Land and Water Resource Management Plan

2020-2029

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LWRD Mission: To preserve, protect, and enhance our natural resources

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Executive Summary

Polk County has a diversity of high quality, accessible resources including: land, wildlife, agriculture, lakes, habitats, soil types, and opportunities for recreation. This diversity of resources makes Polk County a desirable place to live and visit. Polk County is in an ideal location, being close to Minneapolis-St. Paul, Minnesota but still preserving a rural community with a mix of developed, working, and undeveloped lands. However, Polk County's diversity of high quality resources can lead to conflicting resource use and resources being taken for granted. Additionally, a transient population of visitors and out of state residents can make it difficult to instill an ethic of protection and sense of place.

The Polk County Land and Water Resources Department (LWRD) is tasked with preserving, protecting, and enhancing Polk County's natural resources. The Polk County Land and Water Resources Management Plan (LWRMP) describes the strategy LWRD will employ from 2020 –2029 to preserve, protect, and enhance the surface water, groundwater, land, and community resources present in the county.

The goals, objectives, and activities identified in this LWRMP were developed by an advisory committee comprised of Polk County residents and partners. Committee members provided their diverse opinions on current environmental concerns through a series of four meetings and offered a number of objectives for the Land and Water Resources Department and their partners to execute. The main concerns of the advisory committee were organized into four goals, which will be addressed by LWRD over the next ten years in order to protect the natural resources of Polk County for all who live, work, and play in the community and for the intrinsic value of the resources.

The goals of this plan are:

Goal 1. Protect and improve the water quality of lakes, rivers, and streams
Goal 2. Protect and improve groundwater quality and quantity
Goal 3. Sustain and enhance land resources
Goal 4. Support and develop community stewardship and partnerships to improve our natural resources

A public hearing was held and the plan was brought before the County Board of Supervisors for approval. The Polk County Board of Supervisors identified strategic priorities for Polk County in 2017. The work of the Land and Water Resources Department is directly linked to the first and fifth priorities—tourism/recreation and water quality, respectively. Polk County's large tourism and recreation revenues are directly tied to clean lakes and rivers. LWRD works to minimize runoff impacts to surface water and groundwater by forming partnerships with local producers, developers, and lake organizations and by implementing a program to prevent aquatic and terrestrial invasive species.

This LWRMP includes a resource assessment of Polk County, an overview of how LWRD will implement the NR 151 performance standards and prohibitions (agricultural and non-agricultural), and related

management plans and ordinances. Also included are a summary of the LWRMP development process and the process LWRD developed to rank watersheds to prioritize project implementation across Polk County. Goals, objectives, and activities to direct the work of LWRD are included in this document as well as a strategy for information and education and LWRMP implementation and evaluation. A two year work plan for LWRD is also included.

As compared to the Polk County LWRMP prepared in 2009, this updated LWRMP has a greater focus on groundwater and land resources. This LWRMP also prioritizes work based on a watershed approach. All previous Polk County LWRMP's have prioritized work based on water quality management areas (WQMA) which comprise about 43% of the land area of Polk County.[1] With committee input, LWRD prioritized watersheds in Polk County to direct the work of LWRD. This approach focuses the area where work will be prioritized to meet the objectives developed by the advisory committee. Additionally, with a more focused approach, improvements in the water quality within the prioritized watersheds should be more apparent.

[1] A water quality management area is defined as an area 1,000 feet from a lake or 300 feet from a stream.

Land and Water Resource Management Planning Program

In 1997, a County Land and Water Resource Management Planning Program was created through amendments to Chapter 92.10 of the Wisconsin Statutes in Wisconsin Act 27. Act 27 directed the Wisconsin Department of Natural Resources (WDNR) to prescribe performance standards and prohibitions that farms in Wisconsin need to meet to reduce non-point source pollution and improve water quality. Act 27 also directed the Wisconsin Department of Agriculture, Trade and Consumer Protection (WDATCP) in conjunction with the WDNR to promulgate rules that prescribe technical standards and best management practices agriculture producers must follow to meet the performance standards. In October 2002, the rules were promulgated into law. WDNR administrative code NR 151 identifies the agricultural and urban performance standards for Wisconsin and WDATCP administrative code ATCP 50 sets the technical standards that agriculture producers will need to follow to implement the performance standards. County Land and Water Resource Management (LWRM) Plans are the local mechanism to implement NR 151.

Counties are required to develop a LWRM Plan with guidance from a local advisory committee. A public hearing must be held to notify the public of the plan contents and provide an opportunity for individuals to comment. The plan must also be approved by the County Board. LWRM Plans are reviewed by the Wisconsin Land and Water Conservation Board and approved by WDATCP. To be approved, the plan must meet the requirements of Chapter ATCP 50, Wisconsin Administrative Code, also described in Chapter 92 of the State Statutes.

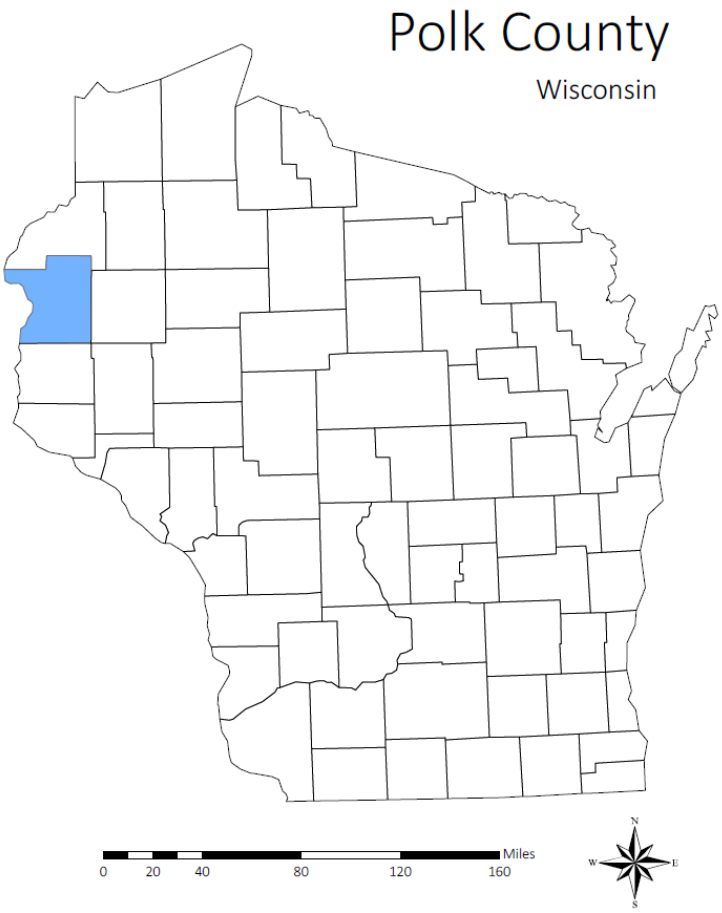
This Polk County LWRM Plan guides the activities of the Land and Water Resources Department from 2020-2029 and includes a two-year implementation plan with an analysis of staff time and a preliminary budget. The 2020-2021 Annual Workplan is included in Addendum A and describes all relevant activities for the department, including benchmarks and performance measures for each activity.

Resource Assessment

This section includes background information on the land and water resources of Polk County, in additional to agricultural and development trends. The information included in this section is critical for management purposes and in many cases was used to rank and prioritize watersheds for implementation. The resource assessment identifies the current state of the resources of Polk County and also identifies inherent characteristics that should be taken into account when implementing best management practices to preserve, protect, and enhance Polk County's natural resources (i.e. areas of step slope, levels of development, etc.).

Polk County is located in west-central Wisconsin along the Minnesota-Wisconsin border. The county is bordered on the west by the St. Croix River, the north by Burnett County, the east by Barron County, and the south by St. Croix County. The county has a total surface area of 612,164 acres (956.5 square miles). Of this area, surface waters cover 24,960 acres (39 square miles). The county has 437 lakes and 365 miles of rivers and streams, including 98 miles of trout streams.

Polk County is generally rural with an estimated 2018 population of 44,380. Polk County includes twenty-four towns, ten villages, and two cities. The Village of Balsam Lake is the county seat.



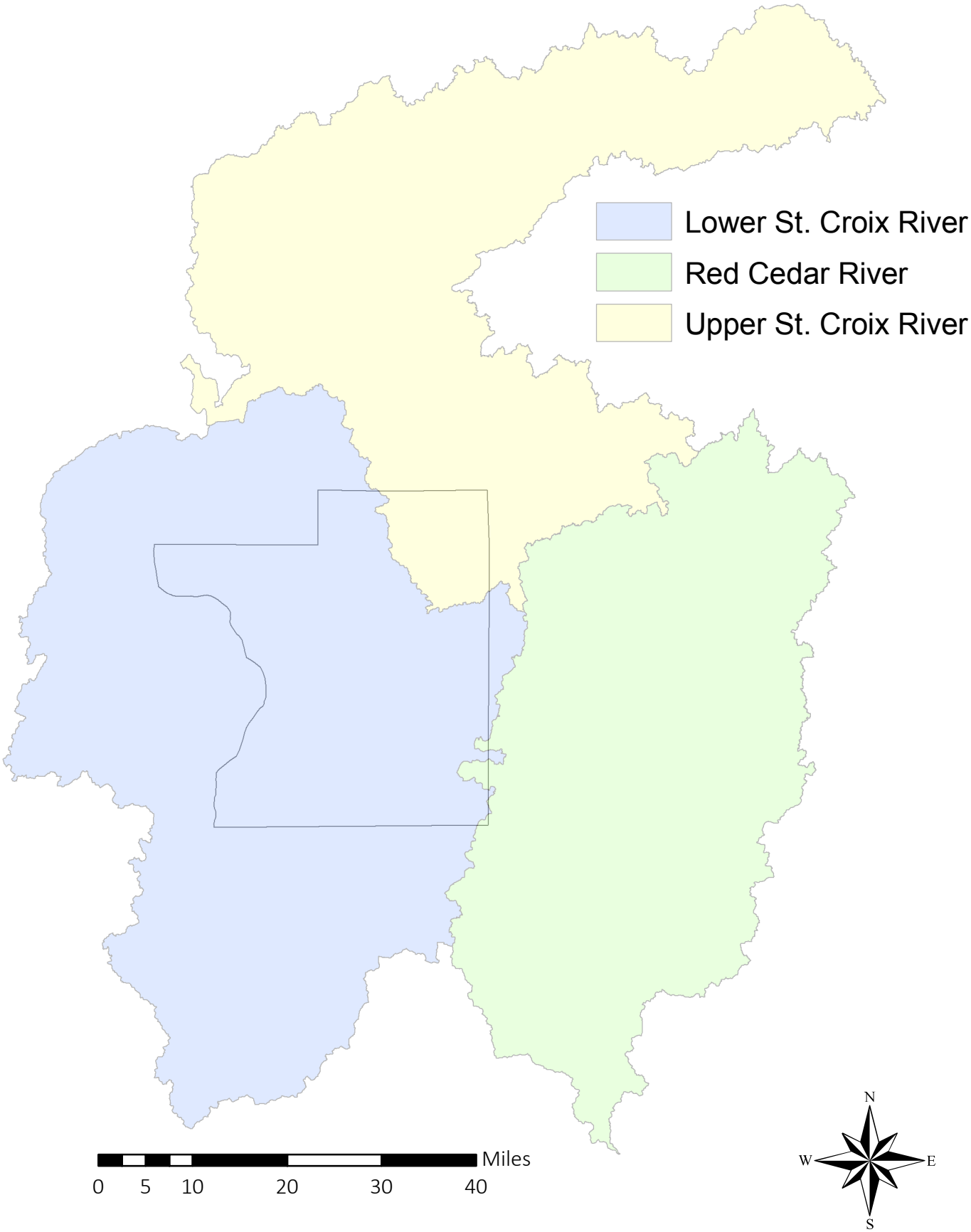
Watersheds

A watershed is an area of land that drains all the streams and rainfall to a common outlet. A nationwide digital watershed boundary dataset exists which comprises nested regions, or hydrologic units, which delineate progressively smaller watersheds. Each hydrologic unit has a code assigned to it, called a hydrologic unit code (HUC). Hydrologic units range in size from regions, which can cover several states, to subwatersheds, which generally cover areas of 25-50 square miles.

At an 8 Digit HUC level, the majority of Polk County falls within the Lower St. Croix watershed. At a 12 Digit HUC level, forty-two watersheds fall fully or partially within Polk County.

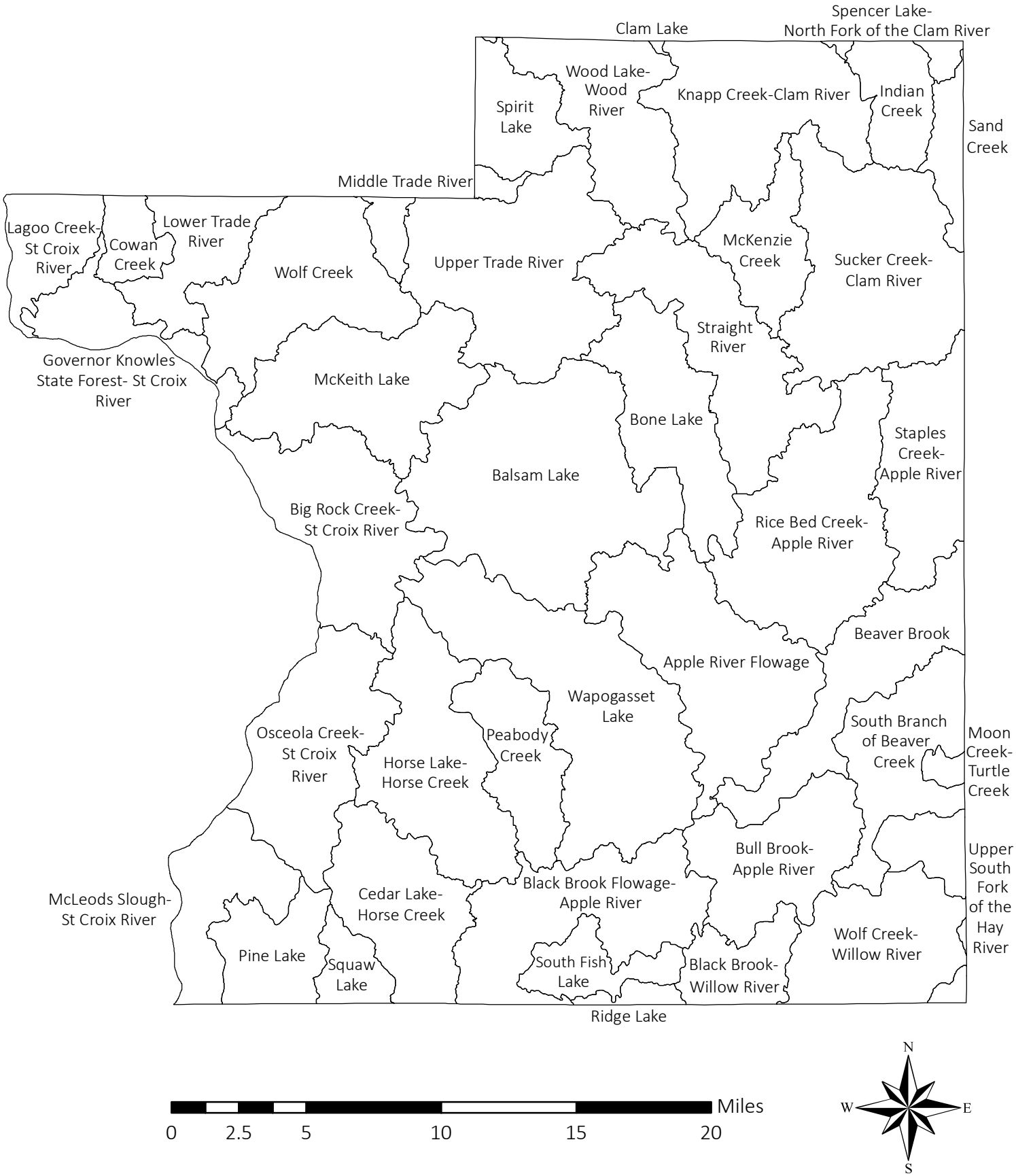
8 Digit HUC

Polk County, Wisconsin



12 Digit HUC

Polk County, Wisconsin



Topography [2]

Polk County has a diverse landscape ranging from broad, nearly level glacial outwash and lacustrine plains to rough, broken glacial moraines and areas of pitted outwash. The landscape generally has a young drainage pattern with many closed depressions and pothole lakes.

Generally, Polk County is moderately rolling, becoming increasingly more rugged in the western portion of the county, particularly in the St. Croix River valley. The surface geology of Polk County is primarily the result of glacial depositions over bedrock. The modern landscape was most strongly influenced by glaciers from the north and northwest about 25,000 to 15,000 years ago and by a glacier from the west about 12,300 years ago.

Two terminal moraines extending from the southwest to the northeast are the most significant glacial features in the county. These areas are characterized by rough hills and undrained depressions or kettles. The eastern-most moraine extends from New Richmond northeast to Turtle Lake, while a second moraine extends from a point east of St. Croix Falls to near Indian Creek in the northeast corner of the county. Between these moraines the landscape is gently rolling to level with poorly developed drainage and many lakes due to several ice advances and retreats.

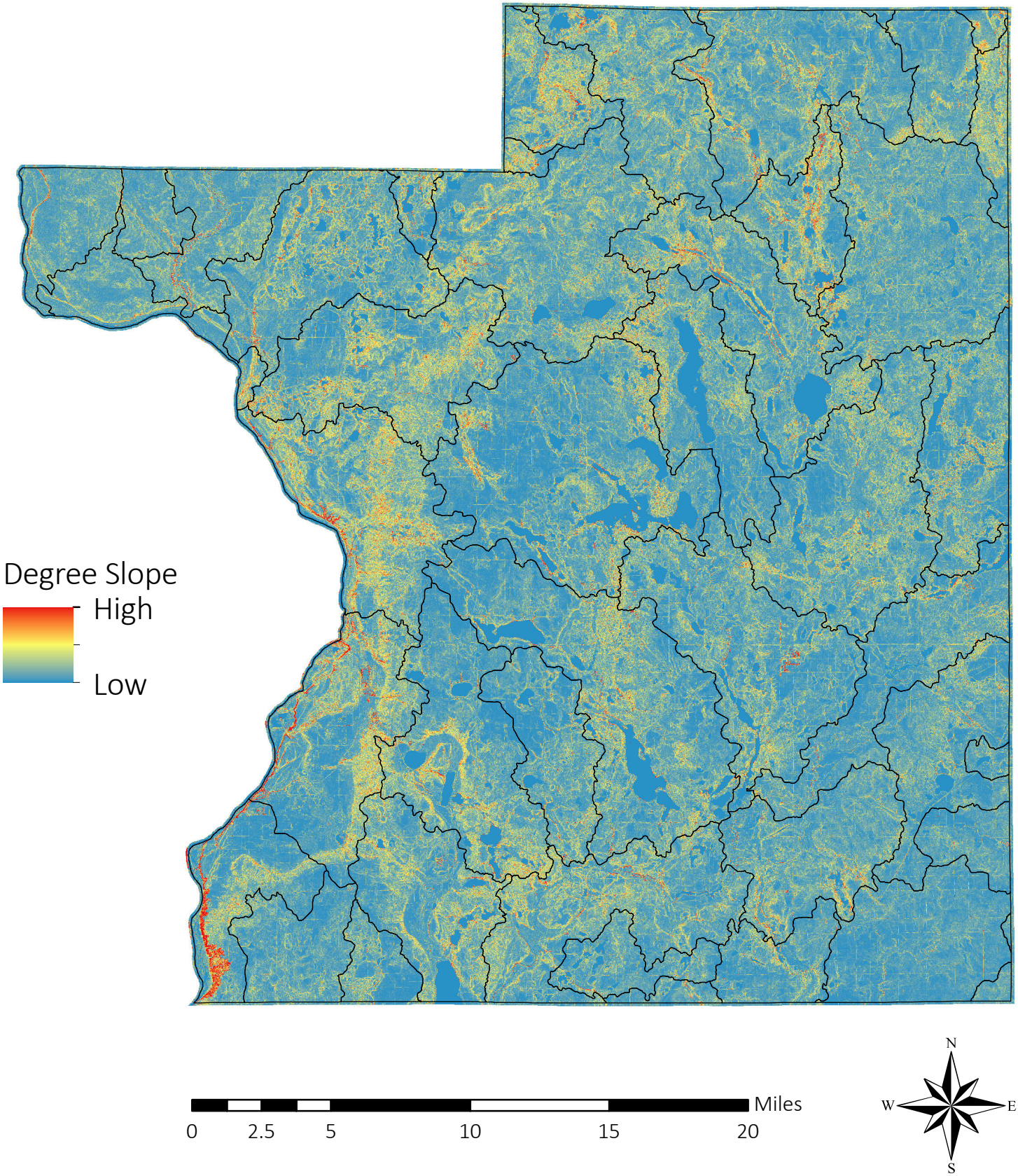
The northwestern portion of the county is level sand and gravel deposits, mostly forested, and known as the pine barrens. Since the last period of glacial activity, the landscape has been further sculpted by naturally occurring and man-induced erosion and drainage activity. The southwest corner of the county is an area of long, gentle slopes and broad drainage ways. Soils are mostly moderately well drained and somewhat poorly drained and the elevation averages about 1,200 feet. Throughout the eastern part of the county are scattered small areas of nearly level and gently sloping glacial lacustrine plains. Most of the soils on these plains are silty or loamy. They formed in sediments that were deposited in old glacial lakes.

Steep slopes occur in areas where the gradient of the land is 13 percent or greater. Areas having steep slopes can be categorized into three levels: 13-20% slope, 21-25%, and greater than 25%. Based on the Soil Survey for Polk County, there are 95,661 acres (16% of the total land base) that potentially have a slope of 13% or greater. Of this, 31,105 acres (5.3%) have slopes of 21% or greater and 2.6 percent have a slope of 25% and greater.

[2] West Central Planning Commission. Polk County Comprehensive Plan. 2009-2029

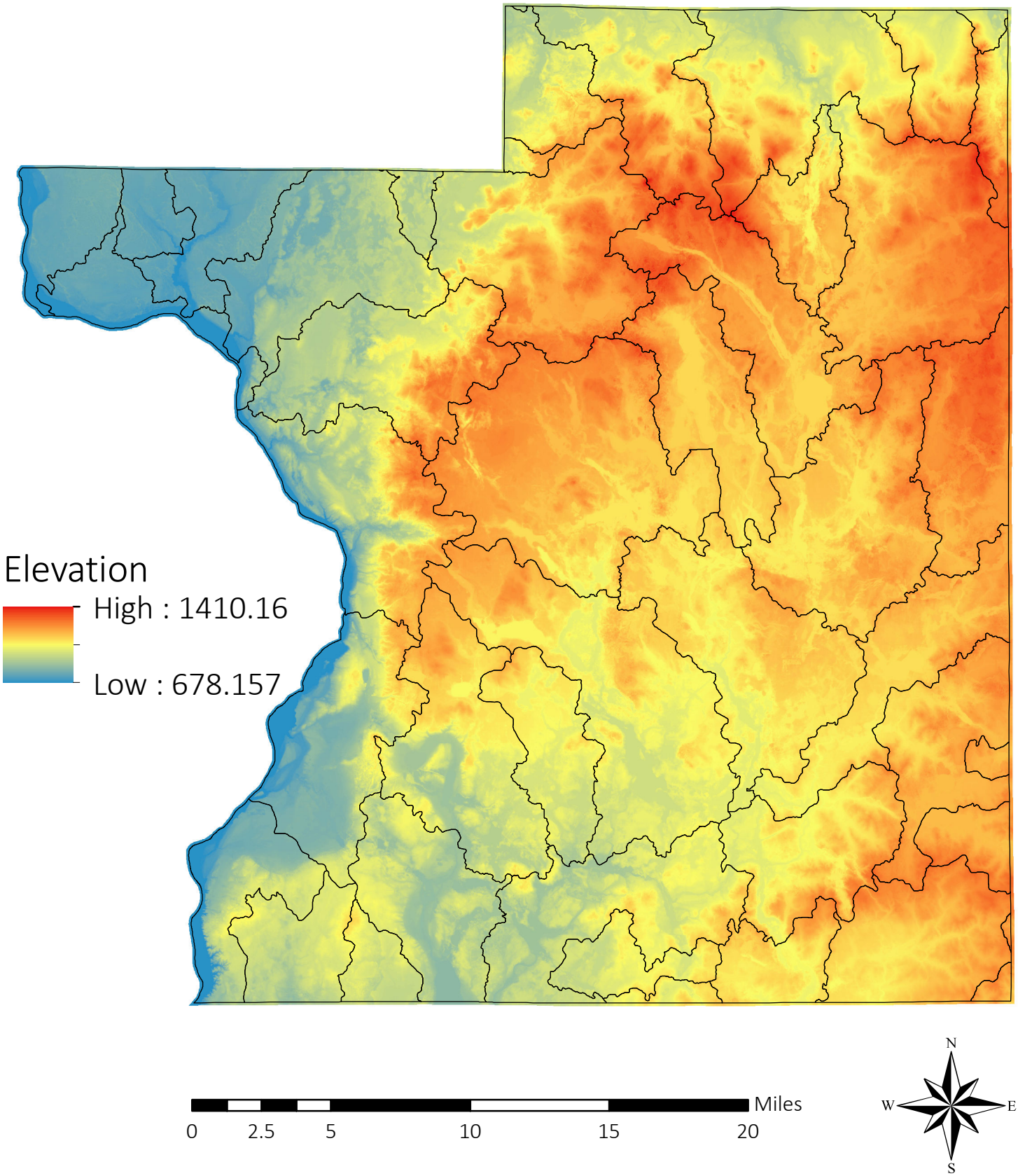
Degree Slope

Polk County, Wisconsin



Elevation

Polk County, Wisconsin



Land Use

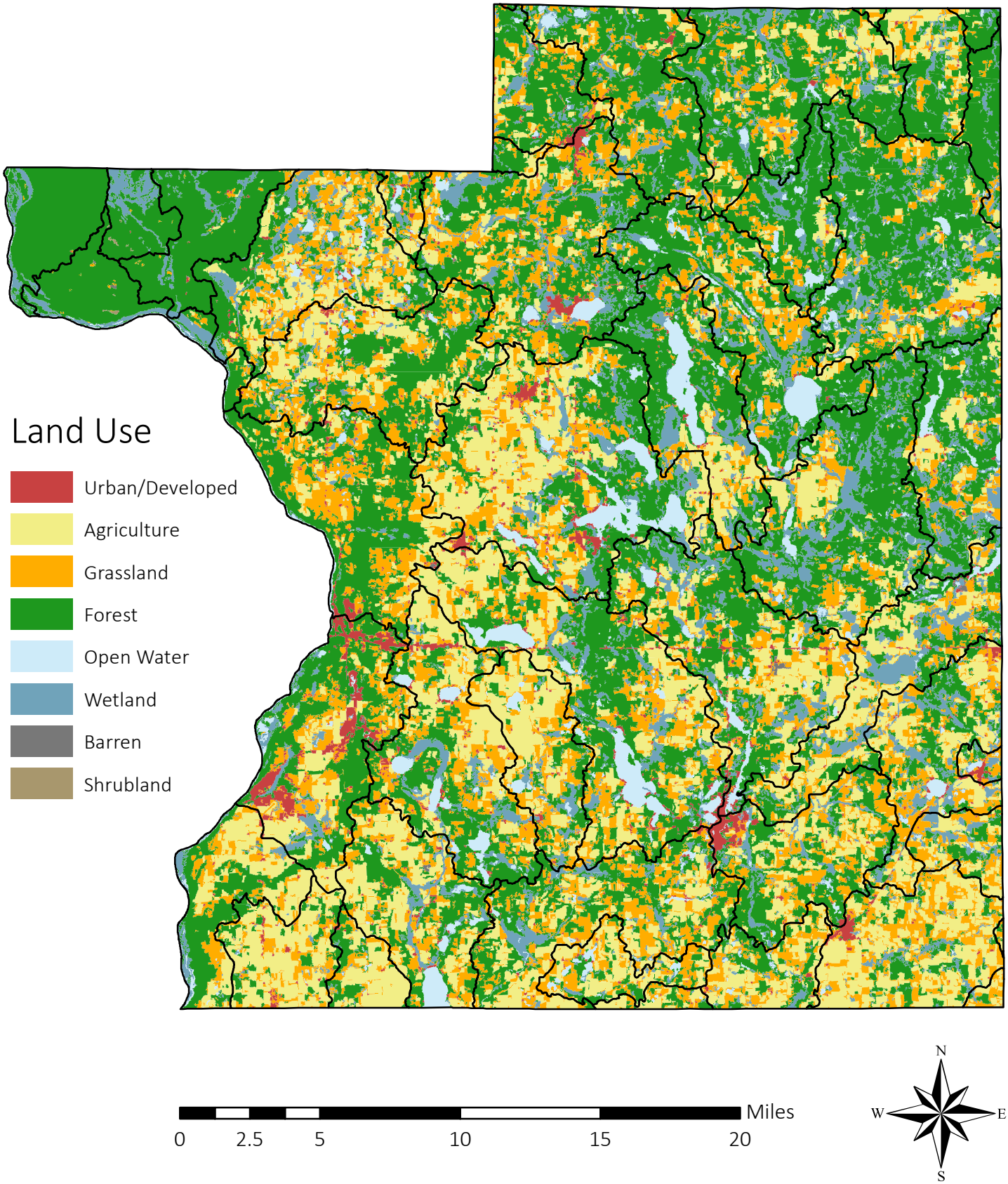
Land Use was delineated using the Wiscland 2 (Level 4) land cover project, a collaborative effort of the Wisconsin Department of Natural Resources, University of Wisconsin-Madison, and the Wisconsin State Cartographer's Office conducted between the fall of 2013 and August 2016. The scale of the data limits the accuracy of the classification. Data is expected to be accurate to a 2 acre minimum. Some "urban" land uses such as lakeshore residential are likely to be under represented by this classification because of small lot size and tree canopies over residential lots.

