3.0 Watershed Resource Inventory

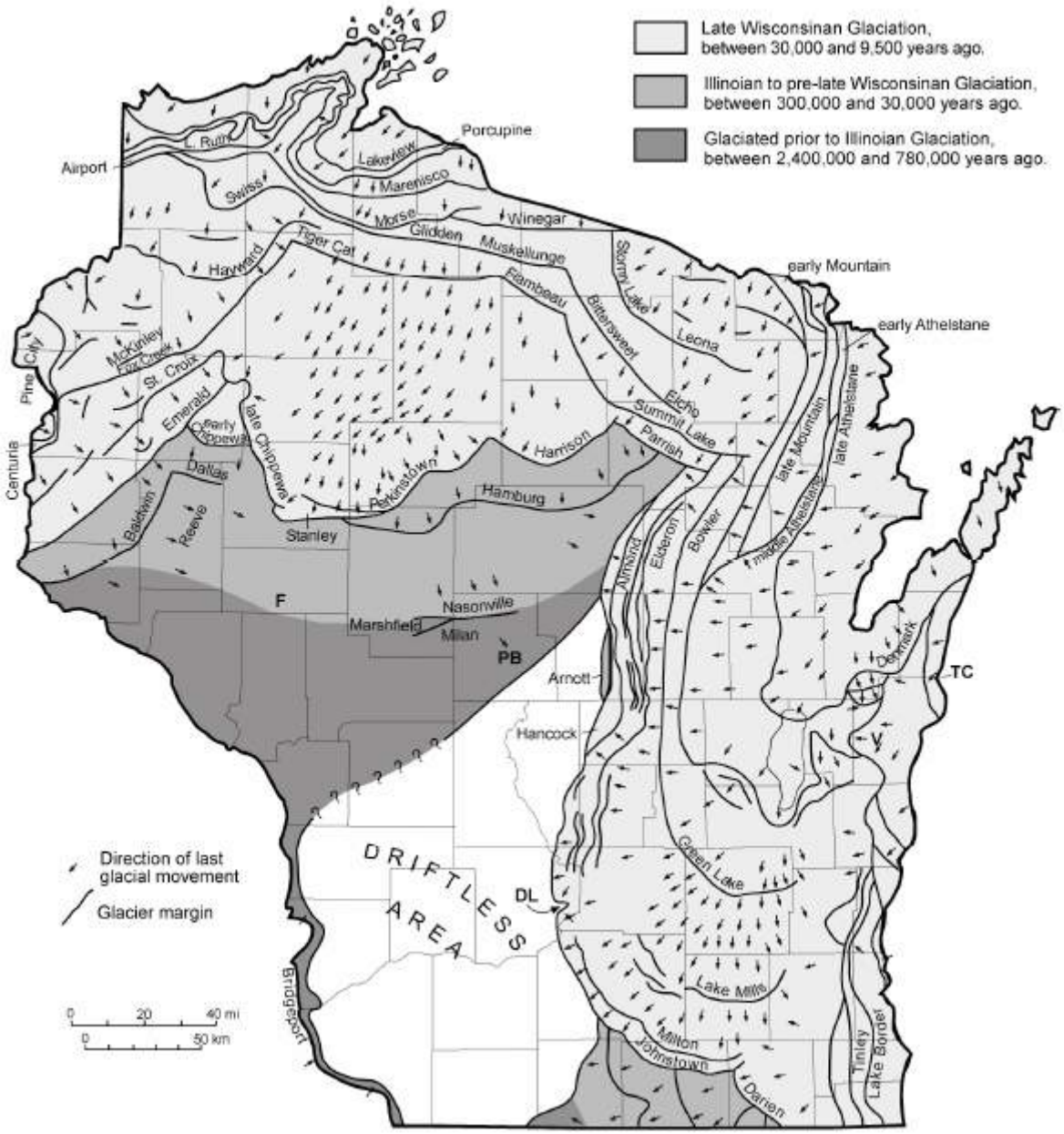
3.1 Geologic History & Climate

Geologic History

The terrain of the Midwestern United States was created over thousands of years as glaciers advanced and retreated during the Pleistocene Era or "Ice Age". Some of these glaciers were a mile or more thick. The area of southeastern Wisconsin where Wind Point watershed now lies was covered by the most recent glacial event known as the Late Wisconsin Glaciation that began approximately 30,000 years ago and ended around 9,500 years ago (Figure 3). During this period the earth's temperature warmed and the ice slowly retreated leaving behind moraines and glacial ridges where it stood for long periods of time (Hansel 2005). As the glaciers from this period receded, they scoured out what have become the Great Lakes and left behind a nearby terminal moraine known as the Kettle Moraine. Massive amounts of meltwater also carved out many of the ravines found along the coastline.

The composition of the soil in Wind Point watershed is also a remnant of the ancient ice movement. Above the bedrock lies a layer of deposits

Figure 3. Phases of glaciations in Wisconsin. Source: Syverson & Colgan.



left behind from the glaciers, consisting of clay, silt, sand, and limestone cobble.

A somewhat tundra-like environment covered by spruce forest was the first ecological community to colonize after the glaciers retreated. As temperatures continued to rise, cool moist deciduous forests dominated by maple, basswood, and beech trees developed along Lake Michigan coastal areas and oak-hickory forests, oak savannas, marshes, and prairies developed more inland. Black ash, relict cedar, and tamarack swamps were also part of the landscape. The ravines in the area also harbored a unique ecosystem because they naturally provide relief from surrounding temperature extremes, creating a safe place for species unable to exist elsewhere along the coastline.

Climate

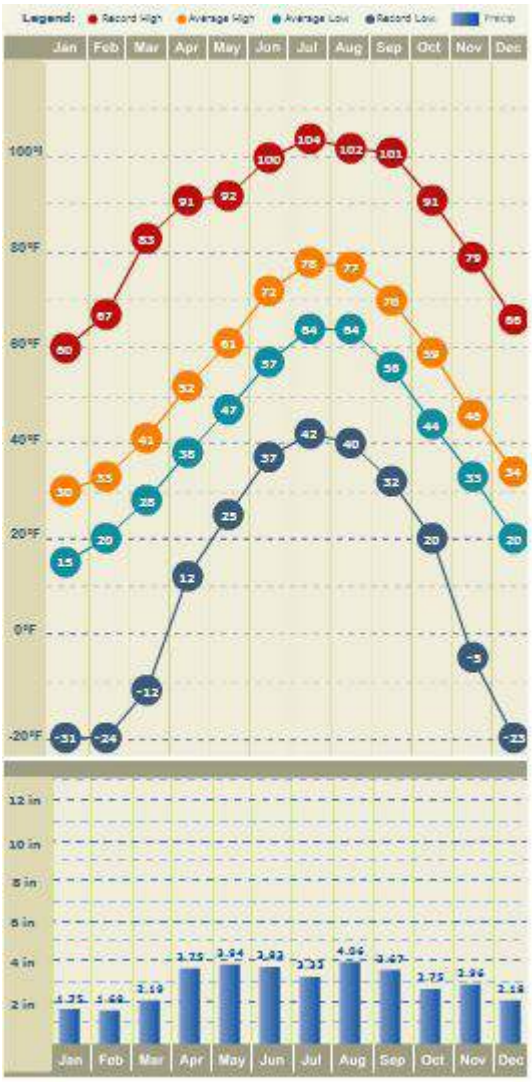
The southeast Wisconsin climate can be described as temperate with cold winters and warm summers where great variation in temperature, precipitation, and wind can occur on a daily basis. Surges of polar air moving southward or tropical air moving northward causes daily and seasonal temperature fluctuations. The action between these two air masses fosters the development of low-pressure centers that generally move eastward and frequently pass over the study area, resulting in abundant rainfall. Prevailing winds are generally from the west, but are more persistent and blow from a northerly direction during winter. Lake Michigan significantly influences the study area as it reduces the heat of summer and buffers (warms) the cold of winter by several degrees on average.

The Weather Channel website (www.weather.com) provides an excellent summary of climate statistics including monthly averages and records for most locations in Southeast Wisconsin. Data for Racine was selected to represent the climate and weather patterns experienced in Wind Point watershed (Figure 4). The winter months are cold averaging highs around 32° F while winter lows are around 18° F. Summers are warm with average highs around 74° F and summer lows around 61° F. The highest recorded temperature was 104° F in July 1995 while the lowest temperature was -31° F in January 1982.

Fairly typical for the Midwest, the current climate of Wind Point watershed consists of an average rainfall around 36 inches and snowfall around 38 inches. According to data collected in Racine, the most precipitation on average occurs in August (4.06 inches) while January receives the least amount of precipitation with 1.7 inches on average.

According to Wisconsin Initiative on Climate Change Impacts (WICCI) Wisconsin's climate is changing. On average, Wisconsin has become warmer and wetter over the past 60 years. Future projections for Wisconsin created by University of Wisconsin-Madison suggest Wisconsin's warming trend will continue and increase considerably. By the middle of the century, statewide annual average temperatures are likely to warm by 6-7 ° F.

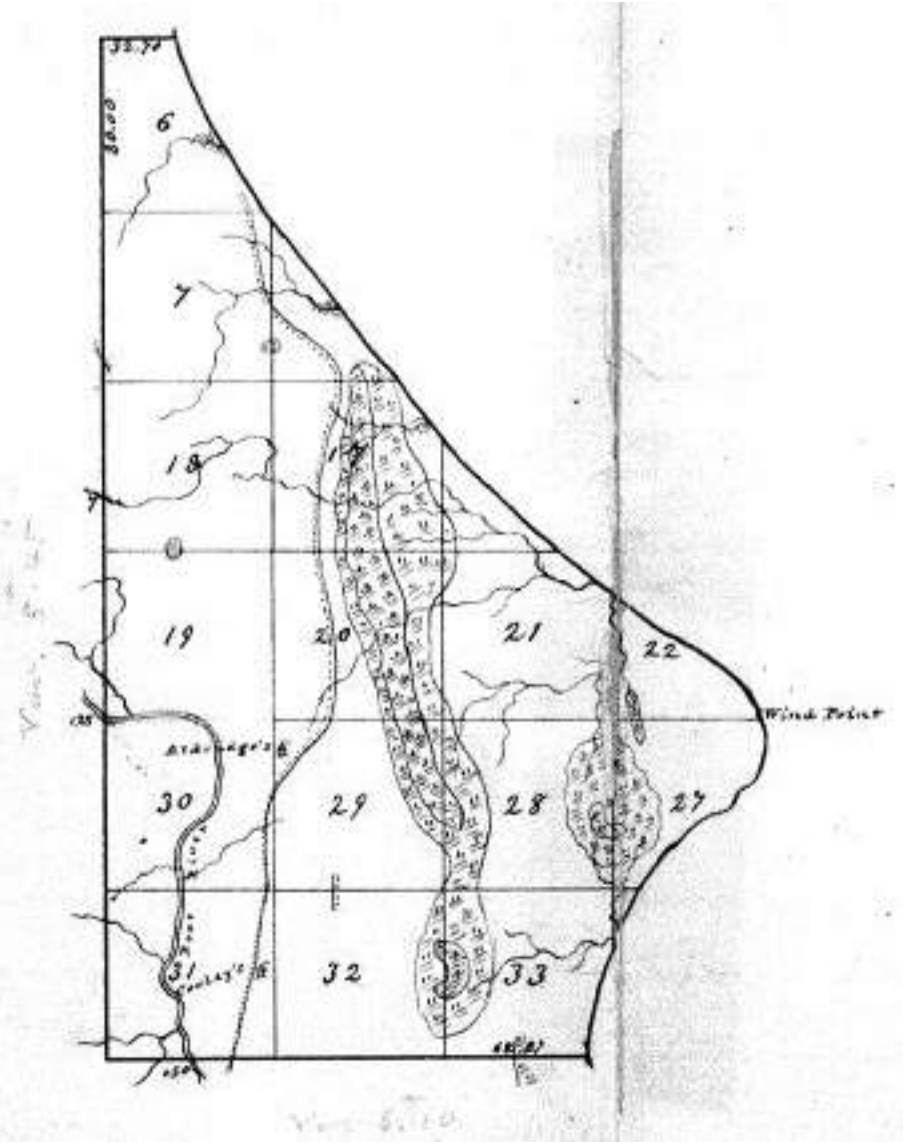
Figure 4. Monthly averages, highs, and lows for temperature and precipitation in Racine. Source: the Weather Channel.



