SECTION 3.0 LAND AND WATER RESOURCES NARRATIVE

3.1 Topography, Soils, and General Geology

Soils in the WRW are primarily loamy glacial till with scattered lacustrine areas, potholes, outwash, and floodplains. It was formed during the Wisconsin glaciation in Minnesota with glacial till deposited from the Des Moines lobe. The landscape is level to gently undulating with relatively short slopes.

Strip Tillage, Watonwan Watershed

Glacial till plains dominate the watershed with a mixture of clay, silt, sand and gravel. In portions of the WRW, the now dry Glacial Lake Minnesota deposited a layer of clay on top of the glacial till (NRCS, 2015). In the eastern side of the watershed the geology shows a combination of till plains, glacial lake plains, and moraines, resulting in poorly drained soil and ultimately more tiling activity (NRCS, 2015) (MPCA, 2016).

The western half of the watershed lies primarily within the Blue Earth Till Plain. This portion of the landscape has a mixture of gently sloping (2-6%) well-drained loamy soils and nearly level (0-2%) poorly drained loamy soils. This region of the watershed contains extensive use of artificial drainage to remove ponded water from flat and depressional areas. Water erosion potential is moderate throughout much of the western half of the watershed. The water erosion potential for most of the eastern half of the watershed is considered low, as it is not bordered by streams, lakes, or drainage ditches (NRCS, 2015).

The western, southern, and eastern boundaries of the WRW consist of end moraines formed by the last glaciation period. Soils are predominantly loamy in texture, ranging from steep and well-drained to nearly level and poorly drained. Much of the landscape can be described as undulating to hilly (2-12%) and approximately a quarter of these lands are adjacent to streams and ditches. Fifty percent (50%) of the cropped lands within this region have a high potential for water erosion (NRCS, 2015). Soil quality within this region is susceptible to sheet and rill erosion which removes productive topsoil from agricultural and other lands and may result in sediment delivery to water.

Ravines are geologic and topographic features that are present within the watershed, though to a lesser degree than the nearby Blue Earth and Le Sueur Watersheds (Mulla, 2010). Ravines are steep, deep, incised gullies at the tips of a drainage channel network. Seeps may occur on steep or near-vertical slopes. Ravines connect the uplands to the river valleys and are often formed by ephemeral streams with only seasonal discharge. Erosion in ravines proceeds by a combination of fluvial and hillslope processes. Further, erosion from tile outlets at the head of ravines has the potential to expedite their progression. Channel incision and migration leads to over-steepened slopes and mass wasting.

3.2 Hydrogeology

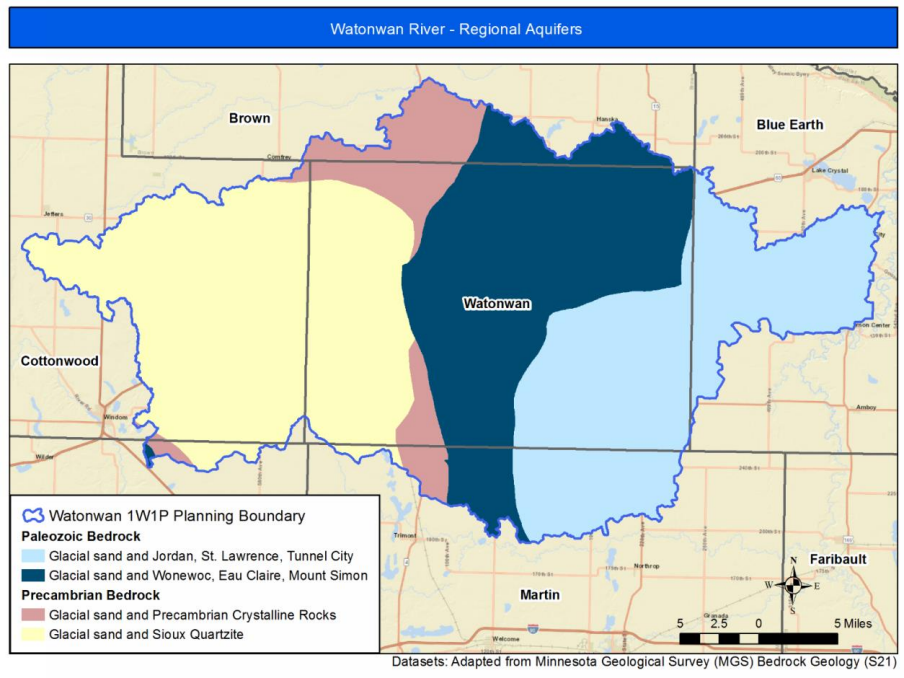
Geology in the WRW is the result of complex processes, which occurred from igneous, metamorphic, sedimentary, and glacial action that took place in the region over several geologic time periods (MDH, 2018). Figure 3-1 depicts a generalized map of aquifers in the watershed on the following page.

There are four major types of bedrock aquifers in the watershed (MDH, 2018) (Figure 3-1):

- Jordan, St. Lawrence, and Tunnel City aquifers are present in the eastern portion of the watershed in Watonwan, Blue Earth, and Martin Counties
- Wonewoc, Eau Claire, and Mount Simon Sandstone aquifers are present through the center of the watershed primarily in Watonwan County
- Precambrian Crystalline Rock is present in the northernmost portion of the watershed in Brown and Watonwan Counties, and in limited extent in the southern half of the watershed, however, the overlying glacial material primarily serves as the aquifer material in these areas
- Sioux Quartzite aquifers are present in the western region of the watershed, in Cottonwood County and in the Western portion of Watonwan County

Glacial outwash deposits in the watershed overlay bedrock aquifers. These outwash units form aquifers locally.

Figure 3-1: Watonwan River Watershed – Aquifers (GRAPS, p. 15).



Watonwan River Watershed - Regional Aquifers: (1) Glacial sand and Jordan, St. Lawrence, Tunnel City, (2) Glacial sand and Wonewoc, Eau Claire, Mount Simon, (3) Glacial sand and Precambrian Crystalline Rocks, and (4) Glacial sand and Sioux Quartzite

3.3 Precipitation

The climate within the planning area is continental, with cold dry winters and warm wet summers. Climatic records from the City of St. James have shown that temperatures over the last thirty years ranged from -30 degrees Fahrenheit (F) in January of 1970 to 105 degrees F in July of 1988. Average monthly temperatures from the same location have ranged from 14 degrees F in January to 73 degrees F in July over this same time period.

Annual precipitation (1981-2012) within the watershed ranges between 28 to 32 inches (Figure 3-2.Per the National Oceanic and Atmospheric Administration (NOAA) Precipitation-Frequency Atlas (Atlas 14), the 10 year, 24 hour rain event for St. James, Minnesota is 4.19 inches (NOAA, 2018).

Precipitation ranking data from the two most recent growing seasons (2018 and 2019) is presented in Figure 3-3 on the following page. This is noteworthy, as both years were wetter than 85-100% of previous years for WRW counties, indicating climate will likely continue to play a significant role in the management of watershed quantity and quality related issues.

Figure 3-2: Minnesota Normal Annual Precipitation 1981-2010 (DNR, 2012).

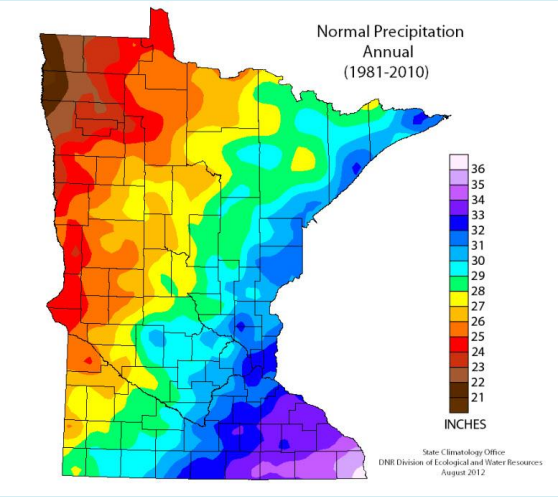
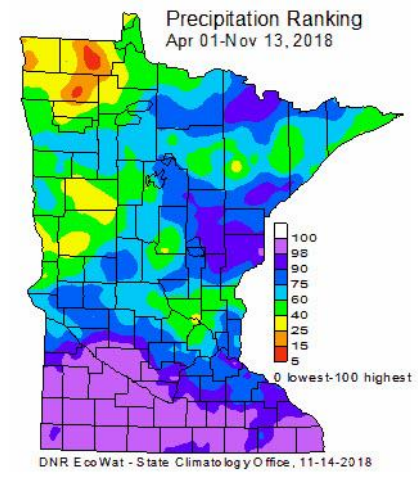
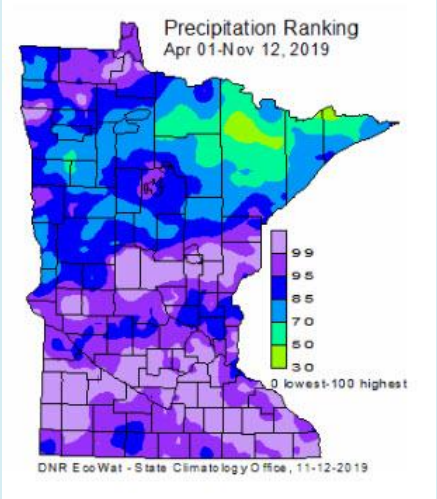


Figure 3-3: Minnesota Growing Season Precipitation Rankings, 2018 and 2019 (DNR, 2018, 2019).





