Ho-Chunk Nation

Clean Water Act Section 106 Program
Assistance Agreement I-07E00738

Combined Two Year
Water Quality Assessment Report

Monitoring Period January 1, 2022-December 31, 2023

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1. Program Background

The Ho-Chunk Nation (Nation) is unique from most other Native American tribes in that it does not have one large contiguous reservation. In turn, the Ho-Chunk Nation Division of Environmental Health (DEH) surface water program focuses on the Territory of the Ho-Chunk Nation. The Ho-Chunk Nation Territory is comprised of 14,847 acres with 4,742 acres held in fee-simple by the Nation and the remaining 10,105 acres held in Trust by the United States for the benefit of the Nation or the People (individual trust allotments). The Territory is located in 23 counties of Wisconsin, Minnesota and Illinois. Current tribal enrollment is 7,843 with approximately half the members living in fifteen counties located in the central part of Wisconsin.

Tribal members utilize water resources for everyday needs including recreation, cultural practices and as a source of food. The Ho-Chunk Nation continually works to preserve the culture of their people and is therefore dedicated to protecting and improving the quantity and quality of water resources within the Territory. Program activities under the 106 Program are limited to the water resources that are directly associated with Trust land or influence the quality and quantity of the water resources associated with those lands. Table 1 is a water atlas summarizing these resources.

Table 1 Atlas Table of Ho-Chunk Nation Trust Water Resources	
Total Number of Stream Miles	19.0
Total Number of Lake/Pond Acres	20.1
Total Number of Wetland Acres	1,246

The DEH has been managing the EPA CWA Section 106 Program since the Nation first became eligible for funding in FY06. The DEH has successfully managed the program through nine two-year grant periods and is currently administering the first year of assistance agreement I-07E00738 which covers program activities for calendar years 2024-2025.

2. Purpose of Monitoring Program

The Nation has become increasingly concerned with surface water quality in recent years due to the increase in row crop agriculture, cranberry cultivation, sand mining, large-scale pipeline and utility projects and overall shifts to more intensive land-uses within the watersheds containing tribal lands and waters.

Currently, the Nation lacks the necessary data to establish a baseline of surface water quality from which to measure changes in future water quality. Based on the lack of chemical, habitat and biological information pertaining to tribal water resources the following monitoring program objectives and goals have been identified:

- Establish a baseline of chemical water quality for the surface waters on selected tribal lands.
- Determine biological community composition by surveying fish and sampling macroinvertebrates.
- Complete habitat assessments and begin to develop relationships with observed biological communities and chemical water quality data.
- Determine extent to which surface water quality is changing over time.

- Identify problem areas with poor surface water quality and/or the potential to degrade surface water quality.
- Identify areas that need protection and what that level of protection would be.
- Determine wetland location by reviewing available data and conducting site visits.
- Establish a baseline of floristic quality to measure changes in wetland quality.
- Determine wetland functional value.

3. Monitoring Framework

The Ho-Chunk Nation monitoring program includes program activities in the areas of baseline water quality monitoring and inventory and assessment of wetland resources. In addition, synoptic studies are incorporated into monitoring when needed and as budget and staffing allow.

Baseline Water Quality Monitoring

Monitoring includes field measurement and laboratory analysis of chemical water quality parameters, stream habitat assessments and biological monitoring. Funding was used to monitor nine fixed stations on a quarterly basis during the 2022-2023 monitoring period. In addition, (2) Rotating Year 2 stations and (5) Rotating Year 3 stations were monitored in 2022 and 2023 respectively.

Inventory and Assessment of Wetland Resources

Monitoring program activities related to wetland inventory and assessment includes determining wetland location by reviewing available information such as the county soil survey, Wisconsin Wetland Inventory and aerial photographs. Field visits are then conducted to document wetland indicators so that an accurate wetland boundary can be flagged and mapped. Wetlands are then classified using the *Classification of Wetlands and Deepwater Habitats of the United States* (U.S. Fish and Wildlife Service, 1979), commonly referred to as the Cowardin classification system. Wetlands are also classified using the Eggers and Reed classification, *Wetland Plants and Plant Communities of Minnesota and Wisconsin, Version 3.2 July 2015.*

Wetland assessments may also be performed using several methods including the*: Floristic Quality Assessment Methodology for Wisconsin, Wisconsin Rapid Wetland Assessment Methodology (WRWAM)* for evaluating wetland functional values and metrics from the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands, 1989.*

4. Monitoring Locations

Table 2 identifies the monitoring locations for the period of January 1, 2022-December 31, 2023.

Table 2 Monitoring Locations

Station ID	Station Name	Station Type	Latitude	Longitude
310700HCN02	Middle Branch Embarrass R.	Fixed	44.8513	89.1622
1182400HCN03	Kickapoo R. (Bridge 8)	Fixed	43.6652	90.5861
1182400HCN04	Kickapoo R. (Bridge 14)	Fixed	43.6224	90.6289
1195400HCN01	Indian Creek	Fixed	43.6324	90.6142
1196900HCN01	Billings Creek	Fixed	43.6771	90.5840
1198200HCN01	unnamed (Hay Valley)	Fixed	43.6786	90.6064
1714200HCN01	Morrison Creek	Fixed	44.3539	90.7641

1714300HCN01	Dickey Creek	Fixed	44.3536	90.7614
1715800HCN01	Valentine Creek	Fixed	44.3541	90.7540
1654900HCN01	unnamed creek (Wo gis na pi)	Rotating Yr 2	43.8825	90.9115
allot1045HCN01	unnamed creek (Blackhawk)	Rotating Yr 2	43.7466	91.2872
1326700HCN01	Mill Creek	Rotating Yr 3	44.0520	90.4441
1327200HCN01	unnamed (Mill Creek trib.)	Rotating Yr 3	44.0610	90.4903
5025163HCN01	unnamed (Smoke)	Rotating Yr 3	44.0060	90.3800
5024814HCN01	unnamed (Greendeer)	Rotating Yr 3	44.0240	90.4002
5024918HCN01	unnamed (Shaw)	Rotating Yr 3	44.0197	90.3928
Wetland Sites	**Parcel Name**	**Acres**	**Latitude**	**Longitude**
	Little Sam 76 acres	72.66	43.8073	91.3108
	Little Sam 6 acres	2.17	43.811	91.3086
	Red Cloud Thunder	89.05	44.0644	91.2608
	Sine	1.97	43.9838	91.411
	Red Eagle, G.	42.35	43.9811	90.3401
	Red Eagle, J.	40.1	44.0317	90.3493
	Wo gis napi	450	43.8829	90.9098
	Blackhawk Hopinka	79.51	43.7496	91.2913
	Littlejohn Purchased Restricted	3.49	43.7591	91.2827
	Littlejohn Purchased Trust	7.77	43.7581	91.2827
	Little Sam 130 acres	134.54	43.7338	91.2801

5. Monitoring and Assessment Parameters

Baseline Chemical Water Quality Monitoring

Different types of water quality data have been collected and included in this assessment. For the purpose of this assessment, baseline chemical water quality data is in tabular format for field and laboratory parameters. Table 3 is a complete list of all field and lab parameters that were monitored during the assessment period. This section is followed by a brief description of several of the core parameters included in this assessment.

Table 3 Field and Lab Parameters

Matrix	Parameter	Comments
Water	Temperature	Field Measurement
Air	Temperature	Field Measurement
Water	pH	Field Measurement
Water	Dissolved Oxygen	Field Measurement
Water	Specific Conductance	Field Measurement
Water	Salinity	Field Measurement
Water	Turbidity	Field Measurement
Water	Discharge	Field Measurement
Water	Chloride	Sample analyzed by contracted laboratory
Water	Nitrite + Nitrate-nitrogen	Sample analyzed by contracted laboratory
Water	Ammonia-nitrogen	Sample analyzed by contracted laboratory
Water	Kjeldahl nitrogen	Sample analyzed by contracted laboratory
Water	Ortho-phosphorus	Sample analyzed by contracted laboratory
Water	Phosphorus (total)	Sample analyzed by contracted laboratory
Water	Sulfate	Sample analyzed by contracted laboratory
Water	Alkalinity (total)	Sample analyzed by contracted laboratory
Water	Total Suspended Solids	Sample analyzed by contracted laboratory
Water	Chlorophyll a,b,c	Sample analyzed by contracted laboratory
Water	Total Coliform	Sample analyzed by DEH
Water	*E.coli*	Sample analyzed by DEH

Temperature
Temperature governs the type of aquatic life that can exist in a stream. Fish and other aquatic organisms have specific temperature range requirements for survival and various life cycle functions. Temperature also affects water chemistry such as the rate of chemical reactions. Certain compounds are more toxic to aquatic life at higher temperature. The saturation content of a constituent in water is also affected by temperature. For example, oxygen is dissolved more readily in cold water than warm water. The thresholds identified in this document are based on the stream temperature classifications of cold-water, warm-water sport fishery, warm-water forage fishery and warm-water limited aquatic life.

Dissolved Oxygen
Oxygen is required for respiration in fish and other aquatic organisms. The microscopic bubbles of oxygen gas in water are called dissolved oxygen (DO). Fish and other organisms require different amounts of oxygen to survive and thrive minimum. In addition, oxygen is also used for the decomposition of organic matter and other biological processes. Therefore, degraded oxygen levels also indicate contamination when high levels of organic matter, such as manure, are present.

pH
The pH is a measurement of the concentration of hydrogen ions. The pH scale is logarithmic and ranges from 0 to 14 with 0 being the most acidic and 14 the most basic. The pH of most natural waters ranges between 6.5- 8.5. However, in the Black River Falls and Dells Dam area the natural waters can sometimes have a pH less than 6.0. The pH of water determines the solubility (amount that can be dissolved in the water) and biological availability (amount that can be utilized by aquatic life) of chemical constituents such as nutrients (e.g., phosphorus, nitrogen, and carbon) and heavy metals (e.g., lead, cadmium, copper). For example, in addition to determining how much and what form of phosphorus is most abundant in the water, pH also determines whether aquatic life can use it. Heavy metals tend to be more toxic at lower pH because they are more soluble and more bioavailable. The impairment threshold for pH is a value outside the range of 6.0 to 9.0 or if the change is greater than 0.5 units outside the natural seasonal maximum and minimum.

Turbidity
Turbidity is a measurement of the water clarity. Turbidity is caused by sediment entering the water column and in some cases is caused but excessive nutrients causing algal growth. The threshold for turbidity is based on the EPA reference criteria identified in the document titled: *Ambient Water Quality Criteria Recommendations Information Supporting the Development of State and Tribal Nutrient Criteria, Rivers and Streams in Nutrient Ecoregion VII. 2000. US Environmental Protection Agency*. The values listed are specific to the appropriate sub-ecoregion identified in the document.

Specific Conductance
Specific conductance is a measure of the drop-in voltage caused by the resistance of the water. Each stream tends to have a relatively constant range of conductivity. Significant changes in

conductivity can be an indicator that a discharge or some other source of pollution has entered a stream.

Nutrients

Nutrients are essential for growth. Streams often contain excessive levels of nutrients, which results in additional algae and other plant growth. The main nutrients of concern are phosphorus and nitrogen, and both elements can be found in several forms. Phosphorus can be measured as total phosphorus (TP) or ortho-phosphorus. Ortho-phosphorus typically represents the "reactive" and bioavailable form of phosphorus. Ortho-phosphorus can also be called Soluble Reactive Phosphorus depending on the analytical laboratory method used to quantify the amount of available phosphorus. Nitrogen can be measured as total nitrogen (TN), Kjeldahl nitrogen (TKN), nitrate+nitrite and ammonia nitrogen. TKN represents the fraction of TN that is unavailable for growth or bound up in organic form, it also includes ammonium. The remaining fractions, nitrate-nitrite and ammonia represent bioavailable forms of nitrogen. Phosphorus and nitrogen in excess amounts can accelerate eutrophication, causing dramatic increases in aquatic plant growth and changes in the types of plants and animals that live in the stream. This, in turn, affects dissolved oxygen, temperature and other indicators. Excess nitrates can cause hypoxia (low levels of dissolved oxygen) and can become toxic to warm-blooded animals at higher concentrations. The threshold values listed for nutrients are based on the EPA reference criteria identified in the document titled: *Ambient Water Quality Criteria Recommendations Information Supporting the Development of State and Tribal Nutrient Criteria, Rivers and Streams in Nutrient Ecoregion VII. 2000. US Environmental Protection Agency.* The values listed are specific to the appropriate sub-ecoregion identified in the document. In addition, the State of Wisconsin has passed a phosphorus rule that established a value of 0.075 mg/L of total phosphorus for most streams.

Bacteriological

Coliform bacteria are a commonly used indicator of the sanitary quality of foods and water. Coliforms are abundant in the feces of warm-blooded animals, but are also found in the aquatic environment, soil and on vegetation. While coliforms are themselves not normally causes of serious illness, they are easy to culture and their presence is used to indicate that other pathogenic organisms of fecal origin may be present. *E. coli* bacteria have been commonly found in recreational waters and their presence is used to indicate the presence of recent fecal contamination, but *E. coli* presence may not be indicative of human waste. *E. coli* are harbored in all warm-blooded animals, birds and mammals alike. *E. coli* bacteria have also been found in fish and turtles.

The Nation analyzes bacteriological surface water samples using the IDEXX Colilert Quanti-tray enumeration method. Traditional membrane filtration tests for bacterial water quality generally count colonies of bacteria and report the value as colony forming units (CFU). The newer defined substrate tests, such as Colilert, report values as a most probable number (MPN). MPN is a statistical representation of what level of Total Coliforms or *E.coli* are likely present in a sample. For the purpose of this assessment, the terms CFU and MPN are used interchangeably. Threshold values for *E.coli* are based on NR102.04 (6) that states the geometric mean (126 counts per 100mL) shall not be exceeded in any rolling 90-day period during the recreation

season. The statistical threshold value (410 counts per 100mL) shall not be exceeded more than 10% of the time during any rolling 90-day period during the recreation season. It should be noted that comparison of sample results to these threshold values is limited because of the small number of samples the Nation collects at any given sampling station. The percent exceedance listed in the table for each station is the comparison of sample results to the 410 colonies per 100mL threshold.

Biological Monitoring

In the past, chemical criteria and related monitoring have been the traditional mechanism employed by agencies responsible for protecting aquatic life and assessing the condition of surface waters. Significant improvements in water quality have been made in the last several decades utilizing this approach.

However, human actions impact a wider range of water resource attributes than water chemistry alone can measure. The degradation of surface waters can be attributed to a multitude of sources including: chemical pollutants from municipal and industrial point source discharges; agricultural runoff of pesticides, nutrients, and sediment; hydrologic alteration from stream channelization, dams, and artificial drainage; and habitat alteration from agricultural, urban, and residential development.

Biological communities are subjected to the cumulative effects of all activities and are continually integrating environmental conditions over time. They represent the condition of their aquatic environment.

Biological monitoring is often able to detect water quality impairments that other methods may miss or underestimate. It provides an effective tool for assessing water resource quality regardless of whether the impact is chemical, physical, or biological in nature. To ensure the integrity of surface waters, we must understand the relationship between human induced disturbances and their effect on aquatic resources.

Macroinvertebrates

Macroinvertebrate surveys are conducted closely following the *Guidelines for Collecting Macroinvertebrate Samples from Wadable Streams*, published by the Wisconsin Department of Natural Resources (Wisconsin Department of Natural Resources, 2000). Data collection activities associated with macroinvertebrate sampling are outlined under the approved QAPP titled*: Quality Assurance Project Plan Habitat Assessment and Biological Monitoring of Surface Waters, Ho-Chunk Nation Clean Water Act Section 106 Grant# I-05E00738, Revision 2* dated April 14, 2020.

Macroinvertebrates (inverts) are organisms that are large (macro) enough to be seen with the naked eye and lack a backbone. They inhabit all types of waters, from fast flowing streams to ponds with standing water. Aquatic macroinvertebrates are good indicators of stream quality because they are affected by the physical, chemical, and biological conditions of the stream. Inverts can't escape pollution and show the effects of short and long-term pollution that other traditional water chemistry assessments may fail to detect.

Some of the common macroinvertebrate metrics are provided below. In many cases there are no strict rules available to assign qualitative designations to a sample metric. That is, it is difficult to say one value is "bad" while another is "good". Judgements under such circumstances remain subjective and open to debate. Nevertheless, the metric may be valuable in making *relative* comparisons of water resource quality among streams (or among stations within streams) *or* in identifying possible pollution sources (Lillie, 2003).

