COMMUNITY ASSISTANCE
PLANNING REPORT NO. 266
(4TH EDITION)

RACINE COUNTY HAZARD MITIGATION PLAN UPDATE: 2023-2028

SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION

KENOSHA COUNTY
John Holloway
Amy Maurer
Robert W. Pitts

RACINE COUNTY
Peggy L. Shumway
Vacant
Vacant

MILWAUKEE COUNTY
Donna Brown-Martin
Priscilla Coggs-Jones
Michael Maistelman

WALWORTH COUNTY
Charles L. Colman, *Chairman*
Brian E. Holt
Mary Knipper

OZAUKEE COUNTY
Thomas H. Buestrin
Natalia Minkel-Dumit
Eric Stelter

WASHINGTON COUNTY
Katrina Hanson
Jeffrey D. Schleif
David L. Stroik, *Treasurer*

WAUKESHA COUNTY
Michael A. Crowley, *Secretary*
James T. Dwyer, *Vice-Chairman*
Dewayne J. Johnson

COUNTY BOARD OF SUPERVISORS

Tom Kramer, *County Board Chair*
Scott Maier, *County Board Vice Chair*
Valena Lena Coleman
Jason Eckman
Greg Horeth
Eric Hopkins
Melissa Kaprelian
Renee Kelly
Gary Kolb
Robert N. Miller
Brett A. Nielsen
Tom Preusker
Thomas E. Roanhouse
Ernie Rossi
Tom Rutkowski
Q.A. Shakoor, II
Jody Spencer
Don Trottier
Tony Veranth
Taylor Wishau
John Wisch

MEMBERS OF THE RACINE COUNTY HAZARD MITIGATION LOCAL PLANNING TEAM

Alex Freeman, *Co-Chair*.....Racine County Office of Emergency Management
Chad Sampson, *Co-Chair*.....Racine County Department of Public Works and Development Services
Katelyn Miner, *Secretary*.....Southeastern Wisconsin Regional Planning Commission
Julie Anderson.....Racine County Department of Public Works and Development Services
Alan Babe.....City of Burlington Fire Department
Roley Behm.....Racine County Department of Public Works and Development Services
Brian Beiley.....Village of Wind Point
Jeff Berard.....Journey Disaster Response Team
Chris Birkett.....Village of Rochester
Aaron Bixby.....Waxdale Emergency Response Brigade
Daniel Bocock.....Burlington Area School District
Christopher Botsch.....Caledonia Police Department
Dotti-Kay Bowersox.....City of Racine Public Health Department
Carissa Brunner.....Racine County Public Health Division
Kim Chapman.....Sturtevant Police Department
Kim Christman.....Racine County
Jonathan Delagrave.....Racine County
Joel Dietl.....Southeastern Wisconsin Regional Planning Commission
Steve Hansen.....Racine Fire Department
Keith Hendricks.....Racine County Public Health Division
Jeff Henningfeld.....Caledonia Fire Department
Laura Herrick.....Southeastern Wisconsin Regional Planning Commission
Jeff Hintz.....City of Racine Department of City Development
Ken Hinz.....Town of Waterford Public Works Department
Rick Huening.....Village of Waterford
Zeke Jackson.....Village of Waterford
Chris Jenkins.....Village of Elmwood Park
Matt Johnson.....Waterford Police Department
Kathryn Kasper.....Village of Caledonia
Tom Kramer.....Town of Norway
Jeremy Krusemark.....City of Burlington Police Department
Stephan Kurdas.....City of Racine Public Health Department
Gary Larsen.....Caledonia Police Department
Kevan Leedle.....Raymond Fire & Rescue Department
Adrian Machalik.....Racine Fire Bells
Michael McKinney.....Village of Yorkville
Ron Molnar.....Kansasville Fire and Rescue Department
Miranda Page.....Southeastern Wisconsin Regional Planning Commission
Cody Pearce.....City of Racine Public Health Department
Blair Pfeffer.....Village of Mount Pleasant Department of Public Works
Rick Piette.....Village of Union Grove
Ron Pritzlaff.....City of Racine
Peter Reynolds.....Racine Unified School District
Peter Riggs.....City of Burlington
Mark Schall.....Village of North Bay
John Serketich.....Racine County
Robert Stedman.....South Shore Fire Department
David Stroupe.....Mount Pleasant Police Department
Skip Twardosz.....Town of Burlington
Pete Wagner.....Village of Caledonia
Bryan Walter.....Southeastern Wisconsin Regional Planning Commission
Carina Walters.....City of Burlington
Megan Watkins.....City of Burlington
Sarah Webb.....Volunteer Center of Racine County, Inc
Linsey Weber.....Village of Mount Pleasant
Brian Zmudzinski.....City of Burlington Police Department

COMMUNITY ASSISTANCE PLANNING REPORT
NUMBER 266 (4TH EDITION)

RACINE COUNTY HAZARD MITIGATION PLAN UPDATE: 2023-2028

Prepared by the
Southeastern Wisconsin Regional Planning Commission
W239 N1812 Rockwood Drive
P.O. Box 1607
Waukesha, Wisconsin 53187-1607
www.sewrpc.org

July 2024

TABLE OF CONTENTS

TABLE OF CONTENTS

CHAPTER 5
HAZARD MITIGATION STRATEGIES 101

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF MAPS

Chapter 5

LIST OF TABLES

Chapter 1

Chapter 2

Chapter 3

INTRODUCTION AND BACKGROUND 1

1.1 INTRODUCTION

In February of 2022, the Southeastern Wisconsin Regional Planning Commission (Commission), the Racine County Office of Emergency Management, and the Racine County Department of Planning and Development agreed to cooperatively prepare an update to the 2017 all-hazards mitigation plan for Racine County.[1] The plan update set forth herein is designed to be consistent with the guidelines of the Wisconsin Department of Military Affairs, Division of Emergency Management (DMA, DEM), and the Federal Emergency Management Agency (FEMA).[2] As such, this new plan update is directed to a "natural hazards only" mitigation approach. Thus, consideration is given to only natural hazard conditions such as flooding, lakeshore bluff failure, windstorms, tornadoes, extreme heat or cold, and winter storms. While the plan considers all potential natural hazards, it recognizes that only limited mitigative actions were feasible for some of these hazards, since they are not site-specific or repetitive in nature.

This planning effort focuses upon activities that are most directly related to the Racine County Office of Emergency Management. However, because of the importance in developing a partnership approach to coordinate emergency mitigation programs, the plan also incorporates consideration of programs involving other agencies, units of government, and private interests both inside and outside of the boundaries of Racine County.

The first edition of the Racine County hazard mitigation plan was set forth in Community Assistance Planning Report No. 266, *Racine County Hazard Mitigation Plan,* dated August 2004, which was adopted by the County on August 2, 2004. It was subsequently adopted by the Cities and Villages within the County. The plan was prepared by the staffs of the Racine County Office of Emergency Management and Department of Planning and Development, and the Southeastern Wisconsin Regional Planning Commission. On April 27, 2010, Racine County in cooperation with its 17 municipalities and the Southeastern Wisconsin Regional Planning Commission, adopted an update of the initial plan, entitled Community Assistance Planning Report No. 266 (2nd Edition), *Racine County Hazard Mitigation Plan Update: 2010-2015*, dated July 2010. Similarly, on November 7, 2017, Racine County adopted, in cooperation with its 17 municipalities and the Southeastern Wisconsin Regional Planning Commission, a second update entitled Community Assistance Planning Report No. 266 (3rd Edition), *Racine County Hazard Mitigation Plan Update: 2017-2022*, dated December 2017.

In preparing the initial and updated plans, the County involved other County departments as needed. In addition, the planning was coordinated with the related activities of other concerned units and agencies of government and was developed under the guidance of the Racine County Hazard Mitigation Plan Task Force.[3] The mitigation planning requirements of 44 *Code of Federal Regulations*, Section 201.6 (d) (44 CFR 201.6(d)) call for local hazard mitigation plans to be reviewed; updated to reflect changes in development, progress in local mitigation efforts, and changes in priorities; and reapproved every five years for local jurisdictions to be able to receive hazard mitigation funding. The Local Planning Team (LPT) for this 4th edition plan update includes all participating municipalities: the Cities of Burlington and Racine; the Villages of Caledonia, Elmwood

[1] *The 2017 All Hazards Mitigation Plan for Racine County, set forth in SEWRPC Community Assistance Planning Report No. 266 (3rd Edition),* Racine County Hazard Mitigation Plan Update: 2017 – 2022*, dated December 2017, was developed in accordance with FEMA's Disaster Mitigation Act of 2000 under the Pre-Disaster Mitigation Plan (P-DM) grant program.*

[2] *Federal Emergency Management Agency, State and Local Mitigation Planning How-to-Guide, "Understanding Your Risks: Identifying Hazards and Estimating Losses," Publication No. FEMA 386-2, September 3, 2015; Federal Emergency Management Agency, Multi-jurisdictional Mitigation Planning, March 10, 2009; Federal Emergency Management Agency, Local Mitigation Planning Policy Guide, April 2022.*

[3] *For the development of the initial plan and the 2009-2010 update, this group was called the Racine County Hazard Mitigation Plan Task Force. For the 2015-2017 and current plan update, the name of this group (Racine County Hazard Mitigation Plan Local Planning Team) has been changed to reflect the current terminology used by FEMA.*

Park, Mount Pleasant, North Bay, Raymond, Rochester, Sturtevant, Union Grove, Waterford, Wind Point, and Yorkville; and the Towns of Burlington, Dover, Norway, and Waterford. The participating municipalities and agencies of government are listed in Table 1.1

In assembling the Racine County Hazard Mitigation Plan Local Planning Team (LPT), the County Planning and Development Department and Office of Emergency Management sought representatives from a cross-section of community interests. Representatives from each municipality in the County were invited to participate. In addition, invitations to participate were sent by e-mail to other stakeholders such as elected and appointed officials and representatives of law enforcement agencies, fire departments, public health departments, public works departments, engineering departments, private sector firms, and nonprofit organizations. It should be noted that not all invitees chose to participate, and thus, Table 1.1 reflects only those that chose to participate from the list of representatives and stakeholders that were invited to participate.

The mitigation planning requirements identified in 44 CFR 201.6 call for all jurisdictions participating in a multi-jurisdictional hazard mitigation plan to actively take part in the planning process. Examples of participation include, but are not limited to, attending planning meetings, contributing research, data, or other information, and commenting on drafts of the plan. Tables 1.1 through 1.3 summarize municipal participation in the planning process, regulations and programs, and outreach activities, respectively, for the updated plan. Table 1.4 lists hazard mitigation activities undertaken by the municipalities in the County since the second plan update (3rd edition) was adopted in 2017.

For more complete details on the level of participation of local citizens and community groups in the Local Planning Team (LPT) for this update, the public involvement process, and summary notes for each LPT meeting, see Appendix A.

The procedures utilized in this plan update are based upon guidance provided by the Federal Emergency Management Agency and the Wisconsin Department of Military Affairs, Wisconsin Emergency Management.[4] As such, the plan is also consistent with the requirements and procedures defined in the Disaster Mitigation Act of 2000, which in part requires an analysis comprised of three components: 1) profile and analysis of hazard events, 2) inventory of vulnerability assessment of community assets, and 3) development of hazard mitigation strategies.

1.2 OVERVIEW OF STUDY AREA

Racine County is located in Southeastern Wisconsin, and is bordered on the east by Lake Michigan, on the north by Milwaukee and Waukesha Counties, on the west by Walworth County, and on the south by Kenosha County. The impacts of urbanization in the greater Milwaukee and Chicago metropolitan areas are increasingly affecting the County.

Racine County covers about 340 square miles and contains two cities, eleven villages, and four towns, as shown on Map 1.1. Table 1.2 details the total area and percent of the whole county area for each city, village, and town. It can also be noted that all or parts of five natural watersheds and a total of about 4,000 acres of inland surface waters are located within the County. The County has a diversified natural resource base, including the Lake Michigan nearshore area, several major inland lakes (Browns Lake, Eagle Lake, Tichigan Lake, and Wind Lake), two major river systems (the Fox River and the Root River), and numerous smaller lakes, rivers, and streams.

The majority of the population resides in the eastern portion of the County, within the City of Racine and the Villages of Caledonia, Mt. Pleasant, and Sturtevant. However, population centers are also found in the western communities, including the City of Burlington and the Villages of Rochester, Union Grove, and Waterford, and in the vicinity of the major lakes, including the Bohner Lake , Browns Lake, Eagle Lake, Tichigan Lake, and Wind Lake areas. Much of the land in the County remains in agriculture, but the dairy

[4] *Federal Emergency Management Agency, State and Local Mitigation Planning How-to Guide, "Understanding Your Risks, Identifying Hazards and Estimating Losses," Publication No. FEMA 386-2, August 2001; Federal Emergency Management Agency, Local Multi-Hazard Mitigation Planning Guidance, July 1, 2008. Federal Emergency Management Agency, Local Mitigation Planning Handbook, March 2013. See also Federal Emergency Management Agency, State and Local Plan Interim Criteria under the Disaster Mitigation Act of 2000, July 11, 2002.*

Table 1.1
Participation in the Racine County Hazard Mitigation Plan Update Planning Process: May 2023

Community	Attendance at Local Planning Team Meetings		Provision of Data[a]	Review of Report
	April 13, 2022	May 31, 2023		
County				
Racine County	X	X	X	X
Cities				
Burlington	X	X	X	X
Racine	X	X	X	X
Villages				
Caledonia	X	X	X	X
Elmwood Park	--	--	X	--
Mount Pleasant	X	X	X	X
North Bay	--	--	X	--
Raymond	X	--	X	X
Rochester	--	--	X	--
Sturtevant	X	--	X	X
Union Grove	X	X	X	X
Waterford	X	--	X	X
Wind Point	--	X	--	X
Yorkville	--	--	X	--
Towns				
Burlington	X	--	X	X
Dover	X	--	X	X
Norway	--	X	--	X
Waterford	X	--	--	X
Other Stakeholders				
State of Wisconsin	--	--	X	X
Southeastern Wisconsin Regional Planning Commission	X	X	X	X
Racine County Public Health Division	X	X	X	X
Mount Pleasant Aurora Health Network	X	--	--	X
Racine Unified School District	X	--	--	X

Note: "X" indicates participation by at least one representative of the municipality or organization.

[a] *Provision of data includes providing information on hazards experienced, projects undertaken, and outreach efforts as well as sharing of relevant plans, reports, and concerns.*

Source: SEWRPC

industry (which was once the primary agricultural use) has steadily declined. The major industries within the County are generally located along and east of Interstate Highway (IH) 94, with smaller amounts of industrial development located in the other urban centers.

1.3 RELATIONSHIP OF HAZARD MITIGATION PLANNING TO OTHER PLANNING MECHANISMS

The focus of this planning effort is upon natural hazard mitigation measures. Such measures generally involve lasting, often permanent, measures designed to reduce the exposure to, probability of, or potential loss from hazardous events, and are intended to be in place well in advance of any hazardous events. Such measures tend to focus on actions related to where and how to build structures, education to reduce losses or injury, and programs to improve the safety of identified hazard areas. A hazard mitigation plan outlines the strategy for mitigating the hazards potentially impacting a county or community.

The mitigation plan should be distinguished from, but compatible with, an emergency operations plan. An emergency operations plan is defined as a plan which describes how people and property will be protected in and during disaster and disaster threat situations (such as rescuing those trapped in flooded homes, issuing evacuation orders, or providing shelter for those whose homes have been severely damaged; details

Table 1.2
Areal Extent of Civil Divisions in Racine County: 2021

Community	Area		Percent of County Area
	Acres	Square Miles	
Cities			
Burlington	4,909	7.7	2.3
Racine	10,050	15.7	4.6
Villages			
Caledonia	29,175	45.6	13.4
Elmwood Park	98	0.2	<0.1
Mount Pleasant	21,752	33.9	10.0
North Bay	68	0.1	<0.1
Raymond	22,878	35.7	10.5
Rochester	11,312	17.7	5.2
Sturtevant	2,636	4.1	1.2
Union Grove	1,661	2.6	0.8
Waterford	1,620	2.5	0.7
Wind Point	827	1.3	0.4
Yorkville	21,535	33.6	9.9
Towns			
Burlington	21,918	34.2	10.1
Dover	23,146	36.2	10.6
Norway	22,837	35.7	10.5
Waterford	21,541	33.7	9.9
Total	217,963	340.5	100.0

Source: SEWRPC

Table 1.3
Regulations and Programs Within Racine County Related to Hazard Mitigation

Community	General Zoning	Floodplain Zoning	Stormwater Management Ordinance or Plan	Shoreland or Shoreland Wetland Zoning	Emergency Operations Ordinance or Plan
County					
Racine County	Adopted	Adopted	Yes	Adopted	Yes
Cities					
Burlington	Adopted	Adopted	Yes	Adopted	Yes
Racine	Adopted	Adopted	Yes	Adopted	Yes
Villages					
Caledonia	Adopted	Adopted	Yes	Adopted	Yes
Elmwood Park	Adopted	--	Yes	--	Yes
Mount Pleasant	Adopted	Adopted	Yes	Adopted	Yes
North Bay	Adopted	--	Yes	--	--
Raymond	County Ordinance	County Ordinance	Yes	County Ordinance	--
Rochester	Adopted	Adopted	Yes	Adopted	Yes
Sturtevant	Adopted	Adopted	Yes	Adopted	Yes
Union Grove	Adopted	Adopted	Yes	--	--
Waterford	Adopted	Adopted	Yes	Adopted	Yes
Wind Point	Adopted	Adopted	Yes	Adopted	Yes
Yorkville	Adopted	Adopted	Yes	Adopted	--
Towns					
Burlington	County Ordinance	County Ordinance	Yes[a]	County Ordinance	Yes
Dover	County Ordinance	County Ordinance	Yes[a]	County Ordinance	--
Norway	County Ordinance	County Ordinance	Yes[a]	County Ordinance	--
Waterford	County Ordinance	County Ordinance	Yes[a]	County Ordinance	Yes

[a] *The Towns have adopted stormwater management ordinances or regulations. The Towns are also regulated under the County. In the event of conflicting regulations between the Town and County ordinances, the more restrictive regulation applies.*

Source: Racine County Office of Emergency Management and Department of Planning and Development, Racine County Municipalities, and SEWRPC

Table 1.4
Outreach Activities by Local Communities in Racine County Related to Hazard Mitigation

Community	Activity
Racine County	County website Office of Emergency Management webpages Ready Racine County Facebook page Ready Racine quarterly newsletter Contract with Root-Pike WIN for stormwater education and outreach Annual outreach on preparedness efforts CERT Certification classes for youth
City of Burlington	City website Quarterly newsletter Email and text message information notices (Notify Me) City Facebook page City Twitter account City Fire Department Facebook page City Police Department Facebook page Press Releases Contract with Racine County Public Health Division for public health services and outreach City Police Department hosts annual 2-week Safety Town Program for youth
City of Racine	City website Email newsletter City Twitter account City Police Department Twitter account Health Department Facebook and Twitter page Contract with Nixle to send out geographically specific emergency alerts to wireless devices Contract with Root-Pike WIN for stormwater education and outreach
Village of Caledonia	Village website Village Police Department Facebook page Village Fire Department Facebook page Village Fire Department open house Village Fire Department yearly fire safety school program Village Police and Fire Department Safety Day Contract with Root-Pike WIN for stormwater education and outreach Contract with Racine County Public Health Division for public health services and outreach
Village of Elmwood Park	Village website Quarterly newsletter Village Facebook page Village Email Informational Notices
Village of Mount Pleasant	Village website Village Facebook page Village Twitter account Village Police Department Facebook page Contract with Root-Pike WIN for stormwater education and outreach Contract with Racine County Public Health Division for public health services and outreach Village staff meet with residents on regular basis to address concerns
Village of North Bay	Village website Quarterly Newsletter Village Email Informational Notices Contract with Racine County Public Health Division for public health services and outreach
Village of Raymond	Town website Yearly newsletter Various public education events Contract with Racine County Public Health Division for public health services and outreach
Village of Rochester	Quarterly newsletter Compiling list of special needs residents who would need special assistance in the event of a disaster Visits by public works staff to homes at risk of flooding in the event of upstream dam failure to inform and advise residents Email and text message information notices Village Facebook page Contract with Racine County Public Health Division for public health services and outreach

Table continued on next page.

Table 1.4 (Continued)

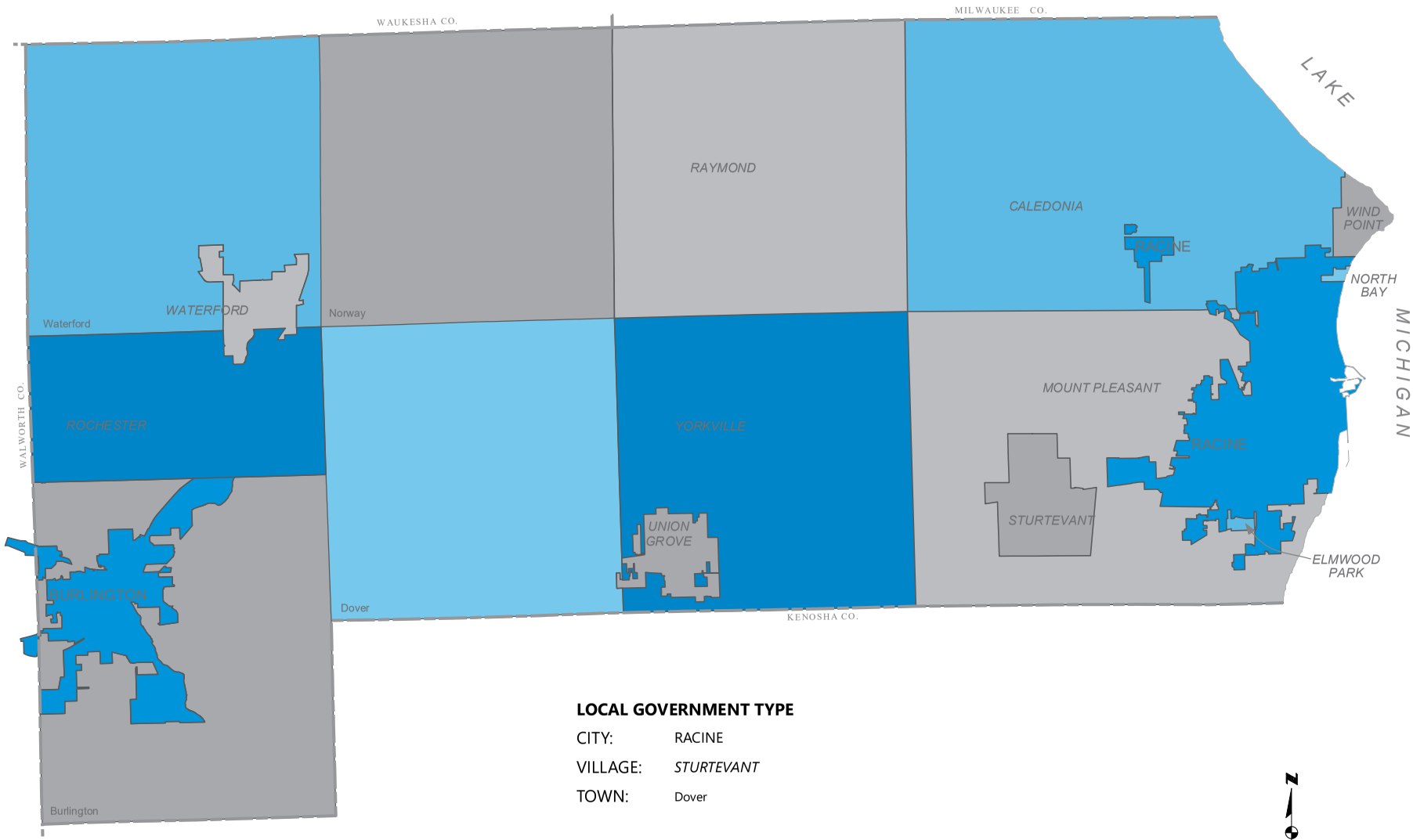
Community	Activity
Village of Sturtevant	Village website Quarterly newsletter Village Police Department Facebook page Contract with Root-Pike WIN for stormwater education and outreach Member of the Racine County Local Emergency Planning Committee (LEPC) Work closely with Racine County Public Health Division for public health services and outreach
Village of Union Grove	Village website Quarterly newsletter Village Facebook page Contract with Racine County Public Health Division for public health services and outreach
Village of Waterford	Village website Quarterly newsletter Press releases Contract with Racine County Public Health Division for public health services and outreach
Village of Wind Point	Village website Monthly E-newsletter Village Facebook page Village Twitter account Contract with Root-Pike WIN for stormwater education and outreach
Village of Yorkville	Village website Quarterly newsletter Village Facebook page Public health services and outreach provided by Racine County Public Health Division
Town of Burlington	Town website Fire department Facebook page Contract with Racine County Public Health Division for public health services and outreach
Town of Dover	Town website Yearly newsletter Kansasville Fire and Rescue website Town of Dover Water Patrol Facebook page Fire department safety school program Contract with Racine County Public Health Division for public health services and outreach
Town of Norway	Town website Quarterly newsletter Town Facebook page Wind Lake Fire Department website Contract with Racine County Public Health Division for public health services and outreach
Town of Waterford	Town website Town Police Department Facebook page Contract with Racine County Public Health Division for public health services and outreach

Source: Racine County Office of Emergency Management, Local Municipalities, and SEWRPC

who is responsible for carrying out specific actions; identifies the personnel, equipment, facilities, supplies, and other resources available for use in the disaster; and outlines how all actions will be coordinated. Numerous such plans have been developed at the jurisdictional level, and often involve mutual assistance and cooperation agreements between local units of government in adjoining municipalities, both within and outside of Racine County.

Plans for mitigating natural hazards are also often related to emergency operation activities involving short-term recovery decision-making, since such activities may highlight prospects for implementation of a mitigation strategy aimed at reducing long-term risk to human life and property. Short term recovery efforts may include the provision of redundancy or other enhancements or improvements to critical essential services such as power, communication, water, sewage, and transportation systems.

Map 1.1
Civil Division Boundaries in Racine County: 2022



Source: Racine County and SEWRPC

Emergency Operations Planning

Racine County has developed a comprehensive emergency management plan[5] which sets forth an all-hazards action plan. In addition, many of the local units of government have developed emergency operations plans and/or programs which complement the County plan, and which also sets forth procedures and actions to deal with a range of situations and events. Racine County's comprehensive emergency management plan notes that the County is exposed to many hazards that have the potential for disrupting the community, causing damage, and creating casualties. In regard to natural hazards, in addition to flooding, the plan recognizes that the County is vulnerable to other natural hazards including tornadoes and severe weather. Other hazards related either directly or indirectly to natural hazard events may include technological hazards, accidents involving hazardous materials, terrorism and civil disorder, and utility hazards such as power failure and water shortages or contamination.

The County plan includes procedures and protocols to respond to disasters or large-scale emergencies. The purpose and goal of the County emergency operations plan is to assist government in protecting lives, property, and the environment from major emergencies through addressing the areas of mitigation, preparedness, response, and recovery. This basic plan is the core of the Racine County emergency operations program. It provides policy for department and agency managers and emergency management professionals to use in planning and actual operations. In response to a disaster or large-scale emergency, all local government forces, including law enforcement, fire, medical, health, public works, and others, will be considered a part of the County's emergency management organization, and will be the first line responders to such an emergency. When the emergency or disaster exceeds the capability of the local government and the County to respond, assistance will be requested from the State of Wisconsin. The Federal government will aid the State of Wisconsin when it is determined that the severity, magnitude, and damages exceed local and state resources. The County plan includes elements on direction and control, warning and communications, and management of resources during emergency situations.

Regulations and Programs Related to Hazard Mitigation

The current ordinances and programs which are most directly related to hazard mitigation and plan implementation include general zoning, floodland zoning, shoreland or shoreland–wetland zoning regulations, and emergency operations programs. Those ordinances and operations programs administered by Racine County and the local units of government in the County are summarized in Table 1.3.

General Zoning

Cities in Wisconsin are granted general, or comprehensive, zoning powers under Section 62.23 of the *Wisconsin Statutes*. The same powers are granted to villages under Section 61.35 of the *Wisconsin Statutes*. Counties are granted general zoning powers within their unincorporated areas under Section 59.69 of the *Wisconsin Statutes*. General zoning is in effect in all communities in Racine County. The four towns of Burlington, Dover, Norway, and Waterford are under the jurisdiction of the County zoning ordinance, which is administered jointly by Racine County and the towns.

Floodplain Zoning

Section 87.30 of the *Wisconsin Statutes* requires that cities, villages, and counties with respect to their unincorporated areas, adopt floodplain zoning to preserve floodplain areas and to prevent the location of new flood damage-prone development in flood hazard areas. The minimum standards that such ordinances must meet are set forth in Chapter NR 116, "Wisconsin's Floodplain Management Program", of the *Wisconsin Administrative Code*. Under Chapter NR 116, local floodplain zoning regulations must prohibit nearly all forms of development within the floodway. Local regulations must also restrict filling and development within the flood fringe. The County Shoreland and Floodplain Zoning Ordinance applies in all of the unincorporated areas of the towns in Racine County. All incorporated cities and villages, where floodplains have been identified, have adopted floodplain zoning ordinances. The two municipalities without floodplain ordinances, the Villages of Elmwood Park and North Bay have no identified flood hazard areas within their boundaries.

[5] *Racine County, Wisconsin, Comprehensive Emergency Management Plan (CEMP), [Racine County, Racine Wisconsin], 2022.*

Shoreland and Shoreland-Wetland Zoning

Under Section 59.692 of the *Wisconsin Statutes*, counties in Wisconsin are required to adopt zoning regulations within their unincorporated areas—depending upon whichever distance is greater—that are either:

1. Within statutorily defined shoreland areas
2. Or lands that are within 1,000 feet of the ordinary high-water mark (OHWM) of a navigable lake, pond, or flowage
3. Or 300 feet of the OHWM of a navigable stream
4. Or to the landward side of the floodplain

Standards for county shoreland zoning ordinances are set forth in Chapter NR 115, "Wisconsin's Shoreland Protection Program", of the *Wisconsin Administrative Code*.[6] Chapter NR 115 sets forth requirements regarding lot sizes and building setbacks; restrictions on cutting of trees and shrubbery; and restrictions on filling, grading, lagooning, dredging, ditching, and excavating that must be incorporated into county shoreland zoning regulations. In addition, Chapter NR 115 requires that counties place all wetlands five acres or larger and within the statutory shoreland zoning jurisdiction area into a wetland conservancy zoning district to ensure their preservation after completion of appropriate wetland inventories by the WDNR.

County shoreland-wetland zoning ordinances are in effect in all unincorporated areas of Racine County. The incorporated Cities of Burlington and Racine, Villages of Caledonia, Mt. Pleasant, Rochester, Sturtevant, Waterford, and Wind Point, have adopted their own shoreland-wetland zoning ordinances pursuant to Sections 62.231 and 61.351, respectively, of the *Wisconsin Statutes*, and Chapter NR 117 of the *Wisconsin Administrative Code*. The remaining five Villages of Elmwood Park, North Bay, Raymond, Union Grove and Yorkville, did not contain shoreland wetlands and were thus not required to adopt such ordinances.

1.4 SCOPE AND PURPOSE OF PLAN

The scope of this plan is countywide, and is intended to set forth the most appropriate, feasible, and effective hazard mitigation strategy for Racine County and the local units of government within the County. The plan complements, refines, and focuses the *State Hazard Mitigation Plan of Wisconsin*[7] on local conditions and hazards likely to occur or be experienced within Racine County and Southeastern Wisconsin. The plan development process is intended to encourage innovative programming and leadership, and to build constructive partnerships with local units of government, business, and other stakeholders with a shared interest and obligation in protecting the safety and economic stability of Racine County, and to provide information and guidance to neighboring communities as they develop jurisdictional hazard mitigation plans at the local and subregional levels.

While it is acknowledged that the County can be affected by hazardous incidents that occur outside of the County jurisdiction, the degree of impact—in terms of property damage, injury, loss of life, and ability of the County to respond—is significantly limited and frequently unquantifiable. Thus, while some hazards can extend over a wide area, most affect Racine County only tangentially, and many result in site specific impacts. Those that are site-specific in their impact may be best addressed within local level hazard mitigation plans and through local action. Nevertheless, where appropriate, areas of cooperation between jurisdictions have been noted, especially with respect to hazards such as flooding, for example, which commonly affect entire

[6] *The 2015-2017 State Budget (Act 55) changed State law relative to shoreland zoning. Under Act 55 a shoreland zoning ordinance may not regulate a matter more restrictively than it is regulated by a State shoreland-zoning standard unless the matter is not regulated by a standard in Chapter NR 115, "Wisconsin's Shoreland Protection Program," of the* Wisconsin Administrative Code*. (Examples of unregulated matters may involve wetland setbacks, bluff setbacks, development density, and stormwater standards.) In addition, under Act 55, a local shoreland zoning ordinance may not require establishment or expansion of a vegetative buffer on already developed land and may not establish standards for impervious surfaces unless those standards consider a surface to be pervious if its runoff is treated or is discharged to an internally drained pervious area.*

[7] *Wisconsin Emergency Management, State Hazard Mitigation Plan of Wisconsin, December 2021.*

river basins as well as the specific communities located within them. Generally, hazard mitigation as well as emergency response planning at the local and subregional levels is beyond the scope of this plan.

This plan was developed through a collective effort of a number of municipalities, agencies, organizations, and business representatives. These efforts were conducted under the guidance of the Racine County Local Planning Team (LPT). The membership, formation, and active participation of the LPT is documented in Appendix A of this report. In addition to formation and active participation of the LPT, the development of this plan included the following steps:

- Collation and review of all pertinent reports relating to the hazard mitigation activities in Racine County since adoption of the current plan
- Review of materials developed as a part of the multi-jurisdictional comprehensive planning process for Racine County[8]
- Review and update of inventories developed for the current plan
- Review and update of hazard and risk assessments
- Review of implementation activities
- Review and update of plan recommendations and the initial implementation plan

1.5 PLAN MAINTENANCE AND IMPLEMENTATION ACTIVITIES

Outreach Activities

Since the adoption of the current hazard mitigation plan, the Racine County Office of Emergency Management and local municipalities in the County have conducted a number of outreach activities to educate the public about emergency preparedness, including hazard mitigation. These outreach activities are summarized in Table 1.4. The most common methods used by the communities include making information available through posting on the municipality's website and mailing or emailing periodic newsletters to residents of the municipality. As part of these activities, a number of campaigns have been conducted on hazard awareness, including campaigns related to winter weather awareness, tornado awareness, hazardous materials awareness, heat awareness, pandemic influenza, and family preparedness. Specific activities include print media publications, presentations to schools and community groups, safety and preparedness seminars, broadcast media interviews, and display presentations at community events.

Implementation Activities

Since the adoption of the current hazard mitigation plan, Racine County and the local municipalities have conducted several projects intended to implement recommendations of the plan. These projects are summarized in Table 1.5. One implementation activity the County recently participated in was distributing NOAA weather radios to schools to help increase awareness and preparedness for severe weather hazards. Another implementation activity occurred in 2018 and 2019, when Commission staff evaluated the flooding impact of the proposed Village of Mount Pleasant Electronic & Information Technology Manufacturing (EITM) Zone, which included the Foxconn campus and possible future supporting businesses. Flooding impacts were evaluated for the Kilbourn Road Ditch (KRD), Unnamed Tributary (UT) No. 15 to KRD, and UT No. 18 to KRD in the Des Plaines River watershed and the Pike River, South Branch Pike River, Waxdale Creek, Chicory Creek, Lamparek Creek, and School Tributary in the Pike River watershed. Commission staff evaluated if stormwater ponds sized using the existing Village ordinances would be sufficient to not increase flood flows on the impacted streams. This evaluation was done using hydrologic and hydraulic models developed for FEMA. The modeling effort confirmed that stormwater ponds in the EITM Zone sized per ordinance requirements would not alter the regulatory floodplains for the listed streams.

[8] *SEWRPC Community Assistance Planning Report No. 301,* A Multi-Jurisdictional Comprehensive Plan for Racine County: 2035*, November 2009*.

Table 1.5
Hazard Mitigation Activities by Local Communities in Racine County: 2017-2022

Community	Project	Cost ($)	Funding Source	Completion Date
Racine County	Zoning ordinances in floodplain areas	--	Levy	2021
	Emergency Action Plans for downstream areas near dams	50,000	Grants/DNR	Ongoing
	Road building modifications to further elevate certain flood-prone segments of roads	--	--	--
	Annual public outreach and education efforts related to citizen preparedness and emergency readiness	--	--	Ongoing
	Numerous trainings for responders on the Incident Command System and National Incident Management System principles.	--	Grants	Ongoing
	The formation of a Racine County Incident Management Team	--	--	Ongoing
	Multiple preparedness exercises to increase agency and community readiness.	--	--	Ongoing
	NOAA weather radio distribution to schools in 2022	--	Preparedness Grant	2022
	Brine for snowstorms	--	Levy/GTA	Ongoing
	Dam inspections	25,000	Levy	Ongoing
	Tree trimming in the right-of-way	--	Levy/GTA	Ongoing
	Shoreline stabilization	--	--	--
	Updates to volunteer sites to register to volunteer – new database to be implemented in 2023 on the Volunteers Center website	--	United Way	--
City of Burlington	Dam compliance initiatives	--	General Fund/Grants/ Bonding	Ongoing
	Stormwater utility analysis	44,000	General Fund	2021
	Incident Action Plans for weather-related events	--	--	Ongoing
	EOP approved by Common Council in 2022	--	--	2022
	MABAS approved agreement	--	--	Ongoing
	ARA with neighboring communities	--	--	Ongoing
	Racine County CEMP	--	--	Ongoing
	FEMA floodplain map revisions	--	--	2019
	In process of updating City-wide Comprehensive Plan	45,000	General Fund	2022
	Fire department swift water rescue team in place	--	--	Ongoing
	Updated Ms4 Plans	--	--	2022
	Stormwater Agreement with McHenry St properties	100,000	General Fund	2022
	Wastewater Adaptive Management Plan	30.000	General Fund	2018
	Tornado Siren analysis	--	--	2020
	Water System Risk & Resiliency Assessment/EAP	21,000	General Fund	2021
	Hydrant Flow Testing	--	--	Ongoing
	Congress Street restroom raised out of floodplain	275,000	Bonding	2018
	Railroad crossing signal interoperability	40,000	General Fund	2018
	Installed generators at PD	65,000	Bonding	2017
	Installed generator at Origen well house	176,000	Bonding	2021
	All newly hired officers since 2017 have been trained in Incident Command Systems classes 100/200/700/800	--	--	Ongoing
	Police Supervisors training in ICS 300	--	--	Ongoing
	Police Partnership in a Racine County Incident Management Team	--	--	Ongoing

Table continued on next page.

Table 1.5 (Continued)

Community	Project	Cost ($)	Funding Source	Completion Date
City of Racine	Shoreline damage mitigation • Restoration of Shoop Park to Carre-Hogle Park • Habitat & dune encouragement at North Beach/Zoo Beach	Funded by FEMA	FEMA/City	Ongoing
	Beach resiliency assessments	700,000	City	Ongoing
	Flood Response Plan	Staff Operations	City	2021
	Snow & Ice Operations Manual	Staff Operations	City	2021
	Update of Comprehensive Plan	145,000	City	2022
	Conversion of downtown Streets • Rerouting of STH 32 • Conversion of one-way streets to two-way	470,000	City	Ongoing
Village of Caledonia	Turtle Creek Restoration Project – Preliminary Plans to increase stormwater storage, mitigate flooding and improve water quality	--	Various Grants through Root Pike WIN	Ongoing
	STH 32 Channel Stream Bank Restoration Project – to increase storm water storage and mitigate flooding	530,000	Utility District	2019-2022
	Lake Michigan Bluff stabilization – Water Edge/Erie Street	--	Private Parties	2021-2022
	Westview Village Stormwater Improvements Projects – to increase storm sewer capacity and mitigate flooding	210,000	Utility District	2020-2022
	Hoods Creek Brushing Project – Remove fallen trees and obstructions from Hoods Creek to mitigate flooding	28,600	Utility District	Ongoing
	Husher Creek Brushing Project – Remove fallen trees and obstructions from Husher Creek to mitigate flooding	23,100	Utility District	Ongoing
	Hoods Creek Attenuation Basin – Expansion of existing Storage Basin for controlling Sanitary Sewer Flow in Extreme rain events from I & I to prevent basement backups and SSO's to surface waters.	12,000,000	Utility District	2020-2023
	Central Lift Station Attenuation Basin – Facility Plan for the Construction of a Storage Basin for controlling Sanitary Sewer Flow in extreme rain events from I & I to prevent basement backups and SSO's to surface waters.	250,000	Utility District	2020-2022
	Riverbend Lift Station – Facility Plan for improvements to the Sanitary Sewer system from extreme rain events from I & I to prevent basement backups and SSO's to surface waters.	310,000	Utility District	2020-2022
	Utility District Newsletter – Public Outreach for Utility District issues, Sanitary Sewer, Water & Storm Water	--	Utility District	Ongoing
Village of Mount Pleasant	Stabilization of Lake Michigan bluff	1.2 Million	VMP	2018
	Additional stabilization of Lake Michigan bluff	Funded by FEMA	FEMA	Ongoing
	Restoration of Pike River to increase stormwater storage & mitigate flooding	21 Million	VMP, Grants	2016
	Brine application before snowstorms	--	VMP	Ongoing
	Tree trimming within right-of-way	--	VMP	Ongoing
	Clearing of utility easements for easy access	--	VMP	Ongoing
	Flood impact study of the proposed Village of Mount Pleasant Electronic & Information Technology Manufacturing (EITM) Zone	--	--	2018-2019
Village of North Bay	Lighthouse Drive stormwater flow restoration and improvement project	1,930	Village	2020
	North Bay Beach shoreline repairs and erosion control project	2,600	Village	2020
Village of Raymond	Updated community DPW & emergency response equipment/vehicles	2.5 million	State Loans/ Operating Budget	2022
	Stormwater management & maintenance of the Root River Canal	--	Stormwater Operating Budget	Ongoing

Table continued on next page.

Table 1.5 (Continued)

Community	Project	Cost ($)	Funding Source	Completion Date
Village of Rochester	Collected real time data regarding inundating flood water during 2017 flood as it effected sewer system.	1,000.00	Village of Rochester	2017
	Replace Eagle Creek culvert after flood damage to N. River Road with an improved design that increased capacity of culvert.	92,814.00	--	2017
	Created CMOM Doc for our sewer system to use for measuring progress toward short- and long-term goals. The village has updated once in 2019	1,200.00	Village of Rochester	2016
	Developed a catastrophic event plan with emphasis on non-governmental resources and assets.	900.00	Village of Rochester	2019
	Conduct drainage review on new development and impacts to existing properties	--	State of WI 90% Rochester 10%	2019
	Manage stormwater issues by prioritizing capital improvement list in our storm water utility.	2,00.00/year	Storm water Utility	Ongoing
Village of Sturtevant	Added Law Enforcement members to the Racine County Incident Management Team	--	--	2021
Village of Union Grove	Stormwater ditch, retention, & pipe modifications throughout village	250,000	Village	2020
	Berm revision at School Yard Park to reduce flooding issues	5,000	Village	2020
	Repaired detention pond berm at Perk Circle	3,000	Village	2020
	Installation of larger storm sewer & curb replacement	400,000	DOT Grant	2021
	Flood study to determine solution for 7th and US 45	8,000	Village	2022
Village of Waterford	Acquisition of properties within the floodplain along Fox River	1.6 million	TID/Tax Funds	2019
Village of Yorkville	Update to Village-wide Comprehensive Plan	--	Village	2020
	Public outreach and education efforts related to citizen preparedness and emergency readiness	--	Village	Ongoing
	Tree trimming in the right-of-way	--	Village	Ongoing
	Zoning ordinances in floodplain areas	--	Village	2019
Town of Burlington	Browns Lake Sanitary District stormwater drainage improvement project	--	--	2022
	Bohners Lake Sanitary District plans to stabilize Spring Creek shoreline	--	--	Ongoing
	New fire engine and command vehicle	842,000	General Fund	2021
	New emergency generators for Town Hall and Highway Department facility	38,370	General Fund	2020
	New emergency radios for Town	226,842	General Fund	2020
	Installation of flood warning signage on Brever Road near the confluence of Hoosier Creek and the Fox River	--	NWS	2023
Town of Dover	Established Stormwater Utility Commission	--	--	2018
	Tree-trimmed rights-of-way	--	Tax Funds	Ongoing
	MABAS approved agreement	--	--	Ongoing
	Joined voluntary Compact of Intergovernmental Cooperation Council	--	--	2022

Source: Racine County Office of Emergency Management, Local Municipalities, and SEWRPC

1.6 REVIEW OF PLAN DEVELOPMENT EFFORTS, PROCESS, AND ADOPTION

As previously noted, this update of the Racine County Natural Hazards Mitigation Plan was prepared under the guidance of a Local Planning Team (LPT) comprised of representatives of all of the incorporated communities within the County including elected officials, law enforcement and fire personnel, engineering and public works departments, and planning departments. In addition, the planning process included stakeholders such as representatives from utilities, the business community, nonprofit organizations, school districts, and churches. The LPT met twice during the plan update preparation period to provide input on the types of hazards to be considered, the appropriate mitigation strategies, and to review the draft report chapters. Those chapters were then refined to reflect the comments and recommendations of the Local Planning Team (see Appendix A).

As draft chapters of this update of the plan were completed, copies were placed in downloadable form on the Commission website, and a webpage was available on which members of the public could ask questions and submit comments on the draft plan update. Following completion of updates to the community profiles, the risk and vulnerability assessments sections of the plan, and review of drafts of the corresponding chapters by the Local Planning Team, a public informational meeting was held to review these sections of the plan with local officials, business and industry, and citizens, to solicit their input.

After the update of the plan was completed in draft form, an additional public informational meeting was held to review the draft plan with local officials, businesses and industry, and citizens. Copies of the draft plan were made available at the Racine County Office of Emergency Management and on the Commission website.

Following a finding by FEMA that the plan was approvable after adoption, the plan was brought to the Racine County Board for adoption (a copy of the adopted resolution approving the plan is included in Appendix F). Copies of the plan were also sent to each of the local units of government, requesting that they adopt the plan in order to retain future eligibility for mitigation funding for the FEMA Hazard Mitigation Grant, Flood Mitigation Assistance, and Pre-Disaster Mitigation programs administered by the Wisconsin DMA, DEM. In addition, County and Commission staffs were available to meet with communities on an individual basis to review the plan update and consider adoption and implementation steps.

BASIC STUDY AREA INVENTORY AND ANALYSIS 2

2.1 INTRODUCTION

Information on certain pertinent natural and built features and aspects of the study area is an important consideration in sound hazard mitigation planning. Accordingly, the collection and collation of definitive information regarding basic demographic characteristics, existing and planned land use, surface water and Lake Michigan shoreline system characteristics, emergency services, critical facilities, and existing hazard management programs constitute an important step in the planning process. The resulting information is an important element to the planning process, since sound mitigation approaches cannot be formulated and evaluated without an in-depth knowledge of the relevant conditions in the study area.

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 civil divisions in Racine County are shown on Map 1.1 in Chapter 1 of this report. There are four towns in Racine County, including Burlington, Dover, Norway, and Waterford. In addition, there are eleven villages – the Villages of Caledonia, Elmwood Park, Mount Pleasant, North Bay, Raymond, Rochester, Sturtevant, Union Grove, Waterford, Wind Point, and Yorkville – and two cities – the Cities of Racine and Burlington – located within the County. Corresponding with Map 1.1, the total land area and proportion of the county within each civil division is presented in Table 1.1.

2.3 DEMOGRAPHIC AND ECONOMIC CHARACTERISTICS

Population

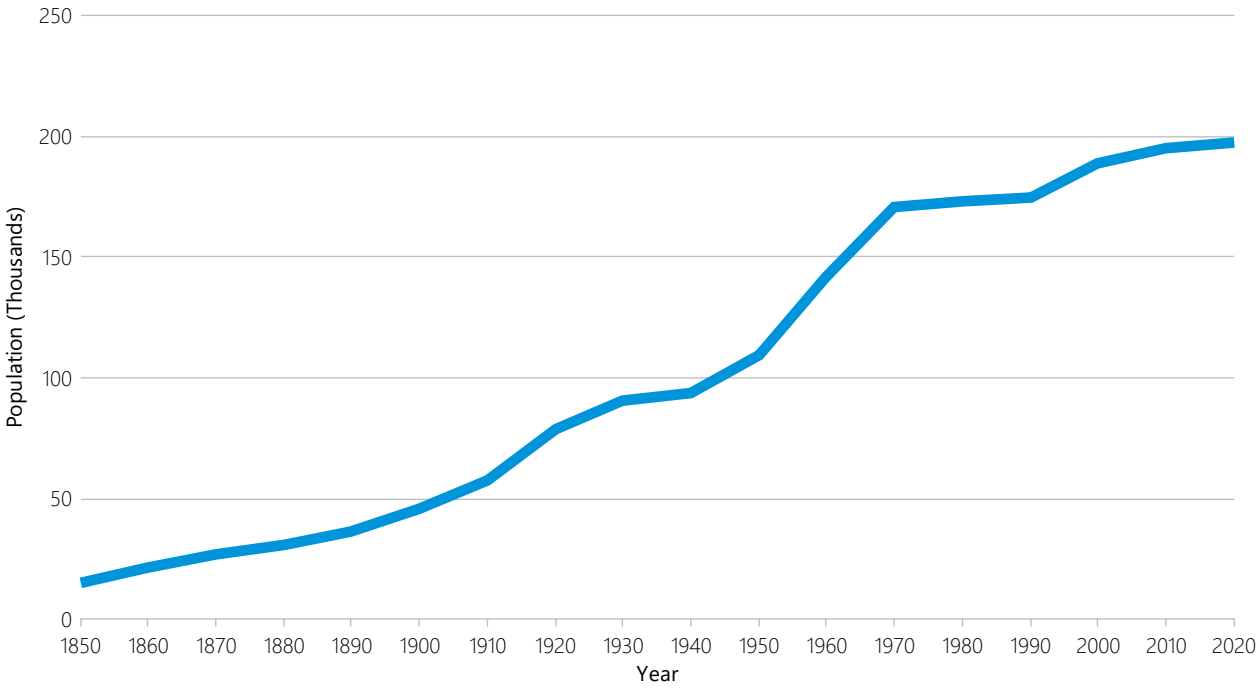
The area that is now Racine County was first included in the Federal census in 1850. Historical population levels in Racine County are shown in Figure 2.1 and in Table 2.1. As of 2020, there were 197,727 individuals residing in the County. This represents an increase of about 1.2 percent between 2010 and 2020. The population in Racine County is expected to increase through the year 2050 by approximately 21 percent.

Based upon 2020 census data, the City of Racine is the most populous community in the County, with 77,816 residents, or about 39 percent of the County's population, in 2020. The next most populous communities are the Village of Mt. Pleasant, with 27,732 residents, and the Village of Caledonia, with 25,361 residents, about 14 percent and 13 percent, respectively, of the County's population; and the City of Burlington, with 11,047 residents, or about 6 percent of the County's population. Based upon the 2020 census data, the remaining Villages and Towns experienced a relatively small increase or decrease in population during that time period.

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 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.

Figure 2.1
Historical Population Levels in Racine County: 1850-2020



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

Table 2.1
Historical Resident Population Levels in Racine County: 1850-2050

Year	Population	Change from Preceding Census	
		Incremental	Percent
1850	14,973	--	--
1860	21,360	6,387	42.7
1870	26,740	5,380	25.2
1880	30,922	4,182	15.6
1890	36,268	5,346	17.3
1900	45,644	9,376	25.9
1910	57,424	11,780	25.8
1920	78,961	21,537	37.5
1930	90,217	11,256	14.3
1940	94,047	3,830	4.2
1950	109,585	15,538	16.5
1960	141,781	32,196	29.4
1970	170,838	29,057	20.5
1980	173,132	2,294	1.3
1990	175,034	1,902	1.1
2000	188,831	13,797	7.9
2010	195,408	6,577	3.5
2020	197,727	2,319	1.2
2050[a]	239,800	42,073	21.3

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

Source: SEWRPC

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 summarize the extent to which every U.S. census tract is socially vulnerable to disaster. The SVI ranks each tract on 16 social factors. 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.

The overall SVI for Racine 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, including the Cities of Burlington and Racine and the Village of Sturtevant. The CDC/ATSDR overall 2020 SVI score for Racine County is 0.46, indicating that Racine County has a medium overall level of social vulnerability relative to the Nation. The Social Vulnerability Index maps for Racine County are included in Appendix H.

Additionally, FEMA 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 their risk to 18 natural hazards. 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. Racine County has a Risk Index rating of 75.2, or "Relatively Low," and a Community Resilience rating of 98.8, 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.

Households

Trends in the number of households in the County are shown in Table 2.2. The County experienced significant gains in the number of new households between 1970 and 2020. The rate of increase in the number of households has significantly exceeded the rate of population increase. Between 1970 and 2020, the number of households increased by about 59 percent, compared to a population increase of about 16 percent. With the number of households increasing at a faster rate than the population, the number of persons per household has decreased.

Employment

Trends in job growth in the County are set forth in Table 2.3. The data reflects the number of jobs within the County, including both full- and part-time jobs. A significant increase in the number of jobs may be expected to attract additional residents to the County, thus influencing population growth. As indicated in Table 2.3, employment growth was significant in the County between 1970 and 2020, with an increase in the number of jobs from 64,506 to 90,345, or an increase of about 40 percent. It should be noted that a substantial number of Racine County employed residents—33,674 of the 90,345 workers in 2020, or about 37.3 percent—worked outside the County, and 3,146 workers, or 3.5 percent, worked outside the State.[9]

Property Value

The value of the real estate and personal property in a community reflects the upper end of the potential for property damages in each community. The equalized value of the real estate and personal property in Racine County and each of the general-purpose units of government in the County for the years 2014 (from the previous plan update) and 2022 is shown in Table 2.4.

[9] *Based on U.S. Census Bureau 2020 American Community Survey estimates.*

Table 2.2
Number of Households in Racine County: Census Years 1970-2050

Year	Number of Households	Change from Preceding Census	
		Number	Percent
1970	49,796	--	--
1980	59,418	9,622	19.3
1990	63,736	4,318	7.3
2000	70,819	7,083	10.0
2010	75,651	4,832	6.8
2020	78,959	3,308	4.4
2050[a]	98,900	19,941	25.0

[a] *Household projection from VISION 2050 Amendment Related to Foxconn, December 2018.*

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

Table 2.3
Number of Jobs in Racine County: Census Years 1970-2050

Year	Number of Jobs	Change from Previous Time Period	
		Number	Percent
1970	64,506	--	--
1980	80,900	16,394	25.4
1990	88,768	7,868	9.7
2000	97,900	9,132	10.3
2010	88,300	-9,600	-9.8
2020	90,345	2,045	2.3
2050[a]	127,000	36,655[b]	40.6

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

[b] *Relative to 2020.*

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

2.4 LAND USE

Land use is an important determinant in the potential impact a particular hazard may have, and in the actions which may 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

Land uses in Racine County in 2015 are set forth on Map 2.1 and in Table 2.5. Urban land uses occupied about 56,744 acres, or 26.1 percent of the County in 2015. Intensive urban development, including most commercial, industrial, and multi-family residential development, is concentrated within or near the communities of Racine, Burlington, Waterford, Sturtevant, and Union Grove or along the Interstate Highway (IH) 94 corridor. Much of the single-family residential development also occurred within or surrounding these urban centers, while scattered low-density development occurred outside these communities amid predominantly rural areas. Single-family residential development was the largest component of urban land uses, encompassing about 25,221 acres, or 44.5 percent of the urban land uses and 11.6 percent of the total area of the County.

Land uses categorized as transportation, communication, and utilities constituted the second largest urban land use category in 2015, encompassing about 14,665 acres, or 25.8 percent of the area of all urban land and 6.7 percent of the total area of the County.

Table 2.4
Equalized Value of Property in Racine County by Community: 2014 and 2022

Community	2014 Equalized Value ($)	2022 Equalized Value ($)	Percent Change
Cities			
Burlington	807,245,600	1,275,950,700	58.1
Racine	3,208,322,900	4,585,521,700	42.9
Subtotal	4,015,568,500	5,861,472,400	46.0
Villages			
Caledonia	1,963,451,300	3,102,954,000	58.0
Elmwood Park	35,755,900	54,725,900	53.1
Mount Pleasant	2,380,865,300	4,772,311,900	100.4
North Bay	34,684,900	46,520,300	34.1
Raymond	443,875,700	702,205,900	58.2
Rochester	352,204,300	435,134,500	23.5
Sturtevant	501,791,000	888,848,300	77.1
Union Grove	294,630,900	504,610,300	71.3
Waterford	418,418,100	711,597,600	70.1
Wind Point	230,252,400	333,063,000	44.7
Yorkville	498,601,900	829,135,100	66.3
Subtotal	7,154,531,700	12,381,106,800	73.1
Towns			
Burlington	620,480,000	917,228,600	47.8
Dover	321,999,200	486,342,700	51.0
Norway	788,026,700	1,259,578,700	59.8
Waterford	723,806,800	885,983,300	22.4
Subtotal	2,454,312,700	3,549,133,300	44.6
Total	13,624,412,900	21,791,712,500	59.9

Source: Wisconsin Department of Revenue and SEWRPC

Nonurban land uses occupied about 161,233 acres or 74 percent of the County in 2015. Agricultural land use was the largest component of nonurban land use, encompassing about 111,885 acres, or 70 percent of the area of all nonurban land and about 51 percent of the total area of the County. Cultivated lands (i.e., cropland) is the largest component of agricultural lands in the County. In 2015 it accounted for about 94,867 acres (see Table 2.6). Other major nonurban land uses present in the County include wetlands, woodlands, open lands, and surface water.

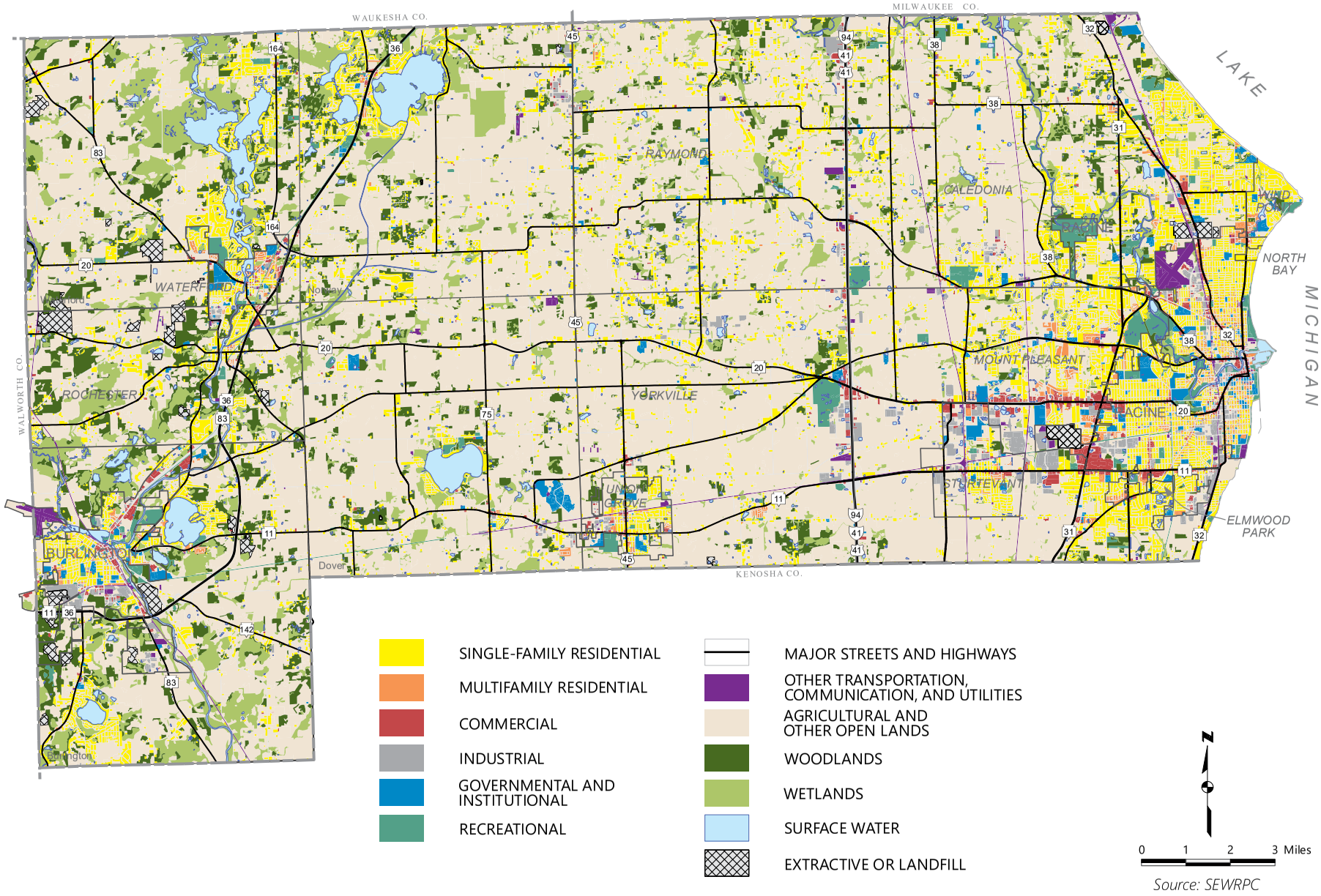
Manufactured homes are a type of structure that can be particularly vulnerable to some hazards such as high winds. Map 2.2 shows the locations of manufactured home parks and individual manufactured homes in Racine County. In 2021, there were 664 manufactured homes located in the County, most located in six manufactured home parks. In addition, there were two sites in the County that contained one manufactured home each.

Planned Land Use

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. The Southeastern Wisconsin Regional Planning Commission (Commission) recently completed projections of land use, population, households, and employment from the period of 2010 to 2050 to provide a basis for preparation of VISION 2050 (the regional land use and transportation plan). Map 2.3 presents the recommended development pattern from the VISION 2050 plan as it pertains to Racine County.

Planned urban-density areas depicted on Map 2.3 include land use categories such as mixed-use city center, mixed-use traditional neighborhood, and small lot traditional neighborhood. Those urban-density areas are associated with the City of Burlington; the City of Racine; and the Villages of Caledonia, Elmwood Park, Mt. Pleasant, North Bay, Sturtevant, Union Grove, and Waterford. There are also several scattered unincorporated communities included as planned urban areas, the largest of which are the Wind Lake area in the Town of Norway, and the Tichigan and Buena Lake areas in the Town of Waterford.

Map 2.1
Existing Land Use in Racine County: 2015



Source: SEWRPC

Table 2.5
Land Uses in Racine County: 2015

Land Use Category[a]	Acres	Percent of Subtotal	Percent of County
Urban			
Single-Family Residential	25,221	44.5	11.6
Multi-Family Residential[b]	1,834	3.2	0.8
Commercial	2,346	4.1	1.1
Industrial	2,997	5.3	1.4
Transportation, Communications, and Utilities	14,665	25.8	6.7
Governmental and Institutional	2,630	4.6	1.2
Recreational	3,379	6.0	1.6
Unused Urban	3,672	6.5	1.7
Urban Subtotal	56,744	100.0	26.1
Nonurban			
Agricultural	111,885	69.5	51.4
Woodlands	14,241	8.8	6.5
Wetlands	19,262	11.9	8.8
Surface Water	5,965	3.7	2.7
Landfill and Extractive	1,784	1.1	0.8
Other Open Lands	8,096	5.0	3.7
Nonurban Subtotal	161,233	100.0	73.9
Total	217,977	--	100.0

Note: This table does not reflect the 163 acres of the City of Burlington that lies within Walworth County.

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

[b] *Includes two-family residential.*

Source: SEWRPC

As indicated in Table 2.7, urban land uses in Racine County are projected to increase by approximately 7,668 acres between 2015 and 2050, or about 14 percent. Table 2.8 shows the forecast growth of population, households, and employment levels for Racine County between the same time periods. 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.

Changes In Development

The projection of future population, household, and employment levels is essential to properly design and plan for the future development of the County. The future demand for land, housing, transportation facilities and services, and utilities and other supporting community facilities depends directly on future population, household, and employment levels.

Under VISION 2050, most new development would be accommodated within urban service areas—areas that provide basic urban services including public sanitary sewer service and typically public water supply and local parks, schools, and shopping areas. Consequently, most of the incremental population, households, and jobs anticipated in the coming decades are allocated to planned urban service areas.

The planned urban service areas envisioned in VISION 2050 are shown on Map 2.3. These are generalized urban service areas, the product of systems level planning. Further identification of precise urban service area boundaries and future growth within the County was accomplished in the County's 2035 multi-jurisdictional comprehensive plan and within the local comprehensive plans.

Table 2.6
Agricultural Lands in Racine County: 2015

Community	Cultivated Lands (acres)	Pasture and Unused Lands (acres)	Orchards, Nurseries, and Christmas Tree Farms (acres)	Special Agricultural Uses (acres)	Farm Buildings (acres)	Total Agricultural Lands (acres)
Cities						
Burlington[a]	401.5	26.6	0.0	0.2	1.7	430.0
Racine	4.2	0.0	0.0	0.0	0.0	4.2
Villages						
Caledonia	11,662.9	1,583.1	78.3	35.2	213.7	13,573.2
Elmwood Park	0.0	0.0	0.0	0.0	0.0	0.0
Mt. Pleasant	9,559.2	457.1	29.2	135.7	140.5	10,321.7
North Bay	0.0	0.0	0.0	0.0	0.0	0.0
Raymond	12,550.1	2,545.6	114.0	27.5	319.4	15,556.6
Rochester	3,589.0	835.6	66.3	0.0	106.8	4,597.7
Sturtevant	637.2	77.6	9.2	0.0	3.8	727.8
Union Grove	456.4	27.1	0.0	0.0	6.7	490.2
Waterford	37.8	7.4	0.0	0.0	0.0	45.2
Wind Point	10.8	0.0	0.0	0.0	0.0	10.8
Yorkville	14,117.4	1,027.8	67.2	36.4	283.4	15,532.2
Towns						
Burlington	8,006.1	1,276.7	6.6	411.7	164.0	9,865.1
Dover	15,119.2	994.2	22.0	192.7	282.0	16,610.1
Norway	9,392.3	1,206.8	30.1	2,580.7	214.4	13,424.3
Waterford	9,323.2	973.5	5.7	178.7	214.8	10,695.9
Total	94,867.3	11,039.1	428.6	3,598.8	1,951.2	111,885.0

[a] *These totals do not include agricultural lands within the portion of the City of Burlington in Walworth County. That portion of the City of Burlington contains 68.8 acres of cultivated lands, and 1.0 acre of pasture and unused lands.*

Source: SEWRPC

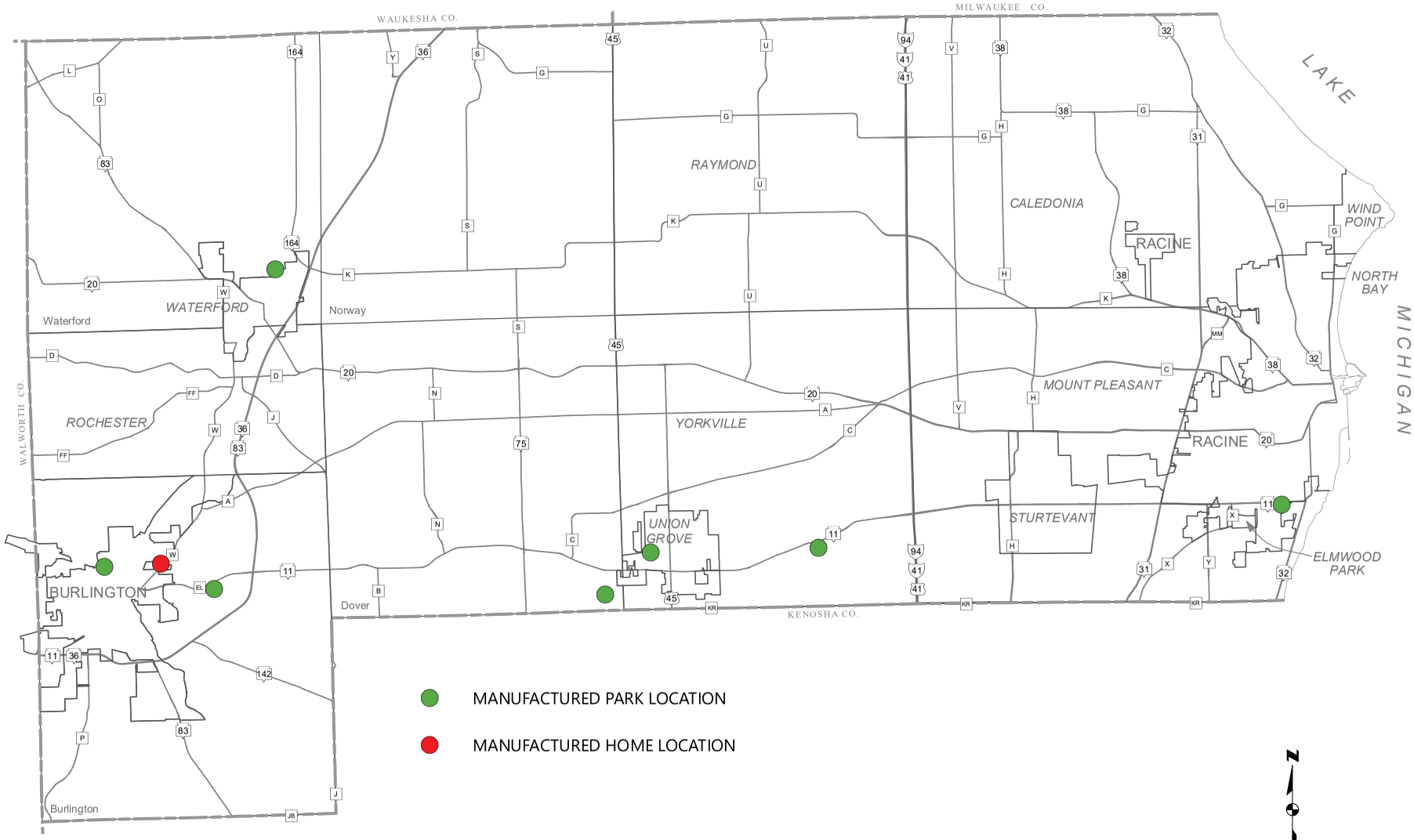
Surface Waters, Floodplains, and Lake Michigan Coastline

There are approximately 101 miles of major streams in Racine County, located within four watersheds: the Fox (Illinois) River, Root River, Pike River, and Des Plaines River watersheds. A fifth watershed encompasses those areas adjacent to Lake Michigan which drain directly into the Lake through intermittent streams. There are also 10 major lakes in Racine County that all lie within the Fox River watershed. The major lakes include Bohner Lake, Browns Lake, Buena Lake, Eagle Lake, Echo Lake, Kee Nong Go Mong Lake, Long Lake, Tichigan Lake, Waubeesee Lake, and Wind Lake.

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. Major streams are defined as those which maintain, at a minimum, a small continuous flow throughout the year except under unusual drought conditions. The Fox River watershed generally encompasses the western half of the County and includes the Fox River, Honey Creek, White River, Wind Lake Drainage Canal, Goose Lake Drainage Canal, Eagle Creek, Hoosier Creek, and Spring Brook. The Des Plaines River watershed covers a small portion of the extreme southern part of the County and includes the Kilbourn Road Ditch, and the beginning of the mainstem of the Des Plaines River near Union Grove. The Root River watershed encompasses most of the eastern half of the County and includes the Root River, East Branch Root River Canal, West Branch Root River Canal, Husher Creek, and Hoods Creek. The Pike River watershed, in the County's southeastern corner, includes the beginning of the mainstem of the Pike River. Maps, tables, and more detailed hazard information of the surface water resources in Racine County can be found in Chapter 3.

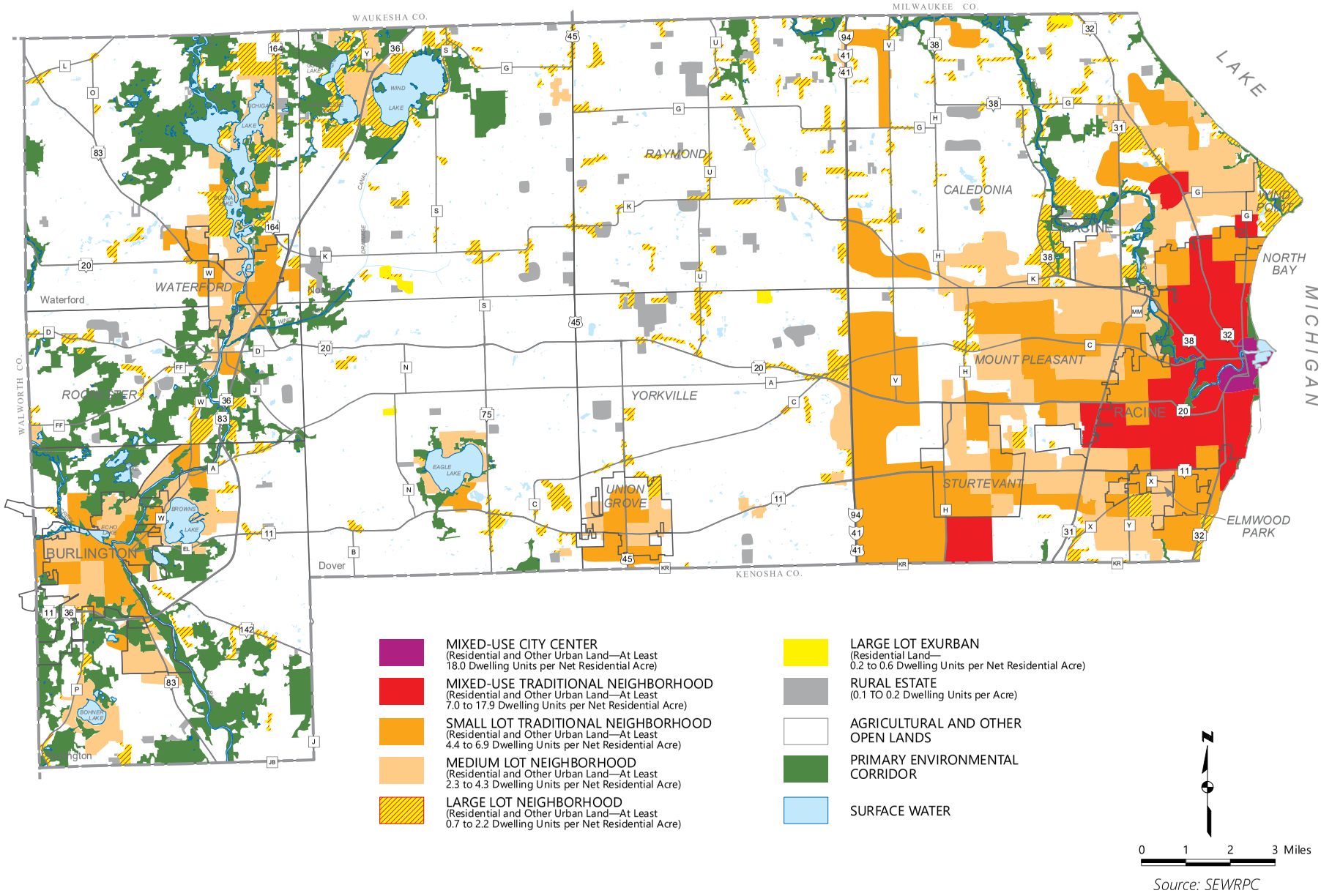
Floodplains are the wide, gently sloping areas contiguous to, and usually lying on both sides of, a stream channel or lake. For planning and regulatory purposes, floodplains are normally defined as the areas subject to inundation by the 1-percent-annual-probability (100-year recurrence interval) flood event. Floodplain

Map 2.2
Manufactured Homes and Parks in Racine County: 2021



Source: Wisconsin Department of Safety and Professional Services and SEWRPC

Map 2.3
Regional Land Use Plan as it Pertains to Racine County: 2050



Source: SEWRPC

Table 2.7
Projected Changes in Land Uses in Racine County: 2015 and 2050

Land Use Category	Acres			Percent Change
	2015	2050	Change	
Developed Land				
Residential	27,055	31,825	4,770	17.6
Commercial	2,346	3,374	1,028	43.8
Industrial	2,997	4,562	1,565	52.2
Transportation, Communications, and Utilities	14,665	15,977	1,312	8.9
Governmental and Institutional	2,630	2,646	16	0.6
Recreational	3,379	4,020	641	19.0
Unused Urban	3,672	2,008	-1,664	-45.3
Developed Land Subtotal	56,744	64,412	7,668	13.5
Undeveloped Land				
Agricultural and Other Open Lands	121,765	114,097	-7,668	-6.3
Surface Water	5,965	5,965	--	--
Wetlands	19,262	19,262	--	--
Woodlands	14,241	14,241	--	--
Undeveloped Land Subtotal	161,233	153,565	-7,668	-4.8
Total	217,977	217,977	--	--

Source: SEWRPC

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. The floodplains shown on Map 3.2 in this report have been identified by Racine County, Commission, and FEMA. Approximately 26,983.4 acres, not including surface water in lakes and existing stream channels, or about 12 percent of the total area of the County, are located within the 1-percent-annual-probability flood hazard area. Maps, tables, and more detailed hazard information related to floodplains in Racine County can be found in Chapter 3.

The Lake Michigan coastline in Racine County consists of about 14.8 miles of shoreline, encompassing portions of five local units of government, including the City of Racine and the Villages of Caledonia, Mount Pleasant, Wind Point, and North Bay. Maps, tables, and more detailed hazard information related to Lake Michigan's coastline in Racine County can be found in Chapter 3.

Dams

A dam is a barrier, typically constructed of earth, rock, concrete, or mine tailings, used to store, control, or divert water. The water impounded behind a dam is referred to as the reservoir and its volume is measured in acre-feet, with one acre-foot being the volume of water that covers one acre of land to a depth of one foot. Due to topography, even a small dam may have a reservoir containing many acre-feet of water. The water (or other liquid) stored behind a dam can have catastrophic downstream impacts if released suddenly due to dam failure or misoperation.[10] There are 19 dams in Racine County, none of which are categorized with a high hazard rating. More information related to the locations of these dams and their hazard ratings can be found in Chapter 3.

Environmental Corridors

Primary environmental corridor (PEC) includes the most important elements of the Region's natural resource base, such as woodlands, wetlands, prairies, wildlife habitat, and surface waters and related shorelands and floodplains. PEC may also include elements such as park and open space sites, scenic views, natural areas, and critical species habitat sites. The elements found in PEC often occur in linear patterns along major stream valleys, the Lake Michigan shoreline, around major inland lakes, and the Kettle Moraine. Racine County has 23,913 acres of primary environmental corridor.

[10] *Wisconsin Emergency Management Department of Military Affairs, State of Wisconsin Hazard Mitigation Plan, December 2016.*

Secondary environmental corridors also contain a variety of resource elements, often remnant resources from primary corridors that were developed for urban or agricultural uses. Secondary corridors are smaller than primary corridors and often connect to primary corridors. Racine County has 7,402 acres of secondary environmental corridor.

Table 2.8
Forecasted Growth in Racine County: 2050

Type	Existing (2020)	Forecast (2050)	Percent Change: 2020-2050
Population	197,727	239,800	21.3
Households	78,959	98,900	25.3
Employment	90,345	127,000	40.6

Source: SEWRPC

Isolated natural resource areas contain natural resource elements that have been separated from the environmental corridors. Racine County has 8,785 acres of isolated natural resource area. Secondary corridors and isolated natural resources areas are generally not considered of regional significance and consequently are not shown on the existing and planned land use maps. However, such resources may be important at the local level and should be considered for preservation by local governments in the development of local plans.

2.5 CLIMATE AND CLIMATE CHANGE

Climate, which is the long-term weather conditions in an area, is important to consider in natural weather hazard mitigation planning. Similar to the rest of Wisconsin, Racine County has a humid, continental climate with some modification by Lake Michigan. The temperatures in Wisconsin vary greatly from summer to winter, with an average annual temperature of 48°F in southern Wisconsin. The average annual precipitation in Racine County at the Racine climate station is about 36 inches, based on data from 1981 to 2010.[11]

Wisconsin's climate continues to change as new data shows continued warming, increases in rain and snow, and more frequent extreme rainfall events. Statewide temperatures have warmed by about 3° Fahrenheit, and precipitation has increased by nearly twenty percent, since 1950. In the last decade, nearly every region of our state has 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.[12]

As climate change and the need for solutions are becoming more apparent, so too is the recognition of environmental and climate justice. It has been recognized that historically disadvantaged communities bear a disproportionate burden and suffer the greatest harms and risks from climate impacts such as flooding, worsening air quality, heat waves, and drought. Decision-makers should acknowledge and understand these uneven impacts of climate change to ensure solutions are effective and equitable.[13]

The risk posed to Racine 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, climate change may render estimates of risk based on historical occurrences and impacts unreliable. 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 Racine County, the increase was about 2°F, as can be seen in Figure 2.2.[14] Much of this increase in average temperature occurred in the form of higher night-time low temperatures. For example, over the period 1950 through 2018, the average number of days in Racine County in which the

[11] *Midwestern Regional Climate Center, Midwest Climate: Climate Summaries, 2021.*

[12] *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.*

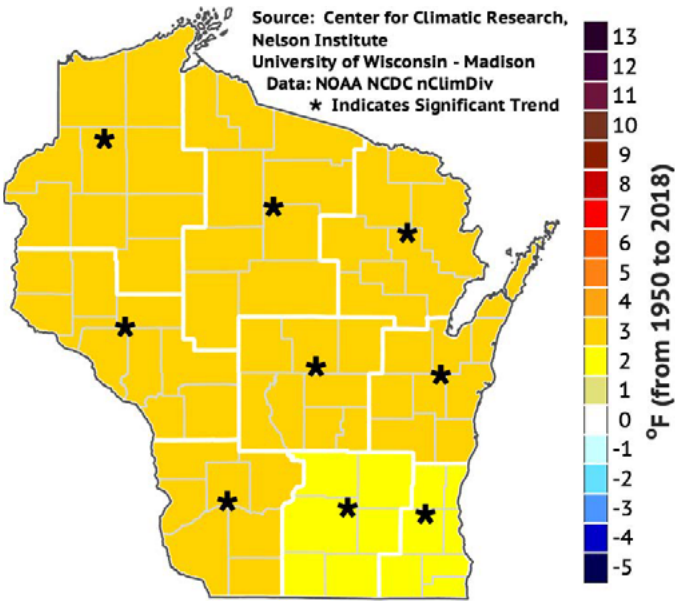
[13] *Wisconsin Initiative on Climate Change, 2021,* op. cit.

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

daily low temperature fell below 0°F decreased by about 7 days per year. The greatest increase in average temperatures occurred during winter months. Average winter temperatures in Racine County increased by about 4°F over this period.

Average annual precipitation in Wisconsin has increased over the last half of the 20th century and into the 21st century. In Racine County annual precipitation increased over the period of 1950 through 2018 by about 15 percent (see Figure 2.3).[15] Most of the increase in average precipitation occurred during winter months. In Racine County, average precipitation during winter months increased by about 20 percent between 1950 and 2018. Increases also occurred during spring and autumn in the County. Throughout the State, the changes in average precipitation during summer months were highly variable. In Racine County, average precipitation during summer months increased about 5 percent between 1950 and 2018. The frequency and magnitude of heavy precipitation events has also been increasing in Wisconsin. Extreme rainfall patterns in the City of Madison illustrate this trend. In the decade between 2001 and 2010, there were 24 days in which 2.0 inches or more of precipitation fell. This is twice the previous maximum of 12 days in the 1950s.

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/wisconsin-climate-trends-and-projections

Climate Change Projections

The consensus from downscaled results from climate models indicate that average annual temperatures will continue to increase through the 21st century.[16] Depending on location, it is projected that average temperatures in the State of Wisconsin will increase by between 4.0°F and 6.0°F over the period 2041 to 2060 (see Figure 2.4). This increase is projected to be on the order of 4.0°F in most of Racine County, with a small portion in the southwestern part of the County projected to increase by about 5.0°F. The greatest changes are projected to occur during winter months, with average winter temperatures being projected to increase by about 5.0°F in Racine County. By contrast, average temperatures in Racine County during the summer are projected to increase by about 4.0°F. Changes in extreme temperatures will accompany these changes in average temperature. 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. This is likely to triple to about 36 days per year by 2055. 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 2055.

The consensus from downscaled results from climate models project several changes in precipitation through the 21st century.[17] 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 25 percent. Due to the projected increase in temperatures, it is projected

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

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

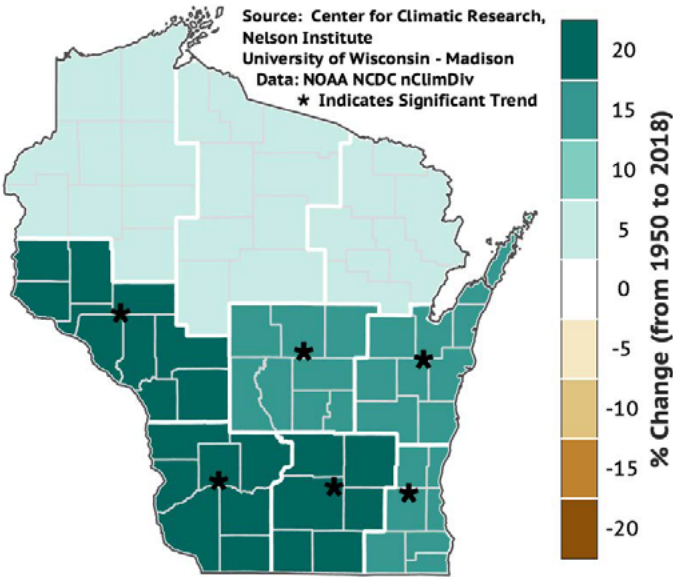
[17] *Wisconsin Initiative on Climate Change Impacts, 2021,* op. cit.

that a greater amount of precipitation occurring during the winter will fall as rain rather than snow.[18] 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 during early spring. As in winter, it will become more likely for early spring precipitation to fall as rain rather than snow. 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 changes will be concentrated in the spring and fall. The projections indicate that the magnitude of the heaviest precipitation events will also increase. 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.

