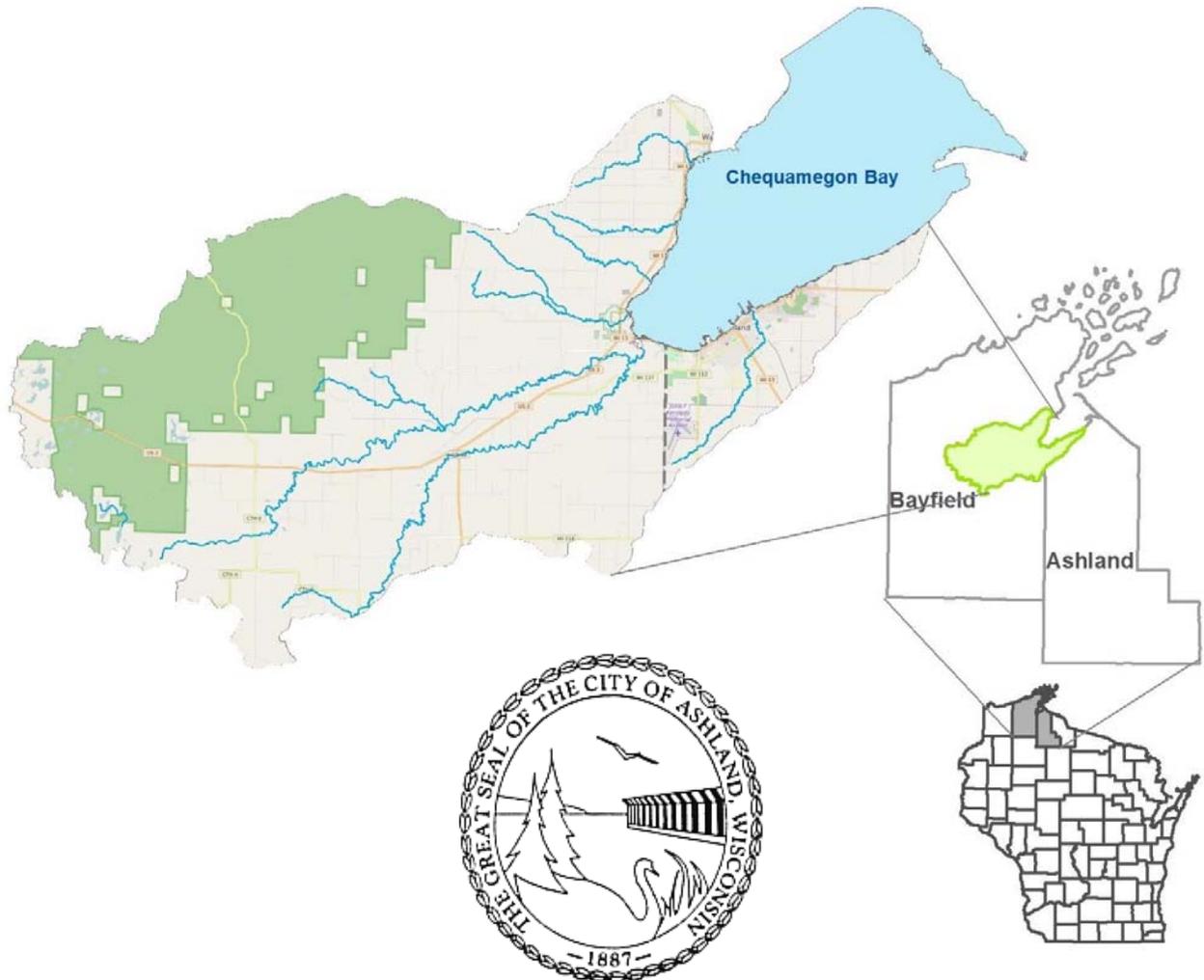


# CITY OF ASHLAND SOURCE WATER PROTECTION PLAN

Draft ~ July, 2021



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Additional Assistance from Wisconsin Department of Natural Resources

## Acknowledgments

The Ashland City Council initiated the development of the source water protection committee in March, 2016. The committee consists of city staff and council members, Ashland and Bayfield County supervisors, Bad River Tribe and watershed association representatives, Northland College staff, and state Department of Natural Resources staff. Additional assistance was received from Wisconsin Rural Water Association, county and federal agency staff, and interested local citizens. Collaboration and input from these individuals has made this project possible. Thank you for the many hours spent working on the project, with particular recognition towards those who volunteered their time to help develop sections of the plan for which they have local knowledge of the issues.