The Hilsenhoff Biotic Index (HBI) and Family Level Biotic Index (FBI) represent the average weighted pollution tolerance value of all arthropods present in a sample (excluding organisms either too immature or damaged to allow for correct identification and organisms which have not been assigned a pollution tolerance value). The HBI is a well-tested metric that has been incorporated into national protocols for rapid bioassessment (Plafkin, 1989). For HBI determinations, identification is carried to the lowest possible taxonomic level necessary to assign a pollution tolerance value. In many cases this means that identification at the genus level is sufficient to assign tolerance values. All FBI determinations are made at the family level. The relation of HBI values to water quality is presented in the table below. Also, the metric HBI Max-10 is the HBI index allowing a maximum of 10 of each species to be counted.

Water Quality Ratings for HBI Values taken from (Hilsenhoff, 1987)

HBI Value	Water Quality Rating	Degree of Organic Pollution
≤ 3.50	Excellent	None Apparent
3.51-4.50	Very Good	Possible Slight
4.51-5.50	Good	Some
5.51-6.50	Fair	Fairly Significant
6.51-7.50	Fairly Poor	Significant
7.51-8.50	Poor	Very Significant
8.51-10.00	Very Poor	Severe

It is extremely important to emphasize that the HBI and FBI are indices of organic pollution and are based on a community's response to the combination of high organic loading and decreased dissolved oxygen levels. The HBI or the FBI was not intended for use outside the purpose of detecting or monitoring organic pollution. It should also be noted that the FBI was designed as a rapid field assessment tool and can be less precise than the HBI. Generally, the FBI underestimates the severity of pollution in highly polluted streams and overestimates the degree of impact in clean streams (Hilsenhoff, 1988a). The water quality index for the FBI is provided below.

Water Quality Ratings for FBI Values taken from (Hilsenhoff, 1988a)

FBI Value	Water Quality Rating	Degree of Organic Pollution
≤ 3.75	Excellent	Organic pollution unlikely
3.76-4.25	Very Good	Possible slight organic pollution
4.26-5.00	Good	Some organic pollution probable
5.01-5.75	Fair	Fairly substantial pollution likely
5.76-6.50	Fairly Poor	Substantial pollution likely
6.51-7.25	Poor	Very substantial pollution likely
7.26-10.0	Very Poor	Severe organic pollution likely

Index of Biotic Integrity (IBI)

IBI Value	Management Recommended	Condition Gradient
7.5-10.0	Consider Outstanding and Exceptional Listing	Excellent
5.0-7.4	Maintain Condition	Good
2.6-4.9	Restoration	Fair
0-2.6	Consider Impairment Listing	Poor

Richness measures represent the number of distinctly different taxa found in a sample. A richness value does not represent the total number of taxa at a site, but rather it is a relative measure or index. Often it is only necessary to process a small fraction of a sample to compute an HBI value. The remainder of the sample is not included in the calculations and any information regarding additional taxa present at the site is lost. This is not intended to be a criticism of the HBI but is reflective of the established laboratory procedures and the need to keep processing costs down. The loss of information is an unfortunate by-product of the established fixed count laboratory procedure. This has significant ramifications with respect to calculations and the use of other metrics derived from the sample. Consequently, the data derived from the HBI subsamples represent relative measures per total number of specimens examined.

Although high taxa richness is generally associated with good water quality, low taxa richness does not necessarily indicate poor water quality, nor does high richness always indicate good water quality. Some habitats such as small cold headwater streams or mineral poor waters may naturally have low numbers of taxa density per unit area.

Fish and Habitat

Fish community and habitat information is collected at stream monitoring sites for the purpose of assessing water quality and classifying streams based on an Index of Biotic Integrity (IBI). Stations are established during the April quarterly water quality sampling event where sampling reaches are measured and marked off for future monitoring. Fish are typically sampled in July and August using electrofishing methods. All fish are collected, regardless of size, identified and returned to the stream after appropriate measurements are collected.

The Ho-Chunk Nation 106 Program uses an ETS backpack electrofishing unit and ETS tote barge unit depending on the stream size, accessibility and site conditions. Fish surveys are conducted closely following the *Guidelines for Assessing Fish Communities of Wadable Streams in Wisconsin*, published by the Wisconsin Department of Natural Resources (2001). Stream habitat assessments are conducted closely following the *Guidelines for Evaluating Habitat of Wadable Streams*, published by the Wisconsin Department of Natural Resources (2002). Data collection activities associated with fish and habitat surveys are outlined in the approved QAPP titled*: Quality Assurance Project Plan Habitat Assessment and Biological Monitoring of Surface Waters, Ho-Chunk Nation Clean Water Act Section 106 Grant# I-05E00738 Revision 2*, dated April 14, 2020.

The Index of Biotic Integrity (IBI) is used to classify each of the streams. The exact method used will be dependent on the maximum daily mean temperatures measured with the temperature data loggers placed in the stream. The streams will either be classified as warm-water or cold-water. Warm-water streams have a maximum daily mean temperature greater than 24°C and

cold-water streams have a maximum daily mean temperature less than 22°C. If the maximum daily temperature is between 22°C and 24°C, the stream is considered to be cool-water. An index has not been established for cool-water streams, so the cold-water IBI is applied to these streams. The maximum IBI score for both cold-water and warm-water streams is 100, indicating excellent biotic integrity, and the minimum score is 0, indicating very poor biotic integrity. Tables 4 and 5 provide the rating and interpretation of IBI scores for warm-water and cold-water streams.

Table 4 Guidelines for interpreting cold-water biotic integrity index (IBI) scores, modified from (Karr, 1986) and (Lyons, 1992a)

Fish IBI Score	Integrity Rating	Interpretation and fish community attributes
100-90	Excellent	Comparable to the best situations with the least human disturbance: mottled or slimy sculpins are usually common; intolerant, native stenothermal cool-water species such as lampreys or redside dace may also be present; brook trout are the primary top carnivores and are present in good numbers; exotic salmonids are absent or uncommon; tolerant species may be present in low to moderate numbers.
80-60	Good	Evidence for some environmental degradation and reduction in biotic integrity: either brook trout or sculpins may be uncommon or absent; exotic salmonids often dominate, keeping the abundance of top carnivores high; tolerant species may be common but do not dominate.
50-30	Fair	The stream reach has experienced moderate environmental degradation, and biotic integrity has been significantly reduced: total species richness is often relatively high, but intolerant and native stenothermal cold-water species are uncommon or absent, native stenothermal cool-water species and exotic salmonids may be moderately common, but tolerant eurythermal species or warm-water species or both are usually more abundant.
20-10	Poor	Major environmental degradation has occurred, and biotic integrity has been severely reduced: total species richness may be relatively high, but intolerant species, top carnivores, and salmonids are absent: a few native stenothermal cool-water species such as brassy minnows or brook sticklebacks may persist in low numbers; tolerant eurythermal species or warm-water species or both dominate.
0 or no score	Very Poor	Human disturbance and environmental degradation have decimated the natural cold-water fish assemblage of the reach: either only warm-water and tolerant species remain, or fish abundance is so low (<25 individuals captured) that the IBI cannot be calculated.

Table 5 Guidelines for interpreting warm-water biotic integrity index (IBI) scores, modified from (Karr, 1986)

Fish IBI Score	Integrity Rating	Interpretation and fish community attributes
100-65	Excellent	Comparable to the best situations with minimal human disturbance; all regionally expected species for habitat and stream size, including the most intolerant forms, are present with a full array of age and size classes; balanced trophic structure.
64-50	Good	Species richness somewhat below expectation, especially due to the loss of the most intolerant forms; some species, especially top carnivores, are present with less than optimal abundances or size/age distributions; trophic structure shows some signs of imbalance.
49-30	Fair	Signs of additional deterioration include decreased species richness, loss of intolerant forms, reduction in simple lithophils, increased abundance of tolerant species, and/or highly skewed trophic structure (e.g., increasing frequency of omnivores and decreased frequency of more specialized feeders); older age classes of top carnivores rare or absent.
29-20	Poor	Relatively few species; dominated by omnivores, tolerant forms, and habitat generalists; few or no top carnivores or simple lithophilous spawners; growth rates and condition factors sometimes depressed; hybrids sometimes common.
19-0	Very Poor	Very few species present, mostly exotics or tolerant forms or hybrids; few large or old fish; DELT fish (fish with deformities, eroded fins, lesions, or tumors) sometimes common.
No Score	Very Poor	Thorough sampling finds few or no fish; impossible to calculate IBI. <50 individuals captured.

6. Monitoring Schedule

Table 6 provides a summary of the monitoring schedule including dates, frequency and monitoring activity performed.

Table 6 Sampling Schedule				
Station ID	**Station Name (type)**	**Monitoring Dates**	**Frequency**	**Monitoring Activity**
310700HCN02	Middle Branch Embarrass R.	1/13/22, 4/5/22, 7/6/22, 10/24/22 1/23/23, 4/4/23, 7/5/23, 10/2/23 8/8/23 5/24/23	Quarterly	Water Quality Monitoring E-fishing Survey Invert Sampling
1182400HCN03	Kickapoo R.at Bridge 8	1/12/22, 4/13/22, 7/7/22, 10/25/22 1/17/23, 4/19/23, 7/6/23, 10/4/23 8/9/22 5/12/22	Quarterly Single Visit Single Visit	Water Quality Monitoring E-fishing Survey Invert Sampling
1182400HCN04	Kickapoo R.at Bridge14	1/12/22, 4/13/22, 7/7/22, 10/25/22 1/17/23, 4/19/23, 7/6/23, 10/4/23	Quarterly	Water Quality Monitoring
1195400HCN01	Indian Creek	1/12/22, 4/13/22, 7/7/22, 10/25/22 1/17/23, 4/19/23, 7/6/23, 10/4/23 7/20/22 5/12/22	Quarterly Single Visit Single Visit	Water Quality Monitoring E-fishing Survey Invert Sampling
1196900HCN01	Billings Creek	1/12/22, 4/13/22, 7/7/22, 10/25/22 1/17/23, 4/19/23, 7/6/23, 10/4/23 7/13/22 5/12/22	Quarterly Single Visit Single Visit	Water Quality Monitoring E-fishing Survey Invert Sampling
1198200HCN01	unnamed creek (Hay Valley)	1/12/22, 4/13/22, 7/7/22, 10/25/22 1/17/23, 4/19/23, 7/6/23, 10/4/23 7/13/22 5/12/22	Quarterly Single Visit Single Visit	Water Quality Monitoring E-fishing Survey Invert Sampling
1714200HCN01	Morrison Creek	1/13/22, 4/5/22, 7/6/22, 10/24/22 1/23/23, 4/4/23, 7/5/23, 10/2/23 7/24/23 5/25/23	Quarterly Single Visit Single Visit	Water Quality Monitoring E-fishing Survey Invert Sampling
1714300HCN01	Dickey Creek	1/13/22, 4/5/22, 7/6/22, 10/24/22 1/23/23, 4/4/23, 7/5/23, 10/2/23 7/24/23 5/24/23	Quarterly Single Visit Single Visit	Water Quality Monitoring E-fishing Survey Invert Sampling
1715800HCN01	Valentine Creek	1/13/22, 4/5/22, 7/6/22, 10/24/22 1/23/23, 4/4/23, 7/5/23, 10/2/23 7/26/23 5/24/23	Quarterly Single Visit Single Visit	Water Quality Monitoring E-fishing Survey Invert Sampling
1654900HCN01	unnamed (Wogisnapi)	1/11/22, 4/12/22, 7/5/22, 10/26/22 7/11/22 5/16/22	Quarterly Single Visit Single Visit	Water Quality Monitoring E-fishing Survey Invert Sampling
allot1045HCN01	unnamed (Blackhawk)	1/11/22, 4/12/22, 7/5/22, 10/26/22 7/11/22 5/16/22	Quarterly Single Visit Single Visit	Water Quality Monitoring E-fishing Survey Invert Sampling
1326700HCN01	Mill Creek	1/24/23, 4/3/23, 7/11/23, 10/3/23 8/9/23 5/25/23	Quarterly Single Visit Single Visit	Water Quality Monitoring E-fishing Survey Invert Sampling
1327200HCN01	unnamed (Mill Creek trib.)	1/24/23, 4/3/23, 7/11/23, 10/3/23 7/26/23 5/25/23	Quarterly Single Visit Single Visit	Water Quality Monitoring E-fishing Survey Invert Sampling
5025163HCN01	unnamed (Smoke)	1/24/23, 4/3/23, 7/11/23, 10/3/23 7/26/23 and 8/9/23 5/25/23	Quarterly Single Visit Single Visit	Water Quality Monitoring E-fishing Survey, no water Invert Sampling

5024814HCN01	unnamed (Greendeer)	1/24/23, 4/3/23, 7/11/23, 10/3/23 7/26/23 and 8/9/23 5/25/23	Quarterly Single Visit Single Visit	Water Quality Monitoring E-fishing Survey, no water Invert Sampling, no water
5024918HCN01	unnamed (Shaw)	1/24/23, 4/3/23, 7/11/23, 10/3/23 7/26/23 and 8/9/23 5/25/23	Quarterly Single Visit Single Visit	Water Quality Monitoring E-fishing Survey, no water Invert Sampling, no water
Wetland Sites	**Parcel Name**	**Monitoring Dates**		**Monitoring Activity**
	Little Sam 76 acres	8/11/22		Delineate, Classify, Map
	Little Sam 6 acres	8/11/22		Delineate, Classify, Map
	Sine	8/9/22		Delineate, Classify, Map
	Red Eagle, G.	8/25/22		Delineate, Classify, Map
	Red Eagle, J.	8/8/22-8/9/22		Delineate, Classify, Map
	Wogisnapi	8/23/22-8/24/22		Delineate, Classify, Map
	Red Cloud Thunder	8/17/22, 8/24/22		Delineate, Classify, Map
	Blackhawk Hopinka	2/10/22		Site visit confirmed upland.
	Littlejohn Purchase Res.	2/10/22		Site visit confirmed upland.
	Littlejohn Purchase Trust	2/10/22		Site visit confirmed upland.
	Little Sam 130 acres	2/17/22		Site visit confirmed upland.

7. Monitoring Results

The following section summarizes the results of the baseline water quality monitoring that was conducted during 2022-2023 for the stations identified in Table 2. The (9) fixed stations were monitored quarterly during the months of January, April, July and October 2022-2023. Rotating Yr. 2 stations were monitored quarterly during the months of January, April, July and October 2022 with Rotating Yr. 3 stations being monitored quarterly in 2023.

MIDDLE KICKAPOO RIVER WATERSHED

Fixed stations 1182400HCN03, 1182400HCN04, 1196900HCN01, 1195400HCN01 and 1198200HCN01 are associated with the Middle Kickapoo River Watershed. This area of Vernon County is part of the unglaciated region of southwest Wisconsin known as the "Driftless Area". Nonpoint sources of pollution in the watershed include runoff from agricultural fields and barnyards, stream bank erosion, roadways and potentially construction site runoff. Pollutants from nonpoint sources are carried to the stream or groundwater through the action of storm runoff, snow melt and seepage. Common water resource issues in the watershed include extreme flooding, sedimentation, organic loading and elevated water temperature, nutrient and bacteria levels. It should be noted that stations 1182400HCN01 and 1182400HCN02 shown on the map below were not monitored during 2022-2023 and are not scheduled for monitoring in upcoming years.

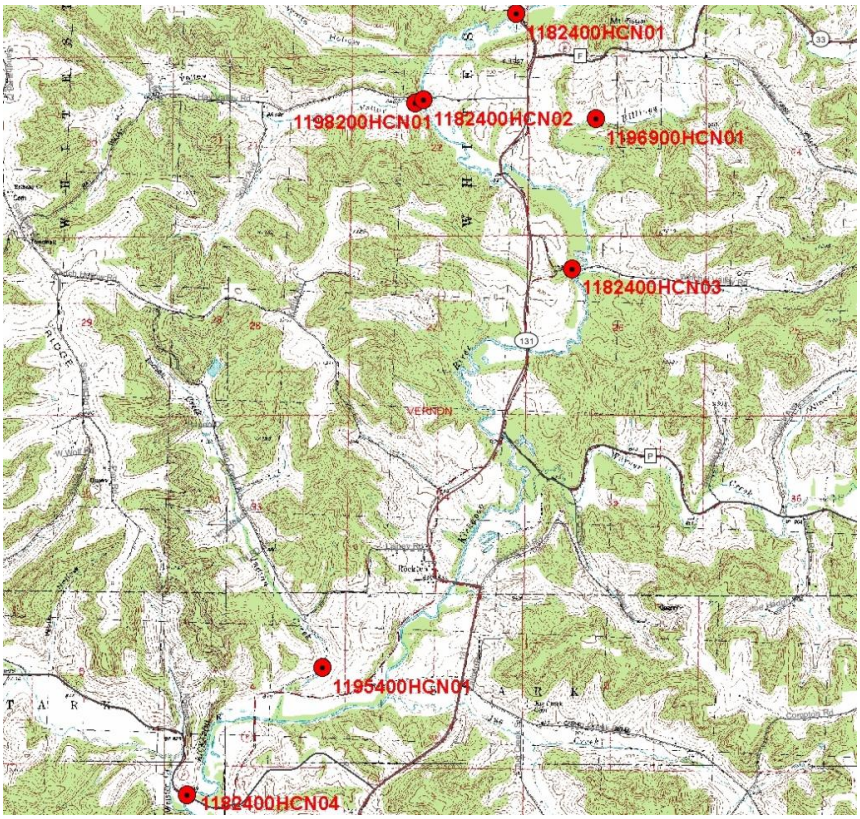

Figure 1 24k Topographic Map

1182400HCN03 KICKAPOO RIVER (BRIDGE 8)
Station 1182400HCN03 is accessed from Winchell Valley Road and is located directly upstream from Bridge 8.