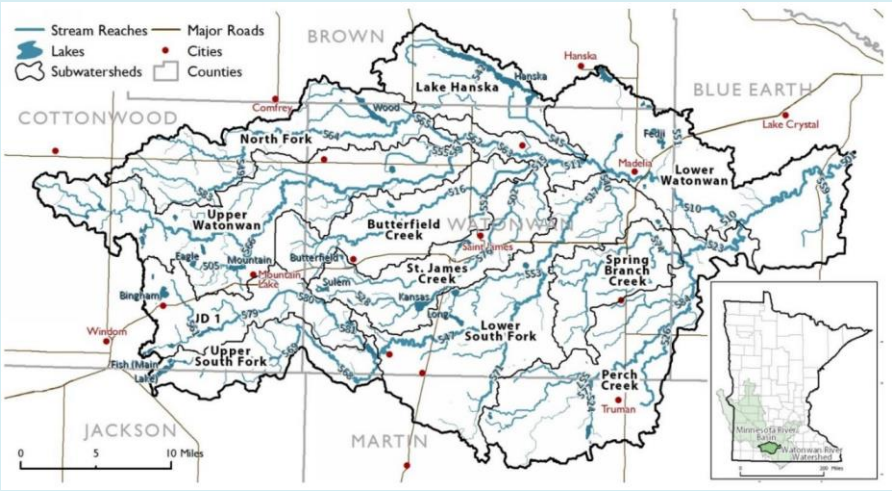
3.4 Water Resources

The Watonwan River begins in central Cottonwood County and flows east for 113 miles into northern Watonwan County. It reaches its confluence with the Blue Earth River about one mile south of the Rapidan Dam near Garden City, 8 miles southwest of Mankato. The total distance of the stream network is 1,074 miles, of which 685 miles are intermittent streams and 389 miles are perennial streams.

Watonwan Tributary

The WRW (HUC 07020010) drains approximately 558,964 acres of land into the Watonwan River (Figure 3-4). Much of the river and its tributaries have been straightened and altered to accommodate drainage of farmland and flood reduction (MPCA, 2016). Wetlands and depressional areas have been altered and drained throughout much of the WRW for agricultural purposes. Higher flows in the area due to extensive drainage activities have led to increased erosion and higher sediment loads into surface water bodies. Addressing water quantity and quality related issues within the WRW will have positive impact to the downstream resources it drains to.

Figure 3-4: Watonwan River Watershed Drainage Area (WRAPS, p. 12).



The Watonwan River watershed drains approximately 558,964 acres from 6 different counties. The Watonwan River watershed is one of the 13 major watersheds that comprise the Minnesota River basin. The stream line size in this image is used to indicate the estimated average stream flow, and stream reaches are labeled by the last three digits of the AUID (AUID-3). MPCAa WRAPS, 2020.

3.5 Surface Water Resources (Streams, Lakes, Wetlands, Public Waters, and Ditches)

The WRW is drained by three primary branches of the Watonwan River (North Fork Watonwan, South Fork Watonwan, and Watonwan rivers), and four minor tributaries to these branches (Butterfield, Saint James, Willow, and Perch creeks). Additional streams are listed in Table 3-1. Table 3-2 summarizes miles of public ditch by watershed county, calculated using DNR's buffer protection map. These values are only indicative of public drainage networks, and do not account for open and subsurface tiling systems that also contribute to the overall drainage of the watershed. Hydrology, connectivity, and geomorphology are three essential components of a healthy watershed. If any of these components depart from natural or stable conditions, one or more of the other components will be impacted and potentially have negative impacts on biology and water quality within the watershed. The soils and geology of the watershed have resulted in highly productive lands, but significant portions of the river and its tributaries have been straightened and altered to provide for drainage of farmland and flood reduction. In addition, enhanced drainage practices, fragmented riparian zones, and land use changes have resulted in an increase in flows and channel instability (DNR, 2014).

Table 3-1: Streams within the Watonwan River Watershed (Minnesota River Basin Data Center).

Stream Name	Total Stream Miles	Total Perennial Stream Miles	Total Intermittent Stream Miles
Butterfield Creek	25.1	20.8	4.3
Elm Creek	2.4	2.4	0
Mink Creek	11.3	9.5	1.8
North Fork Watonwan River	39.3	35.2	4.1
Perch Creek	37.3	37.3	0
South Fork Watonwan River	72.6	69.9	2.7
Spring Branch Creek	18.1	4	14.1
Spring Brook	7.3	0	7.3
St. James Creek	26.9	20.1	6.8
Watonwan River	113.2	103	10.2
Willow Creek	14.4	8.6	5.8

Table 3-2: Miles of public drainage ditches within the Watonwan River Watershed by county.

County	Percentage of Plan Area	Miles of Public Drainage Ditches*
Blue Earth	11%	15
Brown	6%	30
Cottonwood	23%	17
Jackson	1%	0
Martin	9%	16
Watonwan	50%	35

**Mileage calculated using DNR's Buffer Protection Map*

There are 36 named and 19 unnamed lakes within the WRW (Table 3-3). Some of these waters are designated Public Waters and are regulated by the Minnesota Department of Natural Resources (DNR). Lakes within WRW include Mountain Lake, Wood Lake, Lake Hanska, Fish Lake, Long Lake (both in Watonwan and Cottonwood counties), Kansas Lake, and St. James Lake. Additional information about these lakes can be obtained through the Minnesota River Basin Data Center or Minnesota Department of Natural Resources LakeFinder.

In addition, the Watonwan River Watershed has several wetlands and numerous historic wetlands that have the potential to be restored. Figure 4-10 illustrates this information as developed by the Minnesota National Wetland Inventory. These data suggest that approximately 4% of the watershed is currently wetlands that that approximately 93% of historic wetlands in the watershed have been loss.

Table 3-3: Public Waters Inventory (Water Resources Center, Minnesota State University, Mankato, 2000).

Name of Waterbody	County	Acres	Shoreland Class	PWI Class*
Arnolds Lake	Cottonwood	46.42	Natural Environment	P
Bartsch Lake	Cottonwood	63.64	Natural Environment	P
Bergdahl Lake	Watonwan	96.21	Natural Environment	P
Bingham Lake	Cottonwood	270.42	General Development	P
Bullhead Lake	Watonwan	80.38	Natural Environment	W
Butterfield Lake	Watonwan	54.87	Natural Environment	P
Case Lake	Watonwan	36.99	Natural Environment	W
Cottonwood Lake	Watonwan	95.35	Natural Environment	P
Curry Slough	Watonwan	21.70	Natural Environment	W
Eagle Lake	Cottonwood	105.08	Natural Environment	P
Emerson Lake	Watonwan	399.78	Not in shoreland program	N
Ewy Lake	Watonwan	82.80	Natural Environment	W
Fedje Lake	Watonwan	187.11	Natural Environment	P
Fish Lake	Jackson	411.32	Recreational Development	P
Irish Lake	Watonwan	169.86	Natural Environment	P
Kansas Lake	Watonwan	392.88	Recreational Development	P
Lake Hanska	Brown	1,827.47	SL Mgt. Waters – Brown Co.	P
Linden Lake	Brown	271.13	SL Mgt. Waters – Brown Co.	P
Long Lake	Cottonwood	101.05	Natural Environment	P
Long Lake	Watonwan	260.88	Recreational Development	P
Maiden Lake	Cottonwood	29.96	Natural Environment	W
Mary Lake	Watonwan	124.68	Natural Environment	P
Mountain Lake	Cottonwood	236.69	Recreational Development	P
Mud Lake	Watonwan	42.55	Natural Environment	P
Mulligan Marsh	Watonwan	9.62	Multiple	P
Nelson Lake	Watonwan	27.05	Not in shoreland program	N
Parso Lake	Cottonwood	113.87	Natural Environment	P
Perch Lake	Martin	172.81	Natural Environment	P
Rat Lake	Cottonwood	138.41	Natural Environment	P
Round Lake	Martin	42.37	Natural Environment	P
School Lake	Watonwan	136.06	Natural Environment	P
St. James Lake	Watonwan	244.47	Recreational Development	P
Sulem Lake	Watonwan	185.14	Natural Environment	P
Swan Lake	Cottonwood	13.30	Natural Environment	P
Wilson Lake	Watonwan	118.04	Natural Environment	W
Wood Lake	Watonwan	608.31	Multiple	P
	Total Acres	7,219		

**P-Protected (Public Waters); W-Protected (Public Waters) Wetland; N-Not Protected Water or Wetland.*

3.6 Groundwater Resources

Most of the information in this section is leveraged from the Watonwan River Watershed Groundwater Restoration and Protection Strategies Report (GRAPS) (MDH, 2018). Groundwater is an important resource in the WRW. More than 51% of groundwater withdrawn is for public water supply use. In addition, groundwater accounts for 100% of the region's drinking water. It is important to make sure that adequate supplies of high-quality groundwater remain available for the region's residents, businesses, and natural resources.

Groundwater sources within the WRW vary according to the underlying geology. Aquifers and wells used for public water supplies vary widely. Some are very shallow and unprotected and can be easily contaminated by activities at the ground surface. Others are deeper or more protected by geologic materials; these tend to exhibit a low vulnerability to overlying land uses.

Groundwater Withdrawals

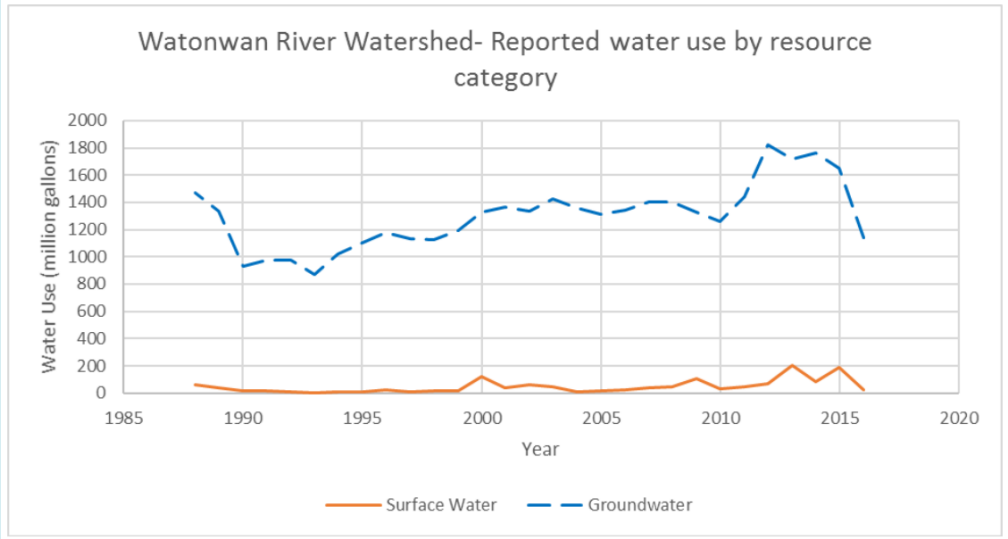
A Water Appropriation Permit (WAP) program is implemented by the DNR, requiring all water appropriators (surface or groundwater) withdrawing more than 10,000 gallons of water per day or 1 million gallons per year. This provides the DNR with the ability to assess which aquifers are being used and for what purpose. The WAP exists to balance competing groundwater management objectives that include both development and protection of Minnesota's water resources.

