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Community Assistance Planning Report No. 330

A RESTORATION PLAN FOR THE OAK CREEK WATERSHED

Chapter 2

PRIOR AND ONGOING STUDIES, PLANS, PROJECTS, AND PROGRAMS

2.1 INTRODUCTION

The Oak Creek watershed restoration plan is a watershed restoration plan that refines and details the recommendations of the 2007 regional water quality management plan update for the greater Milwaukee watersheds (RWQMPU)[1] as they pertain to the Oak Creek watershed. Since efforts to implement the recommendations of the RWQMPU have been ongoing for over a decade, reviewing the implementation status of these recommendations is an important step in the development of this watershed restoration plan.

While this plan represents a refinement of the RWQMPU as it relates to the Oak Creek watershed, it must be recognized that findings and recommendations of a number of other planning efforts and goals and objectives of actions undertaken by a number of recent, current, and ongoing natural resource management programs and efforts also bear upon the focus issues addressed by this plan. To promote effective and sound management of land and water resources, it is important that management activities be conducted in a coordinated manner that takes into account both the needs of the watershed and the objectives and goals of the various programs, initiatives, and efforts involved in natural resource management within the watershed. Achieving this coordination requires that the findings and recommendations of related plans

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

and the goals and objectives of relevant management programs and efforts be taken into account in the design of this watershed restoration plan. Where goals and objectives are consistent with the RWQMPU and where they address the focus issues for this watershed restoration plan, it may be desirable to integrate them into this plan. Thus, an important step to be undertaken is the inventory, collation, and review of the recommendations of relevant previously prepared reports and plans and of relevant recent, current, and ongoing management programs and efforts.

This chapter summarizes the recommendations of the RWQMPU that pertain to the Oak Creek watershed and reviews the status of their implementation. In addition, this chapter also reviews other plans and programs that address the Oak Creek watershed and summarizes the recommendations and efforts from those plans and programs that pertain to the four focus areas of this watershed restoration plan.

2.2 RWQMPU

The RWQMPU updated the initial regional water quality management plan[2] for six watersheds, including the Oak Creek watershed. The RWQMPU addressed three major elements of the original regional water quality management plan: the land use element, the point source pollution abatement element, and the nonpoint source pollution abatement element. The point source pollution abatement element addresses those sources of pollution that enter surface waters through discharge at discrete locations such as outfalls or pipes. The nonpoint source pollution abatement element addresses those sources of pollution that enter surface water through runoff from land surfaces. In addition, the updated plan included consideration of several issues that were not considered in the initial plan, including instream and riparian habitat conditions and groundwater management. The RWQMPU planning effort was conducted in conjunction and coordination with the development of the Milwaukee Metropolitan Sewerage District's (MMSD) 2020 Facilities Plan (MMSD 2020 FP).

The RWQMPU made numerous recommendations that are relevant to the Oak Creek watershed. These recommendations fall into eight broad areas:

- Land Use

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[2]*SEWRPC Planning Report No. 30,* A Regional Water Quality Management Plan for Southeastern Wisconsin: 2000, *Volume One,* Inventory Findings, *September 1978; Volume Two,* Alternative Plans, *February 1979; Volume Three,* Recommended Plan, *June 1979*.

- Point Source Abatement Measures
- Nonpoint Source Pollution Abatement—Rural Control Measures
- Nonpoint Source Pollution Abatement—Urban Control Measures
- Instream Water Quality Management Measures
- Inland Lake Water Quality Management Measures
- Auxiliary Water Quality Management Measures
- Groundwater Management Measures.

Table 2.1 summarizes the recommendations of the RWQMPU as they relate to the Oak Creek watershed. In addition, the table indicates which recommendations relate to each of the four focus areas of the Oak Creek watershed restoration plan: water quality, recreational access and use, habitat conditions, and targeted stormwater drainage and flooding issues.

Summary of Targeted and General Recommendations for the Oak Creek Watershed

Land Use Element

The land use element of the RWQMPU included both an inventory of existing development in the year 2000 and the identification of planned year 2020 development. In addition, projections of buildout land use conditions were developed for municipalities located within the MMSD planning area.

Year 2020 and buildout population and land use estimates were initially developed by the SEWRPC staff and the communities served by the MMSD based on future land use information provided by those communities. Those initial year 2020 populations and land development assessments were used for sizing the conveyance components of MMSD's Metropolitan Interceptor System. Planned land use data and

population forecasts from the SEWRPC 2020 regional land use plan[3] were applied for communities in the study area that are not served by MMSD.

When data from the SEWRPC 2035 regional land use plan[4] became available, 2020 land use and population estimates for the MMSD communities were revised and used to develop the wastewater storage and treatment components called for under the recommended MMSD 2020 facilities plan, which is incorporated in the regional water quality management plan. Similarly refined population estimates were used for the 2020 condition evaluation of all of the public sewage treatment plants in the study area. Revised 2020 industrial and commercial land use estimates were also applied for the development of nonpoint source pollution loads used in modeling the instream water quality conditions under revised future year 2020 and recommended water quality plan conditions.

The RWQMPU makes several recommendations related to land use. It recommends that:

- Primary environmental corridors be preserved in essentially natural, open uses, forming an integrated system of open space lands. Under the RWQMPU, development within the primary environmental corridors would be limited to essential transportation and utility facilities, compatible outdoor recreation facilities, and rural-density residential development in upland corridor areas not encompassing steep slopes. Several measures are in effect that help ensure the preservation of environmentally significant areas in the Oak Creek watershed;

- The preservation of secondary environmental corridors and isolated natural resource areas be encouraged and that counties and communities consider the preservation of these areas in the preparation of county and local land use plans;

- All of the identified natural areas and critical species habitat sites designated for acquisition under the regional natural areas and critical species habitat plan (specified sites not in existing public or public-interest ownership) be preserved;[5] and

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[3]*SEWRPC Planning Report No. 45,* A Regional Land Use Plan for Southeastern Wisconsin: 2020, *December 1997*.

[4]*SEWRPC Planning Report No. 48,* A Regional Land Use Plan for Southeastern Wisconsin: 2035, *June 2005*.

[5]*SEWRPC Planning Report No. 42,* A Regional Natural Areas and Critical Species Habitat Protection and Management Plan for Southeastern Wisconsin, *September 1997; amended December 2010*.

- To the extent practicable, the most productive farmland, identified as farmland covered by agricultural capability Class I and Class II soils as classified by the U.S. Natural Resources Conservation Service (NRCS) be preserved.[6] Class I soils are those that have few to slight limitations that may restrict their use for cultivation. Class II soils are those that have moderate limitations that may either reduce the choice of plants that can be grown in them or require moderate conservation practices. Examples of limitations that can restrict the choice of plants or require conservation practices include susceptibility to erosion, excess water due to poor drainage or the presence of a high water table, presence of a shallow rooting zone, low moisture holding capacity, or high salinity.

Point Source Pollution Abatement Plan Subelement

The RWQMPU includes recommendations related to public wastewater treatment plants (WWTPs) and associated sewer service areas, private wastewater treatment plants, and other point sources of water pollution. The RWQMPU reiterates the initial regional water quality management plan's recommendation that all sanitary sewer service areas be refined. Unrefined sewer service areas are the product of systems level planning and are normally generalized in nature. The refining process determines a precise sewer service area boundary that is consistent with local land use plans and development objectives. Reports documenting the refined sewer service area include detailed maps of environmentally significant lands within the sewer service area. The refining process is conducted by the community concerned, with the assistance of SEWRPC staff. Following adoption by the designated management agency for the WWTP, local sewer service area plans are considered for adoption by the Regional Planning Commission as formal amendments to the regional water quality management plan. The Commission then forwards the plans to the Wisconsin Department of Natural Resources (WDNR) for approval.

The RWQMPU recommends that both the MMSD and the City of South Milwaukee maintain and operate WWTPs. It recommends that the MMSD upgrade its WWTPs according to its 2020-FP. The RWQMPU recommends that the City of South Milwaukee implement several improvements and upgrades to its WWTP that the City agreed to in a court-ordered stipulation issued in June 2004. Those improvements included

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[6]*The plan does envision that some Class I and Class II farmland that is located in the vicinity of existing urban service areas will be converted to urban use as a result of planned expansion of those urban service areas. This is a matter of balancing objectives for the preservation of productive farmland with objectives for the orderly and efficient provision of urban facilities and services. The plan also anticipates the development of lands beyond planned urban service areas that have been committed to low-density and suburban-density residential development through subdivision plats and certified surveys. This may be expected to result in the additional loss of Class I and Class II farmland.*

increasing the raw sewage pump capacity to meet a design peak flow of 30 million gallons per day (mgd) with the largest unit out of service, installing two new secondary clarifiers, and replacing the ultraviolet disinfection system.

Within the service areas described, the RWQMPU recommends that municipalities construct and maintain local sewer systems. In the Oak Creek watershed, this recommendation applies to all of the municipalities that are wholly or partially located in the watershed. The Cities of Cudahy, Franklin, Greenfield, Milwaukee, and Oak Creek are served by MMSD, while, as noted above, the City of South Milwaukee is served by its own WWTP. The plan also calls for the municipalities operating local sewerage systems to evaluate the need to reduce clearwater infiltration and inflow into sewers and implement Capacity, Management, Operations, and Maintenance (CMOM) programs. CMOM is a program initiated by the U.S. Environmental Protection Agency (USEPA) that provides a framework for municipalities to identify and incorporate widely-accepted wastewater industry practices to better manage, operate, and maintain collections systems; investigate capacity constrained areas of the collection system; and respond to sanitary sewer overflow events. MMSD rules require that the communities within its service area implement CMOM programs. The RWQMPU also recommends eliminating discharges from all points of sewerage flow relief in sewerage systems to natural waterbodies (*i.e.,* overflows).

The RWQMPU recommends continued regulation of WWTP and industrial discharges to surface waters through the Wisconsin Pollutant Discharge Elimination System (WPDES) program, with effluent concentrations of pollutants being controlled to acceptable levels on a case-by-case basis through the operation of the WPDES.

An additional point source issue identified under the RWQMPU is that of phosphorus loads from some industrial noncontact cooling water discharges. The industries involved do not normally add phosphorus to their cooling waters. Phosphorus is contained in the source water used for cooling because some utilities such as the Cities of Cudahy, Milwaukee, and South Milwaukee add orthophosphate or polyphosphate as a corrosion control agent to prevent certain metals such as lead from leaching from distribution systems and building plumbing materials into the treated water. Recognizing the public health benefits involved, it is not recommended that the water utilities end their current corrosion control practice. It is, however, recommended that water utilities serving the watershed give further consideration to an alternative technology that does not result in increased phosphorus loading if such a technology is both effective in controlling corrosion in pipes and cost-effective for the utility to implement.

Nonpoint Source Pollution Abatement Subelement

Recommended Rural Nonpoint Source Pollution Control Measures

The RWQMPU includes recommendations for rural nonpoint source pollution control measures for the Oak Creek watershed that are generally consistent with the Milwaukee County land and water resource management plan.[7]

The RWQMPU calls for practices to reduce soil loss from cropland to be expanded to attain erosion rates less than or equal to "T," the maximum average annual rate of soil loss that can occur without significantly affecting crop productivity, by 2020. This could be accomplished through a combination of practices, including, but not limited to, expanded conservation tillage, grassed waterways, and riparian buffers. The applicable measures should be determined by the development of farm management plans which are consistent with the county land and water resource management plans.[8]

The RWQMPU recommends that manure and any supplemental nutrients be applied to cropland in accordance with a nutrient management plan consistent with the requirements of Sections ATCP 50.04, 50.48, and 50.50 and Section NR 151.07 of the *Wisconsin Administrative Code*.

Based on a review of the literature related to the effectiveness of riparian buffers in controlling nonpoint source pollution, the RWQMPU concludes that a minimum 75-foot riparian buffer width along each side of streams flowing through current crop and pasture land is optimal for the control of nonpoint source pollution. The plan update recommends that:

- In general, where existing riparian buffers adjacent to crop and pasture lands are less than 75 feet in width, they be expanded to a minimum of 75 feet on each side of the waterway

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[7]*SEWRPC Community Assistance Planning Report No. 312,* A Land and Water Resource Management Plan for Milwaukee County: 2012-2021, *August 2011.*

[8]*The recommended rural nonpoint source control measures in the RWQMPU were based upon, and incorporated, agricultural performance standards from Chapter NR 151, "Runoff Management," of the* Wisconsin Administrative Code *that were in effect from 2004 through 2007 when the RWQMPU was being developed. NR 151 was revised in 2010, with the revision taking effect January 1, 2017. The current agricultural performance standards are described later in this chapter.*

- The procedures for targeting buffers to locations where they would be most effective as developed under the Wisconsin Buffer Initiative be considered in the implementation of the riparian buffers recommendations made herein[9]

- Opportunities to expand riparian buffers beyond the recommended 75-foot width be pursued along high-quality stream systems, including those designated as outstanding or exceptional resource waters of the State, trout streams, or other waterways that support and sustain the life cycles of economically important species such as salmon, walleye, and northern pike

- The number of stream crossings be limited and configured to minimize fragmentation of streambank habitat

The RWQMPU recommends that a total of 10 percent of existing farmland and pasture be converted to either wetland or prairie conditions. The focus of this effort should be on marginally productive lands, which are defined as agricultural lands other than those designated as Class I and Class II lands by the NRCS. Consistent with this, the RWQMPU identified candidate areas to be given first consideration when identifying marginally productive lands to be converted to wetlands and prairies. Candidate areas that were identified in the Oak Creek watershed are shown on Map 2.1. In the Oak Creek watershed, the RWQMPU identified approximately 189 acres of candidate wetland or prairie areas.

The RWQMPU recommends that, at a minimum, county-enforced inspection and maintenance programs be implemented for all new or replacement private onsite wastewater treatment systems (POWTS) constructed after the date on which the counties adopted private sewage system programs, that voluntary county programs be instituted to inventory and inspect POWTS that were constructed prior to the dates on which the counties adopted private sewage system programs, and the WDNR and the counties in the RWQMPU study areas work together to strengthen oversight and enforcement of regulations for disposal of septage and to increase funding to adequately staff and implement such programs.[10]

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[9]*College of Agriculture & Life Sciences, University of Wisconsin-Madison,* The Wisconsin Buffer Initiative, *December 2005.*

[10]*As described in more detail later in this chapter, the City of Franklin has an ordinance implementing a POWTS management program.*

Recommended Urban Nonpoint Source Pollution Control Measures

The RWQMPU recommends several best management practices to abate urban nonpoint source pollution. In some instances, the plan includes measures that go beyond what would be required to meet the performance standards of Chapter NR 151, "Runoff Management," of the *Wisconsin Administrative Code*.

The RWQMPU recommends that urban nonpoint source pollution controls be implemented that are consistent with the standards of Chapter NR 151. [11] By implementing controls to meet these standards, municipalities will address control of construction site erosion; control of stormwater pollution from areas of existing and planned urban development, redevelopment, and infill; and infiltration of stormwater runoff from areas of new development. Urban best management practices that could be installed to control nonpoint source pollution from existing or new development could include such measures as 1) runoff infiltration/evapotranspiration and/or pollutant filtration devices such as grassed swales, infiltration basins, bioretention facilities, rain gardens, green roofs, and porous pavement; 2) stormwater treatment facilities, such as wet detention basins, constructed wetlands, sedimentation/flotation devices; and 3) maintenance practices such as vacuum sweeping of roads and parking lots.

To address fecal indicator bacteria and the risks posed to human health from the pathogens whose presence can be indicated by these bacteria, the RWQMPU recommends enhanced urban illicit discharge control and/or innovative methods to identify and control possible pathogen sources in stormwater runoff from all urban areas in the RWQMPU study area, including the Oak Creek watershed. To address the threats to human health and degradation of water quality resulting from human-specific pathogens and viruses entering stormwater systems, the plan recommends that each municipality in the study area implement a program consisting of:

- Enhanced storm sewer outfall monitoring to test for fecal coliform bacteria in dry- and wet-weather discharges

[11] *The recommended urban nonpoint source pollution control measures in the RWQMPU were based upon and incorporated nonagricultural performance standards from Chapter NR 151, "Runoff Management," of the* Wisconsin Administrative Code *that were in effect from 2004 through 2007 when the RWQMPU was being developed. NR 151 was revised in 2010, with revisions taking effect January 1, 2011. The current nonagricultural performance standards are described later in this chapter.*

- Molecular tests for the presence or absence of human-specific strains of *Bacteroides*, an indicator of human fecal contamination, at outfalls where high fecal coliform counts are found in the initial dry-weather screenings

- Additional dry-weather screening upstream of outfalls where human-specific strains of *Bacteroides* are found to be present, with the goal of isolating the source of the illicit discharge

- Elimination of illicit discharges that were detected through the program described in the preceding three steps

It was anticipated that the program outlined above would also identify cases where illicit connections are not the primary source of bacteria, indicating that stormwater runoff is the main source. To adequately assess the appropriate way to deal with such bacteria sources (and the potentially associated pathogens), the RWQMPU recommends that human health and ecological risk assessments be conducted to address pathogens in stormwater runoff.

Water quality monitoring data set forth in the technical report that accompanied the RWQMPU indicated that chloride concentrations in the streams of the RWQMPU study area are increasing over time.[12] The chloride is likely from multiple sources, including sodium chloride and calcium chloride applied for ice and snow control on roads and parking lots, and discharges from water softener systems to either 1) POWTS which discharge to groundwater and, ultimately, to streams and lakes as baseflow, or 2) public wastewater treatment plants which discharge to surface waters. The RWQMPU makes several recommendations to reduce the amount of chlorides introduced into the environment. It recommends that the municipalities and counties in the study area continue to evaluate their practices regarding the application of chlorides for ice and snow control and strive to obtain optimal application rates to ensure public safety without applying more chlorides than necessary for that purpose. It also recommends that municipalities consider alternatives to current ice and snow control programs, such as applying a sand/salt mix to local roads along with enhanced street sweeping in the spring of the year to remove accumulated sand. It recommends that education programs be implemented to provide information about 1) alternative ice and snow control measures in public and private parking lots and 2) optimal application rates in such areas. The RWQMPU recommends that education programs be implemented to provide information about alternative water

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[12]*SEWRPC Technical Report No. 39,* Water Quality Conditions and Sources of Pollution in the Greater Milwaukee Watersheds, *November 2007*.

softening media and the use of more efficient water softeners that regenerate water based upon the amount of water used and the quality of the water.

The RWQMPU recommends that the use of low- or no-phosphorus fertilizers be encouraged in areas tributary to inland lakes and ponds and that consideration be given to adopting low- or no-phosphorus fertilizer ordinances in those areas. It also recommends that information and education programs required under municipal WPDES stormwater discharge permits promote voluntary practices that optimize urban fertilizer application consistent with the requirements of WDNR Technical Standard No 1100, "Interim Turf Nutrient Management." One key provision of these standards calls for no application of fertilizer within 20 feet of a waterbody.

Other urban nonpoint source pollution control measures recommended in the RWQMPU include:

- Existing litter and debris control programs along the urban streams of the RWQMPU study area be continued and that opportunities to expand such efforts be explored;

- All municipalities in the study area have pet litter control ordinance requirements and that these requirements be enforced; and

- Targeted research on bacteria and pathogens and research and implementation of stormwater best management practice (BMP) techniques and programs be supported. As part of this recommendation the plan also calls for support for research to develop and apply more direct methods of identifying sources of pathogens important to human health.

Instream Water Quality Management Measures Subelement

The RWQMPU recommends several instream water quality management measures that apply to the Oak Creek watershed.

In 2004, Milwaukee County assessed the stability and fluvial geomorphic character of streams in several watersheds within the County including the Oak Creek watershed.[13] This study report set forth and prioritized projects for concrete lining removal, channel rehabilitation, and fish passage improvement. The RWQMPU recommends that the projects called for under the Milwaukee County stream assessment study

[13]*Inter-Fluve, Inc.,* Milwaukee County Stream Assessment, *prepared for Milwaukee County, September 24, 2004.*

be implemented over time in a manner consistent with the need to provide flood protection and consistent with the stream rehabilitation recommendations of the regional plan update.

The RWQMPU recommends that abandonment and associated riverine area restoration plans be prepared as part of the design of new or reconstructed dams and prior to abandonment of existing dams. It also recommends that any dam removals specifically include provisions to protect upstream reaches from erosion and downstream reaches from sedimentation by prohibiting excessive sediment transport from the impoundment during and after dam removal.[14]

Culverts, bridges, drop structures, and channelized stream segments fragment and limit connectivity within stream habitat and ecosystems. The RWQMPU recommends that, to the extent practicable, these stream crossings and management strategies be limited. It also recommends that where such crossings are required, they be designed to allow the passage of aquatic organisms in addition to the passage of water, especially under low flow conditions.

