# AVON LAKE

## 2025 Lake Management Study

Prepared for:

Avon Lake Village HOA

3088 Hottis Road Hale, MI 48739
989-728-2200
www.lakeandpond.com

December 23rd, 2025

Avon Lakes Village HOA
Bruce Graves
2123 Avon Lake Ln
Rochester Hills, MI  48307

Mr. Graves,

It was a pleasure assessing Avon Lake for you this past summer. Every year seems to bring a unique set of challenges and we welcome the opportunity to meet these challenges every single year.

While we make the transition and focus our efforts to the 2026 season, we would like to provide you with a full report of the services rendered by Savin Lake Services in 2025. This report will include a brief description of the services rendered and the data that was gathered/generated from services. You will also find included in this report the recommended lakes management approach for 2026.

Please keep in mind that we are a fully integrated lakes management company offering solutions including but not limited to mechanical harvesting, herbicide control, dredging, bio-augmentation, and aeration. Savin Lake Services also offers a complete range of water quality testing, depth contour mapping, individual property solutions, and even aquatic plant density reporting.

We look forward to working with Avon Lake this year.

Sincerely,

Matthew Novotny

Matt Novotny – Operations Manager
Savin Lake Services Inc.



Preserving Our Lakes Today For Our Generations Tomorrow
3088 HOTTIS ROAD HALE, MI 48739 877-SAV-LAKE (877-728-5253) LakeAndPond.com

**Introduction**

Savin Lake Services was hired to complete to complete multiple survey methodologies, acquire water quality data, and assess and control the aquatic vegetation of Avon Lake in 2025. Upon completing these services we would summarize the results in order to recommend a lake management plan that is right for Avon Lake both ecologically and recreationally.

In this report you will find general vegetation assessment, potential treatment information, water quality data, and a lead-in to phosphorus mitigation to improve the health and aesthetics of Avon Lake in the future.

**Aquatic Vegetation**

The primary concern with any vegetation management plan is invasive species. The aquatic vegetation observed in Avon Lake in 2025 consists of mainly native vegetation with only a couple instances of invasive species. In the spring, the invasive species Eurasian watermilfoil and curly leaf pondweed exists throughout most of the lake. However it exists in the deeper middle portions of the lake, not the shallow shoreline areas. Only a few natives were observed early in the season such as sago pondweed. The native macro algae chara was also observed around most of the shallow shoreline area of the lake. As the summer progressed some water lilies were observed as well as larger areas of chara, Illinois pondweed, naiad, and sago pondweed. Phragmites and purple loosestrife, the other invasive species observed, existed on some properties around the lake. The vegetation observed has remained consistent of the past few years.

A comprehensive vegetation survey called an Aquatic Vegetation Assessment Survey (AVAS), was performed on Avon Lake in the Fall. During this survey, the lake is divided into evenly spaced sections. Inside each section, we document every type of aquatic vegetation found and determine its density inside of that section. Compiling all of these sections into a summary page, we determine a complete set of plant species found within Avon Lake and its approximate abundance.

There are 3 different sets of pages. The first is the summary page which gives you the lake wide plant coverage shown as an approximate percentage in column 11. Next is the lake map showing the numerous AVAS sections. The last set of pages are the density pages. Using the map and the density pages together you can determine what plant species exist in each section of the lake.

Looking through all of the pages will look very confusing if you do not understand what the numbers and letters mean. Each plant species has a ‘code number’. You can see this on the summary and density pages on the left side. There are 4 different density categories:

- A = found, or <2% of the area
- B = sparse (2% - 20%)
- C = common (20% - 60%)
- D = dense (60% - 100%)

When surveying the lake, we take the plant species number and pair it with a density rating for each AVAS section. We then compile the totals and the results are generated. The results are on the next couple of pages.

LAKE NAME- Avon Lake COUNTY- Oakland SURVEY DATE: Fall 2025

Standard Aquatic Vegetation Summary Sheet SURVEY BY: Savin Lake Services

| | | Total number of AVAS's for each Density Category | | | | Calculations | | | | Sum of Previous Four Columns | Total Number of AVAS's | Quotient of Column 9 divided by Column 10 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | Category A x 1 | Category B x10 | Category C x 40 | Category D x 80 | | | | | |
| Code No | Plant Name | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | Code No | Plant Name |
| 1 | Eurasian watermilfoil | | | | | 0 | 0 | 0 | 0 | 0 | 20 | 0.0 | 1 | Eurasian watermilfoil |
| 2 | Curly leaf pondweed | 3 | | | | 3 | 0 | 0 | 0 | 3 | 20 | 0.2 | 2 | Curly leaf pondweed |
| 3 | Chara | | | 1 | 19 | 0 | 0 | 40 | 1520 | 1560 | 20 | 78.0 | 3 | Chara |
| 4 | Thin leaf pondweed | | | | | 0 | 0 | 0 | 0 | 0 | 20 | 0.0 | 4 | Thin leaf pondweed |
| 5 | Flat stem pondweed | | | | | 0 | 0 | 0 | 0 | 0 | 20 | 0.0 | 5 | Flat stem pondweed |
| 6 | Robbins pondweed | | | | | 0 | 0 | 0 | 0 | 0 | 20 | 0.0 | 6 | Robbins pondweed |
| 7 | Variable pondweed | 1 | | | | 1 | 0 | 0 | 0 | 1 | 20 | 0.1 | 7 | Variable pondweed |
| 8 | White stem pondweed | | | | | 0 | 0 | 0 | 0 | 0 | 20 | 0.0 | 8 | White stem pondweed |
| 9 | Richardsons pondweed | 1 | | | | 1 | 0 | 0 | 0 | 1 | 20 | 0.1 | 9 | Richardsons pondweed |
| 10 | Illinois pondweed | 7 | 1 | | | 7 | 10 | 0 | 0 | 17 | 20 | 0.9 | 10 | Illinois pondweed |
| 11 | Large leaf pondweed | | | | | 0 | 0 | 0 | 0 | 0 | 20 | 0.0 | 11 | Large leaf pondweed |
| 12 | American pondweed | 1 | | | | 1 | 0 | 0 | 0 | 1 | 20 | 0.1 | 12 | American pondweed |
| 13 | Floating leaf pondweed | | | | | 0 | 0 | 0 | 0 | 0 | 20 | 0.0 | 13 | Floating leaf pondweed |
| 14 | Water stargrass | | | | | 0 | 0 | 0 | 0 | 0 | 20 | 0.0 | 14 | Water stargrass |
| 15 | Wild Celery | 1 | 1 | | | 1 | 10 | 0 | 0 | 11 | 20 | 0.6 | 15 | Wild Celery |
| 16 | Arrowhead (submergent) | | | | | 0 | 0 | 0 | 0 | 0 | 20 | 0.0 | 16 | Arrowhead (submergent) |
| 17 | Native milfoil | | | | | 0 | 0 | 0 | 0 | 0 | 20 | 0.0 | 17 | Native milfoil |
| 18 | Whorled watermilfoil | | | | | 0 | 0 | 0 | 0 | 0 | 20 | 0.0 | 18 | Whorled watermilfoil |
| 19 | Various leaf watermilfoil | | | | | 0 | 0 | 0 | 0 | 0 | 20 | 0.0 | 19 | Various leaf watermilfoil |
| 20 | Coontail | | | | | 0 | 0 | 0 | 0 | 0 | 20 | 0.0 | 20 | Coontail |
| 21 | Elodea | | | | | 0 | 0 | 0 | 0 | 0 | 20 | 0.0 | 21 | Elodea |
| 22 | Bladderwort | | | | | 0 | 0 | 0 | 0 | 0 | 20 | 0.0 | 22 | Bladderwort |
| 23 | Bladderwort (mini) | | | | | 0 | 0 | 0 | 0 | 0 | 20 | 0.0 | 23 | Bladderwort (mini) |
| 24 | Buttercup | | | | | 0 | 0 | 0 | 0 | 0 | 20 | 0.0 | 24 | Buttercup |
| 25 | Najas spp. | | 10 | 4 | | 0 | 100 | 160 | 0 | 260 | 20 | 13.0 | 25 | Najas spp. |
| 26 | Brittle naiad | | | | | 0 | 0 | 0 | 0 | 0 | 20 | 0.0 | 26 | Brittle naiad |
| 27 | Sago pondweed | 7 | 10 | | | 7 | 100 | 0 | 0 | 107 | 20 | 5.4 | 27 | Sago pondweed |
| 28 | | | | | | 0 | 0 | 0 | 0 | 0 | 20 | 0.0 | 28 | |
| 29 | | | | | | 0 | 0 | 0 | 0 | 0 | 20 | 0.0 | 29 | |
| 30 | White waterlily | | | | | 0 | 0 | 0 | 0 | 0 | 20 | 0.0 | 30 | White waterlily |
| 31 | Yellow waterlily | | | | | 0 | 0 | 0 | 0 | 0 | 20 | 0.0 | 31 | Yellow waterlily |
| 32 | Watershield | | | | | 0 | 0 | 0 | 0 | 0 | 20 | 0.0 | 32 | Watershield |
| 33 | Small duckweed | | | | | 0 | 0 | 0 | 0 | 0 | 20 | 0.0 | 33 | Small duckweed |
| 34 | Great duckweed | | | | | 0 | 0 | 0 | 0 | 0 | 20 | 0.0 | 34 | Great duckweed |
| 35 | Watermeal | | | | | 0 | 0 | 0 | 0 | 0 | 20 | 0.0 | 35 | Watermeal |
| 36 | Arrowhead | | | | | 0 | 0 | 0 | 0 | 0 | 20 | 0.0 | 36 | Arrowhead |
| 37 | Pickerelweed | | | | | 0 | 0 | 0 | 0 | 0 | 20 | 0.0 | 37 | Pickerelweed |
| 38 | Arrow arum | | | | | 0 | 0 | 0 | 0 | 0 | 20 | 0.0 | 38 | Arrow arum |
| 39 | Cattail | 6 | 1 | | | 6 | 10 | 0 | 0 | 16 | 20 | 0.8 | 39 | Cattail |
| 40 | Bulrush | 13 | 5 | | | 13 | 50 | 0 | 0 | 63 | 20 | 3.2 | 40 | Bulrush |
| 41 | Iris | | | | | 0 | 0 | 0 | 0 | 0 | 20 | 0.0 | 41 | Iris |
| 42 | Swamp Loosestrife | | | | | 0 | 0 | 0 | 0 | 0 | 20 | 0.0 | 42 | Swamp Loosestrife |
| 43 | Purple Loosestrife | 1 | | | | 1 | 0 | 0 | 0 | 1 | 20 | 0.1 | 43 | Purple Loosestrife |
| 44 | Starry Stonewort | | | | | 0 | 0 | 0 | 0 | 0 | 20 | 0.0 | 44 | Starry Stonewort |
| 45 | Phragmites | 6 | 2 | | | 6 | 20 | 0 | 0 | 26 | 20 | 1.3 | 45 | Phragmites |