Most groundwater in the WRW is used for water supply. Agricultural irrigation is the second largest water user, followed by livestock watering and industrial processing. Other uses account for less than one percent of reported water use.

Groundwater Use

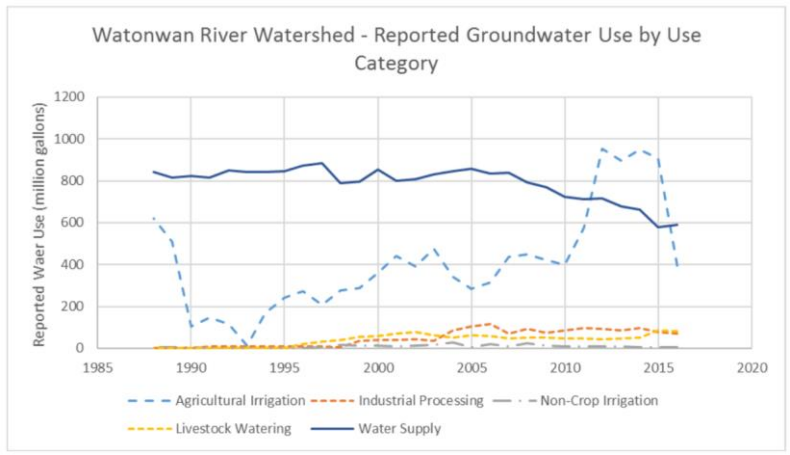
In most years, groundwater accounts for about 97 percent of reported water use (e.g. potable water, irrigation, etc.) according to Minnesota DNR Permitting and Reporting System (MPARS) data (Figure 3-5). Groundwater use totals between 870 and 1,760 million gallons per year and annual use has generally increased from 1990 to the present. Groundwater use for water supply (Figure 3-6, following page) has been mostly constant at 700 to 800 million gallons per year and has been reduced to about 580 million gallons in 2016. Groundwater use for agricultural irrigation has varied more and is highest during drought years in 1988 to 1989 and 2012 to 2015.

Figure 3-5: Groundwater accounts for approximately 97% of water use in the Watonwan River Watershed (GRAPS, p. 24).



Reported groundwater and surface water use. Groundwater accounts for about 97% of the total reported water use in the Watonwan Watershed.

Figure 3-6: Reported Groundwater Use by Use Category (GRAPS, p. 25).



Water supply accounts for most groundwater use in most years. During the 2012 drought, agricultural irrigation was the biggest groundwater use.

Groundwater Issues and Concerns

Groundwater contamination, both naturally occurring and from human activity, is present in parts of the WRW, specifically:

- Arsenic – 47% of tested drinking water wells have elevated levels of arsenic with approximately 16% exceeding the Safe Drinking Water Act (SDWA) standard of 10 µg/L.
- Nitrate (Figure 3-7 And Figure 3-8) –
  - none of the tested drinking water wells had levels at or above the SDWA standard of 10 mg/L, although shallow wells, less than 50 feet deep, had approximately 73% of samples exceeding the natural background levels of 3 mg/L, meaning groundwater quality is influenced by land use activities.
  - In 2016, an ambient Minnesota Department of Agriculture (MDA) monitoring well in Watonwan County recorded a nitrate result of 91.6 mg/L (GRAPS, p. 31). This exceedance observed once, has not recorded similar results since.
  - It is worthy to note that the WRW in part contributes water to the City of Mankato Ranney Wells which have seen higher levels of nitrates. These two wells are officially designated as "groundwater under the direct influence" of surface water. Due to the nitrate concentrations, the wells require blending with deeper groundwater. Highest concentrations occur in early spring and late fall.
  - The MDA has completed vulnerability mapping for nitrate reaching groundwater. This information is included in Figure 3-7 and is based upon soils information and geological information. This map information will be used for the Groundwater Protection Rule.
- Pesticides detected in both MDA monitoring wells, but not at concentrations above human-health based drinking water standards or reference values. In addition, the MDA pesticide testing of private well results are available for select townships on a County basis and should be released in 2021.
- Radionuclides - Elevated concentrations of naturally occurring radioactive radium occur within the bedrock Mt. Simon and Sioux Quartzite aquifers.

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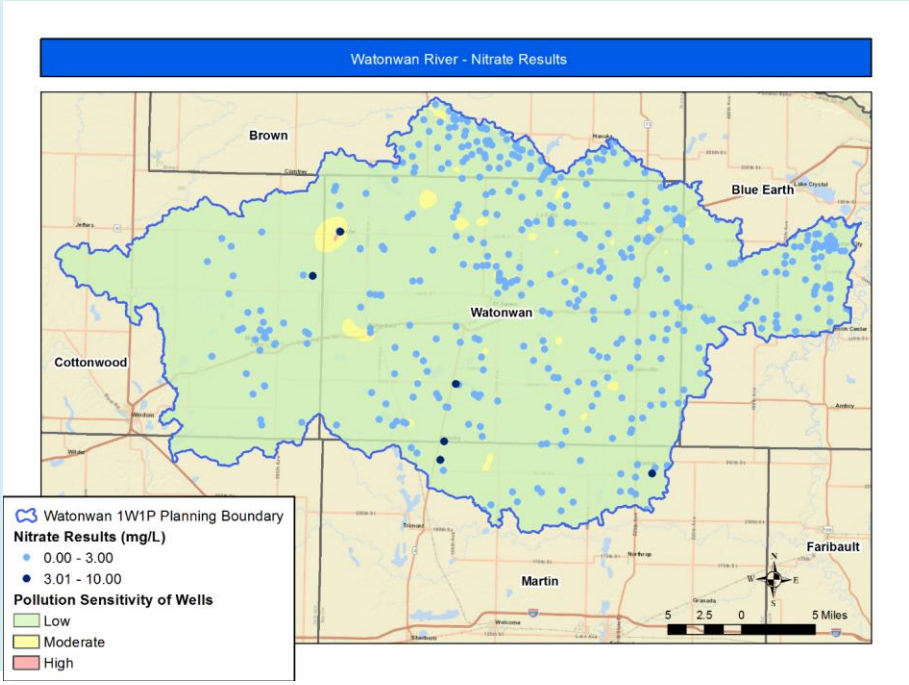
- Contaminated sites – Approximately 14% of all registered tanks are leaking chemicals into the environment and have the potential to cause localized groundwater pollution.

Figure 3-7: Nitrate Monitoring Test Results from well testing along with pollution sensitivity from geologic information. None of the tested drinking water wells had levels at or above the SDWA standard of 10 mg/L – Watonwan River Watershed



These contaminants can affect both private wells and public water systems when levels exceed drinking water standards. Some of the public water systems have water quality issues in their untreated source water that requires either blending or treating the water to meet SDWA standards. About 73% of the people living in the watershed get their drinking water from a public water supply system. Wellhead Protection Plans have been developed for most of the public water suppliers in the WRW and identify land use protections strategies for the approximately 33,255 acres in Drinking Water Supply Management Areas (DWSMAs). Additional information about this contamination and monitoring locations can be found in the GRAPS (MDH, 2018).

In Figure 3-89, the circles represent water use data. The colors of circles correspond to water use permits issued for public water supply, irrigation, and all remaining sources of water use. The size of the symbol indicates how many millions of gallons were reported as pumped in 2016.

Figure 3-8: ~~DNR Monitoring Well Trends and Pumping – Watonwan River Watershed (GRAPS, p. 46MDA)~~ townships with private well nitrate testing that will lead to fall fertilizer restrictions and

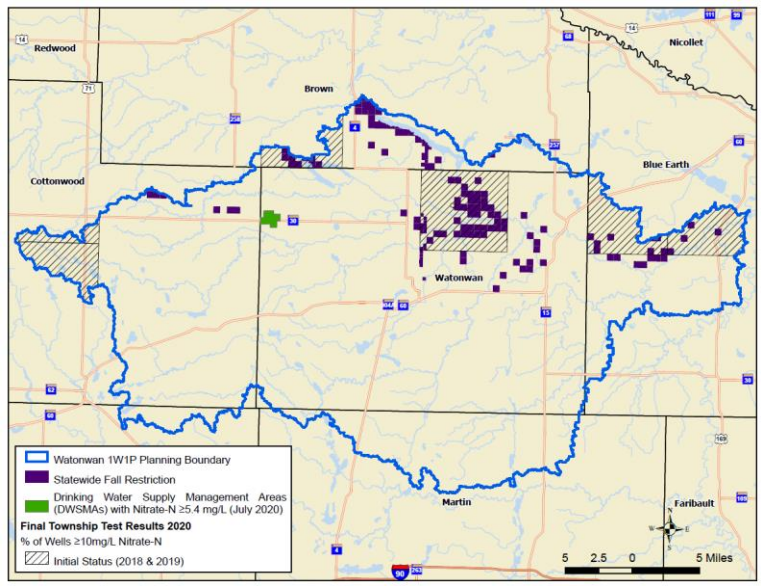
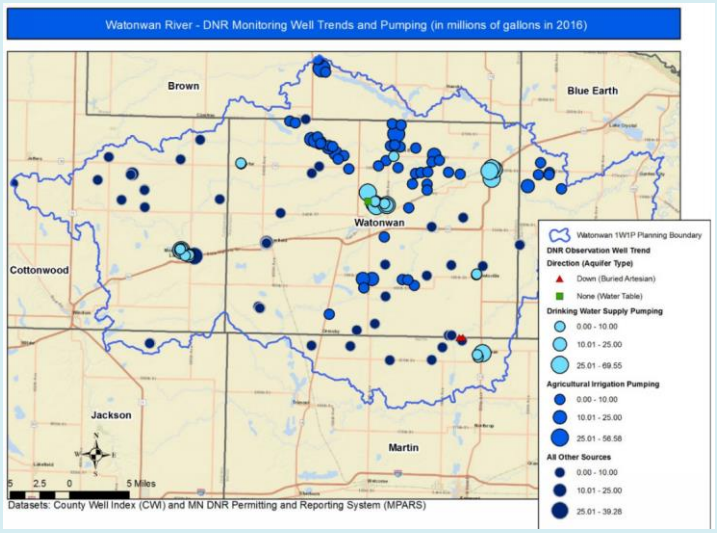


Figure 3-~~8~~9: DNR Monitoring Well Trends and Pumping – Watonwan River Watershed (GRAPS, p. 46).