3.2 Pre-European Settlement Landscape Compared to Present Landscape

The last Native American Indian tribe to call the area home was the Potawatomie. These people lived in harmony with the environment until a treaty in 1833 resulted in their removal from the land by the U.S. Government. This treaty paved the way for European settlement in the area that began with surveys of the land. The original public land surveyors that worked for the office of U.S. Surveyor General in the early and mid 1800s mapped and described natural and man-made features and vegetation communities while creating the township, range, and section ("Rectangular Survey System") for mapping and sale of western public lands of the United States (Daly & Lutes et. al., 2011). Ecologists know by interpreting survey notes and hand drawn Federal Township Plats of Wisconsin (1833-1866) and from documents written by the earliest settlers in the area that a complex interaction existed between several ecological communities including beach/dune, forests, and wetland prior to European settlement in the 1830s (Figures 5 & 6).

Figure 5. Sketch map from survey of Wind Point



The surveyors described about 85% of Wind Point watershed as being forested with a variety of tree species. Forested areas were comprised of two primary sub-communities as described by Curtis (1959). Southern mesic forest dominated by maple, basswood, and beech trees was likely the most common in the watershed. Southern dry-mesic forest, dominated by a variety of oak and hickory species, was also common. Southern lowland forest (10% of watershed) was common on the relatively flat plateau west of Wind Point. These wet areas contained black ash and alder. The beach and dune communities along Lake Michigan make up the third most common ecological community in the watershed. Historically, these areas were sculpted by waves and shifting sand. It is also important to note that most of Wind Point watershed was protected from wildfires that were common to the west.

European settlement beginning in the 1830s resulted in drastic changes to the fragile ecological communities as most of the old growth forests were cleared by settlers who used the wood for fuel, to build their homes, sold it to sawmills, and farmed the cleared land. The large wetland areas west of Wind Point were also cleared and drained for farmland. The majority of streams were channelized and ditched to further drain water off the land. The earliest aerial photographs taken in 1937 (Figure 7) depict Wind Point watershed when row crop farming was the primary land use but before much of the residential, commercial, and industrial development seen today. By 1937, very few forested areas that once dominated the watershed remain.

Figure 8 shows a 2010 aerial photograph of Wind Point watershed. It is clear that residential, commercial, and industrial development have replaced much of the farmland, particularly in the southern half of the watershed. Newer residential development is common between 3 Mile Road and 6 Mile Road within the municipalities of Racine, Wind Point, and Caledonia. Industrial land uses are common along the Union Pacific Railroad and along Lake Michigan from 7 Mile Road north to South Milwaukee. There is also a large

quarry operation north of 3 Mile Road and an airport south of 3 Mile Road. Only small isolated natural areas remain but many are owned by local conservation groups.

With degraded ecological conditions comes the opportunity to implement ecological restoration to improve the condition of Wind Point watershed. Present day knowledge of how pre-European settlement ecological communities formed and evolved provides a general template for developing present day natural area restoration and management plans and projects. One of the primary goals of this watershed plan is to identify, protect, restore, and manage remaining natural areas.

History of Wind Point Lighthouse

Wind Point Lighthouse was constructed in 1880 by the U.S. Lighthouse Service which later merged with the Coast Guard. It is a 108 foot tall-building built of brick with a stone foundation. The lighthouse is one of tallest and oldest in active service on the Great Lakes. In 1999 a "Friends" group formed to preserve the lighthouse and in 2006, the Fog Horn House was converted to a maritime museum.

The original beacon was powered by a 3 wicked mineral oil lamp that was converted to electric in 1923. The beacon was fully automated when the last resident keeper left in 1964 and the Village of Wind Point began to maintain the property. The grounds also harbor the keepers quarters, several fog signal buildings, and the oil house.

In 1984, Wind Point Lighthouse was recognized as a National Historic Landmark and the National Park Service officially awarded ownership to the Village of Wind Point in 1997. The Village uses the keepers quarters as a village hall, police headquarters, and caretakers residence. In addition, the lighthouse still acts as an aid in navigation by the Coast Guard.

