A PROSPECTUS FOR A REGIONAL WATER QUALITY MANAGEMENT PLAN UPDATE

Chapter 3

NEED FOR REGIONAL WATER QUALITY MANAGEMENT PLAN UPDATE

3.1 INTRODUCTION

History of Regional Water Quality Management Planning in Southeastern Wisconsin

The original Regional Water Quality Management Plan for Southeastern Wisconsin (RWQMP or TR-30), adopted in 1979, was designed to meet the Congressional mandate that the waters of the United States be made, to the extent practicable, "fishable and swimmable."[1] Prior to its designation as the water quality management planning agency for Southeastern Wisconsin in 1974 and to the RWQMP adoption in 1979, the Commission had already undertaken a water quality monitoring and assessment effort in the Region. An initial 1964 study, described in SEWRPC Technical Report No. 4,[2] collected benchmark water quality data for streams in the Southeastern Wisconsin Region that served as the foundation for future water quality planning. Since this 1964 study, the Commission and the Wisconsin Department of Natural Resources (WDNR) have cooperatively conducted a continuing water quality management planning effort. Coordination of this monitoring commitment began in 1968, and the resulting regional water quality data was integral to the work completed in SEWRPC Technical Report No. 17, *Water Quality of Lakes and Streams in Southeastern Wisconsin*: *1964-1975*, June 1978 (TR-17). This data summarized in TR-17 was central to the development of recommendations made in the RWQMP.

[1] *SEWRPC Planning Report No. 30,* A Regional Water Quality Management Plan for Southeastern Wisconsin-2000, *July 1979.*

[2] *SEWRPC Technical Report No. 4,* Water Quality and Flow of Streams in Southeastern Wisconsin*, November 1966.*

An important amendment to the RWQMP, adopted in 1987, focused on addressing water quality issues in the Milwaukee Harbor estuary.[3] The Plan amendment outlined recommendations for reducing pollution from combined sewer overflows, including determining the necessary level of protection such abatement should provide. It also addressed pollution from other point and nonpoint sources in the tributary watersheds and included recommendations for instream conditions needed to meet established water use objectives for the estuary.

In 1995, nearly two decades after the RWQMP was completed, the Commission completed SEWRPC Memorandum Report No. 93, *A Regional Water Quality Management Plan for Southeastern Wisconsin: An Update and Status Report*, March 1995 (MR-93), documenting the Plan's implementation status and progress.[4] MR-93 reflected implementation actions taken and plan amendments adopted since the 1979 publication of the original RWQMP. The status report also documented, as available data permitted, the extent of progress that had been made toward meeting the water use objectives and supporting water quality standards set forth in the RWQMP.

In 2007, the RWQMP was partially updated, and extended to design year 2020 for the portion of the planning area encompassed by the greater Milwaukee area watersheds. This Plan update focused on the Kinnickinnic River, Menomonee River, Milwaukee River, Oak Creek, and Root River watersheds as well as adjacent areas draining directly to Lake Michigan, a total planning area of 1,127 square miles. This update also included the Milwaukee Harbor estuary and nearshore Lake Michigan sites. This update, published in SEWRPC Planning Report No. 50 (PR-50),[5] was developed in tandem with the Milwaukee Metropolitan Sewerage District's (MMSD) 2020 Facilities Plan and made use of available water quality data from 1975 through 2007. This work resulted in the reevaluation and revision of the three major elements comprising the RWQMP—the land use element; the point source pollution abatement element; and the nonpoint source pollution abatement element. In addition, a groundwater planning element was also included in PR- 50. An amendment to PR-50 was completed in 2013 to incorporate results based on revised water

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[3] *SEWRPC Planning No. 37,* A Water Resources Management Plan for the Milwaukee Harbor Estuary, *March 1987.*

[4] S*EWRPC Memorandum Report No. 93,* A Regional Water Quality Management Plan for Southeastern Wisconsin: An Update and Status Report, *March 1995.*

[5] S*EWRPC Planning Report No. 50,* A Regional Water Quality Management Plan Update for The Greater Milwaukee Watersheds, *December 2007.*

quality models. These revised models were conducted under a separate study directed toward evaluating the possible effects of future climate conditions on water quality.[6]

Historical Water Quality Assessments

The 1975 RWQMP (PR-30), 1995 status report (MR-93), and 2007 RWQMP update for the greater Milwaukee watersheds (PR-50) each addressed various regional water quality issues by evaluating existing conditions and historical trends for a range of water quality constituents. Water quality parameters examined for rivers and streams included an extensive list of chemical and physical constituents and, to a lesser extent, biological and bacterial constituents, and select toxic and hazardous substances. The reports also included limited water quality assessments for the inland lakes in the Region and used trophic status classifications (mesotrophic, eutrophic, oligotrophic) as an indicator of lake water quality. A full list of stream and lake water quality constituents assessed for each report can be found in Table 3.1.

The RWQMP update outlined in PR-50 also incorporated groundwater data from three groundwater studies conducted for the Region. These studies include a regional groundwater inventory and analysis as well as the development of a regional aquifer simulation model. The groundwater inventory and analysis findings are presented in SEWRPC Technical Report No. 37, *Groundwater Resources of Southeastern Wisconsin*, June 2002 (TR-37), the aquifer simulation model is documented in SEWRPC Technical Report No. 41, *An Aquifer Simulation Model for Southeastern Wisconsin*, June 2005 (TR-41), and the Commission's regional groundwater planning program is described in SEWRPC Planning Report No. 52, *A Regional Water Supply Plan for Southeastern Wisconsin,* December 2010 (PR-52).[7]

Historical Sources of Water Pollution

The RWQMP identified a range of possible water pollution sources within the Region and presented estimates of the character and quantity of the pollutants contributed by those sources. PR-30 contained a summary of SEWRPC Technical Report No. 21, *Sources of Water Pollution in Southeastern Wisconsin: 1975*,

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[6] *Tetra Tech Final Technical Memorandum,* Milwaukee Climate Change Risk Modeling*, September 2012.*

[7] *SEWRPC Technical Report No. 37,* Groundwater Resources of Southeastern Wisconsin, *June 2002; SEWRPC Technical Report No. 41,* An Aquifer Simulation Model for Southeastern Wisconsin, *June 2005*; *SEWRPC Planning Report No. 52,* A Regional Water Supply Plan for Southeastern Wisconsin, *December 2010.*

September 1978 (TR-21), which provided a more detailed analysis of pollution sources in the Region.[8] TR- 21 distinguished between urban and rural sources of pollution and classified sources as either point or nonpoint. The RWQMP identified specific water chemistry indicators associated with these source categories, including total nitrogen, total phosphorus, five-day biochemical oxygen demand, suspended solids, and fecal coliform counts. The Plan also included pollutant channel load estimates by major watershed for each selected indicator and source. These pollutant load estimates formed the foundation for developing water quality management recommendations, which described initial control measures on the most severe pollution sources.[9] The RWQMP found that, of point sources, the sanitary wastewater discharged from municipal and private sewage treatment plants and from sanitary and combined sewage flow relief devices together constituted the most important sources of pollution. The Plan also emphasized the importance of diffuse sources of pollution in the region and nonpoint source abatement plans for both rural and urban areas. Storm water runoff from croplands, pasture, and unused rural lands was the largest single contributor of nitrogen and sediment to inland lakes and streams in the Region and was a significant source of phosphorus and biochemical oxygen demand. Livestock operations were the largest single source of annual phosphorus, biochemical oxygen demand, and fecal coliform loads, and runoff to inland lakes and streams from urban and suburban construction activities was the second largest single contributor of phosphorus and the largest urban source of sediment.

In 2007, PR-50 presented a summary of the sources of pollution in the greater Milwaukee watersheds detailed in SEWRPC Technical Report No. 39, *Water Quality Conditions and Sources of Pollution in the Greater Milwaukee Watershed*, November 2011 (TR-39).[10] TR-39 primarily divided pollutants into two categories: point and nonpoint sources, and pollutant loadings were developed for each source type. PR-50 placed emphasis on sewage treatment plants, sanitary sewer overflow sites, combined sewer overflow sites, and industrial point sources, and reviewed the status of recommendations made in the original RWQMP. Additionally, nonpoint sources identified in the PR-50 included urban stormwater runoff from stormwater management systems, enclaves outside of planned sewer service areas, and solid waste disposal sites, as well as rural stormwater runoff from livestock operations, crop production, and woodlands. Average annual

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[8] S*EWRPC Technical Report No. 21,* Sources of Water Pollution in Southeastern Wisconsin: 1975, *September 1978.*

[9] S*EWRPC Planning Report No. 30,* op. cit.

[10] S*EWRPC Technical Report No. 39,* Water Quality Conditions and Sources of Pollution in the Greater Milwaukee Watershed, *November 2011.*

loads of total phosphorus, total suspended solids, fecal coliform bacteria, total nitrogen, biochemical oxygen demand, and copper in the greater Milwaukee watersheds were included in PR-50 analyses. These annual load calculations were provided for both point and nonpoint sources and were separated by pollution type.[11]

Previous Plan Recommendations

Recommendations of the original RWQMP (PR-30) consisted of five major elements: a land use plan, a point source pollution abatement plan, a nonpoint source pollution abatement plan, a sludge management plan, and a water quality monitoring plan. MR-93 evaluated the progress made towards the RWQMP recommendations and provided additional or updated recommendations based on the status of each of these elements. MR-93 also developed management recommendations for the Milwaukee Harbor Estuary and for groundwater in southeastern Wisconsin.

The RWQMP update for the greater Milwaukee watersheds (PR-50), focused on identifying cost-effective ways to meet the water use objectives in the Region and support water quality standards and criteria. It incorporated various regulatory actions identified in the MMSD 2020 Facilities Plan as well as additional measures to improve water quality through reducing point source and both urban and rural nonpoint source pollution loads. PR-50 was comprised of a land use plan element, a surface water quality management plan element, and a groundwater management plan element. The groundwater management plan element was coordinated with the Regional Water Supply Plan, documented in PR-52.[12]

3.2 EXISTING CONDITIONS AND KNOWLEDGE GAPS

Population and Land Use Changes

The population in the Region was approximately 1,756,100 in 1970. Over the past five decades, the Region's population has steadily increased, surpassing two million in the early 2000s. In 2020, the Region's population was about 2,046,800 and based on projections for 2050, the population is expected to approach 2.5 million in the next three decades. While most of the seven counties have experienced population growth since the 1970s, increases have not been equal across the Region. Milwaukee County's population decreased almost

[11] *SEWRPC Planning Report No. 50,* op. cit.

[12] *SEWRPC Planning Report No. 52,* op. cit.

11 percent from 1970 to 2020 while other counties, including Waukesha County and Washington County have seen significant population increases of about 76 and 114 percent, respectively. Figure 3.1 shows regional changes in population by county at ten-year intervals from 1970 through 2020 as well as the projected population estimates for 2050 based on the Commission's VISION 2050 study.[13]

Since the adoption of the RWQMP in 1979, shifting and growing populations across many southeastern Wisconsin counties have significantly altered regional land use. Table 3.2 summarizes these land use changes for the Region from 1970 to 2020. In 1970, land developed for residential uses, including single and multi-family residences, accounted for just over 9 percent of the entire Region. By 2020, residential land use increased to 15.6 percent of the Region. Simultaneously, non-residential developed land uses such as commercial, industrial, transportation, communication, and utilities, government and institutional, and recreational uses also experienced smaller increases. As urban development in the Region expanded, agricultural and open lands experienced a corresponding decline, dropping from 70.4 percent of the Region in 1970 to 54.7 percent by 2020.

Changes in land use and population throughout southeastern Wisconsin have resulted in a markedly different pollution landscape than existed when the RWQMP was developed. Population growth, expanded urban development, and the increase in impervious surfaces have altered both point and nonpoint source pollution contributions to surface water and groundwater in the Region. Urban land use within each of the Region's 12 major watersheds has gradually increased since the 1960s (see Figure 3.2). Across the Region as a whole, the percentage of urban land use roughly doubled between 1963 and 2020. Watersheds such as Oak Creek and the Pike River experienced particularly steep increases in urban development. Map 3.1 presents the increase of urban land uses that each subwatershed in the Region has experienced over the same time period. The western Oak Creek watershed, portions of the northern Fox River watershed, northern Pike River watershed, southeastern Des Plaines River watershed, northeastern Rock River watershed, northwestern Menomonee River watershed, and central direct drainage area to Lake Michigan have seen the greatest increases in urban land use when compared to the same areas in 1963.

To understand the extent to which these changes have impacted regional water quality and to ensure that the Region's waters continue to meet applicable standards and support their designated uses, a

[13] *SEWRPC Planning Report No. 55 (3rd Edition), VISION 2050: Recommended Regional Land Use and Transportation Plan, June 2024 (VISION 2050).*

comprehensive update to the RWQMP along with a thorough evaluation of current water quality and land use conditions is necessary.

Water Quality Conditions and Trends

The RWQMP identified the importance of water resource management nearly five decades ago, stating that "any meaningful comprehensive regional planning effort must recognize water resources as an important element of a limited natural resource base to which both rural and urban development must be adjusted if serious developmental and environmental problems are to be avoided."[14] The 2007 Plan update for the greater Milwaukee area watersheds reaffirmed the value of water resource management, calling for the implementation of a comprehensive set of actions devised to ensure the enhancement and preservation of surface water quality in the Region. PR-50 also encouraged the preservation of groundwater quality, as it provides the baseflow for streams and lakes and serves as a source of drinking water in the Region.[15] Since the completion of the 2007 update, the RWQMP was amended once in 2013 to address specific modeling revisions. Aside from this amendment, the RWQMP for the greater Milwaukee watersheds has not been updated. Furthermore, there has not been a full Region-wide update of the RWQMP since the Plan's adoption in 1979.

