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SEWRPC Staff Memorandum

SPRING LAKE SURVEY, OZAUKEE COUNTY, WISCONSIN

DECEMBER 30, 2025

In December 2024, Andrew Struck, Director of the Ozaukee County (County) Planning and Parks Department, discussed the Wisconsin Department of Natural Resources (WDNR) Grant Agreement for the Lake Monitoring and Protection Network Program with Southeastern Wisconsin Regional Planning Commission (Commission) staff. The Lake Monitoring and Protection Network program was established by WDNR to support networks of organizations conducting essential lake monitoring activities, such as baseline water quality measurements, inspecting watercraft for aquatic invasive species (AIS), and early detection AIS surveys. Mr. Struck requested that the Commission assist the County with fulfillment of their Grant Agreement by conducting lake surveys and creating reports that include baseline water quality conditions, lake morphometry and sediment composition, the aquatic plant community, and reporting AIS on Ozaukee County lakes. The Commission and the County entered into an agreement to conduct the study in December 2024. Two lakes, Spring Lake and Watts Lake, were surveyed in 2025.

LAKE BACKGROUND INFORMATION

Spring Lake is a 60-acre seepage lake located in the Town of Fredonia within Ozaukee County, Wisconsin as well as the Town of Sherman in Sheboygan County, Wisconsin. Portions of the shoreland along the north end of the lake in Sheboygan County are within the WDNR North Branch Milwaukee River Wildlife and Farm Heritage easement, but the Lake is otherwise surrounded by privately held lands. Based on historic aerial imagery, urban development surrounding the Lake has been minimal and shoreline features have been largely maintained (see Figure 1). Attaining a maximum depth of approximately 22 feet, the Lake has a mean depth of 7 feet and a volume of 415.4 acre-feet.[1] As a spring-fed lake, there are no intermittent or perennial tributary inlets draining into the Lake. Although WDNR classifies the Lake as a seepage lake, the Lake drains to the east under a railroad owned by the Wisconsin & Southern Railroad to an unnamed tributary of Random Lake in Sheboygan County. Random Lake drains to Silver Creek and then to the North Branch of Milwaukee River; consequently, Spring Lake is a headwater lake within the Milwaukee River watershed. The Lake lies within glacial outwash and terminal moraine of the Lake Michigan Glacier.[2] The Lake has not been

[1] *https://apps.dnr.wi.gov/lakes/lakepages/LakeDetail.aspx?wbic=30500*
[2] *https://apps.dnr.wi.gov/water/waterDetail.aspx?WBIC=30500*

the subject of a Commission lake study, but the WDNR produced a report detailing the Lake's watershed, water quality, aquatic plant community, and recreational uses in 1970.[3]

Using the WDNR Watershed Explorer (WEx) tool, Commission staff delineated the lake's watershed and summarized the land use, soils, and pollutant loading information. The lake has a 281-acre watershed that drains lands from the northwest down to the southeast (see Map 1).[4] The three most common soils types within the lake's watershed are the well-drained Casco series (20.1 percent), the well-drained Hochheim series (12 percent), and excessively-drained Rodman series (10 percent). Much of the Lake's watershed is either forest or wetland, with agricultural lands as the most predominant developed land use. Except for a few residences along the lake, the northwest corner of the watershed contains the only residential land use within the watershed. Cultivated farmland lies directly west of the Lake while a sand and gravel quarry owned by Klumb Limited Partnership is within 500 feet of the Lake to the southwest. The Lake has a wetland buffer around nearly the entire shoreline except for the residences and a short section of the railroad.

Pollutant loading to the lake modeled via the Wisconsin Inland Lake Modeling Suite (WiLMS) model predicts a non-point source loading of 91 pounds per year (see Table 1). As most phosphorus transported to lakes is bound to soil particles, these estimates could be considered a proxy for sediment loading sources as well. Row crop agriculture is predicted to be the predominant pollutant loading source, contributing 50 pounds (55 percent of the total phosphorus). Ensuring that agricultural landowners are utilizing best management practices, such as reduced tillage and cover crops, could help protect the water quality of the Lake.

SURVEY FINDINGS

Commission staff worked with Ozaukee County to complete the Spring Lake survey on August 5th, 2025. This work included an aquatic plant survey, water quality measurements, and identification of aquatic invasive species (AIS). Weather conditions were warm and hazy due to drifting Canadian wildfire smoke. The lake's water clarity was poor and the water had a gray tint, most likely from calcium carbonate precipitate (marl) in the water (see Figure 2). The majority of the shoreline was vegetated except for the handful of homes located on the Lake, most of which had turf grass at or near the lake shoreline. A variety of wildlife was observed by Commission and County staff, including purple martins, a common yellowthroat, snapping turtles, painted turtles, largemouth bass, and northern pike.

Commission staff completed a point-intercept aquatic plant survey of the lake using a grid provided by Wisconsin Department of Natural Resources (WDNR) staff (see Figure 3). At each survey point, Commission staff recorded the water depth, sediment type, the qualitative abundance of all aquatic plants combined, and the qualitative abundance of each species. Photos and specimens were collected for each observed aquatic plant species. Water quality measurements, including a Secchi disk reading and profiles of temperature, dissolved oxygen, dissolved oxygen saturation, pH, turbidity, conductance parameters, and total dissolved solids, measured using a Hanna Instruments meter, were recorded at the lake's deep hole site. Surface water grab samples were also collected and sent to the Wisconsin State Laboratory of Hygiene for analysis of chloride, total phosphorus, and chlorophyll-a.

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[3] *Wisconsin Department of Natural Resources,* Lake Use Report No. MI-17: Spring Lake, Ozaukee County, Wisconsin*, 1970. A copy of this report is available at https://www.sewrpc.org/SEWRPCFiles/Publications/lkur/ml-17-spring-lake-ozaukee-county-milwaukee-river-watershed.pdf.*

[4] *The WEx program may be informed by outdated topography data, as the Spring Lake watershed goes through the quarry in the south. The program-generated watershed may therefore be different than the true boundaries.*

Lake Bathymetry and Sediment

Attaining a maximum depth of 22 feet, the lake has a mean depth of seven feet and a volume of 415.4 acre-feet (see Map 2). The Lake has two lobes, with the deep hole occurring in the southern lobe. The north end of the lake is uniformly shallow, around three to five feet deep. The WDNR reports the lake sediment as predominantly muck, which appears to be correct based on the observations of Commission staff.[5] The muck was noted to be marly and gritty, contributing to the grey coloration seen throughout the Lake (see Figure 2).

Aquatic Plant Observations

Commission staff observed ten aquatic plant species during the point-intercept survey (see Table 2), which is greater than the six species observed in the 1968 aquatic plant survey.[6] Of those six species, only long-leaf pondweed (*Potamogeton nodosus*) was not observed in the 2025 survey. The maximum depth of colonization was fifteen feet, which matched the depth observed in 1968, and the total vegetation coverage at locations shallower than the maximum depth of plants was 37.7 percent (see Map 3). The average number of species observed per vegetated point was 1.23. The most common species within the lake were muskgrass (*Chara* spp., 50 percent of vegetated points), followed by spiny naiad (*Najas marina,* 36 percent), and then hybrid Illinois x floating leaf pondweed (*Potamogeton illinoensis X natans,* 28 percent*)*. These species observations generally match species dominance descriptions in the 1968 survey. All other species occurred at less than five percent of vegetated points or were only visually observed by staff. The shallow marl flats in the Lake had little aquatic vegetation, which may indicate low nutrient status in the Lake's water or its sediment. Bays along the western shoreline of the Lake sustained beds of water lilies (*Nuphar variegata* and *Nymphaea odorata*). Submerged mats of cattail (*Typha* spp.) and bulrush (*Schoenoplectus acutus*) roots along the lake shorelines likely provide high quality habitat for fish and herptiles (see Figure 2).

