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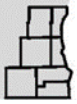

SEWRPC Staff Memorandum

**POINT-INTERCEPT SURVEY FOR HONEY LAKE AND AQUATIC INVASIVE SPECIES MEANDER SURVEY OF IVANHOE LAKE,
WALWORTH COUNTY, WISCONSIN**

October 31, 2024

As requested in a January 5th, 2023, email from Mandy Bonneville, Deputy Director/County Conservationist for the Walworth County Land Use & Resource Management Department ("County") to Justin Poinsatte, Senior Specialist-Biologist of the Southeastern Wisconsin Regional Planning Commission ("Commission"), Commission staff prepared a scope of work detailing efforts to assist the County fulfill their Grant Agreement by conducting separate meander and point-intercept ("PI") surveys, reporting aquatic invasive species ("AIS"), and monitoring water quality on two Walworth County lakes in the summer of 2024. This request was a renewal of a similar effort performed by the Commission on behalf of the County in 2021, 2022, and 2023 which resulted in submission of novel AIS observations and water quality data to the Wisconsin Department of Natural Resources ("WDNR") as well as a staff memorandum report of the Commission's findings. In consultation with the Commission, the County decided to conduct a PI survey and water quality monitoring on Honey Lake, as well as an early detection AIS survey and water quality monitoring on Lake Ivanhoe. The County entered into an agreement to conduct the study on February 14th, 2023.

BACKGROUND INFORMATION

The Lake Monitoring and Protection Network ("LMPN") program was established by WDNR to support networks of organizations conducting essential lake monitoring activities, such as baseline water quality measurements, inspecting watercraft for AIS, purple loosestrife biocontrol, and early detection AIS surveys. Walworth County has received LMPN grant awards each year since 2021. The County has utilized a portion

of these grant awards to retain the Commission's service in monitoring AIS and baseline water quality on lakes within the County. As in previous years, the County has requested that the Commission focus their efforts on County lakes that have less frequent monitoring activities. In contrast to previous years, the County and Commission agreed to conduct an aquatic plant point-intercept survey in lieu of the meander survey on one of the two lakes surveyed. This survey would still provide aquatic invasive species information while also more quantitatively survey the native plant species within the lake.[1] County and Commission staff reviewed a list of lakes with little recent AIS, aquatic plant, or water quality monitoring activity in publicly available databases. Using this preliminary list, the County decided to conduct an early detection AIS survey on Lake Ivanhoe and an aquatic plant point-intercept survey on Honey Lake, which has never been surveyed for aquatic plants using the point-intercept methodology before. Commission staff conducted baseline water quality monitoring on both Lake Ivanhoe and Honey Lake.

HONEY LAKE

Honey Lake is a 40-acre impounded drainage lake located entirely in the Town of Spring Prairie within Walworth County, Wisconsin (Figure 1). The lake has a maximum depth six feet with a mean depth of two feet.[2] The lake bottom is predominantly organic muck.[3] Honey Lake is accessible to the public via the Honey Lake Public Beach on the north shore of the lake, containing a boat launch for non-motorized craft. The WDNR Presto-Lite model estimates that the lake has a 45,863-acre watershed, of which 65 percent is composed of agricultural land use while forest (14 percent), rural residences (9 percent), and urban (8 percent) constitute the other major land uses of the remaining area.[4] Presto-Lite modeled total phosphorus loads to the lake are 17,528 pounds per year, with an 80 percent confidence interval of 9,004 to 34,121 pounds. The Honey Lake Protection & Rehabilitation District ("District") oversees Honey Lake with their mission to protect and maintain the Lake. Honey Lake has not been the subject of a Commission-produced management plan. The Lake also has an outlet dam that controls water levels in the Lake, with the Lake level lowered every autumn for the duration of winter. Since 2018, the District has utilized chemical herbicide treatments on a whole-lake scale to control aquatic plants in the lake.

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[1] Commission staff have provided a list of native species observed in previous staff memorandum reports for the lakes surveyed as part of this program. However, these lists only provide presence/absence information and are not a quantitative assessment of species frequency of occurrence or abundance within the lake. On small lakes, the point-intercept survey provides much more quantitative information for a small increase in survey effort.

[2] For more information, see the WDNR Honey Lake webpage at the following: https://apps.dnr.wi.gov/lakes/lakepages/LakeDetail.aspx?wbic=752300&page=facts.

[3]Ibid.

[4]For more information on the WDNR Presto-Lite model, see https://dnr.wisconsin.gov/topic/SurfaceWater/PRESTO.html.

Honey Lake Survey Findings

Commission staff worked with Walworth County and the District staff to complete the point-intercept survey of Honey Lake on August 8th, 2024, following the protocol established by the WDNR.[5] The survey conducted by Commission staff was the first known point-intercept (PI) survey completed on Honey Lake. The 2024 PI survey utilized a point intercept grid for sample collection, which allows a comprehensive understanding of the aquatic plant species and distribution in the Lake. In this method, sampling sites are based on predetermined global positioning system (GPS) location points that are arranged in a grid pattern across the entire surface of a lake. The grid pattern of Honey Lake was sampled on a set grid pattern of 184 points provided by WDNR staff (Figure 2), which allows the types and abundance of aquatic plants to be directly contrasted to future point-intercept surveys. At each grid point sampling site, a single rake haul is taken and a qualitative assessment of the rake fullness, on a scale of zero to three, is made for each species identified.