The RWQMP and its subsequent update have indicated both trends of improvement and decline in water quality. Implementation of recommendations from both PR-30 and PR-50 as well as changes in technology and best management practices for pollution abatement have likely led to improvements in some water quality metrics over the past several decades. However, the Region continues to face evolving threats to water quality, including growing concerns regarding changes in long-term weather patterns and extreme weather events, new emerging contaminants, continuous land use changes, and aging infrastructure. A comprehensive review of regional water quality and its driving factors is needed to assess current conditions and to address these modern challenges.

A complete inventory of regional water quality data to evaluate current conditions and to document changes over time from 1965 through 2026 will serve as a core component of the proposed Regional Water Quality Management Plan Update (RWQMPU) described in this prospectus. Updated water quality data

[14] S*EWRPC Planning Report No. 30,* op. cit.

[15] S*EWRPC Planning Report No. 50,* op. cit.

inventories should also examine how regional changes, such as shifts in land use patterns, advances in wastewater treatment technologies, and evolving climate conditions, have influenced water quality across southeastern Wisconsin. These assessments will provide the technical foundation for developing recommendations aimed at improving and protecting regional water resources.

Impaired Waters

Under Section 303(d) of the 1972 Clean Water Act, states are required every two years to identify waters that fail to meet applicable water quality standards and submit this list of impaired waters to the U.S. Environmental Protection Agency (USEPA) for regulatory intervention, such as establishing pollutant load limits. Although the RWQMP did not address specific impaired waterbodies, many rivers, lakes, and reservoirs across the Region have been added to the State's impaired waters list since the 1970s, and those within the greater Milwaukee area watershed were discussed in PR-50.

As of 2024, there were numerous rivers and streams, lakes, reservoirs, and beaches in the Region listed as impaired on the WDNR 303(d) list. It is important to note that a waterbody can only be designated as impaired if it has been sufficiently monitored. Because water quality monitoring capacity is limited, there are likely many other waterbodies that would be considered impaired but remain unlisted. Table 3.3 summarizes these impairments by their pollutant cause for impairment. All of these waterbodies were added to the impaired waters list after the RWQMP was adopted, with the majority listed in the past three decades. River and stream reaches account for most of the listings, primarily driven by high concentrations of total phosphorus or chloride. Total phosphorus was also the primary cause of impairment for lakes that were included in the 2024 list. Finally, since the early 2000s, 15 inland lake or Lake Michigan beaches have been listed for elevated *E. coli* levels, resulting in impaired recreational use due to pathogens.

Water Quality Trends

Stream monitoring associated with the Commission's recent Regional Chloride Impact Study informed additional chloride impairments for several stream reaches in the Region. Analysis of all available chloride data also indicated a large portion of chloride samples from lakes and streams in the Region exceeded thresholds associated with negative biological impacts.[16] The findings of this recent Regional Chloride Impact Study illustrate the value of comprehensively assessing trends for individual water quality

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[16] *SEWRPC Technical Report No. 63,* Chloride Conditions and Trend in Southeastern Wisconsin*, in preparation.*

constituents in waterbodies across southeastern Wisconsin. Because other critical water quality constituents—such as total phosphorus, nitrogen, and total suspended solids—have not undergone comprehensive regional analysis, it is currently unknown whether the implementation of the RWQMP have led to improvements in these important constituents.

The WDNR maintains a Long-Term Trends (LTT) Rivers Monitoring Program to collect baseline water quality data across the State. This program was developed to track and analyze water quality trends over time in Wisconsin rivers at 43 sites. This dataset will be useful to illustrate long term water quality trends in the Region. Four of these sites are located within southeastern Wisconsin on the Fox, Root, and Milwaukee Rivers. At these larger drainage area sites, data are regularly collected in the field for parameters such as dissolved oxygen, temperature, conductivity, transparency, pH, and invasive species. Samples are also collected and sent to the State Laboratory of Hygiene to assess nutrients, sediments, metals, bioindicators (chlorophyll a and *E.* coli), and other chemical water quality parameters.

WDNR LTT data for the four larger stream sites in the Region indicate that, between 1977 and 2026, total phosphorus (TP) concentrations have largely decreased at all sites (see Figure 3.3).[17] In the early years of WDNR monitoring, total phosphorus concentrations frequently exceeded the State's 0.1 mg/l criterion for designated large rivers at the Fox River at CTH I Bridge (near Waukesha, Fox River US) and Milwaukee River at Estabrook Park (in Milwaukee) locations. Total phosphorus concentrations also frequently exceeded the State criterion of 0.075 mg/l for smaller rivers and streams in the early sampling years at the Root River at Johnson's Park (in Racine) site. Exceedances for these four sites have decreased in more recent decades; however, concentrations greater than 0.075 mg/l were still recorded in most years. Overall, the highest TP concentrations were recorded at the Root River and the Fox River US locations. At both of these sites, phosphorus concentrations may be driven, in part, by bank erosion and sediment as well as nutrient inputs from surrounding agricultural land uses. The Root River location may also be influenced by runoff directly from the adjacent golf course. The greatest improvements in TP for all four sites occurred between 1970 and 1990, likely due to efforts to improve wastewater treatment processes in the State. More recent declines may also be attributed to efforts to reduce contributions from nonpoint sources, such as from urban and agricultural runoff, and to the State adoption of numeric phosphorus criteria.

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[17] Trend lines on the graphs are shown as blue dashed lines where the trend is statistically significant.

In contrast, smaller tributary streams in the Region may be experiencing rising TP levels. For example, Grantosa Creek is a stream in the Menomonee River Watershed located in Milwaukee County that receives runoff from predominantly urban and suburban sources. While TP levels in the stream have varied annually, median concentrations have increased during the past decade (see Figure 3.4). In large rivers like the WDNR LTT rivers mentioned above, higher baseflow volumes can dilute TP concentrations compared to smaller streams, where lower discharges paired with direct runoff from the surrounding landscape can lead to higher overall concentrations.

Total suspended solids (TSS) data collected at the four WDNR LTT river sites also indicated decreasing concentrations between 1977 and 2026 (see Figure 3.5). Improvements in TSS concentrations at these larger stream sites may be a result of efforts to reduce sediment containing runoff from nonpoint sources to the rivers. TSS concentrations were on average greatest at the Milwaukee River location. However, the highest concentration was recorded at the Root River site (336 mg/l), where high concentrations have also consistently been observed during the most recent decades. These occasional higher TSS concentrations suggest that the Root River site may receive periodic influxes in sediment from sources such as streambank erosion or surface runoff during precipitation events.

Lastly, long-term temperature trends have also varied across the four WDNR LTT sites. The Milwaukee River site has experienced significant decreasing median annual temperatures, while in-stream temperatures appear to be mostly unchanged or even rising slightly at the Fox River US, Fox River at New Munster CTH JB (Fox River DS), and Root River locations (see Figure 3.6). Although the slight increasing temperature trends observed at the three LTT sites are not statistically significant, many rivers and streams in the Region have undergone structural modifications and experienced changes to their surrounding landscape that can result in warming temperatures. Loss of shade from trees and vegetation can expose a river to more sunlight and increase in-stream water temperatures. Higher air temperatures can also impact stream temperatures. Channelization and urbanization can further increase temperatures by altering the natural variability in river flow and by routing warm runoff from roads and parking lots into surface waters. For example, median annual temperatures have increased significantly during the most recent decade in the highly urban Grantosa Creek (see Figure 3.7). The differences in TP, TSS, and temperature trends across rivers and streams underscore the importance of conducting a more comprehensive inventory of stream conditions throughout the Region to ascertain broader trends and patterns in water quality.

The WDNR also conducts long-term water quality monitoring in 61 lakes throughout the State. Nine of these lakes are located in southeastern Wisconsin in Kenosha, Racine, Waukesha, and Washington counties. Figure 3.8 shows summer TP concentrations between 1977 and 2025 in four of the nine LTT lakes selected from different counties in the Region. Three of the four lakes have experienced significant decreases in TP (Pike, Silver, and Whitewater Lake), while Wind Lake has not shown any significant change over time. However, unchanging or improving phosphorus in lakes may not be a consistent trend across the Region. While management practices to control runoff from nonpoint sources in a lake's watershed, shifts from agricultural to urban land uses, and changes in local and state phosphorus-related regulations have contributed to TP decline in lakes, shoreline development, aquatic invasive species, and changes in temperature and weather patterns can cause phosphorus levels to rise. Other chemical and physical water quality parameters are similarly influenced by a lake's size, location, history, and ecology. However, many lakes, especially smaller lakes, have limited available data and have not been evaluated for long-term trends in water quality. As with streams, these uncertainties and knowledge gaps highlight the value of conducting a comprehensive inland lake water quality assessment across the Region.

Finally, surface water and groundwater exist in a continuous state of physical and chemical exchange. Aquifers underlying the landscape actively discharge into and interact with rivers, lakes, and wetlands. Consequently, degraded groundwater can contaminate surface water bodies. Conversely, surface water can recharge aquifers, allowing persistent pollutants to migrate into groundwater. This mutual exchange and potential transfer of contaminants poses risks to both the aquatic ecosystems and human populations that are reliant on these freshwater resources. An example of groundwater chloride levels is shown in Figure 3.9 This figure shows the long-term chloride concentrations for 13 of the City of Brookfield municipal drinking water wells. Note that the four shallow wells, less than 300 feet deep, show steep increases in chloride concentrations over time. Rises in chloride concentrations are also starting to be observed in the five mid-depth wells. Ultimately, evaluating groundwater quality and strengthening the understanding of groundwater-surface water interactions in the Region will be an essential, water quality component of the proposed RWQMPU.

Emerging Contaminants

Emerging contaminants pose an additional threat to water quality in southeastern Wisconsin. Pharmaceuticals, personal care products, and exotic invasive species were addressed in the 2007 RWQMP update.[18] However, Per- and Polyfluoroalkyl substances, microplastics, neonicotinoid pesticides, and 6PPD-quinone are examples of emerging contaminants of great concern today that were not previously examined in regional water quality planning efforts.

Per- and Polyfluoroalkyl substances (PFAS) are an extensive group of human-made chemicals that have been used since the 1950s in various industry and consumer products that do not occur naturally in the environment. Recent studies have found PFAS in humans, fish, wildlife, soils, groundwater, surface water, and the air. In addition to impacts on drinking water, PFAS can accumulate in wildlife, such as fish, posing additional threats to human health and leading to consumption advisories. In 2020, PFOS (perfluorooctane sulfonate) and PFOA (perfluoro-n-octanoic acid) samples were collected at WDNR LTT stream sampling sites throughout the State. The current Wisconsin surface water public health significance criteria are 8 ng/l for PFOS in all surface waters, 20 ng/l for PFOA in waters classified as sources of public water supply, and 95 ng/l for PFOA in waters not classified as sources of public water supply. The four LTT sites in southeastern Wisconsin each had higher levels of both PFOS and PFOA than many of the other LTT streams in the state at the time of sampling.[19] PFOS samples at the four sites ranged from 1.52 ng/l to 2.85 ng/l and PFOA samples from 2.12 ng/l to 6.07 ng/l. While these values are below the Wisconsin public health significance criteria for surface waters, the concentrations surpassed the Draft 2024 USEPA Recommended Human Health Water Quality Criteria (HHC) for PFAS applied to waterbodies used for fish consumption. The recommended concentration for waterbodies not used as a drinking water source but used for fish consumption are 0.07 ng/l for PFOS and 0.0036 ng/l for PFOA.[20] Additionally, a 2024 PFAS sampling effort in the Region detected PFOS and PFOA levels that were significantly higher than surface water standards at multiple locations around the Milwaukee airport. In 2026, two stream segments, the Mitchell Field Ditch (in the Oak Creek watershed) and a section of Wilson Park Creek (in the Kinnickinnic River watershed), were included in the draft 303(d) Water Conditions List for human health hazards with PFAS contaminants as the causes of impairment. The 2026 Water Conditions List is currently in the process of being finalized.

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[18] S*EWRPC Planning Report No. 50,* op. cit.

[19]*Additional information and data on PFAS in Wisconsin's lakes and streams can be found at the following Wisconsin Department of Natural Resources webpage: dnr.wisconsin.gov/topic/PFAS/SWFish.html.*

[20] *United States Environmental Protection Agency,* Final Recommended Aquatic Life Criteria and Benchmarks for Select PFAS*, September 2024.*

Plastics have also become prevalent in both the natural and built environments in the past several decades, resulting in widespread pollution and increasing concern about harm to human health and ecosystems. A growing body of research suggests that microplastics (plastic particles ranging from 5 mm to 1 μm in size) and nanoplastics (particles smaller than 1μm) are present in drinking water, food, and the air.[21] Once released into the environment, these plastic particles can enter terrestrial and aquatic food webs, impacting both human and wildlife alike. Most microplastics in the environment originate from the breakdown of larger plastic litter. However, effluent from wastewater treatment plants (WWTPs) presents an additional pathway to the environment. Plastics collected from residential, commercial, and industrial sources can persist through treatment processes as microplastics and be discharged in treated effluent. In addition, accumulated microplastics are often present in biosolids that are spread on farmland, where they may migrate to surface waters or infiltrate into shallow groundwater aquifers.

