SEWRPC Community Assistance Planning Report No. 345

MILWAUKEE COUNTY HAZARD MITIGATION PLAN UPDATE

Chapter 2

BASIC STUDY AREA INVENTORY AND ANALYSIS

2.1 INTRODUCTION

Prioritizing and identifying at-risk community assets, such as information on pertinent natural and built features, is essential in developing potential projects and mitigation strategies that will reduce natural hazard vulnerabilities within the County and its communities. Accordingly, the collection and collation of definitive information regarding basic geographic and demographic characteristics, existing and planned land use, surface water system characteristics, critical facilities, and climate change trends affecting the County constitute important steps in the planning process. The following in-depth information regarding the relevant conditions in the study area (Milwaukee County) is useful in formulating and evaluating sound mitigation approaches.

2.2 CIVIL DIVISIONS

The geographic extent and functional responsibilities of civil divisions and special-purpose units of government are important factors to be considered in hazard mitigation planning, since these local units of government provide the basic structure of the decision-making framework, within which such planning must be addressed. The boundaries of the 19 civil divisions in Milwaukee County are listed in Chapter 1 and shown on Map 1.1 of this report. The total land area and proportion of the County within each civil division is presented in Table 2.1.

2.3 DEMOGRAPHIC AND ECONOMIC TRENDS AND PROJECTIONS

Information on the size, characteristics, and distribution of population, household, and employment levels can assist the County in preparing for projected changes over time. Mitigation measures, such as proper design and development that help reduce impacts from future hazard weather events and promote community resiliency throughout the various socioeconomic community groups is essential in hazard mitigation planning.

Note, demographic projections for the year 2050 were prepared and developed by SEWRPC in support of the regional land use and transportation plan, which is documented in SEWRPC Planning Report No. 55 (2nd Edition), *VISION 2050: A Regional Land Use and Transportation Plan for Southeastern Wisconsin* (June 2020).[1]

Population

Historical population levels within Milwaukee County are provided in Table 2.2. Between 1850 and 1890, the total population in Milwaukee County increased rapidly from 31,077 to 236,101 residents. After 1970, the County has been experiencing a steady decline in population. Based upon the 2020 Decennial U.S. Census, the population for Milwaukee County was 939,489 people, or about a 1 percent decrease since 2010. Growth is anticipated in the future, as the projected population for year 2050 in Milwaukee County is expected to increase by 8.5 percent from 2020 levels, or roughly to 1,019,100 people (Table 2.2).

As indicated in Table 2.3, in 2020 the City of Milwaukee was the most populous community with 577,222 residents, or about 61 percent (over half) of the County's population. The next most populous communities in Milwaukee County in 2020 were the Cities of West Allis, Wauwatosa, Greenfield, Franklin, and Oak Creek.

Vulnerable Populations

Every community needs to be able to prepare for and respond to hazardous events, including natural disasters. A number of factors including poverty; lack of access to transportation, technology, and educational resources; age; health; language barriers; insufficient education; and crowded housing can affect a community's ability to reduce or prevent the risks associated with a hazardous event. Such factors, known as social vulnerability, are often associated with populations who have been historically

[1] *SEWRPC Planning Report No. 55 is available on the SEWRPC website (www.sewrpc.org).*

underserved or overlooked. Examination of potential additional vulnerabilities that these populations may face from specific hazard events is a critical consideration for hazard mitigation planning.

The Milwaukee County Office of Emergency Management (OEM) GIS Department has an interactive map with various demographic characteristics, including those considered vulnerable, throughout Milwaukee County. This interactive map is accessible through the OEM website. For this Report, a sampling of these maps that show vulnerable population locations is provided in Appendix C. As such, communities associated with certain or multiple social vulnerabilities should be considered in hazard mitigation planning.

Additionally, the Centers for Disease Control and Prevention (CDC) and the Agency for Toxic Substances and Disease Registry (ATSDR) created a Social Vulnerability Index (SVI) database using U.S. Census data to determine the social vulnerability of every U.S. census tract.[2] The SVI ranks each tract on 16 social factors.[3] These social factors are grouped into four related themes to assess an area's social vulnerability including socioeconomic status, household characteristics, race and ethnic minority status, and type of housing and transportation.

As indicated in Figure 2.1, the overall SVI for Milwaukee County (using all 16 variables) ranges from high to low. There is a high degree of correlation between the themes, indicating that many areas of the County have populations who may be especially vulnerable due to multiple factors. Although socially vulnerable individuals live throughout the County, there are high concentrations of socially vulnerable residents in denser urban areas, specifically within and around the City of Milwaukee. The CDC/ATSDR overall 2020 SVI score for Milwaukee County is 0.84, indicating Milwaukee County has a high overall level of social vulnerability.

FEMA also integrates the SVI into its National Risk Index (NRI) dataset and interactive mapping tool. The NRI tool enables public health professionals, emergency planners, and the general public to understand

[2] *Census tracts are subdivisions of counties for which the Census collects statistical data.*

[3] *Socioeconomic Status: Populations Below 150% Poverty, Unemployed, Housing Costs a Burden, No High School Diploma, and No Health Insurance; Household Characteristics: Aged 65 and Older, Aged 17 and Younger, Civilian with a Disability, Single-Parent Household and English language proficiency; Race and Ethnic Minority Status: Hispanic or Latino (or any race); Black and African American, two or more races, American Indian and Alaska Native, Native Hawaiian and Other Pacific Islander and other races; Housing type/Transportation: Multi-Unit Structures, Manufactured Homes, Crowding, No Vehicle, and Group Quarters (www.atsdr.cdc.gov).*

their risk to 18 natural hazards.[4] It was designed and built by FEMA in collaboration with various stakeholders and partners including academia; local, state, and federal governments; and private industry. The NRI uses available source data (i.e., the Social Vulnerability Index by CDC and the Baseline Resilience Indicators for Communities from the University of South Carolina) for natural hazard and community risk factors to develop a standard risk measurement for each county and Census tract in the United States. The NRI provides Risk Index scores and rating based on data for Expected Annual Loss due to natural hazards, Social Vulnerability, and Community Resilience. Milwaukee County has a Risk Index rating of 93.8, or "Relatively Moderate," and a Community Resilience rating of 99.0, or "Very High," when compared to the rest of the U.S. This interactive mapping tool, available through FEMA's website, can be used to support resilience building efforts and ensure that resources go where they are needed most.

Population by Age Distribution

Older adults (65 years of age or more) as well as infants and young children (under the age of 14) are more sensitive and vulnerable to natural weather hazard events, particularly extreme temperature incidents. In addition, people ages 60 and over tend to have more chronic health conditions which can be made worse by high temperatures because as the temperature rises, it becomes harder to cool off the body. Also, elderly people can have mobility issues, which can make it hard to help when it is needed during an extreme heat event. And they tend to live alone and be more socially isolated, which means other people may not know they are in distress.[5] According to the 2020 Decennial U.S. Census age distribution data for Milwaukee County (see Table 2.4), about 14 percent of the total population is aged 65 years or older, while nearly 20 percent is under the age of 14. In 2050, the projected population of older adults and young children in Milwaukee County is estimated to be about the same (about 19 percent for older adults and 19 percent for young children). Note, as shown in Appendix C (Map C.__), the elderly population (20 percent or greater) resides in areas throughout the entire County, with the least amount located within the City of Milwaukee. Accordingly, this vulnerable population will require a larger amount of emergency and health services during hazardous weather events.

[4] *The 18 natural hazards include: Avalanche, Coastal Flooding, Cold Wave, Drought, Earthquake, Hail, Heat Wave, Hurricane, Ice Storm, Landslide, Lightning, Riverine Flooding, Strong Wind, Tornado, Tsunami, Volcanic Activity, Wildfire, and Winter Weather.*

[5] *Anita Snow,* Milwaukee Journal Sentinel, Takeaway about Dangers that Affect Older Populations During Heat Waves*, May, 2023*

Households

In addition to total population, the number of households, or occupied housing units, is of importance in land use planning in that it greatly influences the demand for land, as well as the demand for transportation and other public facilities and services. A household includes all persons who occupy a housing unit, which is defined by the Census Bureau as a house, apartment, manufactured home, or a group of rooms, or a single room that is occupied, or intended for occupancy, as a separate living quarters.[6]

Trends in the number of households in the County are shown in Table 2.5. The County experienced significant gain in the number of new households between 1950 and 1960 (26.3 percent increase). Along with the population rates, the number of households has been quite stagnant since 1970. As such, the projected number of households in 2050 is expected to increase by about eight percent. To note, the number of individuals per household is decreasing (see Table 2.5). This indicates smaller households with a smaller support network or more isolated individuals in the County, which is important information in hazard mitigation planning.

As indicated in Table 2.6 and on Map 2.1 there are 14 manufactured home parks in Milwaukee County. Almost all of these parks have close to, or more than, 100 homes. This is important to note because manufactured homes can be particularly vulnerable to natural hazards such as high winds, tornadoes, or flooding.

Employment

Trends in job growth are set forth in Table 2.7. The data reflect the number of both full- and part-time jobs within the County. A significant increase in the number of jobs may attract additional residents to the County, thus influencing population growth. As indicated in Table 2.7, employment growth rapidly increased between 1970 and 1980, with an increase in the number of jobs of 11 percent. From 1980 to 2000 there was a gradual job increase. Then the year 2010 experienced a job decrease of about 8 percent. After 2010 employment in Milwaukee County has generally increased. Between the year 2021 and year 2050 the total number of jobs in the County is projected to increase by about 8 percent. This translates to about a 3 percent increase per decade, which is comparable to historical employment growth rates.

[6]*Separate living quarters are defined as those in which the occupants live separately from any other persons in the building, and which have direct access from the outside of the building or through a common hall.*

Property Value

The value of the real estate and personal property in a community reflects the upper end of the potential for property damage in each community. The equalized value of the real estate and personal property in Milwaukee County and each of the general-purpose units of government in the County as of 2022 totals $87 billion as shown in Table 2.8.

2.4 LAND USE AND NATURAL RESOURCES

Land use (built or natural) is an important determinant of the potential impact a particular hazard may have, and of the actions which may or should be taken to mitigate the hazard impacts. Accordingly, an understanding of the amount, type, and spatial distribution of urban and rural land uses within the County is an important consideration in the development of a sound hazard mitigation plan. This section presents a description of the land uses in the County.

Existing Land Uses: 2015

Land uses in Milwaukee County are based on the SEWRPC land use inventory conducted in 2015, as shown on Map 2.2 and summarized in Table 2.9.

Urban land uses occupied 117,665 acres, or about 76 percent of the County, in 2015. Residential land uses comprised the largest urban land use category in the County, encompassing 51,868 acres, or about 44 percent of all urban land and about 33 percent of all land in Milwaukee County. The second largest urban land use in the County was transportation, communications, and utility services, which comprised of 34,104 acres, or about 22 percent of all land in Milwaukee County. Both these land use categories are important at-risk community assets which need to be considered for hazard mitigation planning.

Nonurban land uses consist of agricultural lands; natural resource areas, including surface waters, wetlands, and woodlands; quarries and landfills; and open land. As indicated in Table 2.9 and on Map 2.2, nonurban land uses encompassed a total of 37,676 acres, or about 24 percent of the County, in 2015. Agricultural land encompassed 8,507 acres, or about 23 percent of nonurban land uses and only about 5 percent of all land in the County. As indicated on Map 2.3, most of the existing agricultural land is located in the southern portion of the County within the Cities of Franklin and Oak Creek, with a small amount also located at the very north end of the County.

Planned Land Use: 2050

Planned land use must seek to accommodate the impending demand for land within the Region, which primarily depends on future population, household, and employment levels. SEWRPC recently completed projections of land use, population, households, and employment from the period of 2015 to 2050 to provide a basis for preparation of VISION 2050.[7] The land use component of VISION 2050 recommends focusing development within planned urban service areas, preserving environmentally significant lands, and preserving highly productive agricultural lands. Existing local comprehensive plans, input from local planning officials, committed developments, and input from VISION 2050 public outreach activities were considered in allocating increases in regional population, households, employment, and associated land uses to develop the land use component of VISION 2050. Map 2.4 present the recommended development pattern from the VISION 2050 land use component as it pertains to Milwaukee County.

Planned development depicted on Map 2.4 include land uses such as city and traditional mixed-use development (commercial, housing, businesses, industry, and offices in densely populated areas); and, medium (larger lots) and high density (small lots) residential. Developed lands are located throughout the vast majority of the County, with the least amount of planned development located within the Cities of Franklin and Oak Creek as well as a small portion in the northwestern corner of the City of Milwaukee.

Urban (or developed) land uses in Milwaukee County is projected to continue to increase between 2015 and 2050. This urban growth comes predominantly at the expense of agricultural lands, open lands, and woodlands. Anticipating the needs of future populations, rather than responding to problems as they occur, is a main goal of hazard mitigation planning. Therefore, sound land use planning is a necessary tool for reducing or eliminating the costs of future hazard events.

Surface Water Resources and Floodplains,

Surface water resources, consisting of streams and lakes, form a particularly important element of the natural resource base. Surface water resources provide recreational opportunities, influence the physical development of the County, and enhance its aesthetic quality. Understanding the protection, enhancement, and proper development of these invaluable resources constitutes a major role in hazard mitigation planning, particularly in flood and drought mitigation.

[7] *SEWRPC Planning Report No. 55 (2nd Edition),* VISION 2050: A Regional Land Use and Transportation Plan for Southeastern Wisconsin *(June 2020).*

Watersheds

As shown on Map 2.5, there are seven major watersheds within Milwaukee County. With the exception of the Fox River watershed, all of the watersheds in the County are part of the Great Lakes-St. Lawrence River drainage system. The Fox River watershed is located in the extreme southwestern portion of the City of Franklin and ultimately discharges into the Mississippi River system.

The small part of the Fox River watershed within the County encompasses 1.3 square miles, or 0.5 percent of the County. The Kinnickinnic River watershed, which is entirely located within Milwaukee County, encompasses 24.5 square miles, or 10.1 percent of the County. Much of the Menomonee River watershed is located in Milwaukee County and encompasses 55.3 square miles, or 22.8 percent of the County. The lower portion of the Milwaukee River watershed in Milwaukee County encompasses 57.7 square miles, or 23.8 percent of the County. The Oak Creek watershed, which is entirely located within Milwaukee County, encompasses 27.4 square miles, or 11.2 percent of the County. Most of the upper portion of the Root River watershed is located within Milwaukee County and includes 57.7 square miles, or 23.8 percent of the County. A seventh watershed encompasses those areas adjacent to Lake Michigan that drain directly into the Lake through small perennial or intermittent streams or overland flow. This watershed totals 18.9 square miles, or 7.8 percent of the County. The Regional Planning Commission has developed comprehensive watershed plans for all of these watersheds except for the Lake Michigan direct drainage area.[8]

Streams

Major streams are defined as those which maintain, at a minimum, a small continuous flow throughout the year except under unusual drought conditions. There were 103 miles of named perennial rivers and

[8] *SEWRPC Planning Report No. 9,* A Comprehensive Plan for the Root River Watershed*, July 1966; SEWRPC Planning Report No. 12,* A Comprehensive Plan for the Fox River Watershed*, Volume One,* Inventory Findings and Forecasts*, April 1969, Volume Two,* Alternative Plans and Recommended Plan*, February 1970; SEWRPC Planning Report No. 13,* A Comprehensive Plan for the Milwaukee River Watershed*, Volume One,* Inventory Findings and Forecasts*, December 1970, Volume Two,* Alternative Plans and Recommended Plan*, October 1971; SEWRPC Planning Report No. 26,* A Comprehensive Plan for the Menomonee River Watershed*, Volume One,* Inventory Findings and Forecasts*, October 1976, Volume Two,* Alternative Plans and Recommended Plan*, October 1976; SEWRPC Planning Report No. 32,* A Comprehensive Plan for the Kinnickinnic River Watershed*, December 1978; and SEWRPC Planning Report No. 36,* A Comprehensive Plan for the Oak Creek Watershed, *August 1986.*

streams in Milwaukee County.[9] As noted above, the County includes at least portions of seven major watersheds (Map 2.5). No major streams in the Fox River watershed are located in Milwaukee County. Streams in the Kinnickinnic River watershed, which is located in the central portion of the County, include the Kinnickinnic River, Wilson Park Creek, S. 43rd Street Ditch, Lyons Park Creek, Villa Mann Creek, Cherokee Park Creek, and Holmes Avenue Creek. Major streams in the Milwaukee County portion of the Menomonee River watershed, which includes the area in the northwestern portion of the County, include the Menomonee River, Woods Creek, Honey Creek, Underwood Creek, Grantosa Creek, and the Little Menomonee River. Major streams in the Milwaukee County portion of the Milwaukee River watershed, which includes the area in the northeastern portion of the County, include the Milwaukee River, Lincoln Creek, Wahl Creek, Brown Deer Park Creek, Southbranch Creek, Beaver Creek, and Indian Creek. Streams in the Oak Creek watershed, which is located in the southeastern portion of the County, include Oak Creek, the Mitchell Field Drainage Ditch, and North Branch Oak Creek. Major streams in the Milwaukee County portion of the Root River watershed, which includes the area in the southern and southwestern portions of the County, include the Root River, Crayfish Creek, the Root River Canal, Ryan Creek, East Branch Root River, Legend Creek, Dale Creek, Tess Corners Creek, Whitnall Park Creek, Wildcat Creek, and Hale Creek. The Lake Michigan direct drainage area is located along the eastern margins of the County with Fish Creek being the only major stream located in the Milwaukee County portion of this watershed. Major streams in Milwaukee County are included on Map 2.5.

