

## Water Quality Report for Upper Bad River at Gilman Park

The Upper Bad River at Gilman Park in Mellen is listed as a Class III trout stream\* and has an Exceptional Resource Water classification\*\* by the State of Wisconsin. These classifications identify the Bad River at this location as one of Wisconsin's highest quality waters, with no changes in baseline water quality allowed. The data collected from this site will help establish those baseline conditions. Future monitoring can be compared to this baseline to see if changes are occurring and whether action may be needed to address pollution sources.

<p><b>*Trout Stream Classification (State of Wisconsin)</b> <b>Class 1:</b> Highest quality trout waters. No stocking needed to maintain populations. <b>Class 2:</b> Some natural reproduction, but stocking is needed to maintain a desirable sport fishery. <b>Class 3:</b> No natural reproduction. Populations maintained by stocking.</p>	 <p>Brook Trout <i>Salvelinus fontinalis</i></p>
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The Upper Bad River at Gilman Park has one of the longest records of sampling by BRWA volunteers, with 75 water chemistry and 9 macroinvertebrate samples collected over eight years. The first BRWA water chemistry sample from this site occurred on 10/18/2002 and the first macroinvertebrate sample in the spring of 2003. This site has more than enough data to meet BRWA's objective of at least 4 years of baseline data. In fact, this site has enough data to calculate a baseline with the first 4 years of data and then compare an additional 3 years of newer data. The following are water chemistry and macroinvertebrate data summaries for Gilman Park using data through 2010. We will be presenting Gilman Park data compared to other volunteer data in the Bad River Watershed at a public meeting later in 2011.

<p><b>**Water Classification</b> Wisconsin's highest quality surface waters are classified as: <b>Outstanding Resource Waters (ORW):</b> Highest quality waters, typically no human point sources of pollution exist, no changes in baseline water quality allowed. <b>Exceptional Resource Waters (ERW):</b> Similar to ORW but some human point sources of pollution exist. No changes in baseline water quality allowed.</p>
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### Water Chemistry Data Summary

Water chemistry results are summarized for both the four-year baseline period ("Gilman Park Baseline") and the additional 3 years of available data ("Gilman Park Plus"). They are summarized into seasonal averages and overall averages. The standard deviation (std. dev.) gives an idea of how much the results vary from the reported averages. The nutrient data are summarized into the percentage of total samples that exceeded the surface water benchmarks BRWA uses to evaluate these data. A description of results for each parameter and overall summary is included. If you would like more detail on how we calculate baseline, please contact Matt at (715) 682-2661.

**pH:** A measurement of water acidity. A pH of 7.0 is neutral. pH affects what type of organisms can live in a stream. State of Wisconsin criteria indicate natural waters must maintain a pH between 6.0 and 9.0, with no change greater than 0.5 units outside the estimated natural seasonal maximum and minimum. pH at this site remained very consistent around 7.0 across seasons and between the baseline and newer results. The results consistently met Wisconsin criteria, indicating good water quality.

**Dissolved Oxygen:** Dissolved oxygen (DO), which is critical for sustaining aquatic life, is a gas found in water. DO concentration is especially important to the success of trout spawning, because trout eggs need well oxygenated water to survive. State of Wisconsin criteria states that DO content in surface waters listed as Class III trout streams may not be artificially lowered to less than 5.0 mg/L at any time. This site consistently exceeded this criterion, with DO averaging above 7.0mg/L over the entire data record. The "Gilman Park Plus" DO data from spring appears to have a much lower average than the "Gilman Park Baseline" period, but this is likely because more of the samples in the "Plus" period were

taken during warmer water conditions, which naturally hold less oxygen than colder water. Overall, DO data indicates good water quality and favorable conditions for trout & trout spawning.