The RWQMPU made several recommendations regarding the protection and enhancement of fisheries. These are consistent with actions recommended by WDNR for habitat improvement of stream systems.[15]

The RWQMPU recommends:

- To the extent practicable, protecting remaining natural stream channels, including small tributaries and shoreland wetlands that provide habitat for the continued survival, growth, and reproduction of a sustainable fishery throughout the RWQMPU study area

- Restoring wetlands, woodlands, and grasslands adjacent to stream channels and establishing minimum buffers, 75 feet in width, on either side of streams to reduce pollutant loads entering streams and protect water quality

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[14] *The RWQMPU does not recommend the removal of any specific dams within the Greater Milwaukee watersheds, including the Oak Creek watershed. The RWQMPU recommends that the process for construction, operation, and abandonment of constructed waterbodies such as those resulting from dams should involve a public process with consultation and participation of a range of stakeholders, including riparian residents.*

[15]*Wisconsin Department of Natural Resources,* A Review of Fisheries Habitat Improvement Projects in Warmwater Streams with Recommendations for Wisconsin, *Technical Bulletin No. 169, 1990.*

- Restoring, enhancing, and/or rehabilitating stream channels to provide increased quality and quantity of available fisheries habitat—through improvement of water quality, shelter/cover, food production, and spawning opportunities—by management measures that include but are not limited to:

    - Minimizing the number of stream crossings and other obstructions to limit fragmentation of stream reaches

    - Stabilizing stream banks to reduce erosion

    - Limiting instream sedimentation and selectively removing excessive silt accumulations

    - Reestablishing instream vegetation and bank cover to provide fish with food, spawning areas, shelter from predators, and protection from floods

    - Realigning channelized reaches of streams and removing concrete lining to provide heterogeneity in depth (e.g., alternating riffle and pool habitat), velocity or flow regime, and bottom substrate composition

    - As opportunities arise when roadways crossing streams are replaced or reconstructed, removing or retrofitting obstructions such as culverts, dams, and drop structures that limit the maintenance of healthy fish and macroinvertebrate populations

- Monitoring fish and macroinvertebrate populations to evaluate the effectiveness of the water quality management program

- Considering more intensive fisheries manipulation measures—such as removing exotic carp species and/or stocking of gamefish or other native species—where warranted based upon specific goals and objectives established for each project site, reach, or subwatershed through detailed local level planning

The plan also recommends that the locations for carrying out the recommended stream restoration measures be identified with the guidance and direct involvement of the WDNR, based upon site-specific field evaluations.

Inland Lake Water Quality Measures Subelement

The RWQMPU makes several recommendations for inland lake water quality management that apply to ponds in the Oak Creek watershed. The plan recommended:

- Implementation of the recommendations of the Milwaukee County park pond and lagoon plan[16]
- That aquatic plant surveys be conducted in those lakes in which aquatic plant management activities are being conducted
- That long-term water quality monitoring stations be established in inland lakes

Auxiliary Water Quality Management Measures Subelement

The RWQMPU makes numerous auxiliary recommendations addressing several water quality issues.

The plan update recognizes that waterfowl, especially gulls, can be a significant source of fecal coliform bacteria in surface waters. It recommends that programs be implemented to discourage numbers of waterfowl that are high enough to cause water quality problems or generate complaints as a result of congregating near beaches and other water features. Measures that could be implemented in these programs include expanded use of informational signs regarding the negative aspects of feeding waterfowl; ordinances prohibiting the feeding of waterfowl; covered trash receptacles at beaches and water features; vegetative buffers along shorelines that discourage gulls and geese from congregating; and other, innovative measures, such as dogs trained to disperse waterfowl.

The RWQMPU makes the following recommendations related to household hazardous and pharmaceutical wastes:

- That the existing collection programs for household hazardous wastes be continued and supported and that those communities not served by such programs consider developing and instituting such programs

[16]*Milwaukee County Environmental Services,* Milwaukee County Pond & Lagoon Management Plan, *June 2005.*

- That assessments and evaluations be made of the significance to adversely impact human health and to aquatic and terrestrial wildlife from the presence of pharmaceuticals and personal care products in surface waters

- That periodic collections of expired and unused prescription medications be conducted

The RWQMPU makes two recommendations regarding exotic and invasive species:

- That programs to reduce the introduction and spread of exotic and invasive species, including programs to educate the public, be supported and continued

- That the occurrence and spread of exotic and invasive species be monitored and documented

The plan evaluated existing water quality monitoring and data collection programs and characterized gaps in the available data. It found that relatively few data were available from tributary streams throughout the RWQMPU study area. To address monitoring needs in the watershed, the RWQMPU makes the following recommendations:

- That the surface water quality monitoring programs currently being conducted by the MMSD, WDNR, and U.S. Geological Survey (USGS) be supported and continued

- That long-term fisheries, macroinvertebrate, and habitat monitoring stations be established in streams, ideally at sites where water quality is also being monitored

- That efforts to facilitate consolidation of data from various monitoring programs be continued

- That citizen-based monitoring efforts be continued and expanded, with an emphasis on filling geographical gaps in existing data

Finally, the RWQMPU recommends periodic maintenance and updating of the water quality models developed under the RWQMPU/MMSD 2020 FP.

Groundwater Management Element

Three of the RWQMPU recommendations regarding groundwater management grew directly out of SEWRPC's regional water supply planning program which was in progress during the time that the RWQMPU was being prepared.[17] As part of the regional water supply planning program, the most important groundwater recharge areas within the Southeastern Wisconsin Region were identified and mapped.[18] The RWQMPU recommends that important groundwater recharge areas be considered for preservation or for development with corresponding stormwater management practices which are directed toward maintaining the natural hydrology. The RWQMPU recommends that consideration be given to following the recommendations of the regional water supply plan regarding maintenance of these areas. Under the regional water supply planning process, groundwater sustainability analyses were made for six selected demonstration areas, representing a range of hydrogeologic conditions.[19] These areas were analyzed to provide guidance on the density of individual household wells or shared common wells that could be installed without creating significant impacts on the shallow groundwater system. The RWQMPU recommends that the groundwater sustainability guidance results developed under the groundwater sustainability study be considered by municipalities in evaluating proposed developments and in conducting local land use planning and that water utilities develop and implement utility-specific water conservation programs.

The RWQMPU also recommends that the design of stormwater management facilities that directly or indirectly involve infiltration of stormwater consider the potential impacts on groundwater quality, and that the provisions intended to protect groundwater quality in the WDNR's post-construction stormwater management technical standards be applied in the design of stormwater management facilities.

Status of Implementation of Recommendations of the RWQMPU in the Oak Creek Watershed

The recommendations made in the RWQMPU include a series of management strategies designed to improve surface water quality conditions in the Oak Creek watershed. As indicated above, these strategies include measures related to land use, point source pollution abatement, nonpoint source pollution

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[17]*SEWRPC Planning Report No. 52,* A Regional Water Supply Plan for Southeastern Wisconsin, *December 2010.*

[18]*SEWRPC Technical Report No. 47,* Groundwater Recharge in Southeastern Wisconsin Estimated by a GIS-Based Water-Balance Model, *July 2008.*

[19]*SEWRPC Technical Report No. 48,* Shallow Groundwater Quantity Sustainability Analysis Demonstration for the Southeastern Wisconsin Region, *November 2009.*

abatement, instream and inland lake water quality management, groundwater management, and other issues. Efforts to implement the RWQMPU have been ongoing for several years.

To formulate a restoration plan for the Oak Creek watershed, it is important to assess the current status of implementation of the RWQMPU. There are several reasons to do this. Assessing the status of implementation enables an evaluation of how much progress toward the goals of the RWQMPU has been made since the plan was issued. Identifying areas in the watershed where projects implementing specific recommendations have been completed, are in process, or are planned can be useful for targeting locations for future projects. This identification can also indicate locations where recent efforts can be expanded or used as a basis for future actions, which can be especially important for the sorts of projects that act incrementally to produce reductions in pollutant loads to waterbodies, with resultant improvements in water quality. Alternatively, identification of areas where projects implementing specific recommendations have been completed, are in process, or are planned can also assist the process of identifying other portions of the watershed that have not received sufficient attention in the implementation of the specific recommendations. Assessing the status of plan implementation can also point out those specific recommendations that may require more attention in implementation. Finally, assessing the status of implementation at this juncture makes it possible to apply the lessons learned from recent implementation efforts to the identification and prioritization of recommendations under this watershed restoration plan.

In the assessment of the status of implementation of the RWQMPU, the recommendations are grouped into three broad categories: recommendations that reflect, in whole or in part, existing regulatory requirements; recommendations that are in various stages of implementation; and recommendations that have not yet been implemented.

Existing Regulatory Management Strategies

Table 2.2 shows the recommendations of the RWQMPU that reflect existing, ongoing regulatory requirements. The table also indicates the relevant regulations in the *Wisconsin Administrative Code, Wisconsin Statutes,* and local ordinances. It is important to note that some of the recommendations listed in the table are only partially addressed by existing regulations. The following descriptions will note where this is the case.

Land Use Element

Develop According to Approved Land Use Plans

The RWQMPU was developed under the assumption that local communities will develop according to the recommendations given in approved local land use plans. This is partially addressed by existing regulatory requirements. In 1999, the Wisconsin Legislature enacted legislation that greatly expanded the scope and significance of comprehensive plans within the State. The legislation, often referred to as the State's "Smart Growth" law, provides a new framework for the development, adoption, and implementation of comprehensive plans by regional planning commissions and by counties, cities, villages, and towns. The law is set forth in Section 66.1001 of the *Wisconsin Statutes* which also defines the elements that a comprehensive plan must contain. One of the required elements is a land use element that includes "a compilation of objectives, policies, goals, maps, and programs to guide future development and redevelopment of public and private property."

The law does not require the adoption of county and local comprehensive plans; however, Section 66.1001(3) of the *Statutes* requires that county and local general zoning ordinances; county, city, and village shoreland and floodplain zoning ordinances; county and local subdivision ordinances; and local official mapping ordinances enacted or amended on or after January 1, 2010, be consistent with the comprehensive plan adopted by the unit of government enacting or amending the ordinance.

All of the cities that are wholly or partially located in the Oak Creek watershed have adopted comprehensive plans. Because all of the municipalities in Milwaukee County are incorporated as cities or villages, the County has not prepared a comprehensive plan.

Point Source Pollution Abatement Measures

Refining of Sanitary Sewer Service Areas

As previously described, the RWQMPU recommends that unrefined sanitary sewer service areas in the Oak Creek watershed be refined. This has regulatory implications because Chapter NR 110, "Sewerage Systems," of the *Wisconsin Administrative Code*, requires that sanitary sewer extensions and sewerage system facility plans be in conformance with the approved areawide water quality management plan. The sanitary sewer service areas within the Cities of Franklin and Oak Creek within the Oak Creek watershed have been refined. Areas served by MMSD in the Cities of Cudahy, Greenfield, and Milwaukee have not been refined. In addition, the City of South Milwaukee's sanitary sewer service area has not been refined.

Since the completion of the RWQMPU, a second-generation sewer service area plan has further refined the sanitary sewer service area for the City of Franklin, including portions of the Oak Creek watershed. The existing sanitary sewer service areas in the Oak Creek watershed are described in Chapter 3 of this report.

Continue Operation and Maintenance of MMSD and City of South Milwaukee Wastewater Treatment Plants

The RWQMPU recommends that both the MMSD and the City of South Milwaukee continue to operate and maintain their respective WWTPs. Both of the MMSD plants and the City of South Milwaukee plants are currently operating under discharge permits issued through the WPDES and are operated subject to conditions set forth in those permits.

Evaluate the Need to Reduce Infiltration and Inflow and Implement CMOM Programs

The RWQMPU recommends that the municipalities operating local sewerage systems evaluate the need to reduce clearwater infiltration and inflow into sewers and implement CMOM programs that provide a framework for municipalities to identify and incorporate widely accepted wastewater industry practices in order to better manage, operate, and maintain collections systems; investigate capacity constrained areas of the collection system; and respond to sanitary sewer overflow events. Section NR 210.23 of the *Wisconsin Administrative* Code requires that all owners of sanitary sewage collection systems develop and implement CMOM programs by August 1, 2016. This section requires that such programs include implementing all feasible steps to eliminate excessive infiltration and inflow of clearwater into sanitary sewers. Section NR 110.09 of the *Wisconsin Administrative* Code requires that facilities planning for wastewater treatment facilities include an analysis to determine whether excessive infiltration and inflow exists in the sewerage system. The contents of this analysis are specified in sections NR 110.09(5) an NR 100.09(6). In addition, Section 3.105 of MMSD's rules requires that the communities within its service area operating sewer systems tributary to MMSD's system establish and implement CMOM programs. This rule also requires that the communities develop and implement infiltration and inflow management plans.

Continued Regulation of WWTP and Industrial Discharges through the WPDES Permit Program

The RWQMPU recommends continued regulation of WWTP and industrial discharges to surface waters through the WPDES program, with effluent concentrations of pollutants being controlled to acceptable levels on a case-by-case basis through the operation of the WPDES program. Sections 283.31(1) and 283.33 of the *Wisconsin Statutes* require a permit for the legal discharge of any pollutant into the waters of the State, including groundwater. This State pollutant discharge permit system was established by the Wisconsin Legislature in direct response to the requirements of the Federal Clean Water Act. While the Federal law envisioned requiring a permit only for the discharge of pollutants into navigable waters, in

Wisconsin permits are required for discharges from point sources of pollution to all surface waters of the State and, additionally, to land areas where pollutants may percolate, seep to, or be leached to groundwater.

Rules relating to the WPDES are set forth in Chapters NR 200 through 299 of the *Wisconsin Administrative Code*. The following types of discharges require permits under Chapter NR 200, "Application for Discharge Permits and Water Quality Standards Variances":

- The direct discharge of any pollutant to any surface water

- The discharge of any pollutant, including cooling waters, to any surface water through a storm sewer system not discharging to publicly owned treatment works

- The discharge of pollutants other than from agricultural uses for the purpose of disposal, treatment, or containment on land areas, including land disposal systems such as ridge and furrow, irrigation, and ponding systems

- Discharge from an animal feeding operation where the operation causes the discharge of a significant amount of pollutants to waters of the State and the owner or operator of the operation does not implement remedial measures as required under a notice of discharge issued by the WDNR under Chapter NR 243, which deals with animal waste management

Certain discharges are exempt from the permit system as set forth under Chapter NR 200, including discharges to publicly owned sewerage works, some discharges from vessels, discharges from properly functioning marine engines, and discharges of domestic sewage to septic tanks and drain fields. The latter are regulated under another chapter of the *Wisconsin Administrative Code*. Also exempted are the disposal of septic tank pumpage and other domestic waste, also regulated under another chapter of the *Wisconsin Administrative Code*; the disposal of solid wastes, including wet or semi-liquid wastes, when disposed of at a site licensed pursuant to another chapter of the *Wisconsin Administrative Code*; and discharges from private alcohol production systems.

Discharges related to a variety of municipal and industrial activities may be permitted under the WPDES permit system. Particular facilities may be permitted either under an individual permit to the owner or operator of the facility or under a Statewide general permit.

Individual permits are issued to specific facilities that generate wastewater from unique types of activities, have complex mixtures of pollutants, or have physical-chemical treatment systems. Municipal and privately owned wastewater WWTPs are generally permitted under individual permits. Conditions for individual permits include effluent limitations for pollutants that are discharged and monitoring and reporting requirements. Individual permits include a compliance schedule which specifies the actions needed to be taken for the facility to remain in compliance with permit conditions and the dates by which these actions must be completed. Individual permits are issued for a five-year term. To maintain coverage beyond the end of the term, permittees must reapply at least 180 days prior to expiration of the permit.

Statewide general permits are used to cover groups of facilities that generate wastewater from relatively simple operations having similar types and amounts of pollutants. Coverage under a general permit is conferred by completing and submitting a request-for-coverage form to the appropriate WDNR regional office. Compliance with the limitations contained in a general permit must be attained at the time coverage is granted. As of January 2018, the State had issued 27 different WPDES general permits, covering a variety of activities and discharges. Examples of these include general permits for noncontact cooling water, swimming pool facilities, hydrostatic test water, ballast water discharge, and stormwater from industrial facilities. It is important to note that an individual facility may need to be covered under more than one general permit, depending on the different types of waste streams that the facility discharges. General permits contain effluent limitations for pollutants associated with the covered discharges and monitoring and reporting requirements. These permit conditions vary according to the category of general permit. For some general permits, the WDNR has developed standard discharge monitoring reporting forms.

Nonpoint Source Pollution Abatement—Rural Control Measures

Nutrient Management Plans and Nutrient Application

Among the rural nonpoint source pollution abatement measures in the RWQMPU was a recommendation that application of manure and supplemental nutrients to cropland be applied in accordance with approved nutrient management plans. Starting in 2005 for high-priority areas such as impaired or exceptional waters, and in 2008 for all other areas, application of manure or other nutrients to croplands must be done in accordance with a nutrient management plan designed to meet State standards for limiting the entry of nutrients into groundwater or surface water resources. Requirements related to these plans are set forth in Section ATCP 50.04(3) of the *Wisconsin Administrative Code*. In general, for land that does not meet the NR 151 performance standards and that was cropped or enrolled in the U.S. Department of Agriculture Conservation Reserve or Conservation Reserve Enhancement Programs as of October 1, 2002, agricultural performance standards are only required to be met if cost-sharing funds are available. Existing cropland

that met the standards as of October 1, 2002, must continue to meet the standards. New cropland since October 1, 2002 must meet the standards, regardless of whether cost-share funds are available.

Inspection and Maintenance Programs for Private Onsite Wastewater Treatment Systems (POWTS)

As previously described, the RWQMPU recommends that, at a minimum, county-enforced inspection and maintenance programs be implemented for all new or replacement private onsite wastewater treatment systems (POWTS) constructed after the date on which the counties adopted private sewage system programs. It also recommends that voluntary county programs be instituted to inventory and inspect POWTS that were constructed prior to the dates on which the counties adopted private sewage system programs.

At the State level, the Wisconsin Department of Safety and Professional Services has established rules regulating POWTS set forth in Chapter SPS 383, "Private Onsite Wastewater Treatment Systems," of the *Wisconsin Administrative Code*. Much of the regulation is performed by counties and, in counties with population of 500,000 or more, by municipalities. SPS 383.255 requires counties with populations of less than 500,000 and municipalities located in counties with populations of 500,000 or more to develop and implement comprehensive maintenance programs for POWTS within their jurisdictions. These counties and municipalities are referred to as governmental units. These programs are to include:

- Conducting, completing, and maintaining an inventory of all POWTS located within the governmental unit's jurisdiction

- A process that accepts and records inspections, evaluation, maintenance, and servicing reports submitted by owners of POWTS or their agents

- A process that notifies owners of POWTS who are delinquent in meeting reporting requirements

- A process that includes measures meant to ensure that required inspection, evaluation, maintenance, and servicing of POWTS are performed and reported

- Annual reporting to the Wisconsin Department of Safety and Professional Services.

The units of government are required to complete the inventory by October 1, 2017, and have the other elements of the programs in place by October 1, 2019.

For POWTSs installed or constructed on or after July 1, 2000, SPS 383.54 requires submission of a management plan to the governmental unit as part of a plan for installation, construction, or replacement of or addition to a POWTS. This management plan is to include servicing and maintenance requirements, including servicing frequency requirements of the components of the system. In addition to the frequency given in the management plan, servicing is required to occur when the combined volume of sludge and scum in an anaerobic treatment tank (septic tank) equals one-third of the tank's volume. The owner or the owner's agent is required to report to the governmental unit within 30 days of required inspections, evaluations, maintenance, or servicing.

For POWTSs existing prior to July 1, 2000, servicing is also required to occur when the combined volume of sludge and scum in an anaerobic treatment tank (septic tank) equals one-third of the tank's volume. In addition, those systems that include a treatment or dispersal component utilizing in situ soil are required to be visually inspected at least once every three years to determine whether wastewater or effluent is ponding on the surface of the ground. The owner or the owner's agent is required to report to the governmental unit within 30 days of required inspections, evaluations, maintenance, or servicing.

The City of Franklin has an ordinance implementing a POWTS management program. This program requires that inspection and servicing of systems be conducted on a three-year cycle and that the City provide notification to owners of POWTS that their systems are due for inspection and servicing. It should be noted that the Cities of Greenfield, Milwaukee, Oak Creek, and South Milwaukee have enacted ordinances that require that new construction or buildings currently served by POWTS that are adjacent to streets or easements with public sanitary sewer service connect to such service.

Nonpoint Source Pollution Abatement—Urban Control Measures

Implementation of Construction Erosion Control and Urban Nonpoint Source Pollution Controls Consistent with the Performance Standards in NR 151

The nonagricultural performance standards set forth in Chapter NR 151 encompass two major types of land management. The first type includes standards for areas of new development and redevelopment. The second type includes standards for developed urban areas. The performance standards address the following areas:

- Construction sites for new development and redevelopment

- Post-construction stormwater runoff for new development and redevelopment

- Developed urban areas

- Nonmunicipal property fertilizing.

NR 151 requires counties and local units of government in urbanized areas, which are identified based on population density, to obtain a WPDES stormwater discharge permit as required under Chapter NR 216.02. As a result of these requirements, Milwaukee County and all of the municipalities that are located in the Oak Creek watershed have applied for, and have been issued, stormwater discharge permits. These permit holders were required to reduce the amount of total suspended solids in stormwater runoff from areas of existing development that were in place as of October 2004 by 20 percent, or to the maximum extent practicable, by March 10, 2008.