Aquatic plant metrics, such as species richness and the floristic quality index (FQI), can be useful for evaluating lake health. In hard water lakes, such as those common in Southeastern Wisconsin, species richness generally increases with water clarity and decreases with nutrient enrichment.[7] The FQI is an assessment metric used to evaluate how closely a lake's aquatic plant community matches that of undisturbed, pre-settlement conditions.[8] To formulate this metric, Wisconsin aquatic plant species were assigned conservatism (C) values on a scale from zero to ten that reflect the likelihood that each species occurs in undisturbed habitat. These values were assigned based on the species substrate preference, tolerance of water turbidity, water drawdown tolerance, rooting strength, and primary reproductive means. Native "sensitive" species that are intolerant of ecological disturbance receive high C values, while natives that are disturbance tolerant receive low C values. Invasive species are assigned a C value of 0. A lake's FQI is calculated as the average C value of species identified in the lake, divided by the square root of species richness.

Only five aquatic plant species were directly sampled during the point-intercept survey and therefore included in the FQI calculation. The average C-value of Spring Lake's aquatic plant community was 5.8, and the FQI was 12.9. For reference, the average FQI value for the Southeastern Wisconsin Till Plains ecoregion is 20.0. The lower-than-average FQI score is influenced by the low species richness of Spring Lake. However, when referring to the historic plant populations in the Lake, Spring Lake may just naturally support few

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[5] *https://apps.dnr.wi.gov/lakes/lakepages/LakeDetail.aspx?wbic=30500.*

[6] *WDNR, 1970,* op, cit.

[7] *Vestergaard, O. and Sand-Jensen, K. "Alkalinity and Trophic State Regulate Aquatic Plant Distribution in Danish Lakes," Aquatic Botany 67, 2000.*

[8] *S. Nichols, "Floristic Quality Assessment of Wisconsin Lake Plant Communities with Example Applications," Lake and Reservoir Management 15(2), 1999.*

aquatic plant species. The Lake's average C-value and its general lack of submerged invasive plants indicate that the plant community reflects somewhat undisturbed ecological conditions.

Although not found at a point during the survey, County staff found colonies of *Nostoc* cyanobacteria growing in vegetated mats on the northern shore of the Lake (see Figure 2). The colony was identified by WDNR's Statewide Harmful Algal Bloom Coordinator & Inland Beach Monitoring Coordinator, Gina LaLiberte, noting that the colony size found in the Lake is indicative of sufficient water clarity to allow them to get sunlight at the bottom of the waterbody.[9]

Eurasian watermilfoil was reported in the past for the Lake, but was not observed during the 2025 survey. However, the invasive nonnative *Phragmites australis* subsp. *australis* was seen beyond the lake shoreline. This species had not been previously recorded on the WDNR webpage for Spring Lake.[10] Commission staff submitted this new invasive species observation to the WDNR. The 1968 survey noted that bulrush was the dominant emergent species observed and extensive bulrush stands along the northwest shore provided spawning habitat for northern pike; unfortunately, some of these bulrush stands may have been displaced by cattails and would be also threatened by the invasive phragmites population. Management of the cattail and phragmites may facilitate the regrowth of these bulrush stands and enhance northern pike populations in the Lake.

Water Quality

Spring Lake has a limited water quality dataset, with initial measurements in 1968, scattered measurements throughout the 1980s and 1990s, and then no water quality measurements since 1997 (except for satellite water clarity measurements).[11,12] Commission staff have endeavored to provide insight on the Lake's water quality using the available data from the previous and 2025 surveys within the context of the lake characteristics and origin.

Temperature and Dissolved Oxygen

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 throughout a depth profile of the lake (see Figure 4). Water temperatures ranged from 24.1 to 26.3°C (75.3 to 79.3°F). Spring Lake exhibited weak stratification between six to eight feet of depth, meaning the Lake likely experiences slight mixing of waters through the summer. As the lake is spring-fed, the cooler waters in the deep-hole of the lake may contribute to stratification, though the eutrophication process may be decreasing stratification intensity. All water temperatures measured are indicative of healthy conditions for warmwater fish species found in Southeastern Wisconsin, although the maximum temperatures observed approach the sub-lethal temperature thresholds for southern inland lakes.[13]

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

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[9] *Email correspondence between Commission and WDNR staff in December 2025.*
[10] *Ibid*
[11] *Data retrieved from WDNR SWIMS database.*
[12] *WDNR, 1970,* op. cit.
[13] *docs.legis.wisconsin.gov/code/admin_code/nr/100/102.pdf#page=18.*

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. Dissolved oxygen was reported both in ppm, or parts per million, as well as percent saturation. While ppm measures the amount of oxygen in a volume of water, interchangeable with mg/L, the percentage of dissolved oxygen reports the relative amount of oxygen the water could hold at a given temperature and air pressure. When water is holding as much oxygen as can be absorbed, it is 100 percent saturated. However, saturation values above 100 percent, called supersaturation, can occur when photosynthesis is releasing oxygen faster than can be used, indicative of algae blooms or eutrophic conditions. Saturation values of 115 percent or greater can be harmful to fish by causing gas bubble disease, which forms bubbles in the blood that can block blood flow, damage tissue, and cause death.[14] Fortunately, no supersaturation was observed within the DO profile for this Lake.

A minimum DO concentration of 5 mg/L is considered necessary for survival of most species of fish. Commission staff measured dissolved oxygen concentrations ranging from 6.7 to 7.5 mg/L in depths up to 14 feet (see Figure 4). DO concentrations generally decreased with depth, though did not experience sudden declines, indicating well-mixed waters and an oxygenated environment to support fish and other aquatic life. Percent saturation of DO shows similar data patterns, ranging from 80.2 to 94.2 percent throughout the water column.

Nutrients and Trophic Status

Nutrients are elements and compounds needed for plant and algal growth. They are often found in a variety of chemical forms, both inorganic and organic, which may vary in their availability to plants and algae. Typically, growth and biomass of plants and algae in a waterbody are limited by the availability of the nutrient present in the lowest amount relative to the organisms' needs. Lake biological productivity is referred to in terms of "trophic status." Water clarity, total phosphorus, and chlorophyll-a are three important determinants of a lake's trophic status.

Water clarity, or transparency, provides an indication of overall water quality—the greater the clarity, the better the water quality. 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 2.75 feet at the deep hole site, which is indicative of poor water clarity and an abundance of algae and/or suspended solids in the water column. However, this low clarity may not be a typical feature of the Lake as the fifteen-foot depth of aquatic plant colonization suggest that light penetrates more deeply into the Lake than the Secchi measurement would suggest. When referencing historic Secchi depth values from 1980 to 2025, the values have ranged from 2.75 feet to 15.1 feet, with the 2025 observation being the lowest observed Secchi depth in that period (see Figure 5). However, the historic dataset shows fluctuating Secchi readings throughout different years and seasons, with readings similar to the 2025 Secchi depth recorded in the early 2000s and in 2014. Additionally, the data shows that all Secchi depth measurements less than five feet were recorded in the summer, which may suggest that water clarity seasonally decreases.[15] Due to the aforementioned presence of aquatic plants at

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[14] *https://www.epa.gov/caddis/dissolved-oxygen*

[15] *Summer months are defined as July through September.*

fifteen feet in the 2025 survey, the clarity of Spring Lake must be consistently clear enough to sustain plant life at these depths. Commission and County staff also quantified the amount of clarity obstruction, commonly referred to as the turbidity, in Spring Lake with the water quality probe. Turbidity values were between 9.3 and 15.7 FNU, with the highest turbidity around eight feet of depth. These values are consistent with the poor water clarity observed.