2.6 EMERGENCY SERVICES AND CRITICAL FACILITIES

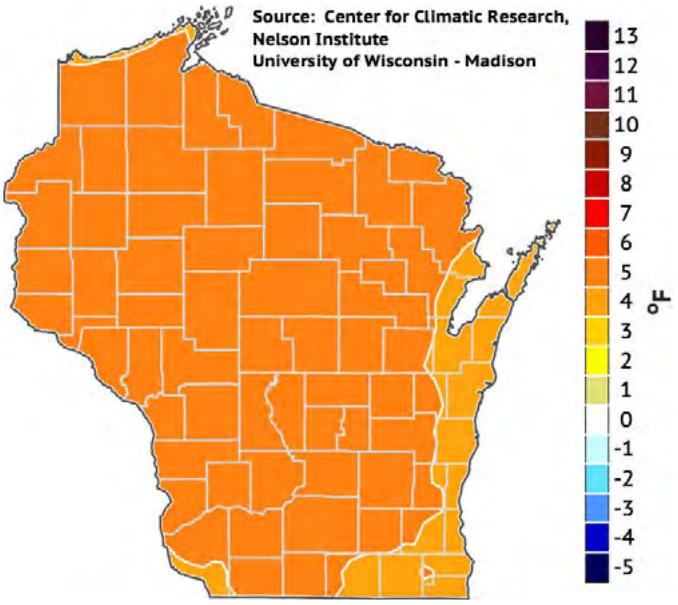
The type and location of emergency services and critical facilities are important considerations in hazard mitigation planning, because of the potential direct involvement of such facilities in certain hazard situations. The location of the fire stations, police stations, and associated emergency service areas are shown in Map 2.4. A listing of these facilities is included in Appendix B. The location of these stations in relationship to the floodplain areas and the Lake Michigan Coastline are further analyzed and described in Chapter 3.

Figure 2.3
Change in Annual Precipitation from 1950 to 2018



Source: Wisconsin Initiative on Climate Change Impacts, Trends and Projections, wicci.wisc.edu/wisconsin-climate-trends-and-projections

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/wisconsin-climate-trends-and-projections

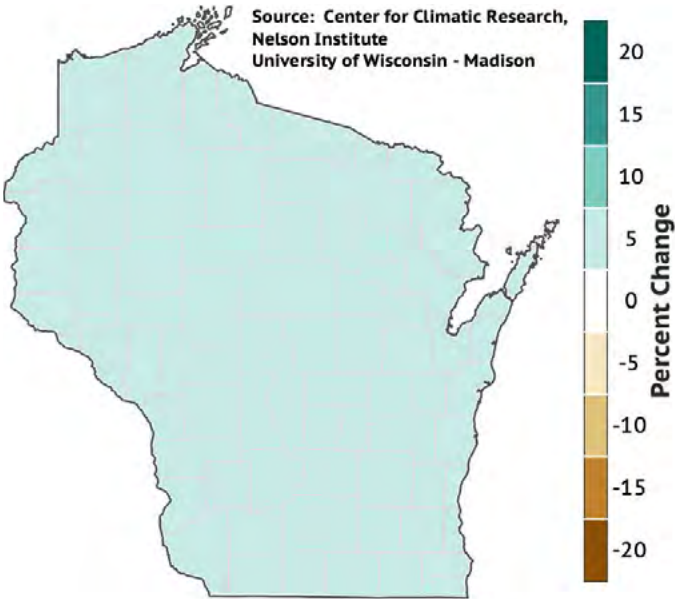
[18] *Michael Notaro, David J. Lorenz, Daniel Vimont, Stephen Vavrus, Christopher Kucharik, and Kristie Franz, "21st Century Wisconsin Snow Projections Based on an Operational Snow Model Driven by Statistically Downscaled Climate Data,"* International Journal of Climatology, *Volume 31, pages 1615-1633,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

Fire Suppression and Rescue Services

Eleven of the 17 local units of government in Racine County independently or jointly provide fire suppression services. Three of the local units rely on private departments which are nonprofit corporations. The remaining municipalities utilize service agreements with adjacent municipalities. The location of each of the fire stations and the fire service areas within Racine County are shown on Map 2.4.

Each of the fire departments in Racine County, except the Town of Burlington, also independently maintains an emergency medical service. The Burlington Fire Department provides rescue services in the City and Town of Burlington. The emergency medical service areas in Racine County are also shown on Map 2.4.

Figure 2.5
Projected Change in Annual Precipitation from 2041 to 2060



Source: Wisconsin Initiative on Climate Change Impacts, Trends and Projections, wicci.wisc.edu/wisconsin-climate-trends-and-projections

All of the fire and rescue departments in Racine County participate in the Mutual Aid Box Alarm System (MABAS) agreement. 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 to the extent of 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 only need infrequently. In addition, MABAS allows communities and fire departments to request fire and rescue resources from outside of Racine County using the standardized MABAS agreement. MABAS agreements are pre-approved by each municipality and emergency responses are pre-planned using a standardized Box Alarm Card form.

Several departments have reciprocal mutual aid agreements with one or more neighboring departments. Some of these are formal written agreements; others are unwritten. Many departments have indicated they would respond to any request for mutual aid, whether or not there is a mutual aid agreement, provided that they are able to do so without jeopardizing their own services.

Law Enforcement

Ten of the 17 municipalities in Racine County provide law enforcement through full-time police departments. In the remaining municipalities, law enforcement is provided through a combination of part time police departments and/or contracting the services of the County Sheriff's Department to provide primary law enforcement. The location of each local law enforcement station in Racine County is shown on Map 2.4. That map also shows the location of the State of Wisconsin Department of Corrections, correctional facilities and County detention centers in the County.

In 2014, Racine County joined the Suburban Mutual Assistance Response Team (SMART). The agreement was made in recognition that situations may occur which are beyond the ability of a local law enforcement agency to deal with effectively in terms of personnel, equipment, and available resources. Under this system Racine County agencies have cooperative agreements with agencies in Jefferson, Milwaukee, Walworth, and Waukesha Counties that allows for mutual aid during a significant emergency or disaster. Within one hour, a community that is a member of SMART can have up to 75 law enforcement officers respond to the community to help where needed.

Specialized Response Teams

Some fire departments and law enforcement agencies in the County participate in several specialized response teams. The Racine County Water Rescue Response Team consists of members of public safety agencies throughout Racine County. This team provides emergency response of trained personnel and equipment in water-related life-threatening situations, recovery of drowning victims, and search and recovery of crime evidence. The Racine County Sheriff's Office Water Patrol operates water safety patrols on Lake Michigan and inland lakes and rivers throughout the County to assist boaters with accidents, engine failures, rescue, and to provide enforcement activities. The Racine County Sheriff's Office also leads an Incident Management Team made up of Fire and Law Enforcement personnel that can provide assistance to communities before, during, and after major incidents.

In addition, the City of Racine Fire Department's specialized operations include a Local Technical Rescue Team, which involves collapse, confined space, trench, and high/low angle rescues; water rescue divers and boat including side scan sonar; Tactical Emergency Medical Technicians; ; and a Regional Command Post.

Critical Community Facilities

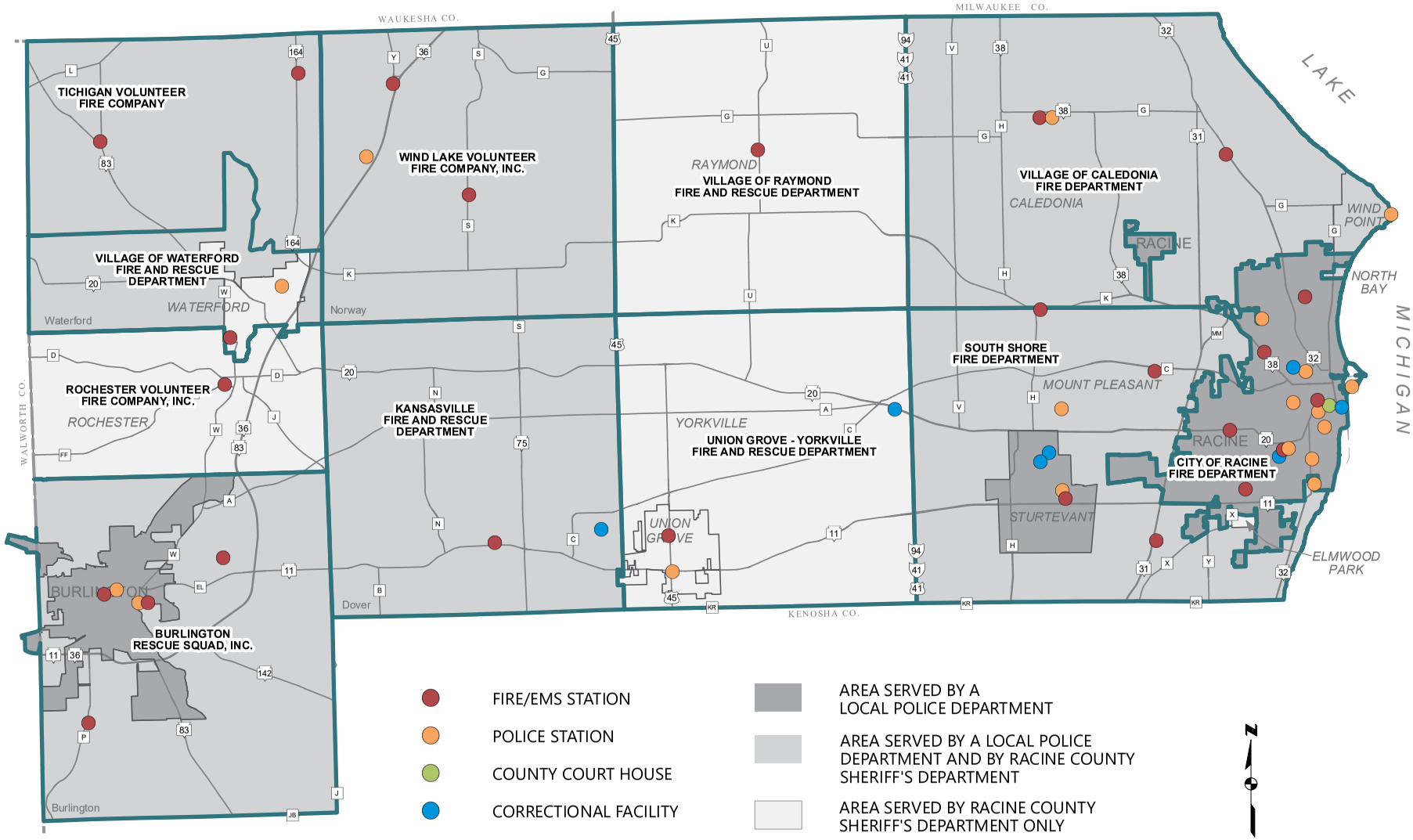
In addition to fire stations and law enforcement stations, as described above, other community facilities which are of importance in hazard mitigation planning include schools, hospitals and major clinics, nursing homes, day care centers with a capacity of 20 children or more, and government administration buildings. Map 2.5 shows the location of selected types of critical community facilities within Racine County. Because of the need for access to and from these facilities, the hazard mitigation plan includes their location. Their location in relation to flood hazard and coastal hazard areas is discussed further in Chapter 3. A listing of the critical community facilities is included in Appendix C.

Historic Sites

Historic sites in Racine County often have important recreational, educational, and cultural value. Certain sites of known historic significance are listed on the National Register of Historic Places. As of 2022, there were 47 individual sites and ten historic districts[19] within the County listed on the National Register. The location of sites and districts in Racine County listed on the National Register of Historic Places are presented on Map 2.6. More detailed information on these historic sites can be found on the National Park Service's National Register of Historic Places Database and Research website. In addition, the Caledonia Historical Society also maintains several historic buildings in Linwood Park in the Village of Caledonia that are not listed on the National Register of Historic Places.

[19] *A historic district is a geographically definable area, urban or rural, that contains a concentration of significant historic sites or structures from the same period of time.*

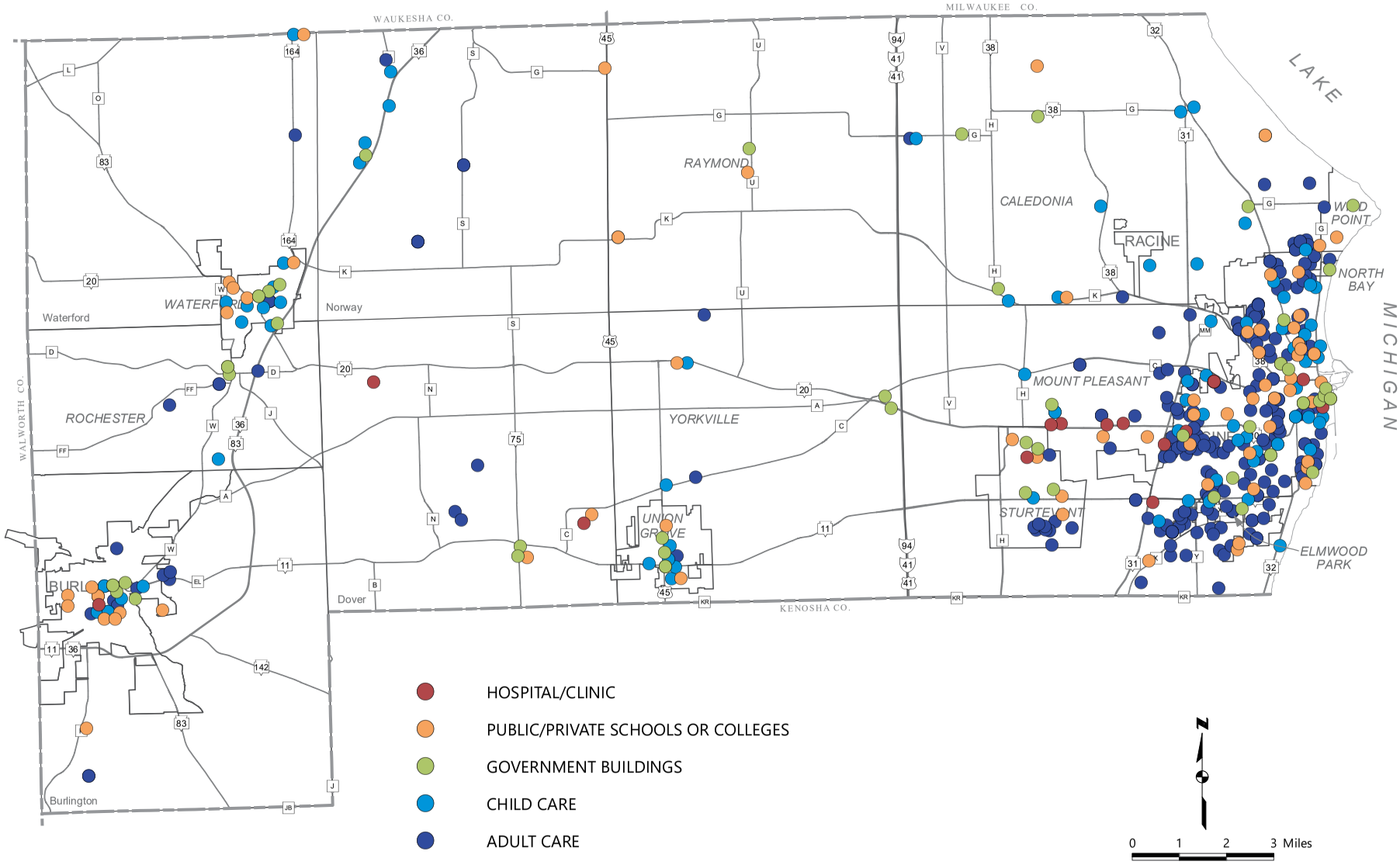
Map 2.4
Emergency Services in Racine County: 2022



Notes: Fire and EMS personnel are housed within the same structure/station, hence the map shows both within the same building.

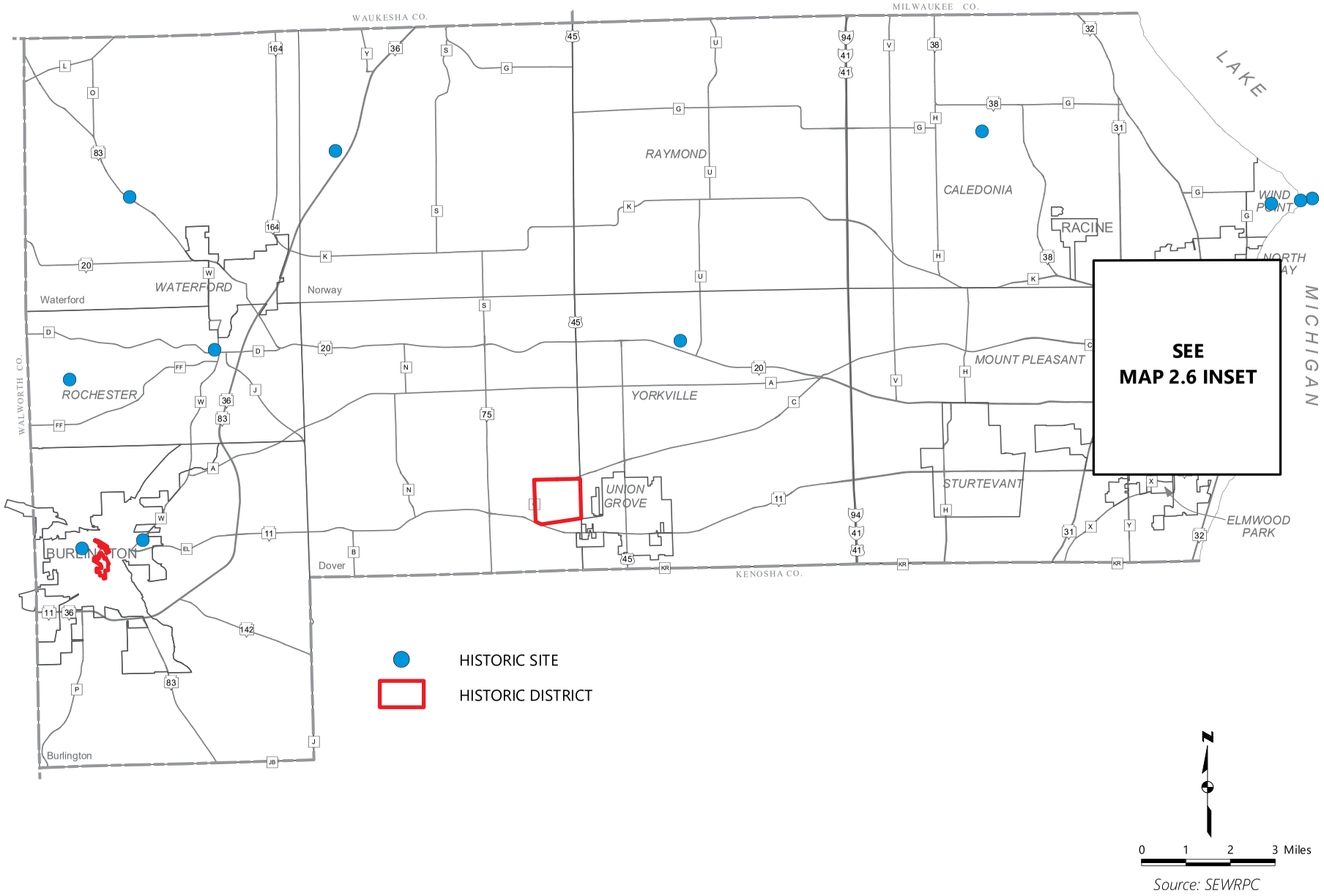
Source: Wisconsin Department of Justice (WILENET), Racine County Office of Emergency Management Department, Racine County, and SEWRPC

Map 2.5
Critical Community Facilities in Racine County: 2022



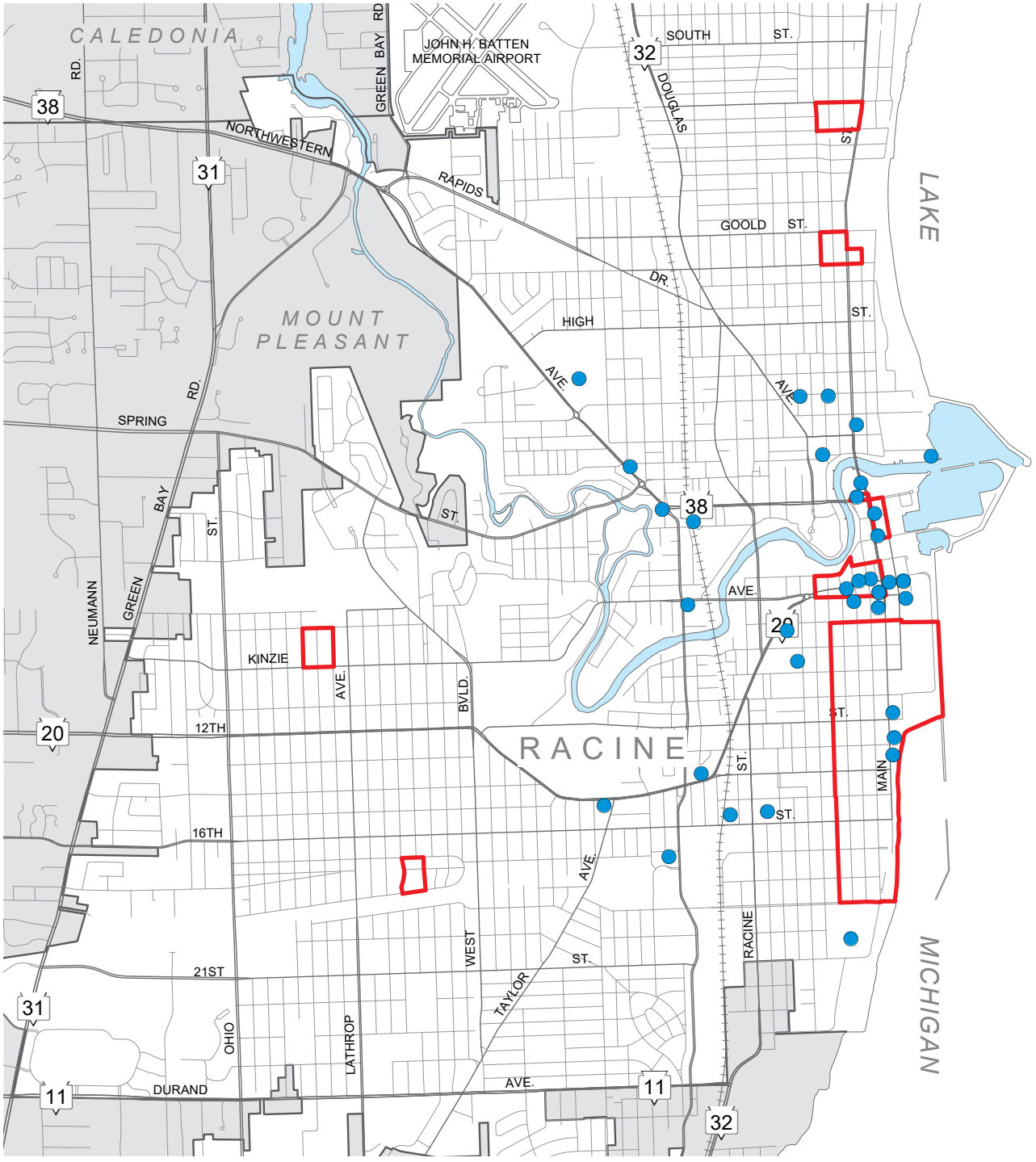
Source: Wisconsin Department of Children and Families, Wisconsin Department of Health and Social Services, Wisconsin Department of Public Instruction, Racine County, and SEWRPC

Map 2.6
National and State Registers of Historic Sites and Districts in Racine County: 2020



Source: SEWRPC

Map 2.6 Inset
National and State Registers of Historic Sites and Districts in Racine County: 2020



Source: SEWRPC

ANALYSIS OF HAZARD CONDITIONS 3

To evaluate various potential hazard mitigation alternatives for Racine County and select the most effective and feasible hazard mitigation strategies, the existing potential hazard problems in the County must first be analyzed and the vulnerability to such hazards documented. Accordingly, this chapter provides the following:

- Identification of the hazards likely to affect Racine County
- Profiles of the extent and severity of recent hazard events which occurred in the County
- Assessment of the vulnerability and risk associated with each type of hazard
- Identification of the potential for changes in hazard severity and risk under future conditions

The vulnerability assessment focuses on the County and community assets described in Chapter 2.

3.1 HAZARD IDENTIFICATION

The process of identifying those hazards that should be specifically addressed in the Racine County hazard mitigation plan was based upon consideration of a number of factors. The process included input from the Racine County Hazard Mitigation Local Planning Team, including a priority ranking of hazards; review of the hazard identification set forth in the State hazard mitigation plan; review of documentation of past hazard events; and review of related available mapping, plans, and assessments. As part of the updating process, the identification of hazards likely to affect Racine County was reviewed and reevaluated. This reevaluation included additional input from the Racine County Hazard Mitigation Local Planning Team.

As part of the updating process for this third plan update (4th Edition), the Local Planning Team reevaluated the hazards to be considered using a hazard and vulnerability assessment tool similar to the one used for reviewing hazard identification for the previous plan update. However, for this plan update the assessment was in the form of an online survey using Survey123. In this survey, members of the Local Planning Team indicated the likelihood of each hazard occurring in Racine County and evaluated the severity of each hazard on the basis of possible impacts to people, property, and businesses. Finally, the Local Planning Team evaluated the relative state of preparedness for each hazard. The ratings given by the Local Planning Team for each hazard were used to derive a perceived level of risk posed by each hazard. Following this, the hazards were ranked by perceived level of risk (Table 3.1).

Summary of Hazard Vulnerability and Risk Assessment Survey Results

Methods

The assessment survey was completed at the April 13, 2022, meeting of the Racine County Hazard Mitigation Local Planning Team, with 33 surveys returned and analyzed. For each of the hazards, a risk was computed for each survey using the formula:

Total risk (in weighted average) =
[(Probability) x (Human impact + Property impact + Business impact - Preparedness)].

Probability (likelihood that an event would occur), Human impact (possibility of death or injury), Property impact (physical losses and damages), Business impact (interruption of services), and Preparedness (mitigation or pre-planning) were each assigned a number from 0 to 3, with 0 indicating not applicable, 1 indicating low probability/impact/level of preparedness, 2 indicating moderate probability/impact/level of preparedness, and 3 indicating high probability/impact/level of preparedness.

Table 3.1
Perceived Risks of Hazards as Determined by Hazard Vulnerability and Risk Assessment Survey: 2022

Hazard[a]	Probability *Likelihood this will occur*	Human Impact[b] *Possibility of death or injury*	Property Impact[b] *Physical losses and damages*	Business & Agency Impact[b] *Interruption of services*	Preparedness[b] *Mitigation or pre-planning*	Total Risk[c] *Relative threat*	Rank[d]
Tornado	2.094	2.531	2.576	2.469	2.182	11.294	1
Stormwater Flooding	2.406	1.844	2.242	1.970	2.182	9.322	2
Ice Storm	2.387	2.094	1.788	2.250	2.273	9.212	3
High Straight-Line Wind	2.531	2.000	2.030	1.879	2.364	8.974	4
Heavy Snowstorm	2.719	1.875	1.636	2.303	2.576	8.805	5
Riverine Flooding	2.313	1.906	2.212	1.727	2.061	8.753	6
Blizzard	2.469	2.063	1.667	2.364	2.576	8.683	7
Extreme Cold	2.656	2.156	1.545	1.818	2.273	8.625	8
Lake Michigan Bluff Failure	2.129	1.594	1.938	1.364	1.061	8.163	9
Extreme Heat	2.406	2.219	1.455	1.636	2.030	7.891	10
Lake Michigan Erosion	2.281	1.484	1.697	1.273	1.152	7.533	11
Thunderstorm	2.719	1.875	1.697	1.576	2.485	7.240	12
Hail	2.452	1.594	1.879	1.364	2.212	6.433	13
Drought	2.219	1.719	1.364	1.303	1.697	5.965	14
Lightning	2.563	1.688	1.636	1.394	2.424	5.877	15
Wildfire	1.323	1.594	1.758	1.515	1.303	4.713	16
Dam Failure	1.219	1.688	1.806	1.697	1.394	4.628	17
Fog	2.406	1.375	1.182	1.152	1.909	4.329	18
Lake Michigan Coastal Flooding	1.469	1.219	1.333	1.061	1.212	3.526	19
Land Subsidence	1.419	1.156	1.182	1.094	1.152	3.237	20
Inland Lake Flooding	1.281	1.219	1.563	1.242	1.576	3.136	21
Earthquake	0.906	1.250	1.364	1.375	0.939	2.763	22
Inland Landslide	1.031	1.156	1.121	1.182	0.848	2.692	23
Dust Storm	1.031	1.000	1.030	0.970	1.121	1.938	24

Note: Ranking is based on the weighted average of the number of votes received for each score of low, moderate, or high.

[a] *Score/Ranking for Each Hazard from Survey123: High (3); Moderate (2); Low (1); N/A (0)*

[b] *Severity = Sum of Impact – Preparedness*

[c] *Total Risk = Probability x Severity*

[d] *Perceived threat/rank increases with weighted average and percentage.*

Source: SEWRPC

The interpretation of the results returned by this formula is that the perceived risk increases with increasing weighted average risk. For each hazard, an average risk was calculated using the results of all the returned surveys. The hazards were then ranked by average risk, with a rank of 1 indicating the highest perceived risk.

Results

The results from the assessment survey are summarized in Table 3.1. Hazard events are listed in order of highest perceived risk to lowest perceived risk. The average level of risk for hazards ranged from 1.938 (5.9 percent) for the lowest ranked hazard (dust storm) to 11.294 (34.2 percent) percent for the highest ranked hazard (tornado).

Summary and Ranking of Hazards

There are several ways the Racine County hazards can be ranked and summarized to be considered in the County hazard mitigation plan. Current guidance for all hazard mitigation plans promotes comprehensive consideration of all natural hazards. These hazards have been ranked by consideration of their frequency, amount of damage, and death and injuries incurred, as well as by concerns of, and degree of importance assigned by, the collective judgment of the Racine County Hazard Mitigation Local Planning Team.

The hazards to be considered in this plan are summarized in Table 3.2[20], along with qualitative information on the hazard severity. As part of the updating process, the hazards considered in the previous plan update were reevaluated based on data related to the occurrence of hazards since the previous plan update and to the perceived risk associated with each hazard, as summarized in Table 3.1.

Hazard severity can be assessed and ranked in a variety of ways. The purpose of ranking hazards is to help set priorities and direct more resources to address those hazards of the greatest severity. However, the kinds of mitigation actions that will be needed and warranted depend on the type of vulnerability to be addressed. Some hazards, such as excessive heat and lightning, are unlikely to cause a Countywide disaster, but they can be fatal and, therefore, are serious hazards. Vulnerability to such hazards can best be addressed by preventative measures, such as public information to encourage hazard awareness and personal protection. Other hazards, such as flooding, are pervasive and devastating, and may require a variety of tools—mapping, building codes, zoning laws, insurance, elevation or acquisition of flood-prone structures, and public awareness—to effectively reduce the risk of disaster. However, flooding might not result in more fatalities than a heat wave. In general, ranking hazards solely or primarily by the number of deaths that they cause shifts the focus away from major and largely avoidable disasters such as floods. In addition, weather related hazards that have caused past Racine County disasters are likely the hazards that will cause future disasters. However, the types of natural hazards that result in fatalities will also remain a public health and safety concern.

The summary listing of hazards in Tables 3.1 and 3.2 does include some hazards that have been found to have minimal chance of occurring or offer only limited applicable mitigation options. Due to this, the hazards listed below will only be briefly discussed here and will not be further addressed..

Fog

Fog is low-level moisture caused by many contributing factors, including ice or snowmelt, moist air from Lake Michigan, or rain evaporation with light winds, which may reduce visibility levels, especially in river valleys and other low spots. Dense fog is often seen with clearing skies the day following a heavy rainstorm. Fog is a widespread natural hazard event that usually covers several counties during an episode. There have been 66 fog events reported in and around Racine County from 2001 through 2021. Although no deaths or injuries were recorded during that period, fog can affect mobility. Dense fog may persist for several hours or days, reducing visibility and leading to vehicle accidents, flight delays, or cancellations at airports. This natural hazard event does not offer significant mitigation alternatives to warrant individual examination.

[20] *The rankings in Table 3.2 were assigned by combining rankings of the natural hazards listed based upon the number of occurrences, amount of damages, numbers of fatalities and injuries reported since 1950, and the perceived risk associated with each hazard as identified by the Local Planning Team and summarized in Table 3.1. It is important to note that some of the natural hazards listed in Table 3.2 represent combinations of hazards listed in Table 3.1. For example, while specific risks associated with thunderstorms, such as hail and lightning are listed separately in Table 3.1, they are combined into one category in Table 3.2.*

Table 3.2
Summary of Hazards to be Considered in the Racine County Hazard Mitigation Plan

Hazard	Risk of Occurrence	Damage to Property	Threat to Life Safety	Duration of Impact	Size of Area Affected
	(high, medium, or low)			(long, moderate, or short)	(large, medium, or small)
Inland Flooding (stormwater, riverine, inland lake, dam failure)	High	High	Medium	Moderate	Large
Severe Thunderstorms Combined (thunderstorm, high straight-line winds, hail, lightning)	High	Medium	Medium	Long	Large
Tornadoes	Low	High	High	Short	Small
Severe Winter Storms (heavy snowstorm, blizzard, ice storm)	High	Low	Medium	Moderate	Large
Temperature Extremes (extreme heat, extreme cold)	High	Low	Medium	Long	Large
Drought	Medium	Low	Medium	Long	Large
Lake Michigan Coastal Hazards (erosion, recession, flooding)	High	Medium	Medium	Long	Medium

Source: SEWRPC

Wildfires

A forest fire is an uncontrolled fire occurring on forest or woodlands typically located outside the limits of incorporated villages or cities. A wildfire is any instance of uncontrolled burning in brush, marshes, grasslands or field lands. The most common of these in Racine County is marsh fires which do occasionally occur. However, these are normally responded to by local fire suppression departments in accordance with established response procedures and no specific mitigation actions are deemed warranted. The causes of these fires include lightning, sparks from trains, human carelessness, or arson. Land use, vegetation, amount of combustible materials present, and weather conditions, such as wind, low humidity, and lack of precipitation, are the chief factors determining the number of fires and acreage burned.

Only about 6.5 percent of the land area in Racine County is woodland. Historical agricultural land use and urbanization has reduced the threat of a large-scale forest or wildfire event. According to the Wisconsin Department of Natural Resources (WDNR), Bureau of Forestry, no forest fires or wildfires over 500 acres have occurred in Racine County from 2011 through 2021. Based on guidance from the National Association of State Foresters, the WDNR, in conjunction with its Federal and tribal partners, developed a Statewide assessment of communities at risk from wildfires. None of the communities in Racine County were determined to be at high or very high risk. Considering the low risk and lack of historic incidents, forest and wildfire hazards will not be addressed in later chapters.

Dust Storms

There have been no dust storm events reported in Racine County from 2011 through 2021. Natural hazard events that occurred in the past are likely to reoccur in the future, providing the opportunity to plan for them. A dust storm event in Racine County would be atypical, therefore, mitigation strategies will not be recommended for this hazard in the current plan.

Land Subsidence

Land subsidence occurs when large amounts of groundwater have been withdrawn from certain types of rocks, such as fine-grained sediments. The rock compacts because the water is partly responsible for holding the ground up. When the water is withdrawn, the rock falls in on itself.[21] Land subsidence is not immediately noticeable because it occurs over large areas over a certain amount of time, unlike sinkholes. Due to the karst terrain of Wisconsin and high groundwater levels, there have been no land subsidence events reports in Racine County from 2011 through 2021. A land subsidence event in Racine County would be atypical, and therefore, mitigation strategies will not be recommended for this hazard in the current plan.

[21] *U.S. Geological Survey, "Land Subsidence", Water Science School, June 2018.*

Inland Landslide

The most frequent and widespread damaging landslides in the U.S. are started by prolonged or heavy rainfall. The majority of rainfall-induced landslides are shallow, small, and move rapidly. Many rainfall-induced landslides transform into debris flows (fast-moving slurries of water, soil, and rock) as they travel down steep slopes, especially those that enter stream channels where they may mix with additional water and sediment.[22] The major concern for the U.S. Geological Survey (USGS) in regard to landslides resides in the State of California. Due to the lack of bare (no plants or trees to hold the soil in place) hills or steep slopes in congruence with heavy rainfall, inland landslides in Racine County are considered a very low hazard level.[23] There have been no inland landslides reported in Racine County from 2011 through 2021. Thus, mitigation strategies for this hazard will not be recommended in the current plan.

Earthquake

An earthquake is a shaking or sometimes violent trembling of the earth that results from the sudden shifting of rock beneath the earth's crust. This sudden shifting releases energy in the form of seismic waves or wave-like movement of the earth's surface. Earthquakes can strike without warning and may range in intensity from slight tremors to great shocks lasting a few seconds or over five minutes. The actual movement of the ground during earthquakes is seldom the direct cause of injury or death. Casualties may result from falling objects and debris; and disruption of communications, electrical power supplies, and gas, sewer, and water lines should be expected from earthquakes. The severity of an earthquake can be measured by comparing the peak acceleration associated with the horizontal shaking it produces to the normal acceleration a falling object experiences due to the force of gravity. This is usually expressed as a percentage of g, the acceleration due to gravity. The level of risk due to an earthquake can be expressed as the percentage of g, for which there is a 2 percent probability of being exceeded in a 50-year period. Depending on location, sites in Racine County have a 2 percent probability of experiencing earthquakes in a 50-year period in which the peak acceleration associated with horizontal shaking exceeds between 4 percent and 8 percent of g.[24] These are low values. While these levels of shaking can be noticeable, they are rarely associated with damages to structures. The earthquake threat to the State and Racine County is considered low, therefore earthquakes will not be considered further in subsequent sections of this report.

Past Hazard Experience

Past experiences with disasters are an indication of the potential for future disasters for which Racine County would be vulnerable. Accordingly, a review was made of the hazards that Racine County has faced in the past. Tables 3.3 through 3.5 detail the history since 2001 of estimated disaster damages caused by federally declared emergencies, the total number of weather hazard events recorded, and the severe weather history in the County.

As shown in Table 3.3, Racine County has had 18 major disaster declarations and 3 emergency disaster declarations between 2001 and 2021. The total documented estimated damages of these 21 events exceeded $17 million.

Since 2001, Racine County has experienced 567 weather hazard events, as summarized in Table 3.4. To illustrate the broader hazard damage potential, Table 3.4 summarizes the damages associated with the 567 natural hazard events. Those hazard events were estimated to have caused over $52 million in damages.

The historical events summarized in Table 3.4 shows that snow and ice are the most frequent weather hazards, closely followed by high straight-line winds. However, flooding is the most damaging weather hazard, followed by tornadoes and high straight-line winds. Extreme temperatures, high straight-line winds, floods, and snow and ice each accounted for one documented death.

---

[22] *U.S. Geological Survey, "Overview of Rainfall-Induced Landslides", Landslide Hazards, July 2018.*

[23] *Global Facility for Disaster Reduction and Recovery (GFDRR), "Think Hazard: Wisconsin Landslide", Retrieved May 31, 2022, from www.thinkhazard.org/en/report/3263-united-states-of-america-wisconsin.*

[24] *U.S. Geological Survey, "2008 United States National Seismic Hazard Maps", USGS Fact Sheet 2008-3018, April 2008.*

Table 3.3
Summary of Estimated Disaster Damages and Assistance in Racine County for Federally Declared Disaster Emergencies: 2001-2021

Date of Disaster and Event(s)	Estimated Property and Crop Damages ($)	Public Assistance[a] ($)	Individual Assistance[b] ($)
2001 – Snow (DR-3136)	--	5,380,816	--
2001 – Severe Storms, Flooding, & Tornadoes (DR-1369)	65,000	19,743,137	--
2002 – Severe Storms & Flooding (DR-1429)	--	2,158,899	--
2002 – Severe Storms, Flooding, & Tornadoes (DR-1432)	--	3,547,202	--
2004 – Severe Storms & Flooding (DR-1526)	6,622,000	10,868,369	6,568,870
2005 – Hurricane Katrina Evacuation (DR-3249)	--	1,236,260	--
2007 – Severe Storms & Flooding (DR-1719)	2,580,000	10,250,605	8,012,383
2008 – Record Snow & Near Record Snow (DR-3285)	--	8,596,849	--
2008 – Severe Storms, Flooding, & Tornadoes (DR-1768)	3,778,000	48,563,081	56,679,489
2010 – Severe Storms, Flooding, & Tornadoes (DR-1933)	46,000	4,019,463	--
2010 – Severe Storms & Flooding (DR-1944)	6,000	8,143,719	--
2011 – Severe Winter Storm & Snowstorms (DR-1966)	--	11,708,670	61,762,768
2012 – Severe Storms & Flooding (DR-4076)	10,000	8,488,330	--
2013 – Severe Storms & Flooding (DR-4141)	--	5,934,364	--
2016 – Severe Storms & Flooding (DR-4276)	--	11,488,732	--
2016 – Severe Storms & Flooding (DR-4288)	--	9,108,327	--
2017 – Severe Storms, Straight-Line Winds, & Flooding (DR-4343)	--	8,928,512	--
2018 – Severe Storms, Straight-Line Winds, & Flooding (DR-4383)	7,000	7,620,232	--
2018 – Severe Storms, Straight-Line Winds, Flooding, & Tornadoes (DR-4402)	--	36,974,388	8,902,520
2019 – Severe Storms, Straight-Line Winds, Flooding, & Tornadoes (DR-4459)	3,000	17,892,260	--
2020 – Severe Winter Storm & Flooding (DR-4477)	4,000,000	5,168,656	--
Total	17,117,000	245,820,871	141,926,030

[a] *Public assistance includes assistance to local units of government and nonprofit organizations.*

[b] *Individual assistance includes disaster assistance through FEMA programs and disaster loans from the U.S. Small Business Administration to individuals, households, and businesses.*

Source: National Climatic Data Center, U.S. Department of Agriculture Risk Management Agency, Wisconsin Emergency Management, Racine County Office of Emergency Management, and SEWRPC

Table 3.4
Historical Hazard Events Recorded in Racine County: 2001-2021

Event	Number of Events	Deaths	Injuries	Property Damages ($)	Crop Damages ($)
Drought	18	0	0	0	525,000
Tornadoes	7	0	3	6,122,000	11,000
Severe Thunderstorms Combined (thunderstorm, high straight-line winds, hail, lightning)	250	1	10	4,543,000	35,000
Flooding (stormwater, riverine, coastal, inland lake, dam failure)	34	1	0	32,543,000	8,876,000
Temperature Extremes (extreme heat, extreme cold)	31	1	0	5,000	0
Severe Winter Storms (heavy snowstorm, blizzard, ice storm)	161	1	0	20,000	0
Total	567	4	13	43,233,000	9,447,000

Source: The National Climatic Data Center (NCDC), National Oceanic and Atmospheric Administration (NOAA), and the National Environmental Satellite, Data and Information Service (NESDIS), and the U.S. Department of Agriculture Risk Management Agency

Table 3.5
Racine County Severe Weather History: 2001-2021

Year	Flash Flood Warning	Flood Warning	Severe Thunderstorm		Tornado	
			Watch	Warning	Watch	Warning
2001	0	0	10	7	1	1
2002	0	0	7	6	1	0
2003	1	0	9	4	3	0
2004	4	0	15	16	5	0
2005	0	0	11	5	0	3
2006	2	0	19	19	3	0
2007	4	3	2	11	3	0
2008	6	15	9	19	5	4
2009	3	7	8	8	1	2
2010	1	7	7	9	8	7
2011	0	1	10	17	2	0
2012	0	0	7	11	0	0
2013	0	8	5	8	2	4
2014	1	1	8	11	1	1
2015	1	1	5	15	2	2
2016	1	0	7	8	0	0
2017	2	6	10	15	2	0
2018	0	12	4	6	1	0
2019	2	8	8	4	0	0
2020	1	6	5	8	2	3
2021	0	0	4	7	0	1
Total	29	75	170	214	42	28

Source: National Oceanic and Atmospheric Administration, National Weather Service, and Iowa State University College of Agriculture – Department of Agronomy, "Iowa Environmental Mesonet"

To illustrate the potential frequency of thunderstorms and tornadoes, a review was made of the warnings historically issued by the National Weather Service, as shown in Table 3.5. Over the period of 2001 through 2021, there have been 384 thunderstorm-related watches or warnings and 70 tornado-related watches or warnings. In comparison, over the period 1990 through 2000, there were only 158 thunderstorm-related watches or warnings and only 41 tornado-related watches or warnings. This indicates that the frequency of such events is increasing over time.

3.2 DESCRIPTION OF ANALYSIS, METHODS, AND PROCEDURES

In the previous section of this report, the hazards considered applicable to Racine County were identified and ranked (Table 3.1). This section of the report develops a vulnerability assessment procedure for the identified hazards. This vulnerability assessment provides the basis for developing mitigation strategies that address the identified vulnerabilities.

The procedures utilized in the vulnerability analyses are based upon guidance provided by the Federal Emergency Management Agency (FEMA) and the Wisconsin Department of Military Affairs, Division of Emergency Management (WEM).[25] The analysis includes three components: 1) profile of hazard events, 2) inventory of assets, and 3) estimation of losses. In addition, potential changes in vulnerability under future conditions and the variance of vulnerability among the 17 communities within Racine County are analyzed. The profiling of hazard events was developed by utilizing the HAZUS methodology, data available on the FEMA and National Oceanic and Atmospheric Administration National Climatic web sites, USDA-RMA, data provided by the Wisconsin Department of Military Affairs, Division of Emergency Management, file data available from the Racine County Office of Emergency Management, and the Southeastern Wisconsin Regional Planning Commission (Commission).

[25] *Federal Emergency Management Agency, State and Local Mitigation Planning How-to Guide, "Understanding Your Risks, Identifying Hazards and Estimating Losses," Publication No. FEMA 386-2, August 2001; Federal Emergency Management Agency, State Mitigation Planning Policy Guide, April. 2022; Federal Emergency Management Agency, Local Mitigation Planning Policy Guide, April 19, 2022.*

Data and estimated losses and vulnerability were developed utilizing standard risk assessment methodology as set forth in FEMA and WEM guidelines for hazard mitigation planning where hazards can be estimated spatially and by order of magnitude over a range of events. For hazards which cannot be quantified, alternative approaches have been used relying on qualitative measures. A vulnerability description has been included for each of the applicable hazards listed in Table 3.2. The hazard analyzed in the next section are mainly listed in the order of ranking from Table 3.1, with the exceptions of the combining of certain hazards.

3.3 HAZARD VULNERABILITY AND RISK ASSESSMENTS

Tornadoes

Wisconsin lies along the northern edge of an area of the United States commonly known as "tornado alley." This area extends northeasterly along an axis extending from Oklahoma and Iowa in the west, to Michigan and Ohio in the east. This corridor accounts for about one-fourth of the total number of tornadoes that occur within the U.S. in any given year, with 758 tornadoes reported in the U.S. during the year 2011.

A tornado is defined as a violently rotating column of air extending from the ground up to the thunderstorm base. It generally lasts for only a short period. The tornado appears as a funnel-shaped column with its lower, narrower end touching the ground and upper, broader end extending into the thunderstorm cloud system. In some cases, the visible condensation cloud may not appear to reach the ground, but meanwhile tornado-force winds may be causing severe destruction (rotating winds can be nearly invisible, except for dust and debris). Similar events, not reaching the land surface, are known as funnel clouds. Funnel clouds may be a precursor to a tornado event. In Wisconsin, tornadoes usually occur in company with thunderstorms formed by eastward-moving cold fronts striking warm moist air streaming up from the south. However, it is not possible to predict all tornado activity based upon the occurrence of thunderstorms, and, occasionally, multiple outbreaks of tornadoes can occur along the frontal boundaries of a thunderstorm, affecting large areas of the Region or the State at one time. Tornadoes generally occur near the trailing edge of a thunderstorm. It is not uncommon to see clear, sunlit skies behind a tornado.

Historically, tornadoes have been categorized based upon the most intense damage along their paths using the Fujita Scale. Since February 2007, the Fujita Scale has been replaced by the Enhanced Fujita Scale, which retains the same basic design of its predecessor with six strength categories. This scale is shown in Table 3.6. The newer scale reflects more refined assessments of tornado damage surveys, more standardization, and consideration of damage over a wider range of structures.

The destructive power of the tornado results primarily from its high-wind velocities, wind-driven debris, and uplifting force. These tornado characteristics probably account for 90 percent of tornado-caused damage. Since tornadoes are generally associated with severe storm systems, hail, torrential rain, and intense lightning usually accompany tornado events. In addition, tornadoes may be accompanied by downbursts, events which are characterized by strong downdrafts initiated by a thunderstorm that manifest as straight-line winds on or near the ground. These winds can be powerful, with speeds up to 70 to 100 mph. These winds interact with tornadoes and can affect the path of the tornado event in such a manner as to make tornadoes somewhat unpredictable. Depending on their intensity, tornadoes can uproot trees and crops, down power lines, and damage or destroy buildings and infrastructure. Flying debris can cause serious injury and death to humans, livestock, and wildlife in their path. An approaching cloud of debris can mark the location of a tornado, even if the classic funnel cloud is not visible. Before a tornado hits, the wind may die down and the air may become very still.

The National Weather Service monitors severe weather nationwide from its Norman, Oklahoma office. This office is the only entity that can issue a tornado watch. The National Weather Service Milwaukee/Sullivan office may issue tornado warnings for Racine County, and the Racine County Communications Center activates municipally owned and maintained Outdoor Warning Sirens when warnings are issued. A tornado watch means that tornadoes are possible, and that persons within the area for which the watches are issued should remain alert for approaching storms. A tornado warning means that a tornado has been sighted in an area or indicated as likely to have occurred by weather radar. When tornado warnings are issued for an area, persons near and within that designated area are advised to move to a pre-designated place of safety. As discussed previously, Table 3.5 shows the total number of tornado watches and warnings in Racine County from 2001 through 2021. Tornado shelters are identified by appropriate signage in public buildings. The National Weather Service operates two 24-hour weather radio transmitters that serve all of Racine County.

Recent Events

In the State of Wisconsin, tornado paths historically have averaged 3.5 miles in length and 50 yards in width, although tornadoes of a mile or more in width and 300 miles in length have been known to occur elsewhere in the United States. On average, tornadoes in Southeastern Wisconsin move across the land surface at speeds of between 25 and 45 miles per hour, although overland speeds of up to 70 mph have been reported. Tornadoes rarely last more than a few minutes over a single spot or more than 15 to 20 minutes in a 10-mile area, but, in those few minutes, significant devastation may occur.

The severity of any particular tornado event is measured in terms of resulting deaths, injuries, and economic losses. The magnitudes of the tornadoes recorded in Southeastern Wisconsin have been low, primarily EF0 or EF1 events on the Enhanced Fujita Scale (see Table 3.6). The strongest tornado ever recorded in Racine County was an EF2. An EF2 tornado occurred in 1957, 1959, 1966, and 1972, but has not occurred in recent years. Nevertheless, tornadoes are second only to stormwater damage associated with floods, as the costliest natural hazard to impact Southeastern Wisconsin.

Table 3.6
Enhanced Fujita Scale Characteristics

EF-Scale	Wind Speed (miles per hour)[a]	Character of Damage	Relative Frequency (percent)
EF0 (weak)	65-85	Light	53
EF1 (weak)	86-110	Moderate	32
EF2 (strong)	111-135	Considerable	11
EF3 (strong)	136-165	Severe	3
EF4 (violent)	166-200	Devastating	1
EF5 (violent)	> 200	Incredible (rare)	<1

[a] *Equivalent wind speeds associated with the Enhanced Fujita Scale represent a three-second gust of wind.*

Source: National Oceanic and Atmospheric Administration

2015 – Recently, there has only been one reported tornado in Racine County between 2011 and 2021. This tornado occurred on August 18, 2015, and was categorized as an EF0, causing sporadic tree damage along its path. Property and crops damage totaled $1,000.

Vulnerability and Community Impact Assessment

In order to assess the vulnerability of the Racine County area to tornado hazards, a review of the community assets described in Chapter 2 was made which indicates the potential for significant tornado impacts to: 1) a variety of residential, commercial, and other developed land uses; 2) agricultural lands; 3) critical community facilities; and 4) historic sites. Significant impacts may also be possible to other infrastructure or utility systems, solid waste disposal sites, or hazardous material storage sites.

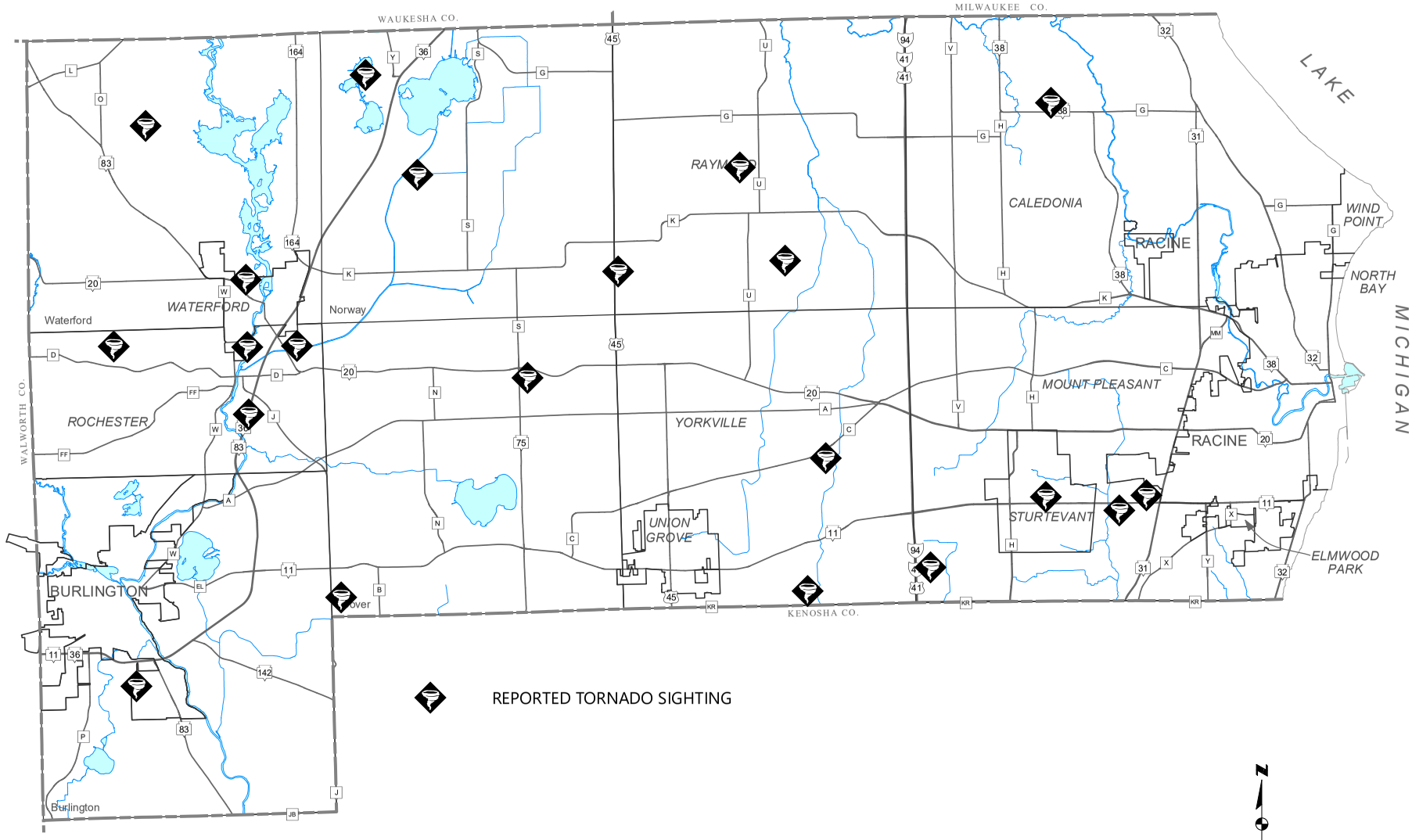
Based on the National Climatic Data Center's (NCDC) 71-year record history, 21 tornadoes have been reported between 1950 and 2021, with about one tornado occurring every 3.4 years in Southeastern Wisconsin. In total, the tornadoes that have occurred in the last 71 years have resulted in 10 injuries and nearly $9.3 million in property and crop damages. From the distribution of historic tornado events, shown on Map 3.1, the locations of tornado impact points are widely scattered throughout the County, although the northwestern portion of the County appears to be more susceptible to tornado events than other portions of the County.

During a tornado, homes, businesses, public buildings, and infrastructure may be damaged or destroyed by the high winds, rain, and/or hail often associated with a tornado. In addition, airborne debris, carried by the tornado and associated high winds, can break windows and doors, allowing winds and rain access to interior spaces. Fixed infrastructure, such as roads and bridges, can also be damaged by exposure to high winds, although more damage appears to result from washout associated with flash flooding and debris jams, as opposed to direct damage due to contact with funnel clouds. In an extreme tornado event, such as a F4 event, the force of the wind alone can cause tremendous devastation, uprooting trees, toppling power lines, and inducing the failure of weak structural elements in homes and buildings. Due to the unpredictability of tornado events, all buildings, infrastructure, and critical facilities within the County are considered at risk.

Future Changes and Conditions

Changes in land use can have an impact on the potential for damage due to tornadoes and related hazards to occur. Such changes relate to the potential future increase in development within the County. Changing land use patterns within Racine County, as documented in the adopted VISION 2050 land use and transportation plan that is summarized in Chapter 2, and the assumption that current trends in the number and severity of tornadoes will continue into the future, indicate a continuing level of moderate risk of tornado damage

Map 3.1
Historic Tornado Events Reported in Racine County: 1950-2021



Source: National Climatic Data Center and SEWRPC

and related losses in the County. However, because of the actions that have been taken by the County and local units of government and individuals, the current vulnerability to tornadoes and related hazards has generally decreased in recent years. These ongoing mitigation measures are described further in Chapter 5.

The likely effects of climate change on tornado frequency and severity are not clear. The projections based upon downscaled climate model results do not address potential trends in tornado conditions. A recent study that examined the evolving contributors of risk and vulnerability to produce disaster potential for tornadoes into the future found that growth in the human-built environment is projected to outweigh the effects of impacts from tornado disasters, however, an increase in risk and exposure of tornadoes may lead to a significant increase in the magnitude and disaster impact of tornadoes on that built environment from 2010 to 2100.[26] Additionally, high-risk tornado regions may experience increased disaster probability, and historically vulnerable regions may be at greater risk of tornado disaster due to a combination of factors: Increased tornado risk, increased exposure, and pre-existing social and physical vulnerabilities.

Multi-Jurisdictional Risk Management

Based upon a review of the historic patterns of tornado events in Racine County, and consideration of potential future changes and conditions, it appears there are no specific municipalities that have unusual tornado related risks. Rather, the events are considered to be relatively uniform and of a countywide concern.

Inland Flooding (Stormwater, Riverine, Inland Lake, Dam Failure)

Flooding is a significant hazard in Racine County. As mentioned in Chapter 2, Racine County has a significant amount of surface water and floodplains that can cause flooding issues. Watershed boundaries, wetlands, and major streams and lakes within the County are shown on Map 3.2. The land area within the 1-percent-annual-probability floodplain in each community is given in Table 3.7.

In addition to flooding, stormwater drainage problems exist on a scattered basis throughout Racine County. The distinction between stormwater drainage, stormwater management, and flood control is not always clear. For the purpose of this report, flood control is defined as the prevention of damage from the overflow of natural streams and watercourses. Drainage is defined as the control of excess stormwater on the land surface before such water has entered stream channels. The term "stormwater management" encompasses both stormwater drainage and nonpoint source pollution control measures. While the focus of this section is on the flooding hazard, the related stormwater drainage hazards are also considered because of the interrelationship between those two hazard conditions.

Dam Failure

A consideration in flood hazard mitigation is the potential for increased flooding due to dam failures, as such, future evaluation of floodplain areas related to dam failure should be considered. As indicated in Table 3.8 and Map 3.3, there are 19 dams identified by the WDNR in Racine County. Dams built according to accepted engineering principles at the time of construction and dams built without application of engineering principles can both equally fail. When a dam fails, or is subject to overtopping, large quantities of water can rush downstream with great destructive force. In the State of Wisconsin, WDNR inspects and assigns hazard ratings to dams.

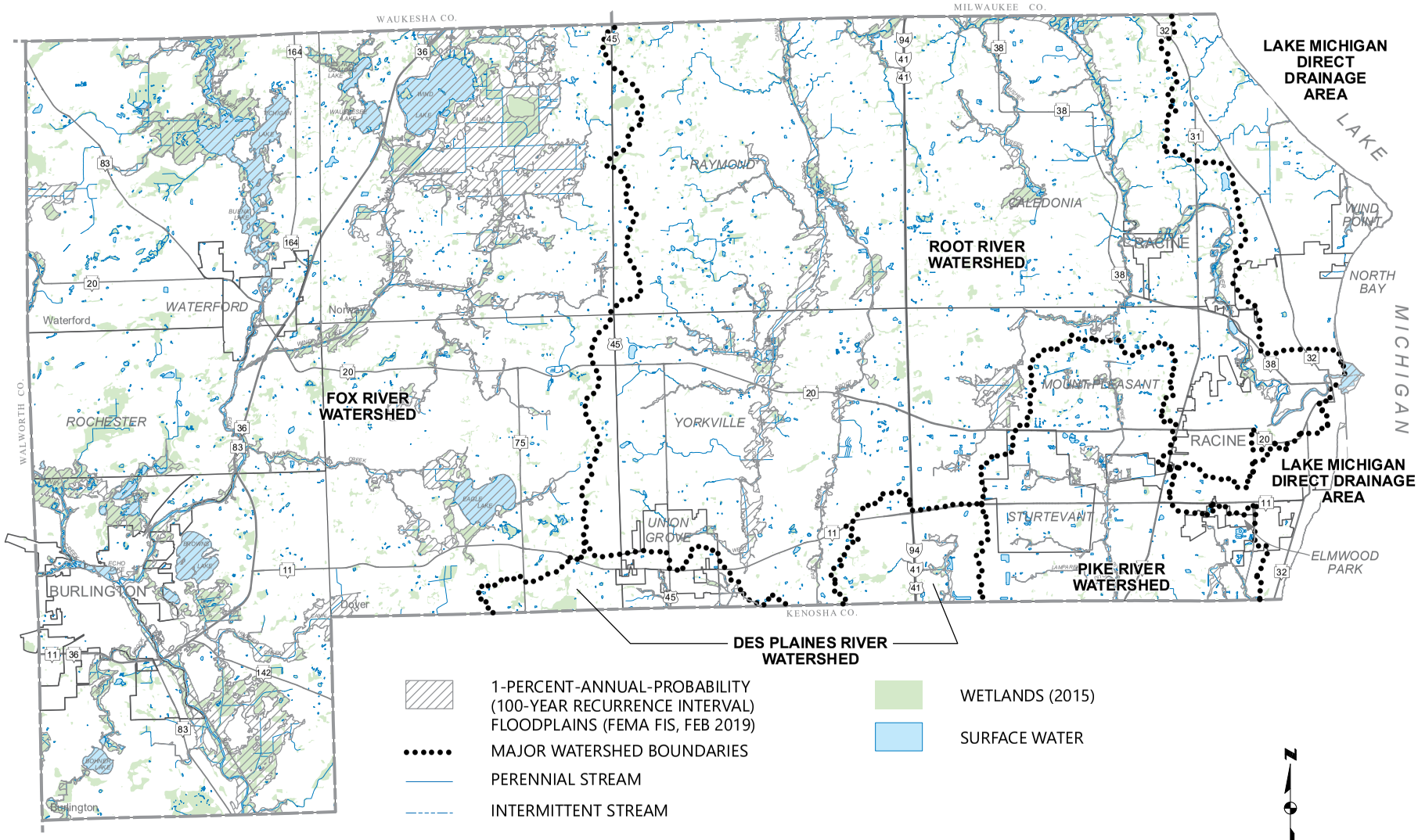
The WDNR assigns hazard ratings to large dams within the State. Two factors are considered when assigning hazard ratings: existing land use and land use controls (zoning) downstream of the dam. Dams are classified, by law, in three categories that identify the potential hazard to life and property.[27]

- A **low hazard** rating is assigned to those dams that have no development unrelated to allowable open space use in the hydraulic shadow where the failure or mis-operation of the dam would result in no probable loss of human life, low economic losses (losses are principally limited to the owners property), low environmental damage, no significant disruption of lifeline facilities, and have land use controls in place to restrict future development in the hydraulic shadow.

[26] *Strader, S. M., Ashley, W. S., Pingel, T. J., & Krmenec, A. J. (2017). Projected 21st century changes in tornado exposure, risk, and disaster potential. Climatic Change, 141(2), 301–313. doi.org/10.1007/s10584-017-1905-4.*

[27] Wisconsin Administrative Code*, NR 333.06*

Map 3.2
Surface Waters, Wetlands, Watersheds, and Floodplains in Racine County



Source: Federal Emergency Management Agency and SEWRPC

- A **significant hazard** rating is assigned to those dams that have no existing development in the hydraulic shadow that would be inundated to a depth greater than 2 feet and have land use controls in place to restrict future development in the hydraulic shadow. Potential for loss of human life during failure is unlikely. Failure or mis-operation of the dam would result in no probable loss of human life but can cause economic loss, environmental damage, or disruption of lifeline facilities.

- A **high hazard** rating is assigned to those dams that have existing development in the hydraulic shadow that will be inundated to a depth greater than 2 feet or do not have land use controls in place to restrict future development in the hydraulic shadow. This rating is assigned if loss of human life during failure or mis-operation of the dam is probable.

In Racine County, three dams are currently assigned significant hazard ratings and the remaining 17 have been assigned low hazard ratings. The risk of dam failure is monitored closely by the WDNR.

Recent Events

A total of 16 flood events have been recorded in Racine County between 2011 and 2021. These events are shown in Table 3.9, based upon data published by the National Climatic Data Center. As shown in Table 3.9 these flood events can range from one event per year or up to 5 events per year, which demonstrates the likelihood and unpredictability of these events. In total, these flood events have resulted in 0 injuries, 1 death, and over $23 million in property and crop damages within Racine County. See Table 3.9 for a full list of recent flood events. A few examples of recent events from Table 3.9 are noted below.

2011 – On September 25 and 26, 2011, showers and thunderstorms produced up to three inches of rain across parts of southern Wisconsin over a 48-hour period ending the morning of September 26. The heavy rains flooded low-lying areas and ditches across the Region, with standing water three to four feet deep in some locations. Heavy rains resulted in flash flooding of a construction zone on the west frontage road of IH 94 between STH 20 and CTH C. This flood caused an estimated $6,300 of property damage and $1,050 in crop damage.

2017 – On July 12, 2017, four to eight inches of rain fell over the southwest half of the County for several hours. Racine County and the city and town of Burlington declared emergencies. The city of Burlington was divided in half from east to west due to flooding on the Fox River (see Figure 3.1). Various road closures over the southwest half of Racine County continued due to flooding through July 17th. The power was out for much of Burlington for a few days. Property damages resulting from this flood were estimated to be $23,800,000. Crop damages were estimated at $16,000.

2019 – On March 14, 2019, mild temperatures and some rainfall led to snow melt and excessive runoff on a frozen ground. Numerous rivers flooded including flooding in atypical areas due to ice jams. Evacuations were needed in some communities. The Fox River at Burlington reached minor flood stage, cresting at 11.9 feet. There was lowland flooding in the Burlington and Big Bend areas. Property damages resulting from this flood were estimated to be $1,000.

2020 – In the middle of May 2020, a slow-moving low-pressure area brought a moderate to heavy rainfall over an 18 to 24 hour period. 3 to 6 inches of rain fell, which resulted in river, creek, and lowland flooding. Numerous roads were flooded and closed. A small number of water rescues were executed. Property damages resulting from this flood were estimated to be $10,000.

Vulnerability and Community Impact Assessment

To assess the vulnerability of the Racine County area to flooding hazards and related stormwater drainage problems, consideration was specifically given to potential structure flooding, including critical facilities, and cropland flood damages.

A review of the community assets described in Chapter 2 indicate the potential for flooding impacts to: 1) a variety of flood-prone residential, commercial, and other developed land uses; 2) agricultural lands; and 3) critical community facilities. No significant impacts are expected to other infrastructure or utility systems, solid waste disposal sites, or hazardous material storage sites.

There are currently 648 structures estimated to be located within the 1-percent-annual-probability (100-year recurrence interval) floodplain hazard areas of Racine County. The approximate locations of these structures are shown on Map 3.4. There are 576 residential structures (including 54 residential manufactured homes), 22 industrial, business, and commercial structures, 29 agricultural buildings, four government buildings, six community utility buildings, and 12 other buildings (including one private school, one adult day care center, one group home, five recreational buildings, two churches, and two miscellaneous buildings). The specific location of each structure and its relationship to the floodplain is shown on the FEMA digital flood insurance rate maps for Racine County, which were finalized in 2020.

As of August 2022, there were six structures which are considered by FEMA to be repetitive- or substantial-loss properties in Racine County. All six structures are residential. There are two multi-family residential structures considered repetitive loss in the City of Racine, two single-family structures in the Town of Dover, and one single-family structure in both the Towns of Norway and Waterford. Repetitive-loss structures are those that have two or more flood insurance claims of at least $1,000 each. Most of these structures sustained damages during the June 7-9, 2008, flood event. The May 17, 2020, flood event was the most recent event to damage one of these repetitive loss structures.

Detailed floodplain hazard data are available for all floodplain hazard areas identified. Estimated damages are included in Table 3.10 for a 1-percent-annual-probability (100-year recurrence interval) flood event. The total value of the 648 structures (not including land value), which are identified as being subject to flooding or stormwater drainage problems, is about $93 million. The total market value plus contents within these structures are estimated at over $136 million. Damages expected during a 1-percent-annual-probability flood event are estimated to be approximately $19.3 million.

Table 3.7
Areal Extent of 1-Percent-Annual-Probability Floodplain by Community in Racine County: 2022

Community	Area (acres)
Cities	
Burlington	727.0
Racine	620.2
Villages	
Caledonia	1,721.5
Elmwood Park	0.0
Mt. Pleasant	1,327.3
North Bay	1.7
Raymond	1,722.2
Rochester	738.3
Sturtevant	74.3
Union Grove	48.5
Waterford	124.3
Wind Point	62.9
Yorkville	1,684.2
Towns	
Burlington	5,213.3
Dover	2,088.4
Norway	7,672.0
Waterford	3,157.4
Total	26,983.4

Source: Federal Emergency Management Agency and SEWRPC

It should be noted that, with a few exceptions, all of these structures were identified as being in the floodplain based upon the best available topographic mapping. Field surveys would be required to determine the precise relationship to the floodplain. Some structures may be found to be outside the flood hazard areas based upon detailed field survey data.

Maps 3.5 and 3.6 show the location relative to the 1-percent-annual-probability floodplain of emergency service structures and critical community facilities. There are 585 buildings identified as critical community facilities, emergency service structures, and historical sites that are distributed geographically throughout the County. A listing of those facilities can be found in Appendices B and C. Seven of these facilities—a private high school, an adult care facility, two historical sites, the Village of Waterford Public library, the Racine County Sheriff's Department Water Patrol Office, and the City of Burlington Police Department—are located within the floodplain hazard area. In addition, other facilities are located in the immediate vicinity of the floodplain hazard area. Because of the need for access to and from these facilities, Maps 3.5, 3.6, and 3.7 include their location and show the relationship to the flood hazard areas.

In addition, east to west travel in the County could potentially be restricted during flood events due to overtopping of a number of arterial streets and highways by the Root River and Root River Canal in the northeastern portion of the County and the Fox River and its tributaries in the western portion of the County. This review of the extent and severity of flooding conditions within Racine County indicates that there is a significant potential community impact due to the damages caused by flooding of buildings and disruption of the transportation system during extreme flooding events.

Table 3.8
Wisconsin Department of Natural Resources Dam Inventory Information: 2021

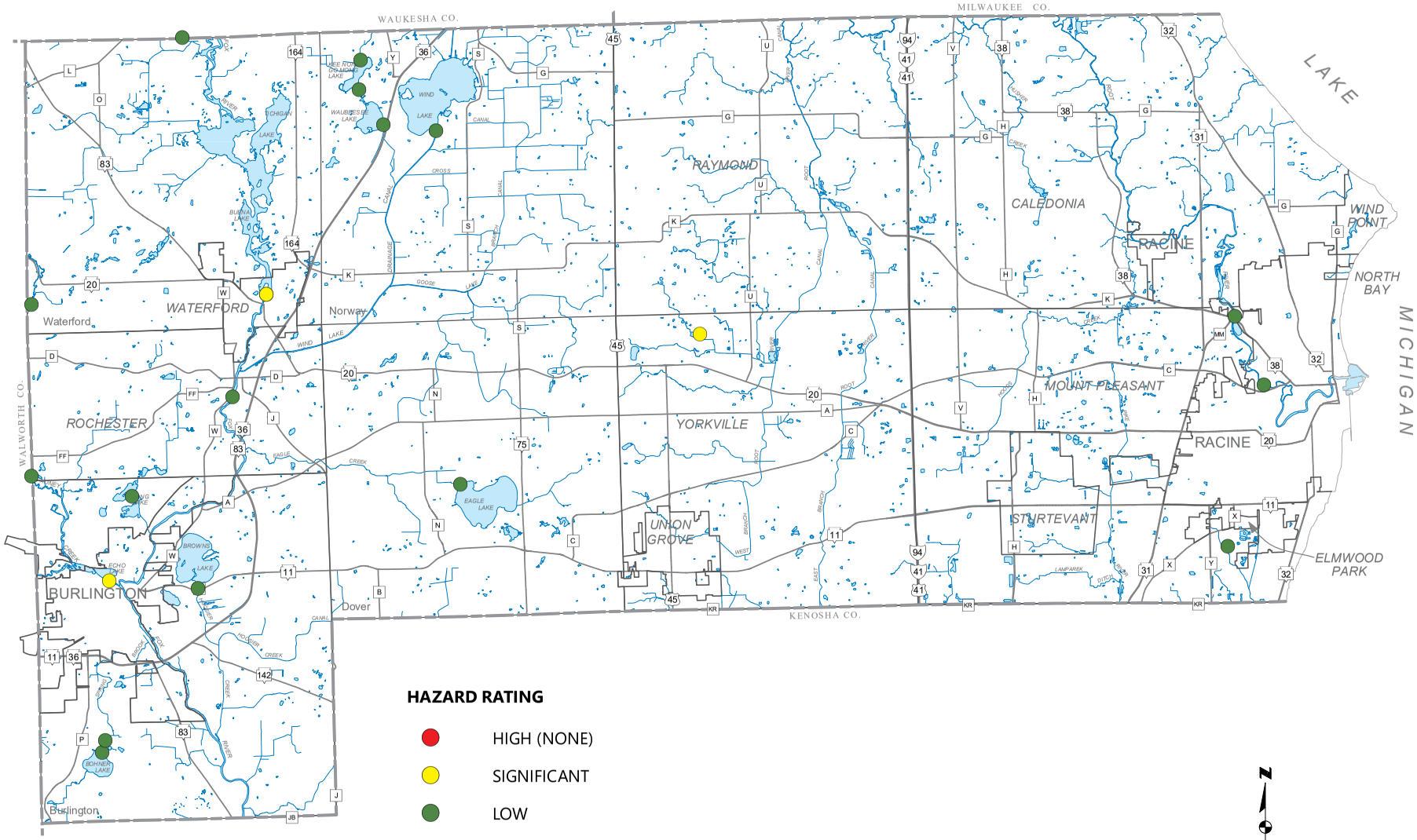
Map ID	Community	Dam Name		Owner Organization	Size	Structural Height (ft.)	Hazard Potential
		Official	Local				
1	Racine	Horlick Dam	--	Racine County	Large	19.0	Low
2	Waterford	Waterford	Buena Lake Dam	Racine County	Large	10.0	Significant
3	Spring Prairie	Honey Lake[a]	Sugar Creek	Honey Lake Protection & Rehabilitation District	Large	12.0	Low
4	Burlington	Burlington	Echo Lake Dam	City of Burlington	Large	10.0	Significant
5	Vernon	Reischl[b]	--	Norris, Inc.	Large	13.0	Low
6	Rochester	Rochester	--	Racine County	Large	9.0	Low
7	Dover	Eagle Lake	Eagle Lake Property Owners Association	Racine County	Large	8.0	Low
8	Norway	Wind Lake	--	Racine County	Large	7.0	Low
9	Norway	Lake Denoon	Riparians	Riparians	Small	2.0	Low
10	Norway	Waubeesee	--	Town of Norway	Large	6.5	Low
11	Burlington	Browns Lake	Even J. Sells	Even J. Sells	Small	4.0	Low
12	Burlington	Bohner Lake	WDNR	Racine County	Small	5.0	Low
13	Burlington	Long Lake	--	Riparians	Small	2.0	Low
14	Norway	Lake Kee Nong A Mong	--	Town of Norway	Small	4.0	Low
15	Mt. Pleasant	Colonial Park Environmental Center	--	City of Racine	Small	6.0	Low
16	Waterford	Joseph Shaffer	--	--	Small	13.0	Low
17	Burlington	Bohner Pond	--	Racine County	Small	12.0	Low
18	Yorkville	Hickory Lake	Dremel	--	Large	20.0	Significant
19	Mt. Pleasant	Pleasant Valley Lake	--	--	--	--	Low

[a] *Dam is located in Walworth County immediately west of the Racine County Line.*

[b] *Dam is located in Waukesha County immediately west of the Racine County Line.*

Source: Wisconsin Department of Natural Resources and SEWRPC

Map 3.3
Dams Located in Racine County: 2021



Source: Wisconsin Department of Natural Resources and SEWRPC

Table 3.9
Recent Flood Events in Racine County: 2011-2021

Date	Location	Type	Deaths	Injuries	Property Damages ($)	Crop Damages ($)
9/26/2011	Ives Grove	Flood	1	--	6,000.00	1,000.00
4/18/2013	Burlington	Flood	--	--	10,000.00	1,000.00
4/18/2013	Kneeland	Flood	--	--	3,000.00	1,000.00
5/12/2014	Bohners Lake	Flash Flood	--	--	--	--
7/12/2017	Honey Lake	Flash Flood	--	--	300,000.00	15,000.00
7/12/2017	Honey Lake	Flood	--	--	23,500,000.00	1,000.00
2/20/2018	Caldwell	Flood	--	--	5,000.00	--
10/1/2018	Kneeland	Flood	--	--	--	5,000.00
10/6/2018	Kneeland	Flood	--	--	--	1,000.00
10/6/2018	Burlington	Flood	--	--	1,000.00	--
3/14/2019	Rochester	Flood	--	--	1,000.00	--
4/29/2020	Kneeland	Flood	--	--	1,000.00	--
5/1/2020	Kneeland	Flood	--	--	1,000.00	--
5/17/2020	Kneeland	Flood	--	--	5,000.00	--
5/18/2020	Downtown Racine	Flood	--	--	5,000.00	--
8/10/2020	Wind Point	Flash Flood	--	--	1,000.00	--
		Total	1	0	23,839,000.00	25,000.00

Source: The National Climatic Data Center (NCDC), National Oceanic and Atmospheric Administration (NOAA)

The flooding impacts on the community infrastructure and the need to prepare for major evacuations and other emergency actions are not a significant concern given the isolated nature and limited severity of the overland flooding problems. However, the ongoing coordinated Racine County and local emergency operations planning programs do have provisions for carrying out such actions if necessary. Significant flood-related impacts on the community economy and businesses are of an infrequent and short-term nature. The only impacts on County and local government operations which are relatively frequent involve posting and closure of roadways at locations where floodwaters frequently overtop structures and cause short-term roadway flooding.

Another potential impact for emergency and police vehicles to consider is the need to utilize alternative transportation routes when providing services during periods of flooding. In most of the County, this is expected to be a rare occurrence. However, in the Town of Norway, where a major portion of the flood-prone structures exist, there is a need for further mitigative action because of the extent of the flooding and emergency vehicle access concerns.

Agricultural Flood Damages

Historically, flood damages to agricultural land have been significant, with crop damages totaling $8.8 million over the period of 2001 to 2021. Thus, the average annual reported damages in the County can be approximated at $443,800 per year. There are about 10,497 acres of agricultural land located within the identified flood hazard area. Thus, the average annual flood damage is about $42 per acre.

Two particularly flood-prone agricultural areas of the County can be considered on a more site-specific basis. The first area is the agricultural lands lying adjacent to the Fox River in the Town of Waterford upstream of the Village of Waterford. Specific data on flood damages was developed for these lands under a 1995 water level control plan developed for the area.[28] In that planning program, 370 acres of land in the Town of Waterford were identified as being frequently flooded. Based upon estimates of the frequency of agricultural damages in a typical year, the total annual agricultural flood damages were estimated at $44,000 in 1995 dollars, or about $76,873 in 2021 dollars, and about $207 per acre per year, for the flood-prone lands located in the Town of Waterford.

[28] *SEWRPC Memorandum Report No. 102,* Water Level Control Plan for the Waterford-Vernon Area of the Middle Fox River Watershed, Racine and Waukesha Counties, Wisconsin*, March 1995.*

The second area of particular concern is lands in the Town of Norway drained by the Wind Lake Canal. These lands total about 4,000 acres, of which about 2,000 acres actually sustain damage during flood events. The frequency and severity of flooding in this area was analyzed in a 1975 drainage and water level control plan.[29] That study estimated the average annual damages on those lands at $186,000 in 1975, or $92 per acre. Using the Consumer Price Index (CPI) to convert the losses from this 1975 study to 2021 dollars, indicates that about $978,090 in damages occur in this area, or about $489 per acre per year, assuming 2,000 acres are still impaired. Given the abovementioned, the two agricultural areas specifically considered above account for a total of $1,054,963 in agricultural damages per year in all of Racine County.

Figure 3.1
July 12, 2017, Flooding: Fox River in the City of Burlington

Source: Burlington Standard Press, myracinecounty.com

Stormwater Drainage Problems

Because of the interrelationship between stormwater management and floodland management, stormwater management actions are an important consideration of the flood vulnerability assessment. Small area stormwater drainage problems are known to exist throughout the urbanized portions of the County. Most of the communities have undertaken stormwater management planning programs or stormwater management system inventories as the initial step in developing comprehensive stormwater management plans. Stormwater management planning in Racine County is described further in the following chapters, and that planning serves as the basis of the assessment of stormwater drainage problem vulnerability. Such problems largely impact community facilities by causing nuisance conditions and are not generally of concern for community health and welfare.

Future Changes and Conditions

Changes in land use can have a direct impact on flood flows and stages and, accordingly, can impact flooding problems. For the Root River watershed, more detailed data under current and future conditions by land use category is documented in the restoration plan for the Root River watershed.[30] The changes in urban land use over the 35-year period from 2015 through 2050 are expected to result in an increase in the amounts of impervious surface in these watersheds. In the absence of mitigative measures, this could lead to increases in future flood flows and stages, especially in downstream areas. As is discussed previously in this report, there are a number of programs in place that are intended to mitigate the potential for such increases in flood flows. Nevertheless, it is important that future condition flood flows and stages be considered as mitigative actions are being considered.

Based upon the above, it can be concluded that the extent and severity of the flooding problem within the County has the potential to become more severe to a limited extent in the near future. This conclusion highlights the importance of carrying out and implementing current floodplain and related ordinances and existing and ongoing stormwater management plans and regulations.