Permitted municipalities are also required to implement the following: 1) public information and education programs relative to specific aspects of nonpoint source pollution control; 2) municipal programs for collection and management of leaf and grass clippings; and 3) site-specific programs for application of lawn and garden fertilizers on municipally controlled properties with over five acres of pervious surface.

In addition to the standards given in NR 151, units of government within the MMSD service area are required to comply with Chapter 13, "Surface Water and Storm Water Rules," of the MMSD rules. This Chapter requires governmental units in MMSD's service area to:

- Manage land use and activities in their jurisdictions to minimize debris and sediment from creating obstructions at outfalls or other structures in watercourses

- Remove debris and sediment that obstructs stormwater outfalls or other drainage structures

- Submit annual reports to the District that provide watershed, drainage, and development information

- Establish which developments and redevelopments must comply with the peak runoff management requirements set forth in Section 13.11 of the MMSD rules

- Submit stormwater management plans for all eligible development and redevelopment projects

In general, developments and redevelopments must provide stormwater management plans and comply with the runoff management requirements if they are in the District's ultimate sewer service area (except for certain riparian areas immediately adjacent to Lake Michigan) which either call for an increase of one-half acre or more of new impervious area or for demolition or construction during redevelopment that disturbs an area larger than two acres. Communities in MMSD's service area are required to have stormwater management ordinances that are consistent with Chapter 13 and to update the ordinances to include amendments to Chapter 13.

Fertilizer Management Programs

As previously discussed, the RWQMPU recommends that the use of low- or no-phosphorus fertilizers be encouraged in areas tributary to inland lakes and ponds and that consideration be given to adopting low- or no-phosphorus fertilizer ordinances in those areas. It also recommends that information and education programs required under municipal WPDES stormwater discharge permits promote voluntary practices that optimize urban fertilizer application consistent with the requirements of WDNR Technical Standard No. 1100, "Interim Turf Nutrient Management."

Sections NR 151.13 and 151.14 of Chapter NR 151 of the *Wisconsin Administrative Code* set forth fertilizer performance standards for municipal and nonmunicipal properties with more than five acres of pervious surface where fertilizer is applied. These standards call for fertilizer application to be done "in accordance with site-specific nutrient application schedules based upon appropriate soil tests." These standards are required to be followed in municipalities with WPDES stormwater discharge permits.

Section 94.643 of the *Wisconsin Statutes* which became effective on April 1, 2010, after completion of the RWQMPU, places restrictions on the use, sale, and display of fertilizers containing phosphorus. This statute prohibits the application to turf of fertilizer that is labeled as containing phosphorus or available phosphate except for:

- Applying such fertilizer to establish grass, using seed or sod, during the growing season in which the person using the fertilizer began establishing the grass

- Applying fertilizer to an area where the soil is deficient in phosphorus as shown in a soil test performed by a laboratory no more than 36 months before the application

The statute restricts the sale of fertilizers containing phosphorus to agricultural uses and the two uses described in the preceding paragraph. It also prohibits the display of fertilizers containing phosphorus.

Pet Litter Management

As previously discussed, the RWQMPU recommends that all municipalities, including those in the Oak Creek watershed, have pet litter control ordinance requirements and that these requirements be enforced. Milwaukee County has enacted an ordinance regarding control of pet litter in County parks and trails. This ordinance requires that the owner, caretaker, or person in control of an animal immediately remove pet litter when it is deposited, wrap it, and properly dispose of it. The ordinance also requires that anyone bringing an animal into a County park or trail also bring an item or device for removing pet litter. This ordinance applies to any animal brought into a County park or trail.

Most of the municipalities in the Oak Creek watershed have pet litter management ordinances. Only two communities—the Cities of Greenfield and Oak Creek—lack such ordinances. The requirements of these municipal ordinances vary. Most require that the owner, caretaker, or person in control of an animal immediately remove and properly dispose of pet litter deposited by an animal under their control on any public property or private property other than that belonging to owner, caretaker, or person in control of the animal. A few of these ordinances apply only to public property or parks and trails. Most, although not all, of these ordinances require that, when an animal is off its owner's or caretaker's premises, the owner or caretaker have an item or device for removing pet litter in his or her possession. Which animals are covered by these ordinances also varies by jurisdiction. Some municipalities have ordinances that apply to any animals while others have ordinances that apply specifically to dogs or dogs and cats.

It should be noted that the University of Wisconsin-Extension has developed educational materials related to pet waste management.[20]

<u>Inland Lake Water Quality Management Measures</u>

Aquatic Plant Surveys for Lakes in Which Plant Management Activities Are Being Conducted

As previously described, the RWQMPU recommends that aquatic plant surveys be conducted in those lakes in which plant management activities are being conducted. This recommendation is partially implemented under existing regulations. Aquatic plant management activities are regulated under two chapters of the *Wisconsin Administrative Code*. Chapter NR 107, "Aquatic Plant Management," regulates the application of

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[20]*University of Wisconsin-Extension, "Pet Waste and Water Quality," UWEX Publication GWQ006, 1999.*

chemical treatment for the management of aquatic plants. Chapter NR 109, "Aquatic Plants: Introduction, Manual Removal and Mechanical Control Regulations," regulates manual removal and mechanical control of aquatic plants. It also regulates the use of biological control agents. With some exceptions, a permit is required for most aquatic plant management activities.

Neither of these chapters specifically requires that an aquatic plant survey be conducted; however, they do require that the permit application include descriptive information of the plants or plant communities proposed to be managed. For chemical treatment, NR 107.04(2)(e) requires that the permit application include a description of the plant community causing the use impairment in the waterbody. Similarly, for manual removal and mechanical control of aquatic plants, NR 109.04(2)(f) requires that the permit application include a description of the aquatic plants to be controlled or removed. Under an additional provision of NR 109, the WDNR may require that an application for a permit for manual removal and mechanical control of aquatic plants include an aquatic plant management plan which describes how the aquatic plants will be introduced, controlled, removed, or disposed. The items that are required to be presented and discussed in such a plan are given in NR 109.09(2) and include a physical, chemical, and biological description of the waterbody. Under these provisions, the completion of an aquatic plant survey has been a common permit condition for applications for permits to conduct aquatic plant management activities under NR 107 and NR 109.

Auxiliary Water Quality Management Measures

Exotic and Invasive Species Management

As described above, the RWQMPU recommends that programs to reduce the introduction and spread of aquatic and terrestrial exotic and invasive species, including programs to educate the public, be supported and continued. Several State regulations address this recommendation.

Chapter NR 40, "Invasive Species Identification, Classification and Control," of the *Wisconsin Administrative Code* sets forth rules regarding the identification, classification, and control of invasive species. Chapter 40 lays out three major requirements as described below.

First, NR 40 creates a comprehensive system with criteria to classify invasive species into two categories: prohibited species and restricted species. A prohibited species is one which the WDNR has determined is likely to survive and spread if introduced to the State, but which is not found in the State or that region of the State where the species is listed as prohibited, except for isolated individuals or small populations of terrestrial species or species that are isolated to a specific watershed in the State or Great Lakes. Prohibited

species are those for which Statewide or regional eradication or containment may be feasible. A restricted species is one which the WDNR has determined is already established in the State or that region of the State where the species is listed as restricted and for which Statewide or regional eradication or containment may not be feasible. Both categories represent species that cause or have the potential to cause economic or environmental harm or harm to human health.[21] With some exceptions, NR 40 bans the transport, possession, transfer, and introduction of prohibited species. It also bans the transport, transfer, and introduction of restricted species. In addition, it bans the possession of restricted fish and crayfish species.

Second, NR 40 contains provisions enabling the WDNR to take action to control or eradicate invasive prohibited species that are present, but not yet established. With landowner permission or a judicial inspection warrant, the WDNR may inspect for, sample, and control prohibited species only. Persons found responsible for a prohibited species' presence on property they own, control, or manage may be ordered to carry out approved control measures. If a control order is not followed, and the WDNR takes control measures, the WDNR may seek cost-recovery. Control of restricted species is encouraged under NR 40, but not required.

Third, NR 40 requires that preventive measures be taken that address common pathways that may allow invasive species to spread. In general, the preventive measures are not species specific. Examples of preventive measures include the requirement that aquatic plants and animals be removed from, and that water be drained from, any vehicle, boat, boat trailer, or boating and fishing equipment when such vehicle or equipment is removed from a waterbody or from the waterbody's bank or shore. It should be noted that Section NR 19.055 of Chapter NR 19, "Miscellaneous Fur, Fish, Game and Outdoor Recreation," of the *Wisconsin Administrative Code*, also requires that boats, boat trailers, boating equipment, and fishing equipment be immediately drained when they are removed from an inland or outlying waterbody or the

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[21] *In addition to the categories of invasive species regulated under NR 40, the WDNR maintains two lists of unregulated invasive species. The first consists of a caution list of species which are not found in the State that may have shown evidence of invasiveness in similar environments in other states and could potentially spread in Wisconsin. Additional information is needed to determine whether species on the caution list belong in another category. The second list consists of nonrestricted species which may have beneficial uses, but also may have adverse environmental, recreational, or economic impacts or cause harm to human health. Most of the nonrestricted species have already integrated into Wisconsin's ecosystems and Statewide control or eradication is not practical or feasible.*

waterbody's bank or shore. This requirement extends to water in any bilge, ballast tank, bait bucket, live well, or other container.

Section NR 45.045 of Chapter NR 45, "Use of Department Properties," of the *Wisconsin Administrative Code*, requires that any firewood brought into State parks or other State-managed lands be from Wisconsin, be from within 25 miles of the State-owned property, and be from outside any quarantine areas, unless the State-owned property is also within the quarantine area.[22] As an alternative, firewood that is sold by Wisconsin certified firewood dealers has been treated to eliminate pests and diseases. This firewood may be brought onto State property. The Wisconsin Department of Agriculture, Trade & Consumer Protection (DATCP) has certification procedures for firewood dealers.

Management of several invasive species which are considered agricultural pests may also be addressed under the DATCP's authority to control pests on agricultural lands and agricultural business premises. These controls are set forth in Chapter ATCP 21, "Plant Inspection and Pest Control," of the *Wisconsin Administrative Code*. Under the rules in this chapter, DATCP may issue a quarantine order prohibiting the movement of any pest or any plant, pest host, or pest-harboring material which may transmit or harbor a pest. In addition, DATCP may issue a pest abatement order requiring the destruction or removal or pests, plants, pest hosts, or pest-harboring material within 10 days or the issuance of the order, if in DATCP's judgment such an order is necessary to prevent or control a hazard to plant or animal life in the State.

ATCP 21 also contains measures specifically addressing particular pest species, most of which are considered either prohibited species or restricted species under NR 40. Examples of invasive species addressed under this authority include both Asian and European gypsy moth; pine shoot beetle; African and Africanized honeybees; hemlock woolly adelgid; emerald ash borer; Asian longhorned beetle; and *Phytophthora ramorum*, the fungus which causes sudden oak death. The details of measures set forth in ATCP 21 vary by pest species. The materials subject to the prohibitions below differ with the particular pest species. In general, these rules prohibit anyone from:

- Importing the pest organisms or materials that may harbor or transmit the pest organisms into the State from regulated, quarantined, or infested areas designated by the State or the U.S. Department of Agriculture

[22]*The Oak Creek watershed is located entirely within quarantine areas for both gypsy moth and emerald ash borer.*

- Moving materials that may harbor or transmit the pest organisms from any regulated, quarantined, or infested areas designated by the State or the U.S. Department of Agriculture, unless the material has been inspected and certified in written certification by a pest control officer from the State of origin as either

    - Originating from noninfested premises and having not been exposed to the pest organism

    - Being free from the pest organism

    - Having been effectively treated to destroy the pest organism

    - Having been produced, processed, stored, handled, or used under conditions which preclude effective transmission of the pest organism

At the local level, management of invasive species may be addressed through municipal ordinances. A few municipalities in the watershed have ordinances that specifically address invasive species. The Cities of Franklin and Greenfield have ordinances that define certain invasive plant species as noxious weeds and require that these species be controlled along with other noxious weeds. Most of the municipalities in the watershed have noxious weed ordinances. While the content of these ordinances vary among the communities, they generally define certain plant species as noxious weeds and require their destruction or control. Some of these ordinances, such as those of the Cities of Milwaukee and Oak Creek, specifically relate to plant species that cause hay fever or skin rashes.

Groundwater Management Measures

Utility-Specific Water Conservation Programs

As previously noted, the RWQMPU recommends that water utilities develop and implement utility-specific water conservation programs. For water utilities withdrawing water from surface water or groundwater sources in the Great Lakes Basin, including the Oak Creek watershed, this recommendation is partially implemented through the requirements of Chapter NR 852, "Water Conservation and Water Use Efficiency," of the *Wisconsin Administrative Code*. This chapter requires mandatory water conservation programs for all new and increased withdrawals and diversions of water from sources in the Great Lakes Basin after December 8, 2008. It does not require water conservation for existing facilities at their pre-December 8, 2008 level of water withdrawal.

The rule classifies new withdrawals and diversions into three tiers, based upon the daily average amount of water withdrawn, whether the new or increased withdrawal constitutes a diversion of water from the Great Lakes basin, and whether the new or increased withdrawal would result in an average water loss through consumptive use or diversion of more than 2 million gallons per day. The measures that are required to be implemented vary by tier. For all new or increased withdrawals by utilities withdrawing an average of 100,000 gallons per day or more, the utility is required to develop a water conservation plan, conduct a water use audit, develop a leak detection and repair program, measure their sources of water, and educate their staff and customers about their water conservation activities. Utilities withdrawing more than an average of 1 million gallons per day, seeking a new or increased diversion of Great Lakes water, or making withdrawals that result in an average water loss of more than 2 million gallons per day are required to implement additional conservation and efficiency measures. Under the rule, conservation and efficiency measures that require retrofitting are optional.

Consider the Potential Impact on Groundwater Quality in the Design of Stormwater Management Facilities

As previously noted, the RWQMPU recommends that the design of stormwater management facilities that directly or indirectly involve infiltration of stormwater consider the potential impacts on groundwater quality, and that the provisions in the WDNR's post-construction stormwater management technical standards intended to protect groundwater quality be applied in the design of stormwater management facilities. These recommendations are addressed by regulations contained in Chapters NR 151, "Runoff Management," and Trans 401, "Construction Site Erosion Control and Storm Water Management Procedures for Department Actions," of the *Wisconsin Administrative Code*. Chapter NR 151 sets forth post-construction performance standards for new development and redevelopment and infiltration performance standards for both nonagricultural (urban) areas and transportation facilities.[23] Trans 401 sets forth post-construction performance standards for those transportation facilities that are regulated by the Wisconsin Department of Transportation. These performance standards include several elements that are intended to protect groundwater quality:

- They prohibit the infiltration of runoff that originates from certain types of source areas that can be expected to contribute contaminants that could degrade groundwater quality. Examples of these

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[23]*The post-construction performance standard for new development and redevelopment in nonagricultural (urban) areas is set forth in NR 151.12. The infiltration performance standard for nonagricultural (urban) areas is set forth in NR 151.124. The post construction performance standard for transportation facilities is set forth in NR 151.24. The infiltration performance standard for transportation facilities is set forth in NR 151.244.*

source areas include fueling and vehicle maintenance areas, storage and loading areas from certain types of industrial facilities, and rooftop and parking areas of certain types of industrial facilities.

- They prohibit the infiltration of runoff that originates from certain types of source areas in close proximity of landscape features that can cause groundwater to be susceptible to contamination. Examples of these include prohibitions against infiltrating any runoff within 1,000 feet upgradient or 100 feet downgradient of karst features and infiltrating runoff from commercial, industrial, and institutional land uses or regional devices for one- and two-family residential development within 400 feet of a community water system or 100 feet of a private well.

- They specify required soil characteristics and separation distances between the bottom of an infiltration system and the elevation of seasonal high groundwater or the top of bedrock. These specified soil characteristics and separation distances depend upon the source of the runoff.

- They prohibit the infiltration of runoff in areas where contaminants of concern are present in the soil through which infiltration will occur.

- They require pretreatment prior to infiltration of runoff from parking lots and new road construction in commercial, industrial, and institutional areas.

- They require that infiltration systems shall, to the extent technically and economically feasible, minimize the level of pollutants infiltrating to groundwater and to maintain compliance with the preventive action limits for groundwater pollutants promulgated by the WDNR.[24]

Other Management Strategies that Are in Various Stages of Implementation

Table 2.3 summarizes the recommendations of the RWQMPU that have been or are being implemented to some degree in the Oak Creek watershed.

[24]*Preventive action limits are groundwater quality criteria. They are set forth in Chapter NR 140, "Groundwater Quality," of the* Wisconsin Administrative Code.

Land Use Element

Preserve Primary Environmental Corridors in Essentially Natural Open Space Uses

The current protection status of primary environmental corridors in the watershed is shown on Map 2.2. About 744 acres, or 100 percent, of the primary environmental corridors in the Oak Creek watershed are protected, or substantially protected, through one or more of the following means:

- Public interest ownership, including publicly owned lands, privately held lands owned by conservancy organizations and other privately held lands that were in compatible outdoor recreational use, and surface water

- Joint State-local floodplain and shoreland-wetland zoning

- State administrative rules governing sanitary sewer extensions within planned sanitary sewer service areas

- Local land use regulations

Consider Preserving Secondary Environmental Corridors and
Isolated Natural Resource Areas in Essentially Natural Open Space Uses

The RWQMPU encourages the preservation of secondary environmental corridors and isolated natural areas and recommends that counties and communities consider the preservation of these areas in the preparation of county and local land use plans. Some secondary environmental corridor sites and isolated natural resource areas in the Oak Creek watershed are in protective ownership. Example of these sites include portions of the Oak Creek Parkway.

Preserve All Identified Natural Areas and Critical Species Habitat Sites in Public or Public Interest Ownership

The RWQMPU recommends the preservation of all identified natural areas and critical species habitat sites. As called for under the regional natural areas and critical species habitat protection and management plan,[25] the RWQMPU recommends acquisition of those sites not in existing public or public-interest ownership. The identified natural areas and critical species habitat sites in the Oak Creek watershed and their current and recommended protection status are shown on Map 2.3. The status of implementation of the RWQMPU

[25] *SEWRPC Planning Report No. 42,* op. cit.

recommendations for placing these sites in protective ownership was assessed as part of the 2010 amendment to the regional natural areas and critical species habitat protection and management plan. This status is indicated in Table 2.4. There are 11 natural areas and 12 critical species habitat sites that are wholly or partially located within the Oak Creek watershed. The total area of these sites is 609 acres, with 521 acres located within the watershed. As of 2010, 364 acres were in protective ownership. The regional natural areas and critical species habitat protection and management plan, as amended, recommends that an additional 213 acres be acquired and placed in protective ownership.

Point Source Pollution Abatement Measures

Construct and Maintain Local Sanitary Sewer Systems

As discussed previously, the RWQMPU recommends that all of the municipalities in the watershed construct and maintain local sanitary sewer systems. These jurisdictions have all constructed such systems and perform maintenance on an ongoing basis.

Nonpoint Source Pollution Abatement—Rural Control Measures

These RWQMPU recommendations for controlling nonpoint source pollution in rural areas include:

- Implementing practices to reduce soil loss from cropland to attain erosion rates less than or equal to "T," the maximum average annual rate of soil loss that can occur without significantly affecting crop productivity

- Establishing minimum 75-foot-wide riparian buffers along each side of streams flowing through current crop and pasture land

- Limiting the number of stream crossings and configuring crossings to minimize fragmentation of stream habitat

The Environmental Services Unit of the Milwaukee County Department of Administrative Services operates as the County's land conservation department. It has been pursuing implementation of these recommendations both through projects on County-owned lands and by providing cost-share assistance and technical assistance to land owners to install practices that address soil erosion and agricultural nonpoint source pollution.

Nonpoint Source Pollution Abatement—Urban Control Measures

Programs to Detect and Eliminate Discharges and Control Pathogens that Are Harmful to Human Life

As previously described, the RWQMPU recommends enhanced urban illicit discharge control and/or innovative methods to identify and control possible pathogen sources in stormwater runoff from all urban areas in its study area, including the Oak Creek watershed. This recommendation is intended to address fecal indicator bacteria, the presence of which may indicate risks to human health from pathogens. As part of the sampling it conducted in support of the development of this watershed restoration plan, the City of Racine Public Health Department (RHD) examined over 100 stormwater outfalls in the watershed for dry weather flow. The RHD performed microbial source tracking on samples collected from those outfalls with dry weather flow in which the flow contained high concentrations of fecal indicator bacteria.

Chloride Reduction Programs

The RWQMPU recommendations to reduce the amount of chlorides introduced into the environment include:

- Evaluation of deicing practices by counties and municipalities to obtain optimal application rates to ensure public safety without applying more chlorides than necessary for that purpose

- Consideration of alternatives to current ice and snow control programs

- Implementation of education programs to provide information about alternative ice and snow control measures in public and private parking lots and optimal deicer application rates in such areas

- Implementation of education programs to provide information about alternative water softening media and the use of more efficient water softeners.