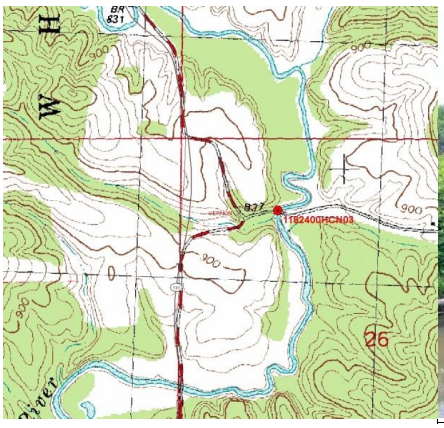

Fig. 2 24k Topographic Map


Station Photo 7/15/22 Downstream Bridge 8

Station 1182400HCN03 was visited on (8) sampling events to monitor baseline water quality during 2022-2023. Core measurements were completed and water samples were collected and analyzed for nutrients and additional parameters including alkalinity, chloride, sulfate, total suspended solids, Total coliform and *E.coli*. Table 7 provides basic statistics for laboratory and core field parameters.

Table 7 Station ID	1182400HCN03						
Parameter	**Units**	**# (n) Samples**	**Min.**	**Max.**	**Avg.**	**Threshold Value**	**% (n) Exceedance**
Dissolved oxygen (DO)	mg/l	7	8.07	10.86	9.13	6.0	
pH	None	7	7.48	8.31	8.09	6.0-9.0	
Specific conductance	uS/cm	7	369.8	474.7	449.8		
Temperature, water	deg C	8	0.32	20.69	11.26	22.8	
Turbidity	NTU	7	2.58	16.1	6.27	3.38	71
Alkalinity, total	mg/l	8	160	240	211		
Chloride	mg/l	8	8.2	14.0	9.50		
Sulfate	mg/l	8	8.6	13	11.33		
Total suspended solids	mg/l	8	7.2	110	41.4		
Ammonia-nitrogen	mg/l	8	ND	0.28	0.09		
Nitrate + Nitrite	mg/l	8	1.00	2.10	1.36	1.73	13
Kjeldahl nitrogen	mg/l	8	ND	1.10	0.43	0.15	50
Phosphorus	mg/l	8	0.030	0.250	0.017	0.070/0.075	75/75
Orthophosphate	mg/l	8	ND	0.140	0.074		
Escherichia coli	MPN/100ml	8	105.0	>2419.6	1137.1*	410	63
Total Coliform	MPN/100ml	8	866.4	>2419.6	2053.8*		

*Avg. calculated using 2419.6 MPN/100mL when sample value >2419.6 MPN/100mL.

Parameters of notable concern include:

- Turbidity ranging from 2.58 – 16.1 NTUs410Total Suspended Solids ranging from 7.2 – 110 mg/L
- Kjeldahl Nitrogen (TKN) ranging from ND – 1.10 mg/L
- Nitrate of Nitrite ranging from 1.00 – 2.10 mg/L
- Total Phosphorus ranging from 0.030 – 0.250 mg/L
- Total Coliforms samples 866.4 - >2,419.6 MPN/100mL
- *E.coli* ranging from 105.0 – >2,419.6 MPN/100mL

No dissolved oxygen, temperature or pH values exceeded the established threshold criteria. Based on the EPA reference criteria for Ecoregion VII sublevel ecoregion 52, all sampling events produced results above the threshold for Kjeldahl nitrogen and 71% of Turbidity samples were above the threshold. Six Total P values were above the EPA reference criteria of 0.070 mg/L and the State of Wisconsin standard of 0.075 mg/L. The January 2022 sample was above the EPA reference criteria of 1.73 mg/L for nitrate+nitrite. Threshold values for *E.coli* are based on NR102.04 (6) that states the geometric mean (126 counts per 100mL) shall not be exceeded in any rolling 90-day period during the recreation season. The statistical threshold value (410 counts per 100mL) shall not be exceeded more than 10% of the time during any rolling 90-day period during the recreation season. Samples shall be required at least 5 times per month. It should be noted that comparison of sample results to these threshold values is limited because of the small number of samples the Nation collects at any given sampling station. However, 63% of sampling events produced results above the 410 cfu/100mL threshold.

Macroinvertebrate sampling was also completed at station 1182400HCN03. Table 8 provides a summary of the macroinvertebrate metrics.

Table 8 Macroinvertebrate Data Station 1182400HCN03							
Date	Hilsenhoff Biotic Index (HBI)	10-Max HBI	Index of Biotic Integrity (IBI)	Family Biotic Index (FBI)	Shannon Diversity Index	Species Richness	Genera Richness
5/12/2022	4.15	4.20	4.40	4.23	2.12	26	21

The macroinvertebrate IBI condition gradient rating at station 1182400HCN03 is "fair" and management efforts should focus on restoration to improve water quality. The HBI water quality rating for this station is "very good" suggesting possible slight organic pollution. The FBI value rating was "very good" also suggesting possible slight organic pollution at this station. The diversity index and richness values indicated some improvement from the last monitoring event on 5/13/20 when Species and Genera richness were 17 and 15 respectively.

An electrofishing survey was completed at station 1182400HCN03 using a DC electrofishing tote barge system. The survey crew was impeded by water depth and flow in several areas which made it difficult to wade and sample the fish community. A temperature data logger was deployed in the stream on 4/13/22 to collect hourly temperature readings in order to determine the correct assessment tool to apply to the sampling reach. Recovery of the logger was attempted on 10/25/22, but the logger could not be found and was presumed lost. It should be noted that the most recent temperature assessments in 2018 and 2020 have concluded the use of the warm-water IBI for this station even though fish surveys occasionally capture cold-water species including Brown trout. Table 9 provides a summary of the fish data.

Table 9 Fish Data Station 1182400HCN03					
Date	IBI Classification	Max. Daily Mean Temp C°	Index of Biotic Integrity (IBI) Score	IBI Rating	Comments
8/9/22	Warm-water	Not Determined	42	Fair	(54) fish captured, 52% of species cool or cold-water, (5) Brown Trout captured in survey.

The fish survey resulted in (54) individuals being captured representing (8) species. The Warmwater IBI score was (42) corresponding to a rating of Fair. (5) Brown trout were captured during the survey ranging in size from approximately 7-13 inches. (7) native species were also documented during the survey.

In summary, water quality at station 1182400HCN03 should be considered fair based on the information collected during 2022-2023. Water quality appears to be negatively impacted by non-point source runoff likely stemming from agricultural activities in the watershed.

1182400HCN04 MIDDLE KICKAPOO RIVER (BRIDGE 14)

Station 1182400HCN04 is accessed from CTH P and is located directly upstream of Bridge 14. This station is situated at the southernmost extent of the Ho-Chunk Nation Kickapoo Trust lands and is used to monitor water quality as it leaves the trust parcel.

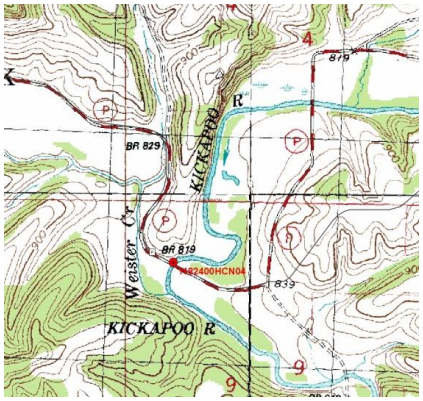

Fig 3. 24k Topographic Map


Station Photo Facing upstream 1/17/23

Station 1182400HCN04 was visited on (8) sampling events to monitor baseline water quality during 2022-2023. Core measurements were completed and water samples were collected and analyzed for nutrients and additional parameters including alkalinity, chloride, sulfate, total suspended solids, Total Coliforms and *E.coli*. Table 10 provides basic statistics for laboratory and core field parameters.

Table 10 Station ID	**1182400HCN04**						
Parameter	**Units**	**# (n) Samples**	**Min.**	**Max.**	**Avg.**	**Threshold Value**	**% (n) Exceedance**
Dissolved oxygen (DO)	mg/l	8	8.00	11.18	9.40	6.0	
pH	None	8	7.47	8.39	8.03	6.0-9.0	
Specific conductance	uS/cm	8	376	471.7	443.2		
Temperature, water	deg C	8	0.82	21.4	11.59	22.8	
Turbidity	NTU	8	2.12	20.6	8.10	3.38	88
Alkalinity, total	mg/l	8	160	240	209		
Chloride	mg/l	8	7.7	12.0	8.6		
Sulfate	mg/l	8	8.7	19	12		
Total suspended solids	mg/l	8	8.8	130	45.0		
Ammonia-nitrogen	mg/l	8	ND	0.15	0.08		
Nitrate + Nitrite	mg/l	8	0.93	1.90	1.24	1.73	13
Kjeldahl nitrogen	mg/l	8	ND	0.85	0.28	0.15	13
Phosphorus	mg/l	8	0.036	0.210	0.098	0.070/0.075	63/38
Orthophosphate	mg/l	8	ND	0.130	0.073		
Escherichia coli	MPN/100ml	8	28.5	>2419.6	872.8*	410	50
Total Coliform	MPN/100ml	8	517.2	>2419.6	2073.5*		

*Avg. calculated using 2419.6 MPN/100mL when sample value >2419.6 MPN/100mL.

Parameters of notable concern include:

- Turbidity ranging from 2.12 – 20.6 NTU
- Total Suspended Solids ranging from 8.8 – 130 mg/L
- Total Phosphorus ranging from 0.036 – 0.210 mg/L
- Total Coliforms samples 517.2 - >2,419.6 MPN/100mL
- *E.coli* ranging from 28.5 - >2,419.6 MPN/100mL

No dissolved oxygen, pH or temperature values exceeded the established threshold criteria. Based on the EPA reference criteria for Ecoregion VII sublevel ecoregion 52, 88% of samples produced results above the threshold for turbidity with only one sample having values above the Kjeldahl nitrogen and Nitrate + Nitrite thresholds. Five Total P values were above the EPA reference criteria of 0.070 mg/L with three also being above the State of Wisconsin standard of 0.075 mg/L. Threshold values for *E.coli* are based on NR102.04 (6) that states the geometric mean (126 counts per 100mL) shall not be exceeded in any rolling 90-day period during the recreation season. The statistical threshold value (410 counts per 100mL) shall not be exceeded more than 10% of the time during any rolling 90-day period during the recreation season. Samples shall be required at least 5 times per month. It should be noted that comparison of sample results to these threshold values is limited because of the small number of samples the Nation collects at any given sampling station. However, 50% of sampling events produced results above the 410 cfu/100mL threshold.

Macroinvertebrate sampling and electrofishing surveys were not completed at station 1182400HCN04 due to water depth and flow conditions that made it impossible to wade for such surveys.

In summary, water quality at station 1182400HCN04 should be considered fair based on the information collected during 2022-2023. Water quality appears to be negatively impacted by non-point source runoff likely stemming from agricultural activities in the watershed.

1195400HCN01 Indian Creek

Indian Creek flows in a southeasterly direction for 2.2 miles before reaching the Kickapoo River south of Rockton. This stream has a gradient of 59 feet per mile and drains forested hillsides with some ridge top agriculture. Indian Creek is currently a warm-water forage fishery. Station 1195400HCN01 is located east of the multi-use path that was formerly Indian Creek Road and approximately 400 feet downstream of the Indian Creek multi-use bridge. Reaches of Indian Creek under state jurisdiction are designated with the default Fish and Aquatic Life use by the WDNR because it does not have a specific use subcategory designation.

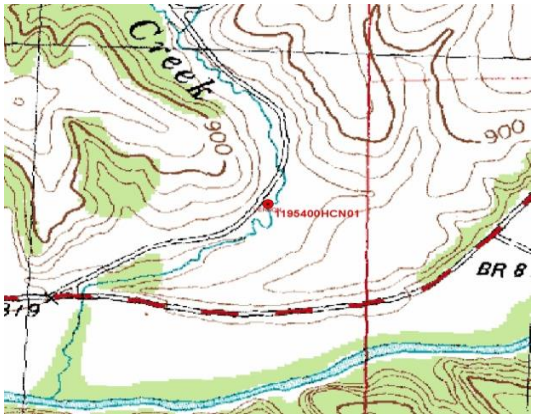

Fig. 4 24k Topographic Map


Station Photo Facing upstream 1/17/23

Station 1195400HCN01 was visited on (8) sampling events to monitor baseline water quality during 2022-2023. Core measurements were completed and water samples were collected and

analyzed for nutrients and additional parameters including alkalinity, chloride, sulfate, total suspended solids, Total Coliforms and *E.coli*. Table 11 provides basic statistics for laboratory and core field parameters.

Table 11 Station ID	**1195400HCN01**						
Parameter	**Units**	**# (n) Samples**	**Min.**	**Max.**	**Avg.**	**Threshold Value**	**% (n) Exceedance**
Dissolved oxygen (DO)	mg/l	7	8.21	11.50	9.99	6.0	
pH	None	8	7.47	8.35	8.02	6.0-9.0	
Specific conductance	uS/cm	8	307.8	484.2	425.8		
Temperature, water	deg C	8	0.06	17.5	9.99	22.8	
Turbidity	NTU	8	2.16	25.1	6.88	3.38	50
Alkalinity, total	mg/l	8	140	260	219		
Chloride	mg/l	8	3.1	5.4	3.9		
Sulfate	mg/l	8	5.9	12	9.5		
Total suspended solids	mg/l	8	3.4	110	20.4		
Ammonia-nitrogen	mg/l	8	ND				
Nitrate + Nitrite	mg/l	8	0.62	1.10	0.80	1.73	
Kjeldahl nitrogen	mg/l	8	ND	1.70	0.46	0.15	38
Phosphorus	mg/l	8	0.039	0.210	0.110	0.070/0.075	50/50
Orthophosphate	mg/l	8	ND	0.190	0.081		
Escherichia coli	MPN/100ml	8	86.2	>2419.6	1477.7*	410	75
Total Coliform	MPN/100ml	8	1046.2	>2419.6	2247.9*		

*Avg. calculated using 2419.6 MPN/100mL when sample value >2419.6 MPN/100mL.

Parameters of notable concern include:

- Turbidity ranging from 2.16 – 25.1 NTU
- Total Suspended Solids ranging from 3.4 – 110 mg/L
- Kjeldahl Nitrogen (TKN) ranging from ND – 1.70 mg/L
- Total Coliforms samples 1046.2 - >2,419.6 MPN/100mL
- *E.coli* ranging from 86.2 – >2,419.6 MPN/100mL
- Total phosphorus ranging from 0.039 – 0.210 mg/L

No dissolved oxygen, temperature or pH values exceeded the established threshold criteria. Based on the EPA reference criteria for Ecoregion VII sublevel ecoregion 52, 38% of samples produced results above the threshold for Kjeldahl nitrogen and 50% were above the threshold for turbidity. The *E.coli* threshold of 410 cfu/mL was exceeded in 75% of samples collected in 2022-2023. 50% of Total phosphorus values exceeded the EPA reference criteria for Ecoregion VII sublevel ecoregion 52 and the State of WI standard of 0.075 mg/L.

Macroinvertebrate sampling was also completed at station 1195400HCN01. Table 12 provides a summary of the macroinvertebrate data.

Table 12 Macroinvertebrate Data Station 1195400HCN01							
Date	Hilsenhoff Biotic Index (HBI)	10-Max HBI	Index of Biotic Integrity (IBI)	Family Biotic Index (FBI)	Shannon Diversity Index	Species Richness	Genera Richness
5/12/2022	3.85	4.14	4.81	4.21	2.65	24	22

The IBI condition gradient rating at station 1195400HCN01 is "fair" and efforts should focus on management actions that promote watershed restoration. The HBI and FBI water quality ratings for this station were both "very good" with possible slight organic pollution. The diversity index and richness values indicate fairly healthy diversity at this station with a slight increase in Genera and Species richness from the prior macroinvertebrate monitoring conducted in 2020.