In southeastern Wisconsin, one study focused on microplastics in fish digestive tracts found that fish in the Milwaukee River have an average concentration of about 10 microplastic particles per individual.[22] The number of particles varied based on fish species, ranging from a median of 17 particles per individual for round gobies, to a median of 2 particles per individual for minnows, and 3 particles per individual for suckers. Similarly, invasive freshwater mussels in the Milwaukee Harbor have been reported to have up to 3 microplastic particles per individual.[23] Furthermore, a 2021 literature review found an average reported microplastic concentration in Lake Michigan waters of 17,000 particles/km^2, underscoring the relevance of considering microplastic contamination in the proposed RWQMPU.[24]

Neonicotinoid insecticides are widely used in agriculture and home landscaping, with more than 500 products containing neonicotinoid active ingredients registered for use in Wisconsin.[25] While these insecticides have frequently received attention for their detrimental effects on non-target terrestrial

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[21] *Clean Wisconsin,* Microplastic in Our Bodies: Exposure and Potential Health Harms, *April 2025*.

[22] *R.E. McNeish et al.,* Microplastic in ravine fish is connected to species traits, *August 2018*.

[23] *T. Hoellein et al.,* Microplastics in Invasive Freshwater Mussels (Dreissena sp.): Spatiotemporal Variation and Occurrence with Chemical Contaminants, *June 2021*.

[24] *A. Earn et. al., "A systematic review of the literature on plastic pollution in the Laurentian Great Lakes and its effects on Freshwater Biota,"* Journal of Great Lakes Research*, 47(1):120–133*, 2021.

[25] S. *Senger et al.,* Neonicotinoid Pesticides in Wisconsin Groundwater and Surface Water, *WI DATCP*, *2019*.

pollinators, such as honeybees, they also pose significant threats to aquatic invertebrates in streams receiving pesticide-laden runoff. Recent studies, including a 2008-2016 assessment conducted by the Wisconsin Department on Agriculture, Trade and Consumer Protection (DATCP), have detected neonicotinoids in both groundwater and streams in Wisconsin.[26] In addition, southeastern Wisconsin stream data collected in 2021 and 2022 by the WDNR indicated uniformly chronic toxicity levels of neonicotinoids for aquatic invertebrates. The RWQMP and the RWQMP update for the Milwaukee area watersheds did not directly address neonicotinoid presence in groundwater and surface water.

A 2021 study linked coho salmon (*Oncorhynchus kisutch*) death to the byproduct of a known chemical additive in vehicle tires, 6PPD (*N*-(1,3-dimethylbutyl)-*N*′-phenyl-*p*-phenylenediamine).[27] This chemical is added to tires as an anti-ozonate, preventing the tire from breaking down due to reactions with the air. When 6PPD reacts to ozone, 6PPD-quinone (*N*-(1,3-dimethylbutyl)-*N*′-phenyl-*p*-phenylenediamine-quinone) is formed. As tires leave particles and residue on roads and parking lots, the 6PPD-quinone (6PPD- Q) tire byproduct enters the environment, washing into waterbodies from impervious surfaces in stormwater or transported to waterbodies in airborne dust. Recent studies have shown that 6PPD-Q is toxic enough to cause lethal or sublethal health effects for some fish species. Many of these sensitive species can be found in Lake Michigan and streams throughout southeastern Wisconsin, including Coho and Chinook salmon and several trout species. Most data on the impacts of 6PPD-quinone in rivers and lakes originates from studies conducted outside of the Midwest. As of 2026, no data on existing 6PPD-quinone levels is available for Wisconsin surface waters. This highlights the need for future monitoring and assessment of this contaminant to determine its presence and potential consequences for water quality and aquatic life within the Region.

Precipitation and Temperature Trends

The average daily temperature in Wisconsin has increased by three degrees Fahrenheit since the 1950s and the past two decades have been the warmest on record. The latest historical climate trends published on the WICCI website cover the period from 1950 to 2024. Figure 3.10 presents the change in annual average daily temperatures and average daily summer temperatures (June, July, and August) from 1950 to 2024. The annual average daily temperature in the Region has increased by approximately 3°F since 1950. The

[26] Ibid.

[27] *Z. Tian et al.,* "A ubiquitous tire rubber-derived chemical induces acute mortality in coho salmon", *Science, 2021.*

warming trends in the Region are less significant during the summer months. However, average daily summer temperatures still increased by about 1 or 2ºF over the same time period.

Recent precipitation trends indicate that Wisconsin is also getting wetter. Wisconsin's average precipitation has increased by 17 percent since 1950, and the decade from 2010-2019 was the wettest decade on record.[28] Furthermore, six of the top ten wettest years on record have occurred between 2000 and 2024. Figure 3.11 shows the statewide historical changes in annual precipitation and summer season precipitation from 1950 to 2024. When compared to other parts of the State, southern Wisconsin has experienced the highest increase in precipitation. While there was substantial variability in the change in precipitation statewide, all seven counties in the Region exhibited significant increasing precipitation trends from 15 to 20 percent. During the summer months, changes in total precipitation varied in the Region, with precipitation increasing in the northern counties and decreasing or remaining unchanged in the southern counties. However, these changes in summer precipitation were not statistically significant from 1950 to 2024.

Figure 3.12 shows historical change in total winter precipitation and minimum winter temperatures in Wisconsin. During the winter months, the seasonal precipitation total for the entire Region shows a significant increasing trend of approximately 20 percent from 1950 to 2024. Similarly, minimum winter temperatures have significantly increased in the Region by 5 to 6 ºF during the same time period. This suggests that winters in southeastern Wisconsin are not only getting wetter, but also warmer. The 2021 WICCI report indicates that Wisconsin winters are warming more rapidly than summers and nighttime low temperatures are warming faster than daytime high temperatures.[29] Overall, Wisconsin's warming climate is having the greatest effect on colder weather periods with fewer extended stretches of extreme cold temperatures.

The USEPA website summarizes long term lake ice conditions for lakes across the United States. Changing ice cover conditions is also a function of air temperatures, which, as mentioned previously, have been warming for Wisconsin winters since 1950. The USEPA website shows that Geneva Lake in Walworth County

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[28] *WICCI,* Wisconsin's Changing Climate: Impacts and Solutions for a Warmer Climate, *Nelson Institute for Environmental Studies, University of Wisconsin-Madison and Wisconsin Department of Natural Resources, 2021.*

[29] Ibid.

thawed four days earlier on average in 2015 compared to 1905. Two other southern Wisconsin lakes outside of the Region, Lake Mendota and Lake Monona, experienced similar trends in ice cover, with Lake Mendota and Lake Monona ice-off dates being eight and five days earlier on average, respectively.[30]

PR-50 reported that global climate models project changes in both the frequency and patterns of precipitation across the Great Lakes area over the next century. The plan noted that, should such changes occur, it could significantly alter stream hydrology and impact both sewerage systems and wastewater treatment capacities.[31] Overall, extreme weather, including significant increases in precipitation, has become more common, and the frequency of extreme weather events are projected to increase. Therefore, as recommended in PR-50, the proposed RWQMPU should incorporate climate data with streamflow data to compare current water quality conditions against the historical record.

Total Maximum Daily Loads

Under the Clean Water Act, states are required to develop total maximum daily loads (TMDLs) for impaired waterbodies that do not meet state water quality standards or that do not achieve their intended designated uses. A TMDL includes a calculation of the maximum amount of a specific pollutant that a body of water can receive and still meet its water quality standards and allocates that load among the various point and non-point sources of that pollutant. TMDLs offer a useful tool to determine a pollutant reduction target and the load reductions necessary for each of the pollutant sources. TMDLs were not available for impaired waterbodies in the Region at the time of the RWQMP or the 2007 update for the greater Milwaukee area watersheds. WDNR and USEPA have approved three TMDL reports for watersheds encompassing portions of the Southeastern Wisconsin Region, including: the Rock River Basin TMDL (2012), the Milwaukee River Basin TMDL (2018), and the Northeast Lakeshore TMDL (2023). Additionally, at the time of this Prospectus (2026), a draft TMDL report has been developed for the Fox-Illinois River Basin in Wisconsin. The Milwaukee River Basin TMDL established wasteload allocations and load reductions for fecal coliform bacteria, total suspended solids, and total phosphorus. The Rock River Basin, Northeast Lakeshore, and Fox-Illinois River Basin TMDLs have established wasteload allocations and load reductions for total phosphorus and total

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[30] *United States Environmental Protection Agency,* Climate Change Indicators, *19january2021snapshot.epa.gov/climate-indicators/climate-change-indicators-lake-ice_.html*

[31] *SEWRPC Planning Report No. 50,* op. cit.

suspended solids. These TMDLs can be utilized for analysis and recommendations for this proposed RWQMPU.

Landscape and Environmental Considerations

Several landscape-level inventories relevant to the conditions of the Region's lakes, streams, and groundwater are required to inform the proposed RWQMPU. Since 1979, substantial landscape changes and urban development have occurred throughout southeastern Wisconsin, rendering portions of the original inventories outdated. Updated inventories are therefore necessary to identify and assess these changes. The proposed RWQMPU will also require revised inventories related to the Region's natural resource base and existing environmental conditions. These inventories have direct implications for both surface water and groundwater quality and provide critical context for evaluating pollutant transport pathways, infiltration capacity, and habitat protection and improvement potential.

Collectively, these updated inventories will inform the recommendations developed as part of the proposed RWQMPU. For example, inventories assessing the size and location of environmental corridors and floodplains, the presence of steep slopes, the distribution of existing and restorable wetlands, and the identification of groundwater recharge areas will help identify lands that warrant protection from development or sanitary sewer service area (SSSA) expansion. From a water quality perspective, this information is central to preserving and improving regional water conditions.

While not a direct indicator of water quality, surface water connectivity and fish passage assessments also offer essential information about the health of the aquatic communities in lakes and streams. Healthy aquatic ecosystems depend on the ability of fish and other organisms to move freely throughout a watershed and between bodies of water to access diverse habitats that are required for different life stages. These movements are essential for efficient foraging, reaching spawning grounds, and accessing refuges that protect fish and other organisms from predators or extreme temperatures. When barriers like dams or poorly designed culverts obstruct these paths, habitat fragmentation can occur, resulting in reduced species abundance, loss of genetic diversity, and even local extinctions. Furthermore, the health of fish populations can serve as a strong indicator of overall water quality and ecosystem health. Water connectivity and fish passage were not evaluated in the RWQMP and were only addressed for the greater Milwaukee area watersheds in PR-50. Therefore, understanding where fish populations may be at risk due to impassable bridges, culverts, or other barriers as part of the RWQMPU will provide valuable insight into the overall health of the Region's aquatic habitats.

Wastewater Treatment

In the 1979 RWQMP, emphasis was placed on modernizing and consolidating WWTPs that served the Region. Since the adoption of the Plan and even the update to the RWQMP for the greater Milwaukee watersheds, wastewater treatment technologies and sanitary sewer service areas have evolved across southeastern Wisconsin. Updated WWTP inventories are necessary to evaluate current treatment capabilities and facility needs, assess the environmental impacts of effluent discharges, and determine whether opportunities exist for further plant consolidation or the development of new facilities. This effort will also require a review of existing sanitary sewer service area (SSSA) planning processes, leading to recommendations to improve both SSSA planning and WWTP coordination.

A regional sludge management plan was a key outcome of the RWQMP. Today, WWTPs manage sludge through a variety of practices, with most facilities in the Region continuing to land apply biosolids. Certain contaminants, including PFAS, can persist through treatment processes and remain in biosolids, where they may leach into soil, groundwater, or nearby surface waters following land application. Since the original RWQMP, much has been learned about the severe impacts of land spreading contaminated biosolids. Identifying where sludge is land applied and conducting a comprehensive review of current sludge management practices will help identify opportunities for improvement and determine which locations may be particularly vulnerable to contamination.

Lastly, several newer regulatory and assistance programs are available to WWTPs seeking to meet nutrient discharge limits. These include water quality trading, adaptive management, and multi-discharger variance programs administered through the WDNR. A comprehensive evaluation of how communities are utilizing these programs to offset phosphorus discharges, and an assessment of their overall effectiveness, would provide valuable insight for inclusion in the proposed RWQMPU.

Sources of Pollution

Of the 21 public sewage treatment plants identified for abandonment in the RWQMP, one remains in 2026: the Yorkville facility. All but one of the eight new plants recommended for construction in the RWQMP have been built and are now operating in their recommended locations. Big Bend is the only location where a WWTP was recommended but has not yet been constructed as of 2026. In 1979, there were 61 WWTP facilities that served the Region (see Map 3.2). Since 1979, several additional WWTP facilities were either established or abandoned aside from those outlined in the Plan's recommendations. Therefore, as of 2026, there are 45 active, public WWTPs in southeastern Wisconsin. Six of these plants discharge treated effluent directly to Lake Michigan, and 13 discharge to streams tributary to Lake Michigan. The remaining 27 discharge treated effluent to streams in the Des Plaines, Fox, and Rock River basins. In addition, there are still seven private wastewater treatment plants in operation within the Region that are regulated by the WDNR and discharge treated effluent to surface waters or groundwater, in the Des Plaines, Fox, and Root River basins (see Table 3.4).