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# 1. INTRODUCTION

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Source water is untreated water from streams, rivers, lakes, and groundwater aquifers. Source water protection is a watershed based approach to protecting drinking water sources and reducing treatment costs. A watershed is not limited to political boundaries such as township, county or state. Instead, it is simply an area of land that drains to a common point. Although we often manage land according to political boundaries, it makes more sense to plan and manage areas by the lay of the land, and all people living within a watershed play an important role in protecting their water.

Affordable, safe drinking water is essential to the health, development and stability of all communities. Treatment is used to maintain safe drinking water for surface water systems; however, the cost and quality of treated drinking water is a function of the pretreatment water quality. One of the best ways to ensure safe drinking water and reduce treatment costs is to develop a local source water protection program designed to protect the source of drinking water against potential contamination.

Source Water Protection (SWP) is the first line of defense in a multi-barrier approach to assure the availability and reduce the cost of clean safe drinking water. It focuses on protecting and improving water quality at the origin before reaching the drinking water intake and undergoing treatment. SWP is accomplished using four main steps: assessment, planning, implementation, and long-term management. For the City of Ashland, the first step, “assessment,” was completed in March 2003 by the Wisconsin Department of Natural Resources (WDNR) and documented in the report *Source Water Assessment For Ashland Water Utility, Ashland, Wisconsin March 27, 2003* (A copy of Ashland’s source water assessment is available by contacting the WDNR or the City of Ashland). The source water assessment for Ashland suggests that the next steps in protecting their drinking water is for the city to develop a SWP program by forming a SWP committee to plan and implement best management practices in the source water area. This source water protection program is intended to put in place the remaining steps of planning, implementation, and long term management of the city’s source water.

In February 2016, due to an increase in public awareness about water quality concerns, city employees compiled a list of potential source water protection committee members who could collaboratively develop a SWP plan for the City of Ashland. In March 2016, the City Council voted to approve the formation of a SWP committee and development of the SWP plan. The city contacted the Wisconsin Rural Water Association (WRWA) for assistance with facilitating the SWP plan writing process. WRWA is a non-profit association of utilities that provides technical assistance to utilities. Ashland is a long time member of WRWA. SWP planning efforts began with an initial meeting of the SWP committee in August 2016. The committee started to develop the SWP plan and conducted several additional meetings throughout 2016 and 2017. Due to staff turnover at the city, the plan stalled before being completed. In early 2020, with new city staff in place and a refreshed SWP committee, the SWP planning efforts were renewed and the SWP plan was completed.

## 1.1 Integration With City Of Ashland Planning (Comprehensive Plan and Strategic Plan)

Integration of the Ashland Source Water Protection Plan with the City of Ashland is done two ways: through city operations and through ordinances. Two city council members and several city staff members sit on the SWP committee. These individuals are tasked with implementing the plan by

revising and updating the city's operating procedures and developing ordinances that improve and protect water quality in the Chequamegon Bay and the tributaries leading to it.

## **1.2 Integration With Ashland And Bayfield Counties (Including Resource Management Plan)**

Ashland and Bayfield Counties have Land & Water Resource Management (LWRM) Plans. Plans are approved for a 10-year term and work plans are updated every 5 years. LWRM plans address natural resource conservation and protection including surface water, groundwater, soils, forests, agriculture, and wildlife habitat. While these planning efforts are related, the Ashland Source Water Protection Plan takes a more focused look at surface water quality in Chequamegon Bay.

In Chapter VIII of the Ashland County plan, coordination with the City of Ashland is specifically listed. This includes the goal "Increase collaboration on Lake Superior waterfront issues, stormwater management, invasive species, and beach health." The Bayfield County plan lists the City of Washburn and the City of Bayfield as implementation partners. The City of Ashland should look for commonalities in the Ashland and Bayfield Counties' Land and Water Resource Management Plans and look for opportunities to participate in the regular planning cycle.

## **1.3 Integration With Other Planning Efforts (Tribal Governments And Entities And Non-Governmental Organizations)**

Tribal government entities in the area include the Bad River Band of Lake Superior Chippewa, Red Cliff Band of Lake Superior Chippewa, and the Great Lakes Indian Fish and Wildlife Commission. Prominent non-governmental organizations in the area include the Superior Rivers Watershed Association, Chequamegon Bay Area Partnership, Mary Griggs Burke Center for Freshwater Innovation at Northland College, and others. The Ashland city staff and SWP committee members should seek opportunities to coordinate these tribal and non-governmental organizations to improve and protect water quality in the Chequamegon Bay and coordinate source water protection in planning efforts.