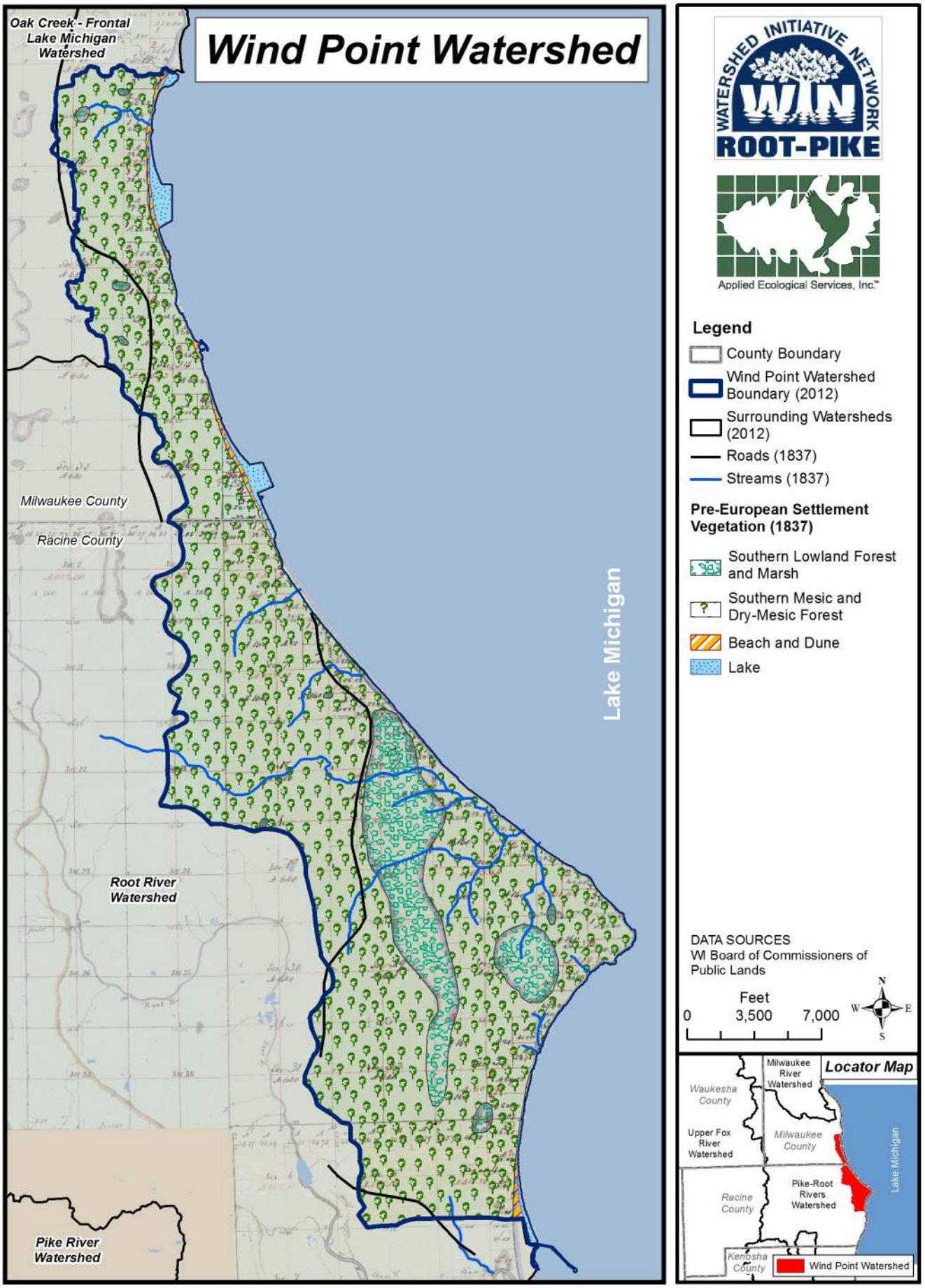


Fig. 6: Pre-European Settlement Vegetation

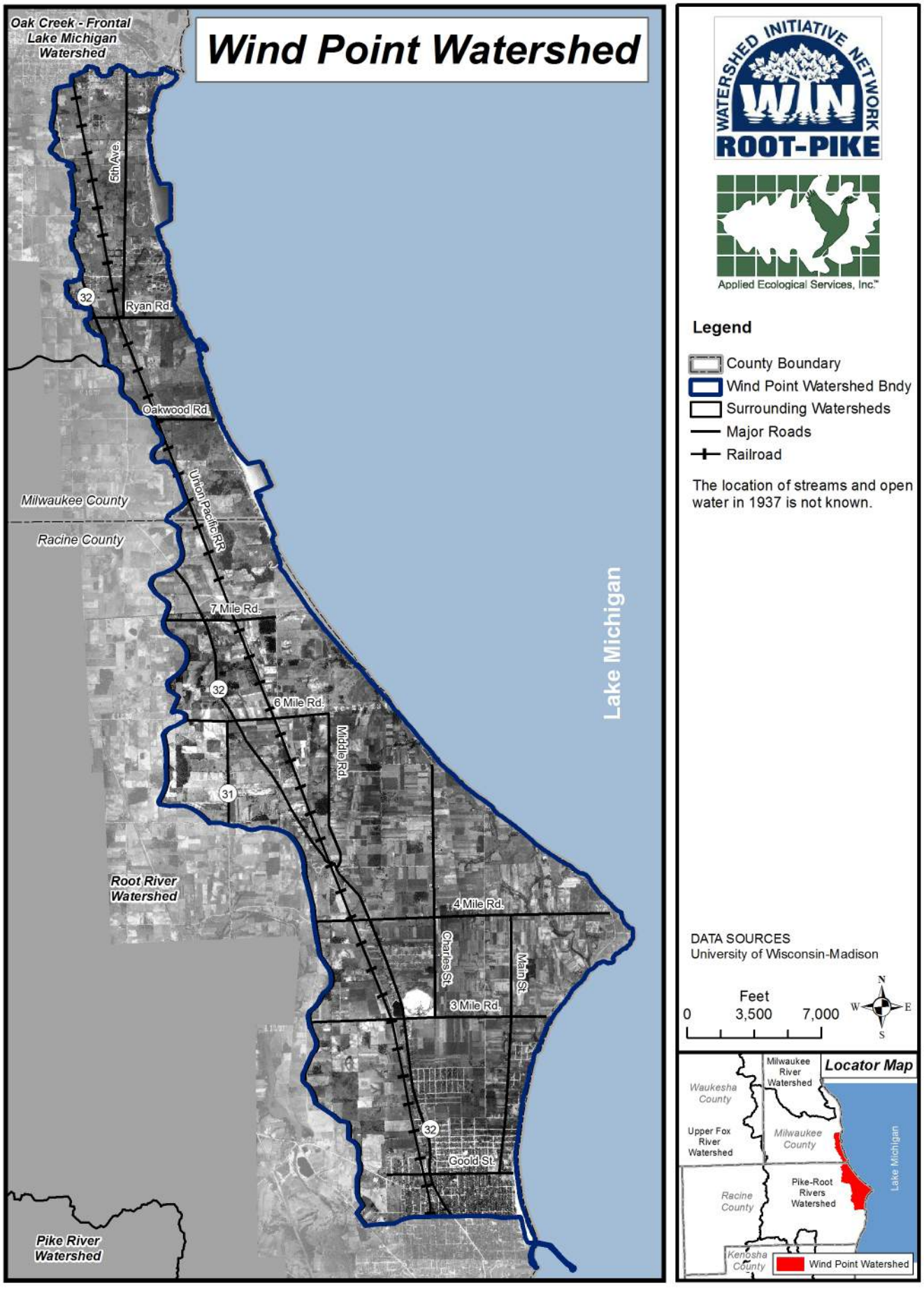


Fig. 7: 1937 Aerial Image

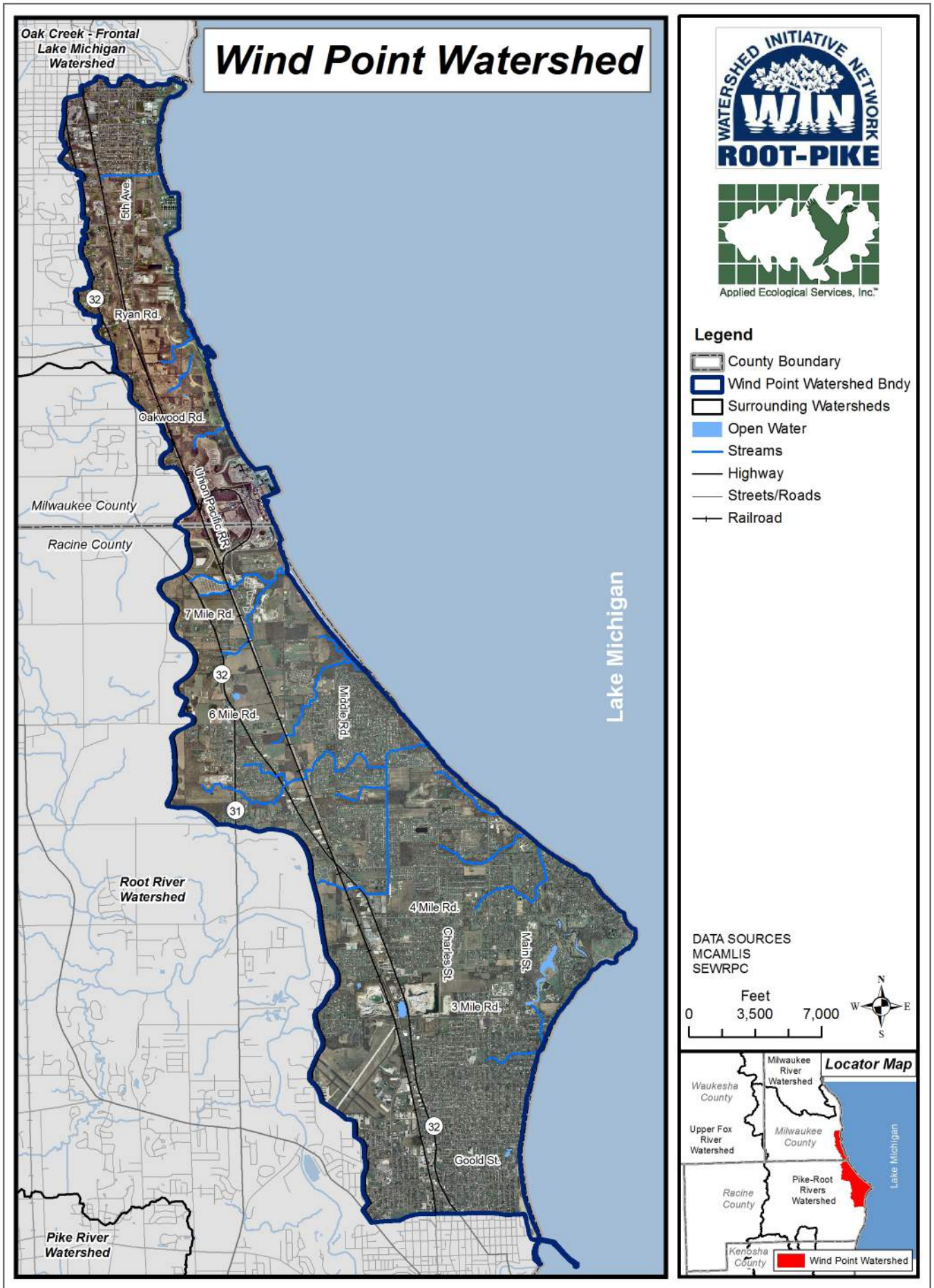


Fig. 8: 2010 Aerial Image

3.3 Topography, Watershed Boundary, & Subwatershed Management Units

Topography & Watershed Boundary

The Wisconsin glacier that retreated about 10,000 years ago formed much of the topography and defined the Wind Point watershed boundary observed today. Topography refers to elevations of a landscape that describe the configuration of its surface and ultimately defines watershed boundaries. And, the specifics of watershed planning can not begin until a watershed boundary is clearly defined.

The Wind Point watershed boundary used in this study is a combination of boundaries provided by both Wisconsin Department of Natural Resources (WDNR) and Southeast Wisconsin Regional Planning Commission (SEWRPC). Small discrepancies noted during field inventories were also used to alter the boundary where appropriate. The refined watershed boundary and available 2-foot elevation data from Milwaukee and Racine Counties was then input into a GIS model (Arc Hydro) that generated a Digital Elevation Model (DEM) of the watershed (Figure 9).

Wind Point watershed is 11,996 acres or 18.7 square miles in size. The entire watershed drains from west to east and eventually to Lake Michigan. Elevation within the watershed ranges from a high of 751 feet above mean sea level (AMSL) to a low of 577 feet AMSL along the Lake Michigan coast for a total relief of 174 feet (Figure 9). The highest point is found just south of 6 Mile Road on a ridge that extends north to the Lake Michigan coast where severe bluff erosion can be found generally between 7 Mile Road and Ryan Road.

An interesting feature is the large relatively flat plateau in the southeast portion of the watershed generally between 6 Mile Road and the southern watershed boundary and east of Route 32. According to the original public land survey conducted in the mid 1800s, this plateau harbored significant areas of wet southern lowland forest and marsh whereas higher elevations to the west harbored dryer southern mesic and dry-mesic forest. Most of the wetlands that once existed on the plateau have been drained. This area is now dense with residential development within the municipalities of Racine, North Bay, Wind Point, and Caledonia.

Wind Point watershed coast

Eroded bluff east of Oakwood Road

Subwatershed Management Units (SMUs)

The Center for Watershed Protection (CWP) is a leading watershed planning agency and has defined watershed and subwatershed sizes appropriate to meet watershed planning goals. In 1998, the CWP released the "Rapid Watershed Planning Handbook" (CWP 1998) as a guide to be used by watershed planners when addressing issues within urbanizing watersheds. The CWP defines a watershed as an area of land that drains anywhere from 10 to 100 square miles. Broad assessments of conditions such as soils, wetlands, and water quality are generally evaluated at the watershed level and provide some information about overall conditions. Wind Point watershed is about 19 square miles and therefore this plan allows for a detailed look at watershed characteristics, problem areas, and management opportunities. However, an even more detailed look at smaller drainage areas must be completed to find site specific problem areas or "Critical Areas" that require immediate attention.

A watershed can be divided into subwatersheds called Subwatershed Management Units (SMUs) to address issues at a smaller scale. Wind Point watershed was delineated into 24 SMUs using a combination of the Digital Elevation Model (DEM), stormsewer information, and personal contacts with local municipal engineers (Table 2; Figure 10). Most SMUs drain to Lake Michigan via a stream outlet or storm sewer outfall point. SMUs 3, 4, 5, 9, 16 and 24 have no known single outlet point. SMU 24 is not a single subwatershed but rather a compilation of several small areas that drain to Lake Michigan via overland flow. Information obtained at the SMU scale allows for detailed analysis and better recommendations for site specific "Management Measures" otherwise known as Best Management Practices (BMPs). Delineation into SMUs also allows for better identification of areas contributing to water quality problems as summarized in Section 4.0.

Table 2. Subwatershed Management Units and size.

SMU #	Total Acres	Total Square Miles
SMU 1	493.9	0.8
SMU 2	278.6	0.4
SMU 3	273.1	0.4
SMU 4	310.3	0.5
SMU 5	92.7	0.1
SMU 6	238.5	0.4
SMU 7	146.1	0.2
SMU 8	242.7	0.4
SMU 9	374.9	0.6
SMU 10	947.0	1.5
SMU 11	788.6	1.2
SMU 12	2,138.4	3.3
SMU 13	332.1	0.5
SMU 14	442.8	0.7
SMU 15	1,040.3	1.6
SMU 16	473.0	0.7
SMU 17	573.9	0.9
SMU18	382.2	0.6
SMU19	71.5	0.1
SMU 20	242.3	0.4
SMU 21	134.8	0.2
SMU 22	1,324.0	2.1
SMU 23	274.5	0.4
SMU 24	377.2	0.6
Totals	11,996	18.7