(For use with the next couple of pages)

Lake Name: Avon Lake | County: Oakland | Surveyor Name: Savin Lake Services | Survey Date: Fall 2025

## Standard Aquatic Vegetation Assessment Site Species Density Sheet

Aquatic Vegetation Assessment Site Number

| Code No. | Plant Name | NO. 1 | NO. 2 | NO. 3 | NO. 4 | NO. 5 | NO. 6 | NO. 7 | NO. 8 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Eurasian watermilfoil | | | | | | | | |
| 2 | Curly leaf pondweed | | | | | | A | | |
| 3 | Chara | D | D | D | D | D | D | D | D |
| 4 | Thin leaf pondweed | | | | | | | | |
| 5 | Flat stem pondweed | | | | | | | | |
| 6 | Robbins pondweed | | | | | | | | |
| 7 | Variable pondweed | | | | | | A | | |
| 8 | White stem pondweed | | | | | | | | |
| 9 | Richardsons pondweed | | | | | | | | |
| 10 | Illinois pondweed | | | A | | | A | | |
| 11 | Large leaf pondweed | | | | | | | | |
| 12 | American pondweed | | | | | | | | |
| 13 | Floating leaf pondweed | | | | | | | | |
| 14 | Water stargrass | | | | | | | | |
| 15 | Wild Celery | | | | | | | | |
| 16 | Arrowhead (submergent) | | | | | | | | |
| 17 | Native milfoil | | | | | | | | |
| 18 | Whorled watermilfoil | | | | | | | | |
| 19 | Various leaf watermilfoil | | | | | | | | |
| 20 | Coontail | | | | | | | | |
| 21 | Elodea | | | | | | | | |
| 22 | Bladderwort | | | | | | | | |
| 23 | Bladderwort (mini) | | | | | | | | |
| 24 | Buttercup | | | | | | | | |
| 25 | Najas spp. | | | | | B | B | B | B |
| 26 | Brittle naiad | | | | | | | | |
| 27 | Sago pondweed | | A | A | A | B | B | B | B |
| 28 | | | | | | | | | |
| 29 | | | | | | | | | |
| 30 | White waterlily | | | | | | | | |
| 31 | Yellow waterlily | | | | | | | | |
| 32 | Watershield | | | | | | | | |
| 33 | Small duckweed | | | | | | | | |
| 34 | Great duckweed | | | | | | | | |
| 35 | Watermeal | | | | | | | | |
| 36 | Arrowhead | | | | | | | | |
| 37 | Pickerelweed | | | | | | | | |
| 38 | Arrow arum | | | | | | | | |
| 39 | Cattail | A | | | | | | | |
| 40 | Bulrush | A | A | A | A | A | B | A | A |
| 41 | Iris | | | | | | | | |
| 42 | Swamp Loosestrife | | | | | | | | |
| 43 | Purple Loosestrife | | A | | | | | | |
| 44 | Starry Stonewort | | | | | | | | |
| 45 | Phragmites | | | | A | A | | | B |

Aquatic Vegetation Assessment Site Number

| Code No. | Plant Name | NO. 9 | NO. 10 | NO. 11 | NO. 12 | NO. 13 | NO. 14 | NO. 15 | NO. 16 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Eurasian watermilfoil | | | | | | | | |
| 2 | Curly leaf pondweed | | | | | | | | A |
| 3 | Chara | D | D | D | D | D | D | D | C |
| 4 | Thin leaf pondweed | | | | | | | | |
| 5 | Flat stem pondweed | | | | | | | | |
| 6 | Robbins pondweed | | | | | | | | |
| 7 | Variable pondweed | | | | | | | | |
| 8 | White stem pondweed | | | | | | | | |
| 9 | Richardsons pondweed | | | | | | | | |
| 10 | Illinois pondweed | | | | | A | A | A | |
| 11 | Large leaf pondweed | | | | | | | | |
| 12 | American pondweed | | | | | | | | |
| 13 | Floating leaf pondweed | | | | | | | | |
| 14 | Water stargrass | | | | | | | | |
| 15 | Wild Celery | | | | | | | | |
| 16 | Arrowhead (submergent) | | | | | | | | |
| 17 | Native milfoil | | | | | | | | |
| 18 | Whorled watermilfoil | | | | | | | | |
| 19 | Various leaf watermilfoil | | | | | | | | |
| 20 | Coontail | | | | | | | | |
| 21 | Elodea | | | | | | | | |
| 22 | Bladderwort | | | | | | | | |
| 23 | Bladderwort (mini) | | | | | | | | |
| 24 | Buttercup | | | | | | | | |
| 25 | Najas spp. | B | C | B | | B | C | C | C |
| 26 | Brittle naiad | | | | | | | | |
| 27 | Sago pondweed | A | A | | B | B | A | B | B |
| 28 | | | | | | | | | |
| 29 | | | | | | | | | |
| 30 | White waterlily | | | | | | | | |
| 31 | Yellow waterlily | | | | | | | | |
| 32 | Watershield | | | | | | | | |
| 33 | Small duckweed | | | | | | | | |
| 34 | Great duckweed | | | | | | | | |
| 35 | Watermeal | | | | | | | | |
| 36 | Arrowhead | | | | | | | | |
| 37 | Pickerelweed | | | | | | | | |
| 38 | Arrow arum | | | | | | | | |
| 39 | Cattail | | A | | A | A | B | | A |
| 40 | Bulrush | A | A | | B | B | B | | B |
| 41 | Iris | | | | | | | | |
| 42 | Swamp Loosestrife | | | | | | | | |
| 43 | Purple Loosestrife | | | | | | | | |
| 44 | Starry Stonewort | | | | | | | | |
| 45 | Phragmites | | A | | | A | B | | |

Sheet Number 1 of 2

# SAVIN LAKE SERVICES

Lake Name: Avon Lake    County: Oakland    Surveyor Name: Savin Lake Services    Survey Date: Fall 2025