The largest land use in Polk County is forest (42%), followed by agriculture (22%), grassland (20%), wetland (11%), open water (4%), and urban/developed (2%).

Land Use	Acres	Percent
Forest	254,444	42%
Agriculture	133,962	22%
Grassland	119,489	20%
Wetland	67,568	11%
Open Water	22,981	4%
Urban/Developed	13,264	2%
Barren	361	0%
Shrubland	95	0%

Land Use

Polk County, Wisconsin



Soils[3]

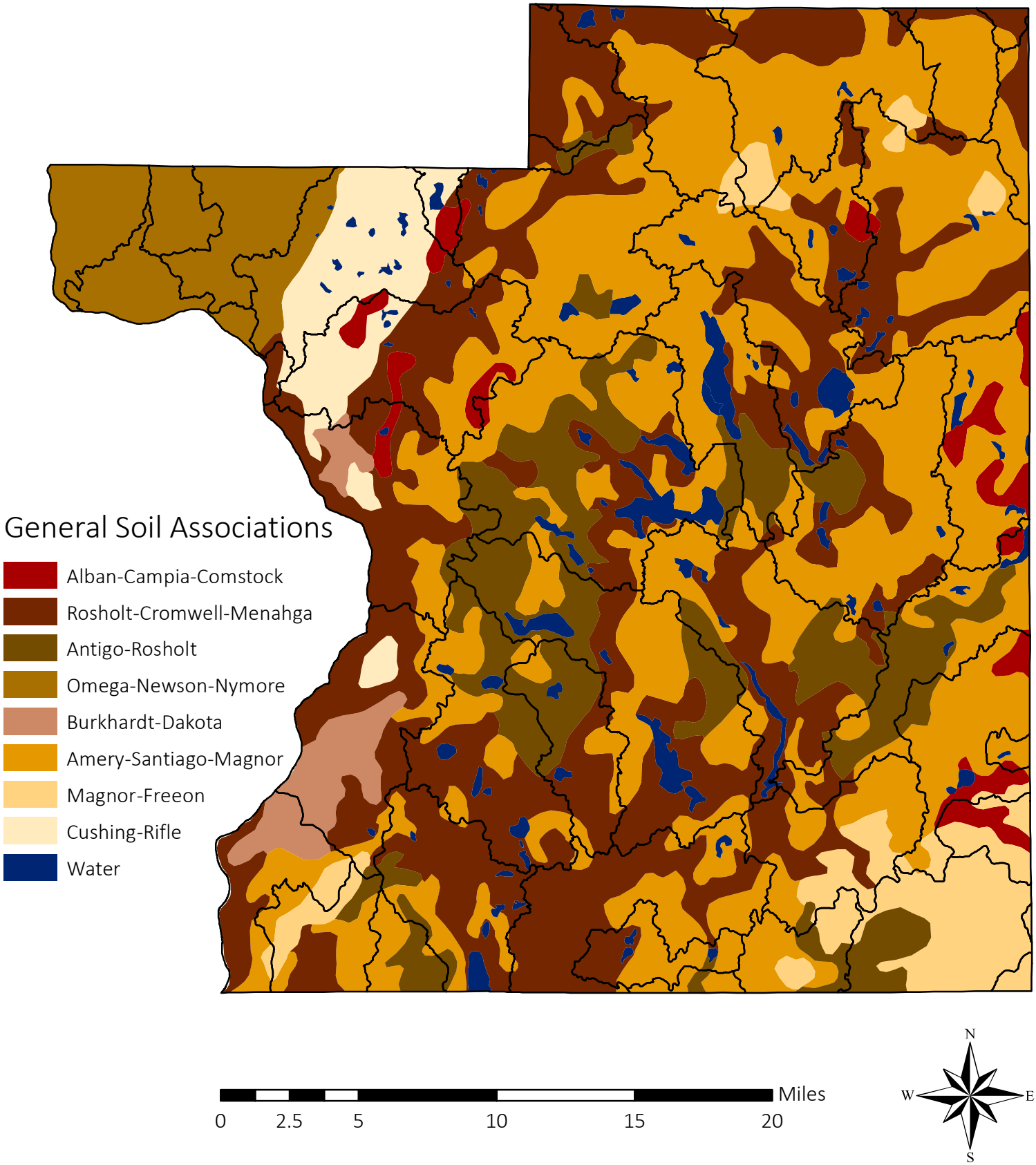
Soil properties are an important factor in how land is used. Soils determine how productive farmland is, and the type and amount of development that can be reasonably supported based on the various soil characteristics. The best use of the land is often dictated by the types of soils there are in an area. Subsequently, identifying and reviewing soil suitability interpretations, for specific urban and rural land uses, are essential for physical development planning and determining the most suitable land use. General soils information is useful for policy and planning purposes, but not for site specific applications. Eight general soil associations are located in Polk County.

General Soil Association	Description
Cushing-Rifle	Undulating to very hilly, well and moderately well drained, loamy and nearly level very poorly drained organic soils on till plains
Magnor-Freeon	Nearly level and gently sloping, somewhat poorly and moderately well drained silty soils on till plains
Amery-Santiago-Magnor	Nearly level to very hilly, well and somewhat poorly drained loamy and silty soils on till plains
Omega-Newson-Nymore	Nearly level to hilly, somewhat excessively and poorly to very poorly drained sandy soils on outwash plains
Antigo-Rosholt	Nearly level to sloping well-drained silty and loamy soils on outwash plains
Burkhardt-Dakota	Nearly level to sloping, well and somewhat excessively drained loamy soils on outwash plains
Rosholt-Cromwell-Menahga	Nearly level to very hilly, well and somewhat excessively drained loamy and sandy soils on pitted outwash plains
Alban-Campia-Comstock	Nearly level to moderately steep, well to somewhat poorly drained loamy and silty soils on glacial lake plains

[3] West Central Planning Commission. Polk County Comprehensive Plan. 2009-2029

General Soil Associations

Polk County, Wisconsin

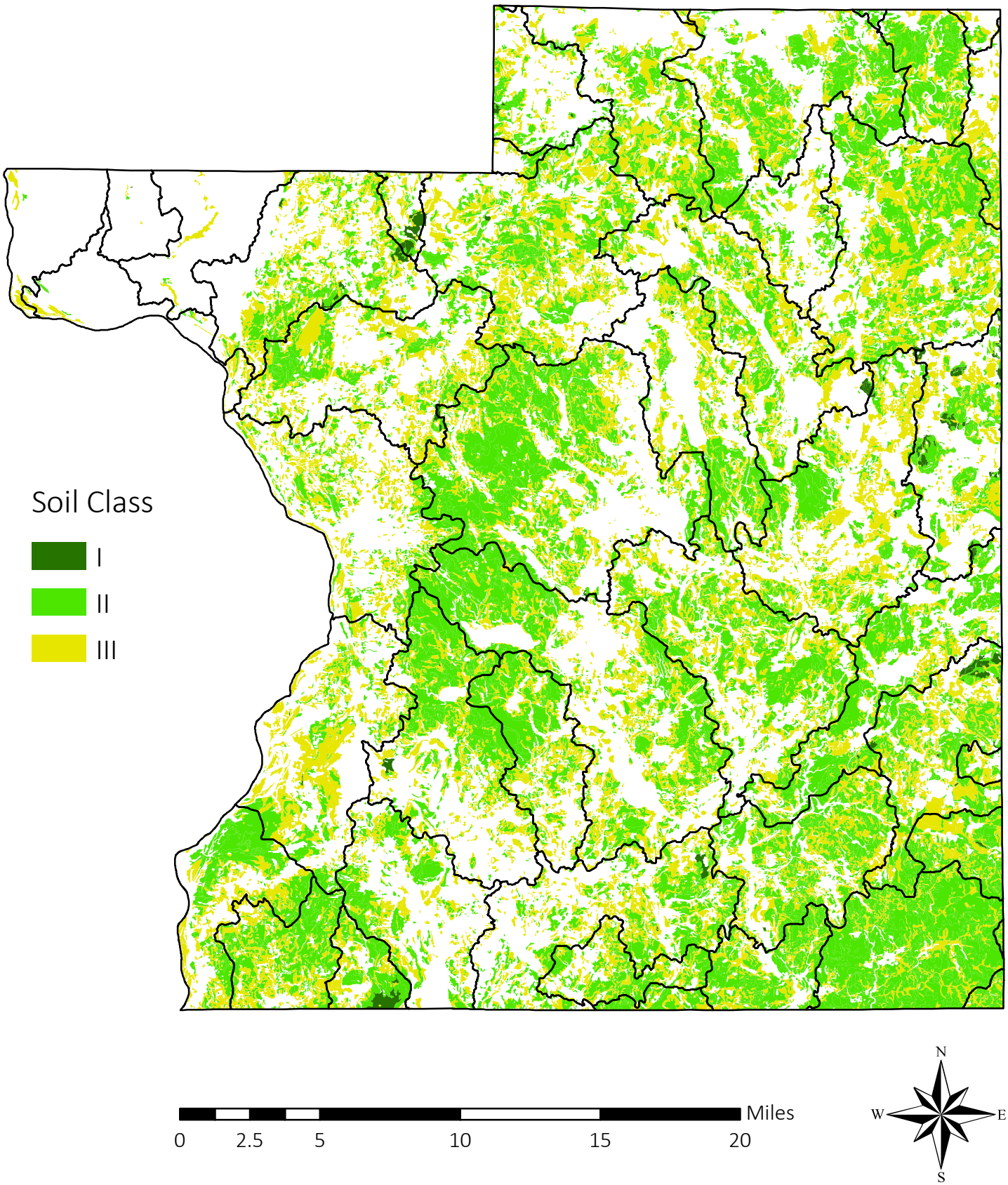


The Natural Resources Conservation Service (NRCS) has established a soils classification system to evaluate the suitability of soils for agricultural production. Under the classification system Class I, II, and III soils are considered prime farmland.

Soil Class	Description	Acres in Polk County	Total acres in Polk County (%)
Class I	Have few limitations that restrict their use	1,719	.28%
Class II	Have some limitations that reduce the choice of plants or require moderate conservation practices	170,152	27.81%
Class III	Have severe limitations that reduce the choice of plants or require moderate conservation practices (or both) and can be cultivated safely with special precautions	150,757	24.64%

Prime Farm Land

Polk County, Wisconsin



Groundwater

Groundwater is the sole source of drinking water in Polk County, meaning that the health of the citizens is directly linked to the quality of the groundwater. The 2009-2029 Polk County Comprehensive Plan identified groundwater as the most important natural resource in Polk County.

The Wisconsin Department of Natural Resources, US Geological Society, Wisconsin Geological and Natural History Survey, and University of Wisconsin-Madison developed the Groundwater Contamination Susceptibility Model in the mid 1980's to estimate the susceptibility of groundwater based on particular natural resource characteristics. The natural resource characteristics include bedrock depth, bedrock type, soil characteristics, surficial deposits, and water table depth. The result of this analysis is a groundwater susceptibility map for the State of Wisconsin which shows that the majority of Polk County has contamination susceptibility numerical scores above the "moderately susceptible" level.

The University of Wisconsin-Stevens Point maintains an interactive Well Water Quality Viewer summarizing private well water quality data collected by state agencies and voluntarily submitted by homeowners over the past 25 years. Health standards exist for arsenic, lead, manganese, and nitrate. Ten percent of Polk County wells exceeded the standard for lead, 5% for manganese, and 3% for nitrate. Additionally, twenty-one percent, or 41 wells, tested positive for coliform whereas no wells tested positive for E. coli (sample size 37).

Polk County Summary Statistics, University of Wisconsin Well Water Quality Viewer, November Updated Statistics Available Online: https://gissrv3.uwsp.edu/webapps/gwc/pri_wells/

Parameter	Total Samples	Minimum	Median	Average	Maximum	Exceeds Health Standard
Alkalinity (mg/L CaCO3)	201	28	127	127	357	
Arsenic (ppb)	56	ND[4]	ND	0	8	0% > 10
Atrazine (ppb)	90	ND	ND	0.1	2	
Chloride (mg/L)	201	ND	2	5.7	99.8	
Conductivity (umhos/cm)	201	67	243	256	759	
Copper (mg/L)	20	ND	0.048	0.204	1.52	
Lead (ppb)	21	ND	2	5	20	10% > 15
Manganese (ppb)	20	ND	8	47	399	5% > 300
Nitrate (mg/L as N)	1,262	ND	1	2.2	38.6	3% > 10
pH	201	6.29	7.8	7.69	8.41	
Saturation Index	180	-3.3	-0.1	-0.2	0.9	
Total Hardness	179	4	128	128	368	

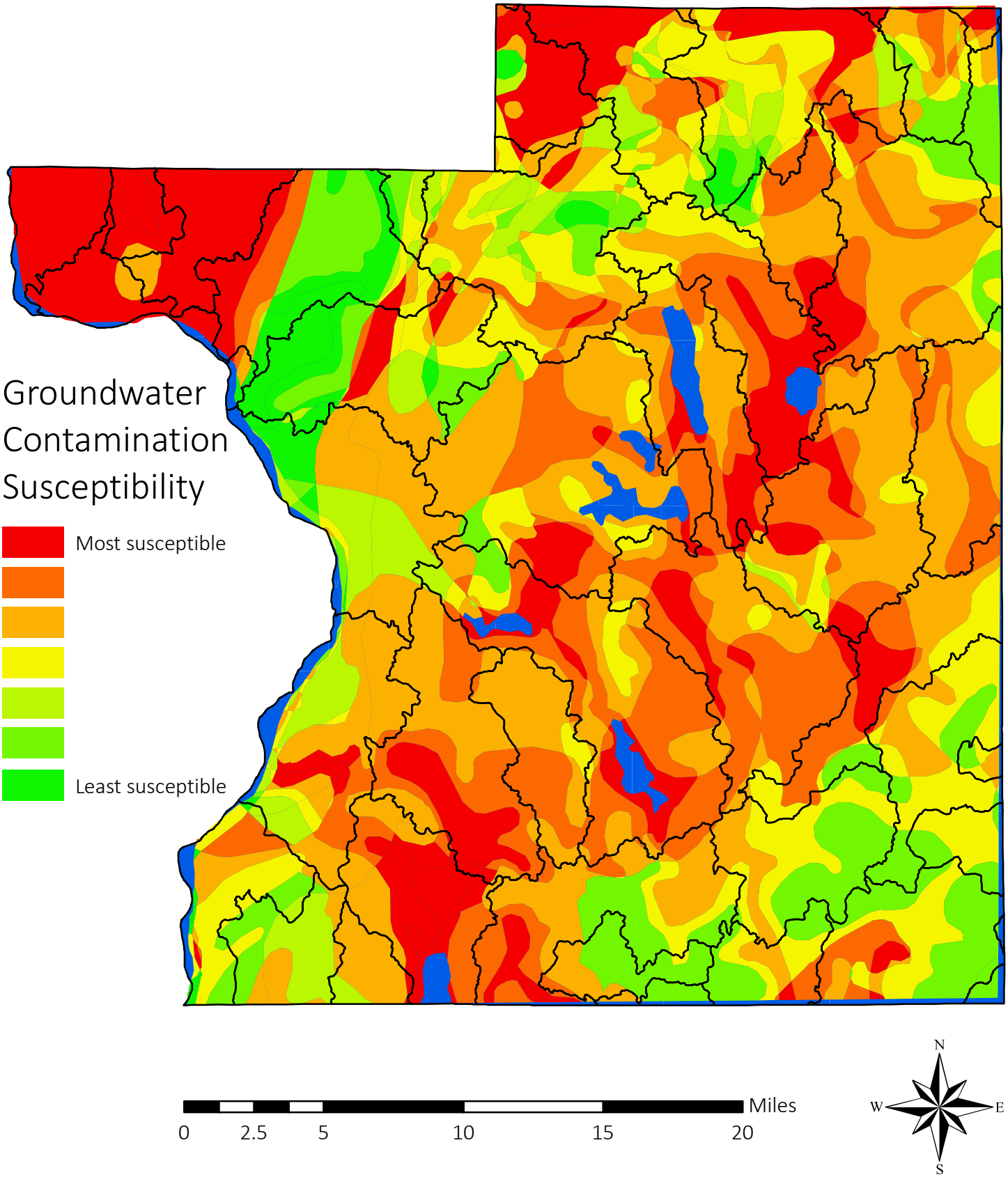
[4] ND = no detect

WDNR maintains a database of Remediation and Redevelopment sites that have contaminated groundwater and or soil. As of November 2018, there are twenty-eight open status sites in Polk County. Fifteen sites are environmental repair sites, twelve are leaking underground storage sites, and one is a spill site. An additional seventy-two sites in the county have continuing obligations.

There are ninety-three active high capacity wells in Polk County, of which eighty-eight are sourced from groundwater and five of which are sourced from surface water.

Groundwater Susceptibility

Polk County, Wisconsin



Surface Water

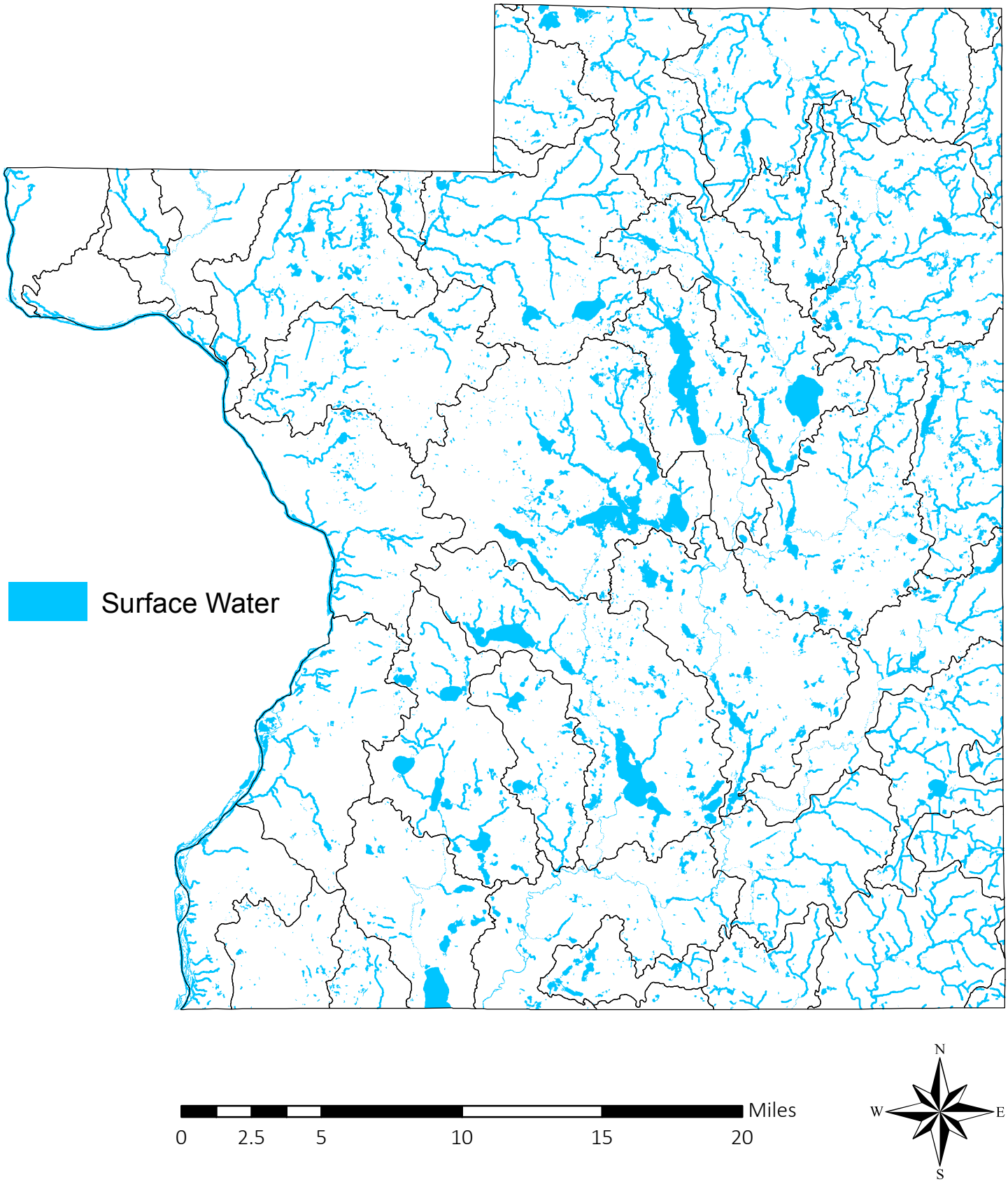
Polk County has an abundance of surface water resources with 437 lakes and 365 miles of streams and rivers distributed throughout the county. Polk County's lakes range widely in size and depth, with the largest being Balsam Lake (1,901 acres), Bone Lake (1,667 acres), and Lake Wapogasset (1,189 acres) and the deepest being Lower Pine Lake (102 feet). Homes and cottages ring most large lakes, and the shores of many smaller lakes have become targets for residential development. The St. Croix River flows along the county's western border receiving water from most of Polk County. Wetlands dot the surface of the landscape.

The lakes, rivers, and wetlands of the county are impacted by upland land use practices in the watersheds that drain to them. Most of the pollutants that enter water resources are carried in runoff from many diffuse, or nonpoint sources. The major pollutants of concern are sediment (carried from areas with bare soil such as crop fields and construction sites) and phosphorus (both attached to soil particles and dissolved in water from fertilizers and animal waste). Many Polk County lakes are shallow and as a result are more susceptible to internal loading, or the release of nutrients from lakebed sediments.

The appearance and structure of shorelines has changed drastically with development. As homes and cottages are built, many landowners clear vegetation and destroy habitat both on the shoreline and in the water. Fish lose cover, shade, and food as aquatic insects that dwell on plants decrease. Amphibians such as frogs lose important habitat as well. Shoreline birds no longer have places to nest or find cover and food. The protective ring of vegetation both on shore and in the lake that once served to intercept and filter runoff is no longer present.

Surface Water

Polk County, Wisconsin



Outstanding and Exceptional Resource Waters [5]

Wisconsin has designated many of the state's highest quality waters as Outstanding Resource Waters (ORWs) or Exceptional Resource Waters (ERWs). Waters designated as ORW or ERW are surface waters which provide outstanding recreational opportunities, support valuable fisheries and wildlife habitat, have good water quality, and are not significantly impacted by human activities. ORW and ERW status identifies waters that the State of Wisconsin has determined warrant additional protection from the effects of pollution. These designations are intended to meet federal Clean Water Act obligations requiring Wisconsin to adopt an "antidegradation" policy that is designed to prevent any lowering of water quality – especially in those waters having significant ecological or cultural value.

ORWs typically do not have any point sources discharging pollutants directly to the water (for instance, no industrial sources or municipal sewage treatment plants), though they may receive runoff from nonpoint sources. New discharges may be permitted only if their effluent quality is equal to or better than the background water quality of that waterway at all times—no increases of pollutant levels are allowed. Six waterbodies in the county are classified as ORWs: Clam River, McKenzie Creek, Orr Creek, Pipe Lake, Sand Creek and Tributaries, and portions of the St. Croix River.

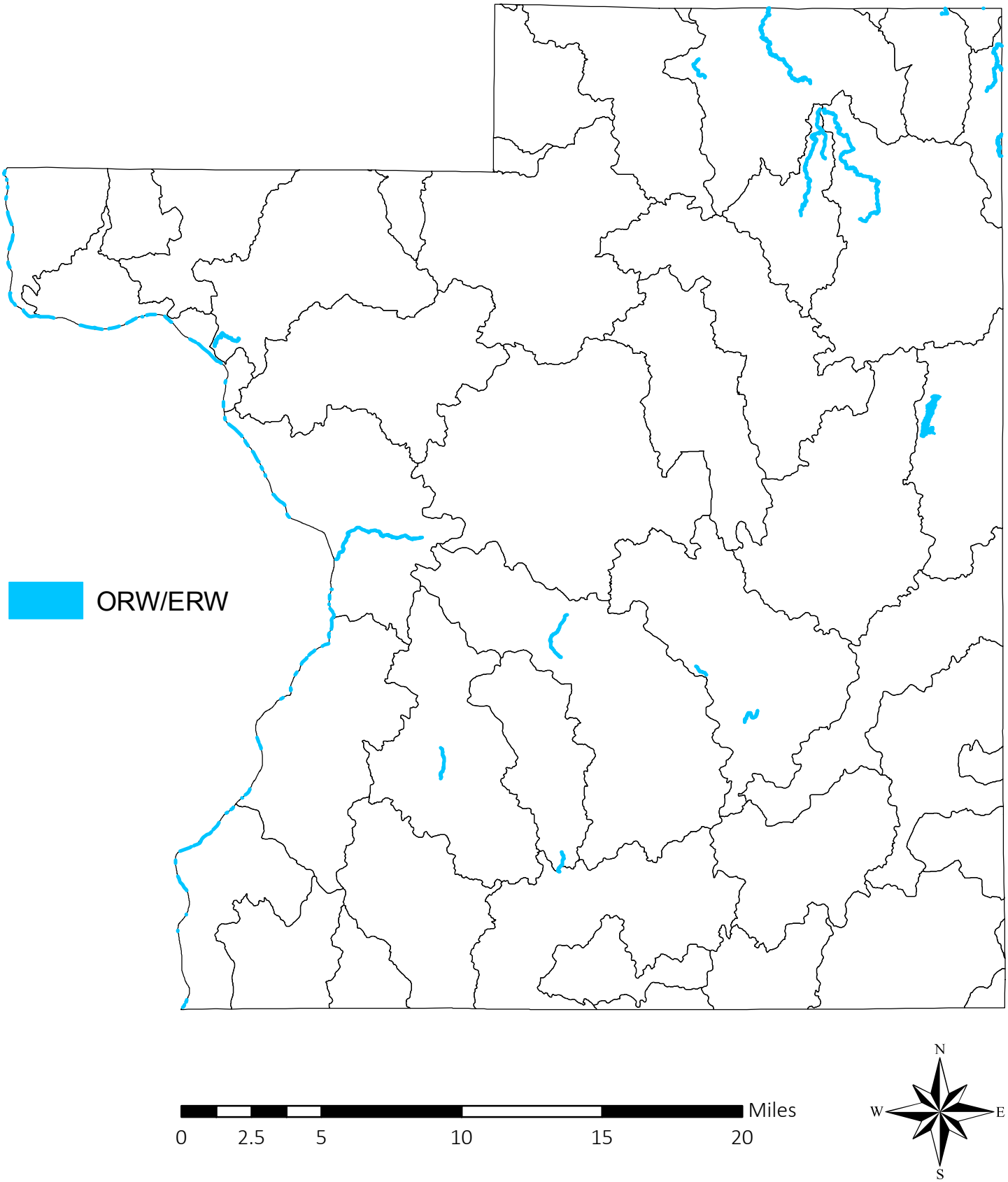
If a waterbody has existing point sources at the time of designation, it is more likely to be designated as an ERW. Like ORWs, dischargers to ERW waters are required to maintain background water quality levels; however, exceptions can be made for certain situations when an increase of pollutant loading to an ERW is warranted because human health would otherwise be compromised. Ten waterbodies in the county are classified as ERWs: Behning Creek, Big Rock Creek, Burns Creek, Knapp Creek, Little McKenzie Creek, Marquee Creek and Springs, Peabody Creek, portions of the St. Croix River, Toby Creek and Springs, and Wolf Creek.