On the date of the aquatic plant survey, the weather conditions were warm and partly cloudy with low wind speeds. Honey Lake had adequate water clarity, allowing enhanced visibility of AIS and native species during the survey. In general, the aquatic plant species were mature. Commission staff also observed herons, turtles, geese, and ducks during the survey.

Commission staff recorded the water depth, sediment type, the qualitative abundance of all aquatic plants combined, and the qualitative abundance of each species. A total of 181 sites were sampled during the survey, 15 of which had aquatic vegetation present at them. The average rake fullness was 0.11 (Figure 3) with the vast majority of sites visited having a rake fullness of zero, indicative of no aquatic plants present and only one point having a rake fullness of 2. A total of three species of aquatic plants were found: coontail (*Ceratophyllum demersum*, found at 11 sites), water stargrass (*Heteranthera dubia*, found at 2 sites), and Sago pondweed (*Stuckenia pectinata*, found at 3 sites). Filamentous algae was also seen at 6 sites across the Lake. Three sites had more than one species present (Figure 4).

[5]*Wisconsin Department of Natural Resources, Recommended Baseline Monitoring of Aquatic Plants in Wisconsin, March 2010. https://www3.uwsp.edu/cnr-ap/UWEXLakes/Documents/ecology/Aquatic%20Plants/PI-Protocol-2010.pdf*

Honey Lake Water Quality

Water quality measurements, including a Secchi disk reading and profiles of temperature and dissolved oxygen measured using a YSI Pro meter, were recorded at the Lake's deep hole site. The District regularly takes water samples for chlorophyll-a, nitrates/nitrites, total Kjeldahl nitrogen, and total phosphorus which are sent to University of Wisconsin Stevens Point's Water & Environmental Analysis Laboratory for analysis. Water clarity, or transparency, provides an indication of overall water quality—the greater the clarity, the better the water quality. Clarity may decrease because of turbidity caused by:

- high concentrations of small aquatic organisms, such as algae and zooplankton
- suspended sediment and/or inorganic particles
- color caused by high concentrations of dissolved organic substances (e.g., tannins that stain water of bog lakes in northern Wisconsin)

In most Southeastern Wisconsin lakes, water clarity is influenced by the abundance of algae and suspended sediment. Water clarity generally varies throughout the year as algal populations increase and decrease in response to changes in lake temperature, sunlight, and nutrient availability. Large rainfall events can also influence water clarity, with sediment-induced clarity declines caused by heavy runoff. Clarity is measured using a Secchi disk, a black-and-white, eight-inch-diameter disk. This disk is lowered into the water until it is no longer visible, at which point the depth is recorded, and then it is raised until visible again, when depth is recorded again. The average of these depths is called the "secchi depth." Commission staff measured a secchi depth of 2.5 feet; most likely influenced by recent rainfall events causing suspended sediment. This is a relatively low Secchi depth and is indicative of poor water clarity and quality.

Seasonal air temperature fluctuation and varying amounts of sunshine influence lake temperatures, causing waters to mix and stratify seasonally. In spring and fall, most lakes are well mixed and therefore are the same temperature from the water surface to the lake bottom. In summer, surface water warms and becomes more buoyant than underlying cooler water. Commission staff measured water temperatures down to six feet in the lake (Figure 5). Water temperatures ranged from 71.4°F at the surface to 66.2°F at six feet deep. The uniform temperatures within three feet of the lake surface followed by a rapid decline below indicates that the lake does thermally stratify. All temperatures measured are indicative of healthy conditions for most

fish species found in Southeastern Wisconsin.[6] Fish were observed while conducting the meander survey although no fish species were identified by Commission.

Dissolved oxygen (DO) levels are one of the most critical factors affecting the living organisms of a lake ecosystem. DO is generally higher at the surface of a lake where there is an interchange between the water and atmosphere, stirring by wind action (which aids in atmospheric oxygen diffusion into the surface waters at the air-water interface), and oxygen production by plant and algae photosynthesis. Metabolic processes, such as bacterial decomposition and respiration by aquatic organisms, consume oxygen and decrease DO concentrations. A minimum DO concentration of 5 mg/l is considered necessary for survival of most species of fish. Although Commission staff only measured dissolved oxygen concentrations down to six feet, these concentrations ranged from 10.7 to 8 mg/L (Figure 5). These concentrations would likely have continued to decline further below the thermocline as the lack of lake mixing and hypolimnetic respiration and decomposition utilize the available oxygen in the deepest part of the lakes. However, the lake's waters above the thermocline have DO concentrations that are supportive of most Southeastern Wisconsin fish species.

Commission staff also measured the specific conductance of Honey Lake at its surface. Specific conductance is a measure of the ability of a liquid, such as lake water, to conduct electricity, standardized at a specific temperature (25°C). This ability is greatly dependent on the water's dissolved solids concentration: as the amount of dissolved solids increases, the specific conductance increases. While many of these dissolved solids, such as magnesium, are minerals leaching from soil and bedrock, salts containing chloride and sodium can contribute to higher specific conductance values as well. The surface specific conductance of Honey Lake was 163.53 µS/cm @ 25°C. These measurements lower are than the specific conductance measurements of highly road-salt impacted lakes in Southeastern Wisconsin.