## Standard Aquatic Vegetation Assessment Site Species Density Sheet

| Code No. | Plant Name | Aquatic Vegetation Assessment Site Number NO. 17 | NO. 18 | NO. 19 | NO. 20 | NO. 21 | NO. 22 | NO. 23 | NO. 24 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Eurasian watermilfoil | | | | | | | | |
| 2 | Curly leaf pondweed | A | | | | | | | |
| 3 | Chara | D | D | D | D | | | | |
| 4 | Thin leaf pondweed | | | | | | | | |
| 5 | Flat stem pondweed | | | | | | | | |
| 6 | Robbins pondweed | | | | | | | | |
| 7 | Variable pondweed | | | | | | | | |
| 8 | White stem pondweed | | | | | | | | |
| 9 | Richardsons pondweed | | | A | | | | | |
| 10 | Illinois pondweed | B | A | A | | | | | |
| 11 | Large leaf pondweed | | | | | | | | |
| 12 | American pondweed | A | | | | | | | |
| 13 | Floating leaf pondweed | | | | | | | | |
| 14 | Water stargrass | | | | | | | | |
| 15 | Wild Celery | B | A | | | | | | |
| 16 | Arrowhead (submergent) | | | | | | | | |
| 17 | Native milfoil | | | | | | | | |
| 18 | Whorled watermilfoil | | | | | | | | |
| 19 | Various leaf watermilfoil | | | | | | | | |
| 20 | Coontail | | | | | | | | |
| 21 | Elodea | | | | | | | | |
| 22 | Bladderwort | | | | | | | | |
| 23 | Bladderwort (mini) | | | | | | | | |
| 24 | Buttercup | | | | | | | | |
| 25 | Najas spp. | B | B | | B | | | | |
| 26 | Brittle naiad | | | | | | | | |
| 27 | Sago pondweed | B | A | B | | | | | |
| 28 | | | | | | | | | |
| 29 | | | | | | | | | |
| 30 | White waterlily | | | | | | | | |
| 31 | Yellow waterlily | | | | | | | | |
| 32 | Watershield | | | | | | | | |
| 33 | Small duckweed | | | | | | | | |
| 34 | Great duckweed | | | | | | | | |
| 35 | Watermeal | | | | | | | | |
| 36 | Arrowhead | | | | | | | | |
| 37 | Pickerelweed | | | | | | | | |
| 38 | Arrow arum | | | | | | | | |
| 39 | Cattail | A | | | | | | | |
| 40 | Bulrush | A | A | A | A | | | | |
| 41 | Iris | | | | | | | | |
| 42 | Swamp Loosestrife | | | | | | | | |
| 43 | Purple Loosestrife | | | | | | | | |
| 44 | Starry Stonewort | | | | | | | | |
| 45 | Phragmites | | | A | A | | | | |

| Code No. | Plant Name | Aquatic Vegetation Assessment Site Number NO. 25 | NO. 26 | NO. 27 | NO. 28 | NO. 29 | NO. 30 | NO. 31 | NO. 32 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Eurasian watermilfoil | | | | | | | | |
| 2 | Curly leaf pondweed | | | | | | | | |
| 3 | Chara | | | | | | | | |
| 4 | Thin leaf pondweed | | | | | | | | |
| 5 | Flat stem pondweed | | | | | | | | |
| 6 | Robbins pondweed | | | | | | | | |
| 7 | Variable pondweed | | | | | | | | |
| 8 | White stem pondweed | | | | | | | | |
| 9 | Richardsons pondweed | | | | | | | | |
| 10 | Illinois pondweed | | | | | | | | |
| 11 | Large leaf pondweed | | | | | | | | |
| 12 | American pondweed | | | | | | | | |
| 13 | Floating leaf pondweed | | | | | | | | |
| 14 | Water stargrass | | | | | | | | |
| 15 | Wild Celery | | | | | | | | |
| 16 | Arrowhead (submergent) | | | | | | | | |
| 17 | Native milfoil | | | | | | | | |
| 18 | Whorled watermilfoil | | | | | | | | |
| 19 | Various leaf watermilfoil | | | | | | | | |
| 20 | Coontail | | | | | | | | |
| 21 | Elodea | | | | | | | | |
| 22 | Bladderwort | | | | | | | | |
| 23 | Bladderwort (mini) | | | | | | | | |
| 24 | Buttercup | | | | | | | | |
| 25 | Najas spp. | | | | | | | | |
| 26 | Brittle naiad | | | | | | | | |
| 27 | Sago pondweed | | | | | | | | |
| 28 | | | | | | | | | |
| 29 | | | | | | | | | |
| 30 | White waterlily | | | | | | | | |
| 31 | Yellow waterlily | | | | | | | | |
| 32 | Watershield | | | | | | | | |
| 33 | Small duckweed | | | | | | | | |
| 34 | Great duckweed | | | | | | | | |
| 35 | Watermeal | | | | | | | | |
| 36 | Arrowhead | | | | | | | | |
| 37 | Pickerelweed | | | | | | | | |
| 38 | Arrow arum | | | | | | | | |
| 39 | Cattail | | | | | | | | |
| 40 | Bulrush | | | | | | | | |
| 41 | Iris | | | | | | | | |
| 42 | Swamp Loosestrife | | | | | | | | |
| 43 | Purple Loosestrife | | | | | | | | |
| 44 | Starry Stonewort | | | | | | | | |
| 45 | Phragmites | | | | | | | | |

Sheet Number 2 of 2

**Vegetation Treatment in 2025**

The primary concern with any vegetation management plan are invasive species. In Avon Lake, this means curly leaf pondweed, Eurasian watermilfoil, purple loosestrife, and phragmites. For the control of curly leaf pondweed, usually one treatment early in the season (May or June) with contact aquatic herbicides such as Diquat Dibromide is all that is necessary, as the plant will not regrow very well in warmer water temperatures. This will also kill the plant before turion production occurs, limiting future plant growth. Unfortunately a systemic herbicide is not approved for use in Michigan for curly leaf pondweed. Therefore, early treatment with contact herbicides is the best plan for now.

Applicators observed Eurasian watermilfoil during initial treatments this year, but only very minimal. Contact herbicide use was all that was needed, as we did not observe any regrowth later in the season. Should the plant return in 2026, systemic control options should be used while species spread is low.

Fortunately systemic control does exists for phragmites and purple loosestrife. Throughout the season, nutrients travel through these plants both from the roots upwards to the rest of the plant (nutrients in the soil), and also at the same time from the rest of the plant down to the roots (photosynthesis). However, during the late summer and early fall months, the net movement of these nutrients becomes downwards to the roots as the plant essentially stores the nutrients for overwintering. It is at this time that we suggest you treat the phragmites and loosestrife with a product like glyphosate in order to have the herbicide also move downward into the root system more favorably.

Native vegetation and algae should be treated only as needed, if nuisance conditions exist. A healthy ecosystem includes having a wide variety of native plant species present, as well as algae. Native plants and algae provide protection and food sources for juvenile fish and aquatic animals. Additionally, complete removal of native vegetation will open substrate for non-native invasive species to take root. Emergent vegetation such as lily pads and cattails can spread and grow in new areas if it is not managed. However, these plants should be managed similar to other native submerged vegetation and only treated where they may impede recreational use of the lake.

Besides herbicides, mechanical harvesting can sometimes be utilized to manage nuisance vegetation. While removal of vegetation may be beneficial for the lake, for instance due to nutrient release and organic build up once a plant decomposes if treated with herbicides, the harvesting process is slow and more expensive per acre. Additionally, the invasive species starry stonewort and Eurasian watermilfoil can regrow by fragmentation, thus cut stems and fragments of Eurasian watermilfoil and starry stonewort that is not collected (or dropped) by the harvesters may spread and grow in new areas. Harvesting is not recommended for Avon Lake.


Preserving Our Lakes Today For Our Generations Tomorrow
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In 2025, Savin Lake Services treated the vegetation with those recommendations in mind. Our initial treatment occurred on May 14th to mainly target the curly leaf pondweed that existed throughout most of the lake. We did treat some algae and some native pondweeds that existed at the time. As stated previously, it is important to manage the curly leaf pondweed early in its growth, which we did.

We treated 4 additional times for submerged vegetation and algae on June 16th, July 28th, August 25th, and September 17th. These treatments were completed for the control of nuisance native vegetation and algae. Purple loosestrife was additionally targeted on August 25th and phragmites, was treated on September 17th.

The following are some pieces of information for a few of the vegetation observed in 2025.

## Curly Leaf Pondweed

(Potamogeton Crispus)

*Restricted in Michigan*

*Chris Evans Illinois Wildlife Action Plan, Bugwood.org*

*Leslie J Mehrhoff University of Connecticut, Bugwood.org*

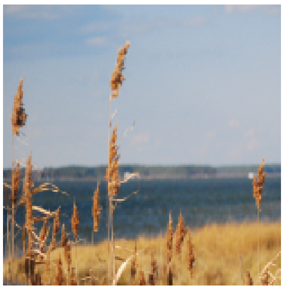
Leaves are dark green with wavy, serrated margins. Oblong, stiff translucent leaves have distinctly wavy edges with fine teeth and 3 main veins. This is a submersed weed with thick roots. It can reach up to 2 meters long, with the flowering spike growing above the water's surface.

