Flood Mitigation in Western Racine County’s Lake Country

A Case Study of Planning for Natural Hazards Resilience in the Fox River Basin Communities of Southeastern Wisconsin

by

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RACINE COUNTY, ITS COMMUNITIES AND NATURAL ENVIRONMENT

LOCATION
Racine County is approximately 400 square miles of territory located in southeastern Wisconsin in the Great Lakes region of the United States. The county’s boundaries begin on its eastern edge, with fifteen miles of Lake Michigan coastline, and then extend westward for twenty-five miles before terminating on its western edge. Racine County is bordered on its south by Kenosha County, on its west by Walworth County, and on its north by both Waukesha County and Milwaukee County. All territory in Racine County is classified as part of the Racine metropolitan statistical area, comprised of approximately 195,000 people. Racine County is also categorized as part of the larger eight-county Milwaukee – Racine – Waukesha combined statistical area, composed of roughly two million people.

Figure 1: Racine County Political Boundaries
Source – Google Maps

POPULATION DENSITY
Racine County's 195,000 inhabitants are spatially distributed in an irregular fashion throughout its cities, villages, and towns. Nearly 89,000 people, roughly 45% of county residents, live in its only two urban centers, with 79,000 living in the city of Racine along the Lake Michigan coastline and 10,000 living in the city of Burlington along the Fox River in the county's southwestern corner. Another 74,000 people, or 35% of county residents, live in the county’s nine suburban villages, in Mount Pleasant, Caledonia, or Sturtevant near Racine or in Waterford, Rochester, or Union Grove near Burlington. The rest of Racine County’s 32,000 people, or 20% of county residents, live in towns or other unincorporated areas, in rural or exurban fringe communities like Wind Lake, Tichigan, Browns Lake, Kansasville, or Raymond.
Climate
Racine County has a humid continental climate with four distinct seasons, punctuated by hot and humid summers and bitterly cold winters. July is the hottest month of the year, with average highs near 80°F and average lows near 60°F, and January is the coldest month, averaging highs near 30°F and lows near 10°F. Precipitation is heaviest in the summer months, peaking in August around four inches of rainfall on average, then declines during the winter, with 1.65 inches of rainfall on average in February representing Racine County’s driest month. The county’s heaviest month for snowfall is typically January, with average snowfall nearing 14 inches for the month.

Water Resources
Racine County is known for its myriad landscape of wetlands, rivers, streams, and lakes, especially in the western half of the county. The importance of water goes far beyond its necessity for consumption or irrigation for county residents; it also is an important component of local culture and recreation. Boating, fishing, canoeing, and swimming aptly describe the lifestyles of many Racine County residents. Owning shoreline property implies status and privilege here, as it does in many other places, primarily due to the unrestrained recreational access to surface water resources that ownership implies for those affluent enough to afford it. There are approximately 5,200 acres of surface water features in Racine County. Over 100 miles of rivers and streams cross Racine County’s territory, with the Fox River in the west and Root River in the east predominant. Racine County also contains ten major lakes greater than fifty acres in size, all of which are located in the county’s western
half, with Wind Lake, Tichigan Lake, Eagle Lake, Browns Lake, and Bohners Lake the largest among them. Wetlands such as swamps, bogs, and meadows make up 7% of Racine County. Floodplains, or territory subject to submergence during a 100-year flood event, make up an additional 12% of the county.

![Figure 3: Racine County Surface Waters, Wetland, and Floodplains Map](source)

**LAND USE PATTERNS**

Before 1950, most county inhabitants lived in urban areas, largely in the city of Racine and to a much lesser extent in the city of Burlington. For a century before then, and unless one planned on living as a farmer on the urban fringe, nearly all newcomers to Racine County resided in high density urban places. Since 1950, Racine County has seen a reversal in that trend. Most growth has instead occurred in the suburbs and on the exurban fringe, especially in the western part of the county. Villages and towns along the Fox River, like Waterford, Rochester, and Wind Lake, and those not quite so distant from Racine, like Union Grove, doubled their size during the fifty years from 1950 – 2000. Growth in these communities fueled a population boom in neighboring Burlington, which also doubled its size during this time. Growth along the Fox River brought large numbers of people to the river’s watershed and the beautiful chain of lakes for the first time. Nearly all of this growth was channeled into suburban-style, single-family residential neighborhoods clustered near lakes and streams and then expanded into nearby farmlands and wetland areas, oftentimes settling in homes built on floodplains or near areas subject to frequent flooding events. Land use policies in the Fox River watershed promoted development in high-price areas near water because of high consumer demand for natural aesthetic beauty, but these policies also happened to increase the number of households vulnerable to damaging flood events.
FLOODING IN RACINE COUNTY