Commission and County staff collected surface water grab samples that were submitted and analyzed at the Wisconsin State Laboratory of Hygiene for total phosphorus, chlorophyll-a, and chloride. Phosphorus is a key nutrient for aquatic plants and algae and its availability often limits their growth and abundance in freshwater systems. Chlorophyll-a is a photosynthetic pigment whose abundance is used to indicate algal biomass within a lake. The total phosphorus concentration within the Lake was 0.0105 mg/L, lower than 0.04 mg/L numeric criterion that would indicate impairment due to nutrient enrichment. When referencing past phosphorus levels, the values have ranged from 0.006 to 0.022 mg/L between 1980-2025 (see Figure 5).[16] Thus, current phosphorus levels are within historic range for the Lake, though on the lower end of observed values. This decrease could be due to implementing farming practices that reduce phosphorus loading, though more information would need to be collected to confirm this.

The chlorophyll-a concentration was 6.62 µg/L, which is also lower than the 27 µg/L criterion that would suggest impairment of lakes and reservoirs. Historical data collected within Spring Lake has shown chlorophyll-a ranges between 2 and 9 µg/L (see Figure 5).[17] When converted to a trophic state index, these measurements indicate that Spring Lake is a mesotrophic lake bordering on eutrophic, meaning that it is moderately to excessively rich in nutrients. Mesotrophic lakes can support healthy fisheries, a robust aquatic plant community, and generally have lower risk of algal blooms than eutrophic lakes.

pH, Specific Conductance, and Chloride

The acidity of water is measured using the pH scale, a logarithmic measure of the hydrogen ion concentration on a scale of 0 to 14. Pure water has a pH of 7, neutral on the pH scale. In Wisconsin lakes, pH can range anywhere from 4.5 in some acid-bog lakes to 8.4 in hard water, marl lakes.[18] Many chemical and biological processes are affected by pH, as are the solubility and availability of many substances. Different organisms can tolerate different ranges of pH, with most preferring ranges between about 6.5 and 8.0. Although moderately acidic (slightly below a pH of 7) does not usually harm fish, as pH drops to 6.5 or lower, some species can be adversely affected, especially during spawning. In addition, many metals are more soluble in water with low pH than they are in water with high pH and can be released from lake sediment if present under low pH conditions.

With an average pH of 8.1, Spring Lake is a basic waterbody.[20] The pH of the Lake ranged from 7.98 to 8.29 and was more alkaline near the surface (see Figure 4). The pH has not changed substantially since the 1968 survey (pH of 7.8). A waterbody's pH can be affected by acids released by decomposition of organic material, underlying soil and bedrock type, and photosynthesis of aquatic plants, phytoplankton, and algae. Additionally, external factors such as pollutants contained in discharges from point sources and in stormwater runoff can also affect the waterbody's pH.

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[16] *Data retrieved from WDNR SWIMS database.*
[17] *Ibid.*
[18] *Wisconsin Department of Natural Resources, Byron Shaw, Christine Mechenich, and Lowell Klessig, Understanding Lake Data: www.uwsp.edu/cnr-ap/UWEXLakes/Documents/ecology/shoreland/background/understanding%20lake%20data.pdf.*
[20] *Lillie and Mason, 1983, op. cit.*

Specific conductance is a measure of the ability of a liquid, such as lake water, to conduct electricity at a given temperature. This ability is greatly dependent on the water's dissolved solids concentration: as the amount of dissolved solids increases, the specific conductance increases. The amount of total dissolved solids (TDS) recorded in Spring Lake in 2025 ranged between 255 and 367 mg/L. Specific conductance values ranged between 509 and 727 µS/cm @ 25 °C, substantially higher than the 345 and 354 µS/cm @ 25 °C recorded in 1968. The high correlation between TDS and specific conductivity to can be observed by their nearly identical data shape when graphed (see Figure 4). While many 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 average salinity, or the total amount of salts, was 0.27 PSU in Spring Lake, which is typical for a freshwater system. For comparison, the salinity of seawater is 35 PSU.[21]

Chloride, a negative ion, readily forms salts (sodium chloride, magnesium chloride, calcium chloride) that are highly soluble in water causing dissociation of the ion. Under natural conditions, surface water in Southeastern Wisconsin contains very low concentrations of chloride with measurements in the early 20th century of 5 to 10 mg/L in Waukesha County lakes. Elevated chloride concentrations are generally associated with high specific conductance values, as the abundance of chloride ions increases the water's conductance. The chloride concentration was 38.5 mg/L, which is elevated beyond natural background concentrations and indicates that the lake has been influenced by road salt or other salt sources. In comparison, the chloride concentrations reported in the 1968 survey were 4.5 and 5.3 mg/L, indicating that this increase has occurred over the past five decades. This increase may be due in part to a waste field to the east of the Lake that is used for the disposal of cheese brine, a byproduct of the cheese manufacturing process that is very high in salts. Nearby chloride concentrations were obtained from shallow wells to the south and north of Spring Lake, with some concentrations reaching almost 2,000 mg/L. These levels were mostly associated with Cedar Valley Cheese to the south and Lakeside Foods, a food processing plant in Random Lake, to the north. As a seepage lake, Spring Lake relies on this nearby groundwater for its water supply and may be rising in chloride due to elevated concentrations in its source. The aforementioned higher absolute conductance measurements may be due to the increase in chloride concentrations within the Lake.[22]

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[21] https://sfyl.ifas.ufl.edu/media/sfylifasufledu/miami-dade/documents/sea-grant/Temperature,-Salinity-and-pH.pdf
[22] Other water quality parameters collected by staff included absolute conductance, conductance, and electric resistivity. These values can be seen in Table 1.

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TABLES

Table 1
WiLMS Nonpoint Phosphorus Loading Output for the Spring Lake Watershed

Land Use Class	Area of Land Use Class (acres)	Percent of Watershed	Low Phosphorus export (kg/ha)	Likely Phosphorus export (kg/ha)	High Phosphorus export (kg/ha)	Annual Phosphorus Load (lbs) (Lower est. – Higher est.)
Forest	59	20.91	0.05	0.09	0.18	5 (3 – 9)
Pasture/Grass	58	20.62	0.1	0.3	0.5	16 (5 – 26)
Row Crop Ag	56	19.95	0.5	1	3	50 (25 – 150)
Lake Surface	54	19.34	0.1	0.3	1	15 (5 – 49)
Wetlands	45	15.9	0.1	0.1	0.1	4[a]
Rural Res (> 1 Ac)	9	3.28	0.05	0.1	0.25	1 (0 – 2)
Total	**281**	**100**	**0.9**	**1.89**	**5.03**	**91 (42 – 240)**

[a] The lower and higher estimated loads are both calculated to be 4 pounds a year and thusly have no range.