Concerns: Curly Leaf Pondweed out-competes native aquatic plant species and reduces diversity which can hinder fish movement and recreational activity.

## Phragmites

(Common Reed) (Phragmites Australis)

*Restricted in Michigan*



*Leslie J Mehrhoff University of Connecticut, Bugwood.org*

*Bernd Blossey Cornell University Bugwood.org*

Leaves are green to grayish-green, flat and smooth. This is a perennial grass that can grow up to 15 feet tall. The flowers grow dense, branched clusters on the end of each stem that are open, and feathery at maturity. This is a native plant, but there is a strain of this species that is thought to be exotic or hybrid and it is quickly replacing the native strain in many areas.

Concern: Phragmites can be difficult to walk through, for humans and wildlife, obstruct landowner's views, reduce native fish and wildlife populations, block out native salt marsh vegetation and can be a fire danger.

## Chara

(Muskgrass)

*Leslie J Mehrhoff University of Connecticut, Bugwood.org*

*Bernd Blossey Cornell University Bugwood.org*

This is an advanced form of algae often mistaken as a submerged flowering plant. It is often called muskgrass or skunkweed because of its foul odor. It is a gray-green color, has no flowers and will not extend above the water surface. It has a grainy or crunchy texture and cylindrical whorled branches with 6-16 branchlets around each node.

Concern: It grows very rapidly and can take over a lake or pond if left untreated. If it takes over it can cause problems for fish habitat, boating and swimming.

## Sago Pondweed

(Stuckenia Pectinata)

*Attribution: Christian Fischer*

*Robert H. Mohlenbrock, hosted by the USDA-NRCS PLANTS Database / USDA NRCS. 1992.*

A perennial plant that arises from thickly matted rhizomes and has no floating leaves. The stems are thin, long, and highly branching with leaves very thin and filament-like. It is generally completely submersed except the reproductive stalk that peaks above the water.

Concern: Dense formations can limit movement of predator fish and inhibit fishing. Because it is considered a harmful plant it can hinder recreational activities and irrigation.

## Large Leaf Pondweed

*Edward G. Voss, hosted by the USDA-NRCS PLANTS Database / USDA NRCS. 1995*

*A. A. Reznicek http://michiganflora.net/image.aspx?img=18873&id=2320*

This plant has thick, large stems and broad leaves. The submerged leaves appear wavy and taper toward the stem. Floating leaves are egg shaped.

Concerns: If it grows out of control it can interfere with recreational activities.

## Purple Loosestrife

(Lythrum Salicaria)

*Restricted in Michigan*

*Linda Wilson University of Idaho, Bugwood.org*

*John D Byrd Mississippi State University, Bugwood.org*

This is a perennial herb with a woody, square stem. Leaves are arranged in whorls. They are lance shaped, stalk less and heart shaped or rounded at the base. The plant can grow from 4-10 feet along roadsides and in wetlands. They produce magenta colored flower spikes with 5-7 petals.

Concern: With the right conditions, they can rapidly establish and replace native vegetation. This can lead to a reduction in plant diversity which can have a negative effect on wildlife.

**Water Quality**

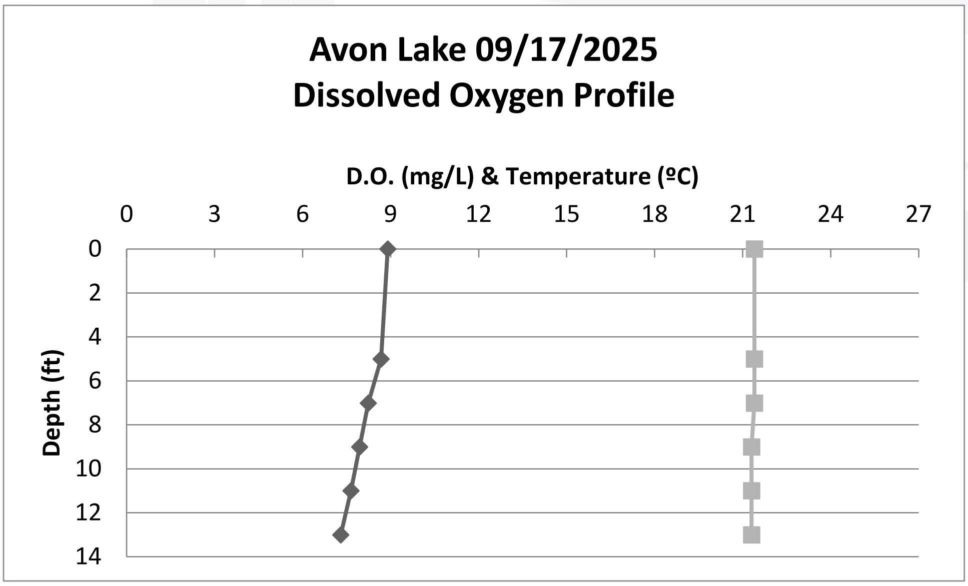
Avon Lake had water samples taken on May 5th and September 17th. Water samples were taken at 2 sites for water quality testing. Thirteen parameters were analyzed from the water samples at these sites for this report. Of the parameters tested, Temperature, Dissolved Oxygen, Secchi Disk, and pH were sampled while on the lake. Chlorophyll α, Nitrate-N, Phosphorus, Alkalinity, Conductivity, Total Kjeldahl Nitrogen, Orthophospate, Total Dissolved Solids, and Total Suspended Solids were sampled by sending the water in sample bottles to an independent laboratory, White Water Associates located in Amasa, MI, where the analysis was run. A complete lake profile for temperature and dissolved oxygen only was taken from site 2, which is the deepest part of the lake.

A well known limnologist named Wally Fusilier developed a grading scale for various parameters of water quality. Data collected in 2023 is shown below and nine of the parameters analyzed were given a grade based on Fusilier's scale. Additionally, the trophic state index is quantified. This index is used to generalize the biological productivity of a waterbody. The 3 main trophic states for a lake are oligotrophic (low productivity), mesotrophic (medium productivity), and eutrophic (high productivity). The index is calculated based on only chlorophyll α, total phosphorus, and secchi disk values.


*(Water Quality Sampling Sites)*

| Date: 5/5/25 | Surface | Surface | | | |
|---|---|---|---|---|---|
| **Site Number:** | **1** | **2** | | **Average** | **Grade** |
| Chlorophyll α (ug/L) | 0 | 0 | | 0.00 | A |
| Total Phosphorus (ug/L) | 30 | <20 | | 20.00 | A |
| Nitrate-N | <130 | <130 | | <130 | A |
| Alkalinity (mg/L) | 170 | 170 | | 170 | A |
| pH | 8.17 | 8.06 | | 8.12 | A |
| Conductivity (umhos/cm) | 630 | 640 | | 635 | C |
| Secchi Disk Depth (meters) | 2.99 | 3.05 | | 3.0 | C |
| Surface Temp (ºC) | 16.6 | 16.4 | | 16.50 | A |
| Surface D.O. (mg/L) | 13.1 | 12.23 | | 12.67 | B |
| | | | | | |
| **TSI** | **Value** | | **Trophic State** | | |
| Secchi Disk | 44.1 | | Mesotrophic | | |
| Chlorophyll α | ND | | Oligotrophic | | |
| Total Phosphorus | 47.3 | | Mesotrophic | | |
| | | | | | |
| Additional Parameters | | | | | |
| **Site Number:** | **1** | **2** | | **Average** | |
| Orthophosphate-P (ug/L) | <10 | <10 | | <10 | |
| Total Kjeldahl Nitrogen (mg/L) | 0.52 | 0.49 | | 0.505 | |
| Total Dissolved Solids (mg/L) | 330 | 340 | | 335 | |
| Total Suspended Solids (mg/L) | ND | ND | | Not Detected | |

| Date: 9/17/2025 | Surface | Surface | | | |
|---|---|---|---|---|---|
| Site Number: | 1 | 2 | | Average | Grade |
| Chlorophyll α (ug/L) | 0 | 1.3 | | 0.65 | A |
| Total Phosphorus (ug/L) | <20 | <20 | | <20 | A |
| Nitrate-N | <130 | <130 | | <130 | A |
| Alkalinity (mg/L) | 130 | 130 | | 130 | A |
| pH | 8.66 | 8.68 | | 8.67 | C |
| Conductivity (umhos/cm) | 550 | 530 | | 540 | B |
| Secchi Disk Depth (meters) | 4.11 | 4.27 | | 4.2 | B |
| Surface Temp (ºC) | 23.3 | 22.6 | | 22.95 | A |
| Surface D.O. (mg/L) | 8.04 | 8.38 | | 8.21 | A |
| | | | | | |
| **TSI** | **Value** | | **Trophic State** | | |
| Secchi Disk | 39.4 | | Oligotrophic | | |
| Chlorophyll α | 26.4 | | Oligotrophic | | |
| Total Phosphorus | 37.4 | | Oligotrophic | | |




| Temp (ºC) | D.O. (mg/L) | Depth (ft) |
|---|---|---|
| 21.4 | 8.9 | 0 |
| 21.4 | 8.68 | 5 |
| 21.4 | 8.24 | 7 |
| 21.3 | 7.94 | 9 |
| 21.3 | 7.65 | 11 |
| 21.3 | 7.3 | 13 |

The dissolved oxygen profile suggests that a thermocline did not develop in 2025. This is not uncommon for lakes of Avon's size and shallowness.

