

TUDARE WiseH2O Mobile Application (WiseH2O mApp)

Pilot Project Location: West-Central Wisconsin
Pilot Project Lead: Kiap-TU-Wish Chapter, Trout Unlimited

Monitoring Plan

Project Location:

This location of the TUDARE WiseH2O mApp pilot project is in west-central Wisconsin. Although the jurisdiction for the Kiap-TU-Wish Chapter of Trout Unlimited (Kiap-TU-Wish) includes Pierce, Polk, and St. Croix Counties, the project location will be limited to Pierce County, which is a part of the four-state Driftless Area in Minnesota, Wisconsin, Iowa, and Illinois (Figure 1). The location of Pierce County in the far northwestern corner of Wisconsin's Driftless Area is shown in Figure 2.

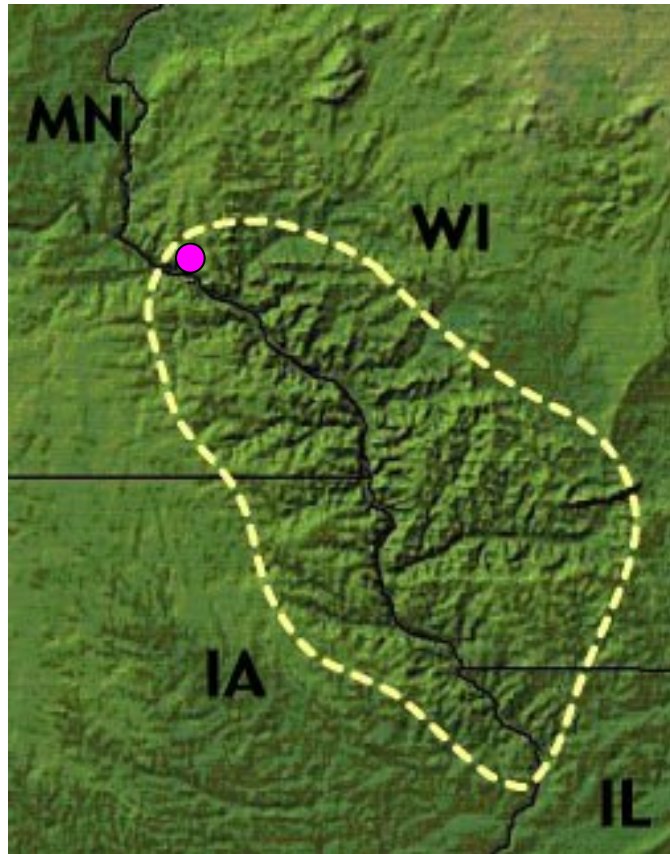


Figure 1. Kiap-TU-Wish Pilot Project Location in the Driftless Area

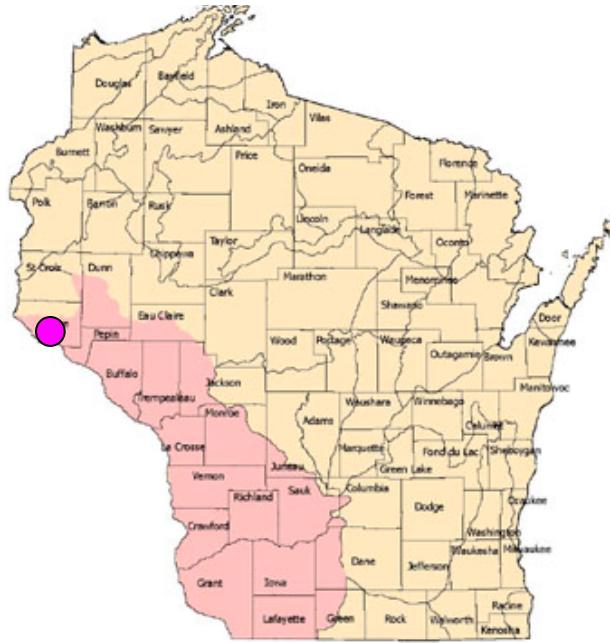


Figure 2. Pierce County, in Wisconsin’s Driftless Area

Project Team:

The Kiap-TU-Wish Project Team will be led by John Kaplan, who serves as the chapter’s Water Monitoring Coordinator. Project support will be provided by Kent Johnson, Kiap-TU-Wish member and WiseH2O mApp Advisory Team member. Anglers participating in the pilot project are members and friends of the Kiap-TU-Wish Chapter of Trout Unlimited. Within this membership, a small group of ten “target anglers” will be monitoring at designated stream sites on a prescribed schedule, to ensure that the project meets its goal of representing broad spatial and temporal variations in stream water quality throughout the project location. A larger group of 25-50 “general anglers” will have the flexibility to monitor stream sites of their choice throughout Pierce County.