Commission staff applaud the water quality monitoring that the Honey Lake Protection and Rehabilitation District is already conducting and recommend that they continue this monitoring program. Additionally, since the District manages the lake's aquatic plant community, the Lake would benefit from completing an Aquatic Plant Management Plan. This plan could set the foundation for future management and if the District desired serve as one of the requirements for an aquatic plant harvesting permit from the WDNR.

[6] Wisconsin Administrative Code *NR 102.25, 16-8,* *https://docs.legis.wisconsin.gov/code/admin_code/nr/100/102.pdf#page=18*.

LAKE IVANHOE

Lake Ivanhoe is an 46-acre drainage lake located entirely in the Town of Lyons within Walworth County, Wisconsin, and is recognized as a historical site by the Wisconsin Historical Society as the state's first Black-founded resort community.[7] The lake has a maximum depth of approximately ten feet with a mean depth of five feet.[8] The lake bottom is comprised almost entirely by organic muck.[9] A publicly-accessible boat launch is present on the eastern shoreline of the lake, managed by the Town of Lyons. The WDNR Presto-Lite model estimates that the lake has a 5,192-acre watershed, of which 43 percent is composed of agricultural land use while wetland (18 percent) and forest (11 percent) constitute the other major land uses of the remaining area. Presto-Lite modeled total phosphorus loads to the lake are 774 pounds per year, with an 80 percent confidence interval of 394 to 1,521 pounds. The Lake Ivanhoe Property Owner's Association is invested in the health of Lake Ivanhoe. The Lake has not been the subject of a Commission-produced management plan.

Lake Ivanhoe Survey Findings

Commission staff worked with Walworth County staff to complete the meander survey of Lake Ivanhoe on August 7th, 2024, following the protocol established by the WDNR. When staff performed the survey, nearly the entire water column by the shoreline was filled with aquatic vegetation that made previously mapped locations unnavigable. Staff surveyed five target site locations in addition to the boat launch sites (Figure 6). The weather conditions during the survey were warm with clear skies and moderate winds. Recent precipitation events decreased water clarity likely due to sediment runoff into the Lake.

Lake Ivanhoe water clarity was adequate with a secchi reading of 2.5 feet in depth. The water had a slightly murky orange appearance. Beginning with the boat launch, Commission staff conducted a clockwise meander of Lake Ivanhoe, noting incidences of native and invasive plant and animal species. Commission staff surveyed the lake using plant rakes and visual observations for the target sites and around the boat launch, as the soft, organic sediment made wading around the shoreline non-viable. Photos were collected

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[7] *Milwaukee Journal Sentinel, Wisconsin's first Black-owned resort community, Lake Ivanhoe, gets historic recognition, October, 2022. https://www.jsonline.com/story/news/2022/10/17/wisconsin-black-owned-lake-ivanhoe-community-gets-historic-designation/10509158002/*

[8] *For more information, see the WDNR Lake Ivanhoe webpage at the following link:* https://apps.dnr.wi.gov/lakes/lakepages/LakeDetail.aspx?wbic=756700.

[9] Ibid.

for observed AIS species (Figure 7). Commission staff also measured water clarity and profiles of temperature and dissolved oxygen at the lake's WDNR-designated deep hole site.

Lake Ivanhoe Species Observations

Two AIS were observed during the survey: Eurasian watermilfoil (*Myriophyllum spicatum*) and purple loosestrife (*Lythrum salicaria*). Eurasian watermilfoil was growing in dense mats throughout much of the lake with leaves and flowers breaking the water's surface. Purple loosestrife was found near the main boat launch on Lake Ivanhoe. No invasive mussels or snails were observed in the Lake. Observations of purple loosestrife had not been previously recorded on the WDNR webpage for the Lake nor on the published list of waterbodies with these AIS species.[10,11] However, purple loosestrife was noted on a 2008 point-intercept survey completed by WDNR. Commission staff submitted these new AIS observations to the WDNR.

Lake Ivanhoe's aquatic plant community has been regularly monitored since 2005 with a complete point-intercept survey being conducted each year up to 2022. These surveys provide an excellent timeline for invasive species population in the lake (Figure 8). Lake Ivanhoe has a fairly diverse community of plant with many surveys finding up to of 13 plant species. Several native aquatic plant species were observed during the Lake Ivanhoe meander survey including species that are beneficial to the lake's ecology. Spatterdock and white water lily were observed across much of the lake's near shore area.

Lake Ivanhoe Water Quality

Water quality measurements, including a Secchi disk reading and profiles of temperature and dissolved oxygen measured using a YSI Pro meter, were recorded at the Lake's deep hole site. Water quality sampling of phosphorus and chlorophyll-a has never been conducted on Lake Ivanhoe. The most recent Secchi readings to measure water clarity are from 1993 and 1994 where they averaged at a depth of 13.25 feet.
Water clarity, or transparency, provides an indication of overall water quality—the greater the clarity, the better the water quality. In 2024, Commission staff measured a secchi depth of 2.5 feet on Lake Ivanhoe. Clarity may decrease because of turbidity caused by:

- high concentrations of small aquatic organisms, such as algae and zooplankton

[10] *WDNR Lake Ivanhoe webpage,* op. cit.
[11] *WDNR Aquatic Invasive Species Database accessed August 2023 at*https://apps.dnr.wi.gov/lakes/invasives/AISLists.aspx?species=PURPLE_LOOSESTRIFE&location=65.