## 2. BACKGROUND

Source water refers to water from streams, rivers, lakes, or underground aquifers that provide water to an end user such as a municipal water supplier providing domestic drinking water. The City of Ashland is located in Northwest Wisconsin along the southern shore of Lake Superior, and the city water utility relies solely upon water from Lake Superior's Chequamegon Bay to provide drinking water to residents.

The first work done to protect Ashland's source of drinking water was the WDNR's Source Water Assessment completed in 2003. The Source Water Assessment delineated the source water area for Ashland's municipal water intake. The source water area is defined as the area that contributes water to the public drinking water system. For Ashland that includes land drained by Bono Creek, Boyd Creek, Fish Creek, Bay City Creek, and multiple unnamed tributaries to Chequamegon Bay. Clay soils predominate throughout the watershed, which exacerbate erosion and runoff problems. Land cover consists of many naturally vegetated areas with some agriculture and urbanized land in the cities of Ashland and Washburn.

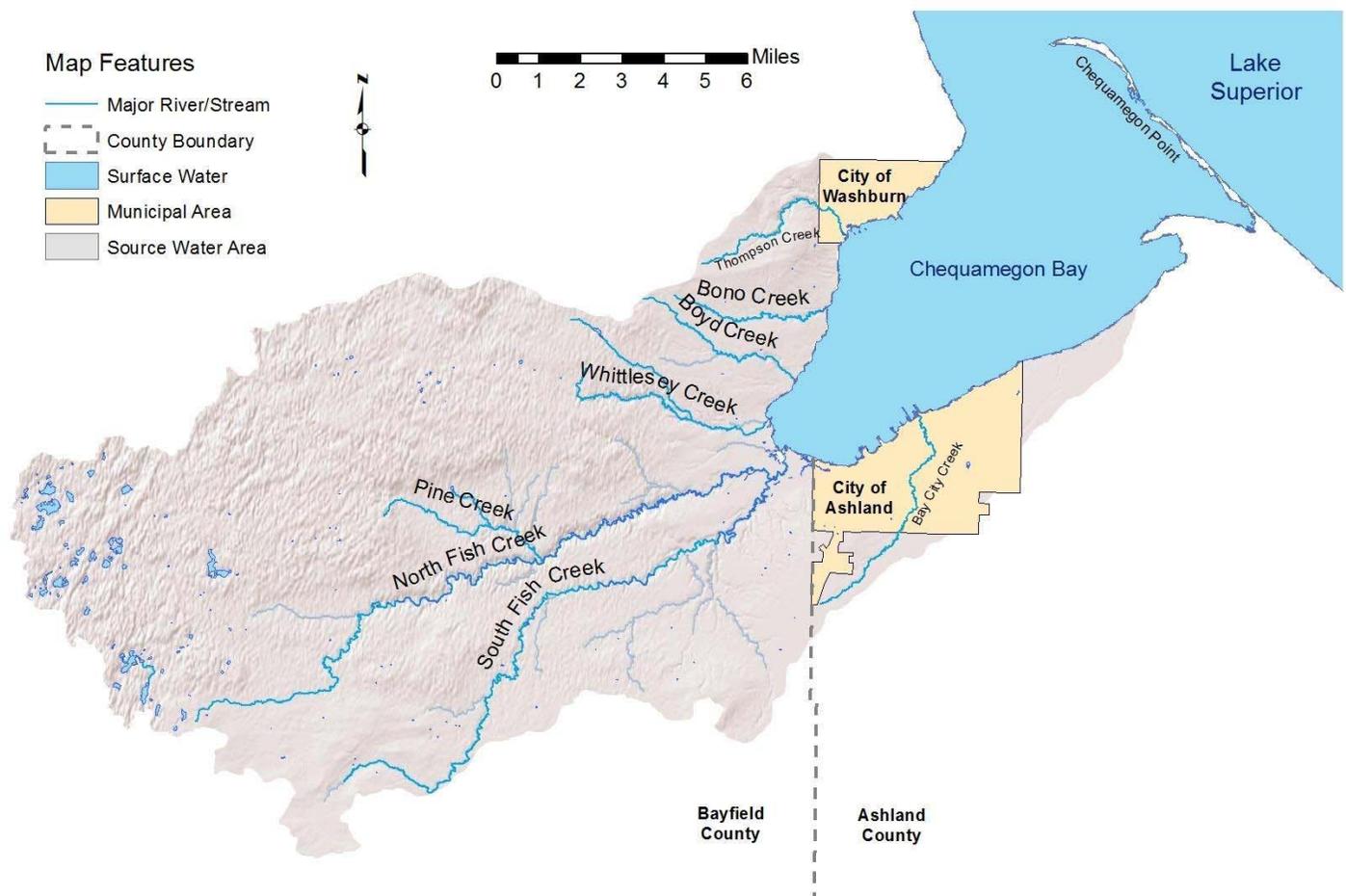


Figure 1: Watershed Overview

## 2.1 Source Water Assessment Overview

A source water assessment provides not only an understanding of current conditions but also serves as a predictive tool for management and protection efforts. This information can be used as a basis for voluntary, community-based barriers to drinking water contamination.

The 1996 amendments to the Safe Drinking Water Act required that states complete source water assessments for all public drinking water systems. The primary purpose of these assessments was to determine the relative susceptibility of each community's source water to contamination. Susceptibility is defined as the likelihood that a contaminant of concern will enter a public water supply at a level that may result in adversely impacting human health.

The source water assessment for the Ashland Water Utility was completed by the WI DNR in 2003. It states that, as with most surface water systems, "Ashland's source water is impacted by the source water area and highly susceptible to contamination". The assessment identifies the confined nature of the Chequamegon Bay, erodible soils, and land use as the biggest factors affecting source water susceptibility. It concludes that contaminants of particular concern to Ashland's source water include microbial, volatile organic, and synthetic organic contaminants as well as precursors of treatment by-products. It suggests that SWP efforts should focus on preventing contamination from agriculture and pasture land draining into Bono, Boyd, and Fish Creeks, urban development in the city of Ashland, and sites of historic contamination. The primary recommendation of the source water assessment is for the City of Ashland to develop a local source water protection program designed to protect Ashland's drinking water source from potential contamination. A copy of Ashland's source water assessment can be obtained by contacting the WDNR.