In the absence of mitigative measures, increased urbanization in a watershed may be expected to result in increased streamflow rates and volumes, with potential increases in flooding problems. In communities in Milwaukee County, the requirements of MMSD Chapter 13, "Surface Water and Stormwater,"[10] are applied to mitigate instream increases in peak rates of flow that could occur due to new urban development. The authority for MMSD to reduce the risk of flooding is in Wis. Stats., sec. 200.31(1).

Map 2.6 shows the channel bed conditions in streams within Milwaukee County as of 2019. Much of the stream network has been modified over time. Many stream reaches have been channelized and straightened, and some stream reaches have been enclosed in conduit. In addition, some sections of stream channel have been concrete lined. These modifications can be found on the mainstem of the

[9] *Wisconsin Department of Natural Resources (Wisconsin Conservation Department*), Surface Water Resources of Milwaukee County*, 1964.*

[10] *Milwaukee Metropolitan Sewerage District,* Chapter 13, Surface Water and Stormwater*, Adopted: September 24, 2001; Amended October 25, 2010; Amended March 24, 2014; Amended December 19, 2016; Repealed and recreated March 25, 2019; Amended July 27, 2020; Amended March 27, 2023*

Kinnickinnic River and Wilson Park Creek and small reaches of Edgerton Creek, Lyons Park Creek, and Villa Mann Creek in the Kinnickinnic River watershed; portions of Honey Creek, Underwood Creek, and Woods Creek in the Menomonee River watershed; reaches of Beaver Creek, Brown Deer Park Creek, Indian Creek, Lincoln Creek, Southbranch Creek, and Wahl Creek in the Milwaukee River watershed; and reaches along the mainstem of Oak Creek and a tributary to the North Branch of Oak Creek in the Oak Creek watershed.

It should be noted that MMSD is in the process of or has just completed removing concrete lining and constructing a natural streambed for four additional stream sections within the Kinnickinnic River watershed, including three sections within the Kinnickinnic River. Within the Kinnickinnic River, MMSD removed 1,600 feet of concrete channel lining, improved two bridges, and enhanced natural resource and recreational assets at Pulaski Park, completing the project in October 2020. In addition, MMSD is planning to remove about 2,100 feet of concrete channel lining and 700 feet of stream enclosed in culverts, reshape portions of the park and dredge contaminated sediments from the lagoon to improve flood storage, and enhance natural resource and recreational assets at Jackson Park; and remove 4,000 feet of concrete channel lining, expand the stream channel from 50 to 200 feet, acquire and remove 83 residential structures, and improve five bridges between 6th Street and 16th Street on the Kinnickinnic River. MMSD also plans to remove 2,100 feet of concrete channel lining from Wilson Park Creek, improve two bridges, and construct a new flood storage detention basin along Wilson Park Creek.[11]

Lakes and Ponds

While Milwaukee County contains no major lakes with surface areas over 50 acres, it has a number of small lakes, pond, and lagoons. Most of these waterbodies have less than 10 acres of surface area. Many of them are located within the County parks system. The lakes, ponds, and lagoons in the County are shown on Map 2.5.

Wetlands

Wetlands form at the transition between surface water, groundwater, and land resources. As such, these areas are inundated or saturated by surface water or groundwater at a frequency, and with a duration sufficient to support vegetation adapted for life in saturated soils. Wetlands generally occur in depressions and near the bottom of slopes, particularly along lakeshores and streambanks, and on large land areas that are poorly drained. They perform important natural functions that include water quality protection, stabilization of lake levels and streamflow, reduction in stormwater runoff by providing areas for floodwater impoundment and storage, and protection of shorelines from erosion.

[11] *storymaps.arcgis.com (MMSD-Kinnickinnic River Watershed Flood Management).*

The location and extent of wetlands in Milwaukee County are shown on Map 2.5. These wetlands are based upon the 2015 Wisconsin Wetlands Inventory. In total, the County's wetlands encompassed about 7,440 acres, or about 5 percent of all land in the County.

Floodplains

Floodplains are the wide, gently sloping areas contiguous to, and usually lying on both sides of, a stream channel. For planning and regulatory purposes, floodplains are normally defined as the areas excluding the stream channel, subject to inundation by the 1-percent-annual-probability (100-year recurrence interval) flood event. There is a 1 percent chance of this event being reached or exceeded in any given year. Floodplain areas are generally not well suited to urban development, not only because of the flood hazard, but also because of the presence of high-water tables and, generally, of soils poorly suited to urban uses. Floodplain areas often contain important natural resources, such as high-value woodlands, wetlands, and wildlife habitat and, therefore, constitute prime locations for parks and open space areas.

Floodplains utilized in this Report were derived from a variety of sources and are shown on Map 2.7. The majority of the floodplains in Milwaukee County areas identified by the Federal Emergency Management Agency (FEMA) under the National Flood Insurance Program's (NFIP). The latest effective flood insurance study for Milwaukee County was approved in September 2008. Other sources include more recent floodplain work completed by WDNR, MMSD, and SEWRPC. In total, the 1-percent-annual-probability (100- year recurrence interval) floodplains, as shown on Map 2.7, encompass about 11,616 acres, or about 7 percent, of the County. The area of floodplains for cities and villages in the County is presented in Table 2.10. Additional sources related to the County's floodplain mapping, resources about property protection from flood events, and information about flood insurance and risks are provided on FEMA, WEM, WDNR, and Milwaukee County websites.

Lake Michigan Coastline

Wisconsin has several hundred miles of Great Lakes coastline composed of bluffs, beaches, and waterfront infrastructure. Structures (residential, commercial, municipal, and county infrastructure) and recreational lands and facilities along the Lake Michigan coastline are vulnerable to coastal hazards including shoreline erosion, bluff failure, lake level changes, waves, storm surge, floods, ice shove, and landslides. Portions of the Lake Michigan shoreline in Milwaukee County are highly susceptible to shore and bluff erosion because much of the coastal landforms are comprised of mixed, unconsolidated glacial materials such as gravels, lake-deposited clays, and tills.

The Lake Michigan coastline in Milwaukee County spans 35 miles long encompassing portions of nine local units of government, including the Cities of Cudahy, Milwaukee, Oak Creek, St. Francis, and South Milwaukee; and the Villages of Bayside, Fox Point, Shorewood, and Whitefish Bay (see Table 2.11). Land uses along the coastline primarily include residential, recreational/open space, and transportation, communications, and utilities (Map 2.2).

Since 1977 there have been a number of coastal studies and assessments on the Lake Michigan coastline in Milwaukee County on the condition and remediation of certain coastline assets.[12] These reports focused largely on shoreline and beach erosion; bluff stability and conditions; shoreline protection measures and structures along the shore. Examples of these reports are highlighted below.

- Wisconsin Coastal Management Program, *Wisconsin Shore Erosion Study*, *1977*
- SEWRPC Community Assistance Planning Report No. 155, *A Lake Michigan Shoreline Erosion Management Plan for Northern Milwaukee County Wisconsin*, December 1988
- SEWRPC Community Assistance Planning Report No. 163, *A Lake Michigan Shoreline Erosion Management Plan for Milwaukee County Wisconsin*, October 1989
- SEWRPC Technical Report No. 36, *Lake Michigan Shoreline Recession and Bluff Stability in Southeastern Wisconsin: 1995* (published in December 1997)
- STS Consultants, *Shoreline Erosion Study for Warnimont Park in the City of Cudahy*, 2001
- SEWRPC Memorandum Report No 156, *Lake Park Bluff Stability and Plant Community Assessment, 2003*, September 2004
- Integrated Assessment on Water Level Variability and Coastal Bluff Erosion, 2015.
- SEWRPC Memorandum Report No. 248, *Milwaukee County Coastline Management Guidelines*, February, 2021.

[12] *An asset is defined as a useful or valuable thing, person, or quality. A broad definition, so this can include anything from personal to public property, structures, equipment, recreational resources, wildlife habitat, natural areas, roadways, infrastructure, critical facilities, etc.*

As shown in Map 2.8, in 2018 the general bluff conditions along the Lake Michigan Milwaukee County shoreline were primarily considered moderately stable with several locations being moderately unstable to failing. Bluff conditions are discussed in more detail in Chapter 3.

Additionally, in 2020, Milwaukee County, in partnership with Wisconsin Sea Grant, and SEWRPC completed a comprehensive report on County-owned facilities, assets, and infrastructure along the Lake Michigan shoreline.[13] The study was funded by a coastal resilience grant from the National Oceanic and Atmospheric Administration (NOAA), administered by WCMP, aimed at helping the County to plan and prepare for hazards like shoreline recession, bluff failure, beach erosion, coastal flooding, and damage to waterfront infrastructure. This was an important step in initiating the County's preparedness for extreme weather events. The project inventoried the resilience of Milwaukee County's coastal resources in five stages: asset inventory, condition assessment, vulnerability assessment, asset valuation, and risk score. The metrics used to evaluate the condition, vulnerability, risk, and value of each asset are explained in Chapter 3. As a result, 477 assets were inventoried and 90 of those inventoried assets are considered to be at high risk from coastal hazards impacts (i.e., storms, high water levels, and erosion). The type and location of high-risk assets are also explained in more detail in Chapter 3 of this Report. This assessment was also documented in Geographic Information System (GIS). As such, the Milwaukee County Land Information Office (MCLIO) maintains an interactive map to easily review and interact with the data in a user-friendly format. The map highlights which areas of the bluffs are at risk, the assets ratings, and supporting data that can be used to gain understanding of the coastal area.[14]

Environmental Corridors

Preserving environmental corridors and isolated natural resource areas in essentially natural, open uses can help reduce flood flows, reduce noise pollution, and maintain air and water quality. SEWRPC has identified and delineated those areas of Milwaukee County having concentrations of natural, recreational, historic, aesthetic, and scenic resources that should be preserved and protected to maintain the overall quality of the environment. Such areas normally include one or more of the following seven integral elements of the natural resource base which are essential to the maintenance of both the ecological balance and the natural beauty of the Region: 1) lakes, rivers, and streams and the associated undeveloped shorelands and floodplains; 2) wetlands; 3) woodlands; 4) prairies; 5) wildlife habitat areas; 6)

[13] *Milwaukee County, Environmental Services Unit,* Milwaukee County Coastal Resources Inventory, *October 7, 2020.*

[14] *Milwaukee County Land and Information Office,* Coastal County Data for Download*, September 2020. gis-mclio.opendata.arcgis.com*

wet, poorly drained, and organic soils, and 7) rugged terrain and high-relief topography. There are five additional elements that are important considerations in identifying and delineating areas with scenic, recreational, and educational value. These additional elements are: 1) existing outdoor recreation sites; 2) potential outdoor recreation and related open space sites; 3) historic, archaeological, and other cultural sites; 4) significant scenic areas, and 5) natural and scientific areas.

In Southeastern Wisconsin, the delineation of these 12 natural resource and natural resource-related elements on maps result in an essentially linear pattern of relatively narrow, elongated areas which have been termed "environmental corridors" by SEWRPC. Primary environmental corridors include a wide variety of the aforementioned important resource and resource-related elements and are, by definition, at least 400 acres in size, two miles in length, and 200 feet in width.

As shown on Map 2.9, the primary environmental corridors in the Milwaukee County planning area are primarily located along major stream valleys and along the Lake Michigan shoreline. These primary environmental corridors contain almost all of the best remaining woodlands, wetlands, and wildlife habitat areas in the County planning area, and represent a composite of the best remaining elements of the natural resource base. Primary environmental corridors encompassed approximately 10,078 acres (15.7 square miles), or about 6.5 percent of the County, in 2015.

Secondary environmental corridors are generally located along the small perennial and intermittent streams within the County. Secondary environmental corridors also contain a variety of resource elements, often remnant resources from primary environmental corridors that have been developed for intensive urban or agricultural purposes. Secondary environmental corridors facilitate surface-water drainage, maintain pockets of natural resource features, and provide corridors for the movement of wildlife, as well as for the movement and dispersal of seeds for a variety of plant species. In 2015, secondary environmental corridors encompassed approximately 3,734 acres (5.8 square miles), or about 2.4 percent of the County.

In addition to the primary and secondary environmental corridors, other smaller pockets of wetlands, woodlands, surface water, or wildlife habitat exist within the Region. These pockets are isolated from the environmental corridors by urban development or agricultural use, and although separated from the environmental corridor network, these isolated natural resource areas have significant value. They may provide the only available wildlife habitat in an area, usually provide good locations for local parks, and

lend unique aesthetic character and natural diversity to an area. Widely scattered throughout the County (see Map 2.9), isolated natural resource areas encompassed approximately 2,514 acres (3.9 square miles), or about 1.6 percent of the County, in 2015.

2.5 CRITICAL COMMUNITY FACILITIES AND EMERGENCY SERVICES

FEMA generally defines a critical facility, infrastructure, or location as state-run resources that are vital to the health and welfare of the population and that are especially important following hazard events. Critical facilities include, but are not limited to emergency shelters, police and fire stations, dispatch centers, hospitals, nursing homes, daycares, schools, government administration buildings, financial institutions, utility services (i.e., electrical power generation stations, and wastewater or water treatment facilities), transportation resources (i.e., roadways, bridges, railways, and airports), communication systems (computers, radio, TV, phones), and hazardous materials storage facilities. The type and location of these facilities are important at-risk community assets that should be considered in hazard mitigation planning in that such facilities can have potential direct involvement in certain hazard situations and reduce the potential for additional resources required for emergency response and recovery.

Fire and Emergency Medical Services (EMS)

Throughout Milwaukee County there are a total of 13 fire departments and 53 fire stations, which are listed in Table 2.12. Many fire department personnel are cross-trained to provide both firefighting, emergency medical care, and/ or hazardous materials handling. Map 2.10 shows the locations of local fire departments in 2023.

Of the 53 fire stations in Milwaukee County, 29 belong to the City of Milwaukee. The City of Milwaukee Fire Department (MFD) is made up of 10 Battalions, or service areas, which consists of 29 fire stations, 29 engines, 8 trucks, 12 paramedic (i.e., ambulance) units, and one fire boat.[15] All Milwaukee firefighters are trained as basic emergency medical technicians (EMTs). The MFD Special Operations Division is responsible for marine operations, including the dive rescue team and fireboat; hazardous materials (HAZMAT); tactical emergency medical services (tactical EMS); and heavy urban rescue (HURT). HURT members are trained in the disciplines of confined space rescue, collapse rescue, and trench rescue, as

[15] *A fire engine (i.e., Engine or Pumper) is equipped with a 500-gallon water tank, a pump and fire hose. A Fire Truck (i.e., Truck, Aerial, or Ladder) doesn't carry water or a hose. Trucks carry a steel ladder that stretches to 105 feet, with a nozzle at the tip to spray water onto a fire from above and have to be connected to an Engine.*

well as in high and low angle rescue. All MFD fire fighters are full-time employees. The fire stations within the City of Milwaukee are also listed in Table 2.12 and also shown on Map 2.10.

All of the fire and rescue departments in Milwaukee County provide mutual aid to each other and numerous other State of Wisconsin fire and rescue departments through a Mutual Aid Box Alarm System (MABAS) agreement (MABAS Division 107). This agreement enables each department to render assistance to, and receive assistance from, other departments in the County as needed to respond to fire and rescue emergencies. Under the agreement, departments render assistance without charge by providing available resources not required for the protection of their own service areas. This agreement enables individual departments to significantly supplement their own personnel, apparatus, and equipment with that from other departments in responding to emergencies. Importantly, the agreement allows individual departments to access equipment, such as tankers, aerial trucks, and extrication equipment, which they themselves do not possess and which they may need infrequently.

Additionally, since 2013, MFD has participated in the "Shared Services Initiative" with many of its suburban neighbors. The premise of the initiative is to dispatch the closest most appropriate resources for fires and emergency incidents, regardless of municipal borders. The initiative has developed beyond its initial scope to include sharing and maintenance of emergency vehicles and equipment, training, and transfer of emergency vehicles into empty fire stations during fires and emergency incidents.[16] Current members include the Milwaukee Fire Department, the Greenfield Fire Department, the North Shore Fire Department, the Oak Creek Fire Department, the Wauwatosa Fire Department, and the West Allis Fire Department.

