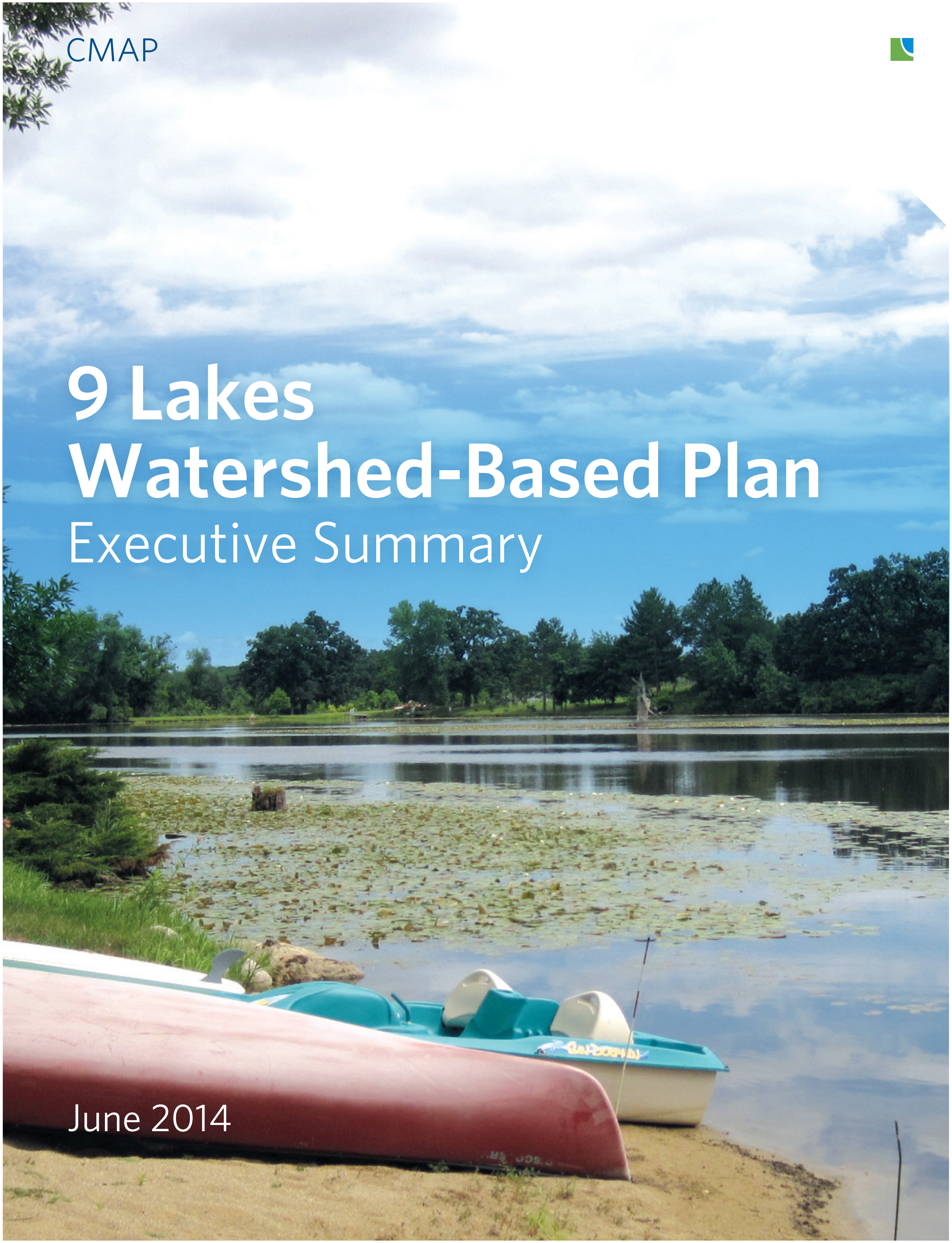
CMAP

9 Lakes Watershed-Based Plan

Executive Summary

June 2014



Acknowledgments

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CMAP staff wishes to thank all of those people listed in Appendix C of the full 9 Lakes Watershed-Based Plan who participated in the two-year planning process. We wish to especially acknowledge the support of the following agencies and organizations: Lake County Stormwater Management Commission, Lake County Health Department, 4 Lakes Initiative, Barrington Area Conservation Trust, Tower Lakes Improvement Association, and Timber Lake Civic Association. We are grateful for the support and meeting space provided by the Village of Wauconda, Village of Lake Barrington, Village of Port Barrington, Village of Island Lake, Wauconda Park District, Northern Moraine Water Reclamation District, Slocum Lake Management Association, Village of Tower Lakes, and Lake Barrington Shores.