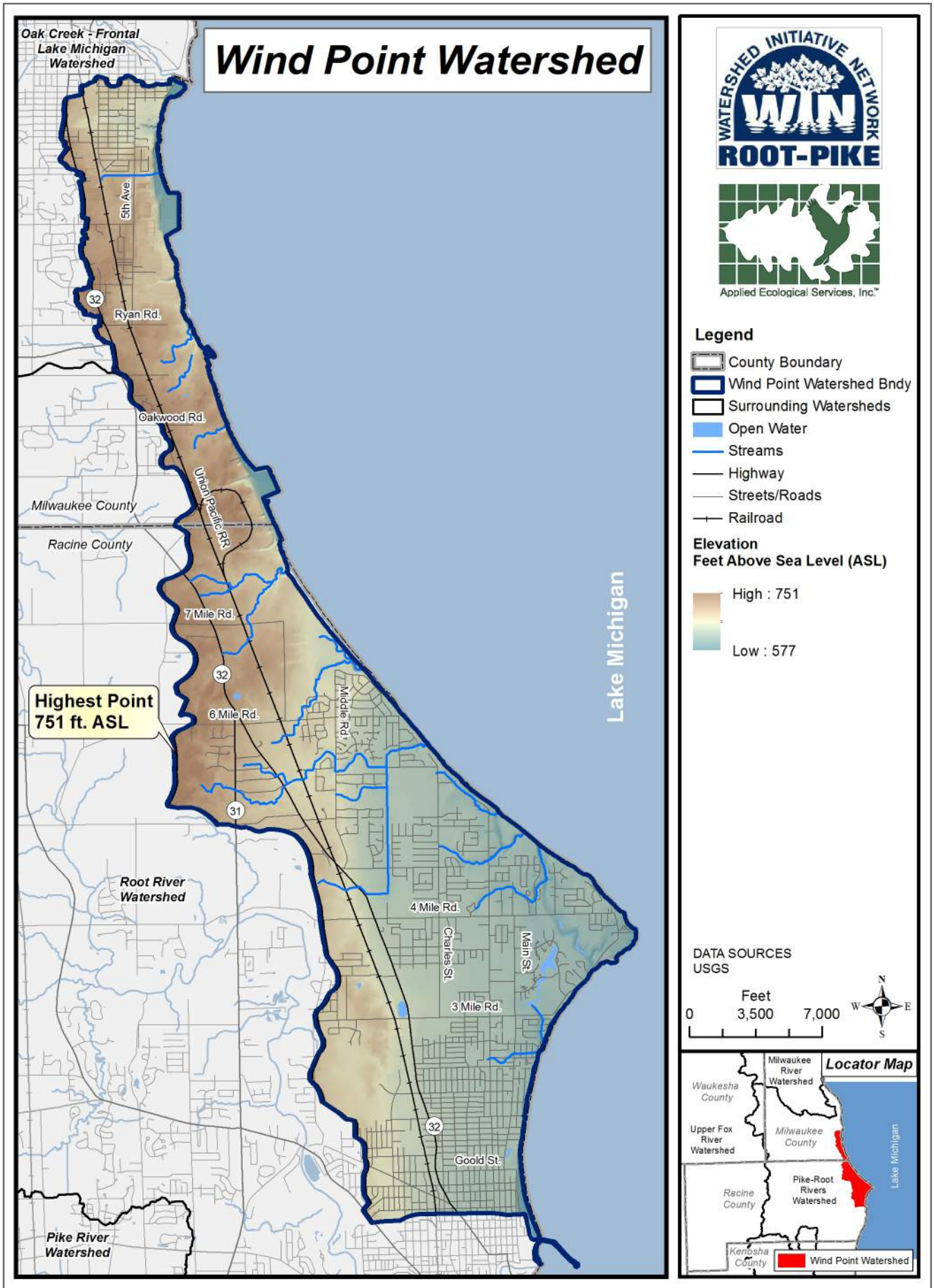


Fig. 9: Digital Elevation Model

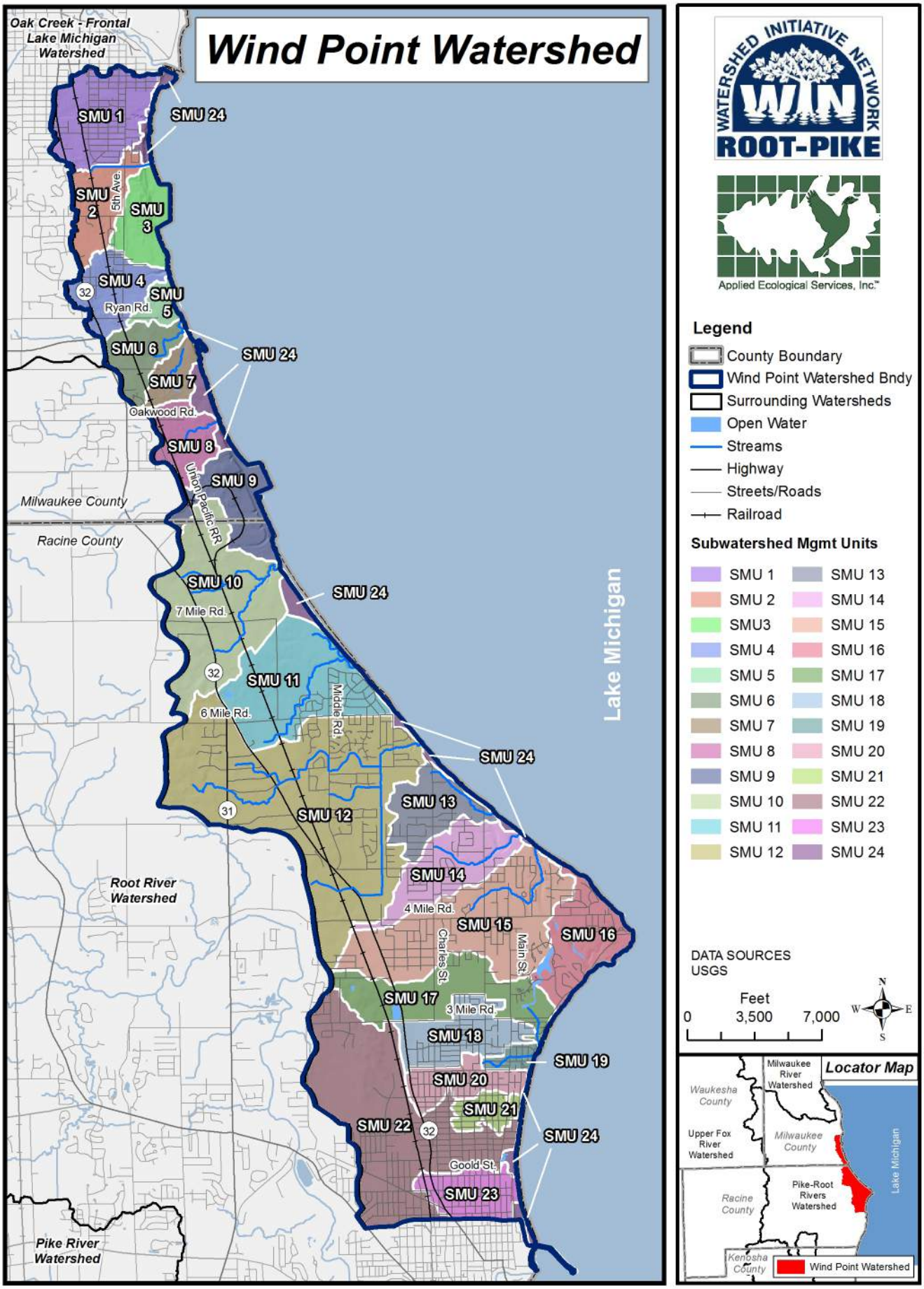


Fig. 10: Subwatershed Management Units (SMUs)

3.4 Hydric Soils, Soil Erodibility, & Hydrologic Soil Groups

Soils

Deposits left by the Wisconsin glaciation 10,000 years ago are the raw materials of present soil types in the watershed. These raw materials include till (debris) and outwash. A combination of physical, biological, and chemical variables such as topography, drainage patterns, climate, and vegetation, have interacted over centuries to form the complex variety of soils found in the watershed. Most soils formed under wetland, woodland, and prairie vegetation. The most up to date soils mapping provided by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) for Milwaukee and Racine Counties was used to summarize the extent of hydric soils, soil susceptibility to erosion, and infiltration capacity of soils in Wind Point watershed (Tables 3-6; Figures 11-13).

Hydric Soils

Wetland or "Hydric Soils" generally form over poorly drained clay material associated with wet prairies, marshes, and other wetlands and from accumulated organic matter from decomposing surface vegetation. Hydric soils are important because they indicate the presence of existing wetlands or drained wetlands where restoration may be possible. Most of the wetlands in Wind Point watershed were intact until the late 1830s when European settlers began to alter significant portions of the watershed's natural hydrology and wetland processes. Where it was feasible wet areas were cleared of vegetation and drained to farm the rich soils. The location of hydric, partially hydric, and upland soils in the watershed is summarized and depicted on Table 3 and Figure 11 respectively.

Hydric soils comprise 2,945 acres or 24.5% of the watershed. Most of these soils are located on the relatively flat plateau east of Route 32 and south of 6 Mile Road. Early vegetation mapping suggests this area was southern lowland forest and marsh. Most of this once large wetland complex is now gone. According to wetland inventories conducted by SEWRPC and WDNR in 2005, about 580 acres or 20% of the pre-European settlement wetlands remain.

3,474 acres or 29% of the watershed is comprised of partially hydric soils which exhibit some, but not all, of the characteristics of hydric soils. These soils are scattered throughout the watershed but again, they are concentrated on the flat plateau in the southeast portion of the watershed adjacent to hydric soils. These soils likely did not support true wetland communities.

Approximately 5,215 acres (43.5%) are not hydric and the remaining 331 acres (2.7%) have unknown classification because they have been disturbed by human land practices such as quarry mining occurring north of 3 Mile Road.

Table 3. Percent coverage of hydric soils and non-hydric soils within the watershed.

Soil	Total Area (acres)	Percentage of Watershed
Hydric Soil	2,945	24.5
Partially Hydric Soil	3,474	29.0
Non-Hydric Soil	5,215	43.5
Not Classified/Unknown	331	2.8
Totals	**11,996**	**100.0**

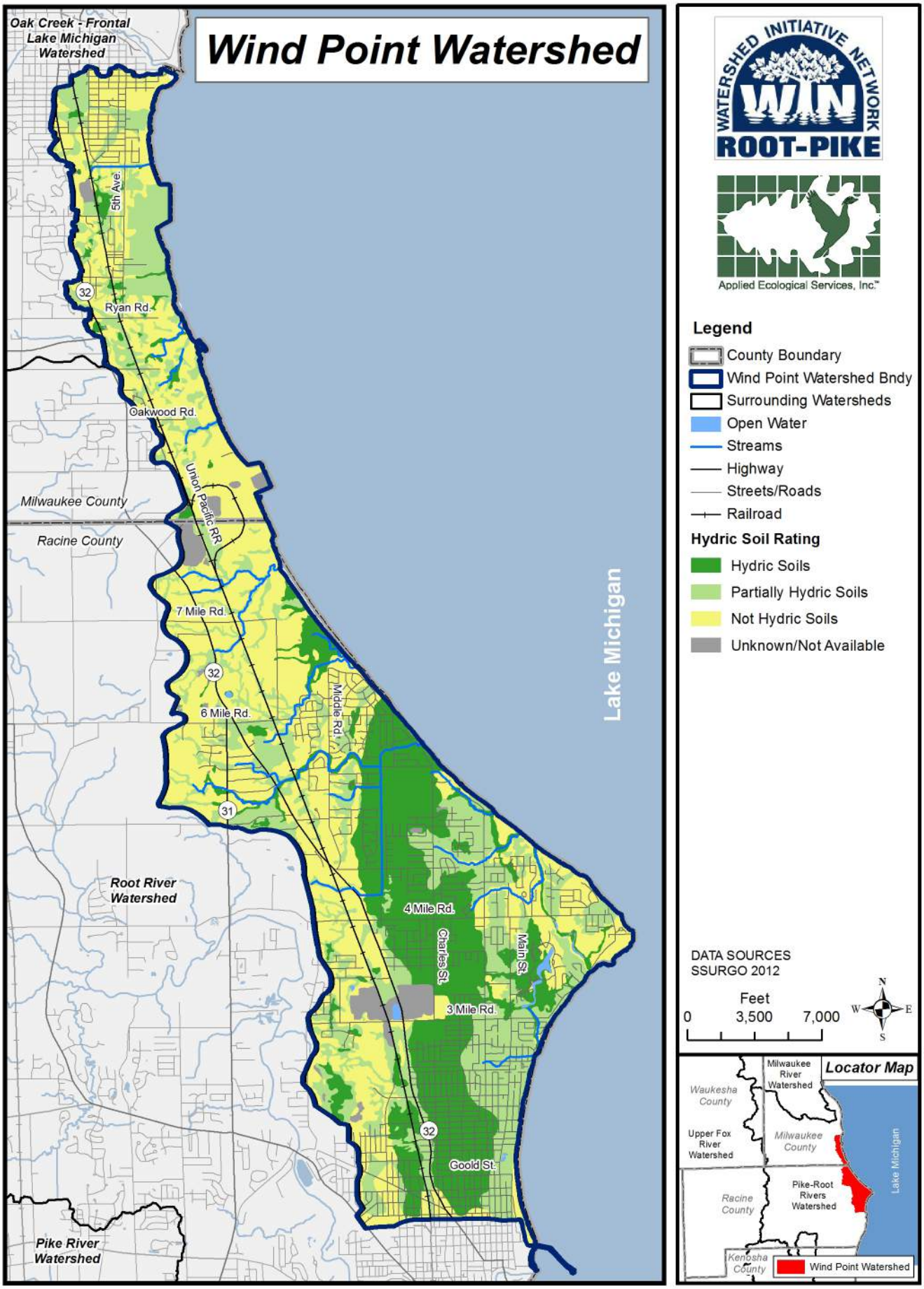


Fig. 11: Hydric Soils

Soil Erodibility

Soil erosion is the process whereby soil is removed from its original location by flowing water, wave action, wind, and other factors. Sedimentation is the process that deposits eroded soils on other ground surfaces or in bodies of water such as streams and lakes. Soil erosion and sedimentation reduces water quality by increasing total suspended solids (TSS) in the water column and by carrying attached pollutants such as phosphorus, nitrogen, and hydrocarbons. When soils settle in streams and lakes they often blanket rock, cobble, and sandy substrates needed by fish and aquatic macroinvertebrates for habitat, food, and reproduction.

A highly erodible soils map was created based on soil information provided by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) (Figure 12). Highly erodible soils have attributes that when located on slopes are susceptible to erosion. It is important to know the location of highly erodible soils because these areas have the highest potential to degrade water quality during farm tillage, development, or other factors such as what caused a bluff failure at WE Energies Oak Creek Power Plant in October, 2011. Based on mapping, 334 acres or about 3% of the soils in the watershed are "Highly Erodible", 4,838 acres or 40% of soils are "Potentially Erodible", and the remaining 6,794 (57%) acres are "Not Highly Erodible" (Table 4).

Fortunately, much of the highly erodible areas are currently stabilized by existing land uses/ cover. But others are located on bluffs or row crop farmland where erosion following annual tilling is a possibility. One option for farmers is to convert highly erodible areas to vegetative cover under the USDA NRCS's Conservation Reserve Program (CRP). Under this program farmers receive an annual rental payment for the term of the multi-year contract.

Table 4. Percent coverage of highly erodible, potentially erodible, and not highly erodible soils.