Racine County residents are particularly at risk for severe floods, especially for those living in communities located in floodplains, in large drainage basins, or near rivers and streams. Racine County is more vulnerable to damaging floods than to any other natural hazard. Thirty-eight major flooding events have occurred there since 1990. Of the nine federally-declared disasters experienced by the county from 1993 – 2009, seven involved major flooding. The other two, predictably, involved snowstorms. Flood events have destroyed homes and infrastructure. Over $7 million in property damage was caused by flooding during that time. Floods have also destroyed nearly $35 million in crops over the last six decades. Approximately 10% of Racine County land is located within an 100-year flood hazard area. A 1996 flood damaged crops in excess of $17 million and the 2008 flood created property damage in excess of $2 million. Subdivision encroachment in floodplains and flood-prone areas has reached such an extent in Racine County over the last six decades that there are now 793 structures, 77% of which are private homes, in these areas. In the event that all of these structures would fall victim to severe flooding from a single 100-year flood event simultaneously, property damage estimates are projected to exceed $21 million.
THE FOX RIVER BASIN AND WESTERN RACINE COUNTY

LOCATION
While Lake Michigan remains the principle water feature for most in eastern Racine County, the Fox River is the most important waterway in the western part of the county. Flowing from its source just north of the city of Waukesha in Wisconsin and emptying into the Illinois River at its outfall near the city of Ottawa in Illinois, the Fox River is 200 miles long in its entirety, with 80 miles in southeastern Wisconsin. The Fox enters Racine County near its northwestern corner, in the town of Tichigan, where it sustains the Tichigan Wildlife Area and forms the 279-acre, 63 foot deep Tichigan Lake, where Largemouth Bass and Northern Pike are abundant. The river continues south, past several small islands, until it reaches the Village of Waterford where it narrows considerably, before meandering through the Village of Rochester and the Cherry Lake Sedge Meadow State Natural Area. The Fox flows further south, entering the City of Burlington at Riverside Park, before finally turning southeast and entering Kenosha County.

LAKE COUNTRY
The Fox River basin contains 500,000 people living in 10 cities, 22 villages, and 42 towns. The basin holds nearly 700 miles of streams that drain approximately 1,000 square miles of land. It is home to more than 78 lakes and 78,000 acres of wetlands. The basin contains three watersheds in southeastern Wisconsin. Western Racine County is home to the Middle Fox River Watershed, which stretches north into Waukesha County and south into Kenosha County. This watershed is primarily rural, with farmlands (41%), grassland (18%), wetlands (14%), and forests (13%) accounting for the vast majority of land. Human settlement and the built environment accounts for only 4% of land use here. The Fox River has three major drainage areas in western Racine County, the 26.2 square mile Tichigan Lake drainage area, the 28.6 square mile Wind Lake drainage area, and the 12.4 square mile Long Lake drainage area. These drainage zones sustain the regions many major lakes, including Wind Lake, Waubeesee Lake, and Long Lake in the town of Norway, Tichigan Lake in the town of Tichigan, and Browns Lake and Echo Lake in the city of Burlington. Over 3,600 acres of lakes, or 70% of the county's total surface waters, are located here.
FLOODING IN LAKE COUNTRY

The Fox River drainage basin is also riddled with floodplains and wetlands, concentrated heavily near these lakes, leaving many communities at risk of chronic flooding problems. The city of Burlington has 735 acres of floodplains and an additional 329 acres of wetlands, accounting for approximately 20% of total municipal land area. The nearby town of Burlington counts 5,131 acres of land in floodplains and an additional 3,214 acres of wetlands in its land survey, exceeding 37% of total land inventory. The villages of Waterford and Rochester, and the nearby town of Waterford, collectively hold floodplains in excess of 3,300 acres and another 3,000 acres, or approximately 60% of all land area. And the town of Norway, all alone in the Wind Lake drainage area, counts 7,672 acres of floodplains and 2,283 acres of wetlands in its survey, representing 44% of its territory. The area has witnessed major flood disasters in 1938, 1960, and 1973 and significant flooding events in 1993, 1998, 2000, 2004, 2007, and 2008.

Figure 7: Racine County Flood Hazard Areas Map
Source – Racine County Hazard Mitigation Plan Update (2010-2015)
Southeastern Wisconsin Regional Planning Commission
Racine County Department of Planning and Development
Racine County Office of Emergency Management
FLOOD HAZARD MITIGATION IN RACINE COUNTY’S LAKE COUNTRY

RACINE COUNTY HAZARD MITIGATION PLAN
The Southeastern Wisconsin Regional Planning Commission, the Racine County Department of Planning and Development, and the Racine County Office of Emergency Management, in cooperation with the Federal Emergency Management Agency, collaborated to produce the Racine County Hazard Mitigation Plan. Updated in 2009, the plan embodies Racine County’s flood hazard mitigation strategies moving forward. Estimated to cost $8.6 million to implement, the plan calls for a four-pronged strategy to combat flooding in the region.

WETLANDS AND OPEN SPACE PRESERVATION
The county’s plan focuses on increasing public investment in mitigation infrastructure and flood sensitive land preservation actions that will result in better floodland management practices. The plan calls for the preservation of wetlands and natural areas through public acquisition and zoning that will prohibit further development encroachment and protect open space that acts as natural reservoirs for flood waters. Future projects include the acquisition of 370 perennially flooding farmlands in the town of Waterford for a projected $1.2 million.