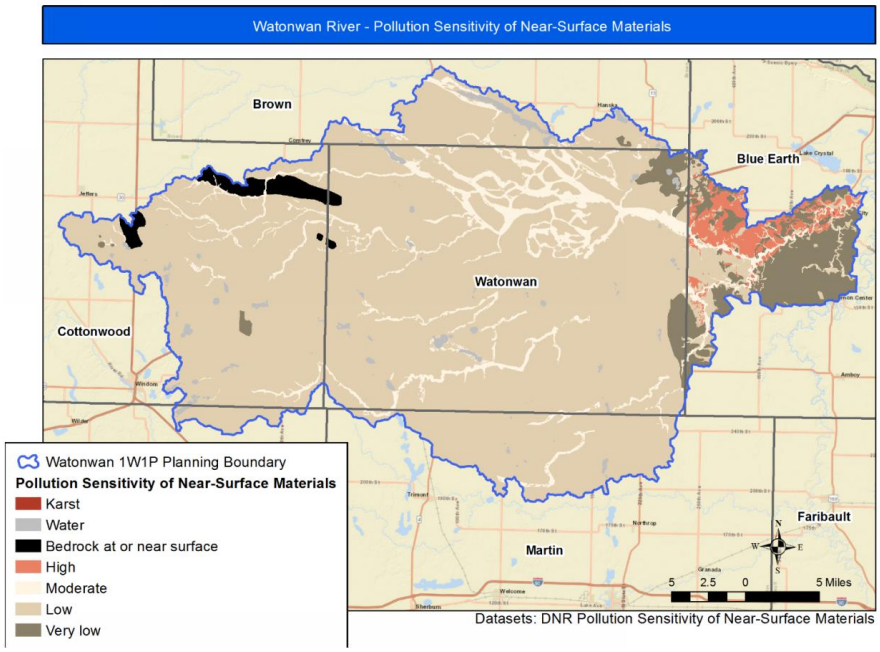
Water use by category type and location of Long-Term DNR Groundwater Level Monitoring Wells with enough water level measures to do a statistical trend analysis.

~~P~~Pollution Sensitivity

Understanding pollution sensitivity is important for prioritizing and targeting implementation efforts. Pollution sensitivity (also known as aquifer vulnerability or geologic sensitivity) refers to the time it takes recharge and contaminants at the ground surface to reach the underlying aquifer.

It is important to understand the target aquifer when assessing pollution sensitivity. Certain aquifers may be deeper and more geologically protected than water table aquifers, or surficial sand aquifers, in each area. Figure 3-~~9~~10 on the following page depicts the pollution sensitivity of near-surface materials dataset developed by the DNR. This dataset only considers the top ten feet of soil and geologic material when assigning a sensitivity rating. This figure shows that the watershed has a mix of pollution sensitivity ratings based on surficial materials. While the predominant rating across the WRW is 'low', it is important to note that much of the Blue Earth County portion of the WRW is identified as highly sensitive to pollution. This portion of the watershed contributes to the City of Mankato's Ranney wells which have recently seen higher levels of nitrates. This is a key consideration for implementation of practices that serve multiple water resource benefits.

Figure 3-~~9~~10: Watonwan River Watershed – Pollution Sensitivity of Near Surface Materials (GRAPS, p. 16).



Groundwater Connected Natural Features at Risk

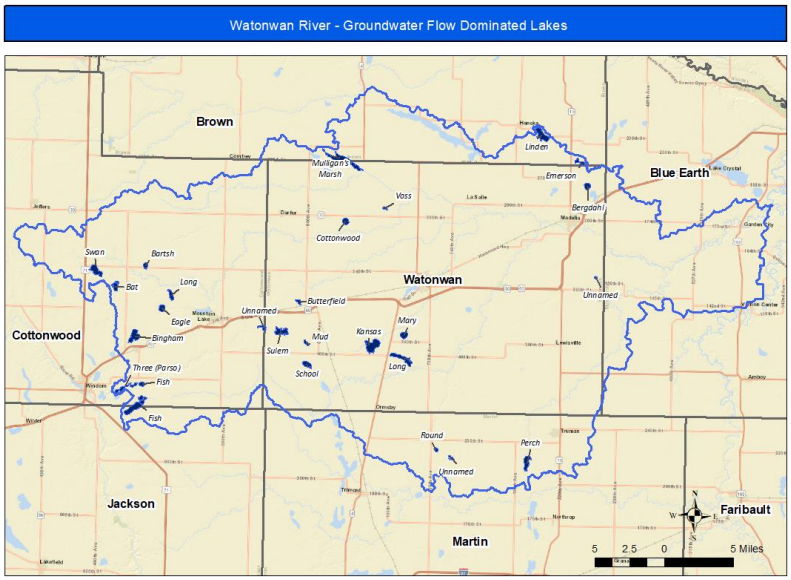
The WRW boundary includes significant natural features, including surface waters that depend on groundwater to sustain them. Groundwater appropriations and land-use changes can impact the health of these natural resources. If groundwater quantity or quality is degraded, these resources are at risk. The following features are present within the WRW:

- Two designated calcareous fens: Delton 20 and Perch Creek WMA;
- Wetland complexes across the entire area;
- Lakes that may be susceptible to changing aquifer levels;
- Twenty-three kinds of native plant communities connected to groundwater; and
- Ten rare plant and animal species connected with groundwater that are listed as threatened or special concern (see Table 3-6).

Groundwater Flow Dominated Lakes

All lakes are connected to groundwater, but the specific interaction between lake water and groundwater depends on the geology, topography, and volume of surface-water inflow and outflow associated with the lake. Groundwater-dominant lakes are shown in Figure 3-10~~9~~1. Twenty-seven lakes in the WRW have a watershed to lake area ratio of 10 or less and are considered groundwater-dependent lakes. Large-scale groundwater pumping near a lake will likely have more impact on groundwater-dominated lakes than on surface water dominant lakes.

Figure 3-10~~9~~: Watonwan River Watershed – Groundwater flow dominated lakes (GRAPS, p. 54).



3.7 Water Quality and Quantity

The USGS collected stream data on the Watonwan River from 1940-1946. The site was reestablished in 1976 and has been consistently operating since then. The river reached its flood record of 19,000 cubic feet per second (CFS) in 1965. More recently, the highest peak occurred on September 25, 2010, with flows reaching 16,100 CFS. The annual flow of the Watonwan River has increased by roughly 50% over the last four decades, despite a slight decrease in annual precipitation (MPCAa, 2020). The effect of subsurface drainage is generally to increase baseflows (i.e., that portion of streamflow that is derived from seepage or shallow groundwater, as opposed to surface runoff), regardless of whether peak flows are increased or decreased (Schilling & Libra, 2003).

According to Local County Water Plans, flooding is an issue throughout WRW. Flooding results in damages to cropland, inadequate land treatment, and excessive channel erosion. In Watonwan County, flooding occurs in all townships with varying amounts of damages. A total of 237,000 acres of farmland were affected in Watonwan County during 1991 and 1993 due to flooding. Blue Earth County has recognized the floodplains in Sections of 22, 23, 24, 26, and 27 of Garden City Township. The Garden City townsite is also located in flood prone areas. The portion of the watershed located in Cottonwood County is classified as having high flood potential. Specific areas near Mountain lake, North Fork of Watonwan River, South Fork of Watonwan River and the mainstem of Watonwan River are also prone to flooding (Water Resources Center, Minnesota State University, Mankato, 2000). Further, Federal Emergency Management Agency (FEMA) flood mapping efforts help to specifically define flood prone boundary areas.

The water quality of the waterbodies within the Watonwan River Watershed have been studied, the results of which are summarized in the Watonwan River Watershed Resotration and Protection Strategies (WRAPS) Report (MPCa, 2020). In addition, a watershed wide Total Maximum Daily Load (TMDL) study has been

completed for the Watonwan River Watershed. The TMDL documents the regulated pollutant sources and permitted wastewater discharges within the watershed and, for impaired water bodies, provides TMDL calculations. Both reports can be found online (https://www.pca.state.mn.us/water/watersheds/watonwan-river) The TMDL and WRAPS reports also indentify stressors causing aquatic life impairments. Figure 4.6 provides a map of imapired waters within the Watonwan River Watershed.

The Watonwan River feeds into the Blue Earth River, which is a source of drinking water for the City of Mankato. Mankato operates two shallow wells located in surficial sands aquifers near the Blue Earth and Minnesota River. The Ranney wells provide 61% of the total water volume for the City. These wells, called the Ranney collector wells, are not surface water wells. However, the Blue Earth and Minnesota Rivers do influence the shallow aquifers below the rivers and their banks.~~Mankato has two shallow aquifer Ranney wells that pull water from the Blue Earth and Minnesota Rivers. Portions of the spill management area buffer for the city of Mankato are within the Watonwan Watershed.~~ Nitrate concentrations in Mankato Ranney Wells and in the City of Darfur has reached levels of concern. These areas will be of focus to install nitrogen BMPs due to the mutual benefits of protecting drinking water supplies.