Soil Erodibility	Total Area (acres)	Percentage of Watershed
Highly Erodible	334	2.8
Potentially Erodible	4,838	40.3
Not Highly Erodible	6,794	56.6
Totals	**11,996**	**100.0**

October, 2011 bluff failure at We Energies Oak Creek Power Plant. Source: WDNR & We Energies

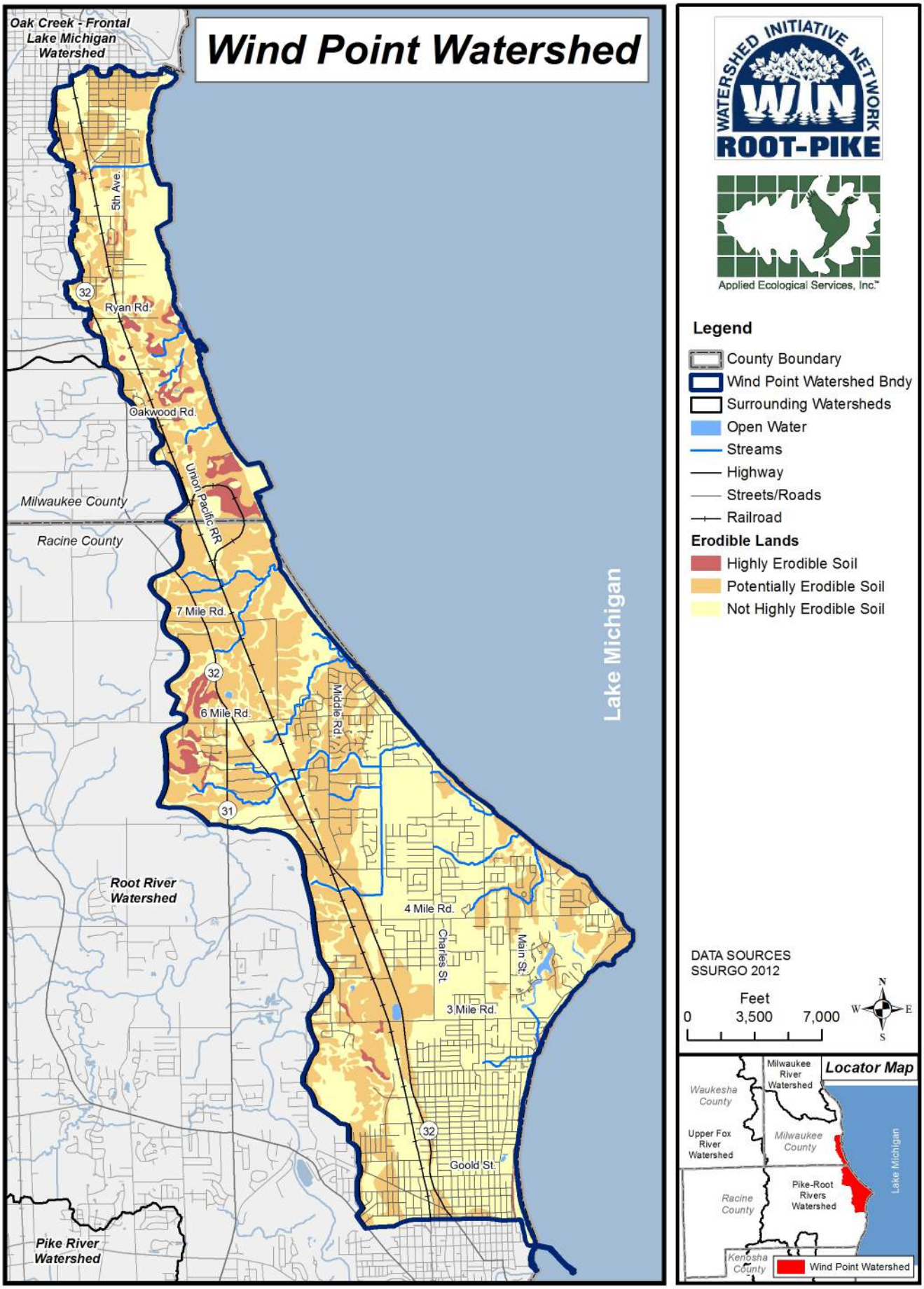


Fig. 12: Highly and Potentially Highly Erodible Soils

Hydrologic Soil Groups
Soils also exhibit different infiltration capabilities and have been classified to fit what are known as "Hydrologic Soil Groups" (HSGs). HSGs are based on a soil's infiltration and transmission (permeability) rates and are used by engineers and planners to estimate stormwater runoff potential. Knowing how a soil will hold water ultimately affects the type and location of recommended infiltration Management Measures such as wetland restorations and detention basins. More importantly however is the link between hydrologic soil groups and groundwater recharge areas. Groundwater recharge is discussed in detail in Section 3.14.

HSG's are classified into four primary categories; A, B, C, and D, and three dual classes, A/D, B/D, and C/D. Figure 13 depicts the location of each HSG in the watershed. The HSG categories and their corresponding soil texture, drainage description, runoff potential, infiltration rate, and transmission rate are shown in Table 5 while Table 6 summarizes the acreage and percent of each HSG. Group C soils are dominant throughout the watershed at about 52% coverage and are found in most upland areas. Group B and B/D soils together make up another 3,587 acres or 30% of the watershed. Group D soils comprise 584 acres or another 5% of the watershed. Group B/D and D soils generally line up with areas exhibiting hydric soils in the southeast portion of the watershed.

Table 5. Hydrologic Soil Groups and their corresponding attributes.

HSG	Soil Texture	Drainage Description	Runoff Potential	Infiltration Rate	Transmission Rate
A	Sand, Loamy Sand, or Sandy Loam	Well to Excessively Drained	Low	High	High
B	Silt Loam or Loam	Moderately Well to Well Drained	Moderate	Moderate	Moderate
C	Sandy Clay Loam	Somewhat Poorly Drained	High	Low	Low
D	Clay Loam, Silty Clay Loam, Sandy Clay Loam, Silty Clay, or Clay	Poorly Drained	High	Very Low	Very Low

Table 6. Hydrologic Soil Groups including acreage and percent of watershed.

Hydrologic Soil Group	Area (acres)	% of Watershed
A	33	0.3
A/D	447	3.7
B	1,672	13.9
B/D	1,915	16.0
C	6,984	58.2
D	584	4.9
Unknown	331	2.8
Totals	**11,996**	**100.0**

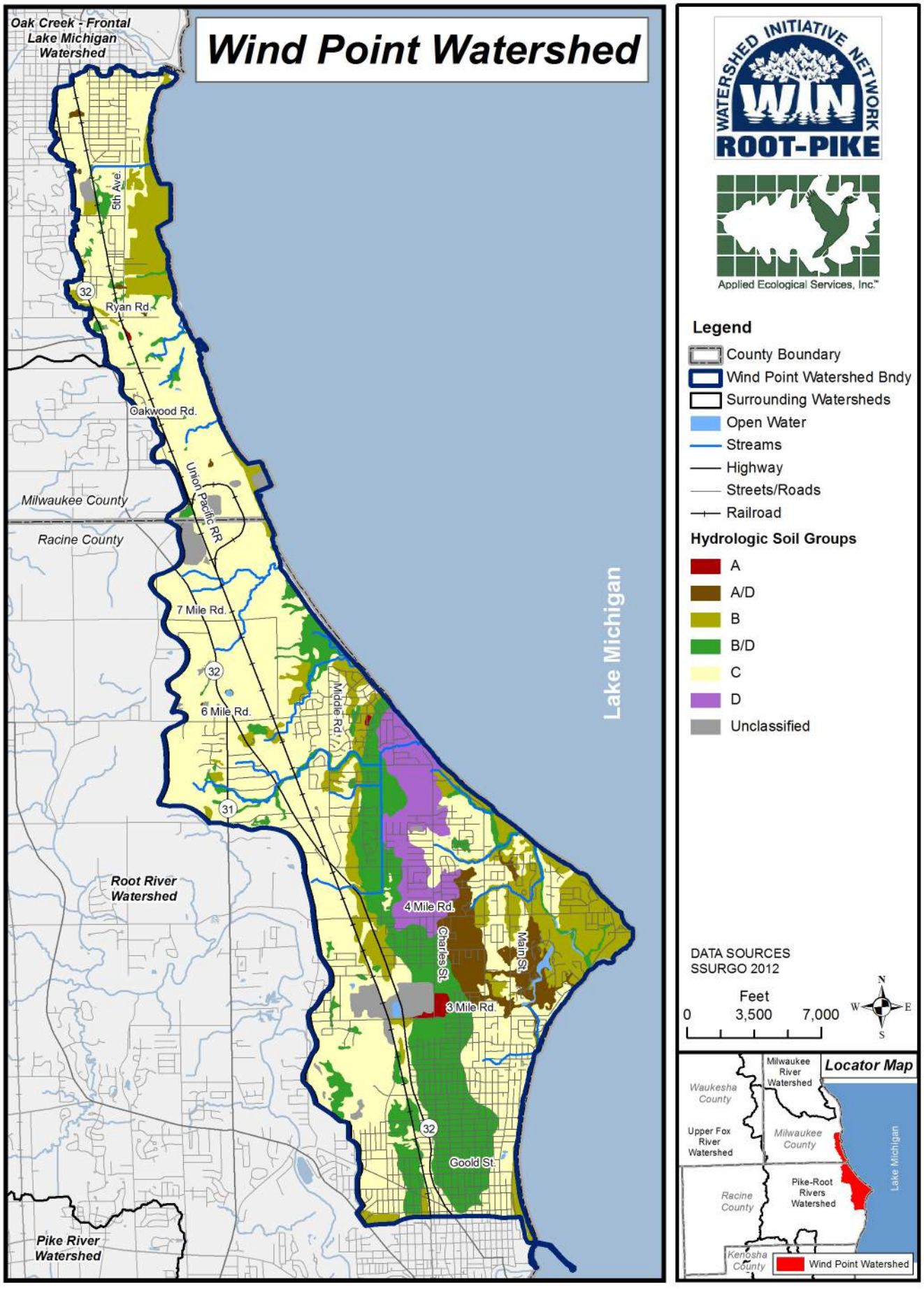


Fig. 13: Hydrologic Soil Groups

Table 7. County and municipal jurisdictions.

Jurisdiction	Area (acres)	% of Watershed
County	11,960	100
Milwaukee	2,534	21
Racine	9,427	79
Municipalities	11,960	100
Caledonia	6,234	52
North Bay	64	<1
Oak Creek	1,961	16
Racine	2,334	20
South Milwaukee	573	5
Wind Point	825	7

Source: Milwaukee County, Racine County, SEWRPC

Wind Point watershed is located in two counties and six municipalities (Table 7, Figure 14). The northern 1/3 of the watershed (2,534 acres; 21%) is located in Milwaukee County while the southern 2/3 (9,427 acres: 79%) is in Racine County. The entire watershed falls within the borders of a municipality. Of the six municipalities in the watershed, the Village of Caledonia is the largest (6,234 acres; 52%) followed by the City of Racine (2,334 acres; 20%) and City of Oak Creek (1,961; 16%). The Villages of North Bay and Wind Point and City of South Milwaukee account for the remaining 1,462 acres or 12% of the watershed. There are no large state or federally owned nature/forest preserves of parks in the watershed.

Jurisdictional Roles and Protections

Water quality and land protection throughout the United States are protected to some degree under federal, state, and/or local law.

Water Quality Protection

At the federal level, the Clean Water Act (CWA) is the strongest tool in protecting water resources. Within the state of Wisconsin, the authority to administer the provisions of the CWA has been delegated to the Wisconsin Department of Natural Resources (WDNR). Section 402 of the CWA establishes the National Pollution Discharge Elimination System (NPDES), while Section 319 Nonpoint Source Management Program was created in order to further support state and local nonpoint pollutant source efforts not addressed by NPDES permits. Section 319 permits states to receive grant money towards activities such as technical assistance, financial assistance, education, training, technology transfer, demonstration projects, and monitoring to assess the success of nonpoint pollutant source implementation projects. Section 303 of the CWA requires states to catalogue impaired waters, prioritize them, and calculate Total Maximum Daily Loads (TMDLs) of pollutants a waterbody can receive and still safely meet the water quality standards. Wisconsin has also utilized Section 208, or the Priority Watershed Program, to develop a nonpoint pollutant source program. WDNR identified watersheds and lakes in most need of nonpoint pollution abatement and encouraged the use of nonpoint source controls to improve water quality (Kent & Dudiak 2001).

The Safe Drinking Water Act also plays a role in protecting surface and groundwater resources. In Wisconsin, the Wellhead Protection Program includes both mandatory and voluntary initiatives aimed at protecting groundwater resources.

Additionally, Wisconsin is part of three interstate compact agreements that also have jurisdiction over Lake Michigan. The first is the Great Lakes Basin Compact which established the Great Lakes Commission and gave it the authority to research and make recommendations regarding water use and development in the Great Lakes. The Council of Great Lakes Governors established the Great Lake Protection Fund to finance projects used to protect and restore the Great Lakes. Finally, the Great Lakes Charter, signed by the Council of Great Lakes Governors, regulates water transfers out of the Great Lakes Drainage basin in excess of 100,000 gallons per day.

The Wisconsin Coastal Management Program, established under the Federal Coastal Zone Management Act, also serves to protect the Lake Michigan coast and manage this valuable resource.