- suspended sediment and/or inorganic particles
- color caused by high concentrations of dissolved organic substances (e.g., tannins that stain water of bog lakes in northern Wisconsin)

This water clarity is indicative of eutrophic conditions within the lake, suggesting that the suspended sediment and algae concentrations within the lake are likely moderate. The lake does exhibit some indicators of excessive sediment or nutrient pollution from its watershed, such as low water clarity and muddy orange/brown watercolor. Thus, the risk that the lake may experience harmful effects from excessive nutrient pollution, such as algal blooms and/or a summer fish kill should be taken into consideration when managing this lake.

Seasonal air temperature fluctuation and varying amounts of sunshine influence lake temperatures, causing waters to mix and stratify seasonally. Commission staff measured water temperatures down to 9 feet in the lake. Water temperatures ranged from 73.8°F at the surface to 71.4°F at 9 feet deep (Figure 9). The uniform temperatures within four feet of the lake surface followed by a rapid decline below indicates that the lake does thermally stratify. All temperatures measured are indicative of healthy conditions for most fish species found in Southeastern Wisconsin.[12]

Dissolved oxygen (DO) levels are one of the most critical factors affecting the living organisms of a lake ecosystem. A minimum DO concentration of 5 mg/l is considered necessary for survival of most species of fish. Although Commission staff measured dissolved oxygen concentrations down to 9 feet, these concentrations ranged from 4.4 to 1.2 mg/L with a sharp decline in DO after 6 feet in depth (Figure 9). These concentrations would likely have continued to decline further below the thermocline as the lack of lake mixing and hypolimnetic respiration and decomposition utilize the available oxygen in the deepest part of the lakes. However, the lake's waters above the thermocline have DO concentrations that are not supportive of most Southeastern Wisconsin fish species.

Commission staff also measured the specific conductance of Lake Ivanhoe at its surface. Specific conductance is a measure of the ability of a liquid, such as lake water, to conduct electricity, standardized at a specific temperature (25°C). This ability is greatly dependent on the water's dissolved solids

[12] Wisconsin Administrative Code *NR 102.25, 16-8,* *https://docs.legis.wisconsin.gov/code/admin_code/nr/100/102.pdf#page=18*.

concentration: as the amount of dissolved solids increases, the specific conductance increases. While many of these dissolved solids, such as magnesium, are minerals leaching from soil and bedrock, salts containing chloride and sodium can contribute to higher specific conductance values as well. The surface specific conductance of Lake Ivanhoe was 123.67 µS/cm @ 25°C. These measurements are the first to be taken on Lake Ivanhoe.

Based on the less than ideal water quality profiles collected in 2024, Commission staff recommend the Lake residents begin regular water quality testing. Wisconsin has Citizen Lake Monitoring Network (CLMN) that provides training and supplies to lakes to monitor their water quality each year during the open-water season.[13] It is recommended that the Lake residents reach out to it's regional CLMN coordinator to begin monitoring.[14] In addition to water clarity, temperature, and dissolved oxygen measurements, Lake residents may want to consider collecting grab samples for total phosphorus, chlorophyll-a, and chloride to evaluate lake health impacts from excessive nutrients and salts.

[13] *https://dnr.wisconsin.gov/topic/lakes/clmn*
[14] *https://apps.dnr.wi.gov/lakes/contacts/contacts.aspx?role=CLMN_START*

SEWRPC Staff Memorandum

POINT-INTERCEPT SURVEY FOR HONEY LAKE AND AQUATIC INVASIVE SPECIES MEANDER SURVEY OF IVANHOE LAKE,
WALWORTH COUNTY, WISCONSIN