<https://dnr.wisconsin.gov/topic/DrinkingWater/SWAP.html>.

## 2.2 Source Water Protection Overview

Source water protection is the next step beyond the source water assessment. Source water protection begins when the local community decides to develop a program designed to protect the drinking water sources from potential contamination. A source water protection committee must be formed to plan and implement best management practices to prevent contamination. It is the first line of defense to reduce the chance that contamination will reach the end user. Additionally, SWP reduces potential health risks and minimizes the costs of treating drinking water. SWP consists of the following steps:

- **Delineate the source water protection area:** The source water protection area was delineated in the 2003 source water assessment and is described in section 3.1. This plan includes an additional "secondary" source water protection area, which is described in section 3.2.
- **Inventory known and potential source of contamination and determine susceptibility to contaminant source within the SWP area:** In order to protect the source water, it is necessary to know what potential sources of contamination threaten the water. Potential contaminant sources are evaluated in Sections 4 & 5.
- **Implement management measures to prevent, reduce, or eliminate risks to the source water:** The key to a successful plan is creating meaningful action. The implementation measures laid out in section 7 are designed to protect the drinking water source for the City of Ashland.
- **Develop contingency planning strategies that address water supply contamination or service interruption emergencies:** In the event of a contamination event or emergency, section 8

outlines what actions need to be taken and lays out communication procedures. Preparing for emergencies is a critical part of any drinking water protection program.

Protecting source water is everyone's responsibility. Some key contributors include federal, state, and local government entities, water and wastewater utilities, business and industry, non-governmental organizations, and individuals. More information about SWP can be found at the following Wisconsin DNR and EPA websites.

<http://dnr.wi.gov/topic/drinkingwater/sourcewaterprotection.html>

<https://www.epa.gov/sourcewaterprotection/source-water-protection-basics>

### **2.3 City Of Ashland Water System Overview**

The Ashland Water Utility pumps an average of around 500,000 gallons of water per day and serves more than 9,115 people through more than 3,000 service connections. Raw water is collected from the Chequamegon Bay by a 24-inch diameter pipeline and single raw water intake, which extends approximately one half mile into the bay. Gravity feeds water through the intake pipe into the collection chamber. From there it is pumped to the microfiltration building on the east shore of the bay off Water Street.