Land Protection

The U.S. Fish and Wildlife Service (USFWS) and WDNR protect various dedicated natural areas and threatened and endangered species. Local conservation groups such as the Caledonia Conservancy and Root-Pike Watershed Initiative Network also serve in a similar capacity by working to protect and restore natural areas.

The U.S. Army Corps of Engineers (USACE), with approval of WDNR, regulates wetlands through Sections 401 and 404 of the Clean Water Act (CWA). Land development affecting water resources (rivers, streams, lakes, wetlands, and floodplains) is regulated by the USACE when "Waters of the U.S." are involved. These types of waters include any wetland or stream/river that

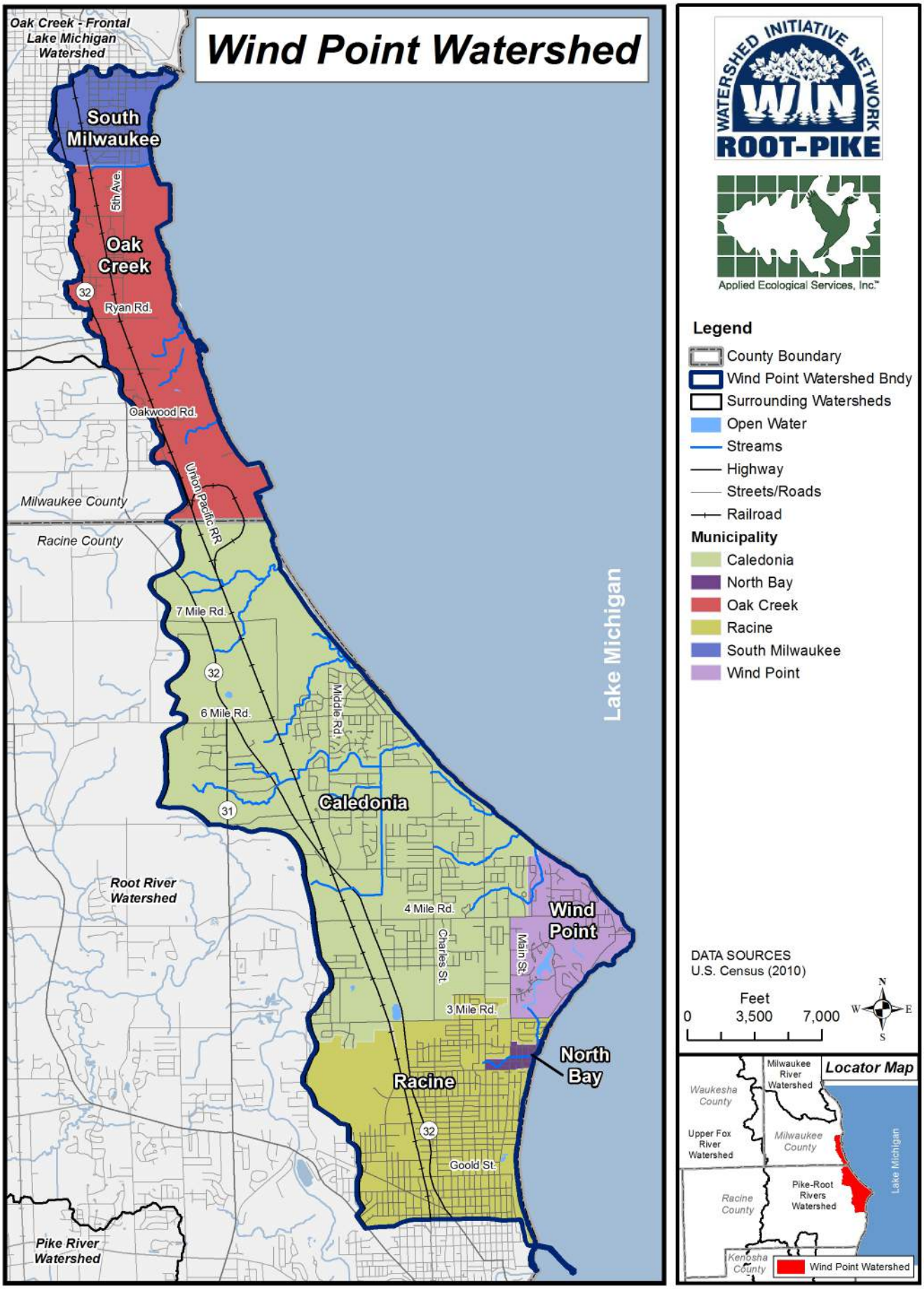


Fig. 14: Watershed Jurisdictions

is hydrologically connected to navigable waters. The USACE primarily regulates filling activities and requires buffers or wetland mitigation for developments that impact jurisdictional wetlands. Wind Point watershed falls within USACE's Detroit District of the Great Lakes & Ohio River Division.

Land development in the watershed is regulated by county and municipal ordinances. Racine County has a Subdivision Ordinance and Zoning Ordinance, but no dedicated regulating ordinances for either stormwater or erosion control. Milwaukee County does not have either dedicated Zoning or Subdivision regulations.

Beyond county-level regulations, each municipality has their own applicable regulations. Municipalities in the watershed may or may not provide additional watershed protection above and beyond existing local municipal codes. Most municipal codes provide ordinances covering businesses regulations, building regulations, zoning regulations, new subdivision regulations, stormwater management, streets, utilities, landscaping/restoration, tree removal, etc.

Municipal codes and ordinances include:

- *Village of Caledonia:* Land development is regulated under both subdivision and zoning codes. Dedicated ordinances include Subdivision Controls, Conservation Subdvisions, Construction Site Erosion Control, Floodplain Regulations, and Pollution Abatement.

- *Village of North Bay:* This small, fully developed community consisting of 97 homes has no additional applicable land development ordinances.

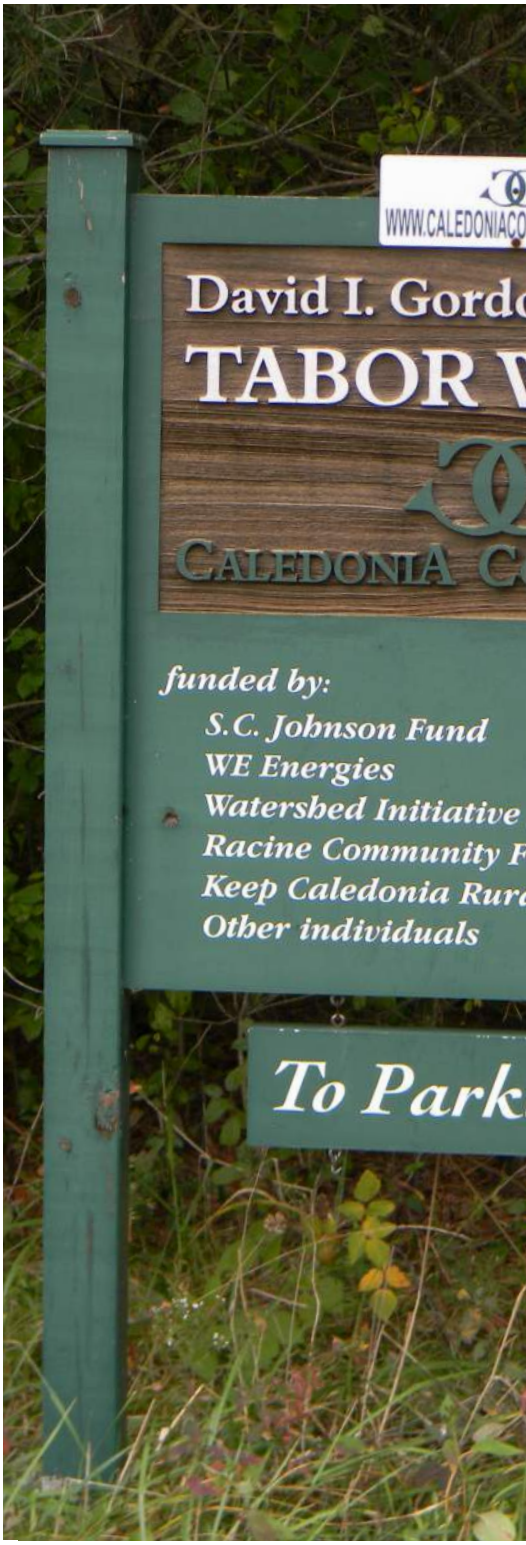
- *City of Oak Creek:* Land Use, Subdivision and Zoning Codes regulate the City of Oak Creek which include Erosion and Sediment Control, Stormwater Runoff, Shoreland Wetland Conservancy, Floodway regulations.

- *City of Racine:* Development is regulated under their Zoning Ordinance. Municipal codes present opportunities for outlining and requiring some of the recommendations in this plan such as conservation and/or low density development, Special Service Area (SSA) or watershed protection fees, and use of native trees and plants in landscapes.

- *City of South Milwaukee:* This community has dedicated Wetland, Stormwater Management, Illicit Discharge, Construction Site Erosion Control, and Flood Plain Regulations Ordinances within the city's Zoning Code.

- *Village of Wind Point:* this small community regulates its land development through Subdivision and Zoning Codes which include Environmental Preservation, Floodplain, and Shoreland/ Wetland Overlay Districts as well as Construction Site Pollutant Control, Post Construction Stormwater Management, and Floodplain Ordinances.

Other governments and private entities with watershed jurisdictional or technical advisory roles include the Federal Emergency Management Agency (FEMA), the USDA's Natural Resources Conservation Service (NRCS), and Southeastern Wisconsin Planning Commission (SEWPC). County Boards are also important because they oversee decisions made by respective county governments and therefore have the power to override or alter policies and regulations.



Caledonia Conservancy sign at Tabor Woods

NPDES Phase II Stormwater Permit Program

The Wisconsin Department of Natural Resources (WDNR) oversees the National Pollutant Discharge Elimination System (NPDES) program. The NPDES program was initiated under the federal Clean Water Act to reduce pollutants to the nation's waters. This program requires permits for discharge of: 1) treated municipal effluent; 2) treated industrial effluent; and 3) stormwater from municipal separate stormsewer systems (MS4's) and construction sites.

The NPDES Phase I Stormwater Program began in 1990 and applies only to large and medium-sized municipal separate stormsewer systems (MS4's), several industrial categories, and construction sites hydrologically disturbing 5 acres of land or more.

The NPDES Phase II program began in 2003 and differs from Phase I by including additional MS4 categories, additional industrial coverage, and construction sites hydrologically disturbing greater than 1 acre of land. Under NPDES Phase II, all municipalities with small, medium, and large MS4's are required to complete a series of Best Management Practices (BMPs) and measure goals for six minimum control measures:

1. Public education and outreach
2. Public participation and involvement
3. Illicit discharge detention and elimination
4. Construction site runoff control
5. Post-construction runoff control
6. Pollution prevention and good housekeeping

The Phase II Program also covers all construction sites over 1 acre in size. For these sites the developer or owner must comply with all requirements such as completing and submitting a Notice of Intent (NOI) before construction occurs, developing a Stormwater Pollution Prevention Plan (SWPPP) that shows how the site will be protected to control erosion and sedimentation, completing final stabilization of the site, and filing a Notice of Termination (NOT) after the construction site is stabilized.

All six municipalities in the Wind Point watershed are covered under a NPDES Phase II permit. The Village of North Bay has current permit for their lift stations only.

Planning, Policy and Regulation

Planning, policy, and regulation are the foundation of watershed protection, because the process sets the minimum standards for development that occurs or is proposed to occur in the vicinity of water resources. It is hoped that recommendations from this watershed plan would be referenced in future comprehensive plans and implemented in ordinances. In many cases, municipal codes also lay the foundation for the types of trees that can be removed from sites as well as what types of plant communities and species that can be replanted. County stormwater ordinances are the primary preventative measure that can be used to standardize for the respective county the requirements that proposed developments must meet. Monitoring and enforcement of implemented municipal codes and county regulations falls in the hands of local municipalities or County agencies. It is up to these enforcing bodies to communicate effectively and discuss often the problems with how ordinance language is interpreted and amendments that may help clarify certain regulations.

Planning/zoning guidance provides another level of watershed and natural resource protection. Most planning and zoning guidance is in the form of local floodplain or zoning ordinances that regulate onsite land use practices to ensure adequate floodplain, wetland, stream, lake, pond, conservancy soil, and other natural resource protection. Zoning ordinances and overlay districts in particular define what type of development is allowed and where it can be located relative to natural resources. For example, Village of North Bay's Code of Ordinances contains a section related to "Residential Conservation Overlay District Establishment." Other examples of planning/zoning forms of resource protection include riparian and wetland buffers, impervious area reduction, open space/greenway dedication, conservation easements and conservation and/or low density development.