Wastewater treatment facilities in the Region vary in both size and age and are not consistent in their treatment practices and technologies. As a thorough review of the Region's WWTP facilities has not been conducted since the adoption of the RWQMP in 1979, an evaluation of the existing plants is needed to determine if facilities should be upgraded, abandoned, or added and if further regionalization of plants could be recommended for adjacent communities. Such an evaluation should include a regional WWTP inventory to determine the capacity of each plant, current treatment processes, and sludge management procedures.

3.3 SUMMARY

An update to the Regional Water Quality Management Plan is needed for the following reasons.

- A comprehensive review of water quality in the streams, lakes, and groundwater in the Region has not been completed since the original RWQMP in 1979.
- The Region has experienced significant growth in both urban land coverage and population in the almost 50 years since the original RWQMP was completed. This has led to greater impervious area and larger wastewater flows, which by themselves should have negative impacts on water quality.
- Currently there are a significant number of streams, lakes, and reservoirs in the Region that are State listed as impaired for water quality.
- Based on a cursory review for this Prospectus, water quality conditions appear to be improving for some streams and lakes, while getting worse for others.

- There have been significant changes to the regional climate in the 50 years since the RWQMP was completed. These include both warmer and wetter conditions, which should have significant impacts on water quality.

- There are new water quality concerns not addressed in the original RWQMP, including PFAS, microplastics, neonictinoids, and 6PPD-quinone.

- TMDLs have been developed for some of the watersheds in the Region since the original RWQMP, thus there is a need to better integrate the TMDL recommendations into the proposed RWQMPU.

- There is a need for a better understanding to what degree stream crossings have impeded the movement of both aquatic and terrestrial organisms.

- A comprehensive review of WWTPs and the areas served by WWTPs in the Region has not been done since 1979. Many of the recommendations in the original RWQMP related to WWTPs have been completed, while more stringent phosphorus limits have been implemented and treatment technologies have evolved. Thus, a detailed review of current wastewater treatment across the Region is needed.

- New practices and innovative approaches for improving water quality have been implemented in the Region since 1979. Documentation of how these efforts have performed will provide insights into recommendations for the future.

A PROSPECTUS FOR A REGIONAL WATER QUALITY MANAGEMENT PLAN UPDATE

Chapter 3

NEED FOR REGIONAL WATER QUALITY MANAGEMENT PLAN UPDATE

TABLES

Table 3.1
Stream and Lake Water Quality Parameters Evaluated in Previous RWQMP Reports

	PR-30[a]		MR-93[b]		PR-50[c]	
Water Quality Parameters	Rivers and Streams	Inland Lakes	Rivers and Streams	Inland Lakes	Rivers and Streams	Inland Lakes
Chemical						
Dissolved Oxygen[d]	X	X	X		X	
Hydrogen Ion Exchange (pH)	X	X	X		X	
Specific Conductance	X		X		X	
Total Phosphorus[dP]	X	X	X	X	X	X
Soluble Orthophosphate						
Dissolved Phosphorus	X	X	X		X	
Nitrate-Nitrogen	X		X		X	
Inorganic Nitrogen	X	X	X		X	
Ammonia Nitrogen	X	X	X		X	
Kjeldahl Nitrogen					X	
Organic Nitrogen	X					
Chloride	X		X		X	
Biological Oxygen Demand (BOD)			X		X	
Hardness			X		X	
Alkalinity			X		X	
Physical						
Temperature[d]	X	X	X	X	X	X
Total Suspended Sediment/Solids	X		X		X	
Clarity [d]				X		X
Bacteriological and Biological						
Chlorophyll-a[d]			X	X	X	X
Total and/or Fecal Coliform Counts	X	X	X		X	
E. coli Bacteria			X		X	
Fishery Index of Biotic Integrity Values			X		X	
Macroinvertebrate HBI Values			X		X	
Macroinvertebrate ETP Values			X		X	
Qualitative Habitat Evaluation Index			X		X	
Toxic and Hazardous Materials						
Heavy Metals	X					
Pesticides and Herbicides	X		X		X	
Polychlorinated Biphenyls (PCBs)	X		X		X	
Polycyclic Aromatic Hydrocarbons (PAHs)			X		X	
Personal Care Products			X		X	
Pharmaceuticals			X		X	
Other Organic Compounds (detergents, disinfectants, dye agents, flavoring agents, flame retardants, etc.)			X		X	

[a] *SEWRPC Planning Report No. 30,* A Regional Water Quality Management Plan for Southeastern Wisconsin-2000, *July 1979.*

[b] *SEWRPC Memorandum Report No. 93*, A Regional Water Quality Management Plan for Southeastern Wisconsin: An Update and Status Report, *March 1995.*

[c] *SEWRPC Planning Report No. 50*, A Regional Water Quality Management Plan Update for the Greater Milwaukee Watersheds, *December 2007.*

[d] *Constituents used to determine lake trophic status.*

Source: SEWRPC

Table 3.2
Historical and Current Land Uses in the Region: 1970-2020

	Historical (1970)		Existing (2020)	
Land Use	Square Miles	Percent of Total	Square Miles	Percent of Total
Urban				
Residential[a]	244	9.1	419	15.6
Commercial	10	0.4	38	1.4
Industrial	16	0.6	39	1.4
Transportation, Communication and Utilities	171	6.3	218	8.1
Government and Institutional	26	1	39	1.4
Recreation	45	1.7	56	2.1
Nonurban				
Agricultural Open Lands[b]	1,893	70.4	1,472	54.8
Surface Water and Wetlands	283	10.5	407	15.2
Total	2,688	100.0	2,688	100.0 c

[a] *Includes single and multi-family residential.*

[b] *Includes woodlands, landfills and extractive sites.*

[c] *The rounded percentages in the table add up to slightly less than 100 percent.*

Source: SEWRPC

Table 3.3
Number of Section 303(d) Impaired Waterbodies in Southeastern Wisconsin as of 2024

	Number of Impaired Waterbodies			
Pollutant (Cause)	River and Stream Reaches	Lakes	Reservoirs	Beaches
Total Phosphorus	51	14	5	--
Total Suspended Solids	17	--	1	--
Chloride	41	--	--	--
Fecal Coliform	2	--	--	--
Polychlorinated Biphenyls (PCBS)	15	3	1	--
Polycyclic Aromatic Hydrocarbons (PAHS)	2	--	--	--
Escherichia coli (*E.* coli)	--	--	--	15
Other Cause[a]	8	1	1	--
Unknown Cause	19	3	--	--

[a] *Includes impairments from metals, mercury, and creosote.*

Source: WDNR and SEWRPC

Table 3.4
Active and Abandoned Public Wastewater Treatment Plants Within the RWQMPU Area

Facility Name	Sewer Service Areas	Population Served[a, b]	Annual Average Design Flow (MGD)	Facility Status	Receiving Water
Des Plaines Watershed					
Bristol Utility District No. 1	Bristol	1,780	0.87	Active	Tributary to Des Plaines River
Paddock Lake Wastewater Treatment Facility	Paddock Lake	3,000	0.80	Active	Tributary to Brighton Creek
Hooker Lake	*Hooker Lake*	--[c]	--[c]	--[c]	--[c]
Pleasant Prairie Sanitary District No. 73-1	*Pleasant Prairie*	--[c]	--[c]	*Abandoned (2010)*	*Des Plaines River via Unnamed Tributary*
Pleasant Prairie Sewer Utility District D	*Pleasant Prairie*	--[c]	--[c]	*Abandoned (2010)*	*Des Plaines River via Pleasant Prairie Tributary*
Direct Drainage Area Tributary to Lake Michigan					
Kenosha Wastewater Treatment Facility	Greater Kenosha	124,870	28.6	Active	Lake Michigan
Milwaukee Metropolitan Sewerage District – Jones Island Facility and South Shore Facility	Bayside, Brown Deer, Cudahy, Fox Point, Franklin, Greendale, Greenfield, Glendale, Hales Corners, Milwaukee, Oak Creek, Shorewood, St. Francis, River Hills, Whitefish Bay, Wauwatosa, West Allis, West Milwaukee, *Mequon/Thiensville, Caddy Vista, Caledonia (part), Germantown, Brookfield East, Butler, Elm Grove, Menomonee Falls East, Muskego (part), New Berlin*	1,077,520[e]	236	Active	Milwaukee River Outer Harbor and Lake Michigan[f]
Port Washington Wastewater Treatment Plant	Port Washington	11,470	3.10	Active	Lake Michigan
Racine Wastewater Utility	Greater Racine	135,940	36.0	Active	Lake Michigan
South Milwaukee Wastewater Treatment Facility	South Milwaukee	21,130	6.00	Active	Lake Michigan
North Park	*Wind Point*	--[c]	--[c]	*Abandoned (1988)*	*Lake Michigan*
Pleasant Park Utility Company	*Kenosha*	--[c]	--[c]	*Abandoned (1990)*	*Lake Michigan*
Fox River Watershed					
Village of Bloomfield Utility Department	Bloomfield, Powers–Benedict-Tombeau Lakes	3,670	0.46	Active	Tributary to East Branch Nippersink Creek
Burlington Water Pollution Control	Burlington, Bohner Lake, Browns Lake	15,040	3.50	Active	Fox River
Eagle Lake Sewer Utility District	Eagle Lake	1,640	0.40	Active	Eagle Creek
East Troy Wastewater Treatment Facility	East Troy	5,690	0.81	Active	Honey Creek

Table continued on next page.

Facility Name	Sewer Service Areas	Population Served[a, b]	Annual Average Design Flow (MGD)	Facility Status	Receiving Water
		Fox River Watershed (continued)			
Fox River Water Pollution Control Center	Brookfield West, New Berlin (part), Pewaukee, Menomonee Falls (part)	50,280	12.5	Active	Fox River
Genoa City Water Treatment Plant	Genoa City	3,070	0.58	Active	North Branch Nippersink Creek
Lake Geneva Wastewater Treatment Plant	Lake Geneva	8,600	2.50	Active	Discharge to Soil
Lyons Sanitary District No. 2	Lyons, Country Estates	1,390	0.21	Active	White River
Mukwonago Wastewater Treatment Plant	Eagle Spring Lake/Mukwonago County Park/Rainbow Springs, Mukwonago	7,430	1.50	Active	Mukwonago River
Salem Lakes – Salem Wastewater Treatment Plant[d]	Salem	11,130	2.13	Active	Fox River
Salem Lakes – Silver Lake Wastewater Treatment Plant[d]	*Silver Lake*	*2,380*	*0.47*	*Abandoned (2021)*	*Fox River*
Sussex Wastewater Treatment Facility	Lannon, Menomonee Falls West, Sussex	16,740	5.10	Active	Spring Creek
Town of Norway Sanitary District No. 1 Wastewater Treatment Facility	Norway/Wind Lake, Muskego South	6,660	1.60	Active	Tributary to Wind Lake Drainage Canal
Twin Lakes Wastewater Treatment Facility	Twin Lakes	5,980	1.30	Active	Tributary to Bassett Creek (to Fox River)
Waukesha Wastewater Treatment Facility	Delafield-Fox River, Genesee East, Wales, Waukesha	73,580	14.0	Active	Fox River
Western Racine County Sewerage District	Waterford/Rochester	12,370	2.50	Active	Fox River
Brookfield	*Brookfield*	--[c]	*Flow now received by Fox River Water Pollution Control Center*	*Abandoned (Between 1980-1990)*	*Fox River*
Fontana	*Fontana-on-Geneva Lake*	--[c]	*Flow now received by Fontana – Walworth Water Pollution Control Commission*	*Abandoned (1986)*	*Discharged to Soil*
Muskego-Big Muskego	*Muskego*	--[c]	*Flow now received by MMSD*	*Abandoned (1984)*	*Big Muskego Lake*
New Berlin Regal Manor Greenridge Plant	*New Berlin*	--[c]	*Flow now received by MMSD*	*Abandoned (1984)*	*Deer Creek*
Pewaukee	*Pewaukee*	--[c]	*Flow now received by Fox River Water Pollution Control Center*	*Abandoned (1981)*	*Pewaukee River*

Table continued on next page.