Note: Information obtained from the WiLMS Nonpoint Phosphorus Loading tool found at: https://dnr-wisconsin.shinyapps.io/WaterExplorer/

Source: WDNR and SEWRPC

Table 2
Ecological Significance of Aquatic Plant Species in Spring Lake

Species Name	Ecological Significance
Chara spp. (muskgrass)	Excellent producer of fish food, especially for young trout, bluegills, small and largemouth bass, stabilizes bottom sediments, and has softening effect on the water by removing lime and carbon dioxide.
Najas flexilis (slender naiad)	Important food source for waterfowl, marsh birds, and muskrats; provides food and shelter for fish; native.
Najas marina (spiny naiad)	Important food source for waterfowl, marsh birds, and muskrats; provides food and shelter for fish; naturalized nonnative.
Nuphar variegata (yellow water lily)	Provides food for waterfowl and mammals; provides habitat for fish and aquatic invertebrates.
Nymphaea odorata (white water lily)	Seeds consumed by waterfowl while rhizoids consumed by mammals.
Potamogeton gramineus (variable pondweed)	The fruit is an important food source for many waterfowl; also provides food for muskrat, deer, and beaver; native.
Potamogeton illinoensis X natans (Illinois and floating leaf pondweed hybrid)	Provides shade and shelter for fish; seeds are eaten by waterfowl; native.
Schoenoplectus acutus (hardstem bulrush)	Habitat for muskrats, invertebrates and young fish; nutlets and rhizoids and a food source for waterfowl and muskrats.
Stuckenia pectinata (sago pondweed)	Most important pondweed for ducks as food source. Provides food and shelter for young fish.
Typha spp. (cattail)	Provides food and shelter for aquatic and terrestrial lifeforms.

Note: Information obtained from A Manual of Aquatic Plants by Norman C. Fassett, University of Wisconsin Pressure; Guide to Wisconsin Aquatic Plants, Wisconsin Department of Natural Resources; Through the Looking Glass: A Field Guide to Aquatic Plants, Wisconsin Lakes Partnership, University of Wisconsin – Extension; and U.S. Forest Service; Encyclopedia Brittanica.