Figure 8: Racine County Open Space Plan (2020) Map; Source – Racine County Hazard Mitigation Plan (2010-2015)
Infrastructure Upgrades

Mitigation infrastructure upgrades are the most substantial and costly recommendations offered. The construction of 12,500 feet of earth dikes, 2,100 linear feet of concrete floodwalls, and 22 automatic drainage gates in the city of Burlington at a cost of $2.3 million is already underway. The project was temporarily delayed in 2009, pending a review of Burlington's future development and land use strategies by Racine County officials. Planned improvements to the Hoosier Creek drainage district, at a cost of $1.6 million, include 49,000 feet of channel improvement, 20,600 feet of earth dikes, 66 surface water inlets, and the revegetation of 112 acres. Already completed projects include the construction of two 20-feet by 4-feet remote sensing gates at the Waterford Dam and to 16-feet by 4-feet radial gates further upstream at the Rochester Dam, a combined $760,000 undertaking that promises to save these communities hundreds of millions of dollars in potential flood damage costs over the next several decades. Plans also call for the construction of 211,000 lineal feet of earth dikes and the installation of 40 new pumping stations along the Wind Lake Drainage Canal in the town of Norway, a $980,000 project intended to prevent massive agricultural flood losses in the future. Major dredging projects are also on the horizon for Waterford and the Wind Lake Drainage Canal. The Muskego Canal in the town of Norway was dredged and cleared of debris prior to 2009. Even with nearly $8 million in flood mitigation investment slated for western Racine County, officials warn that over 436 structures will still remain at risk of serious flood damage and will require additional resources beyond this sum for flood proofing or even property evacuation if necessary.

Figure 9: Racine County Flood Mitigation Measures for Fox River Watershed Map
Source – Racine County Hazard Mitigation Plan Update (2010-2015)
Southeastern Wisconsin Regional Planning Commission
Racine County Department of Planning and Development
Racine County Office of Emergency Management
Flood Insurance, Emergency Preparedness, and Community Buy-In

Racine County’s Hazard Mitigation Plan also places a great deal of emphasis on educating and communicating with the public concerning flood hazard issues and building stakeholder support for large projects and investments. The plan warns that disaster preparedness, improving training and response capabilities, holding emergency drills in the home and workplace, and keeping a database of volunteer contact information are critical for community resilience to flood hazards. Burlington, Waterford, Rochester, and the towns of Norway, Burlington, and Waterford all qualify for participation in the National Flood Insurance Program. The plan calls for crafting ways to encourage all property owners in lake country to carry flood insurance. And in an effort to better assess costs associated with the 436 structures still at risk in the area, an intense survey is recommended. Several of these structures are located within the 100-year floodplain of Wind Lake, in the town of Norway. Several properties there, especially on the lake’s south shore, would become completely submerged or cut-off during an event of that magnitude, making access by emergency vehicles impossible. Homes along the south shore of neighboring Waubeesee Lake, also in the town of Norway, are also at-risk of submergence. Racine County maintains an Emergency Action Plan with the town of Norway for this reason, providing the community with a flood warning system, emergency contacts for county agencies, emergency shelter locations, evacuation routes, and emergency services should the need arise. Finally, better stormwater management should be encouraged by bringing together the village of Waterford, the town of Waterford, and the town of Norway together to create one stormwater utility.

Figure 10: Wind Lake Emergency Action Plan Map
Source – Racine County Hazard Mitigation Plan Update (2010-2015)
Southeastern Wisconsin Regional Planning Commission
Racine County Department of Planning and Development
Racine County Office of Emergency Management
CONCLUSION

By preserving and protecting natural wetlands and open space, investing heavily in flood mitigation infrastructure, encouraging official partnerships and cooperative municipal agreements, leveraging participation in risk-sharing measures like the National Flood Insurance Program, and fostering community dialogue about regional flood hazards, the Racine County Hazard Mitigation Plan offers a way forward for communities that suffer from chronic flooding or remain at-risk of inundation from a 100-year flood event. The communities of western Racine County’s lake country have suffered a long history of hazardous flooding events, inflicting millions of dollars of property and crop damage over the years. And for every major flood event disastrous in magnitude, there are several close calls with flood waters that inflict relatively minor damage and disrupt the lives of households in neighborhood pockets as a result of heavy precipitation and storm events. It could very easily take more than a decade to implement all of the hazard mitigation plan’s recommendations for flood mitigation. With projected costs expected to exceed original estimates, it certainly represents a substantial investment in community resilience. When finished, Racine County’s Hazard Mitigation Plan for Fox River lake country will create a more sustainable future for the people of western Racine County.

ALL STATISTICS AND MAPS OBTAINED FROM:

UNITED STATES CENSUS BUREAU

RACINE COUNTY COMPREHENSIVE PLAN 2035 –
RACINE COUNTY DEPARTMENT OF PLANNING AND DEVELOPMENT
SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION (SEWRPC)

RACINE COUNTY HAZARD MITIGATION PLAN UPDATE (2010 – 2015) –
SOUTHEASTERN WISCONSIN REGIONAL PLANNING COMMISSION (SEWRPC)
RACINE COUNTY DEPARTMENT OF PLANNING AND DEVELOPMENT
RACINE COUNTY OFFICE OF EMERGENCY MANAGEMENT