An electrofishing survey was completed at station 1195400HCN01 using a DC electrofishing ETS Backpack system. A temperature data logger was deployed in the stream from 4/13/22 to 10/25/22 to collect hourly temperature readings in order to determine the correct IBI to apply to the sampling reach. The temperature profile concluded the use of the cold-water IBI for fish. Table 13 provides a summary of the fish data.

Brown Trout Captured in prior survey 2020

Table 13 Fish Data Station 1195400HCN01

Date	IBI Classification	Max. Daily Mean Temp C°	Index of Biotic Integrity (IBI) Score	IBI Rating	Comments
7/20/22	Cold-water	20.79	20	Poor	39 fish captured, 67% tolerant species, 13% cool/cold-water species including Brook and Brown Trout

The fish survey resulted in only (39) individuals being captured representing eight species including (1) Brown trout, (2) Brook trout, (8) Creek chubs, (18) White suckers and several minnow species. The trout captured in 2022 represent the second time since 2009 that salmonids were captured in a survey with the first occurrence being 2020 when a single Brown trout was captured.

In summary, water quality at station 1195400HCN01 is generally fair based on information collected during 2022-2023. Water quality appears to be somewhat negatively impacted by non-point source runoff, but significantly less than observed at the Kickapoo River stations. Indian Creek water quality is also influenced by multiple beaver dams above and below the sampling station that impede fish movement and affect stream temperature and movement of sediment within this system.

1196900HCN01 Billings Creek

Billings Creek begins in south central Monroe County and then flows into north central Vernon County. This stream flows in a southwesterly direction for 11.3 miles before reaching the Kickapoo River south of Ontario. Billings Creek has a gradient of 35 feet per mile and drains forested hillsides and agricultural lands in both valley and ridgetop settings. Billings Creek is a Class II trout stream for its entire length. Station 1196900HCN01 is located south of CTH F approximately 1.1 miles downstream of the CTH F bridge crossing.

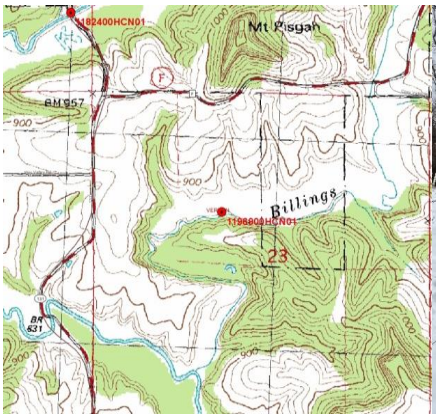

Fig 5. 24k Topographic Map

Station Photo Facing upstream 1/17/23

Station 1196900HCN01 was visited on (8) sampling events to monitor baseline water quality during 2022-2023. Core measurements were completed and water samples were collected and analyzed for nutrients and additional parameters including alkalinity, chloride, sulfate, total suspended solids, Total Coliforms and *E.coli*. Table 14 provides basic statistics for laboratory and core field parameters.

Table 14 Station ID	**1196900HCN01**						
Parameter	**Units**	**# (n) Samples**	**Min.**	**Max.**	**Avg.**	**Threshold Value**	**% (n) Exceedance**
Dissolved oxygen (DO)	mg/l	8	8.53	12.22	10.27	6.0	
pH	None	8	7.84	8.39	8.12	6.0-9.0	
Specific conductance	uS/cm	8	376.1	477.4	444.5		
Temperature, water	deg C	8	0.02	17.56	9.97	22.8	
Turbidity	NTU	8	1.03	18.3	5.27	3.38	38
Alkalinity, total	mg/l	8	180	240	220		
Chloride	mg/l	8	5.5	6.8	6.2		
Sulfate	mg/l	8	8.1	11	10.2		
Total suspended solids	mg/l	8	2	25	11.3		
Ammonia-nitrogen	mg/l	8	ND				
Nitrate + Nitrite	mg/l	8	1.10	1.90	1.34	1.73	13
Kjeldahl nitrogen	mg/l	8	ND	2.20	0.51	0.15	38
Phosphorus	mg/l	8	0.031	0.110	0.052	0.070/0.075	13/13
Orthophosphate	mg/l	8	ND	0.130	0.073		
Escherichia coli	MPN/100ml	8	65.0	1553.1	687.0	410	88
Total Coliform	MPN/100ml	8	727	>2419.6	2068.0*		

*Avg. calculated using 2419.6 MPN/100mL when sample value >2419.6 MPN/100mL.

Parameters of notable concern include:

- Turbidity ranging from 1.03 – 18.3 NTUs
- Kjeldahl Nitrogen (TKN) ranging from ND – 2.20 mg/L
- Total Coliforms samples 727 - >2,419.6 MPN/100mL
- *E.coli* ranging from 65.0 – 1553.1 MPN/100mL
- Total phosphorus values 0.031 – 0.110 mg/L

No dissolved oxygen, temperature or pH values exceeded the established threshold criteria. Based on the EPA reference criteria for Ecoregion VII sublevel ecoregion 52, three samples produced results above the thresholds for Kjeldahl nitrogen and turbidity. The *E.coli* threshold of 410 cfu/mL was exceeded in 88% of samples collected in 2022-2023. 13% of samples exceeded both the EPA and State of WI reference criteria for Total phosphorus.

Macroinvertebrate sampling was also completed at station 1196900HCN01. Table 15 provides a summary of the macroinvertebrate data.

Table 15 Macroinvertebrate Data Station 1196900HCN01

Date	Hilsenhoff Biotic Index (HBI)	10-Max HBI	Index of Biotic Integrity (IBI)	Family Biotic Index (FBI)	Shannon Diversity Index	Species Richness	Genera Richness
5/12/2022	4.59	4.73	3.44	4.26	2.32	22	19

The IBI condition gradient rating at station 1196900HCN01 is "fair" and management efforts should focus on watershed restoration. The HBI water quality rating for this station is "good" with potentially some organic pollution. The FBI value rating was also "good" indicating some organic pollution is probable. The diversity index and richness values indicated a fairly diverse macroinvertebrate community at this station although Genera and Species richness were slightly lower than in 2020 when values were 22 and 28 respectively.

An electrofishing survey was completed at station 1196900HCN01 using a DC electrofishing tote barge system. A temperature data logger was deployed in the stream on 4/13/22 but was declared lost on 10/25/22 after an extensive search could not relocate the sensor. However, prior temperature profiling of this stream concluded the use of the cold-water IBI.

Table 16 Fish Data Station 1196900HCN01

Date	IBI Classification	Max. Daily Mean Temp C°	Index of Biotic Integrity (IBI) Score	IBI Rating	Comments
7/13/22	Cold-water	Not determined	40	Fair	40 Brown trout captured.

The survey resulted in (74) individuals being captured and the temperature regime indicated use of the cold-water IBI. The corresponding IBI rating was fair with 58% of species being cool or cold-water. Brown trout was the only salmonid present with multiple size classes encountered. Other species included Mottled sculpin, White sucker and various minnow species.

In summary, water quality at station 1196900HCN01 is generally fair to good based on information collected during 2022-2023. Water quality is negatively impacted by non-point source agricultural runoff, with conditions similar to the Kickapoo River stations during extreme run-off events. Total phosphorus, organic nitrogen, total suspended solids and bacteriological values often exceed reference criteria following a runoff event. However, the waterway is still supportive of a cold-water fishery.

1198200HCN01 unnamed (Hay Valley Rd.)

Hay Valley Rd. Creek is a 3.03-mile stream that drains forested hillsides with agricultural uses in both valleys and ridgetop settings. Hay Valley Creek is a Class I Trout Water that joins the Kickapoo River just below Bridge 6. Station 1198200HCN01 is located south of Hay Valley Road approximately 0.1 miles upstream of the confluence with the Kickapoo River.

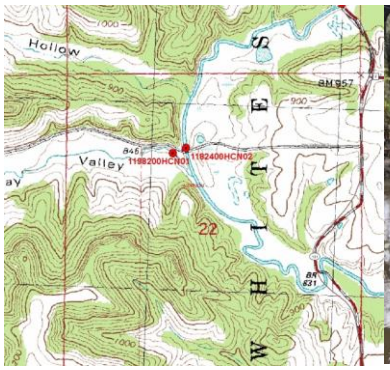

Fig. 6 24k Topographic Map


Station Photo facing upstream following storm event

Station 1198200HCN01 was visited on (8) sampling events to monitor baseline water quality during 2022-2023. Core measurements were completed and water samples were collected and analyzed for nutrients and additional parameters including alkalinity, chloride, sulfate, total suspended solids, Total Coliforms and *E.coli*. Table 17 provides basic statistics for laboratory and core field parameters.

Table 17 Station ID	**1198200HCN01**						
Parameter	**Units**	**# (n) Samples**	**Min.**	**Max.**	**Avg.**	**Threshold Value**	**% (n) Exceedance**
Dissolved oxygen (DO)	mg/l	7	8.07	11.69	9.89	6.0	
pH	None	8	7.65	8.18	7.98	6.0-9.0	
Specific conductance	uS/cm	8	327	465.3	416.3		
Temperature, water	deg C	8	0.6	15.29	9.00	22.8	
Turbidity	NTU	8	1.66	33.5	8.67	3.38	63
Alkalinity, total	mg/l	8	150	240	210		
Chloride	mg/l	8	3.0	5.6	3.9		
Sulfate	mg/l	8	6.6	11	9.7		
Total suspended solids	mg/l	8	5.6	150	34.7		
Ammonia-nitrogen	mg/l	8	ND				
Nitrate + Nitrite	mg/l	8	0.63	1.10	0.89	1.73	
Kjeldahl nitrogen	mg/l	8	ND	0.56	0.27	0.15	25
Phosphorus	mg/l	8	0.010	0.170	0.060	0.070/0.075	25/25
Orthophosphate	mg/l	8	ND	0.160	0.077		
Escherichia coli	MPN/100ml	8	344.8	>2419.6	1356.2*	410	88
Total Coliform	MPN/100ml	8	>2419.6	>2419.6	>2419.6*		

*Avg. calculated using 2419.6 MPN/100mL when sample value >2419.6 MPN/100mL.

Parameters of notable concern include:

- Total Suspended Solids ranging from 5.6– 150 mg/L
- Kjeldahl Nitrogen (TKN) values ranging from ND – 0.56 mg/L

- Total Coliforms samples >2,419.6 MPN/100mL
- *E.coli* samples 344.8 - >2,419.6 MPN/100mL
- Turbidity 1.66 – 33.5 NTUs
- Total Phosphorus 0.010 - 0.170 mg/L

No dissolved oxygen, temperature or pH values exceeded the established threshold criteria. Based on the EPA reference criteria for Ecoregion VII sublevel ecoregion 52, two samples produced results above the thresholds for Kjeldahl nitrogen and 63% exceeded the turbidity threshold. The *E.coli* threshold of 410 cfu/mL was exceeded in 88% of samples collected in 2022-2023. The EPA and State of WI threshold values for Total phosphorus were exceeded in 25% of samples.

Macroinvertebrate sampling was also completed at station 1198200HCN01. Table 18 provides a summary of the macroinvertebrate data.

Table 18 Macroinvertebrate Data Station 1198200HCN01

Date	Hilsenhoff Biotic Index (HBI)	10-Max HBI	Index of Biotic Integrity (IBI)	Family Biotic Index (FBI)	Shannon Diversity Index	Species Richness	Genera Richness
5/12/2022	2.96	4.07	5.24	3.24	2.13	25	22

The IBI condition gradient rating at station 1198200HCN01 is "good" and efforts should focus on maintaining this condition. The HBI water quality rating for this station is "excellent" with no apparent organic pollution. The FBI value rating was also "excellent" suggesting that organic pollution was unlikely. The diversity index and richness values indicated a fairly good level of diversity in the macroinvertebrate community with an increase in both Species and Genera Richness from the prior survey in 2020 when values were 17 and 13 respectively.

An electrofishing survey was completed at station 1198200HCN01 using a DC electrofishing ETS backpack system. A temperature data logger was deployed in the stream from 4/13/22 to 10/25/22 to collect hourly temperature readings in order to determine the correct IBI to apply to the sampling reach. The temperature profile concluded the use of the cold-water IBI for fish with the Maximum Daily Mean Temperature being 18.50 degrees Celsius on May 12th.

Backpack Electrofishing Survey 7/13/22

Table 19 Fish Data Station 1198200HCN01

Date	IBI Classification	Max. Daily Mean Temp C°	Index of Biotic Integrity (IBI) Score	IBI Rating	Comments
7/13/22	Cold-water	18.50	60	Good	14 Brook Trout and 6 Brown Trout captured during survey.

The fish survey resulted in (28) individuals being captured with (14) Brook trout and (6) Brown trout comprising the cool or cold-water species. Other species captured include White suckers and various minnow species. The last survey at this station in 2020 resulted in (30) fish being captured with a corresponding IBI score of zero with a rating of Very Poor due to tolerant non-cold/cool-water species dominating the community.

In summary, water quality at station 1198200HCN01 is generally good based on information collected during 2022-2023. Water quality appears to be negatively impacted by non-point source runoff, but significantly less than observed at the Kickapoo River stations. Water quality is also influenced by multiple beaver dams above and below the sampling station that impede fish movement and movement of sediment within this system. Beavers are also the contributors to high bacteria counts in this stream.

Black River Basin

The Black River Basin is one of three distinct main stem river basins including the Black, Buffalo and Trempealeau Rivers which drain to the Mississippi River. This basin is part of the Great Western Rivers area of Wisconsin that contains forested hillsides with agricultural uses in both valleys and ridgetop settings. The Driftless terrain drains to the Mississippi's wide floodplains that can be viewed for miles from the region's steep bluff overlooks. Fixed Stations 1714200HCN01, 1714300HCN01 and1715800HCN01 and Rotating Basin Year One sites are associated with the Morrison Creek and O'Neill Cunningham 24k WDNR watersheds. Major portions of Morrison Creek watershed were logged in the late 1800's. Dense stands of large pines survived on islands in the extensive wetland areas of this watershed until the lumbermen found ways to access and transport the large logs using railways.

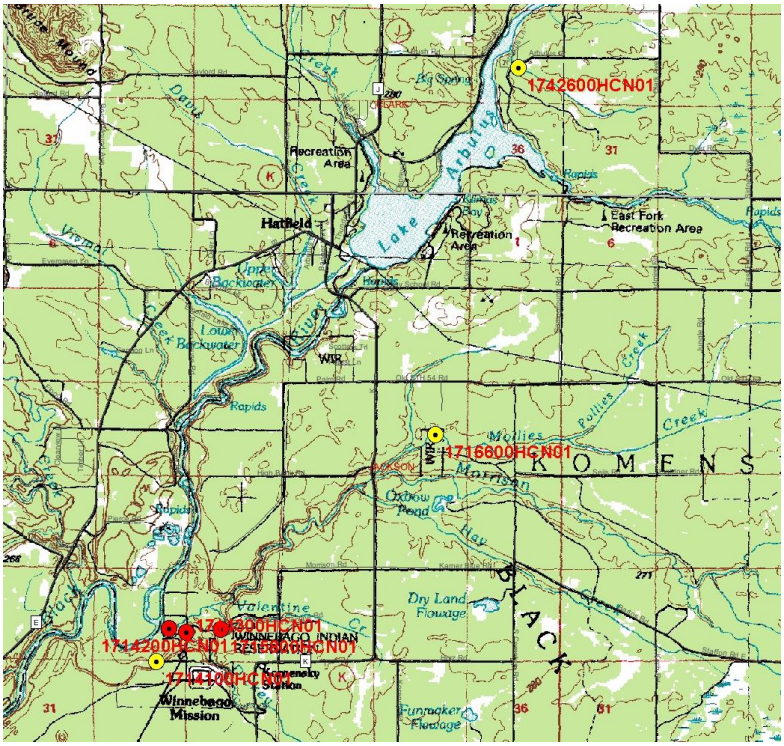

Fig. 7 100k Topographic Map

Forest and wetland dominate the Morrison Creek watershed landscape. The majority of the Black River State Forest lies within this watershed as do many Ho-Chunk Nation parcels. Cranberries are the major crop in the Morrison Creek watershed and many streams have been impounded to divert water for cranberry operations. Since most of the streams in this watershed historically contained forage fisheries, thermal changes in streams resulting from the discharge of impounded water are not considered a major problem. Only Valentine, Clear and portions of Levis Creek are classified trout streams.

The O'Neill and Cunningham Creeks watershed, located in Clark County, is approximately 162 square miles. Low base flow and gradient, as well as flashy flows during rain events, characterize the streams in the O'Neill and Cunningham Creeks watershed. These conditions greatly influence the fisheries in these streams. All streams support at least a forage fishery. Some streams can support a sport fishery, if water levels are adequate. The majority of the historically forested areas were converted to agricultural use as mechanized agriculture took hold in the area.

