quality standards. The GM (126 cfu/100 mL) was selected as the target for the TMDL and was consistent with the U.S. EPA's position as described in the U.S. EPA's promulgated federal criteria (Pages 67224-5 of Federal Register Notice, November 16, 2004). In November 2012 the U.S. EPA released recommendations for Recreational Water Quality Criteria (2012 RWQC). The Beach Act directs States and Tribes to adopt and submit to U.S. EPA the RWQC for Beach Act waters. Although the selected TMDL target is based on the 2004 Federal *E. coli* criteria it still provides at least equivalent health protection as would be provided by the 2012 RWQC.

In order to identify the sources of bacteria to the impaired segments, given no sources are immediately identified in the 303(d) listing, research was conducted into studies of beach contamination in the area and over swimming beaches in general. Then, any data on identified potential sources were gathered from the available site-specific data provided by local beach managers, federal data repositories, and beach monitoring groups. These data were screened to provide a daily time series of any available monitored source or other environmental parameter with a corresponding bacteria measurement. The environmental parameters include measurements of a potential bacteria source, such as magnitude of precipitation as a surrogate measure of bacteria from stormwater. Finally, these time series were used in a statistical method to determine which monitored sources or other environmental parameters were best correlated with the daily monitored bacteria concentration. Based on the statistical relationships found with the multi-level empirical modeling, load reduction strategies could be set to obtain the TMDL target by altering model parameters that can be managed as opposed to those solely controlled by nature.

### **Implementation Recommendations**

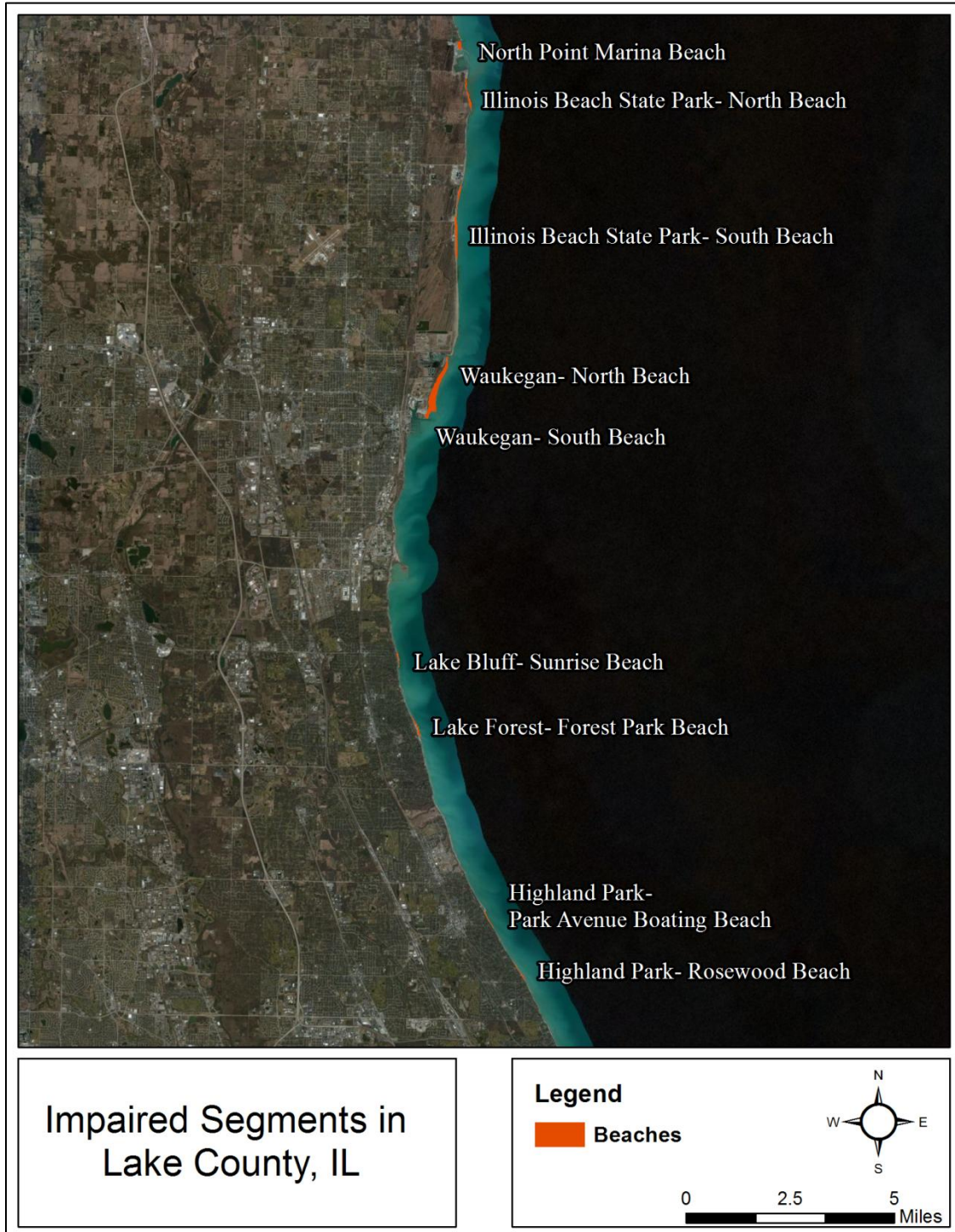
Implementation actions were developed to directly target the load reduction strategies but also to address general beach health. Load reduction strategies were focused on factors that can be managed through actions under the control of beach managers. The number of seagulls and the slope of beach segments are two manageable factors that contribute to *E. coli* deposition at impaired beaches. Pools of standing water at the beach provide an area for gulls to congregate and allow *E. coli* to remain suspended in the surrounding sand and washed back into the water. Regrading the impaired beaches would help to reduce these areas of standing water which will in turn reduce the amount of *E. coli* found in beach sand. One other manageable contributor to *E. coli* deposition is runoff from the surrounding land areas, including impervious areas, which can pick up bacteria and carry it to the beach. Stormwater Best Management Practices (BMPs) can be implemented to reduce impervious surface cover and allow more runoff to infiltrate into the soil.