Source: SEWRPC

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FIGURES

Figure 1
Aerial Imagery of Spring Lake: 1937, 1967, 2005, and 2020

1937 Aerial

1967 Aerial

2005 Aerial

2020 Aerial

Source: U.S. Department of Agriculture and SEWRPC

Figure 2
Images from Spring Lake

Low water clarity due to suspended marl

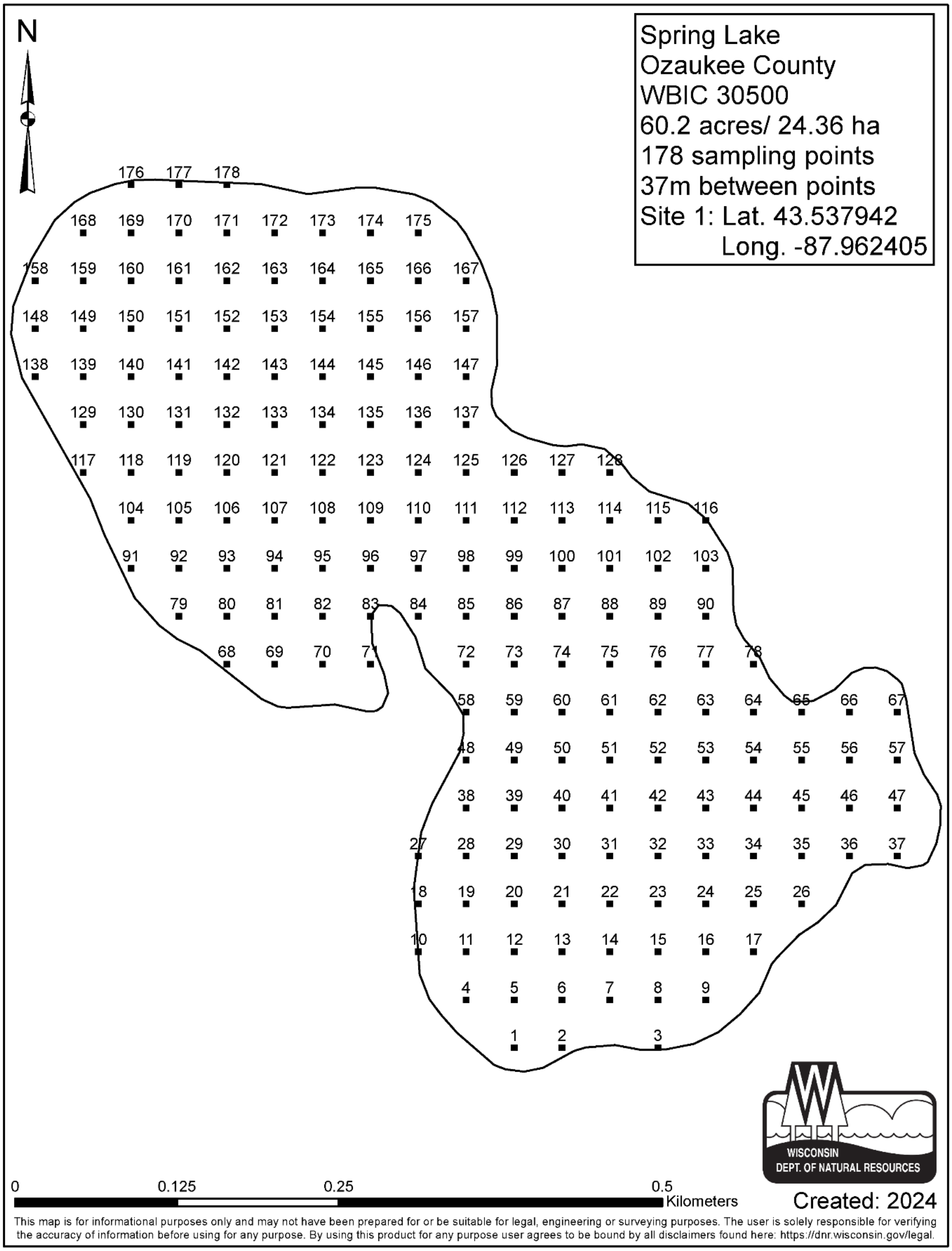
Wetlands surrounding Spring Lake

Nostoc spp. colony, a type of cyanobacteria

Cattail and bulrush root mats along shoreline

Source: WDNR and SEWRPC

Figure 3
Aquatic Plant Point-Intercept Grid of Spring Lake



Source: WDNR

Figure 4
Water Quality Profiles for Spring Lake

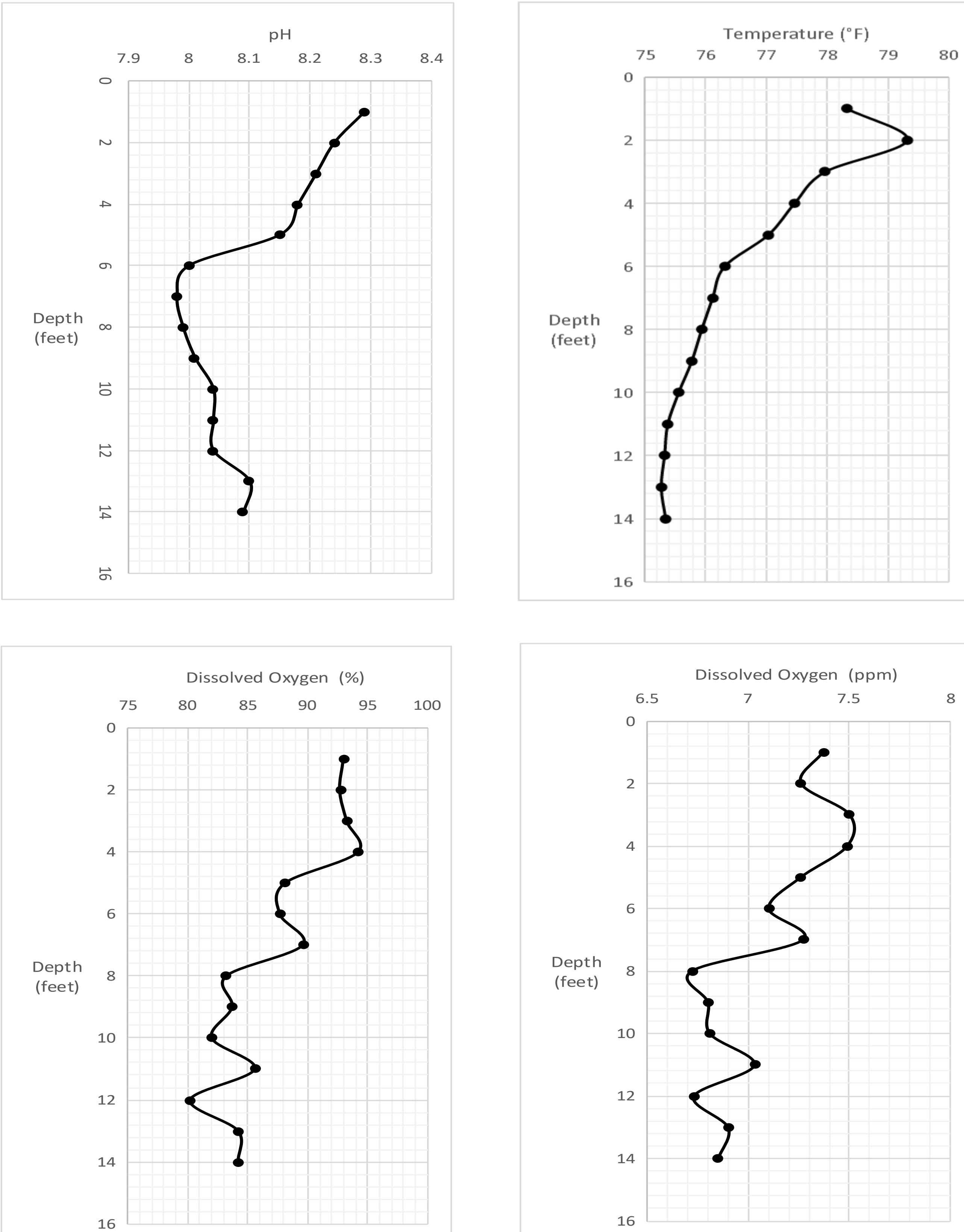
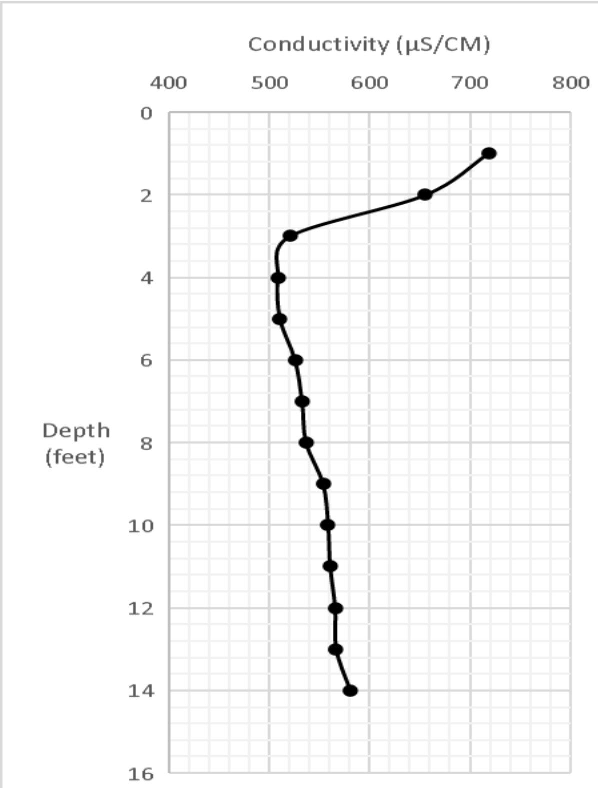
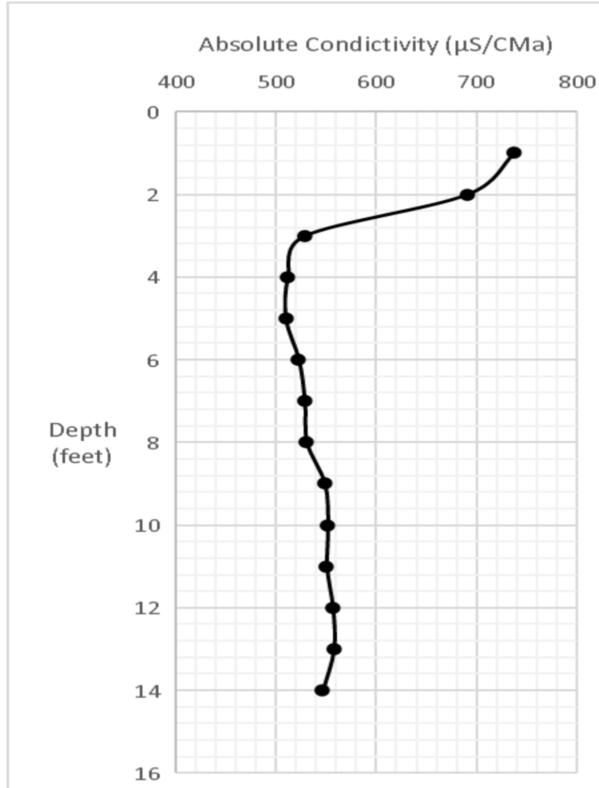
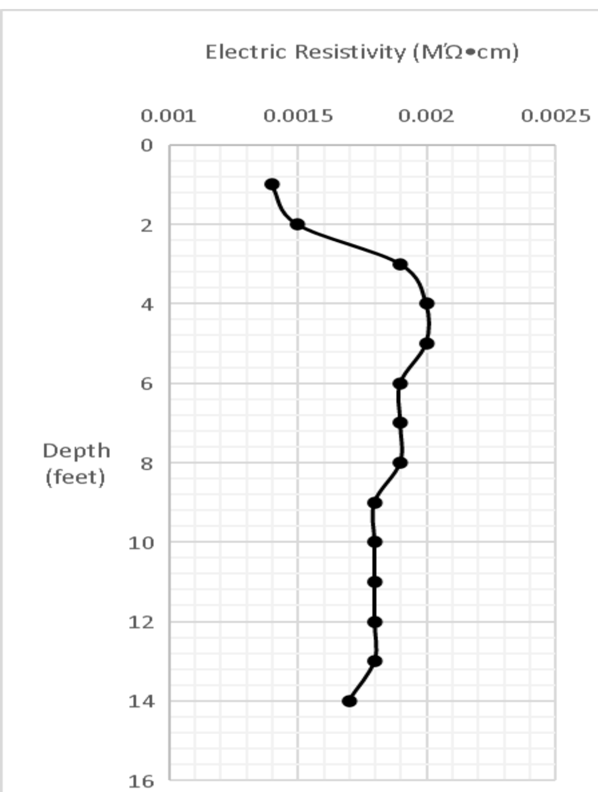


Figure 4 (cont.)