3.8 Stormwater Systems, Drainage Systems, and Control Structures

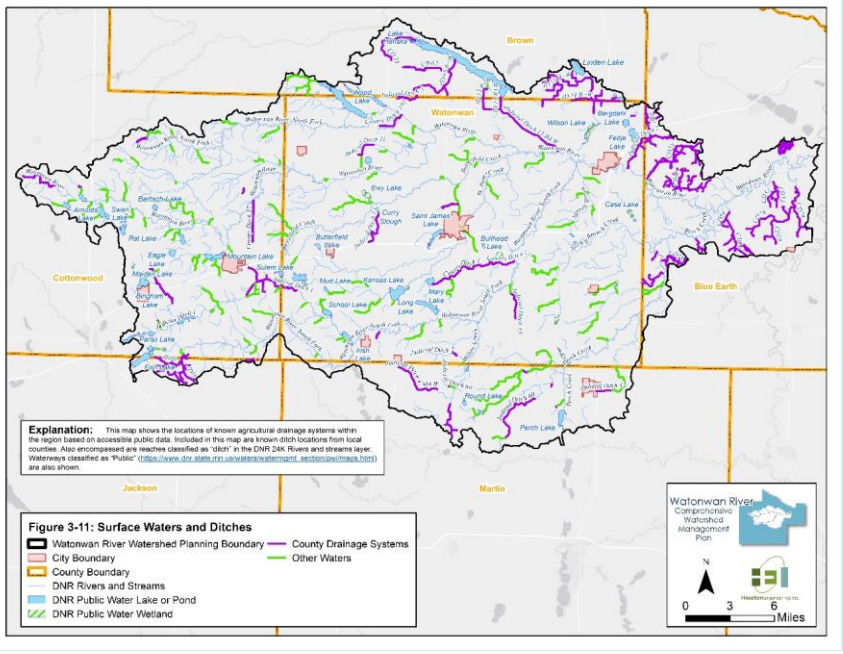
Low Impact Development (LID) along with Conservation Design are techniques used for managing urban and rural stormwater systems in developed areas. LID replicated natural filtration processes of a site's pre-development hydrology. There are no municipal separate stormwater sewer system (MS4) communities in the WRW. Conservation Design is a planning process that clusters development in a portion of a site so other areas remain in natural and/or agricultural use. Where appropriate, utilizing methods such as cluster development, along with regulatory controls, stewards' lands and builds resilient communities.

The ~~drainage~~ watershed network is defined by the Watonwan River and its major tributaries: North Fork of the Watonwan River, South Fork of the Watonwan River, St. James Creek, and Perch Creek; other smaller streams, public and private drainage systems, lakes, and wetlands complete the whole drainage network.

Total length of streams is 1,074 miles of which 685 miles are intermittent and 389 miles are perennial.

The planning area has a total of 331 stream crossings, either a bridge or culvert. There are 11 dams in the watershed; of those, two are considered by the DNR as potential barriers to fish passage. Seven of the dams are at lake outlets. Fish barriers exist on both the North Fork and South Fork of the Watonwan River. ~~The 'Wood Lake diversion' is a dam and water diversion structure positioned in the North Fork Watonwan River that is used to divert water to the Wood Lake SWMA.~~ For example, there is a culvert on the Watonwan River in Nelson Township (township road 67) that is currently a barrier to fish passage. The 'Watonwan River Diversion' is a low head dam and water diversion structure positioned in the South Fork Watonwan River used to impound water to the level of a pump that transports water uphill to Long Lake (DNR, 2014). Figure 3-12 only contains information that was available across the entire watershed. There is subsurface drainage throughout the watershed that is not represented in this figure.

Figure 3-121: Surface water and ditches in the WRW.



3.9 Water-based Recreation Areas

According to the DNR Recreation Compass, there are many lakes with public boat access, waterfowl production areas (WPAs), wildlife management areas (WMAs), and aquatic management areas (AMAs) that provide public access to water related recreation. More information on specific resources can be found on the DNR's websites:

- DNR, Recreation Compass: https://www.dnr.state.mn.us/maps/compass/index.html
- DNR, LakeFinder: https://www.dnr.state.mn.us/lakefind/index.html
- DNR, Water Access Sites: https://www.dnr.state.mn.us/lakefind/was/report.html

The DNR lists part of the Watonwan River as a State Water Trail encouraging canoers and kayakers to enjoy

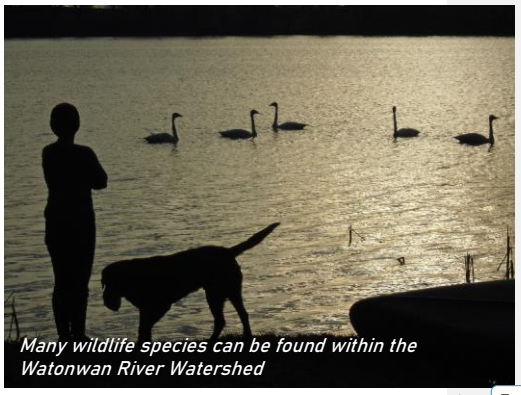
the nearly 30 miles of gentle currents of the Watonwan River from Madelia to Garden City. The amenities associated with the water trail are described here: https://files.dnr.state.mn.us/maps/canoe_routes/minnesota3.pdf.

Fishing is a popular recreational activity in the watershed, with walleye often caught on the mainstem of the Watonwan River (MPCA, 2016). There are many public parks in the watershed with water-based recreation as well. Additional public water access and fishing pier maps by county can be accessed here: https://www.dnr.state.mn.us/water_access/counties.html.

3.10 Fish and Wildlife Habitat, Rare and Endangered Species

The WRCWMP area is located within the Minnesota River Prairie Subsection of the North Central Glaciated Plains Section of the Prairie Parkland Province. Presently, agriculture is the dominant land use. This subsection is the heart of the Minnesota Corn belt. Pre-settlement vegetation included tallgrass prairie, with many islands of wet prairie. Further, Big Woods extended throughout the WRW along stream banks and floodplains, as vegetation here was better protected from fire. Portions of the Big Stone Moraine supported dry and dry-mesic prairie. There were also dry gravel prairies on kames. Upland prairie species were common throughout most of this ecological subsection. Remnant stands of tallgrass prairie are now rare. Fire was the most common natural disturbance before settlement. Fire suppression has allowed woodlands to develop from what were originally oak openings of brush prairies. Other causes of disturbance are floods and tornadoes (DNR, 2018).

~~According to the DNR, *Minnesota River Prairie Subsection Profile*, there are 116 species in Greatest Conservation Need within the Minnesota River Prairie ecological subsection (DNR, 2018). Of these species, 52 species are federal- or state-listed endangered, threatened, or of special concern. Species' habitat degradation and loss are generally the problem for these listed species followed by invasive species and competition, pollution, social tolerance/persecution/exploitation, and other reasons. Prairie and wetland-non forest habitats are key habitats that support the species that naturally reside in this region. Managing invasive species, use of prescribed fire, grassland management, prairie protection and restoration, and wetland protection/enhancement/restoration would assist native prairie habitats and the species they support.~~



Many wildlife species can be found within the Watonwan River Watershed

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Habitat

Healthy terrestrial habitat helps to promote greater species diversity and abundance, more resilient ecosystems, and, subsequently, greater ecosystem services. Within the Watonwan River Watershed, key factors associated with terrestrial habitat include:

- Habitat Loss – complete removal of a parcel of habitat
- Habitat degradation – habitat is still present, but the quality of the habitat has been substantially reduced
- Habitat fragmentation – the breakup of large contiguous or connected habitat into smaller disconnected parcels or fragments.

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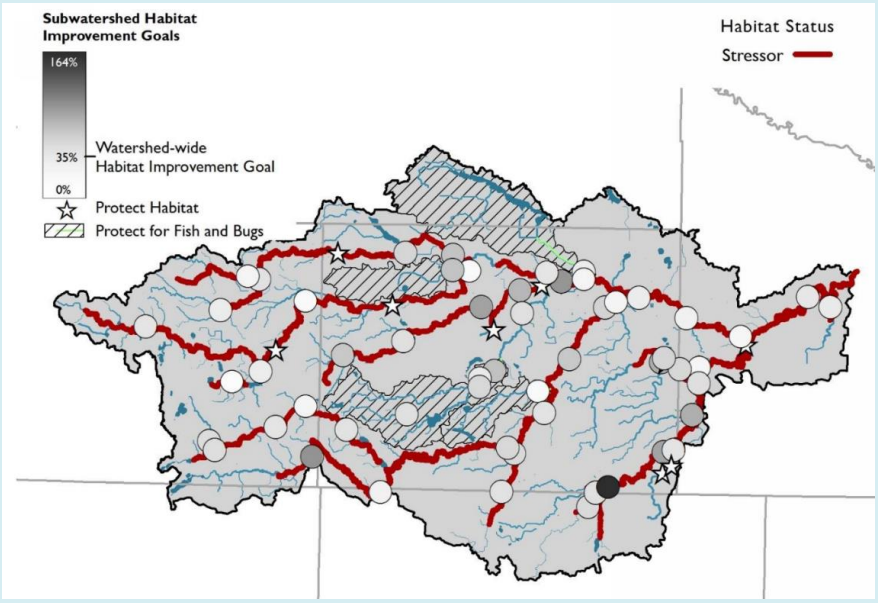
Aquatic Habitat, as identified in the Watonwan River ~~Watershed Restoration and Protection Strategies~~ WRAPS (MPCAa, 2020), refers to the physical stream habitat. Important stream habitat components include: stream size and channel dimensions, channel gradient (slope), channel substrate, habitat complexity and cover, vegetation cover and structure in the riparian zone, and channel-riparian interactions. Degraded habitat reduces aquatic life's ability to feed, shelter, and reproduce, which results in altered behavior, increased mortality, and decreased populations. Other areas not identified in the WRAPS, specifically to bolster waterfowl production, include WMAs, WPAs, other wetlands, and some easements. See associated resource concern maps in Section 4 for more information, which includes data from the Minnesota Wildlife Action Plan (DNR, 2015).

Of the 30 bio-impaired stream reaches, degraded habitat was identified as a stressor in all 30 stream reaches. The MPCA Stream Habitat Assessment (MSHA; PCA, 2014) scores in the WRW range from 24-69 (Figure 3-1~~2~~3) with an average score of 50. The specific habitat issues identified in the WRW show a complex, interconnected set of factors that are driven by primarily a handful of stressors. Of the 30 stream reaches

stressed by lack of habitat, most showed some issues with land use, riparian vegetation, channel instability, and excess sediment (Table 3-5). Without an adequate riparian buffer, issues such as excessive flow – which causes stream instability and sediment issues - are magnified because the stream lacks the strength to resist erosion.