1714200HCN01 Morrison Creek

Morrison Creek begins in the far eastern portion of the watershed and flows west for 30 miles through Potter's Flowage, the Black River State Forest and Ho-Chunk land before entering the Black River. The lower eight miles of Morrison Creek contain sport fish. A warm water forage fishery inhabits the remaining 22 miles of the creek. Numerous cranberry operations are established on streams that contribute flow to Morrison Creek. Manipulation of water levels in these tributaries for cranberry production may affect the flow and water quality in Morrison Creek. Station 1714200HCN01 is located 0.2 miles west of Pettibone Pass Rd. and is accessed via the Black River canoe launch road. The site is approximately 0.35 miles above the confluence with the Black River.

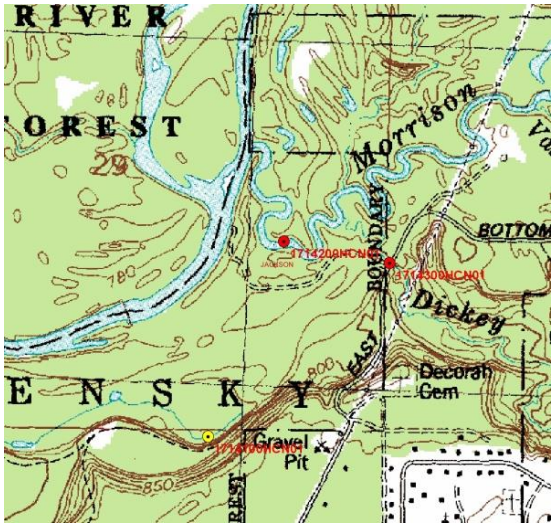

Fig. 8 24k Topographic Map


Station Photo Facing upstream

Station 1714200HCN01 was visited on (8) sampling events to monitor baseline water quality during 2022-2023. Core measurements were completed and water samples were collected and

analyzed for nutrients and additional parameters including alkalinity, chloride, sulfate, total suspended solids, Total Coliforms and *E.coli*. Table 20 provides basic statistics for laboratory and core field parameters.

Table 20 Station ID	**1714200HCN01**						
Parameter	**Units**	**# (n) Samples**	**Min.**	**Max.**	**Avg.**	**Threshold Value**	**% (n) Exceedance**
Dissolved oxygen (DO)	mg/l	8	8.02	12.75	10.23	5.0	
pH	None	8	4.75	6.64	5.84	6.0-9.0	63
Specific conductance	uS/cm	8	17	39.2	27.0		
Temperature, water	deg C	8	-0.02	22.41	10.41	31.7	
Turbidity	NTU	8	1.55	3.21	1.91	0.84	100
Alkalinity, total	mg/l	8	ND	21	3		
Chloride	mg/l	8	1.5	3.3	2.5		
Sulfate	mg/l	8	2	7.2	3.3		
Total suspended solids	mg/l	8	ND	5.8	2.8		
Ammonia-nitrogen	mg/l	8	ND				
Nitrate + Nitrite	mg/l	8	ND	0.20	0.12	0.13	63
Kjeldahl nitrogen	mg/l	8	ND	1.00	0.47	0.33	50
Phosphorus	mg/l	8	ND	0.021	0.040	0.02875/0.075	25/0
Orthophosphate	mg/l	8	ND				
Escherichia coli	MPN/100ml	8	ND	235.9	62.2	410	
Total Coliform	MPN/100ml	8	11.3	>2419.6	1110.2*		

*Avg. calculated using 2419.6 MPN/100mL when sample value >2419.6 MPN/100mL.

Parameters of notable concern include:

- Turbidity ranging from 1.55 – 3.21 NTUs.
- Kjeldahl Nitrogen (TKN) ranging from ND – 1.00 mg/L
- Total Phosphorus ranging from 0.021 - 0.040 mg/L.
- Total Coliforms ranging from 11.3 - >2,419.6 MPN/100mL.

No dissolved oxygen or temperature values exceeded the established threshold criteria. The pH threshold was exceeded in 63% of samples but low pH values are a normal condition in this watershed. Based on the EPA reference criteria for Ecoregion VII sublevel ecoregion 51, 50% of samples produced results above the threshold for Kjeldahl nitrogen; 63% exceeded the Nitrate +Nitrite threshold; and 100% exceeded the turbidity value. 25% of samples were above the EPA threshold for Total Phosphorus but none exceeded the WDNR Total phosphorus threshold.

Macroinvertebrate sampling was also completed at station 1714200HCN01. Table 21 provides a summary of the macroinvertebrate data.

Table 21 Macroinvertebrate Data Station 1714200HCN01							
Date	Hilsenhoff Biotic Index (HBI)	10-Max HBI	Index of Biotic Integrity (IBI)	Family Biotic Index (FBI)	Shannon Diversity Index	Species Richness	Genera Richness
5/25/23	2.16	2.36	8.04	3.07	4.28	32	31

The IBI condition gradient rating at station 1714200HCN01 is “excellent”. The HBI water quality rating for this station is “excellent” with no apparent organic pollution. The FBI value

rating is also “excellent” suggesting that organic pollution was unlikely. The diversity index and richness values indicated a diverse community of aquatic life.

An electrofishing survey was completed at station 1714200HCN01on 7/24/23 using a DC electrofishing ETS tote barge system. A temperature data logger was deployed in the stream from 6/5/23 to 10/1/23 to collect hourly temperature readings in order to determine the correct IBI to apply to the sampling reach. The maximum daily mean temperature of 25.01 C°, documented on 8/24/23, was 0.32 C° lower than the maximum daily mean during the last temperature profiling conducted in 2021. The temperature profile concluded the use of the warm-water IBI for fish. Table 22 provides a summary of the fish data.

Table 22 Fish Data Station 1714200HCN01

Date	IBI Classification	Max. Daily Mean Temp C°	Index of Biotic Integrity (IBI) Score	IBI Rating	Comments
7/24/23	Warm-water	25.01	50	Good	75 fish captured, 9 native species,

The fish survey resulted in (75) fish being captured consisting of (9) native species. 69% of the specimens captured were simple lithophils with 80% being insectivores.

In summary, water quality at station 1714200HCN01 is good based on the information collected during 2022-2023. Morrison Creek may be influenced to some degree by upstream cranberry operations that are highly dependent on the management of water for irrigation and crop harvest.

1714300HCN01 Dickey Creek

Dickey Creek is currently a warm water forage fishery. Elevated water temperatures due to upstream impoundments, low gradient and a shifting sand substrate limit the stream as a potential sport fishery. The Dickey Creek watershed is located entirely within the Black River State Forest with few identifiable nonpoint sources. Three waterfowl production ponds located upstream of the sampling station result in water temperatures that are generally too warm to support a cold-water fishery. Station 1714300HCN01 is located approximately 50 feet upstream of the Pettibone Pass Road crossing.

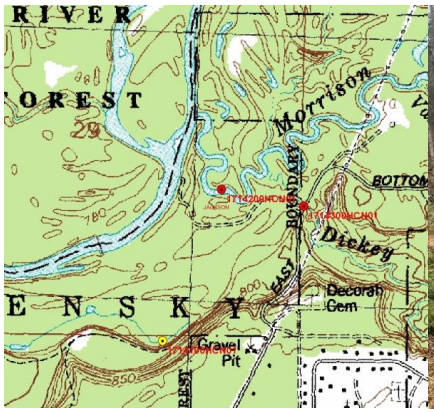

Fig. 9 24k Topographic Map

Station Photo facing upstream 4/4/23

Station 1714300HCN01 was visited on (8) sampling events to monitor baseline water quality during 2022-2023. Core measurements were completed and water samples were collected and

analyzed for nutrients and additional parameters including alkalinity, chloride, sulfate, total suspended solids and Total Coliforms/*E.coli*. Table 23 provides basic statistics for laboratory and core field parameters.

Table 23 Station ID	**1714300HCN01**						
Parameter	**Units**	**# (n) Samples**	**Min.**	**Max.**	**Avg.**	**Threshold Value**	**% (n) Exceedance**
Dissolved oxygen (DO)	mg/l	8	7.46	12.73	10.04	6.0	
pH	None	8	4.72	6.68	6.15	6.0-9.0	25
Specific conductance	uS/cm	8	21.3	77.5	49.9		
Temperature, water	deg C	8	0.12	19.48	9.61	22.8	
Turbidity	NTU	8	0.55	2.45	1.27	0.84	75
Alkalinity, total	mg/l	8	ND	22	3		
Chloride	mg/l	8	2.5	17.0	9.1		
Sulfate	mg/l	8	2.2	3.9	2.8		
Total suspended solids	mg/l	8	ND	4.2	2.8		
Ammonia-nitrogen	mg/l	8	ND				
Nitrate + Nitrite	mg/l	8	ND	0.22	0.14	0.13	75
Kjeldahl nitrogen	mg/l	8	ND	0.55	0.32	0.33	38
Phosphorus	mg/l	8	ND	0.026	0.016	0.02875/0.075	
Orthophosphate	mg/l	8	ND				
Escherichia coli	MPN/100ml	8	ND	206.4	71.1	410	
Total Coliform	MPN/100ml	8	103.9	>2419.6	1245.1*		

*Avg. calculated using 2419.6 MPN/100mL when sample value >2419.6 MPN/100mL.

Parameters of notable concern include:

- Turbidity ranging from 0.55 – 2.45 NTUs.
- Kjeldahl Nitrogen (TKN) ranging from ND - 0.55 mg/L
- Nitrate + nitrite ranging from ND - 0.22 mg/L
- Total Coliforms ranging from 103.9 - >2,419.6 MPN/100mL.

No dissolved oxygen or temperature values exceeded the established threshold criteria. The pH threshold was exceeded in 55% of samples due to pH values below 6.0 but low pH values are a normal condition in this watershed. Based on the EPA reference criteria for Ecoregion VII sublevel ecoregion 51, 38% of samples produced results above the threshold for Kjeldahl nitrogen and 75% exceeded the turbidity and nitrate + nitrite thresholds.

Macroinvertebrate sampling was also completed at station 1714300HCN01. Table 24 provides a summary of the macroinvertebrate data.

Table 24 Macroinvertebrate Data Station 1714300HCN01							
Date	Hilsenhoff Biotic Index (HBI)	10-Max HBI	Index of Biotic Integrity (IBI)	Family Biotic Index (FBI)	Shannon Diversity Index	Species Richness	Genera Richness
5/24/23	3.06	3.10	5.52	3.16	4.24	29	28

The IBI condition gradient rating at station 1714300HCN01 was “good” and efforts should be made to maintain that condition. The HBI water quality rating for this station is “excellent” with

no apparent organic pollution. The FBI value rating is also "excellent" suggesting that organic pollution was unlikely. The diversity index and richness values indicated a diverse community of aquatic life.

An electrofishing survey was completed at station 1714300HCN01on 7/24/23 using a DC electrofishing ETS tote barge system. A temperature data logger was deployed in the stream from 6/5/23 to 10/1/23 to collect hourly temperature readings in order to determine the correct IBI to apply to the sampling reach. The maximum daily mean temperature of 20.76 C°, documented on 8/24/23, was 0.95 C° lower than the maximum daily mean during the last temperature profiling conducted in 2021. The temperature profile concluded the use of the cold-water IBI for fish. Table 25 provides a summary of the fish data.

Table 25 Fish Data Station 1714300HCN01

Date	IBI Classification	Max. Daily Mean Temp C°	Index of Biotic Integrity (IBI) Score	IBI Rating	Comments
7/24/23	Cold-water	20.76	0	Very Poor	2% of capture were cool or cold-water species

The fish survey resulted in a total of (93) individuals being captured with only 2% of specimens being cool or cold-water. 70% of species were considered tolerant to warmer stream temperatures.

In summary, water quality at station 1714300HCN01 is fair to good based on the information collected during 2022-2023. Dickey Creek water quality and biological populations are likely influenced by upstream impoundments that influence water temperature, sediment transport and fish movement.

1715800HCN01 Valentine Creek

This three-mile-long Class I trout stream is a tributary to Morrison Creek and located near the confluence with the Black River. Valentine Creek flows through mostly undeveloped land that is part of the Black River State Forest and Ho-Chunk trust lands. Station 1715800HCN01 is located directly upstream of the Pettibone Pass (formerly Bottom Rd.) road culvert.

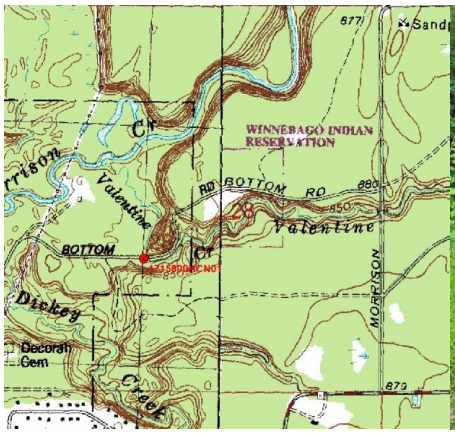

Fig. 10 24k Topographic Map

Station Photo Facing upstream 7/5/23

Station 1715800HCN01 was visited on (8) sampling events to monitor baseline water quality during 2022-2023. Core measurements were completed and water samples were collected and analyzed for nutrients and additional parameters including alkalinity, chloride, sulfate, total suspended solids, Total Coliforms and *E.coli*. Table 26 provides basic statistics for laboratory and core field parameters.

Table 26 Station ID	**1715800HCN01**						
Parameter	**Units**	**# (n) Samples**	**Min.**	**Max.**	**Avg.**	**Threshold Value**	**% (n) Exceedance**
Dissolved oxygen (DO)	mg/l	8	8.38	12.71	10.49	6.0	
pH	None	8	4.62	6.89	5.93	6.0-9.0	50
Specific conductance	uS/cm	8	41.5	64.9	53.1		
Temperature, water	deg C	8	0.49	16.23	8.41	22.8	
Turbidity	NTU	8	0.12	1.36	0.75	0.84	50
Alkalinity, total	mg/l	8	ND	23	3		
Chloride	mg/l	8	7.3	13.0	9.6		
Sulfate	mg/l	8	2.7	6.5	3.4		
Total suspended solids	mg/l	8	ND	2	1.1		
Ammonia-nitrogen	mg/l	8	ND				
Nitrate + Nitrite	mg/l	8	ND	0.20	0.14	0.13	75
Kjeldahl nitrogen	mg/l	8	ND	0.77	0.38	0.33	50
Phosphorus	mg/l	8	ND			0.02875/0.075	0/0
Orthophosphate	mg/l	8	ND				
Escherichia coli	MPN/100ml	8	1.0	160.7	55.8	410	
Total Coliform	MPN/100ml	8	18.8	>2419.6	961.0*		

*Avg. calculated using 2419.6 MPN/100mL when sample value >2419.6 MPN/100mL.

Parameters of notable concern include:

- Nitrate of nitrite ranging from ND – 0.20 mg/L
- Total Coliforms ranging from 18.8- >2,419.6 MPN/100mL
- Kjeldahl nitrogen values from ND – 0.77 mg/L
- Turbidity values ranging from 0.12 – 1.36 NTUs

No dissolved oxygen or temperature values exceeded the established threshold criteria. The pH threshold was exceeded in 50% of samples but low pH is a normal condition within this watershed. Based on the EPA reference criteria for Ecoregion VII sublevel ecoregion 51, 75% of samples produced results above the threshold for nitrate+nitrite and 50% exceeded the Kjeldahl threshold. The turbidity threshold was also exceeded in 50% of samples.

Macroinvertebrate sampling was also completed at station 1715800HCN01. Table 27 provides a summary of the macroinvertebrate data.

Table 27 Macroinvertebrate Data Station 1715800HCN01							
Date	Hilsenhoff Biotic Index (HBI)	10-Max HBI	Index of Biotic Integrity (IBI)	Family Biotic Index (FBI)	Shannon Diversity Index	Species Richness	Genera Richness
5/24/23	3.92	3.24	4.08	4.20	3.67	25	25

The IBI condition gradient rating at station 1715800HCN01 was “fair”. The HBI water quality rating for this station is “very good” with possible slight organic pollution. The FBI value rating is also “very good” suggesting possible slight organic pollution. The diversity index and richness values indicated a diverse community of aquatic life.

An electrofishing survey was completed at station 1715800HCN01 using a DC electrofishing ETS backpack system. A temperature data logger was deployed in the stream from 6/5/23 to 10/1/23 to collect hourly temperature readings in order to determine the correct IBI to apply to the sampling reach. The maximum daily mean temperature of 17.88 C°, documented on 8/24/23, was 4.06 C° lower than the maximum daily mean during the last temperature profiling conducted in 2021. The temperature profile concluded the use of the cold-water IBI for fish. Table 28 provides a summary of the fish data.