The microfiltration building was constructed in 2001. Filtration starts with a 500-micron strainer to remove any large debris. Next, water flows through four membrane microfiltration units which remove particles as small as 0.2 microns in size. After filtration, finished water is treated with chlorine for disinfection and fluoride for dental health. Treated water flows to a ground storage reservoir which allows for sufficient contact time with the chlorine to completely disinfect the water. Additional treatment consists of adding small doses of Polyphosphate and Sodium Hydroxide. These chemicals have been successful at reducing the amount of lead that leaches into water if a home still has lead pipes.

From the ground reservoir, three high-lift service pumps, capable of pumping 840 gallons per minute each, discharge to the distribution system. The system contains 54 miles of main pipe that ranges from one inch to twenty-four inches in diameter. Storage for the water system is provided by a 1.4 million gallon standpipe and a half-million gallon elevated water tower. All facilities are continuously monitored by computer through a telemetry system and physically checked daily for proper operation.

## **3. HYDROGEOLOGIC SETTING**

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Lake Superior is the largest freshwater lake in the world by surface area and the third-largest by volume. It has 1,826 miles of shoreline and covers 31,700 square miles with a maximum depth of 1,332 feet. The lake's watershed drains approximately 49,300 square miles of land.

Chequamegon Bay is a shallow, sandy bay relatively isolated from Lake Superior by the Bayfield Peninsula to the northwest and Chequamegon Point to the northeast. The bay is connected to Lake Superior by a 2 mile stretch of open water between the tip of Chequamegon Point and Houghton Point on the Bayfield Peninsula. The Chequamegon Bay area watershed is a compilation of several watersheds that flow toward Lake Superior. The Chequamegon Bay watershed includes nearly 1,500

square miles of land in Ashland, Bayfield, and Iron counties. It contains more than 2,100 linear miles of tributaries that originate near the watershed divide created by the Penokee Range to the south and flow north towards Chequamegon Bay and Lake Superior.

The Superior region contains portions of two distinct geologic provinces: the Lake Superior Lowland along the lakeshore and the higher elevations of the Northern Highlands to the south. The geography of the region was shaped by glaciers that covered the area more than 20,000 years ago during the later portion of the most recent glacial period. The Northern Highlands consist of the sandy till of the Copper Falls Formation deposited by glacial meltwater. The sandy, coarse-grained till allows much precipitation and snowmelt to infiltrate and supports less surface runoff to streams. As the glaciers retreated to the north, they deposited till with much more silt and clay known as the Miller Creek Formation. The fine-grained, low permeability in these areas supports high surface runoff to streams (Clayton, 1984; Gotkowitz and Li, 2016). The old beach shoreline of Glacial Lake Duluth is composed of sand layers on top of clay layers as well as interwoven sand and clay layers. These transitional soils are highly susceptible to erosion, especially when undercut by water (Fitzpatrick et al., 1999). Surface runoff in the Fish Creek and Whittlesey Creek watersheds give the Chequamegon Bay a prominent cloudy red appearance during high runoff events such as during spring snowmelt and after heavy rains.

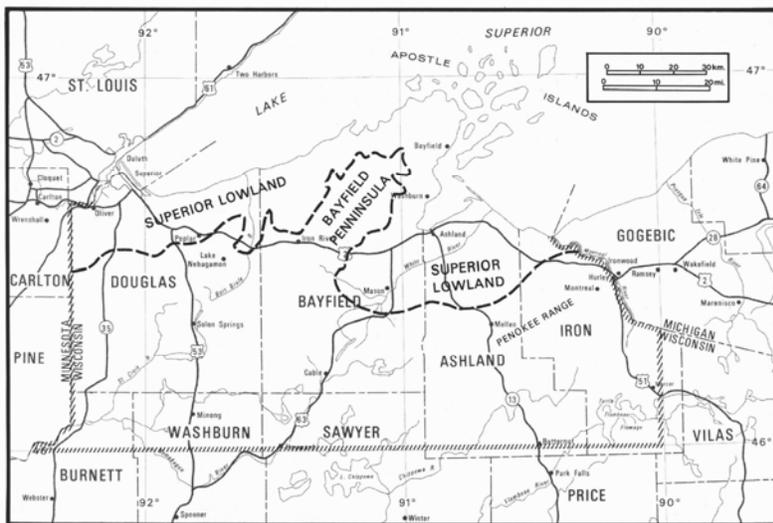


Figure 2: Superior Region (Clayton, 1984)

While the entire Chequamegon Bay area watershed and other factors such as lake-wide episodic events can affect water quality in the bay, implementing SWP in the entire Lake Superior Watershed is not practical. To protect and improve water quality at a more manageable scale, Ashland’s source water area was delineated to include the local watersheds that discharge near Ashland’s intake and have the most direct impact on water quality in Chequamegon Bay. The Source Water Protection (SWP) area for Ashland is divided into Primary and Secondary SWP areas which are described below.