Milwaukee County also has a Fire Department (MCFD) at Milwaukee Mitchell International Airport (MMIA). MCFD at MMIA provides fire education and outreach and responds to all hazards. The MCFD consists of 24 full-time members, including one Fire Chief, five Assistant Chiefs, and 18 Firefighters. The MCFD operates under the direction of MMIA Airport leadership. The Milwaukee County Fire Department responds to nearly 1,000 calls per year, with the vast majority located on property. MCFD also responds to aircraft emergencies and vehicle accidents in the vicinity of the Airport. The one Fire Station is strategically located near the middle of the airfield, close to the intersection of the Airport's two longest runways. MCFD is also a full participating member of MABAS Division 107 (Mutual Aid Box Alarm System), which allows the MABAS partners to call upon the large supply of Firefighting Foam and unique application devices.

[16] *city.milwaukee.gov*.

Law Enforcement

The Milwaukee County Sheriff's Office (MCSO) is located in the City of Milwaukee and is shown in Map 2.11. MCSO maintains the county jail, provides bailiff services for the circuit court, patrols the freeway, provides law enforcement at Milwaukee Mitchell International Airport and the Milwaukee County Institutions Complex.

The City of Milwaukee law enforcement is divided into seven police districts. The location of each City of Milwaukee police station is shown on Map 2.11. and listed in Table 2.13. Milwaukee County communities (outside the City of Milwaukee) and their corresponding police department locations are also shown on Map 2.11 (red dot) and listed in Table 2.13.

Milwaukee County's Sheriff's Department as well as the City of Milwaukee and other local community police departments operate under mutual aid provisions of Section 66.0313(2) of the *Wisconsin Statutes*. As such, the City Police Department and County Office of the Sheriff routinely provide or receive assistance from other community personnel in law enforcement matters. Because of the relatively high level and specialization of law enforcement capabilities that exist at the City and County level, mutual aid is often provided to other communities when specialized capabilities are needed.

Dispatch Services

The Milwaukee County OEM 911 Communications Division serves as the Public Safety Answering Point (PSAP) for the County. Milwaukee County OEM provides cellular 911 call-taking services for West Allis, West Milwaukee, Wauwatosa, South Milwaukee, Greenfield, Cudahy, Greendale, and occasionally from other PSAPs within the County. Table 2.14 also lists the different 911 emergency services provided in Milwaukee County.

In 2022, Text-to-911 services became available for Milwaukee County. This gives residents near county cellphone towers the option to text 911 for emergency assistance instead of making a voice call which is essential for deaf and hard-of-hearing citizens. Table 2.14 also lists the jurisdictions that participate in this service.

Telecommunications and Alerting Services

Telecommunication services include the following categories: 1) Voice Transmission Services; 2) Data Transmission Services, including the internet; 3) Multimedia Services, including video, imaging, streaming video, data, and voice; and 4) Broadcast Services, including: AM/FM radio, satellite radio and television,

television, and cable television. As listed below, telecommunication services help facilitate communication, coordination, and intelligence among emergency responders, government officials, and citizens before, during, and after emergency situations, including natural disasters.

- **Before** a disaster, these systems provide early warnings through alert systems, sirens, or mobile notifications that help communities prepare for disasters.

- **During** a disaster, telecommunications enable real-time communication among first responders, government agencies, and affected communities

- **After** a disaster, telecommunication systems provide citizens the ability to connect to important resources or declare their safety through emergency calls, text messages, or social media updates

Communication infrastructure and services provide the dissemination of public safety information which can help reduce the loss of life or substantial loss of property. As noted in the Milwaukee County OEM Comprehensive Emergency Management Plan, County residents receive notification or warning information of hazardous weather events through a number of services, including outdoor warning sirens, local broadcasts or printed media, mobile phone public address systems, and/or weather alert radios. Functional needs groups also receive extreme weather alerts or warnings through door-to-door for the handicapped, visually and hearing impaired; foreign language media messaging, and/or close-caption Emergency Alert System (EAS) television messaging. Alerting services and the infrastructure that supports them are important community assets that should be considered in hazard mitigation planning.

Emergency alert or warning notifications and functions used within Milwaukee County are listed in Appendix D. Examples of these systems and functions are highlighted below.

Interoperable Communications

Milwaukee County OEM Radio Services Division administers and maintains the County's digital radio system, or "OASIS" (Organization of Affiliated Secure Interoperable Radio Frequency (RF) Subsystems). Oasis is an upgraded P25 digital, 800MHz regional radio system that provides critical and interoperable communications for public safety agencies and first responders in Milwaukee and Waukesha counties. Each county has its own radio tower and infrastructure equipment (i.e., transmitters and dispatch consoles). The Milwaukee County Emergency Alerting System's (EAS) RF infrastructure was also upgraded and is now integrated into the OASIS radio system. All of Milwaukee County is now provided with an

Emergency Alert System, including the most underserved communities. Additionally, the City of Milwaukee recently linked their OpenSky system (see Appendix D) to the Countywide OASIS system through an Inter-RF Sub-System Interface (ISSI) gateway.

Emergency Alert System (EAS) and Wireless Emergency Alerts (WEA)

The Emergency Alert System (EAS) is a national public warning system that requires radio and TV broadcasters, cable TV, wireless cable systems, and satellite to address the public during emergency situations, including hazardous weather events. WEA is also a public safety system that allows compatible mobile devices to receive geographically targeted, text-like alert notifications or warnings about critical situations. Citizens and government employees have the responsibility to monitor severe weather alerts via television, radio, and weather alert radios – text alerts. Warning to the affected populace will be made by any expeditious methods available at the time to include, but not limited to, sirens, telephone, fax, radio, EAS, amateur radio, media, and police and fire mobile units.

In Milwaukee County, The National Weather Service (NWS) sends out all messages related to weather events, alerts, and warnings directly to the general public via FEMA's Integrated Public Alert and Warning System (IPAWS),[17] Wireless Emergency Alerts, and NOAA Weather Radios.[18]

Outdoor Warning System

During a tornado watch or warning, outdoor warning sirens are sounded throughout Milwaukee County. The tornado sirens are owned, in part, by the County or municipalities. The Milwaukee County 911 Emergency Dispatch Center has the capability to activate the sirens in communities that do not have local dispatching. The OEM tests these sirens on the second Wednesday of each month at noon (weather permitting).

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[17] *The Integrated Public Alert & Warning System (IPAWS) is FEMA's national system for local alerting that provides authenticated emergency and life-saving information to the public through mobile phones using Wireless Emergency Alerts; to radio and television via the Emergency Alert System; and on the National Oceanic and Atmospheric Administration's Weather Radio.*

[18] *NOAA Weather Radio (NWR) is a nationwide network of radio stations broadcasting continuous weather information directly from the nearest NWS office. NWR broadcasts official Weather Service warnings, watches, forecasts, and other hazard information 24 hours a day, seven days a week.*

Other Critical Community Facilities

In addition to fire, emergency medical services, law enforcement stations, and emergency communication systems, other community facilities which are of importance in hazard mitigation planning include schools, government buildings, public works facilities, hospitals, daycares[19] and adult assisted living facilities. The importance of being able to access and prevent damage to these facilities, especially during a hazard event, is discussed in detail in Chapter 3. A listing of these critical community facilities and precise locations are included in Appendix E.

Transportation Systems

The major transportation systems of Milwaukee County (see Maps 2.12 and 2.13) provide the basis for the movement of goods and people into, out of, through, and within the County. Disruptions to critical transportation system(s) due to extreme weather events can potentially create economic and sometimes life-threatening impacts. As such, having a good understanding of the existing transportation infrastructure network and how to make it more resilient in the event of extreme weather events is important in hazard mitigation planning.

Major Roadway Systems (Interstates, U.S Highways, and County Highways) in Milwaukee County

As indicated on Map 2.12, the major highway systems serving Milwaukee County include Interstate Highways (IH): 41, 43, 94, 794, and 894; U.S. Highways (USH): 18, 41, and 45; Wisconsin/State Trunk Highways (STH): 24, 32, 36, 38, 57, 59, 100, 119, 119, 145, 175, 181, 241, and 794; and, County Trunk Highways (CTH): A, D, E, G, H, J, N, S, T, U, V, W, BB, MM, NN, OO, and ZZ. This roadway grid pattern in the County provides good alternative route options during a hazard event.

Railway Facilities

Amtrak's passenger Hiawatha line runs between Milwaukee and Chicago via the Canadian Pacific and the Metra Milwaukee District North tracks with three Wisconsin stations: Milwaukee Intermodal Station, Milwaukee Airport Railroad Station, and Sturtevant Station. Railroad freight services, as shown on Map 2.13, are also provided within the County by four major railway companies, including the Union Pacific Railroad (UP), the Canadian Pacific Kansas City Railway (CPKC), Canadian National Railway (CN), and the Wisconsin & Southern Railroad (WSOR).

[19] *A listing of current daycare facilities in Milwaukee County is provided through Wisconsin Department of Children and Families or childcarefinder.wisconsin.gov.*

Airports

Milwaukee has two airports which serve the public—Milwaukee Mitchell International Airport and Lawrence J. Timmerman Field (see Map 2.12). Both airports are owned and operated by Milwaukee County. Milwaukee Mitchell International Airport is a medium-hub airport and is the largest in Wisconsin. The airport hosts 9 airlines, and approximately 310 departures and arrivals occur each day. Located on Milwaukee's northwest side, Timmerman Field serves private and corporate aviation. In addition to these, there are several private airports, heliports, and helipads within Milwaukee County.

Historic Sites

Historic sites in Milwaukee County often have important recreational, educational, and cultural value. As such, preserving and protecting these sites are an important consideration in hazard mitigation planning. In 2023, there were 309 historic places and districts listed on the National Register of Historic Places and the State Register of Historic Places for Milwaukee County. The inventory can be accessed through the State of Wisconsin Historical Society website at www.wisconsinhistory.org/ahi as well as on the Milwaukee County Historical Society website.

2.7 CLIMATE AND CLIMATE CHANGE

Climate, which is the long-term weather conditions in an area, is significant for hazard mitigation planning. Wisconsin's climate continues to change. In the ten years since the initial 2011 Wisconsin Initiative on Climate Change Impacts (WICCI) Assessment Report, new data continues to show increases in warming, rain and snow, and more frequent extreme rainfall events. Statewide temperatures have warmed by about 3°F (Fahrenheit), and precipitation in southern Wisconsin has increased by nearly 20 percent since 1950.[20] For example, Southern Wisconsin has experienced the highest increase in precipitation over the last decade and nearly every region of the state has recently experienced extreme rainfall events that led to flooding of roads, homes, businesses, and farm fields. New analyses reaffirm previous projections indicating that many of these trends will continue with wide ranging consequences throughout Wisconsin's natural and built environments.[21]

[20] *Wisconsin Initiative on Climate Change Impacts, Wisconsin's Changing Climate: Impacts and Adaptation, Nelson Institute for Environmental Studies, University of Wisconsin-Madison and Wisconsin Department of Natural Resources,* 2021.

[21] *Wisconsin Initiative on Climate Change, 2021, op. cit.*

The risk posed to Milwaukee County by many of the natural hazards profiled in this plan have been estimated largely upon the historical occurrence of, and impacts attributed to, the hazard within the County. Over longer periods of time, however, climate change may render these risk estimates and impacts less reliable. The following subsections describe the changes that have occurred in Wisconsin's climate since 1950, and the changes that are projected to occur by the middle of the 21st century. For those hazards whose frequency of occurrence or impacts are likely to be affected by the changes in climate, these descriptions will form the basis of evaluating potential long-term changes in hazard conditions.

Historical Climate Change Trends

Average annual temperatures in Wisconsin have increased over the last half of the 20th century and into the 21st century. In the period of 1950 to 2018, the average annual temperature increase in Milwaukee County was about 2°F, as can be seen in Figure 2.2.[22] Much of this increase in average annual temperature can be attributed to warmer winters and higher night-time low temperatures in summer. It should be noted that this warming trend for Wisconsin is not evenly distributed between night-time low temperatures and daytime high temperatures, and from season to season. Around this same time period (1950-2020), the average winter night-time temperatures increased by about 4°F in Milwaukee County.[23]

Average annual precipitation in Wisconsin has also increased over the last half of the 20th century and into the 21st century. Over the period of 1950 through 2018, Milwaukee County experienced an estimated 15 percent increase in precipitation (see Figure 2.3).[24] Most of the increase in average annual precipitation, in the form of both snow and rainfall, occurred during winter months. In Milwaukee County, and throughout most of the state, average precipitation during winter months increased by about 15 percent during this time period. The same percentage of increases also occurred during the spring and autumn months in the County. Average precipitation during the summer months increased by about 10 percent in Milwaukee County.

[22] *Wisconsin Initiative on Climate Change website, wicci.wisc.edu.*

[23] *Wisconsin Initiative on Climate Change, 2021, op. cit.*

[24] *Wisconsin Initiative on Climate Change, website, wicci.wisc.edu.*

Climate Change Projections

The consensus of downscaled results from climate models indicate that average annual temperatures will continue to increase through the 21st century.[25] Depending on location (see Figure 2.4), it is projected that average temperatures in the State of Wisconsin will increase by between 4.0°F and 5.0°F over the period 2041 to 2060. During this time, it is projected that Milwaukee County will experience an increase of about 4.0°F. The greatest temperature changes are projected to occur during winter months, with average winter temperatures projected to increase by about 5.0°F in Milwaukee County. Changes in extreme temperatures will accompany these changes in average temperature and the frequency of extreme daily high temperatures is projected to increase. The average number of days per year with daily high temperatures greater than 90°F is currently about 12 in southern Wisconsin.[26] This is likely to triple to about 36 days per year by 2060 In Milwaukee County, the number of extremely hot days per year is projected to increase to about 20 to 30 days.[27] By contrast, the frequency of extreme daily low temperatures is projected to decrease. The average number of days per year with daily low temperatures below 0°F is currently about 15 in southern Wisconsin. This is projected to decrease to about nine days per year by 2060[28]

The consensus of downscaled results from climate models projects several changes in precipitation through the 21st century.[29] There is a projected increase in annual precipitation in the whole State of Wisconsin by about 5 percent (see Figure 2.5). The projections indicate that the amount of precipitation falling during winter is likely to increase by about 10 percent. Due to the predicted increase in temperatures, it is assumed that a greater amount of precipitation occurring during the winter will fall as rain rather than snow.[30] This will be accompanied by both an increase in the likelihood of freezing rain events and decreases in snow depth and snow cover. Model projections also show that Wisconsin will receive more precipitation and more frequent intense precipitation events during the spring, especially

[25] *Wisconsin Initiative on Climate Change Impacts, 2021,* op. cit.

[26] *Wisconsin Initiative on Climate Change Impacts, 2011,* op. ct.

[27] *Wisconsin Initiative on Climate Change Impacts, 2021,* op. cit.

[28] *Wisconsin Initiative on Climate Change Impacts, 2011,* op. ct.

[29] *Wisconsin Initiative on Climate Change Impacts, 2021, op. cit.*

[30] *Michael Notaro, David J. Lorenz, Daniel Vimont, Stephen Vavrus, Christopher Kucharik, and Kristie Franz, "21st Century Wisconsin Snow Projections Based on an Operational Snow Model Driven by Statistically Downscaled Climate Data,"* International Journal of Climatology, *Volume 31, pages 1615-1633, 2011.*

during early spring. As in winter, it will be more likely for early spring precipitation to fall as rain rather than snow.

Based on downscaled climate models, the total amount of precipitation occurring during the summer is not projected to change much, however the frequency of intense rainfall events will increase. In southern Wisconsin, the frequency of precipitation events in which two or more inches fall in a 24-hour period is expected to increase from about 12 events per decade to 15 events per decade by the middle of the 21st century. These intense rainfall events will be concentrated in the spring and fall. The heaviest rainfall events are also projected to increase in magnitude. The magnitude of a 100-year storm event (five to seven inches of precipitation in a 24-hour period) is expected to increase by about 10 percent in the State of Wisconsin.[31] It should be noted that in the decade from 2010 to 2019, Wisconsin experienced at least 21 extreme rainfall events that exceeded the 100-year event. The shift to more heavy rainfall events, but little change in total summertime precipitation, implies that more dry days will occur in Wisconsin during the summer. More dry days, coupled with higher summer temperatures and the increases in evapotranspiration that are likely to result from higher temperatures, will lead to an increase in the likelihood of summer droughts.

[31] *Wisconsin Initiative on Climate Change Impacts, 2011,* op. ct.