**Chloride and Turbidity:** Chloride is a measure of salt in water. It occurs naturally but can also indicate human influences from things such as failing septic systems, road salt use, and agricultural runoff. Turbidity is a measure of sediment suspended in water, indicating areas where erosion may be a problem. Wisconsin’s chronic toxicity criterion for chloride is 395 mg/L. There is currently no criterion for turbidity. BRWA monitoring will establish baselines for both parameters from which future data can be compared. Both chloride and turbidity were consistently very low at this site, indicating erosion and human influences at this site are very low.

**Nutrients:** Phosphate and nitrate are nutrients critical for plant growth and occur naturally in water. Elevated nutrients may indicate pollution such as agricultural runoff, failing septic systems, and storm water runoff. Until criteria for Wisconsin’s Lake Superior region are developed, BRWA compares its data to U.S. Geological Survey (USGS) surface water benchmarks for phosphate (0.1 mg/L) and nitrate (1.0 mg/L). These benchmarks are not regulatory criteria, but they provide an indication of where nutrients may be a problem. By looking at the percent of sample events where the benchmarks are exceeded, BRWA can determine where testing with more sensitive methods may be needed.

Nutrients do not appear to be a problem at this site. Nitrate was occasionally (18% of samples) detected above 1.0 mg/L during the baseline period, but this is more likely due to the high presence of wetlands in this part of the Bad River Watershed than from human influence.

Table 1. Water chemistry results for the Upper Bad River at Gilman Park. Data are summarized by season and an overall average for the first four years of data (Gilman Park Baseline) and an additional three years of data beyond the baseline period (Gilman Park Plus).

Season*	Site	# samples	pH	Std. Dev.	Dissolved Oxygen (mg/L)	Std. Dev.	Turbidity (JTU)	Std. Dev.	Chloride (mg/L)	Std. Dev.	Phosphate % of samples >0.1	Nitrate % of samples >1.0
Spring	Gilman Park Baseline	12	6.8	0.3	11.0	1.4	5.9	6.6	6.3	2.3		
Summer	Gilman Park Baseline	10	7.0	0.2	7.4	0.7	5.0	4.1	5.8	3.3		
Fall	Gilman Park Baseline	12	7.2	0.4	9.6	2.2	2.8	1.0	7.9	1.9		
Winter	Gilman Park Baseline	12	6.9	0.2	12.3	0.9	2.9	1.0	6.5	2.1		
<b>Average</b>	<b>Gilman Park Baseline</b>	<b>46</b>	<b>7.0</b>	<b>0.3</b>	<b>10.2</b>	<b>2.3</b>	<b>4.1</b>	<b>4.0</b>	<b>6.6</b>	<b>2.5</b>	<b>7%</b>	<b>18%</b>
Spring	Gilman Park Plus	7	6.9	0.4	8.8	1.1	3.8	1.3	8.6	2.3		
Summer	Gilman Park Plus	8	6.8	0.1	7.2	1.1	5.9	2.7	7.5	4.0		
Fall	Gilman Park Plus	8	7.0	0.4	8.6	1.6	3.3	2.0	8.0	1.9		
Winter	Gilman Park Plus	6	7.3	0.5	12.5	0.7	2.4	0.2	6.0	2.1		
<b>Average</b>	<b>Gilman Park Plus</b>	<b>29</b>	<b>7.0</b>	<b>0.4</b>	<b>8.8</b>	<b>2.1</b>	<b>3.9</b>	<b>2.2</b>	<b>7.6</b>	<b>2.8</b>	<b>0%</b>	<b>3%</b>