To improve the impact of planning/zoning guidance on water resource protection, there needs to be improved coordination and communication between county and local government. Watershed development regulations should be made very clear to local enforcement officers; local planners and zoning boards should consider revisions to local ordinances that address watershed, subwatershed, and/or site-specific natural resource issues. For example, communities with less impervious development now should revise their zoning ordinances sooner rather than later in order to adequately prevent the types of development that contribute to flooding, degrade wildlife habitat, and reduce water quality.

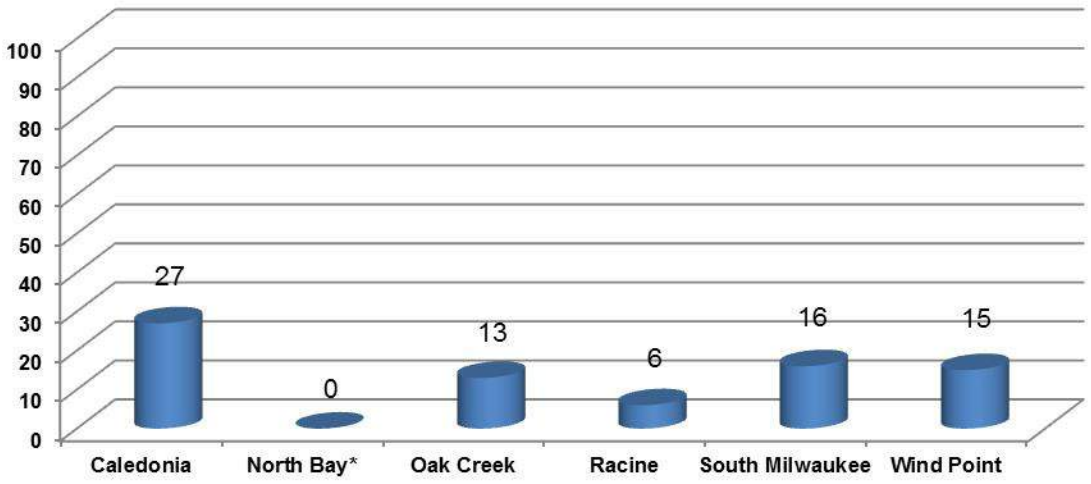
3.6 Existing Policies and Ordinance Review

Protection of natural resources and green infrastructure during future urban growth will be important for the future health of Wind Point watershed. To assess how future growth might further impact the watershed, an assessment of local municipal ordinances was performed to determine how development is regulated in each municipality. In this way, potential improvements to local ordinances can be identified. As part of the assessment, municipal governments were asked to compare their local ordinances against model policies outlined by the Center for Watershed Protection (CWP) in a publication entitled *"Better Site Design: A Handbook for Changing Development Rules in Your Community"* (CWP 1998).

Applied Ecological Services, Inc. (AES) began the assessment process by reviewing local municipal ordinances including those for Caledonia, Oak Creek, Racine, South Milwaukee and Wind Point. The results of the initial review were then sent to each municipality for review and update if needed. The municipality of Wind Point was the only entity to review and update the findings. The results of the review for each municipality can be found in Appendix B.

CWP's recommended ordinance review process involves assessments of three general categories including "Residential Streets & Parking Lots", "Lot Development" and "Conservation of Natural Areas". Various questions with point totals are examined under each category. The maximum score is 100. CWP also provides general rules based on scores. Scores between 60 and 80 suggest that it may be advisable to reform local development ordinances. Scores less than 60 generally mean that local ordinances are not environmentally friendly and serious reform may be needed. Municipal scores ranged from 6 to 27 with an average score of 15 (Figure 15). Caledonia scored the highest with 27 points followed by South Milwaukee with 16 points and Wind Point with 15 points. Although all scores are low, it should be noted that this assessment is meant to be a tool to local communities to help guide development of future ordinances. Various policy recommendations are included in the Action Plan section of the report to address general ordinance deficiencies.

Figure 15. Center for Watershed Protection ordinance review results for local municipalities.



3.7 Demographics

The Southeastern Wisconsin Regional Planning Commission (SEWRPC) provides a Multi-Jurisdictional Comprehensive Plan for both Milwaukee and Racine Counties that projects regional change out to 2035 and provides reliable growth forecasts. This was produced as part of the "Smart Growth Initiative" in 2009 which also let to development of comprehensive plans for the municipalities in the watershed. SEWRPC also predicts demographics data extending to 2050 but this data is only available at the County level so it is not particularly useful in this watershed plan. The County data is published in SEWRPC Technical Reports No. 10 and 11 (fifth edition), available on SEWRPC's website. SEWRPC will convert the data to quarter-section data in 2015.

SEWRPC's 2000 to 2035 forecasts of population, households, and employment were used to project how these attributes will impact Wind Point watershed. These forecasts were created under the guidance of SEWRPC's Advisory Committee on Regional Population and Economic Forecasts (SEWRPC 2004). The Committee utilized the cohort-component method to develop their population projections; used the projection of the population in households, the projection of average household size, and the application of the projected household size to the projected household population to achieve household projections; and used a disaggregate approach to the preparation of employment projects that took into account the explicit consideration of employment in selected industry groups and the preparation of projections for those groups.

Table 8 includes SEWRPC's population, households, and employment forecast changes between 2000 and 2035 for the Wind Point watershed area. The data is generated by Township, Range, and quarter Section and is depicted on Figures 16 & 17. Note: AES used GIS to overlay the Wind Point watershed boundary onto SEWRPC's quarter Section data. If any part of a quarter Section fell inside the watershed boundary, the statistics for the entire quarter Section were included in the analysis.

Table 8. SEWRPC 2000 data and 2035 forecast data.

Data Category	2000	2035	Change (2000-2035)	Percent Change
Population	51,163	60,402	9,239	18
Household	19,864	24,648	4,784	24
Employment	15,107	14,781	-326	-2

Source: Southeastern Wisconsin Regional Planning Commission 2035 Forecasts

The combined population of the watershed is expected to increase from 51,163 in 2000 to 60,402 by 2035, an 18% increase. The highest population increase is expected in the northern portion of the watershed within the City of Oak Creek. Much of this area is currently vacant and multiple residential developments are currently in progress. Moderate population growth is expected in the south-central portion of the watershed within the Village of Caledonia. Some of this growth is already occurring or is anticipated in areas that are currently farmed or vacant. Similarly, projected household change generally follows change in population. The combined number of households in the watershed is expected to increase from 19,864 in 2000 to 24,648 by 2035, a 24% increase.

Employment is expected to decrease slightly from 15,107 jobs in 2000 to 14,781 jobs by 2035, a 2% decrease. Employment reduction is projected to be highest in the northern tip of the watershed/City of South Milwaukee and along Route 32 in the City of Racine. Despite a general decrease in employment, there are a few areas that are projected to see increased employment opportunities. These areas are associated with population and household increases in the south-central and northern portion of the watershed.

Socioeconomic Status

The communities within the watershed can best be described as middle class. Active growth slowed beginning in 2007 due to an economic downturn. However, the region did experience a mixture of residential, industrial, and commercial growth over the past 20 years and offers amenities such as parks, shopping, conservation areas, beaches, schools and libraries, and is in somewhat close proximity to interstate highway access.

2010 U.S. Census Bureau data for the Village of Caledonia, City of Racine, and City of Oak Creek, the largest communities in the watershed, were averaged and used as a basis for profiling the socioeconomic status of Wind Point watershed. To summarize, the area is comprised of a mostly white population (>80%); the African American population exceeds 22% in Racine. The median household income is about $60,000 although nearly 14% of the population in Racine is below poverty level. In addition, approximately 67% of housing units are owner occupied; the remainder are rented. Owner occupied units are valued at about $210,000 on average in Oak Creek and Caledonia and about $130,000 per unit on average in Racine.