[5] Wisconsin Department of Natural Resources website

Waterbody	Portion within ORW/ERW Classification	Status
Clam River	West edge S8 T36N R15W downstream to Clam Falls Flowage	ORW
McKenzie Creek	Downstream from 0.5 miles below McKenzie Lake	ORW
Orr Creek	Lower 1.0 mile of stream in S13 T37N R15W	ORW
Pipe Lake	All	ORW
Sand Creek & Tributaries	All	ORW
St. Croix River	All, except portion from the northern boundary of the St. Croix Falls city limits to a distance one mile below the STH 243 bridge at Osceola	ORW
Behning Creek	All	ERW
Big Rock Creek	All	ERW
Burns Creek	All	ERW
Knapp Creek	Middle S17 T37N R16W to Knapp Flowage	ERW
Little McKenzie Creek	All	ERW
Markee Creek & Springs	All	ERW
Peabody Creek	Lower 1.0 mile	ERW
St. Croix River	From the northern boundary of the St. Croix Falls city limits to a distance one mile below the STH 243 bridge at Osceola	ERW
Toby Creek & Springs	All	ERW
Wolf Creek	CTH G downstream 1.2 mile	ERW

Outstanding/Exceptional Resource Waters

Polk County, Wisconsin



Impaired Waters

Wisconsin lakes, rivers, and streams are managed to determine if their conditions are meeting state and federal water quality standards. Water samples are collected through monitoring studies and results are compared to guidelines designed to evaluate conditions as compared to state standards. On many lakes, water samples have not been collected through monitoring studies. General assessments place waters in four different categories: poor, fair, good, and excellent. The results of assessments can be used to determine which actions will ensure that water quality standards are being met (anti-degradation, maintenance, or restoration).

If a waterbody does not meet water quality standards, it is placed on Wisconsin's Impaired Waters List under the Federal Clean Water Act, Section 303(d). Every two years the State of Wisconsin is required to submit list updates to the United States Environmental Protection Agency for approval. Twenty-eight waterbodies in Polk County are listed on Wisconsin's 2018 impaired waters list. The majority of waterbodies are listed for total phosphorus and eutrophication/excess algae growth.

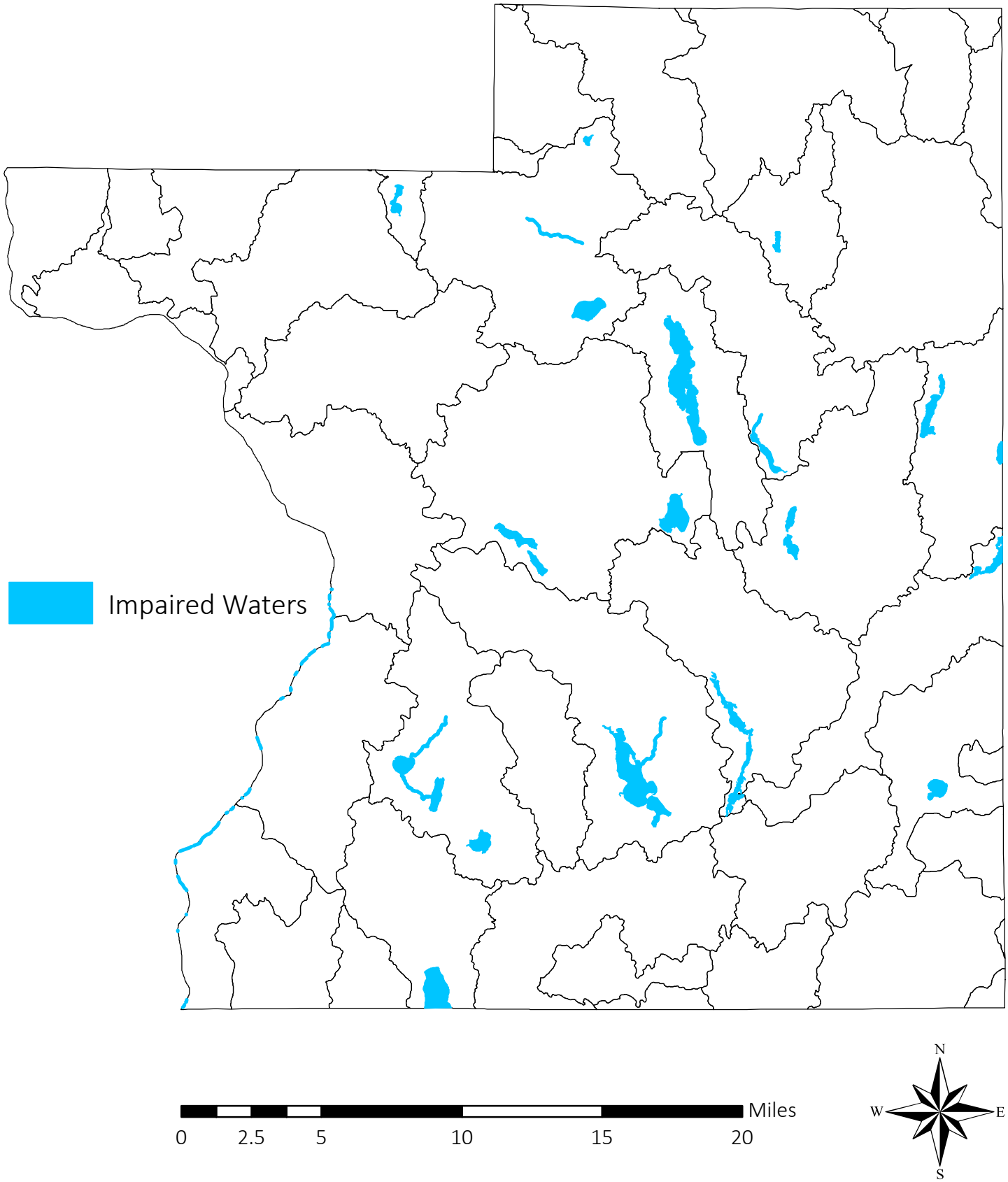
Waterbodies can be listed as impaired based on pollutants such as total phosphorus, chlorophyll a (indicator of algae), total suspended solids, and metals. Wisconsin waters are each assigned four uses (fish and aquatic life, recreation, public health and welfare, and wildlife) that carry with them a set of goals.

Portions of the St. Croix River and Pipe Lake are classified as ORW/ERW and are also listed as Impaired. These waterbodies provide outstanding recreational opportunities, support valuable fisheries and wildlife habitat, have good water quality, and are not significantly impacted by human activities but are listed as impaired for contaminated fish tissue.

Waterbody Name	Pollutant	Impairment
Apple River Flowage	Total phosphorus	Water quality use restrictions, excess algal growth
Bear Trap Lake	Unknown pollutant	Excess algal growth
Big Blake Lake	Total phosphorus	Eutrophication, excess algal growth
Big Butternut Lake	Total phosphorus	Eutrophication, excess algal growth
Big Lake	Unknown pollutant	Excess algal growth
Bone Lake	Total phosphorus	Impairment unknown, excess algal growth
Cedar Lake	Total phosphorus	Excess algal growth, elevated pH
Coon Lake	Total phosphorus	Impairment unknown
East Balsam Lake	Unknown pollutant	Excess algal growth
Friday Creek	Total phosphorus	Degraded biological community
Horse Lake	Total phosphorus	Eutrophication, excess algal growth
Horseshoe Lake	Unknown pollutant	Excess algal growth
Long Lake	Total phosphorus	Eutrophication, excess algal growth
Long Trade Lake	Total phosphorus	Eutrophication, excess algal growth
Lost Creek	Total phosphorus	Impairment unknown
Lotus Lake	Total phosphorus	Eutrophication, excess algal growth
Lotus Lake Outlet	Total phosphorus	Impairment unknown
Loveless Lake	Unknown pollutant	Excess algal growth
Magnor Lake	Total phosphorus	Eutrophication, excess algal growth
Pipe Lake	Mercury	Contaminated fish tissue
Pipe Lake, North	Unknown pollutant	Excess algal growth
South Branch Trade River	Total phosphorus	Water quality use restrictions
St Croix River (mi 17-44)	PCB's	Contaminated fish tissue
St Croix River (mi 44-54)	PCB's	Contaminated fish tissue
Staples Lake	Total phosphorus	Eutrophication, excess algal growth
Un. Trib to Lotus Lake	Total phosphorus	Impairment unknown
Wapogasset Lake	Total phosphorus	Eutrophication, excess algal growth
Ward Lake	Total phosphorus	Excess algal growth
White Ash Lake	Total phosphorus	Eutrophication, excess algal growth
White Ash Lake, North	Total phosphorus	Impairment unknown

Impaired Waters

Polk County, Wisconsin



Agricultural Trends

Polk County has a diverse range of agricultural enterprises. The dominating livestock operation types in the county are dairy, beef, and turkey, but range from small, hobby size farms with several horses, sheep, or cattle, to large Concentrated Animal Feeding Operations (CAFOs) with over 1,000 animal units. Livestock operations with over 1,000 animal units are required to have a Wisconsin Pollution Discharge Elimination System (WPDES) permit. This permit requires those facilities to meet agricultural standards and prohibitions set in WI Administrative Rules NR 151 and NR 243. There are 5 permitted CAFOs in the county (4 dairy and 1 turkey operation).

Cropping operations range from fresh vegetable producers who sell at farmers markets or offer CSA boxes to the surrounding communities and the Twin Cities metro area, to cash grain operations that farm several thousand acres. Crops grown in the county are driven by the types of livestock operations and demand from agricultural markets across the county, region, and world. Corn (grain and silage), soybeans, and forages (alfalfa and grasses) make up the majority of crops grown. Snap bean production, driven by demand from local processors, has been increasing in the county.

In 2017, Polk County had approximately 164,959 total cropland acres, up from 159,940 acres in 2012. Data from 2017 indicated that 66,575 acres were planted to corn, 39,540 acres were planted to forage, and 37,087 acres were planted to soybean. Small grains were planted on 2,707 acres. Vegetables were produced on 3,465 acres. Christmas trees, and orchards accounted for an additional 380 acres. [6]

The following tables summarize data from the 2017 and 2012 US Census of Agriculture for Polk County producers and their operations.

US Census of Agriculture Reported Data		
	2017	2012
# Farms	1,234	1,313
Land in Farms (acres)	256,114	255,917
Total Cropland (acres)	164,959	159,940
Harvested Cropland (acres)	149,327	144,401
Irrigated Land (acres)	2,144	1,477
Principal Farm Producer Demographics		
Primary occupation - farming	815	627
Primary occupation - other	867	686
Male	1207	1102
Female	475	211
Average Age	57	57.7

[6] 2012 and 2017 Census of Agriculture – County Data, USDA

Livestock Inventory: US Census of Agriculture Reported Data				
	2017		2012	
Livestock Type	# Farms	Total Animals	# Farms	Total Animals
Cattle and calves	501	44,081	536	42,815
Sheep and lambs	97	4,357	73	2,481
Hogs and pigs	21	257	36	1,853
Goats	85	652	50	692
Poultry	182		215	
Equine	317	1,311	384	1,948

Commodity Acreage: US Census of Agriculture Reported Data				
	2017		2012	
Crop	# Farms	Total Acres	# Farms	Total Acres
Corn - grain	353	54,135	464	63,209
Forage (all hay, haylage, grass silage, green chop)	687	39,540	664	38,417
Soybean	246	37,087	222	24,811
Corn - silage	138	12,440	170	9,813
Vegetables	73	3,465	61	3,656
Rye - grain	20	1,158	9	577
Oats - grain	28	699	66	1,430
Wheat - grain	13	556	25	1,225
Barley	8	294	19	668
Cultivated Christmas Trees	16	211	17	214
Orchards	38	169	36	157

Livestock Sold: US Census of Agriculture Reported Data				
	2017		2012	
Livestock Type	# Farms	Total Animals	# Farms	Total Animals
Cattle and Calves	410	16,401	443	15,188
Sheep and Lambs	62	3,322	54	2,274
Hogs and Pigs	40	581	38	2,458
Goats	22	316	16	170
Poultry	101		129	

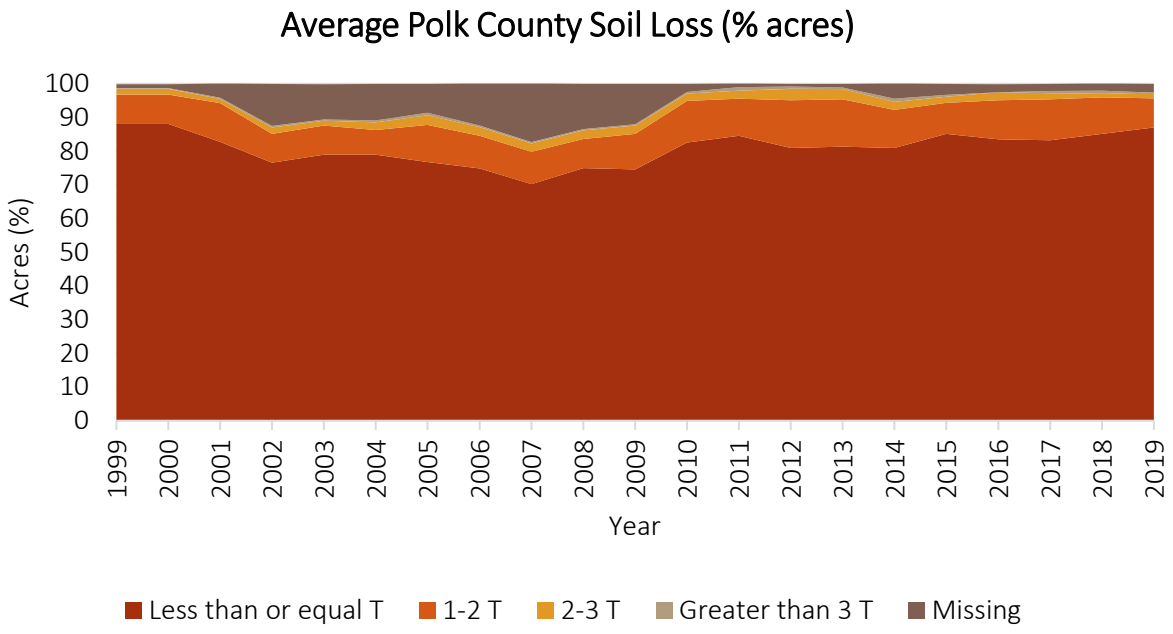
The agricultural operations and their trends have impacts on our natural resources. Animal agriculture results in the production of manure. With proper management, manure is a source of organic matter and nutrients for growing crops and can reduce the need for commercial fertilizers. Improper management can lead to runoff of nutrients that can impair surface water and groundwater resources. Animal agriculture also has an effect on the types of crops grown. Dairy producers often feed their cattle corn silage. After these fields are harvested, the soil is bare until the next crop is planted the following spring causing increases in erosion and nutrient loss to surface and ground water. On the

other hand, many animals are fed forages like alfalfa and grass. These fields are maintained with vegetative cover for multiple years thus limiting erosion and nutrient loss to surface and ground water. As more livestock based farms cease operation, many fields are transitioned into a row crop rotation of corn and soybeans. This system can have ranging differences in erosion based on tillage and planting practices. In recent years the use of cover crops have been expanding across the county as well as the region. Farmers are seeing the benefits cover crops can provide and are implementing them into their operations. Trends in county cropping systems have been documented by conducting a yearly transect survey.

Cropland Transect Survey

Since 1999 the Polk County Land and Water Resources Department has been conducting a cropland transect survey of approximately 835 fields. The survey was developed by Purdue University and is designed to collect conservation tillage and crop residue information to estimate county-wide soil loss. Each field is visited in the spring after crop emergence and the current crop, tillage system, residue cover, and the existence of erosion is documented.

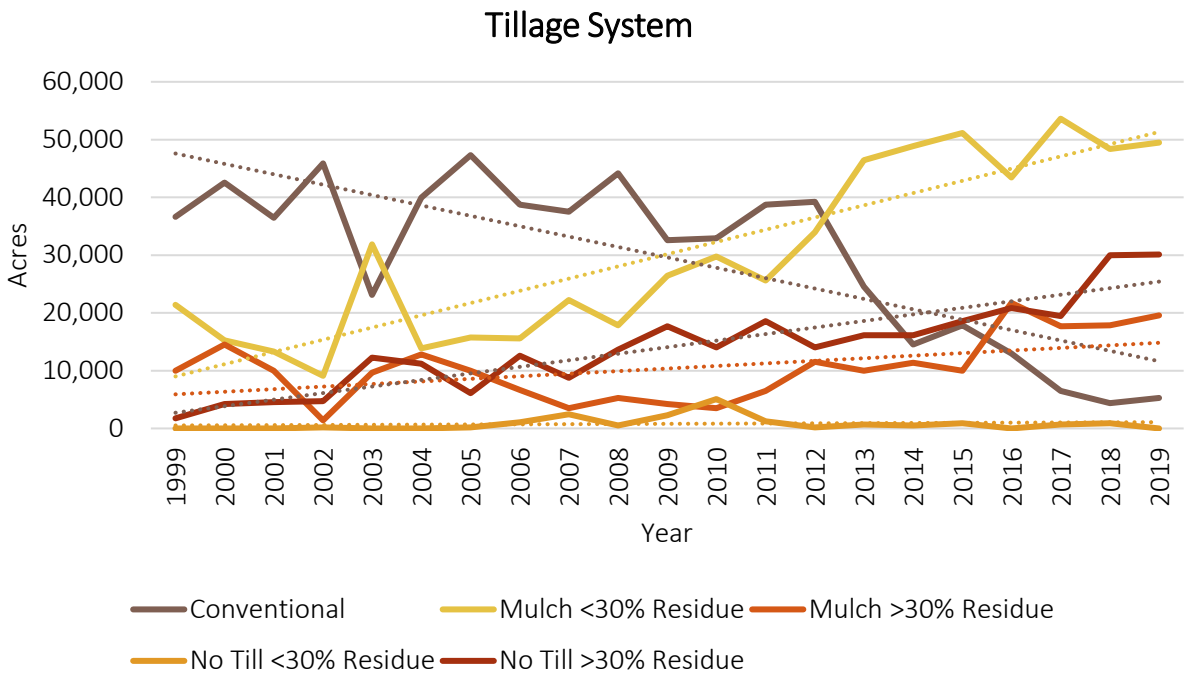
All soils have an estimated amount of soil they can lose annually and still maintain productivity. The value is called "T" or tolerable soil loss (tons/acre). The average T value for Polk County soils is 3.29 tons/acre. The transect survey helps estimate soil erosion levels compared to the county wide average value for T. Averaged over the past 20 years, the vast majority of acres (81%) are less than or equal to T. Approximately 10% of the acres were 1-2 times greater than T. Fewer acres were 2-3 times greater than T (2%) or more than 3 times greater than T (0.5%).



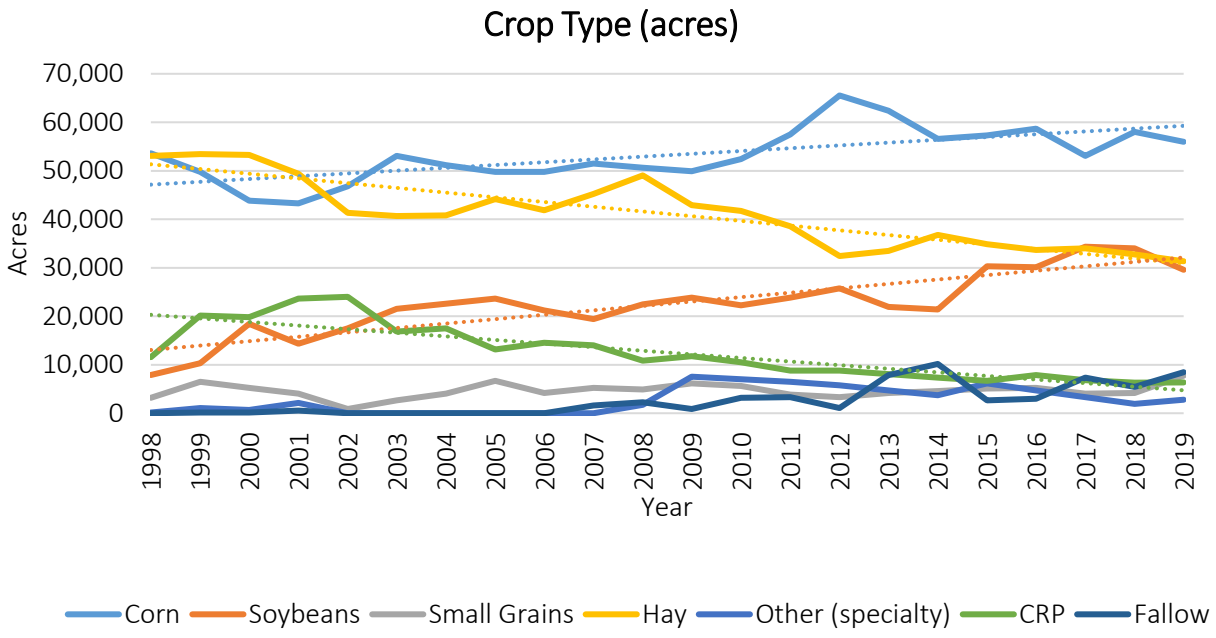
[7]

The transect survey can be used to examine trends in tillage systems across the county. Since 1999 conventional tillage has decreased dramatically, from a high of approximately 47,307 acres in 2005 to a low of 4,380 acres in 2018. Currently, the most common tillage systems are mulch (less than 30% residue), followed by no till (greater than 30% residue), and mulch (greater than 30% residue).

[7] Missing acres represent those fields where at the time of the survey no data was able to be collected (i.e. not planted, not tilled, etc.)



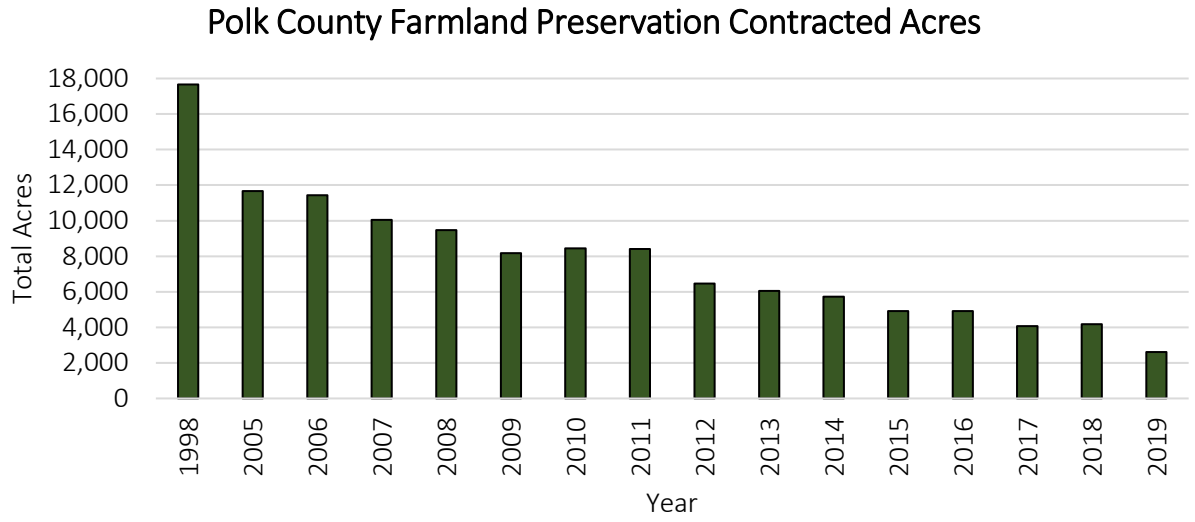
The transect survey can also be used to examine trends in crop type across the county. Currently, the most common crop type in Polk County is corn, followed by soybeans and hay. Long term trends indicate an increase in fields being planted to corn and soybeans and a decrease in fields being planted to hay and CRP.



Farmland Preservation

The Polk County Farmland Preservation Plan was adopted in 1980 and updated in 2004 and 2013. In 2013, land suitability for farmland preservation was re-evaluated and the plan incorporated new farming practices and farm business opportunities. Income tax relief is provided to farmland owners who participate in the program. The county currently has 2,619 acres enrolled in eight farmland preservation agreements which is a decrease from 17,664 acres in 1998. Many factors have contributed to the decrease in farmland preservation acres. More recently, the decrease is due to the 2010 overhaul of the program into the Working Lands Initiative, which specifically identified areas eligible for participation through Agriculture Enterprise Areas. Polk County currently has one Agriculture Enterprise Area where new contract agreements are eligible.

Farmland Preservation Program compliance is evaluated annually. Attempts are made to review 25% of all active Farmland Preservation participants each year. Annual self-certification forms are sent to all active participants and are typically due back by June 1st of each year. For those agreements needing nutrient management plans to meet the soil and water compliance requirements a nutrient management plan checklist is collected each year following the update of the nutrient management plan. For the remaining contracts only in need of a conservation plan to meet compliance, compliance is checked as needed and conservation plans are updated by the request of the participant or as a random status review/update selection. All compliance data is tracked in an Excel database which is maintained by the Polk County Land and Water Resources Department.

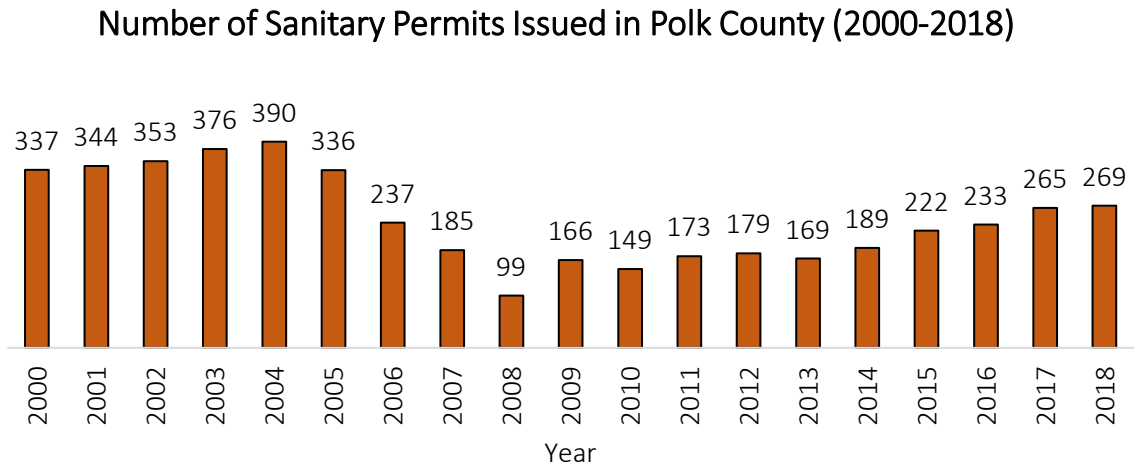


Development Trends

Polk County is generally rural with a 2010 population of 44,205 and a 2018 population estimate of 44,380. Incorporated areas contain 35% of the population. The largest Towns are Osceola and Alden and the largest municipalities are the City of Amery and the Village of Osceola. Since 2010, the Towns of Clam Falls and McKinley and the Villages of Osceola and Clear Lake have had the greatest growth in population. In contrast, the greatest loss in population has occurred in the Villages of Turtle Lake and Luck and in the City of St. Croix Falls.

Residential development is primarily influenced by the county's proximity to metropolitan Minneapolis and St. Paul, Minnesota. Commuting to jobs in the Twin Cities is common. According to the 2010 census, over 20% of Polk County's workforce commutes to jobs in nearby Minnesota. Additionally, Minnesota residents own many of the lakeshore homes in the county.