Figure 3-1~~2~~3: Watonwan River Watershed – Aquatic Habitat Improvement Goals prescribed in the WRAPS (MPCAa, 2020)



The watershed-wide aquatic habitat goal for the Watonwan River Watershed is to increase the average MSHA score in the watershed by 35%, from the current score of 50 (fair) to a score of >66. The relative amount of change needed at a point location is illustrated by the color of the dot: the darker the dot, the more improvement needed. Locations with good habitat scores, illustrated with stars, should be protected. (WRAPS, January 2020, p. 35)

Table 3-~~5~~4: Watonwan River Watershed habitat stressors (MPCAa, 2020)

Stream	AUID	Flow Alteration	Degraded Riparian	Altered Channel	Bedded Sediment	Streambank Erosion	Lack of Cover
Watonwan River	501				x	x	?
Unnamed Creek	505		x	x	x		x
Watonwan River	510		x		x	x	x
Watonwan River	511				x	x	x
Butterfield Creek	516	x	x	x	x	x	x
Watonwan River	517	x	x		x	x	x
Perch Creek	523				?	x	x
Perch Creek	524		x		x	x	x
Unnamed Creek	526	x	x	x	x	?	x
Spring Brook	540			x	x	?	
Watonwan River	547	x			x	x	
Unnamed Creek	549	x	x	x		x	x
Unnamed Creek	552		x	x	?		x
Unnamed Creek	557	x		x	x	x	
County Ditch 78	559		x	x		x	x

Stream	AUID	Flow Alteration	Degraded Riparian	Altered Channel	Bedded Sediment	Streambank Erosion	Lack of Cover
Unnamed Creek	561	x	x	?	x	x	x
Watonwan Creek	563				x	x	
Watonwan Creek	564	x	x	x	x	x	
Watonwan Creek	565	x		x		x	
Watonwan Creek	566	x	x		x	x	
Watonwan Creek	567	x	x	x	x	x	x
Watonwan Creek	568	x	x		x	x	
Watonwan Creek	569	x	x	x	x	x	x
Willow Creek	571	x	x		x	x	x
Spring Branch Creek	574	x	x	x	x	x	x
Mink Creek	577	x	x	x	x	x	
Judicial Ditch 1	579	x	x	x	x	x	x
Judicial Ditch 1	580	x		x	x		x
Judicial Ditch 1	581	x	x	x	?	x	x
Unnamed Creek	583	x	x	x	x	x	x

x = likely source or driver ? = unknown effect <blank> = not likely source or driver

The specific sources of lack of habitat were assessed for the Watonwan River Watershed in the Stressor ID report (WRAPS, January 2020, p. 34). Excessive flow alteration (altered hydrology) and degraded riparian areas are two driving factors contributing to other sources.

In addition to streams, lakes are important habitat features within the WRW. The DNR Fisheries Lakes of Biological Significance (2015 GIS layer) identifies high quality lakes based on unique in-lake habitat features. Specifically, waterbodies noted for wildlife habitat include: Perch Creek provides Blanding's Turtle (endangered species) habitat; Lake Hanska is a designated wildlife lake; Bat Lake is in the 'outstanding' biological significance class with higher quality aquatic plant assemblages; Linden Lake and an unnamed wetland located East of Lewisville ranked as moderate with diverse bird life; and lastly, Kansas, Hanska, Bingham, and Fedji Lakes have opportunities to improve water fowl production.

Rare Natural Features and High Value Resources

According to the DNR, *Minnesota River Prairie Subsection Profile*, there are 116 species in Greatest Conservation Need within the Minnesota River Prairie ecological subsection (DNR, 2018). There are 14 endangered and threatened species documented in the WRW (DNR 2018b, Appendix F). There are an additional 47 species that are in suspected decline and are listed as special concern, species of greatest conservation need, or non-listed species (DNR 2020, Appendix F). ~~Of these species, 52 species are federal- or state-listed endangered, threatened, or of special concern.~~ These species are often tied to native plant communities that may also be in decline. In addition, other species rely on these communities to provide migration or normal travel corridors. In the WRW there are clusters of rare species that primarily occur along the main branch of the Watonwan River and Perch Creek. Most documented species are either tied to upland prairie and grasslands or aquatic habitats like rivers, lakes, streams, and wetlands. Maintaining upland and lowland connections across the watershed is important for retaining these species and for achieving stream stability and good water quality. ~~Species' habitat degradation and loss are generally the problem for these listed species followed by invasive species and competition, pollution, social tolerance/persecution/exploitation, and other reasons.~~ Prairie and wetland-non forest habitats are key habitats that support the species that naturally reside in this region. Managing invasive species, use of prescribed fire, grassland management, prairie protection and restoration, and wetland protection/enhancement/restoration would assist native prairie habitats and the species they support.

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Rare features contribute to the health of the habitat and environment that surrounds us. Some even contribute directly to local economies in the form of recreation—including hunting/fishing, wildlife viewing, canoeing/kayaking, and camping. The DNR has a statutory responsibility to conserve rare features (Minnesota Stat. 84.0895). Rare features can include species of unique plants and animals as well as native plant communities (habitats). Rare features are often key indicators of the health of our environment. When they decline, it is usually a signal that a natural process or element is not functioning well.

There are 14 endangered and threatened species documented in the WRW (DNR 2018b, Table 3-6). There are an additional 47 species that are in suspected decline and are listed as special concern, species of greatest conservation need, or non-listed species (DNR 2020, Table 3-6). These species are often tied to native plant communities that may also be in decline. In addition, other species rely on these communities to provide migration or normal travel corridors. In the WRW there are clusters of rare species that primarily occur along the main branch of the Watonwan River and Perch Creek. Most documented species are either tied to upland prairie and grasslands or aquatic habitats like rivers, lakes, streams, and wetlands. Maintaining upland and lowland connections across the watershed is important for retaining these species and for achieving stream stability and good water quality.

Table 3-6: Watonwan River Watershed documented rare species and features.

Scientific Name	Common Name	Species Class	Listing Status	General H
Actinonaias ligamentina	Mucket	Mussel	THR; SGCN	Medium to large rivers with sand and gravel substrates
Aechmophorus occidentalis	Western Grebe	Bird	SGCN	Fresh water lakes and marshes with extensive areas of open water bordered by emergent vegetation (breeding)
Alasmidonta marginata	Elktoe	Mussel	THR; SGCN	Medium to large rivers with sand and gravel substrates
Ammodramus henslowii	Henslow's Sparrow	Bird	END; SGCN	Grasslands and uncultivated old fields with stalks for perching
Ammodramus savannarum	Grasshopper Sparrow	Bird	Watch list, SGCN	Open grasslands and prairies with patches of bare ground
Anaxyrus cognatus	Great Plains Toad	Amphibian	SPC; SGCN	Upland and lowland prairie
Arnoglossum plantagineum	Tuberous Indian-plantain	Terrestrial Plant	THR	Native, moist prairies in southern MN
Asclepias sullivantii	Sullivant's Milkweed	Terrestrial Plant	THR	Mesic tallgrass prairies
Bartramia longicauda	Upland Sandpiper	Bird	Watch List	Native prairie and open grasslands
Bombus affinis	Rusty Patched Bumble Bee	Insect	Watch List	Native prairie and open grasslands
Buchloe dactyloides	Buffalo Grass	Terrestrial Plant	SPC	Southern bedrock outcrops
Buteo swainsoni	Swainson's Hawk	Bird	Watch list, SGCN	Native prairie and open grasslands; They will forage in hay or alfalfa fields
Catocala abbreviatella	Abbreviated Underwing	Insect	SPC	Prairies and grasslands with populations of leadplant (host plant)
Chaetura pelagica	Chimney Swift	Bird	Watch list, SGCN	Roost/Nest: suburban, urban, and rural areas with cavities for nesting like chimneys, hollow trees, or caves; Forage in open habitats
Chlidonias niger	Black Tern	Bird	Watch list, SGCN	Marshes/wetlands
Circus cyaneus	Northern Harrier	Bird	Watch list, SGCN	Large, undisturbed tracts of wetlands and grasslands with low, thick vegetation
Cistothorus platensis	Sedge Wren	Bird	Watch list, SGCN	Summer: Wet meadows, prairies, and marshes; Winter: grassy marshes and dry grasslands
Coccyzus americanus	Yellow-billed Cuckoo	Bird	Watch list, SGCN	Shrublands or wooded habitat with dense cover and water nearby
Coccyzus erythropthalmus	Black-billed Cuckoo	Bird	Watch list, SGCN	Woodlands and thickets, including aspen, poplar, birch, sugar maple, hickory, hawthorn, and willow; Prefer deciduous woodlands over coniferous
Colonial Water bird Nesting Area	N/A	Grouping of a variety of nesting bird species	N/A	Large, shallow lakes; marsh complex
Cygnus buccinator	Trumpeter Swan	Bird	SPC; SGCN	Small ponds, lakes, or bays
Cyperus acuminatus	Short-pointed Umbrella-sedge	Terrestrial Plant	THR	Edge of shallow rock pools and in the muddy margins of ponds and lakes
Cypripedium candidum	Small White Lady's-slipper	Terrestrial Plant	SPC	Calcareous seeps; wet prairie
Dolichonyx oryzivorus	Bobolink	Bird	Watch list, SGCN	Tallgrass and mixed prairies, hayfields, and meadows
Emydoidea blandingii	Blanding's Turtle	Reptile	THR; SGCN	Wetland complexes, small streams, and adjacent uplands, typically, but not always mapped as sandy soils
Eryngium yuccifolium	Rattlesnake Master	Terrestrial Plant	SPC	Prairies (dry to moist soils)
Falco sparverius	American Kestrel	Bird	NL, SGCN	Prairies, grasslands, open meadows, farmsteads
Gallinula galeata	Common Gallinule	Bird	SPC; SGCN	Freshwater cattail-bulrush marshes

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Watonwan River Comprehensive Watershed