Table 28 Fish Data Station 1715800HCN01

Date	IBI Classification	Max. Daily Mean Temp C°	Index of Biotic Integrity (IBI) Score	IBI Rating	Comments
7/26/23	Cold-water	17.88	70	Good	21 Brook Trout captured

Photos from prior electrofishing event, left photo showing multiple age classes of native Brook trout, right photo mature Brook trout

The fish survey resulted in (33) individuals being captured with (21) being native Brook trout. The remaining species included Creek chub, White sucker and Longnose dace. 64% of species captured were cool or cold-water species.

In summary, water quality at station 1715800HCN01 continues to be very good to excellent based on the information collected during 2022-2023. Valentine Creek can serve as a reference stream in the area because it is a headwater stream within a primarily undeveloped watershed. Although this station is within Ho-Chunk trust land, the majority of the stream is located on land owned by the State of Wisconsin. The WDNR has subsequently classified the segment under state jurisdiction as an Exceptional Resource Water (ERW) because of water quality condition. Valentine Creek is also classified as a Class I trout water because it supports naturally reproducing Brook trout.

Middle and South Branches Embarrass River Watershed

The Middle and South Branch of the Embarrass River Watershed covers 251 square miles and is located in Shawano, Marathon and Langlade counties. The Middle Branch of the Embarrass

River winds for 52 miles in this watershed. It should be noted that stations 310700HCN01 and 312800HCN01 depicted on the map below were not sampled during the reporting period and are not scheduled for sampling in upcoming years.

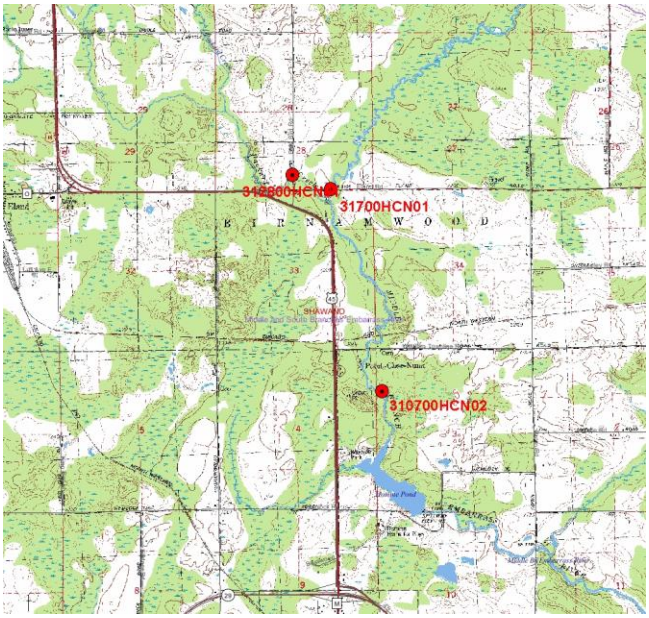

Fig. 11 24k Topographic Map

310700HCN02 Middle Branch Embarrass River

Station 310700HCN02 is located approximately 0.43 miles upstream of Homme Pond. The station is located on the Ho-Chunk Nation Christiansen parcel directly east of the Ho-Chunk North Ancillary Casino. This segment of the river is designated as Class II trout water by the WDNR.

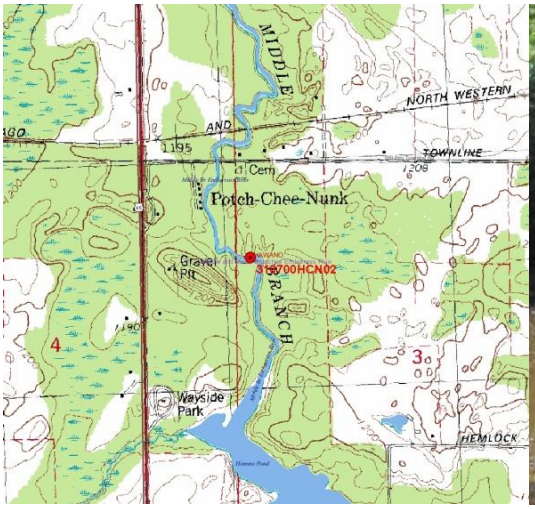

Fig. 12 24k Topographic Map


Station Photo Facing upstream

Station 310700HCN02 was visited on (8) sampling events to monitor baseline water quality during 2022-2023. Core measurements were completed and water samples were collected and

analyzed for nutrients and additional parameters including alkalinity, chloride, sulfate, total suspended solids, Total Coliforms and *E.coli*. Table 29 provides basic statistics for laboratory and core field parameters.

Table 29 Station ID	**310700HCN02**						
Parameter	**Units**	**# (n) Samples**	**Min.**	**Max.**	**Avg.**	**Threshold Value**	**% (n) Exceedance**
Dissolved oxygen (DO)	mg/l	8	8.22	12.41	10.32	6.0	
pH	None	8	7.24	8.39	7.88	6.0-9.0	
Specific conductance	uS/cm	8	193.4	504.9	400.8		
Temperature, water	deg C	8	0.01	20.92	8.65	22.8	
Turbidity	NTU	8	0.14	2.05	0.95	0.84	38
Alkalinity, total	mg/l	8	85	240	184		
Chloride	mg/l	8	6.6	14.0	11.6		
Sulfate	mg/l	8	4.1	8.4	7.0		
Total suspended solids	mg/l	8	ND	10	4.1		
Ammonia-nitrogen	mg/l	8	ND				
Nitrate + Nitrite	mg/l	8	0.72	3.10	2.03	0.13	100
Kjeldahl nitrogen	mg/l	8	ND	3.60	0.69	0.33	38
Phosphorus	mg/l	8	ND	0.082	0.026	0.02875/0.075	25/13
Orthophosphate	mg/l	8	ND				
Escherichia coli	MPN/100ml	8	6.3	193.5	86.4	410	
Total Coliform	MPN/100ml	8	40.8	>2419.6	1171.0*		

*Avg. calculated using 2419.6 MPN/100mL when sample value >2419.6 MPN/100mL.

Parameters of notable concern include:

- Turbidity ranging from 0.14 – 2.05 NTUs.
- Kjeldahl Nitrogen (TKN) ranging from ND – 3.60 mg/L
- Nitrate+Nitrite ranging from 0.72 – 3.10 mg/L.
- Total Phosphorus ranging from ND - 0.082 mg/L.
- Total Coliforms values ranging 40.8 - >2,419.6 MPN/100mL.

No temperature, pH or dissolved oxygen values exceeded the established threshold criteria. Based on the EPA reference criteria for Ecoregion VII sublevel ecoregion 51, all samples were above the threshold values for nitrate + nitrite; 38% were above the turbidity and Kjeldahl nitrogen thresholds. 25% of Total P values were above the EPA reference criteria but only one sample collected in April 2022 exceeded the State of Wisconsin standard of 0.075 mg/L.

Macroinvertebrate sampling was also completed at station 31700HCN02. Table 30 provides a summary of the macroinvertebrate data.

Table 30 Macroinvertebrate Data Station 310700HCN02							
Date	Hilsenhoff Biotic Index (HBI)	10-Max HBI	Index of Biotic Integrity (IBI)	Family Biotic Index (FBI)	Shannon Diversity Index	Species Richness	Genera Richness
5/24/23	3.85	3.75	6.37	4.17	4.34	35	31

The IBI condition gradient rating at station 310700HCN02 was “good”. The HBI water quality rating for this station is “very good” with possible slight organic pollution. The FBI value rating

is also “very good” suggesting possible slight organic pollution. The diversity index and richness values indicated a diverse community of aquatic life.

An electrofishing survey was completed at station 310700HCN02 using a DC electrofishing ETS backpack system. A temperature data logger was deployed in the stream from 6/5/23 to 10/1/23 to collect hourly temperature readings in order to determine the correct IBI to apply to the sampling reach. The temperature profile concluded the use of the cold-water IBI for fish. Table 31 provides a summary of the fish data.

Table 31 Fish Data Station 310700HCN02

Date	IBI Classification	Max. Daily Mean Temp C°	Index of Biotic Integrity (IBI) Score	IBI Rating	Comments
8/8/23	Cold-water	21.55	40	Fair	34% species cool or cold-water

The fish survey resulted in (138) individuals being captured with 28% being native Brook trout. (3) Rainbow trout were also captured. 34% of species were cool or cold-water species. Other species captured included White sucker, Blackside darter, Longnose dace, Smallmouth bass, Mottled sculpin, Creek chub and Johnny darter.

In summary, water quality at station 310700HCN02 is considered good based on the information collected during 2022-2023. Although this station is within Ho-Chunk trust land, much of the stream flows through private land upstream. The WDNR has subsequently classified this segment and upstream portions as an Outstanding Resource Water because of high water quality and as a Class II trout stream since it is capable of supporting trout but unable to sustain natural reproduction.

LITTLE LACROSSE RIVER WATERSHED

The Little La Crosse River Watershed is the largest in the La Crosse River basin covering 240 square miles. Approximately one third of the watershed lies in La Crosse County with the balance in Monroe County. It includes all streams draining to the La Crosse River between the Lake Neshonoc dam in West Salem and the Perch Lake dam in Sparta. Major tributaries are Dutch, Burns, Big, Fish, Farmers Valley and Beaver Creeks, as well as the Little La Crosse River. Approximately 30 miles of Class I, 54 miles of Class II and 22 miles of Class III trout water, including the La Crosse River between Rockland and Sparta, exist in the Little La Crosse River Watershed.

This watershed contains approximately the same amount of wooded hillsides as agricultural fields, with some wetlands located adjacent to the La Crosse River. Agricultural land is found both in the valleys and ridge tops in the Little La Crosse River watershed. However, due to the steep hills and narrow valleys, many valley farms contain limited tillable acreage. Consequently, riparian corridors of many streams in the watershed contain cultivated fields and barnyards. Storm water runoff from these fields and barnyards can contribute sediment, nutrients, and bacteria to streams, all of which eventually reach Lake Neshonoc.

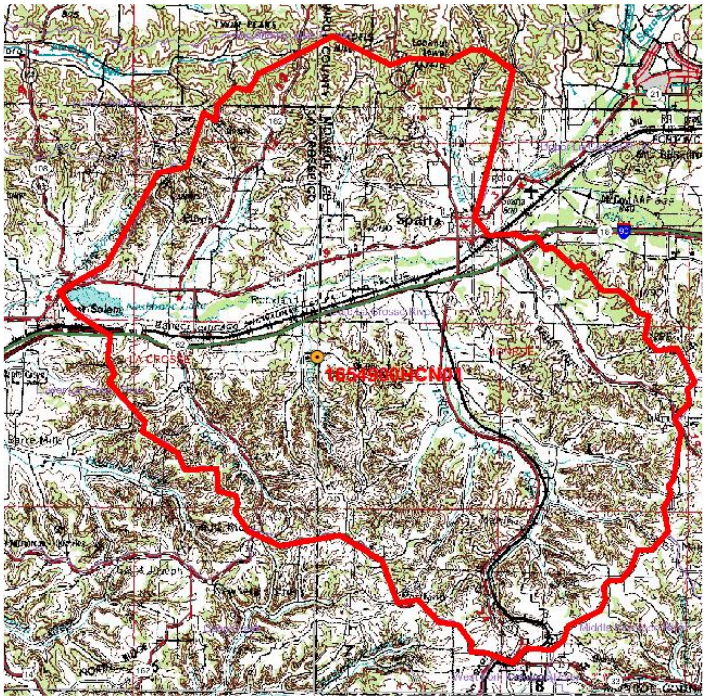

Fig. 13 100k Little La Crosse River Watershed

RB2 Station 1654900HCN01 unnamed (Wo gis na pi)

This unnamed creek flows approximately 3.5 miles northwest before joining with Fish Creek at the western boundary of the Ho-Chunk Nation trust parcel. Fish Creek is classified as a Class III trout stream in La Crosse County. Fish Creek and this unnamed tributary are spring fed streams that drain steep forested hillsides and agricultural valley land. These streams are known to be impacted by suspended sediments, bank erosion, nutrients and high bacteria counts. Sampling station 1654900HCN01 is located directly upstream of the field road culvert on the Ho-Chunk Nation Wo gis na pi trust parcel. Long-term hourly temperature monitoring conducted by the Ho-Chunk Nation concluded that the stream is a cool water system and likely capable of supporting trout species.

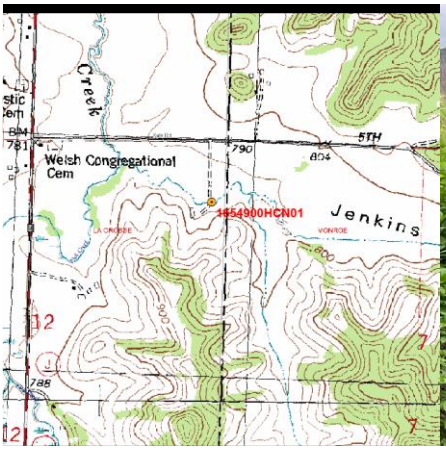

Fig. 14 24k Topographic Map


Station Photo Facing upstream 7/5/22

Station 1654900HCN01 was visited on (4) sampling events in January, April, July and October 2022 to monitor baseline water quality. Core measurements were completed and water samples were collected and analyzed for nutrients and additional parameters including alkalinity, chloride, sulfate, total suspended solids, Total Coliforms and *E.coli*. Table 32 provide basic statistics for laboratory and core field parameters.

Table 32 Station ID	**1654900HCN01**						
Parameter	**Units**	**# (n) Samples**	**Min.**	**Max.**	**Avg.**	**Threshold Value**	**% (n) Exceedance**
Dissolved oxygen (DO)	mg/l	4	7.29	10.72	9.48	6.0	
pH	None	4	7.69	8.16	7.91	6.0-9.0	
Specific conductance	uS/cm	4	412.1	458.6	439.2		
Temperature, water	deg C	4	2.34	19.95	9.81	22.8	
Turbidity	NTU	4	3.26	9.95	5.03	3.38	50
Alkalinity, total	mg/l	4	190	230	215		
Chloride	mg/l	4	5.1	9	6.2		
Sulfate	mg/l	4	12.0	16.0	13.3		
Total suspended solids	mg/l	4	6.8	15	10.6		
Ammonia-nitrogen	mg/l	4	ND				
Nitrate + Nitrite	mg/l	4	1.00	3.90	2.20	1.73	50
Kjeldahl nitrogen	mg/l	4	ND	0.48	0.27	0.15	25
Phosphorus	mg/l	4	0.028	0.070	0.047	0.070/0.075	25/0
Orthophosphate	mg/l	4	ND	0.13	0.08		
Escherichia coli	MPN/100ml	4	25.6	547.5	222.5	410	25
Total Coliform	MPN/100ml	4	547.5	>2,419.6	1779.9*		

*Avg. calculated using 2419.6 MPN/100mL when sample value >2419.6 MPN/100mL.

Parameters of notable concern include:

- Turbidity ranging from 3.26 – 9.95 NTUs.
- Kjeldahl Nitrogen (TKN) from ND – 0.48 mg/L
- Nitrate+Nitrite ranging from 1.00 - 3.90 mg/L.

No dissolved oxygen, pH or temperature values exceeded the established threshold criteria. Based on the EPA reference criteria for Ecoregion VII sublevel ecoregion 52, 50% of samples exceeded the turbidity and nitrate + nitrite thresholds. The Kjeldahl nitrogen, Total phosphorus and E. coli were exceeded in 25% of samples.

Macroinvertebrate sampling was also completed at station 1654900HCN01. Table 33 provides a summary of the macroinvertebrate data.

Table 33 Macroinvertebrate Data Station 1654900HCN01							
Date	Hilsenhoff Biotic Index (HBI)	10-Max HBI	Index of Biotic Integrity (IBI)	Family Biotic Index (FBI)	Shannon Diversity Index	Species Richness	Genera Richness
5/16/2022	4.23	4.55	4.32	4.19	1.53	18	17

The IBI condition gradient rating for this unnamed creek is “fair” and management actions should focus on watershed restoration to improve conditions. The HBI water quality rating was “very good” with possible slight organic pollution. The FBI value rating was also “very good”

indicating possible slight organic pollution. The diversity index and richness values indicated a fairly low level of diversity of macroinvertebrates.

An electrofishing survey was completed at station 1654900HCN01 on 7/11/22 using a DC electrofishing ETS back-pack system. A temperature data logger was deployed in the stream from 4/12/22 to 10/26/22 to collect hourly temperature readings in order to determine the correct IBI to apply to the sampling reach. The temperature sensor was recovered on 10/26/22; however, the sensor failed during deployment and no data was recovered. Prior temperature profiling has concluded use of the cold-water IBI for fish. Table 34 provides a summary of the fish data.