Project Streams and Rivers:

Streams and rivers within the Pierce County project location that could be monitored include:

- Kinnickinnic River and tributaries
- Trimbelle River and tributaries
- Rush River and tributaries
- Eau Galle River (Upper)
- Cady Creek
- Pine Creek
- Isabelle Creek
- Plum Creek

Project Monitoring Period:

Project monitoring will be conducted from March-October, 2019. To fully evaluate the range of water quality characteristics present in project streams and rivers, monitoring will be conducted: 1) during baseflow conditions, when groundwater contributions dominate the stream flow regime, and 2) during runoff conditions (after snowmelt and rain events), when watershed contributions dominate the flow regime.

Angler Monitoring Observations:

During the project monitoring period, a minimum of 200 angler monitoring observations will be made on streams and rivers within the project location, using the WiseH2O mApp. Each angler observation should consist of the following measurements:

- Alkalinity (mg/L)
- Hardness (mg/L)
- Nitrate-Nitrogen (mg/L)
- Nitrite-Nitrogen (mg/L)
- pH
- Orthophosphate (mg/L)
- Stream Disturbances
- Temperature (°F)

Measurements of alkalinity, hardness, nitrate-nitrogen (NO3), nitrite-nitrogen (NO2), pH, and orthophosphate will be made using test strips provided to the participating anglers. Details on the test strips and their analyte concentration intervals can be found in Table 1.

Table 1. Test Strips Used for Measurement of Water Quality Analytes

Maker	Model	Name	Analyte Suite	Intervals (mg/L)	Reagent
LaMotte	3038	Insta-Test 5-Way TS	Hardness	0, 30, 60, 120, 180	N
LaMotte	3038	Insta-Test 5-Way TS	Alkalinity	0, 40, 80, 120, 180, 240	N
LaMotte	3038	Insta-Test 5-Way TS	pH	6.0, 6.5, 7.0, 7.5, 8.0, 8.5, 9.0	N
Hach	2745425	Nitrate and Nitrite TS	NO3	0, 1, 2, 5, 10, 20, 50	N
Hach	2745425	Nitrate and Nitrite TS	NO2	0, 0.15, 0.3, 1, 1.5, 3	N
LaMotte	3021	Low Range Phosphate TS	Orthophosphate	0, 0.1, 0.2, 0.3, 0.5, 1.0, 2.5	Y*

* Requires a reagent, which is a pad on the strip. Requires user to view the mixture through a tube. "TS" denotes test strip

Observations of any local stream disturbances can be made using photos and notes via the WiseH2O mApp. Examples of such disturbances may include fish barriers (culverts, beaver dams), livestock (trampling banks and/or accessing the stream), stream bank erosion and siltation, trash, and drain tile outlets.

Water temperature can be measured using a high quality digital field thermometer, with the measurement entered in the WiseH2O mApp.

Target Angler Monitoring:

Target angler monitoring will be conducted at the following ten stream sites, with a designated angler responsible for each site. These Pierce County monitoring sites are shown in Figure 3.

- Kinnickinnic River in Lower Glen Park (River Falls)¹
- Rocky Branch Creek in Lower Glen Park (River Falls)¹
- South Fork Kinnickinnic River at 900th Street¹
- Trimbelle River at County Road W^{1,2}
- Rush River at 570th Avenue¹
- Eau Galle River at WI Highway 29¹ (near Spring Valley)
- Cady Creek at 50th Street¹ (near Elmwood)
- Pine Creek at County Road AA (near Maiden Rock)^{1,2}
- Isabelle Creek at County Road EE¹ (near Bay City)
- Plum Creek at Plum City Park¹

¹WDNR annual trout survey sites

²Locations where water chemistry monitoring is already being conducted by Kiap-TU-Wish.

Approximately 100 target angler observations will be made at these 10 stream sites during the project monitoring period (March-October, 2019), to characterize water quality during baseflow and runoff conditions:

- Baseflow Observations: Monthly baseflow observations will be made during the April-October period, constituting 7 baseflow observations per stream site. Anglers will have the flexibility to select a monitoring date each month, although a 15-30 day interval between dates is preferable.
- Runoff Observations: Runoff observations will be made during the spring snowmelt event, and after rainfall events ≥ 1.0 ".



Figure 3. Kiap-TU-Wish WiseH2O mApp Sites for Target Angler Monitoring

The United States Geological Survey (USGS) operates a [Kinnickinnic River monitoring station](#) (number 05342000) at County Highway F, near Kinnickinnic State Park, approximately five miles west of River Falls, Wisconsin in northwestern Pierce County. The station measures river stage (water height) and flow at 15-minute intervals year-round. Because accurate monitoring of river stage and flow entails a significant investment in equipment and labor, no continuous measurements of stream flow are currently being conducted within the Pierce County project location, with the exception of the Kinnickinnic River station. However, the Kinnickinnic River flow data clearly document when baseflow and runoff conditions are occurring. While the flow data are most helpful for identifying baseflow and runoff conditions in the Kinnickinnic River and tributaries, the data can often be applied to evaluate flow conditions in other Pierce County streams, especially when rainfall patterns are consistent across the county.