**Parameter Descriptions:**

**TEMPERATURE AND DISSOLVED OXYGEN**

Temperature exerts a wide variety of influences on most lakes, such as the separation of layers of water (stratification), solubility of gases, and biological activity.

Dissolved oxygen is the parameter most often selected by lake water quality scientists as being important. Besides providing oxygen for aquatic organisms in natural lakes, dissolved oxygen is involved in phenomena such as phosphorus precipitation to, and release from, the lake bottom sediments and decomposition of organic material in the lake.

Low dissolved oxygen concentrations (below 4 milligrams per liter) are generally insufficient to support fish life. In most Michigan lakes, there is no dissolved oxygen below the thermocline in late summer. Some experts like to see some dissolved oxygen in the bottom water of a lake, even if it is almost zero. This is because as long as there is some dissolved oxygen in the water at the bottom of the lake, phosphorus precipitated by iron to the bottom sediments will remain there. Once a lake runs out of dissolved oxygen in the water at the bottom iron comes back into solution. When that happens, it releases the phosphorus back into the water. This can cause additional algae to grow when the lake mixes.

**DISSOLVED OXYGEN, PERCENT SATURATION**

Because the amount of dissolved oxygen a water can hold is temperature dependent with cold water holding more than warm water, dissolved oxygen saturation is often a better way to determine if oxygen supplies are adequate. The best is between 90 and 110 percent.

**CHLOROPHYLL α**

Chlorophyll α is used by lake scientists as a measure of the biological productivity of the water. Generally, the lower the chlorophyll α, the better. High concentrations of chlorophyll α are indicative of an algal bloom in the lake, an indication of poor lake water quality. The highest surface chlorophyll α concentration found by Wallace Fusilier (Water Quality Investigators, WQI) in a Michigan lake was 216 micrograms per liter. Best is below one microgram per liter.

**SECCHI DISK TRANSPARENCY (originally Secchi's disk)**

In 1865, Angelo Secchi, the Pope's astronomer in Rome, Italy devised a 20-centimeter (8 inch) white disk for studying the transparency of the water in the Mediterranean Sea. Later an American limnologist (lake scientist) named Whipple divided the disk into black and white quadrants which many are familiar with today.

The Secchi disk transparency is a lake test widely used and accepted by limnologists. The experts generally felt the greater the Secchi disk depth, the better quality the water. However, one Canadian scientist pointed out acid lakes have very deep Secchi disk readings. (Would you consider a very clear lake a good quality lake, even if it had no fish in it? It would be almost like a swimming pool.) Most lakes in southeast Michigan have Secchi disk transparencies of less than ten feet. On the other hand, Elizabeth Lake in Oakland County had 34 foot Secchi disk readings in summer 1996, evidently caused by a zebra mussel invasion a couple of years earlier.

Most limnology texts recommend the following: to take a Secchi disk transparency reading, lower the disk into the water on the shaded side of an anchored boat to a point where it disappears. Then raise it to a point where it's visible. The average of these two readings is the Secchi disk transparency depth.

Secchi disk measurements should be taken between 10 AM and 4 PM. Rough water will give slightly shallower readings than smooth water. Sunny days will give slightly deeper readings than cloudy days. However, roughness influences the visibility of the disk more than sunny or cloudy days.

**TOTAL PHOSPHORUS**

Although there are several forms of phosphorus found in lakes, the experts selected total phosphorus as being most important. This is probably because all forms of phosphorus can be converted to the other forms. Currently, most lake scientists feel phosphorus, which is measured in parts per billion (1 part per billion is one second in 31 years) or micrograms per liter (ug/L), is the one nutrient which might be controlled. If its addition to lake water could be limited, the lake might not become covered with the algal communities so often found in eutrophic lakes.

Based on WQI's studies of many Michigan inland lakes, they've found many lakes were phosphorus limited in spring (so don't add phosphorus) and nitrate limited in summer (so don't add nitrogen).

10 parts per billion is considered a low concentration of phosphorus in a lake and 50 parts per billion is considered a high value in a lake by many limnologists.

**NITRATE NITROGEN**

Nitrate, also measured in the parts per billion range, has traditionally been considered by lake scientists to be a limiting nutrient. The experts felt any concentration below 200 parts per billion was excellent in terms of lake water quality. The highest value found by Fusilier was 48,000 parts per billion in an Ottawa County River which flowed into Lake Macatawa in Holland, Michigan

On the other hand, WQI has studied hundreds of Michigan inland lakes, and many times they find them nitrate limited (very low nitrate nitrogen concentrations), especially in summer.

WQI was finding many lakes have lower nitrate nitrogen concentrations in summer than in spring. This is probably due to two factors. First, plants and algae growing in lakes as water warms can remove nitrates from the water column. And second, bacterial denitrification (where nitrates are converted to nitrogen gas by bacteria) also occurs at a much faster rate in summer when the water is warmer.

Generally, limnologists feel optimal nitrate nitrogen concentrations (which encourage maximum plant and algal growth) are about 10-20 times higher than phosphorus concentrations. The reason more nitrogen than phosphorus is needed is because nitrogen is one of the chemicals used in the production of plant proteins, while phosphorus is used in the transfer of energy, but is not used to create plant material. If the nitrate concentration is less than 10-20 times the phosphorus concentration, the lake is considered nitrogen limited. If the nitrate concentration is higher than 10-20 times the phosphorus concentration, the lake is considered phosphorus limited.

**TOTAL ALKALINITY**

Alkalinity is a measure of the ability of the water to absorb acids (or bases) without changing the hydrogen ion concentration (pH). It is, in effect, a chemical sponge. In most Michigan lakes, alkalinity is due to the presence of carbonates and bicarbonates which were introduced into the lake from ground water or streams which flow into the lake. In lower Michigan, acidification of most lakes should not be a problem because of the high alkalinity concentrations.

**HYDROGEN ION CONCENTRATION (pH)**

pH has traditionally been a measure of water quality. Today it is an excellent indicator of the effects of acid rain on lakes. About 99% of the rain events in southeastern Michigan are below a pH of 5.6 and are thus considered acid. However, there seems to be no lakes in southern Michigan which are being affected by acid rain. Most lakes have pH values between 7.5 and 9.0.

**SPECIFIC CONDUCTIVITY**

Conductivity, measured with a meter, detects the capacity of a water to conduct an electric current. More importantly however, it measures the amount of materials dissolved in the water, since only dissolved materials will permit an electric current to flow. Theoretically, pure water will not conduct an electric current. It is the perception of the experts that poor quality water has more dissolved materials than does good quality water

**Orthophosphate**

Another common name for orthophosphate is "reactive phosphorus". Orthophosphate is the form of phosphate available to living organisms. For example, orthophosphate is the phosphorus form that is directly taken up by algae. Thus, the amount of orthophosphate in the amount available for potential algal growth.

**Total Kjeldahl Nitrogen (TKN)**

TKN is the amount of nitrogen in the water in the form of ammonia and in all biological forms. The higher the value, the more likely a problem exists such as algae blooms and less oxygen.