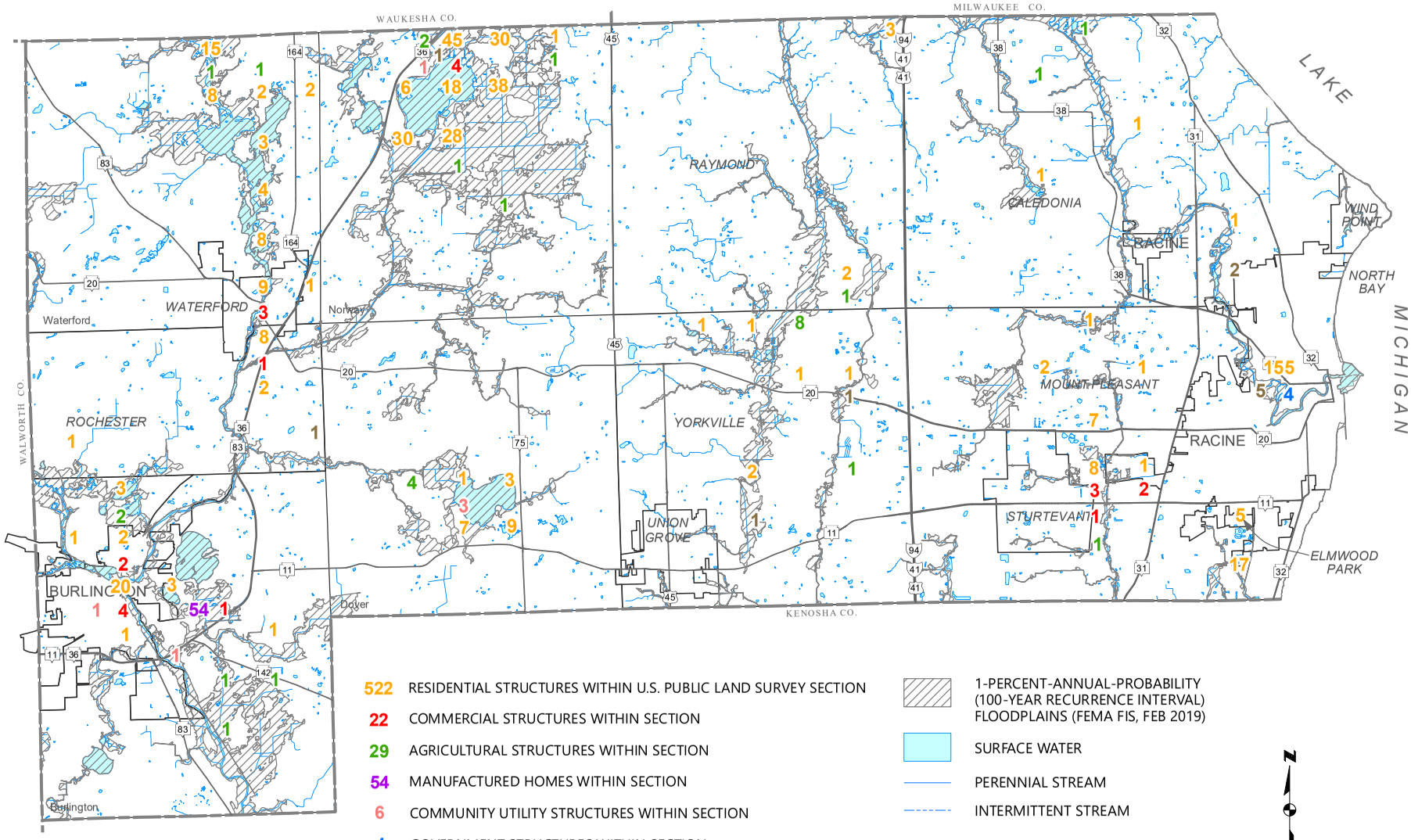
In addition, changes in climate are likely to affect the potential for flooding in Racine County during the 21st century. As previously described in Chapter 2, model projections show Wisconsin receiving more precipitation and more frequent intense precipitation events. By the mid-21st century, Racine County may receive three more precipitation events of two or more inches in 24 hours per decade, roughly a 25 percent increase in the frequency of heavy precipitation events.[31] This is likely to increase the frequency of high flows and high water levels and potentially increase the frequency and severity of flooding. In particular,

[29] *SEWRPC Community Assistance Planning Report No. 5,* op. cit.

[30] *SEWRPC Community Assistance Planning Report No. 316,* A Restoration Plan for the Root River Watershed*, July 2014.*

[31] *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.*

Map 3.4
Structures Located Within the 100-Year Floodplain: 2022



Source: Federal Emergency Management Agency, Racine County, and SEWRPC

Table 3.10
Estimated Flood Damages for a 1-Percent-Annual-Probability Flood in Racine County

Community	Number of Structures in Floodplain	Flood Damages		
		Direct ($)	Indirect ($)	Total ($)
Cities				
Burlington	33	838,710	172,390	1,011,100
Racine	166	4,548,880	1,140,730	5,689,610
Villages				
Caledonia	7	153,150	37,940	191,090
Elmwood Park	0	--	--	--
Mt. Pleasant	46	1,546,880	376,650	1,923,530
North Bay	0	--	--	--
Raymond	6	195,340	30,080	225,420
Rochester	13	298,910	73,250	372,160
Sturtevant	1	26,160	10,460	36,620
Union Grove	0	--	--	--
Waterford	13	688,720	122,670	811,390
Wind Point	0	--	--	--
Yorkville	17	400,270	114,270	514,540
Towns				
Burlington	67	529,510	114,350	643,860
Dover	28	488,190	90,900	579,090
Norway	207	5,650,830	941,810	6,592,640
Waterford	44	646,770	99,700	746,470
Total	648	16,012,320	3,325,200	19,337,520

Note: Estimated damages are based on assessed improvement values in 2022.

Source: Wisconsin Department of Natural Resources and SEWRPC

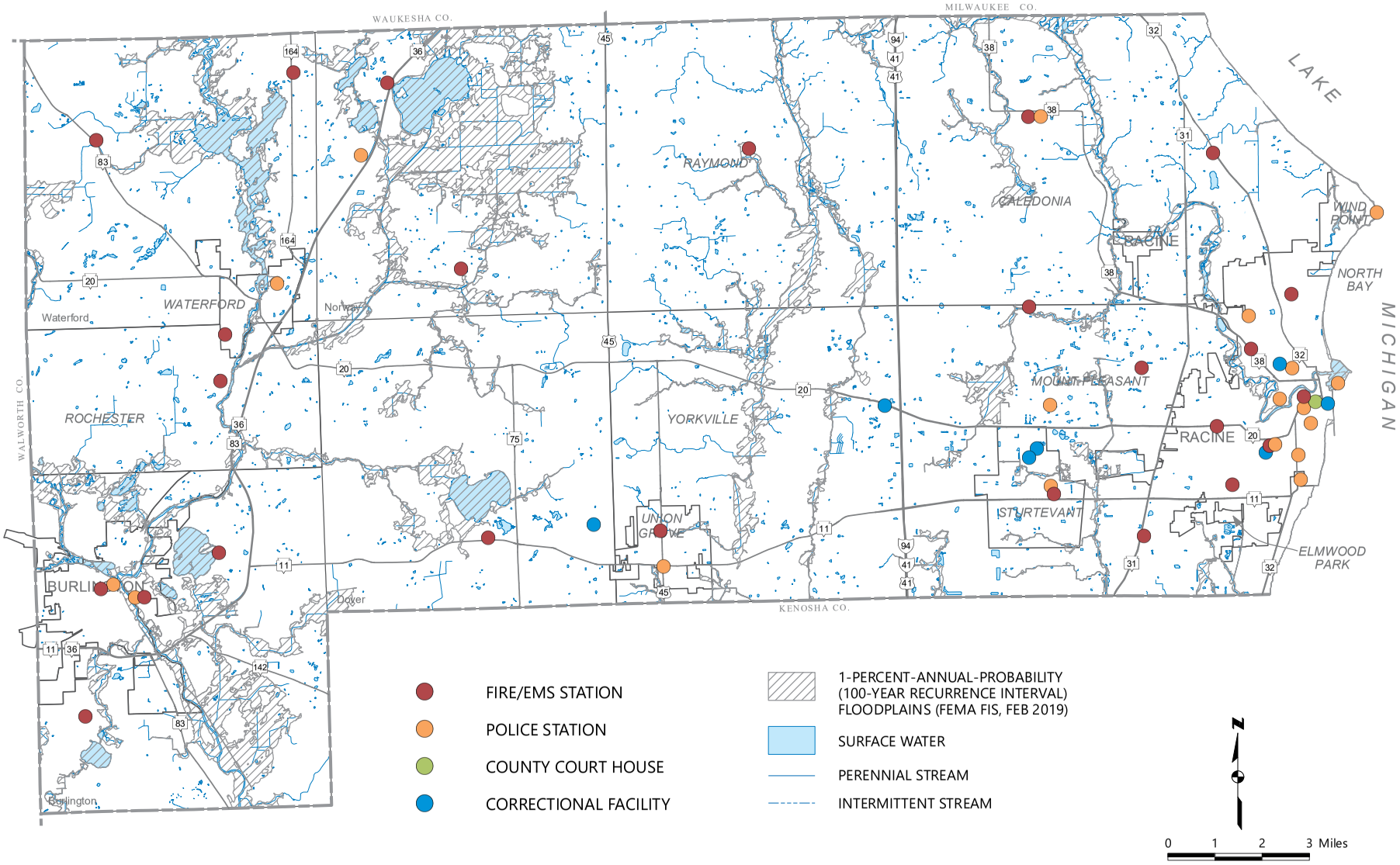
the expected increases in the magnitude and frequency of large rainfall events will likely increase flood magnitudes in streams and rivers in Wisconsin, although the amount of increase will vary from place to place. The amount of precipitation that falls as rain during winter and early spring months is expected to significantly increase. Winter rain can create stormwater management problems due to icing and runoff over frozen ground which may also lead to increased risk of flooding.

These changes may lead to several flood and stormwater related impacts. Increased rainfall and shifting precipitation patterns that favor more rain during periods of low infiltration and evapotranspiration may lead to more frequent and severe stream and river flooding. Increased precipitation during winter and spring may result in increased occurrence of inland lake flooding. Increased cold-weather precipitation and increased variability in frost conditions may cause a rise in water tables in some areas leading to an increase in groundwater flooding.

The projected increase in the magnitude and frequency of heavy storms could also affect the performance of existing and planned stormwater management and flood mitigation systems. This increase could also expand flood hazard areas, such as the 1-percent-annual-probability flood hazard area, beyond their existing boundaries, potentially encompassing more existing development. This could lead to an increase in the risk of flood damages and a need for larger stormwater management facilities and programs.

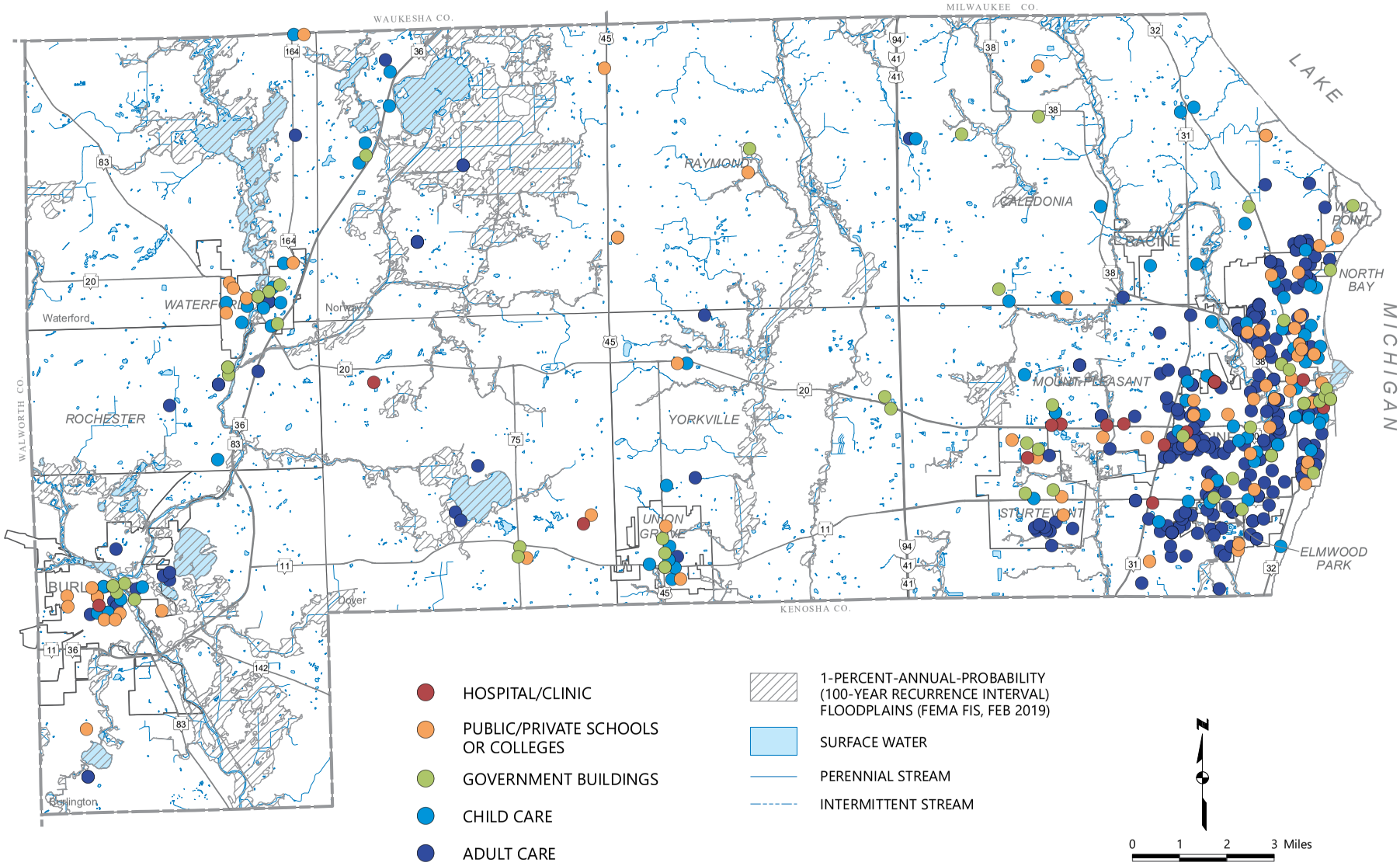
The magnitudes of potential increases in flooding are unknown, and there is a complex interrelationship between the climatological factors that will be affected by climate change and the features of watersheds that produce runoff. In some cases, climate change-induced changes in certain climatological factors may offset the changes in other factors relative to their effects on flood flows. In other cases, the effects will reinforce one another. Thus, it is very important to continue to improve methods for downscaling climatological data, to expand the climatological parameters for which downscaled data can be developed, and to apply hydrologic and hydraulic simulation models to quantify the potential effects on flooding resulting from climate change.

Map 3.5
Emergency Service Structures in Relation to 100-Year Floodplains: 2022



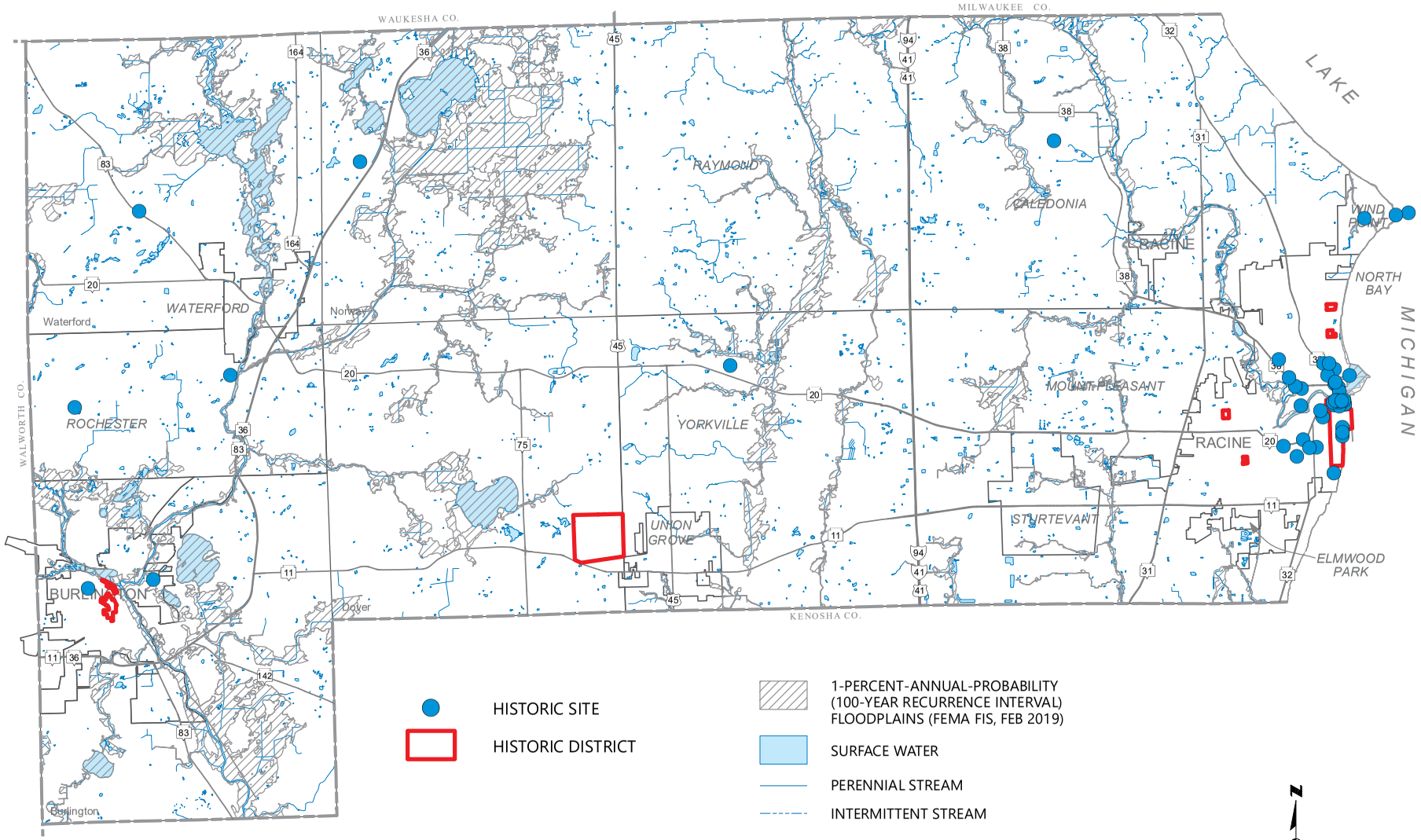
Source: Wisconsin Department of Justice (WILENET), Racine County Office of Emergency Management Department, Racine County, FEMA, and SEWRPC

Map 3.6
Critical Community Facilities in Relation to 100-Year Floodplains: 2022



Source: Wisconsin Department of Children and Families, Wisconsin Department of Health and Social Services, Wisconsin Department of Public Instruction, Racine County, FEMA, and SEWRPC

Map 3.7
National and State Registers of Historic Sites and Districts in Relation to 100-Year Floodplains: 2022



Source: FEMA and SEWRPC

Multi-Jurisdictional Risk Management

Flooding and associated stormwater drainage problems have been identified as a significant risk in Racine County. As noted earlier and shown on Map 3.4, structures within flood hazard areas have been identified within all of the 17 general-purpose local units of government in the County, except for the Villages of Elmwood Park, North Bay, Union Grove, and Wind Point. In addition, there are related stormwater drainage problems in selected areas of many communities. Based upon the number of structures potentially impacted (see Map 3.4), the extent of the agricultural flood damage potential, and the extent of roadway flooding, 10 of the 17 communities will require special consideration with regard to the selection of mitigation measures for flooding and related stormwater problems. Based on census tract data, vulnerable populations (such as low-income areas and minority groups) that are found mainly in the City of Racine are not affected by flooding or the floodplains.[32]

Severe Thunderstorms Combined (Thunderstorms, High Straight-Line Winds, Hail, Lightning)

Compared to other natural hazards within the State of Wisconsin and Racine County thunderstorms are the most common type of severe weather event. A thunderstorm is defined as a severe and violent form of convection produced when warm, moist air is overrun by dry, cool air. As the warm air rises, thunderheads (cumulonimbus clouds) form. These thunderheads produce the strong winds, lightning, thunder, hail, and heavy rain that are associated with these storm events. The thunderheads formed may be a towering mass averaging 15 miles in diameter and reach up to 40,000 to 50,000 feet in height. These storm systems may contain as much as 1.5 million tons of water and enormous amounts of energy that often are released in one of several destructive forms, such as high winds, lightning, hail, excessive rains, and tornadoes. Thunderstorms and their related high winds, lightning, hail hazards, and non-thunderstorm high winds are covered within this section. However, excessive rains that cause flash flooding, such as occurred in the summer storm events in 1998, 2000, 2007, and 2008 when the request for Presidential disaster declaration was approved (see Vulnerability Assessment for Flooding and Associated Stormwater Drainage Problems) and tornadoes are covered separately from this hazard analysis (see Vulnerability Assessment for Tornadoes).

A thunderstorm often lasts approximately 30 minutes in a given location, because an individual thunderstorm cell frequently moves at an average velocity that ranges between 30 to 50 miles per hour. However, strong frontal systems may produce more than one squall line composed of many individual thunderstorm cells. In Wisconsin, these fronts can often be tracked across the entire State from west to east.[33] Thunderstorms may occur individually, form clusters, or as a portion of a large line of storms. Therefore, it is possible that several thunderstorms may affect one particular area in the course of a few hours, as well as larger areas of the State or County, within a relatively short period of time.

All thunderstorms are potentially dangerous. However, only about 10 percent of the thunderstorms that occur each year nationwide are classified as severe. According to the National Weather Service, a thunderstorm is considered severe if it produces hail sizes at least one-inch in diameter, wind speeds equal to or greater than 58 miles per hour (measured or implied by tree and/or structural damage), or a tornado. A thunderstorm with wind speeds equal to or greater than 40 miles per hour or hail at least 0.5 inch in diameter is defined as approaching severe. Severe thunderstorms can cause injury or death and can also result in substantial property and crop damage. They may cause power outages, disrupt telephone service, and severely affect radio communications, as well as surface and air transportation, which may seriously impair the emergency management capabilities of the impacted areas.

The National Weather Service monitors severe weather for 20 southern Wisconsin counties, including Racine County, from its Milwaukee/Sullivan office.[34] A thunderstorm watch indicates that conditions are favorable for severe weather, and that persons within the area for which the watches are issued should remain alert for approaching storms. A severe thunderstorm warning indicates that severe weather has been sighted in an area or indicated by weather radar and persons should seek shelter immediately. These severe thunderstorms watch and warning bulletins and advisories are disseminated over a number of telecommunication channels, including the NOAA Weather Radio, the NOAA Weather Wire, and the State

[32] *SEWRPC,* Comprehensive Economic Development Strategy for Southeastern Wisconsin: 2021-2025*, September 2021*.

[33] *National Weather Service Forecast Office*.

[34] *National Weather Service, Milwaukee/Sullivan Weather Forecast Office*.

Law Enforcement TIME System. NOAA Weather Radio is available to any individual with a weather alert radio. This system and the other sources are routinely monitored by local media which rebroadcast the weather bulletins over public and private television stations, radio stations, and mobile alert applications on cell phones. In addition, the National Weather Service operates two 24-hour weather radio transmitters that serve all of Racine County. KZZ76, operating at a frequency of 162.450 megahertz (MHz), transmits from a location at CTH KR and Wood Road in Racine County. KEC60, operating at a frequency of 162.400 MHz, transmits from a location near Delafield in Waukesha County.

Thunderstorm Winds

High-velocity, straight-line winds that are produced by thunderstorms and widespread non-thunderstorm high winds are a very destructive natural hazard in Wisconsin and are responsible for most wind-related damages to property.[35] Although distinctly different from tornadoes, straight-line winds produced by thunderstorms can be very powerful, are fairly common, and can cause damage similar to that of a tornado event.

Depending upon their intensity, thunderstorm winds can uproot trees and crops, down power lines, and damage or destroy buildings and infrastructure. Flying debris can cause serious injury and death to humans, livestock, and wildlife in their path. Boats, manufactured homes, and airplanes are also extremely vulnerable to damage from thunderstorm winds.

High Straight-Line Wind

High winds are also produced in the absence of thunderstorms. Non-thunderstorm high winds tend to be less forceful than thunderstorm winds but are typically more sustained and widespread. These high winds can affect a region for hours, or even several days. Longer lasting windstorms have two main causes: large differences in atmospheric pressure across a region, and strong jet-stream winds overhead. Horizontal pressure differences can accelerate the surface winds substantially as air travels from a region of higher atmospheric pressure to one of lower pressure. Intense winter storms can also cause long-lasting and damaging high winds. Cold fronts associated with intense low-pressure systems can produce high winds both as they pass and for a period afterward as colder air flows overhead. High winds in the winter can produce dangerous wind chills when air temperatures are cold. Severe wind chills are discussed further in the extreme temperature section later in this chapter.

Like thunderstorm winds, non-thunderstorm high winds can uproot trees and crops, cause widespread power outages, damage buildings, and make travel treacherous. Non-thunderstorm high winds tend to be more sustained and widespread, leading to more damage over a whole region, as compared to thunderstorm winds.

Hail

Hailstorms are also associated with thunderstorms and are the fourth most destructive type of weather hazard in the State of Wisconsin and Racine County. A hailstorm is a product of strong thunderstorms and unique weather conditions where atmospheric water particles form into rounded or irregular masses of ice that fall to earth. Hail normally falls near the center of the moving storm along with the heaviest rain. In some instances, strong winds at high altitudes can blow the hailstones away from the storm center, causing unexpected hazards at places that otherwise might not appear threatened. Hailstones normally range from the size of a pea to the size of a golf ball, but hailstones 1.5 inches or larger in diameter are not uncommon in the State of Wisconsin. Hailstones form when subfreezing temperatures cause water in thunderstorm clouds to accumulate in layers around an icy core. When strong underlying, updraft winds no longer can support their weight, the hailstones fall earthward. Hail tends to fall in swaths that may be 20 to 115 miles long and five to 30 miles wide and can fall continuously or sporadically in a series of hail strikes. Hail strikes are typically one-half mile wide and five miles long. They may partially overlap, but often leave completely undamaged gaps between them.

Hailstorms are considered formidable among the weather and climatic hazards to property and farm crops, because they dent vehicles and structures, break windows, damage roofs, and batter crops to the point that significant agricultural losses result. Falling hailstones can also cause serious injury and loss of human

[35] *Wisconsin Emergency Management Department of Military Affairs, State of Wisconsin Hazard Mitigation Plan, December 2021.*

life and livestock, however these occurrences are rarely associated with hailstorms. In addition to impact damage, thick hail combined with heavy rain can clog storm sewers and contribute to stormwater flooding. Hail sufficiently thick to cover a road will pose a traffic hazard. The peak season for hailstorms is April through August, although hail has been reported with thunderstorms in every month of the year.

Lightning

Every thunderstorm produces lightning, and lightning has been shown to kill more people within the United States each year than tornadoes.[36] Lightning is defined as a sudden and violent discharge of electricity from within a thunderstorm due to a difference in electrical charges and represents a flow of electrical current from cloud to cloud or cloud to ground. Water and ice particles also affect the distribution of electrical charge. Lightning bolts can travel 20 miles before striking the ground. The air near a lightning bolt can be heated to 50,000 degrees Fahrenheit (°F), which is hotter than the surface of the sun. The rapid heating and cooling of the air near the lightning channel causes a shock wave that results in thunder.

Lightning is a significant hazard associated with any thunderstorm and can cause extensive damage to buildings and structures, kill or injure people and livestock, start forest fires and wildfires, and damage electrical and electronic equipment. Lightning is a major cause of damage to farm buildings and equipment, responsible for more than 80 percent of all livestock losses, and is the number one cause of farm fires. Counties in southern Wisconsin have been observed to experience a higher number of lightning events than other parts of the State due to higher thunderstorm frequency and more thorough documentation by the local media. Statistics have also shown that 92 percent of lightning-related fatalities occur during May through September and 73 percent of these events occur during the afternoon and early evening. Approximately 30 percent of persons struck by lightning die and 74 percent of lightning strike survivors have permanent disabilities.

Recent Events

A total of 103 thunderstorm-related events have been recorded in Racine County between 2011 and 2021. This total includes thunderstorm winds, strong winds, hail, and lightning. These events are documented in Table 3.11, based upon data published by the National Climatic Data Center. As shown in Table 3.11 these storms can range from one to two events per year or up to 10 events per year, which demonstrates the high unpredictability of these events. In total, these severe thunderstorms combined events have resulted in 2 injuries, 1 death, and over $800,000 in property and crop damages within Racine County. A few examples of recent events from Table 3.11 are noted below.

2011 – On June 8th, strong winds knocked large branches out of trees and uprooted a couple dozen large trees, causing a few power-lines to snap and two roads to be blocked. Semi-tractor trailers were blown over on Interstate-94 at STH 11 and CTH K, resulting in the injury of two drivers. The moist, unstable air mass over the region produced severe thunderstorms with damaging winds and large hail. A cluster of supercell thunderstorms from Lafayette into Dane County moved east and created damaging wind gusts of 60 to 80 mph across much of the area along and south of Interstate-94. At the height of the event, over 27,000 customers had no electric power in Southeast Wisconsin.

2014 – On October 31st, high winds blew over a 51-foot grain auger early in the afternoon, killing a farmer in the Town of Yorkville. Also, large tree branches fell in two separate areas of the City of Racine landing in the streets. One large tree branch landed on a vehicle. Strong low pressure and associated cold front moved southeastward from Canada into the Great Lakes region.

2016 – On June 5th, clusters of strong to severe thunderstorms produced areas of straight line wind damage in southern Wisconsin as a cold front was passing through the region. Sporadic trees, branches, and power lines were down. A car was flipped near 7 Mile Road during high winds and heavy rain. WE Energies approximated 20,000 customers were without power for at least a brief period across southeast Wisconsin.

2021 – On August 11th, supercell thunderstorms developed in the afternoon and continued east into southern Wisconsin, bringing a few tornadoes and damaging winds. Multiple trees and power lines were down.

[36] *National Oceanic and Atmospheric Administration.*

Table 3.11
Recent Severe Thunderstorms Combined Events in Racine County: 2011-2021

Date	Location	Event Type	Magnitude	Reported Damages			
				Deaths	Injuries	Property Damages ($)	Crop Damages ($)
February 18, 2011	Racine County	Strong Wind	30 mph	--	--	2,000.00	--
April 15, 2011	Racine County	Strong Wind	36 mph	--	--	3,000.00	--
May 11, 2011	Bohners Lake	Hail	0.88 in.	--	--	--	--
May 15, 2011	Racine County	Strong Wind	46 mph	--	--	5,000.00	--
May 22, 2011	Burlington	Thunderstorm Wind	81 mph	--	--	150,000.00	--
May 22, 2011	Union Grove	Thunderstorm Wind	60 mph	--	--	--	--
June 8, 2011	Burlington	Thunderstorm Wind	65 mph	--	--	--	--
June 8, 2011	Sturtevant	Thunderstorm Wind	65 mph	--	2	--	--
June 21, 2011	Burlington	Hail	1.25 in.	--	--	--	--
June 30, 2011	Wind Point	Thunderstorm Wind	82 mph	--	--	100,000.00	--
August 2, 2011	Downtown Racine	Thunderstorm Wind	65 mph	--	--	--	--
September 29, 2011	Racine County	Strong Wind	47 mph	--	--	2,000.00	--
October 19, 2011	Racine County	High Wind	73 mph	--	--	10,000.00	--
November 13, 2011	Racine County	Strong Wind	30 mph	--	--	1,000.00	--
November 29, 2011	Racine County	Strong Wind	53 mph	--	--	1,000.00	--
January 1, 2012	Racine County	Strong Wind	45 mph	--	--	1,000.00	--
March 12, 2012	Kansasville	Hail	1 in.	--	--	--	--
March 12, 2012	Union Grove	Hail	1 in.	--	--	--	--
March 12, 2012	Caledonia	Hail	1.75 in.	--	--	--	--
April 16, 2012	Racine County	Strong Wind	30 mph	--	--	1,000.00	--
April 16, 2012	Racine County	Strong Wind	47 mph	--	--	1,000.00	--
June 18, 2012	Racine County	Strong Wind	45 mph	--	--	10,000.00	--
July 18, 2012	Downtown Racine	Thunderstorm Wind	65 mph	--	--	--	--
July 31, 2012	Waterford	Thunderstorm Wind	65 mph	--	--	--	--
July 31, 2012	Downtown Racine	Hail	1 in.	--	--	25,000.00	--
September 4, 2012	Tichigan	Thunderstorm Wind	65 mph	--	--	10,000.00	--
September 4, 2012	Wind Lake	Thunderstorm Wind	60 mph	--	--	5,000.00	--
November 11, 2012	Racine County	Strong Wind	46 mph	--	--	3,000.00	--
January 18, 2013	Racine County	Strong Wind	45 mph	--	--	5,000.00	--
January 19, 2013	Racine County	Strong Wind	51 mph	--	--	5,000.00	--
April 11, 2013	Racine County	Strong Wind	47 mph	--	--	10,000.00	--
July 21, 2013	Waterford	Thunderstorm Wind	58 mph	--	--	--	14,000.00
August 21, 2013	Waterford	Hail	0.88 in.	--	--	--	--
August 21, 2013	Waterford	Hail	1 in.	--	--	--	--
November 17, 2013	Racine County	Strong Wind	55 mph	--	--	5,000.00	--
May 6, 2014	Franksville	Hail	0.75 in.	--	--	--	--
May 6, 2014	Husher	Hail	0.75 in.	--	--	--	--

Table continued on next page.

Table 3.11 (Continued)

Date	Location	Event Type	Magnitude	Reported Damages			
				Deaths	Injuries	Property Damages ($)	Crop Damages ($)
May 12, 2014	Bohners Lake	Hail	2 in.	--	--	--	--
May 12, 2014	Bohners Lake	Thunderstorm Wind	70 mph	--	--	30,000.00	--
May 12, 2014	Union Grove	Hail	0.88 in.	--	--	--	--
May 12, 2014	Burlington	Thunderstorm Wind	58 mph	--	--	2,000.00	--
May 12, 2014	Bohners Lake	Hail	2 in.	--	--	--	--
May 12, 2014	Ives	Hail	0.75 in.	--	--	--	--
May 12, 2014	Sturtevant	Thunderstorm Wind	58 mph	--	--	1,000.00	--
May 12, 2014	Sturtevant	Hail	1.25 in.	--	--	--	--
May 12, 2014	Gatliff	Hail	1 in.	--	--	--	--
May 12, 2014	Downtown Racine	Hail	1.5 in.	--	--	--	--
May 12, 2014	Downtown Racine	Hail	2.5 in.	--	--	--	--
June 1, 2014	Caldwell	Thunderstorm Wind	60 mph	--	--	5,000.00	--
October 31, 2014	Racine County	Strong Wind	48 mph	1	--	5,000.00	--
April 9, 2015	Burlington	Hail	0.88 in.	--	--	--	--
April 9, 2015	Wind Lake	Hail	0.88 in.	--	--	--	--
July 18, 2015	Downtown Racine	Thunderstorm Wind	63 mph	--	--	20,000.00	--
August 2, 2015	Racine County	Strong Wind	50 mph	--	--	5,000.00	--
August 2, 2015	Wind Lake	Thunderstorm Wind	58 mph	--	--	15,000.00	--
August 2, 2015	Wind Lake	Hail	2.75 in.	--	--	--	--
August 2, 2015	Union Grove	Hail	1 in.	--	--	--	--
August 2, 2015	Waterford	Hail	1 in.	--	--	--	--
August 2, 2015	Franksville	Hail	1 in.	--	--	--	--
August 2, 2015	Downtown Racine	Hail	1 in.	--	--	--	--
August 10, 2015	Ives Grove	Thunderstorm Wind	69 mph	--	--	5,000.00	--
December 23, 2015	Racine County	Strong Wind	56 mph	--	--	1,000.00	--
February 19, 2016	Racine County	High Wind	60 mph	--	--	75,000.00	--
March 16, 2016	Racine County	High Wind	58 mph	--	--	8,000.00	--
March 31, 2016	Elmwood Park	Hail	1 in.	--	--	--	--
March 31, 2016	Downtown Racine	Hail	1 in.	--	--	--	--
March 31, 2016	Downtown Racine	Hail	1 in.	--	--	--	--
June 5, 2016	Caddy Vista	Thunderstorm Wind	65 mph	--	--	10,000.00	--
June 5, 2016	Franksville	Thunderstorm Wind	58 mph	--	--	10,000.00	--
June 5, 2016	Elmwood Park	Thunderstorm Wind	58 mph	--	--	7,000.00	--
March 8, 2017	Racine County	High Wind	58 mph	--	--	40,000.00	--
March 23, 2017	Husher	Hail	0.75 in.	--	--	--	--
April 10, 2017	Sturtevant	Hail	1 in.	--	--	--	--
April 20, 2017	Burlington	Thunderstorm Wind	59 mph	--	--	--	--
April 20, 2017	Kneeland	Thunderstorm Wind	81 mph	--	--	50,000.00	--

Table continued on next page.

Table 3.11 (Continued)

Date	Location	Event Type	Magnitude	Reported Damages			
				Deaths	Injuries	Property Damages ($)	Crop Damages ($)
April 20, 2017	Thompsonville	Thunderstorm Wind	70 mph	--	--	7,500.00	--
April 20, 2017	Gatliff	Thunderstorm Wind	60 mph	--	--	5,000.00	--
May 17, 2017	Waterford	Hail	1 in.	--	--	--	--
June 14, 2017	Browns Lake	Hail	1 in.	--	--	--	--
July 6, 2017	Waterford	Thunderstorm Wind	65 mph	--	--	4,000.00	--
July 6, 2017	Union Grove	Thunderstorm Wind	58 mph	--	--	3,000.00	--
December 4, 2017	Racine County	High Wind	58 mph	--	--	7,000.00	--
June 18, 2018	Tichigan	Thunderstorm Wind	58 mph	--	--	7,000.00	--
October 20, 2018	Racine County	Strong Wind	51 mph	--	--	20,000.00	--
February 24, 2019	Racine County	Strong Wind	52 mph	--	--	1,000.00	--
June 24, 2019	Downtown Racine	Hail	1 in.	--	--	--	--
July 2, 2019	Horlick Racine	Thunderstorm Wind	58 mph	--	--	5,000.00	--
July 17, 2019	North Cape	Thunderstorm Wind	65 mph	--	--	3,000.00	--
November 27, 2019	Racine County	Strong Wind	52 mph	--	--	10,000.00	--
April 29, 2020	Union Grove	Heavy Rain	--	--	--	500.00	--
April 29, 2020	Racine County	Strong Wind	45 mph	--	--	1,000.00	--
July 9, 2020	Racine Batten Airport	Thunderstorm Wind	68 mph	--	--	--	--
July 9, 2020	Midway Park	Thunderstorm Wind	58 mph	--	--	500.00	--
July 9, 2020	Midway Park	Thunderstorm Wind	58 mph	--	--	1,000.00	--
August 10, 2020	Union Grove	Thunderstorm Wind	58 mph	--	--	2,000.00	--
August 10, 2020	Elmwood Park	Thunderstorm Wind	58 mph	--	--	8,000.00	--
August 10, 2020	Downtown Racine	Thunderstorm Wind	58 mph	--	--	6,000.00	--
August 10, 2020	North Bay	Thunderstorm Wind	58 mph	--	--	3,000.00	--
November 10, 2020	Burlington	Thunderstorm Wind	65 mph	--	--	25,000.00	--
November 10, 2020	Rochester	Thunderstorm Wind	75 mph	--	--	25,000.00	--
August 11, 2021	Statewide	Thunderstorm Wind	58 mph	--	--	8,000.00	4,000.00
October 24, 2021	Racine County	Strong Wind	47 mph	--	--	5,000.00	--
December 15, 2021	Racine County	High Wind	63 mph	--	--	10,000.00	--
			Total	1	2	811,500.00	18,000.00

[a] *Deaths, injuries, and property damages reported were based upon a geographic area impacted by the hazard event, which affected Racine County and, in some cases, a larger area of impact than the County itself, generally within the southeast regional area of Wisconsin.*

[b] *Dollar values were adjusted to year 2014 by using the average annual Consumer Price Index (CPI) values from the U.S. Department of Labor, Bureau of Labor Statistics.*

Source: The National Climatic Data Center (NCDC), National Oceanic and Atmospheric Administration (NOAA), and the National Environmental Satellite, Data and Information Service (NESDIS), and the U.S. Department of Agriculture Risk Management Agency

Vulnerability and Community Impact Assessment

The National Weather Service can forecast and track a line of thunderstorms that may be likely to produce severe high winds, hail, lightning, and tornadoes, but where these related hazards form or touch down and how powerful they might be, remains unpredictable and the locations of storm impact points are widely scattered throughout the County.

In order to assess the vulnerability of the Racine County area to thunderstorm related hazards, a review of the community assets described in Chapter 2 indicate the potential for significant thunderstorm and related hazard impacts to: 1) a variety of residential, commercial, and other developed land uses; 2) agricultural lands; 3) roadway transportation system; 4) utilities; 5) critical community facilities; and 6) historic sites. Significant impacts may also be possible to other infrastructure or utility systems, or hazardous material storage sites.

On average, the thunderstorm related events occurring over the period of 2001-2021 have resulted in about $4,578,000 of total reported damages in the County, consisting of about $4,543,000 of damages to property and $35,000 in damages to crops. However, many events had no damages reported to the NCDC, and very few events have been responsible for a large percentage of the total damages. On average there are about one lightning related thunderstorm event per year, about three hail related thunderstorm events per year, and about four high straight-line wind related thunderstorm events per year in Racine County.

In 2021, total equalized assessed property value in Racine County was estimated at $19.5 billion. Based on the current average estimate of $227,150 in reported property damages per year it can be expected that approximately 0.001 percent of the value of all property, including buildings and infrastructure, in Racine County will be damaged from these events each year. Due to the unpredictability of severe thunderstorms combined that include high straight-line wind, hail, and lightning events, all buildings, infrastructure, and critical facilities within the County are considered at risk.

Future Changes and Conditions

Based upon recent historical data from the period 2011-2021, Racine County can expect to experience averages of 4.0 thunderstorm wind events per year, 3.3 hail events per year, 2.9 non-thunderstorm high-wind events per year, and 1 lightning event per year somewhere in the County. It should be noted that the historical record shows considerable variation among years in the numbers of these events that occurred. While it would be expected that in some years the County will experience either fewer events or more events than the average number, the average annual number of events is not expected to change.

The likely effect of climate change on severe thunderstorms combined events is not clear. While projections based upon downscaled climate model results indicate that the magnitude and frequency of heavy precipitation events are likely to increase by the middle of the 21st century, they do not address potential trends in wind, hail, or lightning conditions. Modeling studies utilizing the output of multiple climate models suggest that number of days per year in which atmospheric environments that are known to support the formation of severe thunderstorms under current climatic conditions will increase between now and the end of the 21st century.[37] It should also be noted that wind strengths over the Great Lakes have increased and are expected to continue increasing in the future.[38] Surface wind speeds above the Lakes are increasing by about 5 percent per decade, exceeding trends in wind speed over land.

Changes in land use can have an impact on the potential for damage to occur from thunderstorm related events. Such changes relate to the potential future increase in development within the County. Changing land use patterns within Racine County, as documented in the adopted regional land use plan and County land and water resource management plan, and summarized in Chapter 2, indicate a potential increased risk of thunderstorm-related damage and related losses due to the expanding urbanized areas within the County. Because of the actions that have been taken by the County and local units of government and individuals, the current vulnerability to thunderstorms and related hazards has decreased in recent years. These ongoing mitigation measures are described further in Chapter 5.

---

[37] *Noah S. Diffenbaugh, Martin Scherer, and Robert J. Trapp, "Robust Increases in Severe Thunderstorm Environments in Response to Greenhouse Forcing," Proceedings of the National Academy of Sciences, Volume 110, pages 16,361-16366, 2013.*

[38] *Ankur R. Desai, Jay A. Austin, Val Bennington, and Galen A. McKinley, "Stronger Winds Over a Large Lake in Response to Weakening Air-to-Lake Temperature Gradient," Nature Geoscience, Volume 2, pages 855-858, 2009.*

Multi-Jurisdictional Risk Management

Based upon a review of the historic patterns of severe thunderstorms combined events that include high straight-line wind, hail, and lightning events in Racine County, there are no specific municipalities that have unusual risks. Rather, the events are considered to be relatively uniform and of countywide concern.

Temperature Extremes (Extreme Heat, Extreme Cold)

The sections below describes extreme heat and extreme cold hazards that affect the County.

Extreme Heat

The Centers for Disease Control and Prevention (CDC) reports that nationwide between 2018 and 2020, a total of 3,066 heat-related deaths occurred.[39] Excessive heat has become the deadliest hazard in Wisconsin. According to the National Weather Service, 22 people have died in Wisconsin directly as a result of heat waves from 2011 to 2021. Temperature data for two selected observation stations in the Cities of Burlington and Racine in Racine County are shown in Table 3.12. The table shows extreme high and low temperatures and the departure from average temperatures recorded in the period from 2011 through 2021. The average annual high and low extreme temperatures for these two stations are 93.2°F and -11.1°F for the City of Burlington and 94.4°F and -6.3°F for the City of Racine during this period. Prolonged exposure to either of these temperatures could present a significant danger. It should be noted that Lake Michigan may be exerting some effect on the average annual temperature but is not appreciably reducing the average extreme high temperature.

Heat and humidity together can create the most severe problems to human health. High humidity makes heat more dangerous because it slows the evaporation of perspiration, which is the body's natural cooling process. The Heat Index (HI) is a measure of discomfort and the level of risk posed to people in high-risk groups by heat and humidity. The HI is expressed in degrees Fahrenheit (°F) and incorporates an adjustment to the air temperature for relative humidity (RH). For example, if the air temperature is 94°F and the RH is 55 percent, the HI would equal about 106°F (see Figure 3.2). Since HI values were devised for shady, light wind conditions, exposure to full sunshine can increase HI values by up to 15°F. The level of risk to people in high-risk groups associated with different levels of the HI is shown in Table 3.13. The NWS will initiate alert procedures (advisories or warnings) when the Heat Index is expected to have a significant impact on public safety. The expected severity of the heat wave determines whether advisories or warnings are issued. High temperature periods are often also accompanied by the related air quality problems related to ground-level ozone which can be harmful, especially to sensitive groups, such as active children and adults with respiratory problems.

Most heat-related deaths occur in cities. Large urban areas become "heat islands." Brick buildings, asphalt streets, and tar roofs store and radiate heat like a slow burning furnace. Heat builds up in a city during the day and cities are slower than rural areas to cool down at night. The amount of sunshine is an important contributing factor in urban heat waves. In addition, the stagnant atmospheric conditions associated with a heat wave trap ozone and other pollutants in urban areas. The worst heat disasters, in terms of loss of life, happen in large cities when a combination of high daytime temperatures, high humidity, warm nighttime temperatures, and an abundance of sunshine occurs for a period of several days. There are also socioeconomic problems that result in greater risk to some urban populations. Older people and some persons with access or functional needs are especially susceptible to heat-related illness and death.

<u>Recent Events</u>

Extreme heat that affects Racine County are not localized events, as they usually encompass the entire south-central to southeastern portion of the State and may continue for several days or weeks. Table 3.14 lists the extreme heat events in southeastern Wisconsin from 2011-2021. A few examples of recent events from Table 3.14 are noted below.

[39] *Merianne R. Spencer and Matthew F. Garnett., "QuickStats: Percentage Distribution of Heat-Related Deaths, by Age Group – National Vital Statistics System, United States, 2018-2020". MMWR Morbidity and Mortal Weekly Rep 2022; 71:808. June 17, 2022.*

Table 3.12
Extreme Temperature and Departure from Average Temperature Within Racine County: 2011-2021

Year	Burlington Inland Site				Racine Lakeshore Site			
	High Temperature (°F)	Low Temperature (°F)	Average Annual Temperature (°F)	Departure from Average Temperature (°F)	High Temperature (°F)	Low Temperature (°F)	Average Annual Temperature (°F)	Departure from Average Temperature (°F)
2011	97.0	-14.0	46.4[a]	+0.2	100.0	-8.0	48.1[a]	+0.2
2012	102.0	-4.0	48.6[a]	+2.4	104.0	-1.0	51.1[a]	+3.2
2013	94.0	-10.0	44.2[a]	-2.0	96.0	-6.0	N/A	N/A
2014	87.0	-19.0	42.6	-3.6	90.0	-1.0	43.9	-4.0
2015	91.0	-15.0	46.4	+0.2	92.0	-10.0	47.3	-0.6
2016	91.0	-14.0	48.1	+1.9	94.0	-10.0	49.8	+1.9
2017	92.0	-10.0	45.9	-0.3	90.0	-6.0	49.0	+1.1
2018	93.0	-13.0	45.7	-0.5	91.0	-9.0	46.6	-1.3
2019	94.0	-27.0	45.0	-1.2	92.0	-24.0	45.6	-2.3
2020	92.0	20.0	47.4	+1.2	95.0	14.0	47.9	0.0
2021	92.0	-16.0	47.9	+1.7	94.0	-8.0	49.4	+1.5
Average	93.2	-11.1	46.2	--	94.4	-6.3	47.9	--

Note: N/A indicates data not available.

[a] *Average and/or total values computed with one to nine daily values missing.*

Source: National Weather Service and National Oceanic and Atmospheric Administration NOWData

Figure 3.2
Heat Index Chart

Relative Humidity (%)	**Temperature (°F)**															
	80	82	84	86	88	90	92	94	96	98	100	102	104	106	180	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

Likelihood of heat disorders with prolonged exposure or strenuous activity:

- Caution
- Extreme Caution
- Danger
- Extreme Danger

Source: National Weather Service and SEWRPC

Table 3.13
Level of Risk for Persons in High Risk Groups Associated with the Heat Index

Heat Index (°F)	Category	Possible Heat Disorders for Persons in High-Risk Groups
80-90	Caution	Fatigue possible with prolonged exposure and/or physical activity
90-105	Extreme Caution	Sunstroke, muscle cramps, and/or heat exhaustion possible with prolonged exposure and/or physical activity
105-129	Danger	Sunstroke, muscle cramps and/or heat exhaustion likely. Heatstroke possible with prolonged exposure and/or physical activity
130 or above	Extreme Danger	Heat stroke or sunstroke likely

Source: National Weather Service

Table 3.14
Recent Extreme Heat Events in Racine County: 2011-2021

Date	Type	Deaths	Injuries	Property Damage ($)	Crop Damage ($)
July 17, 2011	Heat	0	0	--	--
July 20, 2011	Heat	0	0	--	--
June 28, 2012	Heat	0	0	--	--
July 3, 2012	Excessive heat	0	0	--	--
July 16, 2012	Heat	0	0	--	--
July 23, 2012	Heat	0	0	--	--
July 25, 2012	Heat	0	0	--	--
July 16, 2013	Heat	0	0	--	--
August 30, 2013	Heat	0	0	--	--
July 21, 2016	Heat	0	0	--	--
June 17, 2018	Heat	0	0	--	--
June 29, 2018	Excessive heat	0	0	--	--
July 1, 2018	Excessive heat	0	0	--	--
July 4, 2018	Heat	0	0	--	--
July 19, 2019	Excessive heat	0	0	--	--
	Total	0	0	--	--

Source: National Climatic Data Center

2012 – On July 6th, a hot air mass settled over southern Wisconsin, bringing 100-degree heat to many locations for multiple days between July 2nd and July 6th. Maximum heat indices climbed between 100 and 115 during the hot spell. Based on news reports, hundreds of people received medical treatment at hospitals or clinics due to heat-related illnesses. Numerous new daily record highs were set as well as record high minimums. The long duration of this excessive heat period likely makes this one of the four most dangerous heat waves to strike southern Wisconsin in recorded history.

2018 – On June 29th, hot and humid conditions produced heat index values ranging from 100 to 110 degrees. Numerous cooling centers were opened by local communities throughout southern Wisconsin. Some public swimming pools hours were extended due to the heat. The heatwave continued into July 1st.

Vulnerability and Community Impact Assessment

Heat extremes are primarily a public health concern. People whose incomes are below the federal poverty level and older people are much more susceptible to temperature-related deaths and injury. Education, improved social awareness, and community outreach programs have likely helped to reduce the number of individuals killed or injured by extreme temperature events. Those at greatest risk are the very young, the very old, and the sick. Most deaths during a heat wave are the result of heat stroke. Large and highly urbanized cities can create an island of heat that can raise the area temperature by 3°F to 5°F. Therefore, urban communities with substantial populations of people who are elderly, or who have functional and access needs, could face a significant medical emergency during an extended period of excessive heat. Some residents in high crime areas, especially the elderly, are afraid to open windows or go out to cooling shelters. As neighborhoods change, some older residents become isolated because of cultural, ethnic, and language differences.

The Building Resilience Against Climate Effects (BRACE) program in the Wisconsin Department of Health Services has compiled heat vulnerability index maps for the State and each county. The results of the Racine County heat vulnerability index are shown in Figure 3.3. The heat vulnerability index is based on multiple indicators associated with risk for heat-related illnesses and mortality including health factors, demographic and household characteristics, natural and built environment factors, and population density. As indicated in Figure 3.3, areas within Racine County that have the highest vulnerability to an extreme heat event include portions of the City of Racine, Village of North Bay, and Village of Elmwood Park.

High demands for electricity can result in black outs and brown outs. Loss of water pressure can result from opening of fire hydrants in urban areas. Stagnant atmospheric conditions that occur with heat waves are also favorable for trapping ozone and other pollutants in urban areas. Pets and livestock can suffer from prolonged exposure to excessive heat. Although there has been no reported deaths, injuries, or damages between 2011 and 2021, on average, there are about 1.5 extreme heat events per year in Racine County that can still have an impact on people, pets, and other forms of life.

A review of the community assets described in Chapter 2 indicate the potential for extreme heat hazard events to impact: 1) residents at a countywide level, especially people whose incomes are below the federal poverty threshold, older people, and people with pre-existing medical conditions; 2) agricultural croplands; 3) pets and livestock; 4) municipal water and electric utilities; and 5) natural surface and groundwater reserves. No specific cost data are estimated for extreme heat events, because the nature of such events does not readily permit direct cost analysis.

Future Changes and Conditions

Based upon recent historical data, Racine County can expect to experience an average of 1.5 extreme heat events per year. It should be noted that the historical record shows considerable variation among years in the numbers of these events that occurred. While it would be expected that in some years the County will experience either fewer events or more events than the average number, the average annual number of events is not expected to change over the five-year term of this plan update.

The projections based on downscaled results from climate models indicate that there will likely be substantial changes in the frequencies of extreme heat events over the 21st century. Extreme heat events are likely to occur more frequently and to be more severe by the middle of the century. As previously described in Chapter 2, average summertime temperatures in Racine County are projected to increase by 6.0 to 7.0°F by year 2055.[40] The number of days per year in which temperatures in southern Wisconsin exceed 90°F is expected to triple by 2055. Given that much of the documented increases in average temperature since 1950 have occurred through increases in night-time low temperatures, it is likely that there will be fewer night-time breaks in the heat during extreme heat events in the future. This could result in some extreme heat events persisting longer. Heat waves have direct impacts on human health, especially among sensitive populations such as the young children and older adults. In the absence of mitigative measures, the projected increase in the frequency, duration, and severity of heat waves will be likely to cause increases in fatalities and/or illnesses related to extreme heat.

Multi-Jurisdictional Risk Management

Based upon a review of the historic patterns of extreme heat events in Racine County, there are no specific municipalities that have unusual risks. Rather, the events are of a uniform countywide concern. However, larger cities, such as the City of Racine, may pose a bigger risk to heat related problems for the vulnerable populations located within the city, such as low-income areas and minority groups that may have less access to air conditioned shelters or cold water to keep them safe from extreme heat.

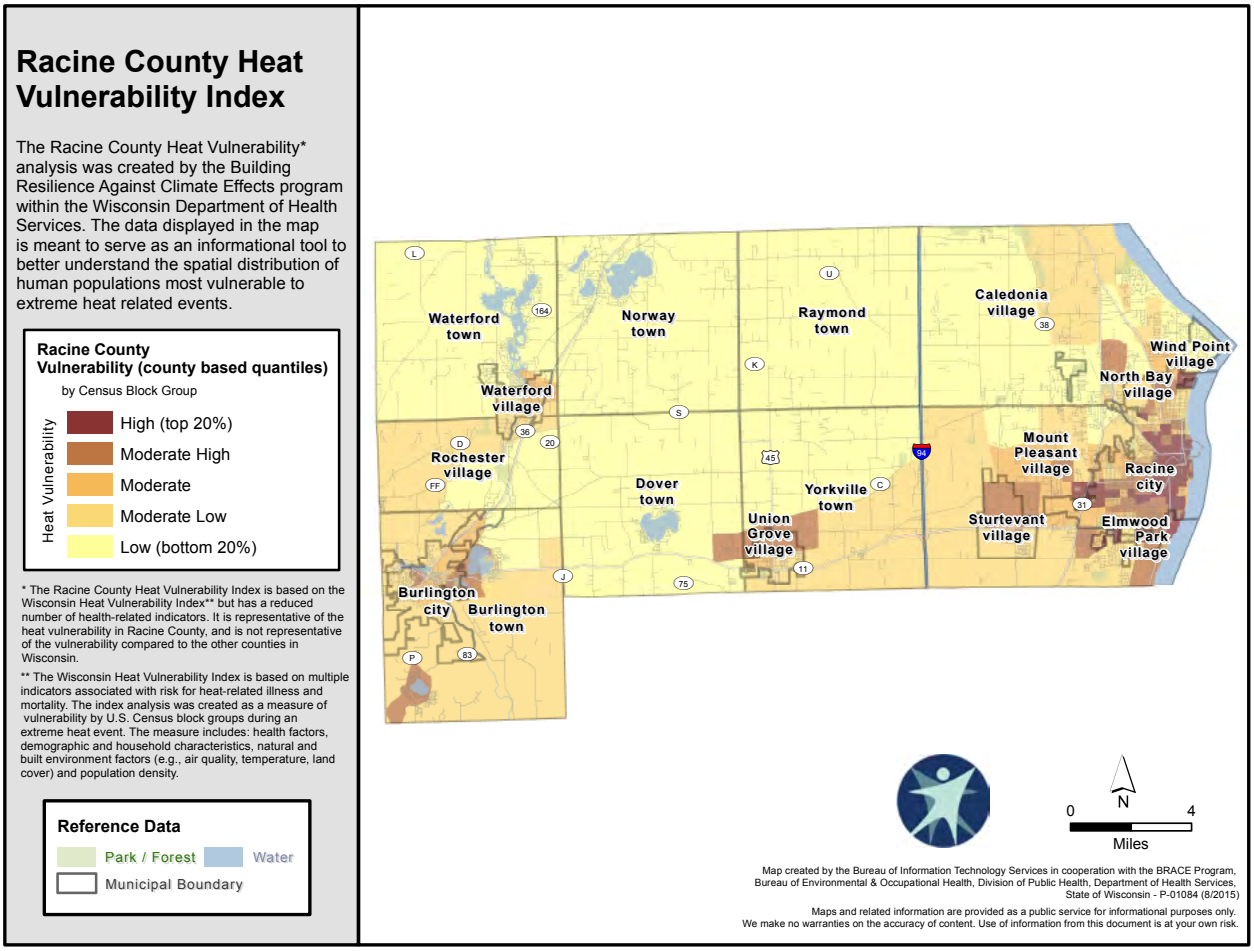
Extreme Cold

Like extreme heat, extreme cold is also a deadly hazard. The CDC reports nationwide that the death rate of excessive cold as the underlying cause ranges from 1 to 2.5 deaths per million people and over 19,000 people have died from exposure to cold since 1979.[41] Exposure to extreme cold temperatures can also cause a number

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

[41] *CDC, 2018.*

Figure 3.3
Racine County Heat Vulnerability Index: 2015



Source: Wisconsin Department of Health Services

of health conditions and can lead to loss of fingers and toes; or cause permanent kidney, pancreas, and liver injury, and even death. These health impacts often result from a combination of cold temperatures, winds, and precipitation. As a result, winter storms can pose substantial risks because they can last for several days and be accompanied by high winds, freezing rain or sleet, heavy snowfall, and cold temperatures. In addition, when deaths and injuries due to cold-related vehicle accidents and fatalities, fires due to dangerous use of heaters, carbon monoxide poisoning due to use of nontraditional sources of heat such as cooking ovens, and other winter weather fatalities are considered, the impact of severe cold periods becomes even greater.

Frostbite and hypothermia are two major health risks associated with severe cold. Frostbite is an injury caused by freezing of the skin and underlying tissues. Frostbite causes a loss of feeling and a white or pale appearance in extremities. Severe frostbite can damage skin and underlying tissues and requires medical attention. Potential complications of severe frostbite include infection and nerve damage. Frostbite is most common on fingers, toes, nose, ears, face, and chin. While exposed skin in cold, windy weather is most vulnerable to frostbite, this injury can also occur on skin covered by gloves or other clothing.

Hypothermia is a condition brought on when the core body temperature drops to less than 95°F. It occurs when the body loses heat more quickly than it is able to produce it. As with frostbite, wind or wetness can contribute to producing hypothermia. Symptoms of moderate to severe hypothermia include lack of coordination, slurred speech, confusion, drowsiness, progressive loss of consciousness, weak pulse, and shallow breathing. Hypothermia may cause lasting kidney, liver, and pancreas problems or death. Members of certain populations are particularly vulnerable to hypothermia. These include older adults, infants and very young children, people who are homeless, persons consuming alcohol or other drugs, and persons taking certain medications.

Wind chill is an index used to evaluate the risk posed by the combination of cold temperatures and wind. It is based on temperature and wind speed. Table 3.15 shows the wind chill table used by the National Weather Service. Wind chill is not the actual temperature, but rather a measure of how the combination of wind and cold feel on exposed skin. As the wind increases, heat is carried away from the body at an accelerated rate, driving down the body temperature. This combination can strongly affect the risks associated with exposure to extreme cold. For example, a wind chill of -20°F will cause frostbite on exposed skin in just 30 minutes.

The National Weather Service issues wind chill advisories when wind chill temperatures are potentially hazardous and wind chill warnings when wind chill temperatures are life threatening. The exact criteria of a wind chill advisory and warning varies from state to state. A wind chill advisory in Wisconsin is issued when wind chill values reach -20°F to -34°F, with wind speeds of 4 mph or more. A wind chill warning in Wisconsin is issued when wind chill values will reach -35°F or colder, with wind speeds of at least four mph for three hours or more. In addition, a wind chill watch is issued 12 to 48 hours before these conditions are expected to occur.

What constitutes extreme cold varies in different parts of the country. In the south, near freezing temperatures are considered extreme cold. Freezing temperatures can cause severe damage to citrus fruit crops and other vegetation. Pipes may freeze and burst in homes that are poorly insulated or without heat. In the north, extreme cold means temperatures well below zero. Winter residents in Racine County may see heavy snow, strong winds/blizzards, extreme wind chill, lake-effect snow, and ice storms. The public can stay informed by listening to NOAA Weather Radio, commercial radio or television for the latest winter storm warnings and watches.

Recent Events

Extreme cold that affects Racine County are not localized events, as they usually encompass the entire south-central to southeastern portion of the State and may continue for several days or weeks. Between 2011 and 2021, about $91,335 in crop damages have been reported as a result of extreme cold temperatures. Table 3.16 lists the extreme cold events in southeastern Wisconsin from 2011-2021. A few examples of recent events from Table 3.16 are noted below.

2013 – On January 21st, arctic air spread into southern Wisconsin behind deep low pressure that tracked to the north of the state. High winds combined with surface temperatures in the single digits below zero to produce wind chills between -20°F to -30°F. The frigid wind chills began the morning of January 21 and continued into the morning hours of January 22. This was one of the relatively few times Milwaukee recorded a low temperature below zero without having a snow cover.

2014 – On January 27th, an arctic cold wave affected southern Wisconsin. West to northwest winds of 10 to 20 mph with the passage of an arctic cold front brought wind chill temperatures of -20°F to -38°F beginning in the early morning of January 27. These wind chills did not end until the morning of January 29. The coldest period was the morning of January 28 when wind chills ranged from -30°F to -38°F. Widespread school and business closings occurred during this time. The Governor declared a state of emergency due to a propane shortage across the state. Numerous water main breaks and frozen laterals continued to occur throughout the entire month of January. Two cold weather deaths occurred in the southeastern Wisconsin area.

2019 – On January 29th, a surge of historically cold arctic air settled over southern WI. Windy conditions and low temperatures in the -20s to -30s degrees Fahrenheit resulted in wind chill temperatures of 35 below to 55 below zero for much of this period. Widespread government, school, and business closings were common on January 30-31st. The United States Postal Service suspended mail delivery on January 29-30th. Many water main breaks and power outages occurred. A man was found frozen in his garage in Milwaukee and had collapsed after shoveling snow. Another man was found frozen in the snow in Cudahy and died from hypothermia.

Vulnerability and Community Impact Assessment

Similar to extreme heat, extreme cold is primarily a public health concern, with people whose incomes are below the federal poverty threshold and older people being much more susceptible to extreme temperature-related deaths and injury. Pets and livestock can also suffer from prolonged exposure to excessive cold. Severe cold temperatures can cause breaks in water mains that can interrupt water supply. The impacts of a

Table 3.15
Wind Chill Temperatures[a]

Wind (mph)	Temperature (°F)																	
	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

[a] *Wind Chill (°F) = 35.74 + 0.6215T - 35.75($V^{0.16}$) + 0.4275T($V^{0.16}$), where T = air temperature (°F) and V = wind speed (mph). The wind chill temperature is only defined for temperatures at or below 50°F and wind speeds above 3 mph. Bright sunshine may increase wind chill temperature by 10°F to 18°F.*

Frostbite times associated with wind chills:

- 30 minutes
- 10 minutes
- 5 minutes

Source: National Weather Service

Table 3.16
Recent Extreme Cold Events in Racine County: 2011-2021

Date	Type	Deaths	Injuries	Property Damage ($)	Crop Damage ($)
January 21, 2011	Cold/wind chill	0	0	--	12,045
January 21, 2013	Cold/wind chill	0	0	--	--
January 6, 2014	Extreme cold/wind chill	0	0	--	39,645
January 27, 2014	Extreme cold/wind chill	0	0	--	39,645
January 7, 2015	Cold/wind chill	0	0	--	--
January 9, 2015	Cold/wind chill	0	0	--	--
December 14, 2016	Cold/wind chill	0	0	--	--
December 18, 2016	Cold/wind chill	0	0	--	--
December 25, 2017	Cold/wind chill	0	0	--	--
January 1, 2018	Cold/wind chill	0	0	--	--
February 5, 2018	Cold/wind chill	1	0	--	--
January 29, 2019	Extreme cold/wind chill	0	0	--	--
February 7, 2021	Cold/wind chill	0	0	--	--
February 13, 2021	Cold/wind chill	0	0	--	--
	Total	1	0	--	91,335

Source: National Climatic Data Center and U.S. Department of Agriculture Risk Management Agency

water main break depend on the size and location of the main. Frozen service laterals can also interrupt water supply to individual buildings. Water main breaks can be costly to municipalities. In the first three months of 2014 alone, the City of Racine responded to 103 water main breaks, costing nearly $450,000 to repair.

Property and crop damages have occasionally been reported as resulting from extreme cold events. Table 3.16 shows that between 2011 and 2021, extreme cold events have been reported as causing about $91,335 in crop damages in Racine County. On average, there are about 1.4 extreme cold events per year in Racine County.

A review of the community assets described in Chapter 2 indicate the potential for extreme cold hazard events to impact: 1) residents at a countywide level, especially people whose incomes are below the federal poverty threshold, older people, and people with preexisting medical conditions; 2) agricultural croplands; 3) pets and livestock; 4) municipal water and electric utilities; and 5) natural surface and groundwater reserves. No specific cost data are estimated for extreme cold events, because the nature of such events does not readily permit direct cost analysis.

Future Changes and Conditions

As mentioned previously, Racine County can expect to experience an average of 1.4 extreme cold events per year. It should be noted that the historical record shows considerable variation among years in the numbers of these events that occurred. While it would be expected that in some years the County will experience either fewer events or more events than the average number, the average annual number of events is not expected to change over the five-year term of this plan update.

The projections based on downscaled results from climate models indicate that there will likely be substantial changes in the frequencies of extreme cold events over the 21st century.[42] The frequency of extreme cold events may decrease by the middle of the century. The projected warming trends are expected to be greatest during the winter. Average winter temperatures in Racine County are projected to increase by about 7.5°F. This may result in a reduction of some risks associated with extreme cold.

Multi-Jurisdictional Risk Management

Based upon a review of the historic patterns of extreme cold events in Racine County, there are no specific municipalities that have unusual risks. Rather, the events are of a uniform countywide concern.

Lake Michigan Coastal Hazards

As mentioned in Chapter 2, the Lake Michigan coastline encompasses portions of five local units of government, including the City of Racine and the Villages of Caledonia, Mount Pleasant, Wind Point, and North Bay. The portion of the Lake Michigan shoreline lying within the jurisdiction of each of these general-purpose local units of government is shown in Table 3.17. There are three types of Lake Michigan coastal hazards of concern that pose risk to Racine County:

- **Erosion of Coastal bluffs, beaches, and near shore lake beds**
- **Coastal Flooding** from high Lake Michigan levels and/or storm surge and storm-induced waves (i.e., wave run-up) causing damage to structures such as residences, businesses, and public facilities
- **Damage and failure of shoreline protection structures** (revetments[43], seawalls, and groins[44]) from wave action, storm surge, and varying Lake levels

The main focus of this vulnerability assessment will be on the first two types of coastal hazards noted above: erosion of coastal bluffs and beaches and coastal flooding from high Lake levels and/or storm surge. With regard to the third hazard listed above—damage and failure of shoreline protection structures—there is little available information about the amount, location, and condition of shoreline protection structures in the County, particularly on privately owned coastal parcels. For this reason, this hazard will not be addressed at length in this assessment.

It is important to note that shoreline protection structures have been known to contribute to coastal problems by decreasing, or preventing, natural erosion of littoral material (lake bottom near shore) such as sand

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

[43] *Revetments are sloping structures placed on banks or cliffs in such a way as to absorb the energy of incoming water (i.e., wave impact). Many materials may be used such as wooden piles, loose-piled boulders (i.e., riprap), concrete shapes, or geotextile fabric sandbags.*

[44] *A groin is a narrow structure (i.e., breakwater and/or jetty) built out into the water from a beach in order to prevent beach erosion or to trap and accumulate sediments that would otherwise drift along the beach face. A groin can be successful in stabilizing a beach on the up-drift side, but erosion tends to be aggravated on the down-drift side.*

and gravel from existing shorelines. Additionally, these structures can disrupt the natural flow and deposition of those sediments along the lake shore, affecting beach ecosystems. Some shoreline protection structures may redirect wave energy to adjacent shorelines, which can increase the potential for erosion at neighboring sites.[45]

Table 3.17
Length of Lake Michigan Shoreline Within Racine County Communities

Community	Lake Michigan Shoreline Length (miles)	Percent of County Total
Village of Caledonia	4.47	30.2
Village of Mt. Pleasant	2.53	17.1
Village of Wind Point	2.40	16.3
Village of North Bay	0.63	4.2
City of Racine	4.76	32.2
Total	14.79	100.0

Source: SEWRPC

Nearly 80 percent of Wisconsin's Lake Michigan shoreline is affected by coastal erosion and bluff recession to some degree, and recurring erosion presents a significant risk in almost every coastal county. The terms recession and erosion are often used interchangeably. Recession is the landward movement of a land feature, such as a bluff crest, while erosion is the wearing away of land. Recession is expressed as distance or a change in distance, while erosion is expressed as a volume or change in volume. Recession can be thought of as a consequence of erosion. Shoreline recession rates are usually determined by comparing aerial photographs taken on different dates.

The rate at which coastal erosion occurs is dependent on a variety of factors including Lake Michigan level fluctuations, disruption of the transport of beach-building sediments, elevated groundwater levels, storms, and surface stormwater runoff. Additional contributing factors to coastal erosion can include soil composition, vertical cracks in the upper slope of the soil, shoreline ice cover, freezing and thawing cycles, shoreline orientation, beach composition, beach width and slope, the presence or absence of shore protection, and the type of shore protection.[46] Shores that have cohesive materials, such as clay, till, and bedrock have strong binding forces. Shores that have non-cohesive materials, such as sand and/or gravel have weak or no binding forces. Like most of the Great Lakes Region, the soils in Racine County are composed of sand, gravel, clay, and clay-like material known as glacial till. Much of the bluffs along the Racine County coast are relatively high (50-200 feet) and are prone to landslides, slumping, surface rill erosion, and soil creep[47].

Lake Level Fluctuations

Lake level can be a significant factor in determining the rate of erosion along Wisconsin's coasts. As mentioned above, high Lake levels and increased wave action can worsen both coastal erosion and coastal flooding issues. As Lake levels rise, bluff recession rates can also increase. Major storm events can also lead to high erosion rates because of increased wave action on the shoreline. The effects of wave-induced erosion are usually greater during periods of high Lake levels. Conversely, low Lake levels pose problems for facilities that are dependent on constant access to water, such as ports, marinas, and nearshore water utility intakes. Low water levels can also cause problems with shore protection structures, such as normally submerged timber pilings being exposed to air.

Water levels in the Great Lakes fluctuate seasonally, annually, and over multi-decade cycles. Seasonally, the lakes are at their lowest levels during the winter, when much of the precipitation is held on land in the form of snow and ice, and evaporation occurs over open water. The highest seasonal levels are during the summer when snowmelt from the spring thaw and summer rains contribute to the Lake water supply. For Lake Michigan in the 30-year-period between 1991-2021, the average difference between summer high water levels and winter low water levels has been about one foot.[48] Long-term variations in Lake levels (over multi-decades) depend on climatic factors such as precipitation, the presence or absence of ice cover on the Lake during the winter, and evaporation of water from the Lake.

[45] *University of Wisconsin Sea Grant,* Great Lakes Coastal Shore Protection Structures and Their Effects on Coastal Processes, *2013*.

[46] *U.S. Army Corps of Engineers-Detroit District, University of Wisconsin Sea Grant,* Living on the Coast: Protecting Investments in Shore Property on the Great Lakes, *2003*.

[47] *Soil creep (also known as downhill creep, or creep) is the slow and subtle downward progression of rock and soil down a low grade slope.*

[48] *This is a calculated average from monthly water levels obtained from the National Oceanic and Atmospheric Administration's Great Lakes Environmental Research Laboratory.*

Coastal hazard problems have been most evident in southeastern Wisconsin and Racine County during high water periods. These have occurred in recent history on Lake Michigan in the early 1950s, the early 1970s, and the mid-1980s, with water levels in 2019 approaching the record set in 1986. As of November 2021, Lake Michigan water levels continued their seasonal decline, decreasing by about 3 inches from October to November. Though Lake Michigan is about 25 inches below the highest monthly water level recorded for November in 1986, the Lake is still about 13 inches above the long-term average water level as of November 2021. Water levels are expected to continue their seasonal decline through the early winter but remain above the long-term average.[49]

Shoreline Recession and Bluff Stability Conditions

An inventory of the shoreline conditions and bluff stability within the entire Southeastern Wisconsin Region was conducted in 1977[50] by a number of coastal technical consultants under the Wisconsin Coastal Management Program (WCMP) and again in 1995 for a study published in 1997 by the Commission in conjunction with the WCMP.[51] The study found nine feet per year of shoreline recession over the period 1963 to 1995, with an average of 1.8 feet per year. Similarly, bluff erosion rates of up to eight feet per year, with an average of 1.1 feet per year were found for the period 1975 to 1995. With 20 of the 34 sites evaluated, the study found Racine County's bluff conditions to be mostly stable in 1995. The areas with unstable bluffs are limited to the northern part of the County, which is considered part of the City of Racine. In general, the 1995 survey generally found bluff stability had improved compared to 1977 conditions. This is likely due to the construction of shoreline protection measures in areas of development.

Wisconsin Shoreline and Oblique Photo Viewer

WCMP, the Association of State Floodplain Managers (ASFPM), and Geo-Professional Consultants, LLC have developed a web mapping tool to view shoreline conditions along most of Wisconsin's Great Lakes coast. The Wisconsin Shoreline Inventory and Oblique Photo Viewer (shoreline viewer tool)[52] can be used to view and compare assessments on shoreline protection and shore and bluff conditions. Shoreline characteristics and conditions were derived from interpretation of oblique aerial photography of the Lake Michigan coastline taken in 1976 and 2007, performed by David M. Mickelson.[53] It should be noted that these interpretations represent conditions on the date that these photographs were taken and are limited by what can be seen in the photos.

In addition, geotagged oblique images can be viewed and compared on the shoreline viewer tool from 1976, 2007, 2010, 2017, 2018, 2019, 2020, and 2021. These images can be used with the interactive mapping tool to understand and evaluate how bluffs along the Racine County coast have changed over time.

The shoreline viewer tool also provides insight into current general conditions of Lake Michigan bluffs in 2021, as shown in Map 3.8. In 2021, 28.5 percent of Racine County's shoreline was considered to have moderately unstable to unstable/failing bluffs (as shown in black and red on Map 3.8).

Types of Shore Protection in Racine County

Table 3.18 summarizes an assessment of the types of shore protection in the County in 2018-2019, as provided on the shoreline viewer tool. About 30 percent of the shoreline in Racine County was unprotected in 2018-2019. The most common type of shore protection in the County was revetment (42.8 percent).

---

[49] *Collaborative Action for Lake Michigan (CALM) Coastal Resilience Monthly Newsletter, November 2021.*

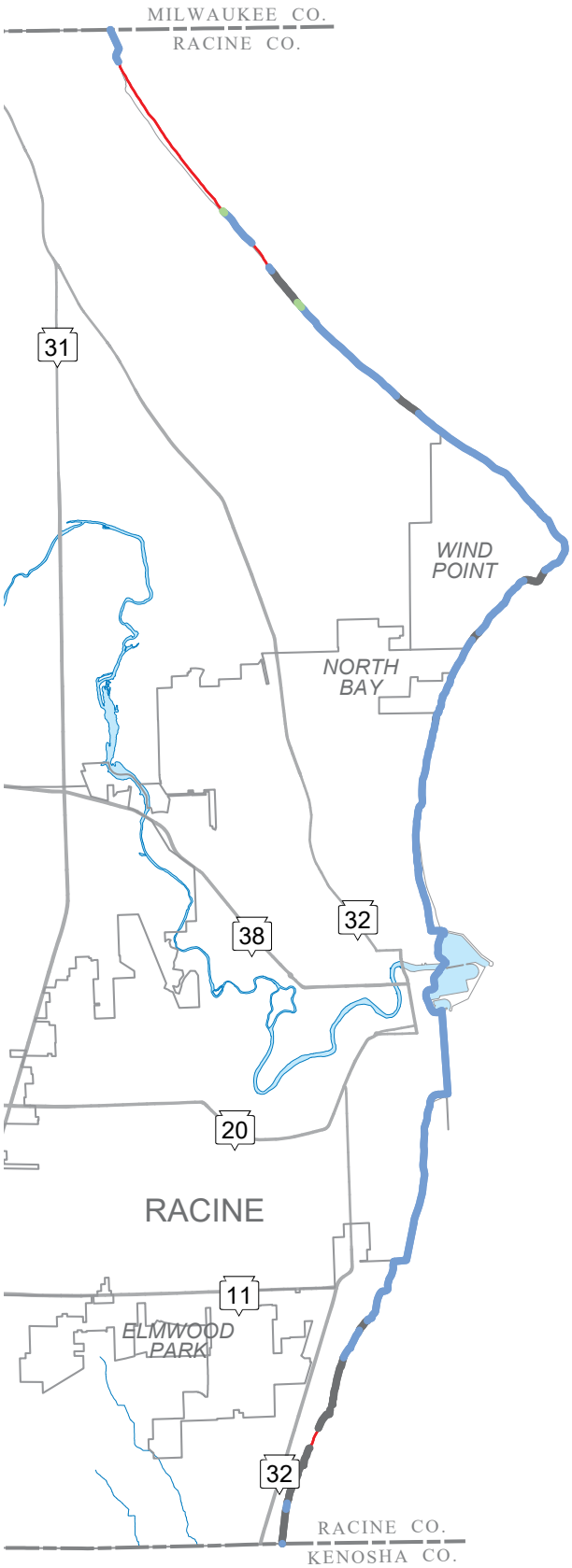
[50] *D.M. Mickelson, L. Acomb, N. Brouwer, T.B. Edil, C. Fricke, B. Haas, D. Hadley, C. Hess, R. Klauk, N. Lasca, and A.F. Schneider,* Technical Report, Shoreline Erosion and Bluff Stability Along Lake Michigan and Lake Superior Shorelines of Wisconsin, *Wisconsin Coastal Management Program, February 1977.*

[51] *SEWRPC Technical Report No. 36,* Lake Michigan Shoreline Recession and Bluff Stability in Southeastern Wisconsin: 1995, *December 1997.*

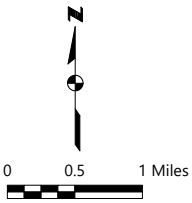
[52] *Floodatlas.org.*

[53] *Mickleson, D and Stone J,* Wisconsin's Lake Superior and Lake Michigan Shoreline Oblique Photography: Analysis of Changes 1976 (78) to 2007 (08), A Report to the Wisconsin Coastal Management Program, *2012.*

Map 3.8
General Bluff Conditions in Racine County: 2018



	(PERCENTAGE OF COUNTY SHORELINE)
UNSTABLE/FAILING	12.8
MODERATELY UNSTABLE	15.7
MODERATELY STABLE	71.1
NO BLUFF	0.47



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

Types of Bluff Failure in Racine County

Table 3.19 specifies the types of bluff failure that was occurring at the time of the 2018-2019 assessment. Shallow slides were the most common observed type of bluff failure, occurring at 29.7 percent of the assessed County shoreline. This is relatively low considering that 64.3 percent of the coastline showed no obvious failures.

Long-Term (1956-2015) and Short-Term (1995-2015) Bluff Toe and Bluff Crest Recession

A recent analysis by the University of Wisconsin-Madison Coastal Sustainability and Environmental Fluid Mechanics Laboratory is also available to view on the shoreline viewer tool. The study measured long-term (1956-2015) and short term (1995-2015) bluff toe recession, bluff crest recession, and general shoreline recession along the shores of Kenosha, Milwaukee, Ozaukee, and Racine Counties.[54] Bluff recession distances were measured from historical aerial photos in Geographic Information Systems (GIS) software. The bluff crest, bluff toe, and shoreline were carefully traced on each aerial photo. The bluff crest is identified as the break in slope between the upland and the bluff slope; the bluff toe is identified as the break in slope between the bluff slope and the beach; and the shoreline is defined as the location that appears as the interface between the water and land at the time the photo was taken (see Figure 3.4). Data in Maps 3.9 through 3.12 show recession distances that have been spatially averaged along 300-foot sections of coast. The data therefore represent average recession over a distance wider than a typical parcel or shoreline frontage and should not be interpreted as recession at a specific property.

Table 3.18
Shore Protection in Racine County: 2018-2019

Type of Shore Protection	Percent of County Shoreline
Public Marina	5.5
Seawall/Bulkhead	3.1
Revetment	42.8
Poorly Organized Rip-Rap/Rubble	18.3
No Protection	30.2
Total	100.0

Source: SEWRPC

Table 3.19
Bluff Failure in Racine County: 2018-2019

Type of Bluff Failure	Percent of County Shoreline
Shallow Slides	29.7
Creep	5.5
No Obvious Failures	64.3
No Bluff	0.5
Total	100.0

Source: SEWRPC

This recession analysis can provide useful insights into the historic migration of the Lake Michigan coast in Racine County. It should be noted that bluff recession can be sporadic. A bluff crest that remained unchanged for decades can recede many feet almost instantly due to a bluff collapse. This analysis represents how the bluffs have responded to historical environmental conditions and human actions over a specific time period. There will always be uncertainty in how bluff and shoreline recession will respond to future conditions.

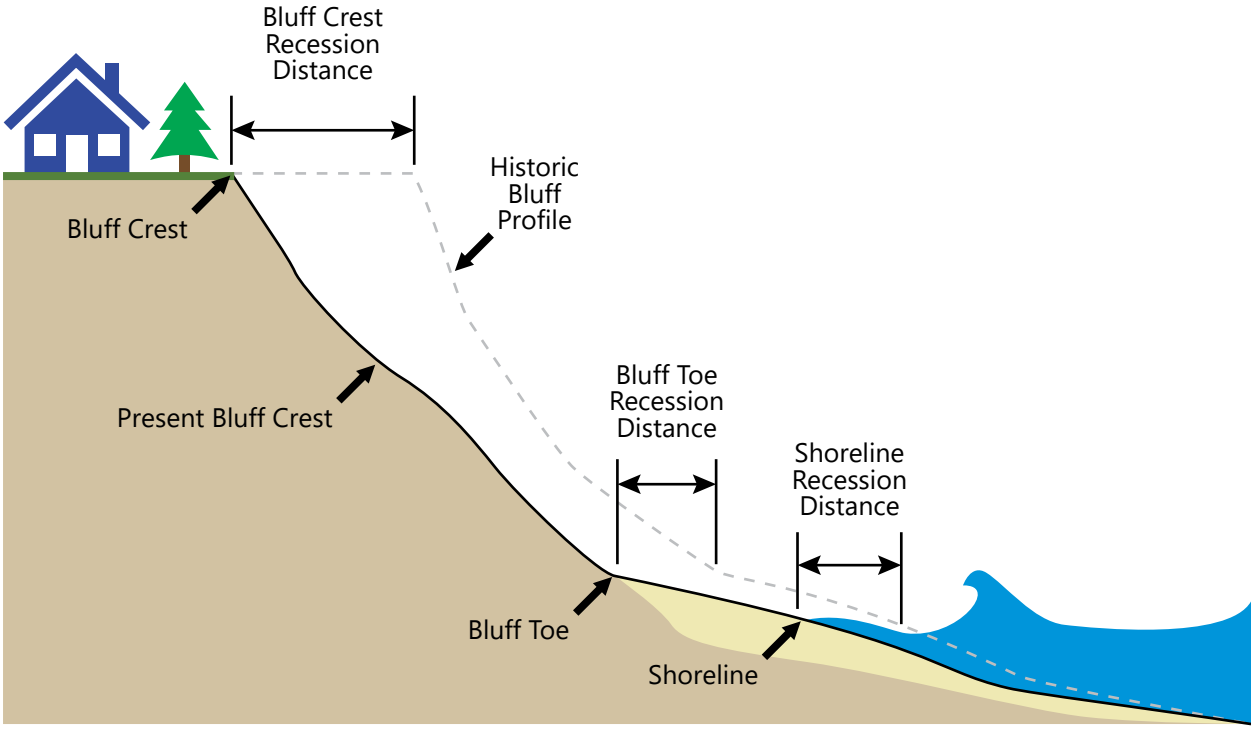
Long-Term Bluff Toe and Crest Recession

As shown in Map 3.9, about 52.2 percent of the bluff toe in Racine County has experienced at least some recession in the 59-year long term period from 1956 to 2015. Furthermore, about 20.5 percent of the County's bluff toe was estimated to have experienced significant recession of at least 20 feet to more than 60 feet. The most severe long term bluff toe recession has occurred in the City of Racine (see Map 3.9). It is estimated that about 47.8 percent of the bluff toe in the County has either experienced no recession or has moved towards the Lake. It should be noted that accretion or small bluff toe recession distances may represent areas where the bluff crest has slumped towards the shoreline or where the construction of shore protection structures has advanced the bluff toe lakeward.