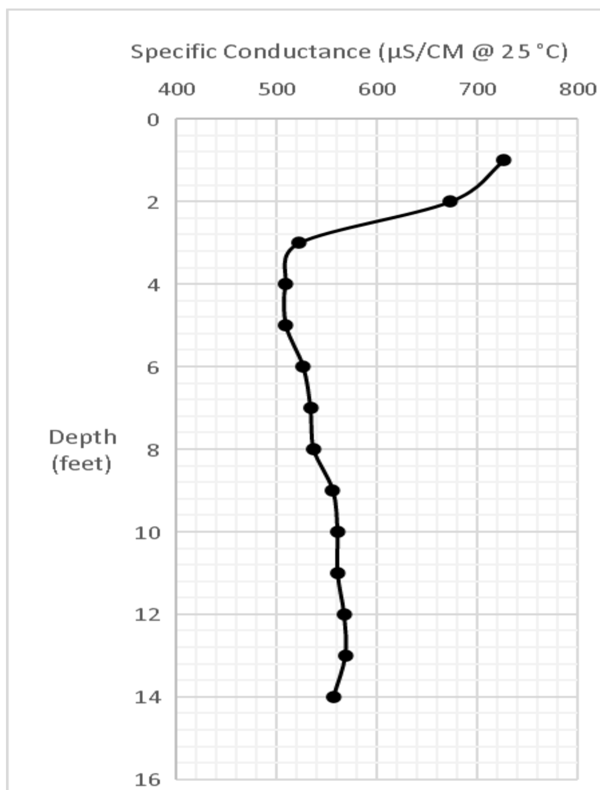
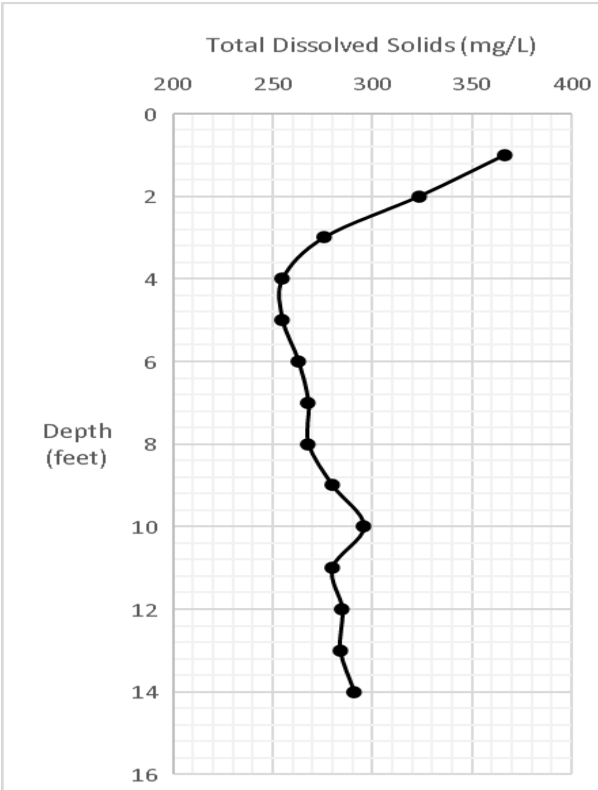
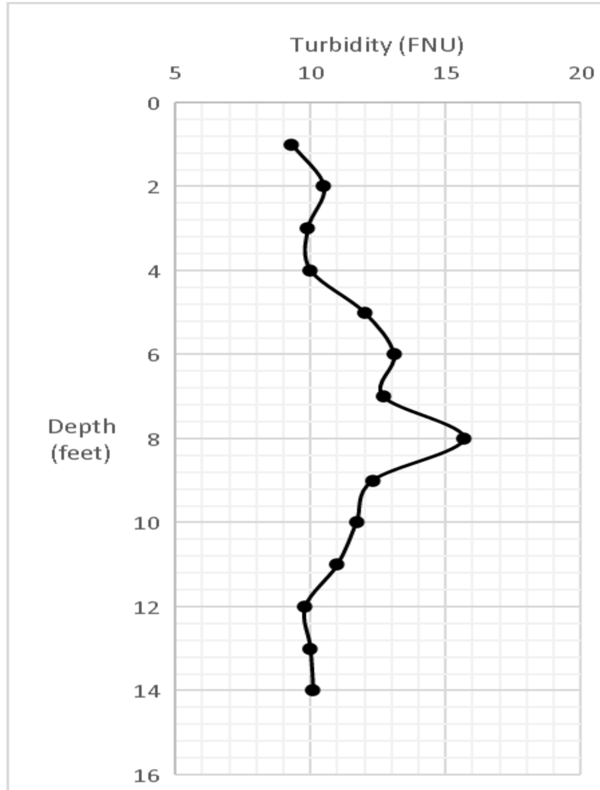
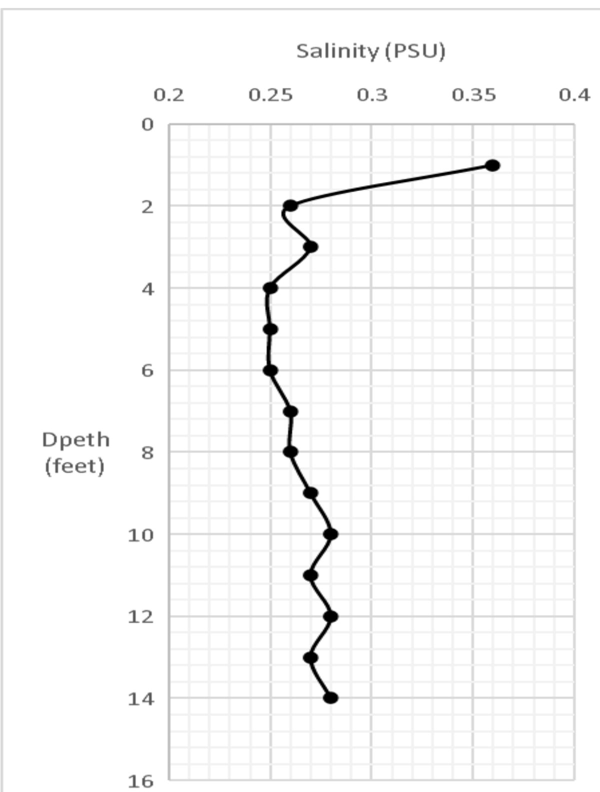


Figure 4 (cont.)