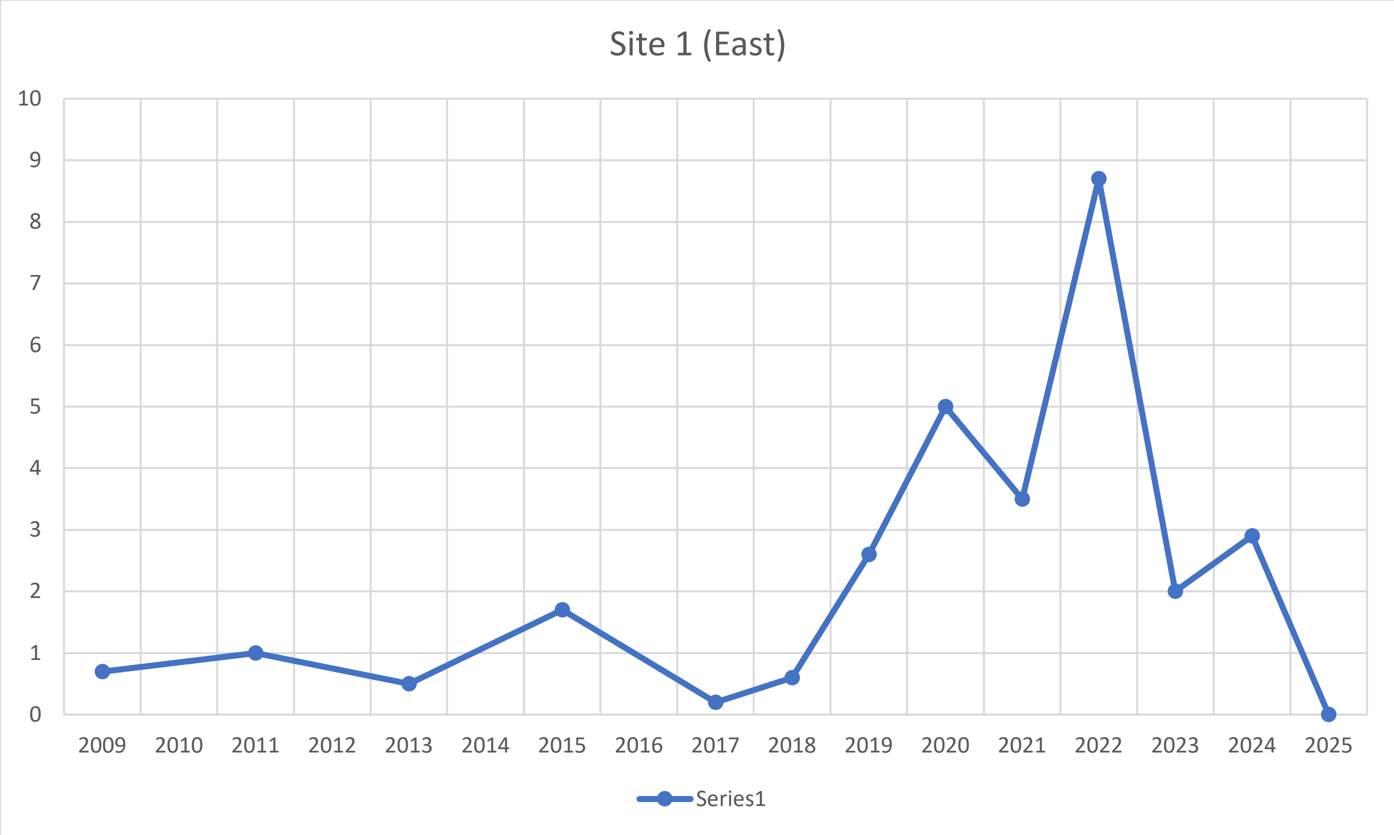
**Total Dissolved Solids (TDS)**

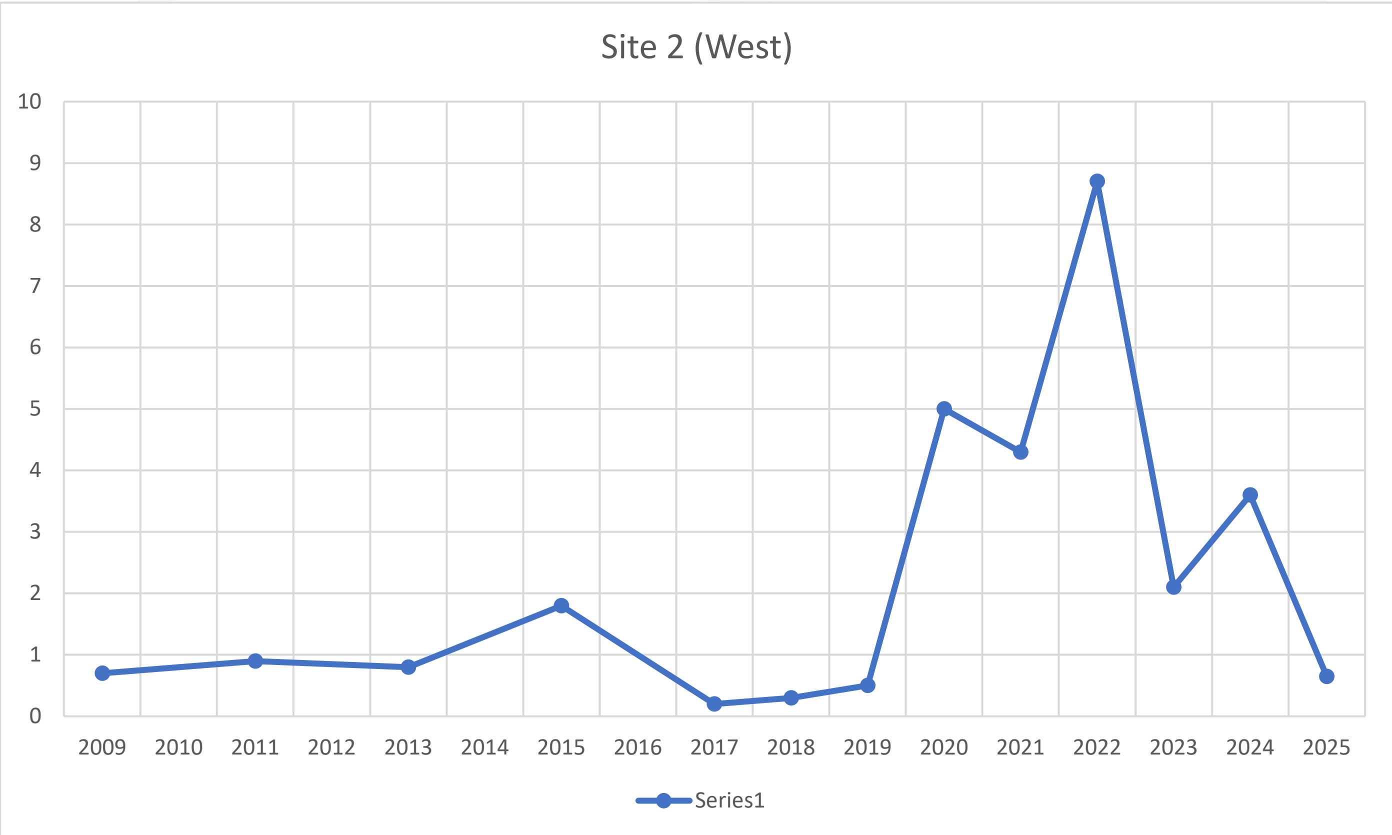
Total dissolved solids is the amount of dissolved organic and inorganic material in the water. Generally higher TDS results in poorer water quality.