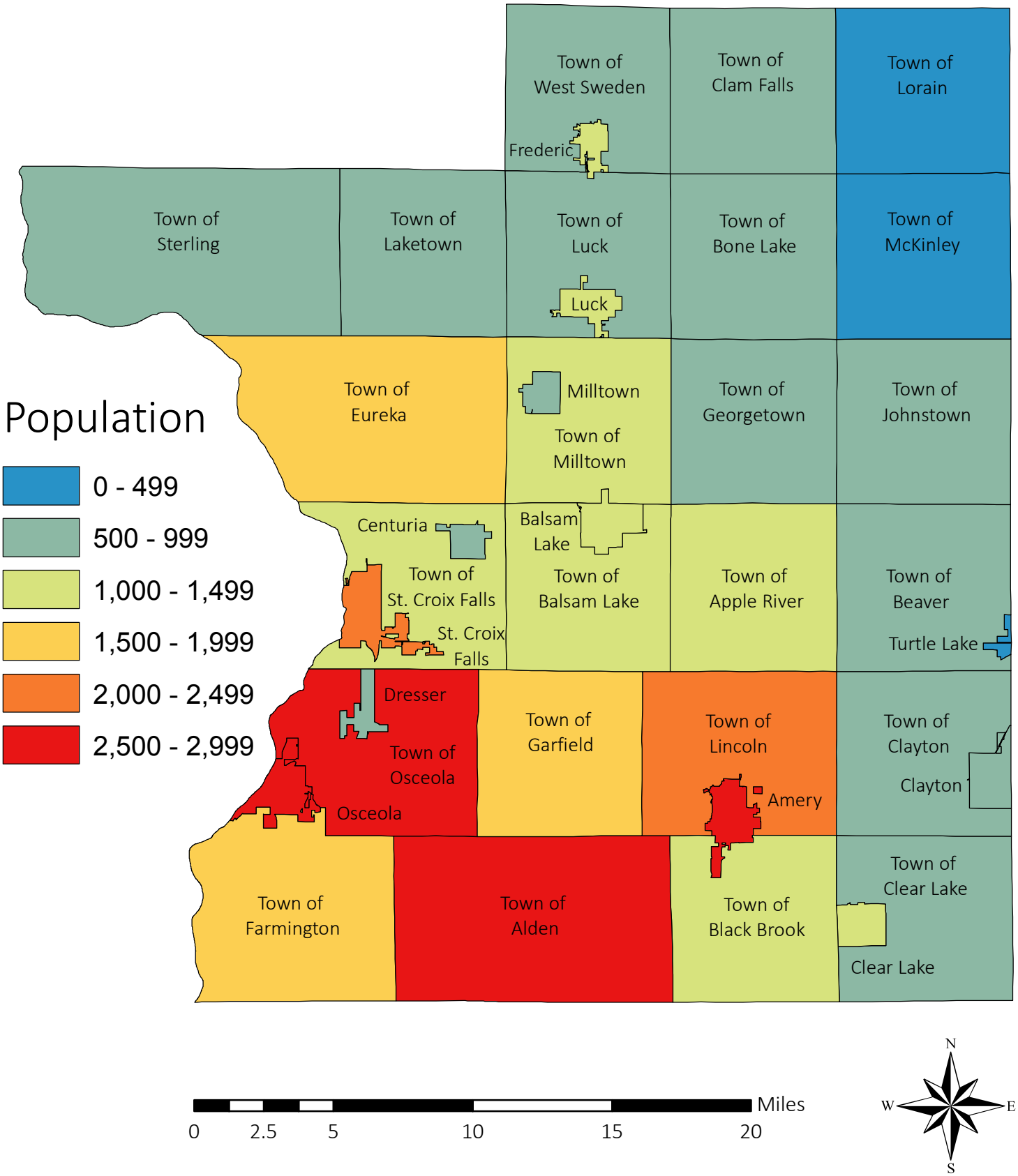
While population growth shows increases only in permanent residents, sanitary permits indicate where new construction in any area of the county without a public sanitary sewer system. Sanitary permits issued from 2000-2018 have varied widely. The County has experienced a significant fluctuation in development levels in the past nearly two decades. Showcasing this variation is the number of sanitary permits issued annually from a low of about 100 in 2008, to a high of nearly 400 in 2004.



During home and road construction, the protective cover of vegetation is removed, infiltration of precipitation decreases, impervious surfaces increase, and rates of soil loss and runoff increase. Increased runoff can increase sediment delivery, increase erosion, increase nutrient loading, and cause flooding on adjacent property. The appeal of living near water attracts development along lakes, streams, and wetlands. When homes and roads are constructed near water resources, soil loss and runoff directly affect water resources in a negative way.

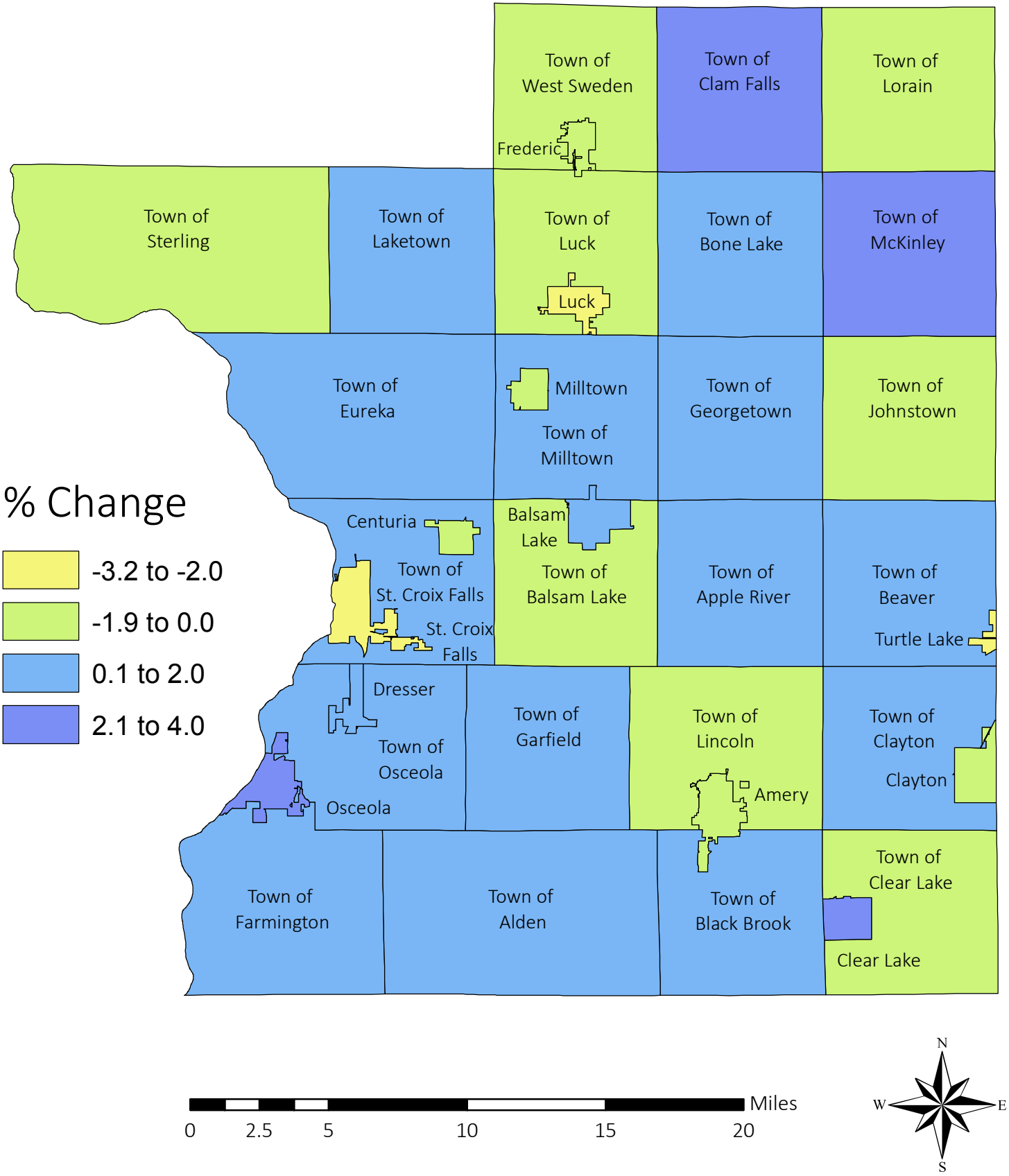
2018 Population

Polk County, Wisconsin



% Population Change 2010-2018

Polk County, Wisconsin



Invasive Species

Aquatic and terrestrial invasive species are non-indigenous species that dwell in water or wetlands and on dry land whose introduction cause, or is likely to cause, economic or environmental harm or harm to human health. When invasive species arrive in Polk County they have a competitive advantage over native species because they lack natural predators, parasites, pathogens, diseases, and competitors to keep their populations in check. As a result, populations of invasive species can explode and outcompete native species by using available resources.

Additionally, many invasive species have life strategies which give them a competitive advantage over native species. Strategies include high reproductive rates, early seasonal growth and development, and tolerance for a wide range of environmental conditions.

Invasive species can come from other parts of the United States or from other countries and can be released either intentionally or unintentionally. Modes and reasons for introduction can vary widely and include: ballast water for shipping, mowing of highway ditches, parks/recreation, food sources, bait sources, seed sources, and the garden/aquarium plant trade. Although some species may have been introduced through natural migration, humans are the primary way invasive species are spread.

Invasive species can displace native species; reduce wildlife habitat; and negatively impact property values, recreational activities, tourism, and industries.

Common invasive species in Polk County include: curly leaf pondweed, Chinese/banded mystery snails, Japanese/giant knotweed, buckthorn, Eurasian bush honeysuckle, wild chervil, wild parsnip, spotted knapweed, purple loosestrife, and yellow iris.

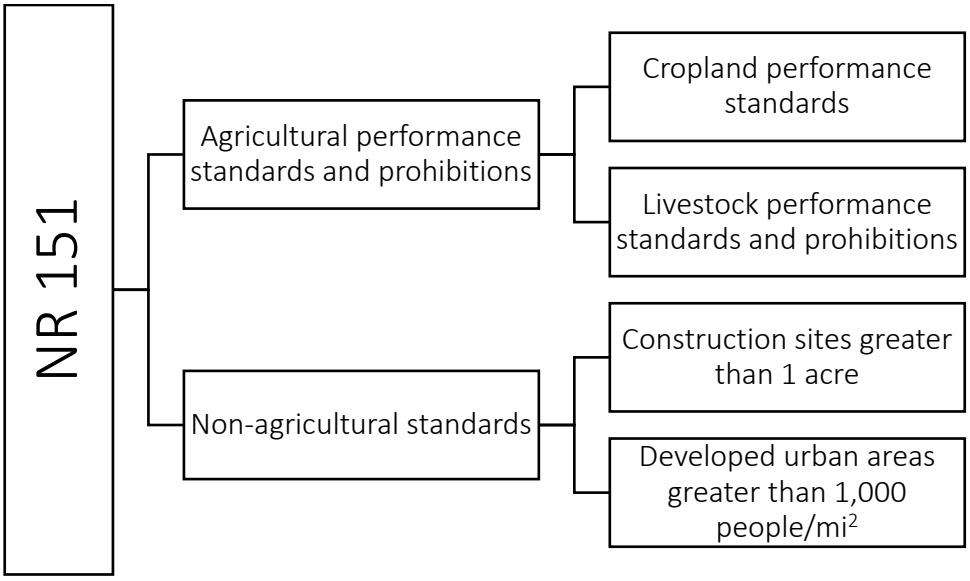
Smaller populations of zebra mussels, phragmites, leafy spurge, oriental bittersweet, Eurasian water milfoil, and rusty crayfish are present in the County. Additionally, both bighead and silver carp have been caught in the St. Croix River, but never upstream of the City of Stillwater and never in large numbers.

WDNR Administrative Rule NR 151 Standards and Prohibitions

County Land and Water Resource Management Plans are the local mechanism to implement Wisconsin Administration Code NR 151, which establishes agricultural and non-agricultural performance standards and prohibitions to reduce runoff and protect water quality.

Through Wisconsin Act 27, the Legislature amended the statutes to allow county Land Conservation Committees to develop and adopt standards and specifications for management practices to control erosion, sedimentation, and nonpoint source water pollution. The Performance Standards and Prohibitions outlined in Chapter 281.16(3a) are a set of procedures used to protect water resources from various agricultural sources of pollution. The statutes require WDNR and WDATCP to further develop performance standards for agricultural and non-agricultural nonpoint pollution sources and identify conservation practices to meet the standards.

Agricultural performance standards and prohibitions apply to both cropland and livestock. Additional performance standards have been developed to target sensitive environmental areas such as Silurian bedrock. Non-agricultural standards apply to construction sites greater than 1 acre and developed urban areas with a population density greater than 1,000 people/square mile.



NR 151 Agricultural Performance Standards and Prohibitions [8]

Cropland Performance Standards

- All land where crops or feed are grown, including pastures shall be managed to achieve a soil erosion rate equal to, or less than, the "tolerable" (T) rate established for that soil.
- No crop producer may conduct a tillage operation that negatively impacts stream bank integrity or deposits soil directly in surface waters. No tillage operations may be conducted within 5 feet of the top of the channel of surface waters. Tillage setbacks greater than 5 feet but no more than 20 feet may be required to meet this standard. Crop producers shall maintain the area within the tillage setback in adequate sod or self –sustaining vegetative cover that provides a minimum of 70% coverage.
- Croplands, pastures, and winter grazing areas shall average a phosphorus index of 6 or less over the accounting period and may not exceed a phosphorus index of 12 in any individual year within the accounting period.
- Manure, commercial fertilizer and other nutrients shall be applied in conformance with a nutrient management plan.

Livestock Performance Standards and Prohibitions

- New or substantially altered manure storage facilities shall be designed, constructed, and maintained to minimize the risk of structural failure and minimize leakage of the facility. The levels of material in the storage facility may not exceed the margin of safety level.
- Closure of a manure storage facility shall occur when an operation where the facility is located ceases operations, or manure has not been added or removed from the facility for a period of 24 months. Manure facilities shall be closed in a manner that will prevent future contamination of groundwater and surface water.
- Existing manure storage facilities that pose an imminent threat to public health, fish, and aquatic life, or groundwater shall be upgraded, replaced, or abandoned.
- There may be no significant discharge of process wastewater to waters of the state.
- Runoff shall be diverted away from contacting feedlots, manure storage areas and barnyard areas within a WQMA.
- A livestock operation shall have no overflow of manure storage facilities.
- A livestock operation shall have no unconfined manure pile in a WQMA.
- A livestock operation shall have no direct runoff from a feedlot or stored manure into waters of the state.
- A livestock operation may not allow unlimited access by livestock to waters of the state in a location where high concentrations of animals prevent the maintenance of adequate sod or self-sustaining vegetative cover.

[8] http://docs.legis.wisconsin.gov/code/admin_code/nr/100/151

Silurian Bedrock Performance Standards

In 2018, WDNR adopted new targeted performance standards into NR 151 to address groundwater issues and protect drinking water and public health. These new standards apply to all crop producers and livestock producers that mechanically apply manure to cropland or pasture areas that meet the definition of Silurian bedrock. This was done to protect the groundwater resources in areas of shallow soils and fractured bedrock also described as karst topography. The Silurian dolomite area comprises portions of the following counties: Brown, Calumet, Dodge, Door, Fond du Lac, Kenosha, Kewaunee, Manitowoc, Milwaukee, Outagamie, Ozaukee, Racine, Sheboygan, Walworth, Washington, and Waukesha. While Polk County is not included in this new targeted performance standard, we do have areas of the county with shallow soils over bedrock. These areas may pose resource concerns depending on surrounding land use.

NR 151 Non-Agricultural Performance Standards

Construction Sites greater than 1 acre

- Must limit discharge of sediment in runoff to no more than 5 tons per acre per year, from initial grading until final stabilization.
- Stormwater management plans and practices on developed sites must meet standards for: total suspended solids, peak discharge rate, infiltration, and buffers around surface water resources.

Municipalities and Developed urban areas greater than 1,000 persons/square mile

- Must address: Public environmental education, yard waste management, nutrient management, and reduction of suspended solids.

Polk County Ordinances

One way the Polk County Board establishes policy is by adopting ordinances. Ordinances are local laws prescribing rules of conduct and are enforced by county officials. Ordinances become a permanent part of the governmental code and may be amended from time to time. Once policy has been approved by the county board of supervisors through plans, budgets, ordinances, and resolutions, it is the responsibility of county staff to implement the decisions of the board. Ordinances relevant to the Land and Water Resource Management Plan are administered by the Land and Water Resources Department and the Department of Land Information Zoning and are briefly summarized below.

Land and Water Resources Department

Manure and Water Quality Management Ordinance

The purpose of this ordinance is to enhance public health, prosperity, and welfare by protecting ground and surface water resources by promoting the proper storage and management of animal waste, including the prohibitions found in NR151.08.

Storm Water Management and Erosion Control Ordinance

The general purpose of this ordinance is to establish regulatory requirements for land development and land disturbing activities aimed to minimize the threats to public health, safety, welfare, and the natural resources in Polk County from construction site erosion and post-construction storm water runoff.

Nonmetallic Mining Reclamation Ordinance

The purpose and goal of this ordinance is to ensure the effective reclamation of nonmetallic mining sites after mining operations have ceased. This ordinance adopts and implements the uniform statewide standards for nonmetallic mining reclamation required by Section 295 of Wisconsin Statute and contained in Wisconsin Administrative Code NR 135. The ordinance in effect means that any proposed nonmetallic mining site (sand, gravel, or other nonmetallic minerals) is required to receive an approved reclamation permit to begin nonmetallic mining operations in Polk County. The permit also requires the development of an approved site specific reclamation plan and for the operator to post financial assurance to guarantee the completion of reclamation.

Illegal Transport of Aquatic Plants and Invasive Animals Ordinance

The purpose of this ordinance is to prevent the spread of aquatic invasive species in Polk County and surrounding waterbodies in order to protect property values and the property tax base and ensure quality recreational opportunities. It requires all plants and invasive animals be removed from a boat and trailer prior to entering a public roadway.

Land Information-Zoning

Comprehensive Land Use Ordinance

The purpose of this ordinance is to promote and protect public health, safety, and other aspects of the general welfare. Further purposes of this ordinance are to: aid in the implementation of provisions of the county comprehensive plan; promote planned and orderly land use development; protect property values and the property tax base; fix reasonable dimensional requirements to which buildings, structures, and lots shall conform; prevent overcrowding of the land; advance uses of land in accordance with its character and suitability; provide property with access to adequate sunlight and clean air; aid in protection of groundwater and surface water; preserve water quality, shorelands, and wetlands; protect the beauty of landscapes; conserve flora and fauna habitats; preserve and enhance the county's rural characteristics; protect vegetative shore cover; promote safety and efficiency in the county's road transportation system; define the duties and powers of certain county officers and administrative bodies relative to the application, administration, and enforcement of the ordinance; and prescribe penalties in the form of civic forfeitures for violations of this ordinance and to facilitate enforcement of the provisions of this ordinance by injunctive relief.

Shoreland Protection Ordinance

The purpose of these shoreland regulations is to ensure the proper management and development of the shoreland of all navigable lakes, ponds, flowages, rivers, and streams in the unincorporated areas of Polk County. The intent of these regulations is to further the maintenance of safe and healthful conditions; prevent and control water pollution; protect spawning ground for fish and aquatic life; control building sites, placement of structures, and land uses; and preserve shore cover and natural beauty.

Private Sewage System Ordinance

The underlying principles of this ordinance are basic goals in environment, health, and safety accomplished by proper siting, design, installation, inspection, maintenance, and management of private on-site waste treatment systems and non-plumbing sanitary systems.

Subdivision Ordinance

The purpose of this ordinance is to regulate and control subdivision development within Polk County to promote public health, safety, general welfare, water quality, and aesthetics. This purpose can be accomplished by requiring an orderly layout and use of land, providing safe access to highways, roads and streets, facilitating adequate provision of water, sewer, transportation and surface drainage systems and parks, playgrounds, and other public facilities.

Lower St. Croix Riverway Ordinance

The purpose of this ordinance is to promote the public health, safety, and general welfare of the public by: reducing the adverse effects of overcrowding and poorly planned shoreline and bluff area development; preventing soil erosion and pollution and contamination of surface water and groundwater; providing sufficient space on lots for sanitary facilities; minimizing flood damage;

maintaining property values; and preserving and maintaining the exceptional scenic, cultural, and natural characteristics of the water and related land of the Lower St. Croix Riverway in a manner consistent with the National Wild and Scenic Rivers Act, the Federal Lower St. Croix River Act of 1972, and the Wisconsin Lower St. Croix River Act.

Floodplain Ordinance

This ordinance is intended to regulate floodplain development in order to minimize the potential for damage, the expenditure of public funds for flood control projects, and interruptions to businesses or other land uses.

Related Plans

The Land and Water Resource Management Plan is meant to direct the work of the Polk County Land and Water Resources Department through the development of goals, objectives, and activities for a ten year timeframe.

However, the planning process is not unique to the Land and Water Resources Department and many organizations have plans with goals, objectives, and activities which are related to or align with those of the Polk County Land and Water Resource Management Plan.

Lake St. Croix Total Maximum Daily Load (TMDL) Implementation Plan, 2013

The St. Croix Lake TMDL plan calls for a 38% reduction in the human-caused phosphorus carried to the rivers and streams of the basin, and eventually entering the St. Croix River and Lake St. Croix. The TMDL sets goals for each watershed in the basin, based on land cover and land uses practices. It also sets a cap on the amount of phosphorus that can be discharged each year by wastewater treatment plants serving communities and industries in the St. Croix Basin. Polk County's phosphorus load is 160,976 pounds of phosphorus per year, which is the largest of any county in the basin.

Subwatershed	Acres in Basin	Loading (lbs/year)	TMDL Load Reduction
Apple	303,298	84,087	28,493
Clam	74,533	14,393	3,733
Trade	60,563	11,607	3,098
Trout	46,172	14,599	5,099
Willow	26,821	9,055	3,350
Wolf	69,725	21,339	7,310
Wood	24,301	5,897	1,676

The Squaw Lake, Lake Mallalieu, and Cedar Lake TMDL also exist within the boundary of the Lake St. Croix TMDL. The Squaw Lake and Cedar Lake TMDL boundary includes land in Polk and St. Croix County and the Lake Mallalieu TMDL includes land in St. Croix, Polk, and Barron County.

Agriculture and Farmland Preservation Plan, 2014

Under Chapter 91, a county must have a certified farmland preservation plan. The Polk County Agricultural and Farmland Preservation Plan identifies the county's goals and policies related to farmland preservation and agricultural development and identifies farmland preservation areas, agricultural enterprise areas, and areas for development within the next 15 years.

Polk County Aquatic Invasive Species Strategic Plan, 2015-2020

This plan provides an overview of aquatic invasive species in Polk County and includes an implementation plan to direct aquatic invasive species work.

Goal 1. Prevent the introduction, establishment, and spread of AIS in Polk County waterbodies
Goal 2. Control populations of aquatic invasive species

Goal 3. Monitor Polk County waterbodies for AIS and document results
Goal 4. Provide AIS information and education in Polk County and surrounding areas
Goal 5. Sustain the implementation of the plan

Polk County Comprehensive Plan, 2009-2029

The Polk County Comprehensive Plan presents a vision for the future of Polk County, with long-range goals, objectives, and policies for housing, transportation, utilities and community facilities, economic development, intergovernmental cooperation, land use, energy and sustainability, and agricultural, natural, and cultural resources.

St. Croix-Red Cedar Cooperative Weed Management Area Strategic Management Plan, 2017

The St. Croix Red Cedar (SCRC) Cooperative Weed Management Area (CWMA) is a partnership of local, state, tribal, and federal agencies, businesses, nonprofits, community organizations, and individuals. Formed in 2013, the group combats invasive species in Washburn, Barron, Burnett, Polk, and St. Croix Counties in northwestern Wisconsin. The SCRC CWMA fosters multi-generational awareness of invasive species and works to prevent and limit their intrusive impacts through partnerships.

Goal 1. Raise public awareness about invasive species through education and outreach efforts
Goal 2. Develop an early detection and management framework
Goal 3. Maintain and build organizational capacity

Polk County Outdoor Recreation Plan, 2014-2019

This plan assesses the existing recreation system in Polk County, identifies recreation needs based upon public input and recreation standards, sets forth goals and objectives to be used as guidelines in formulating recreation plans, and establishes recommendations for improving the recreation system over the next five years.

Polk County Forest Comprehensive Land Use Plan, 2006-2020

The County Forest Comprehensive Land Use Plan seeks to use sustainable forest management practices to protect forestry resources for present and future ecological and socioeconomic needs.

State of the St. Croix Basin, 2002

The Wisconsin Department of Natural Resources prepared the State of the St. Croix Basin in March 2002. The report describes the status of land and water resources in the Wisconsin portion of the basin. Goals for the St. Croix Basin include maintaining and improving water and air quality; maintaining diverse, rich shoreland habitat; preserving large contiguous blocks of forestland; working with the agricultural community to minimize non-point runoff; and working with cities, villages, towns, and counties to help stem urban sprawl.

St. Croix National Scenic Riverway Management Plans

A Cooperative Management Plan was completed for the Lower St. Croix National Scenic Riverway in 2002 and a General Management Plan for the Upper St. Croix and Namekagon Rivers was completed in

1998. The plans describe the direction the National Park Service intends to follow to manage the upper and lower riverways for the next 15-20 years.

Lake Management Plans

Lake studies identify challenges and threats to a lake's health along with opportunities for improvement. These studies identify practices already being implemented by watershed residents to improve water quality and areas providing benefits to a lake's ecosystem. Additionally, these studies quantify practices or areas on the landscape, or within the lake, which have the potential to negatively impact the health of a lake and identify best management practices for improvement.

The end product of most lake studies is a lake management plan which identifies goals, objectives, and action items to either maintain or improve the health of a lake. These goals should be realistic based on inherent lake and watershed characteristics (lake size, depth, land use, etc.) and should align with the goals of watershed stakeholders. Lake management plans are designed to be working documents that are used to guide the actions that take place to manage a specific lake. Additionally, having an approved lake management plan allows lake organizations to apply for WDNR funding to implement improvement projects.

WDNR approved Comprehensive Lake Management Plans are usually updated every five years and exist for the following Polk County Lakes:
Pipe and North Pipe Lakes 2018-2023
Lotus Lake 2018-2022
Big Blake Lake 2016-2021
Long Lake 2017-2022
Loveless Lake 2016-2021
Bone Lake 2015-2020
Big Round Lake 2015-2020
Church Pine, Round, and Big Lakes 2013-2018
Apple River Flowage 2013-2018

Aquatic Plant Management Plans

In many cases an Aquatic Plant Management plan is required to apply for a permit to remove, add, or control aquatic plants. Generally, Aquatic Plant Management Plans describe the lake, present the aquatic plant management circumstances for a lake, and propose a set of goals and actions for managing aquatic plants in the lake.

WDNR approved Comprehensive Aquatic Plant Management Plans are updated every five years and exist for the following Polk County Lakes:
Long Lake 2017-2022
Apple River Flowage 2017-2022
Deer Lake 2017-2022
White Ash Lakes 2017-2022

Staples Lake 2016-2021
Balsam Lake 2015-2020
Church Pine, Round, and Big Lakes 2015-2020
Lake Wapogasset/Bear Trap Lake 2015-2020
Amery Lakes 2014-2019
Bone Lake 2013-2018

Priority Watershed Plans

Priority watershed plans have been completed for the Balsam Branch Watershed, Horse Creek Watershed, and the Osceola Creek Watershed. Priority watershed planning provided a funding mechanism in the 1980s to begin implementing water quality and habitat improvement activities in these watersheds. Through the Priority Watershed Planning program, the WDNR ranked watersheds for nonpoint source problems to identify high priority areas under the state's Nonpoint Source Pollution Abatement Program. Today the WDNR uses these watershed and waterbody rankings to direct funding decisions in the Targeted Runoff Management Grant Program and identify specific work tasks needed in the watershed.

Polk County Land and Water Resource Management Plan Development Process

The Polk County Land and Water Resources Department is tasked with preserving, protecting, and enhancing Polk County's natural resources. This section of the Polk County Land and Water Resources Management Plan (LWRMP) describes the process that was used to develop the goals, objectives, and activities that the Land and Water Resources Department (LWRD) will employ from 2020 –2029 to preserve, protect, and enhance the surface water, groundwater, land, and community resources present in the county.

The Land and Water Resources Department facilitated an advisory committee to elicit local leadership and obtain input to develop the strategy LWRD will employ from 2020-2029 to address agriculture and non-agriculture runoff management, groundwater quality and quantity, stormwater discharge, shoreline management, soil conservation, invasive species and other environmental degradation that affects the natural resources of Polk County.

An initial advisory committee meeting was held on November 27th, 2018. The purpose of the meeting, LWRM Plan Development process, relevant background information, and the approach to implementation were provided at the meeting. A brainstorming session identified Polk County resources to protect and resource concerns. The meeting concluded with a SWOT (strengths, weaknesses, opportunities, threats) analysis. At a second meeting on January 9th, 2019 the committee provided feedback on the goals for the LWRM Plan.

The third planning meeting was held on March 19th, 2019. At this meeting the committee decided that a watershed approach would be best to implement the LWRM Plan, and also completed a worksheet to collect feedback regarding factors to consider when ranking watersheds.[9] Watershed ranking will be used to direct work for implementation. As a point of reference, in the 2009 LWRM Plan the implementation process was driven by location within a water quality management area [10] (WQMA). The committee also provided feedback on the draft goals, objectives, and activities at this meeting.

A fourth planning meeting was held on July 9th, 2019. At this meeting an overview of the watershed ranking process was presented along with the timeline for review and approval of the plan. Committee recommendations were received and incorporated into the plan. The committee approved the draft plan for public review.

A public hearing was held for the Polk County LWRM Plan on August 28th. The Environmental Services Committee approved the plan on August 28th. The Polk County Board of Supervisors approved the plan on September 17th. The plan was submitted to WDATCP and WDNR for review in July, 2019 and for review and approval by the Wisconsin Land and Water Conservation Board in December, 2019.

[9] Rankings were based off of 12 Digit HUC watersheds

[10] A water quality management area is defined as an area 1,000 feet from a lake or 300 feet from a stream

Watershed Ranking

A criteria was developed to rank watersheds at the 12 Digit HUC level to prioritize the workload of the Land and Water Resources Department. The advisory committee provided input on the various factors used to develop the watershed ranking system. Factors were determined to be either primary or secondary. Each watershed was allocated points for each factor. Primary factors received a maximum of fourteen points; whereas, secondary factors received a maximum of ten points. The cumulative point total was used to finalize the watershed priority ranking.