A number of efforts have been made to reduce the use of chlorides in deicing. In 2017, Milwaukee Riverkeeper sponsored a snow and ice control workshop that focused on salt use reduction for private contractors maintaining parking lots.

Fertilizer Management Programs

As described previously, the RWQMPU recommends that information and education programs required under municipal WPDES stormwater discharge permits promote voluntary practices that optimize urban fertilizer application consistent with the requirements of WDNR Technical Standard No 1100, "Interim Turf Nutrient Management." Several programs provide information and education regarding fertilizer

application and management to residents of the Oak Creek watershed. The Root-Pike Watershed Initiative Network (WIN) and the Southeastern Wisconsin Watersheds Trust, Inc. conduct the Respect Our Waters program, an educational program providing information with the long-term goal of reducing polluted runoff and improving water quality in local waterways. This program is sponsored by 50 counties and municipalities, including Milwaukee County and all of the municipalities in the Oak Creek watershed. The WDNR and the University of Wisconsin-Extension also provide educational materials regarding urban fertilizer management.

Beach and Riparian Litter Debris Control Programs.

As previously noted, the RWQMPU recommends that existing litter and debris control programs along the urban streams of the study area be continued and that opportunities to expand such efforts be explored. In the Oak Creek watershed, Friends of the Mill Pond and Oak Creek Watercourse, Inc. sponsors annual spring and fall clean ups to remove trash and debris from selected areas along Oak Creek.

Instream Water Quality Management Measures

Implement Projects Called for Under the Milwaukee County Stream Assessment Study

The RWQMPU recommends that the projects called for under the Milwaukee County stream assessment study be implemented over time in a manner consistent with the need to provide flood protection and consistent with the stream rehabilitation recommendations of the regional plan update. Milwaukee County has been pursuing funding to implement projects recommended by this assessment.

Culverts, Bridges, Drop Structures, and Channelized Stream Segments

The RWQMPU recommends limiting the installation of culverts, bridges, drop structures, and channelized stream sections, removing them where possible, and retrofitting them to allow the passage of fish and other aquatic organisms. Two crossings have been removed from streams in the Oak Creek watershed. A private drive bridge on the mainstem of Oak Creek upstream of S. 35th Street was removed in 2004 or 2005. Another private drive bridge on the North Branch of Oak Creek downstream of Weatherly Drive was also removed. Since 2002, 13 bridges and culverts have been replaced along the major streams in the watershed: ten on the mainstem of Oak Creek, two on the North Branch of Oak Creek, and one on the Mitchell Field Drainage Ditch. At least one of these structures includes aquatic organism passage features. The culvert on the mainstem of Oak Creek at the northernmost crossing of W. Ryan Road was replaced in 2006. The replacement culvert incorporates baffles along the invert that decrease flow velocity and increase water depth, facilitating the passage of fish and other aquatic organisms.

Protect Remaining Natural Stream Channels

The RWQMPU recommends that to the extent practicable, remaining natural stream channels, including small tributaries and shoreland wetlands that provide habitat for the continued survival, growth, and reproduction of a sustainable fishery throughout the study area, be protected. No specific examples of implementation of this recommendation were identified within the Oak Creek watershed.

Restore Wetlands, Woodlands, and Grasslands Adjacent to
Stream Channels and Establish Minimum 75-Foot-Wide Buffers

As previously noted, the RWQMPU recommends restoring wetlands, woodlands, and grasslands adjacent to stream channels and establishing buffers that are a minimum of 75 feet in width on each side to reduce pollutant loads entering the stream and protect water quality. Some projects conducted by the Milwaukee County Department of Parks, Recreation and Culture (DPRC) address this recommendation. DPRC has recently conducted a reforestation project within Grant Park. It has also recently conducted native planting projects in Copernicus and Grant Parks.

Restore and Enhance Stream Channels

Several recent projects have addressed the RWQMPU recommendations to restore, enhance, and/or rehabilitate stream channels. From 2013 through 2015, an approximately 1,100-foot section of steam channel within a tributary to Oak Creek was relocated and restored in conjunction with road construction at the IH 94 interchange at Ryan Road. This project included wetland mitigation within an adjacent stormwater pond. From 2013 through 2015, over 1,900 linear feet of stream channel were relocated and restored within tributaries to the North Branch of Oak Creek in association with road construction along IH 94 at Drexel Avenue. This project included a specialized culvert designed to allow fish passage under both low- and high-flow conditions and wetland mitigation in an adjacent residential area.

Monitor Fish and Macroinvertebrate Populations

The RWQMPU recommends that fish and macroinvertebrate populations be monitored to evaluate the effectiveness of the water quality management program. The WDNR conducts monitoring of these organisms in the Oak Creek watershed, and the most recent monitoring was conducted in 2015. In 2004

and 2007, fish and macroinvertebrate data were also collected at two sampling stations along the mainstem of the Oak Creek in Milwaukee County as part of the MMSD Corridor Study.[26]

The Milwaukee County DPRC conducts natural history inventories and wildlife surveys in County parks and natural areas. Parks and natural areas within the Oak Creek watershed that have been recently examined include Cudahy Park, Cudahy Nature Preserve, Copernicus Park, Esch-Honadel Woods, Grant Park, Maitland Park, the Oak Creek Parkway, and Rawson Woods.

Consider More Intensive Fisheries Manipulation Measures Where
Warranted Based Upon Specific Goals Developed in Detailed Local Level Planning

As part of its fisheries management programs, the WDNR considers the appropriate management measures for fisheries in the Oak Creek watershed. The WDNR annually stocks catchable-size rainbow trout In the Oak Creek Mill Pond under its Southeast Region Urban Fishing Program.

Inland Lake Water Quality Management Measures

Implement Recommendations of the Milwaukee County Park Pond and Lagoon Management Plan

The RWQMPU recommends implementation of the recommendations of the Milwaukee County park pond and lagoon management plan. Milwaukee County has been pursuing funding to implement projects recommended under the plan.

Auxiliary Water Quality Management Measures

Continue, Support, and Institute Household Hazardous Waste Collection Programs

MMSD has three Milwaukee County collection facilities that are open two to three days per week throughout the year. In addition, the MMSD sponsors periodic mobile collection events for Milwaukee County residents. Five of these events spread over seven days were held in 2017.

Continue, Support, and Institute Collection Programs for Unused and Expired Medications

Two types of programs have been developed that are implementing this RWQMPU recommendation in the Oak Creek watershed. First, several jurisdictions have established drop-off sites or drop boxes where

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[26]*U.S. Geological Survey Scientific Investigations Report No. 2007-5084,* Water Quality Characteristics for Selected Sites within the Milwaukee Metropolitan Sewerage District Planning Area, Wisconsin: February 2004-September 2005, *2007; U.S. Geological Survey Scientific Investigations Report No. 2010-5166,* Biological Water Quality Assessment of Selected Streams within the Milwaukee Metropolitan Sewerage District Planning Area of Wisconsin: 2007, *2010.*

residents may dispose of expired or unused medications. These sites are usually located at law enforcement offices. In the Oak Creek watershed, collection sites have been established at police departments in the Cities of Cudahy, Franklin, Greenfield, Milwaukee, Oak Creek, and South Milwaukee. In addition, collection sites have been established in some pharmacies. For example, Walgreens Pharmacies have installed safe medication disposal kiosks at five of their locations in Milwaukee County. Second, mail-back programs for disposal of expired or unwanted medications also serve residents of the watershed. As part of a two-year pilot program, postage-paid drug disposal envelopes are available to the public at 10 Milwaukee area CVS Pharmacy locations, the Milwaukee and Cudahy Police Departments, and the MMSD's main office.

Continue and Support Programs to Reduce the Introduction and Spread of Exotic and Invasive Species

In addition to the regulatory approaches previously described, there are a number of ongoing efforts for reducing the introduction and spread of exotic and invasive species in the Oak Creek watershed. The DPRC conducts aquatic plant management activities in park ponds and lagoons for aquatic invasive plants such as Eurasian water milfoil. Management efforts are conducted on an as-needed basis. DPRC also conducts terrestrial invasive plant management and removal activities in parks and natural areas of the Milwaukee County Park System. The methods used depend on the particular invasive species and the biological community in which they are located. These methods include mowing, prescribed burns, hand removal, mechanical removal, and application of herbicides. Many of DPRC's activities in the management of invasive species are conducted in cooperation with partner groups. The Park People of Milwaukee County, an umbrella organization of park friends groups, park watch groups, and neighborhood associations concerned with specific parks of the Milwaukee County Park System, coordinates weed-out events in the Milwaukee County Park System. The annual weed-out events held in Grant Park by the Friends of Grant Park are an example of this. This coordination includes recruiting volunteers and providing onsite tools and training. Other recent partners include Americorps, the Student Conservation Association, the Boy Scouts and Girl Scouts, and service learning programs at local colleges and universities.

During 2013 and 2014, DPRC established release sites in Grant Park and the Oak Creek Parkway for beetles intended to control purple loosestrife, an exotic plant that invades wetlands.

Document and Monitor the Occurrence and Spread of Exotic and Invasive Species

In recent years, several ongoing efforts have addressed the RWQMPU recommendation to document and monitor the occurrence and spread of exotic and invasive species.

As part of its field activities, the WDNR documents the occurrence of exotic and invasive species. In addition, in 2003 and 2004, the Department used satellite data to map the degree to which wetlands in the State are infested with reed canary grass.[27] Distributions of several invasive species are documented on the Department's surface water data viewer, an internet-based mapping utility.[28] The Department has also implemented an internet-based reporting system for citizens and other agencies to report occurrences of invasive species.[29]

As part of its activities, the Milwaukee County DPRC has conducted natural resource inventories for natural areas management units within the Park System, which inventories include inventories of invasive species. Parks and natural areas within the Oak Creek watershed that have been recently examined include Cudahy Park, Cudahy Nature Preserve, Copernicus Park, Esch-Honadel Woods, Grant Park, Maitland Park, the Oak Creek Parkway, and Rawson Woods. In addition, DPRC staff have conducted surveys for aquatic invasive species in the Oak Creek Mill Pond and ponds in Grant Park and the Oak Creek Parkway.

In 2011, volunteers under the direction of the Southeastern Wisconsin Invasive Species Consortium (SEWISC)—a coalition of local units of government; Federal, State, and local government agencies; businesses; land trusts; and nongovernmental organizations that promotes efficient and effective management of invasive species throughout Kenosha, Milwaukee, Ozaukee, Racine, Sheboygan, Walworth, Washington, and Waukesha Counties— conducted roadside surveys for the presence and population sizes of four invasive plant species: common teasel (*Dipsacus sylvestris*), cut-leaf teasel (*Dipsacus laciniatus*), giant reed grass (*Phragmites australis*), and Japanese knotweed (*Polygonum cuspidatum*). This survey covered all roads with lane markings within the eight counties served by SEWISC. As part of this effort, surveys were also performed on areas in or near primary and secondary environmental corridors and isolated natural resource areas.

Continue and Support Current Surface Water Quality Monitoring Programs.

The RWQMPU recommends that the surface water quality monitoring programs currently being conducted by the MMSD, WDNR, and USGS be supported and continued. While there have been some changes to

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[27]*Wisconsin Department of Natural Resources,* Mapping Wisconsin Wetlands Dominated by Reed Canary Grass, *Phalaris arundinacea* L.: A Landscape Level Assessment, *Final Report to the U.S. Environmental Protection Agency, October 2008.*

[28]*The surface water data viewer can be accessed at* http://dnr.wi.gov/topic/surfacewater/swdv/.

[29]*The WDNR online reporting system can be accessed at dnr.wi.gov/topic/Invasives/report.html.*

sampling sites and sampling frequencies in response to budget considerations, these monitoring programs continue to operate in the Oak Creek watershed.

Establish Long-Term Fisheries, Macroinvertebrate, and Habitat Monitoring Stations

As noted previously, the RWQMPU recommends establishing long-term fisheries, macroinvertebrate, and habitat monitoring stations in streams—ideally at sites where water quality is also being monitored. As part of its 2015 monitoring efforts the WDNR monitored fish and macroinvertebrate populations at the sample sites in the watershed that had been previously sampled for fish and macroinvertebrates.

Continue and Maintain Citizen-Based Monitoring

Efforts, with an Emphasis on Filling Geographic Data Gaps

Activities implementing this recommendation have included: 1) some citizen-based water quality monitoring conducted by Milwaukee Riverkeeper in the Oak Creek watershed, mostly as a part of the WDNR/University of Wisconsin-Extension (UWEX) Level 3 Water Action Volunteers Program and through 2) a DPRC citizen-scientist program that focuses on Milwaukee County parks and natural areas. This program includes using volunteers to conduct wildlife surveys and monitoring of biota in ephemeral and other wetlands.

Maintain and Update RWQMPU/MMSD 2020 FP Water Quality Models

The RWQMPU recommends periodic maintenance and updating of the water quality models developed under the RWQMPU/MMSD 2020 FP. As part of its ongoing activities, SEWRPC has been maintaining and updating these models.

Groundwater Management Measures

Maintain Important Groundwater Recharge Areas

As previously discussed, the RWQMPU recommends that consideration be given to following the recommendations of the regional water supply plan regarding maintenance of groundwater recharge areas. The regional water supply plan recommended the preservation and protection of groundwater recharge areas having a high or very high recharge potential.[30] Such protection may be largely achieved through the implementation of the adopted design year 2035 regional land use plan and supporting municipal comprehensive plans, since these plans recommend the preservation of environmental corridors, isolated natural resource areas, and prime and other agricultural areas that facilitate recharge. The plan estimated

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

that, within the Southeastern Wisconsin Region, about 76 percent of the highly rated and very highly rated recharge areas may be expected to be preserved by inclusion in environmental corridors, isolated natural resource areas, and prime and other agricultural areas identified for preservation in the adopted regional land use plan.

Management Strategies Recommended by the RWQMPU that Are Not Yet Implemented

Some recommendations of the RWQMPU have not yet been implemented in the Oak Creek watershed. These are summarized in Table 2.5.

2.3 FLOOD MITIGATION AND STORMWATER PLANS

MMSD Oak Creek Phase 1 Watercourse Management Plan

The Milwaukee Metropolitan Sewerage District published Phase I of a Watercourse Management Plan for Oak Creek in 2000.[31] This plan was developed to identify flooding issues in the Oak Creek watershed, estimate potential structural damages, and analyze potential alternatives to resolve these flooding problems. Evaluations were done for each subwatershed, including the Oak Creek mainstem, the North Branch of Oak Creek, and the Mitchell Field Drainage Ditch.

Hydrologic and hydraulic models of the watershed were developed to determine the extent of the flooding problem and to analyze alternative solutions. Four watercourse alternatives were evaluated for their potential to mitigate damages during floods with annual probabilities of one-percent or greater. The alternatives evaluated include the construction of regional storage facilities, the construction of levees or berms, conveyance improvements, and acquisition or floodproofing of structures located in the one-percent-annual probability floodplain.

The Oak Creek Phase 1 Watercourse Management Plan recommends floodproofing and acquisition of several structures to mitigate impacts of flood with probabilities of one-percent or greater. This proved to be the most cost effective option due to the scattered nature of the flood-prone structures in the watershed. The plan also recommends implementing regulations for new development to control stormwater runoff

[31] *Camp Dresser & McKee*, Oak Creek Phase 1 Watercourse System Management Plan, Milwaukee Metropolitan Sewerage District, *August 2000*.

increases, preserving natural storage in the watershed, evaluating existing drop structures for potential removal, and investigating sewer capacity problems caused by low outfalls.

Subsequently, SEWRPC agreed to provide MMSD with an update for the Oak Creek Phase 1 Watercourse Management Plan completed in 2000.[32] The SEWRPC study updates the structural damage estimates and recommendations of the Phase 1 plan. The hydrologic and hydraulic models for the North Branch of Oak Creek were updated to include new survey information. New flood damage estimates were calculated to approximate the costs of direct and indirect damages in 2010 dollars. This update also identified critical use facilities that would likely become flooded in a 0.2-percent-annual-probability event, and listed major roads that could become flooded to a depth of at least 1.5 feet, blocking emergency vehicle access. In addition, three stormwater detention basins that were constructed as part of the IH-94 North-South Freeway reconstruction project were evaluated in the models to determine whether the basins would make any significant changes in flooding. The evaluation found that these basins somewhat reduced flood flows and attendant flood stages, resulting in slightly reduced estimated flood damage costs. The changes due to the presence of the basins did not reduce flood elevations sufficiently to remove any structures from the one-percent-annual probability floodplain.

This update also analyzed alternative plans for managing floodwater along the North Branch of Oak Creek near S. 13th Street and W. College Avenue. The alternative plans include replacing or adding capacity to the Canadian Pacific Railway culvert; adding flood storage at Maitland Park; floodproofing, elevating, and/or acquiring and demolishing structures in the floodplain; and cleaning out the channel. The evaluation of the alternatives for effectiveness of protection, ability to implement, and cost determined that the alternative consisting of structure floodproofing, elevation, and/or acquisition and demolition would protect structures from floods up to the one-percent-annual probability event, and would be relatively easy to implement, while incurring the lowest cost.

City of Oak Creek Stormwater Management Master Plan

The stormwater management master plan adopted by the City of Oak Creek in 2002 was developed to provide alternatives, recommendations, and implementation strategies for water quality and quantity issues, as well as to minimize the impact of stormwater runoff from existing and future developments.[33] The master planning area comprises the entire City of Oak Creek which includes a majority of the Oak Creek watershed

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[32] *SEWRPC Memorandum Report No. 198*, Oak Creek Updated Phase 1 Watercourse Management Plan, *(draft)*.
[33] *City of Oak Creek,* Stormwater Management Master Plan, *December 2001*.

and portions of the Root River watershed and the Lake Michigan direct drainage area. Major sections within the plan include stormwater management objectives and guidelines, an inventory of physical features within the study area, a hydrologic/hydraulic analysis, a water quality analysis, and recommendations related to stormwater flooding alternatives, water quality improvement alternatives, and implementation priorities.

The stormwater management master plan provides a set of design guidelines for elements of the stormwater management system in the City. Under these guidelines, a minor stormwater drainage system shall be designed to convey the 10-percent-annual-probability (10-year recurrence interval) critical duration storm. A major open channel drainage system should be designed to convey the one-percent-annual-probability (100-year recurrence interval), 24-hour duration storm. Culverts and bridges shall be designed to convey the 10-percent-annual-probability flood discharge for minor and collector streets, the two-percent-annual-probability (50-year recurrence interval) flood flow for arterial streets and highways, and the one-percent-annual-probability flood flow for freeways, expressways, and railways. Culverts and bridges shall also be designed, as feasible, to facilitate fish passage. Dikes and floodwalls shall not be constructed to facilitate new development within the regulatory FEMA floodplain.

Water quality goals in the stormwater management plan include reducing suspended solids and phosphorus loads by 50 percent for existing urban development and reducing suspended solids loads by 90 percent for future urban development.[34]

The City of Oak Creek Stormwater Management Master Plan included the following inventory summary of existing physical features of the study area.

- Drainage facilities such as storm sewers, watercourses, detention basins, and culverts locations
- Flooding and drainage problem locations
- Existing and future land use conditions
- Industrial discharge permits
- A climate summary

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

- Soils classification, with soils in the areas consisting predominantly of poorly drained group C soils
- Groundwater table depths
- Wetland resource classifications
- Waste disposal site locations
- Stream classifications and water quality conditions

The hydrologic and hydraulic analysis methodology and results are presented in the stormwater management plan. Both existing 1995 and planned 2020 land use conditions were evaluated. The plan includes the FEMA one-percent-annual-probability floodplain maps and identifies areas with flooding problems. It also evaluated existing storm sewer capacities for the 50-percent-annual-probability and 10-percent-annual-probability storm events. Seven City of Oak Creek storm sewer systems were identified to be under capacity for the 10-percent-annual-probability storm event, with two of these systems surcharging above manholes, resulting in street flooding. Flood and drainage solution recommendations include construction of regional detention facilities, channel modifications and diversions, storm sewer improvements, structure floodproofing, and structural relocations. The plan also recommends a stringent on-site detention policy for future developments.

The water quality analysis for the Master Plan was conducted using the Source Loading and Management Model (SLAMM). Pollutant loading was calculated for the 579 subbasins in the City which were delineated as part of the hydrologic analysis. The plan summarizes and maps annual loadings for total suspended solids (TSS), total phosphorous, particulate lead, particulate copper, and particulate zinc. This water quality analysis found that commercial and industrial lands contribute 63 percent of the pollution loading, while comprising only 16 percent of the land cover.

Pollution reduction alternatives are presented in the stormwater plan in three categories: source control, volume reduction, and storage and treatment. Due to physical limitations within the City such as high groundwater levels and poorly drained soils, and limited effectiveness of certain pollution control practices, only a small selection of potential water quality improvement practices are recommended. Recommendations for City-wide implementation include enforcement of erosion control and stormwater management ordinances; public education programs for fertilizer, composting, lawn clipping disposal, and

waste disposal; support for the Milwaukee County Hazardous Response Team; coordination between municipalities on stormwater management efforts; weekly sweeping of streets with curbs during spring and fall; catch basin cleaning twice per year or when sumps are 30 to 40 percent full; and development of a "Business Partnership Program for Clean Water." Recommendations for subbasin-level improvements include wet detention basins, constructed wetlands, and streambank stabilization. The Master Plan estimated that implementation of all the water quality recommendations will result in an annual TSS load reduction of 42 percent to the receiving streams.