**Total Suspended Solids (TSS)**

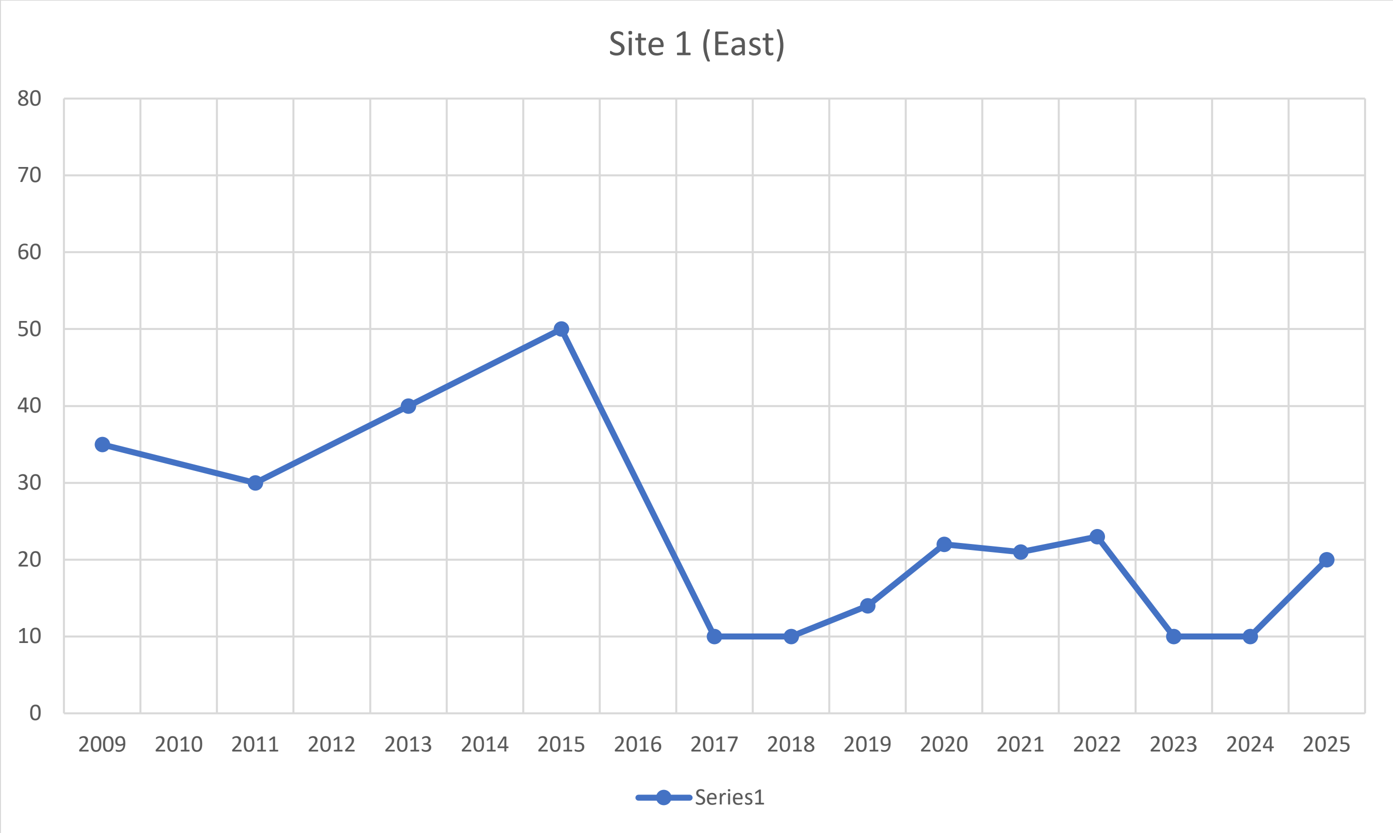
Total suspended solids is the amount of suspended material in the water. Higher levels of TSS will increase water temperatures and decrease dissolved oxygen levels. Suspended particles will absorb more heat from the sun than water will.