Facility Name	Sewer Service Areas	Population Served[a, b]	Annual Average Design Flow (MGD)	Facility Status	Receiving Water
		Fox River Watershed (continued)			
Williams Bay	*Williams Bay*	--[c]	*Flow now received by Walworth County Metropolitan Sewerage District*	*Abandoned (1986)*	*Discharged to Soil*
		Menomonee River Watershed			
Germantown	*Germantown*	--[c]	*Flow now received by MMSD*	*Abandoned (1986)*	*Menomonee River*
Menomonee Falls – Lilly Road	*Menomonee Falls*	--[c]	*Flow now received by MMSD*	*Abandoned (year unknown)*	*Menomonee River*
Menomonee Falls – Pilgrim Road	*Menomonee Falls*	--[c]	*Flow now received by MMSD*	*Abandoned (year unknown)*	*Menomonee River*
		Milwaukee River Watershed			
Campbellsport Wastewater Treatment Facility	Campbellsport	--[b]	0.47	Active	Milwaukee River
Cascade Wastewater Treatment Facility	Cascade, Lake Ellen	--[b]	0.13	Active	North Branch Milwaukee River
Cedarburg Wastewater Treatment Facility	Cedarburg	11,610	2.75	Active	Cedar Creek
Fredonia Municipal Sewer and Water Utility	Fredonia, Waubeka	2,260	0.60	Active	Milwaukee River
Grafton Water and Wastewater Utility	Grafton	11,950	2.50	Active	Milwaukee River
Jackson Wastewater Treatment Plant	Jackson	7,350	1.69	Active	Cedar Creek
Kewaskum Wastewater Treatment Plant	Kewaskum	4,030	0.75	Active	Milwaukee River
Village of Newburg Sanitary Sewer Treatment Facility	Newburg	1,290	0.12	Active	Milwaukee River
Random Lake Sewage Treatment Plant	Random Lake	--[b]	0.45	Active	Silver Creek
Saukville Sewer Utility	Saukville	4,460	1.61	Active	Milwaukee River
Town of Scott Sanitary District No.1	Batavia (Town of Scott)	--[b]	0.03	Active	Discharge to Soil
City of West Bend Sewage Treatment Facility	West Bend	33,630	9.00	Active	Milwaukee River
Thiensville	*Thiensville*	--[c]	*Flow now received by MMSD*	*Abandoned (year unknown)*	*Milwaukee River*
		Pike River Watershed			
Somers Utility District No. 1	*Somers*	--[c]	*Flow now received by Kenosha Wastewater Treatment Facility*	*Abandoned (1986)*	*Tributary of Pike River*
Sturtevant	*Sturtevant*	--[c]	*Flow now received by Racine Wastewater Treatment Facility*	*Abandoned (1980)*	*Tributary of Pike River*
		Rock River Watershed			
Allenton Sanitary District Wastewater Treatment Plant	Allenton	740	0.35	Active	East Branch Rock River

Table continued on next page.

Facility Name	Sewer Service Areas	Population Served[a, b]	Annual Average Design Flow (MGD)	Facility Status	Receiving Water
		Rock River Watershed (continued)			
Delafield – Hartland Water Pollution Control Commission	Delafield-Nashotah, Delafield South, Hartland	18,210	3.23	Active	Bark River[h]
Dousman Wastewater Treatment Facility	Dousman, Genesee Lake, Golden Lake	2,710	0.57	Active	Bark River
Fontana – Walworth Water Pollution Control Commission	Fontana/Walworth	4,700	1.77	Active	Picasaw Creek
Hartford Water Pollution Control Facility	Hartford	15,190	3.60	Active	Rubicon River
Oconomowoc Wastewater Treatment Plant	Ashippun Lake, Beaver Lake, Lake Keesus, Merton, North Lake, Oconomowoc, Oconomowoc Lake, Okauchee Lake, Pine Lake	20,440	4.02	Active	Oconomowoc River
Sharon Wastewater Treatment Facility	Sharon	1,640	0.26	Active	Little Turtle Creek
Slinger Wastewater Treatment Facility	Slinger	5,530	1.50	Active	Tributary to the Rubicon River
Walworth County Metropolitan Sewerage District	Darien, Delavan/Delavan Lake, Elkhorn, Mallard Ridge Landfill, Williams Bay/Geneva National/Lake Como	30,530	7.00	Active	Turtle Creek
Whitewater Wastewater Treatment Facility	Whitewater	11,110	3.65	Active	Whitewater Creek[g]
Darien	*Darien*	--[c]	*Flow now received by Walworth County Metropolitan Sewerage District*	*Abandoned (1994)*	*Tributary of Darien Creek*
Delavan	*Delavan*	--[c]	*Flow now received by Walworth County Metropolitan Sewerage District*	*Abandoned (1981)*	*Turtle Creek*
Elkhorn	*Elkhorn*	--[c]	*Flow now received by Walworth County Metropolitan Sewerage District*	*Abandoned (1981)*	*Tributary of Jackson Creek*
Hartland	*Hartland*	--[c]	*Flow now received by Delafield – Hartland Water Pollution Control Commission*	*Abandoned (1980)*	*Bark River*
Slinger (old)	*Slinger*	--[c]	*Flow now received by new Slinger Wastewater Treatment Facility*	*Abandoned (year unknown)*	*Tributary to the Rubicon River*
Walworth	*Walworth*	--[c]	*Flow now received by Fontana – Walworth Water Pollution Control Commission*	*Abandoned (1986)*	*Tributary of Piscasaw Creek*

Table continued on next page.

Facility Name	Sewer Service Areas	Population Served[a, b]	Annual Average Design Flow (MGD)	Facility Status	Receiving Water
		Root River Watershed			
Union Grove Wastewater Treatment Plant	Southern Wisconsin Center, Union Grove	5,730	2.00	Active	West Branch Root River Canal
Yorkville Sewer Utility District No. 1	Yorkville	250	0.15	Active	Ives Grove Ditch (to Hoods Creek)
Caddy Vista	*Caledonia*	--[c]	*Flow now received by MMSD*	*Abandoned (1982)*	*Root River*
Hales Corners	*Hales Corners*	--[c]	*Flow now received by MMSD*	*Abandoned (1981)*	*Whitnall Park Creek Tributary*
Muskego-Northeast District	*Muskego*	--[c]	*Flow now received by MMSD*	*Abandoned (1985)*	*Tess Corners Creek*
Rawson Homes Sewer and Water Trust	*Greendale*	--[c]	*Flow now received by MMSD*	*Abandoned (1977)*	*East Branch Root River*
		Sheboygan River Watershed			
Belgium Wastewater Treatment Facility	Belgium, Lake Church	2,260	0.63	Active	Belgian-Holland Ditch[g]

Note: Italic text in this table represents information for WWTFs that have been abandoned.

[a] *Represents population sewered as of 2010. Does not include unsewered population as of 2010.*

[b] *Populations located within sewer service areas outside of the Southeastern Wisconsin Region are not reported.*

[c] *Information about the abandoned facility is unknown.*

[d] *The Town of Salem and Village of Silver Lake merged to create the Village of Salem Lakes in 2017. There were two wastewater treatment facilities that originally served the two separate municipalities. In 2021 a project was completed that converted the Silver Lake Wastewater Treatment Plant to a lift station that now pumps wastewater to a sanitary sewer where it then flows by gravity to the Salem Wastewater Treatment Plant for treatment. The latter plant was expanded and currently operates as the only wastewater treatment facility for the Village of Salem Lakes.*

[e] *This total includes the combined populations served by both the Jones Island and the South Shore treatment facilities.*

[f] *The Jones Island Facility discharges to the Milwaukee Outer Harbor. The South Shore Facility discharges to Lake Michigan.*

[g] *Flows out of the Southeastern Wisconsin Region.*

[h] *Effluent from the Delafield-Hartland Water Pollution Control Commission treatment facility is pumped via force main and discharged into the Bark River at a point approximately four miles southwest of the facility.*

Source: WDNR and SEWRPC

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300-5100
EEP/AWO/LKH/ko
7/7/26, 8/7/26, 8/21/26