### 3.1 Primary Source Water Protection (SWP) Area

The Primary SWP area is the land that contributes a majority of the surface water flowing into the Chequamegon Bay and most directly affects source water quality due to proximity. It covers more than 200 square miles and includes land drained by Bono Creek, Boyd Creek, Fish Creek, Bay City Creek and

multiple unnamed tributaries to Chequamegon Bay. Ashland's source water is most directly affected by runoff from the Fish Creek 10 digit Hydraulic Unit Code (HUC 10) watershed and the Whittlesey Creek HUC 12 watershed. The primary SWP area is the main focus of this report and the efforts of the Ashland SWP program. The primary SWP area is mapped along with the secondary SWP area in Figure 3.



Figure 3: Ashland Source Water Protection Area

### 3.2 Secondary Source Water Protection (SWP) Area

The Secondary SWP area includes adjoining subwatersheds outside of the primary SWP area that contribute less directly to the surface flow and water quality of Chequamegon Bay and Ashland's source water quality. The area is much larger than the primary SWP area and includes the following HUC 10 Watersheds: Bayfield Peninsula, Beartrap Creek, Lower Bad River, Marengo River, Potato River, Tyler Forks, Upper Bad River, and White River. Due to the large size of the secondary SWP area, Ashland's SWP program does not directly address issues and implementation measures in the secondary SWP area; however, it is important to acknowledge that these surrounding watersheds do have some impact on Ashland's source water quality, particularly when certain variables such as wind direction or circulation patterns in the bay are just right.

The Source Water Protection Committee includes representatives from primary and secondary SWP areas and recognizes the importance of working with all local units of government, tribes, organizations, and individuals in implementation of the Source Water Protection Program in both the primary and secondary SWP areas.

### 3.3 Impaired Waters List

Every two years, Section 303(d) of the Clean Water Act requires states to publish a list of all waters that do not meet water quality standards known as the Impaired Waters List. As of 2020, the water bodies in the primary SWP area listed as impaired are South Fish Creek, an unnamed tributary to South Fish Creek, Bay City Creek, and Maslowski Beach. Bayview Park Beach was listed previously but has been removed. The streams are impaired because of total phosphorus from rural and/or urban nonpoint source runoff. Maslowski Beach is impaired for E. coli. Additionally, Lake Superior is listed as impaired for PCBs and Mercury. Below is a table and a map of the listed impaired waters in the primary source water protection area. <https://dnr.wisconsin.gov/topic/SurfaceWater/ConditionLists.html>

County	Local Waterbody	Water Type	Waterbody Condition	Date Listed	Source Category	Pollutant	Impairment	Listings Status	TMDL Priority	Listing Condition
Ashland	Bay City Creek	RIVER	Category 5A	4/1/2016	PS/NPS	Total Phosphorus	Degraded Biological Community	303d Listed	Low	TMDL Needed (5A)
Ashland	Chequamegon Bay (Ashland Coal Tar Site)	BAY/HARBOR	Category 5A	4/1/1998	Contam. Sed.	PAHs	Chronic Aquatic Toxicity, PAHs	303d Listed	Low	TMDL Needed (5A)
Ashland	Maslowski Beach, Lake Superior	GREAT LAKES BEACH	Category 5A	4/1/2016	PS/NPS	E. coli	Recreational Restrictions - Pathogens	303d Listed	Low	TMDL Needed (5A)
Bayfield	South Fish Creek	RIVER	Category 5P	4/1/2016	PS/NPS	Total Phosphorus	Impairment Unknown	303d Listed	Low	Phosphorus Listed (5P)
Bayfield	Unnamed Trib to S Fish Creek	RIVER	Category 5P	4/1/2016	PS/NPS	Total Phosphorus	Impairment Unknown	303d Listed	Low	Phosphorus Listed (5P)