Primary factors included:

- ✓ Phosphorus loading
- ✓ Impaired waters
- ✓ Number of partner groups (Lake organizations, farmer-led groups)
- ✓ Percent acres in water quality management areas
- ✓ Watershed concludes in a lake
- ✓ Percent acres in Polk County
- ✓ Stream order

Secondary factors included:

- ✓ Percent agriculture land cover
- ✓ Number of potential livestock operations
- ✓ Groundwater contamination susceptibility
- ✓ Lake development
- ✓ Highly erodible soils
- ✓ Outstanding resource waters/exceptional resource waters
- ✓ Depth to bedrock

A description of each factor, points assigned for each factor, and final watershed ranking can be found in Addendum B.

Land and Water Resource Management Plan Goals, Objectives, and Activities

The following goals, objectives, and activities were developed and finalized with the Advisory Committee. A two year work plan can be found in Addendum A. The main principles of goal 4—community stewardship, buy-in through a bottom-up approach, and strengthening partnerships—are relevant for the implementation of all goals of the plan.

Goal 1. Protect and improve the water quality of lakes, rivers, and streams
Goal 2. Protect and improve groundwater quality and quantity
Goal 3. Sustain and enhance land resources
Goal 4. Support and develop community stewardship and partnerships to improve our natural resources

The Polk County Board of Supervisors identified strategic priorities for Polk County in 2017. The work of the Land and Water Resources Department is directly linked to the first and fifth priorities—tourism/recreation and water quality, respectively. Polk County's large tourism and recreation revenues are directly tied to clean lakes and rivers. LWRD works to minimize runoff impacts to surface water and groundwater by forming partnerships with local producers, developers, and lake organizations and by implementing a program to prevent aquatic and terrestrial invasive species. The goals, objectives, and activities presented below advance the priorities developed by the Polk County Board of Supervisors for tourism/recreation and water quality.

Goals and Objectives

Goal 1. Protect and improve the water quality of lakes, rivers, and streams

- Objective 1A. Limit runoff and pollution from working lands
- Objective 1B. Limit runoff and pollution from developed landscapes
- Objective 1C. Monitor surface water to ascertain condition and address problems before they impact the resource or human health
- Objective 1D. Prevent and control aquatic invasive species (AIS)

Goal 2. Protect and improve groundwater quality and quantity

- Objective 2A. Obtain pertinent groundwater data to determine current groundwater conditions
- Objective 2B. Evaluate landscape susceptibility to groundwater impairment
- Objective 2C. Administer programs that protect groundwater

Goal 3. Sustain and enhance land resources

- Objective 3A. Preserve working lands and improve soil health and productivity
- Objective 3B. Prevent, control, and eradicate terrestrial invasive species
- Objective 3C. Protect and restore native aquatic and terrestrial habitat
- Objective 3D. Preserve and protect existing landscape diversity

Goal 4. Support and develop community stewardship and partnerships to improve our natural resources

- Objective 4A. Educate the public and elected officials to instill a conservation ethic
- Objective 4B. Encourage natural resource management through civic engagement
- Objective 4C. Maintain and expand partnerships to promote natural resource programs to accomplish the goals of this plan
- Objective 4D. Support staff needs for professional development

Goal 1. Protect and improve the water quality of lakes, rivers, and streams

Objective 1A. Limit runoff and pollution from working lands

Activities:

1. Implement best management practices regarding NR 151 Runoff Management Performance Standards and Prohibitions
2. Continue to administer the Polk County Manure and Water Quality Management Ordinance
3. Continue to support existing Farmer Led Watershed Councils and pursue the formation of new councils
4. Provide education on proper nutrient management and erosion control practices to agricultural producers
5. Encourage use of cover crops, cropland residue, and soil health principles to agricultural producers through education and collaboration with federal or state programs
6. Continue to administer the Working Lands Initiative and the Farmland Preservation Program
7. Collaborate with multi-state efforts to achieve the 20% reduction in total phosphorus loading to the St. Croix Basin
8. Apply for surface water grants to obtain money for installation of conservation practices

Objective 1B. Limit runoff and pollution from developed landscapes

Activities:

1. Continue to administer the Polk County Storm Water Management and Erosion Control Ordinance
2. Provide technical assistance for urban runoff planning and upgrading storm water infrastructure
3. Partner with riparian groups and lake organizations to encourage native plantings, diversions, rock infiltration, rain gardens, rain barrels, and other practices to manage runoff
4. Complete site visits with riparian landowners to provide technical assistance for managing runoff through the WDNR Healthy Lakes grant program
5. Assist with local planning efforts to encourage conservation and resource protection
6. Continue to advise WDNR with NR 115 and Polk County Land Information Department with the Polk County Shoreland Protection Zoning Ordinance
7. Collaborate with multi-state efforts to achieve the 20% reduction in total phosphorus loading to the St. Croix Basin

Objective 1C. Monitor surface water to ascertain condition and address problems before they impact the resource or human health

Activities:

1. Perform water quality studies of chemical, physical, and biological features to ascertain condition of local surface waters as possible
2. Assess the condition of each watershed on a 10 year rotational basis
3. Work with lake and river groups to apply for grants to monitor surface water
4. Assess historic changes at the waterbody and landscape level using sediment cores as possible
5. Quantify runoff and pollution reductions and track practice location and effectiveness using tracking software
6. Utilize and expand the use of new technologies and sampling tools for measuring water quality
7. Expand tributary monitoring for waterbodies as possible
8. Prioritize monitoring of waterbodies known to have blue-green algae blooms
9. Engage volunteers in surface water monitoring programs
10. Analyze landscape features using digital data and computer models to accurately identify drainage patterns

Objective 1D. Prevent and control aquatic invasive species (AIS)

Activities:

1. Implement the Polk County-wide AIS Strategic Plan (below, italics)
    a. *Prevent the introduction, establishment, and spread of AIS in Polk County waterbodies*
    b. *Control populations of aquatic invasive species*
    c. *Monitor Polk County waterbodies for AIS and document results*
    d. *Provide AIS information and education in Polk County and surrounding areas*
    e. *Sustain the implementation of the plan*
2. Update the Polk County-wide AIS Strategic Plan every five years
3. Engage volunteers and partners in AIS monitoring and education whenever possible
4. Continue to administer the Polk County Illegal Transport of Aquatic Plants and Invasive Animals Ordinance
5. Pursue decontamination opportunities
6. Determine which waterbodies are most susceptible to aquatic invasive species to target efforts

Goal 2. Protect and improve groundwater quality and quantity

Objective 2A. Obtain pertinent groundwater data to determine current groundwater conditions

Activities:

1. Reexamine, repeat, and expand previous groundwater inventories including testing for nitrogen, pesticides, and contaminants of concern in drinking water
2. Obtain and utilize data collected by partner groups to expand groundwater datasets from previous inventories
3. Determine the relationship between surface water and groundwater quality and quantity

Objective 2B. Evaluate landscape susceptibility to groundwater impairment

Activities:

1. Identify Wellhead Protection, recharge areas, and potential sources of groundwater contamination
2. Promote Wellhead Protection through other agencies to preserve quality of drinking water
3. Obtain and utilize data collected by partner groups to evaluate risk susceptibility

Objective 2C. Administer programs that protect groundwater

Activities:

1. Facilitate proper abandonment of wells by assisting landowners with locating, properly filling, and sealing unused wells
2. Assist landowners with closing abandoned manure storage facilities
3. Develop and implement measures to protect areas identified in Objective 2B, Action 1

Goal 3. Sustain and enhance landscape resources

Objective 3A. Preserve working lands and improve soil health and productivity

Activities:

1. Continue to administer the Polk County Manure and Water Quality Management Ordinance
2. Continue to administer the Working Lands Initiative and the Farmland Preservation Program
3. Continue to support existing Farmer Led Watershed Councils and pursue the formation of new councils
4. Continue to provide technical assistance and funding for the installation of best management practices to meet NR 151 agricultural performance standards and prohibitions
5. Assess the condition of agricultural land in priority watersheds by completing a cover crop inventory, tillage inventory, and soil phosphorus indexing on a rotational basis
6. Encourage use of cover crops, cropland residue, and soil health principles to agricultural producers through education and collaboration with federal or state programs
7. Utilize computer models to assess erosion vulnerability, nutrient runoff reductions, and crop residue to prioritize best management practice implementation
8. Continue to collect countywide cropland data through the Transect Survey
9. Provide technical assistance and resources as needed to agriculture producers, graziers networks, and other agriculture related conservation organizations
10. Provide education on proper nutrient management, cover crops, soil health principles, erosion control, and nutrient management to agricultural producers
11. Encourage implementation of soil health principles and regenerative agriculture to improve agricultural productivity

Objective 3B. Prevent, control, and eradicate terrestrial invasive species

Activities:

1. Promote and participate in the mission and goals (below, italics) of the St. Croix-Red Cedar Cooperative Weed Management Area
    a. *Raise public awareness about invasive species through education and outreach efforts*
    b. *Develop an early detection and management framework*
    c. *Maintain and build organizational capacity*
2. Work with Towns, Highway Departments, contractors, and utility companies to deliver education and develop best management practices for mowing, seeding, and control strategies
3. Provide education to make the public aware of invasive species, their impact, and their means of spread
4. Support and encourage removal of terrestrial invasive species and restoration of habitat whenever possible
5. Employ strategies to keep native ecosystems intact
6. Work with partner agencies and volunteers to coordinate programs and provide information

Objective 3C. Protect and restore native aquatic and terrestrial habitat

Activities:

1. Partner with riparian groups and lake organizations to promote native riparian and near-shore habitat
2. Promote native habitat on mine reclamation sites when administering NR135 and the Polk County Nonmetallic Mining Reclamation Ordinance
3. Promote re-establishment of native vegetation following invasive species control efforts
4. Promote wetland and shoreland restoration
5. Work with the Polk County Forestry, Parks, and Trails Department to maintain or improve native habitats on county land
6. Assist with conservation easements when opportunities arise
7. Continue to administer the County tree sale

Objective 3D. Preserve and protect existing landscape diversity

Activities:

1. Develop a GIS database documenting land use/land cover changes, cover crops and tillage, aquatic and terrestrial invasive species, nutrient management planning, and best management practices
2. Assist with conservation easements when opportunities arise

Goal 4. Support and develop community stewardship and partnerships to improve our natural resources

Objective 4A. Educate the public and elected officials to instill a conservation ethic

Activities:

1. Provide information and promote events using a variety of communication tools, workshops, and demonstrations
2. Expand natural resource education through innovative approaches and offer incentives whenever possible
3. Foster advocacy for the Land and Water Resources Department (LWRD) by sharing positive outcomes of the department
4. Provide education using the Information and Education Strategies section of this plan

Objective 4B. Encourage natural resource management through civic engagement

Activities:

1. Provide support for volunteers and residents who are properly managing natural resources by both technical and financial means whenever possible
2. Continue to support existing Farmer Led Watershed Councils and pursue the formation of new councils
3. Continue to support existing lake and river organizations and the formation of new organizations
4. Support the formation of riparian watershed councils
5. Encourage and assist citizen peer-to-peer education strategies

Objective 4C. Maintain and expand partnerships to promote natural resource programs to accomplish the goals of this plan

Activities:

1. Join forces with other agencies and volunteers on projects whenever possible and practical
2. Apply for grants with partners whenever feasible.
3. Facilitate meetings and idea exchange between citizens and agencies
4. Expand relationships with local universities to continue an LWRD intern program
5. Continue technical assistance to Polk County Zoning Department regarding NR115 and Polk County Shoreland Protection Zoning Ordinance
6. Explore all means to accomplish the goals of this plan, such as updating and creating ordinances, laws, policies, and incentive programs

Objective 4D. Support staff needs for professional development

Activities:

1. Encourage LWRD staff to attend conferences, seminars, and other educational opportunities to maintain and enhance knowledge of specific subjects as it relates to their job duties whenever possible
2. Achieve and maintain appropriate staff certifications as it relates to their job duties

Information and Education Strategy

An information and education strategy is an important element in meeting the goals, objectives, and action items of this plan. LWRD relies on education to develop stewardship for our natural resources with the ultimate goal of enacting behavior changes that improve Polk County's lakes, rivers, streams, groundwater, and landscape resources.

The information and education strategy includes: groups to reach, messages to convey, and methods used to reach various groups

The information and education strategy will be intended for a variety of groups including:

- Agricultural landowners
- Livestock and crop producers/operators
- Crop consultants
- Owners and homebuyers along lakes, rivers, and streams
- Lake and river organizations (Districts, associations, and conservancies)
- Landscapers
- Contractors
- Garden groups and gardeners
- Outdoor recreation individuals and groups
- Users of lawn fertilizers and pesticides
- FFA, 4-H, and other youth groups
- School and camp groups
- Highway and transportation workers
- Realtors
- Developers
- Homeowner associations

Messages LWRD will convey include:

- The number one pollutant to many of our surface waters is sediment carried by rain (erosion) and snowmelt runoff from streets, yards, development areas, and farm fields
- Vegetation reduces soil loss (erosion) and encourages infiltration
- Best management practices exist to protect surface water, groundwater, and land resources
- LWRD can provide education, technical assistance, and cost share funding for the installation of best management practices
- LWRD can provide site visits to identify options for mitigating the harmful effects of runoff and erosion.
- Cover crops, ground cover, and reduced tillage limit runoff and pollution from agricultural landscapes and improve soil health and productivity
- Erosion control practices and timely construction reduce runoff, pollution, and soil loss from development

- Natural shorelines and vegetated surfaces limit the amount of runoff and pollution that reach surface water
- Wetlands attenuate flooding and filter sediments, nutrients, and pesticides from water
- Municipalities can adopt storm water/erosion control and subdivision ordinances
- Nutrient management plans help agricultural producers effectively manage crop inputs and outputs
- Animal waste is a valuable soil amendment and excellent source of nutrients that when handled properly, can reduce impacts to surface water and groundwater and reduce purchased fertilizers
- Untreated runoff from barnyards and ill-timed manure spreading can negatively impact surface water and groundwater by supplying excess nutrients and bacteria
- County ordinances regulate the temporary storage and application of animal waste near waterbodies
- Native natural areas are the best defense against nutrient and sediment pollution
- Native natural areas are the best defense against invasive species
- Being able to recognize invasive species may allow viable treatment and prevent their spread
- Control of invasive species is costly and not always possible; prevention is paramount
- Eradication of new and localized invasive species should be attempted whenever possible
- Surface water and groundwater are affected by what happens on the land
- Surface water quality and groundwater quality are linked
- Abandoned wells, abandoned manure storage facilities, failing septic systems, and fertilizer applications not used by the crop can negatively impact groundwater
- Effective shoreland zoning helps protect surface water quality
- Well planned development that maintains habitat connectivity preserves agricultural land, wildlife habitat, and other natural resources
- Well planned development decreases the cost of public services to taxpayers
- Land use planning tools, such as conservation easements, green space development, cluster development, rain gardens, swales, and infiltration areas exist for responsible zoning and planning
- Polk County's tourism industry and tax base relies on the health of our water resources

Multiple methods will be used to convey the messages listed above including:

- Tours and field days to highlight conservation areas and projects
- Workshops and trainings
- Presentations
- Attendance at meetings (Town, County, Lake Organization) and events
- Presentations at schools and youth events
- Demonstration sites with educational signs
- Signs and billboards
- Public displays and posters
- Booth at Polk County Fair
- Brochures (existing and newly designed)

- One-on-one site visits
- Individual contact with citizens
- Offer cost sharing and financial assistance
- Provide technical assistance and review services
- Radio announcements and programs
- Newspaper and newsletter articles
- Videos
- LWRD website
- Social media
- Partnerships with organizations with similar messages
- Recognition of conservation stewards
- Conservation themed contests

Land and Water Resource Management Plan Implementation

Implementation of the priority farm strategy will occur on a HUC12 watershed-by-watershed basis, starting with the watershed identified as the highest priority, using the factors and procedures approved by the advisory committee and outlined elsewhere in this plan.

Available staff and cost-share resources will be dedicated toward addressing resource and runoff issues in the highest priority watershed until phosphorus runoff reduction goals are met. The phosphorus reduction goals of the Lake St. Croix TMDL Plan will be used to determine when goals have been achieved for that portion of the county (see page 48 for reductions). Farms and working lands will be reviewed and certified in compliance, or on a path to compliance, with WDNR NR151. Waterfront and developed properties will be reviewed and runoff problems addressed, as well as watershed councils formed and functioning to good effect. The agricultural elements within the watershed may be completed before the waterfront and developed properties, or vice versa, at which time the staff who specialize in those areas may move to the next watershed before work is finished by the other group.

Progress will depend on the level of staffing and cost-sharing available. The two-year work plan found in Addendum A outlines the progress to expect with current staff and cost-share levels. It is the hope and intent of the developers of this plan that additional grant money for staff and cost-sharing will be obtained once this plan has been adopted.

In an effort to document water quality improvement, water quality data will be collected prior to, during, and after watershed work is complete.

Once runoff reduction goals have been met with the highest priority watershed then the next highest ranked watershed will be addressed in similar fashion, and so on until all watersheds have been addressed.

The Polk County LWRD plans to work with the WDNR and other agencies to implement NR 151 using the strategy outlined below. Completion of each task is dependent on receiving adequate funds. Effort will be made to secure necessary funds, and a good faith effort will be made to accomplish each task.

1. Conduct information and education activities

LWRD will distribute information and educational material prepared by the WDNR, USDA, WDATCP, NRCS, and LWRD to relevant landowners. The information may be distributed via news media, newsletters, public information meetings, and one-on-one contacts and will be designed to meet the following objectives:

- Educate landowners and operators about Wisconsin's agricultural performance standards and prohibitions, county ordinances, applicable conservation practices, cost share grant opportunities, and the long term benefits of farming in a sustainable manner
- Promote implementation of conservation practices necessary to meet performance standards and prohibitions

- Inform landowners of compliance procedures and agency roles to be used statewide and locally
- Make landowners aware of expectations for compliance and consequences for non-compliance
- Reach all livestock operations, including those with small numbers of livestock on small acreage

2. Use a watershed approach to select and evaluate parcels for compliance with standards and prohibitions

A list of watershed rankings by priority can be found in Addendum B.

3. Procedure for records, map, GIS inventory review [11]

A map of crop and livestock farms in Polk County will be developed for priority watersheds selected in task 2 above. Parcel records will be evaluated to determine which standards and prohibitions are likely to apply. Landowners already meeting standards and prohibitions as a result of installed or implemented best management practices under an existing state or federal cost share agreement, or maintaining compliance with state or county animal waste regulations, will be determined.

4. Onsite evaluations procedure

A map of farm parcels for on-site evaluations will be compiled and landowners will be contacted to schedule site evaluations. The extent of current compliance with each performance standard and prohibition will be determined and documented. Costs and eligibility for cost sharing will be determined for parcels that are non-compliant. [12]

5. Document and report compliance status

Following completion of records review and on-site evaluation, a NR 151 status report will be developed by the WDNR, completed by LWRD, and issued to owners of the evaluated parcels. At a minimum, the report will convey the following information: [13]

- Current status of compliance of individual parcels with each of the performance standards and prohibitions
- Corrective measure options and rough cost estimates to comply with each of the performance standards and prohibitions for which a parcel is not in compliance.
- Status of eligibility for public cost sharing
- Grant funding sources and technical assistance available from federal, state, and local government
- An explanation of conditions that apply if public cost share funds are used *(if public funds are used, applicable technical standards must be met)*
- A timeline for completing corrective measures, if necessary
- Signature lines indicating landowner agreement or disagreement with report findings

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[11] It is expected that most landowners identified as priorities above will require on-site visits.

[12] Cost share requirements are based upon whether or not the evaluated cropland or livestock facility is new or existing and whether or not corrective measures entail eligible costs (see NR 151).

[13] A cover letter signed by LWRD describing the status report will be attached.

- Process and procedures to contest evaluation results to county
- (Optional) A copy of performance standards and prohibitions and technical design standards

The evaluation and compliance information will be maintained as public record. [14]

6. Offer or arrange for technical assistance and make cost sharing available as needed to install or implement best management practices

Voluntary, or cooperative, course

Landowners will be prompted to voluntarily apply for cost sharing based on information provided in a NR 151 Compliance Status Report. If a landowner request is received by LWRD, cost-share grant eligibility and availability of cost-share and technical assistance will be confirmed. A cost-share agreement listing best management practices to be installed or implemented, estimated costs, project schedule, and notification requirements under NR 151 will be developed.

Non-voluntary, or non-cooperative, course

In the event that a landowner chooses not to install corrective measures either with or without cost sharing, the landowner will be issued notification designed by LWRD with consultation from WDNR per NR151. If eligible costs are involved, the notification will include an offer of cost sharing throughout the compliance period. [15]

7. Administer funding and technical assistance

If cost sharing is involved, a cost-share agreement that includes the schedule for installing and implementing best management practices will be finalized and executed. A list of eligible practices is found in ATCP 50. [16] Cost share rates vary by practice and include eligibility requirements.

The following technical service and oversight will be provided: [17]

- Provide conservation plan assistance
- Review conservation plans prepared by other parties
- Provide engineering design assistance

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[14] The primary objective of this step is to ensure subsequent owners are made aware of and have access to NR 151 information pertinent to their property. The method for maintaining these records and for ensuring relevant information is conveyed to subsequent owners will be discussed with Polk County Corporation Counsel and will follow Polk County Public Records policy.

[15] The notification will include 1) A description of the performance standard or prohibition being addressed; 2) the compliance status determination made in accordance with NR 151; 3) the determination of which best management practices or other corrective measures are needed and which, if any, are eligible for cost sharing; 4) the determination that cost sharing is available, including a written offer of cost sharing when appropriate; 5) an offer to provide or coordinate the provision of technical assistance; 6) a compliance period for meeting the performance standard or prohibition; 7) an explanation of the possible consequences if the owner of operator fails to comply with provisions of the notice; and 8) an explanation of state appeals procedures.

[16] https://docs.legis.wisconsin.gov/code/admin_code/atcp/020/50.

[17] Polk County LWRD does not provide engineering and design assistance to Waste Storage projects (NRCS 313) and other more difficult design projects, unless cost shared.

- Review engineering designs provided by other parties
- Provide construction inspection and/or reviews
- Evaluate and certify installation of conservation practices

After corrective measures are applied, an evaluation will be conducted to determine if the parcel is now in compliance with relevant performance standard(s) or prohibition(s). If site is compliant, the NR 151 Status Report will be updated and a "Letter of NR151 Compliance" will be issued.[18] If the site is not compliant, non-regulatory remedies will be sought or enforcement action will be initiated. [19]

8. Conduct enforcement activities

If a landowner refuses to respond appropriately to a compliance notice, or is in breach of a cost share contract, LWRD will notify the WDNR in writing of the refusal. If landowner is found to be out of compliance, the LWRD will schedule and conduct an enforcement conference. [20] The WDNR will be informed of the enforcement conference. Cases will be referred to Polk County Corporation Council and/or WDNR for enforcement action

9. Monitor compliance

LWRD will conduct periodic evaluations to verify ongoing compliance with agricultural performance standards and prohibitions. Landowners will be asked to complete a self-certification form annually and return it to the LWRD. The LWRD will also complete spot checks on 5-10 percent of sites on an annual basis.

LWRD will respond to complaints by investigating allegations with file review, telephone confirmation, and/or an on-site visit. If the review demonstrates significant violation of the agricultural performance standards, staff will proceed with the strategy for compliance (tasks 3-6 above).

Situations where noncompliance creates an imminent threat to public health and safety will be immediately referred for enforcement action through appropriate county and state entities.

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[18] A letter of NR 151 compliance serves as official notification that the site has been determined to now be in compliance with applicable performance standards and prohibitions. Such a determination is significant because once a site has been determined to be in compliance, it is now the responsibility of the landowner to stay in compliance. No more public cost share money will be used to regain compliance unless noncompliance was a result of forces beyond landowner control. This letter would also include an appeals process if a landowner wishes to contest the findings. When and where counties are not operating under a local ordinance, the issuance of a letter of NR 151 compliance would likely be a joint effort with the WDNR in order to establish the standing that it merits.

[19] Follow-up measures at this stage will differ depending on the circumstances, including whether or not failure to comply is the fault of the landowner. If it is not the fault of the landowner, then non-regulatory remedies will likely be sufficient. If there is an intentional breach of contract, then enforcement action may be necessary.

[20] Enforcement begins at this point in the process. It will be pursued in circumstances where 1) a breach of contractual agreement including failure to install, implement, or maintain BMPs according to the provisions of the agreement occurs OR the landowner has failed to comply with a notice issued, AND 2) non-regulatory attempts to resolve the situation have failed. Polk County may choose to take enforcement action where appropriate based upon authority and procedures under the Polk County Manure and Water Quality Management Ordinance.

10. Track and report program activities and progress

The following records will be maintained and conveyed to DATCP in an annual report:

- Annual site evaluations showing location and compliance status
- Record of estimated costs of corrective measures for each evaluated parcel
- List and location of parcels where public cost sharing has been applied to implement standards and prohibitions, the amount and source of those funds, and the landowner share
- List and location of parcels receiving notification and violation letters
- Annual cost of technical and administrative assistance needed to administer agricultural performance standards and prohibitions, as established in NR151
- List and location of parcels that meet state runoff standards

Land and Water Resource Management Plan Evaluation

Monitoring, modeling, and the storage of data are important tools to evaluate progress towards meeting the goals of the Polk County LWRM Plan. A list of water quality monitoring efforts, non-point source monitoring efforts, models, and databases is included below.

The Land and Water Resources Department prepares an annual Work Plan for DATCP. Progress made towards completing the Work Plan will be used to evaluate LWRD's progress towards meeting the goals of the Polk County Land and Water Resource Management Plan. A Two Year Workplan (2020-2021) is included in Addendum A.

Water Quality Monitoring

Water quality monitoring tracks changes in water quality. LWRD supported programs are italicized.

Program	Resource	Responsible Entity
Citizen Lake Monitoring	Lakes	WDNR, lake organizations
Lake and River Planning Grants	Lakes, rivers	WDNR, lake organizations
Water Quality Appraisals	Lakes, streams	WDNR, farmer-led watershed councils
Directed Lakes	Lakes	WDNR
Sensitive Area Identification	Lakes	WDNR
Aquatic Plant Surveys	Lakes	Lake organizations, WDNR
Macroinvertebrate Data	Lakes, streams	WDNR
Sediment Chemistry	Lakes	WDNR
AIS Citizen Lake Monitoring	Lakes	WDNR, UWEX, lake organizations
Project RED (AIS)	Rivers, streams	River Alliance, WDNR
Nitrate Testing	Groundwater	Health Department
Beach Sampling	Public swim areas	Health Department
Water Action Volunteers	Rivers, streams	Lake organizations, UWEX
Algae Alert Network	St. Croix River	NPS, SCRA
Blue-green Algae Monitoring	Lakes	Health Department
Paleolimnology Studies	Lakes	LWRD, WDNR
Water level data loggers	Lakes, streams	LWRD

Nonpoint Source Monitoring

Nonpoint source monitoring tracks changes in land use or land management practices that affect water quality. Several programs are currently used by resource agencies to track these changes.

Program	Resource	Responsible Entity
Transect Survey	Cropland	LWRD
CRP Acres	Cropland	FSA
Cover Crop and Tillage Inventory	Cropland	LWRD
LandSat	Land cover	WDNR
National Resource Inventory	Land use	NRCS

Nonpoint Source Modeling

Nonpoint source modeling helps estimate environmental conditions and pollutant loads from the field level up to the watershed level. Modeling can also help prioritize where best management practices can be installed and calculate reductions in pollutant loads. Several models are currently used by resource agencies to analyze environmental impacts.

Model	Resource	Responsible Entity
BARNY	Livestock barnyards	LWRD
BERT	Livestock barnyards	LWRD
SnapPlus	Ag nutrient/erosion reduction	LWRD
RUSLE2	Ag soil loss	LWRD
STEPL	Ag BMP pollutant reduction	LWRD
EVAAL	Ag erosion potential	LWRD
NDTI/NDVI	Tillage/cover crop trends	LWRD
WiLMS	Watershed and surface water	LWRD
BATHTUB	Watershed and surface water	LWRD
FLUX	Surface water	LWRD
R	Various resource data	LWRD
P8	Stormwater, watersheds	LWRD
WinSLAM	Stormwater	LWRD

Databases

Databases are used to store and analyze data that is collected through water quality and nonpoint monitoring and modeling.

Polk County LWRD has been working in conjunction with Burnett County and the software company Respec to develop a tracking software to document the installation of conservation practices, track compliance with NR 151 Ag Performance Standards and Prohibitions, aid in the monitoring of invasive species, and assist with the administration of NR135 non-metallic mining reclamation. The software is a spatially based platform that tracks information to the tax parcel level. The software includes a web-based interface called mapFeeder and a mobile application called Fulcrum. This allows LWRD to enter data in the field and access it from the office. This program will help the LWRD document program compliance, phosphorus reductions, and assist with progress reporting. The software will be used to document the installation of conservation practices and track NR 151 compliance beginning in 2020.

LWRD also uploads water quality and aquatic invasive species data into the Wisconsin Department of Natural Resources Surface Water Integrated Monitoring System (SWIMS) database and uses the Great Lakes Early Detection Network (GLEDN) mobile application to report invasive species.