FIGURES

Figure 1
Photos of Honey Lake: August 2024

Southwestern shore of lake near western inlet

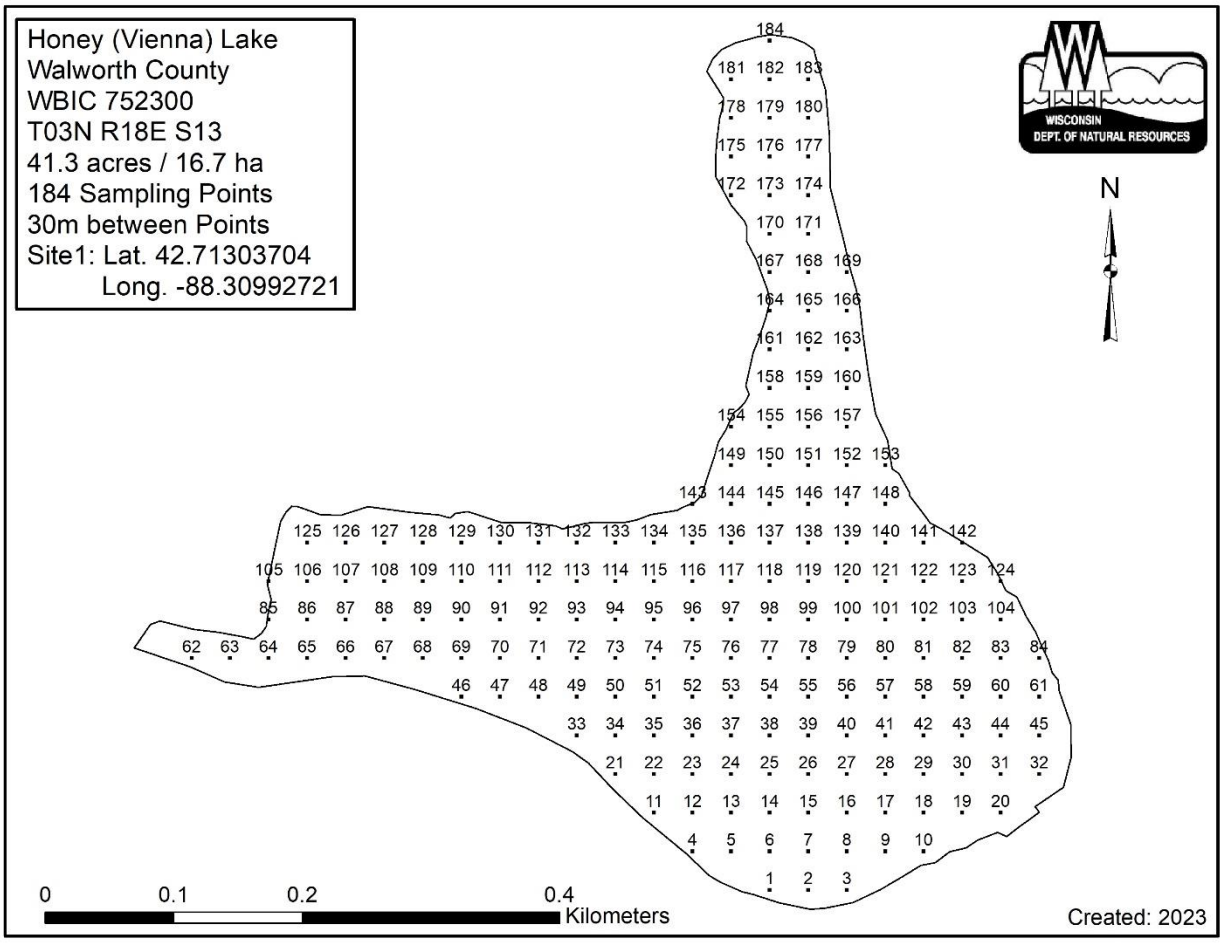
Park at north end of lake

Northwestern shore of main basin

View from park on north end of lake, facing south.