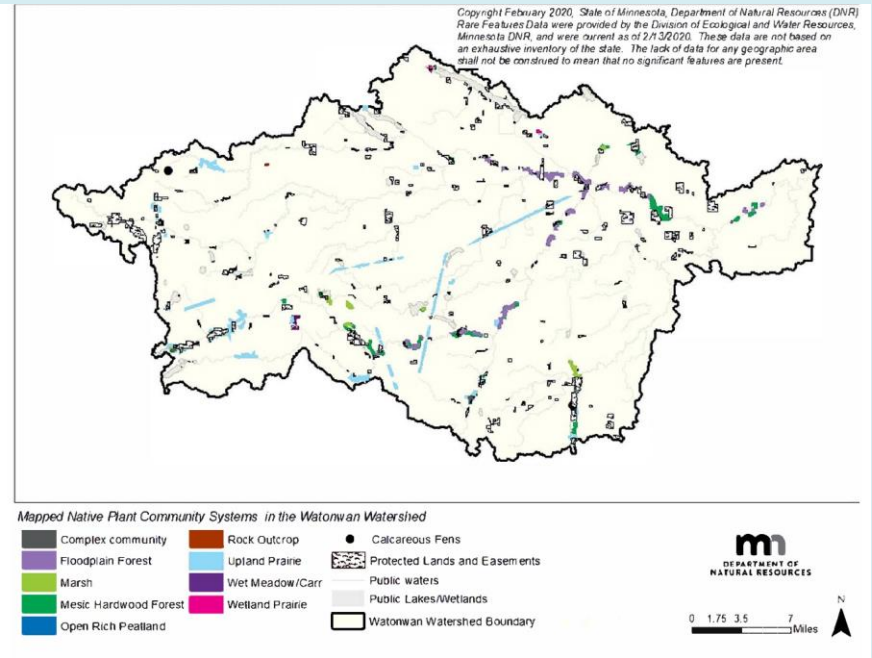
Scientific Name	Common Name	Species Class	Listing Status	General Habitat Type
Haliaeetus leucocephalus	Bald Eagle	Bird	Bald Eagle and Golden Eagle Protection Act (Federal)	Areas with dense or scattered trees and wet areas
Hylocichla mustelina	Wood Thrush	Bird	Watch List; SGCN	Mature deciduous and mixed forests
Ironoquia punctatissima	A Caddisfly	Insect	THR	Small cold-water spring habitats
Ixobrychus exilis	Least Bittern	Bird	Watch list, SGCN	Freshwater or brackish marshes with tall, emergent vegetation
Lasmigona compressa	Creek Heelsplitter	Mussel	SPC; SGCN	Creeks, small rivers, and the upstream portions of large rivers with sand, fine gravel, or mud substrates
Lasmigona costata	Fluted Shell	Mussel	THR; SGCN	Medium to large rivers dominated by gravel substrates
Lepus townsendii	White-tailed Jackrabbit	Mammal	Watch list, SGCN	Native prairies and grasslands
Lespedeza leptostachya	Prairie Bush Clover	Terrestrial Plant	THR; Fed THR	Mesic to dry-mesic prairie; Bluff prairies
Ligumia recta	Black Sandshell	Mussel	SPC; SGCN	Medium to large rivers in the riffles and runs with sand or gravel substrates
Ligumia subrostrata	Pondmussel	Mussel	THR, SGCN	Small creeks or ponds with muddy or sandy substrates
Megaceryle alcyon	Belted kingfisher	Bird	Watch list, SGCN	Rivers, streams, lakes, and ponds with clear water; Vertical earthen banks are used for nesting
Melanerpes erythrocephalus	Red-headed Woodpecker	Bird	Watch list, SGCN	Breeding: Open woodlands with dead or dying trees; Winter: Mature forests with oak, oak-hickory, maple, ash, and beech
Necturus maculosus	Mudpuppy	Amphibian	SPC; SGCN	Freshwater lakes, rivers, streams, and ponds
Oarisma poweshiek	Poweshiek skipperling	Insect	END; Fed END, SGCN	Wet to Dry native prairie
Onychomys leucogaster	Northern Grasshopper Mouse	Mammal	SPC; SGCN	Dry prairies
Pelecanus erythrorhynchos	American White Pelican	Bird	SPC; SGCN	Large, shallow bodies of water
Perognathus flavescens	Plains Pocket Mouse	Mammal	SPC	Upland prairie; savanna; open, well-drained areas, typically on sandy soils with sparse, grassy or brushy vegetation
Pleurobema sintoxia	Round Pigtoe	Mussel	SPC; SGCN	Medium to large rivers with sand, gravel, or mud substrates
Podiceps grisegena	Red-necked Grebe	Bird	Watch list, SGCN	Lakes or wetlands usually with emergent vegetation; bogs, sloughs, quiet river channels, alkaline lakes, large irrigation ditches, and borrow pits (breeding)
Progne subis	Purple Martin	Bird	SPC; SGCN	Breeding: near cities or along forest edges and rivers with dead snags that have woodpecker holes for nest sites; Winter: savannas and agricultural fields in S. America
Rallus elegans	King Rail	Bird	END, SGCN	Shallow freshwater, brackish, or saltwater marshes
Rallus limicola	Virginia Rail	Bird	Watch list, SGCN	Freshwater marshes with dense, emergent vegetation
Reithrodontomys megalotis	Western Harvest Mouse	Mammal	SPC; SGCN	Grasslands, meadows, and marshes
Schinia indiana	Phlox Moth	Insect	SPC; SGCN	Native upland prairie
Speyeria idalia	Regal Fritillary	Insect	SPC, SGCN	Upland and wet prairie
Spilogale putorius	Eastern Spotted Skunk	Mammal	THR	Open areas with sufficient cover, such as fencerows, shelterbelts, thickets, brush, and riparian woodlands

Scientific Name	Common Name	Species Class	Listing Status	General Habitat Type
Spiza americana	Dickcissel	Bird	Watch list, SGCN	Grasslands, hayfields, and lightly grazed pastures and roadsides
Spizella pusilla	Field Sparrow	Bird	Watch List, SGCN	Open or scrub habitats with low perches
Stelgidopteryx serripennis	Northern Rough-winged Swallow	Bird	Watch list, SGCN	Open habitats with vertical surfaces
Sturnella magna	Eastern Meadowlark	Bird	Watch list, SGCN	Native grasslands and prairies; Minimum of 6 acres to establish territories; Where their range overlaps with W. Meadowlarks they will use wetter, low-lying grasslands
Sturnella neglecta	Western Meadowlark	Bird	Watch list, SGCN	Open grasslands, prairies, meadows, and some agricultural fields; In winter they forage on bare ground
Toxostoma rufum	Brown Thrasher	Bird	Watch list, SGCN	Forests with cottonwoods, willows, dogwoods, and American plum; Breed: Fencerows, shelterbelts, woody edges
Vireo bellii	Bell's Vireo	Bird	SPC; SGCN	Early successional forests and riparian areas with dense, shrubby vegetation
Xanthocephalus xanthocephalus	Yellow-headed Blackbird	Bird	Watch list; SGCN	Breeding: Prairie wetlands, shallow marshes, ponds, and rivers

**END =State Endangered; THR = State Threatened; SPC = State Special Concern; Watch list = Species the DNR is tracking because they are in suspected decline SGCN= Species of Greatest Conservation Need; NL=Non-listed species*

There are 23 kinds of native plant communities in the WRW. They range from dry and mesic prairies to marshes, seepage meadows, and floodplain forests. Figure 3-1~~3~~4 illustrates existing native plant communities. The WRW has lost many of its native plant communities so those that remain are a high priority for preservation in order to achieve watershed health. Dry and mesic prairies are the dominant remnant land cover with marshes and seepage meadows and floodplain forests tied for a close second. All the native plant communities that remain are considered critically imperiled, imperiled, or vulnerable to extirpation.

Figure 3-1~~4~~3: Watonwan Watershed Native Plant Communities (Procured by DNR, 2020).



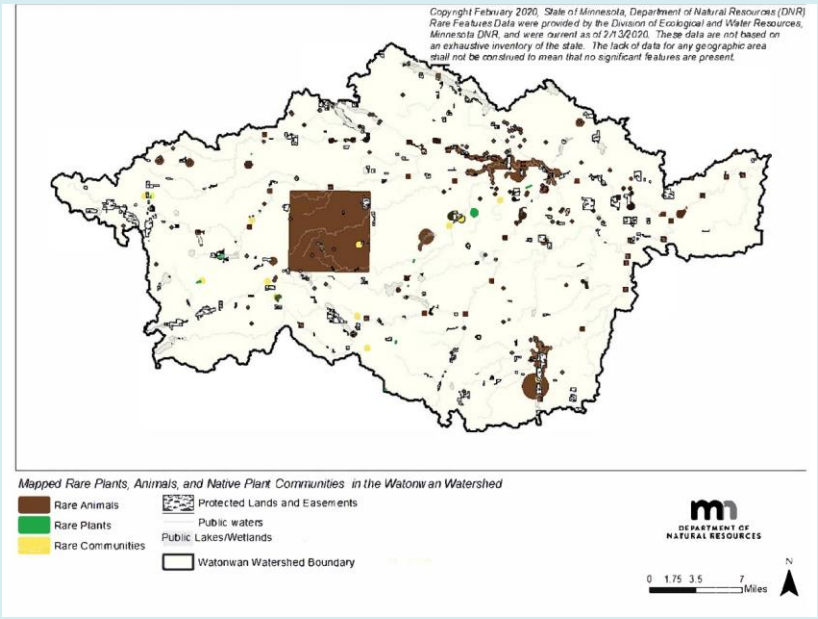
Connections between wildlife species, native plant communities, lakes and wetland features are many and often complex. In order to conserve these features, a tiered approach should be used—preserving native communities, restoration and enhancement to create larger habitat networks, and incorporating best management practices such as soil health into the agricultural landscape. All three tiers can be implemented at the same time and focusing on these three levels of restoration and protection strategies maximizes conservation benefits. Remaining clusters of rare or sensitive natural features helps maintain high quality habitat while their scarcity elsewhere in the watershed signal the need for restoration or adaptive management. Maintaining and restoring biological diversity, abundance, and resiliency is a component of integrated watershed health. The more diverse an area is, the better chance it has at long-term health and self-sustainability. Over the years, there will be variations in invasive species pressure, soil conditions, and climate such as extreme drought or extreme moisture. Having a diversity of communities and species ensures that more of these will become established/adapted to these extremes and can therefore meet the ebb and flow of change.

The WRW has concentrations of high value ecological features that primarily occur along the main and south branches of the Watonwan River, Perch Creek, Judicial Ditch 1 and their associated tributaries (Figure 3-1~~3~~4). The first two are identified as priority habitat networks in the Minnesota Wildlife Action Plan (2015-2025). The western lobe of the watershed also includes a priority area with a goal of establishing a prairie and wetland connected habitat corridor for the Minnesota Prairie Conservation Plan. These areas are hot spots in terms of conservation potential. There are opportunities to create a connected corridor of native and restored plant communities

building off of the existing Perch Creek, Younger Brothers, Little Swan, and Delft Wildlife Management Areas that occur along the Watonwan River, Perch Creek, and the western lobe of the watershed. These communities, which include priority fish and wildlife habitat areas, wetland/upland complexes, and natural areas not only provide quality habitat, but sequester carbon, provide a home for rare species, contribute to clean water, and offer many recreational opportunities.

