

Water Quality Report for the Bad River at Hwy. 2

The Bad River at Hwy. 2 is the Bad River Watershed Association's only regular sampling location on the Bad River Reservation. The site is a regular monitoring location monitored by staff of the Bad River Natural Resources Department and was also added as a BRWA site to provide some comparison. It has one of the longest records of sampling by BRWA volunteers, with 74 water chemistry, 5 macroinvertebrate, and 8 *E. coli* samples collected over 7 years. The first BRWA water chemistry sample from this site occurred on 5/2/2004, the first macroinvertebrate sample in the spring of 2003, and *E. coli* data were collected in 2007 and 2008. This site has more than enough data to meet BRWA's objective of at least 4 years of baseline data for water chemistry and macroinvertebrates. In fact, this site has enough data to calculate a baseline with the first 4 years of water chemistry data and then compare an additional 2.5 years of newer data. The following are water chemistry, macroinvertebrate, and *E. coli* data summaries for Will Rd. using data through 2010. We will be presenting Will Rd. data compared to other volunteer data in the Bad River Watershed at a public meeting later in 2011.

Water Chemistry Data Summary

Water chemistry results are summarized for both the four-year baseline period ("Will Rd. Baseline") and the additional 3 years of available data ("Will Rd. 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 II trout streams may not be artificially lowered to less than 6.0 mg/L at any time nor less than 7.0 mg/L during trout spawning season (typically fall). This site consistently averaged greater than 7.0mg/L over the entire data record, indicating 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.

Phosphate does not appear to be a problem at this site. However, nitrate was detected above 1.0 mg/L in 74% of baseline samples and 23% of the samples beyond baseline. This site had some of the most frequent detection of nitrate of all the BRWA monitoring sites. It is recommended that this site and additional sites upstream of Will Rd. be tested for both nitrate and phosphate with more sensitive methods to determine if there are potential pollution sources to the Bad River.

Table 1. *Water chemistry results for the Bad River at Hwy. 2. Data are summarized by season and an overall average for the first 4 years of data (Will Rd. Baseline) and an additional 2.5 years of data beyond the baseline period (Will Rd. 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	Will Rd. Baseline	12	6.9	0.3	10.1	1.9	4.2	2.9	5.7	1.5		
Summer	Will Rd. Baseline	10	7.3	0.2	7.0	0.7	3.5	1.3	5.7	1.1		
Fall	Will Rd. Baseline	11	7.2	0.3	9.0	1.3	3.2	1.2	7.1	1.4		
Winter	Will Rd. Baseline	10	6.9	0.3	11.3	1.1	3.0	1.1	7.2	1.9		
Average	Will Rd. Baseline	43	7.1	0.3	9.4	2.0	3.5	1.8	6.4	1.6	5%	74%
Spring	Will Rd. Plus	7	7.3	0.4	10.0	1.4	4.4	3.6	5.9	3.3		
Summer	Will Rd. Plus	9	7.4	0.2	7.2	1.3	4.1	2.4	10.6	6.9		
Fall	Will Rd. Plus	8	7.0	0.5	8.4	1.5	3.6	1.2	9.8	4.0		
Winter	Will Rd. Plus	7	7.3	0.2	9.9	0.7	2.9	0.2	9.3	3.8		
Average	Will Rd. Plus	31	7.3	0.4	8.7	1.7	3.8	2.2	9.0	5.0	0%	23%

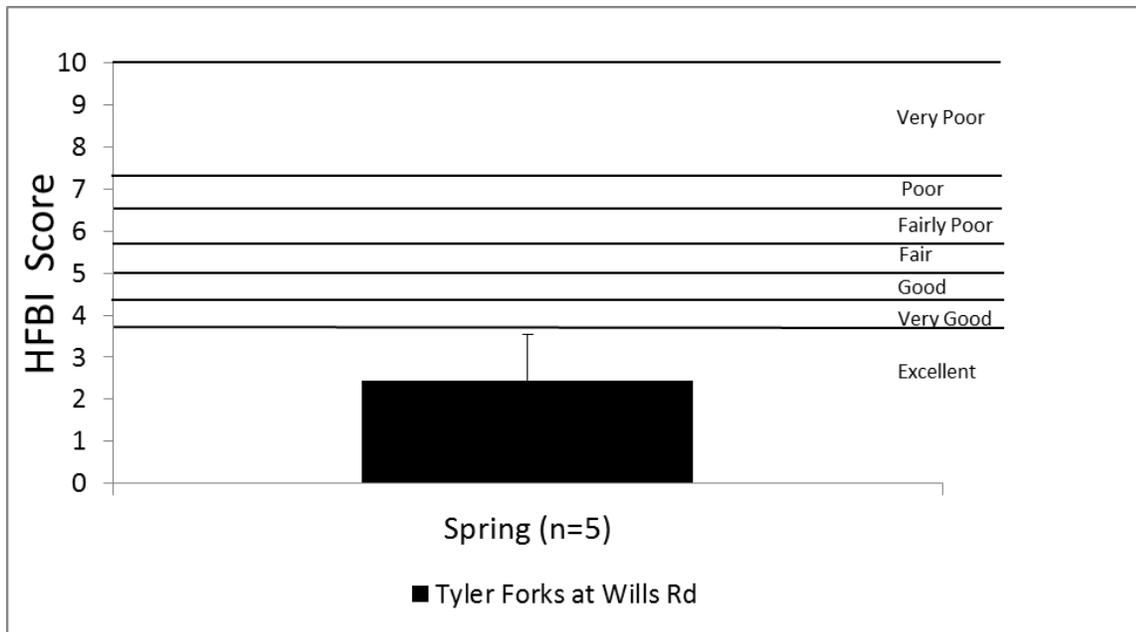
*Seasons are defined as follows: *Spring* = March, April, May; *Summer* = June, July, August; *Fall* = September, October, November; *Winter* = December, January, February; *Average* = average of all samples collected.

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.

Only samples in spring have been collected from this site. The average HFBI of the five samples was 2.4, indicating “Excellent” water quality (Table 2).

Table 2. *Average Hilsenhoff Family Biotic Index (HFBI, with one standard deviation) scores for spring and fall macroinvertebrate samples collected from the Bad River at Hwy. 2. The lines indicate the water quality rating scores used in the HFBI.*



E. coli Data Summary

Escherichia coli (*E. coli*) are a type of fecal coliform bacteria found in the intestines of all warm-blooded animals, including humans. The presence of *E. coli* in water may indicate contamination from sewage or animal waste. During rain events or snow melts, *E. coli* may be washed into streams. BRWA compares its *E. coli* data to the United States Environmental Protection Agency (EPA) criterion of 235 CFU/100mL (colony forming units per 100 mL). Colony counts above this number may indicate water that is unsafe for drinking and swimming.

A total of 8 *E. coli* samples were collected from this site in 2007 and 2008. All of the samples were taken during or following rain events. All samples were well below EPA’s criterion, indicating good water quality.

Conclusion

Most of the BRWA volunteer data indicates that the Bad River at Hwy. 2 has good water quality. However, frequent detections of nitrate are of concern. Other indicators of potential agricultural runoff or human waste at this site were all very low, so it’s possible nitrate could be entering the river through groundwater at this location. Regardless, these results warrant further investigation and it is recommended that this site and additional sites upstream of Will Rd. be tested for both nitrate and phosphate with more sensitive methods to determine if there are potential pollution sources to Tyler Forks. These and other future measurements will help determine whether Bad River is meeting its designation as an Outstanding Resource Water by the State of Wisconsin.

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