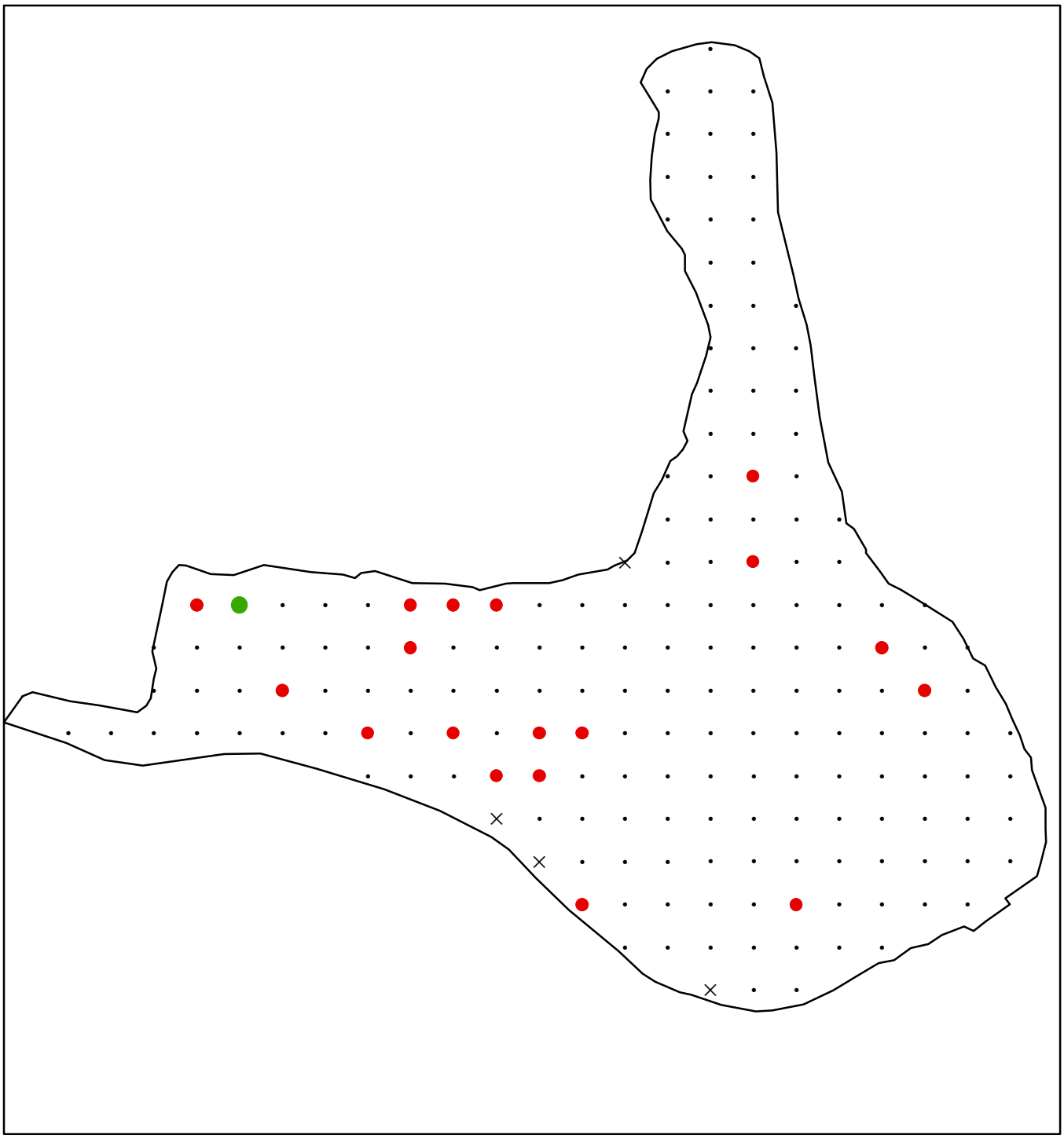
Source: SEWRPC

Figure 2
WDNR Point-Intercept Map for Honey Lake, Walworth County



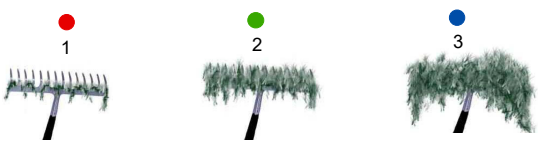
Source: WDNR

Figure 3
Rake Fullness on Honey Lake 2024

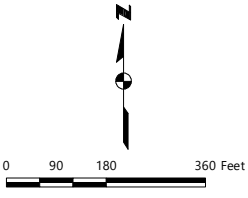


NOTE: Survey was conducted on Honey Lake on August 8th, 2024.

RAKE FULLNESS RATING

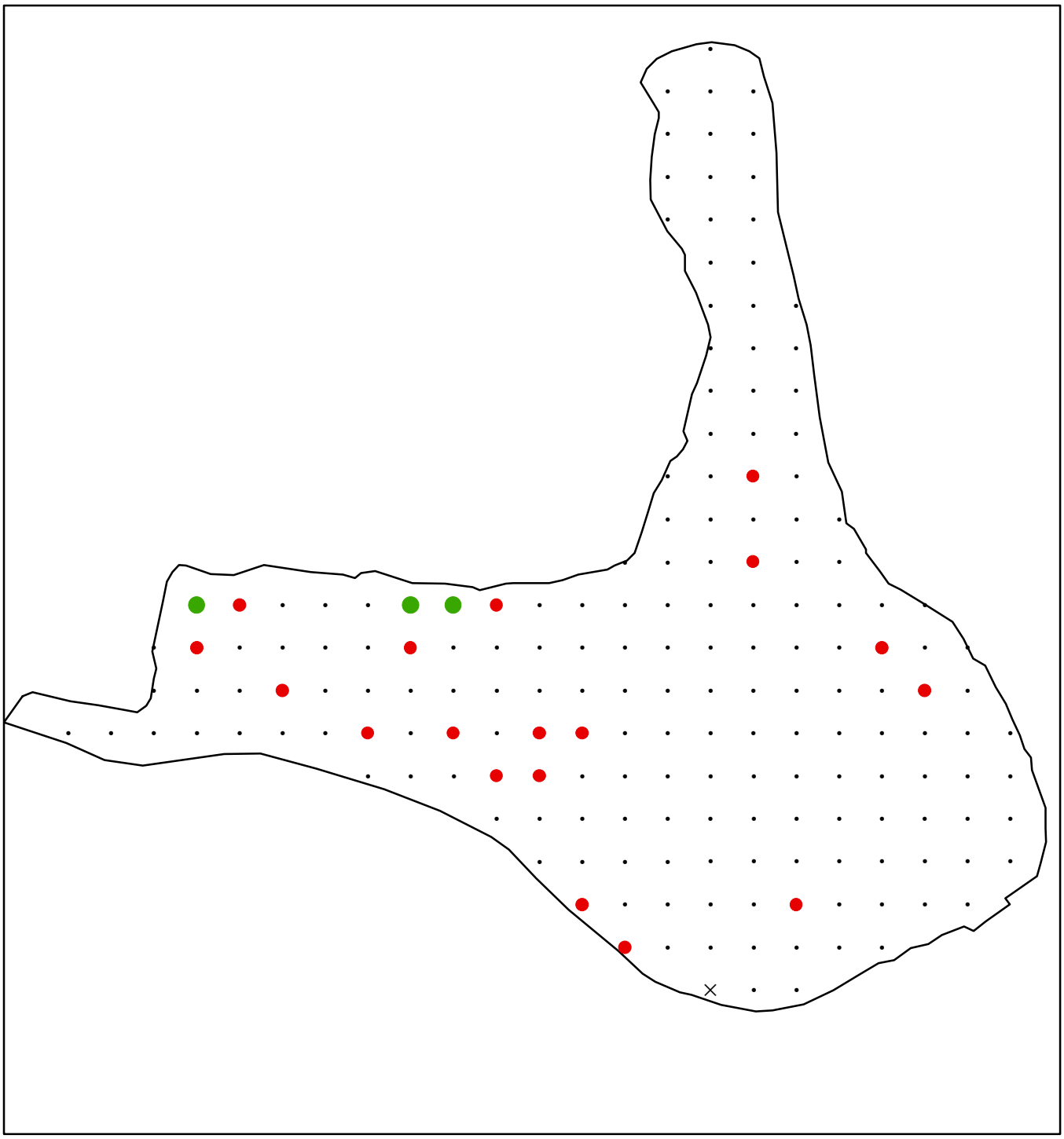


- • NO AQUATIC PLANTS FOUND
- × NOT SAMPLED



Source: SEWRPC and WDNR

Figure 4
Species Richness on Honey Lake 2024



NOTE: Survey was conducted on Honey Lake on August 8th, 2024.