Map 3.10 shows long term bluff crest recession distances in the County. About 11.6 percent of the bluff crest in Racine County has experienced at least some recession, with 2.6 percent experiencing at least 20 feet of retreat. The largest bluff crest recession distances have occurred in the City of Racine. About 88.3 percent of the bluff crest in the County has had no recession or has experienced accretion, possibly due to fill added to the bluff in slope stabilization projects.

[54] *This study was funded by the Wisconsin Coastal Management Program and the National Oceanic and Atmospheric Administration, Office for Coastal Management.*

Figure 3.4
Bluff Recession Schematic



Source: Wisconsin Coastal Management Program and SEWRPC

Short-Term Bluff Toe and Crest Recession

As shown in Map 3.11, about 20.9 percent of the bluff toe in Racine County has experienced at least some recession in the 20-year short term period from 1995 to 2015, with most of that percentage experiencing 0 to 10 feet of bluff toe retreat. It is estimated that 79.1 percent of bluff toe in the County has had no recession or has experienced accretion. Again, it should be noted that bluff toe accretion may represent areas where material has slumped from the bluff crest above or where the construction of shore protection structures has advanced the bluff toe lakeward.

Map 3.12 shows short term bluff crest recession distances in Racine County. About 8.1 percent of bluff crest data collected in the County has shown at least some recession in the 20-year short term period. Bluff crest recession distances greater than 20 feet have occurred in the City of Racine and the Village of Caledonia. Conversely, 92 percent of the bluff crest in Racine County has either experienced no recession or accretion during this short term period.

Coastal Flooding

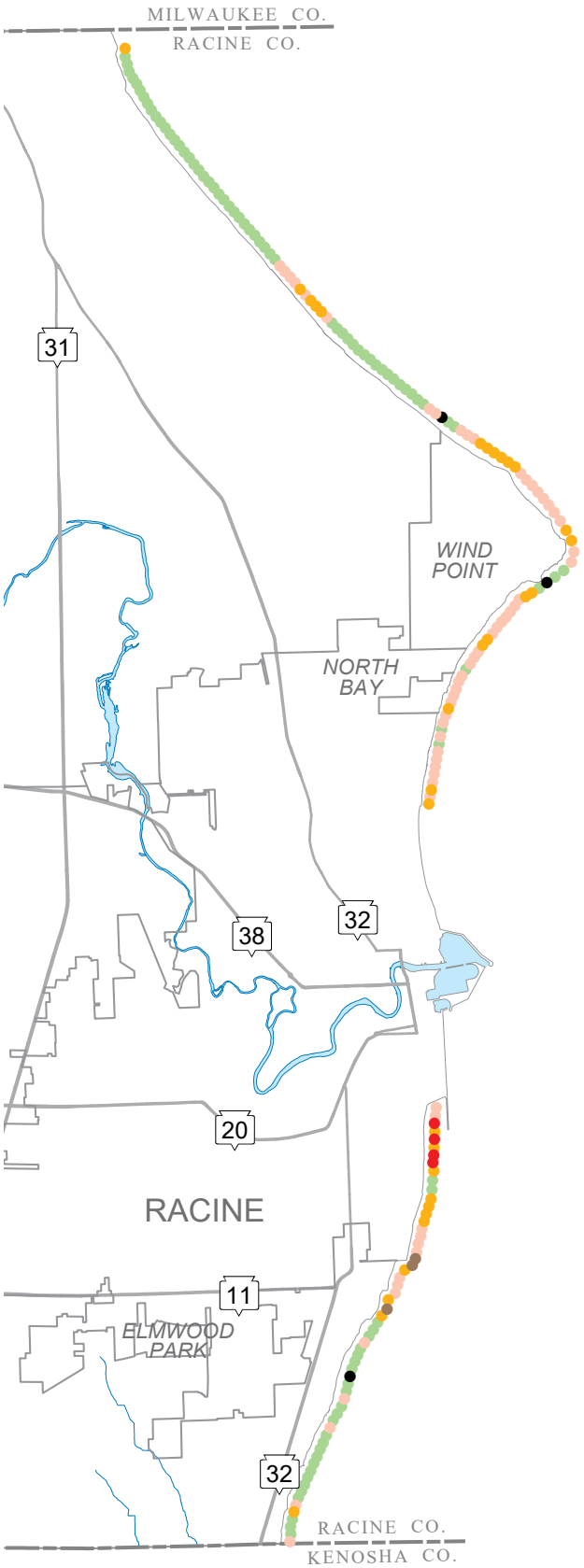
Coastal flooding tends to be most serious in the low-lying areas.[55] The risk of coastal flooding is reduced when Lake levels are low, however other factors such as storm-induced winds and wave run-up can cause or exacerbate coastal flooding. Likewise, when Lake levels are high, storm surge, wave height, and wave run-up also influence the severity of coastal flooding. Communities positioned on low terraces are at a medium-risk of flooding, whereas communities in the County located on high bluff areas are not vulnerable to coastal flooding.[56]

Racine County's mid-shoreline, located in the City of Racine, is low-lying with beaches. Based on Commission's parcel-based analysis, there are no structures identified within Lake Michigan's 100-year recurrence interval floodplain (special flood hazard area).

[55] *State of Wisconsin Hazard Mitigation Plan, December 2016,* op. cit.

[56] Ibid.

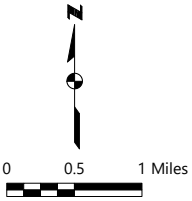
Map 3.9
Long Term Bluff Toe Recession in Racine County: 1956-2015



BLUFF RECESSION

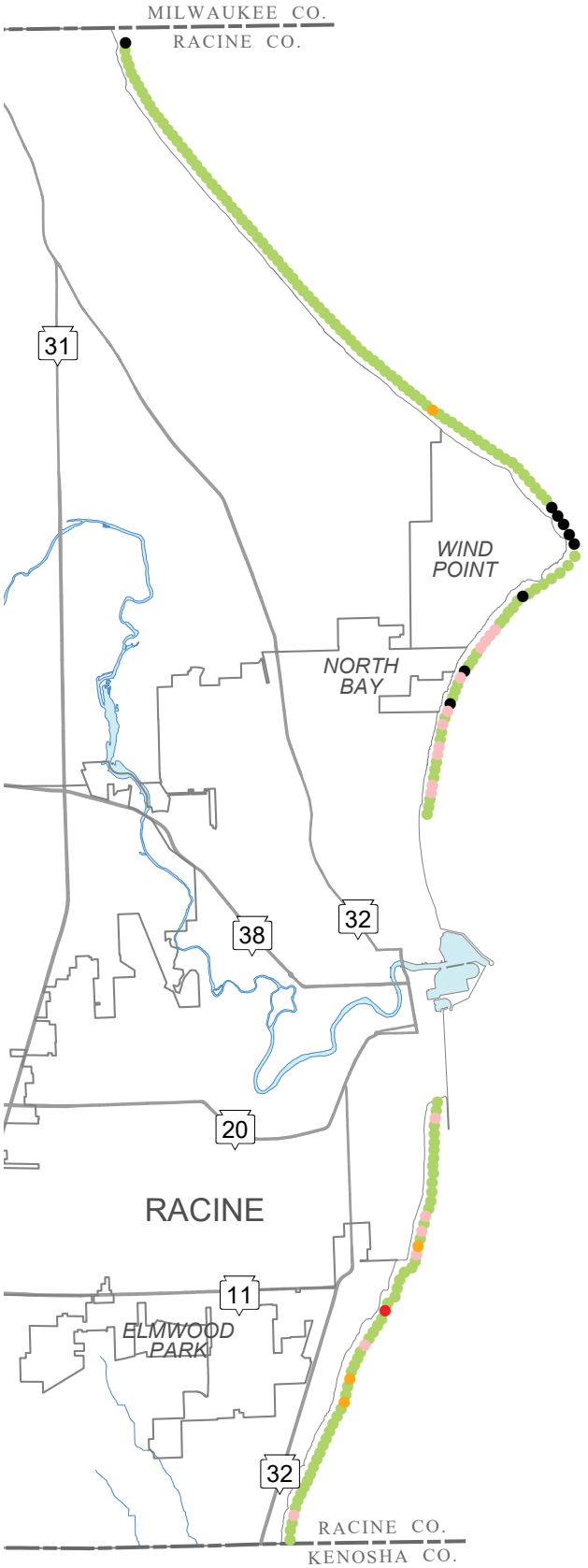
(IN TOTAL FEET)	(PERCENT OF DATA)
GREATER THAN 60 (Greater than 1 Ft/Year)	1.6
40 TO 60 (0.7 to 1 Ft/Year)	2.2
20 TO 40 (0.3 to 0.7 Ft/Year)	16.7
0 TO 20 (0 to 0.3 Ft/Year)	31.7
NO RECESSION	1.6
ACCRETION	46.2

Note: Areas with no data points indicate locations where no bluff is present.



Source: Wisconsin Shoreline Inventory and Oblique Viewer (Association of State Floodplain Managers, National Oceanic and Atmospheric Administration, University of Wisconsin Coastal Sustainability Laboratory, UW Sea Grant Institute, Wisconsin Coastal Management Program) and SEWRPC

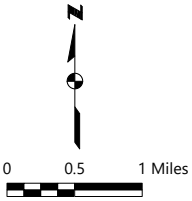
Map 3.10
Long Term Bluff Crest Recession in Racine County: 1956-2015



BLUFF RECESSION

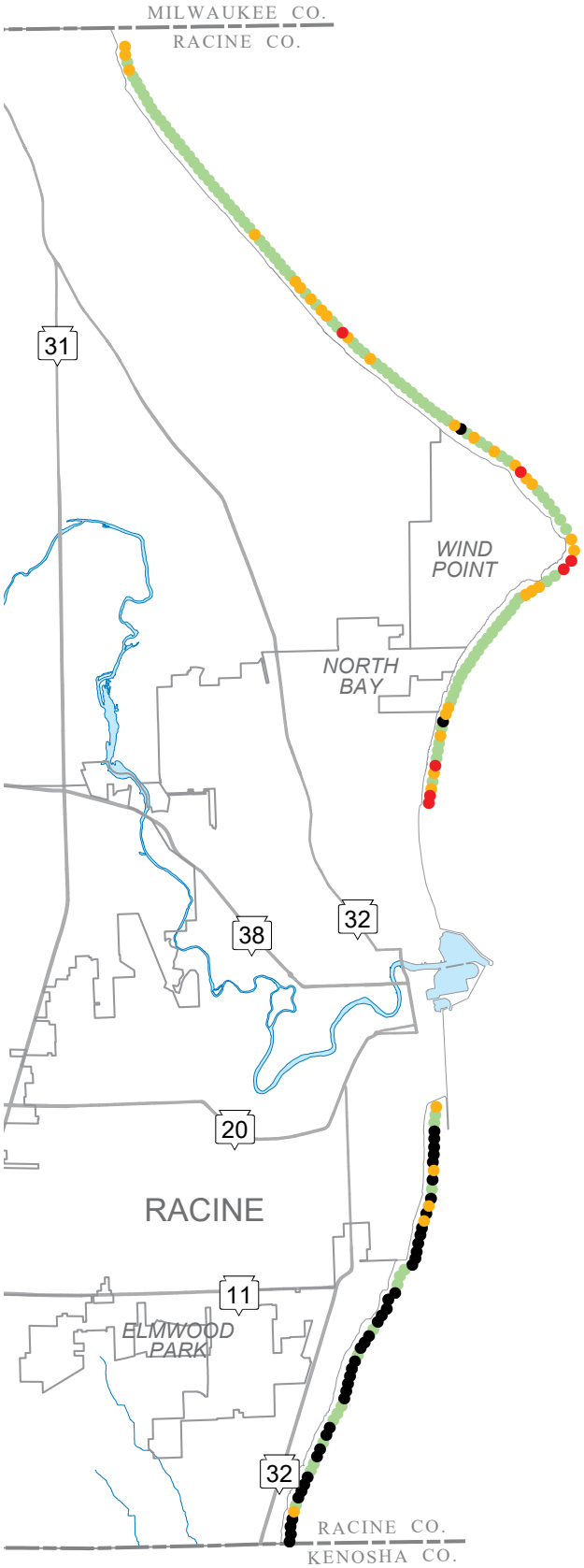
(IN TOTAL FEET)	(PERCENT OF DATA)
GREATER THAN 60 (Greater than 1 Ft/Year)	0.0
40 TO 60 (0.7 to 1 Ft/Year)	0.6
20 TO 40 (0.3 to 0.7 Ft/Year)	2.1
0 TO 20 (0 to 0.3 Ft/Year)	9.0
NO RECESSION	4.8
ACCRETION	83.5

Note: Areas with no data points indicate locations where no bluff is present.



Source: Wisconsin Shoreline Inventory and Oblique Viewer (Association of State Floodplain Managers, National Oceanic and Atmospheric Administration, University of Wisconsin Coastal Sustainability Laboratory, UW Sea Grant Institute, Wisconsin Coastal Management Program) and SEWRPC

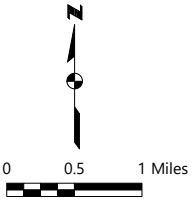
Map 3.11
Short Term Bluff Toe Recession in Racine County: 1995-2015



BLUFF RECESSION

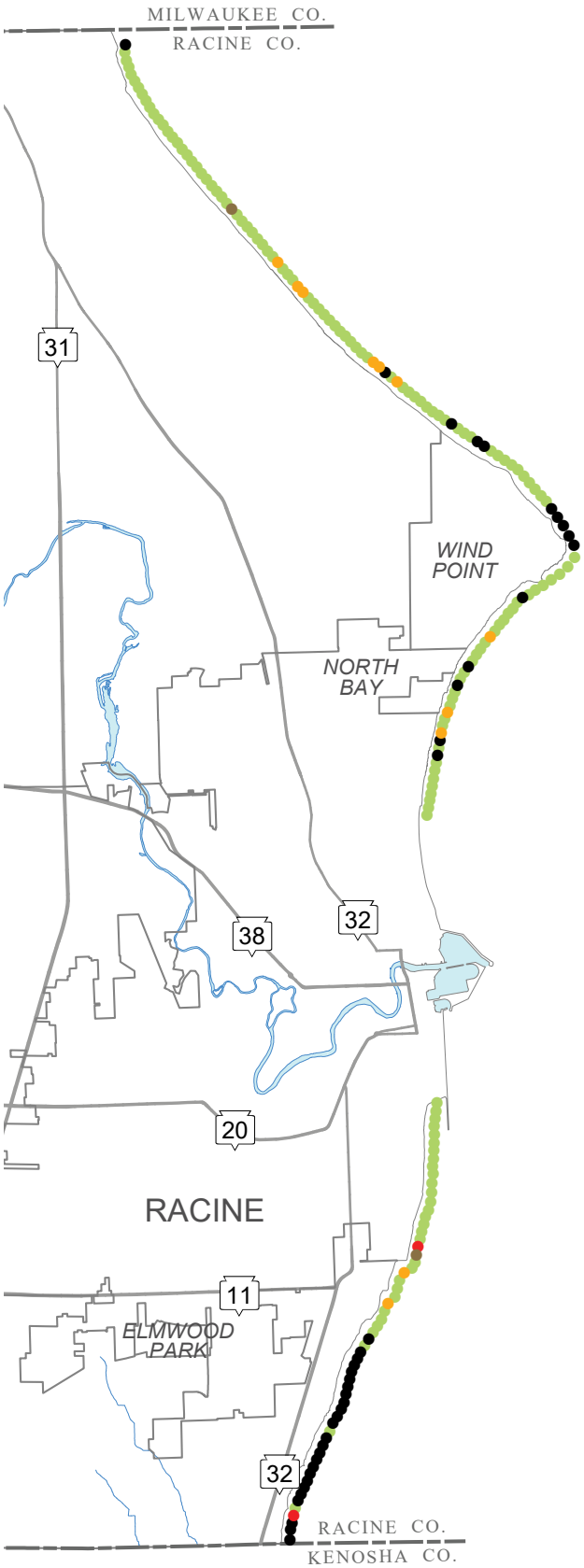
(IN TOTAL FEET)		(PERCENT OF DATA)
●	GREATER THAN 20 (Greater than 1 Ft/Year)	0.0
●	10 TO 20 (0.5 to 1 Ft/Year)	3.7
●	0 TO 10 (0 to 0.5 Ft/Year)	17.2
●	NO RECESSION	22.6
●	ACCRETION	56.5

Note: Areas with no data points indicate locations where no bluff is present.



Source: Wisconsin Shoreline Inventory and Oblique Viewer (Association of State Floodplain Managers, National Oceanic and Atmospheric Administration, University of Wisconsin Coastal Sustainability Laboratory, UW Sea Grant Institute, Wisconsin Coastal Management Program) and SEWRPC

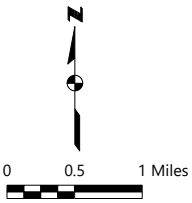
Map 3.12
Short Term Bluff Crest Recession in Racine County: 1995-2015



BLUFF RECESSION

(IN TOTAL FEET)		(PERCENT OF DATA)
●	GREATER THAN 20 (Greater than 1 Ft/Year)	1.1
●	10 TO 20 (0.5 to 1 Ft/Year)	1.1
●	0 TO 10 (0 to 0.5 Ft/Year)	5.8
●	NO RECESSION	21.3
●	ACCRETION	70.7

Note: Areas with no data points indicate locations where no bluff is present.



Source: Wisconsin Shoreline Inventory and Oblique Viewer (Association of State Floodplain Managers, National Oceanic and Atmospheric Administration, University of Wisconsin Coastal Sustainability Laboratory, UW Sea Grant Institute, Wisconsin Coastal Management Program) and SEWRPC

The Great Lakes Coastal Flood Study (GLCFS)—an on-going collaboration between FEMA and the U.S. Army Corps of Engineers (USACE)—will soon complete mapping for coastal flood velocity zones (V Zones) for the Great Lakes. At this time, the Lake Michigan coast has flood Zones A or AE along much of its coast, including Racine County.[57] Zones A and AE are typically inland (i.e., lakes and rivers) flood zones that do not account for wave action greater than 3 feet or storm surge. Zones V and VE represent the area along the coast that is subject to inundation by the 1-percent-annual-probability flood with additional hazards associated to wave run-up greater than 3 feet above the base flood elevation (BFE). Note, Zones AE and VE have detailed hydraulic studies to determine the BFE (i.e., elevation data), while Zones A and V do not and are approximate flood Zones. Digital Flood Insurance Rate Maps (DFIRMs) showing the new coastal V and VE Zones for the Great Lakes should be available for Southeast Wisconsin within the life span of this plan.[58]

Recent Events

2013 – Lake Michigan water levels are up an average of more than three feet since January 2013, its highest level since 1998 according to the National Weather Service. The large amount of ice cover in the winters of 2013 and 2014 has led to less evapotranspiration, contributing to rising Lake levels.

2015 – Beginning in 2015, residents in the Lake Park neighborhood of the Village of Mount Pleasant, whose homes reside on a bluff overlooking Lake Michigan, have experienced significant erosion and bluff recession issues. The erosion has been caused by a combination of wave action reaching up to the bottom of the bluff and groundwater seepage from the top of the bluff. Some property owners have reported losing 40 feet or more of land due to the erosion.

2016 – One home on Sheridan Road needed to be removed in April 2016, while another 10 to 12 homes are threatened by the receding bluff. In addition, public utilities and roads are at risk. In addition, several homes in the Village of Caledonia were also at risk due to Lake Michigan bluff erosion. As of June 2016, a project was underway to stabilize and reinforce the shoreline on a private property on Waters Edge Road. On Novak Road erosion had undercut the bluff where a home resides, and the home's deck was at risk of falling into the Lake.

In May 2016 the Racine County Executive issued a declaration of emergency to better position the County to receive State and Federal assistance as well as to make personnel and resources available to assist affected residents. Several public meetings were hosted in the Village of Mount Pleasant in the summer of 2016 that included local, County, State, and Federal officials. The meetings provided information for property owners on temporary actions they can take to stabilize the bluff while more permanent solutions are explored. Long term solutions to stabilize bluffs could cost property owners tens of thousands of dollars, or more.[59]

2018 – On April 15th, a prolonged period of strong and gusty onshore northeast winds resulted in high waves crashing into the western shore of Lake Michigan from overnight of April 13th through the 14th, into the early morning of April 15th. Northeast winds were persistent 20 to 30 mph with frequent gusts of 35 to 45 mph for about a 24 hour period. Waves were estimated to reach 15 feet as they crashed into shore. These waves and high Lake levels resulted in areas of lakeshore erosion and damage from Port Washington south to Kenosha with the most erosion in the Racine and Kenosha County lake shore areas. A prolonged period of strong winds and high waves caused erosion damage to the beach at the Wind Point Lighthouse. Erosion damage was also noted at Sam Myers Park in Racine.

2019 – On October 21st, Pershing Park Drive in the City of Racine was closed due to rocks and debris being thrown onto the roadways by high waves. The gravel parking area adjacent to the park will need to be re-graded due to the debris. A period of strong east to southeast onshore winds caused high waves at the Lake Michigan shoreline for several hours. These conditions resulted in an enhanced risk of lakeshore erosion and flooding. The strongest onshore winds occurred between 10 am CDT and 4 pm CDT Monday, October 21st.

---

[57] *Note that the Racine County FIS indicates that the Lake Michigan coastal AE Zone floodplain elevations were based on wave run-up calculations.*

[58] *State of Wisconsin Hazard Mitigation Plan, December 2016,* op.cit.

[59] *Mark Schaaf, "'Significant' Erosion Due to Lake Surge," Racine Journal Times, August 23, 2015.*

2020 – On January 11th, Lakeshore erosion at Carre Hogel Park (200' shoreline), Pershing Drive (900' shoreline), North of Zoo Beach (260' embankment/bluff and shoreline erosion), and Shoop Park (50' erosion). Strong low pressure passing by to the southeast resulted in an extended period of strong north to northeast winds along the Lake Michigan shoreline of southeast and east central Wisconsin. Wind gusts at Milwaukee Mitchell Field gusted 40 to 50 knots at time from 9 pm CST the evening of January 10 through 3 pm CST the afternoon of January 11. The persistent strong onshore winds combined with near record high Lake Michigan water levels producing severe lakeshore flooding and erosion at the Port of Milwaukee as well as at spots all along Lake Michigan from Kenosha to Sheboygan. Wave heights were estimated to be in the 10 to 18 foot range at the height of the event the morning of January 11th.

On April 30th, a slow moving low pressure area brought several inches of rain to far eastern WI over a 24-40 hour period. River and lake flooding occurred along with some road flooding. Almost all of North Beach in Racine was underwater due to lakeshore flooding and record high water levels on Lake Michigan.

Vulnerability and Community Impact Assessment

In 2021, Wisconsin Emergency Management (WEM) conducted a county-level coastal erosion risk and vulnerability assessment for the State as part of the Threat and Hazard Identification and Risk Assessment (THIRA). WEM used the statewide parcel inventory (Wisconsin Statewide Parcel Database) as the basis for estimating the existing potential losses from Lake Michigan coastal erosion. Each parcel contained information such as total parcel value, improvement value, and property class. A GIS buffer analysis was conducted to identify parcels within one-quarter and one-half mile of the Lake Michigan coastline. Parcels within one-quarter of a mile from the coast were considered to be in a High Risk Erosion Zone, while parcels within one-half mile were considered to be in a Low Risk Erosion Zone. As a result, in Racine County a total of 11,688 parcels were determined to be within the coastal risk erosion zones (see Table 3.20). Of those 11,688 total identified parcels, 10,860 were classified as residential, 789 as commercial, and 39 as manufacturing. The low-risk zone has an estimated value of improvements of more than $1.2 billion, while the high-risk zone has a value of improvements of more than $669 million, for a combined total value of improvements around $1.89 billion. It should be noted that the high and low risk coastal zones are solely based on distance from the Lake Michigan shoreline. Steps already taken, such as shoreline protection structures, likely have reduced the coastal hazard risk to many of these structures.

In addition, the analysis described above has highlighted particular areas along the Racine County coast that are of particular concern due to bluff toe and crest recession over time. These communities include the City of Racine, Village of North Bay, and Village of Wind Point.

Some low lying areas in the central portion of the County, where bluffs are not present, have been susceptible to recent beach erosion. The North Beach, Zoo Beach, and Samuel Myers Park in the City of Racine have seen significant impact due to recent high Lake levels, such as consistent flooding that has caused erosion of the sand and trails.

A review of the community assets described in Chapter 2 indicate the potential for coastal hazard impacts to: 1) flood prone residential, commercial, and other developed land uses; and 2) agricultural lands. A review of the mapping of critical community facilities, emergency service facilities, and historic sites in the County indicate that there are seven childcare facilities, 23 adult care facilities, two government buildings, five public schools, five private schools, three emergency service buildings, one health clinic, and six historic sites within the 1/2 mile low risk coastal hazard zone. Critical facilities within the 1/4 mile high risk coastal hazard zone include six childcare facilities, two adult care facilities, six government buildings, two private schools, three emergency service buildings, one health clinic, and 26 historic sites (including one shipwreck in Lake Michigan). The names of these critical facilities within the high risk coastal zones are included in Appendix C. As noted above, the high and low risk coastal zones are solely based on distance from the Lake Michigan shoreline. Steps already taken, such as shoreline protection structures, likely have reduced the coastal hazard risk to many of these structures.

A review of the Lake Michigan coastal erosion conditions within Racine County indicates that there is a significant potential community impact as a result of the potential loss of land improvements and infrastructure in selected areas due to lakeshore erosion. A review of coastal flooding conditions within Racine County indicates that there is little to no potential community impact as indicated from the lack

Table 3.20
Parcels Within the Low and High Risk Coastal Erosion Zones in Racine County: 2021

	Improved Parcels in Erosion Risk Zone				Value of Improvements ($)			
Racine County	Residential	Commercial	Manufacturing	Total	Residential	Commercial	Manufacturing	Total
Low-Risk Zone (within 0.5 miles)	7,300	550	31	7,881	958,820,700	206,358,150	52,690,600	1,217,869,450
High-Risk Zone (within 0.25 miles)	3,560	239	8	3,807	530,551,000	119,447,850	19,781,000	669,779,850
Total	10,860	789	39	11,688	1,489,371,700	325,806,000	72,471,600	1,887,649,300

Source: Wisconsin Emergency Management

of structures within the 1-percent-annual-probability flood hazard area along the coast of the County. However, it should be noted that community impact for coastal flooding should be assessed when v zones become effective. At the time of this plan development, v zones are still preliminary and not included as part of this analysis.

Future Changes and Conditions

Changes in land use can have an impact on the potential for coastal erosion hazards to occur. Such changes relate to the potential future increase in development within the erosion hazard areas, particularly when not accompanied by proper shore protection measures. Enforcement of the current zoning procedures that are in place in the coastal communities of Racine County call for the use of shoreline protection, bluff stabilization structural measures, and bluff setbacks for new development along portions of the Lake Michigan shoreline where urban shoreline development exists, or is envisioned, and provides for a larger setback for development in areas where structural protection is not envisioned to be used due to limited planned urban development.

As discussed in the sections above, Lake Michigan is about 13 inches above the long-term average water level as of November 2021, causing some residents in the City of Racine, and Villages of Caledonia and Mount Pleasant to experience significant erosion and bluff recession issues. In addition, climate change may lead to more drastic fluctuations in Lake Michigan water levels. Over the five-year period covered by this plan update, Lake Michigan water levels are expected to continue to fluctuate. Potential future fluctuations in Lake Michigan water levels could lead to continued bluff failures, particularly in areas that have no shoreline protection, where shoreline protection structures are not maintained adequately, or where shoreline protection structures are not built to sufficient specifications to protect against fluctuating water levels. Mitigation measures to protect areas along the Lake Michigan coast are described further in Chapter 5.

Changes over the 20th century and projections based on downscaled results from climate models indicate that there will likely be changes affecting coastal conditions over the 21st century. Coastal areas have experienced, and are projected to experience, increases in air temperatures, increases in precipitation, especially during fall, winter, and spring months, and increases in the frequency of heavy precipitation events.[60] Wind strengths have increased over the Great Lakes and are expected to continue increasing into the future.[61] In addition, wind patterns over Lake Michigan have altered. Prevailing winds during summer months shifted from coming from the southwest during the 1980s to coming from the east after 1990.[62] These climatic changes are expected to influence Lake levels, coastal erosion, flooding, and shoreline stability, sometimes in complex ways. According to the NOAA Office for Coastal Management in 2015, "recent climate studies, along with the large spread in existing modeling results, indicate that projections of Great Lakes water levels represent evolving research and are still subject to considerable uncertainty."

For example, Lake Michigan is likely to be impacted by trends that act both to increase and to decrease water levels. Increased precipitation will increase water contributions to the Lake. At the same time, increases in temperatures will lead to increases in evaporation of water from the Lake. The temperature increase will also

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

[61] *Desai, Austin, Bennington, and McKinnley, 2009,* op.cit.

[62] *James T. Waples and J. Val Klump, "Biophysical Effects of a Decadal Shift in Summer Wind Direction over the Laurentian Great Lakes," Geophysical Research Letters, Volume 29, pages 43-1 through 43-4, 2009.*

result in reduced ice cover over the winter. This affects evaporation because ice cover on the Lake acts as a cap, reducing evaporation by preventing water vapor from escaping into the air. As a result of both of these processes, evaporation from the Lake is projected to increase.[63] It should be noted that water levels in the Lake vary widely around their average, with high-water and low-water decades occurring. This variability is expected to continue.

While the hazard impacts associated with water level variations should be similar in type to those impacts currently resulting from water level variations, there may be some increase in the magnitude of these impacts. While low water levels may allow beaches and beach ridges to build and beach-anchoring vegetation to move toward the Lake, they may also adversely impact shipping, power generation, and tourism. It should be noted that long periods of low water levels may lead to erosion of the lakebed, which may allow storm-generated waves to reach farther inland when water levels rise. While high water levels may benefit communities, businesses, and industries that depend upon Great Lakes waters for commercial shipping, hydro power, recreational boating, and tourism, higher water levels with increased storm frequency and intensity could increase shoreline and bank erosion. This could increase damages to lakefront property and reduce the area of beaches.

Several other elements of climate change may also act to intensify shoreline erosional processes. Increases in wind strength over the Lake and changes in prevailing wind direction would be likely to lead to greater offshore wave development. This would produce higher waves along the coast. Changes in several elements of climate may affect the stability of bluffs along the lakeshore. The amount of water contained in bluff soils is an important factor determining their stability. Friction between soil particles hold them in place. As water fills the spaces between these particles the friction between soil particles decreases, causing the soil to become more fluid and less stable. Higher Lake levels and increases in 1) precipitation, 2) the frequency of heavy storms, and 3) the number of freeze-thaw cycles will all contribute to shoreline bluffs becoming less stable and more susceptible to slumping. Prolonged dry periods and droughts may also contribute to reduced stability of coastal bluffs. As bluff soils dry out, cracks in the soil can form, weakening the surface soil. During long-term droughts, these cracks can develop into deep fractures. Such fractures can allow surface water to penetrate deep into bluff soils. If heavy rainfall events occur following a drought, they may cause rapid saturation of dry, fractured bluff soils. This could cause a long-term major slope failure.

Multi-Jurisdictional Risk Management

Shoreline erosion, bluff failure, and coastal flooding, when combined, present a moderate risk in Racine County. As discussed above, coastal hazard risks are present in all five local units of government in Racine County along Lake Michigan. Areas of recent active erosion have been identified within the City of Racine and the Villages of Caledonia, Mount Pleasant, and Wind Point. In addition, there is a need for continued surveillance of coastal conditions in the Villages of North Bay and Wind Point.

Severe Winter Storms (Heavy Snowstorm, Blizzard, Ice Storm)

Winter storms can vary in size and strength and include heavy snowstorms, blizzards, freezing rain, sleet, ice storms, and blowing and drifting snow conditions. Extremely cold temperatures accompanied by strong winds can result in wind chills that cause bodily injury, such as frostbite and death. A variety of weather phenomena and conditions can occur during winter storms. For clarification, the following are National Weather Service approved descriptions of winter storm elements:

- **Heavy Snowfall** – The accumulation of six or more inches of snow in a 12-hour period or eight or more inches in a 24-hour period.

- **Blizzard** – An occurrence of sustained wind or frequent gusts 35 mph or higher accompanied by falling or blowing snow, and visibilities of one-quarter mile or less, for three or more hours.

- **Ice Storm** – An occurrence of rain falling from warmer upper layers of the atmosphere to the colder ground, freezing upon contact with the ground and exposed surfaces, resulting in ice accumulations of one-quarter inch or more within 12 hours or less.

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

- **Freezing Drizzle/Freezing Rain** – The effect of drizzle or rain freezing upon impact on objects that have a temperature of 32°F or below.

- **Sleet** – Solid grains or pellets of ice formed by the freezing of raindrops or the refreezing of largely melted snowflakes. This ice does not cling to surfaces.

- **Wind Chill** – An apparent temperature that describes the combined effect of wind and low air temperatures on exposed skin.

Much of the snowfall in Wisconsin occurs in small amounts of between one and three inches per occurrence. Heavy snowfalls that produce at least eight to 10 inches of widespread accumulation happen on the average only once per winter season across southern Wisconsin. In addition, a snowfall event of six to eight inches usually occurs once per winter. The southwestern and southeastern portions of Wisconsin receives most of its snow during mid-winter. Snowfall amounts in Racine County average 38 inches per season in the far southwest corner to about 45 inches near Lake Michigan.

Lake Michigan can have both an enhancement effect and a dampening effect on snowfall totals in the County. Warmer water temperatures in the Lake can keep winter air temperatures on land near the lakeshore warm enough for precipitation to fall as rain where it may fall as snow only a mile further inland. On the other hand, lake effect snow bands can drop significant amounts of snow on nearshore communities, while areas slightly further inland may see none. Lake effect snow occurs when cold air moves across the relatively warm open waters of Lake Michigan, causing warm air and moisture to transfer into the lowest portion of the atmosphere, forming snow producing clouds.

Blizzard-like conditions often can occur during heavy snowstorms when gusty winds cause severe blowing and drifting of snow, even if the conditions did not last long enough to be considered a true blizzard. True blizzards are not common in Wisconsin. However, when they do occur, they tend to affect the eastern counties near Lake Michigan. Due to less frictional drag over Lake Michigan, northwest windstorms can reach higher speeds. According to the National Climatic Data Center (NCDC) and shown in Table 3.21, Racine County has experienced two blizzard events from 2011 to 2021.

Freezing rain, ice, and sleet storms can occur at any time from October into April. In a typical winter season, there are three to five light freezing rain events in the southeastern Wisconsin region. On average, a major ice storm occurs about once every other year somewhere in the State and once every seven years over southeastern Wisconsin. If one-half inch of rain freezes on trees and utility wires, extensive damage can occur, especially if accompanied by high winds that compound the effects of the added weight of the ice. There are also between three and five instances of glazing (less than one-quarter of an inch of ice) throughout the State during a normal winter.

Recent Events

Generally, the winter storm season in Wisconsin runs from October through March. Severe winter weather has occurred, however, as early as September and as late as the latter half of April and into May in some locations in the State. The average annual duration of snow cover in Racine County is approximately 85 days. Table 3.21 lists the recent winter storm events that have occurred in Racine County from 2011 to 2021. A few examples of recent events from Table 3.21 are noted below.

2011 – During the overnight hours of February 1 to February 2, 2011, a powerful low pressure center passing south of Wisconsin produced blizzard conditions across much of southern Wisconsin (the Groundhog Day Blizzard of 2011). Snow associated with the system began in the mid-afternoon hours in far southern Wisconsin and pushed northward into the State through the evening. Twenty-four hour snowfall totals were between 20 and 26 inches, with 24 inches of snow reported at the Racine Wastewater Treatment Plant, setting a one-day record. This was in addition to several inches of snow that had fallen on January 31. In the City of Racine, this storm set new two-day and three-day snowfall records, with snowfall totals of 26 inches. Very strong winds were associated with this storm for an extended period of time. Sustained northeast winds of 30 to 40 mph were common through the event, with peak wind gusts between 45 and 65 mph. Strong wind gusts were reported near Lake Michigan, with the lakeshore observation site at Kenosha reporting a gust of 64 mph. The combination of high winds and heavy snow created widespread sustained

Table 3.21
Recent Winter Events in Racine County: 2011-2021

Date	Type[a]	Deaths	Injuries	Property Damages ($)	Crop Damages ($)
January 17, 2011	Winter Weather	--	--	--	--
February 1, 2011	Blizzard	1	--	--	--
February 6, 2011	Winter Weather	--	--	--	--
February 21, 2011	Winter Weather	--	--	--	--
December 29, 2011	Winter Weather	--	--	--	--
January 12, 2012	Winter Weather	--	--	--	--
January 17, 2012	Winter Weather	--	--	--	--
January 20, 2012	Winter Weather	--	--	--	--
February 23, 2012	Winter Weather	--	--	--	--
March 2, 2012	Winter Storm	--	--	--	--
January 27, 2013	Winter Weather	--	--	--	--
January 30, 2013	Winter Weather	--	--	--	--
February 7, 2013	Winter Storm	--	--	--	--
February 22, 2013	Winter Weather	--	--	--	--
February 26, 2013	Winter Storm	--	--	--	--
March 5, 2013	Winter Storm	--	--	--	--
March 18, 2013	Winter Weather	--	--	--	--
November 25, 2013	Winter Weather	--	--	--	--
December 8, 2013	Winter Weather	--	--	--	--
December 19, 2013	Winter Weather	--	--	--	--
December 22, 2013	Winter Storm	--	--	--	--
December 31, 2013	Winter Weather	--	--	--	--
January 1, 2014	Winter Weather	--	--	--	--
January 10, 2014	Winter Weather	--	--	--	--
January 14, 2014	Winter Weather	--	--	--	--
January 24, 2014	Winter Weather	--	--	--	--
January 26, 2014	Winter Weather	--	--	--	--
January 26, 2014	Winter Weather	--	--	--	--
February 4, 2014	Winter Weather	--	--	--	--
February 13, 2014	Winter Weather	--	--	--	--
February 17, 2014	Winter Storm	--	--	--	--
March 4, 2014	Winter Weather	--	--	--	--
November 22, 2014	Winter Weather	--	--	--	--
January 8, 2015	Winter Weather	--	--	--	--
February 1, 2015	Blizzard	--	--	--	--
February 25, 2015	Winter Weather	--	--	--	--
March 3, 2015	Winter Weather	--	--	--	--
November 20, 2015	Winter Storm	--	--	--	--
December 28, 2015	Winter Storm	--	--	--	--
February 29, 2016	Winter Weather	--	--	--	--
March 1, 2016	Winter Weather	--	--	--	--
March 24, 2016	Winter Weather	--	--	--	--
April 2, 2016	Winter Weather	--	--	--	--
April 8, 2016	Winter Weather	--	--	--	--
December 4, 2016	Winter Weather	--	--	--	--
December 10, 2016	Winter Storm	--	--	--	--
December 16, 2016	Winter Storm	--	--	--	--
January 10, 2017	Winter Weather	--	--	--	--
January 11, 2017	Winter Weather	--	--	--	--
January 16, 2017	Winter Weather	--	--	--	--
February 24, 2017	Winter Weather	--	--	--	--
March 12, 2017	Lake-Effect Snow	--	--	--	--
January 7, 2018	Winter Weather	--	--	--	--

Table continued on next page.

Table 3.21 (Continued)

Date	Type[a]	Deaths	Injuries	Property Damages ($)	Crop Damages ($)
January 14, 2018	Winter Weather	--	--	--	--
January 22, 2018	Winter Storm	--	--	--	--
February 3, 2018	Winter Weather	--	--	--	--
February 5, 2018	Winter Weather	--	--	--	--
February 8, 2018	Winter Storm	--	--	--	--
February 11, 2018	Winter Weather	--	--	--	--
March 5, 2018	Winter Weather	--	--	--	--
April 3, 2018	Winter Weather	--	--	--	--
April 15, 2018	Winter Weather	--	--	--	--
April 18, 2018	Winter Weather	--	--	--	--
November 25, 2018	Winter Storm	--	--	--	--
December 28, 2018	Winter Weather	--	--	--	--
January 18, 2019	Winter Storm	--	--	--	--
January 22, 2019	Winter Weather	--	--	--	--
January 27, 2019	Winter Storm	--	--	--	--
February 5, 2019	Winter Weather	--	--	--	--
February 7, 2019	Winter Weather	--	--	--	--
February 11, 2019	Winter Storm	--	--	--	--
February 17, 2019	Winter Weather	--	--	--	--
February 26, 2019	Winter Weather	--	--	--	--
April 14, 2019	Winter Storm	--	--	--	--
April 27, 2019	Winter Weather	--	--	--	--
October 30, 2019	Winter Weather	--	--	--	--
November 10, 2019	Winter Weather	--	--	--	--
January 11, 2020	Winter Weather	--	--	--	--
January 17, 2020	Winter Weather	--	--	--	--
January 24, 2020	Winter Weather	--	--	--	--
January 31, 2020	Winter Weather	--	--	--	--
February 9, 2020	Winter Weather	--	--	--	--
February 12, 2020	Winter Weather	--	--	--	--
December 29, 2020	Winter Storm	--	--	--	--
January 1, 2021	Winter Weather	--	--	--	--
January 25, 2021	Winter Storm	--	--	--	--
January 30, 2021	Winter Storm	--	--	--	--
February 4, 2021	Winter Weather	--	--	--	--
February 11, 2021	Winter Weather	--	--	--	--
February 13, 2021	Winter Weather	--	--	--	--
February 15, 2021	Winter Storm	--	--	--	--
March 15, 2021	Winter Weather	--	--	--	--
December 28, 2021	Winter Weather	--	--	--	--
	Total	1	0	--	--

Note: The data presented in this table only accounts for damages, injuries, and deaths that are directly caused by each winter storm event. Damages, injuries, and deaths that occur indirectly as the result of traffic accidents, slips and falls, or health issues associated with winter storms are not included in this table.

[a] *NWS defines the following types of events:*

- ***Blizzard*** *as a winter storm which produces the following conditions for three consecutive hours or longer: (1) sustained winds or frequent gusts 30 knots (35 mph) or greater, and (2) falling and/or blowing snow reducing visibility frequently to less than 1/4 mile.*
- ***Winter Storm*** *is an event that has more than one significant hazard (i.e., heavy snow and blowing snow; snow and ice; snow and sleet; sleet and ice; or snow, sleet and ice) and meets or exceeds locally/regionally defined 12 and/or 24-hour warning criteria for at least one of the precipitation elements.*
- ***Winter Weather*** *as an event that causes a death, injury, or a significant impact to commerce or transportation, but does not meet locally/regionally defined warning criteria. Such an event could result from one or more winter precipitation types (snow, or blowing/drifting snow, or freezing rain/drizzle). The Winter Weather event can also be used to document out-of-season and other unusual or rare occurrences of snow, or blowing/drifting snow, or freezing rain/drizzle.*

Source: National Climatic Data Center

visibilities of less than one-quarter mile, with frequent whiteout conditions and near zero visibilities. Many locations saw blizzard conditions beginning early during the evening of February 1 and continuing through the early morning hours of February 2. Snow drifts of four to 12 feet were common, with reports of some drifts reaching up to 15 feet in open rural areas. Drifting snow closed county highways and roads with many stranded motorists having to be rescued from vehicles buried in the drifting snow. The Racine Fire Department responded to 150 emergency calls related to the storm. About 100 National Guardsman were mobilized statewide in response to the Governor's emergency declaration for 29 counties. At the height of the storm, WE Energies reported 5,200 customers were without power across southeastern Wisconsin. A Yorkville woman died from exposure when she became disoriented in the whiteout conditions, after she was dropped off by a tow truck driver at her driveway and was unable to find her way into her home. An estimated $1.4 million was spent in Racine County for snow removal. Trucks were forced to dump snow cleared from roadways at Pershing Park, where snow piles reached 70 feet in height. A Presidential disaster declaration was issued for 11 Wisconsin Counties, including Racine County, as a result of the Groundhog Day Blizzard of 2011. Racine County received almost $825,000 in public assistance under this declaration.

2015 – Intensifying low pressure tracked from the central Great Plains to southeast Indiana the night of January 31st into the evening of February 1st. This resulted in a long duration winter storm and blizzard over portions of southern Wisconsin. Snowfall of 6 to 14 inches accumulated over far southern and eastern Wisconsin. Winds gusted from 30 to 40 mph with blizzard conditions, including frequent whiteouts from heavy and blowing snow, in Racine and Kenosha Counties. Vehicle slide-offs and accidents were prevalent. The Milwaukee County Medical Examiner Office reported the death of three men who died after collapsing from shoveling snow.

Vulnerability and Community Impact Assessment

Between 2011 and 2021, 93 winter weather events have affected Racine County. Based on this, it is estimated that Racine County experiences an average of 9.3 winter weather events per year. It should be noted that during this time period there has been considerable variation around this average, with the County experiencing as few as four winter storm events in some years and as many as 13 winter storm events in other years (Table 3.21).

The NCDC database contains few reports of property damages and crop damages for winter storms. For Racine County, records of crop insurance indemnities from the U.S. Department of Agriculture Risk Management Agency show that about $406,330 have been paid out between 2011 and 2021 due to damage caused by winter related weather, such as frost, freeze, or snow. In addition, since 2001, about $20,000 in property damages have been reported as having been caused by winter weather events in Racine County. Given that the County received almost $825,000 in public assistance under the disaster declaration related to the Groundhog Day blizzard of 2011, the reported damages in the NCDC database clearly represent an underestimate of the potential damages associated with severe winter storms impacting Racine County.

Winter storms can present a serious threat to the health and safety of affected citizens and can result in significant damage to property. Snow and ice are the major hazards associated with winter storms and are the eighth most destructive natural hazard in Wisconsin. Snow and ice can cause traffic accidents, bring down telephone and power lines, damage trees, impede transportation, burst water pipes, and can tax the public's capabilities for snow removal during heavy storms. A major winter storm can have a serious impact on a community. Loss of heat and mobility are key complications that contribute to winter storm fatalities.

Ice storms and freezing rain are less common than snow but produce road conditions that can make travel hazardous. Even fog or mist on cold roads can produce a glaze of ice that makes travel slippery and dangerous. Accumulated ice can cause the structural collapse of buildings, bring down trees and power lines, causing property damage, loss of power, and isolate people from assistance or services.

Future Changes and Conditions

Based upon recent historical data from the period 2011-2021, Racine County can expect to experience an average of 9.3 winter storm events per year. It should be noted that the historical record shows considerable variation among years in the numbers of these events that occurred. While it would be expected that in some years the County will experience either fewer events or more events than the average number, over the five-year term of this plan update the average annual number of events is not expected to change.

Changes in the 20th century and projections based on downscaled results from climate models indicate that there will likely be changes in winter storm conditions affecting Racine County over the 21st century. It is projected that by 2055, the average amount of precipitation that Racine County receives during the winter will increase by about 0.5 to 1.0 inch (measured as water), an increase of about 25 percent.[64] Due to increasing winter temperatures, the amount of precipitation that falls as rain during the winter rather than as snow is projected to increase significantly. It is also projected that freezing rain will be more likely to occur.

It should also be noted that the likelihood of lake effect snow occurring could be affected by climate change. A lack of ice cover over Lake Michigan during the winter promotes the development of lake effect snow. Rising temperatures during the winter will reduce the frequency and extent of ice cover over the Lake. Because the increase in temperature may also result in some of this precipitation falling as rain, it is not clear whether this will lead to an increase in the frequency of lake effect snow events.

Multi-Jurisdictional Risk Management

Based upon a review of the historic patterns of winter storm events in Racine County, there are no specific municipalities that have unusual risks. Rather, the events are of a uniform countywide concern.

Drought

Drought is the result of a natural decline in the expected precipitation over an extended period of time, and occurs in virtually every climate on the planet, including areas of high and low precipitation. The severity of drought can be aggravated by other climatic factors, such as prolonged high winds, high temperatures, and low relative humidity. Drought is a complex natural hazard which is reflected in the following four definitions commonly used to describe it:

1. **Meteorological drought** – The degree of dryness, expressed as a departure of actual precipitation from expected average or normal amount, based on monthly, seasonal, or annual time scales

2. **Hydrological drought** – The effects of precipitation shortfalls on streamflow, reservoir, lake, and groundwater levels

3. **Agricultural drought** – Soil moisture deficiencies relative to water demands of crop life

4. **Socioeconomic drought (or water management drought)** – Occurs when the demand for water exceeds the water supply, resulting in a water shortage

A drought's severity depends on several factors, including its duration, its intensity, its geographic extent, and the demands for water for use by both humans and vegetation.

Drought can be difficult to define in exact terms. This is partly due to its multi-dimensional nature and partly due to the ways it differs from other natural hazards. There is no exact and universally accepted definition of what constitutes a drought. The onset and end of a drought are difficult to determine due to the slow accumulation of its impacts and the lingering of its effects after its apparent end. The impacts of drought are less obvious than those of some other hazards and may be spread over a larger geographic area. These characteristics have hindered the preparation of drought contingency or mitigation plans by many governments and can make it difficult to perform an accurate risk assessment analysis.

Droughts can have several impacts. They can reduce water levels and flows in surface waterbodies and groundwater. This can cause shortages of water for human and industrial consumption, hydroelectric power, recreation, and navigation. Water quality may also decline, and the number and severity of wildfires may increase during a drought. Severe droughts may result in reduced yields or the loss of agricultural crops and forest products, undernourished wildlife and livestock, and lower land values.

One method to measure the magnitude of a drought is by using the Palmer Drought Severity Index. This method considers factors like temperature, soil moisture, and precipitation, which are entered into an algorithm that returns results between -4 (extreme drought) and 4 (extremely moist) with zero being normal conditions. The U.S. Drought Monitor uses the Palmer Index, along with other indicators, to rate drought conditions into categories, as described below in Figure 3.5.

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

Figure 3.5
U.S. Drought Monitor Classifications

			Ranges				
Category	**Description**	**Possible Impacts**	Palmer Drought Severity Index (PDSI)	CPC Soil Moisture Model (Percentiles)	USGS Weekly Streamflow (Percentiles)	Standardized Precipitation Index (SPI)	Objective Drought Indicator Blends (Percentiles)
D0	Abnormally Dry	Going into drought: • short-term dryness slowing planting, growth of crops or pastures Coming out of drought: • some lingering water deficits • pastures or crops not fully recovered	-1.0 to -1.9	21 to 30	21 to 30	-0.5 to -0.7	21 to 30
D1	Moderate Drought	• Some damage to crops, pastures • Streams, reservoirs, or wells low, some water shortages developing or imminent • Voluntary water-use restrictions requested	-2.0 to -2.9	11 to 20	11 to 20	-0.8 to -1.2	11 to 20
D2	Severe Drought	• Crop or pasture losses likely • Water shortages common • Water restrictions imposed	-3.0 to -3.9	6 to 10	6 to 10	-1.3 to -1.5	6 to 10
D3	Extreme Drought	• Major crop/pasture losses • Widespread water shortages or restrictions	-4.0 to -4.9	3 to 5	3 to 5	-1.6 to -1.9	3 to 5
D4	Exceptional Drought	• Exceptional and widespread crop/pasture losses • Shortages of water in reservoirs, streams, and wells creating water emergencies	-5.0 or less	0 to 2	0 to 2	-2.0 or less	0 to 2

Source: U.S. Drought Monitor Drought Classification (droughtmonitor.unl.edu/About/AbouttheData/DroughtClassification.aspx)

Wisconsin is vulnerable to agricultural drought. The State has approximately 14.2 million acres of farmland on 64,100 farms.[65] Even small droughts of limited duration can significantly reduce crop growth and yields, adversely affecting farm incomes and local economies. Droughts significantly increase the risk of forest fires and wildfires. Additionally, the loss of vegetation in the absence of sufficient water to maintain it can result in increased flooding and soil erosion, even from average rainfall.

Estimates of agricultural losses experienced in Racine County due to drought over the period 2011 to 2021 are shown in Table 3.22. Due to inconsistent reporting with NCDC data, these estimates come from records of indemnities paid to agricultural operators by Federal crop insurance programs.[66] The loss estimates reflect several factors. First, crop losses often go unreported. Second, Federal crop insurance policies offer coverage to only certain types of crops in any particular year. Third, agricultural operators generally insure only a portion of their crops when purchasing Federal crop insurance. Thus, loss estimates are likely to represent underestimates of actual losses. It should be noted that indemnities for drought related losses were paid out in most years. This probably reflects variability in rainfall causing localized crop losses. Based on these sources, it is estimated that Racine County experienced crop damages in excess of $1.9 million between 2011 and 2021. Based on this, average annual crop losses due to drought in Racine County are estimated to be about $176,037.

Small droughts of shortened duration have occurred in Wisconsin at an interval of about once every 10 years since the 1930s. Extended, widespread droughts have been infrequent in Wisconsin. The five most significant droughts, in terms of severity and duration, are 1929-1934, 1948-1950, 1955-1959, 1976-1977, and 1987-1988.

[65] *State of Wisconsin Department of Agriculture, Trade and Consumer Protection, 2022 Wisconsin Agricultural Statistics.*

[66] *Payments of crop insurance indemnities are reported by the U.S. Department of Agriculture Risk Management Agency.*

The 1929-1934 drought probably was the most significant in Wisconsin history considering its duration, as well as its severity. This drought affected a large majority of the United States and contributed to the Dust Bowl period that greatly damaged agriculture throughout the Country (see Figure 3.6). Wisconsin experienced at least a 75-year recurrence drought interval in most of the State and over 100-year recurrence drought interval in certain areas. The severe economic impact of the Depression compounded its effects. The drought continued with somewhat decreased effect until the early 1940s in some parts of the State.

Table 3.22
Estimates of Crop Losses Due to Drought in Racine County: 2011-2021

Year	Crop Insurance Indemnity Paid ($)
2011	58,901
2012	1,211,969
2013	60,947
2014	5,556
2015	24,774
2016	185,385
2017	1,228
2018	2,349
2019	0
2020	8,372
2021	376,930
Total	1,936,411

Source: National Climatic Data Center (NCDC), the U.S. Department of Agriculture Risk Management Agency, and SEWRPC

Recent Events

The only drought event that has occurred recently between 2011 and 2021 took place in 2012. A lack of rain over south central and southeastern Wisconsin during June 2012 allowed a drought to slowly develop. The intensity of this drought increased rapidly. By July 3, conditions in Racine County had progressed from abnormally dry to moderate drought. By July 17, Racine County was experiencing extreme drought. The drought was moderated by several rounds of thunderstorms that moved through the area during the latter half of July; however, this rain came too late for much of the corn crop which had passed the critical pollination stage. In addition, not enough precipitation was deposited by these storms to end the drought. Severe drought conditions continued in Racine County until late August and moderate drought conditions persisted until the end of October. Conditions remained abnormally dry in Racine County into March 2013. The drought reduced crop yields. Agricultural operators in Racine County received over $1.21 million in crop insurance indemnities in 2012 due to drought (Table 3.22). The drought also forced sell offs of some dairy and beef cattle herds. Farmers also reported that heat impacts to cows reduced milk production, in some instances by as much as 20 percent. In response to this drought, the Governor declared a drought emergency and authorized the WDNR to expedite permit applications for water withdrawals from lakes and streams for the purpose of watering crops.

Vulnerability and Community Impact Assessment

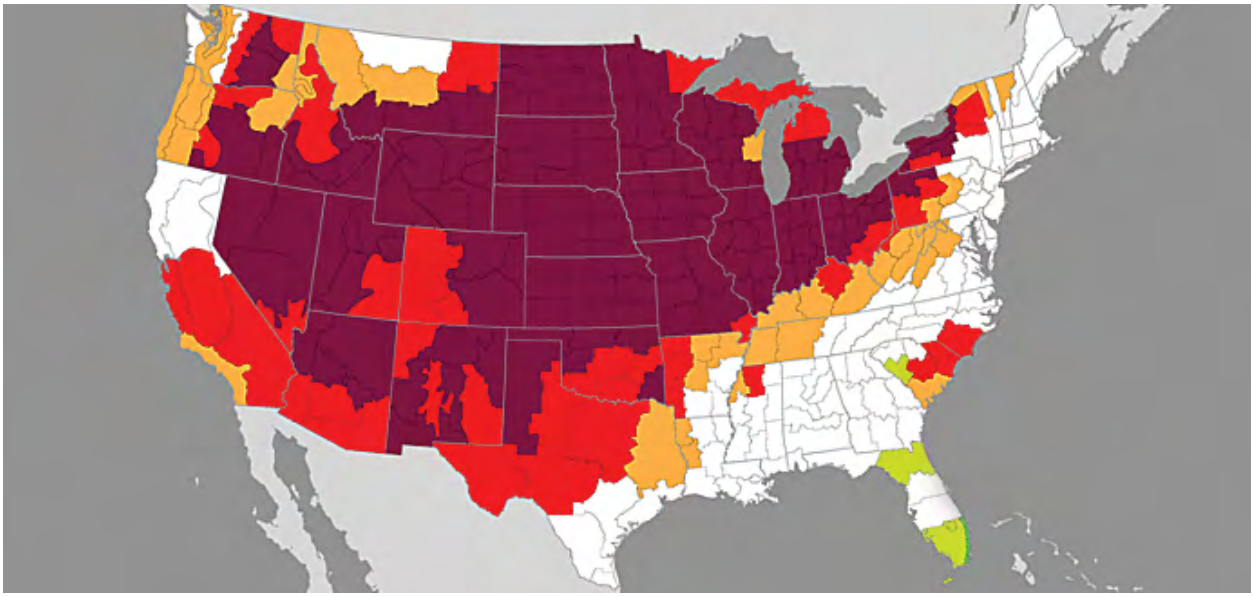
Racine County is vulnerable to agricultural drought. There are about 111,884 acres of farmland on 611 farms.[67] Even small droughts of limited duration can significantly reduce crop growth and yields, adversely affecting farm income. More substantial events can decimate croplands and result in total loss, hurting the local economy. Due to the importance of agriculture to the Racine County economy and the potential for large crop losses, drought is a major natural hazard threat. There are also 101 miles of major streams, five major and numerous smaller lakes, and over 19,000 acres of wetlands which can also be negatively impacted due to drought conditions. In addition, groundwater levels can be affected by drought conditions. This is most important in the portion of the County west of IH 94, as well as limited areas of development east of IH 94, which rely on groundwater as a source of water supply. Severe droughts may only happen on average once every 25 or 50 years, but the 1976 drought proves that, while severe droughts are rare, they can be devastating to agriculture, damaging to the local economy, and negatively impact the natural surface water system and groundwater supply system.

In 2017, the most recent year for which data are available, the market value of agricultural products sold by farms in Racine County was about $86.4 million. This was comprised of about $64.6 million in crops and $21.7 million in livestock, poultry, and their products.[68] Based on the current average estimate of $176,037 in crop losses per year, it can be expected that approximately 1.8 percent of the market value of all crops, or about 1.3 percent of the market value of all agricultural products sold by farms in the County, will be lost to drought each year. It is also expected that there will be considerable variation among years in the number of losses experienced.

[67] *United States Department of Agriculture, National Agricultural Statistics Service, 2017 Census of Agriculture.*

[68] *U.S. Department of Agriculture National Agricultural Statistics Service* op. cit.

Figure 3.6
Palmer Drought Severity Index for July 1934



Source: National Climatic Data Center

The ample supply of fresh water available in the Great Lakes and the Mississippi River basins help to minimize water supply problems in Racine County. However, during a severe drought some wells, mainly private wells, will go dry. It is agriculture that is most vulnerable to drought, as many farms in Racine County do not irrigate.

A review of the community assets described in Chapter 2 indicate the potential for drought hazard events to impact: 1) residents at a countywide level, 2) agricultural croplands, 3) livestock, 4) municipal water utilities, and 5) natural surface and groundwater reserves.

Future Changes and Conditions

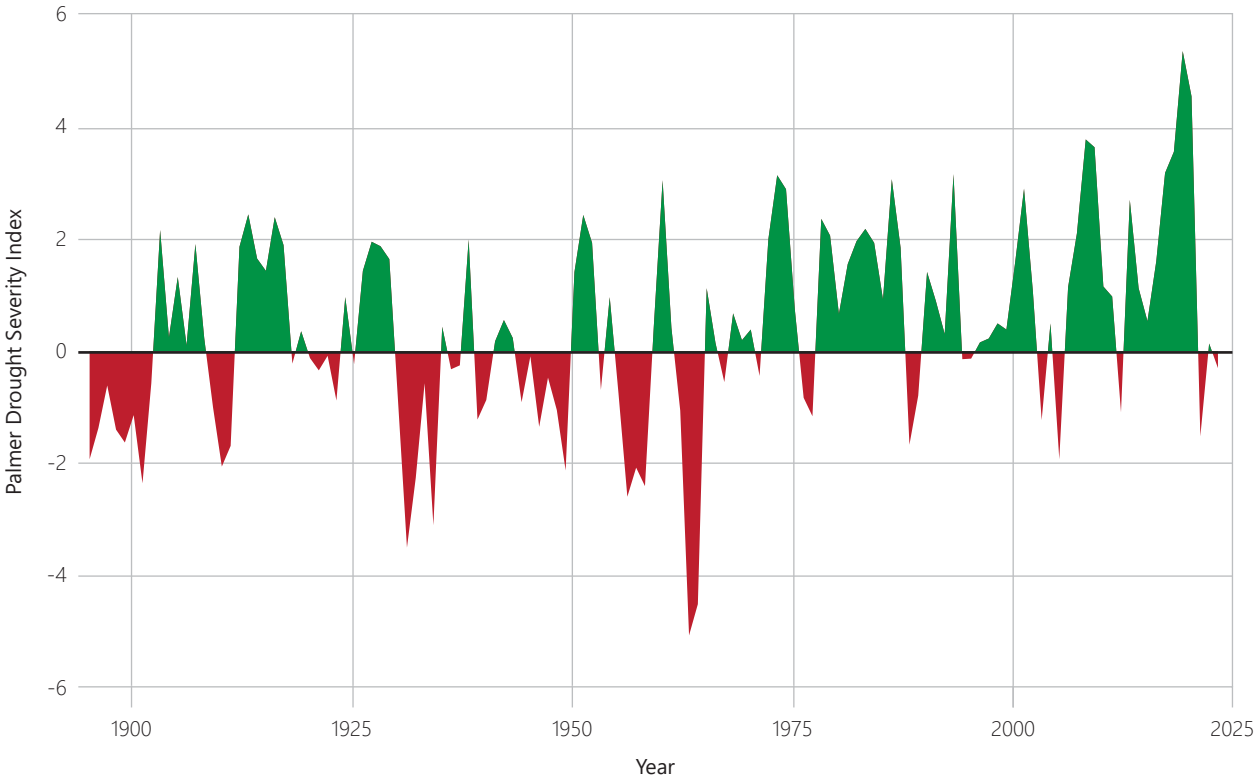
Some of these episodes are likely to be of short duration. The statewide historical record indicates that severe droughts can be expected to occur at roughly 10-year intervals. As can be seen in Figure 3.7, southeastern Wisconsin regularly experienced drought to at least a moderate level two to three times every ten years from 1895 to 2022.[69] It is not expected that the probability of drought will change during the five-year term of this plan update.

Historical changes over the 20th century and projections based on downscaled results from climate models indicate that there will likely be changes in drought conditions affecting Racine County over the 21st century. By mid-century, average temperatures are projected to rise, leading to longer summers and shorter winters. The temperature increase will also lead to a longer growing season and increased rates of evapotranspiration during summer and early fall months. While the amount of rain during the summer is not projected to change, a greater proportion of precipitation is projected to fall in heavy rainfall events. This will result in a greater number of dry days during the summer. More dry days, coupled with higher summer temperatures and increases in evapotranspiration rates, will increase the likelihood of summer droughts occurring.[70]

[69] *University of Wisconsin-Madison, Atmospheric and Oceanic Sciences, www.aos.wisc.edu.*

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

Figure 3.7
Palmer Drought Severity Index for Southeastern Wisconsin: 1895-2023



Source: University of Wisconsin Atmospheric and Oceanic Sciences, Wisconsin State Climatology Office

Multi-Jurisdictional Risk Management

Based upon a review of the potential impacts of droughts in Racine County, the areas most susceptible to hazard conditions are the agricultural communities, the municipalities served by public water supply which use groundwater as a source of supply, and those communities which have the largest numbers of private wells. This includes all of the communities in the County, except the City of Racine and the Villages of Elmwood Park, North Bay, Sturtevant, and Wind Point. The events are of a uniform countywide concern, with those communities with largely agricultural land uses being the most vulnerable to risk.

HAZARD MITIGATION GOALS AND OBJECTIVES 4

Planning may be defined as a rational process for formulating and meeting goals and objectives. Consequently, the formulation of goals and objectives is an essential task that must be undertaken before plans can be prepared. This chapter sets forth hazard mitigation goals and objectives for use in the consideration of alternative hazard mitigation strategies for Racine County and in the selection of recommended strategies from among those alternatives.

In formulating and setting forth goals and objectives, their differing natures and purposes must be kept in mind. In this regard, the definition of goals and objectives used herein is as promoted by the Federal Emergency Management Agency (FEMA). Goals are general guidelines that explain what a community desires to achieve. Based upon the selected goals, a community can then develop the specific objectives needed to attain the goals. Objectives and standards more narrowly define strategies for meeting the selected goals and are more specific than goals.

4.1 RELATIONSHIP OF HAZARD MITIGATION GOALS AND OBJECTIVES TO OTHER RELEVANT PLANNING EFFORTS

Racine County and 17 of its local units of government have prepared a comprehensive plan that will provide a basis for broad-based decision-making on land use-related matters by County and local government officials, and will increase the awareness and understanding of County, city, village, and town planning goals and objectives by landowners, developers, and other private interests.[71] The City of Racine endorsed the multi-jurisdictional comprehensive plan and adopted a city comprehensive plan based upon the multi-jurisdictional plan.[72] These plans incorporate and update elements from other pertinent County and Regional plans as appropriate. Racine County has prepared and adopted a park and open space plan[73] to guide the County and local units of government in preserving and developing recreational and other open space uses throughout the County. The County has also assisted communities in developing land use plans which are prepared within the framework of the regional land use plan.[74]

Comprehensive watershed plans[75] have been developed for each of the major watershed areas which include areas in Racine County. These plans included evaluation of alternatives and recommended flood mitigation plans developed on a comprehensive, watershed-wide basis. As comprehensive planning, park and open space planning, land use, and floodplain management planning has been carried out in Racine County and in the related watersheds, an integration and coordination of the goals and objectives has taken place. This is accomplished at the watershed level by developing comprehensive watershed plans which include floodplain management, land use, park and open space, and water quality planning in one integrated planning program. These watershed plans form a potential framework for sub-watershed-level planning programs. As an example, the comprehensive watershed planning objectives, principles, and standards for

[71] *SEWRPC Community Assistance Planning Report No. 301,* A Multi-Jurisdictional Comprehensive Plan for Racine County: 2035, *November 2009.*

[72] *SEWRPC Community Assistance Planning Report No. 305,* A Comprehensive Plan for the City of Racine: 2035, *November 2009.*

[73] *SEWRPC Community Assistance Planning Report No. 134, 3rd Edition,* A Park and Open Space Plan for Racine County, *February 2013.*

[74] *SEWRPC Planning Report No. 48,* A Regional Land Use Plan for Southeastern Wisconsin: 2035, *June 2006.*

[75] *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; and* Volume Two, Alternative Plans and Recommended Plan, *February 1970; SEWRPC Planning Report No. 35,* A Comprehensive Plan for the Pike River Watershed, *June 1983; and SEWRPC Planning Report No. 44,* A Comprehensive Plan for the Des Plaines River Watershed, *June 2003.*

the Pike River watershed plan include six specific objectives and supporting standards related to land use and park and open space use, as well as objectives and standards relating to flood control. Similarly, the Racine County park and open space plan contains a specific plan element for wetland and floodplain preservation.

4.2 HAZARD MITIGATION GOALS AND OBJECTIVES

Figure 4.1 presents the six goals for the Racine County hazard mitigation planning program. The goals are based, in part, upon the goals established in the previous edition of the Racine County hazard mitigation plan, as well as in related County planning programs. Complementing each of these goals is a set of objectives which can be used to define more specific actions or strategies to achieve the goals.

Figure 4.1
Goals and Objectives for the Racine County Hazard Mitigation Plan

➤ **Goal 1: Maintain a spatial distribution of the various land uses which minimizes hazards and dangers to health, welfare, and safety, as well as further enhancing the economic base of the County and will result in a compatible arrangement of land uses properly related to the existing and proposed supporting transportation, utility, public safety systems, and public facility systems.**

- **Objective 1.1:** Urban high-, medium-, and low-density residential uses should be located within planning units which are served with centralized public sanitary sewerage and water supply facilities and contain, within a reasonable walking distance, necessary supporting local service uses, such as neighborhood park, local commercial, and educational facilities, and should have reasonable access through the appropriate component of the transportation system to employment, commercial, cultural, and governmental centers, and elementary and secondary school and higher educational facilities; and should be provided with readily available fire and police protection and emergency medical services.

- **Objective 1.2:** Rural- and suburban-density residential uses should have reasonable access through the appropriate component of the transportation system to local service uses; employment, commercial, cultural, and governmental centers; elementary, secondary schools, and higher educational facilities and should have reasonable access to fire and police protection and emergency medical services.

- **Objective 1.3:** Industrial uses should be located to have direct access to arterial street and highway facilities and reasonable access through an appropriate component of the transportation system to residential areas and to railway, seaport, and airport facilities, and should be provided with readily available fire and police protection and emergency medical services.

- **Objective 1.4:** Major commercial uses should be located in centers of concentrated activity on only one side of an arterial street and should be afforded direct access to the arterial street system; and should be provided with readily available fire and police protection and emergency medical services.

➤ **Goal 2: Maintain a spatial distribution of the various land uses that maintains biodiversity and will result in the protection and wise use of the natural resources of the County, including its soils, inland lakes and streams, groundwater, wetlands, woodlands, wildlife, and natural areas and critical species habitats.**

- **Objective 2.1:** Floodplains should not be allocated to any urban development which would cause or be subject to flood damage.

- **Objective 2.2:** No unauthorized structure or fill should be allowed to encroach upon and obstruct the flow of water in perennial stream channels.

- **Objective 2.3:** The types and distribution of land uses should be developed considering the potential impacts on flood flows, on surface water quality, and on groundwater quality and quantity.

- **Objective 2.4:** All remaining undeveloped lands within the designated primary environmental corridors in the County should be preserved in essentially natural, open uses.

- **Objective 2.5:** All remaining undeveloped lands within the designated secondary environmental corridors and isolated natural resource areas in the County should be considered for preservation as urban development proceeds and used as drainageways, floodwater storage areas, and parks.

- **Objective 2.6:** All wetlands adjacent to streams or lakes, all wetlands within areas having special wildlife or other natural values, and all wetlands having an area of five acres or greater should not be allocated to any urban development, except limited recreational use, and should not be drained or filled. In addition, County and local units of government may choose to preserve all wetlands.

Figure 4.1 (Continued)

➤ **Goal 3: Provide facilities necessary to maintain a high quality of fire and police protection and emergency medical services throughout the County.**

- **Objective 3.1:** Because adequate fire and police protection and emergency medical services are essential to the protection of the public health and safety and of real property values, and is a public service which enhances the economic development potential of an area, fire and police stations and emergency medical equipment should be developed and distributed based upon the accepted standards for such services.

➤ **Goal 4: Develop a stormwater and floodplain management system which reduces the exposure of people to drainage- and flooding-related inconvenience and to health and safety hazards and which reduces the exposure of real and personal property to damage through inundation resulting from flooding and inadequate stormwater drainage.**

- **Objective 4.1:** In order to prevent significant property damage and safety hazards, the major components of the stormwater management system and the floodplain management system should be designed to accommodate runoff from a 100-year recurrence interval storm event.

- **Objective 4.2:** In order to provide for an acceptable level of access to property and of traffic service, the minor components of the stormwater management system should be designed to accommodate runoff from a storm event to be determined appropriate by each community.

- **Objective 4.3:** In order to provide an acceptable level of access to property and of traffic service, the stormwater management system should be designed to provide two clear 10-foot lanes for moving traffic on existing arterial streets, and one clear 10-foot lane for moving traffic on existing collector and land access streets during storm events up to and including the 10-year recurrence interval event

- **Objective 4.4:** Flow of stormwater along and across the full pavement width of collector and land access streets shall be acceptable during storm events exceeding a 10-year recurrence interval when the streets are intended to constitute integral parts of the major stormwater drainage system

- **Objective 4.5:** Plan components shall be designed to comply with the requirements of Chapter NR 116 of the Wisconsin Administrative Code.

- **Objective 4.6:** All new and replacement bridges and culverts over waterways shall be designed so as to accommodate, according to the categories listed below, the designated flood events without overtopping of the related roadway or railway track.

    - Minor and collector streets used or intended to be used primarily for access to abutting properties: a 10-year recurrence interval flood discharge.

    - Arterial streets and highways, other than freeways and expressways, used or intended to be used primarily to carry heavy volumes of through traffic: a 50-year recurrence interval flood discharge.

    - Freeways and expressways: a 100-year recurrence interval flood discharge.

    - Railways: a 100-year recurrence interval flood discharge.

- **Objective 4.7:** All new and replacement bridges and culverts along waterways shall be designed so as not to inhibit fish passage in areas which are supporting, or which are capable of supporting, valuable recreational sport and forage fish species.

- **Objective 4.8:** Provide for the capability to provide fire and police protection and emergency medical services and for adequate operation of wastewater treatment facilities during a 100-year recurrence interval flood event.

Figure 4.1 (Continued)

- **Goal 5: Identify high erosion risk Lake Michigan shoreline areas and the development of a coastal erosion control program which reduces the exposure of people and real and personal property to shoreline erosion and bluff recession.**

  - **Objective 5.1:** Erosion risk areas and structure setback distances from the Lake Michigan shoreline should be established based upon the recommendations included in the Racine County coastal erosion management study.

- **Goal 6: The identification and development of programs which complement County and local emergency operations plans, to mitigate the potential exposure to health and safety and the exposure of real and personal property resulting from a broad range of hazards which are unpredictable and not geographically specific in nature.**

HAZARD MITIGATION STRATEGIES 5

5.1 PLANNING FOR HAZARD MITIGATION MEASURES

Hazard mitigation planning may be defined as the systematic evaluation of the nature and vulnerability of hazards present, along with the development and implementation of sustained actions to reduce or eliminate long-term risks from hazards and their effect. Specific purposes of hazard mitigation include eliminating loss of life, lessening of danger to human health and safety, minimizing monetary damage to private and public property, reducing the cost of utilities and services, and minimizing disruption in community affairs. Hazard mitigation also involves avoiding both intensification of existing hazards and creation of new hazards.

The preparation of a hazard mitigation plan for Racine County involves the development and evaluation of alternative mitigation measure plan elements and the synthesis of the most effective elements into an integrated plan. Some of the mitigative measures described are ongoing or committed actions, which do not require the evaluation of alternative measures, but are proposed to be integrated into the mitigation plan as such. For other hazards, there may be only one or a number of integrated viable options. In these cases, alternatives are not presented, and cost-effectiveness is not specifically addressed, but is implied by the nature of the mitigation measures. In other instances, where there are viable alternatives, such alternatives are described and evaluated. This chapter describes the hazard mitigation measures considered to resolve the identified hazard problems within Racine County.

Measures have been identified and evaluated for each of the hazards for which a vulnerability analysis was developed as set forth in Chapter 3.

In preparing updates to the plan, the Racine County Hazard Mitigation Plan Local Planning Team reviewed and reevaluated the hazard mitigation goals for the County (see Chapter 4 of this report). This review included consideration of whether the goals of the initial plan were still applicable and whether additional goals should be added. In addition, the Local Planning Team also reviewed and reevaluated hazard conditions within the County (see Chapter 3 of this report). This review included reevaluation of the identification of the hazards likely to affect the County, updating the data upon which the profiles of the extent and severity of hazard events which occurred in the County were based, reassessment in light of the updated data of the vulnerability and risk associated with each type of hazard, and reevaluation as warranted by the updated assessments of the potential for changes in hazard severity and risk under future conditions. This review and reevaluation of hazard mitigation goals and hazard conditions, along with consideration of changes in conditions within Racine County since the drafting of the initial plan and progress in implementing the initial hazard mitigation plan and first plan update, served as the basis for the Local Planning Team's review and reevaluation of viable measures to reduce vulnerability to hazards identified in the updated risk assessment and its selection of priority mitigation measures to address those hazards. The activities of the Racine County Hazard Mitigation Plan Local Planning Team are documented in Appendix A of this report.

5.2 HAZARD MITIGATION PLAN COMPONENT FOR INLAND FLOODING (STORMWATER, RIVERINE, INLAND LAKE, DAM FAILURE)

The flooding and related stormwater drainage problem mitigation plan for Racine County consists of five elements: a floodplain and environmentally sensitive lands preservation element; a floodplain management element; a stormwater management element; a public information and education element; and an additional plan element. Each element of the plan is an important component of the overall strategy for reducing flood risk and flood damage. Some aspects of the overall plan are already being implemented in the form of existing and ongoing activities being carried out by the County and local units of government that contribute toward realizing the flood mitigation goals and objectives.

Floodplain and Environmentally Sensitive Lands Preservation Element

Floodplain management regulations and programs perform critical roles toward assuring that flood mitigation efforts are properly implemented. Racine County and the municipalities within the County currently have several pertinent floodplain management regulations and programs in place, most notably in the form of zoning regulations and other ordinances, and environmentally sensitive area and open space preservation policies. A significant portion of the environmentally sensitive lands within the County, including wetlands, shorelands, and floodplains, are under protective ownership and/or zoning.

Floodplain Zoning and Wetland Preservation Zoning

Floodplain management regulations include the floodplain district zoning ordinances and shoreland or shoreland wetland zoning ordinances. The floodplain zoning ordinances are intended to preserve the floodwater conveyance and storage capacity of floodplain areas and to prevent the location of new flood-damage-prone development in flood hazard areas. The shoreland and wetland preservation zoning ordinances seek to maintain the stormwater and floodwater storage capacity of wetlands in the County and prohibit certain land uses detrimental to shoreland and wetland areas. More information regarding each of these ordinances is set forth in Chapter 2 of this report. Implementation of these ordinances on an ongoing basis is an integral part of the County flood mitigation strategy.

Environmentally Sensitive Area and Open Space Preservation Actions

The preservation of environmentally sensitive areas (i.e. environmental corridors and certain other important natural features) can assist in the prevention of increased flood flows and associated problems. These areas often include the most significant floodplains, shorelands, wetlands, surface waters, woodlands, and prairies within a given area. The preservation of wetlands is of particular importance because wetlands often afford natural filtration and floodwater storage. In addition, the intrusion of intensive urban land uses into environmentally sensitive areas may result in the creation of serious and costly problems, such as failing foundations for pavements and structures, wet basements, excessive operation of sump pumps, excessive clear-water infiltration into sanitary sewerage systems, and poor drainage. Destruction of ground cover may result in soil erosion, stream siltation, more rapid runoff, and increased flooding.

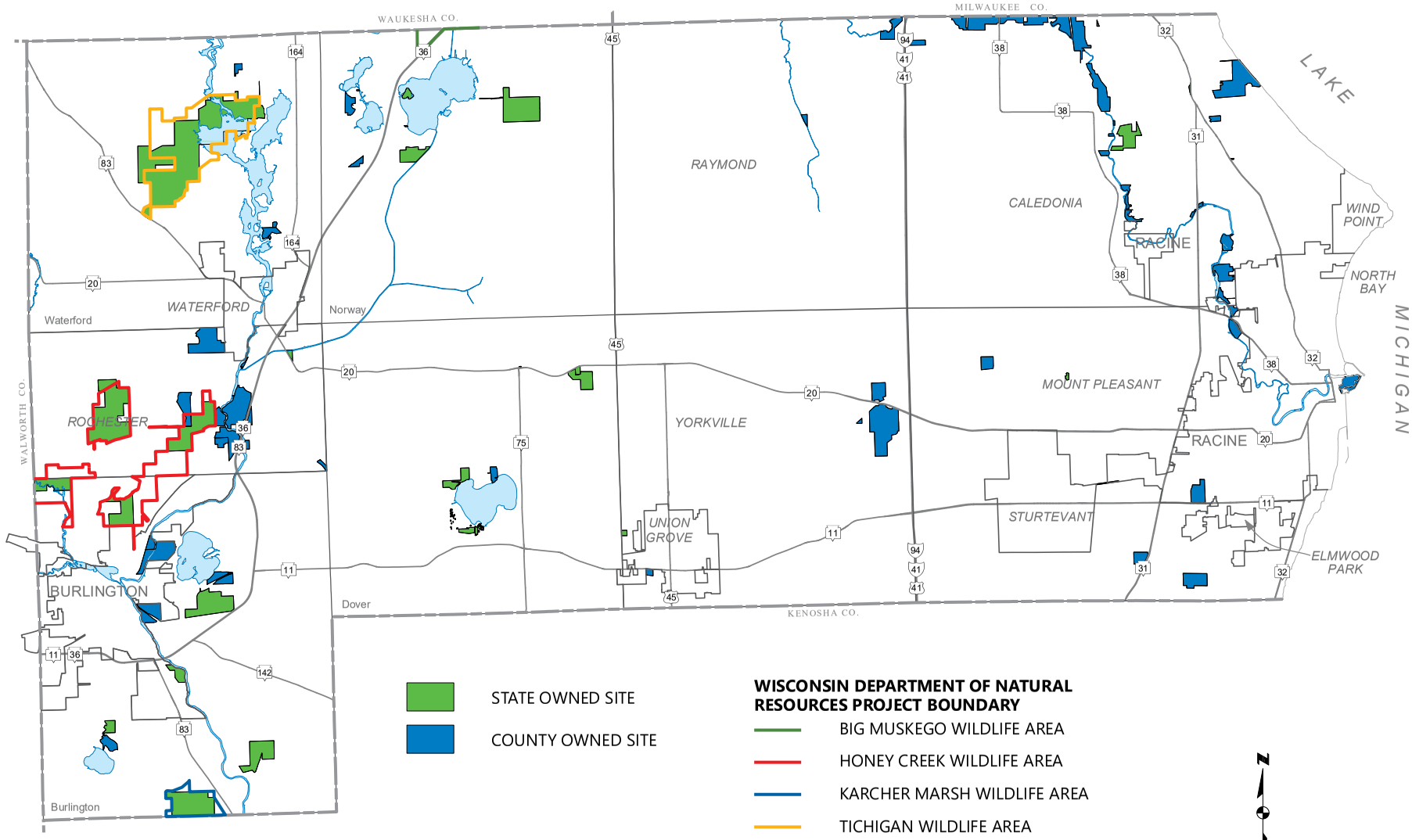
The regional land use plan described in Chapter 2 of this report includes provisions to preserve the environmentally sensitive areas comprised of primary environmental corridors, secondary environmental corridors, and isolated natural resource areas. This regional plan forms the framework for local land use planning by the local units of government in the County. In 2010, there were 34 park and open space sites owned by the County, encompassing 2,788 acres. In addition, there were 21 State owned recreation and open space sites within the County, totaling 3,863 acres. The current status of ownership of park and open space sites by the County and State is shown on Map 5.1. In 2013, the County completed an update to their park and open space plan which provides for the preservation of environmental corridors and isolated natural resource areas. The open space preservation element of that plan is summarized on Map 5.2. This element recommends that 4,964 acres be acquired by Racine County, the State of Wisconsin, local governments within the County, and nonprofit conservation organizations operating in the County.

Racine County has been active in promoting and assisting local units of government in the County in preparing land use plans which are consistent with the Regional and County objectives for preservation of environmentally sensitive lands. In addition, all of the municipalities with significant areas of environmental corridors and/or isolated natural resource areas, have local land use and/or park and open space plans completed or underway which are consistent with the Regional and County plans with regard to preservation of environmentally sensitive lands.

Wetland Restoration to Reduce Crop and Property Damages

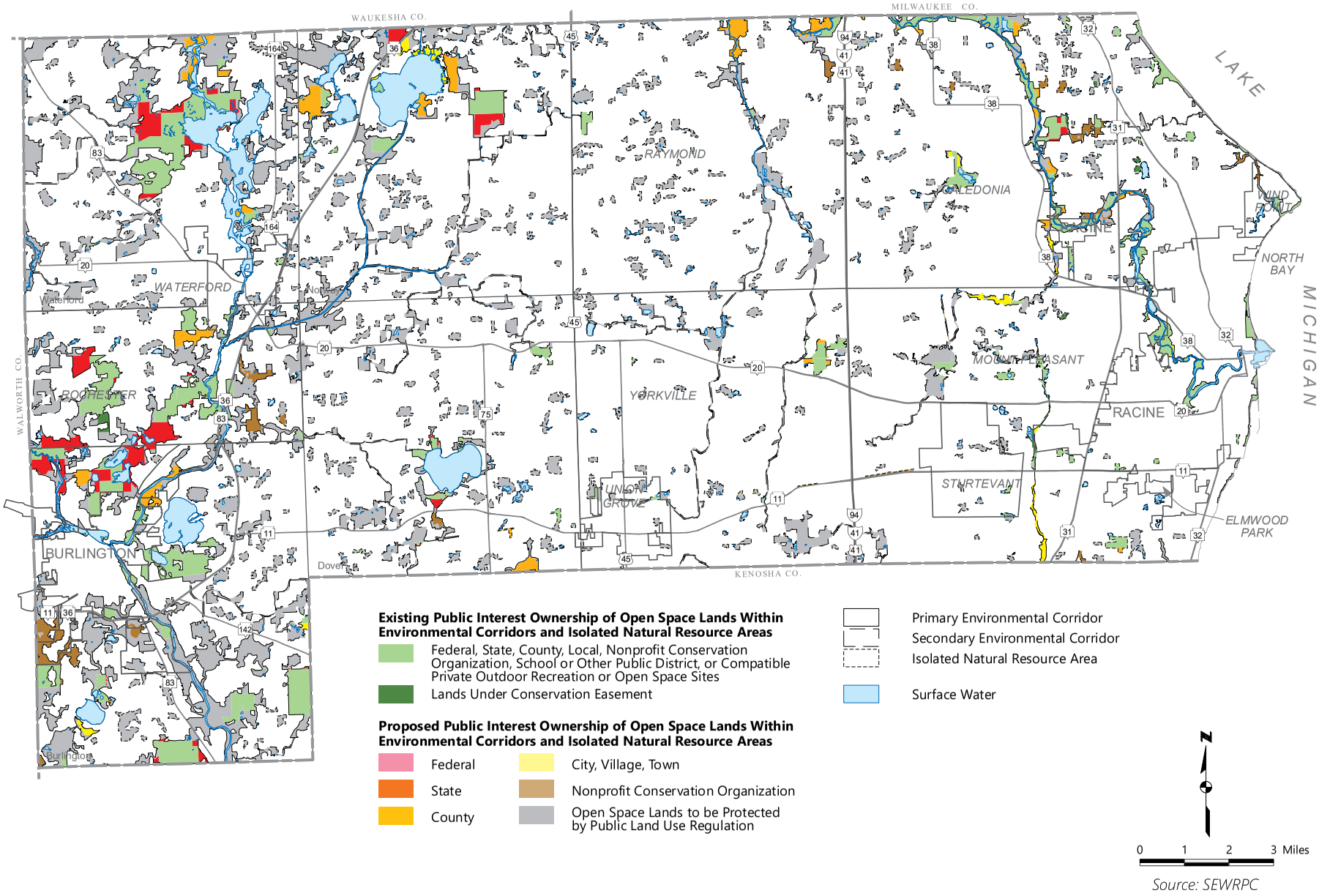
Wetlands and floodplains can provide natural storage areas for floodwaters during heavy rain events or melting snow. Restoring the natural function of former wetland areas can be an effective strategy to reduce potential flood damages in downstream areas. According to the USEPA, a one-acre wetland can typically store about three acre-feet of water, or one million gallons. Wetland vegetation can slow flood water down in addition to providing infiltration and evapotranspiration benefits. Increasing flood storage capacity in Racine County through restoration of wetlands may also help communities adapt to, and reduce, the potential impacts of climate change.