SEWRPC Community Assistance Planning Report No. 345

MILWAUKEE COUNTY HAZARD MITIGATION PLAN UPDATE

Chapter 2

BASIC STUDY AREA INVENTORY AND ANALYSIS

TABLES

#269391 – CAPR-345 Table 2.1 Civil Divisions in Milwaukee County
500-1151
MAS/mlp/nkk
1/11/2024

Table 2.1
Areal Extent of Civil Divisions in Milwaukee County: 2015

Municipality	Area (Acres)	Percent of the County
Cities		
Cudahy	3,054	2.0
Franklin	22,197	14.3
Glendale	3,817	2.5
Greenfield	7,389	4.8
Milwaukee	61,886	39.8
Oak Creek	18,229	11.7
St. Francis	1,647	1.1
South Milwaukee	3,104	2.0
Wauwatosa	8,466	5.4
West Allis	7,300	4.7
Subtotal	137,089	--
Villages		
Bayside[a]	1,480	1.0
Brown Deer	2,812	1.8
Fox Point	1,838	1.2
Greendale	3,564	2.3
Hales Corners	2,046	1.3
River Hills	3,412	2.2
Shorewood	1,022	0.7
West Milwaukee	720	0.5
Whitefish Bay	1,358	0.9
Subtotal	18,252	--
Total	155,341	100.0

[a] *This table reflects the jurisdictional acres for the Village of Bayside that lies within Milwaukee County only.*

Source: SEWRPC

#262578 – CAPR-345 Table 2.2 Historical Resident Population Levels in Milwaukee County
500-1151
MAS/nkk
5/12/2023

Table 2.2
Historical Resident Population Levels in Milwaukee County: 1850-2050

Year	Population	Change from Preceding Census	
		Incremental	Percent
1850	31,077	--	--
1860	62,518	31,441	101.2
1870	89,930	27,412	43.8
1880	138,538	48,608	54.1
1890	236,101	97,563	70.4
1900	330,017	93,916	39.8
1910	433,187	103,170	31.3
1920	539,449	106,262	24.5
1930	725,263	185,814	34.4
1940	766,885	41,622	5.7
1950	871,047	104,162	13.6
1960	1,036,041	164,994	18.9
1970	1,054,249	18,208	1.8
1980	964,249	-89,261	-8.5
1990	959,275	-5,713	-0.6
2000	940,164	-19,111	-2.0
2010	947,735	7,571	0.8
2020	939,489	-8,246	-0.9
2050[a]	1,019,100	79,611	8.5

[a] *Population estimate based on projections from SEWRPC's* VISION 2050 Plan.

Source: U.S. Census Bureau (1950-2020 decennial censuses), Wisconsin Department of Health Services, and SEWRPC

#268262 – CAPR-345 Table 2.3 Population by Civil Divisions in Milwaukee County
500-1151
MAS/nkk
5/12/2023

Table 2.3
Population Change by Civil Divisions in Milwaukee County: 2010-2020

Civil Division	Population		Percent of Change	Percent of County (2020)
	2010	2020		
Cities				
Cudahy	18,267	18,204	-0.3	1.9
Franklin	35,451	36,816	3.9	3.9
Glendale	12,872	13,357	3.8	1.4
Greenfield	36,720	37,803	2.9	4.0
Milwaukee	594,833	577,222	-3.0	61.4
Oak Creek	34,451	36,497	5.9	3.9
St. Francis	9,365	9,161	-2.2	1.0
South Milwaukee	21,156	20,795	-1.7	2.2
Wauwatosa	46,396	48,387	4.3	5.2
West Allis	60,411	60,325	-0.1	6.4
Villages				
Bayside[a]	4,300	4,378	1.8	0.5
Brown Deer	11,999	12,507	4.2	1.3
Fox Point	6,701	6,934	3.5	0.7
Greendale	14,046	14,854	5.8	1.6
Hales Corners	7,692	7,720	0.4	0.8
River Hills	1,597	1,602	0.3	0.2
Shorewood	13,162	13,859	5.3	1.5
West Milwaukee	4,206	4,114	-2.2	0.4
Whitefish Bay	14,110	14,954	6.0	1.6
Total	947,735	939,489	-0.9	100.0

[a] *Milwaukee County portion only. Total population for the Village of Bayside was 4,389 in 2010 and 4,482 in 2020.*

Source: U.S. Census Bureau and SEWRPC

#268263 – CAPR-345 Table 2.4 Population by Age in Milwaukee County
500-1151
MAS/nkk
5/16/2023

Table 2.4
Actual and Projected Population by Age in Milwaukee County: 2020-2050

Age Group	Actual Population 2020	Percent of County	Projected Population 2050	Percent of County
Under 5	58,874	6.3	64,221	6.6
5 to 9	60,142	6.4	59,857	6.1
10 to 14	63,818	6.8	58,378	6.0
15 to 19	64,275	6.8	58,236	6.0
20 to 24	69,980	7.4	65,068	6.7
25 to 29	76,012	8.1	69,614	7.1
30 to 34	72,426	7.7	68,430	7.0
35 to 39	64,849	6.9	63,684	6.5
40 to 44	56,313	6.0	59,504	6.1
45 to 49	52,202	5.6	57,764	5.9
50 to 54	53,407	5.7	55,667	5.7
55 to 59	56,675	6.0	58,107	5.9
60 to 64	55,963	6.0	55,443	5.7
65 to 69	46,738	5.0	47,911	4.9
70 to 74	34,225	3.6	38,199	3.9
75 to 79	21,210	2.3	30,600	3.1
80 to 84	14,756	1.6	25,358	2.6
85 and Older	17,624	1.9	40,663	4.2
Total	939,489	100.0	976,704	100.0

Note: Projected population by age data has not been updated to reflect numbers associated with the proposed Foxconn manufacturing campus. Because of this, the total projected population in this Table differs from the total projected population in Table 2.2, which considers the proposed Foxconn development.

The 2050 projected population by age data is derived from *SEWRPC Technical Report No.11 (5th Edition)*, The Population of Southeastern Wisconsin, *2013*.

Source: U.S. Census Bureau and SEWRPC

#268264 – CAPR-345 Table 2.5 Number of Households in Milwaukee County
500-1151
MAS/nkk
5/16/2023

Table 2.5
Number of Households in Milwaukee County: 1950-2050

Year	Number of Households	Change from Preceding Census		Household Size
		Number	Percent	
1950	249,232	--	--	3.49
1960	314,875	65,643	26.3	3.29
1970	338,605	23,730	7.5	3.11
1980	363,653	25,048	7.4	2.65
1990	373,048	9,395	2.6	2.57
2000	377,729	4,681	1.2	2.49
2010	383,591	5,862	1.5	2.47
2020	393,601	10,010	2.6	2.39
2050[a]	427,800	31,070	7.8	2.38

[a] *Number of households are projections from SEWRPC's* VISION 2050 Plan.

Source: U.S. Bureau of the Census and SEWRPC

269039 – CAPR-345 Table 2.6 Manufactured Home Parks in Milwaukee County
500-1151
MAS/nkk
7/12/2023

Table 2.6
Manufactured Home Parks Located in Milwaukee County: 2023

City	Park Name	Address	Park Size (Number of Homes)
Cudahy	White's Mobile Home Estates	5926 S. Packard Avenue	Medium (51-100)
Franklin	Franklin Mobile, LLC.	6361 S. 27th Street	Medium (51-100)
	Badger Mobile Home Park	6405 S. 27th Street	Medium (51-100)
Milwaukee	Tower View Court, Inc.	700 W. Layton Avenue	Medium (51-100)
	Tower View Court, Inc.	4217 S. 6th Street	Large (>100)
	Tower View Court, Inc.	4157 S. 6th Street	Medium (51-100)
	College Mobile Home Court	6160 S. 6th Street	Large (>100)
Oak Creek	Oak Creek Estates, LLC.	2301 W. College Avenue	Large (>100)
	HyView Mobile Home Park	2331 W. College Avenue	Large (>100)
	Sunrise Shores Mobile Home Court	8481 S. 5th Avenue	Small (<50)
West Allis	Mayfair Village Mobile Home Court, LLC	1000 S. 108th Street	Large (>100)
	Hillside Properties	10211 W. Greenfield Avenue	Medium (51-100)
	Greenfield Terrace, LLC	10525 W. Greenfield Avenue	Medium (51-100)
	Lincoln Park Mobile Home Court, LLC.	10315 W. Greenfield Avenue	Large (>100)
	Mobile Estates of West Allis	10401 W. Greenfield Avenue	Small (<50)

Source: Wisconsin Department of Safety and Professional Services

#268265 – CAPR-345 Table 2.7 Number of Jobs in Milwaukee County
500-1151
MAS/nkk
5/16/2023

Table 2.7
Number of Jobs in Milwaukee County: 1970-2050

Year	Number of Jobs	Change from Previous Time Period	
		Number	Percent
1970	525,142	--	--
1980	583,175	58,033	11.0
1990	609,787	26,612	4.6
2000	624,639	14,852	2.4
2010	574,458	-50,181	-8.0
2015	597,698	23,240	4.0
2020	578,605	19,093	3.2
2050[a]	634,600	55,995	9.7

[a] *Estimated jobs for the year 2050 as modeled in SEWRPC's* VISION 2050 Plan.

Source: U.S. Bureau of Economic Analysis and SEWRPC

#268266 – CAPR-345 Table 2.8 Equalized Value of Property
500-1151
MAS/nkk
5/16/2023

Table 2.8
Equalized Value of Property in Milwaukee County by Community: 2022

Community	2022 Equalized Value ($)
Cities	
Cudahy	1,530,067,600
Franklin	5,423,303,100
Glendale	2,313,903,100
Greenfield	4,053,650,500
Milwaukee	39,432,998,900
Oak Creek	5,226,696,500
St. Francis	857,917,100
South Milwaukee	1,713,241,100
Wauwatosa	9,006,577,400
West Allis	5,518,411,300
Subtotal	75,076,766,600
Villages	
Bayside	782,030,400
Brown Deer	1,295,316,300
Fox Point	1,359,086,300
Greendale	1,778,430,400
Hales Corners	814,963,700
River Hills	509,420,400
Shorewood	2,047,163,700
West Milwaukee	459,054,300
Whitefish Bay	2,911,508,400
Subtotal	11,956,973,900
Total	87,033,740,500

Source: Wisconsin Department of Revenue and SEWRPC

#268267 – CAPR-345 Table 2.9 Existing Land Use (2015)
500-1151
MLP/MAS/nkk
01/08/2024

Table 2.9
Existing Land Use in Milwaukee County: 2015

Land Use Category[a]	Acres	Percent of Subtotal	Percent of Total
Urban[a]			
Residential	51,868	44.1	33.4
Commercial	7,981	6.8	5.1
Industrial	6,993	5.9	4.5
Transportation, Communications, and Utilities	34,104	29.0	22.0
Governmental and Institutional[b]	8,719	7.4	5.6
Recreational[c]	8,000	6.8	5.1
Urban Subtotal	117,665	100.0	75.7
Nonurban			
Agricultural	8,507	22.6	5.5
Wetlands	7,440	19.8	4.8
Woodlands	5,691	15.1	3.7
Extractive, Landfills, and Other Open Lands	14,483	38.4	9.3
Surface Water	1,555	4.1	1.0
Nonurban Subtotal	37,676	100.0	24.3
Total	155,341	--	100.0

[a] *Parking lots are included with the associated use.*

[b] *Includes public and private schools, government offices, police and fire stations, libraries, cemeteries, religious institutions, hospitals, nursing homes, and similar facilities.*

[c] *Includes only land which is intensively used for recreational purposes.*

Source: SEWRPC

#269393 – CAPR-345 Table 2.10 Floodplains by Community
500-1151
MLP/MAS/nkk
01/08/2024

Table 2.10
Area of 100-Year Floodplain by Community in Milwaukee County

Community	Acres of 100-Year Floodplain
Cities	
Cudahy	62
Franklin	2,632
Glendale	473
Greenfield	373
Milwaukee	3,124
Oak Creek	2,580
South Milwaukee	25
Wauwatosa	507
West Allis	283
Villages	
Bayside[a]	68
Brown Deer	135
Fox Point	87
Greendale	643
Hales Corners	156
River Hills	451
Shorewood	11
Total	11,610

[a] *Floodplain acres for the Village of Bayside are for Milwaukee County only.*

Source: SEWRPC

#270721 Milwaukee Co HMP Table 2.11 Length of Michigan Shoreline Length by Comm.
500-1151
MLP/MAS/nkk
01/09/2024

Table 2.11
Lake Michigan Shoreline Length of Communities in Milwaukee County

Community	Lake Michigan Shoreline Length (miles)	Percent of County Total
Cities		
Cudahy	2.7	7.6
Milwaukee	13.5	38.1
Oak Creek	5.4	15.3
St. Francis	1.9	5.4
South Milwaukee	3.3	9.3
Villages		
Bayside	1.7	4.8
Fox Point	2.8	7.9
Shorewood	1.2	3.4
Whitefish Bay	2.8	7.9
Total	35.4	100.0

Source: SEWRPC

Table 2.12
Fire and Emergency Medical Service (EMS) Stations in Milwaukee County: 2023

Department	Fire/EMS Station	Address	Municipality
Milwaukee County Airport	Station 1	5800 S. Howell Avenue	Milwaukee
Northshore Fire	Station 81	4401 W. River Lane	Brown Deer
	Station 82	5901 N. Milwaukee River Parkway	Glendale
	Station 83	3936 N. Murray Avenue	Shorewood
	Station 84	825 E. Lexington Boulevard	Whitefish Bay
	Station 85	665 E. Brown Deer Road	Bayside
Cudahy Fire Department	Station 1	4626 S. Packard Avenue	Cudahy
	Station 2	3115 E. Ramsey Avenue	Cudahy
Franklin Fire Departments	Station 1	8901 W. Drexel Avenue	Franklin
	Station 2	9911 S. 60th Street	Franklin
	Station 3	4755 W. Drexel Avenue	Franklin
Greendale Fire Department	Station 1	5911 W. Grange Avenue	Greendale
Greenfield Fire Departments	Station 91	5330 W. Layton Avenue	Greenfield
	Station 92	4333 S. 92nd Street	Greenfield
Hales Corners Fire Department	Station 1	10000 W. Forest Home Avenue	Hales Corners
City of Milwaukee Fire Departments	Station 1	784 N. Broadway	Milwaukee
	Station 2	755 N. James Lovell Street	Milwaukee
	Station 4	9511 W. Appleton Avenue	Milwaukee
	Station 7	3174 S. Chase Avenue	Milwaukee
	Station 8	5585 N. 69th Street	Milwaukee
	Station 9	4141 W. Mill Road	Milwaukee
	Station 10	5600 W. Oklahoma Avenue	Milwaukee
	Station 11	2526 S. Kinnickinnic Avenue	Milwaukee
	Station 12	2130 W. Oklahoma Avenue	Milwaukee
	Station 13	2901 N. 30th Street	Milwaukee
	Station 14	6074 S. 13th Street	Milwaukee
	Station 16	10320 W. Fond du Lac Avenue	Milwaukee
	Station 18	3628 N. Holton Street	Milwaukee
	Station 21	2050 N. Palmer Street	Milwaukee
	Station 22	8814 W. Lisbon Avenue	Milwaukee
	Station 23	1400 S. 9th Street	Milwaukee
	Station 24	4927 W. Fiebrantz Avenue	Milwaukee
	Station 26	1140 S. 26th Street	Milwaukee
	Station 27	2647 N. Bartlett Avenue	Milwaukee
	Station 28	424 N. 30th Street	Milwaukee
	Station 29	3529 S. 84th Street	Milwaukee
	Station 30	2903 N. Teutonia Avenue	Milwaukee
	Station 32	1551 N. 30th Street	Milwaukee
	Station 33	4515 W. Burnham Street	Milwaukee
	Station 34	6205 W. Burleigh Street	Milwaukee
	Station 36	4060 N. 27th Street	Milwaukee
	Station 37	5335 N. Teutonia Avenue	Milwaukee
	Station 38	8463 N. Granville Road	Milwaukee
	Station 39	8025 W. Bradley Road	Milwaukee
Oak Creek Fire Department	Station 1	7000 S. 6th Street	Oak Creek
South Milwaukee Fire Department	Station 1	929 Marshall Court	South Milwaukee
St. Francis Fire Department	Station 1	3400 E. Howard Avenue	St. Francis
Wauwatosa Fire Departments	Station 51	1601 Underwood Avenue	Wauwatosa
	Station 52	4187 N. Mayfair Road	Wauwatosa
	Station 53	10525 W. Watertown Plank Road	Wauwatosa

Table continued on next page.