Executive Summary

Watershed planning got underway in the spring of 2012 for a 29 square mile area of lakes and streams draining to the Upper Fox River Basin. The planning effort was led by the Chicago Metropolitan Agency for Planning (CMAP) with Clean Water Act funding provided through the Illinois Environmental Protection Agency's Bureau of Water.

Dubbed the 9 Lakes area and situated primarily in southwest Lake County, Illinois, the focus is on addressing water quality impairments in the following lakes: Island Lake, Lake Barrington, Lake Fairview, Lake Napa Suwe, Ozaukee Lake, Slocum Lake, Timber Lake, Tower Lake, and Woodland Lake (see Figure 1).

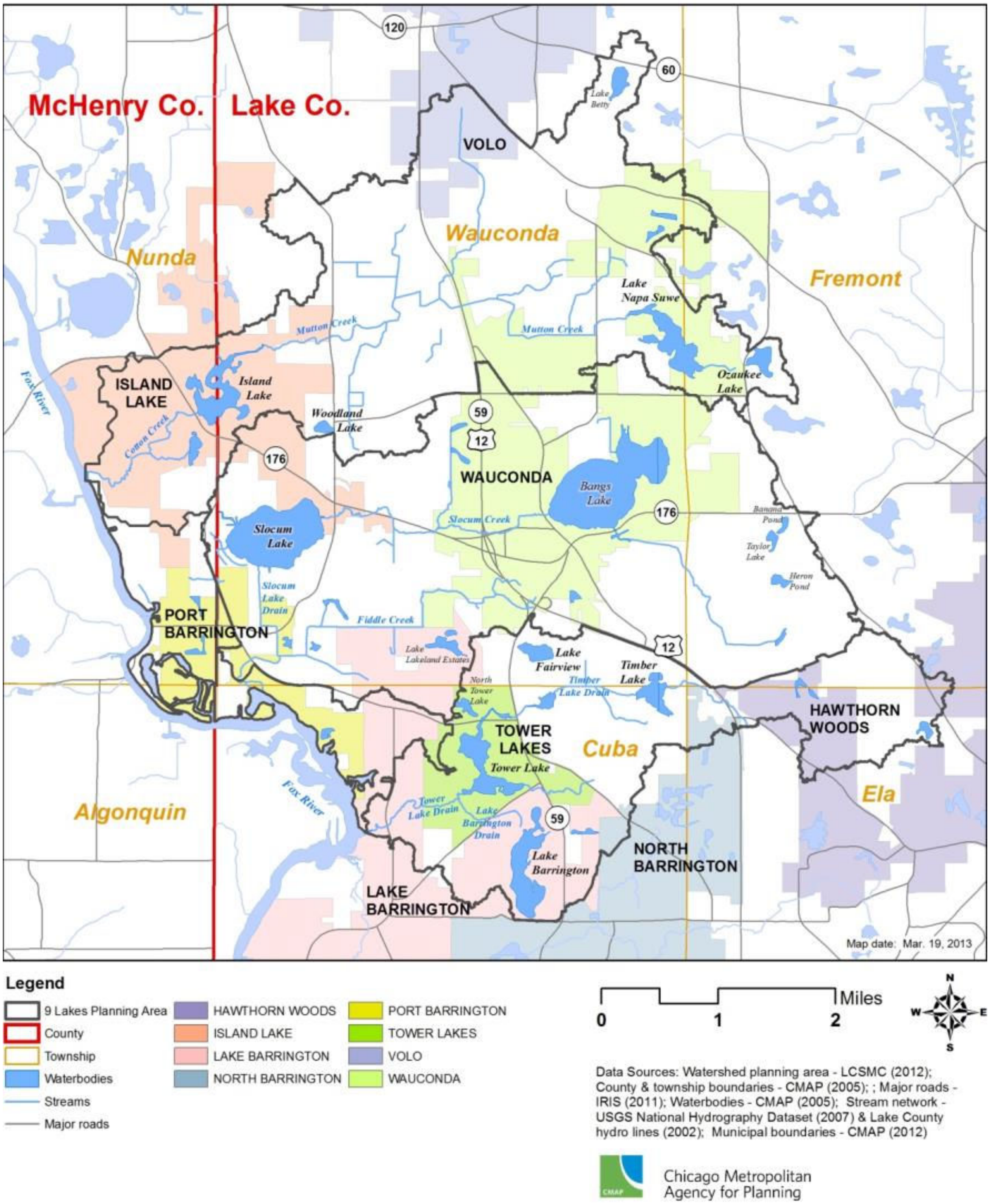
All nine lakes feature an aesthetic quality and designated use impairment with total phosphorus the common cause of impairment among others. Woodland Lake is also Section 303(d) listed for an impaired aquatic life use designation and both Tower Lake and Lake Barrington are additionally listed for primary contact recreation use impairment with fecal coliform the cause of impairment. Fiddle Creek, a tributary to the Upper Fox River, features an impaired aquatic life use designation. The Fox River is impaired for both aquatic life and fish consumption.