SPECIES RICHNESS

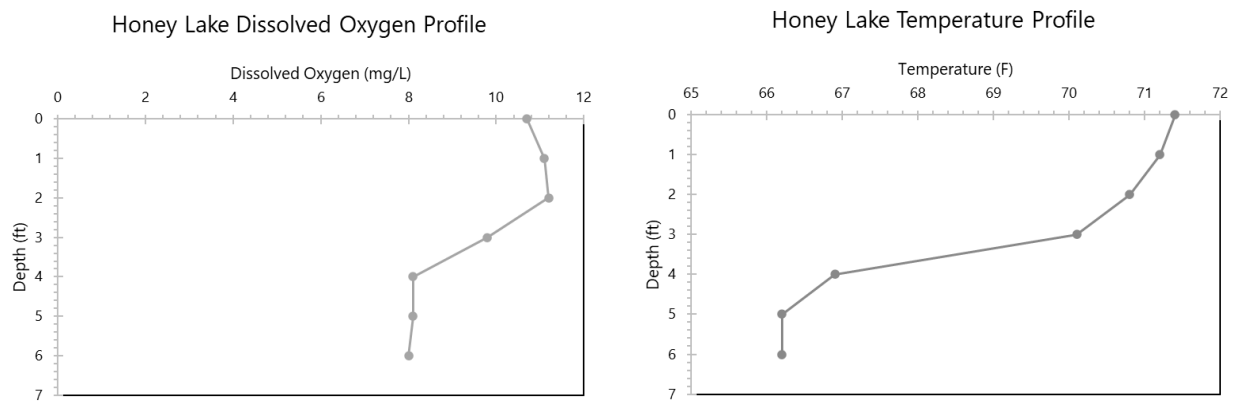
- 1
- 2
- 3
- NO AQUATIC PLANTS FOUND
- NOT SAMPLED