Table 34 Fish Data Station 1654900HCN01

Date	IBI Classification	Max. Daily Mean Temp C°	Index of Biotic Integrity (IBI) Score	IBI Rating	Comments
7/11/2022	cold-water	Not Determined	Not Calculated	Very Poor	<25 individuals captured

The fish survey resulted in only (18) individuals being captured; therefore, the IBI score was not calculated due to the small sample size and the site was assigned the default IBI rating of Very poor. However, for informational purposes, the cold-water IBI rating for the (18) individuals would be Good with 72% of individuals captured being native Brook trout. Low fish abundance on this stream may represent degraded waterbody conditions when water chemistry is taken into consideration. The stream routinely suffers from high turbidity and total suspended solids coupled with high levels of nutrients. It is also likely that other agri-chemicals affect water quality and biological populations. Habitat also appears to be somewhat degraded with observations of pockets of silty sediment in transit with a lack of pools, riffles and undercut banks. The Nation has implemented various restoration projects and BMPs to address water quality concerns on the segment traversing tribal lands. These include removing Highly Erodible Land and farm fields adjacent to the stream from agricultural production and restoring these areas to native prairie buffer strips. In addition, the Nation has removed the canopy cover from the stream bank resulting in an herbaceous cover that is better suited at stabilizing the banks during high flow events.

In summary, water quality at station 1654900HCN01 is considered fair based on information collected during 2022. Although this station is within Ho-Chunk trust land, much of the stream flows through private land in an agriculture dominated watershed. Downstream of station 1654900HCN01, the stream flows into Fish Creek a Class III trout water.

<u>MISSISSIPPI RIVER (Reno) WATERSHED</u>

RB2 Station allot1045HCN01unnamed (Blackhawk Hopinka)

This unnamed first order stream originates from drainage and springs within the Blackhawk Hopinka allotment parcel. This cold-water stream then flows approximately 0.5 miles east before entering the backwaters of the Mississippi River in the area known as Lawrence Lake. The mid-section of the stream flows through a small wooded subdivision of approximately 20 homes before crossing Hwy 26 and entering the backwater wetland complex of Lawrence Lake. The sampling site is located 20 feet upstream of the two culverts on Brookwood Drive.

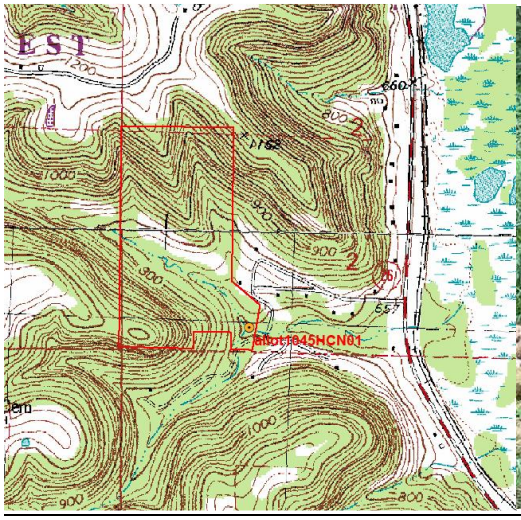

Fig. 15 24k Topographic Map

Station Photo Facing Upstream 7/5/22

Station allot1045HCN01 was visited on (4) sampling events in January, April, July and October 2022 to monitor baseline water quality. Core measurements were completed and water samples were collected and analyzed for nutrients and additional parameters including alkalinity, chloride, sulfate, total suspended solids, Total Coliforms and *E.coli*. Table 35 provide basic statistics for laboratory and core field parameters.

Table 35 Station ID	**allot1045HCN01**						
Parameter	**Units**	**# (n) Samples**	**Min.**	**Max.**	**Avg.**	**Threshold Value**	**% (n) Exceedance**
Dissolved oxygen (DO)	mg/l	4	9.82	10.57	10.17	6.0	
pH	None	4	7.66	7.96	7.79	6.0-9.0	
Specific conductance	uS/cm	4	72.5	479.5	366.0		
Temperature, water	deg C	4	8.30	10.39	9.47	22.8	
Turbidity	NTU	4	0.07	3.63	1.13	3.38	25
Alkalinity, total	mg/l	4	230	250	240		
Chloride	mg/l	4	4.6	4.9	4.7		
Sulfate	mg/l	4	12.0	13.0	12.3		
Total suspended solids	mg/l	4	ND	2.2	1.3		
Ammonia-nitrogen	mg/l	4	ND				
Nitrate + Nitrite	mg/l	4	2.10	2.30	2.20	1.73	100
Kjeldahl nitrogen	mg/l	4	ND			0.15	
Phosphorus	mg/l	4	ND			0.070/0.075	
Orthophosphate	mg/l	4	ND				
Escherichia coli	MPN/100ml	4	ND	104.6	34.5	410	
Total Coliform	MPN/100ml	4	84.8	2419.6	772.4		

Parameters of notable concern include:

- Nitrate+Nitrite ranging from 2.10 – 2.30 mg/L.
- Turbidity ranging from 0.14 – 3.63 mg/L

No dissolved oxygen, temperature or pH values exceeded the established threshold criteria. Based on the EPA reference criteria for Ecoregion VII sublevel ecoregion 52, all samples were above the nitrate + nitrite threshold value and one sample was above the turbidity threshold.

Macroinvertebrate sampling was also completed at station allot1045HCN01. Table 36 provides a summary of the macroinvertebrate data.

Table 36 Macroinvertebrate Data Station allot1045HCN01

Date	Hilsenhoff Biotic Index (HBI)	10-Max HBI	Index of Biotic Integrity (IBI)	Family Biotic Index (FBI)	Shannon Diversity Index	Species Richness	Genera Richness
5/16/2022	3.84	3.52	7.77	4.03	0.92	11	10

The IBI condition gradient rating for this unnamed stream is "excellent" and management actions should consider Outstanding or Exceptional Resource listing. The HBI water quality rating was "very good" with possible slight organic pollution. The FBI value rating was also "very good" indicating possible slight organic pollution. The diversity index and richness values indicated a low range of diversity; however, this is likely attributed to low productivity and very cold stream temperatures throughout the year.

An electrofishing survey was completed at station allot1045HCN01 on 7/11/22 using a DC electrofishing ETS back-pack system. A temperature data logger was deployed in the stream from 4/12/22 to 10/26/22 to collect hourly temperature readings in order to determine the correct IBI to apply to the sampling reach. Temperature profiling concluded the use of the cold-water IBI for fish. No fish were captured or observed during the survey for the 100-meter sampling reach. It is important to note that lack of fish in this stream does not represent degraded waterbody conditions, this unnamed creek is a very cold headwater stream with low productivity and therefore does not provide adequate conditions for a sustainable fish population.

Table 37 Fish Data Station allot1045HCN01

Date	IBI Classification	Max. Daily Mean Temp C°	Index of Biotic Integrity (IBI) Score	IBI Rating	Comments
7/11/2022	cold-water	11.03	Not Calculated	Very Poor	No fish present

In summary, water quality at station allot1045HCN01 is very good to excellent based on information collected during 2022. This unnamed stream may serve as a reference stream in the area because it is a headwater stream and is primarily undeveloped upstream of the sampling station and residential subdivision.

<u>UPPER LEMONWEIR RIVER WATERSHED</u>

Stations 1326700HCN01, 1326700HCN02, 1327200HCN01, 5024814HCN01, 5024918HCN01 and 5025163HCN01are located in the Upper Lemonweir River HUC-10 watershed. All streams in the watershed ultimately drain to the Lemonweir River. Numerous impoundments are found throughout the watershed, some of which are used for cranberry production and others are managed for wildlife production or fishing. Land adjacent to many flowages is county, state or federally owned. The Upper Lemonweir River Watershed is located in the driftless region of the state, which was covered at one time by glacial melt water, also known as Glacial Lake

Wisconsin. Evidence of the ancient lakebed in this watershed is found in the extensive acreage of wetlands. Forests also account for a large portion of land cover in the watershed.

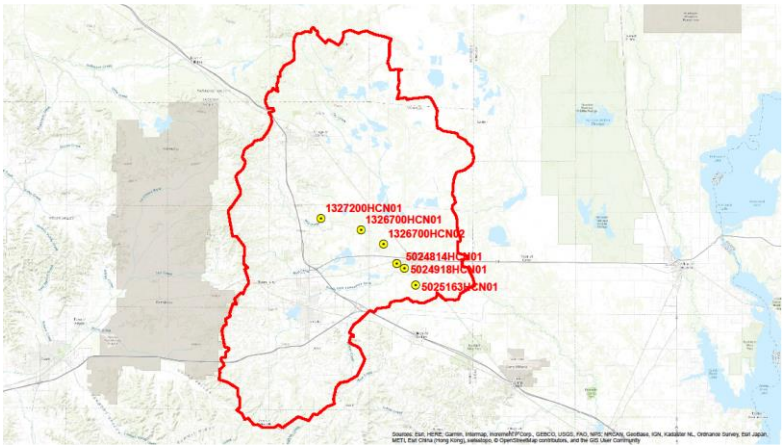

Fig. 16 24k Topographic Map

RB3 Station 1326700HCN01 Mill Creek

Mill Creek, located in northeast Monroe County, flows in a southeasterly direction for nearly 10 miles before reaching the East Fork of the Lemonweir River near Wyeville. Upstream of HWY 12 for five miles, Mill Creek is a Class I trout stream and designated as an Exceptional Resource Water (ERW). Downstream of HWY 12 to the Water Mill Pond, Mill Creek is a Class II trout stream. Below the Water Mill Pond, Mill Creek is not a classified trout stream. Mill Creek provides water for two cranberry operations and has been ditched in its lower reaches. The WDNR has not assigned a specific designated use for those portions of Mill Creek under state jurisdiction and therefore the default designated use of Fish and Aquatic Life (FAL) has been assigned. The default FAL states that the waters are considered fishable and swimmable. The sampling station for Mill Creek is located approximately one mile downstream of the Water Mill Pond in the area that has been ditched and is not classified as trout stream.

Fig. 17 24k Topographic Map


Station photo facing upstream 4/3/23
Commercial Cranberry Bed Under Construction Upper Right.

Station 1326700HCN01 was visited during (4) sampling events in January, April, July and October 2023 to monitor baseline water quality. Core measurements w ere completed and water

samples were collected and analyzed for nutrients and additional parameters including alkalinity, chloride, sulfate, total suspended solids, Total Coliforms and *E.coli*. Table 38 provides basic statistics for laboratory and core field parameters.

Table 38 Station ID	**1326700HCN01**						
Parameter	**Units**	**# (n) Samples**	**Min.**	**Max.**	**Avg.**	**Threshold Value**	**% (n) Exceedance**
Dissolved oxygen (DO)	mg/l	4	5.87	10.89	8.76	5.0	
pH	None	4	6.71	7.41	6.95	6.0-9.0	
Specific conductance	uS/cm	4	111.3	146	132.3		
Temperature, water	deg C	4	2.97	21.03	12.28	31.7	
Turbidity	NTU	4	0.66	10.62	4.20	0.84	75
Alkalinity, total	mg/l	3	38	42	39		
Chloride	mg/l	4	11.0	18.0	14.8		
Sulfate	mg/l	4	4.8	6.9	5.8		
Total suspended solids	mg/l	4	ND	8.6	3.4		
Ammonia-nitrogen	mg/l	4	ND				
Nitrate + Nitrite	mg/l	4	0.45	2.80	1.48	0.13	100
Kjeldahl nitrogen	mg/l	4	ND	0.74	0.48	0.33	75
Phosphorus	mg/l	4	0.070	0.130	0.092	0.02875/0.075	100/50
Orthophosphate	mg/l	4	ND				
Escherichia coli	MPN/100ml	4	3.0	60.2	22.2	410	
Total Coliform	MPN/100ml	4	214.2	>2419.6	1759.9*		

*Avg. calculated using 2419.6 MPN/100mL when sample value >2419.6 MPN/100mL.

Parameters of notable concern include:

- Turbidity ranging from 0.66-10.62 NTU
- Kjeldahl Nitrogen (TKN) ranging from ND - 0.74 mg/L
- Nitrate+Nitrite ranging from 0.45-2.80 mg/L
- Total phosphorus values ranging from 0.070-0.130 mg/L
- Total Coliform values ranging from 214.2 - >2,419.6 MPN/100mL

No dissolved oxygen, pH or temperature values exceeded the established threshold criteria. Based on the EPA reference criteria for Ecoregion VII sublevel ecoregion 51, all four samples exceeded the EPA reference for nitrate + nitrite and Total phosphorus with 50% also exceeding the state Phosphorus threshold. 75% of samples also exceeded the turbidity and Kjeldahl nitrogen thresholds.

Macroinvertebrate sampling was also completed at station 1326700HCN01. Table 39 provides a summary of the macroinvertebrate data.

Table 39 Macroinvertebrate Data Station 1326700HCN01							
Date	Hilsenhoff Biotic Index (HBI)	10-Max HBI	Index of Biotic Integrity (IBI)	Family Biotic Index (FBI)	Shannon Diversity Index	Species Richness	Genera Richness
5/25/23	7.45	6.98	-0.43	7.38	3.15	20	19

The IBI condition gradient rating for Mill Creek at station 1326700HCN01 is “poor” and management actions should include additional monitoring to determine impairment listing. The

HBI water quality rating is “fairly poor” indicating a significant degree of organic pollution. The FBI value rating was “very poor” suggesting that severe organic pollution is likely. The diversity index and richness values indicated a lack of species diversity and a community tolerant of degraded water quality.

An electrofishing survey was completed at station 1326700HCN01 using a DC electrofishing ETS backpack system. A temperature data logger was deployed in the stream from 6/5/23 to 10/3/23 to collect hourly temperature readings in order to determine the correct IBI to apply to the sampling reach. Temperature profiling concluded use of the warm-water IBI. Table 40 provides a summary of the fish data.

Table 40 Fish Data Station 1326700HCN01

Date	IBI Classification	Max. Daily Mean Temp C°	Index of Biotic Integrity (IBI) Score	IBI Rating	Comments
8/9/23	Warm-water	25.14	15	Very Poor	Too few fish to calculate IBI

The fish survey resulted in (11) individuals being captured, therefore the IBI score was not calculated and the default rating of Very poor was assigned. Fish species included Golden shiner Pumpkinseed, Bluegill, Brown bullhead, Common shiner and Smallmouth bass.

In summary, water quality at station 1326700HCN01 should be considered poor based on the information collected during 2023. Water quality is negatively impacted by channelization, non-point source runoff, cranberry cultivation and impoundments. These impacts result in degraded habitat, poor water clarity, elevated stream temperature and high levels of nutrients.

RB3 Station 1327200HCN01 unnamed (Mill Creek Tributary)
This unnamed tributary to Mill Creek originates in a wetland area and flows southeasterly through undeveloped land for approximately one mile before entering Mill Creek 0.25 miles above the Water Mill Pond. This tributary is associated with the portion of Mill Creek that is classified as a Class II trout stream.

Fig. 19 24k Topographic Map


Station Photo facing upstream

Station 1327200HCN01 was visited on (4) sampling events in January, April, July and October 2023 to monitor baseline water quality. Core measurements were completed and water samples were collected and analyzed for nutrients and additional parameters including alkalinity,

chloride, sulfate, total suspended solids, Total Coliforms and *E.coli*. Table 41 provides basic statistics for laboratory and core field parameters.

Table 41 Station ID	**1327200HCN01**						
Parameter	**Units**	**# (n) Samples**	**Min.**	**Max.**	**Avg.**	**Threshold Value**	**% (n) Exceedance**
Dissolved oxygen (DO)	mg/l	4	5.84	10.36	8.69	6.0	25
pH	None	4	6.25	7.01	6.50	6.0-9.0	
Specific conductance	uS/cm	4	92.1	223.9	146.5		
Temperature, water	deg C	4	2.04	19.6	10.01	22.8	
Turbidity	NTU	4	1.26	3.15	2.66	0.84	100
Alkalinity, total	mg/l	3	24	27	25		
Chloride	mg/l	4	7.6	50.0	31.7		
Sulfate	mg/l	4	2.9	6.6	4.2		
Total suspended solids	mg/l	4	ND	4.2	2.3		
Ammonia-nitrogen	mg/l	4	ND				
Nitrate + Nitrite	mg/l	4	0.50	3.30	1.93	0.13	100
Kjeldahl nitrogen	mg/l	4	ND	0.62	0.38	0.33	50
Phosphorus	mg/l	4	ND	0.030	0.019	0.02875/0.075	25/0
Orthophosphate	mg/l	4	ND				
Escherichia coli	MPN/100ml	4	7.4	>2419.6	1213.8*	410	50
Total Coliform	MPN/100ml	4	46.9	>2419.6	1275.8*		

*Avg. calculated using 2419.6 MPN/100mL when sample value >2419.6 MPN/100mL.