Table 2.12 (Continued)

Department	Fire/EMS Station	Address	Municipality
West Allis Fire Departments	Station 61	7332 W. National Avenue	West Allis
	Station 62	2040 S. 67th Place	West Allis
	Station 63	10830 W. Lapham Street	West Allis

Source: Milwaukee County Office of Emergency Management and SEWRPC

Table 2.13
Police and Sheriff Departments Located in Milwaukee County: 2023

Municipality Police Department(s)	Address
Village of Bayside	9075 N. Regent Road
Village of Brown Deer	4800 W. Green Brook Drive
City of Cudahy	4626 S. Packard Avenue 3115 E. Ramsey Avenue
Village of Fox Point	7300 N. Santa Monica Boulevard
City of Franklin	9455 W. Loomis Road
City of Glendale	5909 N. Milwaukee River Parkway
Village of Greendale	5911 W. Grange Avenue
City of Greenfield	5300 W. Layton Avenue
Village of Hales Corners	5635 S. New Berlin Road
City of Milwaukee	749 W. State Street (Police District 1) 245 W. Lincoln Avenue (Police District 2) 2333 N. 49th Street (Police District 3) 6929 W. Silver Spring Drive (Police District 4) 2920 N. 4th Street (Police District 5) 3006 S. 27th Street (Police District 6) 3626 W. Fond du Lac Avenue (Police District 7) 2100 W. Wells Street (Police District 8) 951 N. James Lovell Street (Municipal Court)
City of Oak Creek	301 W. Ryan Road
Village of River Hills	7650 N. Pheasant Lane
Village of Shorewood	4057 N. Wilson Drive
City of South Milwaukee	2424 15th Avenue
Village of St. Francis	3400 E. Howard Avenue
City of Wauwatosa	1700 N. 116th Street
City of West Allis	11301 W. Lincoln Avenue
Village of West Milwaukee	4755 W. Beloit Road
Village of Whitefish Bay	5300 N. Marlborough Drive
Milwaukee County Courthouse	901 N. 9th Street
Milwaukee County Jail	949 N. 9th Street
Milwaukee County Sheriff	821 W. State Street
University of Milwaukee Campus	3410 N. Maryland Avenue

Source: Milwaukee County Office of Emergency Management and SEWRPC

269370 – CAPR-345 Table 2.14 Dispatch in Milwaukee County
500-1151
MAS/nkk
8/2/2023

Table 2.14
Emergency Dispatch Centers Located in Milwaukee County: 2023

Public Safety Answering Points (PSAPs)	Emergency Medical Dispatch Centers	Text-to-911 Centers
West Milwaukee Police	Cudahy	Franklin
Fox Point Police	Franklin	North Shore
South Milwaukee Police Department	Greendale/Hales Corners	Milwaukee County OEM
Brown Deer Police	North Shore	
Oak Creek Police	South Milwaukee	
Franklin Police Department	Wauwatosa	
Wauwatosa Police Department	West Milwaukee	
St. Francis Police	Milwaukee County OEM	
Bayside Village Police Department		
Glendale Police Department		
Hales Corners Police		
North Shore Public Safety Communications		
Cudahy Police		
Greendale Police & Fire		
Milwaukee Police Department		
Greenfield Police Department		
West Allis Police Department		
West Allis Police & Fire		

Source: Milwaukee County Office of Emergency Management

SEWRPC Community Assistance Planning Report No. 345

MILWAUKEE COUNTY HAZARD MITIGATION PLAN UPDATE

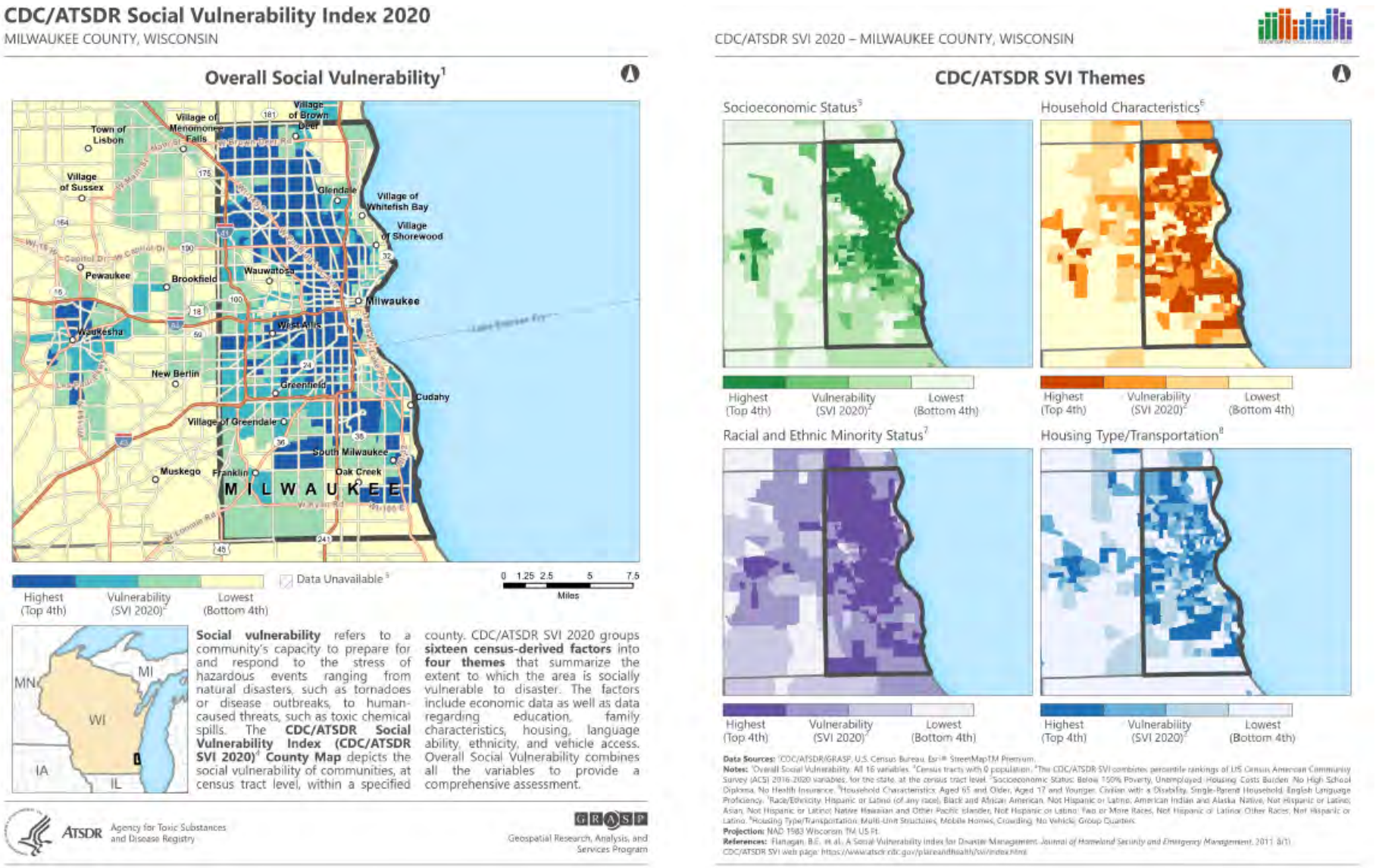
Chapter 2

BASIC STUDY AREA INVENTORY AND ANALYSIS

FIGURES

269082 – CAPR-345 Figure 2.1
500-1151
MAS/mid
1/23/2023; 8/2/2022

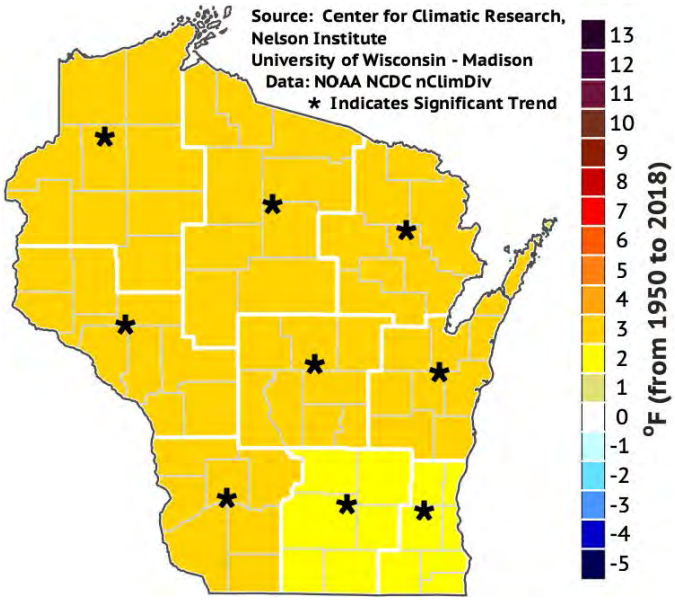
Figure 2.1
Social Vulnerability Impacts in Milwaukee County: 2020



Source: Agency for Toxic Substances and Disease Registry

268970 – CAPR-345 Figure 2.2 Change in Annual Average Temp
500-1151
MAS/mid
1/23/2023; 8/2/2022

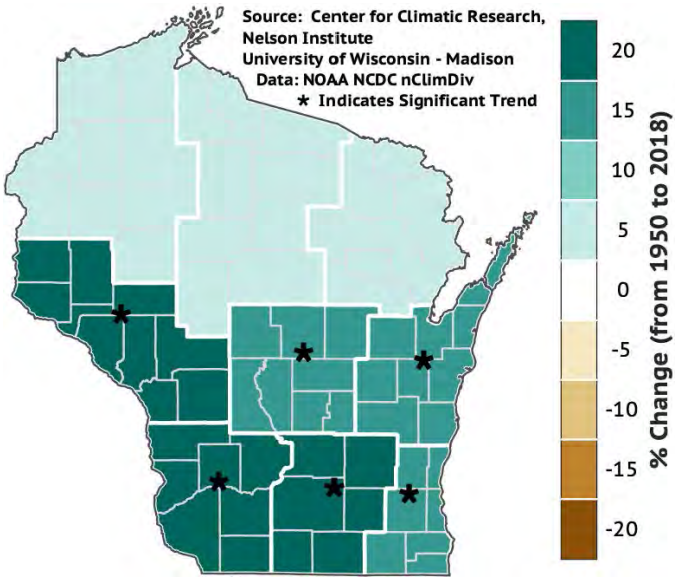
Figure 2.2
Change in Annual Average Temperature from 1950 to 2018



Source: Wisconsin Initiative on Climate Change Impacts, Trends and Projections, wicci.wisc.edu

268971 – CAPR-345 Figure 2.3 Change in Annual Precipitation
500-1151
MAS/mid
1/23/2023; 8/2/2022

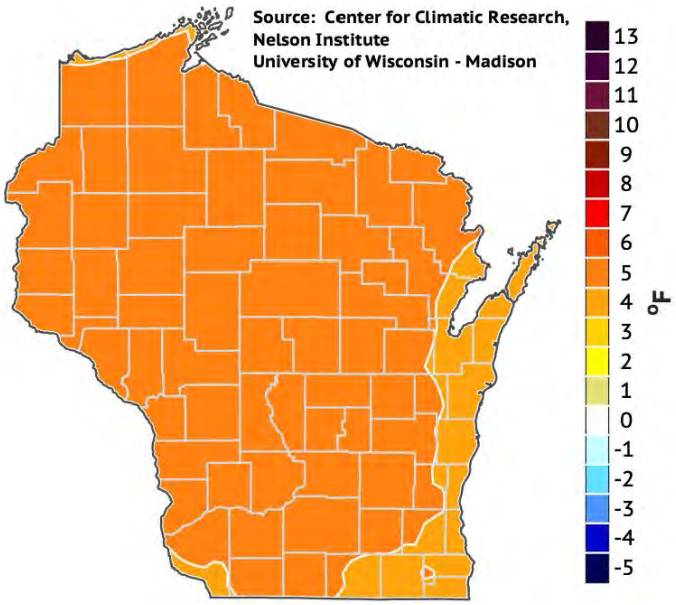
Figure 2.3
Change in Annual Precipitation from 1950 to 2018



Source: Wisconsin Initiative on Climate Change Impacts, Trends and Projections, wicci.wisc.edu

268972 – CAPR-345 Figure 2.4 Projected Change in Annual Average Temp
500-1151
MAS/mid
1/23/2023; 8/2/2022

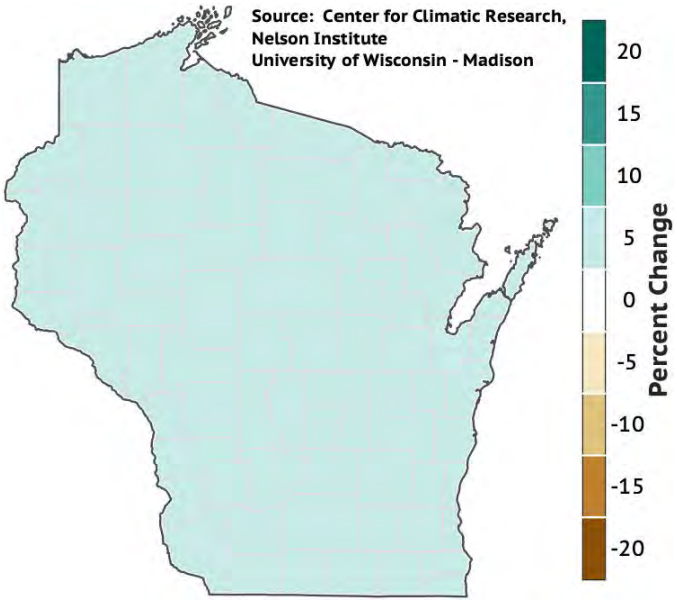
Figure 2.4
Projected Change in Annual Average Temperature from 2041 to 2060



Source: Wisconsin Initiative on Climate Change Impacts, Trends and Projections, wicci.wisc.edu

268973 – CAPR-345 Figure 2.5 Projected Change in Annual Precipitation
500-1151
MAS/mid
1/23/2023; 8/2/2022

Figure 2.5
Projected Change in Annual Precipitation from 2041 to 2060



Source: Center for Climatic Research, Statistical Downscaling for Wisconsin, ccr.nelson.wisc.edu

SEWRPC Community Assistance Planning Report No. 345

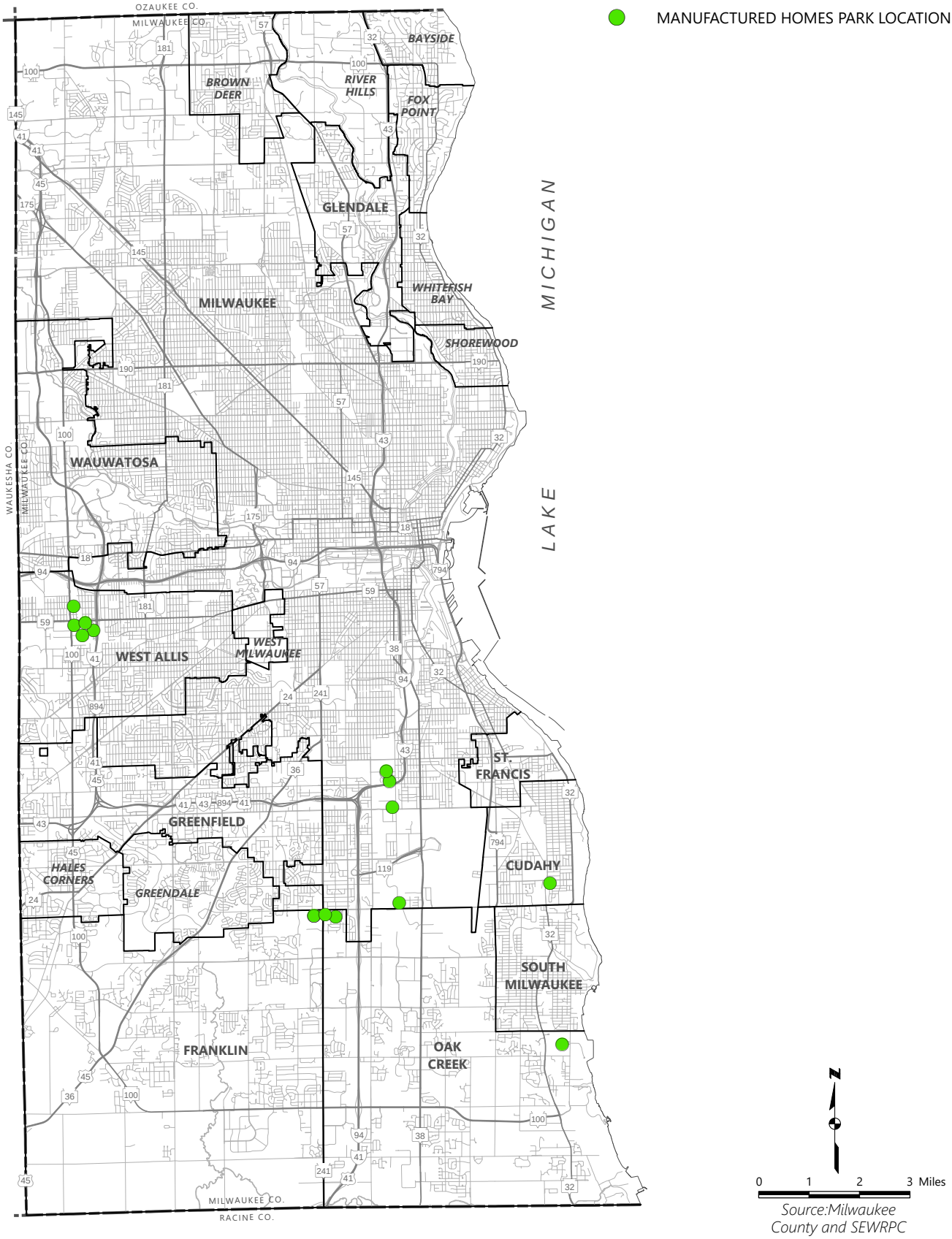
MILWAUKEE COUNTY HAZARD MITIGATION PLAN UPDATE