LWRD uses ArcMap to store data related to: closed and sealed wells, animal waste facilities, non-metallic mines, invasive species, and watershed and surface water characteristics.

Addendum A: Two-Year Work Plan (2020-2021)

POLK COUNTY LWRD 2020-21 ANNUAL WORK PLAN
LOCALLY-IDENTIFIED PRIORITIES

CATEGORY (goal and objective from LWRM plan can be added in each category)	PLANNED ACTIVITIES WITH BENCHMARKS If applicable identify focus areas, e.g. HUC 12 watershed code (examples of types of "planned activities" in italics)	PERFORMANCE MEASUREMENTS (examples in italics)
• *Cropland*		
Cropland, soil health and/or nutrient management	*HUC 12 – 070300050801 - farm reviews* *- No-till* *- Cover crops* *- Nutrient mgmt. plan* *- NDTI satellite imagery tool* *Apply for Farmer Written or SEG grant for NMPs* *No-till – HUC 12's 070300050804, 06, 08* *No-till – rest of county* *Cover crops – HUC12's 070300050804, 06* *Cover crops – rest of county* *NM plans – HUC12's 070300051001, 03, 05 and HUC12's 070300050708, 50805, 50807* *NM plans – HUC12's 070300050804, 06* *NM plans – HUC12's 070300050703, 04, 07* *NM plans – rest of county* *Cover crop survey HUC12's 070300050804, 06* *County-wide transect survey* *Try farmer led council - HUC12 070300050707*	*8 reviews* *400 acres* *800 acres* *1600 acres* *LWRM Plan HUC12 priority watershed* *1 grant application per year* *250 new acres, 500 lbs P red., 2900 ac. maintain* *0 new acres, 300 ac. maintain* *0 new acres, 300 ac. maintain* *250 new acres, 188 lbs P red., 1750 ac. maintain* *0 new acres, 1500 ac. maintain* *Total of 2000 new acres, 2000 lbs P red.* *0 new acres, maintain 1428 ac.* *0 new acres, 80 ac. maintain* *0 new acres, 5800 ac. maintain* *Inventory watersheds (24,000 ac.)* *County wide survey about 900 points* *Attempt 1 new farmer led watershed council*
• *Livestock*		
Livestock	*Manure pit closure* *Barnyard runoff control* *Livestock inventory HUC12 070300050801*	*1 pit, 42 lbs P red.* *1 barnyard* *LWRM Plan HUC12 priority watershed*
• *Water quality*		
Water quality/quantity (other than activities already listed in other categories)	*Directed lakes protocol* *Public beach samples* *Lake management plans developed and written* *Lake management plans assisted* *Shoreline inventory* *Water quality testing* *Water quality/quantity monitoring* *Lake level monitoring* *Technical assistance for healthy lakes program* *Point intercept aquatic plant surveys* *Well decommissioning* *Groundwater monitoring grant application*	*6 lakes* *5 beaches each week all summer* *1 lake* *4 lakes* *1 lake* *7 lakes* *3 stream sites* *3 lakes* *15 sites* *3 lakes* *1 well* *1 application (partner with Polk County Health Dept.)*

POLK COUNTY LWRD 2020-21 ANNUAL WORK PLAN
LOCALLY-IDENTIFIED PRIORITIES

- *Forestry*

Forestry	*None*	

- *Invasive*

Invasive species	*State AIS campaigns* *Smart prevention protocol* *Purple loosestrife beetles* *CWMA program* *State AIS citizen training/monitoring program* *AIS signs inventory*	*3 campaigns* *6 lakes* *1 site* *1 enclosed trailer with tools* *3 programs* *Maintained for 86 boat landings using tracking software*

- *Wildlife*

Wildlife-Wetlands-Habitat (other than forestry or invasive species)	*Wildlife damage program* *Tree and plant sales*	*40 participants* *12000 trees sold*

- *Urban*

Urban issues	*Stormwater and construction site erosion control* *Stormwater and construction site erosion control* *Stormwater and construction site erosion control* *Stormwater and construction site erosion control*	*50 site visits* *20 plan reviews* *20 permits, 400 lbs P red.* *At least 2 compliance issues*

- *Watershed*

Watershed strategies	*Producer led watershed council HUC12's 070300050804, 06, 08* *Producer led watershed council – same HUC12's* *County-wide tracking system* *Land and Water Resource Management Plan - #1 ranked HUC12 070300050801*	*6 meetings attend/presentation* *Track P reductions using STEPL and SnapPlus* *10 partner contacts* *BMP and NR 151 compliance GIS tracking system development* *On-site assessment of livestock operations in watershed*

- *Other*

Other	*Nonmetallic mine reclamation* - *Same* - *Same*	*64 plan reviews per year* *64 site inspections per year* *64 mines tracked using GIS tracking software*

Table 2: Planned activity related to permits and ordinances

Permits and Ordinances	Plans/application reviews anticipated	Permits anticipated to be issued
Feedlot permits	0	0
Manure storage construction and transfer systems	1	1
Manure storage closure	1	1
Livestock facility siting	0	0
Nonmetallic/frac sand mining	64 per year	64 per year
Stormwater and construction site erosion control	20	20
Shoreland zoning	0	0
Wetlands and waterways (Ch. 30)	0	0
Other	0	0

Table 3: Planned inspections

Inspections	Number of inspections planned
Total Farm Inspections	*15*
For FPP	*7*
For NR 151	*8*
Animal waste ordinance	3
Livestock facility siting	0
Stormwater and construction site erosion control	20
Nonmetallic mining	64

Table 4: Planned outreach and education activities

Activity	Number
Tours	2
Field days	3
Trainings/workshops	5
School-age programs (camps, field days, classroom)	6
Newsletters	1
Social media posts	0
News release/story/radio	24

Table 5: Staff Hours and Expected Costs (staff can be combined or listed individually)

Staff/Support	**Hours**	**Costs**
County Conservationist	2080 per year	$198,000
Planners/Techs/Water Quality staff	*10400 per year*	*$856,000*
Admin Assistant	*2080 per year*	*$98,000*
Cost Sharing (can be combined)		
Ex. Bonding	*N/A*	*$81,000*
Ex. SEG	*N/A*	$44,000
Ex. MDV	*N/A*	*$0*

HUC 12 Codes

HUC12 Code	HUC12 Name
070300010803	Sand Creek
070300010804	Indian Creek
070300010805	Spencer Lake-North Fork of the Clam River
070300010901	McKenzie Creek
070300010902	Sucker Creek-Clam River
070300010903	Knapp Creek-Clam River
070300010904	Clam Lake
070300050101	Spirit Lake
070300050103	Wood Lake-Wood River
070300050207	Lagoo Creek-Saint Croix River
070300050501	Upper Trade River
070300050503	Middle Trade River
070300050504	Cowan Creek
070300050505	Lower Trade River
070300050601	Wolf Creek
070300050602	Governor Knowles State Forest-St. Croix River
070300050604	McKeith Lake Non-Contributing Area
070300050605	Big Rock Creek-Saint Croix River
070300050701	Staples Creek-Apple River
070300050702	Straight River
070300050703	Bone Lake
070300050704	Rice Bed Creek-Apple River
070300050705	South Branch of Beaver Creek
070300050706	Beaver Brook
070300050707	Apple River Flowage
070300050708	Bull Brook-Apple River
070300050801	Balsam Lake
070300050802	Wapogasset Lake
070300050803	Peabody Creek
070300050804	Horse Lake-Horse Creek
070300050805	South Fish Lake Non-Contributing Area
070300050806	Cedar Lake-Horse Creek
070300050807	Black Brook Flowage-Apple River
070300050808	Squaw Lake Non-Contributing Area
070300050902	Osceola Creek-Saint Croix River
070300050903	McLeods Slough-St. Croix River
070300050904	Pine Lake

070300051001	Wolf Creek-Willow River
070300051003	Black Brook-Willow River
070300051005	Ridge Lake Non-contributing
070500070501	Upper South Fork of the Hay River
070500070603	Moon Creek-Turtle Creek

Addendum B: Watershed Ranking Metadata Descriptions

A criteria was developed to rank watersheds at the 12 Digit HUC level to prioritize the workload of the Land and Water Resources Department. Descriptions of each primary and secondary factor important for ranking watersheds and final watershed ranking can be found below.

Primary Factors

Phosphorus Loading

The phosphorus loading for each HUC 12 within the county was estimated using the Pollutant Load Ratio Estimation Tool-Lite (PRESTO-Lite). PRESTO-Lite summarizes upstream watershed characteristics including point and nonpoint phosphorus loads, landcover, modeled stream flow, and natural community type for any user-defined watershed. The application relies on existing DNR efforts including the Pollutant Load Ratio Estimation Tool (PRESTO) desktop program and the Wisconsin Hydrography Dataset Plus.

Areas outside the HUC 12 level of a particular watershed were subtracted from the total in order to give an accurate representation of the phosphorus loading only within the HUC 12 boundary. The phosphorus load was adjusted by multiplying the total load by the percent of the watershed acres in Polk County in an effort to estimate pounds of phosphorus contributed from Polk County.

Phosphorus is necessary for plant and animal growth. Excessive amounts can lead to an overabundance of growth which can decrease water clarity and lead to nutrient pollution in lakes. Watersheds with higher phosphorus loads received a higher priority ranking.

Points	Phosphorus Loading (pounds in Polk)
0	
2	
4	0 - 999
6	1000 - 1999
8	2000 - 2999
10	3000 - 3999
12	4000 - 4999
14	≥ 5000

Impaired Waters

Data sets detailing Wisconsin lakes, rivers, and streams listed as impaired waters under Section 303(d) of the Clean Water Act were obtained from the Wisconsin Department of Natural Resources GIS Open Data Portal. These data sets include water bodies that have been evaluated and determined to not meet state water quality standards. The list of Wisconsin's impaired waters are updated with the United States Environmental Protection Agency on a biennial basis. The most recent update was approved in 2018.

Impaired waters are an indicator that land use practices within the watershed are having a negative effect on water quality. Efforts to improve water quality should be prioritized in watersheds containing impaired waters. The total number of impaired waters within each watershed was documented. Watersheds with a higher number of impaired watershed received a higher priority ranking.

Points	Number of Impaired Waters
0	0
2	
4	
6	1
8	2
10	3
12	4
14	5

Number of Partner Groups

Lake and river organizations (Districts, Associations, Conservancies, etc.) and farmer led groups were included in the count of partner groups. A formalized dataset does not exist for partner groups. LWRD staff identified partners within a watershed. Partner groups increase the likelihood that a project will be implemented successfully. Additionally, in many cases partner groups are eligible for a diversity of funding sources for project implementation. Watersheds with more partners received a higher priority ranking.

Points	Number of Partner Groups
0	0
2	
4	1
6	2
8	3
10	4
12	5
14	6

Percent Acres in Water Quality Management Areas

Water Quality Management Areas (WQMA) are defined as all land within 1,000 feet from a lake, pond, or flowage and 300 feet from a river or stream. Polk County maintains two ESRI shapefiles delineating water bodies and steams within the county. Polk County aerial imagery was flown in May 1996 at a height of approximately three miles, resulting in a photo scale of 1:31,680 and a digital orthophoto resolution of one meter pixels. Ayres Associates, Madison, digitized all hydrography features and provided this data as a two-dimensional AutoCAD drawing file. The data was provided in the custom

Polk County Coordinate system. In 2006 Polk County converted the AutoCAD hydrography file into an ESRI shapefile creating the Hydro96Body and Hydro96Stream files. These files have been updated as more accurate information has become available. WQMAs were delineated by applying a 1,000 foot buffer around the Hydro96Body features and a 300 foot buffer around the Hydro96Stream features.

Land in close proximity to surface waters are susceptible to having a direct impact on water quality. The total number of acres of land falling within a WQMA was calculated for each watershed. The percent of the total watershed area that includes a WQMA was determined. Watersheds with a higher percentage of land within a WQMA have the potential to have a larger negative impact and received a higher priority ranking.

Points	Percent Watershed in WQMA
0	0 - 9
2	10 - 19
4	20 - 29
6	30 - 39
8	40 - 49
10	50 - 59
12	60 - 69
14	≥ 70

Watershed Concludes in a Lake

Water quality at the outlet of a watershed can be used as an indicator of the environmental condition of the entire watershed. Lakes near the downstream end of a watershed offer an opportunity to assess water quality based on standardized lake monitoring procedures. Long term water quality monitoring of these lakes can be used to document changes that validate the effect conservation practices are having throughout the watershed. The Hydro96Body and Hydro96Stream shapefiles were analyzed by measuring stream distance from the end of the watershed to the nearest waterbody. Lakes that were within 5 miles of the end of the watershed received a higher priority ranking.

Points	Distance (miles) to nearest lake
0	≥ 5.1
7	2.6 - 5
14	0 - 2.5

Percent Acres in Polk County

A data set delineating the complete set of digital hydrologic unit boundaries, to the sub-watershed (HUC-12) level, for the State of Wisconsin was downloaded from the Wisconsin DNR GIS Open Data Portal. This layer was modified to include only HUC-12 watersheds that fall partially or entirely within the boundary of Polk County. This data layer included the total acreage of each watershed.

The primary scope of the work the Polk County LWRD conducts reaches only those areas within the county boundary. The portion of watersheds outside the county boundary would fall under the authority of adjoining counties. The total area of each watershed that falls within the county boundary was calculated. The percent of each watershed within the county boundary was recorded. Watersheds with a higher percentage of land within the county received a higher priority ranking.

Points	Percent of Watershed in Polk County
0	< 10
2	10 - 24
4	25 - 39
6	40 - 54
8	55 - 69
10	70 - 84
12	85 - 99
14	100

Stream Order

Stream order is a systematic way to measure the relative size of a stream or river. First-order streams are the smallest, outermost tributaries that feed a steam system. Stream order increases where two stream segments of the same stream order merge. Where streams with different stream orders merge, the resulting stream maintains the larger order designation. The Wisconsin DNR maintains a classification of stream order on their Surface Water Data Viewer website.

As stream order increases, the amount of potential land surface feeding that stream also increases. Watersheds with a higher stream order could be prone to higher water quality impairment due to land use practices over a larger geographic area. Conservation practices implemented in watersheds lower in a stream system may not have a large impact on water quality if pollutants are being transported from areas upstream. Conservation practices implemented in watersheds with lower stream order have the potential to have a larger impact on preserving or improving water quality within its watershed and downstream watersheds. The highest stream order at the outflow of each watershed was documented. Watersheds with lower stream order received a higher priority ranking.

Points	Highest Stream Order
0	
2	
4	
6	5
8	4
10	3
12	2
14	1

Secondary Factors

Percent Agricultural Land Cover

Agricultural land cover for Polk County was determined from the United States Department of Agriculture-National Agricultural Statistics Service (USDA-NASS) Cropland Data Layer (CDL) from 2017. The CDL is an annual geo-referenced, crop-specific land cover raster data layer that utilizes satellite images to identify land cover. This layer is available for download from the USDA-NASS website [21] or the CropScape web portal. [22] The data layer classifies land cover as 1 of 85 possible standardized categories with an emphasis placed on identifying cropland. The CDL was manipulated to remove non-agricultural land cover resulting in a data layer identifying only agricultural land in Polk County in 2017.

Agricultural land can be used for a variety of agricultural practices from continuous row crop with intense tillage to managed rotational grazing. Potential impacts to water quality fluctuate depending on the management practices utilized on agricultural land. The total acres of agricultural land cover was determined for each watershed using the CDL. The percentage of the watershed with agricultural land was calculated. Watersheds with a higher percentage of agricultural land have the potential to have a greater negative impact on water quality and received a higher priority ranking.

Points	Percent of Watershed with Agricultural Land
0	0
2	1 - 14
4	15 - 29
6	30 - 44
8	45 - 59
10	60 - 79

Number of Potential Livestock Facilities

Ayres Associates provided Polk County with digital, color orthoimagery services in 2015 as part of the Wisconsin Regional Orthophotography Consortium. The aerial imagery was collected on April 14th and 15th using a Microsoft Vexcel UltraCam Eagle sensor mounted in a fixed-wing aircraft. Aerial imagery was collected to support 0.5 foot ground sample distance (GSD) orthoimagery to meet ASPRS Class II horizontal accuracy specifications at 1" = 100' map scale. The horizontal accuracy meets our 2.0 foot RMSE using the National Standard for Spatial Data Accuracy standards. Resultant orthoimagery was rectified to a DEM created from LiDAR data acquired in 2015.

Orthoimagery was delivered in PLSS section GeoTiff and MrSID tiles and a project-wide MrSID mosaic. The orthoimagery was delivered according to a section tile schematic. The total project area is 946 sq.

[21] https://www.nass.usda.gov/Research_and_Science/Cropland/SARS1a.php
[22] https://nassgeodata.gmu.edu/CropScape

miles, plus a 500-ft buffer to the north, east and south and a 1000-ft buffer to the west around the county boundary.

The 2015 aerial photo was utilized to identify potential livestock facilities by documenting sites with indicators of the presence of livestock. Indicators include farm buildings, outdoor animal lots, bare soil areas, animals, animal feeding equipment, fencing, and other indicators visible by aerial photo.

Facilities that house livestock have the potential to negatively impact water quality through runoff from animal lots, feed storage facilities, and improper manure management practices. Watersheds with a higher number of livestock facilities have the potential to have a greater negative impact on water quality thus receiving a higher priority ranking.

Points	Number of Potential Livestock Facilities
0	0
2	1 - 19
4	20 - 39
6	40 - 59
8	60 - 79
10	80 - 100

Groundwater Contamination Susceptibility

The Groundwater Contamination Susceptibility Map of Wisconsin is a composite of five resource characteristic maps, each of which was derived from generalized statewide information at small scales, and cannot be used for any site-specific purposes.

Five physical resource characteristics were identified as important in determining how easily a contaminant can be carried through overlying materials to the groundwater. These characteristics are depth to bedrock, type of bedrock, soil characteristics, depth to water table and characteristics of surficial deposits. Existing statewide maps of these five characteristics were used whenever possible. New maps were compiled when existing information wasn't already mapped. The resource characteristic maps used in this project were compiled from generalized maps at a scale of 1:250,000 or 1:500,000.

The Groundwater Contamination Susceptibility Map of Wisconsin doesn't show areas that will be contaminated, or areas that cannot be contaminated. Whether an area will have groundwater contamination depends on the likelihood of contaminant release, the type of contaminants released and the sensitivity of the area to the contamination. In turn, the likelihood of contaminant release depends on the type and intensity of the land use and contaminant sources in an area. The map highlights areas sensitive to contamination and shows them in a generalized way.

There are many limitations in the use of this composite map. It is compiled from much generalized statewide information at a small scale, and therefore, cannot be used for any site specific purposes. For example, siting waste disposal facilities or locating an industry requires site-specific, geologic and hydrogeologic information, and can't be made based on this composite map. The Groundwater Contamination Susceptibility Map doesn't consider the individual characteristics of specific contaminants or the subsurface release of contaminants. That is, it only considers the ability of water to move from the land surface to the water table.

Map source: Schmidt, R.R., 1987, Groundwater contamination susceptibility map and evaluation: Wisconsin Department of Natural Resources, Wisconsin's Groundwater Management Plan Report 5, PUBL-WR-177-87, 27 p. Available at the "Protecting Wisconsin's Groundwater through Comprehensive Planning" website. [23]

The groundwater-contamination susceptibility map was used to determine a ranking of groundwater contamination by watershed in Polk County. Groundwater contamination values were selected by watershed and averaged to obtain average groundwater contamination values. The groundwater contamination values range from low to high on a numerical scale, with low numbers indicating higher potential for contamination and higher numbers indicating lower potential for groundwater contamination.

Watersheds with a higher risk of groundwater contamination received a higher priority ranking.

Points	Groundwater Susceptibility Factor
0	
2	60.1 - 70
4	50.1 - 60
6	40.1 - 50
8	30.1 - 40
10	20 - 30

Lake Development

Lake classification in Polk County is a relatively simple model that considers: lake surface area, maximum depth, lake type, watershed area, shoreline irregularity, and existing level of shoreline development. These parameters are used to classify lakes as class one, class two, or class three lakes. Class one lakes are large and highly developed, class two lakes are less developed and more sensitive to development pressure, and class three lakes are usually small, have little or no development, and are highly sensitive to development pressure. Lake classification is a component of the Hydro96Body shapefile.

[23] http://wi.water.usgs.gov/gwcomp/

Class one lakes have increased levels of development, impervious surfaces, and degraded shoreline. Restoration is a greater priority on these higher developed lakes. Watersheds with class one lakes received a higher priority ranking.

Points	Highest Lake Class Present in Watershed
0	Class 1, 2, and 3 absent
2	Class 3
6	Class 2
10	Class 1

Highly Erodible Soils

A list of soils that have been determined to meet the definition of Highly Erodible Land was obtained from the United States Department of Agriculture-Natural Resource Conservation Service (USDA-NRCS) Field Office Technical Guide. Highly Erodible Soils were identified from the Gridded Soil Survey Geographic (gSSURGO) Database for Wisconsin. This data layer is a digital soil survey developed from the National Cooperative Soil Survey and is available online from the USDA-NRCS Geospatial Database. [24]

Highly erodible soils are vulnerable to the erosive effects of development and intense agricultural management. These soils have the potential to have an increased negative effect on water quality. Using the gSSURGO data layer, the total acres of highly erodible soils within each watershed was calculated. The percent of the total watershed area that contains highly erodible soils was determined. Watersheds with a higher percentage of land with highly erodible soils have the potential to have a larger negative impact on water quality thus receiving a higher priority ranking.

Points	Percent of Watershed with Highly Erodible Soils
0	0
2	1 - 14
4	15 - 29
6	30 - 44
8	45 - 59
10	60 - 79

Outstanding Resource Waters/Exceptional Resource Waters

Data sets detailing Outstanding Resources Waters (ORW) and Exceptional Resource Waters (ERW) were obtained from the Wisconsin Department of Natural Resources GIS Open Data Portal. These datasets

[24] Soil Survey Staff. Gridded Soil Survey Geographic (gSSURGO) Database for Wisconsin. United States Department of Agriculture, Natural Resources Conservation Service. Available online at http://datagateway.nrcs.usda.gov/. November 16, 2015 (FY2016 official release)

were developed in the 1990s using descriptions of ORW/ERW designations listed in Wisconsin Administrative Code Chapter NR102. Datasets were based off a 1:24,000 scale hydrography datalayer using 7.5 minute USGS topographic quadrangle maps. Additional ORW/ERW designations were developed from the 1:24,000 scale hydrolayer. The spatial data quality has been reviewed and updated as more detailed data is available.

ORW and ERW waters are the state's highest quality lakes, streams, and flowages. The pristine nature of these waters are worth protecting against future impairment. The number of ORW and ERW was determined for each watershed. Watersheds with ORW and ERW or multiple designated waters received higher priority.

Points	Number of ORW/ERW
0	0
2	
4	
6	1
8	
10	2

Depth to Bedrock

Areas of land that are less than five feet to bedrock are delineated in the feature class created by the Department of Agriculture, Trade and Consumer Protection on 5/6/2016 with SSURGO soils data provided by the USDA Natural Resources Conservation Service, November 2015.

Depth to bedrock is defined as the distance from the land surface to the top of the bedrock (uppermost consolidated deposit). When the depth to bedrock is shallow, contaminants generally have less contact time with the earth's natural pollutant removal process. Depth to bedrock is therefore an important indicator in determining an areas susceptibility to groundwater contamination. Watersheds with more total acres of shallow bedrock (less than 5 feet) received higher priority.

Points	Total Acres of Shallow Bedrock (<5ft)
0	0
2	1 - 399
4	400 - 799
6	800 - 1199
8	1200 - 1599
10	1600 - 1999

Watershed Ranking Metadata

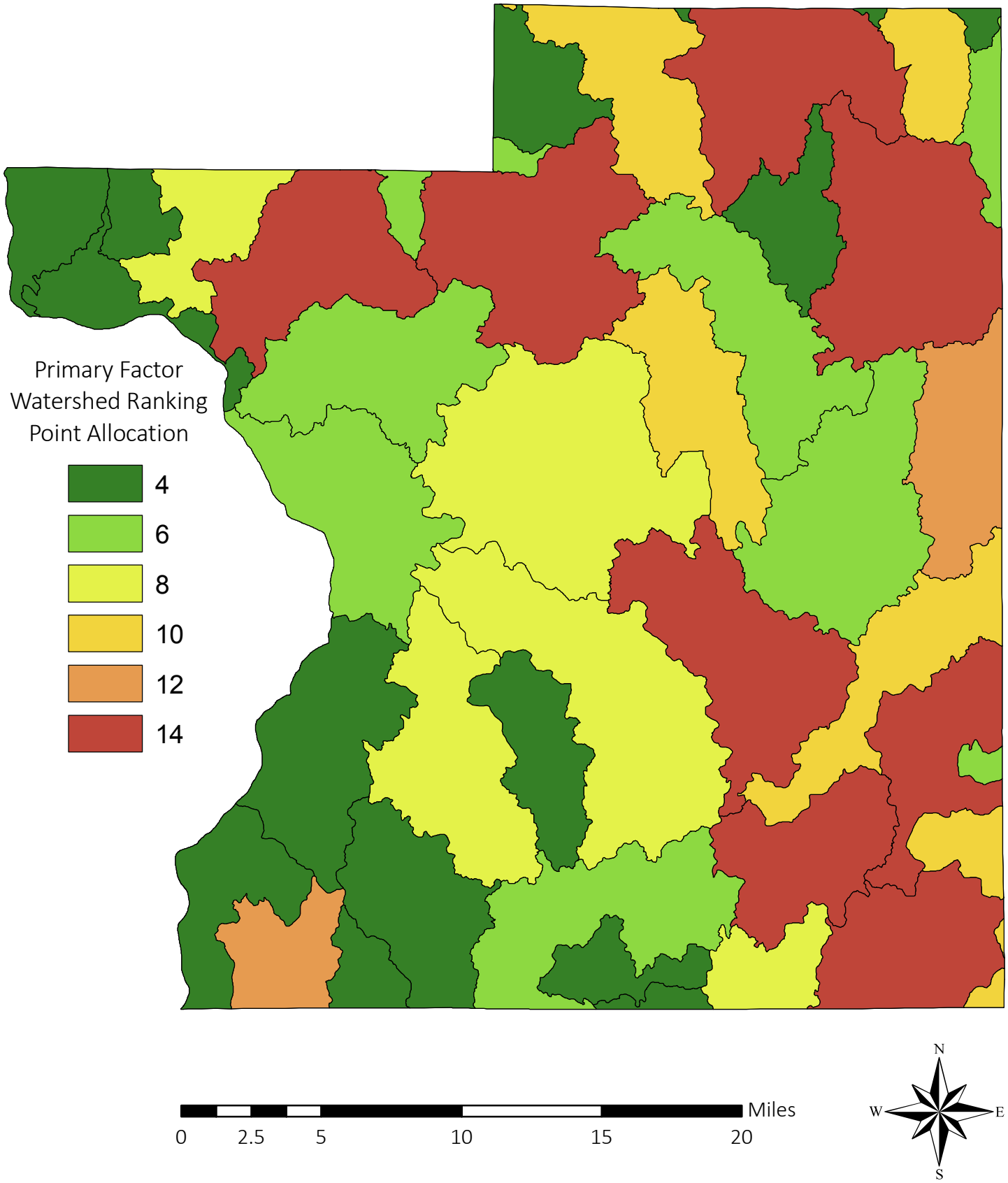
Rank	Name	Phosphorus loading	Impaired waters	Number of partner groups	Percent acres in WQMA	Watershed end in lake	Percent acres in Polk County	Stream order	Sum of primary	Percent agricultural land cover	Number of potential livestock facilities	Groundwater contamination susceptibility	Lake development	Highly erodible soils	ORW/ERW	Depth to bedrock	Sum of secondary	Sum of primary and secondary
1	Balsam Lake	8	10	14	12	14	14	10	82	8	10	6	10	8	0	2	44	126
2	Horse Lake-Horse Creek	8	14	8	8	14	14	10	76	8	6	8	10	8	6	2	48	124
3	Wapogasset Lake	8	10	12	12	7	14	10	73	6	10	6	10	8	6	2	48	121
4	Apple River Flowage	14	6	4	10	14	14	6	68	6	8	6	10	8	10	0	48	116
5	Upper Trade River	14	10	4	8	14	12	10	72	6	8	4	10	8	0	4	40	112
6	Straight River	6	8	6	14	14	14	10	72	4	4	4	10	8	0	2	32	104
7	Cedar Lake-Horse Creek	4	6	6	8	14	12	10	60	8	6	8	10	10	0	2	44	104
8	South Branch of Beaver Creek	14	6	4	10	7	12	8	61	8	6	4	10	6	0	0	34	95
9	Rice Bed Creek-Apple River	6	8	4	12	7	14	8	59	4	6	6	10	8	0	0	34	93
10	McKenzie Creek	4	6	4	10	7	14	10	55	4	2	6	6	8	10	2	38	93
11	Staples Creek-Apple River	12	10	4	12	0	6	8	52	4	4	6	10	8	6	0	38	90
12	Bone Lake	10	6	6	12	0	14	8	56	4	4	6	10	8	0	0	32	88
13	Sucker Creek-Clam River	14	0	4	10	0	12	10	50	4	6	6	10	6	6	0	38	88
14	Wolf Creek	14	0	0	10	0	12	10	46	8	8	4	6	8	6	2	42	88
15	Osceola Creek-Saint Croix River	4	6	0	6	7	10	12	45	6	4	4	2	8	6	10	40	85
16	Beaver Brook	10	6	4	8	0	10	8	46	8	6	6	10	6	0	0	36	82
17	Knapp Creek-Clam River	14	0	0	8	0	10	8	40	4	6	6	6	6	10	4	42	82
18	McKeith Lake Non-Contributing Area	6	0	0	10	0	14	12	42	8	8	4	6	10	0	2	38	80
19	Big Rock Creek-Saint Croix River	6	6	0	8	0	8	10	38	6	10	2	2	10	10	2	42	80
20	Bull Brook-Apple River	14	0	4	8	0	14	10	50	8	6	4	2	6	0	0	26	76
21	Peabody Creek	4	0	0	10	0	14	12	40	10	4	6	2	8	6	0	36	76
22	Black Brook Flowage-Apple River	6	0	0	8	0	12	6	32	8	8	6	10	8	0	0	40	72