Parameters of notable concern include:

- Dissolved oxygen value of 5.84 mg/L in October 2023
- Turbidity values ranging from 1.26 – 3.15 mg/L
- Kjeldahl Nitrogen (TKN) values ranging from ND – 0.62 mg/L
- Nitrate+Nitrite ranging from 0.50 – 3.30 mg/L
- Total Coliforms ranging from 46.9 - >2,419.6 MPN/100mL.

One sample exceeded the dissolved oxygen threshold in October 2023. Based on the EPA reference criteria for Ecoregion VII sublevel ecoregion 51, all samples exceeded the Turbidity and Nitrate + Nitrite thresholds with 50% also exceeding the Kjeldahl nitrogen value. The October 2023 sample exceeded the EPA criteria for Total phosphorus but was well below the state standard of 0.075 mg/L. The Total coliform threshold of 410 cfu/ml was exceeded in the July and October 2023 samples.

Macroinvertebrate sampling was also completed at station 1327200HCN01. Table 42 provides a summary of the macroinvertebrate data.

Table 42 Macroinvertebrate Data Station 1327200HCN01							
Date	Hilsenhoff Biotic Index (HBI)	10-Max HBI	Index of Biotic Integrity (IBI)	Family Biotic Index (FBI)	Shannon Diversity Index	Species Richness	Genera Richness
5/25/23	4.79	3.49	7.82	4.87	2.02	13	13

The IBI condition gradient rating for this unnamed creek was “excellent”. The HBI water quality rating was “good” suggesting some organic pollution. The FBI value rating was also “good”

indicating some organic pollution probably. The diversity index and richness values indicated a limited range of aquatic life.

An electrofishing survey was completed at station 1327200HCN01 using a DC electrofishing ETS backpack system. A temperature data logger was deployed in the stream from 4/3/23 to 10/3/23 to collect hourly temperature readings in order to determine the correct IBI to apply to the sampling reach. The logger was recovered but was no longer functioning and the data was unrecoverable. Prior temperature profiling in 2018 concluded the use of the cold-water IBI for fish. Table 43 provides a summary of the fish data.

Table 43 Fish Data Station 1327200HCN01

Date	IBI Classification	Max. Daily Mean Temp C°	Index of Biotic Integrity (IBI) Score	IBI Rating	Comments
7/26/23	Coldwater	Not Determined	Not Calculated	Very Poor	<25 individuals collected

The fish survey resulted in < 25 individuals being captured, therefore the IBI score was not calculated and the default rating of Very poor was assigned. Two individuals were captured including a Brook stickleback and Central mudminnow.

In summary, water quality at station 1327200HCN01 should be considered good based on the information collected during 2023. This is a headwater stream that originates in a forested wetland area with minimal development influencing water quality. There does not appear to be run-off from non-point sources directly affecting the stream. The poor biological metrics are likely due to the natural conditions found in this wetland community type that is characterized by very high organic material resulting in mucky substrate in the stream channel and adjacent Tag alder swamp wetlands.

RB3 Station 5025163HCN01 unnamed (Smoke)
Station 5025163HCN01 is associated with a man-made drainage ditch that flows northerly for approximately 1.25 miles before entering a wetland area adjacent to the South Fork Lemonweir River. A review of historical aerial photography for this area indicates that the drainage was constructed prior to April 1939. The drainage was likely constructed in an attempt to improve areas for agriculture during periods of white settlement.

Fig. 20 24k Topographic Map

Station 5025163HCN01 was visited on (4) sampling events in January, April, July and October 2023. The station was dry and not sampled when visited during July and October. Core measurements were completed and water samples were collected and analyzed for nutrients and additional parameters including alkalinity, chloride, sulfate, total suspended solids, Total Coliforms and *E.coli*. Table 44 provides basic statistics for laboratory and core field parameters.

Table 44 Station ID	**5025163HCN01**						
Parameter	**Units**	**# (n) Samples**	**Min.**	**Max.**	**Avg.**	**Threshold Value**	**% (n) Exceedance**
Dissolved oxygen (DO)	mg/l	2	3.86	8.58	6.22	5.0	50
pH	None	2	5.46	6.18	5.82	6.0-9.0	50
Specific conductance	uS/cm	2	27.1	49	38.1		
Temperature, water	deg C	2	0.03	6.33	3.18	31.7	
Turbidity	NTU	2	0.87	0.97	0.92	0.84	100
Alkalinity, total	mg/l	1	28	28	28		
Chloride	mg/l	2	1.5	2.4	1.95		
Sulfate	mg/l	2	1.9	4.1	3.00		
Total suspended solids	mg/l	2	ND				
Ammonia-nitrogen	mg/l	2	ND				
Nitrate + Nitrite	mg/l	2	0.12	0.13	0.125	0.13	50
Kjeldahl nitrogen	mg/l	2	0.82	0.95		0.33	100
Phosphorus	mg/l	2	ND	0.020	0.020	0.02875/0.075	
Orthophosphate	mg/l	2	ND				
Escherichia coli	MPN/100ml	2	2.0	2.0	2.0	410	
Total Coliform	MPN/100ml	2	325.5	410.6	368.1		

Parameters of notable concern include:

- Turbidity values of 0.87-0.97 NTU
- Kjeldahl Nitrogen (TKN) values of 0.82 – 0.95 mg/L

One sample exceeded the pH threshold, dissolved oxygen and nitrate + nitrite threshold. Low pH values are expected in forested drainage areas in this area where reducing conditions are often found. Based on the EPA reference criteria for Ecoregion VII sublevel ecoregion 51, both samples exceeded the Kjeldahl nitrogen and turbidity values.

Macroinvertebrate monitoring was also completed at station 5025163HCN01 on 5/25/23. However, no bugs were collected or observed after two sampling efforts following protocols identified in the approved Quality Assurance Project Plan for this activity.

An electrofishing survey was not completed at station 5025163HCN01 because the site was dry when visited on 7/26/23 and again on 8/9/23. The site remained dry throughout the remaining summer. A temperature data logger was not deployed in the waterway because the station was dry when visited 6/5/23. This reach of the waterway is incapable of supporting a population of fish throughout the year but may contain transient minnow species at times when there is sufficient available water.

In summary, water quality at station 5025163HCN01 should be considered fair based on the information collected during 2023. This is a drainage that originates in a forested wetland area. There appears to be minimal impact from surrounding land-use.

RB3 Station 5024814HCN01 unnamed (Greendeer)

Station 5024814HCN01 is associated with an intermittent drainage that flows generally east for approximately 1.85 miles before entering the South Fork Lemonweir River. The monitoring station is located on tribal land approximately 1.05 miles upstream from the confluence with the Lemonweir. The drainage was historically ditched downstream of tribal land but this ditch network has not been maintained and has numerous obstructions and/or breaches that affect hydrology. Tribal members have become increasingly concerned with water quality and quantity issues related to this waterway because of an upstream sand mining operation. The upstream mine had a dewatering and wetland fill violation in 2016 that resulted in a release of sediment laden water. The mine operators implemented corrective measures and continue to operate within an approved WDNR permit that allows the release of "clean" dewatering water into this waterway. Dewatering activities have been occurring in late fall or winter at times when the water table elevation is normally low. It has also resulted in thick ice sheets covering a large portion of the wetland area for months at a time. The Nation is concerned about the long-term impacts of upstream dewatering releases on the wetland community and how it may change the plant and wildlife community associated with this area.

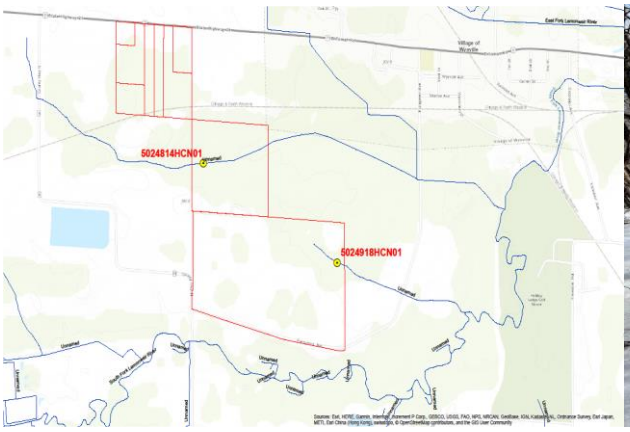

Fig.21 24k Topographic Map


Station Photo 3/27/23 Inundation from Mine Dewatering

Station 5024814HCN01 was visited on (4) sampling events in January, April, July and October 2023. The station was dry and not sampled when visited during July and October. The site was inundated with dewatering water when visited on January 24th and April 3rd. The area was covered with ice during the January visit requiring a spud hole to reach flowing water at the sampling point on the main drainage channel. Core measurements were completed and water samples were collected and analyzed for nutrients and additional parameters including alkalinity, chloride, sulfate, total suspended solids, Total Coliforms and *E.coli*. Table 45 provides basic statistics for laboratory and core field parameters.

Table 45 Station ID	5024814HCN01						
Parameter	**Units**	**# (n) Samples**	**Min.**	**Max.**	**Avg.**	**Threshold Value**	**% (n) Exceedance**
Dissolved oxygen (DO)	mg/l	2	11.29	11.88	11.59	5.0	
pH	None	2	6.17	6.53	6.35	6.0-9.0	
Specific conductance	uS/cm	2	32.3	78.9	55.6		
Temperature, water	deg C	2	0.44	9.34	4.89	31.7	
Turbidity	NTU	2	2	4.35	3.18	0.84	100
Alkalinity, total	mg/l	1	23	23	23		
Chloride	mg/l	2	2.9	11.0	7.0		
Sulfate	mg/l	2	2.8	8.4	5.6		
Total suspended solids	mg/l	2	2	4.4	3.2		
Ammonia-nitrogen	mg/l	2	ND				
Nitrate + Nitrite	mg/l	2	ND	1.10	1.10	0.13	50
Kjeldahl nitrogen	mg/l	2	ND	0.53	0.53	0.33	50
Phosphorus	mg/l	2	ND			0.02875/0.075	
Orthophosphate	mg/l	2	ND				
Escherichia coli	MPN/100ml	2	3.1	9.7	6.4	410	
Total Coliform	MPN/100ml	2	35	488.4	261.7		

Parameters of notable concern include:

- Turbidity values of 2 – 4.35 NTU
- Nitrate + nitrite value of 1.10 mg/L
- Kjeldahl Nitrogen (TKN) value of 0.53 mg/L

Based on the EPA reference criteria for Ecoregion VII sublevel ecoregion 51, both the January and April samples exceeded the turbidity threshold with Kjeldahl nitrogen and Nitrate + nitrite reference criteria being exceeded in one sample.

Macroinvertebrate sampling was not completed at station 5024814HCN01 due to lack of water when the site was visited on 5/25/23.

An electrofishing survey was not completed at station 5024814HCN01 because the site lacked available water during site visits on 7/26/23 and again on 8/9/23.

In summary, water quality at station 5024814HCN01 should still be considered good based on the limited information collected during 2023. The Nation is concerned with the upstream sand mining operation that releases pit water into the waterway during dewatering activities. Measures are in place at the mine site to remove suspended solids, but inundation of this waterway and surrounding lands is occurring more frequently and during periods when this waterway was historically dry or at low flow.

RB3 Station 5024918HCN01 unnamed (Shaw)

Station 5024918HCN01 is associated with a man-made drainage that flows generally east for approximately 0.55 miles before entering the South Fork Lemonweir River. The monitoring station is located on tribal land approximately 0.45 miles upstream from the confluence with the Lemonweir. The waterway originates from a forested wetland area on tribal land and is entirely

ditched through forested areas on tribal land and then runs through small agricultural fields to the east owned by private landowners. This is an intermittent stream typically carrying water during spring snowmelt or following significant precipitation events.

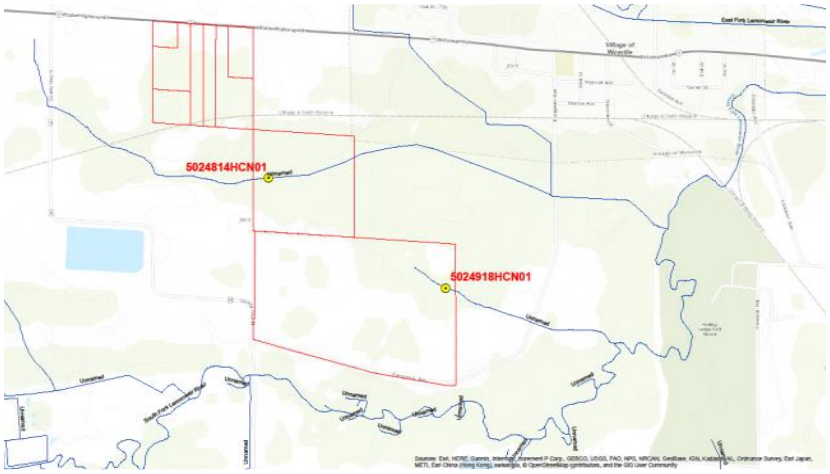

Fig.22 24k Topographic Map

Station 5024918HCN01 was visited on (4) sampling events in January, April, July and October 2023. The site was dry when visited during July and October. The site was also dry when visited for a macroinvertebrate survey on 5/25/23 and during two fish survey attempts on 7/26/23 and 8/9/23. In addition, a temperature data logger was not deployed in the stream because of lack of water during visits for macroinvertebrate and fish. During the January and April visits, core measurements were completed and water samples were collected and analyzed for nutrients and additional parameters including alkalinity, chloride, sulfate, total suspended solids, Total Coliforms and *E.coli*. Table 46 provides basic statistics for laboratory and core field parameters.

Table 46 Station ID	**5024918HCN01**						
Parameter	**Units**	**# (n) Samples**	**Min.**	**Max.**	**Avg.**	**Threshold Value**	**% (n) Exceedance**
Dissolved oxygen (DO)	mg/l	2	5.98	6.48	6.23	5.0	100
pH	None	2	4.22	5.72	4.97	6.0-9.0	100
Specific conductance	uS/cm	2	36.9	38.7	37.8		
Temperature, water	deg C	2	0.07	9.23	4.65	31.7	
Turbidity	NTU	2	0.85	1.45	1.15	0.84	100
Alkalinity, total	mg/l	1	ND				
Chloride	mg/l	2	1.9	2.4	2.2		
Sulfate	mg/l	2	4.7	7.6	6.2		
Total suspended solids	mg/l	2	ND	7.6	4.3		
Ammonia-nitrogen	mg/l	2	ND				
Nitrate + Nitrite	mg/l	2	0.14	0.16	0.15	0.13	100
Kjeldahl nitrogen	mg/l	2	0.59	1.20	0.90	0.33	100
Phosphorus	mg/l	2	ND			0.02875/0.075	
Orthophosphate	mg/l	2	ND				
Escherichia coli	MPN/100ml	2	2.0	110.6	56.3	410	
Total Coliform	MPN/100ml	2	307.6	648.8	478.2		

Based on the EPA reference criteria for Ecoregion VII sublevel ecoregion 51, both the January and April samples exceeded the turbidity, Kjeldahl nitrogen and Nitrate + nitrite reference criteria. The dissolved oxygen and pH values were also above the thresholds. Low pH in forested wetlands in this area is a normal condition and the reducing conditions present may result in low dissolved oxygen values. The Kjeldahl nitrogen values are higher than expected with no known source.

In summary, water quality at station 5024918HCN01 should still be considered good based on the limited information collected during 2023. The waterbody is within a forested wetland with no development in proximity to the sampling station. Ambient water quality values are reflective of normal conditions for this area.

8. Water Quality Issues of Tribal Concern

Baseline water quality monitoring results raise concerns about the current water quality associated with tribal water resources. The sampling locations are vastly different aquatic systems due to the natural variation in surface water resources across the landscape and also the stressors that can affect water quality. However, concerns with water quality stemming from nutrient enrichment, suspended sediments, turbidity and high bacteria counts have been observed on tribal waters regardless of location and land-use.

The review of nutrient data indicates that 30% (28 of 94) samples analyzed for total phosphorus were above the EPA reference criteria for the respective sub-ecoregion and 20% were also above the State of Wisconsin Total phosphorus standard of 0.075 mg/L. In addition, 49% of nitrate+nitrite samples, 40% Kjeldahl nitrogen and 67% of turbidity samples were above the reference criteria for the respective sub-ecoregion. Lastly, E. coli analysis resulted in 30% exceeding the single sample maximum threshold value of 410 cfu/100mL.