Chapter 2

BASIC STUDY AREA INVENTORY AND ANALYSIS

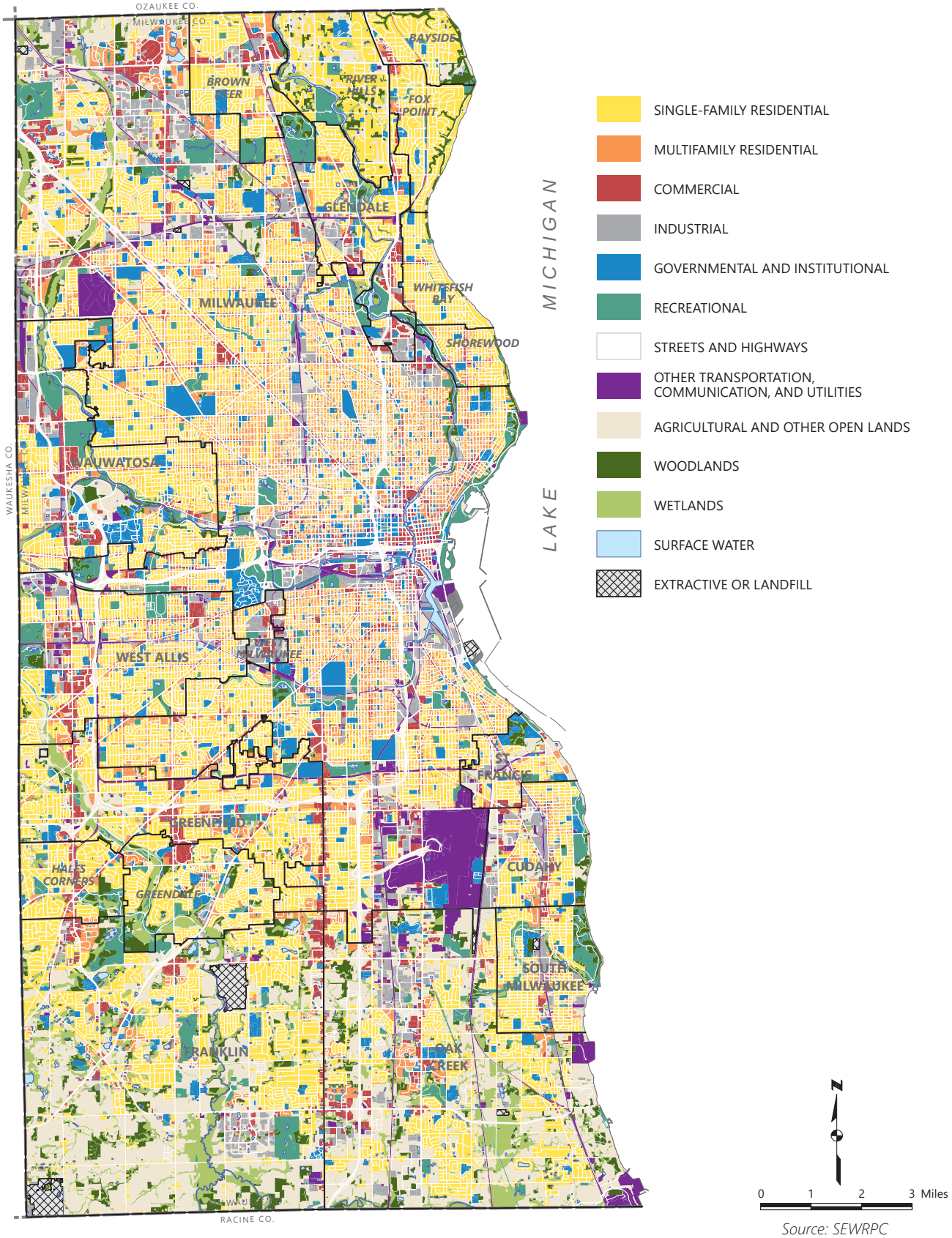
MAPS

Map 2.1
Manufactured Homes and Parks in Milwaukee County: 2023



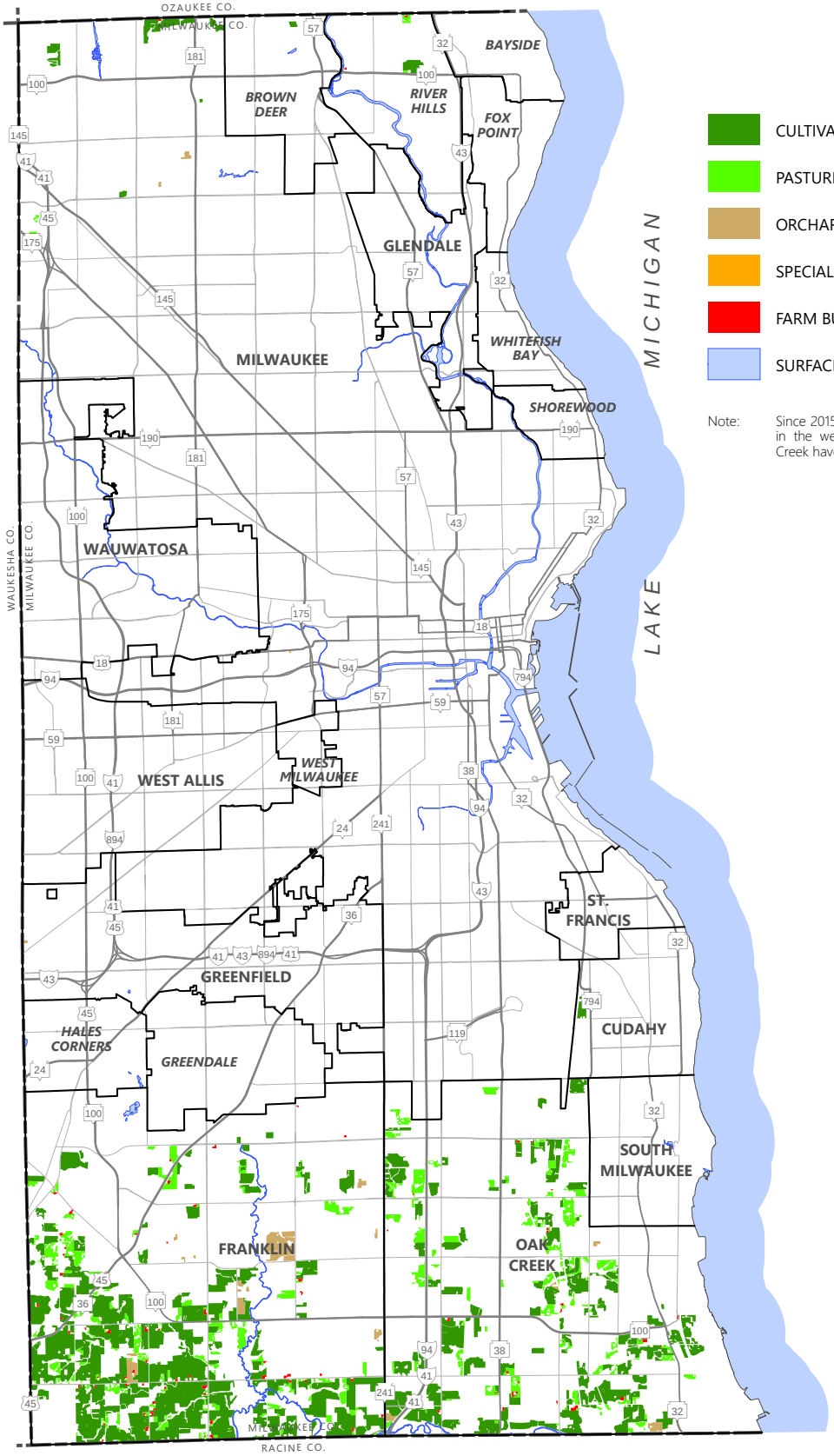
Source:Milwaukee County and SEWRPC

Map 2.2
Existing Land Use in Milwaukee County: 2015



Source: SEWRPC

Map 2.3
Agricultural Lands in Milwaukee County: 2015



CULTIVATED

PASTURE AND UNUSED AGRICULTURE

ORCHARDS AND NURSERY

SPECIAL AGRICULTURE

FARM BUILDING

SURFACE WATER

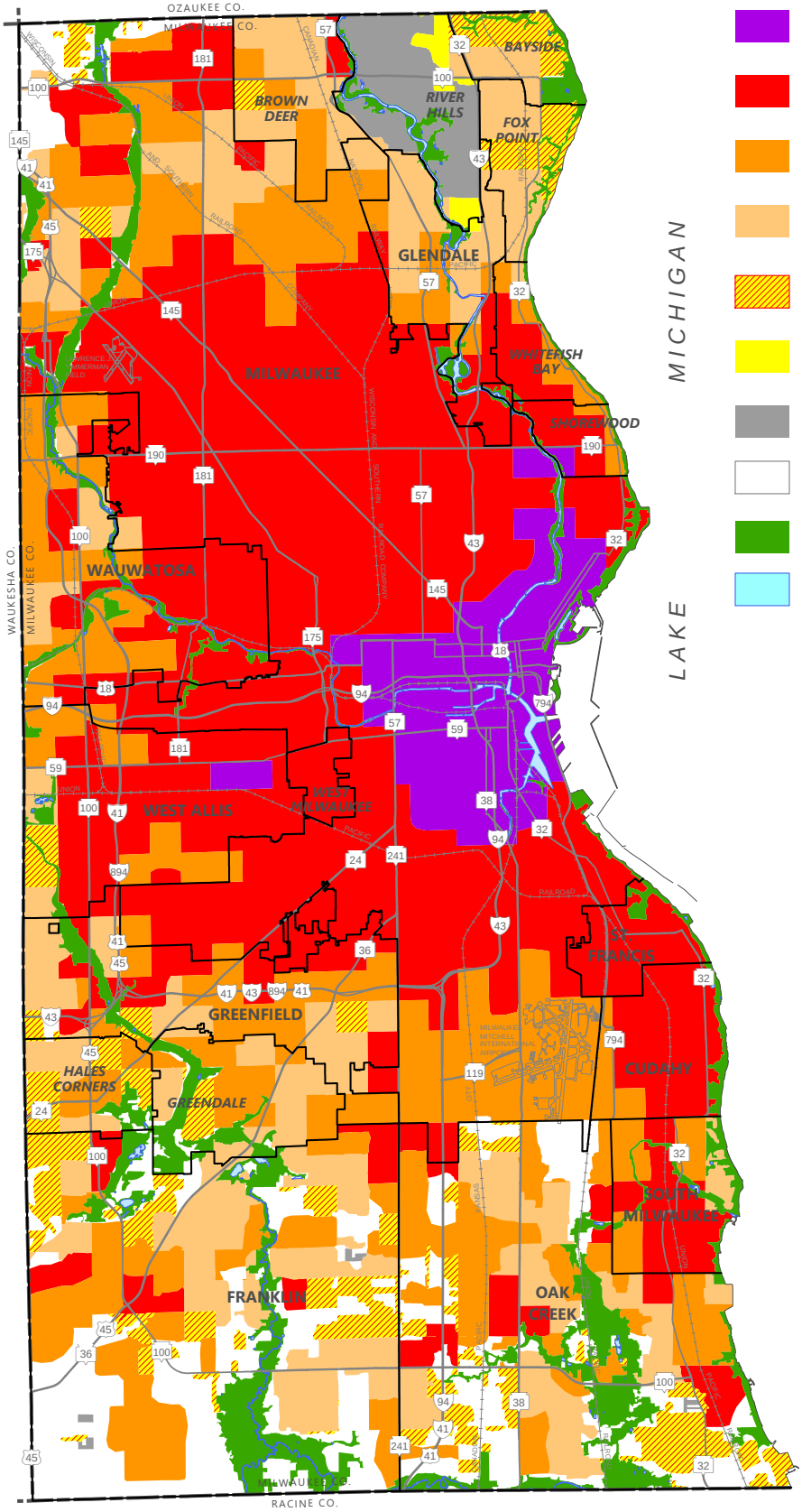
Note: Since 2015, some agricultural lands near Flak Park in the west-central portion of the City of Oak Creek have been either developed or reforested.

N

0 1 2 3 Miles

Source: SEWRPC

Map 2.4
Vision 2050 Land Use Development Pattern as it Pertains to Milwaukee County



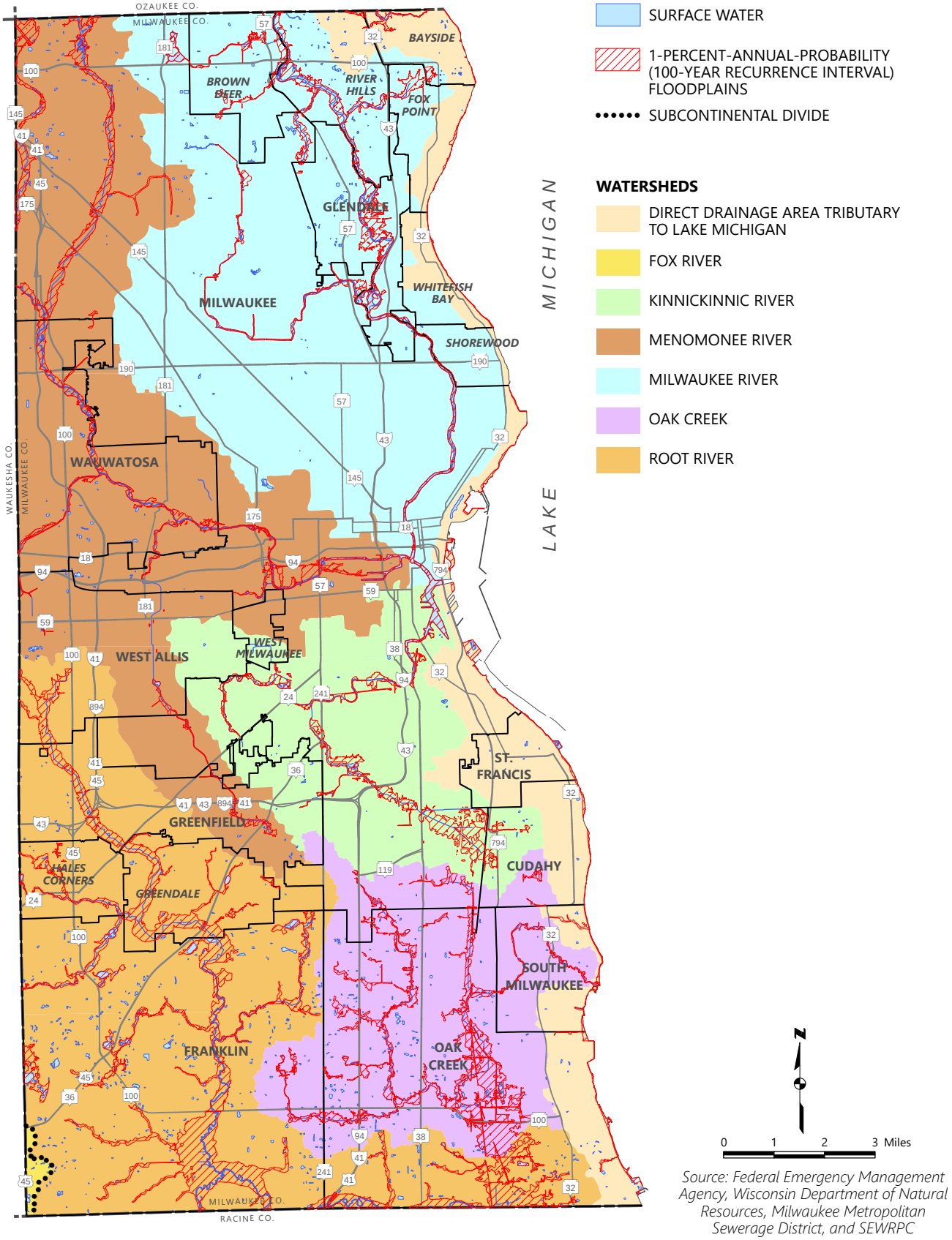
- MIXED-USE CITY CENTER
  (Residential and Other Urban Land—At Least 18.0 Dwelling Units per Net Residential Acre)
- MIXED-USE TRADITIONAL NEIGHBORHOOD
  (Residential and Other Urban Land—At Least 7.0 to 17.9 Dwelling Units per Net Residential Acre)
- SMALL LOT TRADITIONAL NEIGHBORHOOD
  (Residential and Other Urban Land—At Least 4.4 to 6.9 Dwelling Units per Net Residential Acre)
- MEDIUM LOT NEIGHBORHOOD
  (Residential and Other Urban Land—At Least 2.3 to 4.3 Dwelling Units per Net Residential Acre)
- LARGE LOT NEIGHBORHOOD
  (Residential and Other Urban Land—At Least 0.7 to 2.2 Dwelling Units per Net Residential Acre)
- LARGE LOT EXURBAN
  (Residential Land—0.2 to 0.6 Dwelling Units per Net Residential Acre)
- RURAL ESTATE
  (0.1 TO 0.2 Dwelling Units per Acre)
- AGRICULTURAL AND OTHER OPEN LANDS
- PRIMARY ENVIRONMENTAL CORRIDOR
- SURFACE WATER