Map 5.1
Racine County and State of Wisconsin Park and Open Space Sites: 2020



Source: Wisconsin Department of Natural Resources, Racine County, and SEWRPC

Map 5.2
Protection of Environmental Corridors and Isolated Natural Resource Areas in Racine County: 2035



Source: SEWRPC

As discussed in Chapter 2 of this report, Racine County had a little over 19,000 acres of wetland in 2015 (see Table 2.5). However, this is only a fraction of the wetlands that existed in pre-settlement years. Urbanization and agricultural development have altered the landscape with regard to wetlands and surface water drainage characteristics in the County, leading to increased volumes of runoff and flooding. To facilitate drainage of wetland and other low-lying areas for cultivation, drain tiles were installed. Through channelization and installation of these drain tile systems, farmers attempted to protect their crops by lowering the groundwater table and increasing the capacity to convey water downstream. Channelization and diking of stream channels can also reduce the connection between the channel and the overbank areas during floods, causing higher flood levels and velocities.

Examination of the Racine County 1837 plat maps indicate that large swaths of land were covered in wetlands and open marsh, particularly in the Town of Norway. Field notes from the 1837 survey indicated that some areas of "open marsh" south and east of what is now Wind Lake were too deep for the surveyor to walk through. Today much of this area is cultivated, predominantly as sod farms.

In addition to storing flood waters and potentially reducing property damages due to flooding downstream, returning marginally productive agricultural lands to their original wetland or marsh condition would significantly reduce annual crop damages. In 2015, there were approximately 10,497 acres of agricultural land located within the 1-percent-annual-probability (100-year recurrence interval) flood hazard area in Racine County, making them susceptible to riverine flooding during large storm events. Despite the installation of extensive drain tile systems, some agricultural areas in the County continue to have poor drainage. As indicated in Table 3.4, over $8.8 million in crop damages have been reported due to flooding in Racine County from 2001 through 2021. The average annual reported damages are approximately $443,800 per year. It should be noted that economic losses resulting from damage to crops often go unreported and records of crop losses prior to 1989 are spotty. Therefore, these estimated economic losses clearly represent an underestimate of actual damages that have occurred in the County.

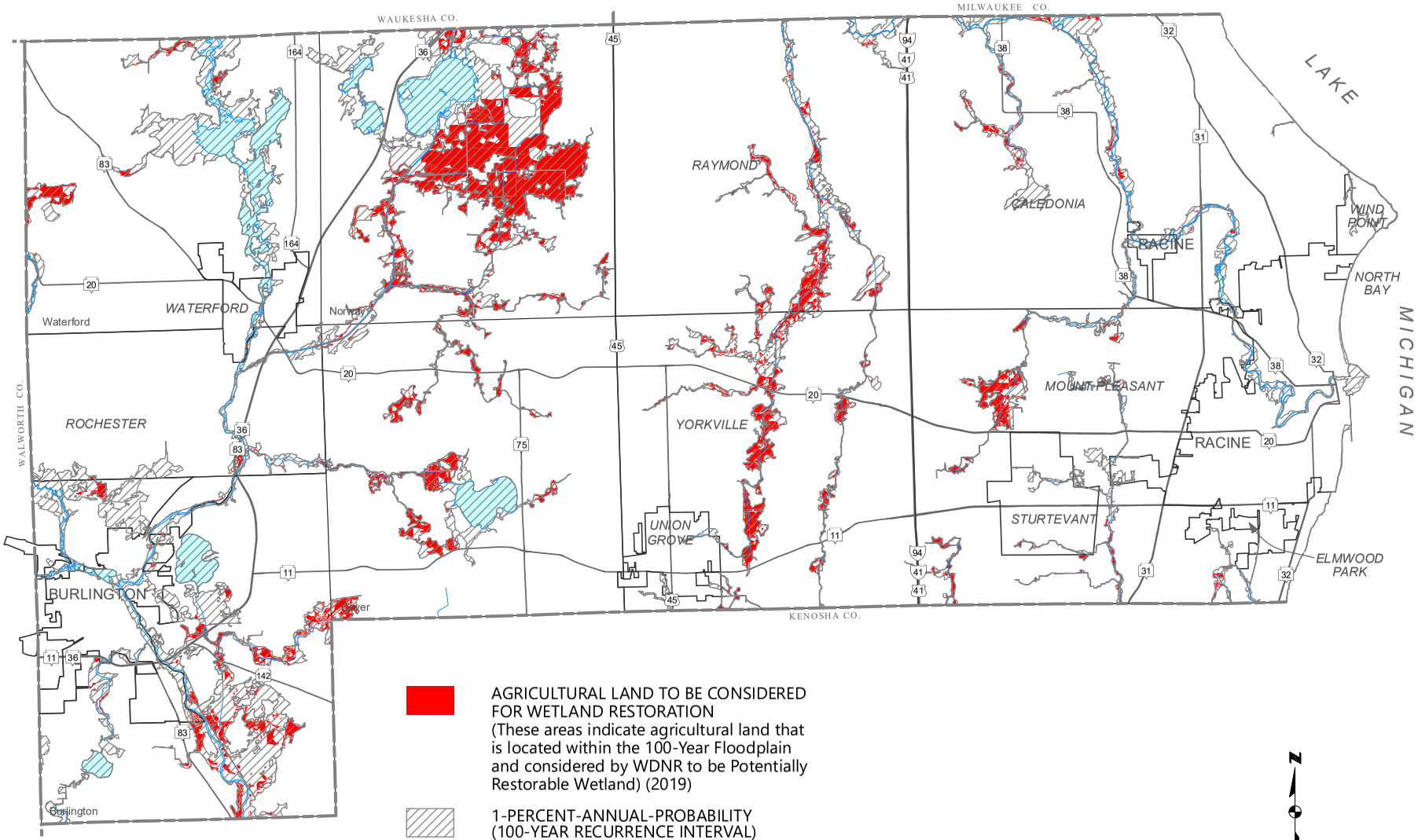
The WDNR has developed a digital dataset to identify areas of former wetlands that were drained and converted to agricultural uses. The WDNR refers to these areas as potentially restorable wetlands. To be considered a potentially restorable wetland, an area must have hydric soils, must not be currently mapped as a wetland, and have a land use compatible with restoration techniques. There are about 22,500 acres of potentially restorable wetlands in Racine County. Of the 22,500 acres of potentially restorable wetland, there are about 1,190 acres that are within the 1-percent-annual probability flood hazard area and were being farmed according to the Southeastern Wisconsin Regional Planning Commission's (Commission) 2015 land use inventory. The locations of these areas are shown on Map 5.3.

Agricultural lands are prime candidates for wetland restoration because they are in undeveloped, open space uses, and because there are Federal and State programs available to support conversion of certain agricultural lands to wetlands. Conversion of agricultural lands could be done through land purchases, donation, or easements. Some programs provide a percentage of the restoration costs as well as an annual rental rate. In some instances, farmers may be able to plant a harvestable grass crop for hay. In other instances, land may be purchased or permanently placed into conservation easement by willing landowners, restricting development and eliminating the chance that these open areas may be placed into more impervious urban land uses in the future.

The floodprone agricultural areas in the Town of Norway drained by the Wind Lake Canal were analyzed in a 1975 drainage and water level control plan. That study indicated that there were approximately 4,200 acres of cropland subject to flooding or impaired drainage during a flood which would result from a 10-year recurrence interval rainfall event. Of these 4,200 acres, about 2,000 acres of land actually sustain crop damage during flood events. The study estimated the average annual crop damages on those lands to be $186,000, or $92 per acre in 1975. Using the Consumer Price Index (CPI) to convert the damages to 2021 dollars, about $933,862 in damages are estimated to occur in this area annually, or about $466 per acre. This floodprone area makes up about two percent of the agricultural land in Racine County and accounts for over 53 percent of the County's annual average crop damages.

The restoration of selected wetlands currently in agricultural uses in Racine County is one alternative flood mitigation measure to be considered in addition to the structural flood mitigation measures that are

Map 5.3
Agricultural Land to be Considered for Wetland Restoration



Source: Federal Emergency Management Agency and SEWRPC

discussed separately for each watershed below. The implementation of this alternative may affect decisions to implement other structural alternatives. In addition, some of the areas identified on Map 5.3 may also be recommended to be acquired by a governmental entity or nonprofit conservation organization as part of the environmentally sensitive areas and open space preservation element discussed in the section above.

If all of the areas shown on Map 5.3 were taken out of agricultural production, crop losses due to flooding could potentially be reduced by up to 11.3 percent, or about $50,311 per year based on reported losses. Additional mitigation of potential downstream property damage is also possible. Wetland restoration projects would potentially have the additional benefits of fish and wildlife habitat improvements, erosion control, water quality improvements, and recreational opportunities.

When opportunities present themselves on a particular tract of land, wetland restoration should be considered. This alternative would be implemented as a voluntary program, considered at the discretion of each individual property owner.

Floodplain Management Element

Mitigation measures specifically pertaining to floodplain management in each watershed in the County are described in the following subsections of this report. It should be noted that, as reported in Chapter 3, as of August 2022, there are six structures considered by the Federal Emergency Management Agency (FEMA) to be repetitive- or substantial-loss properties in Racine County. This represents no increase of structures since development of the last update to the County all hazards mitigation plan.

Floodplain Management Plan for the Fox River Watershed

In 1970, the Commission adopted a comprehensive plan for the physical development of the Wisconsin portion of the Fox River watershed. That plan was further amended as it affects Racine County in 1975 and 1995. In preparing that plan a concerted effort was made to offer for public evaluation a full range of physically feasible alternative plan elements that might satisfy one or more agreed-upon watershed development objectives. Each alternative plan element was evaluated insofar as possible in terms of technical, economic, and legal feasibility, and public acceptability, as well as with respect to satisfaction of the watershed development objectives. The alternative plan elements can best be conceptualized in terms of various combinations of land use patterns and water control facilities. A number of alternatives incorporating both structural and nonstructural measures were explored in the preparation of the plan. The flood control alternatives considered for the Racine County portion of the Fox River watershed include: 1) floodplain evacuation; 2) levee and dike construction and channel improvement; 3) storage facility construction; and 4) lake level control.

Priority Mitigation Measures

After consideration of the technical and economic feasibility of the various alternatives, a final strategy for alleviating problems due to flooding in the Racine County portion of the Fox River watershed was developed and adopted by the Fox River Watershed Committee. Some of these measures were then adapted for current conditions for use in the current hazard mitigation planning program. The plan calls for the following measures:

- Preserve the remaining primary environmental corridor lands along the Fox River and its major tributaries in essentially natural open space uses (primary environmental corridors within Racine County are shown on Map 2.3). The corridors are to be preserved by a combination of public acquisition for parkway purposes and floodland and open space zoning.

- Reevaluate the need for dikes or additional floodwalls in the City of Burlington, considering the City redevelopment actions as well as the ongoing FEMA Risk MAP program. The 1970 Fox River study proposed a combination of earthen dikes and concrete floodwalls that would be constructed along both sides of the Fox River throughout most of the City, and along portions of both sides of the White River between the Echo Lake dam and the confluence with the Fox River. Floodwalls along the developed areas of downtown Burlington have been raised from the elevation of the 1-percent-annual-probability floodplain to six inches above that elevation. The Fox River study also recommended automatic backwater gates to be installed on existing storm sewer outfalls. The need for additional facilities should be reevaluated, given the recent City of Burlington downtown redevelopment actions which have been designed to alleviate flooding problems.

- Continue implementation of the emergency action plan for flooding that was developed in 1997 for the Town of Norway Sanitary District No. 1. About 32 percent of the land located within the Sanitary District's boundary is identified as floodplain. The emergency action plan sets forth procedures for maintaining a flood warning system for the township, including identification of pertinent emergency agencies, locations of emergency shelters, evacuation procedures, and procedures for maintaining services in the event of flooding.

- Structure floodproofing, relocation, or removal of up to 405 structures identified using geographic information system techniques and color orthophotography as potentially being located in the 1-percent-annual-probability floodplain. While this number of structures may include some agricultural structures, no garages or small outbuildings are included in this total. In this regard, when implementation of floodproofing, relocation, or removal measures is being considered, field surveys should be made of those structures identified as being located within the floodplain to obtain a more definitive assessment of their flood hazard status. Where LiDAR topographic data are available, applicants for Letters of Map Amendment (LOMA) may submit LiDAR data to FEMA in lieu of a certified elevation study by a professional engineer or land surveyor provided certain standards are met. Furthermore, this plan element is presented as an option, subject to the preference of the individual property owner. As noted in Chapter 3, there are six structures considered by FEMA to be repetitive- or substantial-loss properties in Racine County, four of which are located within the Fox River watershed. Projects involving acquisition and demolition of properties within the 1-percent-annual-probability floodplain are the highest priority for Wisconsin Emergency Management (WEM) when funding is available. Acquisition and demolition of repetitive- or substantial-loss properties should have highest priority, followed by other structures confirmed to be within the 1-percent-annual-probability floodplain after field survey.

- Replace two 20-foot-wide radial gates at the Waterford Dam.

- Maintenance removal of sediment and debris from the Fox River channel at selected locations upstream of the Waterford Impoundment.

- Purchase of up to 370 acres of agricultural land that is subject to frequent flooding and impaired drainage in the Town of Waterford.

- Installation of two additional 16-foot by five-foot radial gates in the Rochester Dam.

- Maintenance dredging along about 50 acres of shallow bays and other areas in the Waterford Impoundment.

- Complete channel clean out operations of the Wind Lake Drainage Canal every 20 to 25 years.

- Continued cleanout and maintenance of the Muskego Canal.

The following recommendations from the 1970 Fox River watershed study which were intended to protect flood-vulnerable agricultural areas, abate agricultural damages, and improve agricultural drainage should be reevaluated to consider current conditions and contemporary, environmentally sound flood mitigation approaches. One potential alternative is presented above in discussion related to wetland restoration of flood-prone agricultural lands shown in Map 5.3.

- Construction of about 211,000 linear feet of dikes along the Wind Lake Canal, the Goose Lake Branch Canal, and other tributary canals. About 40 pumping stations would also be installed.

- Construction of levees and channel widening and deepening along the lower reaches of Hoosier Creek to increase hydraulic capacity of the Creek. This recommendation was designed to contain the 10-year recurrence interval flood.

In addition to the measures outlined above, the floodland management element contains several accessory measures to meet special needs within the watershed. These include: 1) the standards set forth in Chapter 3

relative to bridge replacement to ensure that major streets and highways remain operable during flood events; 2) adoption of boating restrictions along the Fox River upstream from the Waterford Impoundment; 3) participation in the Federal Flood Insurance Program; 4) continuation of desirable lending institution policies concerning the sale of riverine properties; 5) maintain and consider expansion of the existing stream-gaging network in the watershed ; and 6) enforcement of floodplain regulations in the watershed.

As shown in Tables 5.1 and 5.2, the estimated capital cost of implementing the Fox River watershed portion of the Racine County floodland management plan element would be $88.9 million (in 2021 dollars). Tables 5.1 and 5.2 also show the current implementation status of each plan element.

In 1977 the west spillway of the Waterford Dam was reconstructed with the control gates that were recommended in the Commission's 1970 Fox River comprehensive watershed report. In 1978 the east spillway was reconstructed. Water level sensors and automated gate controls were also installed at that time. Due to operational problems, these sensors and gate controls were abandoned in 1980, with the gates now being operated manually. As discussed above, two radial gates and one actuator motor were replaced on the Waterford Dam in 2016.

The additional control gates that were recommended in the Commission's 1970 Fox River comprehensive watershed report have also been installed in the Rochester Dam. Some maintenance dredging has been carried out within the Waterford Impoundment, along with removal of debris from the Fox River channel. In 1993, the Muskego Canal was cleared and deepened as part of a lake rehabilitation project for Big Muskego Lake.

Fox (Illinois) River Watershed Mitigation Plan

A hazard mitigation plan for the Fox (Illinois) River Watershed was completed by Commission staff in 2023.[76] This plan focused on watershed-wide hazards related to flooding, dams, and drought only. The plan included many projects that would mitigate flood risks for communities in Racine County located in the Fox River watershed. Therefore, the projects included in the watershed plan are included in this Racine County hazard mitigation plan by reference.

Floodplain Management Plan for the Root River Watershed

In 1966, the Commission adopted a comprehensive plan for the Root River watershed. That plan was further amended as it affects portions of Racine County in 1980. In preparing that plan a concerted effort was made to offer for public evaluation a full range of physically feasible alternative plan elements that might satisfy one or more agreed-upon watershed development objectives. Each alternative plan element was evaluated insofar as possible in terms of technical, economic, and legal feasibility, and public acceptability, as well as with respect to satisfaction of the watershed development objectives. The alternative plan elements can best be conceptualized in terms of various combinations of land use patterns and water control facilities. A number of alternatives incorporating both structural and nonstructural measures were explored in the preparation of the plan. The flood control alternatives considered include: 1) channel modification; 2) channel clearing and maintenance; 3) construction of peak flow diversion channels to Lake Michigan; 4) construction of a multi-purpose reservoir; 4) preservation of existing floodplain areas in essentially natural open uses; 5) structure floodproofing and 6) structure removal.

In addition to the Racine County portion of the Root River watershed, alternative floodplain management measures have also been evaluated that address upstream flooding problems in Milwaukee County through the Milwaukee Metropolitan Sewerage District's (MMSD) watercourse planning program. As part of the evaluation of those alternatives, including their potential impact on flooding in Racine County, flood discharges and stages were developed for the Root River main stem through Racine County. That evaluation was designed to ensure that measures implemented in Milwaukee County do not compound problems in Racine County. Flooding problems in the Milwaukee County portion of the Root River watershed are under the Milwaukee Metropolitan Sewerage District's (MMSD) jurisdiction. Additionally, the Commission is currently conducting an update to floodplain mapping for the Milwaukee County Land Information Council and MMSD that includes hydrologic modeling for the Racine County portion of the Root River watershed.

[76] *SEWRPC Community Assistance Planning Report No. 343,* Fox (Illinois) River Watershed Mitigation Plan*, (in progress).*

Table 5.1
Principal Features and Costs of the Floodplain Management Plan Element for the Fox River Watershed

Component Description	Capital Cost[a]		Annual Operation and Maintenance Cost (thousands of dollars)	Implementation Status
	Component Details	Cost (thousands of dollars)[b]		
1. Preserve remaining riparian buffer areas, specifically primary environmental corridor lands along the Fox River and its major tributaries	Primary environmental corridors should be preserved in essentially natural open space uses. Corridors should be preserved by a combination of public acquisition for parkway purposes and floodplain and open space zoning	--	--	Partially implemented
2. Structure floodproofing, relocation, or removal of 405 structures[c]	Remove up to 311 residential structures; relocate or demolish up to 54 manufactured home structures; and floodproof up to 17 agricultural buildings, 16 commercial buildings, 6 utility structures, and 1 other structure	76,314.6[d]	--	Not implemented[e]
3. Installation of gates at Waterford Dam	Replacement of two 20-foot-wide radial gates, replacement of one actuator motor, and concrete repair to the dam structure	110.6	10.5	Implemented[f]
4. Installation of gates at Rochester Dam	Two 16-foot by five-foot radial gates	477.6	4.4	Implemented
5. Channel clean out in Fox River upstream from Waterford Impoundment	Remove selected sediment and debris from channel	19.6	0.2	Not implemented
6. Land acquisition	Purchase 370 acres of agricultural land in Town of Waterford	1,645.0	--	Not implemented
7. Maintenance dredging within Waterford Impoundment	Dredge along 50 acres	1,445.0	--	Partially implemented
8. Channel clean out of Wind Lake Drainage Canal	Clear 7.0 miles of Wind Lake Drainage Canal, 40.0 miles of lateral canals	1,131.0	25.8	Partially implemented
9. Channel clean out and deepening along Muskego Canal	Remove debris and deepen by three feet 0.6 mile of canal	62.7	3.6	Implemented
	Total	81,206.1	44.5	--

Note: The management measures in this table originate from strategies recommended in a comprehensive plan for the Fox River Watershed (*SEWRPC Planning Report No. 12, February 1970*) and further amended as it affects Racine County in 1975 (*SEWRPC Community Assistance Planning Report No. 5, May 1975*) and 1995 (*SEWRPC Memorandum Report No. 102, March 1995*). The floodland management measures as they appear in this table were adapted to reflect current conditions for use in the current hazard mitigation planning program.

[a] *Includes engineering, administration, and contingencies. Costs are shown in 2021 dollars.*

[b] *City of Burlington needs and components are recommended to be reevaluated, given the extensive recent downtown area improvements which include flood mitigation actions.*

[c] *This number reflects the structures determined to be within the one-percent-annual-probability (100-year recurrence interval) floodplain utilizing the most recent FEMA floodplains, effective May 2012, geographic information system techniques, and orthophotographs from April 2015. Field surveys of these structures would provide a more definitive assessment of their flood hazard status.*

[d] *For the purpose of this analysis, it was assumed that all residential structures located within the one-percent-annual-probability (100-year recurrence interval) floodplain would be acquired and demolished. The cost for removal of the residential structures includes an estimated average fair market property value plus $10,000 per property for demolition expenses. Floodproofing or elevating some residential structures, if found to be feasible based on specific factors, could be more cost effective. If floodproofing or elevation is considered at a specific structure, or a group of structures, field surveys of these structures should be conducted to obtain a more definitive assessment of their flood hazard status. All other categories of buildings (agricultural, commercial, utility, governmental, and other) were assumed to be floodproofed for the purpose of this analysis.*

[e] *Structure floodproofing/removal to be carried out at discretion of property owners.*

[f] *A contractor was hired by Racine County in 2016 to replace two 20-foot-wide radial dam gates and one actuator motor on the Waterford Dam. In addition, concrete repair to the dam structure was planned. The project was expected to be completed in January 2017.*

Source: SEWRPC

Table 5.2
Features and Costs of the Floodplain Management Plan Element for the Fox River Watershed that are Recommended to be Reevaluated

Component Description	Capital Cost[a] Component Details	Capital Cost[a] Cost (thousands of dollars)	Annual Operation and Maintenance Cost (thousands of dollars)	Implementation Status
1. Construction of dikes and floodwalls in City of Burlington[b]	a. Earth dikes (12,500 feet)[b]	454.8	--	--
	b. Concrete floodwalls (2,100 lineal feet)[b]	1,962.8	--	--
	c. 22 automatic drainage gates[b]	34.2	--	--
	d. Miscellaneous items[b]	1,203.6	--	--
	Subtotal	3,655.4[b]	5.2[b]	Partially implemented
2. Construction of levees and channel improvements along Hoosier Creek	a. Channel improvement (49,000 feet)	763.3		--
	b. Earth dikes (20,600 feet)	171.4		--
	c. 66 surface water inlets	199.5		--
	d. Revegetation (112 acres)	214.9		--
	e. Miscellaneous items	1,161.2		--
	Subtotal	2,510.3	28.9	Not implemented
3. Construct agricultural dikes along Wind Lake Drainage Canal and tributaries	a. 211,000 lineal feet of earth dike, install 40 pumping stations	1,516.3	25.8	Not implemented
	Total	7,682.0	60.0	--

[a] *Includes engineering, administration, and contingencies. Costs are shown in 2021 dollars.*

[b] *City of Burlington needs and components are recommended to be reevaluated, given the extensive recent downtown area improvements which include flood mitigation actions.*

Source: SEWRPC

FEMA is now emphasizing flood mitigation under Risk MAP; therefore, participating in the program may be an effective approach for Racine County to work with WDNR and FEMA to conduct flood mitigation planning to develop alternatives that address the concentrated flood problems in the County. The projected schedule for initiating the Risk MAP program in the Root River watershed has not yet been established. As was discussed in the previous paragraph, the Commission is developing a hydrologic model to compute flood flows for the Root River watershed. Flood flows from that hydrologic modeling could be coupled with hydraulic models developed under a potential Risk MAP program and applied to delineate revised floodplain boundaries and to analyze flood mitigation measures along the Root River mainstem and its tributaries in the County.

Priority Mitigation Measures

After consideration of the technical and economic feasibility of the various alternatives, a final strategy for alleviating problems due to flooding in the Racine County portion of the Root River watershed was developed and adopted by the Root River Watershed Committee. Selected mitigation measures were subsequently adapted for current conditions for use in the hazard mitigation planning program. The plan calls for the following measures:

- Preserve the remaining primary environmental corridor lands along the Root River and its major tributaries in essentially natural open space uses (primary environmental corridors within Racine County are shown on Map 2.3). The corridors are to be preserved by a combination of public acquisition for parkway purposes and floodland and open space zoning.

- Channel clearing and maintenance on the Root River Canal, including its east and west branches. Specifically, the plan proposes channel debrushing and cleaning along about 8.3 miles of the West Branch of the Root River Canal from a point one-half mile downstream of the CP Rail System bridge near the Village of Union Grove to the confluence with the East Branch, along 9.6 miles of the East

Branch of the Root River Canal from CTH E in Kenosha County to its confluence with the Root River Canal, and along 4.0 miles of the Root River Canal from its confluence with the East and West Branches to County Line Road in Milwaukee County. The plan does not contemplate any major channel deepening or widening, but would improve the operation of agricultural drain tiles and, to a limited extent, reduce agricultural flood damages.

- Structure floodproofing or removal of up to 197 structures identified using geographic information systems techniques as potentially being located in the 1-percent-annual-probability floodplain. While this number of structures may include some agricultural structures, no garages or small outbuildings are included in this total. In this regard, field surveys should be made of those structures identified as being located within the 1-percent-annual-probability floodplain to obtain a more definitive assessment of their flood hazard status. Where LiDAR topographic data are available, applicants for Letters of Map Amendment (LOMA) may submit LiDAR data to FEMA in lieu of a certified elevation study by a professional engineer or land surveyor provided certain standards are met. Furthermore, this plan element is presented as an option, subject to the preference of the individual property owner. The number of structures identified has increased substantially since the initial hazard mitigation plan as a result of revisions to the 1-percent-annual-probability floodplain. As noted in Chapter 3, there are six structures considered by FEMA to be repetitive- or substantial-loss properties in Racine County, two of which are located in the Root River watershed. Projects involving acquisition and demolition of properties within the 1-percent-annual-probability floodplain are the highest priority for Wisconsin Emergency Management (WEM) when funding is available. Acquisition and demolition of repetitive- or substantial-loss properties should have highest priority, followed by other structures confirmed to be within the 1-percent-annual-probability floodplain after field survey.

- Take actions to meet the established WDNR requirement to either increase the spillway capacity of the Horlick dam to safely pass the peak flow during a 1-percent-annual-probability flood, or demolish and remove the dam by 2024.

In addition to the measures outlined above, the floodplain management element contains several accessory measures to meet special needs within the watershed. These include: 1) application of the standards set forth in Chapter 4 relative to bridge replacement to ensure that major streets and highways remain operable during flood events, 2) participation in the Federal Flood Insurance Program, 3) continuation of desirable lending institution policies concerning the sale of riverine properties, 4) maintenance of the existing stream-gaging network in the watershed, and 5) enforcement of floodplain regulations in the watershed.

As shown in Table 5.3, the estimated capital cost of implementing the Root River watershed portion of the Racine County floodland management plan element would be $39.8 million (2021 dollars). Table 5.3 also shows the current implementation status of each plan element.

Some elements of the floodland management plan that have been implemented to date include channel clearing along the east and west branches of the Root River Canal in the early 1980s and again in 2009 through 2015. A Racine County parkway acquisition program has also been established.

Floodland Management Plan for the Pike River Watershed

In 1983, the Commission adopted a comprehensive plan for the physical development of the Pike River watershed. That plan was further amended as it relates to Racine County in 1987, 1996, and 1997. In the preparation of that plan, a concerted effort was made to offer for public evaluation a full range of physically feasible alternative plan sub-elements that might satisfy one or more agreed-upon watershed development objectives. Each alternative floodland management sub-element was evaluated insofar as possible in terms of technical and economic impact, financial and legal feasibility, and public acceptability, as well as with respect to satisfaction of the watershed development objectives.

In a manner similar to that used in the preparation of the plans for the Fox and Root River watersheds, a number of alternatives were explored in the preparation of the floodland management element of the Pike River watershed plan. A total of five structural floodland management measures were identified for possible application, whether individually or in various combinations, to specific floodprone reaches of the watershed:

Table 5.3
Principal Features and Costs of the Floodplain Management Plan Element for the Root River Watershed

Component Description	Capital Cost[a]		Annual Operation and Maintenance Cost (thousands of dollars)	Implementation Status
	Component Details	Cost (thousands of dollars)		
1. Preserve remaining riparian buffer areas, specifically primary environmental corridor lands along the Root River and its major tributaries	Primary environmental corridors should be preserved in essentially natural open space uses. Corridors should be preserved by a combination of public acquisition for parkway purposes and floodplain and open space zoning	--	--	Partially implemented
2. Channel clearing and maintenance along the Root River Canal	Clear 21.9 of canal	740.5	24.4	Partially implemented
3. Structure floodproofing or removal of 197 structures[b]	Remove up to 172 residential structures and floodproof up to 12 agricultural buildings, 4 government structures, and 9 "other" structures	39,086.9[c]	--	Not implemented[d]
	Total	39,827.4	24.4	--

[a] *Includes engineering, administration, and contingencies. Costs are shown in 2021 dollars.*

[b] *This number reflects the structures determined to be within the one-percent-annual-probability (100-year recurrence interval) floodplain utilizing the most recent FEMA floodplains, effective May 2012, geographic information system techniques, and orthophotographs from April 2015. Field surveys of these structures would provide a more definitive assessment of their flood hazard status.*

[c] *For the purpose of this analysis, it was assumed that all residential structures located within the one-percent-annual-probability (100-year recurrence interval) floodplain would be acquired and demolished. The cost for removal of the residential structures includes an estimated average fair market property value plus $10,000 per property for demolition expenses. Floodproofing or elevating some residential structures, if found to be feasible based on specific factors, could be more cost effective. If floodproofing or elevation is considered at a specific structure, or a group of structures, field surveys of these structures should be conducted to obtain a more definitive assessment of their flood hazard status. All other categories of buildings (agricultural, commercial, utility, governmental, and other) were assumed to be floodproofed for the purpose of this analysis.*

[d] *Structure floodproofing/removal to be carried out at discretion of property owners.*

Source: SEWRPC

1) storage; 2) floodwater diversion; 3) dikes and floodwalls; 4) channel modification and enclosure; and 5) bridge and culvert alteration or replacement. A total of 12 nonstructural measures were likewise identified for possible inclusion in the floodland management element of the watershed plan: 1) reservation of floodlands for recreational and related open space use; 2) floodland regulations; 3) control of land use outside of floodlands; 4) community education programs; 5) flood insurance; 6) lending institution policies; 7) realtor policies; 8) community utility policies; 9) emergency programs; 10) structure floodproofing; 11) structure removal; and 12) channel maintenance. Various combinations of structural and nonstructural management measures were evaluated for each of the most floodprone reaches in the watershed.

Priority Mitigation Measures

After consideration of the technical and economic feasibility of the various alternatives, a final strategy for alleviating problems due to flooding in the Racine County portion of the Pike River watershed was developed and adopted by the Pike River Watershed Committee in the previous plan update. The watershed study was further refined in 1987, 1996, and 1997. Selected mitigation measures were subsequently adapted for current conditions for use in the current hazard mitigation planning effort. The plan calls for the following measures:

- Preserve of the remaining primary environmental corridor lands along the Pike River and its major tributaries in essentially natural open space uses (primary environmental corridors within Racine County are shown on Map 2.3). The corridors are to be preserved by a combination of public acquisition for parkway purposes and floodland and open space zoning.

- Complete the final phases of the Pike River improvement project. As of January 2017, the construction of all nine phases of the project has been substantially completed. Maintenance and monitoring of the project is currently underway. This project is described in more detail in the section below.

- Construct an earthen berm upstream of Old Spring Street to protect residential structures along the Bartlett Branch. The berm would be about 500 feet long, with an average height of about five feet.

- Replacement of the Chicory Road crossing of Sorenson Creek with a new clear-span bridge having a waterway opening of about 30 feet.

- Structure floodproofing or removal of up to 46 structures--identified using geographic information systems techniques and color orthophotographs as potentially being located within the 1-percent-annual-probability floodplain--that would not be removed through the structural measures noted above. This number was determined using the 2012 FEMA floodplain mapping which reflects construction of Phases 1 through 5 of the nine-phase project to restore the riverine environment and reduce flooding along the Pike River in the Village of Mount Pleasant. Phases 6 through 9 of the Pike River improvements project are not reflected in the 2012 FEMA floodplains. Construction that was completed after 2012 may remove additional structures from the 1-percent-annual-probability floodplain. While the 48 structures remaining within the floodplain may include some agricultural structures, no garages or small outbuildings are included in this total. At such future time that floodproofing or removal of those structures is considered, field surveys should be made of those structures to obtain a more definitive assessment of their flood hazard status. Where LiDAR topographic data are available, applicants for Letters of Map Amendment (LOMA) may submit LiDAR data to FEMA in lieu of a certified elevation study by a professional engineer or land surveyor provided certain standards are met. Furthermore, this plan element is presented as an option, subject to the preference of the individual property owner. Projects involving acquisition and demolition of properties within the 1-percent-annual-probability floodplain are the highest priority for Wisconsin Emergency Management (WEM) when funding is available. None of the six structures in Racine County considered by FEMA to be repetitive- or substantial-loss properties are located in the Pike River watershed.

In addition to the measures outlined above, the floodland management element contains several accessory measures to meet special needs within the watershed. These include: 1) the standards set forth in Chapter 3 relative to bridge replacement to ensure that major streets and highways remain operable during flood events; 2) participation in the Federal Flood Insurance Program; 3) continuation of desirable lending institution policies concerning the sale of riverine properties; 4) maintain the existing stream-gaging network in the watershed ; and 5) enforcement of floodplain regulations in the watershed.

As shown in Table 5.4, the estimated capital cost of implementing the Pike River watershed portion of the Racine County floodland management plan element would be $33.1 million (in 2021 dollars). Table 5.4 also shows the current implementation status of each plan element. The capital cost for those elements that remain to be implemented is estimated at $10,624,800.

Elements of the floodland management plan that have been implemented to date include the construction of the earthen berm along the Bartlett Branch, and construction all nine phases of the Pike River improvement project from Spring Street (CTH C) to STH 11. As of January 2017, maintenance and monitoring of the project was underway and as of 2022, the project was completed.

Floodland Management Plan for the Des Plaines River Watershed

In 2003, the Commission adopted a comprehensive plan for the physical development of the Des Plaines River watershed. In the preparation of that plan, a concerted effort was made to offer for public evaluation a full range of physically feasible alternative plan elements that might satisfy one or more agreed-upon watershed development objectives. Each alternative floodland management sub-element was evaluated insofar as possible in terms of technical and economic impact, financial and legal feasibility, and public acceptability, as well as with respect to satisfaction of the watershed development objectives.

Table 5.4
Principal Features and Costs of the Floodplain Management Plan Element for the Pike River Watershed

Component Description	Capital Cost[a]		Annual Operation and Maintenance Cost (thousands of dollars)	Implementation Status
	Component Details	Cost (thousands of dollars)[b]		
1. Preserve remaining riparian buffer areas, specifically primary environmental corridor lands along the Pike River and its major tributaries	Primary environmental corridors should be preserved in essentially natural open space uses. Corridors should be preserved by a combination of public acquisition for parkway purposes and floodplain and open space zoning	--	--	Partially implemented
2. Pike River channel enlargement and rehabilitation	Construct 5.25 miles of channel modifications and four wetland/storage basins	22,365.5[b]	29.3	Implemented
3. Berm along Bartlett Branch	500-foot-long earth berm	163.9	1.3	Implemented
4. Chicory Road culvert replacement along Sorenson Creek	Install new clear-span bridge with 30-foot opening width	390.6	0.0	Not implemented
5. Structure floodproofing or removal of 46 structures[c]	Remove up to 39 residential structures and floodproof 1 agricultural building and up to 6 commercial/industrial structures	10,234.2[d]	--	Not implemented[e]
	Total	33,154.2	30.6	--

[a] *Includes engineering, administration, and contingencies. Costs are shown in 2021 dollars.*

[b] *About $4 million of this total cost was paid for in a variety of grants. In addition, the U.S. Army Corps of Engineers contributed about $5 million to the project.*

[c] *This number reflects the structures determined to be within the one-percent-annual-probability (100-year recurrence interval) floodplain utilizing the most recent FEMA floodplains, effective May 2012, geographic information system techniques, and orthophotographs from April 2015. Field surveys of these structures would provide a more definitive assessment of their flood hazard status.*

[d] *For the purpose of this analysis, it was assumed that all residential structures located within the one-percent-annual-probability (100-year recurrence interval) floodplain would be acquired and demolished. The cost for removal of the residential structures includes an estimated average fair market property value plus $10,000 per property for demolition expenses. Floodproofing or elevating some residential structures, if found to be feasible based on specific factors, could be more cost effective. All other categories of buildings (agricultural, commercial, utility, governmental, and other) were assumed to be floodproofed for the purpose of this analysis. If floodproofing or elevation is considered at a specific structure, or a group of structures, field surveys of these structures should be conducted to obtain a more definitive assessment of their flood hazard status.*

[e] *Structure floodproofing/removal to be carried out at discretion of property owners.*

Source: Village of Mt. Pleasant Utility District and SEWRPC

In a manner similar to that used in the preparation of the plans for the other watersheds in Racine County, a number of alternatives were explored in the preparation of the floodland management element of the Des Plaines River watershed plan. A total of five structural floodland management measures were identified for possible application, whether individually or in various combinations, to specific floodprone reaches of the watershed: 1) storage; 2) diversion; 3) dikes and floodwalls; 4) channel modification and enclosure; and 5) bridge and culvert alteration or replacement. A total of 11 nonstructural measures were likewise identified for possible inclusion in the floodland management element of the watershed plan: 1) reservation of floodlands for recreational and related open space use; 2) floodland regulations; 3) control of land use outside of floodlands; 4) community education programs; 5) flood insurance; 6) lending institution policies; 7) community utility policies; 8) emergency programs; 9) structure floodproofing; 10) structure removal; and 11) channel maintenance. Various combinations of structural and nonstructural management measures were evaluated for each of the most floodprone reaches in the watershed.

Priority Mitigation Measures

After consideration of the technical and economic feasibility of the various alternatives, a preliminary strategy for alleviating problems due to flooding in the Des Plaines River watershed was developed and adopted by the Des Plaines River Watershed Committee (see Appendix A for committee member list). While there are no directly-flooded structures in the 1-percent-probability floodplain in the Racine County portion of the watershed, the following selected mitigation measures, adapted for current conditions for use in the hazard mitigation planning program, are applicable to management of stormwater runoff and minimization of possible future flooding in the Racine County portion of the watershed, and in downstream areas in Kenosha County. The plan calls for the following measures:

- Preservation of the remaining primary environmental corridor lands along the Des Plaines River and its major tributaries in essentially natural open space uses (primary environmental corridors within Racine County are shown on Map 2.3). The corridors are to be preserved by a combination of public acquisition for parkway purposes and floodland and open space zoning.

- Provision of onsite detention storage facilities for planned new development. Facilities would be designed to limit peak discharges for the 50-percent (two-year recurrence interval) and 1-percent-annual-probability storm events based on the following release rates: 0.04 cfs per acre of development for the two-year event, and 0.30 cfs per acre of development for the 1-percent-annual probability event.

- Restoration of prairie conditions on 6.0 square miles (watershed wide) on agricultural land.

- Restoration of wetland conditions on 3.1 square miles (watershed wide) of agricultural land in the 1-percent-annual-probability floodplain.

In addition to the measures outlined above, the preliminary floodland management element contains the following accessory measures to meet special needs within the Des Plaines watershed:

- Application of the standards set forth in Chapter 3 relative to bridge replacement to ensure that major streets and highways remain operable during flood events.

- Preparation of detailed sub-watershed wide stormwater management system plans for the Village of Union Grove and the urban areas of the Villages of Mt. Pleasant and Yorkville.

- Encouraging the use of floodland areas for outdoor recreation and related open space activities.

- Continued participation in the National Flood Insurance Program.

- Adoption of the 1-percent-annual-probability flood profiles and floodland maps developed for planned land use conditions under the watershed plan. Also updating of Federal Flood Insurance Studies to reflect these flood profiles and maps.

- Amendment of local floodland zoning ordinances to require the provision of compensatory floodland storage to offset the effects of the placement of fill in the floodplain.

- Purchase of Federal flood insurance by property owners in floodprone areas.

- Determination by lending institutions of the floodprone status of properties prior to granting a mortgage.

- Formulation, or continuation, of governmental and agency policies such that the location, use, and size of public utilities and facilities are consistent with the floodprone status of riverine areas identified in the watershed plan.

- Consideration by local communities of the potential hydrologic impact of proposed development or redevelopment and recognition that planned development should occur according to the land use plan presented in the watershed study.

- Revision of local policies and regulations to encourage low impact source controls and stormwater management practices designed to maintain pre-development hydrologic conditions.

- Provide property owners with information regarding the extent of flood hazard areas.

- Incorporation of channel maintenance functions in the operations of responsible governmental units.

- Maintain the U.S. Geological Survey stream gage on the Des Plaines River at Russell, Illinois, and adding, establishing and maintaining a continuous recording gage on the Des Plaines River near CTH K in Kenosha County.

As shown in Table 5.5, the estimated capital cost of implementing the overall Des Plaines River watershed floodland management plan elements would range from $10,487,200 to $12,559,300 (in 2021 dollars), depending on the techniques used for prairie and wetland restoration. This amount represents the cost of implementing those particular measures in both Racine and Kenosha Counties. The cost for Racine County is estimated to be at most $1,014,413 (2021 dollars) and is largely associated with the provision of stormwater detention for new development and conversion of rural lands to wetland and prairie conditions. Table 5.5 also shows the current implementation status of each plan element.

Stormwater Management Element

Because of the relationship between stormwater management and floodland management, stormwater management actions are an important element of the flood mitigation plan. This element of the plan includes the status of stormwater management planning and stormwater ordinances and related regulations.

Stormwater-Related Regulations and Stormwater Management Plans

Chapter 283 of the *Wisconsin Statutes* and Chapter NR 216 of the *Wisconsin Administrative Code* require certain municipalities to obtain State stormwater discharge permits to discharge stormwater to receiving streams and watercourses from municipal storm sewer systems. The *Statutes* and implementing Administrative Code require municipalities to file applications for the State permits. The permit applications must demonstrate that the municipality concerned has the legal authority to control pollutant contributions to storm sewer systems from various sources. The permit application must provide stormwater management-related data, most of which would be provided by a properly prepared, technically sound, stormwater management system plan.

In 2002 the WDNR issued Chapter NR 151 of the *Wisconsin Administrative Code*, outlining standards governing stormwater runoff from both agricultural and nonagricultural lands. Those standards include controls for both the quantity and quality of runoff from newly developed and redeveloped lands. These rules are administered by the WDNR through the Chapter NR 216 stormwater discharge permit system, although local municipalities have the option of adopting their own ordinances consistent with the Administrative Code. Chapter NR 152 of the Administrative Code contains model ordinances covering both agricultural and nonagricultural operations. Those communities that are required to obtain a stormwater discharge permit are required to have a stormwater management program which most often results in adoption of a stormwater management ordinance.

Communities with Wisconsin Pollution Discharge Elimination System (WPDES) stormwater discharge permits include the Cities of Racine and Burlington, the Village of Yorkville, and the Town of Norway. As a part of the permit application process, these communities also have adopted stormwater-related ordinances.

The remaining urban communities in the County are also encouraged to prepare stormwater management plans. In those townships that are anticipated to remain mostly rural under the adopted land use plan, stormwater management planning is considered to be needed only for certain site-specific areas where urbanization is expected or where isolated urban areas already exist, and stormwater-related problems have developed.

Table 5.5
Principal Features, Costs, and Benefits of the Recommended Floodplain Management Plan for the Des Plaines River Watershed

Component Description	Capital Cost[a,b]		Annual Operation and Maintenance Cost (thousands of dollars)	Implementation Status
	Component Details	Cost (thousands of dollars)		
1. Preserve remaining riparian buffer areas, specifically primary environmental corridor lands along the Des Plaines River and its major tributaries	Primary environmental corridors should be preserved in essentially natural open space uses. Corridors should be preserved by a combination of public acquisition for parkway purposes and floodplain and open space zoning	--	--	Partially implemented
2. Provide onsite detention storage facilities for planned new development	Detention facilities, including land cost	9,307.8[c]	94.8[c]	Partially implemented
3. Restore prairie conditions on 6.0 square miles of agricultural land	Prairie restoration	937.5 to 2,644.8[d]	1.5 to 106.6[d]	Not implemented
4. Restore wetland conditions on 3.1 square miles of agricultural land in the 100-year floodplain	Wetland restoration	241.9 to 606.7[d]	0.5 to 27.5[d]	Not implemented
	Total	10,487.2 to 12,559.3	96.8 to 228.9	--

[a] *A breakdown of costs between Kenosha and Racine Counties is not available. Thus, total costs for both Counties are listed. It is estimated that the capital cost range for measures in Racine County would be relatively small, ranging from $852,124 to $1,014,413.*

[b] *Includes engineering, administration, and contingencies. Costs are shown in 2021 dollars.*

[c] *Incremental cost between control of two-year and 100-year events.*

[d] *Cost reflects range from minimal wetland and prairie operation and maintenance to active management.*

Source: SEWRPC

Public Information and Education Element

Public information, education, and participation constitute an integral aspect of Racine County's flood mitigation and related efforts. This element includes two sub-element activities to be carried out, namely public education activities and public information programming and coordination associated with detailed stormwater and floodland management plans.

Public Education Activities

This sub-element involves preparation and distribution of educational and self-help materials and provision of educational programs. With regard to this sub-element, Racine County and the various municipalities will, as needed, collaborate to prepare and distribute various public informational and educational materials, including materials oriented toward homeowners and designed to help them consider and potentially undertake actions to mitigate damage caused by stormwater flooding and sanitary sewer backups. Methods available include, but are not limited to, social media, cable television, pamphlet development, individual seminars, the internet, and community speaking engagements. The Wisconsin Department of Health Services has prepared a flooding toolkit for citizens. The toolkit provides general flood information, preparedness tips, and guidelines on cleaning up after a flood has occurred. A factsheet prepared by WEM explains the different types of flood watches and warnings and provides information on what citizens should do if a flood is likely to occur in their area.

In partnership with the City of Racine, Racine County has implemented the CodeRED® Emergency and Weather Notification System to deliver customized prerecorded messages directly to homes and businesses, or to persons traveling through the County via the free mobile app. This service uses a high-speed telephone calling system to a phone number in the CodeRED® database to alert users of significant incidents and events where timely notification of an affected population or geographic area is essential. The pre-recorded message may also provide instructions for action to be taken. Messages will only be sent to individuals and

businesses that have registered their home, business, or cellular phone number with the service. Racine County residents who sign up for the additional CodeRED® Weather Warning will automatically receive calls when tornado, flash flood, and severe thunderstorm warnings are issued by the National Weather Service for addresses that are in the path of the storm.

In addition, the County has the capability to issue emergency alerts to cell phones through the Wireless Emergency Alerts (WEA) system. The WEA is a partnership including local and State public safety agencies, FEMA, the Federal Communications Commission (FCC), the Department of Homeland Security (DHS) and the National Weather Service (NWS). Under the WEA system, authorized County officials can send emergency messages to mobile devices of those that may be in harm's way without the need to download an app or subscribe to a service. WEAs are broadcast from area cell towers to mobile devices only in the specific area where there is a danger. These short messages are designed to get the recipient's attention in a critical situation and will look like a text message that will show the type and time of the alert, any action that recipients should take, and the agency issuing the alert. The WEA message includes a special tone and vibration that will be repeated twice. WEA will send alerts for extreme weather warnings including flash flood, tornado, and extreme wind warnings; local emergencies requiring evacuation or immediate action; AMBER Alerts; and Presidential alerts during a national emergency.

Public Participation Activities and Coordination with Other Agencies and Units of Government

The second sub-element of this program involves direct public participation and coordination with other agencies during detailed stormwater and floodland management plan development. One example of this is the active participation of local citizens and community groups in the technical advisory committees that were formed to oversee the development of the four comprehensive watershed plans referenced above. In some of the watersheds, those committees continue to serve to help guide the implementation and refinement of those watershed plans. In the other watersheds, the Commission would reconstitute the committees as needed. In addition, public hearings were held to allow for public input into each of the comprehensive watershed plans.

Toward further informing the public regarding flood mitigation, stormwater and floodland management, and related issues, this hazard mitigation plan update calls for concerned units and agencies of government, including Racine County and all cities, villages, and towns within the County, to involve members of the general public and to seek public input in the preparation and implementation of recommendations regarding such issues.

Additional Plan Elements

In addition to the above recommended measures, several additional measures are included in the floodland management element. These additional measures are described below.

National Flood Insurance Program and Floodplain Map Updating Efforts

Racine County and all cities and villages with exception of the Village of Elmwood Park, have been designated by the Federal Emergency Management Agency as having flood hazard areas and have taken the steps needed to make residents eligible to participate in the National Flood Insurance Program (NFIP). Initial Flood Insurance Studies (FISs) have been completed by FEMA for Racine County and all municipalities identified by FEMA as having flood hazards. This plan calls for the continued participation of Racine County and the municipalities in the NFIP. This plan also calls for the County or incorporated municipalities to request FEMA to revise, as necessary, the local flood insurance studies to reflect new flood hazard data when such data become available. This plan also calls for owners of property in Racine County to purchase flood insurance to provide some financial relief for losses sustained in floods that may occur in floodprone areas where no flood control measures are called for or in other floodprone areas before the implementation of any flood mitigation measures called for under the plan. As of April 2023, 312 flood insurance policies were in effect in Racine County. The average cost of a premium in Racine County was $839 per year. Finally, as the flood control measures are implemented, this plan calls for FEMA to make the necessary revisions to the appropriate FISs. Participation in the NFIP by the communities in Racine County is summarized in Table 5.6.

FEMA has completed an update of the Racine County FIS as part of its Map Modernization program. The Map Modernization products include a countywide FIS and Digital Flood Insurance Rate Maps (DFIRM).

Table 5.6
Participation in the National Flood Insurance Program by Racine County Jurisdictions

Civil Division	Participating in Racine County Hazard Mitigation Plan	Participating in National Flood Insurance Program	Date Initial Flood Hazard Boundary Map Identified	Date Initial Flood Insurance Rate Map (FIRM)	Current Effective Map Date	Entry Date into National Flood Insurance Program
Cities						
Burlington	Y	Y	10/05/1973	05/15/1978	05/02/2012	05/15/1978
Racine	Y	Y	--	06/01/1973	02/01/2019	06/01/1973
Villages						
Caledonia	Y	Y	--	04/01/1982	02/01/2019	12/05/2008
Elmwood Park	Y	N[a]	--	--	--	--
Mt. Pleasant	Y	Y	--	04/01/1982	02/01/2019	04/28/2008
North Bay	Y	N[a]	--	--	05/02/2012	09/06/1975
Raymond	Y	Y	05/20/1977	04/01/1982	05/02/2012	04/01/1982
Rochester	Y	Y	01/09/1974	01/02/1981	05/02/2012	01/02/1981
Sturtevant	Y	Y	05/24/1974	06/04/1980	02/01/2019	04/08/2008
Union Grove	Y	Y	--	06/17/1986	05/02/2012	06/17/1986
Waterford	Y	Y	12/17/1973	01/02/1981	05/02/2012	01/02/1981
Wind Point	Y	Y	06/28/1974	09/30/1980	05/02/2012	09/30/1980
Yorkville	Y	Y	05/20/1977	04/01/1982	05/02/2012	04/01/1982
Towns						
Burlington	Y	Y	05/20/1977[b]	04/01/1982[b]	05/02/2012[b]	04/01/1982[b]
Dover	Y	Y	05/20/1977[b]	04/01/1982[b]	05/02/2012[b]	04/01/1982[b]
Norway	Y	Y	05/20/1977[b]	04/01/1982[b]	05/02/2012[b]	04/01/1982[b]
Waterford	Y	Y	05/20/1977[b]	04/01/1982[b]	05/02/2012[b]	04/01/1982[b]
County						
Racine County	Y	Y	05/20/1977	04/01/1982	05/02/2012	04/01/1982

[a] *There are no floodplains mapped in the Villages of Elmwood Park and North Bay.*

[b] *In Wisconsin, towns are covered under county eligibility in the National Flood Insurance Program.*

Source: Federal Emergency Management

The DFIRM uses an aerial photo base and incorporates updated floodplain boundaries delineated by the Commission and others. The updated Racine County FIS and DFIRM became effective on May 2, 2012.

On November 13, 2012, initial FEMA Risk MAP program discovery meetings were held for the upper Fox River Watershed. This watershed encompasses portions of Kenosha, Racine, Walworth, and Waukesha Counties. Following this meeting, FEMA issued an initial discovery report. Additional discovery meetings were held with communities in the watershed in February 2014. A final discovery report was issued to further reflect additional comments from the communities. As part of the Risk MAP project, detailed studies are proposed for the mainstem of the Fox River and a portion of Eagle Creek in Racine County. Preliminary maps for the Fox River (Illinois) watershed were released in 2022 and are anticipated to become effective in early 2024.

Community Rating System

The Community Rating System (CRS) is an additional program offered by FEMA as part of its NFIP. The CRS recognizes and encourages community floodplain management activities that go beyond the minimum NFIP standards. The program assigns a ranking to communities that participate based on voluntary floodplain management activities and outreach services that the community provides its residents. A high CRS ranking will offer citizens of that municipality reduced flood insurance premiums up to 45 percent. In addition to the benefit of reduced insurance rates, floodplain management and outreach activities associated with CRS aim to further enhance public safety, reduce damages to property and public infrastructure, avoid economic disruption and losses, reduce human suffering, and protect the environment. Participation in the CRS program can provide extra incentive for communities to maintain and improve their floodplain management program moving forward. Technical assistance related to design and implementation of some activities associated with the program is available at no charge.

There are currently no communities in Racine County that participate in the CRS program. It is recommended that municipalities consider participation in the CRS program based on the number of NFIP policies currently in effect in their community. All unincorporated communities would be eligible for premium discounts under Racine County's potential participation. Incorporated villages and cities are required to participate individually.

Lending Institution and Real-Estate-Agent Policies

This plan calls for lending institutions to continue their practice of determining the floodprone status of properties before mortgage transactions. To that end, these institutions should consult with the appropriate local zoning department to inquire about any additional flood hazard studies for areas not identified in the Federal flood insurance studies. The plan also calls for real-estate brokers and salespersons to continue to inform potential purchasers of property of any flood hazard that may exist at the site being sold in accord with the rules of the Wisconsin Department of Safety and Professional Services.

Stream Channel Maintenance

This plan calls for Racine County and local municipalities and drainage districts to work cooperatively to continue and expand programs for regular stream channel maintenance within their respective jurisdictions. These programs would include the periodic removal of sediment deposits, selected heavy vegetation, and debris from all watercourses in the County, including bridge openings and culverts, subject to obtaining any necessary local and State permits.

Stormwater Management Facilities Maintenance

The effectiveness of stormwater management conveyance and detention facilities and other management measures can be sustained only if proper operation, repair, and maintenance procedures are carefully followed. Important maintenance procedures include the periodic repair of storm sewers, clearing of sewer obstructions, maintenance of open channel vegetation, clearing debris and sediment from open channels, maintenance of the infiltration capacity of stormwater infiltration facilities, maintenance of detention facility inlets and outlets, maintenance of detention basin vegetative cover, and periodic removal of sediment accumulated in detention basins. This plan calls for these maintenance activities to be carried out on a continuing basis to maximize the effectiveness of the stormwater management facilities and measures and to protect the capital investment in the facilities.

Dam Safety

The increasing age of dams escalates the need to ensure dam owners understand their responsibilities and the risk a dam can pose to surrounding properties and infrastructure. The best method of avoiding a hazard situation involving a dam is proper operation, maintenance, and inspection. The owner of any sized dam should inspect their dam on a regular basis, including during and after any high water event. The inspection should look for any changes that may indicate the need for repairs or the existence of serious deficiencies that could lead to failure of the dam. The owners of large dams are required by law to hire an experienced professional to inspect their dams on a recurring basis depending on the hazard rating. High hazard large dams require inspection every two years, significant hazard large dams require inspection every three to four years, and low hazard large dams require inspection every ten years.

Emergency action plans are required for all new and existing dams that meet the large dam criteria or pose a threat to life and property. These plans should address the coordination of necessary actions by the dam owner and the responsible local, State, and Federal emergency organizations and provide for timely notification, warning and evacuation in the event of an emergency at the dam. An emergency action plan must be developed in conjunction with the local community and emergency management agency and then be submitted to the WDNR Dam Safety staff for review and approval. These plans should be reviewed and updated regularly to reflect current conditions of the dam and the surrounding area.

In cases where private dams are old, unsafe, or unwanted, or where dam owners are unable to provide proper maintenance, the dam should be considered for removal. The 2015-2017 Wisconsin biennial budget provided $500,000 to fund dam removal projects for any owner who wishes to remove their dam. The Dam Removal Grant Program provides reimbursement for 100 percent of eligible project costs up to a maximum of $50,000 to remove a dam.

Survey of Buildings in and Near the 1-percent-Annual-Probability Floodplain

The extent of the 1-percent-annual-probability floodplain has been delineated on the Racine County large-scale topographic maps, and much of that information is reflected on the FEMA DFIRMs that have been prepared. While those maps are adequate in detail to identify the extent of flooding for planning and zoning purposes, they can only be considered approximate in regard to establishing building grades. Thus, this plan calls for Racine County or the appropriate municipality to survey the low-grade elevations adjacent to buildings and the first-floor elevations of buildings that have been identified as remaining in or near the 1-percent-annual-probability floodplain after all other structural floodland management plan elements called for in this plan have been implemented, and at such time that flood mitigation activities are being considered for those buildings remaining in the floodplain. Such surveys will provide a more definitive identification of the flood hazard for those properties and will assist property owners in deciding upon a course of action regarding floodproofing or structure removal options. It should be noted that where LiDAR topographic data are available applicants for Letters of Map Amendment (LOMA) may submit LiDAR data to FEMA in lieu of a certified elevation study by a professional engineer or land surveyor provided that certain standards are met. This may allow for a more definitive assessment of a structure's flood hazard status to be obtained at a lower cost.

A review of the Letters of Map Change (LOMC) information on the FEMA website reveals that 217 LOMC have been revalidated for Racine County cases from 1992 to 2019. LOMC include two categories: Letters of Map Amendment (LOMA) and Letters of Map Revision (LOMR). LOMA include those cases that have completed a survey and under existing conditions are above the 1-percent-annual-probability floodplain. In Racine County 161 cases have effective LOMA from 2012 to 2021. There is currently one LOMR in Racine County. This LOMR covers a portion of Spring Brook in the City of Burlington.

5.3 HAZARD MITIGATION PLAN COMPONENT FOR SEVERE THUNDERSTORMS COMBINED HAZARDS (THUNDERSTORMS, HIGH STRAIGHT-LINE WINDS, HAIL, LIGHTNING)

As described in Chapter 3, thunderstorms, high straight-line winds, hail, and lightning are natural hazard events of significant concern to be considered in the Racine County hazard mitigation plan. This section describes alternate and selected strategies to mitigate these types of hazards. As part of the updating process, these strategies were reviewed and reevaluated by the Racine County Hazard Mitigation Plan Local Planning Team in light of the updated hazard mitigation goals and hazard conditions documented in Chapters 3 and 4.

Identification of Alternative Mitigation Strategies

All thunderstorm related hazards and high straight-line wind events are potentially dangerous and are the most common type of severe weather event compared to other natural hazards within Racine County as discussed in Chapter 3. About 10 percent of the thunderstorms and related hazard events that occur each year are classified as severe. Severe thunderstorm fronts can often be tracked, which generally provides ample warning for potentially affected areas to take preventative actions. In addition, when severe thunderstorms and related hazard events occur, they generally last for short periods of time.

While it may not be possible to accurately identify specific areas where there is significant risk from thunderstorm related hazard events or non-thunderstorm high-wind events, measures can be taken to reduce the potential damage caused wherever they may occur in the County. High-wind events associated with windstorms and thunderstorms are similar to tornadoes, except they are more common and usually less powerful.

Hailstorms tend to occur in conjunction with severe thunderstorms. A severe thunderstorm weather advisory or advance warning system may indicate that large or damaging hail is imminent. During a hailstorm, personal safety is the first priority and persons should seek shelter and stop driving to avoid accidents. Advance warning systems may allow some actions to reduce hail damage to vehicles and some property, but little can be done to protect structures or crops in the field.

Personal protection is paramount for lightning safety—many people incur injuries or are killed due to misinformation and inappropriate behavior during lightning storms. A few simple precautions can reduce many of the dangers posed by lightning. The individual is ultimately responsible for his/her personal safety and should take appropriate action when threatened by lightning.

Through review by the Racine County Hazard Mitigation Plan Local Planning Team, the following measures to reduce vulnerability to thunderstorm winds, non-thunderstorm high-winds, hail, and lightning have been identified as viable for the County hazard mitigation plan.

Nonstructural

- Review local building codes to determine if revisions are needed to improve the ability of structures to withstand greater wind velocities and impacts from hail
- Local fire departments should obtain and maintain equipment to help detect or mitigate lightning-related fires, such as thermal imaging devices
- Enforce existing local ordinances requiring adequate grounding of newly constructed buildings
- Continue the County's participation in the National Weather Service's (NWS) StormReady program. Requirements for this program include:
    - Establishing a 24-hour warning point and emergency operations center
    - Having multiple ways to receive severe weather warnings and forecasts to alert the public
    - Promoting the importance of public readiness through community seminars
    - Developing a formal hazardous weather plan, which includes training severe weather spotters and holding emergency exercises
- Provide annual access to SKYWARN weather spotter training
- Ensure that mobile and manufactured housing is securely anchored
- Encourage agricultural producers to purchase crop insurance

Structural

- Maintain, update, and upgrade public early warning systems and networks. Consider expanding such systems as necessary. Desirable characteristics of a robust early warning system include:
    - Employing multiple means of communication to alert people of the imminent threat of severe weather. Examples of such means of communication include providing warnings and/or information through outdoor warning systems, broadcast media, cable and satellite media, electronic mail, SMS (text) messaging, social media, reverse-911 telephony, and apps for mobile devices, and
    - Being capable of reaching those who may be vulnerable to thunderstorm related hazards;
- Trim and maintain the health of trees near vulnerable infrastructure, such as utility lines, essential facilities and roads, as well as near homes and businesses. Communities should prepare for emerald ash borer infestation by developing a funding strategy for removal of infested ash trees. A well planned response can minimize the impact of infestation, reduce liability, and lessen the overall cost to a community. Ash trees should be removed at the first sign of infestation of the emerald ash borer;
- Promote planting windbreaks for farm crops;

- Work with municipalities and businesses to explore installation of community safe rooms and hardening projects for community facilities, businesses, and manufacturers. Priority should be considered for those facilities that are located in slab-on-grade structures and for those projects that can be completed as part of a newly planned building or building expansion;

- Provide model mobile home park regulations to municipalities for their consideration which require that community safe rooms (storm shelters) be provided for residents of new and expanding mobile home parks. Based on community and landowner interest, pursue grant funding for installation of community safe rooms in existing mobile home parks;

- Bury and protect power and utility lines;

- Encourage the use of surge protectors on critical electronic equipment;

- Install lightning grade surge protection devices for critical electronic components used by government, public service, and public safety facilities, such as warning systems, control systems, communications, and computers; and

- Promote emergency back-up power at critical facilities.

Public Informational and Educational Programming

- Increase public education and awareness of the potential severity of thunderstorm related hazards and non-thunderstorm high-wind hazards and distribute emergency preparedness information related to thunderstorm hazards. Such educational efforts should include promoting public awareness of proven lightning safety guidelines to reduce the risk of lightning hazards and the potential severity of hailstorms;

- Encourage residents to purchase NOAA All Hazards Weather Radios and register for emergency alert services such as CodeRED® and emergency preparedness and damage reporting mobile apps;

- Promote inclusion of safety strategies for severe weather events in driver education classes and materials;

- Encourage residents to develop a Family Emergency Preparedness Plan that include the preparation of a Disaster Supply Kit (see Appendix D);

- Produce and distribute emergency preparedness information related to thunderstorm related and high-wind hazards.

Current Programs

Federal and State Programs

The National Weather Service (NWS) issues severe thunderstorm warnings, watches and advisories when there is a threat of severe weather conditions. Several categories of warnings, watches, and advisories apply to hazards related to thunderstorms and non-thunderstorm high-wind events. The NWS Milwaukee/Sullivan office will issue a severe thunderstorm warning when either a spotter reports a thunderstorm producing winds that equal or exceed 58 miles per hour (mph) or hail of one inch or larger in diameter or a severe thunderstorm is detected by Doppler radar. The NWS Storm Prediction Center in Norman, Oklahoma will issue a severe thunderstorm watch when conditions are favorable for the development of severe thunderstorms in and close to the watch area. The NWS Milwaukee/Sullivan office will issue a high wind warning when sustained winds of 40 mph are expected to occur for an hour or more or wind gusts of 58 mph or more are expected to occur. The NWS Milwaukee/Sullivan office will issue a wind advisory when sustained winds of 30 mph are expected to occur for an hour or more or wind gusts of 45 mph to 57 mph or more are expected to occur. The office also issues a variety of wind related marine warnings for events in Lake Michigan.

Federal and State programs include awareness and education efforts. The National Weather Service also has an extensive public information program to educate people about the dangers of thunderstorms and related hazards and assist in preventing related deaths and injuries. WEM, in conjunction with the National Weather Service and State and local government agencies, provides both preparedness information and severe weather information to the public. Preparedness information is provided during three severe weather awareness campaigns conducted during the year, each focusing on the prevalent weather hazard at that time. The Wisconsin Department of Health Services has developed a severe thunderstorm and tornado tool kit to provide information to local governments, health departments, and citizens in Wisconsin about preparing for and responding to severe thunderstorms and tornadoes. Similarly, WEM has produced several educational resources regarding thunderstorms and related hazards including prerecorded radio and public service announcements, scripts for radio public service announcements, fliers, and educational materials for children. In addition, numerous other organizations, including the American Red Cross, provide public safety information regarding lightning.

Local Programs

Programs within Racine County include those conducted by the Racine County Office of Emergency Management. The Racine County Office of Emergency Management has a number of brochures, booklets, and pamphlets available for the public on severe weather safety and other general emergency management-related topics. In addition, the Ready Racine County website contains factsheets listing specific information regarding what to do in the event of a tornado watch or warning as well as what residents can do before, during, and after, in the event that a severe thunderstorm was to occur in their area. The Racine County Office of Emergency Management also participates in all State sponsored severe weather awareness campaigns. In addition, a number of local emergency management and fire departments have instituted educational programs and communications on public safety.

Racine County currently relies on NOAA Weather Radio for severe thunderstorm and related hazard warnings and encourages all of the local citizens to have a weather radio. In 2002, NOAA Weather Radio installed a new transmitter at CTH KR and Wood Road in Racine County (frequency is 162.450 megahertz). This transmitter covers both Racine and Kenosha Counties. In addition, severe thunderstorm and related hazard warnings from NOAA Weather Radio are relayed to other media via the Federal Communication Commission's Emergency Alert System (EAS). The EAS allows officials to send emergency information targeted to specific geographical areas. The EAS sends alerts out to broadcast media, cable television providers, satellites, pagers, direct broadcast satellites, high-definition television, and video dial tone. This system uses the same digital protocols as NOAA Weather Radio. Nationally, the National Weather Service generates about 80 percent of EAS activations primarily for short-duration weather warnings and watches. Federal, State, and local emergency personnel can also access this system to disseminate non-weather emergency messages through the National Weather Service's HAZCollect system.

In partnership with the City of Racine, Racine County has implemented the CodeRED® Emergency and Weather Notification System to deliver customized prerecorded messages directly to homes and businesses, or to persons traveling through the County via the free mobile app. This service uses a high-speed telephone calling system to call a phone number in the CodeRED® database, alerting users of significant incidents and events where timely notification of an affected population or geographic area is essential. The pre-recorded message may also provide instructions for action to be taken. Messages will only be sent to individuals and businesses that have registered their home, business, or cellular phone number with the service. Racine County residents who sign up for the additional CodeRED® Weather Warning will automatically receive calls when tornado, flash flood, and severe thunderstorm warnings are issued by the National Weather Service for addresses that are in the path of the storm.

In addition, the County has the capability to issue emergency alerts to cell phones through the Wireless Emergency Alerts (WEA) system. The WEA is a partnership including local and state public safety agencies, FEMA, the Federal Communications Commission (FCC), the Department of Homeland Security (DHS) and the National Weather Service (NWS). With WEA, authorized County officials can send emergency messages to mobile devices of those that may be in harm's way without the need to download an app or subscribe to a service. WEAs are broadcast from area cell towers to mobile devices only in the specific area where there is a danger. These short messages are designed to get the recipient's attention in a critical situation and will look like a text message that will show the type and time of the alert, any action that recipients should

take, and the agency issuing the alert. The WEA message will include a special tone and vibration that will be repeated twice. WEA will send alerts for extreme weather warnings, local emergencies requiring evacuation or immediate action, AMBER Alerts, and Presidential alerts during a national emergency. Although the WEA does not issue alerts for severe thunderstorms, the service will alert for tornado, flash flood, and extreme wind warnings that are often associated with severe thunderstorms.

As described in Chapter 2, Racine County has developed a comprehensive emergency management plan which sets forth a hazard action plan. In addition, many of the local units of government have developed emergency operations plans and/or programs which complement the County plan and which also set forth procedures and actions to deal with a range of situations and events, including thunderstorms, high-wind, and hail events.

Analysis of the vulnerability of humans, infrastructure, and economic production to thunderstorm related hazard events and non-thunderstorm high-wind events demonstrates that the provision of advanced warning systems, as well as public informational and educational programming, are the most important mitigation actions to be considered. Racine County contains a total of 24 warning and communication siren systems, with 14 located within the City of Racine; three within the City of Burlington; two each within the Villages of Sturtevant, Waterford, and Union Grove; and one within the Town of Waterford. These sirens are regularly tested and maintained. New battery powered emergency sirens were installed at two sites in the City of Racine and the electronics on two sirens in the Village of Union Grove were upgraded since the last plan update.

Racine County was redesignated by the National Weather Service as a StormReady® community in 2021. This designation is valid for three years. StormReady® is a national community preparedness program that uses a grassroots approach to help communities develop plans to handle all types of severe weather. In general, a community must possess a solid communication network and provide verification of its multi-hazard emergency operations plan to qualify for this designation. Specifically, to become StormReady® a community must:

- Establish a 24-hour warning point and emergency operations center
- Have multiple methods to receive and disseminate severe weather warnings and information for their community
- Have various methods to monitor weather conditions locally
- Promote the importance of public readiness
- Develop a formal hazardous weather action plan, including severe weather spotter training and drills

Evaluation of Alternatives and Identification of Mitigation Actions

Based upon review of the above by the Racine County Hazard Mitigation Plan Local Planning Team as part of the updating process, refinement and expansion of current ongoing programs continues to represent a major component of the planned mitigation action with regard to early warning systems. The existing warning systems should continue to rely upon the use of multiple means of communication to alert people to the threat of severe weather. Developed urban areas located within unincorporated areas, such as major lake developments, should also be considered as areas needing outdoor warning systems. In addition, informing the public of the significance of thunderstorm watches and warnings so that they take thunderstorm warnings and related hazards seriously and know where to seek shelter in emergency situations, is an important, ongoing component for minimizing the risks associated with these natural hazards. Community- and school-based informational programs should also continue to be conducted by the County in partnership with Federal, State and local authorities.

Promoting the provision of adequate safe places for people to seek shelter during severe storms constitutes an additional approach to mitigating some impacts of severe storms in Racine County. Residents of mobile home parks represent a segment of the County's population that lacks access to adequate shelters. Encouraging and promoting the construction of community safe rooms to provide shelter from severe storms to these vulnerable populations constitutes an important addition to this hazard mitigation plan.

Similarly, severe storm events can cause economic losses, especially to agricultural producers through damage to crops. Providing agricultural producers with information regarding Federal crop insurance programs and encouraging them to purchase crop insurance constitutes a means of providing them with some protection against such losses.

Finally, other feasible, nonstructural and structural mitigation actions include surge protection for sensitive electronic equipment; and other precautions that will limit possible future bodily injuries, deaths, or property damages due to severe weather events. The majority of these measures are currently in place, indicating an emphasis on informational programming and enforcement.

Multi-Jurisdictional Considerations

Thunderstorms and their related hazards can potentially impact all municipalities within the County. In addition, these severe events can potentially cause multiple damages to a variety of infrastructure including, transmission lines, communication lines, and transportation routes due to flooding, as well as damage to buildings from flooding, lightning, and/or high winds. Hence, Racine County, municipalities, and relevant businesses should coordinate hazard mitigation activities through a cooperative County and local government partnership in countywide disaster planning and response mechanisms. Such measures are already well underway through the comprehensive emergency management planning program involving the Racine County Office of Emergency Management and coordinated local community emergency operations programs and should be continued.

Priority Mitigation Measures

Based upon the foregoing evaluation, consideration of risk, and review and action by the Racine County Hazard Mitigation Plan Local Planning Team as a part of the updating process (see Appendix A), the following mitigation measures related to thunderstorm wind, non-thunderstorm high-wind, hail, and lightning events are included in the Racine County hazard mitigation plan:

- Maintain, update, and further develop the early warning and communication systems including coverage of NOAA All Hazard Weather Radios; Emergency Alert System (EAS) capabilities; and emerging technologies, such as the County's targeted Wireless Emergency Alerts (WEA) system, and the CodeRED® Emergency and Weather Notification System;

- Promote educational and informational programming, especially related to the early warning network, including NOAA All Hazard Weather Radio, EAS broadcasts, WEA system, and the CodeRED® Emergency and Weather Notification System;

- Encourage residents to develop a Family Emergency Preparedness Plan including the preparation of a Disaster Supply Kit (see Appendix D);

- Encourage the provision of safe rooms for public buildings, major industrial sites, mobile home parks, and other large businesses or complexes such as shopping malls, fairgrounds, and other vulnerable public areas. Approaches to achieve this recommendation may include:

    - Working with municipalities and businesses to explore installation of community safe rooms and hardening projects for community facilities, businesses, and manufacturers,

    - Consideration by municipalities of adopting model mobile home park regulations which require that community safe rooms be provided for residents of new and expanding mobile home parks, and

    - Based on community and landowner interest, pursue grant funding for installation of community safe rooms in existing mobile home parks;

- Provide annual access to SKYWARN weather spotter training;

- Encourage agricultural producers to purchase crop insurance; and

- Continued coordination of emergency operations and response plans among governmental units and first responders.

The Local Planning Team decided to add the above listed components related to safe rooms and crop insurance to the hazard mitigation plan. Because the remaining measures are intended to be ongoing efforts, the Local Planning Team decided to retain them in the updated plan.

5.4 HAZARD MITIGATION PLAN COMPONENT FOR TORNADOES

As described in Chapter 3, tornadoes are natural hazard events of moderate concern to be considered in this update of the Racine County hazard mitigation plan. This section describes alternate and selected strategies to mitigate this type of hazard. As part of the updating process, these strategies were reviewed and reevaluated by the Racine County Hazard Mitigation Plan Local Planning Team in light of the updated hazard mitigation goals and hazard conditions documented in Chapters 3 and 4, respectively.

Identification of Alternative Mitigation Strategies

All tornadoes are potentially dangerous hazards within Racine County as discussed in Chapter 3. However, tornadoes have been shown to impact Racine County about once every two to three years and these are most likely to be an EF1 magnitude or less. In addition, when tornadoes and related hazard events occur, they generally last for short periods of time and impact relatively small areas upon the landscape.

While it may not be possible to accurately identify specific areas where there is significant risk from tornado events, or the number or severity of the events, measures can be taken to reduce the potential damage caused by tornado and related hazards wherever they may occur in the County. Based upon review by the Racine County Hazard Mitigation Plan Local Planning Team as part of the updating process, the following measures to reduce vulnerability to tornadoes have been identified as viable for this update of the Racine County hazard mitigation plan.

Nonstructural

- Review local building codes to determine if revisions are needed to improve the ability of structures to withstand greater wind velocities
- Conduct of an inventory and inspection of facilities to ensure the quality, quantity, and accessibility of adequate tornado shelters
- Continue the County's participation in the National Weather Service's (NWS) StormReady program
- Provide annual access to SKYWARN weather spotter training
- Organize a local tornado spotter network
- Ensure that mobile and manufactured housing is securely anchored
- Establish safe and appropriate locations for temporary debris disposal sites

Structural

- Maintain, update, and upgrade public early warning systems and networks. Consider expanding such networks as necessary. Desirable characteristics of a robust early warning system include:
    - Employing multiple means of communication to alert people of the imminent threat of severe weather. Examples of such means of communication include providing warnings and/or information through outdoor warning systems, broadcast media, cable and satellite media, electronic mail, SMS messaging, social media, apps for mobile devices, and reverse-911 telephony; and
    - Being capable of reaching those who may be vulnerable to tornadoes;
- Retrofit existing or install new structures to ensure adequate shelters from tornadoes for public buildings, major industrial sites, mobile home parks, and other large businesses or complexes such as shopping malls, fairgrounds, and other vulnerable public areas;

- Work with municipalities and businesses to explore installation of community safe rooms and hardening projects for community facilities, businesses, and manufacturers. Priority should be considered for those facilities that are located in a slab-on-grade structure and for those projects that can be completed as part of a newly planned building or building expansion;

- Provide model mobile home park regulations to municipalities for their consideration which requires that community safe rooms (storm shelters) be provided for residents of new and expanding mobile home parks. Based on community and landowner interest, pursue grant funding for installation of community safe rooms in existing mobile home parks;

- Trim and maintain the health of trees near vulnerable infrastructure, such as utility lines, essential facilities and roads, as well as near homes and businesses. Communities should prepare for emerald ash borer infestation by developing a funding strategy for removal of infested ash trees. A well planned response can minimize the impact of infestation, reduce liability, and lessen the overall cost to a community. Ash trees should be removed at the first sign of infestation of the emerald ash borer; and

- Bury and protect power and utility lines.

Public Informational and Educational Programming

- Increase public education and awareness of the potential severity of tornadoes

- Encourage residents to purchase NOAA All Hazards Weather Radios and register for emergency alert services such as CodeRED® and emergency preparedness and damage reporting mobile apps

- Promote inclusion of safety strategies for severe weather events in driver education classes and materials

- Encourage residents to develop a Family Emergency Preparedness Plan which would include the preparation of a Disaster Supply Kit (see Appendix D)

- Produce and distribute emergency preparedness information related to tornado hazards

Current Programs

Federal and State Programs

The National Weather Service issues warnings, watches, and advisories when there is a threat of severe weather conditions. The National Weather Service issues tornado watches when conditions are favorable for the development of thunderstorms that have a strong capability of producing tornadoes and issues tornado warnings when a tornado has been spotted by a trained observer or Doppler radar has indicated a developing tornado.

Federal and State programs include awareness and educational activities. The National Weather Service has an extensive public information program to educate people about the dangers of tornadoes and related hazards and assist in preventing related deaths and injuries. WEM, in conjunction with the National Weather Service and State and local government agencies, provides both preparedness information and severe weather information to the public. Preparedness information is provided during three severe weather awareness campaigns conducted during the year, each focusing on the prevalent weather hazard at that time. The Wisconsin Department of Health Services has developed a severe thunderstorm and tornado tool kit to provide information to local governments, health departments, and citizens in Wisconsin about preparing for and responding to severe thunderstorms and tornadoes. Similarly, WEM has produced several educational resources regarding tornadoes including prerecorded radio public service announcements, scripts for radio public service announcements, fliers, and educational materials for children. In addition, numerous other organizations, including the American Red Cross, provide public safety information regarding tornadoes.

Local Programs

The Racine County Office of Emergency Management has a number of brochures, booklets, and pamphlets available for the public on tornado safety and other general emergency management-related topics. In addition, the Ready Racine County website contains factsheets listing specific information regarding what to do in the event of a tornado watch or warning as well as what residents can do before, during, and after, in the event that a tornado occurs in their area. A number of local emergency management and fire departments have also instituted educational programs and communications on public safety. The Racine County Office of Emergency Management participates in all State sponsored severe weather awareness campaigns.

Racine County has undertaken a tornado shelter assessment of the public and nonpublic schools within the County. As a result of the assessment, school officials will be able to develop or revise emergency procedures and plans and initiate educational programs. The County is active in promoting mitigation through events such as safety fairs and workshops. The County has produced a coloring book to teach children how to stay safe during a natural hazard event. In addition, in 2000, the Housing Authority of Racine County in partnership with Racine County built a Safe Room in a new home. In this unique partnership, the County of Racine donated the vacant parcel to the Housing Authority of Racine County, a nonprofit organization that builds homes for certain first-time buyers. The County worked with the local technical college to conduct a survey of selected County residents to determine resident's opinions, attitude and preparedness in the event of a disaster within the County. The information gathered from the survey was used to develop public awareness campaigns as well as other hazard mitigation planning-related efforts.

Racine County currently relies on NOAA Weather Radio for tornado and related hazard warnings and encourages all local citizens to have a weather radio. In 2002, NOAA Weather Radio installed a new transmitter at CTH KR and Wood Road in Racine County (frequency is 162.450 megahertz), which covers both Racine and Kenosha Counties. In addition, tornado and related hazard warnings from NOAA Weather Radio are relayed to other media via the Federal Communication Commission's Emergency Alert System (EAS). The EAS allows officials to send emergency information targeted to specific geographical areas. The EAS sends alerts out to broadcast media, cable television providers, satellites, pagers, direct broadcast satellites, high-definition television, and video dial tones. This system uses the same digital protocols as NOAA Weather Radio. Nationally, the National Weather Service generates about 80 percent of EAS activations primarily for short-duration weather warnings and watches.

A variety of methods are used to warn people in Racine County of emergency situations, including tornadoes. These warning systems are described in the section of this chapter related to thunderstorm wind, non-thunderstorm high-winds, hail, and lightning hazards.

As described in Chapter 2, Racine County has developed a comprehensive emergency management plan which sets forth a hazard action plan. In addition, many of the local units of government have developed emergency operations plans and/or programs which complement the County plan and which also set forth procedures and actions to deal with a range of situations and events, including tornado and related hazard events.

Analysis of the vulnerability of humans, infrastructure, and economic production to tornadoes and related hazard events demonstrates that the provision of advanced warning systems; availability of adequate shelters for public buildings, major industrial sites, and other large businesses or complexes such as shopping malls; as well as public informational and educational programming are the most important mitigation actions to be considered. Racine County contains a total of 24 warning and communication siren systems, with 14 located within the City of Racine; three within the City of Burlington; two each within the Villages of Sturtevant, Waterford, and Union Grove; and one within the Town of Waterford. These sirens are regularly tested and maintained. New battery powered emergency sirens were installed at two sites in the City of Racine and the electronics on two of the sirens in the Village of Union Grove were upgraded since the last plan update.

Racine County was redesignated by the National Weather Service as a StormReady® community in 2021. This designation is valid for three years. The program is described in the previous section on hazard mitigation plan components for thunderstorm wind, high straight-line winds, hail, and lightning hazards.

Evaluation of Alternatives and Identification of Mitigation Actions

Based upon review of the above, refinement and expansion of the current ongoing programs represent a major component of the planned mitigation action with regard to early warning systems. The existing warning systems should continue to rely upon the use of multiple means of communication to alert people to the threat of severe weather. Developed urban areas located within unincorporated areas, such as major lake developments, should also be considered as needing early outdoor warning systems. The best shelters are specifically designed tornado shelters or safe rooms. Lacking such shelters, taking refuge in a basement near supporting walls or pillars, and away from windows, or, if there is no basement, taking shelter in smaller interior, windowless rooms, such as hallways or closets, can offer some protection and is the next best option. Cars, mobile homes, garages, and outbuildings are not safe shelters from tornadoes. Thus, promoting the provision of adequate safe places to seek shelter during tornadoes constitutes an additional approach to mitigating some impacts of severe storms in Racine County. Residents of mobile home parks, in particular, represent a segment of the County's population that lacks access to adequate shelters. Encouraging and promoting the construction of community safe rooms to provide shelter from tornadoes to these vulnerable populations constitutes an important addition to this hazard mitigation plan.