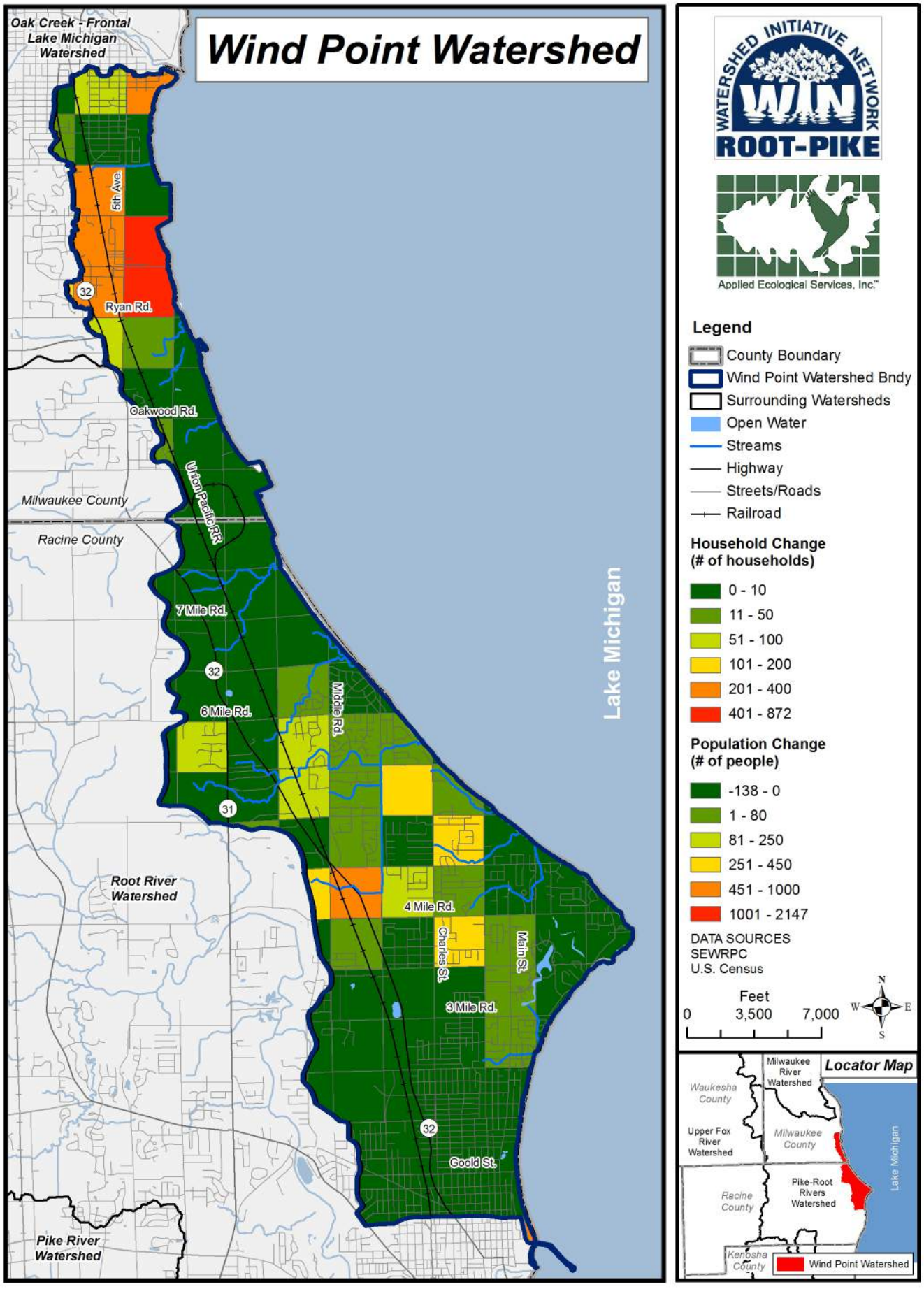


Fig. 16: Household and Population Change Year 2000 - 2035

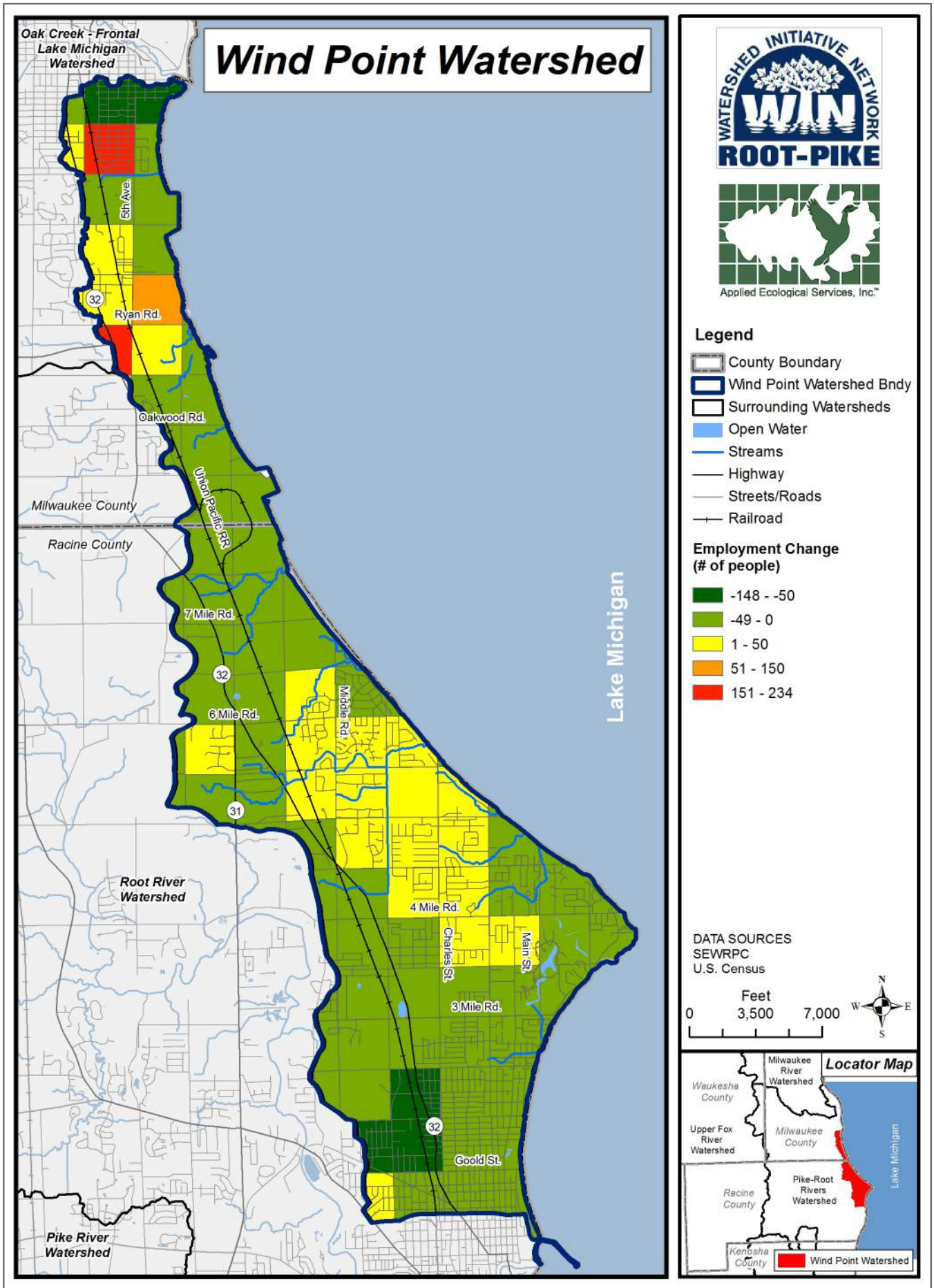


Fig. 17: Employment Change Year 2000 - 2035

3.8 Transportation Network

Roads

A diverse network of roads traverse Wind Point watershed (Figure 18). State Highway 32 is the most used road in the watershed. It generally runs north-south from South Milwaukee to Racine along the western half of the watershed. State Highway 31, another major north-south road, has a small section that joins Route 32 south of 6 Mile Road. There are various major secondary roads that generally run either north-south or east-west. Some of these major secondary roads include Marion Ave and Columbia Avenue in the City of South Milwaukee. Puetz Road, Ryan Road, Fitzsimmons Road, Oakwood Road, and 5th Avenue are located in the City of Oak Creek. 7 Mile Road, 6 Mile Road, 5 Mile Road, 4 Mile Road, 3 Mile Road, Middle Road, Charles Road, and Erie Street run through the Village of Caledonia. Carlton Drive, South Street, Goold Street, High Street, and Rapids Drive are all major secondary roads in the City of Racine.

Railroads

The Union Pacific Railroad, formerly Chicago and North Western Railway (C&NW), runs north-south across the western half of Wind Point watershed. The railroad is one of the oldest and best remembered rail lines in the Midwestern United States and is the first to operate a train out of Chicago. Throughout much of the rail line's life it did two things; serve the Heartland and northern Great Lakes regions as well as ferry traffic to and from Chicago. Aside from freight operations it was quite successful with its passenger operations as well. It's most famous was its fleet of "400s". Aside from its long-distance trains the rail line also operated a number of commuter operations, particularly around the Chicago and Milwaukee regions. In 1995 C&NW became part of Union Pacific. Although the C&NW is no longer an independent company almost all of its main lines continue to serve as important arteries under the Union Pacific banner. Today, large sections of the rail line have been abandoned or severed while others remain important corridors.

Airports

John H. Batten Airport (Batten International Airport) is located on over 450 acres of land in the City of Racine (Figure 18) and provides services to corporate, business and private aircraft twenty-four hours a day, seven days each week. The general-aviation terminal is complete with pilot and passenger lounges, a flight planning facility equipped with computerized weather data and a conference room with audio/video services. The airport is the largest privately-owned, public-use, reliever airport in the United States owned by the Racine Commercial Airport Corporation. The airport was founded in 1941 by Carlyle Godske on roughly 160 acres of land purchased from local businessman J.A. Horlick. For most of its history, the airport was known as Racine-Horlick Field, but on September 5, 1989, the name was changed to John H. Batten Field. John H. Batten was one of the airport's early founders and supporters.

Union Pacific Railroad in South Milwaukee

Harbors

Three area harbors are located along the Lake Michigan coast adjacent to Wind Point watershed. The first is South Milwaukee Harbor located in the far north end of the watershed within the City of South Milwaukee and includes South Milwaukee Yacht Club. This 14 acre site has 95 boat slips, a clubhouse with bar, fuel dock, fish cleaning station, outdoor pavilion, and 24/7 bathroom/shower facilities. The facility has been in existence for over 60 years and is funded and maintained by Club members.

The second is Bender Park Harbor located within Milwaukee County's Bender Park. This harbor provides public access to Lake Michigan and also includes a swimming beach.

A portion of Racine Harbor is located at the southeast tip of the watershed in the City of Racine near the mouth of the Root River. The harbor houses the Racine Yacht Club founded in 1914. The private membership Club offers many attractions including its own slip system, dry sailing area, bar, dining area, patio, and private beach with play ground. The Club also has a racing fleet and offers adult sailing classes.

Trails/Bike Paths

Over 7 miles of major trails/bike paths have been constructed within Wind Point watershed (Figure 18). Hiking/multi use trails within Bender Park account for another 4.25 miles. The Milwaukee-Racine-Kenosha (MRK) Trail is 5 mile long crushed limestone path that runs along a power line next to the Union Pacific Railroad right-of-way. The northern end of the trail is at 7 Mile Road's intersection with railroad. The southern end is at Layard Street in Racine. This trail has no direct connection to any other trail at its south terminus. The north terminus hooks up with We Energies Trail. This trail continues for another mile north on the east side of Route 32 and continues out of the watershed before ending at Elm Road. The Lake Michigan Pathway is located along Lake Michigan in the far southeast portion of the watershed. This path connects to Racine County's Milwaukee-Racine-Kenosha Trail (MRK) at 3-Mile Road and South Street via an on-road connection. On the south side of Racine, it connects to Racine County's North Shore Trail at Chicory Road. The Lake Michigan Pathway provides users with a beautiful view of Lake Michigan and connects to North Beach and Racine Zoological Gardens.

SEWPC's 2035 Comprehensive Plan also identifies various proposed trails and bike path extensions in the watershed (Figure 18). The first is a relatively long path that would pick up where Lake Michigan Pathway ends at August Street and wind its way along Lake Michigan, along 4 Mile and 4 ½ Mile Roads, and eventually to MKR Trail. Another proposed trail is located between Ryan and Oakwood Roads within Bender Park. Future plans for Bender Park include a 0.75 mile trail extension.

MRK Bike Trail near 3Mile Road

Lake Michigan Pathway

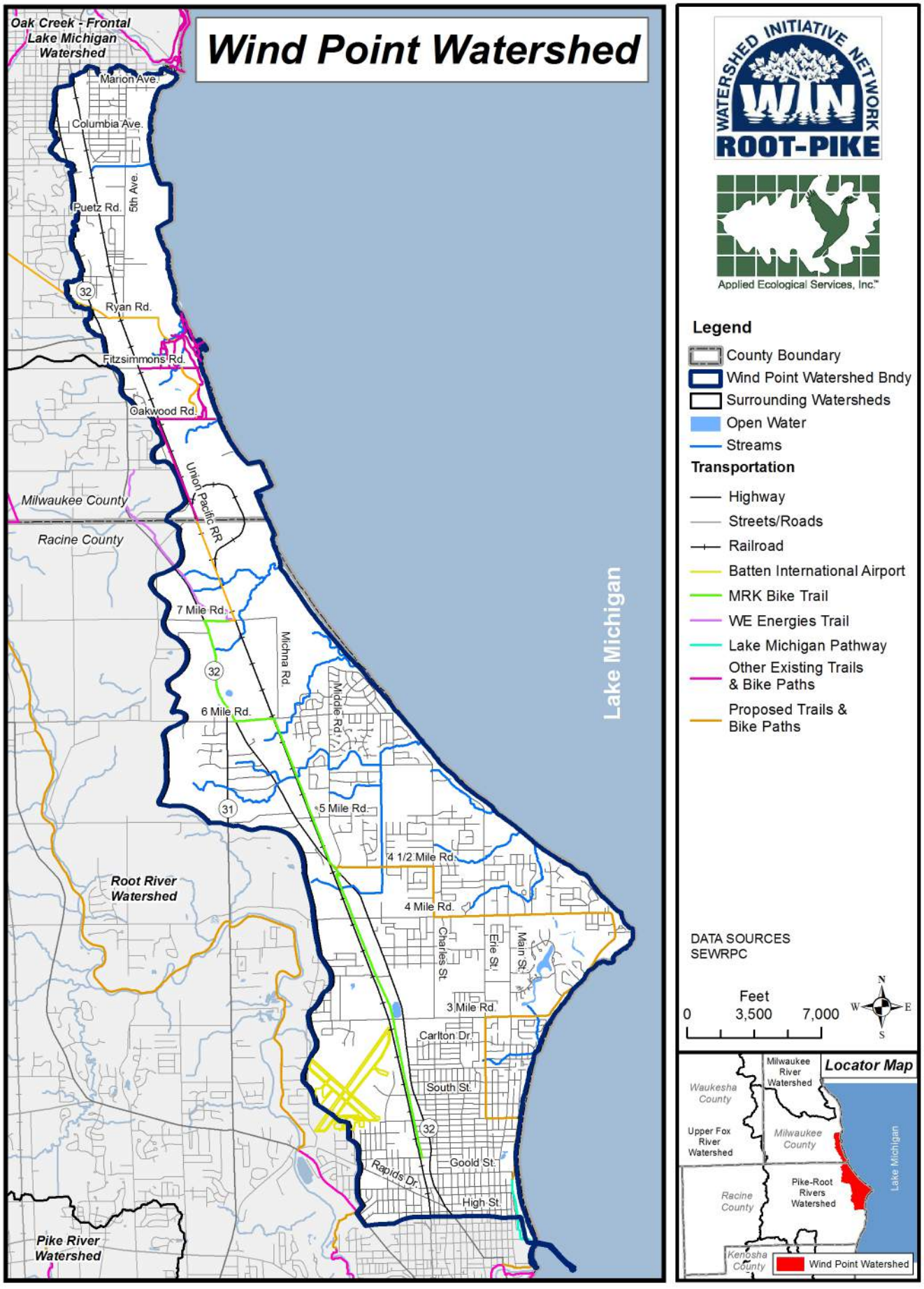


Fig. 18: Transportation Network