Further, there are two designated calcareous fens in the WRW (Delton 20 and Perch Creek WMA, Figure 3-145). Calcareous fens are rare and distinctive peat-accumulating wetlands. They depend on a constant supply of upwelling groundwater rich in calcium and other minerals. This calcium-rich environment supports highly diverse and unique rare plants that tolerate low oxygen conditions, calcium carbonate deposits, low nutrient availability, and relatively cold organic soils (peat)—the calcareous fen ecosystem. Because these types of wetlands are one of the rarest natural communities in the United States, they are specially protected from harm under Minnesota Statute (103G.223). Fens are connected to a larger groundwater system. They are good indicators of groundwater sustainability, contribute to improved water quality and ecological diversity, and are an invaluable part of Minnesota's rich natural heritage. Once lost, these communities cannot be replaced.

Figure 3-145: Watonwan River Watershed – Rare Plants, Animals, and Native Plant Communities (Procured by DNR, 2020).



3.11 Existing Land Uses and Anticipated Land Use Changes

Agriculture is the predominant land use within the watershed, accounting for approximately 87% of the land use. In general, corn/soybean rotations comprise nearly 93% of the cropped lands within the watershed. Land ownership is comprised of 97% private landowners; 2.08% state; 0.21% private major; and 0.09% federally owned lands (Greater Blue Earth River Basin Alliance, 2018).

Incorporated communities with all or part of the corporate limits in the WRW are the following:

- Bingham Lake – Cottonwood County
- Butterfield – Watonwan County
- Darfur – Watonwan County
- La Salle – Watonwan County
- Lewisville – Watonwan County
- Madelia – Watonwan County
- Mountain Lake – Cottonwood County
- Odin – Watonwan County
- Ormsby – Watonwan County
- St. James – Watonwan County
- Truman – Martin County
- Vernon Center – Blue Earth County

Unincorporated communities located in the WRW include, but are not limited to:

- Garden City – Blue Earth County
- Delft - Cottonwood County
- Godahl - Watonwan County

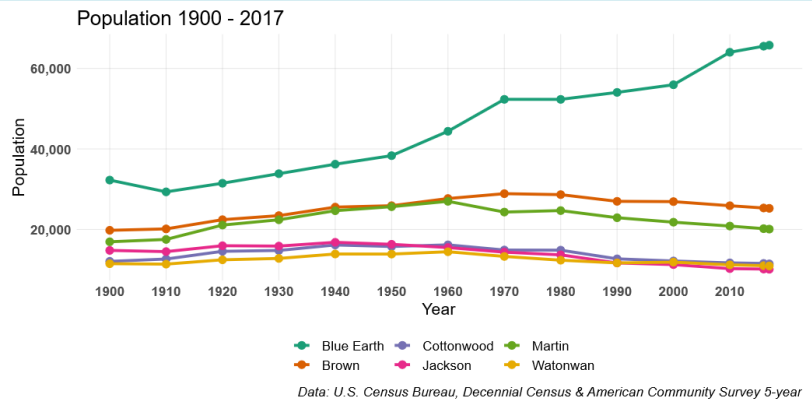
It is anticipated that land use will remain relatively consistent with current use during the implementation of the plan. Agricultural land use and the rural-urban landscapes will continue to develop. Due to the scope of this narrative, additional information can be found on the local jurisdiction's (county, city, township) websites, as available.

3.12 Socioeconomic Information

According to the Minnesota Department of Administration, State Demographic Center, population statistics for each township, in whole or partially within the WRW are provided in Table 3-7. There is a total estimation of 8,443 individuals and 3,449 households within the plan watershed. Population trends from 1900 to 2017 for each county located within the watershed are provided below in Figure 3-1~~5~~6. A graphic showing the percentages of employment by industry type are provided by The Rural Atlas and included below (Figure 3-1~~6~~7).

The partners involved in the development of this plan reviewed the available data sources for describing socioeconomic information within the watershed. The steering committee decided that the information within this section most accurately represented the watershed, recognizing the complexities of socioeconomic information at a watershed scale.

Figure 3-156: Population for each Census year, per County within the Watonwan River Watershed.



Population trends charts : The Rural Atlas – Chapter 1: People – Population for each census year, accessed Oct. 2019: https://center-for-rural-policy.shinyapps.io/Rural_Atlas/.

Table 3–75: Current populations within the Watonwan River Watershed (Please note: Some populations within municipal/township borders may be outside of the watershed boundary)(MN State Demographic Center).*

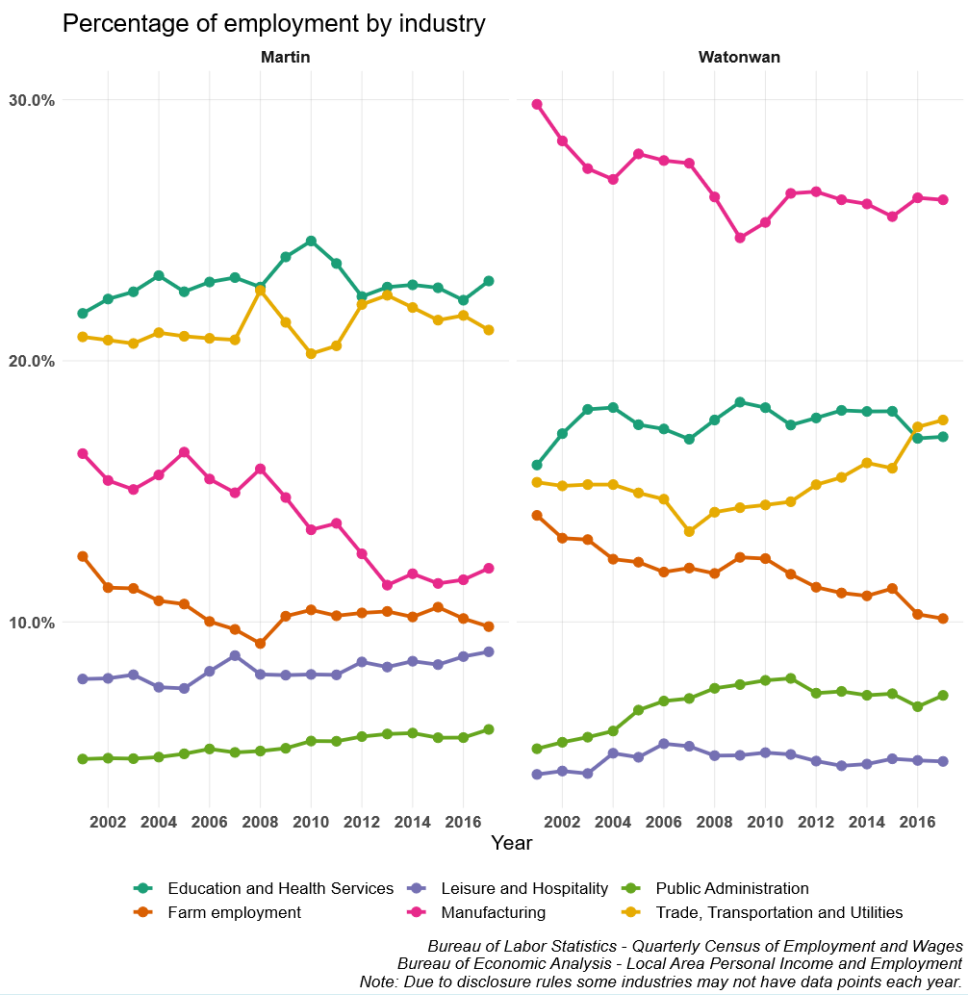
Municipalities and Townships within Watonwan River Watershed	County	Population (2018)*	Households (2018)*
Ceresco TWP	Blue Earth	210	84
Garden City	Blue Earth	255**	-
Garden City TWP	Blue Earth	647	261
Lincoln TWP	Blue Earth	188	80
Pleasant Mound TWP	Blue Earth	195	88
Vernon Center	Blue Earth	303	122
Vernon Center TWP	Blue Earth	236	94
Albin TWP	Brown	329	126
Lake Hanska TWP	Brown	322	132
Linden TWP	Brown	276	108
Mulligan TWP	Brown	210	86
Amboy TWP	Cottonwood	150	66
Bingham Lake	Cottonwood	128	57
Carson TWP	Cottonwood	255	104
Dale TWP	Cottonwood	131	57
Delton TWP	Cottonwood	119	46
Lakeside TWP	Cottonwood	231	93
Midway TWP	Cottonwood	196	79
Mountain Lake	Cottonwood	2,108	854

Municipalities and Townships within Watonwan River Watershed	County	Population (2018)*	Households (2018)*
Mountain Lake TWP	Cottonwood	371	98
Selma TWP	Cottonwood	176	76
Christiania TWP	Jackson	240	111
Kimball TWP	Jackson	123	47
Cedar TWP	Martin	205	87
Galena TWP	Martin	228	89
Ormsby (Partial)	Martin	57	27
Truman	Martin	1,058	468
Waverly TWP	Martin	189	75
Westford TWP	Martin	283	117
Adrian TWP	Watonwan	132	66
Antrim TWP	Watonwan	226	96
Butterfield	Watonwan	572	218
Butterfield TWP	Watonwan	205	90
Fieldon TWP	Watonwan	202	85
Lewisville	Watonwan	243	101
Long Lake TWP	Watonwan	319	141
Madelia	Watonwan	2,302	909
Madelia TWP	Watonwan	334	130
Nelson TWP	Watonwan	273	112
Odin	Watonwan	103	54
Odin TWP	Watonwan	151	65
Ormsby (Partial)	Watonwan	70	37
Riverdale TWP	Watonwan	281	123
Rosendale TWP	Watonwan	291	121
St. James	Watonwan	4,545	1,847
St. James TWP	Watonwan	248	106
South Branch TWP	Watonwan	271	110
	Total	19,932	8,143

**PopFinder for Cities and Townships, through the MN Department of Administration, State Demographic Center, accessed April 2020: https://mn.gov/admin/demography/data-by-topic/population-data/our-estimates/pop-finder2.jsp.*

**2010 US Census

Figure 3-167: Percentage of employment by industry – Martin and Watonwan Counties (The Rural Atlas).



Source: The Rural Atlas, updated with 2017 census data, Chapter 2 – Economic Vitality, earnings per job decreasing in our more rural areas. Accessed Oct. 2019: https://center-for-rural-policy.shinyapps.io/Rural_Atlas/.