In addition, informing the public of the significance of tornado watches and warnings so that they take tornado warnings seriously and know where to seek shelter in emergency situations, are important, ongoing components for minimizing the risks associated with these natural hazards. Community- and school-based informational programs should also continue to be conducted by the County in partnership with Federal, State and local authorities.

Finally, other feasible, nonstructural and structural mitigation actions include incorporation of wind resistant construction methods for the protection of buildings and infrastructure; and other precautions that will limit possible future bodily injuries, deaths, or property damages due to tornado and related hazard events.

Multi-Jurisdictional Considerations

Tornadoes and their related hazards can potentially impact all municipalities within the County. In addition, these severe events can potentially cause multiple damages to a variety of infrastructure including transmission lines, communication lines, and transportation routes, as well as destroyed buildings from high winds. Hence, Racine County, municipalities, and relevant businesses should coordinate hazard mitigation activities through a cooperative County and local government partnership in countywide disaster planning and response mechanisms. Such measures are already well underway through the coordinated emergency management planning program involving the Racine County Office of Emergency Management and coordinated local community emergency operations programs.

Priority Mitigation Measures

Based upon the foregoing evaluation, consideration of risk, and review and action by the Racine County Hazard Mitigation Plan Local Planning Team (see Appendix A), the following mitigation measures related to tornado hazard events are included in the updated Racine County hazards mitigation plan:

- Maintain, update, and further develop the early warning and communication systems including coverage of NOAA All Hazard Weather Radios; Emergency Alert System (EAS) capabilities; and emerging technologies, such as the County's targeted Wireless Emergency Alerts (WEA) system, and the CodeRED® Emergency and Weather Notification System

- Promote educational and informational programming, especially related to the early warning network, including NOAA All Hazard Weather Radio, EAS broadcasts, WEA system, and the CodeRED® Emergency and Weather Notification System

- Encourage residents to develop a Family Emergency Preparedness Plan including the preparation of a Disaster Supply Kit (see Appendix D)

- Encourage the provision of safe rooms for public buildings, major industrial sites, mobile home parks, and other large businesses or complexes such as shopping malls, fairgrounds, and other vulnerable public areas. Approaches to achieve this recommendation may include:
    - Working with municipalities and businesses to explore installation of community safe rooms and hardening projects for community facilities, businesses, and manufacturers
    - Consideration by municipalities of adopting model mobile home park regulations which require that community safe rooms be provided for residents of new and expanding mobile home parks
    - Based on community and landowner interest, pursue grant funding for installation of community safe rooms in existing mobile home parks
- Provide annual access to SKYWARN weather spotter training
- Encourage agricultural producers to purchase crop insurance
- Enforcement of building code ordinance requirements
- Continue coordination of emergency response and operations plans among governmental units and first responders

Because these measures are intended to be ongoing efforts, the Local Planning Team decided to retain them in the updated plan.

5.5 HAZARD MITIGATION PLAN COMPONENT FOR EXTREME TEMPERATURES (EXTREME HEAT, EXTREME COLD)

As described in Chapter 3, extreme temperatures are natural hazard events of moderate concern to be considered in the Racine County hazard mitigation plan. This section describes alternate and selected strategies to mitigate these types of hazards. As part of the updating process, these strategies were reviewed and reevaluated by the Racine County Hazard Mitigation Plan Local Planning Team in light of the updated hazard mitigation goals and hazard conditions documented in Chapters 3 and 4, respectively.

Identification of Alternative Mitigation Strategies

Extreme temperature events pose a serious threat to Racine County and should be expected with each summer and winter season. Extreme heat and cold events do not typically occur suddenly and are generally connected to a weather system that can be forecast days in advance, making this a hazard for which plans to mitigate injury, loss of life, and property damage can be activated with sufficient advanced warning. When temperature extreme events do occur, they commonly last for extended periods of time (days or weeks) and impact entire areas larger than Racine County.

While it may not be possible to accurately identify specific areas where there is significant risk from extreme temperature, extreme heat will have the greatest impact in the large, urbanized areas of the County. Demographically, older adults, disabled populations, low income populations, or those experiencing homelessness are most vulnerable to excessive heat and cold. Fatalities are usually related to age because excessive heat is stressful and can overwhelm those who are weakened because of age or illness. Measures can be taken to reduce the potential injuries and fatalities caused by temperature extremes wherever they may occur in the County. Based upon review by the Racine County Hazard Mitigation Plan Local Planning Team as part of the updating process, the following measures to reduce vulnerability to extreme temperature events have been identified as viable for this update of the Racine County hazard mitigation plan.

Nonstructural

- Maintain, update, and upgrade public early warning systems and networks. Consider expanding such networks as necessary. Desirable characteristics of a robust early warning system include:
    - Employing multiple means of communication to alert people of the imminent threat of extreme temperatures. Examples of such means of communication include providing warnings and/or information through outdoor warning systems, broadcast media, cable and satellite media, electronic mail, SMS messaging, social media, apps for mobile devices, and reverse-911 telephone calls; and
    - Being capable of reaching those who may be vulnerable to extreme heat or cold; and
- Organize neighborhood outreach groups to assist those who may be vulnerable to extreme heat or cold;
- Continue to provide special arrangements for payment of heating bills;
- Designate sites to be used as public cooling/heating shelters during extreme temperature events. In addition:
    - Conduct an inventory and inspection of these facilities to ensure their quality, quantity, and accessibility for use as heating and/or cooling shelters;
    - Extend hours at these sites during extreme temperature events, and
    - Promote transportation options to assist those who may be vulnerable to extreme heat or cold to reach these sites during extreme temperature events;
- Reschedule public events to avoid large outdoor gatherings during periods of extreme heat or cold;
- Extend public swimming pool hours during extreme heat events;
- Establish and promote a donation program of functional window air conditioner units and fans that are no longer in use and distribute these items to those who may be vulnerable to extreme heat or cold; and
- Promote and expand winter weather clothing drives (coats, hats, mittens) where people can drop off unused winter clothing for distribution to those who may be vulnerable to extreme heat or cold.

Structural

- Promote measures to reduce heat island effects in urban areas. Examples of such measures include:
    - Increase the amount of green space throughout urban areas
    - Increase tree plantings around buildings, parking lots, and along public rights-of-way to shade surfaces that contribute to heat island formation
    - Encourage the use of "cool roofing" products made of highly reflective and emissive materials

Public Informational and Educational Programming

- Increase public education and awareness of the potential severity of extreme temperature events and distribute emergency preparedness information related to such events
- Encourage residents to purchase NOAA All Hazards Weather Radios and register for emergency alert services such as CodeRED® and emergency preparedness and damage reporting mobile apps

- Increase awareness of public cooling/heating shelters that are available during extreme heat and cold events. Post the locations of these shelters online, and in newsletters

- Produce and distribute emergency preparedness information related to the safe operation of generators, space heaters, fireplaces, and wood stoves

Current Programs

Federal and State Programs

The NWS issues warnings, watches, and advisories when there is a threat of severe weather conditions. Several categories of warnings, watches, and advisories apply to extreme temperature conditions and associated hazards. The NWS Milwaukee/Sullivan office will issue an excessive heat warning when daytime high temperatures of 105°F or higher and nighttime temperatures of 75°F or higher are expected to occur over a 48-hour period or when high temperatures of 100°F or more are expected over four or more consecutive days. The office will issue a heat advisory when daytime high temperatures of 100°F or higher are expected or when daytime high temperatures are expected between 95°F and 99°F for four or more consecutive days. The NWS office will issue wind chill warnings for Racine County when wind chill values reach -35°F or colder, with wind speeds of at least four mph that are expected to occur for three hours or more. A wind chill advisory is issued when wind chill values will reach -20°F to -34°F, with wind speeds of 4 mph or more.

Heat waves cannot be prevented; therefore, it is important to provide notice of adverse conditions so that the public can anticipate and avoid health-threatening situations. Excessive heat alert thresholds specific to major metropolitan centers are determined based on research results that link unusual amounts of heat-related deaths to city-specific meteorological conditions. The alert procedures are:

- Include Heat Index values in zone and city forecasts

- Issue Special Weather Statements and/or Public Information Statements presenting a detailed discussion of 1) the extent of the hazard including Heat Index values, 2) who is most at risk, and 3) safety guidelines for reducing the risk

- Assist State and local health officials in preparing civil emergency messages in severe heat waves. Meteorological information from Special Weather Statements will be included, as well as medical information, advice, and names and telephone numbers of health officials

- Release to the media and over the NOAA Weather Radio all of the above information

State programs include awareness and education efforts. WEM, in conjunction with the National Weather Service and State and local government agencies, provides both preparedness information and severe weather information to the citizens of Wisconsin. Preparedness information is provided during three severe weather awareness campaigns conducted during the year, each focusing on the prevalent weather hazard at that time. The Wisconsin Department of Health Services has developed an extreme heat toolkit to provide information to local governments, health departments, and citizens in Wisconsin about preparing for and responding to extreme heat events. Similarly, the Department has developed a winter weather toolkit to provide information about winter weather, including extreme cold. WEM has produced several educational resources regarding extreme heat and winter weather, such as extreme cold, including prerecorded radio public service announcements, scripts for radio public service announcements, fliers, and educational materials for children. In addition, numerous other organizations, such as the American Red Cross, provide public safety information.

Local Programs

Programs within Racine County include those conducted by the Racine County Office of Emergency Management. The Racine County Office of Emergency Management has information available for the public on extreme temperatures and other general emergency management-related topics, and also participates in all State sponsored severe weather awareness campaigns. The City of Racine Health Department and the Racine County Public Health Division maintain a list of warming centers and cooling centers available throughout the County that provide safe environments to prevent adverse effects from extreme temperatures. Individuals are encouraged to contact the specific location to verify their operating hours before visiting. During extreme heat events, some locations may have extended hours.

Racine County was redesignated by the National Weather Service as a StormReady® community in 2021. This designation is valid for three years. This program, which includes actions related to extreme temperature conditions, is described in the section above on hazard mitigation plan components for thunderstorm, high-wind, hail, and lightning hazards.

A variety of methods are used to warn people in Racine County of emergency situations, including extreme temperatures. These warning systems are described in the section of this chapter related to thunderstorm wind, non-thunderstorm high-winds, hail, and lightning hazards.

As described in Chapter 2, Racine County has developed a comprehensive emergency management plan which sets forth a hazard action plan. In addition, many of the local units of government have developed emergency operations plans and/or programs which complement the County plan and which also set forth procedures and actions to deal with a range of situations and events, including extreme temperature hazard events.

Evaluation of Alternatives and Identification of Mitigation Actions

Based upon review of the above, the current ongoing informational and educational programs represent a major component of the planned mitigation action. Racine County should promote basic strategies to reduce injuries and fatalities, hazard awareness, and community involvement. Temperature hazards are faced by Racine County residents annually and the ability to make positive decisions concerning exposure limits will depend on safety awareness. Analysis of the vulnerability of humans, infrastructure, and economic production caused by extreme temperature events demonstrates that the provision of advanced weather forecasting systems; availability of adequate shelter from the heat and cold in public buildings, major industrial sites, and other large businesses or complexes such as shopping malls; and public informational and educational programming are the most important mitigation actions to be considered. Public service announcements regarding avoiding heat stress help to minimize exposure. Racine County supports measures presently implemented by the National Weather Service; national, State, and local health organizations; and the media preceding and during excessively hot weather. It is also important to continue to encourage concern and awareness of neighbors, especially of those who are older adults, disabled, whose incomes are below the federal poverty threshold, or are experiencing homelessness. Outreach to these people to inform them of the availability and location of heating and cooling shelters within the County is also an important component to keeping safe those who are vulnerable to extreme temperature events. Community and school-based informational programs should also continue to be conducted by the County in partnership with Federal, State and local authorities.

Multi-Jurisdictional Considerations

Extreme temperature events are primarily a public health concern for all communities within the County and ultimately prevention should fall to the neighborhood watch groups and local authorities. These events can affect all individuals in the County, however, they are particularly dangerous for those who are older adults, disabled, whose incomes are below the federal poverty threshold, or are experiencing homelessness who cannot access shelter with adequate heat or air conditioning. A coordinated effort involving the Racine County Office of Emergency Management and local community emergency operations programs will be needed to identify and protect individuals vulnerable to temperature-related hazards.

Priority Mitigation Measures

Based upon the foregoing evaluation, consideration of risk, and review and action by the Racine County Hazard Mitigation Plan Local Planning Team (see Appendix A), the following mitigation measures related to extreme temperature events are included in the updated hazard mitigation plan for Racine County:

- Organize neighborhood outreach groups to assist those who may be vulnerable to extreme heat or cold

- Designate sites to be used as public cooling/heating shelters during extreme temperature events. In addition:
    - At the request of the sites' owners, conduct inventories and inspections of these facilities to ensure their quality, quantity, and accessibility for use as heating and/or cooling shelters
    - Encourage the sites' owners to extend hours at these sites during extreme temperature events
    - Promote transportation options to assist those who may be vulnerable to extreme heat or cold to reach these sites during extreme temperature events
- Increase awareness of public cooling/heating shelters that are available during extreme heat and cold events. Post the locations of these shelters online, and in newsletters
- Continue to provide special arrangements for payment of heating bills
- Maintain, update, and further develop the early warning and communication systems including coverage of NOAA All Hazard Weather Radios; Emergency Alert System (EAS) capabilities; and emerging technologies, such as the County's targeted Wireless Emergency Alerts (WEA) system, and the CodeRED® Emergency and Weather Notification System
- Promote educational and informational programming, especially related to the early warning network, including NOAA All Hazard Weather Radio, EAS broadcasts, WEA system, and the CodeRED® Emergency and Weather Notification System
- Produce and distribute emergency preparedness information related to the safe operation of generators, space heaters, fireplaces, and wood stoves

Because these measures are intended to be ongoing efforts, the Local Planning Team decided to retain them in the updated plan.

5.6 HAZARD MITIGATION PLAN COMPONENT FOR LAKE MICHIGAN COASTAL HAZARDS

As described in Chapter 3, Lake Michigan bluff recession, shoreline erosion, flooding, and shoreline protection structure damages are natural hazard events of moderate concern to be considered in the Racine County hazard mitigation plan. This section describes alternate and selected strategies to mitigate these types of hazards. As part of the updating process, these strategies were reviewed and reevaluated by the Racine County Hazard Mitigation Plan Local Planning Team in light of the updated hazard mitigation goals and hazard conditions documented in Chapters 3 and 4, respectively.

Identification of Alternative Mitigation Strategies

As reported in Chapter 3, a number of studies and planning programs have been carried out relating to Lake Michigan coastal erosion and related hazards. A review of those plans and materials developed under the State of Wisconsin Coastal Management Program indicates a range of alternative shoreline erosion control mitigation measures. In the review by the Racine County Hazard Mitigation Plan Local Planning Team as part of the updating process, the following measures to reduce the vulnerability to shoreline erosion and related hazards were considered as viable for incorporation into this update of the Racine County hazard mitigation plan.

Nonstructural

- Conduct an updated assessment of the condition and effectiveness of shoreline protection structures in the County. Such an assessment of structures along Lake Michigan in Racine County was last conducted in 2005;

- Consider a study to update bluff recession rates along the Lake Michigan coast and compare these rates to past reports. Bluff recession rates as reported in the 1982 Lake Michigan coastal erosion management study are used for the delineation of non-structural setback overlay erosion risk distance and stable slope distances as set forth in Chapter 20, Division 36 and 37 of the Racine County Code. The 1982 Lake Michigan coastal erosion management study recommends that bluff recession rates be remeasured at approximately 10-year intervals, as appropriate aerial photography becomes available. An updated study of bluff recession rates could determine any correlation of these rates with fluctuating Lake Michigan water levels, and potential effects on bluff recession due to climate change;

- Continue ongoing programs to update, refine, and map shoreline erosion risk data using geographic information system mapping. Such mapping would include shoreline erosion risk areas along with property and other cadastral features mapping;

- Continue working with Wisconsin Coastal Management Program (WCMP) through the Coastal Natural Hazards Work Group to review existing zoning ordinances, other regulations, and comprehensive plans to evaluate the effectiveness of existing local regulations and identify opportunities to better address coastal hazards;

- Develop, adopt, and enforce shoreland zoning ordinances incorporating bluff setback provisions for new development or redevelopment (Guidance on setback provisions is available from the Wisconsin Coastal Management Program); and

- Continue to review wastewater treatment plant outfall capacity to determine capacity at high lake levels. The Racine Utility has completed a wastewater treatment facility plan which included a hydraulic capacity evaluation and includes recommendations for a new additional outfall to provide adequate hydraulic capacity. The new outfall was completed in 2005.

Structural

- Construct and maintain shoreline protection structures and bluff stabilization measures where urban development commitments have been made dictating the need for structures. Effective shore protection requires a combination of bluff stabilization, surface water and subsurface water control, and bluff toe protection. The following considerations should be evaluated prior to any project (Table 5.7 sets forth minimum criteria to use as a basis for structure design.):

    - Structural shore protection measures should be installed if other less invasive measures are inadequate in reducing shoreline erosion and if it can be shown that such measures will effectively reduce shoreline erosion while not adversely affecting adjacent sections of the shoreline.

    - Fish and wildlife preservation measures to limit any adverse impacts during construction should be considered and implemented;

    - Assistance from a geotechnical engineer or geologist trained in slope stabilization, an engineer trained in shore protection design, and a qualified marine contractor should be involved throughout the stabilization project; and

    - It can often be more economical and effective to plan and implement shoreline protection or bluff stability projects in concert with design and implementation of such measures for neighboring properties.

- The WDNR may allow the placement of temporary emergency material in public waters if the landowner makes a request in writing to protect a structure or infrastructure from an eroding shoreline or bluff. Such a request must include descriptions of the type and amount of material that will be used, where this material will be placed, and how the material will be put into place. A letter authorizing the placement of temporary emergency structures may then be sent by the WDNR to the landowner. If such authorization is granted, the landowner may proceed with placing the temporary measures, subject to the condition that the landowner must actively work toward

Table 5.7
Minimum Criteria for Shore Protection Structures Adapted from Criteria Recommended by the Racine County Technical Subcommittee on Shoreland Development Standards

Category	Criteria Required to be Met
Support Information	1. Determine lake bottom profiles offshore of proposed structure and 300 feet on both sides of the structure, from the structure out to a water depth of at least 12 feet 2. Identify existing and planned septic tank systems on the property to be protected and on adjacent properties, and consider the impact of the systems on bluff stability 3. Consider design wave height, wave direction, and the erosive impacts of wave action on the proposed structure
Structural Design	1. Size structure for design waves expected for a two-percent-annual-probability lake level, or 584.2[a] feet above the National Geodetic Vertical Datum (1929)[b] 2. Provide measures to protect the base of the structure against wave scouring 3. Design loose rubble revetment structures with a slope not greater than one vertical on two horizontal 4. Avoid structural damage or erosion on the landward side of the structure by preventing the overtopping of the structure by storm waves, or by providing for the positive drainage of any water which overtops the structure 5. Provide measures to prevent excessive erosion along the flanks of the structure 6. Provide adequate bedding materials to prevent undercutting of the structure
Bluff Stabilization	1. Regrade the bluff to a one on two and one half slope; unless detailed site-specific engineering analyses indicate that a different slope would be stable 2. If the groundwater level is occasionally higher than the lake level and threatens bluff stability, provide subsurface drainage facilities to intercept the groundwater, if necessary 3. If necessary, provide for interception drainage of surface water runoff to prevent surface erosion and saturation of the soils in the bluff 4. Provide adequate vegetative cover of the bluff slope after regrading

[a] *U.S. Army Corps of Engineers Detroit District, Revised Phase I Report on the Great Lakes Open-Coast Flood Levels, April 1988.*

[b] *The Technical Subcommittee established the 2-percent-annual-probability elevation based on Lake Michigan levels available at the time. That elevation has been superseded by the U.S. Army Corps of Engineers 1988 report.*

Source: SEWRPC and the Racine County Technical Subcommittee on Shoreland Development Standards, Recommendations of the Racine County Technical Subcommittee on Shoreland Development Standards for the Racine County Land Use Committee, *1982.*

planning, designing, and implementing a permanent shoreline protection solution through the State permitting process set forth in Chapter 30, "Navigable Waters, Harbors, and Navigation," of the *Wisconsin Statutes*;

- Relocate buildings within a high-risk area. (The Racine County coastal erosion management plan suggests this option as viable in instances where the building can be moved by conventional methods at a cost equal to, or less than, 30 percent of the value of an equivalent building located on secure ground); and

- In circumstances where buildings cannot be relocated safely or economically, or where bluff recession has progressed to the point where the risk of catastrophic failure of the slope is imminent, or where there is an imminent threat of failure within five years, acquisition and demolition of structures should be considered. This plan element is presented as an option, subject to the preference of the individual property owner.

Public Informational and Educational Programming

- Work with WCMP to develop, refine, and distribute guidance and education to local decision makers, permitting staff, developers, consultants, and homeowners related to coastal hazards

- Work with WCMP to conduct public outreach and to provide technical assistance to decision-makers and landowners regarding best management practices to prevent shoreline erosion and bluff recession including shoreline protection structures, planting proper vegetation, and stormwater/groundwater drainage practices

- Provide information on shoreland erosion related hazards to serve as a "fair warning" guide for groups such as realtor-brokers, shoreline property owners, developers, lending institutions, and prospective buyers

- Encourage residents to purchase NOAA All Hazards Weather Radios and register for emergency alert services such as CodeRED® and emergency preparedness and damage reporting mobile apps

Current Programs

Federal Programs

The USACE exercises some control over lake levels through the use of water controls, such as locks and dams. However, these impacts are minimal compared to the impacts due to climatic influence.

FEMA produced a Draft Great Lakes Coastal Guidelines Update, dated March 2009, which includes new methodology to determine flood hazard zones within the FEMA Region V coastal zone. Final guidelines were issued in 2014. Future steps include pilot studies to evaluate the new methodologies at specific Great Lakes locations followed by a prioritization of coastal mapping needs within the FEMA region for future analyses. The ultimate goal of these efforts will be a remapping of flood hazards along the Great Lakes coastal areas that would subsequently be reflected in revised Federal flood insurance studies.

In cooperation with the University of Wisconsin-Madison's Sea Grant Institute, Department of Civil and Environmental Engineering, Land Information and Computer Graphics Facility, the WDNR, several private consultants and agencies from the State of Michigan, the USACE organized the Lake Michigan Potential Damages Study (LMPDS). The objective of this research project, which took place between 1996 and 2000, was to create a modeling procedure and engineering-management tool for predicting future shoreline retreat and estimating economic effects of lake level changes and related social, environmental, and cultural impacts.

The Great Lakes Coastal Flood Study (GLCFS) is a multi-year project led by FEMA to determine what physical processes would need to be included in updated FEMA coastal flood hazard mapping of the Great Lakes coastal communities. These flood maps and related information will be tools that can help communities identify high-risk areas and guide land use planning and capital investments to mitigate future losses.

In May 2016, the Village of Mount Pleasant asked the USACE to consider conducting a study for an emergency bluff stabilization project to protect public infrastructure on a 900-foot-long stretch along the Lake Michigan coast from the old fire department station near the intersection of Sheridan Road and Walter Avenue, north to Graceland Avenue. Section 14 of the Flood Control Act of 1946 authorized the USACE to construct emergency streambank and shoreline erosion protection to protect public infrastructure such as public buildings, roads, and utilities that are endangered by flood-caused bank or shoreline erosion. The USACE has agreed to study whether there is a viable project that fits the Section 14 authority and protects public property in the Village of Mount Pleasant. Suggestions from the USACE on long-term solutions to slow or stop bluff erosion will be the product of the roughly two-year feasibility phase study. During the feasibility phase, Federal interest is determined by evaluating different alternatives, comparing costs and benefits, and identifying potential environmental effects. If a project is deemed to be viable for Section 14 funding, the study will recommend proceeding to the design and implementation phase. The first $100,000 of the feasibility phase is provided by the Federal government and costs exceeding $100,000 must be cost-shared 50/50 with a non-Federal project sponsor. Costs for the design and implementation phase of a project would be shared 65 percent Federal and 35 percent non-Federal. Each project is limited to a total Federal cost of $5 million. Portions of the non-Federal costs can be in the form of lands, easements, rights-of-way, relocations, and disposal areas.

State Programs

Wisconsin's Shoreland Management Program is a partnership between State and local government that requires the adoption of County shoreland zoning ordinances to regulate development near navigable lakes and streams, in compliance with statewide minimum standards. These minimum statewide standards are set forth in Chapter NR 115, *Wisconsin Administrative Code*.

The Wisconsin Coastal Management Program (WCMP), which is part of the Wisconsin Department of Administration, Division of Intergovernmental Relations, oversees management of the State's coastal resources and strives to maintain a balance between preservation and economic needs. Established in 1978 under the Federal Coastal Zone Management Act, the WCMP works to preserve, protect, and wisely use the resources of the Lake Michigan and Lake Superior coastline for this and future generations. The WCMP provides guidance and grants to encourage the management and protection of Wisconsin's coastal resources and to increase public access to the Great Lakes. The WCMP has constituted an interagency coastal hazards work group formed by staff from the WDNR, University of Wisconsin-Madison's Sea Grant Institute, State Cartographer's Office, and the Wisconsin Emergency Management Program as a forum to coordinate initiatives related to coastal management in the State.

The WCMP created a web-based tool that allows users to examine photos from the late 1970s and compare them to corresponding photos from 2007 and 2008 to assess changes to the shoreline. GIS layers for shore structures, beach protection, and bluff conditions for each time frame allow for more detailed analysis of shoreline and bluff changes.

The University of Wisconsin Sea Grant is a statewide program of basic and applied research, education, outreach and technology transfer dedicated to the stewardship and sustainable use of the Great Lakes. The Sea Grant staff has, over the years, provided substantial support to Racine County in dealing with Lake Michigan shoreline management issues.

Local Programs

As reported in Chapter 1, Racine County, the City of Racine, and the Villages of Caledonia, Mount Pleasant, and Wind Point have adopted shoreland zoning regulations which apply to the Lake Michigan shoreland area. The Racine County regulations related to Lake Michigan bluff setbacks are set forth in Chapter 20, Division 36 (structural setback overlay district) and Division 37 (nonstructural setback overlay district) of the Racine County Code. The County bluff setback regulations continue to apply to lands annexed by the City of Racine after May 7, 1982. The Villages of Caledonia and Mount Pleasant have adopted the County's bluff setback requirements by reference into the Village zoning ordinances. Although the Village of Wind Point zoning ordinance does not include specific bluff setback regulations, the Village ordinance applies a shoreland overlay zoning district within 1,000 feet of the Lake Michigan shoreline. The overlay district generally requires approval of a conditional use permit for alterations of steep slopes within the shoreland area.

The current County shoreland regulations regarding Lake Michigan setbacks for development and shore protection, which have been incorporated into Caledonia and Mount Pleasant ordinances, are sound and represent current planning recommendations. The ordinances provide for the use of shoreline protection, bluff stabilization structural measures, and bluff setbacks for development along portions of the Lake Michigan shoreline where urban shoreline development exists or is envisioned, and provides for a larger setback for development in areas where structural protection is not envisioned to be used due to limited planned urban development. County regulations adopted as part of the Caledonia and Mount Pleasant ordinances also provide for specific procedures for the design and review of shore protection measures. These shoreline regulations were developed under the guidance of a County Technical Subcommittee and are documented in a 1982 Lake Michigan coastal erosion management plan. Village of Wind Point regulations for development of steep slopes within the shoreland overlay district require an engineer's report and review and approval of the report by the Village.

A variety of methods are used to warn people in Racine County of emergency situations, including Lake Michigan coastal hazards. These warning systems are described in the section of this chapter related to thunderstorm wind, non-thunderstorm high-winds, hail, and lightning hazards.

Racine County has an ongoing program of inspection and maintenance of shoreline protection structures owned by the County. In addition, the effectiveness and condition of the shoreline protection structures along the lakefront in Racine County was assessed in 2005, and the report was published in 2008.

Evaluation of Alternatives and Identification of Mitigation Actions

A review of the alternative measures noted above and the status of ongoing programs indicates that all of the measures noted above are considered to be appropriate for inclusion in the Racine County hazard mitigation plan. The measures noted have been developed, evaluated, and recommended in other studies and programs.

Multi-Jurisdictional Considerations

The plan elements for Lake Michigan shoreline erosion and related problems correspond only to the City of Racine; the Villages of Caledonia, Mt. Pleasant, North Bay, and Wind Point.

Priority Mitigation Measures

Based upon the foregoing evaluation, consideration of risk, and review and action by the Racine County Hazard Mitigation Plan Local Planning Team (see Appendix A), the following mitigation measures related to Lake Michigan coastal hazards are included in the updated Racine County Hazard Mitigation Plan:

- Continue to enforce and review the County shoreland regulations and policies relating to setbacks for new development or redevelopment and structural shoreline erosion protection and bluff stabilization measures.

- Review of Lake Michigan shoreline municipal shoreland ordinances to assess the need for updating to be consistent with the Wisconsin Coastal Management Program guidance for development setbacks and structural shoreline erosion protection and bluff stability measures.

- Reevaluate the effectiveness of Lake Michigan shoreline protection structures in the County at a 10-year interval, building from the 2005 cooperative program involving Racine County, the Coastal Management Program, the WDNR, and the University of Wisconsin Sea Grant Institute.

- Where possible, relocate buildings within a high-risk area. In circumstances where buildings cannot be relocated safely or economically, or where bluff recession has progressed to the point where the risk of catastrophic failure of the slope is imminent, or where there is an imminent threat of failure within five years, acquisition and demolition of structures should be considered. This plan element is presented as an option, subject to the preference of the individual property owner.

- Continue maintenance and construction of new shoreline protection structures to protect urban development in selected areas of the County and under the provisions provided for under the County Lake Michigan coastal erosion management plan.

- Continue ongoing programs to update and refine coastal hazard area data using geographic information system technology.

- Provide public informational and educational programming on shoreline erosion hazards and allowable property owner shoreline and bluff management actions.

5.7 HAZARD MITIGATION PLAN COMPONENT FOR SEVERE WINTER STORMS (HEAVY SNOWSTORM, BLIZZARD, ICE STORM)

As described in Chapter 3, winter storms are natural hazard events of moderate concern to be considered in the Racine County hazard mitigation plan. This section describes alternate and selected strategies to mitigate this type of hazard. As part of the updating process, these strategies were reviewed and reevaluated by the Racine County Hazard Mitigation Plan Local Planning Team in light of the updated hazard mitigation goals and hazard conditions documented in Chapters 3 and 4, respectively.

Identification of Alternative Mitigation Strategies

Severe winter weather can include blizzards, freezing rain, sleet, ice, and dangerous combinations of temperatures and wind. Winter storms may last for days completely shutting down businesses and government, while isolating residents in their homes. Extreme cold temperatures, often connected to winter storm events, are the number two natural hazard cause of deaths in the State. Additionally, indirect injuries and fatalities from activities associated with winter storms include heart attacks while shoveling snow, automobile accidents, and improper use of space heaters. Severe winter storm fronts can often be tracked, which generally provides ample warning for potentially affected areas to take preventative actions.

While it may not be possible to accurately predict the number or severity of winter storm events, measures can be taken to reduce the potential damage caused by winter storms and their related hazards whenever they may occur in the County. High wind, freezing rain, sleet, ice, and snow may be associated with a winter storm. In the review by the Racine County Hazard Mitigation Plan Local Planning Team as part of the updating process, the following measures to reduce vulnerability to these dangers have been identified as viable for this update of the Racine County hazard mitigation plan.

Nonstructural

- Review local building codes to determine if revisions are needed to improve the structure's ability to withstand greater wind velocities and snow weight

- Review the energy efficiency and winter readiness of critical facilities and housing in the community

- Ensure that the necessary amount of snow removal, anti-icing, and deicing equipment is available and operational

Structural

- Maintain, update, and upgrade public early warning systems and networks. Consider expanding such networks as necessary. Desirable characteristics of a robust early warning system include:

    - Employing multiple means of communication to alert people of the imminent threat of severe weather. Examples of such means of communication include providing warnings and/or information through outdoor warning systems, broadcast media, cable and satellite media, electronic mail, text messaging, social media, apps for mobile devices, and reverse-911 telephone calls; and

    - Being capable of reaching those who may be vulnerable to winter storm related hazards;

- Work with utility companies to assess and improve, as needed, electric service systems reliability;

- Consider burying utilities at critical and vulnerable junctions to avoid power loss due to downed lines;

- Trim and maintain the health of trees near vulnerable infrastructure, such as utility lines, essential facilities and roads, as well as near homes and businesses. Communities should prepare for emerald ash borer infestation by developing a funding strategy for removal of infested ash trees. A well planned response can minimize the impact of infestation, reduce liability, and lessen the overall cost to a community. Ash trees should be removed at the first sign of infestation of the emerald ash borer; and

- Promote planting windbreaks and installing snow fences to protect farm crops and highways.

Public Informational and Educational Programming

- Promote winter hazard awareness, including home and travel safety measures, such as avoiding travel during winter storms; having a shovel, sand, warm clothing, food, and water, if travel cannot be avoided; and installing a back-up heating system in at least one room in the home

- Encourage residents to purchase NOAA All Hazards Weather Radios and register for emergency alert services such as CodeRED® and emergency preparedness and damage reporting mobile apps

- Promote inclusion of safety strategies for severe weather events in driver education classes and materials

- Encourage residents to develop a Family Emergency Preparedness Plan including the preparation of a Disaster Supply Kit (see Appendix D)

- Produce and distribute emergency preparedness information related to winter storm hazards

- Maintain and update shelter sites that have back-up emergency power sources

Current Programs

Federal and State Programs

The NWS issues warnings, watches, and advisories when there is a threat of severe weather conditions. Several categories of warnings, watches, and advisories apply to winter weather conditions and associated hazards. The NWS Milwaukee/Sullivan office will issue a winter storm warning when one or more of the following weather events are expected to occur over a period of 12 or fewer hours:

- Snowfall greater than six inches
- Sleet accumulations of two or more inches
- Intermittent blowing snow that reduces visibility below one-half mile with winds of 25 to 34 mph or closed roads
- Less than one-quarter inch of freezing rain accompanied by another winter event

NWS forecasters also have discretion to issue winter storm warnings for events that may not officially reach warning criteria but are expected to have a significant impact on the public. The NWS Milwaukee/Sullivan office will issue a winter weather advisory when one or more of the following weather events are expected to occur over 12 or fewer hours:

- Snowfall of three to six inches
- Sleet accumulations of less than two inches
- Intermittent blowing snow that reduces visibility below one-half mile with winds of less than 25 mph
- Less than one-quarter inch of freezing rain accompanied by another winter event

The NWS office will issue a blizzard warning under conditions of sustained winds or frequent gusts of 35 mph or more and falling or blowing snow which reduces visibility to one-quarter mile or less for three or more hours. The office will issue an ice storm warning when ice accumulations of one-quarter inch or more are expected over a period of 12 or fewer hours and a freezing rain advisory when ice accumulations of less than one-quarter inch are expected over a period of 12 or fewer hours.
Cold, dry air passing over warmer waters of Lake Michigan can produce snow squalls in downwind shoreline communities of Racine County. The NWS office will issue a lake effect snow warning when more than six inches of heavy lake effect snow squall accumulations are expected within a period of 12 hours. A lake effect snow advisory will be issued when three to six inches of lake effect snow squall accumulations are expected over a period of 12 hours or less.

The NWS bulletins are disseminated over a number of telecommunication channels, including the NOAA Weather Radio All Hazard radio network, the NOAA All Hazards Weather Wire, and the State law enforcement TIME system, and through an emergency e-mailing network. In addition, these bulletins are relayed to other local media via the Federal Communication Commission's Emergency Alert System (EAS) which rebroadcast the weather bulletins over public and private television and radio stations.

Federal and State programs include awareness and education activities. WEM, in conjunction with the National Weather Service, other State agencies, and local emergency management organizations, provides awareness and preparedness information to the public. This information is provided in three severe weather awareness campaigns conducted annually, each focusing on the prevalent weather hazard at that time. In November each year, Winter Awareness Week focuses on informing and educating people concerning the hazards presented by severe winter weather and information on preparedness for extreme weather conditions during winter. The Wisconsin Department of Health Services has developed a weather took kit to provide information to local governments, health departments, and citizens in Wisconsin about preparing for and responding to winter storm events. Similarly, the Wisconsin Department of Emergency Management has produced several educational resources regarding winter weather, including prerecorded radio public service announcements, scripts for radio public service announcements, fliers, and educational materials for children.

The Wisconsin Building Code specifies design requirements to minimize vulnerability to winter storms by setting the load capacity of roofs by region based on likely maximum snowfall. The National Weather Service reports that 70 percent of winter storm fatalities occur in automobiles, therefore, listening to weather advisories and avoiding travel during winter storms would help prevent many fatalities.

Local Programs

The Racine County Office of Emergency Management has a number of brochures, booklets, and pamphlets available for the public on winter weather safety and other general emergency management-related topics. In addition, the Ready Racine County website contains factsheets listing specific information regarding what to do in the event of a winter storm watch or warning as well as what residents can do before, during, and after a winter storm occurs in their area. The Racine County Office of Emergency Management also participates in all State sponsored severe weather awareness campaigns.

Community strategies include plowing, salting and sanding roads, maintaining the health of urban trees to minimize damage from ice storms, and promoting sound levels of home insulation. Older homes can be vulnerable to heat loss and any home is vulnerable to power loss, therefore, possession of a safe alternative heat and power source is a consideration in protecting against winter storm hazards.

As described in Chapter 2, Racine County has developed a comprehensive emergency management plan, which sets forth a hazard action plan. In addition, many of the local units of government have developed emergency operations plans and/or programs which complement the County plan and which also set forth procedures and actions to deal with a range of situations and events, including winter storm events.

Racine County was redesignated by the National Weather Service as a StormReady® community in 2021. This designation is valid for three years. The program is described in the previous section on hazard mitigation plan components for thunderstorm wind, non-thunderstorm high-wind, hail, and lightning hazards.

A variety of methods are used to warn people in Racine County of emergency situations, including winter storms. These warning systems are described in the section of this chapter related to thunderstorm wind, non-thunderstorm high-winds, hail, and lightning hazards.

Evaluation of Alternatives and Identification of Mitigation Actions

Analysis of the vulnerability of humans, infrastructure, and economic production to winter storms and related hazard events demonstrates that the provision of advanced weather forecasts and warning systems, as well as public informational and educational programming, are the most important mitigation actions to be considered. In addition, informing the public of the significance of winter storm watches and warnings so that they take these events seriously and know where to seek shelter in emergency situations, are important, ongoing components to minimizing the risks associated with these natural hazards. The formation of a neighborhood outreach program to assist those who may be vulnerable to winter storms is an important element in ensuring that everyone is protected during these events and assistance is available to those who need help clearing away snow or ice after these events. Community and school based informational programs are currently being conducted by the County in partnership with Federal, State and local authorities.

Multi-Jurisdictional Considerations

Winter storms and their related hazards can potentially impact all municipalities within the County. In addition, these severe events can potentially cause multiple damages to a variety of infrastructure including transmission lines, communication lines, and transportation routes due to slippery conditions and reduced visibility. Racine County, the local units of government and relevant businesses need to coordinate hazard mitigation activities through local government participation in countywide disaster planning and response mechanisms. Such measures are already well underway through the coordinated emergency management planning program involving the Racine County Office of Emergency Management and coordinated local community emergency operations programs.

Priority Mitigation Measures

Based upon the foregoing evaluation, consideration of risk, and review and action by the Racine County Hazard Mitigation Plan Local Planning Team (see Appendix A), the following mitigation measures related to winter storm events are included in the updated hazard mitigation plan for Racine County:

- Organize neighborhood outreach groups to assist those who may be vulnerable to winter storm related hazards;
- Identify and advertise a list of available heated shelters in the immediate area;
- Maintain, update, and further develop the early warning and communication systems including coverage of NOAA All Hazard Weather Radios; Emergency Alert System (EAS) capabilities; and emerging technologies, such as the County's targeted Wireless Emergency Alerts (WEA) system and the CodeRED® Emergency and Weather Notification System
- Promote educational and informational programming, especially related to the early warning network, including NOAA All Hazard Weather Radio, EAS broadcasts, WEA system, and the CodeRED® Emergency and Weather Notification System
- Encourage residents to develop a Family Emergency Preparedness Plan including the preparation of a Disaster Supply Kit (see Appendix D);
- Ongoing review and enforcement of building code ordinance requirements;
- Work with agencies, such as the American Red Cross, to establish a system to provide for short-term shelters and shelter operations during severe winter storm event situations;
- Continued coordination of emergency response plans among governmental units and first responders;
- Continue and refine State, County, and local road maintenance programs; and
- Work with utilities to assess and improve, as needed, electrical service systems reliability. Such improvements should include consideration of burying utilities at critical and vulnerable junctions to avoid power loss due to downed lines.

Because most of these measures are intended to be ongoing efforts, the Local Planning Team decided to retain them in the updated plan.

5.8 HAZARD MITIGATION PLAN COMPONENT FOR DROUGHT

As described in Chapter 3, droughts are natural hazard events of limited concern to be considered in the Racine County hazard mitigation plan. This section describes alternate and selected strategies to mitigate this type of hazard. As part of the updating process, these strategies were reviewed and reevaluated by the Racine County Hazard Mitigation Plan Local Planning Team in light of the updated hazard mitigation goals and hazard conditions documented in Chapters 3 and 4, respectively.

Identification of Alternative Mitigation Strategies

Stresses on the water resources of Racine County include: a growing population, increased competition for available water, and loss of groundwater recharge areas due to development. Severe droughts result from extended periods of limited or no rainfall, which generally provides ample warning for potentially affected areas to take preventative actions. When drought events do occur, they commonly last for extended periods of time (weeks or months) and impact a relatively large area.

While it may not be possible to accurately predict specific areas where there is significant risk from extreme drought, droughts have the greatest impact on agricultural producers. Racine County has 115,737 acres of

farmland, and even droughts of limited duration can significantly reduce crop growth and yields, adversely affecting farm income. More substantial events can decimate croplands and result in total loss, negatively impacting the individual producers and the local economy. Although nothing can prevent a drought, measures can be taken to reduce the potential loss caused by droughts wherever they may occur in the County. In review by the Racine County Hazard Mitigation Plan Local Planning Team as part of the updating process, the following measures to reduce vulnerability to drought events have been identified as viable for this update of the Racine County hazard mitigation plan.

Nonstructural

- Encourage the development and maintenance of drought emergency plans for local utilities and local communities. Such plans should include:
    - Development of criteria for triggering drought-related actions, and
    - Specification of water use regulations to be initiated during drought conditions;
- Encourage the development of local water conservation programs. Such programs may include provisions such as:
    - Water supply system efficiency actions including water audits, meter testing, leak detection and repair, water main maintenance and replacement, water system audits, and water production system refinement,
    - Public information and education programming, distribution of educational materials, and presentations to schools and civic groups;
    - Outdoor watering reduction measures such as the use of rain barrels or implementation of lawn and landscape plant watering restrictions when a severe drought is occurring,
    - Development and use of water conservation rate structures, and/or
    - Fixture and plumbing system retrofits;
- Protect areas of high and very high groundwater recharge potential from inappropriate development and promote regional activities to protect groundwater recharge areas outside of the County boundaries;
- Identify areas with potential groundwater level problems and inspect wells in those areas for adequate depth and construction;
- Promote the use of agricultural methods that reduce evaporation and/or promote infiltration. Such methods may include planting windbreaks for farm crops, planting cover crops, use of no-till or reduced-till methods, and contour plowing;
- Encourage the use of drought-resistant landscaping practices using native plantings;
- Promote the use of green infrastructure and other stormwater management practices that facilitate aquifer recharge, such as rain gardens, permeable pavement, and soil amendments;
- Support agricultural programs that promote soil health, preserve soil moisture, and help to minimize loss of crops and topsoil during drought conditions;
- Consider farm drought management strategies that include monitoring soil moisture levels and planting crops that will tolerate low moisture levels;
- Maintain and support the University of Wisconsin-Extension Farmer to Farmer Hay, Forage, and Corn List;

- Support ordinances to prioritize or control water use during drought conditions;
- Design and plan for water supply infrastructure systems that are not vulnerable to drought events;
- Promote enrollment of agricultural producers into Federal crop insurance programs

Structural

- Consider implementing the recommendations made in the regional water supply plan for additional water supply facilities and programs to meet forecast water use demands
- Where opportunities exist, consider development of interconnections between adjacent water utilities to ensure provision of water in the event of a loss of water supply due to severe drought
- Continue operation and monitoring of stream gaging stations and groundwater monitoring wells by the WDNR, U.S. Geological Survey, National Weather Service, and U.S. Army Corps of Engineers

Public Informational and Educational Programming

- Increase public education and awareness of the potential severity of drought events
- Produce and distribute emergency preparedness information related to droughts
- Encourage farmers to report crop and/or livestock losses to the appropriate officials, including the Racine County Office of Emergency Management

Current Programs

Federal and State Programs

The continuous monitoring of hydrologic conditions is important to identify and assess drought conditions. The U.S. Geological Survey operates a stream gaging program with local cooperators throughout the State. In Southeastern Wisconsin, this program is coordinated by the WDNR and the Commission. The Racine Wastewater Utility is a local cooperator. The Wisconsin Geological and Natural History Survey also monitors a statewide network of groundwater elevation monitoring wells.

The National Drought Mitigation Center (NDMC), based at the University of Nebraska-Lincoln, provides assistance in the development and implementation of measures to reduce societal vulnerability to drought, stressing preparedness and risk management rather than crisis management. Most of the NDMC's services are directed to State, Federal, regional, and tribal governments that are involved in drought and water supply planning. The NDMC's activities include maintaining an information clearinghouse and drought portal; drought monitoring, including participation in the preparation of the U.S. Drought Monitor and maintenance of the web site; drought planning and mitigation; drought policy; advising policy makers; collaborative research; K-12 outreach; workshops for Federal, State, and foreign governments and international organizations; organizing and conducting seminars, workshops, and conferences; and providing data to and answering questions for the media and the general public.

The U.S. Drought Monitor, a joint effort of the U.S. Department of Agriculture (USDA), the National Oceanic and Atmospheric Administration (NOAA), and the National Drought Mitigation Center, provides monitoring of drought conditions and forecasting of seasonal conditions throughout the United States.

The USDA's Farm Service Agency (FSA) provides information about conservation, commodity programs, crop insurance, and farm loans, along with State and county contacts. It also administers several programs which can provide emergency assistance to agricultural producers in the event of natural disasters such as drought. These programs include the Emergency Conservation Program, the Emergency Forest Restoration Program, the Emergency Loan Program, the Livestock Forage Disaster Program, the Noninsured Crop Disaster Assistance Program and the Tree Assistance Program. The FSA's electronic Hay and Grazing Net Ad Service (eHayNet) is an internet-based service allowing farmers and ranchers to share "Need Hay" and "Have Hay" ads online.

Farmers in the County that irrigate can also use the Wisconsin Irrigation Scheduling Program (WISP). This research-based computer program provided by the University of Wisconsin-Extension can assist growers in determining frequency and amounts of irrigation throughout the growing season. Irrigation scheduling provided by this program can be extremely helpful during a drought.

The Farmer to Farmer Hay, Forage and Corn List sponsored by the University of Wisconsin-Extension puts Wisconsin farmers in touch with one another for the purpose of buying and/or selling corn and forage. The farmer to farmer list is free of charge to both buyers and sellers.

Federal and State programs also include awareness and education activities. The Wisconsin Department of Health Services has developed a drought tool kit to provide information to local governments, health departments, and citizens in Wisconsin about preparing for and responding to drought events.

Chapter NR 852, "Water Conservation and Water Use Efficiency", of the *Wisconsin Administrative Code* establishes mandatory water conservation and efficiency measures for withdrawals in the Great Lakes Basin and water loss approvals throughout the State. The requirements set forth in this chapter apply to all persons within the Great Lakes Basin applying for a diversion or a new or increased withdrawal averaging 100,000 gallons per day (gpd) or more and all persons within the State applying for withdrawals that will result in a water loss averaging more than 2,000,000 gpd. The chapter establishes three tiers of requirements based upon the size of the withdrawal and the amount of water not returned to the basin from which it is withdrawn as a result of a diversion or consumptive use. The chapter requires that persons applying for a new or increased withdrawal, diversion, or water loss approval submit a water conservation plan meeting specified requirements with their application. In addition, written documentation must accompany the application showing that water conservation and efficiency measures (CEM) that do not require retrofitting have been implemented or completed. The specific CEMs required vary according to the water use sector and tier to which the application is assigned.

Local Programs

As described in Chapter 2, Racine County has developed a comprehensive emergency management plan which sets forth a hazard action plan. In addition, many of the local units of government have developed emergency operations plans and/or programs which complement the County plan and which also set forth procedures and actions to deal with a range of situations and events, including instances of drought.

Fox (Illinois) River Watershed Mitigation Plan

A hazard mitigation plan for the Fox (Illinois) River Watershed was completed by Commission staff in 2023.[77] This plan focused on watershed-wide hazards related to flooding, dams, and drought only. The plan included many projects that would mitigate drought risks for communities in Racine County located in the Fox River watershed. Therefore, the projects included in the watershed plan are included in this Racine County hazard mitigation plan by reference.

Multi-Jurisdictional Considerations

Droughts and their related hazards can potentially impact all municipalities within the County, however, those communities that depend on groundwater as a source of water supply experience the most severe impacts from drought events. Racine County, the local units of government, and relevant businesses need to coordinate hazard mitigation activities through the local government participation in countywide disaster planning and response mechanisms.

Priority Mitigation Measures

Based upon the foregoing evaluation, consideration of risk, and review and action by the Racine County Hazard Mitigation Plan Local Planning Team (see Appendix A), the following mitigation measures related to drought events are included in the updated hazard mitigation plan for Racine County:

- Encourage the development and maintenance of drought emergency plans for local utilities and local communities;

[77] Op. cit.

- Encourage the development of local water conservation programs;
- Encourage multi-agency approaches to drought planning, water conservation, drought prediction and stream and groundwater monitoring;
- Promote educational and informational programming relating to water conservation;
- Support agricultural programs that promote soil health, preserve soil moisture, and help to minimize loss of crops and topsoil in the event of a drought. Such programs should promote the use of agricultural methods that reduce evaporation and/or promote infiltration;
- Evaluate and design water supply systems that are not vulnerable to drought events;
- Encourage farm operators evaluate the economics of crop insurance programs; and
- Encourage development practices that promote preservation of areas of high and very high groundwater recharge potential and promote stormwater management practices that facilitate aquifer recharge.

Because these measures are intended to be ongoing efforts, the Local Planning Team decided to retain them in the updated plan.

5.9 SUMMARY

Based upon the foregoing evaluation of each of the natural hazards above, the priority mitigation measures identified to be included in the Racine County hazard mitigation plan are summarized in Table 5.8. Table 5.8 provides an evaluation of the mitigation measures identified in each hazard category based upon estimated capital costs and annual operation and maintenance, likely direct and indirect benefits of implementation, and a list of communities affected. Table 5.8 also indicates those mitigation measures that are related to continued compliance with the National Flood Insurance Program.

There are several potential issues inherent in the prioritization or ranking of the mitigation measures, which were considered in development of the recommended ranking of priority mitigation measures summarized below. First, the Racine County hazard vulnerabilities are different for loss of life and injury versus property damages, which may affect prioritization of costs to be incurred. For the purposes of this plan, priority or emphasis was placed upon preventing loss of life and injury.

The costs of avoidance of a particular hazard may not be quantifiable, but the cost of occurrence of the hazard often is—for example, most hazards have been quantified by insurance underwriters in the issuance of property and life insurance policies. Conversely, the benefit of any particular mitigation measure may also not be quantifiable or realized. For example, continued coordination of emergency response and operation plans among governmental units and first responders will directly enhance preparedness and protection of the communities involved; however, this action may or may not ultimately result in reduced property damage, injuries, or death if the hazard does not occur. Similarly, in the case of flood mitigation, upstream actions may result in downstream benefit even if the immediate benefits at the location where the mitigation measure was applied may be less than optimal.

Another potential issue is whether the hazard ranking reflects public health concerns for which mitigation is possible. For example, the vulnerability to hazards such as extreme heat and lightning are very much a matter of personal exposure. Mitigation in the traditional sense (strengthening a structure or moving a structure away from the hazard such as in flood mitigation) is of little use for these hazards. Neither extreme heat nor lightning are emergency management issues in terms of operations. Reducing the risk of mortality from lightning or temperature extremes requires public health information and hazard awareness so that individuals take precautions to limit their exposure to the hazard. While hazard awareness and public safety information are important for any type of hazard, it is especially important for hazards such as temperature extremes, lightning, tornadoes, and severe thunderstorms.

Table 5.8
Cost-Benefit Analysis Summary of Measures Included in the Racine County Hazard Mitigation Plan

Mitigation Measures	Estimated Cost[a]		Costs of Implementation[b]			Direct Benefits				Indirect Benefits[c]	Community/Jurisdictions Affected
	Capital (thousands of dollars)	Average Annual Operation and Maintenance (thousands of dollars)	Low	Moderate	High	Enhanced Preparedness/ Protection	Reduced Property Damage	Reduced Injuries	Reduced Mortalities		
Inland Flooding (Stormwater, Riverine, Inland Lake, Dam Failure)											
Floodplain and Environmentally Sensitive Land Preservation Element											
Floodplain and wetland zoning[d]	--[e]	--[e]	X	--	--	X	X	X	X	5	Racine County; Cities of Burlington and Racine; and Villages of Caledonia, Mt. Pleasant, Rochester, Sturtevant, Union Grove, Waterford, and Wind Point
Environmentally sensitive area and open preservation action[d]	34,911.8[f]	--[f]	--	--	X	X	X	--	--	4	Racine County; Cities of Burlington and Racine; and Villages of Caledonia, Elmwood Park, Mt. Pleasant, North Bay, Rochester, Sturtevant, Union Grove, Waterford, and Wind Point
Wetland Restoration of up to 6,800 acres of agricultural land to reduce flood-related agricultural and property damages	--[s]	--[s]	--	--	X	X	X			4	Racine County; City of Burlington; Villages of Caledonia, Mt. Pleasant, Rochester, Sturtevant, Union Grove, and Waterford; and Towns of Burlington, Dover, Norway, Raymond, Waterford, and Yorkville
Floodplain Management Plan Element											
Fox River Watershed											
Construction of dikes and floodwalls in City of Burlington[g]	3,196.1[g]	4.6[g]	--	--	X	X	X	--	--	--	City of Burlington
Structure floodproofing or removal[d]	76,314.7[h]	--	--	--	X	X	X	--	--	4	Racine County; City of Burlington; Towns of Burlington, Dover, Norway, and Waterford; and Villages of Rochester and Waterford
Replacement of two 20-foot-wide radial gates and one actuator motor at Waterford Dam[i]	110.6	9.2	--	X	--	X	X	--	--	3, 5	Racine County and Village of Waterford
Installation of gates at Rochester Dam	477.6	3.8	--	X	--	X	X	--	--	3 ,4, 5	Racine County and Village of Rochester
Channel clean out in Fox River upstream from Waterford Impoundment	19.6	0.1	X	--	--	X	X	--	--	4	Town of Waterford
Land acquisition[d]	1,645.0	--	--	--	X	X	X	--	--	4	Racine County and Town of Waterford
Maintenance dredging within Waterford Impoundment	1,445.0	--	--	--	X	X	X	--	--	4	Racine County, Town of Waterford, and Village of Waterford
Channel clean out of Wind Lake Drainage Canal	1,131.0	22.6	--	--	X	X	X	--	--	--	Racine County; Towns of Dover and Norway; and Village of Rochester
Channel clean out and deepening along Muskego Canal	62.7	3.1	X	--	--	X	X	--	--	--	Racine County and Town of Norway

Table continued on next page.

Table 5.8 (Continued)

Mitigation Measures	Estimated Cost[a]		Costs of Implementation[b]			Direct Benefits				Indirect Benefits[c]	Community/Jurisdictions Affected
	Capital (thousands of dollars)	Average Annual Operation and Maintenance (thousands of dollars)	Low	Moderate	High	Enhanced Preparedness/ Protection	Reduced Property Damage	Reduced Injuries	Reduced Mortalities		
Inland Flooding (Stormwater, Riverine, Inland Lake, Dam Failure) (continued)											
Floodplain Management Plan Element (continued)											
Fox River Watershed (continued)											
Construct agricultural dikes along Wind Lake Drainage Canal and tributaries[j]	1,325.8	22.6	--	--	X	X	X	--	--	--	Racine County; Towns of Dover, Norway; and Village of Rochester
Construction of levees and channel improvements along Hoosier Creek[j]	2,194.8	25.3	--	--	X	X	X	--	--	5	Racine County and Town of Burlington
Root River Watershed											
Channel clearing and maintenance along the Root River Canal	740.5	21.8	--	X	--	X	X	--	--	4	Racine County and Towns of Raymond and Yorkville
Structure floodproofing or removal[d]	39,086.9[h]	--	--	--	X	X	X	--	--	4	Racine County; City of Racine; Villages of Caledonia and Mt. Pleasant; and Towns of Raymond, and Yorkville
Increase spillway capacity or remove of Horlick Dam	413.8 to 1,073.5[k]	0.8 to 3.2	--	X	--	X	X	--	--	4, 5	Racine County and City of Racine
Pike River Watershed											
Pike River channel enlargement and rehabilitation	22,365.5	29.3	--	--	X	X	X	--	--	2, 3, 4	Racine County and Village of Mt. Pleasant
Berm along Bartlett Branch	163.9	1.3	--	X	--	X	X	--	--	3	Racine County and Village of Mt. Pleasant
Chicory Road culvert replacement along Sorenson Creek	390.6	0.0	--	X	--	X	X	--	--	3	Racine County and Village of Mt. Pleasant
Structure floodproofing or removal[d]	10,234.2[h]	--	--	--	X	X	X	--	--	4	Racine County, City of Racine, and Villages of Mt. Pleasant and Sturtevant
Des Plaines River Watershed[l]											
Provide onsite detention storage facilities for planned new development[d]	9,307.8[m]	94.8[m]	--	--	X	X	X	--	--	3	Racine County, Town of Yorkville, and Villages of Mt. Pleasant and Union Grove
Prairie restoration[d]	937.5 to 2,644.83	1.5 to 106.6	--	X	--	--	X	--	--	4	Racine County, Town of Yorkville, and Villages of Mt. Pleasant and Union Grove
Wetland restoration[d]	241.9 to 606.7[n]	0.5 to 27.5	--	X	--	--	X	--	--	4	Racine County, Town of Yorkville, and Village of Mt. Pleasant
Stormwater management plans[d]	--[o]	--[o]	X	--	--	X	X	--	--	3, 4	Racine County; Cities of Burlington and Racine; and Villages of Caledonia, Elmwood Park, Mt. Pleasant, North Bay, Rochester, Sturtevant, Union Grove, Waterford, and Wind Point

Table continued on next page.

Table 5.8 (Continued)

Mitigation Measures	Estimated Cost[a]		Costs of Implementation[b]			Direct Benefits				Indirect Benefits[c]	Community/Jurisdictions Affected
	Capital (thousands of dollars)	Average Annual Operation and Maintenance (thousands of dollars)	Low	Moderate	High	Enhanced Preparedness/ Protection	Reduced Property Damage	Reduced Injuries	Reduced Mortalities		
Inland Flooding (Stormwater, Riverine, Inland Lake, Dam Failure) (continued)											
Stormwater Management Plan Element											
Stormwater-related regulations[d]	--[p]	--[p]	X	--	--	X	X	--	--	3, 4	Racine County; Cities of Burlington and Racine; and Villages of Caledonia, Elmwood Park, Mt. Pleasant, North Bay, Rochester, Sturtevant, Union Grove, Waterford, and Wind Point
Public Information and Education Element	--[q]	--[q]	X	--	--	X	--	--	--	2, 3, 5	Racine County and all local jurisdictions[r]
Additional Plan Elements											
National Flood Insurance Program and map updating[d]	--[e]	--[e]	--	X	--	X	X	--	--	3	Racine County; Cities of Burlington and Racine; Towns of Burlington, Dover, Norway, Raymond, Waterford, and Yorkville; and Villages of Caledonia, Mt. Pleasant, Rochester, Sturtevant, Union Grove, and Waterford
Lending institution and real estate agent policies[d]	--[e]	--[e]	X	--	--	X	X	--	--	3	Racine County; Cities of Burlington and Racine; Towns of Burlington, Dover, Norway, Raymond, Waterford, and Yorkville; and Villages of Caledonia, Mt. Pleasant, Rochester, Sturtevant, Union Grove, and Waterford
Channel maintenance	--[e]	--[e]	X	--	--	X	X	--	--	3, 4	Racine County; Cities of Burlington and Racine; Towns of Burlington, Dover, Norway, Raymond, Waterford, and Yorkville; and Villages of Caledonia, Mt. Pleasant, Rochester, Sturtevant, Union Grove, and Waterford
Stormwater management facilities maintenance[d]	--[e]	--[e]	--	X	--	X	X	--	--	3	Racine County; Cities of Burlington and Racine; Towns of Burlington, Dover, Norway, Raymond, Waterford, and Yorkville; and Villages of Caledonia, Mt. Pleasant, Rochester, Sturtevant, Union Grove, and Waterford
Dam inspections, emergency action plans, and removals	--[s]	--	X	--	--	X	--	--	--	3, 4, 5	Racine County; Cities of Burlington and Racine; Towns of Burlington, Dover, Norway, Raymond, Waterford, and Yorkville; and Villages of Caledonia, Mt. Pleasant, Rochester, Sturtevant, Union Grove, and Waterford
Survey of buildings near flood hazard area[d]	917.0	--	X	--	--	X	X	--	--	1, 3	Racine County; Cities of Burlington and Racine; Towns of Burlington, Dover, Norway, Raymond, Waterford, and Yorkville; and Villages of Caledonia, Mt. Pleasant, Rochester, Sturtevant, Union Grove, and Waterford

Table continued on next page.

Table 5.8 (Continued)

Mitigation Measures	Estimated Cost[a]		Costs of Implementation[b]			Direct Benefits				Indirect Benefits[c]	Community/Jurisdictions Affected
	Capital (thousands of dollars)	Average Annual Operation and Maintenance (thousands of dollars)	Low	Moderate	High	Enhanced Preparedness/ Protection	Reduced Property Damage	Reduced Injuries	Reduced Mortalities		
Inland Flooding (Stormwater, Riverine, Inland Lake, Dam Failure) (continued)											
Additional Plan Elements (continued)											
Echo Lake dam improvements, including spillway modifications, park improvements, and dredging/shoreline work	9,100.0	--	--	--	X	X	X	X	X	2, 3, 4, 5	City of Burlington
Severe Thunderstorms Combined (Thunderstorms, High Straight-Line Winds, Hail, Lightning)											
Maintain, update, and further develop early warning systems and networks including use of NOAA All Hazard Weather Radios, EAS broadcasts, WEA system, *CodeRED*® Emergency and Weather Notification System	--[s]	--[s, t]	--	X	--	X	--	--	--	5	Racine County and all local jurisdictions[r]
Promote educational and informational programming, especially related to the early warning network, and to individual actions to protect citizens, property, and businesses	--[q]	--[q]	X	--	--	X	--	--	--	5	Racine County and all local jurisdictions[r]
Enforce building code ordinances requirements	--[e]	--[e]	X	--	--	X	X	X	X	--	Racine County; Cities of Burlington and Racine; and Villages of Caledonia, Elmwood Park, Mt. Pleasant, North Bay, Rochester, Sturtevant, Union Grove, Waterford, and Wind Point
Encourage provision of safe rooms and retrofit existing or install new structures to ensure adequate shelters from severe thunderstorms (combined) for vulnerable communities	--[s]	--[s]	--	X	--	X	--	X	X	5	Racine County and all local jurisdictions[r]
Work with municipalities and businesses to explore installation of community safe rooms and hardening projects for community facilities, businesses, and manufacturers	--[u]	--[u]	--	X	--	X	--	X	X	5	Racine County and all local jurisdictions[r]
Consideration by municipalities of adopting mobile home park regulations which require that community safe rooms be provided for residents of new and expanding mobile home parks	--[s]	--[s]	X	--	--	X	--	X	X	5	Racine County and all local jurisdictions[r]
Pursue grant funding for installation of safe rooms in existing mobile home parks, based on community and landowner interest	--[u]	--[u]	--	X	--	X	--	X	X	5	Racine County, Villages of Caledonia, Mt. Pleasant, and Waterford; Towns of Burlington, Dover, and Yorkville

Table continued on next page.

Table 5.8 (Continued)

Mitigation Measures	Estimated Cost[a]		Costs of Implementation[b]			Direct Benefits				Indirect Benefits[c]	Community/Jurisdictions Affected
	Capital (thousands of dollars)	Average Annual Operation and Maintenance (thousands of dollars)	Low	Moderate	High	Enhanced Preparedness/ Protection	Reduced Property Damage	Reduced Injuries	Reduced Mortalities		
Severe Thunderstorms Combined (Thunderstorms, High Straight-Line Winds, Hail, Lightning) (continued)											
Encourage agricultural producers to purchase crop insurance	--[s]	--[s]	X	--	--	X	X	--	--	1, 3	Racine County
Continue to conduct annual weather spotter training	--[s]	--[s]	X	--	--	X	--	--	--	5	Racine County
Continued coordination of emergency operations and response plans among governmental units and first responders	--[e]	--[e]	X	--	--	X	--	--	--	5	Racine County and all local jurisdictions[r]
Tornadoes											
Maintain, update, and further develop early warning systems and networks including use of NOAA All Hazard Weather Radios, EAS broadcasts, WEA system, *CodeRED*® Emergency and Weather Notification System	--[s]	--[s, t]	--	X	--	X	--	--	--	5	Racine County and all local jurisdictions[r]
Retrofit existing or install new structures to ensure adequate shelters from tornadoes for public buildings, major industrial sites, and other large businesses or complexes such as shopping malls, fairgrounds, mobile home parks, and other vulnerable public areas	--[v]	--[v]	--	X	--	X	X	X	X	5	Racine County and all local jurisdictions[r]
Work with municipalities and businesses to explore installation of community safe rooms and hardening projects for community facilities, businesses, and manufacturers	--[u]	--[u]	--	X	--	X	--	X	X	5	Racine County and all local jurisdictions[r]
Consideration by municipalities of adopting mobile home park regulations that require that community safe rooms be provided for residents of new and expanding mobile home parks	--[s]	--[s]	X	--	--	X	--	X	X	5	Racine County and all local jurisdictions[r]
Pursue grant funding for installation of safe rooms in existing mobile home parks, based on community and landowner interest	--[u]	--[u]	--	X	--	X	--	X	X	5	Racine County, Villages of Caledonia, Mt. Pleasant, and Waterford; Towns of Burlington, Dover, and Yorkville
Promote educational and informational programming, especially related to the early warning network, and to individual actions to protect citizens, property, and businesses	--[q]	--[q]	X	--	--	X	--	--	--	5	Racine County and all local jurisdictions[r]

Table continued on next page.

Table 5.8 (Continued)

Mitigation Measures	Estimated Cost[a]		Costs of Implementation[b]			Direct Benefits				Indirect Benefits[c]	Community/Jurisdictions Affected
	Capital (thousands of dollars)	Average Annual Operation and Maintenance (thousands of dollars)	Low	Moderate	High	Enhanced Preparedness/ Protection	Reduced Property Damage	Reduced Injuries	Reduced Mortalities		
Tornadoes (continued)											
Enforce building code ordinances requirements	--[e]	--[e]	X	--	--	X	X	X	X	5	Racine County; Cities of Burlington and Racine; and Villages of Caledonia, Elmwood Park, Mt. Pleasant, North Bay, Rochester, Sturtevant, Union Grove, Waterford, and Wind Point
Continue to conduct annual weather spotter training	--[s]	--[s]	X	--	--	X	--	--	--	5	Racine County
Continue coordination of emergency response and operation plans among governmental units and first responders	--[e]	--[e]	X	--	--	X	--	--	--	5	Racine County and all local jurisdictions[r]
Extreme Temperatures (Extreme Heat, Extreme Cold)											
Organize neighborhood outreach groups to assist those who may be vulnerable to extreme heat or cold	--[s]	--[s]	X	--	--	X	--	--	--	5	Racine County and all local jurisdictions[r]
Identify and advertise a list of available heating and or cooling shelters in the immediate area	--[q]	--[q]	X	--	--	X	--	--	--	5	Racine County and all local jurisdictions[r]
Continue to provide special arrangements for payment of heating bills	--[s]	--[s]	X	--	--	X	--	--	--	5	Utilities, Racine County and all local jurisdictions[r]
Maintain, update, and further develop early warning systems and networks including use of NOAA All Hazard Weather Radios, EAS broadcasts, WEA system, *CodeRED*® Emergency and Weather Notification System	--[s]	--[s, t]	--	X	--	X	--	--	--	5	Racine County and all local jurisdictions[r]
Promote educational and informational programming	--[q]	--[q]	X	--	--	X	--	--	--	5	Racine County and all local jurisdictions[r]
Lake Michigan Coastal Hazards											
Continued enforcement of County shoreland zoning ordinance[d]	--[e]	--[e]	X	--	--	X	X	X	X	3, 5	Racine County; City of Racine; and Villages of Caledonia, Mt. Pleasant, North Bay, and Wind Point
Review Lake Michigan shoreline municipal shoreland ordinances[d]	--[e]	--[e]	X	--	--	X	X	X	X	3, 5	Racine County; City of Racine; and Villages of Caledonia, Mt. Pleasant, North Bay, and Wind Point
Update assessment of the effectiveness of Lake Michigan shoreline protection structures in the County every 10 years	67.7	--	X	--	--	X	X	X	X	3, 5	Racine County; City of Racine; and Villages of Caledonia, Mt. Pleasant, North Bay and Wind Point

Table continued on next page.

Table 5.8 (Continued)

Mitigation Measures	Estimated Cost[a]		Costs of Implementation[b]			Direct Benefits				Indirect Benefits[c]	Community/Jurisdictions Affected
	Capital (thousands of dollars)	Average Annual Operation and Maintenance (thousands of dollars)	Low	Moderate	High	Enhanced Preparedness/ Protection	Reduced Property Damage	Reduced Injuries	Reduced Mortalities		
Lake Michigan Coastal Hazards (continued)											
Continued construction and maintenance of shoreline protection structures	--[u]	--[u]	--	X	--	X	X	--	--	3	Racine County; City of Racine; and Villages of Caledonia, Mt. Pleasant, North Bay and Wind Point
Where possible, relocate buildings within a high-risk area. In circumstances where buildings cannot be relocated safely or economically, or where bluff recession has progressed to the point where the risk of catastrophic failure of the slope is imminent, or where there is an imminent threat of failure within five years, acquisition and demolition of structures should be considered. This plan element is presented as an option, subject to the preference of the individual property owner.	--[u]	--	--	X	--	X	X	X	X	3, 5	Racine County; City of Racine; and Villages of Caledonia, Mt. Pleasant, North Bay and Wind Point
Continue ongoing programs to update and refine coastal hazard area data using geographic information system technology[d]	23.0	--	X	--	--	X	--	--	--	3	Racine County; City of Racine; and Villages of Caledonia, Mt. Pleasant, North Bay and Wind Point
Review water and wastewater treatment plant and outfall capacity and level of protection under range of Lake Michigan water levels	--[u]	--[u]	--	X	--	X	--	--	--	4	City of Racine
Public informational and educational programming	--[q]	--[q]	X	--	--	X	--	--	--	5	Racine County; City of Racine; and Villages of Caledonia, Mt. Pleasant, North Bay and Wind Point
Severe Winter Storms (Heavy Snowstorm, Blizzard, Ice Storm)											
Organize neighborhood outreach groups to assist those who may be vulnerable to winter storm related hazards	--[s]	--[s]	X	--	--	X	--	--	--	5	Racine County and all local jurisdictions[r]
Identify and advertise a list of available heated shelters in the immediate area	--[q]	--[q]	X	--	--	X	--	--	--	5	Racine County and all local jurisdictions[r]
Maintain, update, and further develop early warning systems and networks including use of NOAA All Hazard Weather Radios, EAS broadcasts, WEA system, *CodeRED*® Emergency and Weather Notification System	--[s]	--[s,t]	--	X	--	X	--	--	X	5	Racine County and all local jurisdictions[r]

Table continued on next page.

Table 5.8 (Continued)

Mitigation Measures	Estimated Cost[a]		Costs of Implementation[b]			Direct Benefits				Indirect Benefits[c]	Community/Jurisdictions Affected
	Capital (thousands of dollars)	Average Annual Operation and Maintenance (thousands of dollars)	Low	Moderate	High	Enhanced Preparedness/ Protection	Reduced Property Damage	Reduced Injuries	Reduced Mortalities		
Severe Winter Storms (Heavy Snowstorm, Blizzard, Ice Storm) (continued)											
Promote educational and informational programming	--[q]	--[q]	X	--	--	X	--	--	--	5	Racine County and all local jurisdictions[r]
Encourage residents to develop a Family Emergency Preparedness Plan including the preparation of a Disaster Supply Kit	--	--	X	--	--	X	--	--	--	1	Racine County and all local jurisdictions[r]
Ongoing enforcement of building code ordinance requirements	--[e]	--[e]	X	--	--	X	X	X	X	5	Racine County; Cities of Burlington and Racine; and Villages of Caledonia, Elmwood Park, Mt. Pleasant, North Bay, Rochester, Sturtevant, Union Grove, Waterford, and Wind Point
Work with agencies to establish a system for short-term sheltering	--[s]	--[s]	X	--	--	X	--	--	--	5	Racine County and all local jurisdictions[r]
Continued coordination of emergency response plans among governmental units and first responders	--[e]	--[e]	X	--	--	X	--	--	--	5	Racine County and all local jurisdictions[r]
Continue and refine State, County, and local road maintenance programs	--[e]	--[e]	X	--	--	X	--	--	--	5	Racine County and all local jurisdictions[r]
Work with utilities to assess and improve electrical service reliability	--[e]	--[e]	X	--	--	X	--	--	--	5	Racine County and all local jurisdictions[r]
Drought Events											
Encourage the development and maintenance of drought emergency plans for local utilities and communities	--[s]	--[s]	X	--	--	X	--	--	--	4	Racine County and all local jurisdictions[r]
Encourage development of local water conservation programs	--[s]	105.9[w]	X	--	--	X	--	--	--	4	Cities of Racine and Burlington; Villages of Caledonia, Elmwood Park, Mt. Pleasant, North Bay, Sturtevant, Union Grove, Waterford, Wind Point; Towns of Burlington, Norway, Raymond, and Yorkville; and the Wisconsin Southern Center
Encourage multi-agency approaches to water conservation, drought planning, and stream and ground water monitoring	--[s]	--[s]	X	--	--	X	--	--	--	4	Racine County and all local jurisdictions[r]
Promote educational and informational programming	--[q]	--[q]	X	--	--	X	--	--	--	3	Racine County and all local jurisdictions[r]

Table continued on next page.

Table 5.8 (Continued)

Mitigation Measures	Estimated Cost[a]		Costs of Implementation[b]			Direct Benefits				Indirect Benefits[c]	Community/Jurisdictions Affected
	Capital (thousands of dollars)	Average Annual Operation and Maintenance (thousands of dollars)	Low	Moderate	High	Enhanced Preparedness/ Protection	Reduced Property Damage	Reduced Injuries	Reduced Mortalities		
Drought Events (continued)											
Support agricultural programs that promote soil health, preserve soil moisture, and help to minimize loss of crops and topsoil in event of a drought. Such programs should promote the use of agricultural methods that reduce evaporation and/or promote infiltration	--[e]	--[e]	X	--	--	X	--	--	--	3	Racine County and all local jurisdictions[r]
Evaluate and design water supply systems which are not vulnerable to drought	--[s]	--[s]	X	--	--	X	--	--	--	3	Racine County and all local jurisdictions[r]
Encourage farm operators to evaluate economics of crop insurance	--[u]	--[u]	X	--	--	X	X	--	--	3	Racine County and all local jurisdictions[r]
Encourage development practices that promote preservation of areas of high and very high groundwater recharge potential and promote stormwater management practices that facilitate aquifer recharge	--[s]	--[s]	X	--	--	X	X	--	--	4	Racine County and all local jurisdictions[r]

[a] *All cost expressed in 2021 dollars unless otherwise noted.*

[b] *Cost of implementation is allocated among three categories of low (less than $100,000 dollars), moderate (greater than $100,000 and less than $1,000,000), and high (greater than $1,000,000) costs, which are generally defined as:*

Low
Educational and informational programming
Ongoing enforcement of ordinances
Plan Development
Continued coordination/mutual aid/interagency agreements

Moderate
Addition of new staff
Additional staff hours budgeted
Additional equipment
New ordinance development
New programs/task force

High
Major construction
New buildings (infrastructure)
Capital programs

[c] *Indirect benefits represent a continuum of potential benefits that may occur as a result of the implementation of specific management actions. For example, implementation of informational programming, while not directly saving lives, may ultimately result in people having the knowledge necessary to save lives and protect property. These intangible benefits cannot be readily quantified and range from increased awareness to reduced loss of life and property, and have been assessed using the following relative cumulative scale:*

1 = Increased awareness/preparedness
2 = Enhanced quality of life/social benefits
3 = Reduced property damage
4 = Increased environmental and recreational benefits/ecosystems services
5 = Reduced loss of life and injury with concomitant benefits for economic productivity

[d] *This mitigation measure is related but not essential to continued compliance with the requirements of the National Flood Insurance Program.*

Table continued next page.

Table 5.8 (Continued)

[e] *Costs covered under ongoing activity.*

[f] *Costs are included under Racine County Park and Open Space Plan Implementation. The costs are based on purchasing all land recommended for parks and open space (4,964 acres). It should be noted that the protection of these areas could also be accomplished through conservation through conservation easements, conservation subdivisions, donations, and purchase or transfer of development rights. To the extent that the costs are reduced through the use of alternative methods of land acquisition, and through the use of available State and Federal funds for acquisition, the costs to the County and local governments could be significantly reduced.*

[g] *Flood mitigation measures and project costs to be reviewed and refined to reflect ongoing City of Burlington downtown redevelopment program.*

[h] *Structure floodproofing or removal to be evaluated on a site-by-site basis and to be carried out at the discretion of property owners. Field surveys should be conducted for structures proposed to be floodproofed or removed to obtain a more definitive assessment of their flood hazard status. For the purpose of this analysis, it was assumed that all residential structures located within the 1-percent-annual-probability (100-year recurrence interval) floodplain would be acquired and demolished. The cost for removal of the residential structures includes an estimated average fair market property value plus $10,000 per property for demolition expenses. Floodproofing or elevating some residential structures, if found to be feasible based on specific circumstances, could be more cost effective. All other categories of buildings (agricultural, commercial, utility, governmental, and other) were assumed to be floodproofed for the purpose of this analysis.*

[i] *A contractor was hired by Racine County in 2016 to replace two 20-foot-wide radial dam gates and one actuator motor on the Waterford Dam. In addition, concrete repair to the dam structure was conducted. The project was completed in January 2017.*

[j] *Flood mitigation measures should be reviewed to reflect RiskMAP findings and current flood mitigation best management practices.*

[k] *Capital costs for these alternatives are based upon year 2013 conditions. These are systems-level planning costs and the WDNR has indicated that even after the final design stage, the average dam reconstruction change order amount is 40 percent of the initial capital cost estimate, mainly due to unforeseen site conditions once construction begins.*

[l] *A breakdown of costs between Kenosha and Racine Counties is not available. Thus, total costs for both Counties are listed. It is estimated that the capital cost range for measures in Racine County would be relatively small, ranging from $762,000 to $907,000.*

[m] *Incremental cost between control of two-year and 100-year events.*

[n] *Cost reflects range from minimal wetland and prairie operation and maintenance to active management.*

[o] *Costs to be determined by each community based upon logical subwatershed area. Estimated cost is from $1,318,355 to $1,608,635 countywide.*

[p] *Cost of ordinance development is covered under ongoing programs. Cost of implementation is not determined.*

[q] *Portion of costs included in ongoing program and construction project implementation programs. The additional cost of all of the hazard mitigation and public informational and educational programs is estimated to be $21,800 per year.*

[r] *Jurisdictions include general purpose units of government—Cities, Towns, and Villages—and special purpose units of government such as School Districts, Sanitary and Utility Districts, Public Inland Lake Protection and Rehabilitation Districts and Agricultural Drainage Districts.*

[s] *Costs to be determined. Partially covered under ongoing programs.*

[t] *Costs include an estimated annual subscription fee of $12,000 for the CodeRED® targeted alert notification service.*

[u] *Costs are site-specific and survey is needed for countywide estimate.*

[v] *To be conducted as part of next needed facility planning program.*

[w] *Costs shown are the estimated annual costs of water supply conservation programs for existing water utilities in the County as reported in SEWRPC PR No. 52,* A Regional Water Supply Plan for Southeastern Wisconsin, December 2010.

Source: SEWRPC

Ranking of Priority Mitigation Measures

The mitigation measures identified in each hazard category were evaluated based upon relative cost, direct benefits, and likely indirect benefits as shown in Table 5.8. Consideration was given to the likelihood of occurrence of each type of hazard as set forth in the hazard prioritization analysis. Greatest priority is recommended to be given to those mitigation measures that directly or indirectly resulted in minimized loss of life or injury.

Estimated Cost of Implementation

Where possible, Table 5.8 includes a summary of the estimated capital cost and average annual operation and maintenance cost for each mitigation measure. There are many mitigation measures, especially for hazards other than flooding and related stormwater drainage problems, where a meaningful direct monetary cost analysis was not possible. Therefore, mitigation measures were also assigned a classification of low-, moderate-, and high-cost to categorize the relative expense of implementing the measure (see Table 5.8). The three categories are generally defined as including:

Low-Cost (less than $100,000)
- Educational and informational programming
- Ongoing enforcement of ordinances
- Plan Development
- Continued coordination/mutual aid/interagency agreements

Moderate-Cost (greater than $100,000 and less than $1,000,000)
- Addition of new staff
- Additional staff hours budgeted
- Additional equipment
- New ordinance development
- New programs/task force

High-Cost (greater than $1,000,000)
- Major construction
- New buildings (infrastructure)
- Capital programs

This cost assessment allows the mitigation measures to be prioritized with particular regard to cost effectiveness by comparing the estimated low-, moderate-, and high-cost to the number of both direct and indirect benefits identified.

Direct and Indirect Benefits

The benefits from implementation of a mitigation measure can be classified as direct, or measurable, and as indirect, or intangible. Direct benefits were defined in terms of enhanced preparedness/protection of individuals or communities, reduced property damage, reduced injuries and reduced mortalities. Although the exact numbers or amounts of such direct benefits are often not known, these would be a direct result of implementation of a particular mitigation measure. In contrast, indirect benefits represent a range of potential benefits that may occur as a result of the implementation of specific management actions. For example, implementation of informational programming, while not directly saving lives, may ultimately result in people having the knowledge necessary to save lives and protect property. These intangible benefits cannot be readily quantified and range from increased awareness to reduced loss of life and property, and have been assessed using the following relative cumulative scale:

1 = Increased awareness/preparedness
2 = Enhanced quality of life/social benefits
3 = Reduced property damage
4 = Increased environmental and recreational benefits/ecosystems services
5 = Reduced loss of life and injury with associated benefits for economic productivity

Similar to cost analysis, direct monetary benefits are difficult to assess for most mitigation measures. For example, while constructing a safe room at a mobile home park may save lives during a severe thunderstorm or tornado event, it is difficult to allocate a monetary benefit to avoiding injury or loss of life. Likewise, although it can be assumed that the restoration of farmland that often floods back to its historical wetland state will have the likely benefit of the reduction in crop losses, crop insurance indemnity payouts, crop insurance premiums, and the potential to decrease downstream flood damages, more rigorous modelling would be required to estimate these monetary benefits. Conversely, Commission staff has analyzed the estimated flood damages that would be sustained to structures within the 1-percent-annual-probability (100-year) floodplain in the event of a ten-, two-, and 1-percent-annual-probability flood. Estimated benefits from implementation of the recommendation related to acquisition and demolition, or floodproofing of these structures, are estimated as the annual structural flood damages avoided, as shown in Table 5.9.

Direct and indirect benefits are summarized in Table 5.8. The greatest indirect benefit should be allocated to those mitigation measures that may ultimately result in minimized loss of life or injury. Table 5.8 also indicates a list of the communities affected for each hazard and their corresponding priority mitigation measure.

Table 5.9
Estimated Flood Damages Avoided with the Acquisition and Demolition or Floodproofing of Structures Within Mapped Floodplains: 2021

Annual Probability of Flood Occurrence	Estimated Structural Flood Damages Avoided ($)[a]		
	Fox River Watershed	Root River Watershed	Pike River Watershed
1 Percent	10,756,710	6,638,840	1,914,970
2 Percent	8,548,910	2,154,530	823,000
10 Percent	4,295,070	414,970	325,030
Estimated Annual Average Flood Damages Avoided	2,661,670	422,300	231,020

[a] *Estimated structural damages avoided are based upon the reduction in flood damages within the Racine County portion of the watersheds in the event of a 1-, 2-, and 10-percent-annual-probabilty flood event. The damage estimates were developed by SEWRPC staff based upon assessed 2021 structure values, estimated content value, and depth of flooding data.*

Source: SEWRPC

PLAN ADOPTION, IMPLEMENTATION, MAINTENANCE, AND REVISION 6

The updated hazard mitigation plan described in this report is designed to attain, to the maximum extent practicable, the goals and objectives set forth in Chapter 4 of this report. In a practical sense, however, the plan is not complete until the steps to translate the plan into action policies and programs have been specified. This chapter presents the plan implementation strategies envisioned and includes provisions and information on plan adoption, maintenance, and revision.