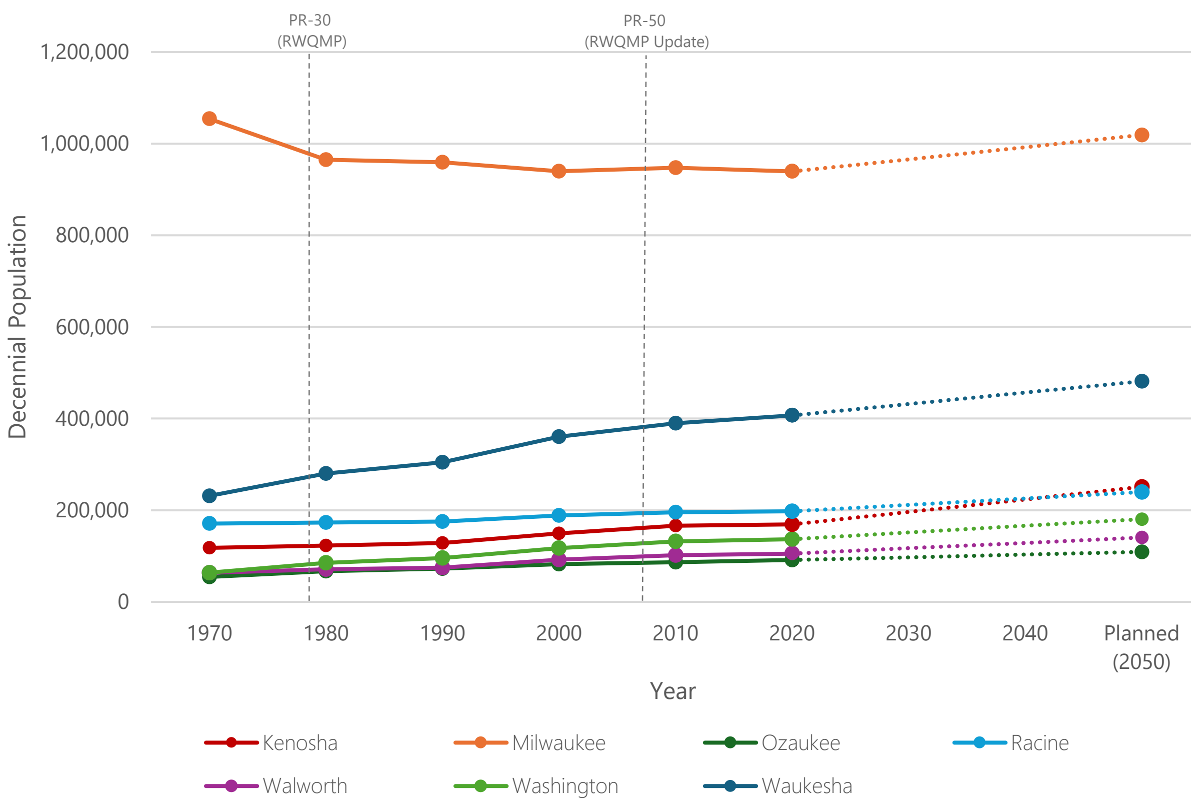
A PROSPECTUS FOR A REGIONAL WATER QUALITY MANAGEMENT PLAN UPDATE

Chapter 3

NEED FOR REGIONAL WATER QUALITY MANAGEMENT PLAN UPDATE

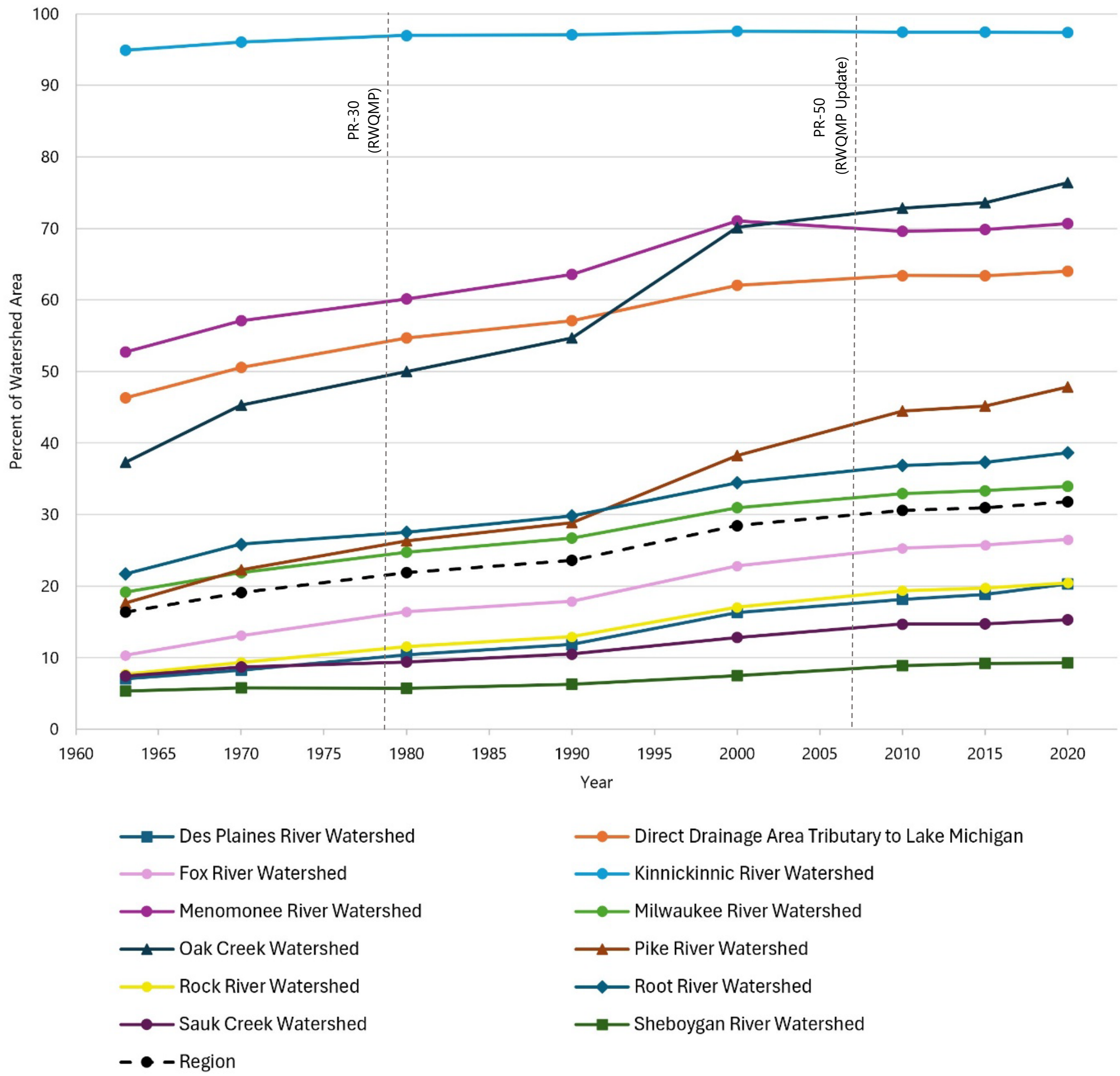
FIGURES

Figure 3.1
Trends in Population by County: 1970-2050



Source: SEWRPC

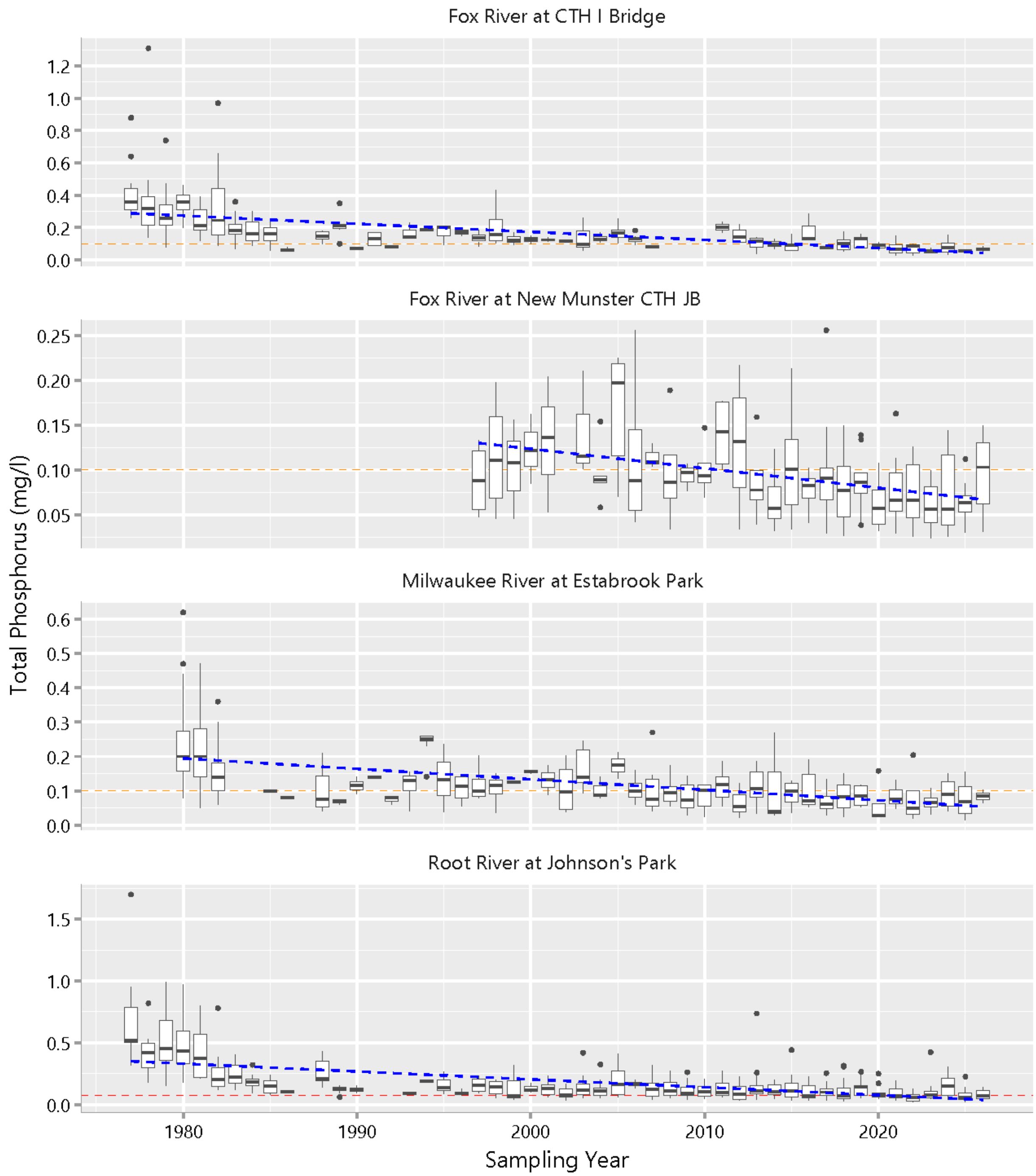
Figure 3.2
Trends in Urban Land Uses Within the Watersheds of the Region: 1963 to 2020



Note: SEWRPC land use inventories are only available for the seven-county Southeastern Wisconsin Region including Kenosha, Milwaukee, Ozaukee, Racine, Walworth, Washington, and Waukesha Counties. Portions of the RWQMPU project area outside of these counties are not included in this figure.

Source: SEWRPC

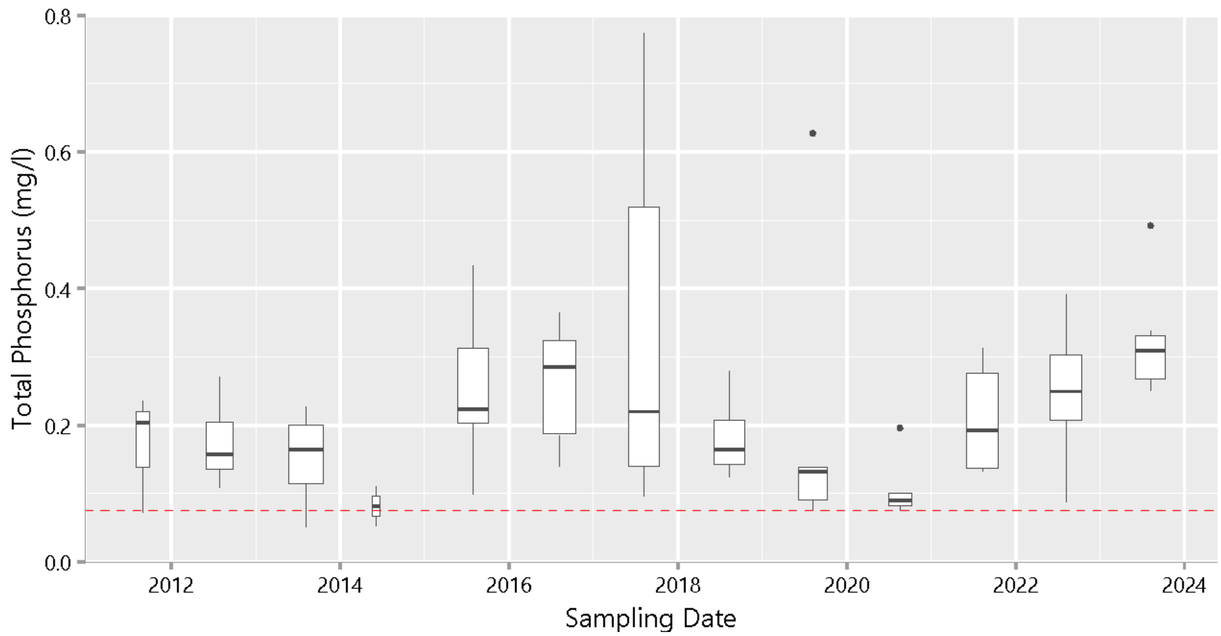
Figure 3.3
Long-term Total Phosphorus Trends at Selected River Sites: 1977-2026



Note: Blue dashed lines indicate that a trend is statistically significant. The red dashed line marks the State TP criterion of 0.075 mg/l for smaller rivers and streams, and orange dashed lines mark the State TP criterion of 0.1 mg/l for larger rivers.

Source: WDNR and SEWRPC

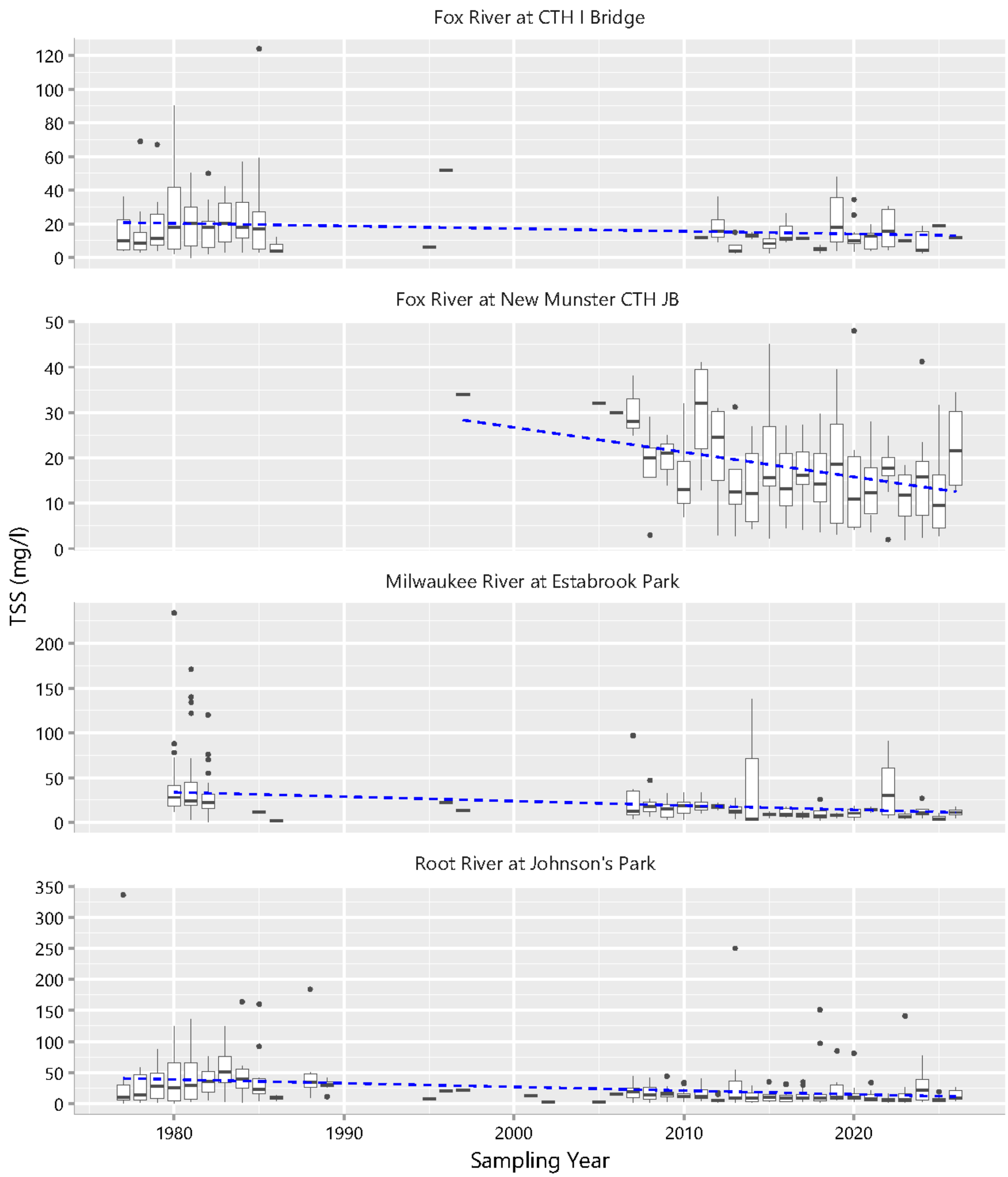
Figure 3.4
Total Phosphorus Concentrations in Grantosa Creek Near Mouth: 2011-2024



Note: The red dashed line marks the State TP criterion of 0.075 mg/l for smaller rivers and streams.