N

0 1 2 3 Miles

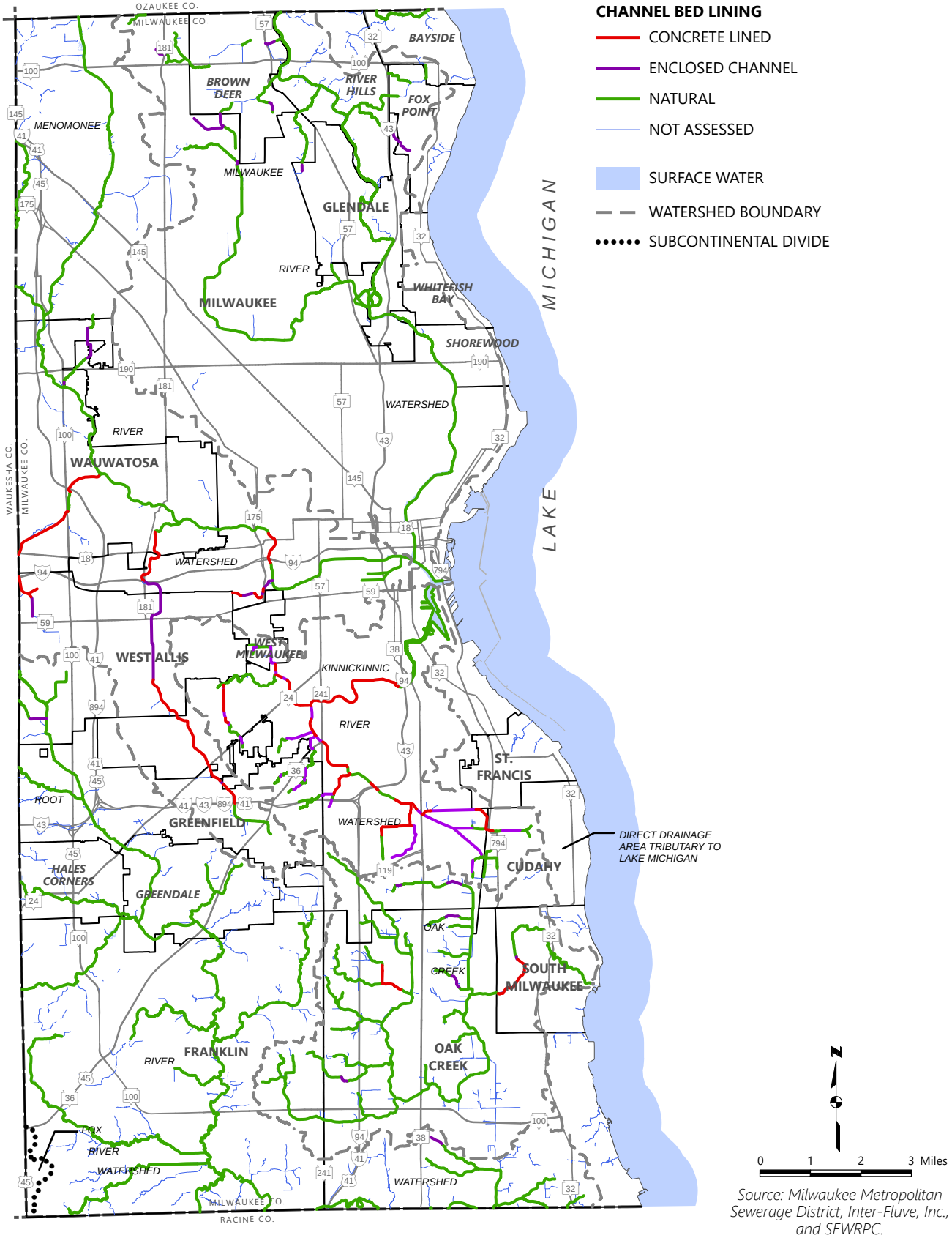
Source: SEWRPC

Map 2.5
Watersheds and Surface Waters in Milwaukee County: 2020



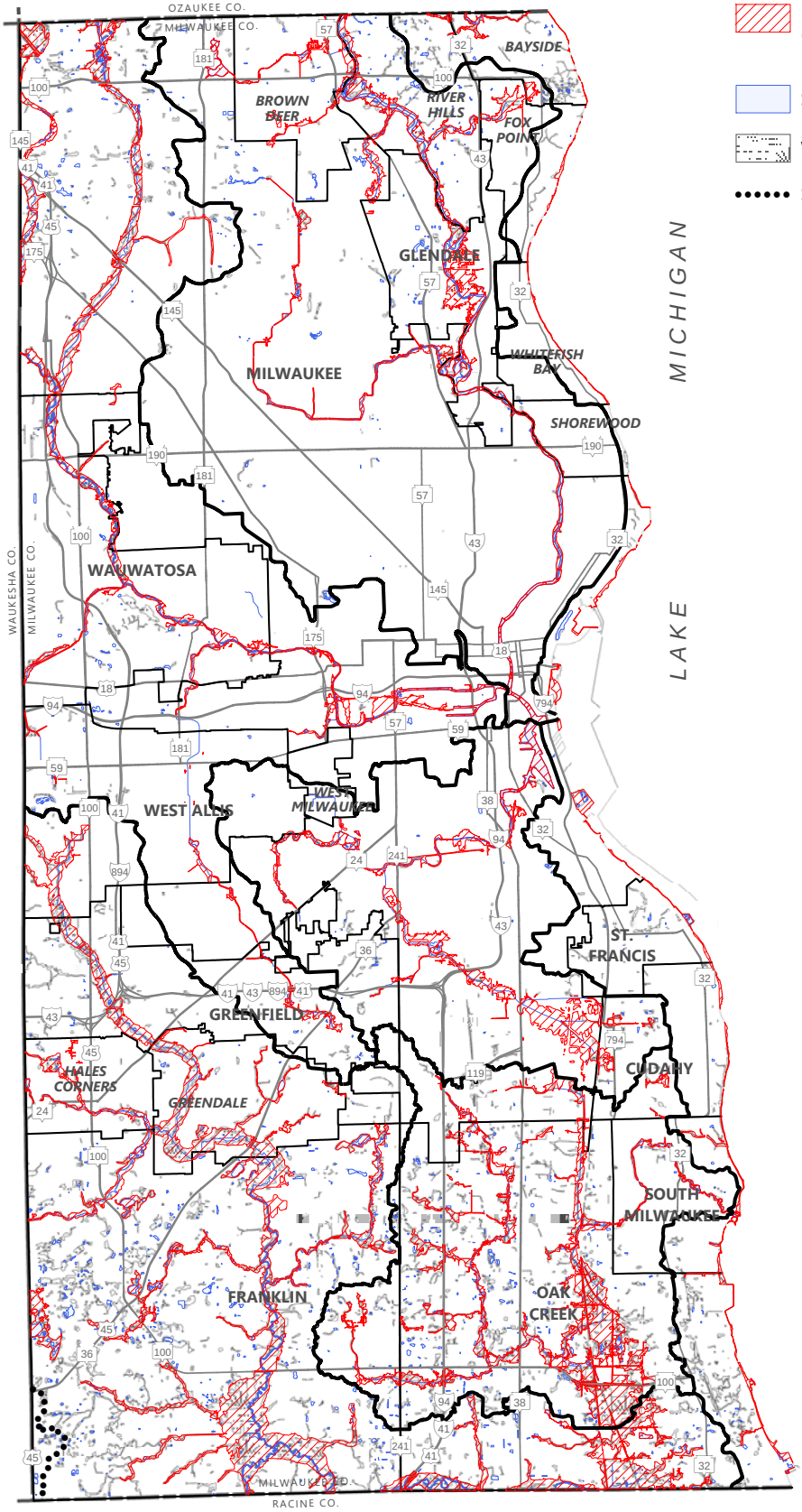
Source: Federal Emergency Management Agency, Wisconsin Department of Natural Resources, Milwaukee Metropolitan Sewerage District, and SEWRPC

Map 2.6
Stream Channel Characteristics within Milwaukee County: 2019



Source: Milwaukee Metropolitan Sewerage District, Inter-Fluve, Inc., and SEWRPC.

Map 2.7
100-Year Floodplains in Milwaukee County



1-PERCENT-ANNUAL-PROBABILITY (100-YEAR RECURRENCE INTERVAL) FLOODPLAINS

SURFACE WATER

WETLANDS

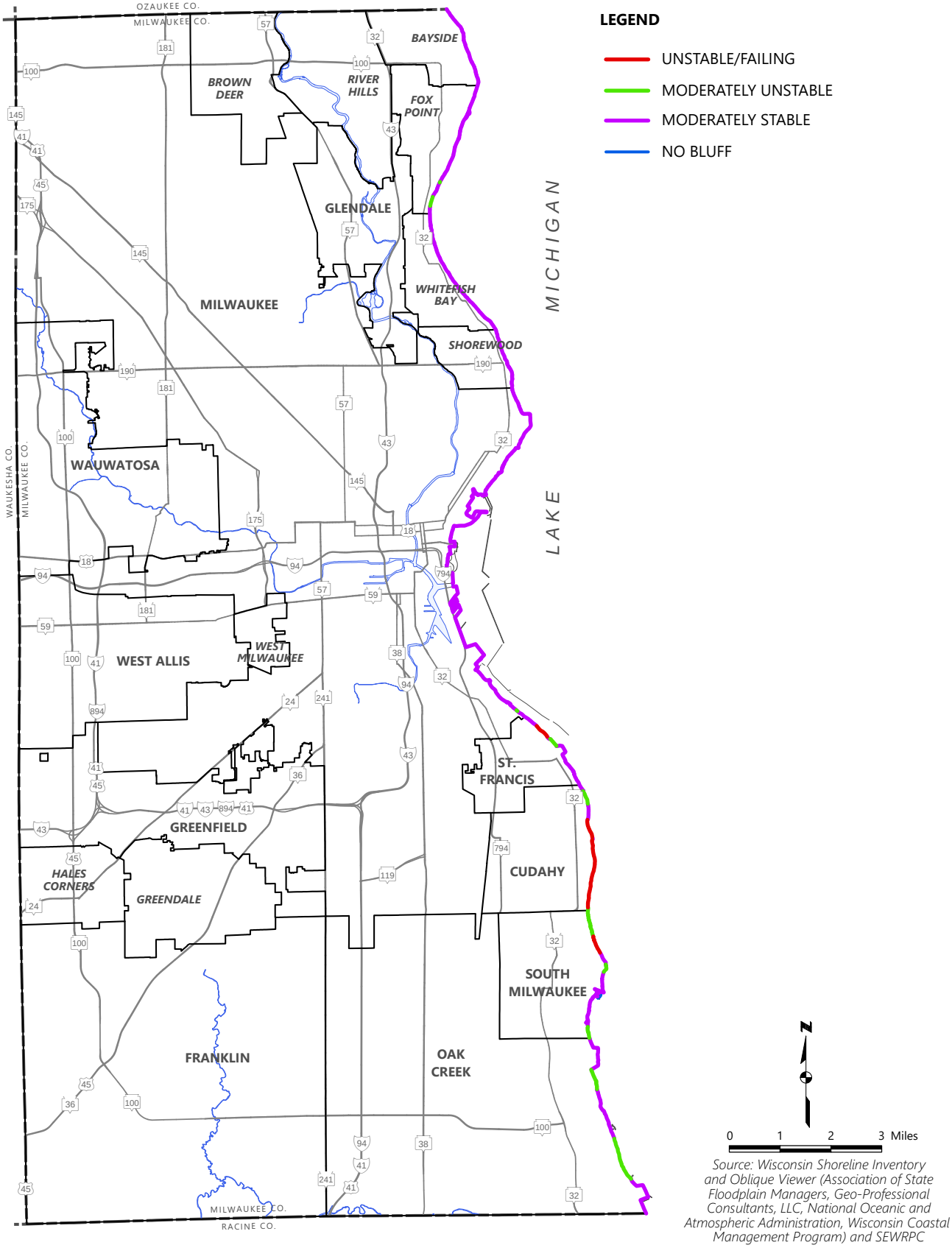
SUBCONTINENTAL DIVIDE

N

0 1 2 3 Miles

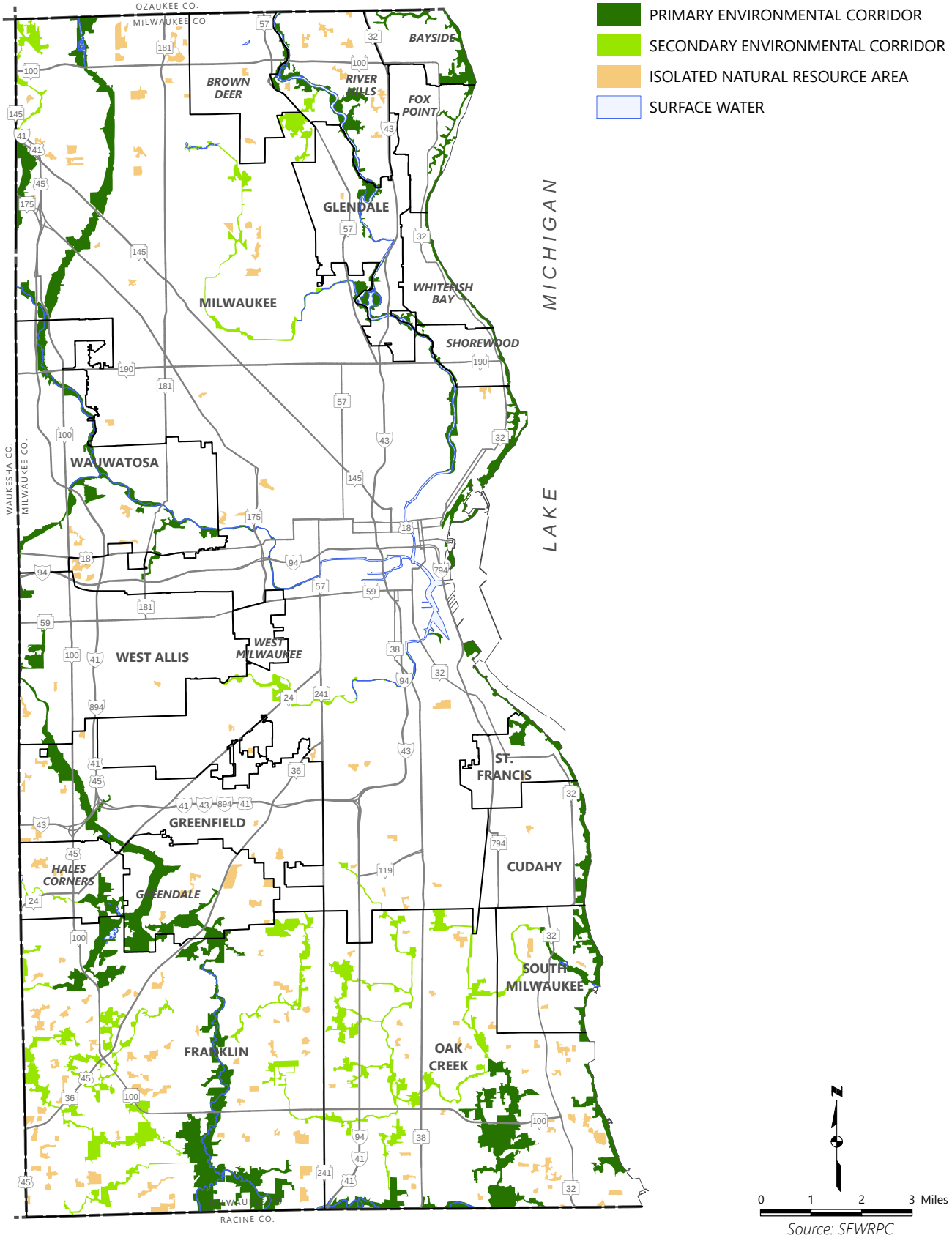
Source: Federal Emergency Management Agency, Wisconsin Department of Natural Resources, Milwaukee Metropolitan Sewerage District, and SEWRPC