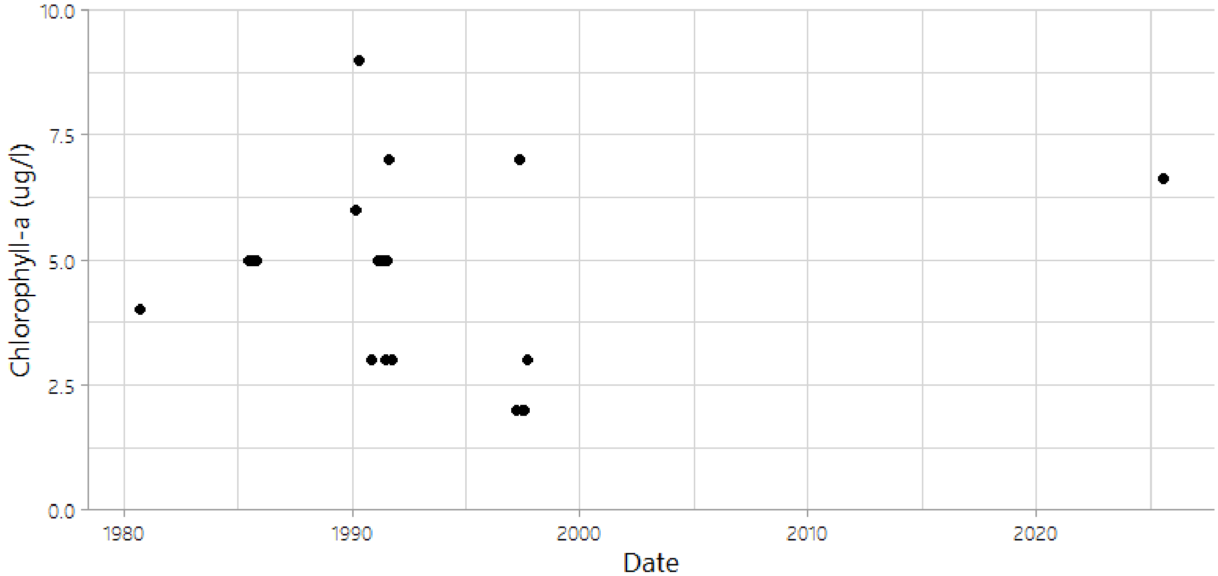




Source: Ozaukee County and SEWRPC

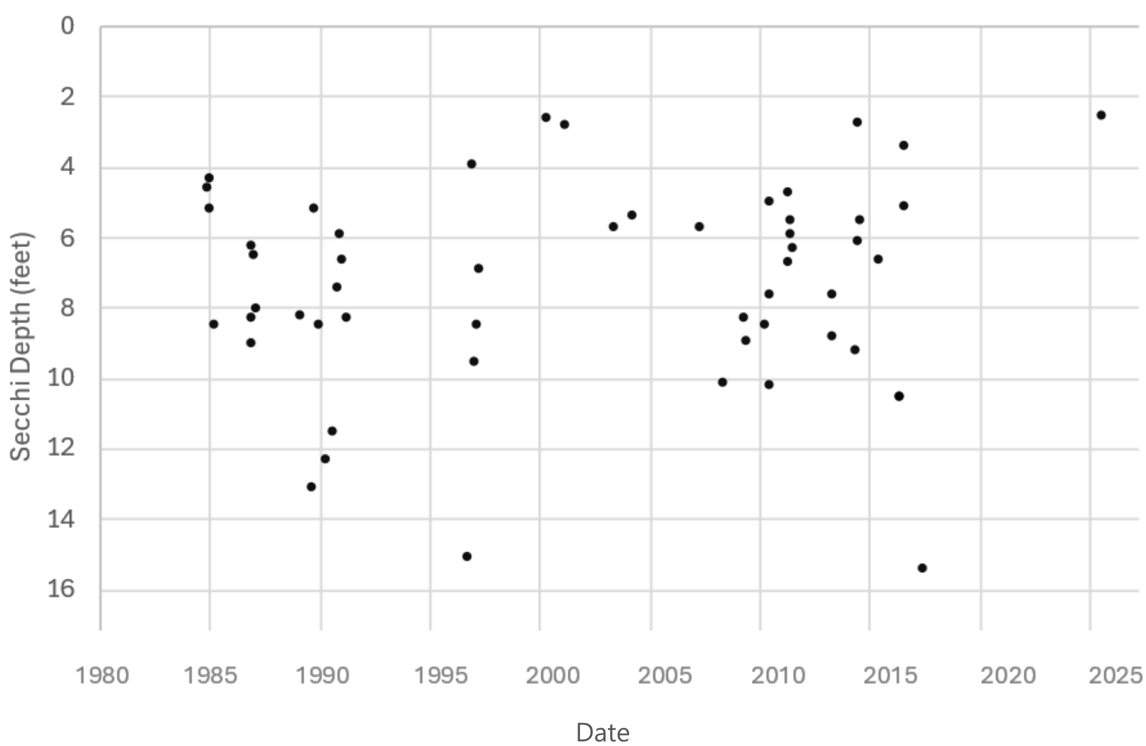
Figure 5
Historic Spring Lake Water Quality Data: 1980-2025

Chlorophyll-a Measurements at Spring Lake: 1980 - 2025



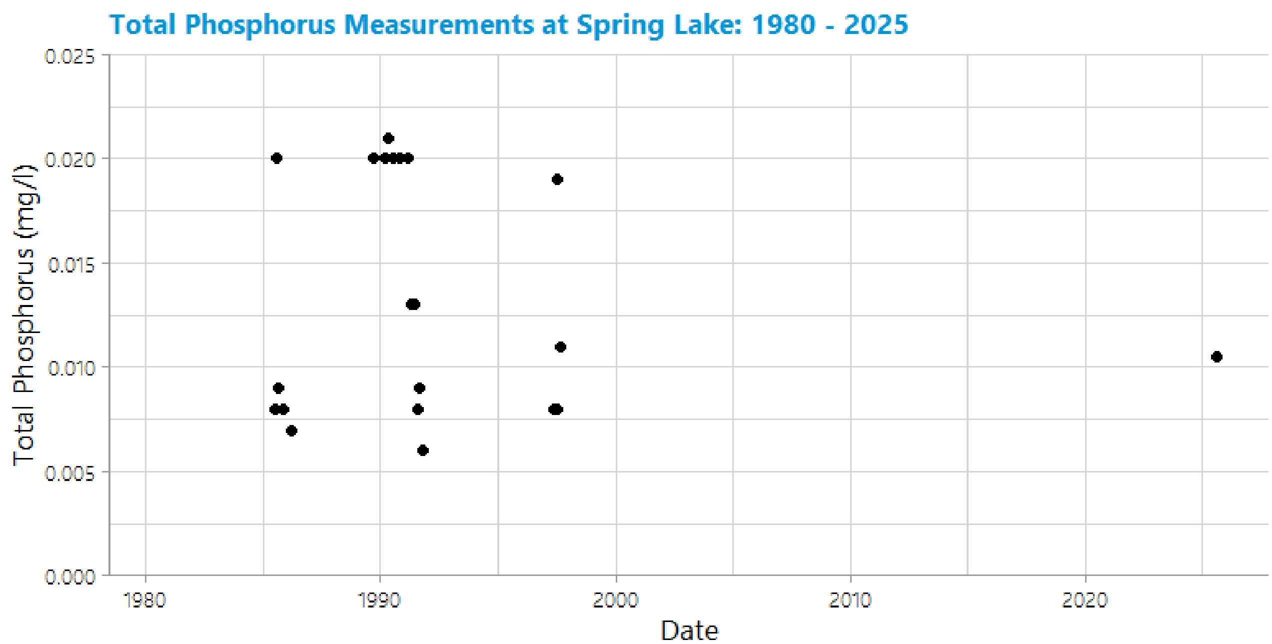
Source: WDNR and SEWRPC

Secchi Depth Measurements at Spring Lake: 1980-2025



Source: WNDR and SEWRPC

Figure 5 (cont.)