Near bi-monthly public meetings were conducted at various venues throughout the planning area where participants set goals and objectives and learned from one another about causes and sources of nonpoint-source pollution. Meetings of this nature over a two-year period were an integral part of the education and information component required of a watershed-based plan. Meetings included many individuals who are involved in local lake or neighborhood groups. Such participation bodes well for plan implementation support and continued collaboration going forward.

Land use is primarily residential (36 percent) with public open space (19 percent) and similar land cover in private ownership (19 percent) the next most common. Agriculture represents 15 percent of the planning area land use and is most concentrated in the northernmost Cotton-Mutton Creek watershed.

Impervious surface, nearly 14 percent in the aggregate, has rendered stream health/water quality "impacted" in most of the 14 subunits delineated for modeling purposes. Exceptions are Ozaukee Lake ("sensitive" at two percent impervious surface) with a very small watershed that is wholly owned by the Lake County Forest Preserve District, and Island Lake with a current classification of "approaching impacted" (9.6 percent impervious surface.) The Slocum Lake subunit is "nonsupporting" at 25.2 percent impervious surface, the highest of the 14 subunits. A projection of future impervious surface suggests that the Island Lake subunit is the most vulnerable to a downgrade of steam health/water quality as imperviousness could nearly double to 18.2 percent. Given the impact of stormwater runoff on local water quality, any increase in impervious surface will make lake and stream remediation more difficult than it already is.

Figure 1. 9 Lakes Planning Area in northeastern Illinois.



Baseline or background pollutant loads to the nine lakes were generated by applying the Spatial Watershed Assessment & Management Model (SWAMM) custom developed for the planning area by a consultant to CMAP. Watersheds for each of the nine lakes represent a subset of the 14 subunits as mentioned. Event-mean concentrations for pollutants were developed from the literature. Along with local climate data inputs, the model is based primarily on a combination of soils, slope, land use, proximity to stream network and parcel data. Pollutant removal efficiencies assigned to the best management practices (BMPs) recommended were developed from a combination of the literature and best professional judgment.

The 9 Lakes Plan details both pollutant loads and load reductions associated with a suite of BMPs (i.e. plan recommendations) for each of the 14 subunits. The plan features four types of recommendations: site-specific BMPs with associated pollutant-load reduction estimates; site-specific BMPs without pollutant-load reduction estimates; watershed-wide BMPs (four types of practices) with associated pollutant-load reductions that are assigned to each of the 14 subunits as appropriate; and other policy and program related recommendations.

Here, aggregate numbers are presented for purposes of an overview of the problem and how well the plan recommendations are able to potentially mitigate nonpoint-source pollution at the scale of the entire planning area (see Table 1).

Table 1. Pollutant-load reduction potential for 9 Lakes Planning Area.

	N (lbs/yr)	*P (lbs/yr)*	*Bacteria (Bcol/yr)*	*TSS (lbs/yr)*	*Sediment (tons/yr)*	*Cl (lbs/yr)*
Baseline p-loads	74,865	7,685	43,353	7,063,987	---	2,235,810
BMP load reductions	9,931	2,342	7,314	1,083,683	794	6,731
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Percent reductions from all BMPs	13.3	30.5	16.9	15.3	---	0.3

Table 1 suggests a number of things. First, nonpoint-source pollution will be difficult, if not impossible, to mitigate entirely. Secondly, modeled plan recommendations (i.e., those that feature a model-derived pollutant-load reduction) have the potential to impact phosphorus loads the most. This is encouraging given that the primary motivation for developing the plan was to address phosphorus in the nine lakes. That said, in-lake management measures will be required for all the lakes to achieve the level of reduction in phosphorus (P) that will allow the lakes to approach or meet the phosphorous standard. Thirdly, chloride is a particularly vexing pollutant to mitigate. In order to reduce chloride loads, the best practice available is to reduce the amount applied to roads (i.e., source control).