City of Franklin Stormwater Management Plan

The City of Franklin originally developed a stormwater management plan in 1993. This plan was updated in 2002.[35] The plan serves to provide a comprehensive guide for expansion and development of the stormwater management system in the City. The stormwater planning area encompasses the entire City of Franklin which includes portions of Oak Creek and North Branch of Oak Creek subwatersheds, as well as portions of the Root River watershed. The plan includes an engineering analysis of stormwater quantity and quality for each stormwater subbasin in the City. In particular, the plan quantifies runoff rates and volumes resulting from the one-percent-annual-probability storm event for each subbasin. The plan also used a spreadsheet approximation of SLAMM to estimate pollutant loads including sediment, phosphorous, lead, copper, and zinc for each subbasin. The plan contains guidance for stormwater quantity management criteria, nonpoint source pollution control specifications, recommendations for drainage system improvements, new development requirements, stormwater pond maintenance guidelines, and natural resources conservation and restoration considerations.

Stormwater Management Regulation

The discharge of stormwater by municipalities is regulated through the WPDES permit program. All of the municipalities within the Oak Creek watershed have applied for and received municipal separate storm sewer (MS4) discharge permits from the WDNR. These permits require that the municipalities reduce the discharge of polluted stormwater runoff by implementing stormwater management programs with best management practices. Examples of activities required as part of a municipality's MS4 program include:

- Public education and outreach programs to encourage the public and businesses to modify their behavior and procedures to reduce stormwater pollution

[35] *City of Franklin,* Stormwater Management Plan Update, *December 2002.*

- Public involvement to encourage participation from individuals in activities to prevent stormwater pollution

- Illicit discharge detection and elimination programs to identify, prevent, and eliminate discharge of waste materials other than from stormwater from storm sewer systems

- Construction site erosion control ordinances to prevent sediment-laden water from construction sites from discharging into waterbodies

- Post-construction stormwater management ordinances to ensure that newly developed and redeveloped areas include measures to control pollutants, control peak flows in watercourses and maintain infiltrations

- Control of total suspended solids in stormwater from existing areas

- Adoption of practices to prevent pollutants from municipally-owned transportations infrastructure, maintenance areas, storage yards, salt and sand storage areas, and waste transfer stations from entering the storm sewer system

2.4 OTHER PLANS, PROJECTS, AND PROGRAMS

As noted in the introductory section of this chapter, effective and sound management of land and water resources requires that coordinated management activities take into account the objectives and goals of the various programs, initiatives, and efforts involved in natural resource management within the watershed. Achieving this coordination requires that the findings and recommendations of related plans and the goals and objectives of relevant management programs and efforts be considered in the design of this watershed restoration plan and integrated into this plan where appropriate. Thus, an important step to be undertaken is the inventory, collation, and review of the recommendations of relevant previously prepared reports and plans and of relevant recent, current, and ongoing management programs and efforts. This section presents a summary of plans and programs that were reviewed.

Plans

A number of plans address the natural resources of the Oak Creek watershed. These plans include recommendations and programs which address the interconnectedness of the natural resources of the Oak

Creek watershed with those of the cities and Milwaukee County within the watershed and which focus on the importance of natural resources at the community level. Elements of these plans directly or indirectly address the focus issues that constitute the emphasis of this plan.

The plans that were collated and reviewed for input into this current planning effort were relevant to actions undertaken or to potentially be undertaken by a variety of entities, including County and local governments, special purpose units of government, and community groups. They include plans that were drafted to specifically address the Oak Creek watershed, as well as regional and subregional plans that include the Oak Creek watershed. Selected plans prepared at the local level were considered, including local comprehensive plans, land use plans, park and open space plans, lake and water quality management plans, and sewer service area plans for individual communities or special-purpose units of government. Because a goal of this planning effort is to develop specific, targeted recommendations for the Oak Creek watershed, this review also included consideration of plans that are relatively narrow in scope. Examples of these include management plans pertaining to particular parks. The identified, pertinent plan reports, which are described below, are listed in Table 2.6. They provide the basis for developing an integrated scheme for the restoration and sustainable management of the natural resources of the Oak Creek watershed through the coordinated efforts of State, County, and local governments, special-purpose units of government, and community groups.

The inventory set forth in Table 2.6 includes plans addressing a variety of issues including land use, flood control, stormwater drainage and management, sanitary sewer service areas, and parks and open space.

Regional Land Use Plan

The regional land use plan provides a long-term guide to land use development and open space preservation in the Southeastern Wisconsin Region and serves as a basis for other elements of the regional plan, including the regional transportation plan, park and open space plan, water quality management plan, and water supply plan.[36] The regional land use plan has been refined and detailed locally through the preparation and adoption of local land use and comprehensive plans. All of the municipalities in the Oak Creek watershed have prepared and adopted comprehensive plans.[37]

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[36]*SEWRPC Planning Report No. 55,* Vision 2050: A Regional Land Use and Transportation Plan for Southeastern Wisconsin, *July 2017.*

[37]*Because all of the municipalities in Milwaukee County are incorporated as either cities or villages, the County has not prepared or adopted a comprehensive plan.*

Flood control, stormwater drainage, and stormwater management plans were discussed in the previous section of this chapter.

Sanitary Sewer Service Area Plans

Sanitary sewer service area plans identify the boundary of the area within which sanitary sewer service may be extended. The plans also identify the extent of environmentally sensitive lands wherein sanitary sewer extensions will generally be prohibited. These sensitive lands include all primary environmental corridors and those portions of secondary environmental corridors and isolated natural resource areas comprised of wetlands, one-percent-annual-probability floodplain, shoreland areas, and areas with steep slopes of 12 percent or greater. Within the sensitive areas, sewered development is confined to limited recreational and institutional uses and unsewered rural-density (one dwelling unit per five acres) residential development in upland areas. Currently, all of the Oak Creek watershed is contained within planned sewer service areas. The planned sewer service areas in the Oak Creek watershed are described in Chapter 3 of this report.

The following subsections describe selected plans that are relevant to the Oak Creek watershed restoration plan.

MMSD 2050 Facilities Plan

The MMSD is currently developing a 2050 Facilities Plan (2050-FP), which will address long range planning through the year 2050 from an asset management perspective. Major asset areas to be addressed in the Facilities Plan include the two MMSD water reclamation (wastewater treatment) facilities, the MMSD conveyance and deep tunnel system, the District's administrative buildings, and watercourses under MMSD jurisdiction. The conveyance system and watercourse portions of the 2050 Facilities Plan are most relevant to this watershed planning effort. It is anticipated that elements of the 2050-FP related to the conveyance system will address reductions in combined and separate sewer overflows. Similarly, it is anticipated that 2050-FP elements related to the jurisdictional watercourses will address long-term plans for green infrastructure, stream corridor maintenance, and flood mitigation. As of October 2018, it was expected that MMSD will begin to release draft 2050-FP documents for public review some time in 2019.

MMSD Conservation Plan

The MMSD has also conducted planning relative to open space preservation and greenway connection. The District completed and adopted a conservation plan that identifies land parcels which are recommended to be protected for multiple purposes, including flood reduction potential and stormwater management

benefits, as well as wildlife habitat, water quality, and recreational benefits.[38] The MMSD conservation plan identified 165 sites, including 42 high-priority sites, for protection through public acquisition or conservation easements, throughout the Menomonee River, Root River, and Oak Creek watersheds within the District. The District later adopted a greenway connection plan that identified potential greenway corridors connecting, and typically downstream of, the isolated parcels identified in the MMSD conservation plan.[39] The conservation plan also synthesized the results of other related open space planning efforts undertaken in the MMSD area to date, resulting in a comprehensive Districtwide greenway connection plan having flood mitigation benefits as well as a wide range of other environmental benefits. Several of the sites identified for acquisition in the conservation plan are along either the mainstem of Oak Creek or the Mitchell Field Drainage Ditch.

MMSD Green Infrastructure Plan

The MMSD has developed a green infrastructure plan for its planning area.[40] This planning area includes the entire Oak Creek watershed. In developing this plan, the District undertook a detailed data analysis of the opportunities and constraints for implementing green infrastructure strategies. Extensive data collection and mapping were conducted as part of this planning effort. These analyses include quantification of the numbers of roads, buildings, and parking lots in the planning area that can be treated with green infrastructure.

The objectives of the MMSD green infrastructure plan include:

1. Capturing the first 0.5 inch of rainfall from impervious surfaces with green infrastructure

2. Striving toward a rainwater harvest goal of capturing the first 0.25 gallon per square foot of area over the watershed for reuse

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[38]*The Conservation Fund; Applied Ecological Services, Inc., Heart Lake Conservation Associates; Velasco and Associates; and K. Singh and Associates,* Conservation Plan, Technical Report Submitted to Milwaukee Metropolitan Sewerage District, *October 31, 2001.*

[39]*SEWRPC Memorandum Report No. 152,* A Greenway Connection Plan for the Milwaukee Metropolitan Sewerage District, *December 2002.*

[40]*Milwaukee Metropolitan Sewerage District,* Regional Green Infrastructure Plan, *June 2013.*

3. Complementing MMSD's Private Property Infiltration and Inflow Program and Integrated Regional Stormwater Management Program

4. Helping municipalities and other entities prioritize green infrastructure actions

5. Helping to meet receiving water quality standards by acknowledging watershed restoration plan recommendations

6. Meeting MMSD's Wisconsin Pollutant Discharge Elimination System (WPDES) discharge permit requirements for green infrastructure volume capture

As part of its approach to meeting these objectives, the plan developed watershed-specific recommendations for the installation of green infrastructure over the plan implementation period of 2014 through 2035. These recommendations were based on individual characteristics of each watershed. Specific recommendations for the Oak Creek watershed include:

- Porous pavement: The installation or retrofitting of porous pavement equivalent to 730 average city blocks (3,650 acres) having 25 percent porous pavement[41]

- Bioretention areas/rain gardens: The installation of bioretention areas and rain gardens equivalent to 12,000 150-square foot rain gardens

- Stormwater trees: The planting of nine new trees per average city block

- Green roofs: The installation or retrofitting of 1,000 buildings with green roofs[42]

- Cisterns: The installation of cisterns with a capacity of 1,000 gallons at 150 large buildings[43]

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[41]For purposes of the MMSD green infrastructure plan, the area of the average city block was estimated to be five acres.

[42]The plan estimates the average size of a green roof to be 5,000 square feet.

[43]The plan defines large buildings with those with roof areas greater than 6,500 square feet.

- Native landscaping: The conversion of an area equivalent to 100 average city blocks (500 acres) to native landscaping

- Rain barrels: The installation of one rain barrel at 7,100 homes

- Soil amendments: The addition of amendments to soil over an area equivalent to 100 average city blocks (500 acres).

MMSD Urban Biodiversity Plan

The MMSD has developed an urban biodiversity plan for its planning area.[44] This planning area includes the entire Oak Creek watershed. This plan is intended to help preserve and restore biodiversity in the MMSD planning area through the application of green infrastructure. The plan evaluates green infrastructure practices for their ability to enhance biodiversity. In addition, it identifies goals and strategies for enhancing urban biodiversity by making recommendations for incorporating biodiversity into green infrastructure and other projects; identifying high priority conservation and rehabilitation areas;,, and suggesting future areas for research, monitoring, education, and outreach.

Milwaukee County Land and Water Resource Management Plan (CAPR 312)

The 1997 revisions to Chapter 92, "Soil and Water Conservation and Animal Waste Management," of the *Wisconsin Statutes* require each county to develop a multi-year land and water resource management plan (LWRM) to conserve long-term soil productivity, protect the quality of related natural resources, enhance water quality, and focus on soil erosion problems. The LWRM plans address both rural and urban nonpoint source pollution problems. Chapter ATCP 50, "Soil and Water Resource Management Program," of the *Wisconsin Administrative Code* sets forth details of the planning requirements. These plans serve as work plans for the counties' land conservation departments.

The Milwaukee County LWRM Plan for 2012-2021 was approved by the Milwaukee County Board in June 2011 and the Wisconsin Land and Water Conservation Board in August 2011.[45] This is a third-generation plan, updating the initial LWRM plan that was adopted in 2001 and a subsequent updated plan that was

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[44]*Milwaukee Metropolitan Sewerage District,* MMSD Planning Area Urban Biodiversity Plan: Draft for Ad Hoc Committee Review, *July 14, 2017.*

[45]*SEWRPC Community Assistance Planning Report No. 312,* A Land and Water Resource Management Plan for Milwaukee County: 2011-2021, *August 2011.*

adopted in 2006. The LWRM plan is intended to guide the activities of the County Environmental Services Division in its efforts to protect and improve land and water resources within the County. The plan goals include improving water quality through reducing the delivery of sediment and nutrients to surface waters; protecting, maintaining, and restoring land and water resources; enhancing Lake Michigan bluff protection initiatives; maintaining the existing information network and land information web portal; and limiting the introduction and reducing the spread of invasive species. In 2016, the Wisconsin Land and Water Conservation Board extended approval of this plan until 2021.

Regional Natural Areas and Critical Species Habitat Protection and Management Plan

The regional natural areas and critical species habitat protection and management plan for the Southeastern Wisconsin Region was undertaken to identify the most significant remaining natural areas, including remnants of the pre-European-settlement landscape and other areas vital to the maintenance of endangered, threatened, and rare plant and animal species in the Region.[46] Under the plan, natural areas are defined as tracts of land or water so little modified by human activity, or which have sufficiently recovered from the effects of such activity, that they contain intact native plant and animal communities believed to be representative of pre-European-settlement landscapes. Critical species habitats are defined as additional tracts of land or water that support endangered, threatened, or rare plant or animal species. The plan recommends that each of the identified natural areas and critical species habitat sites be protected and preserved to the maximum extent practicable as urban and rural development in the Region proceeds. The plan provides descriptive information for each natural area and critical species habitat site, along with recommended means for preservation. The plan was updated and revised in 2010 in a major plan amendment.[47] This amendment incorporated changes in the regional landscape, new findings concerning natural areas and critical species habitat sites, and updated recommendations for the protection of the identified natural areas and critical species habitat sites. The protection status of natural areas and critical species habitat sites in the Oak Creek watershed is described in Chapter 3 of this report.

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[46]*SEWRPC Planning Report No. 42,* A Regional Natural Areas and Critical Species Habitat Protection and Management Plan for Southeastern Wisconsin, *September 1997*

[47]*SEWRPC,* Amendment to the Natural Areas and Critical Species Habitat Protection and Management Plan for the Southeastern Wisconsin Region, *December 2010*.

Milwaukee County Park and Open Space Plan

The regional park and open space plan consists of two basic elements: an open space preservation element and an outdoor recreation element.[48] The open space preservation element consists of recommendations for the preservation of primary environmental corridors within the Region. The outdoor recreation element consists of a resource-oriented outdoor recreation plan providing recommendations for the number and location of large parks, recreation corridors to accommodate trail-oriented activities and water-access facilities, and an urban outdoor recreation plan providing recommendations for the number and distribution of local parks and outdoor recreational facilities required in urban areas of the Region.

Milwaukee County has prepared a park and open space plan.[49] This plan refines, details, and extends the regional park and open space plan. Major recommendations of the Milwaukee County park and open space plan related to Oak Creek include:

- Extension of the existing recreational corridor along the mainstem of Oak Creek
- Public acquisitions of land to link sections of the parkway along the Creek
- Public acquisitions of land to link the parkway along Oak Creek to adjacent parkways along the Root River and Lake Michigan

Local Park and Open Space and Comprehensive Outdoor Recreation Plans

Park and open space and comprehensive outdoor recreation plans have also been prepared, and in some cases updated, for several municipalities within the watershed. These plans are intended to help local governments meet Federal and State requirements for securing grants to help preserve parks and open space land and develop recreational facilities. Local park and open space and comprehensive outdoor recreation plans for communities in the Oak Creek watershed are listed in Table 2.6.

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[48]*SEWRPC Planning Report No. 27,* A Regional Park and Open Space Plan for Southeastern Wisconsin: 2000, *November 1977.*

[49]*SEWRPC Community Assistance Planning Report No. 132,* A Park and Open Space Plan for Milwaukee County, *November 1991. The Regional Planning Commission is currently working with the Milwaukee County Department of Parks, Recreation & Culture to prepare an updated County park and open space plan.*

Milwaukee County Trails Network Plan

Milwaukee County has prepared a trails network plan.[50] This plan identifies trail corridors for potential development and provides guidance to the County Parks Department and other entities for trail development and future land acquisitions. The plan provides guidelines for the design, construction, and maintenance of trails within the County. In the Oak Creek watershed, the plan proposes two additions to the County's existing Oak Leaf Trail. One proposed addition would extend the existing trail along the mainstem of Oak Creek from near S. Howell Avenue to a point near the confluence with the North Branch of Oak Creek. The second proposed addition would extend the existing Oak Leaf Trail from a point where it crosses W. Puetz Road west of the mainstem of Oak Creek toward, and into, Bender Park.

Milwaukee County Pond and Lagoon Management Plan

Milwaukee County parklands include 68 lakes, ponds, and lagoons comprising over 120 acres of surface water.[51] These waterbodies enhance park aesthetics while providing recreational opportunities, including fishing, boating, and ice skating. In addition, some of these lakes, ponds, and lagoons provide stormwater detention, which serves to improve water quality in receiving waters. Concerns about water quality and aesthetics have arisen as degraded conditions along some lagoon shorelines have become more apparent. Residents have also expressed concern over the impacts of poor water quality on fishing and on human health of exposure to water in the ponds. In response to these concerns, Milwaukee County developed a park pond and lagoon management plan.[52] The objectives of this plan were to evaluate water quality conditions in representative ponds, identify and prioritize pond needs and set long-term goals, identify water quality management objectives, compare observed conditions to water quality objectives, and recommend long-term and short-term management actions.

The study identified several issues related to the Milwaukee County park lakes, ponds, and lagoons, including shoreline erosion; the presence of nuisance algae and aquatic plants, related to high nutrient loadings; elevated concentrations of fecal indicator bacteria; litter; the presence of rough fish; and siltation. The plan made three general recommendations for all County park lakes, ponds, and lagoons:

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[50]*Milwaukee County Department of Parks, Recreation, and Culture,* Milwaukee County Trails Network Plan, *2007.*

[51]*These ponds include the Oak Creek Mill Pond and the Oak Creek Parkway Pond.*

[52]*Milwaukee County Environmental Services, 2005,* op. cit.

- Identify and deploy alternative management strategies to mowing grass to short lengths directly adjacent to these waterbodies

- Pursue grant funding for shoreline stabilization projects

- Continue water quality monitoring of these waterbodies to document conditions both before and after restoration projects

Individual Milwaukee County Park Plans

The Milwaukee County Department of Parks, Recreation & Culture has developed management plans for specific County parks or natural areas. These plans provide specific recommendations for management and restoration of park and natural area sites. Parks in the Oak Creek watershed for which these plans have been developed include: Barloga Woods,[53] Cudahy Nature Preserve,[54] Falk Park,[55] a section of the Oak Creek Parkway,[56] and Rawson Woods.[57]

The Milwaukee County park management plans identify potential ecological threats and set management objectives for the parks and natural areas that they cover. They also recommend and present costs for specific projects within management units of the sites. While the recommended projects vary among the parks and management units within the parks, common projects include removal and control of invasive plant species; reforestation of areas impacted by emerald ash borer; conduct of surveys and monitoring of vegetation, wildlife, and ephemeral ponds; forest stand improvement; planting of native trees and shrubs

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[53] *Milwaukee County Department of Parks, Recreation & Culture,* Barloga Woods Ecological Restoration and Management Plan: 2016-2025, *updated January 15, 2018*.

[54] *Milwaukee County Department of Parks, Recreation & Culture,* Cudahy Nature Preserve Ecological Restoration & Management Plan: 2018-2027, *2018*.

[55] *Milwaukee County Department of Parks, Recreation & Culture,* Falk Park Ecological Restoration and Management Plan: 2016-2025, *updated January 18, 2017*.

[56] *Milwaukee County Department of Parks, Recreation & Culture,* Oak Creek Parkway, Section 1 Ecological Restoration and Management Plan: 2016-2025, *updated December 6, 2016*.

[57] *Milwaukee County Department of Parks, Recreation & Culture,* Rawson Woods Ecological Restoration and Management Plan: 2017-2026, *updated February 27, 2017*.

to convert surrogate grasslands to forest; maintenance of designated hiking trails; and trash and litter removal.