Watershed Ranking Metadata

Rank	Name	Phosphorus loading	Impaired waters	Number of partner groups	Percent acres in WQMA	Watershed end in lake	Percent acres in Polk County	Stream order	Sum of primary	Percent agricultural land cover	Number of potential livestock facilites	Groundwater contamination susceptibility	Lake development	Highly erodible soils	ORW/ERW	Depth to bedrock	Sum of secondary	Sum of primary and secondary
23	Pine Lake	12	0	0	8	0	10	14	44	10	4	4	0	8	0	0	26	70
24	Middle Trade River	6	6	4	12	0	2	8	38	6	2	4	10	8	0	2	32	70
25	McLeod's Slough-St. Croix River	4	6	0	8	0	4	14	36	8	4	4	0	6	6	6	34	70
26	Squaw Lake Non-Contributing Area	4	0	4	12	0	6	14	40	10	2	6	0	8	0	0	26	66
27	Spirit Lake	4	0	0	10	0	8	12	34	6	2	6	6	10	0	2	32	66
28	Indian Creek	10	0	0	6	0	12	10	38	6	2	6	2	4	6	0	26	64
29	Wood Lake-Wood River	10	0	0	10	0	6	8	34	4	6	4	6	8	0	2	30	64
30	South Fish Lake Non-Contributing Area	4	0	0	10	0	14	10	38	8	2	6	2	6	0	0	24	62
31	Wolf Creek-Willow River	14	0	0	6	0	6	8	34	10	8	6	0	4	0	0	28	62
32	Black Brook-Willow River	8	0	0	8	0	4	8	28	8	4	6	2	6	0	0	26	54
33	Sand Creek	6	0	0	10	0	2	8	26	2	2	4	0	10	10	0	28	54
34	Lagoo Creek-Saint Croix River	4	0	0	2	0	4	14	24	2	2	10	0	2	6	2	24	48
35	Upper South Fork of the Hay River	10	0	0	8	0	2	8	28	8	4	2	0	4	0	0	18	46
36	Moon Creek-Turtle Creek	6	0	0	12	0	0	8	26	6	2	4	2	6	0	0	20	46
37	Ridge Lake Non-contributing	4	0	0	6	0	2	12	24	10	2	4	0	6	0	0	22	46
38	Governor Knowles State Forest-St. Croix River	4	0	0	4	0	8	10	26	2	2	4	0	4	6	0	18	44
39	Clam Lake	4	0	0	14	0	0	6	24	4	0	10	0	2	0	0	16	40
40	Cowan Creek	4	0	0	2	0	4	12	22	2	0	10	0	4	0	0	16	38
41	Lower Trade River	8	0	0	2	0	4	8	22	2	2	10	0	2	0	0	16	38
42	Spencer Lake-North Fork of the Clam River	4	0	0	8	0	0	6	18	4	0	8	0	4	0	0	16	34