Given the emphasis on total phosphorus related lake impairments and CMAP's charge to determine load reductions required in order for the lakes to attain the P water quality standard, the Canfield-Bachman (CB) artificial lake model was employed. The CB model estimates what the total average annual P influx would need to be (i.e., maximum) in order to achieve the water quality standard of 0.05 mg/L. The CB model also determines what the influx is that corresponds with current water quality data available from samples taken from the lakes. When combined with SWAMM output that estimates land-based inputs of P to the lakes, stakeholders can understand how well the plan recommendations perform relative to reducing land-based pollutants and relative to the total influx that the lakes are receiving (see Table 2).

Table 2. Phosphorus reductions required to attain the lake standard and reductions possible from implementation of plan recommendations

Lake name	*P (lbs/yr) from surface runoff*	*Reduction (lbs/yr) from full implementation of BMPs*	*Max. percent reduction from land-based BMPs compared to inputs from surface runoff*	*Total P (lbs/yr) reduction needed from all sources to attain WQ standard*	*Percent of reduction possible from BMPs relative to WQ standard*
Ozaukee Lake	17	7	41	201	3
Lake Napa Suwe	164	48	29	602	8
Woodland Lake	23	11	48	33	33
Island Lake	2,759	320	12	2,258	14
Slocum Lake	1,245	537	43	6,150	9
Timber Lake	618	525	85	445	118
Lake Fairview	29	16	55	26	62
Tower Lake	505	192	38	633	30
Lake Barrington	228	67	29	327	20

Table 2 offers stakeholders a mix of potential observations. Phosphorus control from implementation of plan recommendations will have variable impact on the nine lakes of special concern. Timber Lake stands to benefit the most from site-specific and watershed-wide plan recommendations with an estimate of as much as an 85 percent reduction of land-based phosphorus loads. Island Lake is at the other end of the spectrum with a 12 percent load reduction estimated from plan implementation. While in-lake management measures are appropriate for all of the lakes, they appear to be most critical for improving Island Lake water quality (i.e., P.)

When considering the total influx of phosphorus including in-lake recycling, the efficacy of BMPs modeled to remediate the problem is less optimistic for most of the lakes. Timber Lake could potentially achieve water quality standards with full implementation of plan recommendations. Lake Fairview offers the next best chance of achieving a phosphorus standard in response to plan implementation, but this lake and others except Timber Lake will require in-lake management strategies to solve the phosphorus problem.

In-lake management practices to be considered are many and include phosphorus inactivation via alum application and accumulated sediment removal to name just a couple of practices. An Illinois Clean Lake Program type diagnostic/feasibility study is recommended for each lake to more thoroughly diagnose each lake's condition (including hydrologic and nutrient budgets) and evaluate the feasibility of rehabilitation alternatives.

The 9 Lakes Plan addresses the nine minimum elements required of a watershed-based plan. The plan also provides details on BMP costs and implementation timeframe priority level (1 = short-term, within 5 yrs., 2 = longer term, within 10 yrs.) and identifies a lead entity for BMP implementation. Most BMPs, however, will require collaboration for grant applications and implementation success. The resource inventory offers a wide range of data and analyses to support an informed implementation effort. Appendices are included with certain details of the overall effort.

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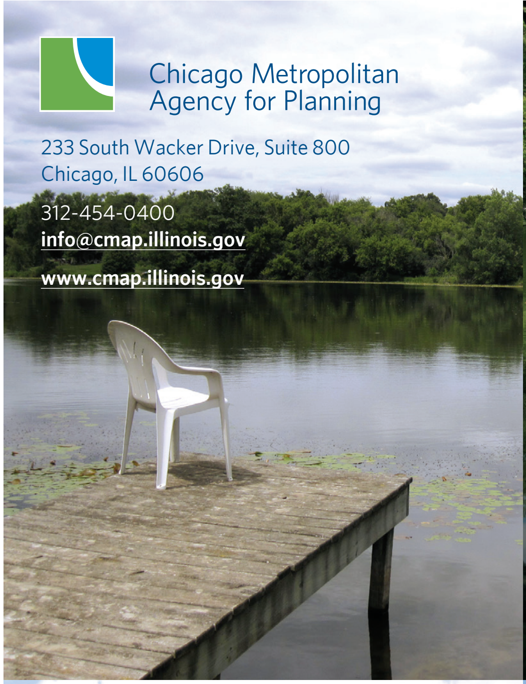

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Images by Chicago Metropolitan Agency for Planning staff.