The Milwaukee County Department of Parks, Recreation & Culture in partnership with the City of Milwaukee developed a master plan for the development of improvements to Copernicus Park[58]. Goals of this plan that relate to the focus areas of the Oak Creek watershed restoration plan include mitigating localized flooding in the neighborhood of the park, improving park safety, and promoting environmental, economic, and social sustainability. The plan includes a design for improvements to be made in the park. Elements of this design related to the focus areas of Oak Creek the watershed restoration plan include:

- Construction of stormwater mitigation facilities
- Improvements to sewer infrastructure
- Restoration of lawn and trees
- Removal of invasive plants
- Steambank grading and stabilization
- Planting of native riparian and woodland vegetation

The plan is intended to be implemented in three phases and includes an implementation schedule and cost estimates. After this plan was developed it was determined that sufficient flood storage was created within the stream channel that there is no longer a need to create stormwater detention within Copernicus Park.

WDNR 2002 State of the Root-Pike River Basin (Oak Creek Portion)

As the State agency tasked with water resources management, the WDNR prepares basin-level plans that guide the application of State resources to the major drainage basins of the State. The Oak Creek watershed is a part of the Root-Pike Basin, which also contains the Root River, Pike River, and Pike Creek watersheds,

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[58] *City of Milwaukee and Milwaukee County Department of Parks, Recreation and Culture,* Copernicus Park Master Plan, *December 2014.*

and the adjacent direct drainage area to Lake Michigan. The plan for the Root-Pike basin provided an overview of the land and water resource quality and identified challenges facing the resources in these watersheds and recommended actions to be taken by the WDNR and its partners.[59] It also summarized the codified, and potentially achievable, water use objectives for streams and lakes of the watersheds. The monitoring and management recommendations in this plan pertaining to the Oak Creek watershed include:

- Encouraging the implementation of urban nonpoint source best management practices
- Encouraging buffer strip development for stream bank stabilization
- Conducting baseline surveys on streams within the watershed
- Assessing sediment delivery, sediment transport, and stream bank erosion within the watershed
- Evaluating, assessing, and improving aquatic and riparian habitat in cooperation with the MMSD and their ongoing flood management improvement projects
- Conducting aquatic habitat and sediment assessments above and below the Mill Pond dam and the Oak Creek drop structures
- Evaluating the Mill Pond dam and Oak Creek drop structures for removal
- Evaluating and implementing aquatic habitat restoration and water quality improvement practices where practicable
- Forming partnerships with schools and community organizations to assess and improve the water quality of Oak Creek
- Assessing impacts and improvements to water quality within communities subject to NR 216, "Storm Water Discharge Permits," municipal stormwater permitting requirements

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[59] *Wisconsin Department of Natural Resources,* The State of the Root-Pike Basin, *WDNR PUBL WT-700-2002, May 2002.*

WDNR Oak Creek FLM TWA WQM Plan 2017

The WDNR issued a water quality management plan update for the Oak Creek watershed in 2017.[60] This plan updates information set forth in the Department's Root-Pike Basin plan for the Oak Creek watershed. The updated information includes the description of characteristics of the watershed and the summary of codified, and potentially achievable, water use objectives for streams and lakes of the watershed. In addition, the plan presents results of a targeted watershed assessment that was conducted in the watershed in 2015. This assessment included monitoring of fish and macroinvertebrate communities, collection and analysis of water chemistry samples, and qualitative assessments of stream habitat at locations in the watershed. Management recommendations set forth in this plan include:

- Working with local area experts and WDNR staff from multiple programs to identify areas throughout the watershed where stream habitat can be restored and connectivity improved

- Working with partners and State grant programs to encourage local entities to seek funds to support habitat restoration and corridor continuity

- Identifying the primary sources of phosphorus and chlorides in the watershed by monitoring, investigations, and, potentially, modeling

- Investigating and pursuing local runoff management and river grants to help initiate management actions that reduce inputs of pollutants such as phosphorus and chloride into the water resources

- Identifying potential partners and stakeholders to participate in an overall awareness and behavioral change program in the watershed that results in reduced erosion and phosphorus inputs

In addition, the plan recommends actions in the areas of management priorities, restoration goals, and monitoring and assessment and recommends management priorities for actions by the WDNR and external partners.

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[60] *Wisconsin Department of Natural Resources,* Oak Creek Frontal Lake Michigan TWA WQM Plan 2017: Oak Creek (SE05) HUC: 040400020102, *WDNR Water Quality Bureau, EGAD #3200-2017-11, September 1, 2017.*

Projects

In addition to the significant planning work completed for the Oak Creek watershed, numerous projects have been completed that address focus areas of this watershed restoration plan. These projects are described below.

1000 Friends of Wisconsin Prioritizing Codes and Ordinances for Green Infrastructure Project

Since 2012, 1000 Friends of Wisconsin has been working with municipalities in southeastern Wisconsin to audit, revise, and prioritize municipal codes and ordinances that prohibit or inhibit more widespread use of green infrastructure. The use of green infrastructure can reduce erosion and contamination of waterbodies resulting from stormwater runoff; however, provisions in municipal codes and ordinances can create barriers to the installation and use of green infrastructure. Through this project, 1000 Friends of Wisconsin reviewed select local codes and ordinances and identified the provisions that created barriers to implementing green infrastructure. Outcomes of this project were that it:

- Clearly outlined barriers to green infrastructure that exist in current codes and ordinances that either prohibited or inhibited greater adoption of green infrastructure

- Increased the potential for green infrastructure-friendly revisions of codes by prioritizing codes for municipalities

- Further enhanced the ability of the municipalities to advance code and ordinance revisions by providing new language for the revisions tailored to their needs.

The project initially focused on nine municipalities located in the Menomonee River watershed. As a result of the success of this initial project, the review of codes and ordinances was expanded to include an additional 19 municipalities in southeastern Wisconsin. Municipalities in the Oak Creek watershed that participate in this project include the Cities of Cudahy, Franklin, Greenfield, Milwaukee, and Oak Creek. Since 2016, Clean Wisconsin has continued the initiative begun by 1000 Friends of Wisconsin. Clean Wisconsin has been working with the participating municipalities to update municipal ordinances and codes.

Drexel Town Square Development

In 2016, the Drexel Town Square project redeveloped an 85-acre former brownfield site to create a downtown core near the intersection of E. Drexel Avenue and S. Howell Avenue in the City of Oak Creek. This redevelopment incorporated an extensive network of green infrastructure practices to capture and

manage stormwater. Stormwater management features of this development include the restoration of a 17-acre portion of the site to wetland and upland prairie conditions, enhancement of an existing upland forest, creation of three stormwater ponds, installation of a bioswale system to capture and treat runoff, and installation of permeable pavement at the parking lot serving the new City Hall and Library. In addition, three floating wetland islands were installed in one of the stormwater ponds. These islands are designed to remove suspended solids and nutrients from water being treated in the pond. They also provide additional habitat for native plants. The species planted in and around the ponds were also chosen to discourage the presence of nuisance waterfowl. The wetland restoration included installation of trails, benches, and a boardwalk to provide public access.

Grant Park Bioblitz

On June 10, 2016, the Milwaukee Public Museum in partnership with 21 other organizations including several Wisconsin Universities and nature centers, the WDNR, the Friends of Grant Park, and the Milwaukee County Parks conducted a bioblitz in Grant Park. A bioblitz is an intensive 24-hour field survey that attempts to identify and record all of the species present in a given area. The species identified that day are dependent on the scientists available, the weather experienced, and the season selected. This survey of Grant Park identified 976 species, including 10 which had not been previously reported at this site.

Recent, Current, and Ongoing Programs and Initiatives Active and/or Available in the Oak Creek Watershed

MMSD Greenseams

MMSD's Greenseams program is an innovative flood management program that reduces flooding risks and impacts from polluted stormwater runoff by permanently protecting key lands. It constitutes implementation of the MMSD conservation plan that was discussed above.[61] The program makes voluntary purchases of undeveloped, privately-owned properties in areas that are expected to have major growth and in open space areas along streams, lakes, and wetlands. On some Greenseams properties, activities have been conducted to restore lands that were previously in agricultural land uses to their pre-European settlement vegetation. Following restoration, these properties are able to absorb more rain and snow melt, reducing and slowing down the flow of runoff into nearby waterbodies. In addition, these sites act as buffers to nearby waterbodies, filtering out nutrients and pollutants from water entering the waterbodies.

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[61] *The Conservation Fund; Applied Ecological Services, Inc., Heart Lake Conservation Associates; Velasco and Associates; and K. Singh and Associates,* op. cit.; *SEWRPC Memorandum Report No. 152,* op. cit.

Greenseams also preserves wildlife habitat and creates recreational opportunities. MMSD has contracted with The Conservation Fund to run the Greenseams program. As of 2018, the Greenseams program has acquired 145 acres in the Oak Creek watershed.

Land Trusts and Conservancies

Land trusts and conservancies are private, nonprofit organizations that work to conserve land—such as sensitive natural areas, farmland, ranchland, water sources, cultural resources, or notable landmarks. Land trusts work in partnership with landowners and communities to permanently conserve natural resources. These organizations use a variety of tools to accomplish their mission. For example, the land trust may acquire land through purchase or donation. Once acquired, the land trust may retain ownership or pass ownership to a third party, such as a unit of government, which will protect and manage the land. Alternatively, the land trust may purchase or otherwise acquire conservation easements on privately owned land. In a conservation easement, the owner of the land gives up some of the rights associated with the land. For example, under a conservation easement, the landowner may give up the right to build structures on the land, while retaining the right to grow crops. Future owners of the land will be bound by the terms of the conservation easement. Finally, land trusts conduct and participate in stewardship of such lands, managing the land for preservation, recreational use, wildlife habitat, or other purposes.

There are two land trusts and conservancies active in the Oak Creek watershed. The Milwaukee Area Land Conservancy is active in Milwaukee County, and in the Oak Creek watershed it has acquired and protected about 25 acres of Fitzsimmons Woods. The Oak Creek watershed is also served by the Prairie Enthusiasts. This land trust has not conducted any land acquisition or easement projects in the Oak Creek watershed.

Community-Based Monitoring Programs

In addition to the long-term monitoring programs conducted by government agencies described previously in this chapter, several citizen-based volunteer monitoring programs have been active, or could potentially be active, in the Oak Creek watershed. Community-based or citizen-based water quality monitoring programs can obtain data on waterbodies that may otherwise go unmonitored. In addition, community-based monitoring efforts can provide a variety of data that may be useful for conducting watershed management activities. Finally, community-based monitoring can act to increase awareness and understanding of local water quality issues.

Table 2.7 lists several active or potential community-based environmental monitoring programs for the Oak Creek watershed. Although the Oak Creek watershed is not the focus of any of these programs, some of

them have conducted monitoring activities at sites within its boundaries. As previously noted, Milwaukee Riverkeeper has conducted some community-based water quality monitoring in the Oak Creek watershed, mostly as a part of the WDNR/UWEX Level 3 Water Action Volunteers Program. In addition, the Southeastern Wisconsin Invasive Species Consortium has conducted surveys of invasive plants in the watershed from cars along road-based routes. The Wisconsin Frog and Toad Survey has also used road-based routes.

Some support for community-based monitoring in the State is provided by the Wisconsin Citizen-Based Monitoring Network. This group is a collaboration of monitoring groups, users of monitoring data, and others designed to improve the efficiency and effectiveness of community-based monitoring by providing coordination, communications, technical and financial resources, and recognition to the Wisconsin community-based monitoring community.

Milwaukee County Parks Community Science Program

The Milwaukee County Parks Natural Area Program currently runs three community science programs. The first program addresses bird mortality resulting from window strikes. Using a rapid architectural bird-risk assessment developed by the University of Wisconsin-Milwaukee, County Parks Natural Areas staff evaluated park buildings and facilities for the collision risks they posed to birds. Out of 70 facilities evaluated, 27 were rated as potentially high-risk for bird collisions. These facilities include the Grant Park Clubhouse, the Oakwood Park Clubhouse, and the Falk Park Pavilion in the Oak Creek watershed. Volunteers in this program are trained to monitor these high-risk facilities. The data from this program could potentially be used to retrofit facilities to reduce bird mortality and to better manage habitat adjacent to these buildings.

The second program monitors the rusty patched bumble bee (*Bombus affinis*), an insect listed on the Federal endangered species list. This species has recently been detected in and near several Milwaukee County parks. Natural Areas staff has inventoried potential bumble bee habitat within the Milwaukee County Park System. Under this program, volunteers are assigned to gather data on all bumble bee species present at a site, using the Bumble Bee Watch protocol. Data from this program will contribute to a better understanding of the factors causing the decline of bumble bee populations and help to guide future land management decisions. Potential survey sites on parkland within the Oak Creek watershed include Falk Park, Grant Park, Oakwood Park, Rawson Woods, and several sections of the Oak Creek Parkway.

Finally, the Natural Areas Program has implemented a wetland monitoring program. Park Department staff and volunteers working in this program monitor amphibian and invertebrate populations in wetlands

including ephemeral ponds, larger marshes, and lagoons. To date, this program has documented 77 ephemeral ponds in the Oak Creek watershed. Data collected through this program in incorporated into the Parks Department's wildlife monitoring database and is used to guide current and future habitat management decisions.

Rain Barrel Programs

Several programs serving the Oak Creek watershed promote and support the installation of rain barrels to collect and store rain water that would otherwise run off roofs and lawns of homes. Information on the installation, use, and maintenance of rain barrels is available on the websites of the City of Milwaukee,[62] MMSD,[63] and UWEX.[64] Root-Pike WIN has provided rain barrels to some participants of its Green Yards, Cleaner Waters workshops. Several government agencies and nonprofit entities in and around the Oak Creek watershed have available for purchase rain barrels and diverter kits for diverting water from roof drains. These include the City of Milwaukee, Keep Greater Milwaukee Beautiful, the Milwaukee County Zoo, MMSD, and the Milwaukee Community Service Corps. Rain barrels are also available for purchase from several commercial sources in the area.

Education Programs

Stormwater Education Programs

Since 2012, Root-Pike WIN and the Southeastern Wisconsin Watersheds Trust, Inc. (Sweet Water) have been conducting the Respect Our Waters campaign, a multi-year marketing initiative to educate area residents on actions that they can take to reduce water pollution associated with stormwater runoff. This initiative has included a television advertising campaign using 30-second spots. These spots emphasize the importance of removing yard debris, cleaning up pet litter, using fertilizers and other yard chemicals responsibly, and preventing motor oil and other fluid from leaking from automobiles. This initiative also includes grassroots outreach, with Sweet Water and Root-Pike WIN conducting educational activities at community events. During these events, Sweet Water and Root-Pike WIN distribute pet waste bags, provide native plants for rain gardens, and conduct giveaways of rain barrels and Milorganite fertilizer. This initiative

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[62]*This can be accessed at: city.milwaukee.gov/ImageLibrary/Groups/cityGreenTeam/Stormwater/FINAL_BunkeRWHGuide_designR1_withAcknowledgements_Sept2017.pdf*

[63]*This can be accessed at: www.mmsd.com/what-we-do/green-infrastructure/rain-barrels.*

[64]*This can be accessed at: fyi.uwex.edu/sewraingardens/other-stuff/*

is funded by Sweet Water in conjunction with over 50 municipalities, including the members of the Southeastern Wisconsin Clean Water Network and the WDNR. As of 2018, Milwaukee County and all six of the municipalities in the Oak Creek watershed were participating in the Respect Our Waters campaign.

As part of the Respect Our Waters activities, Root-Pike WIN has been conducting a targeted runoff pollution campaign. This campaign identified areas in the watersheds that Root-Pike WIN serves that act as runoff pollution hotspots. Mailers that explain the pollution issue and describe solutions were sent directly to households in the hotspot areas. As part of this project, two areas were targeted in the Oak Creek watershed: one along the mainstem of Oak Creek in the City of South Milwaukee and a second along the downstream portions of the North Branch of Oak Creek in the City of Oak Creek.

In partnership with UWEX, Root-Pike WIN conducts workshops on topics related to reducing contributions of polluted stormwater to area waterbodies. Recent events include composting workshops and Greener Yards, Cleaner Waters workshops, which focus on the causes of polluted runoff and on landscaping and yard care practices that can reduce contributions of pollutants to waterbodies.

The UWEX also provides online educational materials related to stormwater runoff.[65]

Nature Centers

Nature centers offer a variety of educational programs related to natural history, natural resources, and environmental issues. While each of these centers offers a unique set of programming, common programs include offering field trip opportunities for school groups; providing nature and environmental education programs for visitors; conducting natural history and environmental education programs for adults and families; offering summer day camps for school-aged children; providing training and resources for educators; and providing materials for self-guided activities, such as nature study. Nature centers may also sponsor or conduct citizen-based science programs, provide nature-based programs to support merit badge programs or scouting organizations, or provide professional continuing education for teachers.

While no nature centers are located within the Oak Creek watershed, Wehr Nature Center is located nearby in Whitnall Park in the City of Franklin. The center's 220-acre facility includes Mallard Lake, a variety of wetlands that are accessible via a boardwalk, restored oak savanna and prairie habitats, maple and oak

[65] *These materials can be accessed at: http://clean-water.uwex.edu/pubs/*

woodlands, over five miles of hiking trails, a visitor center, and an outdoor amphitheater. Wehr Nature Center is the primary environmental education facility of the Milwaukee County Park System, and it provides a number of programs, including:

- Field trips for school groups, including opportunities for homeschooled students
- Natural history education programs for adults and families
- Nature hikes
- Citizen-based science
- Training and resources for educators.

Wehr Nature Center also conducts the Nature in the Parks program. This is a collaborative effort of the Center, the University of Wisconsin-Cooperative Extension Service, and the Milwaukee County Park System. This program provides field trips, summer camps, and other youth programs in parks, schools, libraries, and other sites throughout Milwaukee County. These programs incorporate outdoor experiences, as often as possible.

Integration of Prior and Ongoing Work with this WRP

The Oak Creek watershed restoration plan refines and details pertinent recommendations of the regional water quality management plan. It is intended to provide comprehensive guidance for the management of water resources in the watershed relative to the four focus areas of water quality, recreational use and access, habitat conditions, and flooding. To achieve this, it is desirable to synthesize the findings and recommendations of previous plans and studies that address this watershed and integrate those that address the four focus areas into this watershed restoration plan. Such integration will ensure consistency among plans that are currently active. An additional result of this integration is that currently active recommendations addressing the four focus areas will be presented in a single document.

Thus, this watershed restoration plan draws upon the findings and recommendations presented in the plans and studies inventoried in Table 2.6 and, where appropriate, integrates them into its recommendations. In some instances, such findings and recommendations are incorporated as expressed in the documents in which they were originally presented. In other instances, findings and recommendations have been refined

and detailed, extended, or otherwise modified based upon analyses presented in this plan, subsequent studies, or other relevant information.

Chapter 2

PRIOR AND ONGOING STUDIES, PLANS PROJECTS, AND PROGRAMS

TABLES

Table 2.1
Relationship of Recommendations of the Regional Water Quality Management Plan Update to Focus Areas of the Oak Creek Watershed Restoration Plan

Recommendation	Focus Area			
	Water Quality	Recreation	Habitat	Flooding
Land Use				
Develop according to approved local land use plans	--	X	X	X
Preserve primary environmental corridors in essentially open space uses	X	X	X	X
Consider preserving secondary environmental corridors and isolated natural resource areas in essentially open space uses	X	X	X	X
Preserve all identified natural areas and critical species habitat sites in public or public-interest ownership	--	X	X	X
Preserve, to the extent practicable, all farmland covered by Class I and Class II soils	--	--	--	--
Point Source Pollution Abatement Measures				
Refine sanitary sewer service areas	X	X	--	--
Continue operation and maintenance of MMSD and South Milwaukee wastewater treatment plants	X	X	--	--
Construct and maintain local sanitary sewer systems	X	X	--	--
Evaluate the need to reduce infiltration and inflow of clearwater into sanitary sewers	X	X	--	--
Implement Capacity, Management, Operations, and Maintenance (CMOM) programs	X	X	--	--
Continue to regulate wastewater treatment plant and industrial discharges under the Wisconsin Pollutant Discharge Elimination System (WPDES) program	X	X	--	--
Consider changes in the method of applying corrosion control in municipal water systems to limit phosphorus loading	X	--	--	--
Nonpoint Source Pollution Abatement-Rural Control Measures				
Implement practices to reduce soil loss from cropland to rates below the tolerable soil loss rate, "T"	X	--	X	--
Apply manure and supplemental nutrient to cropland in accordance with nutrient management plans	X	X	--	--
Increase crop and pasture riparian buffers to minimum 75-foot widths	X	X	X	X
Limit the number of stream crossings and configure crossings to minimize fragmentation	--	X	X	X
Convert marginally productive agricultural lands to wetland or prairie conditions	X	X	X	X
Implement county-enforced inspection and maintenance programs for private onsite wastewater treatment systems constructed after counties adopted private sewage system programs	X	X	--	--
Institute voluntary programs to inventory and inspect private onsite wastewater treatment systems constructed before counties adopted private sewage system programs	X	X	--	--
Nonpoint Source Pollution Abatement-Urban Control Measures				
Implement construction erosion control and urban nonpoint source controls consistent with standards in NR 151	X	X	X	--
Implement programs to detect and eliminate illicit discharges and control pathogens that are harmful to human health	X	X	--	--
Conduct human health and ecological risk assessments to address pathogens in stormwater runoff	X	X	--	--
Implement chloride reduction programs	X	--	--	--
Implement fertilizer management programs	X	--	--	--
Implement pet litter management programs	X	X	--	--
Implement beach and riparian litter and debris programs				
Conduct targeted research on bacteria and pathogens and research on stormwater best management practice techniques and programs	X	X	--	--

Table continued on next page.