Source: WDNR and SEWRPC

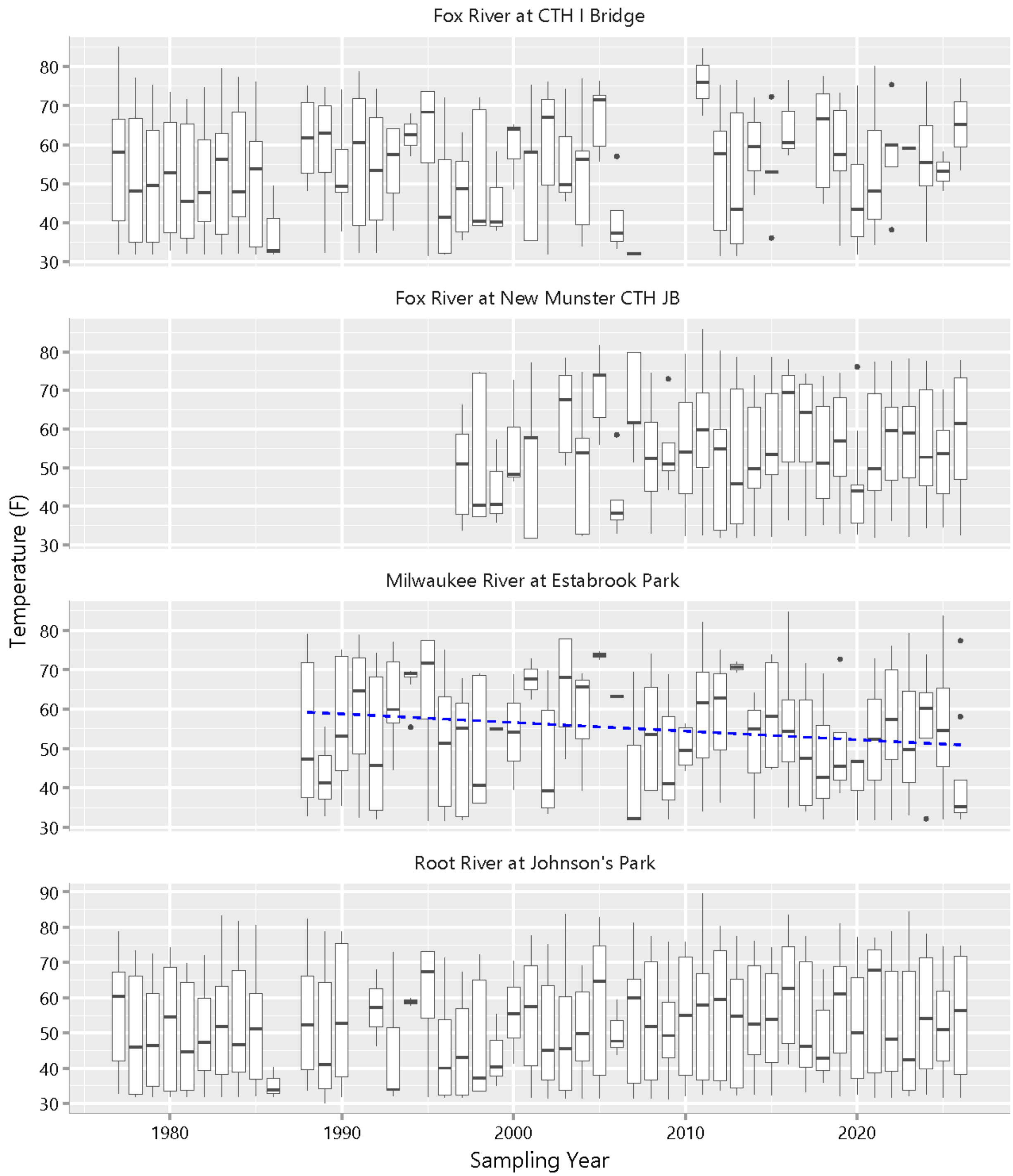
Figure 3.5
Long-term Total Suspended Solids Trends at Selected River Sites: 1977-2026



Note: Blue dashed lines indicate that a trend is statistically significant.

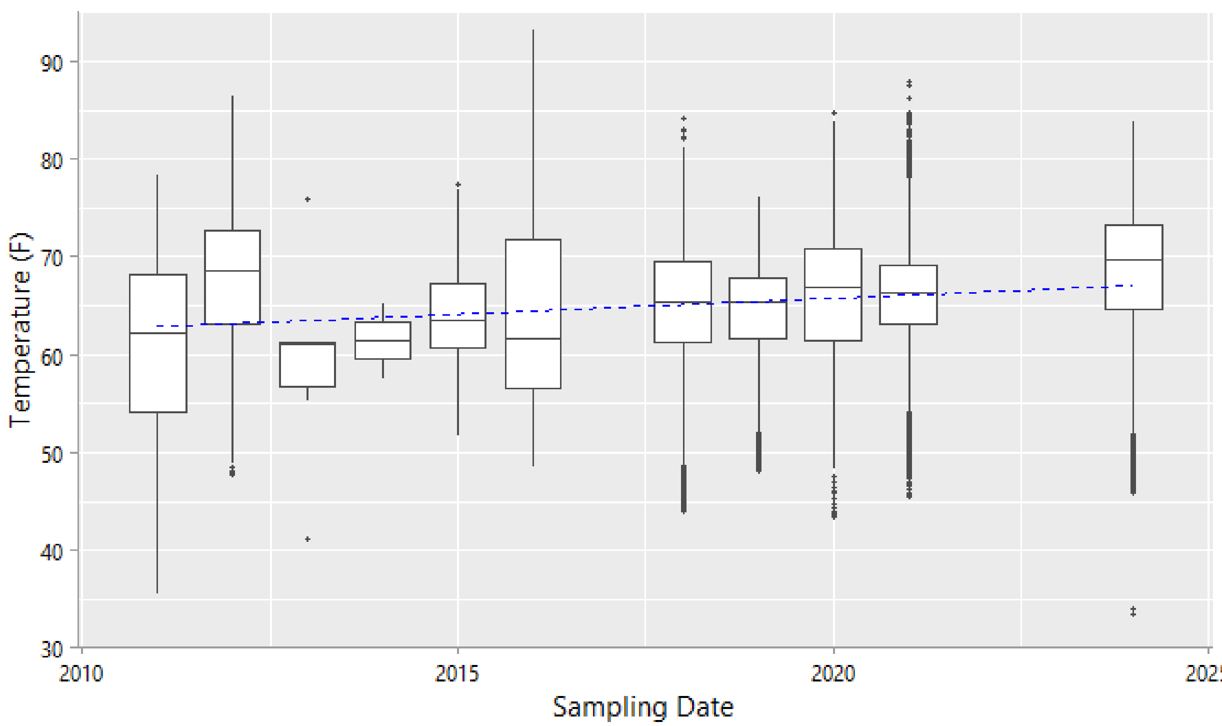
Source: WDNR and SEWRPC

Figure 3.6
Long-term Temperature Trends at Selected River Sites: 1977-2026



Note: Blue dashed line indicates statistically significant trend.
Source: WDNR and SEWRPC

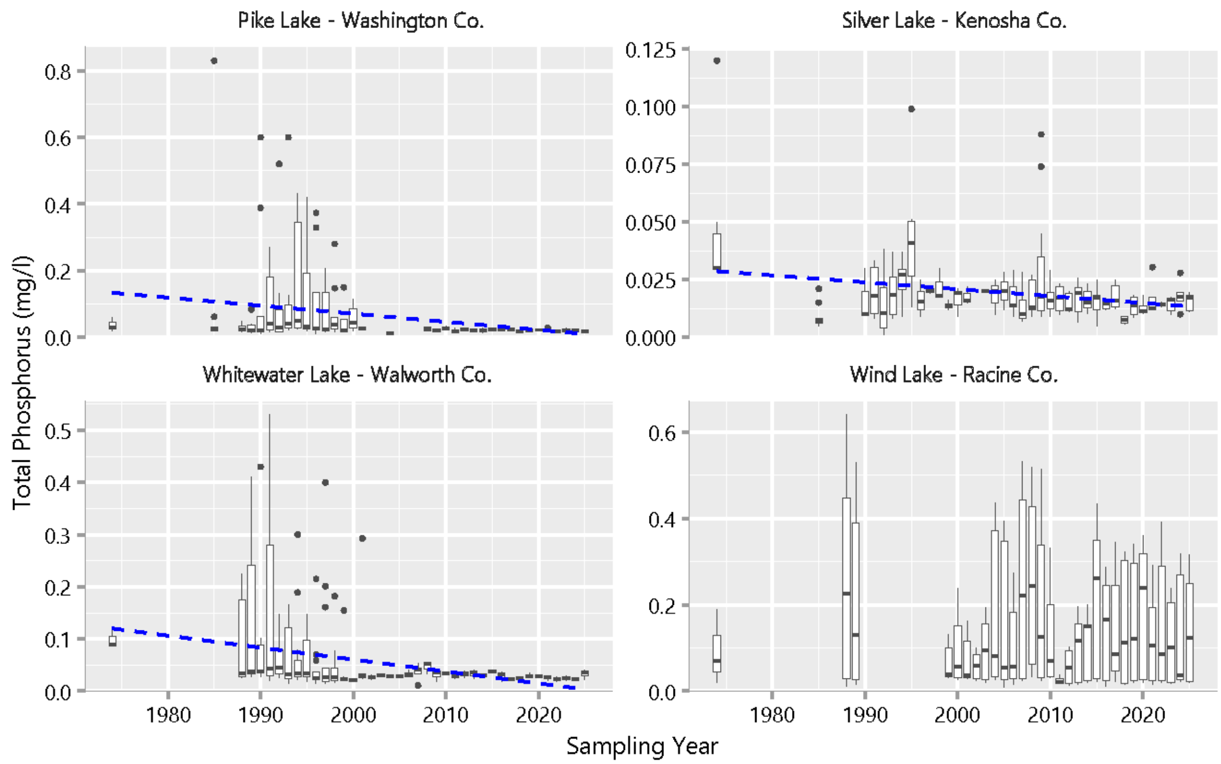
Figure 3.7
Temperature at Grantosa Creek Near Mouth: 2011-2024



Note: Blue dashed line indicates that the trend is statistically significant.

Source: WDNR and SEWRPC

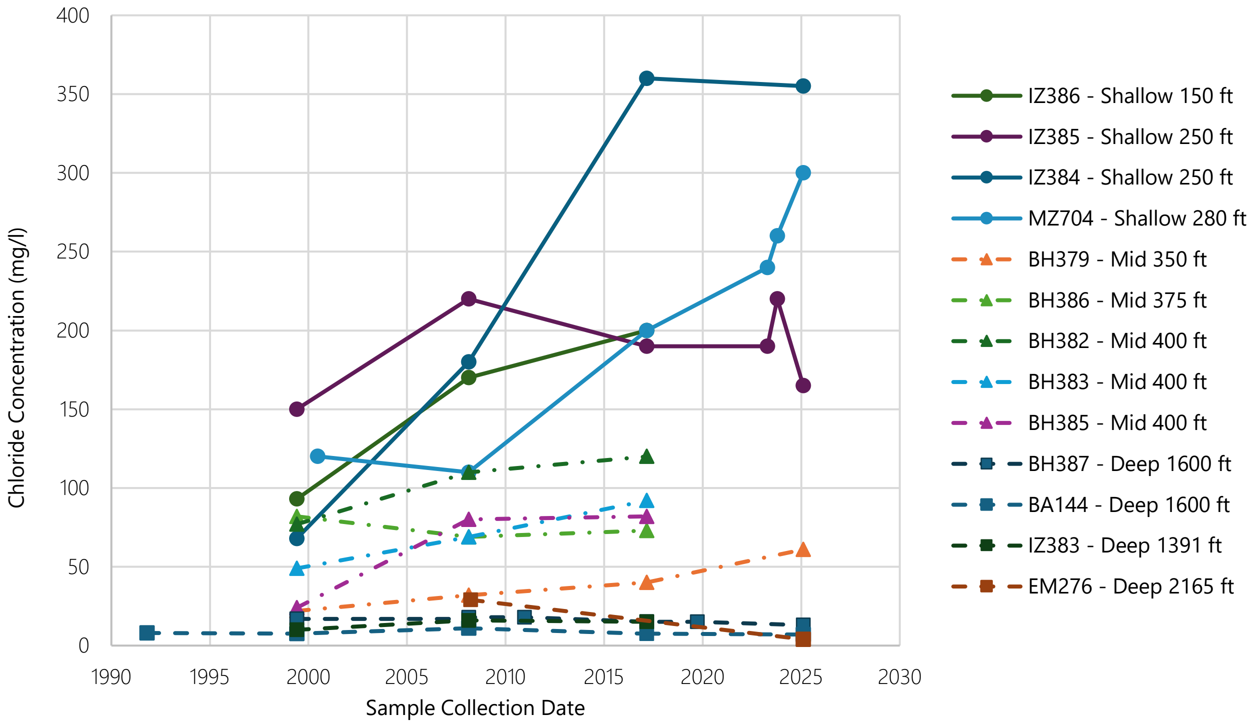
Figure 3.8
Long-term Summer Total Phosphorus Trends in Selected Lakes: 1977-2025



Note: Summer is defined as June 1 through September 15. Blue dashed lines indicate that a trend is statistically significant.
Y-axis scales vary by lake to maintain data readability across different ranges.