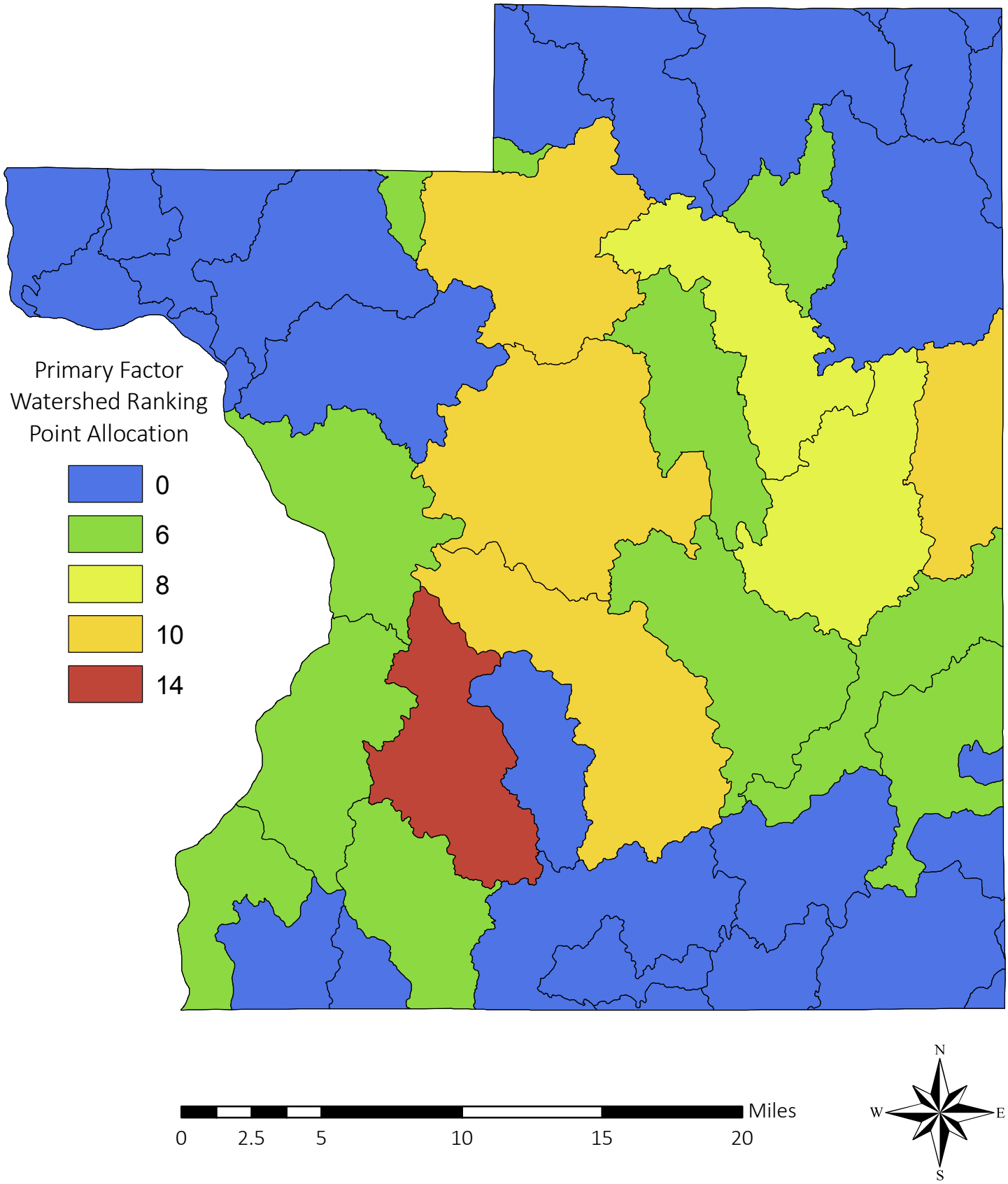
Phosphorus Loading

Polk County, Wisconsin



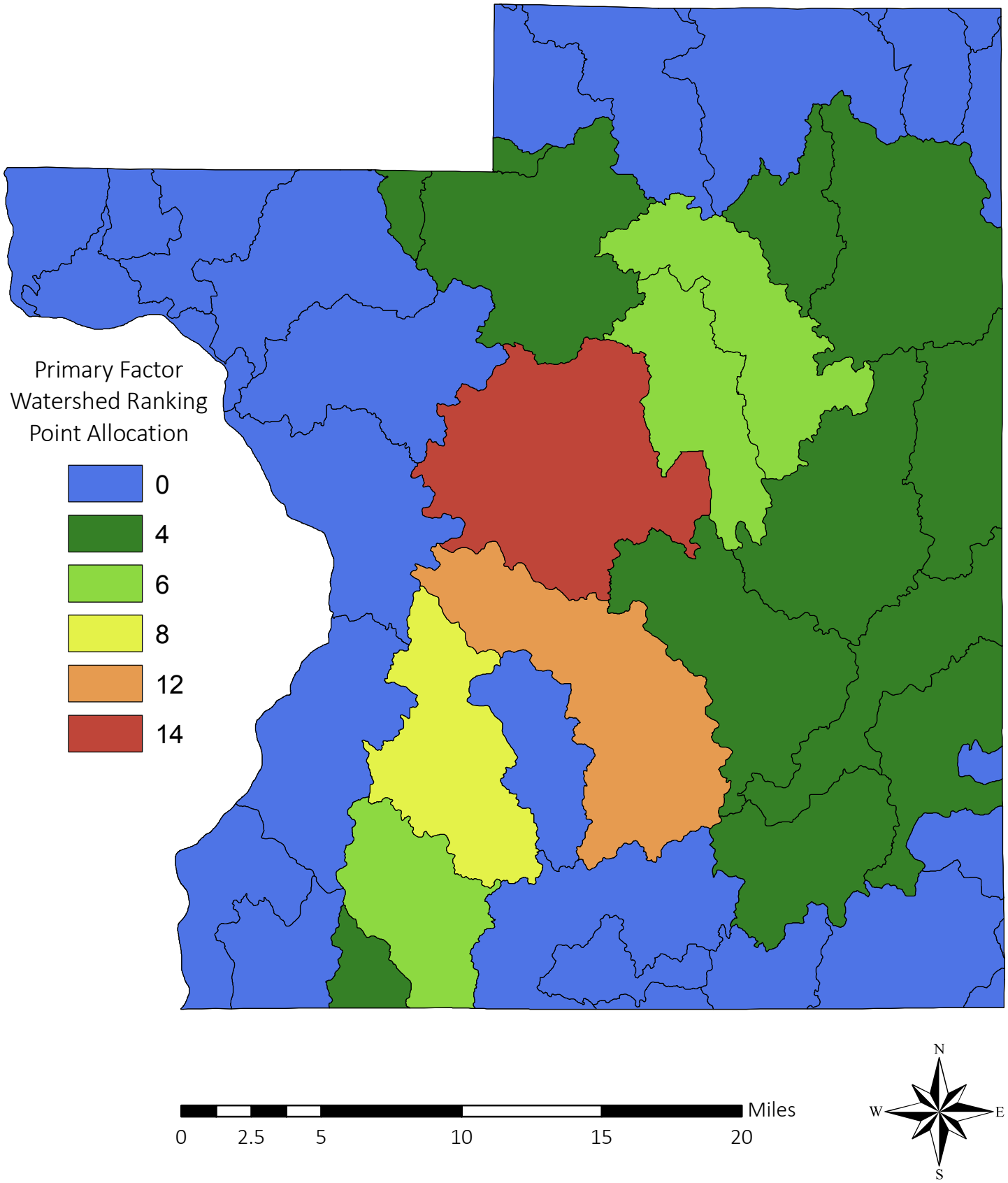
Number of Impaired Waters

Polk County, Wisconsin



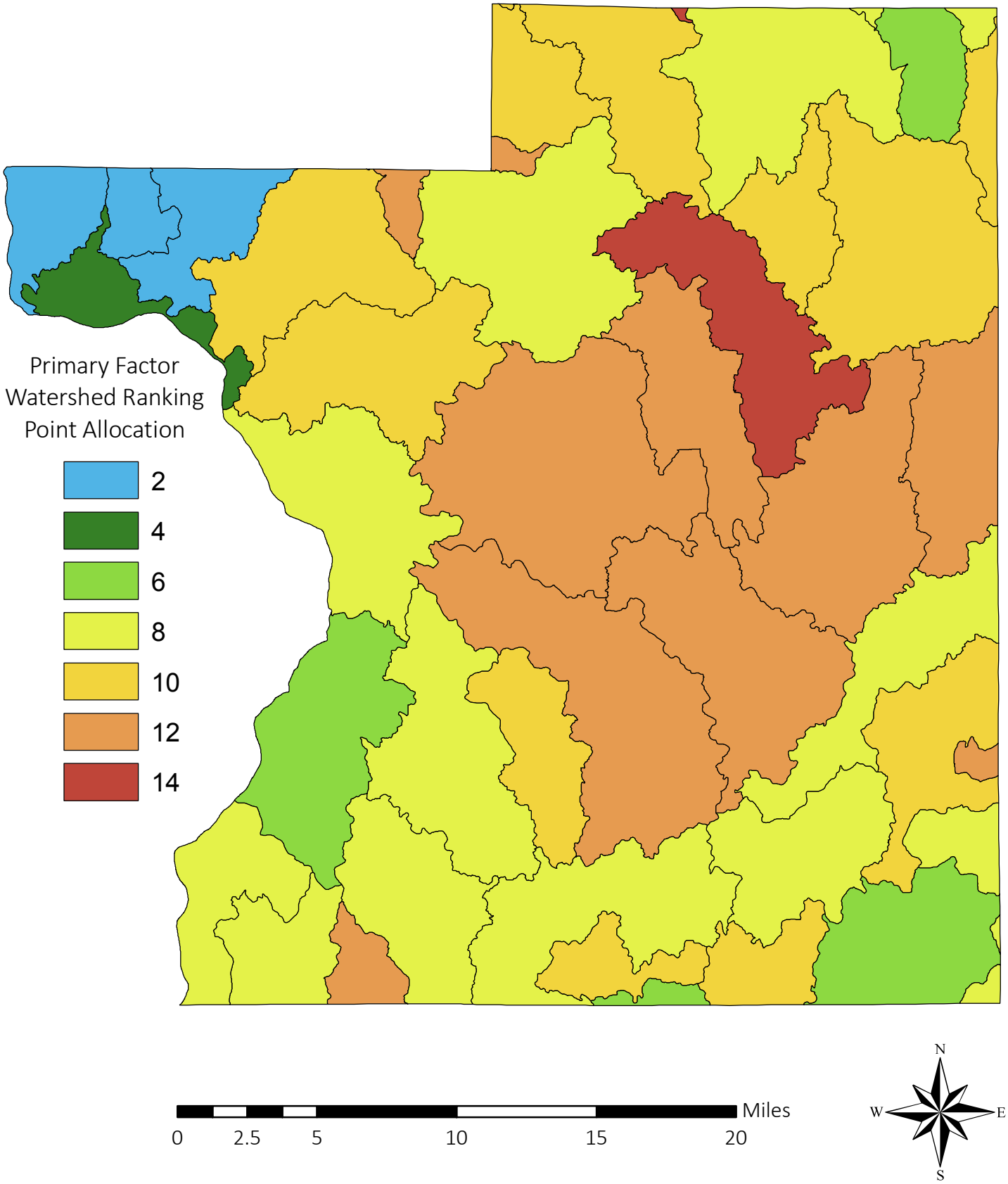
Number of Partner Groups

Polk County, Wisconsin



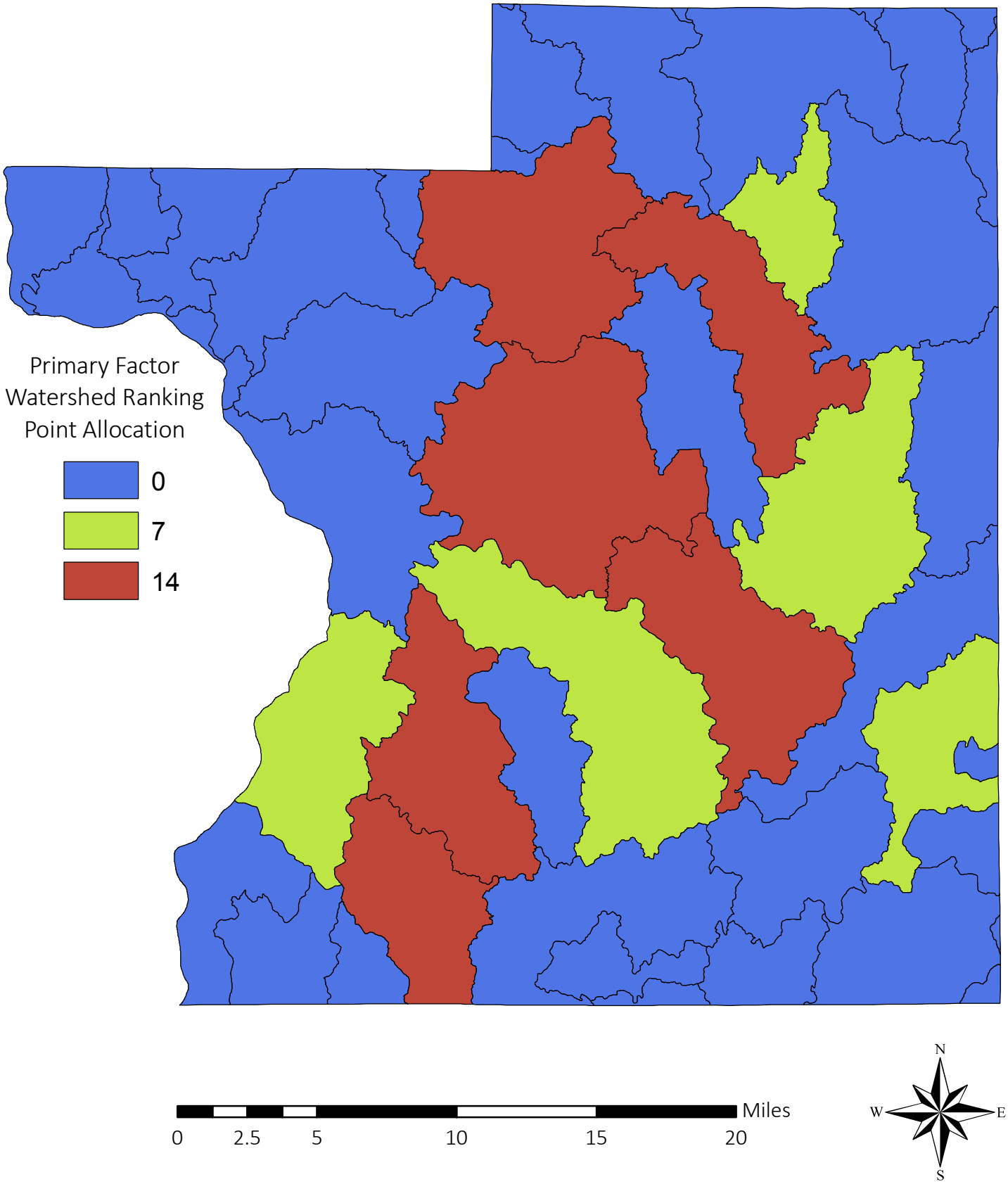
Percent Acres in WQMA

Polk County, Wisconsin



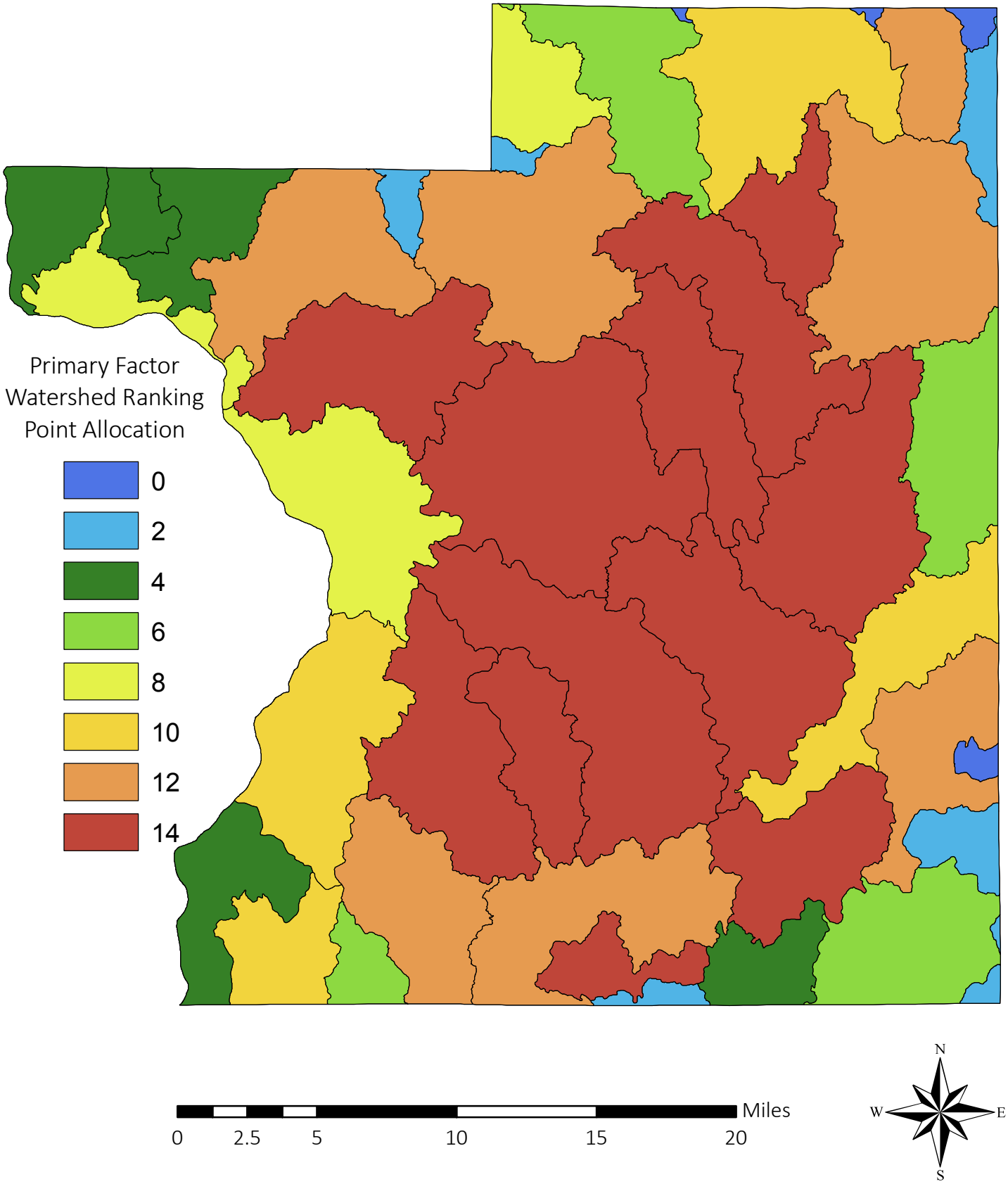
Watershed Concludes in a Lake

Polk County, Wisconsin



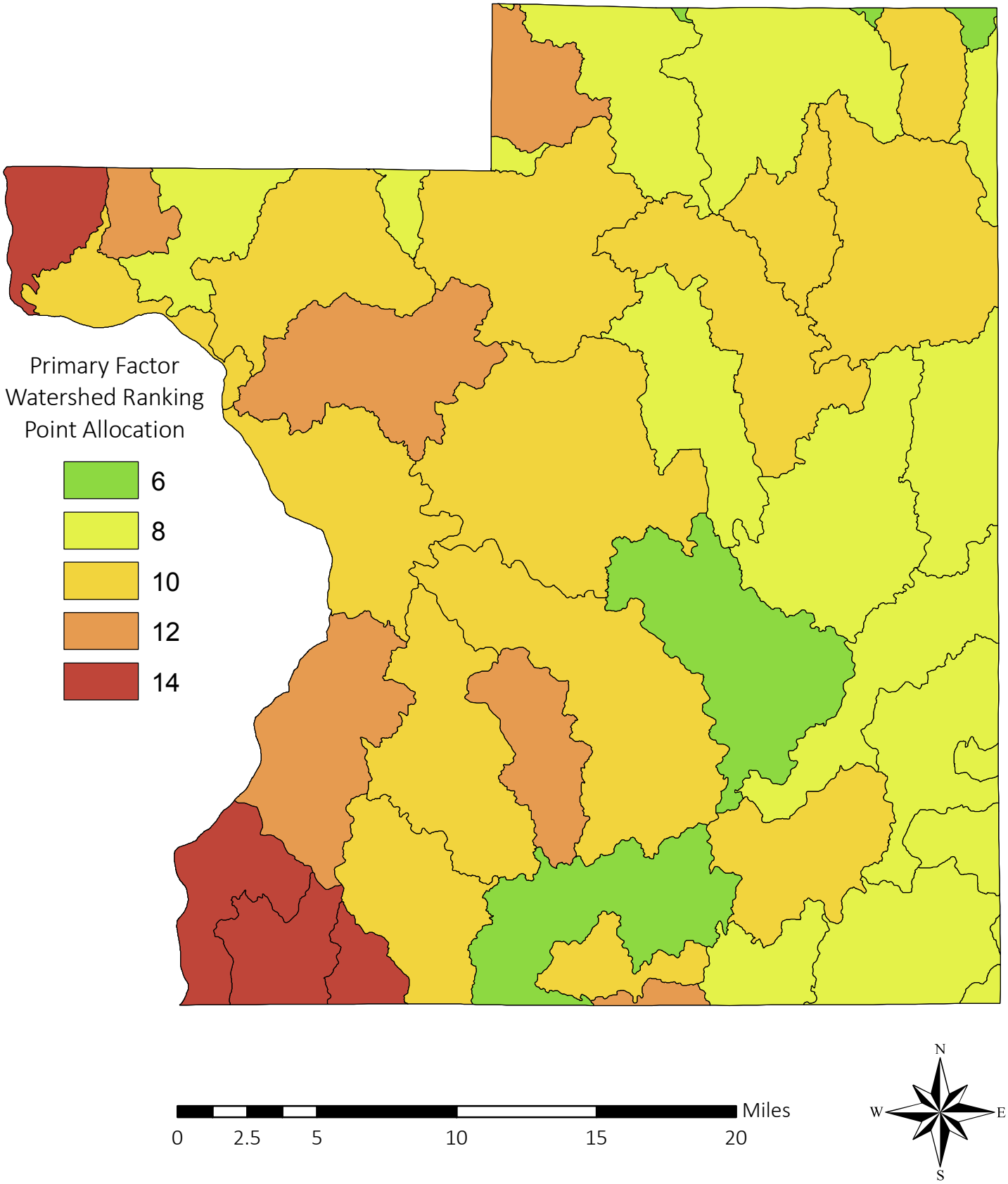
Percent Acres in Polk County

Polk County, Wisconsin



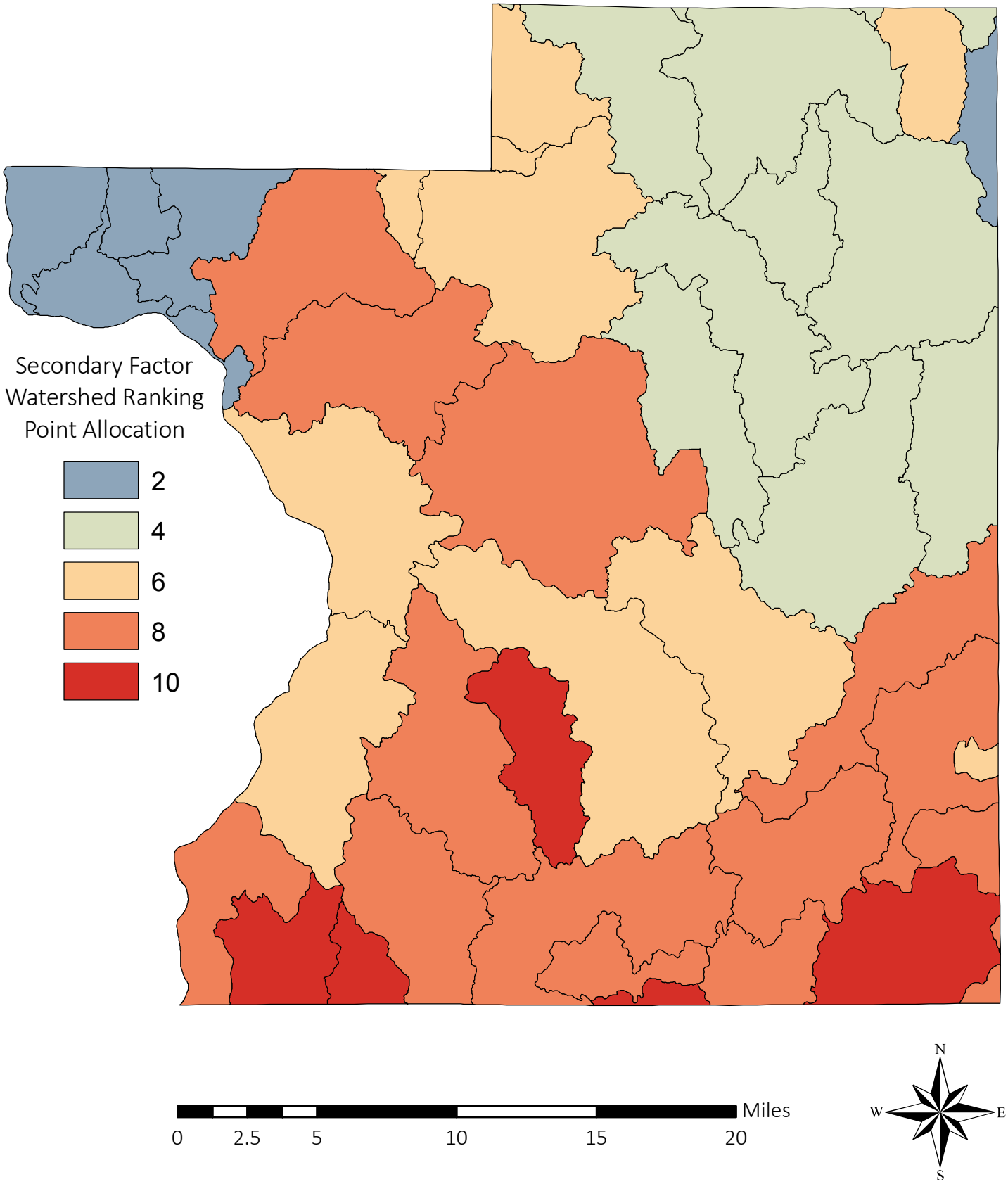
Stream Order

Polk County, Wisconsin



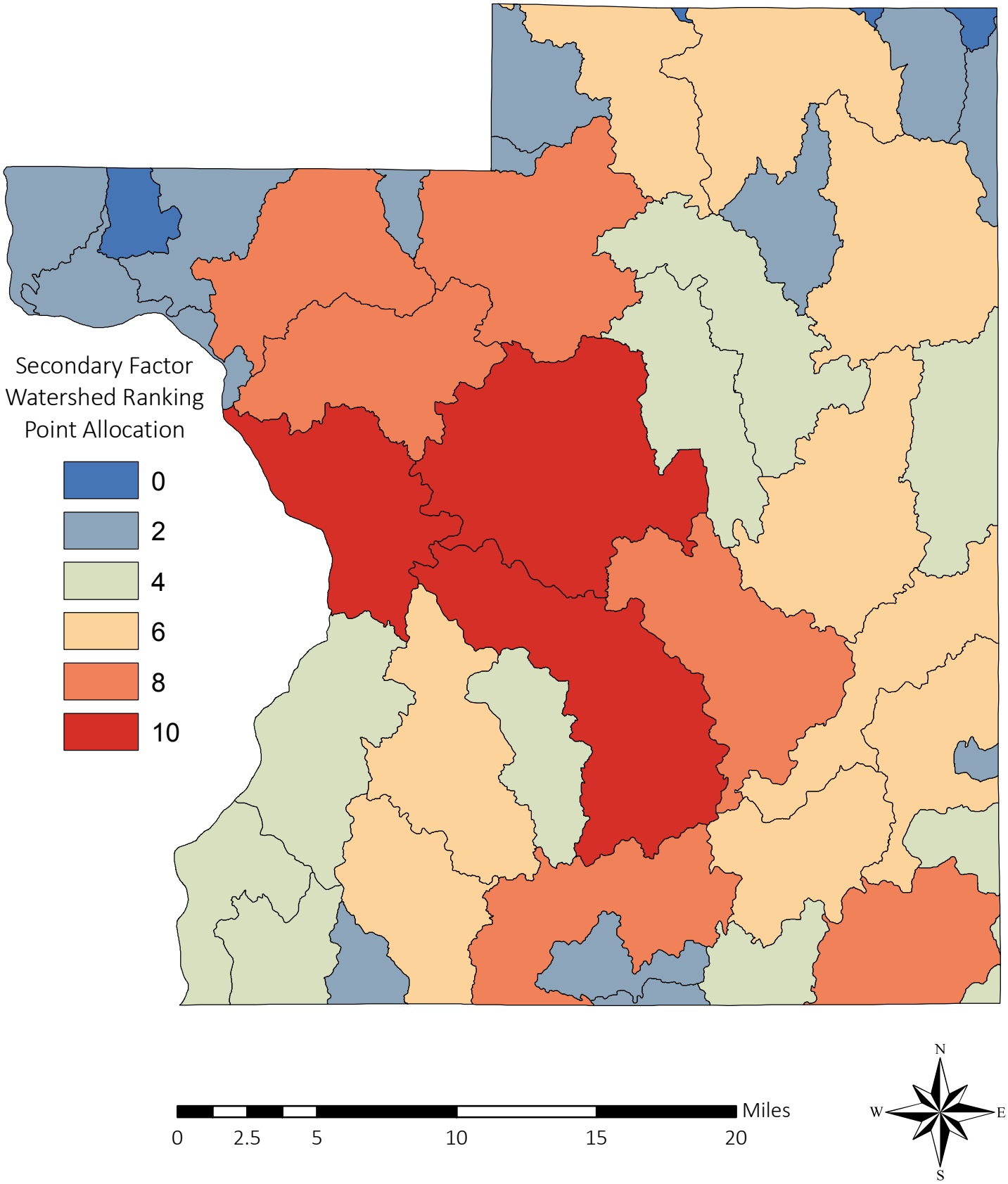
Percent Agricultural Land Cover

Polk County, Wisconsin



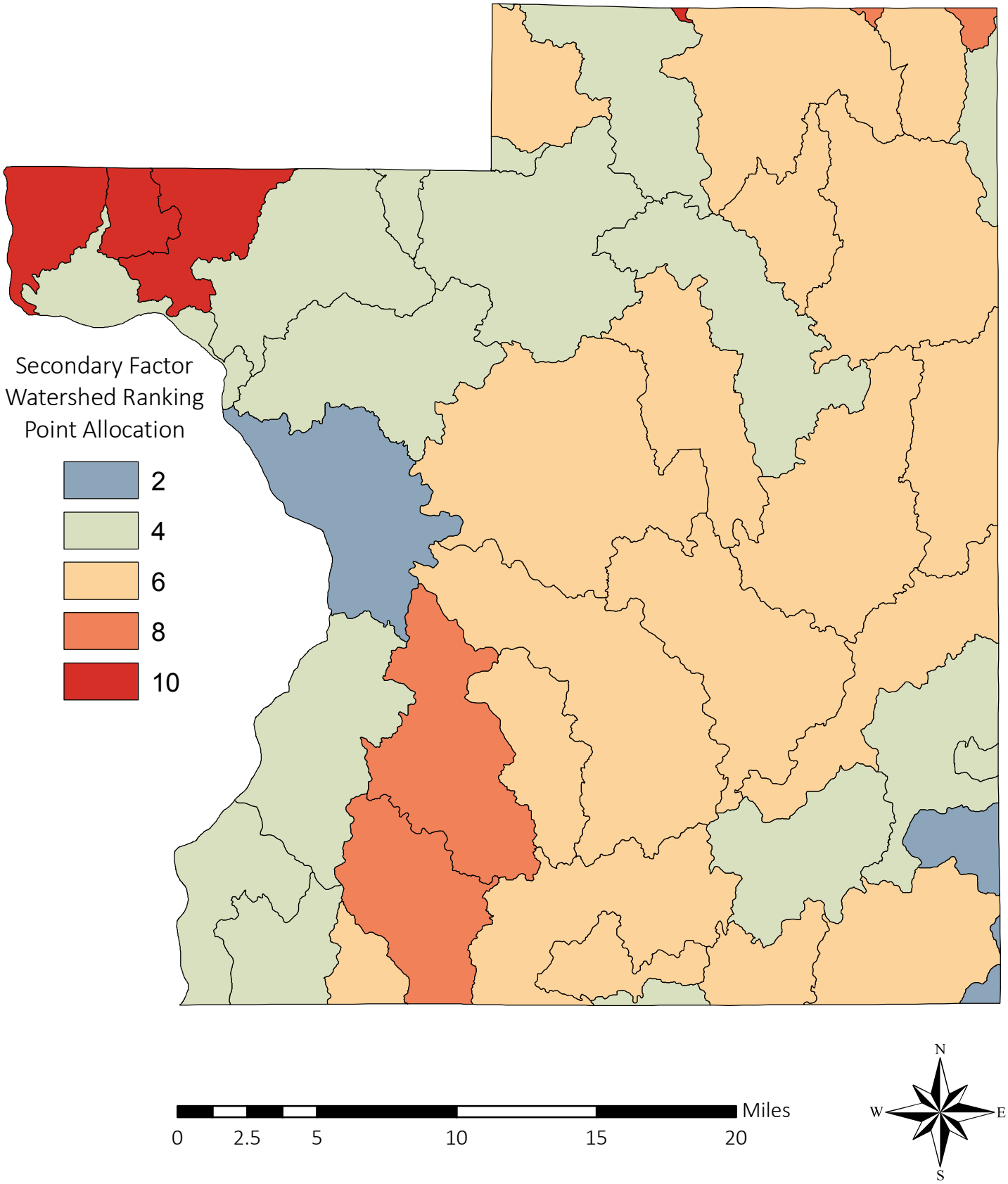
Potential Livestock Facilities

Polk County, Wisconsin



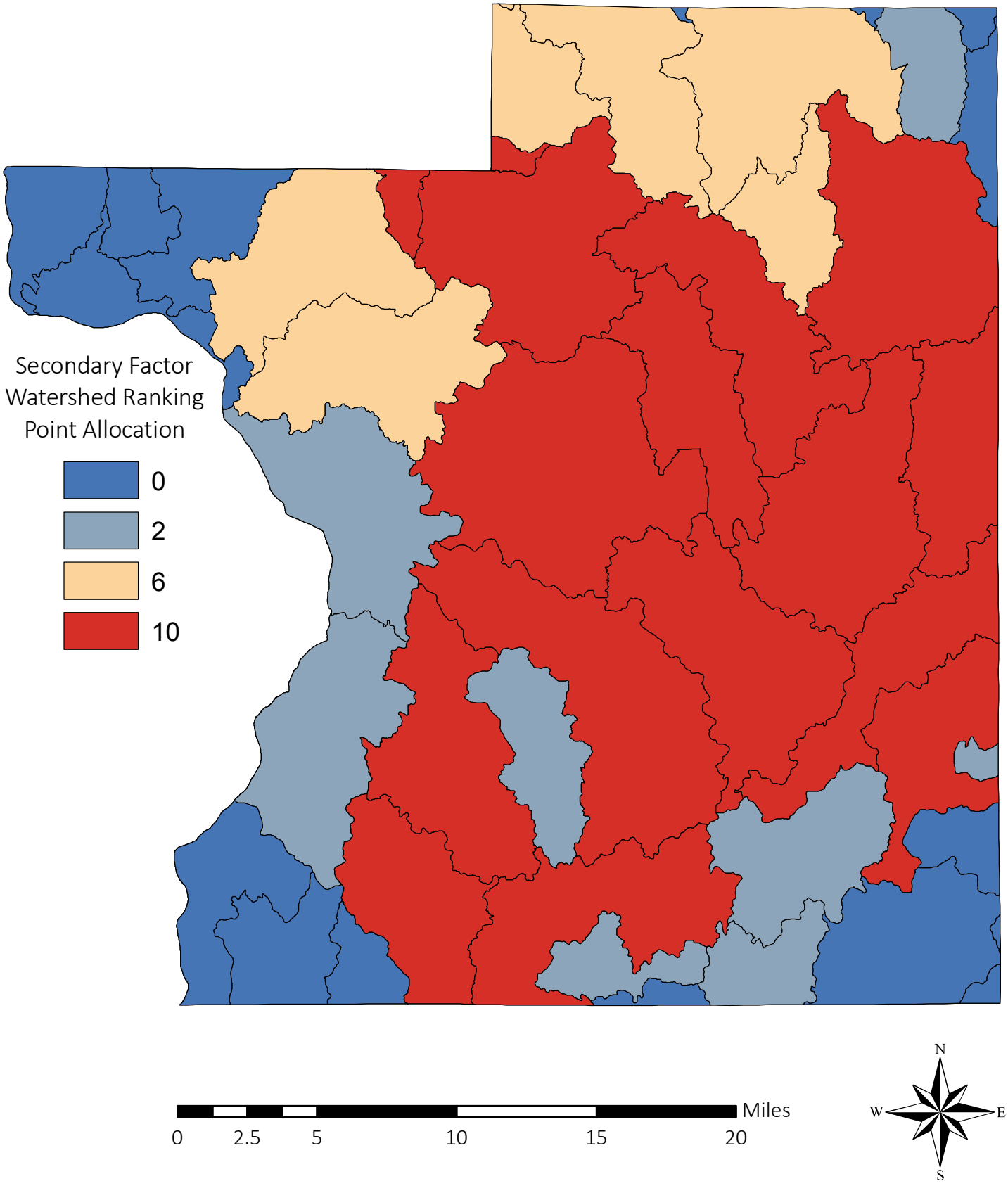
Groundwater Susceptibility

Polk County, Wisconsin



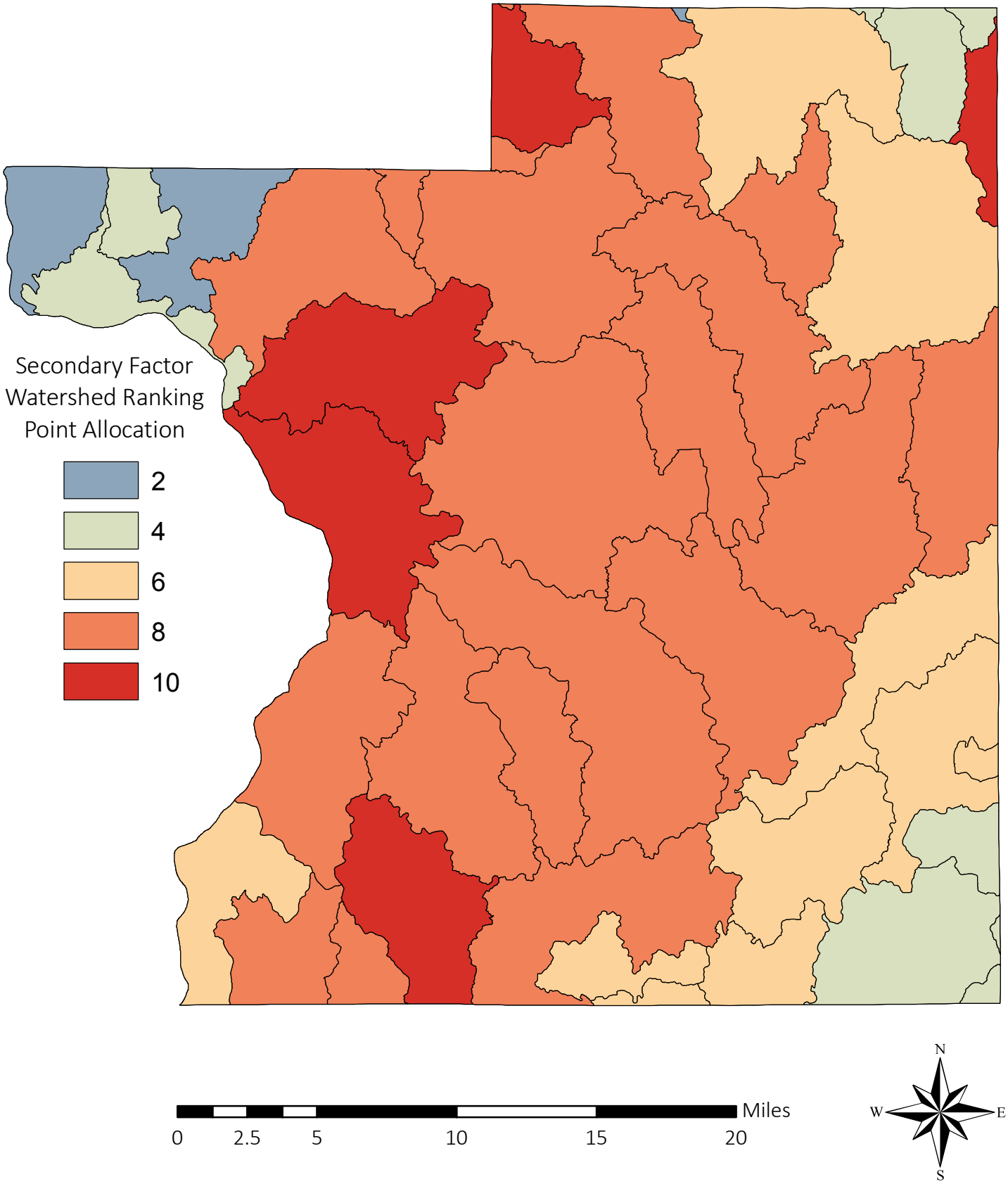
Lake Development

Polk County, Wisconsin



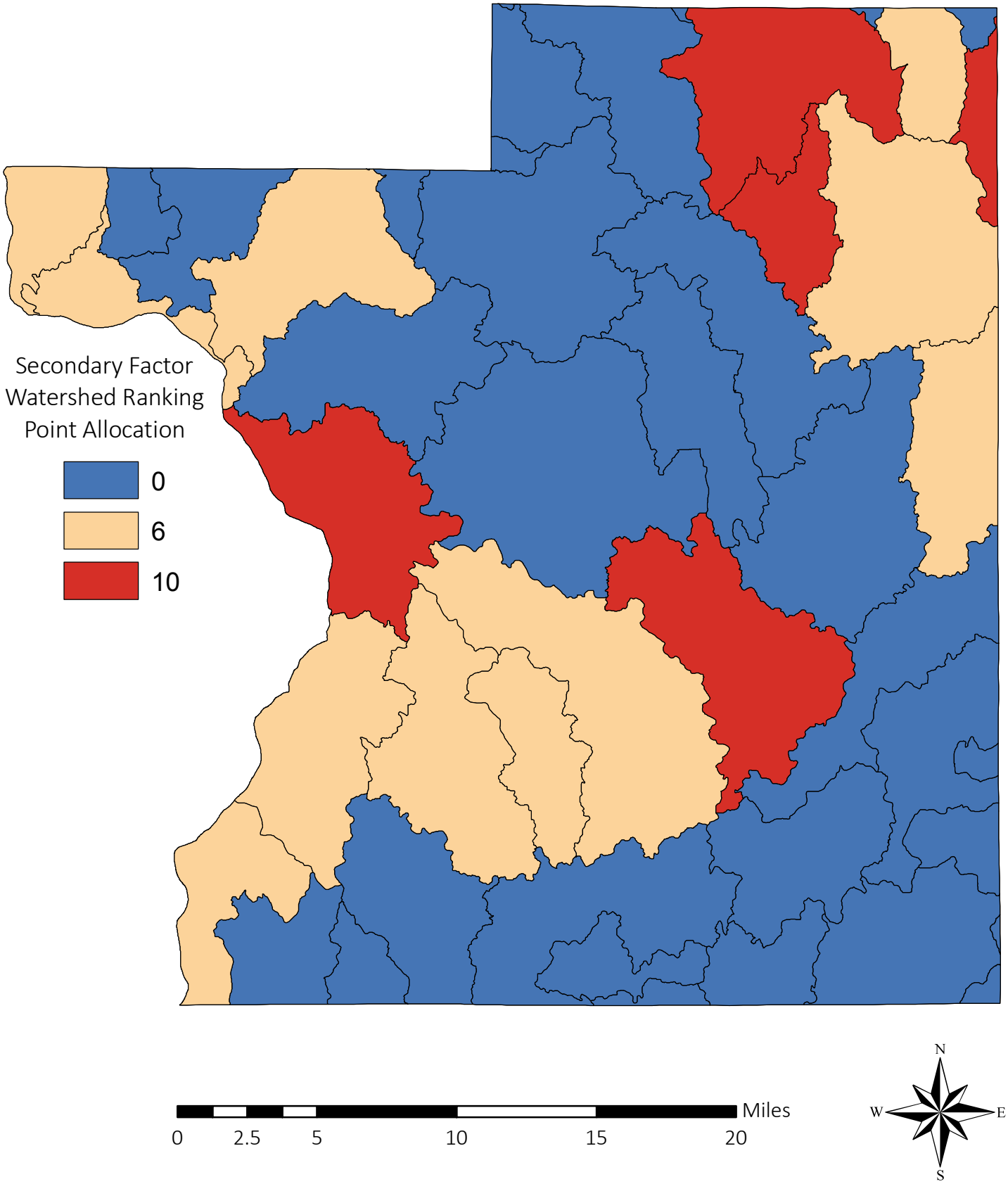
Highly Erodible Soils

Polk County, Wisconsin



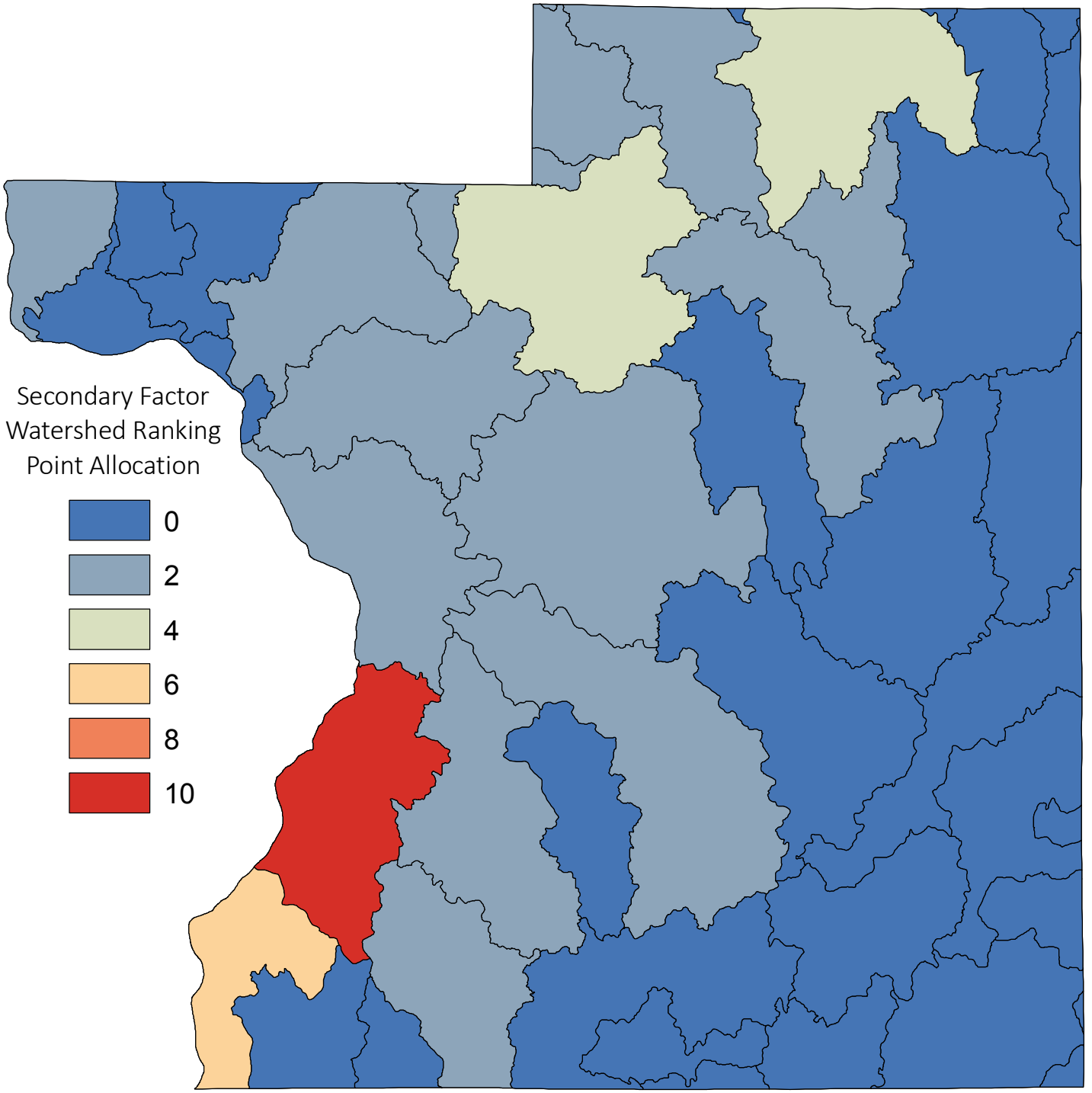
Outstanding & Exceptional Resource Waters

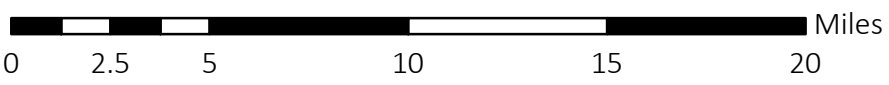
Polk County, Wisconsin

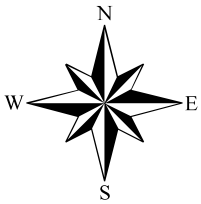


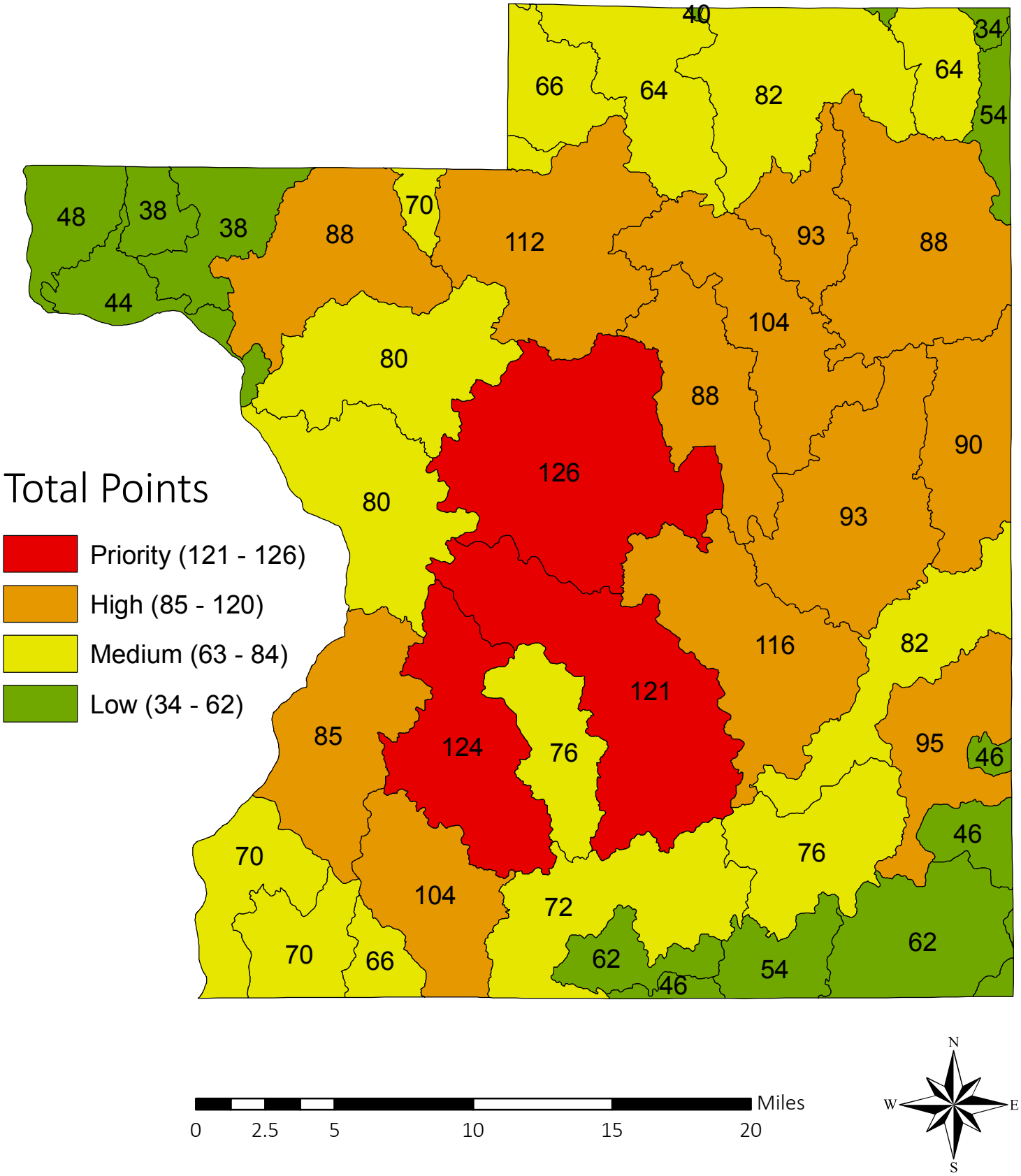
Depth to Bedrock

Polk County, Wisconsin







Final Watershed Ranking

Polk County, Wisconsin