6.1 PLAN REFINEMENT, REVIEW, AND ADOPTION

As described in Chapter 1, the hazard mitigation planning program was initiated by Racine County in 2001. The plan update set forth in this report began in 2022, and was conducted pursuant to the mitigation planning requirements of 44 Code of Federal Regulations, Section 201.6(d) (44 CFR 201.6(d)) which call for local hazard mitigation plans to be reviewed; updated to reflect changes in development, progress in local mitigation efforts, and changes in priorities; and reapproved every five years for local jurisdictions to be able to receive hazard mitigation funding. During 2002, the Federal Emergency Management Agency (FEMA) published new rules for hazard mitigation planning and the hazard mitigation grant program in response to the Disaster Mitigation Act of 2000. These rules address State and local mitigation planning and are important for the Racine County hazard mitigation program in three ways:

- The Wisconsin Department of Military Affairs, Division of Emergency Management (WEM), is directly involved in a partnership role for all-hazard mitigation planning. WEM is responsible for preparing and periodically updating a State all-hazard mitigation plan; providing technical assistance and guidance for local all-hazards planning; and administering the Building Resilient Infrastructure and Communities (BRIC) Program for FEMA.

- The rules outline State and local mitigation planning guidelines for accessing hazard mitigation program grant funds. According to the rules, for disasters declared after November 1, 2004, local governments must have a FEMA-approved mitigation plan in order to receive project grants from the Hazard Mitigation Grant Program (HMGP) and the BRIC program. This element is important because it requires local adoption of an all-hazards mitigation plan to remain eligible to receive grants from specific mitigation funds. Communities can formally adopt the County plan, or, alternatively, create and adopt their own plan.

- The rules and related guidance provide more specifics and detail on the hazard mitigation plan content than did the previous rules.

This hazard mitigation plan guidance was updated again in April 2022 to reflect FEMA requirements to address public outreach, climate change, and equity in these hazard mitigation plan updates. The Racine County hazard mitigation plan and this plan update have been structured to meet the 2002 and updated 2022 guidance. The work on this plan was also coordinated with a Wisconsin Division of Emergency Management statewide task force on hazard mitigation planning.

The initial Racine County all-hazards mitigation plan was prepared in 2004 under the guidance of the Racine County Hazard Mitigation Task Force comprised of representatives of all of the communities within the County, as well as County businesses and agency representatives. That Task Force met four times during the plan preparation period to provide input on the types of hazards to be considered, the appropriate mitigation strategies, and to review the draft report chapters with the report chapters then being refined to reflect the comments and recommendations of the Task Force.

The Task Force was reconvened for the first update effort and met three times during the plan update preparation period in 2010 to provide input on the types of hazards to be considered, the appropriate

mitigation strategies, and to review the draft report chapters with the report chapters then being refined to reflect the comments and recommendations of the Task Force.

For the second update of the Racine County all-hazards mitigation plan in 2017, the Task Force was renamed as the Racine County Hazard Mitigation Plan Local Planning Team. The Local Planning Team met four times during the plan preparation period to provide input on the types of hazards to be considered, the appropriate mitigation strategies, and to review the draft report chapters.

For this, the third update (i.e., 4th edition) of the Racine County plan, the plan was revised to focus on "natural hazards only" to more closely align with the guidelines of the Wisconsin Department of Military Affairs, Division of Emergency Management (DMA, DEM), and the Federal Emergency Management Agency (FEMA). The Local Planning Team was reconvened for this effort and met two times during the plan update preparation period. The report chapters were refined to reflect the comments and recommendations of the Local Planning Team (see Appendix A).

Following completion of the initial plan in draft form, a public informational meeting was held to review the plan with local officials, businesses and industry, and citizens. Following plan finalization, the plan was presented for consideration and adoption to the Racine County Economic Development and Land Use Committee and the County Board. A copy of the report was also sent to each of the local units of government requesting adoption of the plan and advising them of the need for such action in order to retain future eligibility for mitigation funding for the FEMA Hazard Mitigation Grant and the BRIC Program administered by the WEM. In addition, County and Southeastern Wisconsin Regional Planning Commission (Commission) staffs were available to meet with communities on an individual basis to review the plan and consider adoption and implementation steps. A status report on plan adoption by the County and local units of government is maintained by the Racine County Office of Emergency Management.

With some additions, similar local adoption procedures were followed for the first update of this plan. As draft chapters of the updated plan were completed, copies were placed in downloadable form on the Commission's website. A comments page was available on the Commission's website on which members of the public could ask questions and submit comments upon the draft plan update. When the plan was completed in draft form, a public informational meeting was held to review the plan with local officials, businesses and industry, and citizens. Following finalization of the updated plan, the plan update was presented for consideration and adoption to the Racine County Economic Development and Land Use Committee and the County Board. A copy of the report was also sent to each of the local units of government requesting adoption of the updated plan and advising them of the need for such action in order to retain future eligibility for mitigation funding for the FEMA Hazard Mitigation Grant and the BRIC Program administered by the WEM.

For the second update of the Racine County all-hazards mitigation plan, draft chapters of the updated plan were again placed in downloadable form on the Commission's website. Similarly to previous planning efforts, a comments page was available on the Commission website on which members of the public could ask questions and submit comments regarding the draft plan update. During the planning period, no comments were received through this webpage. The local adoption procedures for this third edition of the Racine County all-hazards mitigation plan were also similar to those followed for the first update. The main difference was that two public informational meetings were held during the updating period to review the plan with local officials, business and industry, and citizens. One of these meetings was held following completion of the risk analysis and covered the material documented in Chapters 1 through 4. The second public meeting was held after completion of the plan in draft form and covered the entire plan update. No comments were received from the public at either public meeting. As part of consideration and adoption of the plan by the County Board, the plan was presented to the full County Board and adopted on November 7, 2017.

For this, the third update of the Racine County hazard mitigation plan, consideration of the input and needs of underserved and vulnerable populations was incorporated throughout the planning process. Public feedback on the draft plan was solicited online through the websites of both the Racine County Office of Emergency Management and the Commission, and public participation was encouraged through social media posts. Physical copies of the draft plan were available to be printed on behalf of the public through the Racine County Office of Emergency Management. An opportunity for in-person public comment was provided at a public

informational meeting, held in the evening to accommodate people who could not attend during normal business hours. Meeting notice was provided to local print, internet, and radio broadcast media contacts, and shared via social media. The public meeting notice and agenda was also shared at three separate County facilities, including the County's Ives Grove offices and Aging and Disability Resource Center. The Local Planning Team included leaders from organizations who represent the needs of vulnerable populations, including, among others, the County's two Public Health departments and Youth Volunteer Corps.

The local adoption procedures for this plan update were also similar to those followed in the previous updates, although only one public informational meeting was held, after completion of the plan in draft form. No comments were received from the public at this meeting. Following this meeting, the draft plan was finalized for consideration and adoption. Appendix F details the adoption of the plan by the County Board.

6.2 PLAN IMPLEMENTATION STRATEGIES

An important first step in implementation of this fourth edition hazard mitigation plan for Racine County is the formal adoption of the plan update by Racine County; the Cities of Racine and Burlington; the Villages of Caledonia, Elmwood Park, Mount Pleasant, North Bay, Raymond, Rochester, Sturtevant, Union Grove, Waterford, Wind Point, Yorkville; and the Towns of Burlington, Dover, Norway, and Waterford. Upon the formal adoption, the updated plan becomes an important guide to the making of hazard mitigation and related management decisions for the County and local units of government. Such adoption serves to signify agreement with and official support of the plan recommendations and enables government officials and staff to begin integrating the plan recommendations into other ongoing County and municipal programs, such as land use planning, and public works development planning and programming.

Realization of the plan will require a long-term commitment to the objectives of the plan and a high degree of coordination and cooperation among County officials and staff and various County and community departments and other bodies, including the Racine County Hazard Mitigation Local Planning Team; intergovernmental task forces or other committees that may be created in the future to help address common hazard mitigation issues; other concerned units and agencies of government and their respective officials and staffs; area developers and lending institutions; businesses, industry, and institutions; nongovernmental organizations; and concerned private citizens in undertaking the substantial investments and series of actions needed to implement the plan. Close cooperation with WEM and FEMA is also essential.

A summary of the plan elements and selected implementation strategy information, including implementation status, priority, designated management agencies, and an implementation timetable is included in Table 6.1. In addition, corresponding mitigation measures are also summarized on Map 5.9 in Chapter 5 of this report.

It is recommended that the County and local units of government incorporate the analyses performed and mitigation strategies recommended into other local planning efforts, such as those related to land use, stormwater management, stream and river protection, land and water conservation, and comprehensive planning, where appropriate. As an example of this, the analyses and recommendations of the initial Racine County hazard mitigation plan were reviewed and considered as part of the development of the comprehensive plan for Racine County.

6.3 HAZARD MITIGATION FUNDING SOURCES

The ability of each participant in this hazard mitigation plan to implement the measures proposed is most often limited by their ability to finance the projects and dedicate sufficient staffing time toward implementing projects while still providing other essential services. Financing of the construction, operation, and maintenance of hazard mitigation measures may be accomplished through a number of means, including: the establishment of a stormwater utility; tax-incremental-financing (TIF) districts; local property taxes; reserve funds; general obligation bonds; private-developer contributions, including fees paid to be applied toward construction of regional stormwater management facilities in lieu of providing onsite facilities; non-profit grants; State grants or loans; and certain Federal and State programs.

The identification of potential funding sources, including sources other than solely local-level sources, is an integral part of the implementation of a successful mitigation plan and serves as one way for participants

Table 6.1
Racine County Hazard Mitigation Plan Summary and Implementation Strategies

Mitigation Measures	Status	Priority	Implementation Timetable	Designated Management Agency (see notes for abbreviations)	Potential Funding Programs (see Appendix E)
Inland Flooding (Stormwater, Riverine, Inland Lake, Dam Failure)					
Floodplain and Environmentally Sensitive Land Preservation Element					
Floodplain and wetland zoning	Implemented	High	In place and ongoing	RCDPWDS, Municipal Planning Departments and Commissions	1, 2, 3, 4, 5, 13, 15, 16, 19, 20, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 33, 34, 35, 36, 38, 41, 44, 45, 47, 48, 49, 53, 54, 56, 57, 58, 59, 60, 61, 62, 63, 64, 66, 69, 72, 74, 75, 76, 77, 78, 79, 80, 82
Environmentally sensitive area and open space preservation actions	Partially Implemented	High	Largely in place and ongoing, expand as funding and opportunities become available	RCDPWDS, Municipal Planning Departments and Commissions, Municipal Parks Departments, Municipal Common Councils/Village Boards, WDNR, Wisconsin Coastal Management Program, Seno K/RLT Conservancy	
Wetland Restoration of up to 6,800 acres of agricultural land to reduce flood-related agricultural and property damages	Not Implemented	Medium	As funding and opportunities become available	RCDPWDS, Municipal Planning Departments and Commissions, Municipal Parks Departments, Municipal Common Councils/Village Boards, Seno K/RLT Conservancy, WDNR	
Floodplain Management Plan Element					
Fox River Watershed					
Structure floodproofing or removal	Not Implemented	High	As funding and opportunities become available	Private Property Owners, RCOEM, RCDPWDS, Wisconsin Emergency Management	1, 2, 3, 4, 5, 13, 15, 16, 19, 20, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 33, 34, 35, 36, 38, 41, 44, 45, 47, 48, 49, 53, 54, 56, 57, 58, 59, 60, 61, 62, 63, 64, 66, 69, 72, 74, 75, 76, 77, 78, 79, 80, 82
Replacement of two 20-foot-wide radial gates and one actuator motor at Waterford Dam	Implemented	--	Implemented	RCDPWDS	
Installation of gates at Rochester Dam	Implemented	--	Implemented	RCDPWDS	
Channel clean out in Fox River upstream from Waterford Impoundment	Not Implemented	Medium	As needed	Southeastern Wisconsin Fox River Commission, Waterford Waterway Management District, RCDPWDS, WDNR	
Land acquisition	Not Implemented	Medium	As funding and opportunities become available	RCDPWDS, Southeastern Wisconsin Fox River Commission, Waterford Waterway Management District, WDNR, Seno K/RLT Conservancy	
Maintenance dredging within Waterford Impoundment	Partially Implemented	Medium	As funding and opportunities become available	Private Lake Property Owners, Southeastern Wisconsin Fox River Commission, Waterford Waterway Management District, WDNR	

Table continued on next page.

Table 6.1 (Continued)

Mitigation Measures	Status	Priority	Implementation Timetable	Designated Management Agency (see notes for abbreviations)	Potential Funding Programs (see Appendix E)
Inland Flooding (Stormwater, Riverine, Inland Lake, Dam Failure) (continued)					
Floodplain Management Plan Element (continued)					
Fox River Watershed (continued)					
Channel clean out of Wind Lake Drainage Canal	Not Implemented	Medium	As needed	Racine County Drainage Board	1, 2, 3, 4, 5, 13, 15, 16, 19, 20, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 33, 34, 35, 36, 38, 41, 44, 45, 47, 48, 49, 53, 54, 56, 57, 58, 59, 60, 61, 62, 63, 64, 66, 69, 72, 74, 75, 76, 77, 78, 79, 80, 82
Channel clean out and deepening along Muskego Canal	Implemented	--	Implemented	--	
Measures recommended to be reevaluated considering current conditions and contemporary, environmentally sound flood mitigation approaches:					
• Construction of dikes and floodwalls in City of Burlington	Mostly Implemented	Medium	Largely in place; additional measures to be reevaluated	City of Burlington Public Works Department	
• Construct agricultural dikes along Wind Lake Drainage Canal and tributaries	Not Implemented	Medium	Measures to be reevaluated to consider current conditions and contemporary, environmentally sound flood mitigation approaches	Racine County Drainage Board, RCDPWDS, Municipal Public Works/Engineering Departments, Municipal Planning Departments, WDNR	
• Construction of levees and channel improvements along Hoosier Creek	Not Implemented	Medium	Measures to be reevaluated to consider current conditions and contemporary, environmentally sound flood mitigation approaches	Racine County Drainage Board, RCDPWDS, Kenosha County, Municipal Public Works/Engineering Departments, Municipal Planning Departments, WDNR	
Root River Watershed					
Channel clearing and maintenance along the Root River Canal	Partially Implemented	Medium	Ongoing	Racine County Drainage Board	1, 2, 3, 4, 5, 13, 15, 16, 19, 20, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 33, 34, 35, 36, 38, 41, 44, 45, 47, 48, 49, 53, 54, 56, 57, 58, 59, 60, 61, 62, 63, 64, 66, 69, 72, 74, 75, 76, 77, 78, 79, 80, 82
Structure floodproofing or removal	Not Implemented	High	As funding and opportunities become available	Private property owners, RCOEM, RCDPWDS, WEM	
Increase spillway capacity or removal of Horlick Dam	Not Implemented	High	Must be completed by April 2024	Racine County Board, RCDPWDS, WDNR	
Pike River channel enlargement and rehabilitation	Implemented	--	Implemented	Village of Mount Pleasant Stormwater Drainage Utility	
Berm along Bartlett Branch	Implemented	--	Completed	--	
Chicory Road culvert replacement along Sorenson Creek	Not Implemented	Medium	To be determined	Village of Mount Pleasant Stormwater Drainage Utility	
Structure floodproofing or removal	Not Implemented	High	As funding and opportunities become available	Private property owners, RCOEM, RCDPWDS, WEM	

Table continued on next page.

Table 6.1 (Continued)

Mitigation Measures	Status	Priority	Implementation Timetable	Designated Management Agency (see notes for abbreviations)	Potential Funding Programs (see Appendix E)
Inland Flooding (Stormwater, Riverine, Inland Lake, Dam Failure) (continued)					
Floodplain Management Plan Element (continued)					
Des Plaines River Watershed					
Provide onsite detention storage facilities for planned new development	Partially Implemented	High	Ongoing	Private Property Owners, RCDPWDS, Municipal Public Works/Engineering Departments	1, 2, 3, 4, 5, 13, 15, 16, 19, 20, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 33, 34, 35, 36, 38, 41, 44, 45, 47, 48, 49, 53, 54, 56, 57, 58, 59, 60, 61, 62, 63, 64, 66, 69, 72, 74, 75, 76, 77, 78, 79, 80, 82
Prairie restoration	Not Implemented	Medium	As funding and opportunities become available	Private Property Owners, RCDPWDS, Municipal Planning Departments, Seno K/RLT Conservancy, WDNR	
Wetland restoration	Not Implemented	Medium	As funding and opportunities become available	Private Property Owners, RCDPWDS, Municipal Planning Departments, Seno K/RLT Conservancy, WDNR	
Stormwater Management Plan Element					
Stormwater management plans	Partially Implemented	High	Ongoing	Municipal Stormwater Utility Districts, Municipal Public Works/Engineering Departments, RCDPWDS	5, 15, 18 17, 19, 41, 53, 56, 57, 64, 65, 66, 68, 78, 84
Stormwater-related regulations	Partially Implemented	High	Ongoing	Municipal Stormwater Utility Districts, Municipal Public Works/Engineering Departments, Municipal Planning Departments RCDPWDS	
Public Information and Education Element					
Continue and enhance public education activities related to flood and stormwater management including the distribution of information related to the Federal Flood Insurance Program	Partially Implemented	High	Ongoing	RCOEM, RCDPWDS, MSWUD, Municipal Planning Departments, Municipal Engineering Departments, Root-Pike WIN, WEM, UW-Extension	5, 29, 40, 41, 57, 64, 66, 72, 75, 84
Additional Plan Elements					
National Flood Insurance Program and map updating	Partially Implemented	High	Ongoing, RiskMAP updating efforts underway in Fox River Watershed	FEMA, RCDPWDS, RCOEM, Municipal Planning Departments	1, 2, 3, 5, 13, 14, 15, 16, 17, 18, 19, 21, 24, 28, 30, 35, 36, 37, 38, 43, 44, 53, 62, 64, 68, 72, 78
Lending institution and real estate agent policies	Partially Implemented	High	Ongoing	Lending Institutions and Real Estate Brokers	

Table continued on next page.

Table 6.1 (Continued)

Mitigation Measures	Status	Priority	Implementation Timetable	Designated Management Agency (see notes for abbreviations)	Potential Funding Programs (see Appendix E)
Inland Flooding (Stormwater, Riverine, Inland Lake, Dam Failure) (continued)					
Additional Plan Elements (continued)					
Channel maintenance	Partially Implemented	Medium	Ongoing	Racine County Drainage Board, Southeastern Wisconsin Fox River Commission, Waterford Waterway Management District, RCDPWDS, Municipal Public Works Departments	1, 2, 3, 5, 13, 14, 15, 16, 17, 18, 19, 21, 24, 28, 30, 35, 36, 37, 38, 43, 44, 53, 62, 64, 68, 72, 78
Stormwater management facilities maintenance	Partially Implemented	High	Ongoing	Municipal Stormwater Utility Districts, Municipal Public Works/Engineering Departments, RCDPWDS	
Dam inspections, emergency action plans, and removals	Partially Implemented	High	Ongoing	Public and Private Dam Owners, WDNR	
Survey of buildings near flood hazard area	Not Implemented	High	As needed	Private Property Owners, RCDPWDS, Municipal Public Works/Engineering Departments	
Thunderstorms, High Straight-Line Winds, Hail, and Lightning Hazards					
Maintain, update, and further develop early warning systems and networks including use of National Oceanic and Atmospheric Administration All Hazard Weather Radios, EAS broadcasts, WEA system, CodeRED® Emergency and Weather Notification System	Partially Implemented	High	Ongoing	RCOEM, RCDPWDS, Municipal Public Works Departments, Municipal Police Departments, Racine County Sheriff's Department, NOAA	1, 5, 15, 32, 35, 74, 75
Retrofit existing or install new structures to ensure adequate shelters from tornadoes for public buildings, major industrial sites, and other large businesses or complexes such as shopping malls, fairgrounds, mobile home parks, and other vulnerable public areas	Partially Implemented	High	As needed	Property Owners, Municipal Common Counsels, Village Boards, Town Boards	
Promote educational and informational programming, especially related to the early warning network, and to individual actions to protect citizens, property, and businesses	Partially Implemented	High	Ongoing	RCOEM, UW-Extension	
Enforce building code ordinances requirements	Partially Implemented	High	Ongoing	Wisconsin Department of Safety and Public Services, Municipal Engineering Departments, RCDPWDS	

Table continued on next page.

Table 6.1 (Continued)

Mitigation Measures	Status	Priority	Implementation Timetable	Designated Management Agency (see notes for abbreviations)	Potential Funding Programs (see Appendix E)
Thunderstorms, High Straight-Line Winds, Hail, and Lightning Hazards (continued)					
Encourage provision of safe rooms	Partially Implemented	High	Ongoing	RCOEM	1, 5, 15, 32, 35, 74, 75
Work with municipalities and businesses to explore installation of community safe rooms and hardening projects for community facilities, businesses, and manufacturers	Not Implemented	High	As needed	RCOEM	
Consider municipal adoption of mobile home park regulations that require that community safe rooms be provided for residents of new and expanding mobile home parks	Not Implemented	Medium	Ongoing	RCDPWDS, Municipal Common Counsels, Village Boards, Town Boards	
Pursue grant funding for installation of safe rooms in existing mobile home parks, based on community and landowner interest	Partially Implemented	High	Ongoing	RCOEM, Mobile Home Park Owners	
Encourage agricultural producers to purchase crop insurance	Partially Implemented	Medium	Ongoing	USDA Farm Service Agency, RCDPWDS, RCOEM	
Continue to conduct annual weather spotter training	Implemented	Low	Ongoing	RCOEM	
Continued coordination of emergency operations and response plans among governmental units and first responders	Partially Implemented	High	Ongoing	RCOEM, Racine County Sheriff's Department, Municipal Police Departments, Municipal Fire and EMS Departments	
Tornadoes					
Maintain, update, and further develop early warning systems and networks including use of National Oceanic and Atmospheric Administration All Hazard Weather Radios, EAS broadcasts, WEA system, and CodeRED® Emergency and Weather Notification System	Partially Implemented	High	Ongoing	RCOEM, RCDPWDS, Municipal Public Works Departments, Municipal Police Departments, Racine County Sheriff's Department, NOAA	1, 5, 15, 32, 35, 74, 75
Retrofit existing or install new structures to ensure adequate shelters from tornadoes for public buildings, major industrial sites, and other large businesses or complexes such as shopping malls, fairgrounds, mobile home parks, and other vulnerable public areas	Partially Implemented	High	As needed	Property Owners, Municipal Common Counsels, Village Boards, Town Boards	

Table continued on next page.

Table 6.1 (Continued)

Mitigation Measures	Status	Priority	Implementation Timetable	Designated Management Agency (see notes for abbreviations)	Potential Funding Programs (see Appendix E)
Tornadoes (continued)					
Work with municipalities and businesses to explore installation of community safe rooms and hardening projects for community facilities, businesses, and manufacturers	Partially Implemented	Medium	Ongoing	RCOEM	1, 5, 15, 32, 35, 74, 75
Consider municipal adoption of mobile home park regulations that require that community safe rooms be provided for residents of new and expanding mobile home parks	Not Implemented	Medium	To be determined	RCDPWDS, Municipal Common Councils and Village Boards	
Pursue grant funding for installation of safe rooms in existing mobile home parks, based on community and landowner interest	Not Implemented	High	Ongoing	RCOEM, Mobile Home Park Owners	
Promote educational and informational programming, especially related to the early warning network, and to individual actions to protect citizens, property, and businesses	Partially Implemented	High	Ongoing	RCOEM, UW-Extension	
Enforce building code ordinances requirements	Partially Implemented	High	Ongoing	Wisconsin Department of Safety and Professional Services, Municipal Engineering Departments, RCDPWDS	
Continue to conduct annual weather spotter training	Implemented	Low	Ongoing	RCOEM	
Continue coordination of emergency response and operation plans among governmental units and first responders	Partially Implemented	High	Ongoing	RCOEM, Racine County Sheriff's Department, Municipal Police Departments, Municipal Fire and EMS Departments	
Extreme Temperatures (Extreme Heat, Extreme Cold)					
Organize neighborhood outreach groups who look after vulnerable groups and individuals	Partially Implemented	High	Ongoing	RCOEM, City of Racine Health Department, Central Racine County Health Department, American Red Cross Southeastern Wisconsin Chapter, Racine County Human Services Department	35, 51, 70, 75
Identify and advertise a list of available heating and or cooling shelters in the immediate area	Implemented	High	Ongoing	RCOEM, City of Racine Health Department, Central Racine County Health Department, UW-Extension	
Continue to provide special arrangements for payment of heating bills	Implemented	High	Ongoing	WE Energies	

Table continued on next page.

Table 6.1 (Continued)

Mitigation Measures	Status	Priority	Implementation Timetable	Designated Management Agency (see notes for abbreviations)	Potential Funding Programs (see Appendix E)
Extreme Temperatures (Extreme Heat, Extreme Cold) (continued)					
Maintain, update, and further develop early warning systems and networks including use of National Oceanic and Atmospheric Administration All Hazard Weather Radios, EAS broadcasts, WEA system, and CodeRED® Emergency and Weather Notification System	Partially Implemented	High	Ongoing	RCOEM, RCDPWDS, Municipal Public Works Departments, Municipal Police Departments, Racine County Sheriff's Department, NOAA	35, 51, 70, 75
Promote educational and informational programming	Partially Implemented	High	Ongoing	RCOEM, City of Racine Health Department, Central Racine County Health Department, UW-Extension	
Lake Michigan Coastal Hazards					
Continued enforcement of County shoreland zoning ordinance	Partially Implemented	High	Ongoing	RCDPWDS, Municipal Planning Departments	1, 2, 3, 4, 14, 15, 19, 20, 45, 75, 76, 78, 80, 82
Review Lake Michigan shoreline municipal shoreland ordinances	Partially Implemented	Medium	To be determined	RCDPWDS, Municipal Planning Departments	
Update assessment of the effectiveness of Lake Michigan shoreline protection structures in the County every 10 years	Out of Date	High	Every 10 years; last update 2005	RCDPWDS, Municipal Planning Departments, Municipal Engineering Departments, Wisconsin Coastal Management Program, UW Sea Grant Institute	
Continued construction and maintenance of shoreline protection structures	Partially Implemented	High	As needed	Private Landowners, RCDPWDS, Municipal Engineering Departments, UW Sea Grant Institute, WDNR	
Where possible, relocate buildings within a high-risk area. In circumstances where buildings cannot be relocated safely or economically, or where bluff recession has progressed to the point where the risk of catastrophic failure of the slope is imminent, or where there is an imminent threat of failure within five years, acquisition and demolition of structures should be considered. This plan element is presented as an option, subject to the preference of the individual property owner.	Not Implemented	High	As needed	Municipal Common Councils and Village Boards, Municipal Engineering Departments, RCDPWDS, RCOEM, WEM, FEMA, U.S. Army Corps of Engineers	
Continue ongoing programs to update and refine coastal hazard area data using geographic information system technology	Partially Implemented	Medium	Ongoing	RCDPWDS, Municipal Engineering Departments, Wisconsin Coastal Management Program, UW Sea Grant Institute, SEWRPC	

Table continued on next page.

Table 6.1 (Continued)

Mitigation Measures	Status	Priority	Implementation Timetable	Designated Management Agency (see notes for abbreviations)	Potential Funding Programs (see Appendix E)
Lake Michigan Coastal Hazards (continued)					
Review water and wastewater treatment plant and outfall capacity and level of protection under range of Lake Michigan water levels	Partially Implemented	Medium	Ongoing	City of Racine Water and Wastewater Utility	1, 2, 3, 4, 14, 15, 19, 20, 45, 75, 76, 78, 80, 82
Public informational and educational programming	Partially Implemented	High	Ongoing	RCDPWDS, Municipal Planning Departments, Wisconsin Coastal Management Program, UW Sea Grant Institute, SEWRPC	
Winter Storm Events					
Organize neighborhood outreach groups who look after vulnerable groups and individuals	Partially Implemented	High	Ongoing	RCOEM, American Red Cross Southeastern Wisconsin Chapter, Racine County Human Services Department	1, 5, 70, 75, 85
Identify and advertise a list of available heated shelters in the immediate area	Partially Implemented	High	Ongoing	RCOEM, City of Racine Health Department, Central Racine County Health Department, UW-Extension	
Maintain, update, and further develop early warning systems and networks including use of National Oceanic and Atmospheric Administration All Hazard Weather Radios, EAS broadcasts, WEA system, and CodeRED® Emergency and Weather Notification System	Partially Implemented	High	Ongoing	RCOEM, RCDPWDS, Municipal Public Works Departments, Municipal Police Departments, Racine County Sheriff's Department, NOAA	
Promote educational and informational programming	Partially Implemented	Medium	Ongoing	RCOEM, UW-Extension	
Encourage residents to develop a Family Emergency Preparedness Plan including the preparation of a Disaster Supply Kit	Partially Implemented	Medium	Ongoing	RCOEM	
Ongoing enforcement of building code ordinance requirements	Partially Implemented	High	Ongoing	WDSPS, Municipal Engineering Departments, RCDPWDS	
Work with agencies to establish a system for short-term sheltering	Partially Implemented	Medium	Ongoing	RCOEM, American Red Cross Southeastern Wisconsin Chapter	
Continued coordination of emergency response plans among governmental units and first responders	Partially Implemented	High	Ongoing	RCOEM, Racine County Sheriff's Department, Municipal Police Departments, Municipal Fire and EMS Departments	
Continue and refine State, County, and local road maintenance programs	Partially Implemented	High	Ongoing	RCDPWDS, Municipal Public Works Departments, WisDOT	
Work with utilities to assess and improve electrical service reliability	Partially Implemented	Medium	Ongoing	RCOEM, WE Energies	

Table continued on next page.

Table 6.1 (Continued)

Mitigation Measures	Status	Priority	Implementation Timetable	Designated Management Agency (see notes for abbreviations)	Potential Funding Programs (see Appendix E)
Drought Events					
Encourage the development and maintenance of drought emergency plans for local utilities and communities	Partially Implemented	High	Ongoing	Water Supply Utilities, Municipal Planning Departments	27, 31, 32, 47, 67, 68, 74, 75,
Encourage development of local water conservation programs	Partially Implemented	Medium	2022	Water Supply Utilities, Municipal Planning Departments	
Encourage multi-agency approaches to water conservation, drought planning, and stream and ground water monitoring	Partially Implemented	Medium	Ongoing	Water Supply Utilities, USDA Farm Service Agency, WDNR, USGS	
Promote educational and informational programming	Partially Implemented	High	Ongoing	Water Supply Utilities, RCOEM, WDATCP, UW-Extension	
Support agricultural programs that promote soil health, preserve soil moisture, and help to minimize loss of crops and topsoil in event of a drought. Such programs should promote the use of agricultural methods that reduce evaporation and/or promote infiltration	Partially Implemented	High	Ongoing	Agricultural Producers, RCDPWDS, WDATCP	
Evaluate and design water supply systems which are not vulnerable to drought	Partially Implemented	High	Ongoing	Water Supply Utilities, Agricultural Producers, RCDPWDS, WDATCP	
Encourage farm operators to evaluate economics of crop insurance	Partially Implemented	Medium	Ongoing	USDA Farm Service Agency, UW-Extension, RCDPWDS, RCOEM	
Encourage development practices that promote preservation of areas of high and very high groundwater recharge potential and promote stormwater management practices that facilitate aquifer recharge	Partially Implemented	High	Incorporated into Regional Land Use Plan, Ongoing	RCDPWDS, Municipal Planning Departments	

Note: The following abbreviations are used for designated management agencies:

FEMA = Federal Emergency Management Agency
NOAA = National Oceanic and Atmospheric Administration
RCDPWDS = Racine County Department of Public Works and Development Services
RCOEM = Racine County Office of Emergency Management
SEWRPC = Southeastern Wisconsin Regional Planning Commission
USDA = U.S. Department of Agriculture
USGS = U.S. Geological Survey
WDATCP = Wisconsin Department of Agriculture, Trade, and Consumer Protection
WEM = Wisconsin Emergency Management
WDNR = Wisconsin Department of Natural Resources
WDSPS = Wisconsin Department of Safety and Professional Services
WisDOT = Wisconsin Department of Transportation

Source: SEWRPC

in this plan to expand on and improve their capability to mitigate the impacts of hazard events in their communities. Successfully pursuing and receiving grant funding takes a considerable amount of time and effort and the lack of available staff time to pursue funding opportunities is often a major barrier to successful plan implementation. Having sufficient staff time dedicated to pursuing grant funding opportunities represents a way to expand a community's capability to implement the hazard mitigation measures recommended in this plan, particularly with increasing funding becoming available through the Bipartisan Infrastructure Law.[78]

The following description of funding sources includes those that appear to be potentially applicable for the County and local units of government as of 2021. However, because funding programs and opportunities are constantly changing, the involved County and local units of government staffs will need to monitor the potential funding sources and programs. Some of the programs described in this chapter may not be available under all envisioned conditions in the County or to its residents and/or property owners for a variety of reasons, including, for example, eligibility requirements or lack of funds at a given time in Federal and/or State budgets. Nonetheless, the list of sources and programs set forth in this chapter can provide a starting point for identifying possible funding sources for implementing the hazard mitigation plan recommended in this report. Appendix E provides a summary of available funding programs and Table 6.1 identifies the specific funding programs that could help implement each mitigation element recommended in this plan.

Federal Emergency Management Agency Programs

The Federal Emergency Management Agency (FEMA) funds several programs that in the State of Wisconsin are administered through WEM. These programs include the Hazard Mitigation Grant Program, the Flood Mitigation Assistance Program, the Building Resilient Infrastructure and Communities (BRIC) Program, and the Public Assistance Program. These programs are described below. Examples of types of projects that can be eligible for funding under the Hazard Mitigation Grant Program, the Flood Mitigation Assistance Program, and the BRIC Program are given in Table 6.2. For all three FEMA programs, the projects must be cost-effective (benefits outweigh the costs), environmentally sound, address a repetitive problem, and be a long-term solution.

Hazard Mitigation Grant Program

The Hazard Mitigation Grant Program (HMGP) can provide up to 75 percent of the costs attendant to certain natural hazard mitigation programs. In the case of flood mitigation, projects can include the floodproofing or acquisition and relocation of floodprone properties, the elevation of structures in compliance with National Flood Insurance Program (NFIP) standards, and other flood control measures, including structural projects, where identified as cost-effective. To be eligible for flood mitigation related activities with FEMA funding, structures must be insured under the NFIP. Acquisition and demolition of structures in landslide or bluff recession areas where the risk of catastrophic failure of the slope is imminent and/or an immediate threat is also eligible for HMGP funding. Under the HMGP, the balance of the costs are shared by the State of Wisconsin (12.5 percent) and the grantee (12.5 percent). Communities in Wisconsin can apply through the State for HMGP funds only after a Presidential disaster declaration is issued. The amount that a state is awarded is based upon the size of the declared disaster. Communities applying for HMGP funds do not have to be in the declared disaster area, however, communities within the disaster area receive priority for project funding. HMGP funds must be applied for within 60 days of the declaration. Eligible projects must be included as part of the grantee's hazard mitigation plan and must meet cost-benefit criteria established by FEMA. Although State and local units of government are eligible applicants, HMGP funds can be used on private property for eligible projects. The State, as HMGP grantee, is responsible for identifying and prioritizing projects. The following have been adopted as the State's priorities for HMGP funds:

1. Acquisition and demolition of floodplain properties determined to be substantially damaged per a community's floodplain zoning ordinance

2. Acquisition and demolition of repetitive loss and severe repetitive loss structures

3. Acquisition and demolition of damaged floodplain properties

[78] *U.S. Public Law No. 117-58 (2021),* Infrastructure Investment and Jobs Act, www.govinfo.gov/app/details/PLAW-117publ58.

Table 6.2
Eligible Activities Under Federal Hazard Mitigation Grant Programs

Eligible Activity	Hazard Mitigation Grant Program	Flood Mitigation Assistance Program	BRIC Program
Mitigation Projects	Y	Y	Y
Property Acquisition and Structure Demolition	Y	Y	Y
Property Acquisition and Structure Relocation	Y	Y	Y
Structure Elevation	Y	Y	Y
Mitigation Reconstruction	Y	Y	Y
Dry Floodproofing of Historic Residential Structures	Y	Y	Y
Dry Floodproofing of Non-residential Structures	Y	Y	Y
Generators	Y	--	Y
Localized Flood Risk Reduction Projects	Y	Y	Y
Non-localized Flood Risk Reduction Projects	Y	--	Y
Structural Retrofitting of Existing Buildings and Facilities	Y	Y	Y
Non-structural Retrofitting of Existing Buildings and Facilities	Y	Y	Y
Safe Room Construction	Y	--	Y
Wind Retrofit for One- and Two-Family Residences	Y	--	Y
Infrastructure Retrofit	Y	Y	Y
Soil Stabilization	Y	Y	Y
Wildfire Mitigation	Y	--	Y
Post-Disaster Code Enforcement	Y	--	--
Advanced Assistance	Y	--	--
5 Percent Initiative Projects	Y	--	--
Miscellaneous/Other[a]	Y	Y	Y
Hazard Mitigation Planning	Y	Y	Y
Planning Related Activities	Y	--	--
Technical Assistance	--	Y	--
Management Cost	Y	Y	Y

[a] *Miscellaneous/Other indicates that any proposed action will be evaluated on its own merit against program requirements. Eligible projects may be approved provided funding is available.*

Source: Federal Emergency Management Agency

4. Acquisition and demolition of floodplain properties
5. Acquisition and demolition of flood damaged properties not in the floodplain
6. Elevating, floodproofing, or retrofitting flood damaged structures not in the floodplain
7. Other hazard reduction projects (such as community or residential safe rooms, detention basins, storm sewer improvements, protection of utilities, drainage)

Communities applying for HMGP program funding must have a current hazard mitigation plan (or have adopted the County's hazard mitigation plan) that has been formally approved by FEMA at the time the grant is awarded and funds are obligated.

Flood Mitigation Assistance Program

The Flood Mitigation Assistance (FMA) program can potentially provide up to 75 percent of the costs attendant to the acquisition, relocation, elevation, and floodproofing of structures in compliance with NFIP standards. Properties included in a project sub-application for FMA funding must be NFIP-insured at the time of the application submittal and prior to the period of availability or application start date. Flood insurance must be maintained through completion of the mitigation activity and for the life of the structure. In addition to participating in the NFIP, eligible program applicants must meet cost-benefit criteria established by FEMA. Mitigation of repetitive-loss properties is given a high priority under this program. Properties that meet FEMA's definition for Repetitive Loss (RL) are 90 percent federally funded and Severe Repetitive Loss (SRL) properties are 100 percent federally funded under this program. Increased

cost of compliance (ICC) coverage under the NFIP may provide a funding source for bringing noncompliant structures into compliance after a flood loss. Communities applying for FMA program funding must have a current hazard mitigation plan (or have adopted the County's current hazard mitigation plan) that has been formally approved by FEMA at the time of application deadline. The hazard mitigation plan must also be current at the time the grant is awarded and funds are obligated.

Building Resilient Infrastructure and Communities (BRIC) Program

FEMA's Building Resilient Infrastructure and Communities (BRIC) Program can potentially provide up to 75 percent of the costs attendant to pre-disaster natural hazard mitigation planning and the implementation of cost-effective mitigation projects prior to a disaster event. Funding these plans and projects reduces overall risks to the population and structures, while also reducing reliance on funding from actual disaster declarations. This is a national competitive program that is dependent on Congressional appropriations. The amount and timing of funding appropriations varies from year to year. Examples of eligible projects include property acquisition; structure removal or relocations; structure elevation; safe room construction; dry floodproofing of nonresidential structures and historic residential structures; minor localized flood reduction projects; soil stabilization; and construction or modification of groins, jetties, and breakwaters. Communities applying for BRIC program funding must have a current hazard mitigation plan (or have adopted the County's current hazard mitigation plan) that has been formally approved by FEMA at the time of application deadline. The hazard mitigation plan must also be current at the time the grant is awarded and funds are obligated.

Public Assistance Program

FEMA's Public Assistance Program (PA) can provide some limited assistance with respect to structure elevation and relocation. For example, if entire portions of a community were to be relocated outside of a floodplain, this program can assist in rebuilding the necessary infrastructure in the new location. Funding under this program is provided for repair of infrastructure damaged during a flood that results in a Presidential disaster declaration. In making repairs to the infrastructure, cost-effective mitigation activities may be included. If a community determines that a badly damaged facility is not to be repaired, the estimated damage amount may be used to fund an alternate project. Funding provided under the PA program may pay for cost-effective hazard mitigation measures for facilities damaged by the incident. In addition, funding from the PA program may be combined with funding from the HMGP, FMA, and/or PDM programs to implement mitigation measures on the same facility; however, funding from these programs cannot be combined to pay for the same work.

U.S. Department of Agriculture Farm Service Agency

The U.S. Department of Agricultural Farm Service Agency (USDA-FSA) oversees several voluntary conservation-related programs that provide direct and indirect hazard mitigation benefits. These programs work to address a large number of farming- and ranching-related issues including drinking water protection, reducing soil erosion, preserving wildlife habitat, preserving and restoring forest and wetlands, and aiding farmers whose farms have been damaged by natural disasters. Several of these programs are described below (also see Appendix E).

Conservation Reserve Program

The Conservation Reserve Program (CRP) is a voluntary program for agricultural landowners that provides annual rental payments and up to 50 percent cost-share assistance to establish long-term, resource-conserving covers on eligible farmland. The CRP goal is to reduce soil erosion, protect the nation's ability to produce food, reduce sedimentation in streams and lakes, improve water quality, establish wildlife habitat, and enhance forest and wetland resources. Implementation of the program can also have hazard mitigation benefits, including reduction of crop losses and property damages due to flooding. Through the program, farmers are encouraged to convert highly erodible cropland or other environmentally sensitive areas to vegetative cover such as prairie-compatible, noninvasive forage mix, wildlife plantings, trees, filter strips, or riparian buffers. The rental payment that the land owner receives is based on the agricultural rental value of the land.

Conservation Reserve Enhancement Program

The Conservation Reserve Enhancement Program (CREP) is an offshoot of the CRP that targets exclusively removing high-priority environmentally sensitive riparian areas from crop or pasture production. CREP pays landowners to install riparian buffers, grassed waterways, filter strips along waterways, or to return

continually flooded agricultural fields to restored wetlands. The program provides cost share assistance from both Federal and State funding for project costs. The farmer is also compensated with an annual rental payment. The CREP program enrolls up to 100,000 acres within the State. In drought years, haying may be allowed on CREP land to offset the overall loss of production on farmlands. The program helps reduce environmental damage and improve water quality while reducing crop and property losses from flooding. Participation in this program is voluntary and the contract period is typically ten to 15 years.

Farmable Wetlands Program

The Farmable Wetlands Program (FWP) is also run through the CRP program and is designed to restore previously farmed wetlands to improve both vegetation and water flow. Landowners must agree to restore the wetlands, establish plant cover, and not use the enrolled land for commercial purposes. The program aims to improve surface and groundwater quality, prevent soil erosion, reduce downstream flood damage, and provide habitat for wildlife. FWP contracts last between ten and 15 years. The maximum size of enrollment is 40 acres.

U.S. Department of Agriculture Natural Resources Conservation Service

The U.S. Department of Agricultural Natural Resources Conservation Service (USDA-NRCS) provides farmers and ranchers with financial and technical assistance to voluntarily install conservation measures to concurrently help the environment and agricultural operations. Many of these programs may serve as potential funding sources for flood mitigation efforts by the County and local communities (see Appendix E).

U.S. Department of Housing and Urban Development
Community Development Block Grant Program

Community Development Block Grant (CDBG) programs, funded by the U.S. Department of Housing and Urban Development (HUD), are administered by the Wisconsin Department of Administration (see Appendix E).

The Community Development Block Grant Emergency Assistance Program (CDBG-EAP) is a special program that the Wisconsin Department of Administration, Division of Energy, Housing, and Community Resources activates to assist local units of government that have recently experienced a natural or manmade disaster. The program provides funds to address housing needs which occur as a direct result of natural or man-made disasters, with preference given to those households with incomes at or below 80 percent of the county median household income. A local unit of government that has recently experienced a natural or man-made disaster may apply for assistance in addressing housing problems caused by the disaster. Generally, cities, towns, and villages with populations less than 50,000, and counties with populations less than 200,000 are eligible to apply. The program also makes funds available for the repair of public infrastructure affected by natural disaster. Eligible activities dependent upon the nature of the disaster may include: repair of damage to the dwelling unit, acquisition and demolition of dwellings unable to be repaired, costs for new housing units to replace those lost in the disaster, and repairs to publicly-owned utility systems, streets, and sidewalks. The CDBG-EAP has provided the local match on many hazard mitigation assistance projects around the State. These funds are especially instrumental in non-declared events, as they may be the only source of funding for recovery or mitigation activities after an event. A local unit of government interested in applying for CDBG-EAP funds must do so within 90 days of the disaster event.

The Community Development Block Grant for Public Facilities Program is a versatile financing tool for general-purpose local units of government in need of funds to undertake needed infrastructure and public building projects. This program is designed to enhance the vitality of a community by undertaking public investment that contributes to its overall community and economic development. Eligible applicants are local units of government that are not HUD entitlement communities. Projects must meet one of the three national objectives for the program, which are: 1) the project principally benefits low and moderate income persons; 2) the project eliminates slum and blight; and 3) the proposed activity meets an urgent local need, typically a catastrophic event. Eligible activities include utilities and streets, fire stations and emergency vehicles, community/senior centers and shelters, tornado shelters or shelter retrofits, and municipal telecommunications. Grant funds are available on a continual basis. The maximum grant for any single applicant is $500,000 and applicants can receive only one grant per 12-month period.

U.S. Small Business Administration Programs

The U.S. Small Business Administration (SBA) provides disaster loans to homeowners and businesses to repair or replace property damaged in a declared disaster. SBA loans are granted only for uninsured losses. Loans may be used to meet required building codes, such as the NFIP requirements. SBA may also provide loans for relocation out of special flood hazard areas when such relocations are required by local officials. While SBA's enabling legislation generally prohibits the agency from making disaster loans for voluntary relocations, there are exceptions that can be made, including relocations of homeowners, renters, and business owners out of special flood hazard areas when the community is participating in a buyout program. These loans would be limited to the amount necessary to repair or replace the damage at the disaster site. SBA loans may also be used to refinance existing mortgages. Up to 20 percent of the disaster loan can be used for mitigation measures.

U.S. Army Corps of Engineers

The following U.S. Army Corps of Engineers (USACE) programs are potential sources of funding for implementing the recommendations of this plan related to floodland management and Lake Michigan coastal hazards. In order to be eligible for funding, the plan components must meet specific Corps economic feasibility and other criteria. The programs which may be applicable include the following:

- Section 22—Water resources planning assistance (50 percent Federal, 50 percent local cost share)
- Section 103—Hurricane and Storm Damage Reduction Program. Maximum $5.0 million per project (65 percent Federal, 35 percent local cost share)
- Section 205—Flood damage reduction projects—Maximum Federal cost for planning, design, and construction is $10.0 million per project (65 percent Federal, 35 percent local cost share)
- Section 208—Clearing debris and sediment from channels for flood prevention. Maximum $500,000 per project (65 percent Federal, 35 percent local cost share)
- Section 14—Emergency streambank and shoreline protection. Maximum $1.5 million per project (65 percent Federal, 35 percent local cost share)

Wisconsin Department of Natural Resources

The Wisconsin Department of Natural Resources (WDNR) operates programs that may serve as potential funding sources for flood mitigation efforts by the County and local communities (see also Appendix E). Some of these programs are described below.

Municipal Flood Control and Riparian Restoration Program

This program provides grants for the mitigation of flood-prone property, the restoration of riparian areas, and the construction of flood control projects. Under Chapter NR 199, "Municipal Flood Control Grants", of the *Wisconsin Administrative Code* municipalities, including cities, towns, and villages, as well as metropolitan sewerage districts are eligible for cost-sharing grants from the State for projects such as acquisition and removal of structures; floodproofing and elevation of structures; riparian restoration projects; acquisition of vacant land, or purchase of easements, to provide additional flood storage or to facilitate natural or more efficient flood flows; construction of facilities for the collection, detention, retention, storage, and transmission of stormwater and groundwater for flood control and riparian restoration projects; and preparation of flood mapping projects. Municipalities and metropolitan sewerage districts are eligible for up to 70 percent State cost-share funding for eligible projects, and would have to provide at least a 30 percent local match. Applications are due on March 15th of even-numbered years.

Knowles-Nelson Stewardship Local Grant Assistance Programs

Local units of government are eligible to apply for funding through four stewardship grant programs and two related Federal programs administered by the WDNR. The WDNR programs include the Aids for the Acquisition and Development of Local Parks, the Urban Green Space, the Urban Rivers, and the Acquisition of Development Rights programs. The WDNR also administers the Federal Land and Water Conservation Fund and Recreational Trails Act programs. These programs provide 50 percent matching grants to cities,

villages, towns, counties, public inland lake protection and rehabilitation districts, and qualified nonprofit conservation organizations. Eligible activities include acquisition of land or rights to land; development and renovation projects for nature-based outdoor recreation; development, maintenance, and restoration of trails; river habitat restoration projects that serve public recreation or resource conservation purposes; and purchase of land for noncommercial gardening in urban areas. The annual application deadline is May 1.

Stormwater Management Program

The WDNR administers a Targeted Runoff Management (TRM) grant program provided for under Section 281.65(4c) of the *Wisconsin Statutes*. Local governmental units may be reimbursed up to 70 percent of eligible costs associated with installing Best Management Practices (BMPs) to limit or end nonpoint water pollution. Grant awards for small-scale agricultural and urban projects cannot exceed $150,000. Grants provided under this program may be used for projects to control nonpoint source pollution and may be available to partially support dual-purpose (quality and quantity) detention ponds, streambank protection projects, or other stormwater management facilities.

The WDNR also administers an Urban Nonpoint Source and Stormwater Grant Program provided for under Section 281.66 of the *Wisconsin Statutes*. Cities, towns, villages, and counties are eligible for grants under this program to improve urban water quality by limiting or ending sources of urban nonpoint source pollution. Funded projects are site-specific and targeted to address high priority problems in urban project areas. Two types of grants are available under this program: planning grants and construction grants. Constructions grants are made for construction projects designed to control storm water runoff rates, volumes, and discharge quality from nonpoint sources within existing urban development. Eligible project sponsors can be reimbursed up to 50 percent to construct BMPs. A project must be located in an urban area to be eligible for BMP cost sharing. Eligible activities include: Construction of structural urban BMPs such as detention basins, wet basins, infiltration trenches, infiltration basins, or wetland basins; engineering design and construction services for BMP installation; land acquisition and easement purchase; storm sewers; and streambank and shoreland stabilization projects. Projects are selected for funding based on a competitive process.

Municipal Dam Grant Program

The 2021 biennial budget provided $10 million to fund eligible engineering and construction costs associated with the maintenance, repair, modification, or abandonment and removal of municipally owned dams. The program will cover 50 percent of the first $1,000,000 of eligible project costs and 25 percent of the next $2,000,000 of dam repair, reconstruction, or modification project costs. The program will cover 100 percent of the first $1,000,000 for dam abandonment and removal projects. Cities, towns, villages, counties, tribes, and public inland lake protection and rehabilitation districts may apply for funds through this program.

Dam Removal Grant Program

The 2021 Biennial Budget provides approximately $500,000 to fund dam removal projects for any owner who wishes to remove their dam. This program provides reimbursement for 100 percent of eligible costs up to a maximum of $50,000 to remove a dam. Counties, cities, villages, towns, tribes, public inland lake protection and rehabilitation districts, and private dam owners may apply for grant funds through this program.

Urban Forestry Grant Program

This program funds projects that improve a community's capacity to manage its trees. Counties, cities, villages, towns, and nonprofit organizations may apply for this program. These grants fall into three categories: regular grants, startup grants, and catastrophic storm grants. Regular grants are competitive cost-share grants up to $25,000 to support innovative projects that will develop sustainable urban and community forestry programs. Startup grants are cost-share grants up to $5,000 available to communities that want to start or restart an urban forestry program. Catastrophic storm grants fund tree repair, removal, or replacement within urban areas following a catastrophic storm event for which the governor has declared a State of Emergency.

Wisconsin Coastal Management Program

The Wisconsin Coastal Management Program administers an annual competitive grants program available for the 15 Wisconsin coastal counties. Under the category Coastal Resource and Community Planning, funds are available for projects that support natural hazard planning and development of ordinances.

Other Potential Funding Sources

A variety of other potential funding sources exists which may provide funds for implementation of elements of the recommended hazard mitigation plan. These are listed in Appendix E.

6.4 PLAN MONITORING AND REEVALUATION STRATEGIES

For a hazard mitigation plan to be successful, it must not only be implemented, it must be monitored. Plan monitoring is best accomplished through a formal, periodic process designed to measure and assess progress in implementation, changes in outside circumstances that may affect the plan and efforts to implement it, and changes to the plan or the implementation process. The plan should also be reviewed following each hazard event to assess its continued viability and the need for revisions.

Plan Monitoring

Annual Review

Toward ensuring successful monitoring of the hazard mitigation plan for Racine County, the County intends that the Racine County Hazard Mitigation Local Planning Team meet at least annually to review the plan and the status of its implementation. At the meeting the Racine County Office of Emergency Management will give a status report detailing the progress of various mitigation projects, difficulties encountered, and the coordination efforts identified in the plan. These meetings will provide the opportunity to develop and recommend any necessary revisions and updates of the plan to the County Economic Development and Land Use Planning Committee and the County Board, as well as to the local units of government involved. The revisions would be proposed, considered, and adopted as formal amendments to the hazard mitigation plan. This review process will be coordinated and conducted by the Racine County Office of Emergency Management, with input from, coordination with, and participation by all concerned County officials and staff, all units and agencies of government involved in plan implementation, and concerned private parties.

The Local Planning Team, in its review process, will periodically examine and evaluate the plan and the efforts to implement it with respect to 1) whether any hazards affecting the County and local units of government have changed, and, if so, how they have changed; 2) whether any hazard mitigation goals and objectives have changed, or need to be altered; 3) the degree and extent of progress made in implementing previously identified hazard mitigation actions; 4) whether the plan elements and priorities should remain unchanged or need modification; 5) whether any new plan elements are needed; and 6) whether applicable funding programs and levels have changed. As an integral part of its review process, the County Office of Emergency Management, with the review and guidance of the Hazard Mitigation Local Planning Team will submit an annual written report to the County Economic Development and Land Use Planning Committee and the County Board, setting forth the status of plan implementation efforts, detailing plan implementation actions taken over the past year, prioritizing mitigation goals and activities for the next year, and setting forth any recommended revisions to the plan. It is also recommended that the County Office of Emergency Management oversee the development and maintenance of a tracking and archiving system for all future detailed hazard mitigation studies undertaken by and/or for the County or the local units of government concerned. Such studies should be evaluated using policies established either by the Local Planning Team or the County Board.

The meetings of the Local Planning Team will continue to be recorded in summary notes and posted for public review. Any salient decisions should be recorded in the County Office of Emergency Management files and, where appropriate, on the County web site and in relevant press releases, among others. Meetings of the Racine County Hazard Mitigation Local Planning Team are considered public meetings under Wisconsin Law and are open to all interested parties.

County Office of Emergency Management staff will also continue to organize community level events to increase public awareness, participation, and preparedness. The staff will ensure that appropriate notices, agendas, and other documentation are provided to interested persons and local planning team members in a timely manner. The venue and timing of these events shall be varied to ensure the widest possible participation and geographic spread across the County. Through these community level events, staff will gain an understanding of issues of concern, encourage public involvement, and maintain natural hazard awareness and preparedness at a high level.

The County Office of Emergency Management shall be responsible on a day-to-day basis for creating and implementing a common monitoring system. This will require close cooperation and coordination with other units of government and agencies involved.

Post-Disaster Review

The plan monitoring and refinement strategy will include a post-disaster component whereby the plan is reviewed and evaluated after any future major hazard event. Based upon this review, the hazard mitigation plan will be updated or revised as needed based upon the flood and other hazard event experiences, circumstances, and consequences. In this regard, the post-disaster review effort will be coordinated with the emergency operations program administered by the County Office of Emergency Management in partnership with the local units of government. The experiences of the emergency operations may indicate a need for refined mitigation actions which would then be incorporated into the plan. Any plan updating found to be needed will be incorporated into the annual plan update noted above.

Reevaluation Strategy

The components of the hazard mitigation plan developed under County- and local-level planning efforts will be reevaluated and updated at a minimum of five-year intervals, considering the degree to which the actions recommended under such efforts have been implemented and incorporating any changes in the available hazard mitigation strategy state-or-the-art management methods and procedures. The plan components should be revised as necessary to reflect changing conditions and needs in accord with the plan review-revision procedures recommended above. Reevaluation, updating, and revision of this plan should be initiated by the County Office of Emergency Management approximately 24 months prior to expiration of this updated plan. The County Office of Emergency Management will also be responsible for initiating meetings of the Local Planning Team and the County Board as needed.

When an updated draft of the plan is completed, it will be submitted to the State Hazard Mitigation Officer at the Wisconsin Division of Emergency Management for review. Following any revisions suggested by the State Hazard Mitigation Officer, the draft updated plan will be submitted to FEMA for approval. Once FEMA has found that the updated plan is approvable upon adoption, the Racine County Office of Emergency Management will submit it to the Racine County Board for adoption. Following adoption of the updated plan by County Board, the Racine County Office of Emergency Management will request that the governing bodies of the incorporated municipalities within the County adopt the updated plan.

APPENDICES

RACINE COUNTY HAZARD MITIGATION PLAN UPDATE LOCAL PLANNING TEAM MEMBERS, MEETING AGENDAS, AND MEETING SUMMARY NOTES

APPENDIX A

Figure A.1
Members of the Racine County Hazard Mitigation Local Planning Team

Alex Freeman, Co-Chair	Interim Director, Racine County Office of Emergency Management
Chad Sampson, Co-Chair	County Conservationist, Racine County Department of Public Works and Development Services
Katelyn Miner, Secretary	Planner, Southeastern Wisconsin Regional Planning Commission
Julie Anderson	Director (Retired), Racine County Department of Public Works and Development Services
Alan Babe	Chief, City of Burlington Fire Department
Roley Behm	Director, Racine County Department of Public Works and Development Services
Brian Beiley	Public Works Supervisor, Village of Wind Point
Jeff Berard	Director, Journey Disaster Response Team
Chris Birkett	Director of Public Works, Village of Rochester
Aaron Bixby	Chief, Waxdale Emergency Response Brigade
Daniel Bocock	Director of Buildings & Grounds, Burlington Area School District
Christopher Botsch	Chief, Caledonia Police Department
Dotti-Kay Bowersox	Public Health Administrator, City of Racine Public Health Department
Carissa Brunner	Public Health Strategist, Racine County Public Health Division
Kim Chapman	Lieutenant, Sturtevant Police Department
Kim Christman	Real Property Lister and GIS Manager, Racine County
Jonathan Delagrave	County Executive, Racine County
Joel Dietl	Chief Land Use Planner, SEWRPC
Steve Hansen	Chief, Racine Fire Department
Keith Hendricks	Deputy Health Officer and EH Program Manager, Racine County Public Health Division
Jeff Henningfeld	Chief, Caledonia Fire Department
Laura Herrick	Chief Environmental Engineer, SEWRPC
Jeff Hintz	Planning Manager, City of Racine Department of City Development
Ken Hinz	Supervisor, Town of Waterford Public Works Department
Rick Huening	Supervisor Public Works/Utilities, Village of Waterford
Zeke Jackson	Administrator, Village of Waterford
Chris Jenkins	Administrator (Retired), Village of Elmwood Park
Matt Johnson	Chief, Waterford Police Department
Kathryn Kasper	Administrator, Village of Caledonia
Tom Kramer	Administrator and Treasurer, Town of Norway
Jeremy Krusemark	Lieutenant, City of Burlington Police Department
Stephan Kurdas	Lab Services Coordinator, City of Racine Public Health Department
Gary Larsen	Lieutenant, Caledonia Police Department
Kevan Leedle	Assistant Chief, Raymond Fire & Rescue Department
Adrian Machalik	President, Racine Fire Bells
Michael McKinney	Administrator and Clerk, Village of Yorkville
Ron Molnar	Chief, Kansasville Fire and Rescue Department
Miranda Page	Planner, Southeastern Wisconsin Regional Planning Commission

Figure A.1 (Continued)

Cody Pearce ..... Epidemiologist and Bioterrorism Preparedness Coordinator, City of Racine Public Health Department
Blair Pfeffer ..... Highway Crew Leader, Village of Mount Pleasant Department of Public Works
Rick Piette ..... Director of Public Works, Village of Union Grove
Ron Pritzlaff ..... Assistant Commissioner of Public Works, City of Racine
Peter Reynolds ..... Chief Operating Officer, Racine Unified School District
Peter Riggs ..... Director of Public Works, City of Burlington
Mark Schall ..... President, Village of North Bay
John Serketich ..... Principal Assistant Corporation Counsel, Racine County
Robert Stedman ..... Chief, South Shore Fire Department
David Stroupe ..... Captain, Mount Pleasant Police Department
Skip Twardosz ..... Emergency Management Director, Town of Burlington
Pete Wagner ..... Development Director, Village of Caledonia
Bryan Walter ..... Planner, Southeastern Wisconsin Regional Planning Commission
Carina Walters ..... Administrator, City of Burlington
Megan Watkins ..... Assistant Administrator, City of Burlington
Sarah Webb ..... Youth Volunteer Corps Program Coordinator, Volunteer Center of Racine County, Inc
Linsey Weber ..... Deputy Director of Public Works, Village of Mount Pleasant
Brian Zmudzinski ..... Police Chief, City of Burlington Police Department

Figure A.2
Agenda and Summary Notes for Local Planning Team Meeting: April, 13 2022

Racine County Office of Emergency Management
Southeastern Wisconsin Regional Planning Commission

Notice of Meeting and Agenda

RACINE COUNTY HAZARD MITIGATION PLAN LOCAL PLANNING TEAM

DATE: April 13, 2022

TIME: 9:30 to 11:30 a.m.

PLACE: Ive's Grove Auditorium
14200 Washington Ave.
Sturtevant, Wisconsin 53177

VIRTUAL LINK: https://bit.ly/3wJhS9h

AGENDA:

1. Welcome and introductions: Mr. Jonathan Delagrave, Executive, Racine County
2. Overview of hazard mitigation planning process: Katelyn Miner, SEWRPC
3. Background on the 4th edition of the Racine County Hazard Mitigation Plan: Katelyn Miner, SEWRPC
    a. Overview of previous plan and editions
    b. Main components to be reviewed and revised
    c. Schedule for the plan update (Attachment 1)
    d. Local Planning Team role
4. Review hazard mitigation goals from 3rd edition (Attachment 2): Katelyn Miner
5. Hazard and vulnerability assessment exercise (Attachment 3): Katelyn Miner
6. Adjourn

Frank G. Fierek
Secretary

Figure A.2 (Continued)

Attachment 1

WORK SCHEDULE AND DIVISION OF RESPONSIBILITIES FOR UPDATING THE RACINE COUNTY HAZARD MITIGATION PLAN

Task	Estimated Completion Timeframe	Responsible Agency
Hire Contractor to Develop Updated Plan	February 2022	Racine County
Update Planning Team Membership	March 2022	Racine County with SEWRPC Assistance
Kickoff Meeting	April 2022	Racine County and SEWRPC
Initial Public Participation and Outreach	April-October 2022	SEWRPC and Racine County
Survey Management Agencies Regarding Status of Initial Plan	April-November 2022	SEWRPC
Develop Updated Community Profile	April-December 2022	SEWRPC
Review and Update Identification and Description of Hazards	May 2022-February 2023	SEWRPC
Update Risk and Vulnerability Assessments	June 2022-April 2023	SEWRPC
Public Meeting to Review Hazard Identification and Risk Assessment	April 2023	SEWRPC and Racine County
Revise Draft Plan Based on Public Comment	May 2023	SEWRPC
Review and Update Established Hazard Mitigation Goals and Objectives	November 2022-August 2023	SEWRPC
Develop Updated Mitigation Actions	December 2022-October 2023	SEWRPC
Develop Updated Plan Maintenance Process	July 2023-December 2023	SEWRPC
Public Meeting to Review Draft Plan	December 2023	SEWRPC and Racine County
Revise Draft Plan Based on Public Comment	January 2024	SEWRPC
Submit Draft Plan Update to WEM for Review	February 2024	SEWRPC on Behalf of Racine County
Revise Plan Based on State Review	March 2024	SEWRPC
Submit to FEMA for Approval	April 2024	SEWRPC on Behalf of Racine County
Formal Adoption	May 2024	Racine County

Source: SEWRPC

Figure A.2 (Continued)

Attachment 2

GOALS FOR RACINE COUNTY ALL HAZARD MITIGATION PLAN

The following goals have been established for the Racine County hazard mitigation planning program.[1] The goals have been established based, in part, upon goals previously established in watershed, park and open space, and land use planning programs.

1. A spatial distribution of the various land uses which minimizes hazards and dangers to health, welfare and safety as well as further enhancing the economic base of the County, and will result in a compatible arrangement of land uses properly related to the existing and proposed supporting transportation, utility, public safety systems, and public facility systems.

2. A spatial distribution of the various land uses which maintains biodiversity and which will result in the protection and wise use of the natural resources of the County, including its soils, inland lakes and streams, groundwater, wetlands, woodlands, wildlife, and natural areas and critical species habitats.

3. An integrated transportation system which, through its location, capacity, and design, will safely, economically, and effectively serve the existing and proposed land use pattern and promote the implementation of the land use plan, meeting the current and anticipated travel demand and minimizing the potential for accidents and the associated toll on life and property damage.

4. The provision of facilities necessary to maintain a high quality of fire and police protection and emergency medical services throughout the County.

5. The development of a stormwater and floodplain management system which reduces the exposure of people to drainage- and flooding-related inconvenience and to health and safety hazards and which reduces the exposure of real and personal property to damage through inundation resulting from flooding and inadequate stormwater drainage.

6. The identification of high erosion risk Lake Michigan shoreline areas and the development of a coastal erosion management program which reduces the exposure of people and real and personal property to shoreline erosion and bluff recession.

7. The identification and development of programs which complement County and local emergency operations plans, to mitigate the potential exposure to health and safety, and the exposure of real and personal property, to a broad range of hazards which are unpredictable and not geographically specific in nature.

[1] *SEWRPC Community Assistance Planning Report No. 266, 3rd Edition,* Racine County Hazard Mitigation Plan Update: 2017-2022, *December 2017.*

Figure A.2 (Continued)

Attachment 3

HAZARD AND VULNERABILITY ASSESSMENT SURVEY
RACINE COUNTY HAZARD MITIGATION PLAN UPDATE

Link and QR Code to Survey:
https://arcg.is/1Ou8yG1

Racine County Hazard Ranking Assessment

INSTRUCTIONS

To Local Planning Team Members:
Racine County is conducting a study to better understand the preparedness needs and risk perceptions of its Hazard Mitigation Local Planning Team Members as part of the County's Hazard Mitigation Plan update process.

To do so, a questionnaire has been distributed to the Local Planning Team Members. Your feedback is needed and greatly appreciated!

The questionnaire should only take about 5-7 minutes to complete. Responses will be utilized to inform the Natural Hazard Identification and Risk Assessment portion of the Hazard Mitigation Plan update.

Your input will serve as part of your jurisdiction's participation in the Hazard Mitigation Plan update, which is required under federal guidelines to maintain eligibility for FEMA hazard mitigation funding.

DEADLINE: Please complete the survey by May 15, 2022.

Thank you for your participation!
If you have any questions, please contact Katelyn Miner, Southeastern Wisconsin Regional Planning Commission, at 262.953.3277 or kminer@sewrpc.org.

Please indicate which jurisdiction you are representing:

Figure A.2 (Continued)

Attachment 3 (continued)

PROBABILITY

Please indicate what you consider to be the likelihood that this hazard will occur.

- Low - Occurs very little or not at all (every 51-100 years)
- Moderate - Occurs somewhat or rarely (every 26-50 years)
- High - Occurs often or frequently (every 1-25 years)
- Not Applicable - does not apply to your area/jurisdiction

Issues to consider for Probability include:

- Known risk
- Historical data and experience
- Local government or agency experience

	Low	Moderate	High	Not Applicable
Riverine flooding	○	○	○	○
Stormwater flooding	○	○	○	○
Inland lake flooding	○	○	○	○
Coastal flooding	○	○	○	○
Tornado	○	○	○	○
Thunderstorm	○	○	○	○
High straight-line wind	○	○	○	○
Lightning	○	○	○	○
Hail	○	○	○	○
Heavy snowstorm	○	○	○	○
Blizzard	○	○	○	○

Figure A.2 (Continued)

Attachment 3 (continued)

Ice storm	○	○	○	○
Extreme cold	○	○	○	○
Extreme heat	○	○	○	○
Drought	○	○	○	○
Fog	○	○	○	○
Dust storm	○	○	○	○
Lake Michigan erosion	○	○	○	○
Lake Michigan bluff failure	○	○	○	○
Earthquake	○	○	○	○
Wildfire	○	○	○	○
Dam failure	○	○	○	○
Non-Lake Michigan related landslide	○	○	○	○
Land subsidence	○	○	○	○

PROBABILITY: Other (please specify below)

If you would like to rank another natural hazard not already listed, please do so here.

Figure A.2 (Continued)

Attachment 3 (continued)

HUMAN IMPACT

Please indicate what you consider to be the likely level of impacts to human life if the hazard occurs.

- Low - Minimal or minor impact on people
- Moderate - Somewhat significant impact on people
- High - Severe impact on people
- Not Applicable - does not apply to your area/jurisdiction

Issues to consider for Human Impact include:

- Potential to cause death
- Potential to cause injury requiring medical treatment

	Low	Moderate	High	Not Applicable
Riverine flooding	○	○	○	○
Stormwater flooding	○	○	○	○
Inland lake flooding	○	○	○	○
Coastal flooding	○	○	○	○
Tornado	○	○	○	○
Thunderstorm	○	○	○	○
High straight-line wind	○	○	○	○
Lightning	○	○	○	○
Hail	○	○	○	○
Heavy snowstorm	○	○	○	○
Blizzard	○	○	○	○

Figure A.2 (Continued)

Attachment 3 (continued)

Ice storm	○	○	○	○
Extreme cold	○	○	○	○
Extreme heat	○	○	○	○
Drought	○	○	○	○
Fog	○	○	○	○
Dust storm	○	○	○	○
Lake Michigan erosion	○	○	○	○
Lake Michigan bluff failure	○	○	○	○
Earthquake	○	○	○	○
Wildfire	○	○	○	○
Dam failure	○	○	○	○
Non-Lake Michigan related landslide	○	○	○	○
Land subsidence	○	○	○	○

HUMAN IMPACT: Other (please specify below)

If you would like to rank another natural hazard not already listed, please do so here.

Figure A.2 (Continued)

Attachment 3 (continued)

PROPERTY IMPACT

Please indicate what you consider to be the likely level of physical losses and damages to property if the hazard occurs.

- Low - Minimal or minor impact on properties
- Moderate - Somewhat significant impact on properties
- High - Severe impact on properties
- Not Applicable - does not apply to your area/jurisdiction

Issues to consider for Property Impact include:

- The potential to cause damage to property or crops
- The cost to replace damaged property
- The cost to set up a temporary replacement for damaged property
- The cost to repair damaged property
- The time to recover from the property damage

	Low	Moderate	High	Not Applicable
Riverine flooding	○	○	○	○
Stormwater flooding	○	○	○	○
Inland lake flooding	○	○	○	○
Coastal flooding	○	○	○	○
Tornado	○	○	○	○
Thunderstorm	○	○	○	○
High straight-line wind	○	○	○	○
Lightning	○	○	○	○
Hail	○	○	○	○
Heavy snowstorm	○	○	○	○

Figure A.2 (Continued)

Attachment 3 (continued)

Blizzard	○	○	○	○
Ice storm	○	○	○	○
Extreme cold	○	○	○	○
Extreme heat	○	○	○	○
Drought	○	○	○	○
Fog	○	○	○	○
Dust storm	○	○	○	○
Lake Michigan erosion	○	○	○	○
Lake Michigan bluff failure	○	○	○	○
Earthquake	○	○	○	○
Wildfire	○	○	○	○
Dam failure	○	○	○	○
Non-Lake Michigan related landslide	○	○	○	○
Land subsidence	○	○	○	○

PROPERTY IMPACT: Other (please specify below)

If you would like to rank another natural hazard not already listed, please do so here.

Figure A.2 (Continued)

Attachment 3 (continued)

BUSINESS & GOVERNMENT AGENCY IMPACT

Please indicate what you consider to be the likely level of impact to the operations of businesses and government agencies if the hazard occurs.

- Low - Minimal or minor impact on operations
- Moderate - Somewhat significant impact on operations
- High - Severe impact on operations
- Not Applicable - does not apply to your area/jurisdiction

Issues to consider for Business & Gov. Agency Impact include:

- Business or agency interruption
- Employees unable to report to work
- Customers or clients unable to reach facility
- Company or agency in violation of contractual agreements
- Imposition of fines and penalties or legal costs
- Interruption of access to critical supplies
- Interruption of product or service distribution
- Financial impact or burden
- Interruption of critical care and emergency services

	Low	Moderate	High	Not Applicable
Riverine flooding	○	○	○	○
Stormwater flooding	○	○	○	○
Inland lake flooding	○	○	○	○
Coastal flooding	○	○	○	○
Tornado	○	○	○	○
Thunderstorm	○	○	○	○
High straight-line wind	○	○	○	○
Lightning	○	○	○	○
Hail	○	○	○	○
Heavy snowstorm	○	○	○	○
Blizzard	○	○	○	○

Figure A.2 (Continued)

Attachment 3 (continued)

Ice storm	○	○	○	○
Extreme cold	○	○	○	○
Extreme heat	○	○	○	○
Drought	○	○	○	○
Fog	○	○	○	○
Dust storm	○	○	○	○
Lake Michigan erosion	○	○	○	○
Lake Michigan bluff failure	○	○	○	○
Earthquake	○	○	○	○
Wildfire	○	○	○	○
Dam failure	○	○	○	○
Non-Lake Michigan related landslide	○	○	○	○
Land subsidence	○	○	○	○

BUSINESS & GOV. AGENCY: Other (please specify below)

If you would like to rank another natural hazard not already listed, please do so here.

Figure A.2 (Continued)

Attachment 3 (continued)

PREPAREDNESS

Please indicate what you consider to be the current level of preparedness for dealing with the hazard and its impacts if the hazard occurs.

- Low - Prepared very little or not at all
- Moderate - Prepared somewhat significantly
- High - Prepared significantly well
- Not Applicable - does not apply to your area/jurisdiction

Issues to consider for Preparedness include:

- The status of current plans that address the hazard
- The frequency of drills that address the hazard
- The status of training related to the hazard and its impacts
- Insurance
- The availability of back-up systems
- The availability of community resources

	Low	Moderate	High	Not Applicable
Riverine flooding	○	○	○	○
Stormwater flooding	○	○	○	○
Inland lake flooding	○	○	○	○
Coastal flooding	○	○	○	○
Tornado	○	○	○	○
Thunderstorm	○	○	○	○
High straight-line wind	○	○	○	○
Lightning	○	○	○	○
Hail	○	○	○	○
Heavy snowstorm	○	○	○	○
Blizzard	○	○	○	○

Figure A.2 (Continued)

Attachment 3 (continued)

Ice storm	○	○	○	○
Extreme cold	○	○	○	○
Extreme heat	○	○	○	○
Drought	○	○	○	○
Fog	○	○	○	○
Dust storm	○	○	○	○
Lake Michigan erosion	○	○	○	○
Lake Michigan bluff failure	○	○	○	○
Earthquake	○	○	○	○
Wildfire	○	○	○	○
Dam failure	○	○	○	○
Non-Lake Michigan related landslide	○	○	○	○
Land subsidence	○	○	○	○

PREPAREDNESS: Other (please specify below)

If you would like to rank another natural hazard not already listed, please do so here.

Figure A.2 (Continued)

Attachment 3 (continued)

What specific areas in your jurisdiction are heavily impacted by natural hazard events?

Please list these known areas and be specific.

1000

Please provide a list of the hazard mitigation activities/projects your jurisdiction has initiated and/or completed since 2017.

1000

Please provide a list of the outreach activities your jurisdiction/local communities have initiated and/or completed since 2017.

1000

Additional Comments

If you have any questions, comments, concerns, or would like to rank another natural hazard not already listed, please do so here.

1000

Figure A.2 (Continued)

SUMMARY NOTES OF THE APRIL 13, 2022 MEETING OF THE RACINE COUNTY HAZARD MITIGATION PLAN LOCAL PLANNING TEAM

INTRODUCTION

The April 13, 2022 meeting of the Racine County Hazard Mitigation Plan Local Planning Team was convened at the Ive's Grove Auditorium at 9:30 a.m. The meeting was called to order by James Kerner, Director of Racine County's Division of Emergency Management. Attendance was taken by circulating a sign-in sheet.

In attendance (in-person and virtually) at the meeting were the following individuals:

Local Planning Team Members

James Kerner, Co-Chair	Emergency Management Director, Racine County
Julie Anderson, Co-Chair	Director, Racine County DPW and Development Services
Dave Anderson	Burlington Aurora Health Network
Alan Babe	Fire Chief and EM Coordinator, City of Burlington
George Baumgardt	Parks and Recreation Manager, Mt. Pleasant
Shana Beal	American Red Cross
Roley Behm	Highway Superintendent, Racine County DPW
Jeff Berard	Director, Journey Disaster Response Team
Chris Birkett	Public Works Manager, Village of Rochester
Aaron Bixby	SC Johnson Fire Brigade
Daniel Bocock	Director of Building & Grounds, Burlington Area School Dist.
Michael Burke	Area Maintenance Coordinator, WI DOT
Robert Bowers	Public Works Superintendent, Village of Mt. Pleasant
Dotti-Kay Bowersox	Public Health Officer, City of Racine Health Department
Kim Chapman	Sturtevant Police Department/EM Coordinator
Edward Chart	Village President, Rochester
Kim Christman	Real Property Lister-GIS Manager, Racine County
Jonathan Delagrave	Racine County Executive
James Evans	Racine County Sheriff's Office
Jack Feiner	Public Works Manager, Village of Sturtevant
Bobbi Fergus	Deputy Health Director, City of Racine Health Department
Alex Freeman	Deputy EM Coordinator, Racine County
David Gordon	Ascension All Saints
Lee Greivell	Building Code Enforcement
Tim Halbach	Warning Coordination Meteorologist, National Weather Service
Jenna Hall	Safety Coordinator, UNFI
Steven Hansen	Racine Fire Department/EM Coordinator
Keith Hendricks	Deputy Health Officer/Racine County Public Health
Jeff Henningfeld	Caledonia Fire Department
Jeff Hintz	Planning Manager, City of Racine
Ken Hinz	Director of Public Works, Town of Waterford
Rick Huening	Utilities Supervisor, Village of Waterford
Zeke Jackson	Administrator, Village of Waterford
Matt Johnson	Village of Waterford Police Department
Kathryn Kasper	Administrator, Village of Caledonia
Max Kluth	Mt. Pleasant Aurora Health Network
Stephan Kurdas	Laboratory Health Director, City of Racine Health Department
Jeffrey Langlieb	Health Officer, Racine County Public Health
Gary Larsen	Caledonia Police Department

Figure A.2 (Continued)

Scott Laux	Supervisor of DPW, Town of Norway
Kevan Leedle	Raymond Fire and Rescue Department
Adrian Machalik	President, Racine Fire Bells
Sean Marschke	Sturtevant Police Department/EM Coordinator
Willie McDonald	General Manager, RYDE
Tom Molbeck	Director, City of Racine Parks Department
Ron Molnar	Kansasville Fire Department/EM Coordinator
Kari Morgan	Board Members President, Village of Raymond
Rick Mueller	Waterford Fire Department/EM Coordinator
Michelle Ortwein	Executive Director, Volunteer Center of Racine County
Blair Pfeffer	Crew Leader, Village of Mt. Pleasant
Rick Piette	Director of Public Works, Village of Union Grove
Ken Plaski	Chief Building Inspector, City of Racine
Ron Pritzlaff	Assistant Commissioner of PW, City of Racine
Ahmad Qawi	President, Racine Family YMCA
Peter Reynolds	Chief of Staff, Racine Unified School District
Peter Riggs	Director of Public Works, City of Burlington
Maurice Robinson	Racine Police Department/EM Coordinator
Chad Sampson	Land Conservationist, Racine County
Mark Schall	President, Village of North Bay
Ben Schliesman	Regional EM Director
Jonathan Schulteis	Norway Police Department
Sam Schultz	Development Director, Mt. Pleasant
John Serketich	Principal Assistant Corporation Counsel, Racine County
Matt Soens	Mt. Pleasant Police Department/EM Coordinator
Michael Sponholtz	Parks and Facilities Supervisor, Village of Waterford
Robert Stedman	Southshore Fire Department
David Stroupe	Mt. Pleasant Police Department
Emily Szabo	Development Services Analyst, Racine County
Skip Twardosz	EM Coordinator, Town of Burlington
Paul Vornholt	Administrator, City of Racine
Bill Vrchota	Town of Burlington Fire Department/EM Coordinator
Pete Wagner	Development Director, Village of Caledonia
Carina Walters	Administrator, City of Burlington
Sarah Webb	Volunteer Coordinator, Volunteer Center of Racine Co.
Linsey Weber	Deputy Director of Public Works, Village of Mt. Pleasant
James Weidner	Racine County Sheriffs Office
Brian Wolf	Racine Fire Department/EM Coordinator
Brian Zmudzinski	City of Burlington Police Department/EM Coordinator

In addition, the following attendees (non-Planning Team members) were present (either virtually or in-person):

Mark Anderson	City of Burlington Police Department
Carissa Brunner	Public Health Strategist, Racine County Public Health
Kelly Fragassi	Manager, Journey Disaster Response Team
Rebecca Wallendal	Clerk, Village of Union Grove
Megan Watkins	Assistant City Administrator, City of Burlington

Mr. Delagrave welcomed the attendees to the meeting and thanked them for their participation. He then discussed the importance of the Hazard Mitigation Plan for the County.

Figure A.2 (Continued)

OVERVIEW OF HAZARD MITIGATION AND HAZARD MITIGATION PLANNING PROCESS

Julie Anderson introduced Katelyn Miner, Land Use Planner, Southeastern Wisconsin Regional Planning Commission (SEWRPC). Ms. Miner briefly reviewed the meeting's agenda. She then presented (Powerpoint) an overview of hazard mitigation and the hazard mitigation planning process.

BACKGROUND ON THE CURRENT EDITION OF THE RACINE COUNTY HAZARD MITIGATION PLAN AND DEVELOPMENT OF THE PLAN UPDATE

Ms. Miner presented a brief background on SEWRPC and its role in hazard mitigation planning. She then discussed the previous (2017) update of Racine County's hazard mitigation plan.

After discussion of the current edition of the County's plan, Ms. Miner presented the main components that are developed as part of SEWRPC's hazard mitigation planning format. She also presented a tentative schedule for the current plan updating process. In addition, Ms. Miner explained the main functions of the Local Planning Team in the plan development process. Ms. Miner noted that this plan update will be for natural weather hazards only.

[Secretary's Note: Ms. Miner's presentation can be found here:]

HAZARD AND VULNERABILITY ASSESSMENT EXERCISE

Ms. Miner led the hazard and vulnerability assessment exercise. She noted that a hazard and vulnerability assessment tool and instructions for completing the tool were included with the agenda for this meeting. She asked everyone in attendance to fill out the survey. Those that are interested that were not in attendance can fill out survey by May 15, 2022.

[Secretary's Note: A copy of the hazard and vulnerability assessment tool and the instructions for completing the tool are attached herein as .]

Ms. Miner asked the members of the Local Planning Team and any attendees to complete the hazard and vulnerability assessment tool. She explained that the results of this exercise would be one of the factors used to determine which hazards are addressed by the hazard mitigation plan.

ADJOURNMENT

There being no further business, the meeting was adjourned at 10:30 a.m.

AFTER MEETING DISCUSSIONS

After Ms. Miner's presentation, Mr. Zeke Jackson, Village of Waterford Administrator, asked if 21st Century hazards would be addressed. Ms. Miner affirmed that 21st Century hazards would indeed be addressed.

Figure A.3
Agenda and Summary Notes for Local Planning Team Meeting: May 31, 2023

Racine County Office of Emergency Management and the
Southeastern Wisconsin Regional Planning Commission

Notice of Meeting and Agenda

RACINE COUNTY HAZARD MITIGATION PLAN LOCAL PLANNING TEAM

DATE: May 31, 2023

TIME: 4:00 to 5:30 pm

PLACE: Ive's Grove Auditorium
14200 Washington Ave.
Sturtevant, Wisconsin 53177

AGENDA:

1. Welcome and introductions: Alex Freeman, Emergency Management, Racine County
2. Review of summary notes from the April 13, 2022 kickoff meeting: SEWRPC staff
3. Review of draft chapters for the 4th edition of the Racine County Hazard Mitigation Plan: SEWRPC staff
    a. Chapter 1 – Introduction and Background
    b. Chapter 2 – Basic Study Area Inventory and Analysis
    c. Chapter 3 – Analysis of Hazard Conditions
    d. Chapter 4 – Hazard Mitigation Goals and Objectives
    e. Chapter 5 – Hazard Mitigation Strategies
    f. Chapter 6 – Plan Adoption, Implementation, Maintenance, and Revision
    g. Appendices
4. Discussion of public meeting to follow from 6-7 pm: Alex Freeman
5. Adjourn

Laura K. Herrick
Secretary

The summary notes and preliminary draft chapters can be found on the SEWRPC webpage at www.sewrpc.org/hmp under the section for the Racine County plan update.

Figure A.3 (Continued)

SUMMARY NOTES OF THE MAY 31, 2023 MEETING OF THE RACINE COUNTY HAZARD MITIGATION PLAN LOCAL PLANNING TEAM

INTRODUCTION

The May 31, 2023 meeting of the Racine County Hazard Mitigation Plan Local Planning Team (LPT) was convened at the Ives Grove Auditorium at 4:07 p.m. The meeting was called to order by Alex Freeman, Interim Director of Racine County's Division of Emergency Management. Attendance was taken by circulating a sign-in sheet.