Table 2.1 (Continued)

Recommendation	Focus Area			
	Water Quality	Recreation	Habitat	Flooding
Instream Water Quality Management Measures				
Implement projects called for under the Milwaukee County stream assessment study	X	--	X	--
Prepare abandonment and riverine area restoration plans for dams	X	--	X	--
Limit the number of culverts, bridges, drop structures, and channelized stream segments and incorporate measures to allow for passage of aquatic organisms	--	--	X	X
Remove abandoned bridges and culverts	--	--	X	X
Protect remaining stream channels, including small tributaries and shoreland wetlands	X	--	X	--
Restore wetlands, woodlands, and grasslands adjacent to stream channels and establish minimum buffers 75 feet in width	X	X	X	X
Restore and enhance stream channels	X	--	X	--
Monitor fish and macroinvertebrate populations	X	--	X	--
Consider more intensive fisheries manipulation measures where warranted, based upon specific goals developed in detailed local-level planning	--	X	X	--
Inland Lake Water Quality Measures				
Implement recommendations of the Milwaukee County park pond and lagoon management plan	X	X	X	--
Conduct aquatic plant surveys in those lakes in which plant management activities are being conducted	--	--	X	--
Establish long-term monitoring stations in inland lakes	X	X	--	--
Auxiliary Water Quality Management Measures				
Implement waterfowl control programs, where necessary	X	X	--	--
Continue, support, and institute household hazardous waste collection programs	X	--	--	--
Continue, support, and institute collection programs for unused and expired medications	X	--	--	--
Conduct assessments and evaluations of the significance for human health and wildlife of the presence of pharmaceuticals and personal care products in surface waters	X	--	--	--
Continue and support programs to reduce the introduction and spread of exotic and invasive species	--	--	X	--
Document and monitor the occurrence and spread of exotic and invasive species	--	--	X	--
Continue and support current surface water quality monitoring programs	X	X	--	--
Establish long-term fisheries, macroinvertebrate, and habitat monitoring stations	X	X	X	--
Continue efforts to facilitate consolidation of data from different monitoring programs	X	X	X	--
Continue and expand citizen-based monitoring efforts, with an emphasis on filling geographical data gaps	X	X	X	--
Maintain and update RWQMPU/MMSD 2020 Facility Plan water quality models	X	--	--	X
Groundwater Management Measures				
Maintain important groundwater recharge areas	X	--	X	X
Consider groundwater sustainability guidance from the regional water supply plan in evaluating the sustainability of proposed developments and local land use planning	X	--	X	--
Develop and implement utility-specific water conservation programs	X	--	X	--
Consider the potential impacts on groundwater quality of stormwater management facilities	X	--	--	--

Source: SEWRPC

Table 2.2
Summary of Existing Regulatory Management Strategies Identified in the Regional Water Quality Management Plan Update

Recommendation or Management Strategy	Focus Area Primarily Addressed				Responsible and Participating Organizations	Relevant Regulations
	Water Quality	Recreational Use and Access	Habitat Condition	Flooding		
Develop according to approved land use plans	X	X	X	X	Municipalities	66.1001 STATS[a]
Refine sanitary sewer service areas	X	X	--	--	Municipalities, SEWRPC, WDNR	NR 110 for public systems SPS 382 for private systems[b]
Continue operation and maintenance of the MMSD and South Milwaukee wastewater treatment plants	X	X	--	--	MMSD, City of South Milwaukee	NR 208, NR 210 and WPDES permit conditions
Evaluate the need to reduce infiltration and inflow of clearwater into sanitary sewers	X	X	--	--	MMSD, municipalities	NR 110.09; NR 210.23: Section 3.015 MMSD rules
Implement Capacity, Management, Operations, and Maintenance (CMOM) programs	X	X	--	--	MMSD, municipalities	NR. 210.23 and Section 3.105 MMSD rules
Continue to regulate wastewater treatment plant and industrial discharges under the Wisconsin Pollutant Discharge Elimination System (WPDES)	X	X	--	--	MMSD, City of South Milwaukee, WDNR	Regulated through WPDES program (NR 200-299)
Apply manure and supplemental nutrient to cropland in accordance with nutrient management plans[c]	X	X	--	--	Agricultural operators, Milwaukee County, DATCP, WDNR, NRCS	ATCP 50.04, ATCP 50.08, ATCP 50.48, ATCP 50.50, NR 151.07
Implement county-enforced inspection and maintenance programs for private onsite wastewater treatment systems constructed after counties adopt private sewage system programs	X	X	--	--	WDNR, Wisconsin Department of Safety and Professional Services, Municipalities	SPS 383.255, SPS 383.54, Section 190-28 Franklin Municipal Code
Implement construction erosion control and urban nonpoint source pollution controls consistent with standards in NR 151	X	X	X	--	WDNR, Milwaukee County, municipalities	NR 151; NR 216; MMSD Chapter 13; municipal ordinances
Implement fertilizer management programs[d]	X	--	--	--	Milwaukee County, WDNR	NR 151.13, NR 151.14, 94.643 STATS
Implement pet litter management programs	X	X	--	--	Milwaukee County, municipalities, UWEX	County and municipal ordinances[e]
Conduct aquatic plan surveys in those lakes in which aquatic plant management activities are being conducted	--	--	X	--	Milwaukee County, municipalities, lake associations	A common permit condition for aquatic plant management permits issued under NR 107 and NR 109
Continue and support programs to reduce the introduction and spread of exotic and invasive species	--	--	X	--	WDNR, Milwaukee County, municipalities	Some aspects are regulated under NR 40 and ATCP 21, municipal ordinances

Table continued on next page.

Table 2.2 (Continued)

Recommendation or Management Strategy	Focus Area Primarily Addressed				Responsible and Participating Organizations	Relevant Regulations
	Water Quality	Recreational Use and Access	Habitat Condition	Flooding		
Water utilities develop and implement utility-specific water conservation plans	X	--	X	--	Water utilities	Required for withdrawals from surface water and groundwater in Great Lakes Basin under NR 852
Consider the potential impacts on groundwater quality in the design of stormwater management facilities	X	--	--	--	WDNR, WisDOT, municipalities, Milwaukee County	NR 151.12, NR 151.124, NR 151.24 NR 151.244, Trans 401.106

[a] *Section 66.1001(3) of the* Wisconsin *Statutes requires that county and local general zoning ordinances; county, city, and village shoreland and floodplain zoning ordinances; county and local subdivision ordinances; and local official mapping ordinances enacted or amended on or after January 1, 2010 be consistent with the comprehensive plan adopted by the unit of government enacting or amending the ordinance.*

[b] *NR 110.08(4) and SPS 382 require that sewer service areas conform with the areawide water quality management plan.*

[c] *Compliance required to be eligible for cost-share funding.*

[d] *Includes the State ban on fertilizers containing phosphorus.*

[e] *Milwaukee County's ordinance applies to any animal under a person's control in parks and trails. Municipal ordinances vary among jurisdictions.*

Source: SEWRPC

Table 2.3
Management Strategies Recommended in the Regional Water Quality Management Plan Update that are in Various Stages of Implementation

Recommendation or Management Strategy	Focus Area Primarily Addressed				Responsible and Participating Organizations[a]
	Water Quality	Recreational Use and Access	Habitat Condition	Flooding	
Land Use Element					
Preserve primary environmental corridors in essentially natural open space uses	X	X	X	X	Milwaukee County, municipalities,
Consider preserving secondary environmental corridors and isolated natural resource areas in essentially natural open space uses	X	X	X	X	Milwaukee County, municipalities
Preserve all identified natural areas and critical species habitat sites in public or public interest ownership	X	X	X	X	Milwaukee County, municipalities
Preserve, to the extent practicable, all farmland covered by Class I and Class II soils	--	--	--	--	Milwaukee County, municipalities, DATCP
Point Source Pollution Abatement Measures					
Refine sanitary sewer service areas	X	X	--	--	MMSD, municipalities
Construct and maintain local sanitary sewer systems	X	X	--	--	Municipalities
Nonpoint Source Pollution Abatement-Rural Control Measures					
Implement practices to reduce soil loss from cropland to rates below the tolerable soil loss rate, "T"	X	--	--	--	Milwaukee County, DATCP, WDNR, NRCS
Increase crop and pasture riparian buffers to a minimum of 75-foot widths on each side of streams	X	X	X	X	Milwaukee County, MMSD, DATCP, WDNR, USFSA, NRCS, Land trusts
Limit the number of stream crossings and configure crossings to minimize fragmentation	--	X	X	X	Milwaukee County, DATCP, WDNR, USDA, WisDOT
Nonpoint Source Pollution Abatement-Urban Control Measures					
Implement programs to detect and eliminate discharges and control pathogens that are harmful to human health	X	X	--	--	Municipalities, WDNR
Implement chloride reduction programs	X	--	--	--	Milwaukee County, municipalities, WDNR, WisDOT
Implement fertilizer management programs	X	--	--	--	Milwaukee County, municipalities, WDNR, UWEX
Implement beach and riparian litter and debris control programs	X	X	X	--	Milwaukee County, municipalities, WDNR, UWEX
Instream Water Quality Management Measures					
Implement projects called for under the Milwaukee County stream assessment study	X	--	X	--	Milwaukee County
Limit the number of culverts, bridges, drop structures, and channelized segments and incorporate design measures to allow for passage of aquatic organisms	--	X	X	X	Milwaukee County, municipalities, MMSD, WDNR, WisDOT
Remove abandoned bridges and culverts	--	--	X	X	Milwaukee County, municipalities, MMSD, WDNR, WisDOT

Table continued on next page.

Table 2.3 (Continued)

Recommendation or Management Strategy	Focus Area Primarily Addressed				Responsible and Participating Organizations[a]
	Water Quality	Recreational Use and Access	Habitat Condition	Flooding	
Instream Water Quality Management Measures (continued)					
Protect remaining stream channels, including small tributaries and wetlands	X	--	X	--	Milwaukee County, municipalities, MMSD, WDNR, WisDOT
Restore wetlands, woodlands, and grasslands adjacent to stream channels and establish minimum 75-foot-wide buffers on each side	X	X	X	X	Milwaukee County, municipalities, MMSD, WDNR, WisDOT
Restore and enhance stream channels	X	--	X	--	Milwaukee County, municipalities, MMSD, WDNR, WisDOT
Monitor fish and macroinvertebrate populations	X	--	X	--	WDNR, MMSD
Consider more intensive fisheries manipulation measures where warranted based upon specific goals developed in detailed local level planning	--	X	X	--	WDNR
Inland Lake Water Quality Management Measures					
Implement recommendations of the Milwaukee County park pond and lagoon management plan	X	X	X	--	Milwaukee County
Auxiliary Water Quality Management Measures					
Continue, support, and institute household hazardous waste collection programs	X	--	--	--	Milwaukee County, MMSD, DATCP
Continue, support, and institute collection programs for unused and expired medications	X	--	--	--	Milwaukee County, MMSD, municipalities
Continue and support programs to reduce the introduction and spread of exotic and invasive species	--	--	X	--	WDNR, UWEX, Milwaukee County
Document and monitor the occurrence and spread of exotic and invasive species	--	--	X	--	WDNR, Milwaukee County
Continue and support current surface water quality monitoring programs	X	X	--	--	MMSD, WDNR, USGS
Establish long-term fisheries, macroinvertebrate, and habitat monitoring stations	X	X	X	--	WDNR, MMSD, USGS
Continue and maintain citizen-based monitoring efforts, with an emphasis on filling geographic data gaps	X	X	X	--	WDNR, UWEX, Milwaukee County
Maintain and update RWQMPU/MMSD 2020 Facility Plan water quality models	X	--	--	X	SEWRPC
Groundwater Management Measured					
Maintain important groundwater management areas	X	--	X	X	Milwaukee County, municipalities

[a] *Abbreviations for organizations are:*

DATCP = Wisconsin Department of Agriculture, Trade and Consumer Protection
MMSD = Milwaukee Metropolitan Sewerage District
NRCS = Natural Resources Conservation Service
SEWRPC = Southeastern Wisconsin Regional Planning Commission
USDA = U.S. Department of Agriculture
USFSA = U.S. Farm Services Agency
USGS = U.S. Geological Survey
UWEX = University of Wisconsin-Extension
WDNR = Wisconsin Department of Natural Resources
WisDOT = Wisconsin Department of Transportation

Source: SEWRPC

Table 2.4
Protection Status of Natural Areas and Critical Species Habitat Sites in the Oak Creek Watershed: 2018

Number on Map 2.3[a]	Name	Class[b]	Area (acres)	Area in Watershed (acres)	Area in Protective Ownership (acres)	Areas in Private Ownership (acres)	Area to Be Acquired (acres)[c]
4	Rawson Woods Park	NA-2	23	23	23	0	0
5	Cudahy Woods	NA-2[d]	47	47	47	0	0
6	Falk Park Woods	NA-2	78	78	71	7	7
19	Franklin Woods[e]	NA-3	34	34	37	0	0
20	Fitzsimmons Road Woods	NA-3	39	13	39	0	0
27	Grant Park Woods South	NA-3	45	14	45	0	0
28	Oak Creek Parkway Woods	NA-3	24	28	28	0	0
29	Barloga Woods[f]	NA-3	64	64	64	0	0
30	Wedge Woods	NA-3	17	17	0	17	17
31	Oak Creek Low Woods	NA-3	68	33	31	37	37
32	Ryan Road Woods	NA-3	42	42	42	0	0
		Subtotal	481	393	427	61	61
63	Oak Creek Parkway Bike Trail Woods	CSH	2	2	2	0	0
64	Industrial Park Mesic Woods	CSH	5	5	0	5	0
65	Camelot Park Woods	CSH	15	15	15	0	15
67	Blakewood School Woods	CSH	1	1	1	0	1
68	Meyers Woods	CSH	10	10	0	10	0
69	Puetz Road Woods	CSH	22	22	0	22	22
70	Wood Creek Woods	CSH	27	27	0	27	27
71	Howell Avenue Woods	CSH	21	21	0	21	0
72	Fittshur Wetland	CSH	6	6	0	6	0
77	Ryan Road Upland Woods-East	CSH	4	4	4	0	0
78	Truck Stop Woods	CSH	11	11	0	11	0
93	Cudahy Park Woods	CSH	4	4	4	0	0
		Subtotal	128	128	26	102	65
		Total	609	521	453	163	126

[a] *Map numbers are those assigned in the Milwaukee County map in the Amendment to SEWRPC Planning Report No. 42,* Natural Areas and Critical Species Habitat Protection and Management Plan for the Southeastern Wisconsin Region, *December 2010.*

[b] *NA-1 sites are areas of Statewide significance. These areas contain excellent examples of nearly complete and relatively undisturbed plant and animal communities which are believed to resemble those present prior to European settlement.*

NA-2 sites are areas of regional significance. These areas are so designated either because they show evidence of a limited amount of human disturbance or because they are of the highest quality but have less areas than that required for the NA-1 ranking.

NA-3 sites are areas of local significance. While these areas are substantially altered by human activities, they may contain excellent wildlife habitat or provide refuge for native plant species which no longer exist in the surrounding region due to land use activities.

CSH sites are critical species habitat sites.

[c] *As recommended in the 2010 amendment to the regional natural areas and critical species habitat protection plan.*

[d] *This site is also a designated State natural area.*

[e] *Also known as Puetz Road Woods.*

[f] *The name of this natural area has recently been changed. It was previously known as Esch-Honadel Woods.*

Source: SEWRPC

Table 2.5
Management Strategies Recommended for Implementation in the Regional Water Quality Management Plan Update But Not Yet Implemented

Recommendation or Management Strategy	Focus Area Primarily Addressed				Responsible and Participating Organizations[a]
	Water Quality	Recreational Use and Access	Habitat Condition	Flooding	
Consider changes in the method of applying corrosion control in municipal water systems to limit phosphorus loading	X	--	--	--	Municipalities
Convert marginally productive agricultural lands to wetland or prairie conditions	X	X	X	X	Milwaukee County, WDNR, land trusts
Conduct human health and ecological risk assessments to address pathogens in stormwater runoff	X	X	--	--	MMSD, municipalities
Conduct targeted research on bacteria and pathogens and research on stormwater best management practice techniques and programs	X	X	--	--	MMSD, municipalities
Prepare abandonment and river restoration plans for dams	X	--	X	--	Milwaukee County, WDNR
Establish long-term monitoring stations in inland lakes	X	X	--	--	Milwaukee County, WDNR
Implement waterfowl control programs, where necessary	X	X	--	--	Milwaukee County, municipalities
Conduct assessments and evaluations of the significance for human health and wildlife of the presence of pharmaceuticals and personal care products in surface waters	X	--	--	--	MMSD, USGS
Continue efforts to facilitate consolidation of data from different monitoring programs	X	X	X	--	MMSD, WDNR, UWEX, USGS, USEPA
Expand citizen-based monitoring efforts, with an emphasis on filling geographical data gaps	X	X	X	--	UWEX, WDNR
Consider groundwater sustainability guidance from the regional water supply plan in evaluating the sustainability of proposed development and local land use planning	X	--	X	--	Municipalities

[a] *Abbreviations for organizations are:*

MMSD = Milwaukee Metropolitan Sewerage District
USFSA = U.S. Farm Services Agency
USGS = U.S. Geological Survey
UWEX = University of Wisconsin-Extension
WDNR = Wisconsin Department of Natural Resources

Source: SEWRPC

Table 2.6
List of Management Plans Relevant to the Oak Creek Watershed

Plan Type	Community	Plan and Date of Publication
Land Use	Regional	SEWRPC Planning Report No. 55, *Vision 2050: A Regional Land Use and Transportation Plan for Southeastern Wisconsin,* July 2017
	City of Cudahy	City of Cudahy, *City of Cudahy 2020 Comprehensive Plan,* December 15, 2009
	City of Franklin	City of Franklin Department of City Development, *City of Franklin 2025 Comprehensive Master Plan,* September 2009
	City of Greenfield	Vandewalle & Associates, *City of Greenfield Comprehensive Plan 2008,* November 2008
	City of Milwaukee[a]	City of Milwaukee Department of City Development, *Milwaukee Comprehensive Plan: Citywide Policy Plan,* March 2010 City of Milwaukee Department of City Development, *Milwaukee Comprehensive Plan: An Area Plan for the Southeast Side,* October 2008 SEWRPC Memorandum Report No. 224, *MKE Aerotropolis Development Plan: A Shared Vision for the Communities Around the Airport,* February 2017 City of Milwaukee Department of City Development, *South 27th Street Strategic Action Plan: A Part of the Southeast and Southwest Side Area Plans,* March 2017
	City of Oak Creek	Vandewalle & Associates, *2020 Vision-A Comprehensive Plan for the City of Oak Creek,* Volume I, *Inventory and Analysis Report,* April 14, 1999; Volume II, *Community Visioning Results,* August 25, 1999; Volume III, *Plan Recommendations,* April 1, 2002
	City of South Milwaukee	City of South Milwaukee, *City of South Milwaukee Comprehensive & Downtown Plan Update,* May 2016
Stormwater Drainage, Stormwater Management, and Flood Control	Milwaukee County	Milwaukee County Office of Emergency Management, *Milwaukee County Hazard Mitigation Plan 2016,* September 2016
	MMSD	SEWRPC Community Assistance Planning Report No. 130, *A Stormwater Drainage and Flood Control Policy Plan for the Milwaukee Metropolitan Sewerage District,* March 1989 SEWRPC Community Assistance Planning Report No. 152, *A Stormwater Drainage and Flood Control System Plan for the Milwaukee Metropolitan Sewerage District,* December 1990 Milwaukee Metropolitan Sewerage District, *Oak Creek Phase 1 Watercourse Management Plan,* August 2000
	City of Franklin	Bonestroo, Rosene, Anderlik, & Associated, *City of Franklin Stormwater Management Plan Update-2002,* 2002
	City of Greenfield	AECOM, *City of Greenfield Stormwater Utility Manual,* August 2009, updated January 2010
	City of Milwaukee	SEWRPC Community Assistance Planning Report No. 261, *A Flood Mitigation Plan for the City of Milwaukee, Milwaukee County, Wisconsin,* April 2003 SEWRPC Community Assistance Planning Report No. 282, *City of Milwaukee All Hazards Mitigation Plan (2nd edition),* June 2012 CH2MHill, *Green Streets Stormwater Management Plan,* March 2013.
	City of Oak Creek	City of Oak Creek, *Stormwater Management Master Plan,* December 10, 2001 SEWRPC Community Assistance Planning Report No. 274, *Flood Mitigation Plan of the City for Oak Creek, Milwaukee County, Wisconsin,* April 2004
Sanitary Sewer	City of Franklin	SEWRPC Community Assistance Planning Report No. 176, *Sanitary Sewer Service Area for the City of Franklin, Milwaukee County, Wisconsin, (2nd edition)* June 2011, as amended
	City of Oak Creek	SEWRPC Community Assistance Planning Report No. 213, *Sanitary Sewer Service Area for the City of Oak Creek, Milwaukee County, Wisconsin,* July 1994, as amended
Environmental	Regional	SEWRPC Planning Report No. 30, *A Regional Water Quality Management Plan for Southeastern Wisconsin,* Volume One, *Inventory Findings,* September 1978; Volume Two, *Alternative Plans*, February 1979; Volume Three, *Recommended Plan,* June 1979 SEWRPC Memorandum Report No. 93, *A Regional Water Quality Management Plan for Southeastern Wisconsin: An Update and Status Report,* March 1995 SEWRPC Planning Report No. 42, *A Regional Natural Areas and Critical Species Habitat Protection and Management Plan for South Eastern Wisconsin,* September 1997 SEWRPC Planning Report No. 50, *A Regional Water Quality Management Plan Update for the Greater Milwaukee Watersheds,* December 2007[b]

Table continued on next page.