Source: WDNR and SEWRPC

SEWRPC Staff Memorandum

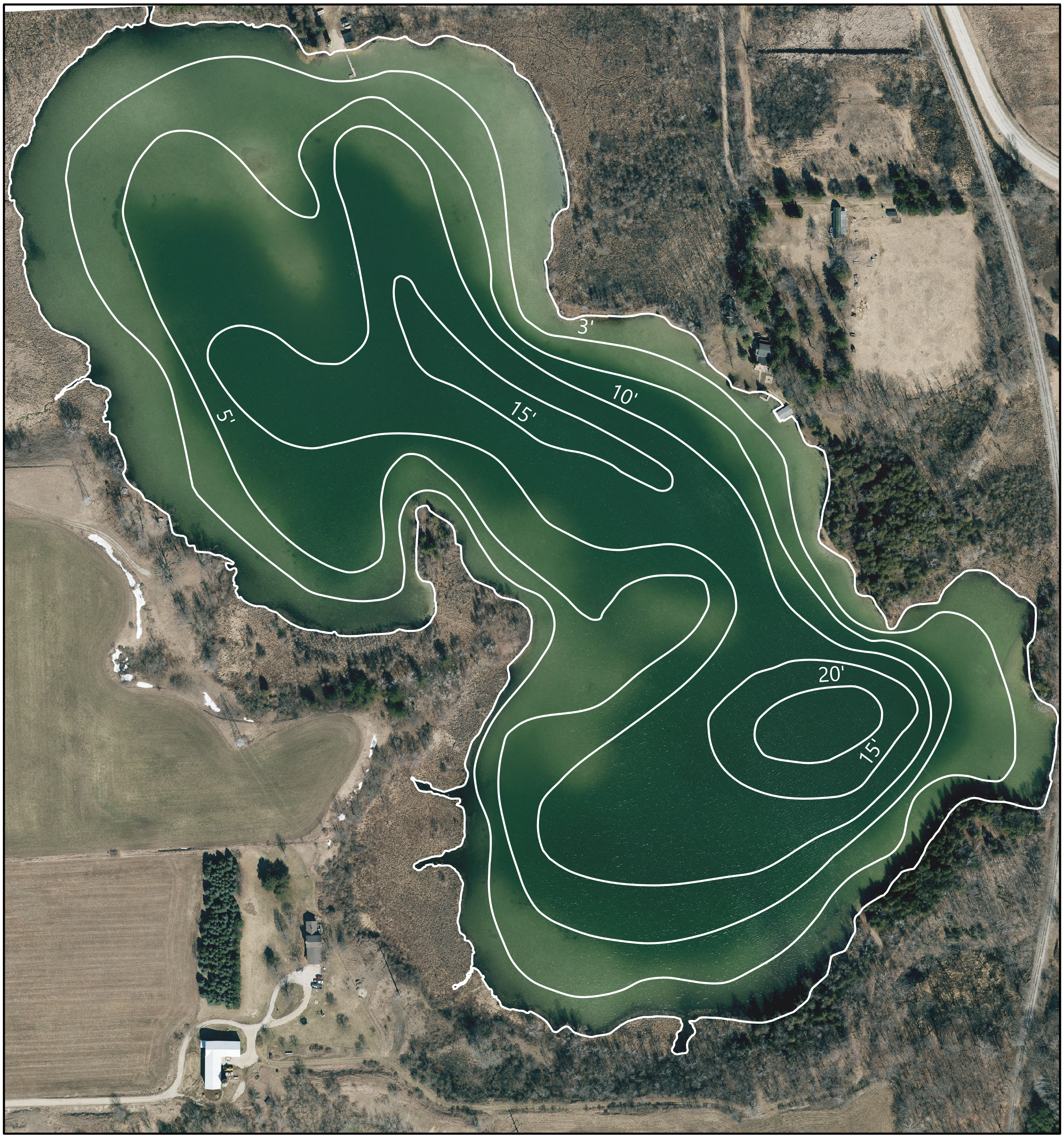
SPRING LAKE SURVEY, OZAUKEE COUNTY, WISCONSIN

MAPS

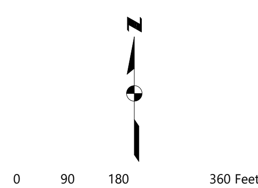
Map 1
WDNR-Delineated Spring Lake Watershed

Source: SEWRPC and WDNR

Map 2
Bathymetric Map of Spring Lake

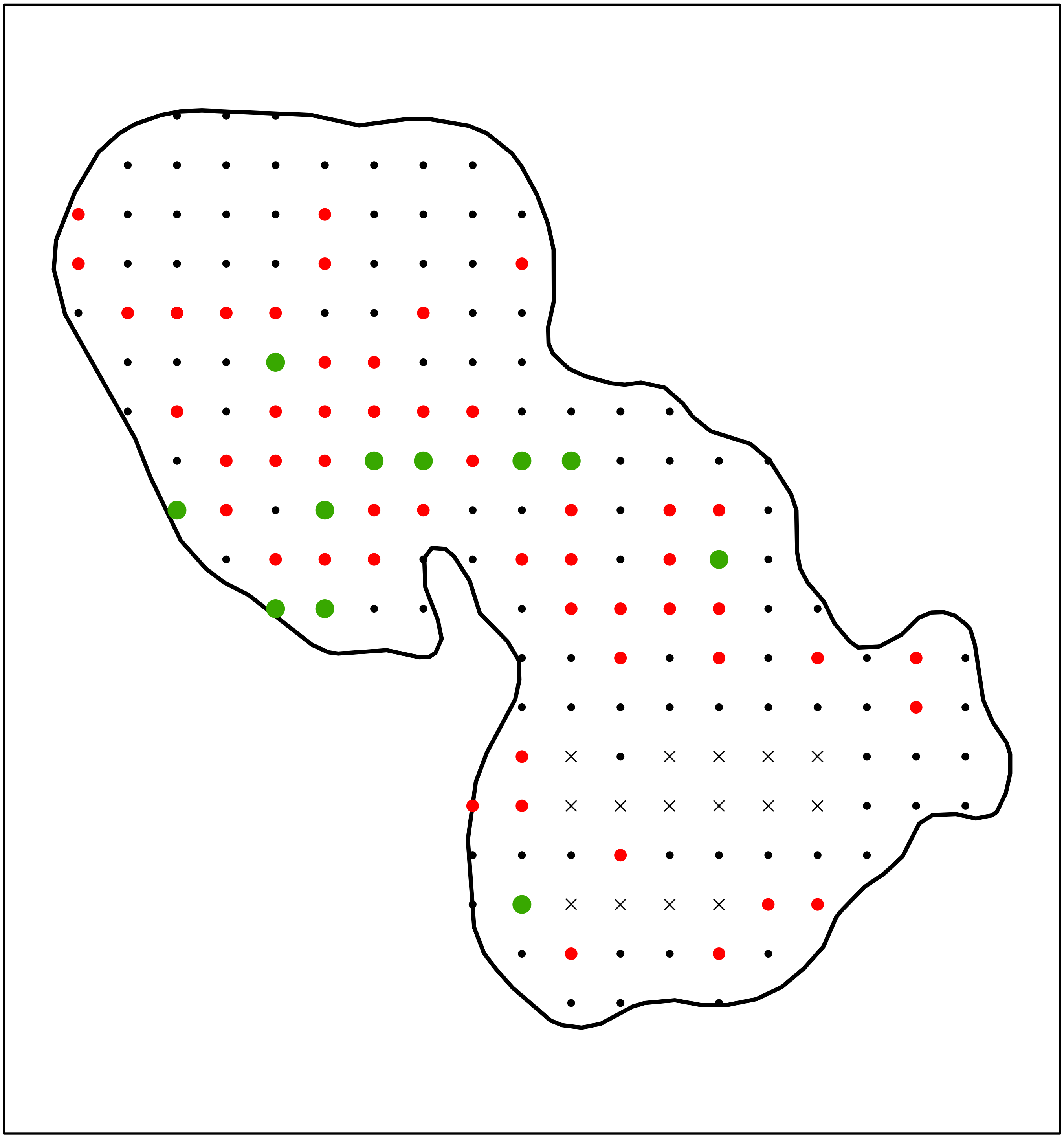


Note: Contour intervals are drawn in intervals of 3-5 feet. Spring Lake's maximum depth is 22 feet.



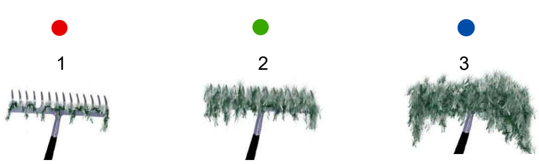
Source: SEWRPC

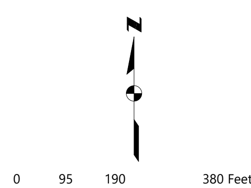
Map 3
Total Rake Fullness in Spring Lake: 2025



Note: Survey was conducted on Spring Lake on August 5th, 2025.

RAKE FULLNESS RATING





Source: SEWRPC

VISIBLE NEARBY

NO AQUATIC PLANTS FOUND

NOT SAMPLED

Source: WDNR and SEWRPC