In attendance at the meeting were the following individuals:

Local Planning Team Members

Alex Freeman, Chair	Interim Emergency Management Director, Racine County
Brian Beiley	DPW Supervisor, Village of Wind Point
Jeff Berard	Director, Journey Disaster Response Team
Aaron Bixby	Chief, SC Johnson Emergency Response Brigade
Kim Christman	Real Property Lister/GIS Manager, Racine County
Keith Hendricks	Environmental Health Manager, Racine County Public Health
Jeff Henningfeld	Chief, Caledonia Fire Department
Tom Kramer	Administrator, Town of Norway
Jeremy Krusemark	Burlington Police Department, City of Burlington
Cody Pearce	Epidemiologist, City of Racine Health Department
Richard Piette	Director of Public Works, Village of Union Grove
Peter Riggs	Director of Public Works, City of Burlington
Chad Sampson	Conservationist, Racine County
Peter Wagner	Development Director, Village of Caledonia
Linsey Weber	Deputy Director of Public Works, Village of Mt. Pleasant

In addition, the following attendees (representing the Southeastern Wisconsin Regional Planning Commission) were present:

Joel Dietl	Chief Land Use Planner, SEWRPC
Laura Herrick	Chief Environmental Engineer, SEWRPC
Miranda Page	Planner, SEWRPC
Bryan Walter	Planner, SEWRPC

Mr. Freeman welcomed the attendees to the meeting and thanked them for their participation. He emphasized the importance of this work for the long-term health and safety of the County and its communities.

OVERVIEW OF AGENDA AND THE HAZARD MITIGATION PLANNING PROCESS

Mr. Freeman briefly introduced hazard mitigation planning and reminded the attendees that this plan would only cover natural hazards, whereas prior versions of the plan had also included man-made hazards. Mr. Freeman introduced Joel Dietl, Chief Land Use Planner, Southeastern Wisconsin Regional Planning Commission (SEWRPC) and Laura Herrick, Chief Environmental Engineer, SEWRPC. Mr. Dietl reviewed the meeting's agenda and asked if there were any comments on the summary notes of the April 13, 2022, kickoff meeting. No comments were made. Mr. Dietl noted that the timeline for the Racine County Hazard Mitigation plan had been accelerated due to funding opportunities for local projects in two communities and proceeded to present (PowerPoint) an overview of the draft updates to the Racine County Hazard Mitigation Plan.

Figure A.3 (Continued)

OVERVIEW OF CHAPTERS IN THE CURRENT DRAFT OF THE RACINE COUNTY HAZARD MITIGATION PLAN UPDATE

Mr. Dietl provided a brief background on hazard mitigation planning as discussed in Chapter 1 of the draft plan. An adopted plan is mandated by the Disaster Mitigation Act of 2000 to be eligible for federal funding. The draft plan focuses on natural rather than man-made hazards as a practical consideration to achieve funding eligibility. Mr. Dietl explained that every city and village must be involved in the planning process and that the County is responsible for including towns. He also provided a summary of the recent hazard mitigation activities and recent outreach activities undertaken by Racine County and the local communities. The LPT did not have any questions or comments.

Mr. Dietl next presented an overview of Chapter 2, which discusses the study area inventory and analysis. This chapter of the draft plan addresses civil divisions, demographic and economic characteristics, land use, and emergency services and critical facilities in Racine County. It also includes an expanded section on climate change, consistent with updated Federal Emergency Management Agency (FEMA) guidelines. Resulting from the consideration of climate change and the geography of Racine County, the plan is especially focused on specific hazards such as flooding and lake shore erosion. Mr. Dietl explained that both average temperature and average precipitation have been increasing, especially in the winter and early spring. This has led to an increase in the frequency and severity of storms and has a substantial impact on farmers and agriculture in the County. The LPT did not have any questions or comments related to Chapter 2.

Chapter 3 of the draft plan provides an analysis of specific hazard conditions. In the interest of brevity, Mr. Dietl explained that these would not be covered in detail during this presentation. The LPT had identified tornadoes, inland flooding, ice storms, high straight-line wind, heavy snowstorms, dam failure, and drought as potential vulnerabilities. Drought was noted as one of the most significantly increased perceived vulnerabilities since the previous plan update. Members of the LPT asked clarifying questions regarding the flooded structures map. Ms. Herrick explained that this map identifies taxable structures, not including auxiliary structures such as garages or sheds, which are located within floodplains. This survey of structures is conducted by SEWRPC staff using assessor's data and large-scale aerial orthophotography. Ms. Herrick noted that the estimated flood damages are based on a hypothetical county-wide 100-year flood, and not any actual historical event. The LPT did not request any changes to the text or content of this chapter following these clarifications.

Ms. Herrick continued the presentation with a brief overview of the plan goals as described in Chapter 4 of the draft plan. These goals are unchanged from the previous update of Racine County's hazard mitigation plan. There were no comments or questions from the LPT.

Regarding Chapter 5, Ms. Herrick noted that there were very few changes from the previous update of the plan due to the compressed schedule. Inland flooding, severe thunderstorms, tornadoes, extreme high or low temperatures, coastal hazards, severe winter storms, and drought are covered in detail by this chapter. Ms. Herrick highlighted Table 5.8, which provides a cost/benefit analysis of mitigation strategies. She presented flooding as an example of the content in this chapter, specifically discussion of preservation of open space, voluntary purchase and demolition, channel cleaning, stream rehabilitation, stormwater management, and prairie and wetland restoration as possible mitigation strategies. There were no comments or questions from the LPT regarding Chapter 5.

Ms. Herrick proceeded with an overview of Chapter 6 and the draft plan's Appendices. She noted that the LPT should review the tables in Appendices B and C for critical facilities. There were no comments or questions from the LPT regarding Chapter 6 or the Appendices.

Figure A.3 (Continued)

NEXT STEPS IN THE HAZARD MITIGATION PLANNING PROCESS

Ms. Herrick reviewed the next steps in the hazard mitigation planning process and requested that any comments or requests for changes be provided by no later than June 16, 2023. One member of the LPT asked a clarifying question about the maps in the draft plan and whether there were any plans to update SEWRPC's planned land use map. Mr. Dietl replied that there were currently no plans to do so, that the current 2050 planned land use map was based upon a combination (at the regional level) of SEWRPC's land use designations and those from the future land use maps from the local comprehensive plans, and that work on the next regional land use plan will likely begin in a few years. There were no further questions or comments from the LPT. Ms. Herrick concluded by reminding the LPT that a public meeting would follow at 6:00pm and thanked the LPT for their attendance and participation.

ADJOURNMENT

There being no further business, the meeting was adjourned at 5:00 p.m.

AFTER MEETING DISCUSSIONS

Following Ms. Herrick's presentation, Peter Riggs, representing the City of Burlington, requested that the plan include more details on the Echo Lake dam, possibly in the project table. Mr. Riggs plans to seek BRIC funding for the work and stated that he would provide more details on the project to Ms. Herrick. He indicated that the project is necessary to address a significant hazard rating due to inadequate spillway capacity of the Echo Lake dam per NR 333. The project will include three components: spillway modifications, park improvements, and impoundment dredging. The spillway work includes the removal of one gate and adding a three bay gate system and a berm in the park. The City of Burlington intends to issue an RFP this summer for construction to be completed in 2025. The City conducted significant outreach work that could be added to the table in Chapter 1.

Tom Kramer, representing the Town of Norway, indicated to Mr. Dietl that there were two corrections needed on Map 2.4. The location of one of the fire stations in the Town is currently incorrect, and Mr. Kramer identified the correct location. Mr. Kramer also noted that the fire department service area boundaries in the Town of Waterford may be incorrect and suggested that SEWRPC staff obtain clarification on these boundaries from Town of Waterford staff. He also identified that the Tichigan Volunteer Fire Department now has its own rescue squad.

Peter Wagner, representing the Village of Caledonia, asked Mr. Dietl about possible comprehensive plan updates for Mt. Pleasant, Caledonia, Racine County, and other communities.

Jeff Henningfield, representing the Caledonia Fire Department, provided some feedback to Mr. Freeman. Mr. Henningfield identified that the fire station at 9433 Northwestern Avenue is a joint station with shared costs and should be indicated as both South Shore Fire Station 10 and Caledonia Fire Station 10. A line should be added to Table B.1 listing it under the Caledonia Fire Department's locations. No changes are required on Map 2.4 as fire department location details are not included on that map. It was also noted that the members of the Racine County Hazard Mitigation Local Planning Team should be updated prior to publishing. Past members may be documented in the summary notes for the 2022 LPT meeting and the main list on page 3 should be updated with current membership. Mr. Freeman indicated that he will complete these updates and provide them to SEWRPC staff. Finally, one of the presentation slides mentioned Ready Badger, now defunct, however this has already been removed from the draft plan text.

PUBLIC MEETING

Mr. Dietl, Mr. Freeman, and Ms. Herrick remained for a public meeting which was convened at 6:00 p.m. No members of the public attended the public meeting. The meeting was closed at 7:00 p.m.

EMERGENCY SERVICES AND FACILITIES IN THE RACINE COUNTY PLANNING AREA

APPENDIX B

Table B.1
Fire Departments and EMS Stations Within the Racine County Planning Area: 2023

Facility Name	Communities Served	Address	Telephone Number	Fax Number
Caledonia Fire Department Station 10	Villages of Caledonia, North Bay, and Wind Point	9433 Northwestern Avenue	(262) 884-1182	(262) 884-3571
Caledonia Fire Department Station 11	Villages of Caledonia, North Bay, and Wind Point	6900 Nicholson Road	(262) 835-2050	(262) 834-4192
Caledonia Fire Department Station 12	Villages of Caledonia, North Bay, and Wind Point	6040 Douglas Avenue	(262) 639-9090	--
City of Burlington Fire Department	City of Burlington[a]	165 W. Washington Street	(262) 763-7842	(262) 767-8602
Kansasville Fire Department	Town of Dover	23730 Durand Avenue	(262) 878-3811	(262) 878-7560
Racine Fire Department Station 1	City of Racine	810 8th Street	(262) 635-7900	(262) 635-7864
Racine Fire Department Station 2	City of Racine	2430 Northwestern Avenue	(262) 635-7852	--
Racine Fire Department Station 3	City of Racine	1107 Lombard Avenue	(262) 635-7858	--
Racine Fire Department Station 4	City of Racine	3821 Washington Avenue	(262) 635-7857	--
Racine Fire Department Station 5	City of Racine	2430 Blaine Avenue	(262) 635-7859	--
Racine Fire Department Station 6	City of Racine	2101 16th Street	(262) 635-7856	--
Raymond Fire and Rescue Department	Village of Raymond	2255 76th Street	(262) 835-1687	(262) 835-1694
Rochester Volunteer Fire Company	Village of Rochester	31020 Academy Road	(262) 534-3444	(262) 642-5910
South Shore EMS Station 7	Village of Mt. Pleasant	1221 N. Emmertsen Road	(262) 995-1200	--
South Shore Fire Station 8	Village of Mt. Pleasant	3900 Old Green Bay Road	(262)-995-1200	(262)-995-1208
South Shore Fire Department Station 9	Village of Sturtevant	2801 89th Street	(262) 554-3041	--
South Shore Fire Department Station 10	Village of Mt. Pleasant	9433 Northwestern Avenue	(262) 884-1182	(262) 884-3571
Tichigan Volunteer Fire Company Station 1	Tichigan	8205 Big Bend Road	(262) 662-3570	(262) 662-4589
Tichigan Volunteer Fire Company Station 2	Tichigan	6838 Caldwell Road	--	--
Town of Burlington Fire Department Station 1	Town of Burlington	32288 Bushnell Road	(262) 763-3070	(262) 539-3075
Town of Burlington Fire Department Station 2	Town of Burlington	7211 McHenry Street	--	--
Town of Burlington Fire Department Station 3	Town of Burlington	30130 Meadow Drive	--	--
Union Grove-Yorkville Fire Department	Villages of Union Grove and Yorkville	700 Main Street	(262) 878-4181	(262) 878-4177
Waterford Fire Department Station 2	Village of Waterford	818 Mohr Avenue	(262) 514-7019	(262) 534-5930
Wind Lake Volunteer Fire Company, Inc.[b]	Wind Lake and Town of Norway	5517 East Wind Lake Road	--	--
Wind Lake Volunteer Fire Company Station 2[b]	Wind Lake	7857 S. Loomis Road	(262) 895-7533	(262) 895-6601

[a] *The City of Burlington Fire Department provides EMS services to the Town of Burlington on a contractual basis.*

[b] *The Wind Lake Volunteer Fire Company, Inc. will be dissolving after 2023 and will be taken over by the Town of Norway Fire Department.*

Source: Racine County Emergency Management and SEWRPC

Table B.2
Law Enforcement Facilities Within the Racine County Planning Area: 2021

Facility Name	Community	Address	Telephone Number	Fax Number
City of Burlington Police Department	City of Burlington	224 E. Jefferson Street	(262) 342-1000	(262) 763-5158
City of Racine Police Department	City of Racine	730 Center Street	(262) 635-7700	(262) 636-9332
Community Oriented Policing House - 16th Street (Richard Polzin)	City of Racine	1900 16th Street	(262) 619-3512	--
Community Oriented Policing House - Anthony Lane (Ernie & Bernice Styberg)	City of Racine	2437 Anthony Lane	(262) 619-2511	--
Community Oriented Policing House - Robert Quantanilla	City of Racine	1140 Geneva Street	(262) 635-7928	--
Community Oriented Policing House - Thema Orr	City of Racine	1146 Villa Street	(262) 635-2880	--
Community Oriented Policing House - West 6th Street (Marty Defatte)	City of Racine	1522 W. 6th Street	(262) 635-7863	--
Community Oriented Policing House - William Wadewitz	City of Racine	1750 Mead Street	(262) 635-7862	--
Racine Correctional Facility	Village of Sturtevant	2019 Wisconsin Street	(262) 886-3214	(262) 886-3514
Racine County Courthouse	City of Racine	730 Wisconsin Avenue	(262) 636-3333	(262) 636-3341
Racine County Juvenile Detention Center	City of Racine	1717 Taylor Avenue	(262) 638-6729	(262) 638-6366
Racine County Sheriff's Office Sub Station	Village of Yorkville	14116 Washington Avenue	(262) 886-9465	(262) 886-3972
Racine Youthful Offender Correctional Facility	City of Racine	1501 Albert Street	(262) 638-1999	(262) 638-1777
Robert E. Ellsworth Correctional Center	Town of Dover	21425-A Spring Street	(262) 878-6000	(262) 878-6015
Sheriff's Office and County Jail	City of Racine	717 Wisconsin Avenue	(262) 636-3822	(262) 637-5279
Sheriff's Office Water Patrol	City of Racine	2 Kipi Kawi Causeway	(262) 636-3297	--
Sturtevant Transitional Facility	Village of Sturtevant	9351 Rayne Road	(262) 884-2410	(262) 886-6069
Town of Burlington Police Department	Town of Burlington	32288 Bushnell Road	(262) 763-7539	(262) 763-7540
Town of Norway Police Department	Town of Norway	6419 Heg Park Road	(262) 895-2195	(262) 895-3651
Town of Waterford Police Department	Village of Waterford	415 N. Milwaukee Street	(262) 534-2119	(262) 534-7789
Village of Caledonia Police Department	Village of Caledonia	6900 Nicholson Road	(262) 835-4423	(262) 835-4799
Village of Mt. Pleasant Lakeside Community Oriented Policing House	Village of Mount Pleasant	2237 Mead Street	(262) 664-7946	--
Village of Mt. Pleasant Police Department	Village of Mount Pleasant	8811 Campus Drive	(262) 884-0454	--
Village of Sturtevant Police Department	Village of Sturtevant	2801 89th Street	(262) 886-7208	(262) 886-7212
Village of Wind Point Police Department	Village of Wind Point	4725 Lighthouse Drive	(262) 639-3022	--

Source: Racine County Emergency Management and SEWRPC

CRITICAL COMMUNITY FACILITIES IN RACINE COUNTY

APPENDIX C

Table C.1
Critical Community Facilities in Racine County: 2022

Name	Community	Address
Hospital/Clinics		
Aurora Health Care - Memorial Hospital of Burlington	City of Burlington	252 McHenry Street
Aurora Health Center, Burlington	City of Burlington	248 McHenry Street
Aurora Health Center, Burlington	City of Burlington	116 N. Dodge Street
Aurora Health Center, Caledonia	City of Burlington	5333 Douglas Avenue
Aurora Health Center, Mount Pleasant	Village of Mount Pleasant	8348 Washington Avenue
Aurora Health Center, Mount Pleasant	Village of Mount Pleasant	8400 Washington Avenue
Aurora Health Center, Mount Pleasant	Village of Mount Pleasant	1151 Warwick Way
Aurora Health Center, Waterford	Village of Waterford	818 Forrest Lane
Central Racine County Health Department	Village of Caledonia	10005 Northwestern Avenue
DaVita Harbor View Dialysis	City of Racine	3113 Washington Avenue
DaVita Willow Creek Dialysis	Village of Mount Pleasant	1139 Warwick Way
Fresenius Medical Care Midwest Racine Dialysis	Village of Mount Pleasant	5409 Durand Avenue
Lakeview Specialty Hospital and Rehab	Town of Dover	1701 Sharp Road
Racine Donor Center	Village of Mount Pleasant	1120 S. Sunnyslope Drive
Racine Health Department	City of Racine	730 Washington Avenue
Wheaton Franciscan Healthcare - Atrium Medical Offices	City of Racine	3821 Spring Street
Wheaton Franciscan Healthcare - Emergency Care Center	City of Racine	3803 Spring Street
Wheaton Franciscan Healthcare - St. Luke's Health Pavilion	City of Racine	3821 Spring Street
Wheaton Franciscan Healthcare - All Saints Spring Street Campus (Formerly St. Mary's Hospital)	City of Racine	3801 Spring Street
Wheaton Franciscan Healthcare - All Saints Walk-In Care	City of Racine	3807 Spring Street
Wheaton Franciscan Medical Group	Village of Caledonia	2408 Four Mile Road
Wheaton Franciscan Medical Group	City of Racine	1 Main Street
Wheaton Franciscan Medical Group	Village of Mount Pleasant	4328 Old Green Bay Road
Wheaton Franciscan Medical Group	Village of Sturtevant	10340 W. Washington Avenue
Wheaton Franciscan Medical Group	Village of Union Grove	1120 Main Street
Wheaton Franciscan Medical Group - All Saints Wisconsin Avenue Campus (Formerly St. Lukes Hospital)	City of Racine	1320 Wisconsin Avenue
Public Schools		
21st Century Preparatory School	City of Racine	1220 Mound Avenue
4K Community School	City of Burlington	100 N. Kane Street
Burlington High School	City of Burlington	400 McCanna Parkway
Cooper Elementary School	City of Burlington	249 Conkey Street
Dr. Edward G. Dyer Elementary School	City of Burlington	201 S. Kendrick Avenue
Drought Elementary School	Town of Norway	21016 Seven Mile Road
Evergreen Elementary School	Village of Waterford	817 West Main Street

Table continued on next page.

Table C.1 (Continued)

Name	Community	Address
Public Schools (continued)		
Fox River Middle School	Village of Waterford	921 W. Main Street
Fratt Elementary	City of Racine	3501 Kinzie Avenue
Giese Elementary	City of Racine	5120 Byrd Avenue
Gifford Elementary	City of Racine	8332 Northwestern Avenue
Gilmore Middle School	City of Racine	2330 Northwestern Avenue
Goodland Elementary School	City of Racine	4800 Graceland Boulevard
Horlick High School	City of Racine	2119 Rapids Drive
J.I. Case High School	Village of Mount Pleasant	7345 Washington Avenue
Janes Elementary School	City of Racine	1425 N. Wisconsin Avenue
Jefferson Lighthouse Elementary	City of Racine	1722 W. Sixth Street
Jerstad Agerholm Elementary	City of Racine	3535 LaSalle Street
Jerstad Agerholm Middle School	City of Racine	3601 LaSalle Street
Jones Elementary	City of Racine	3300 Chicory Road
Julian Thomas Elementary School	City of Racine	930 Martin Luther King Drive
Kansasville Elementary School	Town of Dover	4101 S. Beaumont Avenue
Knapp School	City of Racine	2701 17th Street
Lakeview Elementary School	Town of Norway	26333 Fries Lane
Lyons Center Elementary School	City of Burlington	1622 Mill Street
McKinley Middle School	City of Racine	2326 Mohr Avenue
Mitchell Elementary School	City of Racine	2713 Drexel Avenue
Mitchell Middle School	City of Racine	2701 Drexel Avenue
Nettie E. Karcher Middle School	City of Burlington	225 Robert Street
North Cape Elementary School	Town of Raymond	11926 Highway K
North Park Elementary School	Village of Caledonia	4748 Elizabeth Street
Olympia Brown Elementary School	Village of Caledonia	5915 Erie Street
P-COC Elementary School	City of Racine	914 Saint Patrick Street
Racine Civil Leaders Academy	City of Racine	1325 Park Avenue
Racine Early Education Center	City of Racine	2015 Franklin Street
Raymond Elementary	Town of Raymond	2659 76th Street
Red Apple Elementary School	City of Racine	914 St. Patrick Street
Roosevelt Elementary School	City of Racine	915 Romayne Avenue
S.C. Johnson Elementary School	City of Racine	2420 Kentucky Street
Schulte Elementary School	Village of Sturtevant	8515 Westminster Drive
Southern Lakes Consortium Alternative High School	City of Burlington	209 Wainwright Avenue
Starbuck Middle School	City of Racine	1516 Ohio Street
Stephen Bull Fine Arts Elementary School	City of Racine	815 De Koven Avenue

Table continued on next page.

Table C.1 (Continued)

Name	Community	Address
Public Schools (continued)		
The R.E.A.L. School	City of Racine	5915 Erie Street
Trailside Elementary School	Village of Waterford	615 N. Milwaukee Street
Union Grove Elementary School	Village of Union Grove	1745 Milldrum Street
Union Grove High School	Village of Union Grove	3433 S. Colony Avenue
Wadewitz Elementary School	City of Racine	2700 Yout Street
Walden III Middle and High School	City of Racine	1012 Center Street
Waller Elementary School	City of Burlington	195 Gardner Avenue
Washington Park High School	City of Racine	1901 12th Street
Washington-Caldwell Elementary School	Town of Waterford	8937 Big Bend Road
Waterford Union High School	Village of Waterford	100 Field Drive
West Ridge Elementary	Village of Mount Pleasant	1347 S. Emmertsen Road
Winkler Elementary School	Town of Burlington	34150 Fulton Street
Woodfield Elementary School	Village of Waterford	905 Barnes Drive
Yorkville School	Town of Yorkville	18621 Washington Avenue
Private Schools		
Academy of Racine	City of Racine	401 Wisconsin Avenue #102
Catholic Central High School	City of Burlington	148 McHenry Street
CERT School	City of Racine	1437 Marquette Street
Children's House Montessori School	City of Burlington	125 E. State Street
Concordia Lutheran School	Village of Sturtevant	8500 Durand Avenue
EverGreen Academy	City of Racine	3554 Taylor Avenue
Gateway Technical College, Burlington Center	City of Burlington	496 McCanna Parkway
Gateway Technical College, Racine Campus	City of Racine	1001 S. Main Street
Gateway Technical College, SC Johnson iMet Center	Village of Sturtevant	2320 Renaissance Boulevard
Hillside School (Lakeview School?)	Town of Dover	1701 Sharp Road
John Paul II Academy	City of Racine	2023 Northwestern Avenue
Lutheran High School	City of Racine	251 Luedtke Avenue
Our Lady of Grace Academy	City of Racine	1435 Grove Avenue
Prairie School	Village of Wind Point	4050 Lighthouse Drive
Racine Christian School	City of Racine	912 Virginia Street
Racine Montessori School	City of Racine	2317 Howe Street
Renaissance School	City of Racine	6150 Taylor Avenue
Small World Montessori School	City of Racine	1008 High Street
St. Catherine High School	City of Racine	1200 Park Avenue
St. Charles Borromeo Catholic School	City of Burlington	449 Conkey Street
St. John's Lutheran School	City of Burlington	198 Westridge Avenue

Table continued on next page.

Table C.1 (Continued)

Name	Community	Address
Private Schools (continued)		
St. John's Lutheran School	City of Racine	510 Kewaunee Street
St. Joseph Grade School	City of Racine	1525 Erie Street
St. Lucy's Grade School	City of Racine	3035 Drexel Avenue
St. Mary's Grade School	City of Burlington	225 W. State Street
St. Rita School	Village of Caledonia	4433 Douglas Avenue
St. Thomas Aquinas Grade School	Village of Waterford	302 S. Second Street
Trinity Lutheran Evangelical Church and School	Village of Caledonia	7900 Nicholson Road
Trinity Lutheran School	City of Racine	2055 Geneva Street
Union Grove Christian	Village of Union Grove	417 15th Avenue
Wisconsin Lutheran School	City of Racine	734 Villa Street
Government Buildings		
Burlington City Hall	City of Burlington	300 N. Pine Street
Burlington Post Office	City of Burlington	100 S. Pine Street
Burlington Public Library	City of Burlington	166 E. Jefferson Street
Burlington Town Hall	Town of Burlington	32288 Bushnell Road
Caledonia Post Office	Village of Caledonia	11510 County Road G
Caledonia Village Hall	Village of Caledonia	6922 Nicholson Road
Cesar Chavez Community Center	City of Racine	2221 Douglas Avenue
City of Racine Municipal Court	City of Racine	800 Center Street
Dover Town Hall	Town of Dover	4110 S. Beaumont Avenue
Dr. John Bryant Community Center	City of Racine	601 21st Street
Dr. Martin Luther King Jr. Community Center	City of Racine	1134 Martin Luther King Jr. Drive
Elmwood Park Village Hall	Village of Elmwood Park	3131 Taylor Avenue
Festival Park	City of Racine	5 5th Street
Four Mile Station Post Office	Village of Caledonia	2635 Four Mile Road
Franksville Post Office	Village of Caledonia	3319 Roberts Street
Graham Public Library	Village of Union Grove	1215 Main Street
Humble Park Community Center	City of Racine	2200 Blaine Avenue
Kansasville Post Office	Town of Dover	3825 S. Beaumont Avenue
Lakeshores Libraries Main Office	Village of Waterford	752 Cornerstone Crossing Suite C
Memorial Hall	City of Racine	72 7th Street
Mount Pleasant Village Hall	Village of Mount Pleasant	8811 Campus Drive
North Bay Village Hall	Village of North Bay	3615 Hennepin Place
Norway Town Hall	Town of Norway	6419 Heg Park Road
Racine City Hall	City of Racine	730 Washington Avenue
Racine County Child Support	City of Racine	1717 Taylor Avenue

Table continued on next page.

Table C.1 (Continued)

Name	Community	Address
Government Buildings (continued)		
Racine County Convention and Visitors Bureau	Town of Yorkville	14015 Washington Avenue
Racine County Court House	City of Racine	730 Wisconsin Avenue
Racine County Human Services Center - Burlington	City of Burlington	209 N. Main Street
Racine County Human Services Department - Racine	City of Racine	1717 Taylor Avenue
Racine County Ives Grove Office Complex and Public Works Facilities	Town of Yorkville	14200 Washington Avenue
Racine Post Office	City of Racine	603 S. Main Street
Racine Public Library	City of Racine	75 7th Street
Racine Youthful Offender Correctional Facility, Wisconsin Department of Corrections	City of Racine	1501 Albert Street
Raymond Town Hall	Town of Raymond	2255 76th Street
Rochester Post Office	Village of Rochester	208 W. Main Street
Rochester Public Library	Village of Rochester	208 W. Spring Street
Rochester Village Municipal Hall	Village of Rochester	300 W. Spring Street
Social Security Administration - Racine	City of Racine	4020 Durand Avenue
Sturtevant Transitional Facility, Wisconsin Department of Corrections	Village of Sturtevant	9351 Rayne Road
Sturtevant Post Office	Village of Sturtevant	2849 Wisconsin Street
Sturtevant Village Hall	Village of Sturtevant	2801 89th Street
Tyler Domer Community Center	City of Racine	2301 12th Street
U.S. Army Reserve Center	Village of Sturtevant	1855 Wisconsin Avenue
Union Grove Post Office	Village of Union Grove	830 Main Street
Union Grove Village Hall	Village of Union Grove	925 15th Avenue
Waterford Library	Village of Waterford	101 N. River Street
Waterford Post Office	Village of Waterford	218 N. Milwaukee Street
Waterford Town Hall	Town of Waterford	415 N. Milwaukee
Waterford Village Hall	Village of Waterford	123 N. River Street
West Racine Post Office	City of Racine	1300 Perry Avenue
Wind Point Village Hall	Village of Wind Point	215 E. Four Mile Road
Wisconsin Department of Natural Recourses Service Center	Village of Sturtevant	9531 Rayne Road
Yorkville Town Hall	Town of Yorkville	925 15th Avenue
Child Care Facilities		
Acelero Learning - Burlington	City of Burlington	209 Wainwright Avenue
Acelero Learning - Grand Avenue	City of Racine	1032 Grand Avenue
Acelero Learning - Green Street	City of Racine	1923 Green Street
Acelero Learning at NGN	City of Racine	1220 Mound Avenue
Almost Home Academy	City of Racine	1401 N. Main Street
Atonement Lutheran Child Care	City of Racine	2915 Wright Avenue
Bright & Beautiful Christian Child Care Center	Village of Union Grove	906 12th Avenue

Table continued on next page.

Table C.1 (Continued)

Name	Community	Address
Child Care Facilities (continued)		
Bright and Beautiful Kids Club Program	Village of Union Grove	1745 Milldrum Avenue
Busy Bee's Child Care Center II	City of Racine	1143 College Avenue
Care Bear Childcare Center	City of Racine	1300 Douglas Avenue
Child Harbor Learning Center	City of Racine	703 Washington Avenue
Child Universe Day Care	City of Racine	1015 Washington Avenue
Children's Place Child Development Center	City of Racine	2707 Rapids Drive
Christ Church Childcare	City of Racine	5109 Washington Avenue
Discovery Days Childcare II Inc	Town of Norway	8035 S Racine Avenue
Discovery Stage Preschool & Child Care	Village of Caledonia	13125 County Road G
Dreamland Childcare Center, LLC	City of Racine	3034 Kentucky Street
Ev United Meth Mothers Day Out	City of Racine	212 11th Street
Halo Child Care Center	City of Racine	2000 Dekoven Avenue
Happy Faces Daycare	City of Racine	3417 Douglas Avenue
Heavens Heroes Learning Academy LLC	City of Racine	2510 Douglas Avenue
Holy Family Childcare Center	Village of Rochester	31144 Hunters Trail
Homestead Day Care LLC - Woodfield Elementary School	Village of Waterford	905 Barnes Drive
Homestead Learning Center LLC	Village of Waterford	29200 B Evergreen Drive
In His Arms Early Childhood Center	City of Burlington	417 S Kane Street
It's All About Kids	Village of Waterford	237 N Milwaukee Street
It's All About Kids at Trailside Elementary	Village of Waterford	615 N Milwaukee Street
Kids Klub Dr. Jones	City of Racine	3300 Chicory Road
Kids Klub Fine Arts	City of Racine	815 De Koven Avenue
Kids Klub Jefferson Lighthouse	City of Racine	1722 W 6th Street
Kids Klub Red Apple	City of Racine	914 Saint Patrick Street
Kids Town USA Child Care Center Inc.	Village of Sturtevant	9500 Durand Avenue
Kidz Connection B & A Sch Prog LLC	Town of Yorkville	18621 Washington Avenue
Kidz Connection B & A Sch Prog LLC	Town of Raymond	2659 76th Street
KinderCare Learning Centers - 3 Mile Road	City of Racine	700 3 Mile Road
La Pre Enterprise Dba X-Cite Childcare	City of Racine	2711 19th Street
Lakeview Elementary School Sacc	Town of Norway	26335 Fries Lane
Little Bear Learning Center LLC	Town of Waterford	8221 Big Bend Road
Little Champs Academy I	Village of Caledonia	10127 Northwestern Avenue
Little Champs Academy II	City of Racine	3015 Pritchard Drive
Little Saints Child Care Center	City of Racine	4021 Spring Street
Little VIP Child Care Center	Town of Norway	6710 S Loomis Road
Living Hope Academy	Village of Mount Pleasant	1619 Newman Road

Table continued on next page.

Table C.1 (Continued)

Name	Community	Address
Child Care Facilities (continued)		
Living Hope Kids Kamp	Village of Mount Pleasant	1619 Newman Road
Lots For Tots Early Educational Center	Town of Norway	7345 S Loomis Road
Lov N Care Children's Academy	City of Racine	2000 A Lathrop Avenue
Mauer Home School, LLC	City of Racine	3921 Olive Street
Moe's Learning Academy, LLC	City of Racine	2052 Douglas Avenue
Mustard Seed Preschool	Town of Norway	6321 Heg Park Road
My Little School House Ecc	Town of Yorkville	19120 Spring Street
Noah's Ark Preschool	City of Burlington	126 Chapel Terrace
North Side Preschool	City of Racine	3825 Erie Street
One Step Ahead Child Care Center	City of Racine	1630 Douglas Avenue
Plymouth Children's Center Inc 1	City of Burlington	124 W Washington Street
Plymouth Children's Center Inc 2	City of Burlington	148 E State Street
Plymouth Children's Center Inc 3	City of Burlington	195 Gardner Avenue
Plymouth Children's Center Inc 4	City of Burlington	249 Conkey Street
Prince of Peace Preschool Day Care	City of Racine	4340 Six Mile Road
Racine County Opportunity Center Inc	City of Racine	4214 Sheridan Road
Racine Cooperative Preschool	City of Racine	2500 N. Green Bay Road
RCC Day Camp	Village of Mount Pleasant	2801 Northwestern Avenue
Ree Center 4k Fun Zone	City of Racine	2015 Franklin Street
SC Johnson Childcare Learning Center	City of Racine	3901 Hwy 31
SC Johnson Summer Day Camp	City of Racine	3901 Hwy 31
Sealed Air Child Development Center	Village of Mount Pleasant	8501 N. Campus Drive
Serendipity Children's Center	City of Racine	4811 6 Mile Road
Small World Montessori School	City of Racine	1008 High Street
St Edward's Child Development Center	City of Racine	1430 Grove Avenue
St Peters Rainbow Preschool	Village of Waterford	145 S. 6th Street
TLC Childcare Center	City of Racine	9605 Spring Street
TLC School Age Program Gifford	City of Racine	8332 Northwestern Avenue
Today's Child Learning Academy, LLC	Village of Waterford	214 S. Water Street
Today's Child Learning Academy, LLC - Waterford Area School Age Program	Village of Waterford	817 W Main Street
Total Learning Child Care Inc	Village of Union Grove	1408 15th Avenue
YMCA Kids Camp	Village of Mount Pleasant	8501 N Campus Drive
Your Place To Grow Childcare	Town of Raymond	3862 S 124th Street
Your Place To Grow Childcare II	Town of Raymond	11926 County Hwy K
Y's Kids Schulte School	Village of Sturtevant	8515 Westminster Drive
Y's Kids Wadewitz	City of Racine	2700 Yout Street

Table continued on next page.

Table C.1 (Continued)

Name	Community	Address
Adult Care Facilities		
Abundant Blessings Day Services, LLC	Town of Yorkville	2308 Raymond Avenue
Applewood Cottage	Town of Waterford	7711 Big Bend Road
Arbor View Communities	Town of Burlington	34201 Arbor Lane
Arbor View Memory Care	Town of Waterford	34111 Arbor Lane
Artisan Racine	Village of Mount Pleasant	6109 Braun Road
Bay Pointe at the Atrium	City of Racine	3950 N. Main Street
Becker Shoop Center	Village of Mount Pleasant	6101 16th Street
Burlington Rehabilitation and Care Center	City of Burlington	677 E. State Street
Calebria House	Village of Burlington	155 Beth Court
Chestnut Club	City of Burlington	165 W Chestnut Street
Dolphin Manor Day Care	Town of Dover	21404 Washington Avenue
Eagle House	Town of Yorkville	807 53rd Drive
Elizabeth Gardens	City of Racine	5111 Wright Avenue
Elizabeth Residence Caledonia	Village of Caledonia	5737 Erie Street
Genesis Chatham House	City of Racine	1636 Chatham Street
Genesis Crossroads	City of Racine	4107-09 St. Clair Street
Genesis Spring Place Manor	City of Racine	1725-27 Spring Place
Harmony Commons Racine	Village of Mount Pleasant	8500 Corporate Drive
Harmony of Racine	Village of Mount Pleasant	8600 Corporate Drive
Hil Fox Mead Group Home	Village of Waterford	516 Fox Mead Crossing
Hil Hilside	City of Burlington	373 Church Street
Hil Kendric Home	City of Burlington	265 N. Kendrick Avenue
Hil Kennedy Home	City of Racine	4305 - 4307 Kennedy Drive
Hil Wanda Frogg Villa/Meadowhaven	City of Burlington	524 Summit Avenue
Home Harbor	City of Racine	1600 Ohio Street
Killarney Kourt	Village of Sturtevant	8800 Shannon Lane
Lakeview Neurorehab Center, Inc	Town of Dover	1701 Sharp Road
Lakeview Rehabilitation Center	Town of Dover	1701 Sharp Road
Lincoln Lutheran Adult Day Care Services	City of Racine	2000 Domanik Drive
Lincoln Village Convalescent Center	City of Racine	1700 C.A. Becker Drive
Long Lake House	Town of Norway	8208 Racine Avenue
Maplewood Cottage	Town of Waterford	7711 Big Bend Road
Neurorestorative Wisconsin	Town of Waterford	5310 Buena Park Road
New Heights Family Adult Day Care Center	City of Racine	2836 Crossridge Drive
New Vision Home LLC II	Village of Mount Pleasant	1449 N. Green Bay Road
Oak Ridge Care Center, Inc.	Village of Union Grove	1400 8th Avenue

Table continued on next page.

Table C.1 (Continued)

Name	Community	Address
Adult Care Facilities (continued)		
Parkview Gardens	City of Racine	5321 Douglas Avenue
Pine Brook Pointe	City of Burlington	1001 S. Pine Street
Prospect Heights Community Living Center	City of Racine	2015 Prospect Street
Ridgewood Health Care Center	City of Racine	3205 Wood Road
Rolling Meadows	Town of Norway	8212 Racine Avenue
St. Monica - Senior Living, Inc	Village of Caledonia	3920 N. Green Bay Road
The Manna House Adult Day Care Center	City of Racine	3417 Douglas Avenue
Tree of Life	Village of Sturtevant	10101 Durand Avenue
Waterford Memory Care	Village of Waterford	301 S. 6th Street
Waterford Senior Living	Village of Waterford	301 S. 6th Street
Wheaton Franciscan Healthcare - Lakeshore Manor	City of Racine	1320 Wisconsin Avenue
Willowgreen Home	Village of Caledonia	4719 Kingdom Court
Wisconsin Veterans Home - Boland Hall	Town of Dover	21425 E. Spring Street
Wisconsin Veterans Home - Fairchild	Town of Dover	21425-D E. Spring Street

Source: Racine County and SEWRPC

DISASTER SUPPLY KIT FOR THE RACINE COUNTY PLANNING AREA

APPENDIX D

EMERGENCY SUPPLIES CHECKLIST

RECOMMENDED ITEMS FOR BASIC EMERGENCY KIT

- ☐ Water and non-perishable food for at least three days
- ☐ Extra cell phone battery and charger & extra batteries for other devices
- ☐ Battery-powered or hand crank radio that can receive NOAA Weather Radio alerts
- ☐ Flashlight
- ☐ First aid kit
- ☐ Whistle to signal for help
- ☐ N95 or higher quality dust mask, and plastic sheeting and duct tape to shelter in place
- ☐ Moist towelettes, garbage bags, and plastic ties for personal sanitation
- ☐ Non-sparking wrench or pliers to turn off utilities
- ☐ Can opener (if kit contains canned food)
- ☐ Local maps

ADDITIONAL ITEMS TO BUILD YOUR KIT

- ☐ Prescription medications and glasses
- ☐ Infant formula and diapers
- ☐ Pet food, water, and supplies for your pet(s)
- ☐ Important family documents such as identification, social security, passports, insurance documents, and bank records in a portable waterproof container
- ☐ Cash and change
- ☐ Emergency references such as a first aid book or information from www.ready.gov
- ☐ Sleeping bag and warm blanket for each person including extra in the wintertime
- ☐ Complete change of clothing including a long-sleeved shirt, pants, and sturdy shoes.

ADDITIONAL ITEMS TO CONSIDER ADDING TO KIT

- ☐ **Cold weather gear for wintertime including a jacket, hat, and gloves for each person**
- ☐ **Fire extinguisher**
- ☐ **Matches in a waterproof container**
- ☐ **Feminine hygiene supplies, personal hygiene items, and hand sanitizer**
- ☐ **Mess kits, paper cups, plates, and towels, and disposable utensils**
- ☐ **Paper and pencil**
- ☐ **Books, games, puzzles, or other activities for children**

Information provided via the Federal Emergency Management Agency's Ready Campaign and Racine County Emergency Management

FEMA

POTENTIAL FUNDING PROGRAMS TO IMPLEMENT PLAN RECOMMENDATIONS WITHIN RACINE COUNTY

APPENDIX E

Table E.1
Potential Funding Programs to Implement Plan Recommendations

Reference Number	Administrator of Grant Program	Name of Funding Program	Eligibility	Types of Projects and Funding Eligibility Criteria	Assistance Provided
1	U.S. Department of Homeland Security, Federal Emergency Management Agency (FEMA)	Hazard Mitigation Grant Program	State agencies and participating National Flood Insurance Program (NFIP) communities; federally-recognized tribes, tribal agencies, private nonprofits, and local government/communities	1. Floodproofing 2. Relocation of structures 3. Elevation of structures 4. Property acquisition 5. Conformity with approved state and local mitigation plan 6. Plan preparation 7. Safe room construction 8. Construction or modification of dikes, levees, floodwalls, seawalls, groins, jetties, breakwaters, and stabilized sand dunes	75 percent Federal cost-share assistance; 12.5 percent State match and 12.5 percent local match required[a]
2	FEMA	Flood Mitigation Assistance Grant Program	State agencies and participating NFIP communities; federally-recognized tribes, tribal agencies, local governments/communities	1. Elevation, relocation, or demolition of insured structures 2. Acquisition 3. Dry floodproofing 4. Minor structural projects 5. Beach nourishment activities 6. Projects must be consistent with the goals and objectives identified in the State, tribal, or local mitigation plans	Funding is appropriated by Congress;[b] 75 percent Federal cost-share assistance; 25 percent local match required; two types of grants: Planning grant and project grant[c]
3	FEMA	Public Assistance Grant Program	State, tribal, territorial, and local governments; certain types of private nonprofit organizations	1. Rebuilding infrastructure damaged during a flood 2. Building infrastructure for portions of a community that are to be relocated outside of floodplains 3. Limited assistance with structural elevation and relocation	75 percent Federal cost-share assistance; the State determines the local match
4	FEMA	National Training and Education Division	State and local first responders; private sector and tribal entities	1. Provides preparedness training and exercise support to first responders in the event of a manmade or natural catastrophic event 2. Provides educational services in 18 professional disciplines	Provides over 150 training courses for first responders
5	FEMA	Building Resilient Infrastructure and Communities Program (BRIC)	State agencies and participating National Flood Insurance Program (NFIP) communities; local governments, U.S. Territories, and Federally-recognized tribes	1. Acquisition and relocation or demolition of structures in flood hazard areas 2. Floodproofing 3. Minor structural projects 4. Flood control projects for critical facilities 5. Plan preparation 6. Technical assistance 7. Safe room construction 3. Applicants must have a FEMA-approved Mitigation Plan in order to qualify for project grants	Funding is appropriated by Congress;[b] 75 percent Federal cost-share assistance provided (small, impoverished communities may be eligible for up to 90 percent federal cost-share); 25 percent State or local match is required

Table continued on next page.

Table E.1 (Continued)

Reference Number	Administrator of Grant Program	Name of Funding Program	Eligibility	Types of Projects and Funding Eligibility Criteria	Assistance Provided
6	FEMA	Homeland Security Preparedness Technical Assistance Program	State, local, and tribal governments	1. Activities that help achieve the National Preparedness Goal 2. Education and training on emerging homeland security issues	No statutory matching requirements; Amounts awarded vary based on the scope of the project
7	FEMA	Assistance to Firefighters Grant Program	City, County, Village, Tribal, and Township Fire Departments; nonaffiliated emergency medical services (EMS) organizations, State Fire Training Academies (SFTA)	1. Firefighter and EMT training 2. Firefighting and EMS equipment 3. Firefighter personal protective equipment	Cost-share matching fund requirements dependent upon size of population served by Fire Department
8	FEMA	Staffing for Adequate Fire and Emergency Response Grants (SAFER)	City, County, Village, Tribal, and Township Fire Departments (volunteer, combination, and career fire departments)	1. Hiring of new, additional firefighters to improve staffing levels 2. Recruitment and retention of volunteer firefighters involved with or trained in the operations of firefighting and emergency response	Salary and associated benefits for new firefighters and volunteer firefighters; Recipients of SAFER Recruitment and Retention of Volunteer Firefighters Activity grants are not required to contribute matching funds; Firefighters Activity grant recipients are required to contribute non-federal funds subject to a Position Cost Limit and a Cost Share (see program guidance)
9	FEMA	Fire Prevention and Safety Grants (FP&S)	City, County, Village, Tribal, and Township Fire Departments; non-profit organizations, educational and public health institutions	1. Community risk reduction 2. Fire and arson investigation 3. Clinical Studies 4. Technology and product development 5. Code enforcement/awareness	Non-federal match equal to or greater than five percent of the grant awarded is required
10	FEMA	Fire Management Assistance Grants	States, Indian tribal governments, and local governments	Provides assistance for the mitigation, management, and control of any fire burning on publicly or privately-owned forest or grassland that threatens such destruction as would constitute a major disaster	75 percent Federal cost-share assistance; 25 percent State and local match[d]
11	U.S. Fire Administration	National Fire Academy	People with substantial involvement in fire prevention and control, emergency medical services, fire-related emergency management activities, or allied professions	Provides tuition-free training in firefighting, prevention, emergency medical services, and related areas	Provides tuition-free training in firefighting, prevention, emergency medical services, and related areas
12	U.S. Fire Administration	National Fire Academy Training Assistance Student Stipend Reimbursement Program	People who represent a career or volunteer fire department, rescue squad, or State or local government	Provides travel stipends for students attending National Fire Academy courses	Travel reimbursement
13	U.S. Army Corps of Engineers (USACE)	Continuing Authorities Program—Snagging and Clearing for Flood Risk Management Program	State and local units of government	1. Removal of obstructions that restrict flood flows of navigable waters 2. Projects must be designed and constructed by the Corps	Federal share cannot exceed $500,000 for a given project; cost-share program with local match of 35 percent for design and preparation; construction cost varies between 30 percent and 65 percent federal share

Table continued on next page.

Table E.1 (Continued)

Reference Number	Administrator of Grant Program	Name of Funding Program	Eligibility	Types of Projects and Funding Eligibility Criteria	Assistance Provided
14	USACE	Continuing Authorities Program—Emergency Streambank and Shore Protection Program	Local governments	1. Bank protection of highways, highway bridges, essential public works, churches, hospitals, schools, and other nonprofit public services from flood induced erosion	Federal share cannot exceed $5,000,000 for a given project; cost-share program with local match of 35 percent for design and construction required
15	USACE	Small Hurricane and Storm Damage Reduction Program	State agencies and local units of government	1. Beach nourishment 2. Floodproofing 3. Other structural and nonstructural storm damage reduction projects	Federal share cannot exceed $5,000,000 for a given project; cost-share program with local contribution of 35 percent for design and construction required
16	USACE	Water Resources Development and Flood Control Acts	Local governments	1. Water resources planning assistance 2. Emergency streambank and shoreline protection	50 percent for studies and 65 percent for project implementation of Federal cost-share assistance; 35 to 50 percent local match is required
17	USACE	Continuing Authorities Program—Flood Risk Management Program	Local governments and special authorities	Assistance for planning, design, and construction of structural and non-structural flood control projects. Projects are not limited to any particular type of improvement.	Feasibility study is 100 percent federally funded up to $100,000; 50 percent local match required for any costs exceeding $100,000; 65 percent federal cost share for project implementation with 35 percent local match required
18	USACE	Flood Plain Management Services Program	State, regional, and local governments; federally recognized Native American Tribes; other non-federal public agencies	1. Floodplain delineation 2. Flood hazard evaluation 3. Dam break analysis 4. Stormwater management 5. Flood risk reduction	100 percent federal cost-share assistance provided; entities may provide voluntary contributions
19	USACE	Flood Damage Reduction Program	State and local units of government	1. Projects designed to reduce the impact of flood events 2. Projects must be designed and constructed by the Corps	50 to 65 percent Federal cost-share assistance above $100,000 and cannot exceed $10 million; 35 to 50 percent local match is required
20	National Oceanic and Atmospheric Administration (NOAA)	Coastal Estuarine Land Conservation Program	Public agencies	1. Protect, restore, and enhance Great Lakes coastal wetlands 2. Protect restore, and enhance coastal and riparian habitats in the Great Lakes basin	50 percent Federal cost-share not to exceed $1.5 million; requires 50 percent non-federal match
21	U.S. Department of Agriculture (USDA)	Water and Waste Disposal Loan & Grant Program	Local units of government, nonprofit organizations; Meant for rural areas and towns of less than 10,000 people	Funds may be used to finance the acquisition, construction, or improvement of: 1. Drinking water sourcing, treatment, storage, and distribution 2. Sewage collection, transmission, treatment, and disposal 3. Stormwater collection, transmission and disposal	Long-term, low interest loans. If funds are available, grants may be combined with a loan if necessary to keep user costs reasonable
22	U.S. Department of Agriculture, Farm Services Agency (FSA)	Conservation Reserve Program	Individual landowners in a 10- or 15-year contract	1. Riparian buffers 2. Trees 3. Windbreaks 4. Grassed waterways Farmer must have owned or operated the land for at least 12 months prior to the previous program sign-up period	50 percent Federal cost-share assistance; 50 percent local match from individual; an annual rental payment for the length of the contract is also provided

Table continued on next page.

Table E.1 (Continued)

Reference Number	Administrator of Grant Program	Name of Funding Program	Eligibility	Types of Projects and Funding Eligibility Criteria	Assistance Provided
23	FSA	Conservation Reserve Enhancement Program	Individual landowners who have owned or operated land for at least 12 months prior to submitting an offer	1. Filter strips 2. Riparian buffers 3. Grassed waterways 4. Permanent grasses (only in specially designated grassland project areas) 5. Wetland development and restoration	50 percent Federal cost-share assistance; one-time signing incentive payment of $100 per acre for installing grass waterways, filter strips, and riparian buffers; one-time practice incentive payment equal to 40 percent of the eligible reimbursable cost to install grass waterways, filter strips, and riparian buffers; an annual rental payment; State of Wisconsin provides an incentive payment (equal to 20 percent of the eligible reimbursable cost of installing the approved practice), a one-time payment for land enrolled in the State's perpetual easement, and a one-time payment for land enrolled in the State's agreement program
24	FSA	Emergency Conservation Program	Individual landowners	1. Grading and shaping farmland 2. Restoring conservation structures 3. Redistribution of eroded soil 4. Debris removal 5. Projects must be in response to a natural disaster	Up to 75 percent Federal cost-share assistance, the remaining is determined by the committee reviewing the application
25	FSA	Farmable Wetland Program	Individual agricultural landowners in 10- or 15- year contracts	1. Restore currently farmed wetland	One-time $100 per acre Federal signing incentive; up to 50 percent Federal cost share assistance for installation of practices plus one-time incentive payment of 40 percent of practice installation cost; annual rental payments based on the weighted average dryland cash rate
26	U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS)	Agricultural Conservation Easement Program-Wetlands Reserve Easements	Local government and individual landowners	1. Purchase agricultural land easements that protect the conservation values of eligible land 2. Wetland protection, restoration, and enhancement	Permanent easement: NRCS pays 100 percent of easement value and 75 to 100 percent of restoration cost 30-year easement: NRCS pays 50 to 75 percent of easement value and 50 to 75 percent of restoration cost
27	NRCS	Conservation Stewardship Program	Individual landowners in a five-year contract	1. Filter strips 2. Riparian Buffers 3. Wildlife corridors 3. Stream habitat improvement	Payments for maintaining and/or enhancing natural resources not to exceed $40,000 per year or $200,000 over a five-year period
28	NRCS	Watershed Protection and Flood Prevention Program	State and local units of government; tribal governments	1. Watershed protection 2. Flood prevention measures 3. Benefits that are directly related to agriculture must be at least 20 percent of the total project benefits 4. Watersheds can be no larger than 250,000 acres	Cost-share rates vary depending on the type of measure and the purpose to which the cost is allocated; total average annual monetary benefits equal $2.2 billion

Table continued on next page.

Table E.1 (Continued)

Reference Number	Administrator of Grant Program	Name of Funding Program	Eligibility	Types of Projects and Funding Eligibility Criteria	Assistance Provided
29	NRCS	Emergency Watershed Protection Program – Floodplain Easement Option	Individual landowners provided they have a local sponsor such as a local unit of government	1. Sale of agricultural floodprone lands to NRCS for floodplain easements 2. Land must have a history of repeated flooding (at least twice in the past 10 years) 3. Landowner retains most of the rights as before the sale 4. NRCS has authority to restore the floodplain function and value	The USDA pays the landowner the lowest of three options: a geographic rate, the fair market value of the land, or an offer made by the landowner; 75 percent Federal cost-share assistance; 25 percent local match is required[e]
30	NRCS	Emergency Watershed Protection Program - Recovery Assistance	Individual landowners provided they have a local sponsor such as a local unit of government	1. Debris removal 2. Reshaping and protection of eroded streambanks 3. Repair levees and structures 4. Repair damaged drainage facilities	Up to 75 percent Federal cost-share assistance; 25 percent local match is required
31	NRCS	Environmental Quality Incentives Program	Agricultural producers, owners of non-industrial private forestland, Indian Tribes, and those with an interest in the agricultural or forestry operations	1. Animal waste management practices 2. Soil erosion and sediment control practices 3. Nutrient management 4. Groundwater protection 5. Habitat improvement	Up to 75 percent Federal cost-share assistance; 25 percent local match is required
32	USDA Risk Management Agency	Federal Crop Insurance	Agricultural producers	1. Insurance of selected crops against losses due to natural hazards 2. USDA Risk Management Agency administers this program, however producers purchase Federal crop insurance through private insurance agents	Insurance of selected crops against losses due to natural hazards
33	U.S. Fish and Wildlife Service (FWS)	North American Wetlands Conservation Grants Program	Private or public organizations	1. Land acquisition 2. Restoration, management, and enhancement of wetland ecosystems and other habitat for migratory birds and other fish and wildlife	Applicants must match their grant request at no less than a 1-to-1 ratio; requests for small grants may not exceed $100,000
34	FWS	Partners for Fish and Wildlife Habitat Restoration Program	Private landowners for a 10-year-minimum contract	1. Restoration of degraded wetlands, native grasslands, stream and riparian corridors, and other habitat areas	Full cost-share and technical assistance; individual projects cannot exceed $25,000
35	U.S. Department of Housing and Urban Development (HUD)	Community Development Block Grant Program	Local governments	1. Public Facilities Grants to fund tornado shelters and safe houses 2. Housing Grants to fund the rehabilitation of housing to meet current building codes 2. Funds continuous training course for the building code authority	No matching requirements; Amounts awarded vary based on assessed community needs
36	HUD and Wisconsin Department of Administration, Division of Energy, Housing, and Community Resources	Community Development Block Grant Program-Emergency Assistance Program	Local governments	1. Repair of public infrastructure 2. Housing rehabilitation to low-and moderate-income homeowners 3. Business assistance	75 percent Federal cost-share assistance; 25 percent local match required; maximum grant award equals $500,000

Table continued on next page.

Table E.1 (Continued)

Reference Number	Administrator of Grant Program	Name of Funding Program	Eligibility	Types of Projects and Funding Eligibility Criteria	Assistance Provided
37	HUD	Healthy Homes Technical Studies Grant Program	State, tribal, and local governments; non-profit organizations, for-profit firms, educational institutions	1. Improve methods for detecting and controlling key housing-related health and safety hazards and improve environmental sampling protocols 2. Evaluate efficacy and cost-effectiveness of interventions to address high-priority residential health and safety hazards	Approximately $6 million available nationally;[b] awards range from $300,000 to a maximum grant award of $1,000,000; No match is required, applicant leveraging contributions are encouraged
38	U.S. Small Business Administration	Disaster Loan Program	Homeowners, renters, and businesses	1. Property repair 2. Property replacement 3. Meeting building code requirements 4. Involuntary relocations out of a special flood hazard area	Low interest loans
39	U.S. Environmental Protection Agency (USEPA)	Pesticide Environmental Stewardship Grants	Companies and organizations that use pesticides, represent pesticide users, or implement or influence pest management practices of pesticide users (pesticide manufacturers and producers are not eligible)	1. Implementation of pollution control measures 2. Plan development that includes strategies to reduce pesticide risk	Approximately $500,000 available nationally;[b] locally grants are provided up to a maximum of $50,000
40	USEPA	Environmental Education Grants Program	Local or State education agencies, colleges, and nonprofit organizations; State environmental agencies, tribal education agencies, and noncommercial educational broadcasting agencies	1. Improving environmental education teaching skills 2. Educating teachers, students, or the public about human health problems 3. Building capacity for environmental education programs 4. Education communities 5. Educating the public through print, broadcast, or other media	$3 million available nationally,[b] grants range from $50,000 to $100,000; up to 75 percent federal cost share assistance, 25 percent local match is required
41	USEPA	Targeted Watershed Grants	Watershed organizations nominated by State Governors or Tribal leaders	1. Watershed-based projects to protect water resources (i.e., wetland restoration) 2. Training and technical assistance to local partnerships	75 percent maximum Federal cost-share assistance; Minimum 25 percent non-Federal match
42	U.S. Department of Health and Human Resources, National Institutes of Health	National Institute of Environmental Health Sciences (NIEHS) Hazardous Waste Worker Health and Safety Training	Public and private nonprofit organizations involved in hazardous waste removal, containment, or chemical emergency response	1. Assists organizations in the development of institutional competency to provide appropriate training and education to hazardous waste workers 2. Assists in development of model worker health and safety training programs consisting of classroom and practical health and safety training of workers in the treatment, storage, disposal, removal, containment, transportation or hazardous materials 3. Aids with training and education, emergency response in regard to a hazardous waste incident	No statutory matching requirements; Grants generally range from $26,960 to $2.7 million; Average grant awarded is $833,895 (2018)

Table continued on next page.

Table E.1 (Continued)

Reference Number	Administrator of Grant Program	Name of Funding Program	Eligibility	Types of Projects and Funding Eligibility Criteria	Assistance Provided
43	U.S. Department of Transportation (USDOT), Federal Highway Administration (FHWA)	Surface Transportation Block Grant Program	State and local units of government	Provides funding assistance for smaller-scale transportation projects and activities such as improvements to pedestrian and bicycle facilities and recreational trails; provides assistance for community improvements such as historic preservation and vegetation management, and environmental mitigation related to stormwater and habitat connectivity	80 percent Federal cost-share assistance; 20 percent local match is required
44	USDOT	Transportation Enhancement Program	State and local units of government	1. Wetland preservation and restoration 2. Stormwater treatment systems to address runoff from roads and highways 3. Land acquisition for scenic easements, pedestrian and bike trails, and abandoned railway corridors	80 percent Federal cost-share assistance; 20 percent local match is required For land acquisition: 50 percent Federal cost-share assistance; 50 percent local match is required
45	Wisconsin Department of Administration	Wisconsin Coastal Management Grant Program	State and local units of government, nonprofit organizations, and tribal agencies	Enhancement and restoration of coastal resources within the state's coastal zone; eligible activities include wetland protection, nonpoint source pollution control, and historic preservation projects	Approximately $1.5 million is available biennially to all counties adjacent to Lakes Superior and Michigan
46	WDHS	Chemical Contamination Technical Assistance	Local government	Technical assistance can determine if an actual or potential public health threat is present and if hazard mitigation is warranted or desirable	Provide technical assistance and support
47	Wisconsin Department of Agriculture, Trade, and Consumer Protection (DATCP)	Farmland Preservation Program	Individual landowners for a period of 10 years	Best management practices that will lower the soil erosion rate to the tolerable soil loss rate or below and improve water quality	Tax incentives on an annual basis
48	DATCP	Land and Water Resource Management Program	Individual landowners	1. Grassed waterways 2. Manure storage systems 3. Grade stabilization structures 4. Well abandonment 5. Conservation tillage	50 to 70 percent State cost-share assistance; 30 to 50 percent individual cost-share is required; in the case of financial hardship, up to 90 percent cost-share assistance can be obtained from State
49	DATCP	Soil and Water Resource Management Program	Individual landowners	1. Wetland restoration 2. Filter strip, riparian buffers 3. Subsurface drainage 6. Well abandonment	Program funds 70 percent of the cost of conservation project
50	WDHS, Division of Public Health, Bureau of Communicable Diseases	Communicable or Infectious Diseases Technical Assistance	Local governments	Technical assistance to determine if an actual or potential human threat is present	Provide technical assistance and support
51	WDHS	Special Needs Technical Assistance	Local governments	Technical assistance to determine if an actual or potential human service and/or population threat is present	Provide technical assistance and support

Table continued on next page.

Table E.1 (Continued)

Reference Number	Administrator of Grant Program	Name of Funding Program	Eligibility	Types of Projects and Funding Eligibility Criteria	Assistance Provided
53	Wisconsin Department of Natural Resources (WDNR)	Municipal Flood Control Grants Chapter NR 199 of the *Wisconsin Administrative Code*	Cities, villages, towns, metropolitan sewerage districts	1. Acquisition and removal of structures 2. Flood proofing and elevation of structures 3. Riparian restoration projects 4. Acquisition of vacant land or purchase of easements 5. Construction of stormwater and groundwater facilities related to flood control and riparian restoration projects 6. Flood mapping	50 percent State cost-share assistance; 50 percent local match
54	WDNR	Urban Green Space Program	Local units of government, tribal governments, lake protection and rehabilitation districts, and nonprofit conservation organizations	Land acquisition for greenway space in urban areas, protection of scenic or ecological features, and wildlife habitat improvement; local governments must have a WDNR accepted comprehensive outdoor recreation plan or master plan that has been approved by resolution by the local governing unit	50 percent State cost-sharing assistance; 50 percent local match is required
55	WDNR	Remediation and Redevelopment Program	Responsible Party	Oversees the investigation and cleanup of environmental contamination and the redevelopment of contaminated properties; consolidates state and federal cleanups into one program	Provide technical assistance and support
56	WDNR	Lake Classification and Local Ordinance Development Grants, Section NR 191.30 of the *Wisconsin Administrative Code*	Local units of government, lake districts	Development or improvement of ordinances related to conservancy, wetland, shoreland, floodplain, construction erosion control, stormwater control or other ordinances with water quality or lake protection benefit	75 percent State cost-share, not to exceed $50,000
57	WDNR	Lake Management Planning Grant Program, Chapter NR 190 of the *Wisconsin Administrative Code*	Local units of government, lake districts, town sanitary districts, qualified school districts, and nonprofit conservation organizations	1. Gathering and analyzing water quality information 2. Land use planning within lake watersheds 3. Gathering and compiling demographic information pertinent to individual lakes 4. Developing lake management plans	Up to 67 percent State cost-share assistance for small-scale lake planning grants, not to exceed $3,000; 33 percent local match is required; up to 67 percent State cost-share assistance for large-scale lake planning grants, not to exceed $25,000; 33 percent local match is required; lakes are eligible for more than one grant, however, the total amount of State dollars cannot exceed $100,000; maximum grant award of $50,000 in any one year for each lake
58	WDNR	Lake Protection and Classification Grant Program, Chapter NR 191 of the *Wisconsin Administrative Code*	Local units of government, lake districts, and nonprofit conservation organizations	1. Land acquisition for easement establishment 2. Wetland restoration 3. Lake restoration projects 5. Other projects involving lake improvement	75 percent State cost-share which cannot exceed $200,000 for land/easement acquisition projects; cannot exceed $100,000 for wetland and shoreline habitat restoration projects; 25 percent local match is required

Table continued on next page.

Table E.1 (Continued)

Reference Number	Administrator of Grant Program	Name of Funding Program	Eligibility	Types of Projects and Funding Eligibility Criteria	Assistance Provided
59	WDNR	Land and Water Conservation Fund Program	Counties, cities, villages, towns, school districts	1. Land acquisition or development that will provide opportunities for outdoor recreation 2. Property with frontage on rivers, streams, lakes, estuaries, and reservoirs that will provide water-based outdoor recreation 3. Property that provides special recreation opportunities, such as floodplains, wetland, and areas adjacent to scenic highways	50 percent State cost-share assistance; 50 percent local match is required
60	WDNR	Land/Easement Acquisition for River Management Section NR 195.13 of the *Wisconsin Administrative Code*	Local units of government, lake districts, town sanitary districts, qualified river management associations, and qualified nonprofit conservation organizations	Land acquisition and easements for river protection	75 percent State cost-share assistance; 25 percent local match is required; Grant not to exceed $50,000
61	WDNR	Knowles-Nelson Stewardship Grant Program, Chapter NR 51 of the *Wisconsin Administrative Code*	Local government and nonprofit conservation organizations	1. Streambank protection projects 2. Land acquisition of stream corridors for water quality improvement	50 percent State cost-share assistance; 50 percent local match is required
62	WDNR	Municipal Dam Grant Program	Counties, cities, villages, tribes, inland lake protection and rehabilitation districts	1. Dam repair, reconstruction, or modification to improve safety 2. Dam abandonment and removal	For repair, reconstruction, or modification projects grant awards cover 50 percent of the first $400,000 and 25 percent of the next $800,000 of eligible project costs For abandonment and removal projects, grant awards will cover 100 percent of the first $400,000 of eligible project costs
63	WDNR	Urban Rivers Grant Program. Funding is through Chapter NR 51 of the *Wisconsin Administrative Code*	Local governments, tribal governments, and nonprofit conservation organizations	Land acquisition to preserve open areas in urban environments adjacent to streams and rivers	50 percent State cost-share assistance; 50 percent local match is required
64	WDNR	Urban Nonpoint Source and Stormwater Grants Program. Funding is through Chapter NR 155 of the *Wisconsin Administrative Code*	Local units of government, tribal governments, regional planning commissions, and special purpose lake, sewerage and sanitary districts	1. Planning 2. Educational and information activities 3. Ordinance development and enforcement 4. Land acquisition and easement purchase 5. Storm water detention ponds 6. Streambank and shoreline stabilization	70 percent State cost-share assistance for projects not involving construction, requiring a 30 percent local match; 50 percent State cost-share assistance for projects involving construction, requiring a 50 percent local match
65	WDNR	Targeted Runoff Management Grants, Chapter NR 153 of the *Wisconsin Administrative Code*	Local units of government, tribal governments, regional planning commissions, and special purpose lake, sewerage and sanitary districts	1. Complying with nonpoint source performance standards 2. Improving 303(d) waters 3. Protecting outstanding water resources 4. Compliance with a notice of discharge for an animal feeding operation 7. Addressing a water quality concern of national or statewide importance, such as the Upper Mississippi River concerns	70 percent State cost-share assistance; 30 percent local match is required. Grant awards not to exceed $150,000 for small-scale TMDL and non-TDML projects

Table continued on next page.

Table E.1 (Continued)

Reference Number	Administrator of Grant Program	Name of Funding Program	Eligibility	Types of Projects and Funding Eligibility Criteria	Assistance Provided
66	WDNR	River Protection Grant Program, Chapter NR 195 of the *Wisconsin Administrative Code*	Local units of government and nonprofit conservation organizations, qualified river management organizations	1. Activities designed to develop partnerships that protect river ecosystems 2. Educational projects 3. Activities associated with river management plan development 4. Land acquisition 5. Ordinance development 6. Installation of practices to control nonpoint source pollution	75 percent State cost-share assistance; 25 percent local match is required; Planning grants not to exceed $10,000, and Management grants not to exceed $50,000
67	WDNR	Safe Drinking Water Loan Program	Local units of government, sanitary and utility districts, and federally recognized tribes	Drinking water infrastructure projects	Loans at 55 percent of market share
68	WDNR	Clean Water Fund Program	Local units of government, sanitary and utility districts, and federally recognized tribes	1. Compliance with nonpoint source performance standards 2. Stormwater management projects 3. Projects seeking water conservation, efficiency, and reuse 4. Construction or maintenance of water treatment facilities	Loans at 55 percent of market rate
69	WDNR	Wisconsin Forest Landowner Grant Program	Individual landowners with a Forest Stewardship Plan prepared by a forester	1. Stream buffer establishment 2. Streambank stabilization 3. Wetland restoration	Up to 50 percent cost-share assistance; 50 percent local match is required
70	Wisconsin Department of Transportation (WisDOT)	Transportation Alternatives Program	Local governments, regional transportation authorities, transit agencies, natural resources or public land agencies, school districts, tribal governments	1. Infrastructure-related projects and systems that will provide safe routes for non-drivers 2. Community improvement projects 3. Environmental mitigation activities	80 percent State match; Minimum of $300,000 for infrastructure projects, minimum of $50,000 for non-infrastructure projects; No maximum, but grants exceeding $1 million are unlikely
71	WisDOT	Highway Safety Improvement Program	Local governments	1. Intersection safety improvements 2. Installing guardrails, signs, pavement markings 3. Corridor signal upgrades 4. Warning devices	90 percent Federal reimbursement; 10 percent match required; State pays match on projects on State trunk highways, local government pays match on local streets and highways
72	Wisconsin Emergency Management	Hazard Mitigation Grant Program	State and local units of government, tribal governments, and eligible private, non-profit organizations	1. Mitigation Planning 2. Technical Assistance 3. Mitigation Projects	75 percent Federal cost-share assistance; 25 percent local match
73	Wisconsin Emergency Management	Wisconsin Homeland Security Grant Program	State and local government units that must comply with HSPD-5	1. NIMS and ICS training courses 2. Funds purchase of equipment	Statewide $3,980,000 will be available
74	Wisconsin Public Service Commission	Telecommunications, Water, Energy Divisions	Local governments	Incorporate disaster resilience into regulation development, land use practices and environmental impacts of public utilities	General Utility Assistance
75	University of Wisconsin Cooperative Extension	Extension Disaster Education Network	Local governments	Provides community education and public information programs promoting hazard awareness and mitigation concepts	Education and Information provided through the University of Wisconsin System

Table continued on next page.

Table E.1 (Continued)

Reference Number	Administrator of Grant Program	Name of Funding Program	Eligibility	Types of Projects and Funding Eligibility Criteria	Assistance Provided
76	Great Lakes Protection Fund	Great Lakes Protection Fund Grants Program	State and local units of government, nonprofit organizations, for-profit businesses, educational institutions, and individuals	1. Protect and restore the health of the Great Lakes 2. Promote the interdependence of healthy ecological and economic systems 3. Support innovative, creative, and venturesome ideas	Matching funds not required; past awards have ranged from $20,000 to $1.6 million; average award $460,000
77	Great Lakes Restoration Initiative	Multiple funding programs available	Varies by program	Clean toxins, combat invasive species, protect water quality, restore wetlands and other habitats	Varies by program
78	Joyce Foundation	Joyce Foundation Grant Program	State and local units of government, nonprofit organizations and individuals, educational institutions	1. To protect and restore the health of the Great Lakes 2. To promote the interdependence of healthy ecological and economic systems 3. To support innovative, creative, and venturesome ideas 4. Developing improved regulatory approaches 5. Better understanding of the supply of and demand for Great Lakes 6. Creating transportation alternatives to reduce over reliance on automobiles	Finance the total cost of accepted projects
79	National Fish and Wildlife Foundation (NFWF)	Wal-Mart Stores, Inc. Acres for America Program	State and local units of government, nonprofit organizations, Indian Tribes, educational institutions	Acquisition of permanent easement for conservation of habitat	$3.5 million available nationally annually; minimum 1:1 match ratio required, higher local match preferred
80	NFWF	Five-star and Urban Waters Restoration Grant Program	Nonprofit organizations, local governments, municipal governments, Indian tribes, educational institutions	1. Wetland restoration projects 2. Riparian restoration projects 3. Coastal and forest restoration projects 4. Projects must be part of a larger watershed project 5. Projects must have at least five contributing parties	$2,000,000 available nationally annually; project awards range from $20,000 to $50,000, average award $30,000; 1:1, non-federal match ratio required, higher local match preferred
81	NFWF	Resilient Communities Grant Program	Local governments 501(c) nonprofit organizations	1. Green infrastructure 2. Stream buffer enhancements	Awards range between $200,000 and $500,000
82	NFWF	Sustain Our Great Lakes Community Grant Program	State and local units of government, tribal governments, nonprofit organizations, educational institutions	1. Wetland restoration, enhancement, and protection projects 2. Tributary restoration, enhancement, and protection projects 3. Shoreline restoration, enhancement, and protection projects 4. Projects must be in the Great Lakes basin (current and historic)	Grant awards range from $25,000 to $1,500,000; No match is required, however, the ratio of matching funds offered is considered during review
83	Southeastern Wisconsin Watersheds Trust (Sweet Water)	Sweet Water Mini-Grant Program	Non-profit organizations and community groups Projects must be located in the Greater Milwaukee watersheds (in Racine County this includes the Root River watershed and the direct drainage area to Lake Michigan)	Supports local grassroots efforts that employ green infrastructure practices and other water quality-related activities	Annual grants of $1,000 to $5,000

Table continued on next page.

Table E.1 (Continued)

Reference Number	Administrator of Grant Program	Name of Funding Program	Eligibility	Types of Projects and Funding Eligibility Criteria	Assistance Provided
84	State Farm Companies Foundation	State Farm Good Neighbor Citizenship Company Grants	Government entities, educational institutions, 501(c)(3) nonprofit organizations, 501(c)(4) volunteer fire companies, 501(c)(6) chambers of commerce	1. Auto and road safety 2. Teen driver education 3. Home safety and fire prevention 4. Disaster preparedness and recovery	Grants of $5,000 or more

Note: Cost-share and local match requirements reported in this table can vary depending on specific details for individual projects.

[a] *The non-Federal share is 25 percent. In Wisconsin, the State Division of Emergency Management pays 12.5 percent and the local community pays 12.5 percent.*

[b] *Funding available on an annual basis.*

[c] *Municipalities must have a flood mitigation plan to be eligible for a project grant.*

[d] *The individual fire cost threshold for a State is the greater of $100,000 or 5 percent x $1.07 x State population. The cumulative fire cost threshold for a State is the greater of $500,000 or three times the 5 percent x $1.07 x State population. Both formulas are adjusted annually for inflation using the Consumer Price Index for All Urban Consumers published annually by the Department of Labor.*

[e] *In kind services are allowed as a part of the local cost-share assistance.*

Source: FEMA, Department of Homeland Security, U.S. Environmental Protection Agency, Wisconsin Department of Natural Resources, U.S. Department of Justice, Wisconsin Emergency Management, the State of Wisconsin and SEWRPC

RACINE COUNTY BOARD OF SUPERVISORS AND PARTICIPATING JURISDICTIONS ADOPTION RESOLUTIONS

APPENDIX F

RESOLUTION NO. 2024-3 **May 14, 2024**

RESOLUTION BY THE RACINE COUNTY ECONOMIC DEVELOPMENT AND LAND USE PLANNING COMMITTEE RECOMMENDING ADOPTION OF THE RACINE COUNTY HAZARD MITIGATION PLAN UPDATE: 2023-2028

To the Honorable Members of the Racine County Board of Supervisors:

WHEREAS, in December 2000, the Southeastern Wisconsin Regional Planning Commission (SEWRPC) and the Racine County Office of Emergency Management and Department of Planning and Development agreed to cooperatively prepare an all-hazards mitigation plan for Racine County;

WHEREAS, the initial Racine County Hazard Mitigation Plan was adopted by the County and approved in 2004 and was subsequently adopted by the municipalities within the County;

WHEREAS, the mitigation planning requirements of 44 Code of Federal Regulations, Section 201.6(d) [44 CFR 201.6(d)] call for local hazard mitigation plans to be reviewed; updated to reflect changes in development, progress in local mitigation plan efforts, and changes in priorities; and re-approved every five years for local jurisdictions to be able to receive hazard mitigation funding;

WHEREAS, the Racine County Hazardous Mitigation Plan Update was guided by a planning team consisting of elected and appointed officials from the County and municipalities in the County; agency and business representatives; and citizens from throughout the County knowledgeable in hazard mitigation matters;

WHEREAS, the plan was designed to be consistent with the guidelines of the Wisconsin Department of Military Affairs, Division of Emergency Management, and the Federal Emergency Management Agency (FEMA); and with the requirements and procedures defined in the Disaster Mitigation Act of 2000;

WHEREAS, the County has duly noticed a public information meeting on the Hazard Mitigation Plan Update and a public information meeting was held on Wednesday, May 31, 2023.

NOW, THEREFORE, BE IT RESOLVED, that the Racine County Economic Development and Land Use Planning Committee hereby approves the hazard mitigation plan embodied in *SEWRPC Community Assistance Planning Report No. 266 (4th Edition), Racine County Hazard Mitigation Plan Update: 2023-2028.*

BE IT FURTHER RESOLVED by the Racine County Board of Supervisors that the Racine County Clerk is directed to transmit copies of this resolution to the Southeastern Wisconsin Regional Planning Commission (SEWRPC), to the Racine County Office of Emergency Management and the Racine County Public Works and

RESOLUTION NO. 2024-3
Page Two

Development Services Department and to all municipal clerks within seven (7) days after this resolution is adopted.

Respectfully submitted,

1st Reading 5/14/24

2nd Reading 5/28/24

BOARD ACTION
Adopted X
For 19
Against
Absent 2

VOTE REQUIRED: Majority

Prepared by:
Public Works & Development Services Department

ECONOMIC DEVELOPMENT & LAND USE PLANNING COMMITTEE

Jason Eckman, Chairman

Greg Hoffeth, Vice-Chairman

Taylor Wishau, Secretary

Tom Rutkowski

Tom Preusker

Tony Veranth

Gary Kolb

The foregoing legislation adopted by the County Board of Supervisors of Racine County, Wisconsin, is hereby:

Approved: X
Vetoed:

Date: 05-28-2024

Jonathan Delagrave, County Executive

INVITATION TO SURROUNDING COMMUNITIES FOR REVIEW AND COMMENT ON THE DRAFT RACINE COUNTY HAZARD MITIGATION PLAN UPDATE

APPENDIX G

From: Freeman, Alexander
Sent: Wednesday, May 10, 2023 3:06 PM
To: Chase Forster; Christopher Hannah; Christopher McGowan; Czarkowski, Natalie; Milwaukee County 2 - DMA; Gail Goodchild; Grant Deal; Taylor Williams; Ward, Michelle; Rowland, Jason
Cc: Ben Schliesman; Herrick, Laura K.; Dietl, Joel E.
Subject: Racine County Hazard Mitigation Plan Update

Good afternoon,

This general awareness information is being shared with Emergency Management in counties adjacent to Racine County. This is for awareness and optional feedback; no action is required.

Racine County's Hazard Mitigation Plan 4th Edition update draft chapters are complete and available for review and comment under the Racine County section of SEWRPC's website here. You will have to scroll down to get to the Racine County materials. Our next Local Planning Team meeting to review this information will be May 31st from 4:00 PM to 5:30 PM at the County's Ives Grove Auditorium at 14200 Washington Ave, Sturtevant, WI 53177. If you would like to join us at the meeting or if you would like to provide feedback directly, please contact me.

Thank you,

Alex Freeman, WCEM
Interim Emergency Management Director
Racine County
730 Wisconsin Avenue, Racine, WI 53403
Office: (262) 636-3484
Fax: (262) 636-3466
Mobile: (262) 676-8177

Racine County
WISCONSIN

VULNERABLE POPULATIONS IN RACINE COUNTY AS OF 2020

APPENDIX H

CDC/ATSDR Social Vulnerability Index 2020

RACINE COUNTY, WISCONSIN

Overall Social Vulnerability[1]

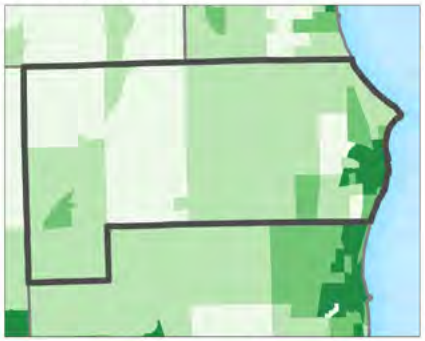
Social vulnerability refers to a community's capacity to prepare for and respond to the stress of hazardous events ranging from natural disasters, such as tornadoes or disease outbreaks, to human-caused threats, such as toxic chemical spills. The **CDC/ATSDR Social Vulnerability Index (CDC/ATSDR SVI 2020)[4] County Map** depicts the social vulnerability of communities, at census tract level, within a specified county. CDC/ATSDR SVI 2020 groups **sixteen census-derived factors** into **four themes** that summarize the extent to which the area is socially vulnerable to disaster. The factors include economic data as well as data regarding education, family characteristics, housing, language ability, ethnicity, and vehicle access. Overall Social Vulnerability combines all the variables to provide a comprehensive assessment.

ATSDR Agency for Toxic Substances and Disease Registry

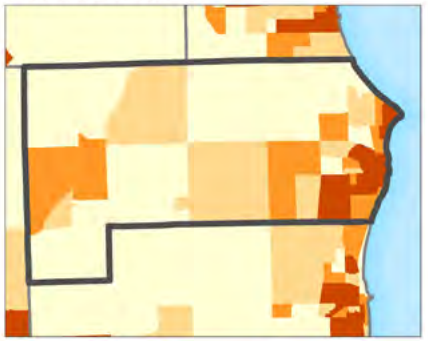
GRASP Geospatial Research, Analysis, and Services Program

CDC/ATSDR SVI Themes

Socioeconomic Status[5]

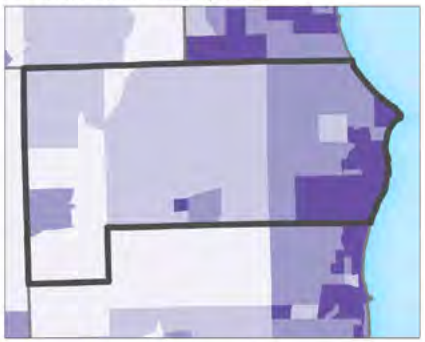


Household Characteris:ics[6]

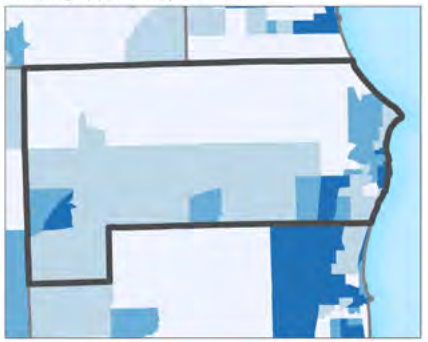


Highest (Top 4th) Vulnerability (SVI 2020)[2] Lowest (Bottom 4th)

Racial and Ethnic Minority Status[7]



Housing Type/Transportation[8]



Highest (Top 4th) Vulnerability (SVI 2020)[2] Lowest (Bottom 4th)

Data Sources: [1]CDC/ATSDR/GRASP, U.S. Census Bureau, Esri® StreetMapTM Premium.
Notes: [1]Overall Social Vulnerability: All 16 variables. [2]Census tracts with 0 population. [4]The CDC/ATSDR SVI combines percentile rankings of US Census American Community Survey (ACS) 2016-2020 variables, for the state, at the census tract level. [5]Socioeconomic Status: Below 150% Poverty, Unemployed, Housing Costs Burden, No High School Diploma, No Health Insurance. [6]Household Characteristics: Aged 65 and Older, Aged 17 and Younger, Civilian with a Disability, Single-Parent Household, English Language Proficiency. [7]Race/Ethnicity: Hispanic or Latino (of any race); Black and African American, Not Hispanic or Latino; American Indian and Alaska Native, Not Hispanic or Latino; Asian, Not Hispanic or Latino; Native Hawaiian and Other Pacific Islander, Not Hispanic or Latino; Two or More Races, Not Hispanic or Latino; Other Races, Not Hispanic or Latino. [8]Housing Type/Transportation: Multi-Unit Structures, Mobile Homes, Crowding, No Vehicle, Group Quarters.
Projection: NAD 1983 Wisconsin TM US Ft.
References: Flanagan, B.E., et al., A Social Vulnerability Index for Disaster Management. *Journal of Homeland Security and Emergency Management*, 2011. 8(1).
CDC/ATSDR SVI web page: https://www.atsdr.cdc.gov/placeandhealth/svi/index.html.

SOUTHEASTERN WISCONSIN
REGIONAL PLANNING COMMISSION STAFF

Stephanie Hacker, AICP, LEED AP ..... Executive Director
Benjamin McKay, AICP ..... Deputy Director
Christopher Hiebert, PE ..... MPO Director
Elizabeth Larsen, SPHR, SHRM-SCP ..... Director of Administration
Joel Dietl, AICP ..... Chief Land Use Planner
Laura Herrick, PE, CFM ..... Chief Environmental Engineer
Ryan Hoel, PE ..... Chief Transportation Engineer
Eric Lynde ..... Chief Special Projects Planner
Rob Merry, PLS ..... Chief Surveyor
Nakeisha Payne ..... Public Involvement and Outreach Manager
Thomas Slawski, PhD ..... Chief Biologist

Special Acknowledgements is due to Katelyn Miner, Former Planner; Aaron Owens, Senior Planner; Megan Deau, Senior Graphic Designer; Timothy Gorsegner, GIS Specialist; Miranda Page, Planner; Bryan Walter, Planner; for their contributions in the preparation of this report.