Table 1: Impaired Waters 2020

## CATEGORY 5 (IMPAIRED WATERS) SUBCATEGORIES

Sub-category	Description	Key Defining Factor
5A	Available information indicates that at least one designated use is not met or is threatened, and/or the anti-degradation policy is not supported, and one or more TMDLs are still needed. This is the default category for impaired waters.	TMDL needed. Default subcategory.
5B	Available information indicates that atmospheric deposition of mercury has caused the impairment and no other sources have been identified.	Mercury only.
5C	Available information indicates that non-attainment of water quality standards may be caused by naturally occurring or irreversible human-induced conditions.	Natural or irreversible conditions.
5P	Available information indicates that the applicable total phosphorus criteria are exceeded; however, biological impairment has not been demonstrated (either because bioassessment shows no impairment or because data are not available).	Phosphorus only.
5W	Pollutant/impairment a low priority for a TMDL because the impaired water is included in a watershed area addressed by at least one of the following WDNR-approved watershed plans: adaptive management plan, adaptive management pilot project, lake management plan, or Clean Water Act Section 319-funded watershed plan (i.e., nine key elements plan).	Alternative cleanup plan.

Table 2: Breakdown Of Impaired Waters Subcategories

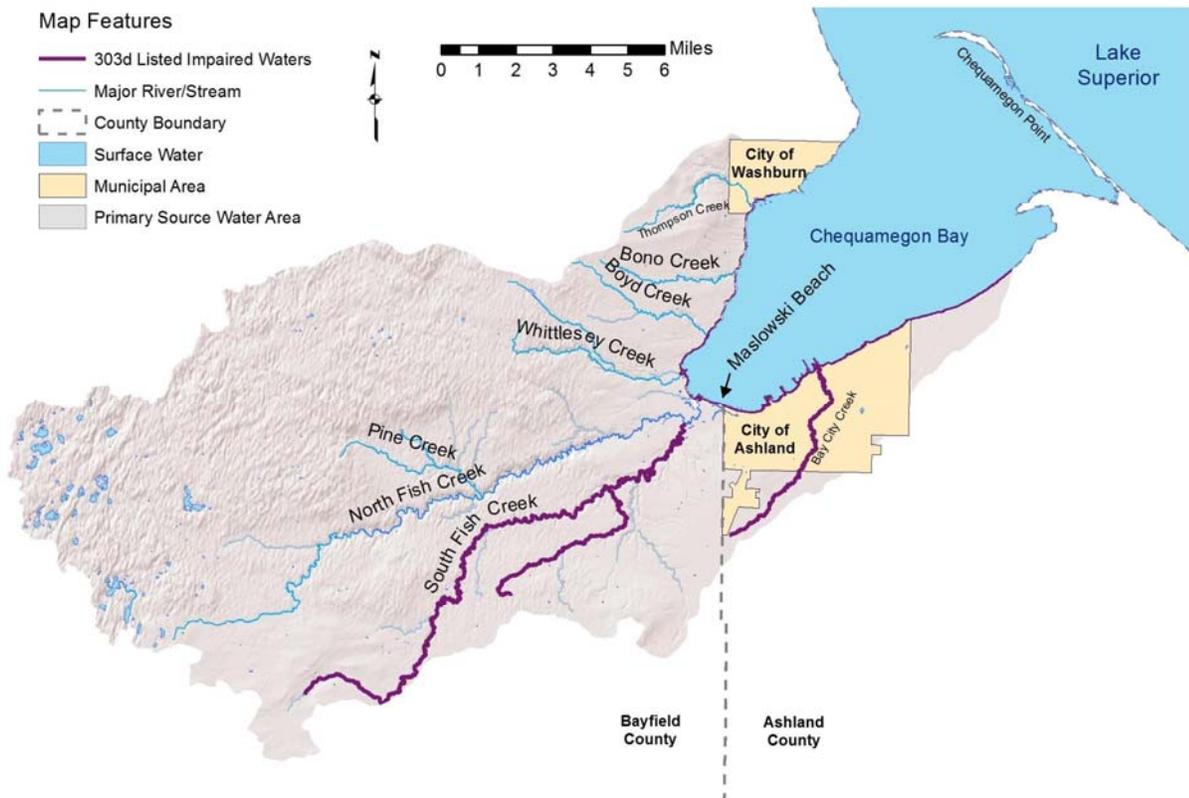


Figure 4: Map Of Listed Impaired Waters