Plan Type	Community	Plan and Date of Publication
Environmental (continued)	Regional (continued)	SEWRPC, *Amendment to the Natural Areas and Critical Species Habitat and Management Plan for the Southeastern Wisconsin Region,* December 2010
	MMSD	Milwaukee Metropolitan Sewerage District, *Regional Green Infrastructure Plan,* June 2013 Milwaukee Metropolitan Sewerage District, *Using Green Infrastructure to Enhance Urban Biodiversity in the MMSD Planning Area,* December 11, 2018
	Watershed	SEWRPC Planning Report No. 36, *A Comprehensive Plan for the Oak Creek Watershed,* August 1986 Wisconsin Department of Natural Resources, *The State of the Root-Pike Basin,* WDNR PUBL WT-700-2002, May 2002 Wisconsin Department of Natural Resources, *Oak Creek Frontal Lake Michigan TWA WQM Plan 2017: Oak Creek (SE05) HUC: 040400020102,* WDNR Water Quality Bureau, EGAD #3200-2017-11, September 1, 2017
	Milwaukee County	SEWRPC Community Assistance Planning Report No 282, *A Land and Water Resource Management Plan for Milwaukee County: 2012-2021,* August 2011
Park and Open Space	Regional	SEWRPC Planning Report No. 27, *A Regional Park and Open Space Plan for Southeastern Wisconsin: 2000,* November 1977
	Milwaukee County	SEWRPC Community Assistance Planning Report No. 132, *A Park and Open Space Plan for Milwaukee County,* November 1991 Milwaukee County Department of Parks, Recreation, and Culture, *Milwaukee County Trails Network Plan,* 2007. Milwaukee County Department of Parks, Recreation, and Culture, *Oak Creek Parkway Ecological Restoration & Management Plan: 2016-2025,* updated December 6, 2016. City of Milwaukee and Milwaukee County Department of Parks, Recreation, and Culture, *Copernicus Park Master Plan,* December 2014. Milwaukee County Department of Parks, Recreation, and Culture, *Falk Park Ecological Restoration & Management Plan: 2016-2025,* updated January 18, 2017. Milwaukee County Department of Parks, Recreation, and Culture, *Rawson Woods Ecological Restoration & Management Plan: 2017-2026,* updated February 27, 2017. Milwaukee County Department of Parks, Recreation, and Culture, *Barloga Woods Ecological Restoration and Management Plan: 2016-2025,* updated January 15, 2018. Milwaukee County Department of Parks, Recreation, and Culture, *Cudahy Nature Preserve Ecological Restoration and Management Plan: 2018-2027,* 2018.
	MMSD	The Conservation Fund, Applied Ecological Services, Resource Data, Heart Lake Conservation Associates, and Velasco and Associates, *Milwaukee Metropolitan Sewerage District Conservation Plan,* October 2001 SEWRPC Memorandum Report No. 152, *A Greenway Connection Plan for the Milwaukee Metropolitan Sewerage District,* December 2002
	City of Franklin	City of Franklin Planning Department, *City of Franklin Comprehensive Outdoor Management Plan 2025,* April 4, 2011
	City of Greenfield	Stantec Consulting Services, *City of Greenfield, Wisconsin Comprehensive Outdoor Recreation Plan: 2017-2022,* July 2017
	City of Milwaukee	City of Milwaukee Department of Community Development, *City of Milwaukee Comprehensive Outdoor Recreation Plan: 2016-2021,* September 2016
	City of Oak Creek	City of Oak Creek, *City of Oak Creek Park & Open Space Plan: 2013,* December 17, 2013, amended April 15, 2014

[a] *The City of Milwaukee's comprehensive plan consists of a citywide policy plan and 13 area plans which address specific neighborhoods or districts of the City. Only those plans pertaining to areas which include portions of the Oak Creek watershed are included in this inventory.*

[b] *See also SEWRPC Technical Report No. 39,* Water Quality Conditions and Sources of Pollution in the Greater Milwaukee Watersheds, *November 2007.*

Source: SEWRPC

Table 2.7
Active and Potential Community-Based and Volunteer Monitoring Programs in the Oak Creek Watershed

Name	Sponsors	Monitoring Scope	Activity in the Oak Creek Watershed[a]	
			Historical	Recent
Bumble Bee Watch	Xerces Society of Invertebrate Conservation	Document species distribution and trends for native bumble bees	N	Y
Firefly Watch	Boston Museum of Science, Tufts University, Fitchburg State College	Population trends and status of fireflies	N	N
Great Backyard Bird Count	Cornell Laboratory of Ornithology, National Audubon Society	Population status and trends of birds	N	N
Milwaukee County Parks Bird Window Strike Monitoring	Milwaukee County Parks	Monitoring of risks of bird window strikes at park facilities	N	Y
Milwaukee County Parks Rusty Patch Bumble Bee Monitoring	Milwaukee County Parks	Document species distribution and trends for bumble bees	N	Y
Milwaukee County Parks Wetland Monitoring	Milwaukee County Parks	Population status and trends of amphibian and invertebrate species in wetlands	N	Y
Monarch Larva Monitoring Project	University of Minnesota	Distribution and abundance of breeding monarch butterflies	N	N
Mussel Monitoring Program of Wisconsin	WDNR	Distribution and status of mussel populations	N	N
Project FeederWatch	Cornell Laboratory of Ornithology	Population status and trends of birds	N	N
Project RED	River Alliance of Wisconsin	Early detection of invasive species	N	N
Water Action Volunteers	UWEX, WDNR, Milwaukee Riverkeeper	Water quality parameters in streams and rivers	N	Y
Wisconsin Bird Monitoring	Wisconsin Bird Conservation Initiative	Population status and trends of birds	N	N
Wisconsin Breeding Bird Survey	Wisconsin Society for Ornithology	Population status and trends of birds	Y	Y
Wisconsin Christmas Bird Count	National Audubon Society	Population status and trends of birds	N	N
Wisconsin Citizen Lake Monitoring Network	UWEX, WDNR, Wisconsin Lakes	Water clarity, some water chemistry, invasive species	N	N
Wisconsin eBird	Cornell Laboratory of Ornithology, Wisconsin Bird Conservation Initiative, WDNR	Population distribution, status, and trends of birds	N	N
Wisconsin Frog and Toad Survey	WDNR, USGS, North American Amphibian Monitoring Program	Population trends and species distribution of frogs and toads	N	N
Wisconsin Odonata Survey	WDNR, Wisconsin Dragonfly Society	Distribution and status of dragonfly and damselfly populations	N	N
Wisconsin Rare Plant Monitoring Program	WDNR	Distribution and trends of rare plants	N	N
Wisconsin Turtle Conservation Program	WDNR	Document species distribution and high mortality locations along roads for turtles	N	N

[a] *Historical activity indicates the existence of monitoring data from the program prior to 2007; recent activity indicates the existence of monitoring data in or after 2007.*

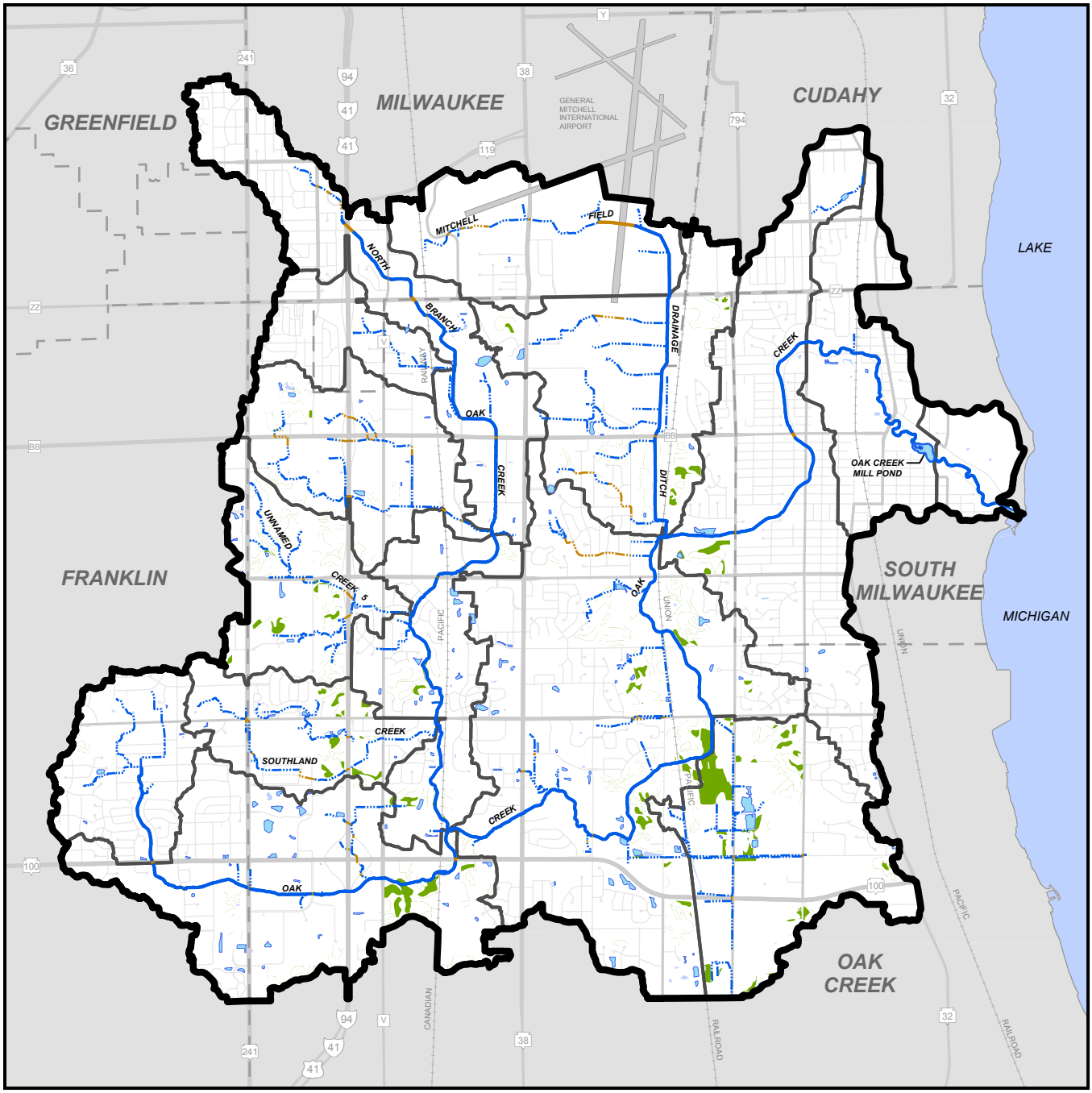
Source: SEWRPC

Chapter 2

PRIOR AND ONGOING STUDIES, PLANS PROJECTS, AND PROGRAMS

MAPS

Map 2.1
Potential Prairie or Wetland Restoration Areas in the Oak Creek Watershed Identified in the Regional Water Quality Management Plan Update



CANDIDATE PRAIRIE OR WETLAND RESTORATION AREA

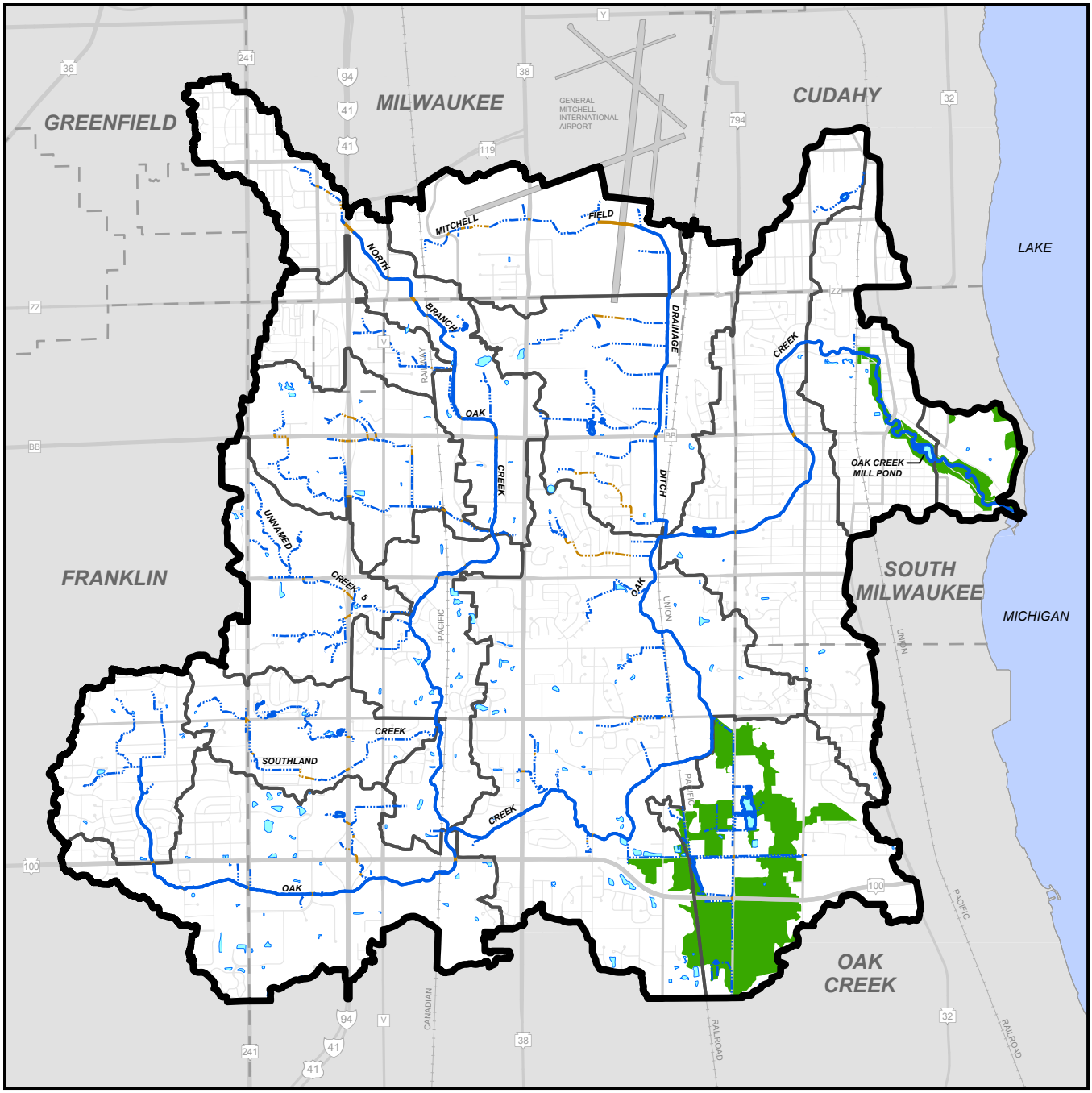
SURFACE WATER

N

0 0.25 0.5 1 Miles

Source: SEWRPC

Map 2.2
Protection of Primary Environmental Corridors in the Oak Creek Watershed: 2015



PROTECTED THROUGH PUBLIC-INTEREST OWNERSHIP OR PUBLIC REGULATION

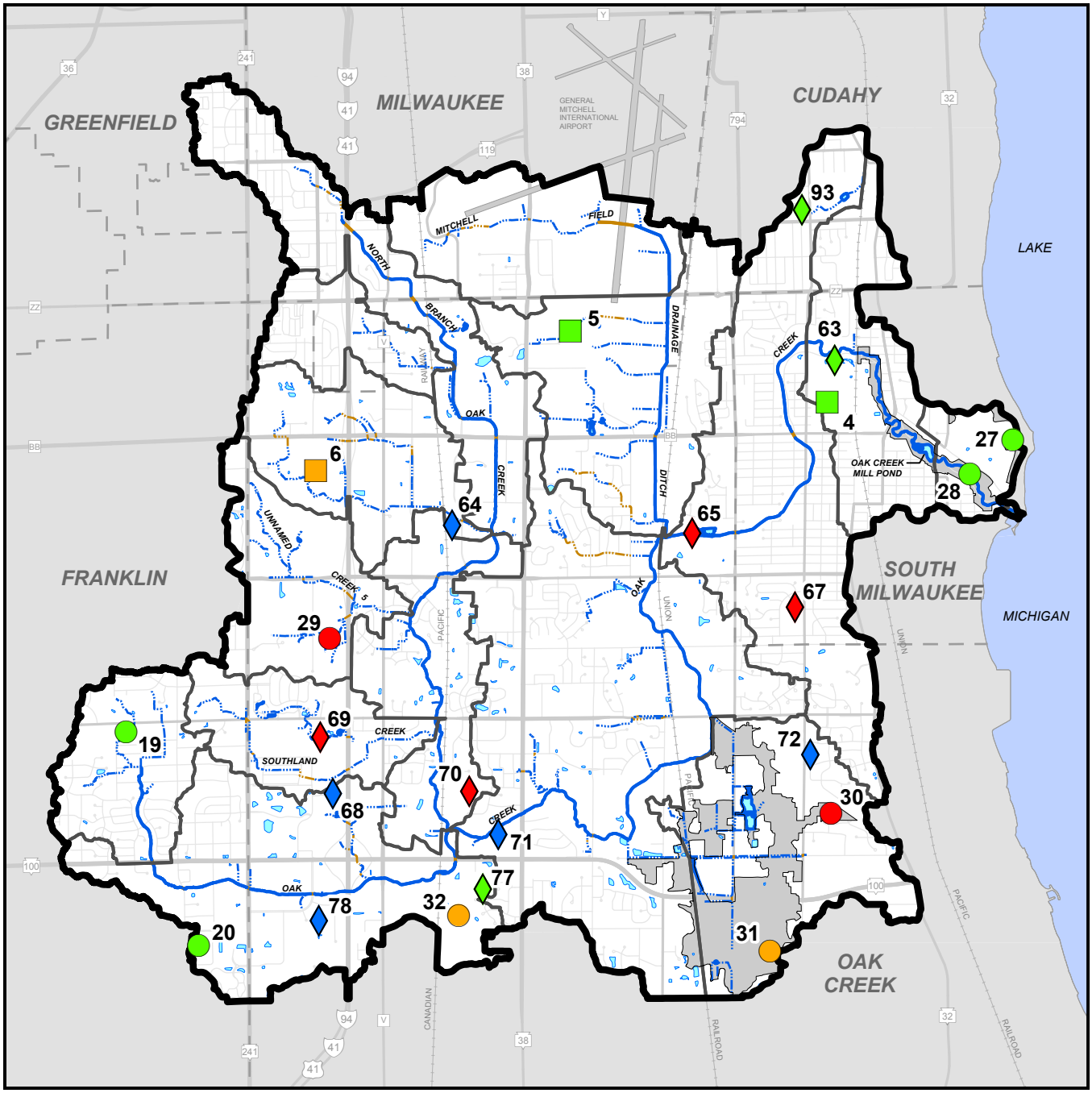
SURFACE WATER

N

0 0.25 0.5 1 Miles

Source: SEWRPC

Map 2.3
Protection Status of Natural Areas and Critical Species Habitat Sites in the Oak Creek Watershed



CURRENT STATUS AND PLAN PROTECTION	NA-1 SITE	NA-2 SITE	NA-3 SITE	CSH SITE
ENTIRELY UNDER PROTECTIVE OWNERSHIP/ PROTECTIVE OWNERSHIP TO BE RETAINED	(NONE)	■	●	◆
PARTIALLY UNDER PROTECTIVE OWNERSHIP/ REMAINDER OF SITE TO BE ACQUIRED	(NONE)	■	●	◆
NOT UNDER PROTECTIVE OWNERSHIP/ ENTIRE SITE TO BE ACQUIRED	(NONE)	(NONE)	●	◆
NOT UNDER PROTECTIVE OWNERSHIP/ TO BE PRESERVED TO THE EXTENT PRACTICABLE WITHOUT PROTECTIVE OWNERSHIP	(NONE)	(NONE)	(NONE)	◆

PRIMARY ENVIRONMENTAL CORRIDOR

4 REFERENCE NUMBER (SEE TABLE 2.4)

Note: Natural area site classifications are defined in Table 2.4.

0 0.25 0.5 1 Miles

Source: SEWRPC