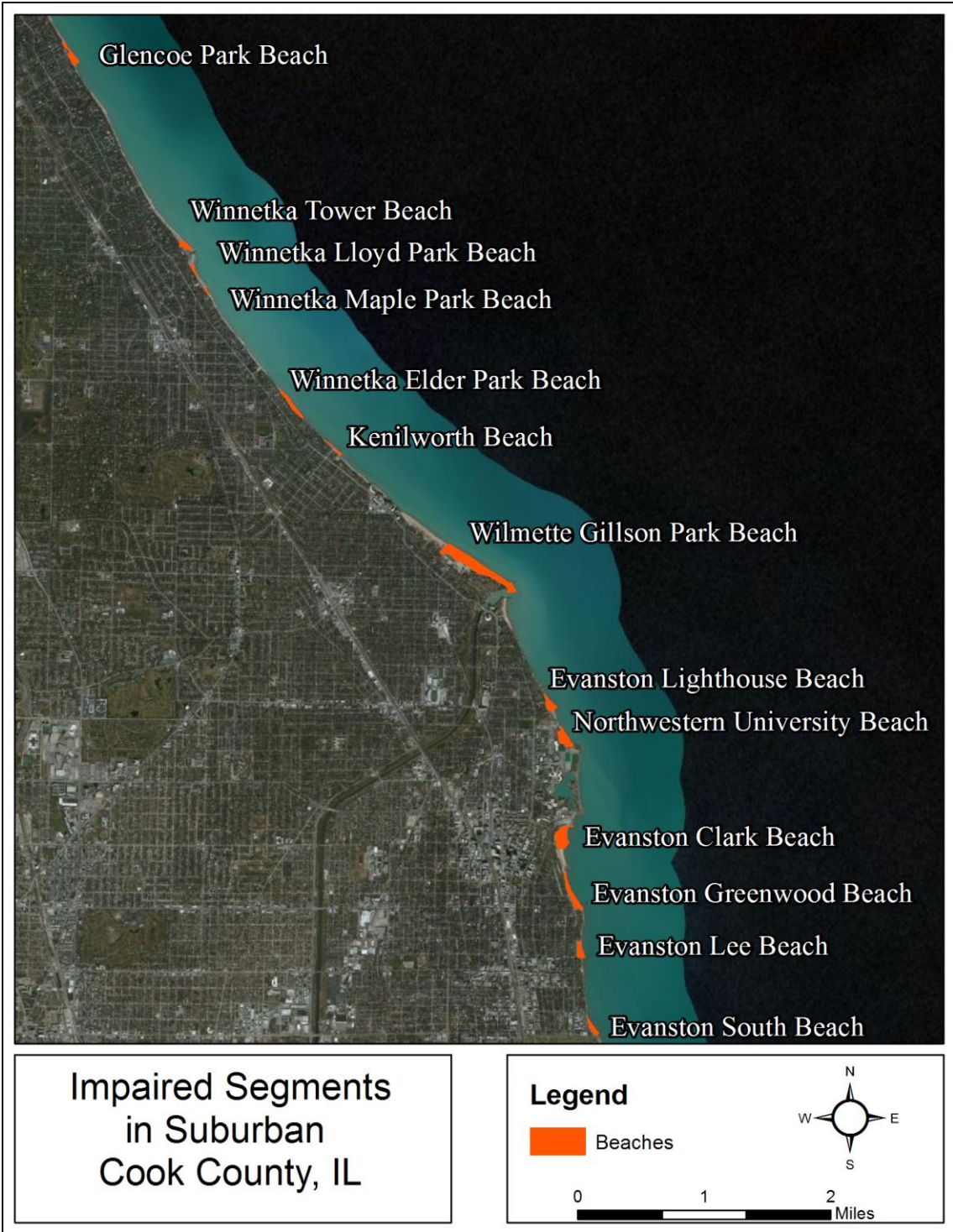
For more information on this specific TMDL or the TMDL program, visit the Illinois EPA website at <http://www.epa.state.il.us/water/tmdl/>.

For information on the assessment of Illinois waters, refer to the Integrated Report and 303(d) List at <http://www.epa.state.il.us/water/tmdl/303d-list.html>.

If you have any questions, please contact Abel Haile by phone at 217/782-3362 or email at [Abel.Haile@Illinois.gov](mailto:Abel.Haile@Illinois.gov).

Maps that List the Impaired TMDL segments







Impaired Segments in Northern Chicago, IL