The City of River Falls operates an electronic tipping-bucket rain gauge that measures 15-minute precipitation amounts in 0.01-inch increments. This rain gauge is part of an Onset HOBO U30 Weather Station that began operating in December 2010. The weather station is located at the River Falls City Hall (222 Lewis Street), in northwestern Pierce County. Although rain amounts can vary across Pierce County, especially with

convective thunderstorm activity, the River Falls rain gauge can be used as a guide to help determine when target rainfall events (≥ 1.0 "") occur. Project team leads (John Kaplan and Kent Johnson) will track these events and send alerts to the target and general anglers, indicating that runoff conditions are likely occurring and monitoring observations should be made.

Appendix A provides a detailed implementation schedule for target angler monitoring.

General Angler Monitoring:

A larger group of 25-50 "general anglers" will have the flexibility to monitor stream sites of their choice throughout Pierce County. Approximately 100 general angler observations will be made within the project location during the monitoring period (March-October, 2019). Although no designated balance will be prescribed for general angler observations made during baseflow and runoff conditions, general anglers will receive an alert (as described above) when runoff conditions are likely occurring.

Quality Assurance of Test Strip Measurements:

To verify the accuracy of the water chemistry concentrations measured using the test strips, water samples will be simultaneously collected in conjunction with 20% of the target angler observations (approximately 20 samples). These samples will be submitted to a certified laboratory for analysis using standardized methods. For the west-central Wisconsin project location, water samples will be analyzed by the Metropolitan Council Environmental Services (MCES) laboratory in St. Paul, MN. Laboratory analyses will include alkalinity, hardness, nitrate-nitrogen, nitrite-nitrogen, and orthophosphate, using the analytical methods shown in Table 2. No laboratory analysis of pH will be conducted, due to the short holding time (15 minutes). The estimated cost for analysis of 20 samples is \$900.00.

To better enable coordination with target anglers and facilitate timely delivery of water samples to the MCES laboratory, samples will be collected at three of the target angler sites:

- Kinnickinnic River in Lower Glen Park (River Falls)
- Trimbelle River at County Road W
- Pine Creek at County Road AA (near Maiden Rock)

These three sites represent a gradient of stream and watershed sizes, from small (Pine Creek) to intermediate (Trimbelle River) to large (Kinnickinnic River). They also reflect a diversity of land use practices and impacts, from conservation/agricultural (Pine Creek) to primarily agricultural (Trimbelle River) to agricultural/urban (Kinnickinnic River). In addition, water chemistry monitoring is already being conducted by Kiap-TU-Wish at two of the three sites (Pine Creek and Trimbelle River), allowing some sampling efficiency to be gained.

Table 2. MCES Analytical Methods for Water Sample Analysis

Project Analyte	Lab Code	Holding Time	Analytical Method
Alkalinity	ALK-AV	14 Days	EPA 310.2
Hardness	HARD-AV	180 Days*	EPA Method 130.1
pH	PH	15 Minutes	SM 4500-H+ B-2011
Nitrite/Nitrate Nitrogen	N_N-AV2	48 Hours	SM 4500-NO3- F-2011
Orthophosphorus (Total)	ORTHO-AV	48 Hours	SM 4500-P F-2011

*Hardness requires acid preservation in addition to cooling to $\leq 6^{\circ}\text{C}$; samples should be delivered to the laboratory as soon as feasible for preservation.

Confirmation of the accuracy of test strip measurements is important, as test strip technology provides estimates of analyte concentrations at designated intervals (Table 1), based on a colorimetric comparison. Laboratory analysis provides the most accurate measurements of the analyte concentrations, for comparison to those generated by the test strip technology. A favorable comparison of test strip measurements to laboratory measurements reinforces the quality of test strip measurements. The laboratory measurements may also provide an opportunity to improve the accuracy of test strip measurements by refining the ability of the WiseH2O mApp to better discern colorimetric patterns between concentration intervals.

John Kaplan and Kent Johnson (Kiap-TU-Wish) will collect the water samples and deliver them to the MCES laboratory. Samples will be collected via standard water quality monitoring protocols used by Kiap-TU-Wish (Figures 4 and 5), as recommended by MCES and the Minnesota Pollution Control Agency (MPCA). Water samples will be collected during baseflow and runoff conditions at all three designated monitoring sites. Ten percent (10%) of the water samples (approximately 10 samples) will be collected in conjunction with target angler baseflow observations, while 10% of the water samples (approximately 10 samples) will be collected in conjunction with target angler runoff observations.

Appendix B provides a detailed implementation schedule for water sample collection.



Figure 4. Collecting a water sample during baseflow conditions at Pine Creek, WI.



Figure 5. Collecting a water sample during runoff conditions at Trimble River, WI

Pilot project monitoring plan prepared by Kent Johnson, Kiap-TU-Wish Chapter of Trout Unlimited
February 2019