Map 2.8
Bluff Conditions Along Milwaukee County Shoreline: 2018



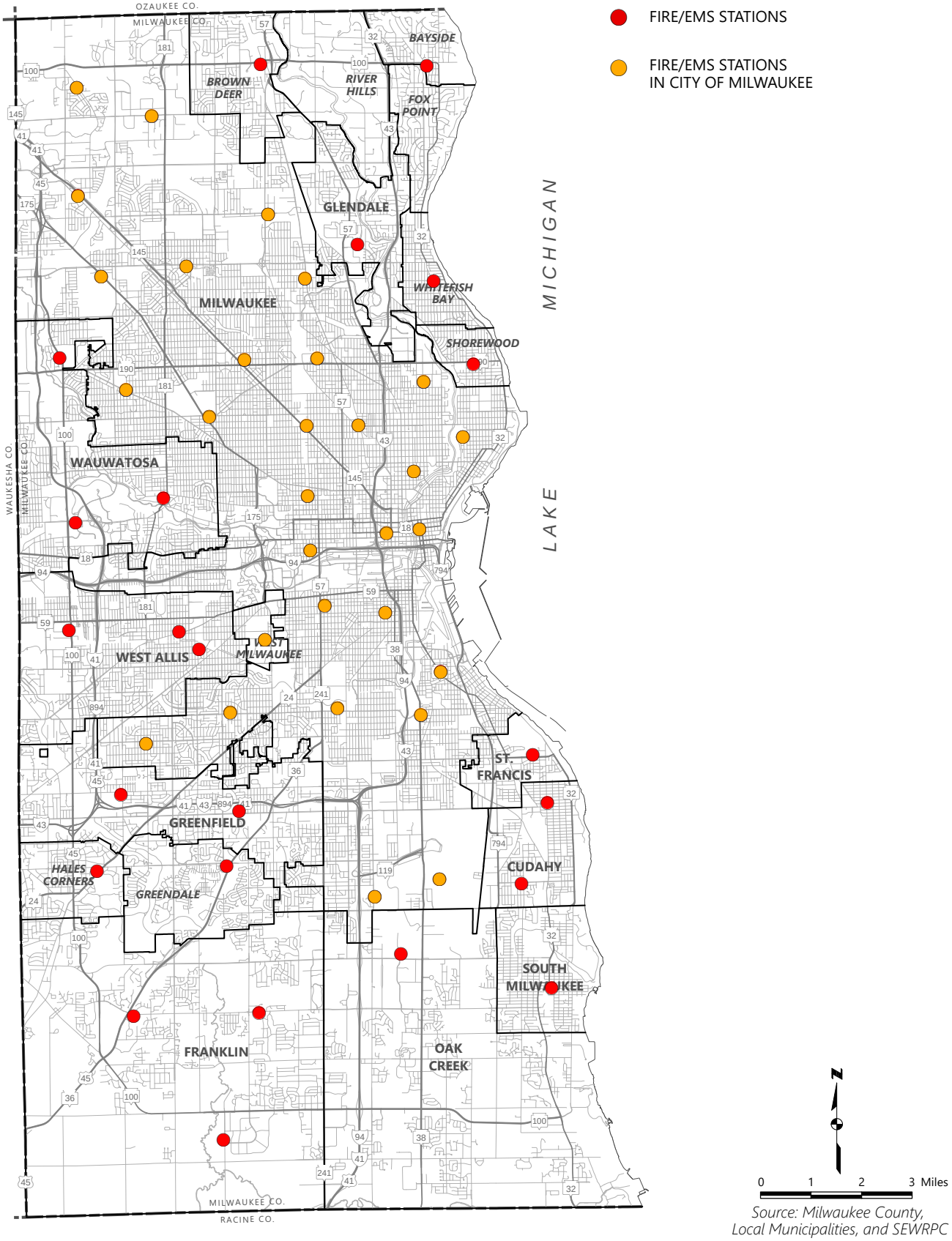
Source: Wisconsin Shoreline Inventory and Oblique Viewer (Association of State Floodplain Managers, Geo-Professional Consultants, LLC, National Oceanic and Atmospheric Administration, Wisconsin Coastal Management Program) and SEWRPC

Map 2.9
Environmental Corridors and Isolated Natural Resource Areas in Milwaukee County: 2015



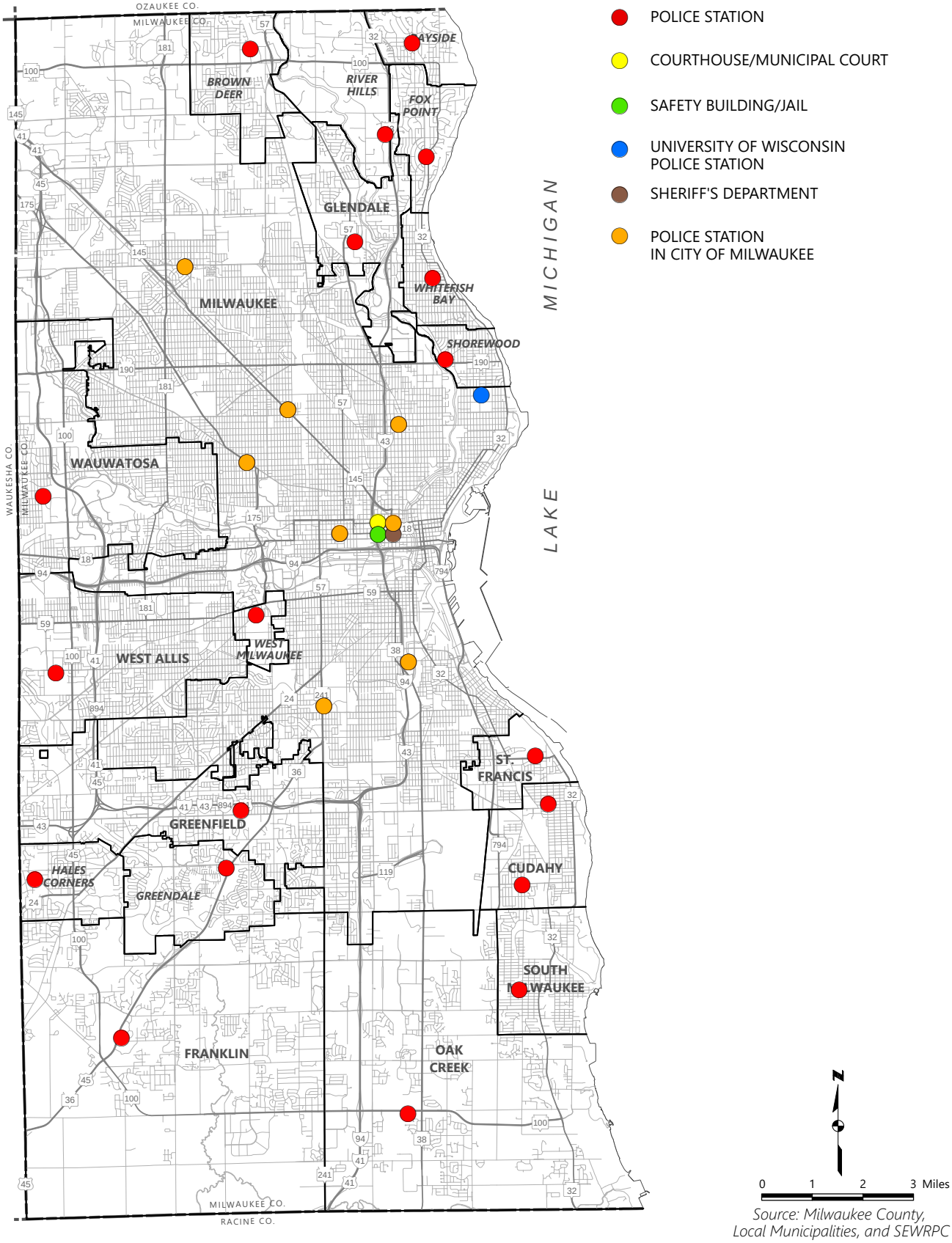
Source: SEWRPC

Map 2.10
Fire Stations and Emergency Medical Services in Milwaukee County: 2023



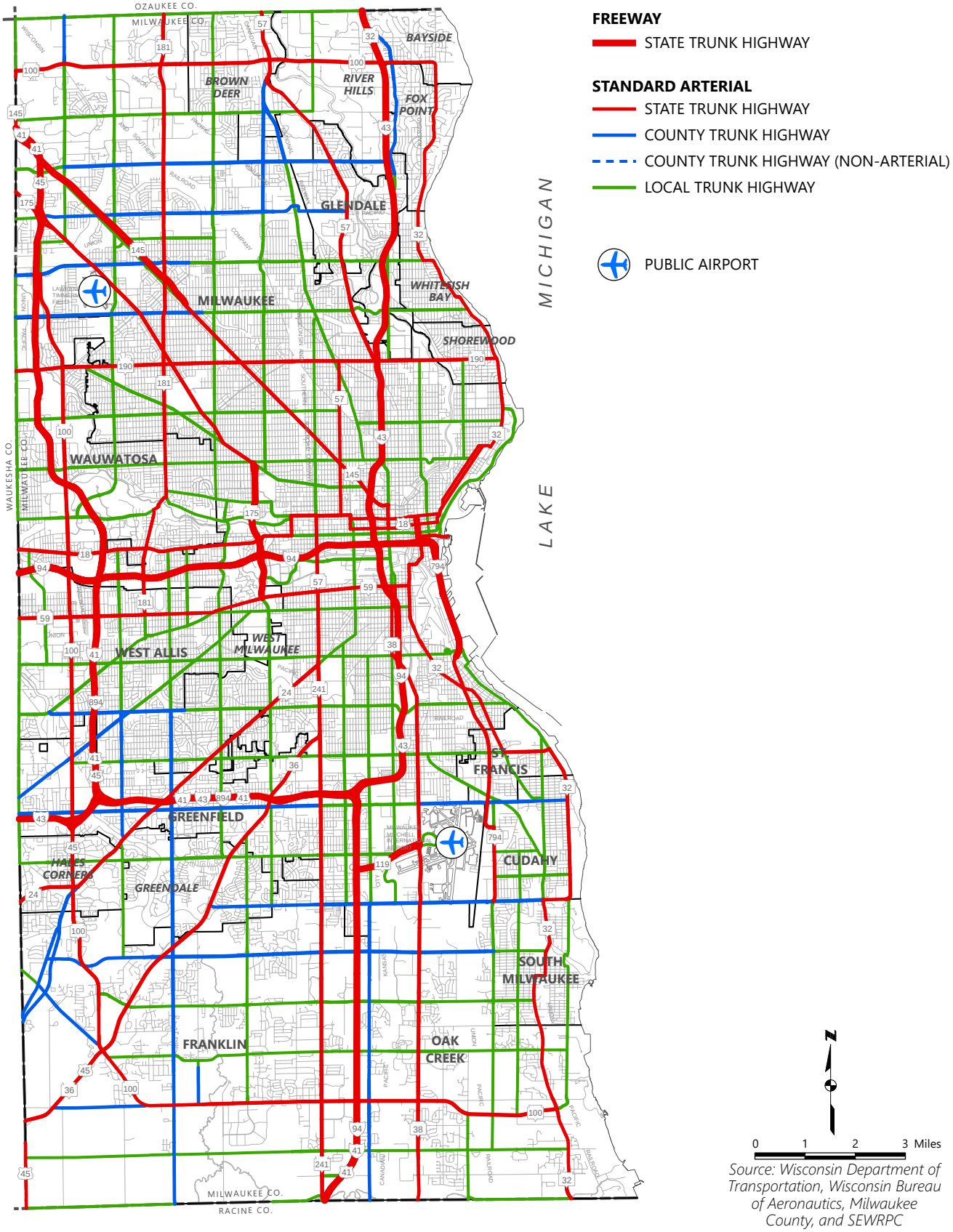
Source: Milwaukee County, Local Municipalities, and SEWRPC

Map 2.11
Law Enforcement Stations in Milwaukee County: 2023



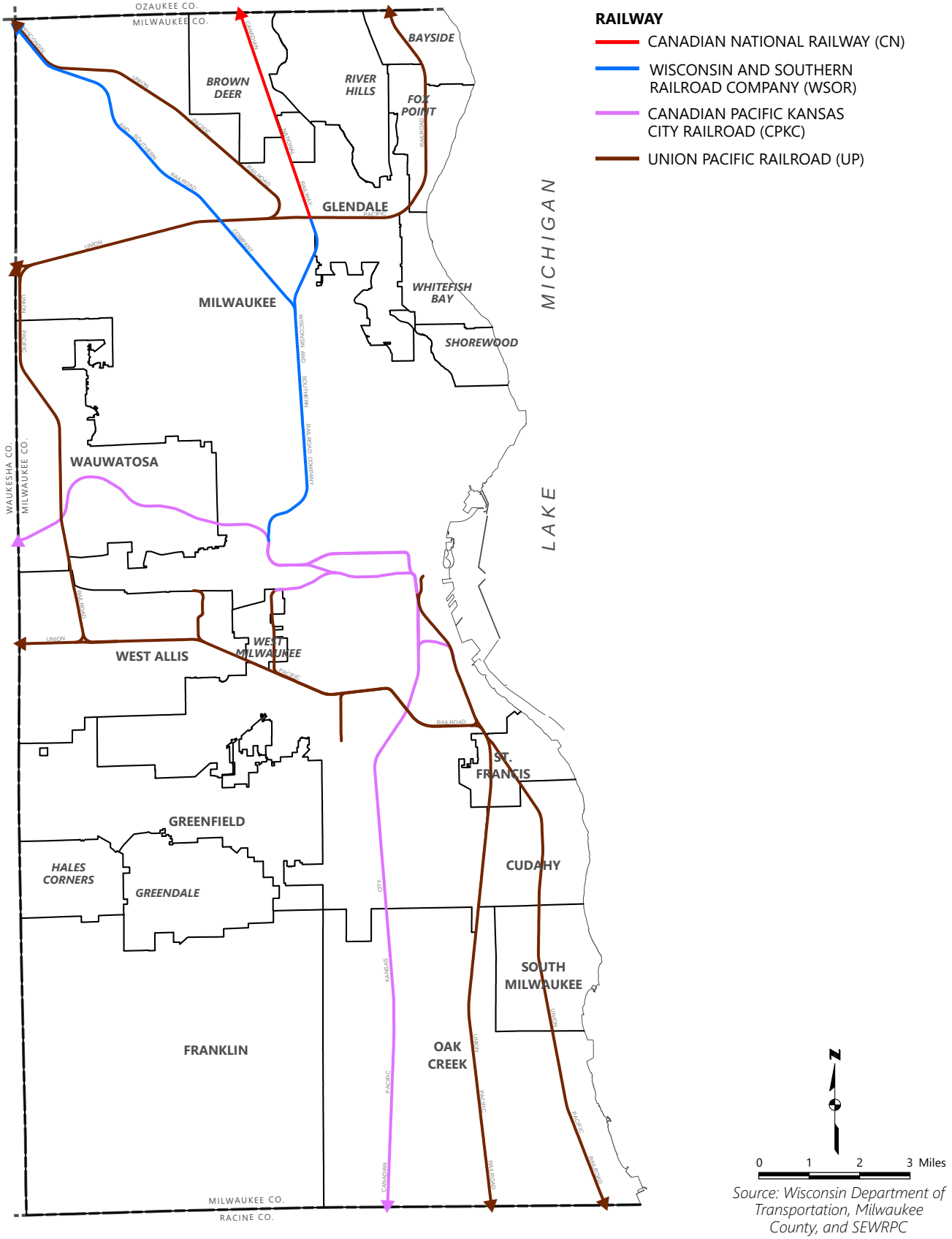
Source: Milwaukee County, Local Municipalities, and SEWRPC

Map 2.12
Major Transportation Systems in Milwaukee County: 2023



Source: Wisconsin Department of Transportation, Wisconsin Bureau of Aeronautics, Milwaukee County, and SEWRPC

Map 2.13
Railways in Milwaukee County: 2023



Source: Wisconsin Department of Transportation, Milwaukee County, and SEWRPC