N

0 90 180 360 Feet

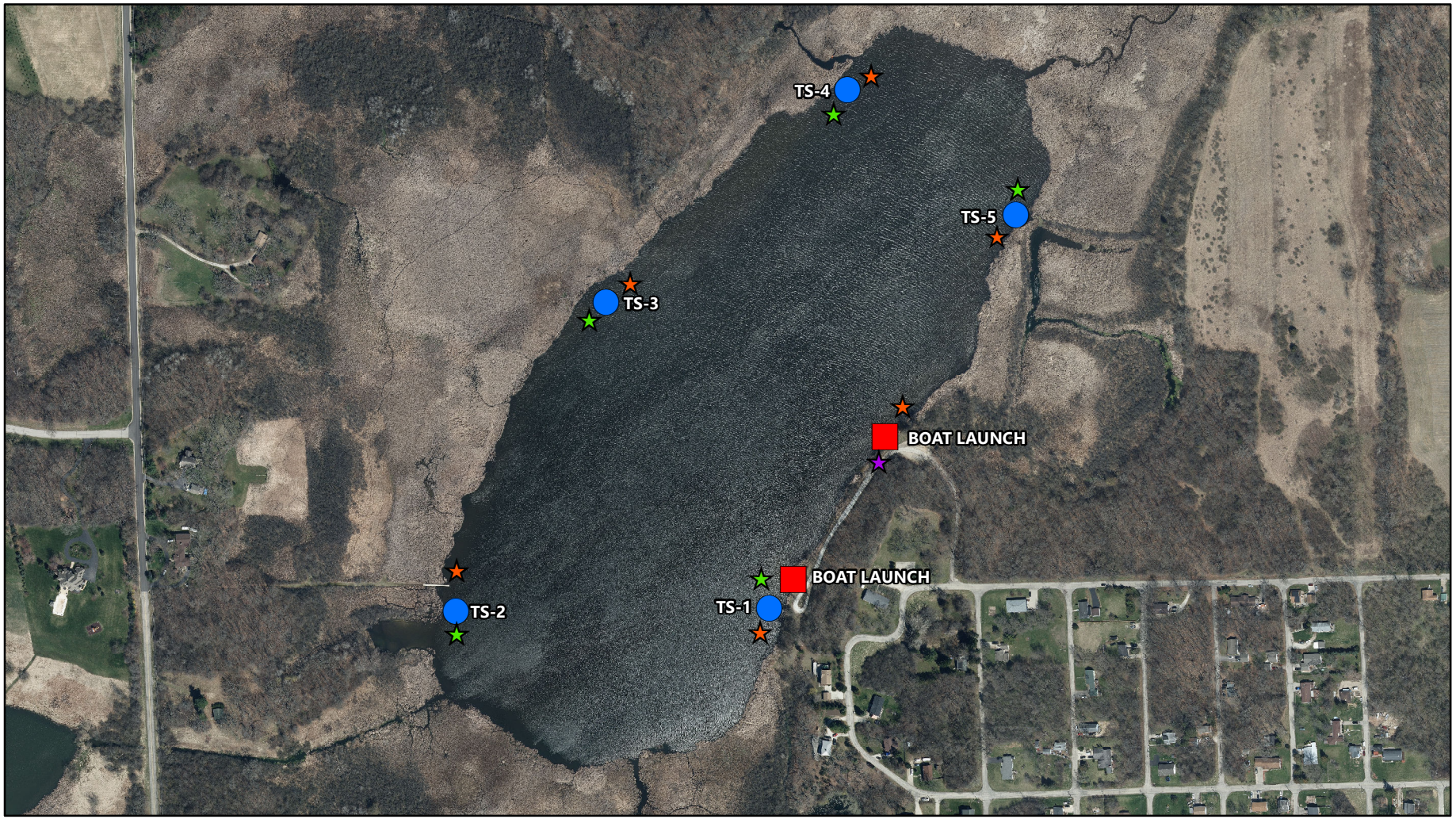
Source: SEWRPC and WDNR

Figure 5
Temperature and Dissolved Oxygen Profiles for Honey Lake



Source: SEWRPC

Figure 6
Meander Survey of Lake Ivanhoe: August 2024



SITES

- BOAT LAUNCH
- TARGET SITE (TS)

AQUATIC INVASIVE SPECIES

- CURLY-LEAF PONDWEED (*POTAMOGETON CRISPUS*)
- EURASIAN WATERMILFOIL (*MYRIOPHYLLUM SPICATUM*)
- PURPLE LOOSESTRIFE (*LYTHRUM SALICARIA*)
- HYBRID CATTAIL (*TYPHA X GLAUCA*)

N

0 125 250 500 Feet

Note: Aquatic invasive species locations are generally marked and are not meant to represent the exact location each speices was observed.

Source: SEWRPC

Figure 7
Photos of Lake Ivanhoe: August 2024

Eurasian Water Milfoil

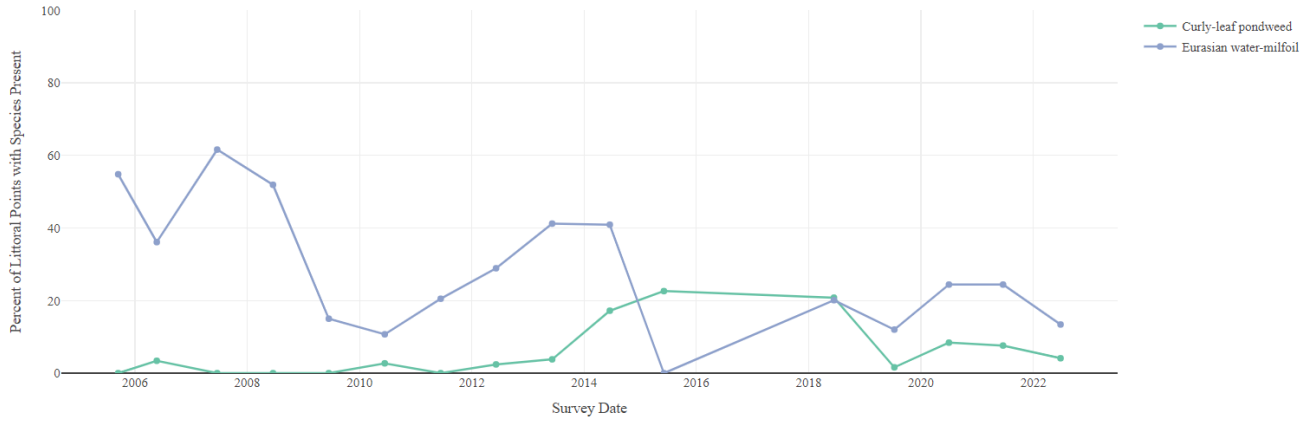
Spatterdock, White water-lily, & Hybrid cattails

Watercolor as viewed from boat

Coontail

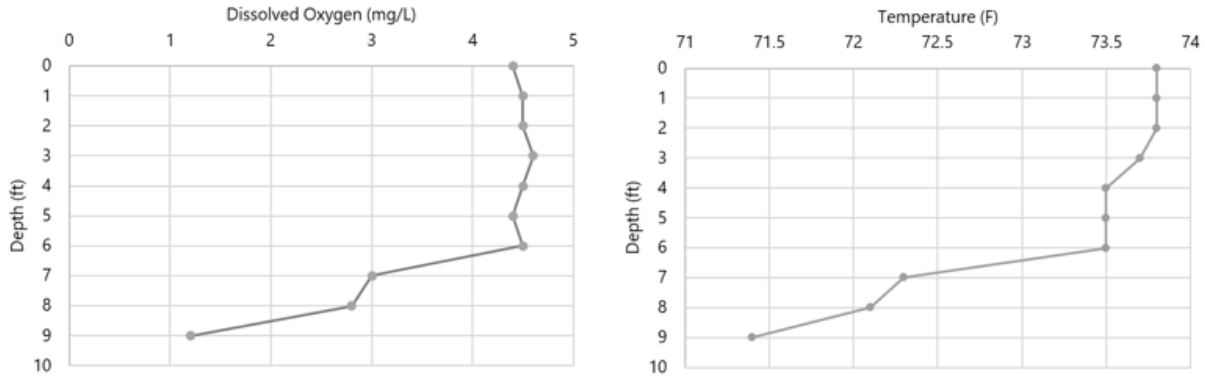
Source: SEWRPC

Figure 8
Eurasian Water Milfoil and Curly Leaf Pondweed Populations in Lake Ivanhoe: 2005-2022



Source: WDNR Aquatic Plant Explorer

Figure 9
Temperature and Dissolved Oxygen Profiles of Lake Ivanhoe: 2024



Source: SEWRPC