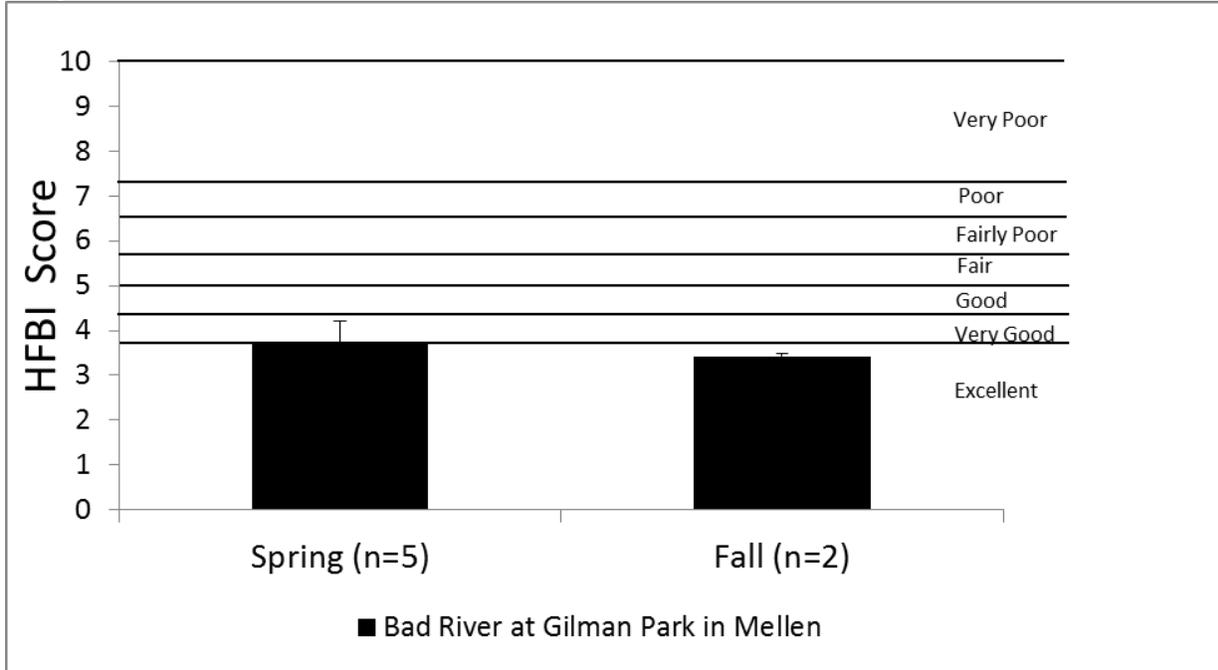
\*Seasons are defined as follows: *Spring* = March, April, May; *Summer* = June, July, August; *Fall* = September, October, November; *Winter* = December, January, February; *Average* = average of all samples collected.

## **Macroinvertebrate Data Summary**

Macroinvertebrates (different types of aquatic bugs) provide important long term information about water quality in a stream because they typically spend a large part of their lives in the water and differ in their tolerance to pollution. The types of macroinvertebrates found at a site are translated into a score called the Hilsenhoff Family Biotic Index (HFBI), which allows us to interpret the macroinvertebrate data and get an idea of water quality at the site. The HFBI score can range between 0 and 10, with lower scores indicating the best water quality.

The average HFBI of five spring samples was 3.7, indicating “Excellent” to “Very Good” water quality. The average of two fall samples was 3.4, indicating “Excellent” water quality (Graph 1).

Graph 1. Average Hilsenhoff Family Biotic Index (HFBI, with one standard deviation) scores for spring and fall macroinvertebrate samples collected from the Upper Bad River at Gilman Park. The lines indicate the water quality rating scores used in the HFBI.



## **Conclusion**

BRWA volunteer data indicates that the Bad River at Gilman Park currently has good water quality and is meeting or exceeding standards for its designation as a Class III trout stream based on the water chemistry and macroinvertebrate parameters. Baseline water quality conditions and the additional data collected at this site provide a reference to ensure this river continues to meet its designation as an Exceptional Resource Water by the State of Wisconsin.

Thanks to volunteers that collected data at this site: Dr. Andy Goyke and his classes, Tracey Ledder, April Stone Dahl and family, Plinio Beres, Keith and Laura Carlson, Sarah Yoshikane, Steven Yoshikane, Rachel Orwan, Scott Bagley, and Colleen Matula.