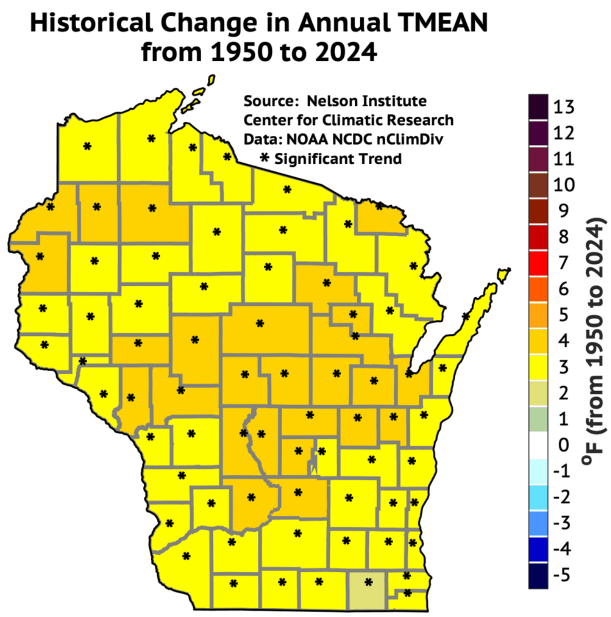
Source: WDNR and SEWRPC

Figure 3.9
Municipal Well Chloride Trend – City of Brookfield: 1991-2025



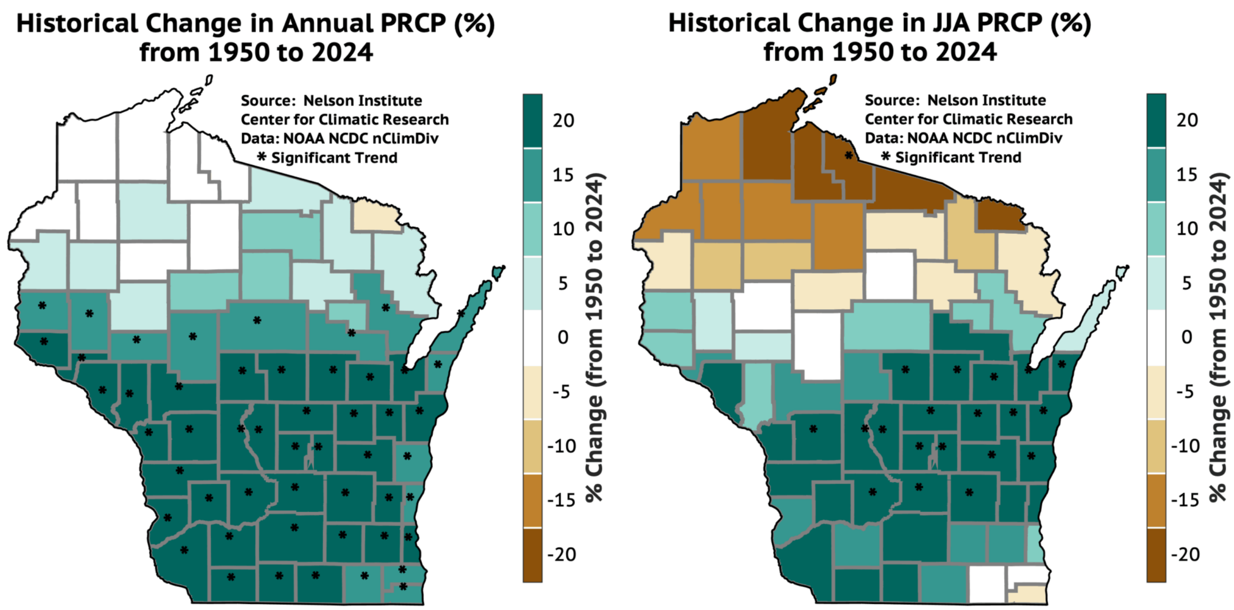
Source: WDNR, City of Brookfield, and SEWRPC

Figure 3.10
Historical Change in Annual Average Temperature and Average Summer Temperature: 1950-2024



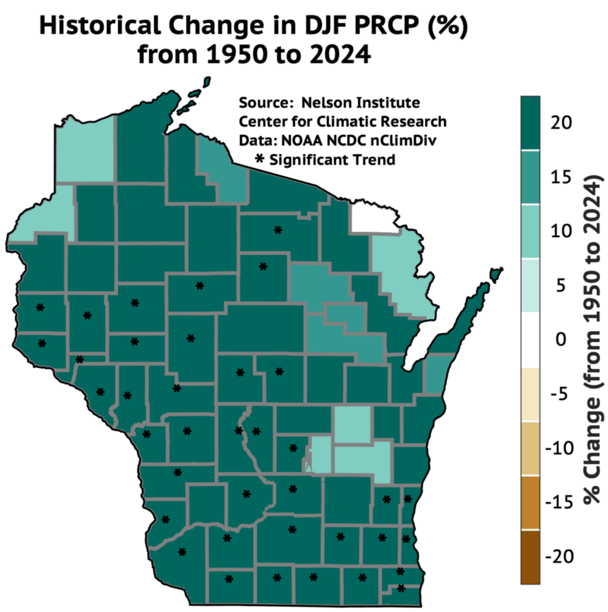
Source: WICCI

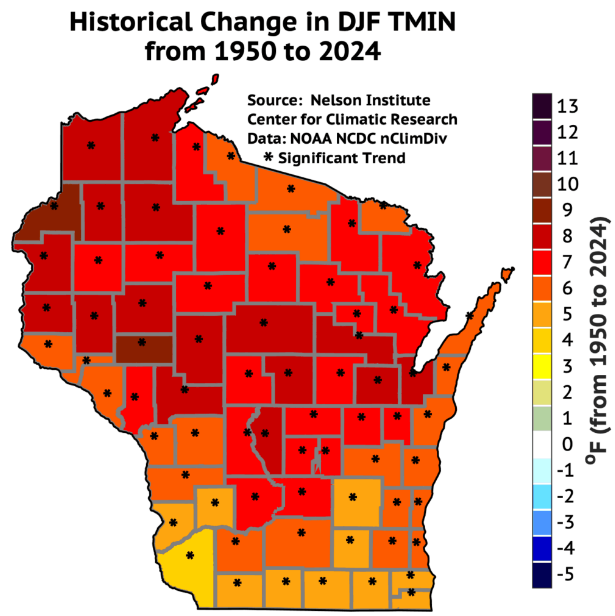
Figure 3.11
Historical Change in Annual Average Precipitation and Average Summer Precipitation: 1950-2024



Source: WICCI

Figure 3.12
Historical Change in Total Winter Precipitation and Minimum Winter Temperature: 1950-2024





Source: WICCI

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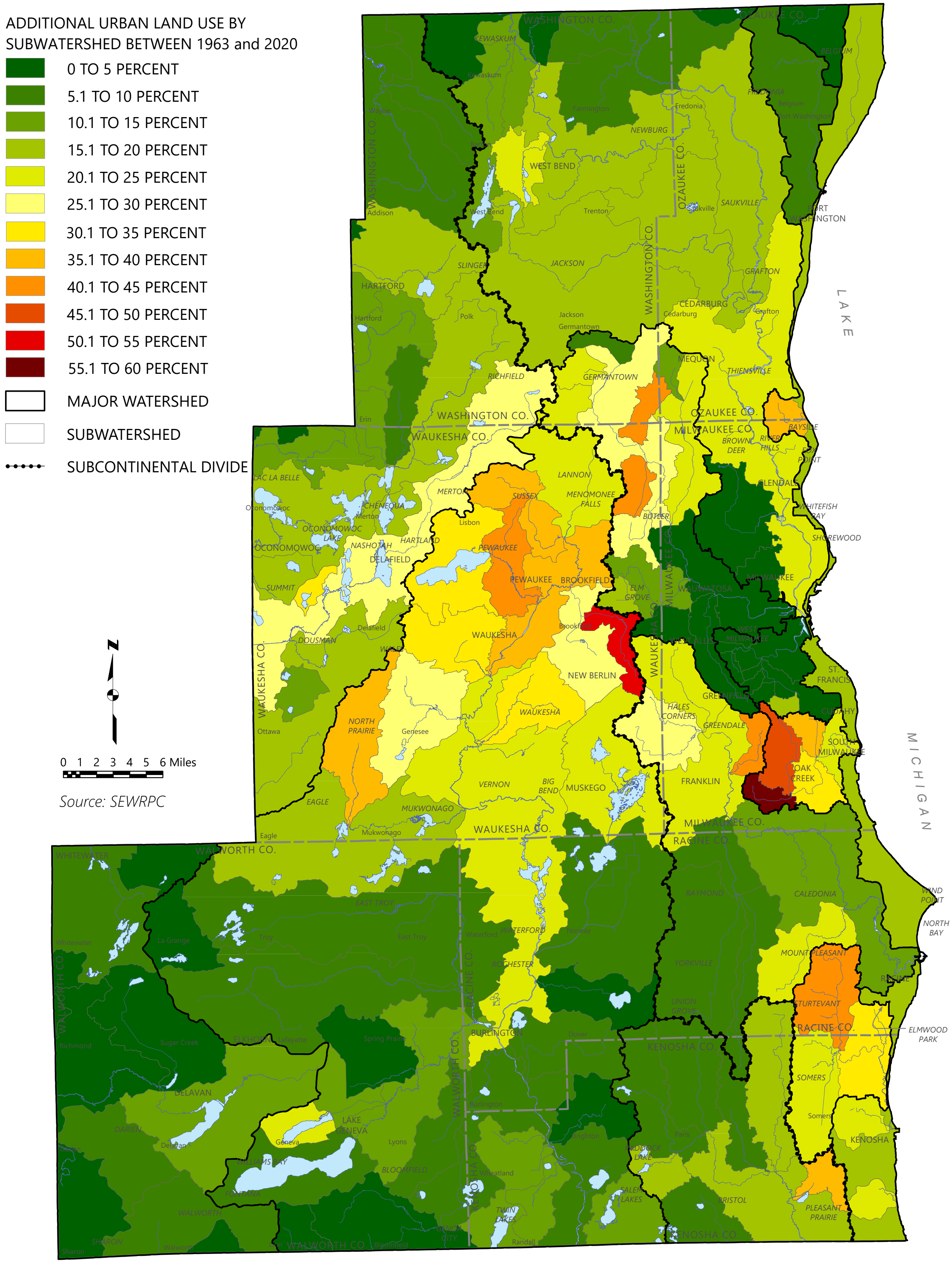
A PROSPECTUS FOR A REGIONAL WATER QUALITY MANAGEMENT PLAN UPDATE

Chapter 3

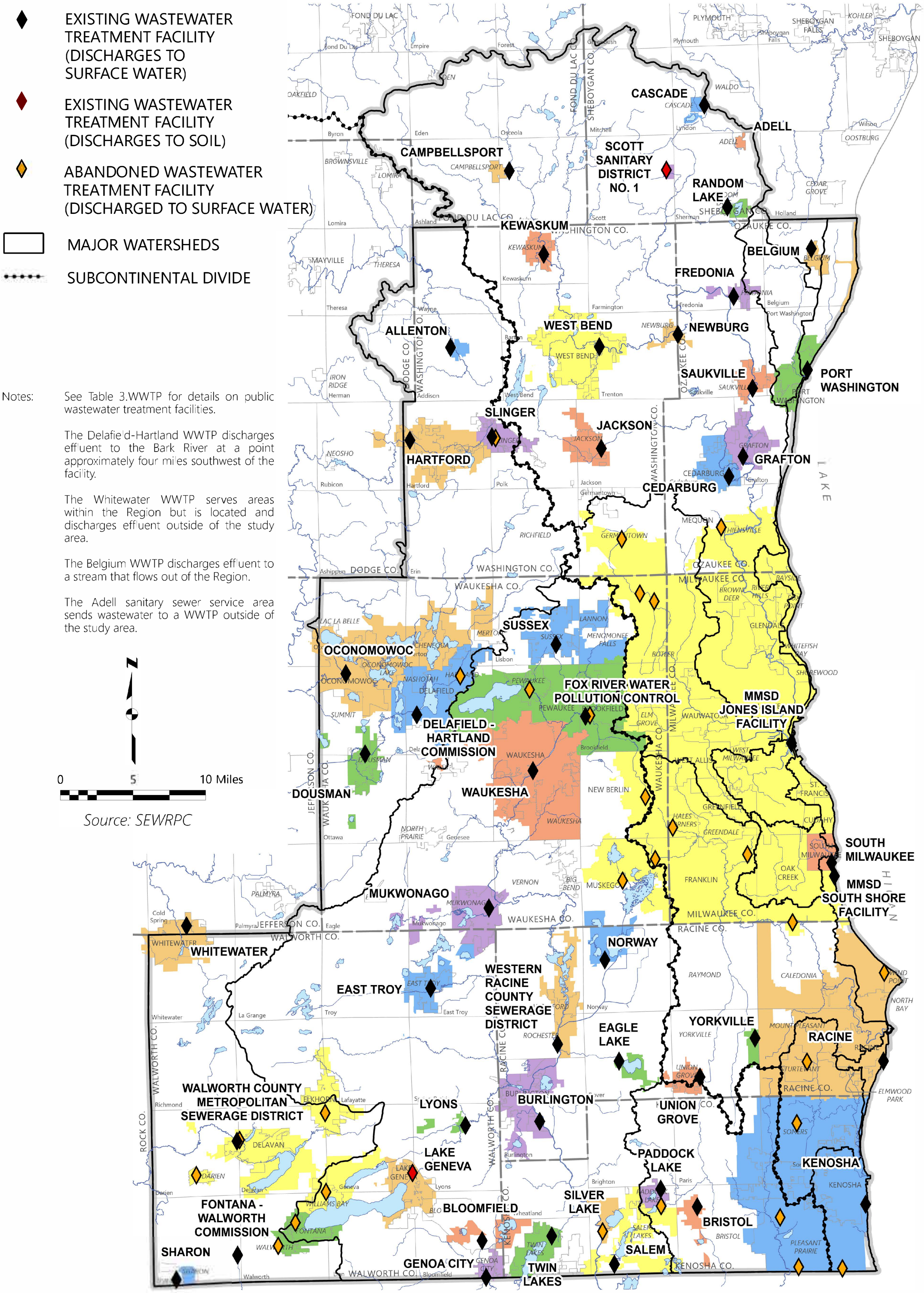
NEED FOR REGIONAL WATER QUALITY MANAGEMENT PLAN UPDATE

MAPS

Map 3.1
Increases in Urban Land Use Within Subwatersheds of the Region: 1963–2020



Map 3.2
Existing and Abandoned Wastewater Treatment Facilities and Planned Sanitary Sewer Service Areas



Notes: See Table 3.WWTP for details on public wastewater treatment facilities.

The Delafield-Hartland WWTP discharges effluent to the Bark River at a point approximately four miles southwest of the facility.

The Whitewater WWTP serves areas within the Region but is located and discharges effluent outside of the study area.

The Belgium WWTP discharges effluent to a stream that flows out of the Region.

The Adell sanitary sewer service area sends wastewater to a WWTP outside of the study area.

Source: SEWRPC