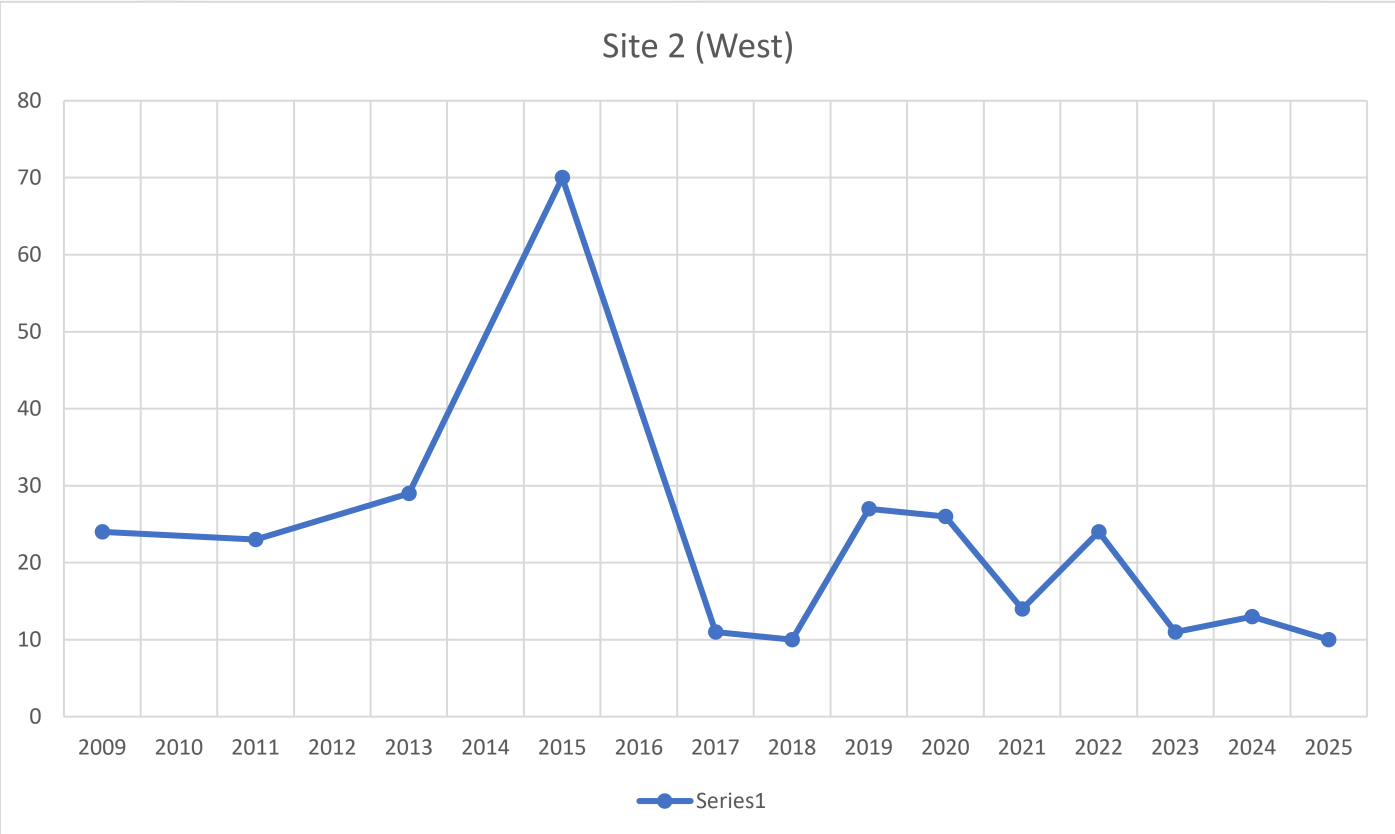
**Chlorophyll-a Trend**



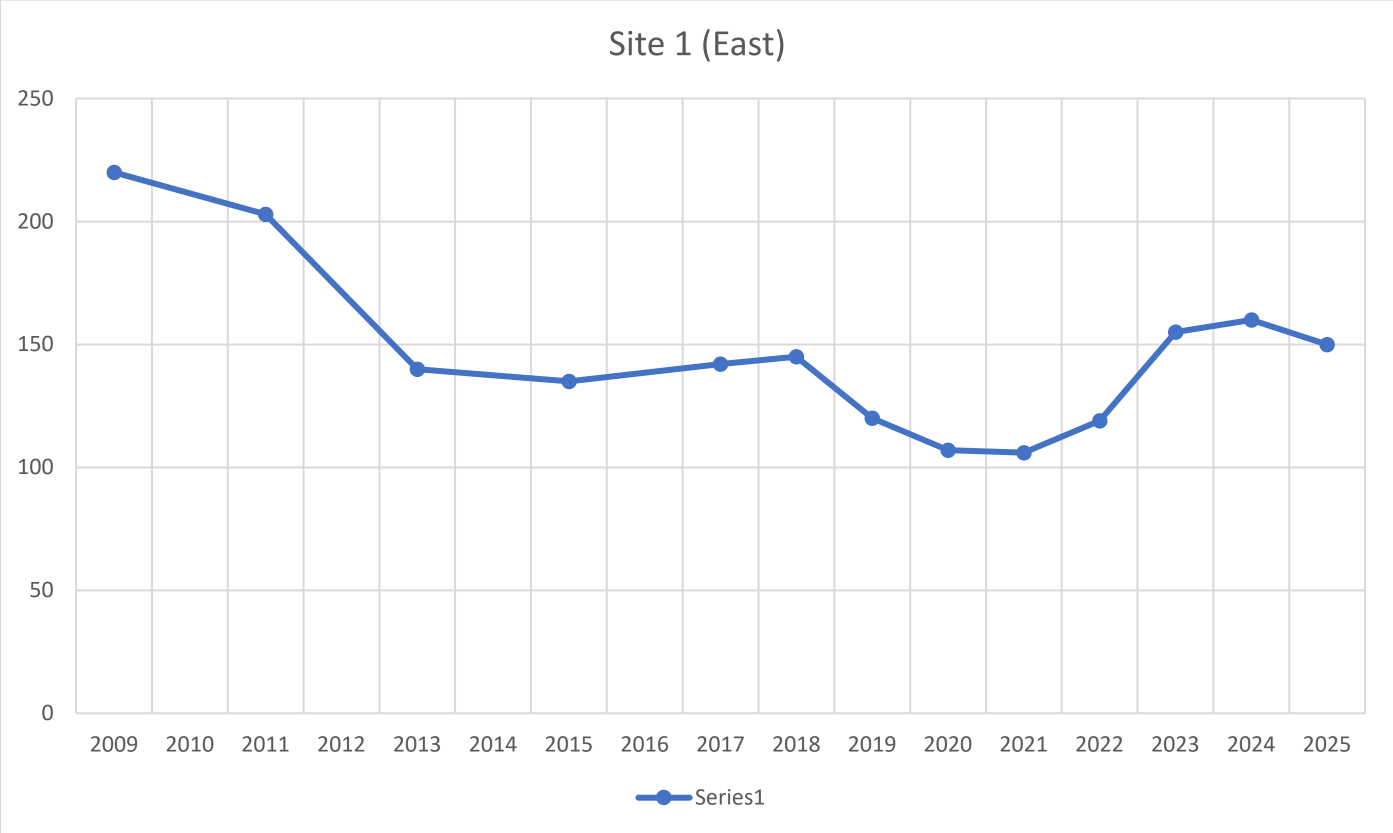



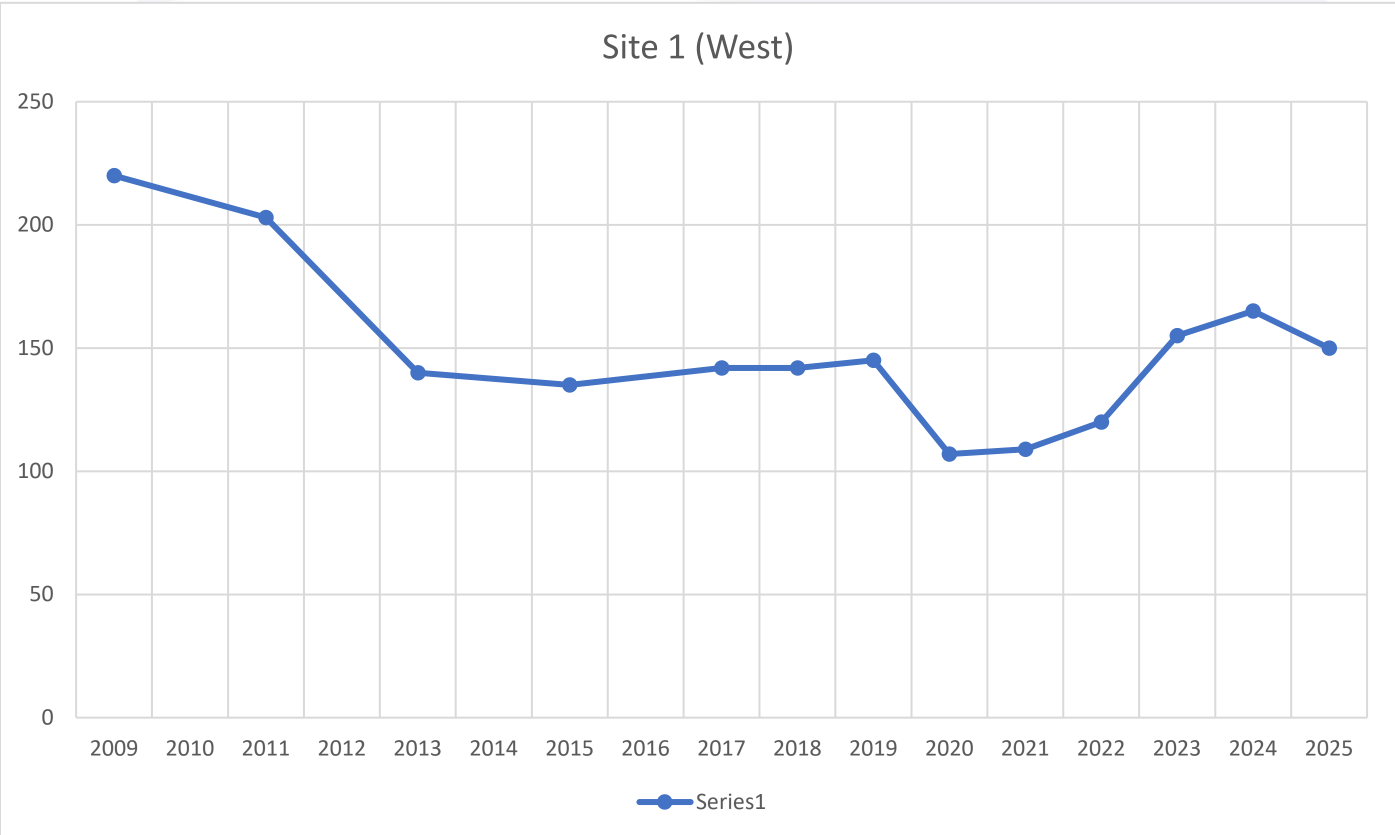
**Total Phosphorus Trend**



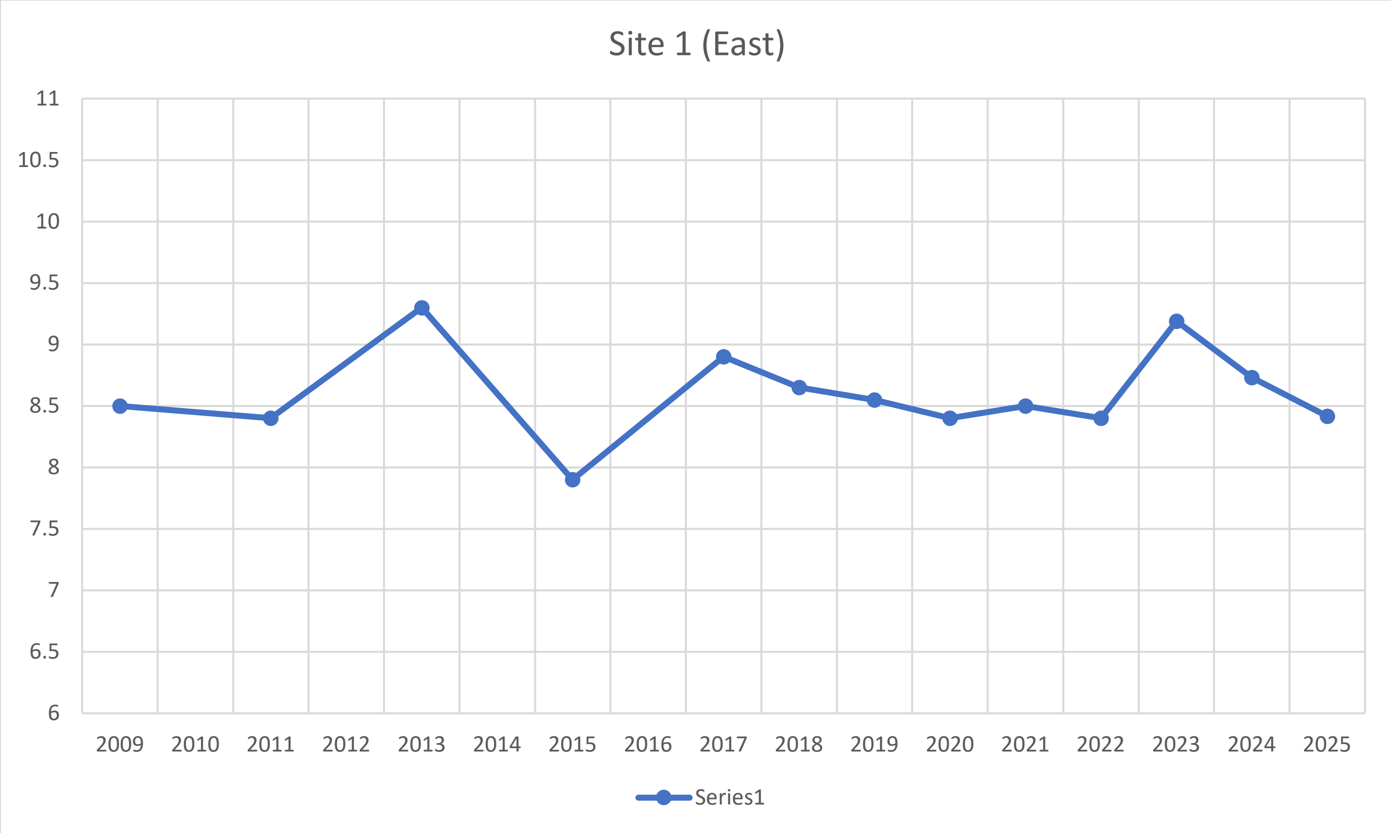



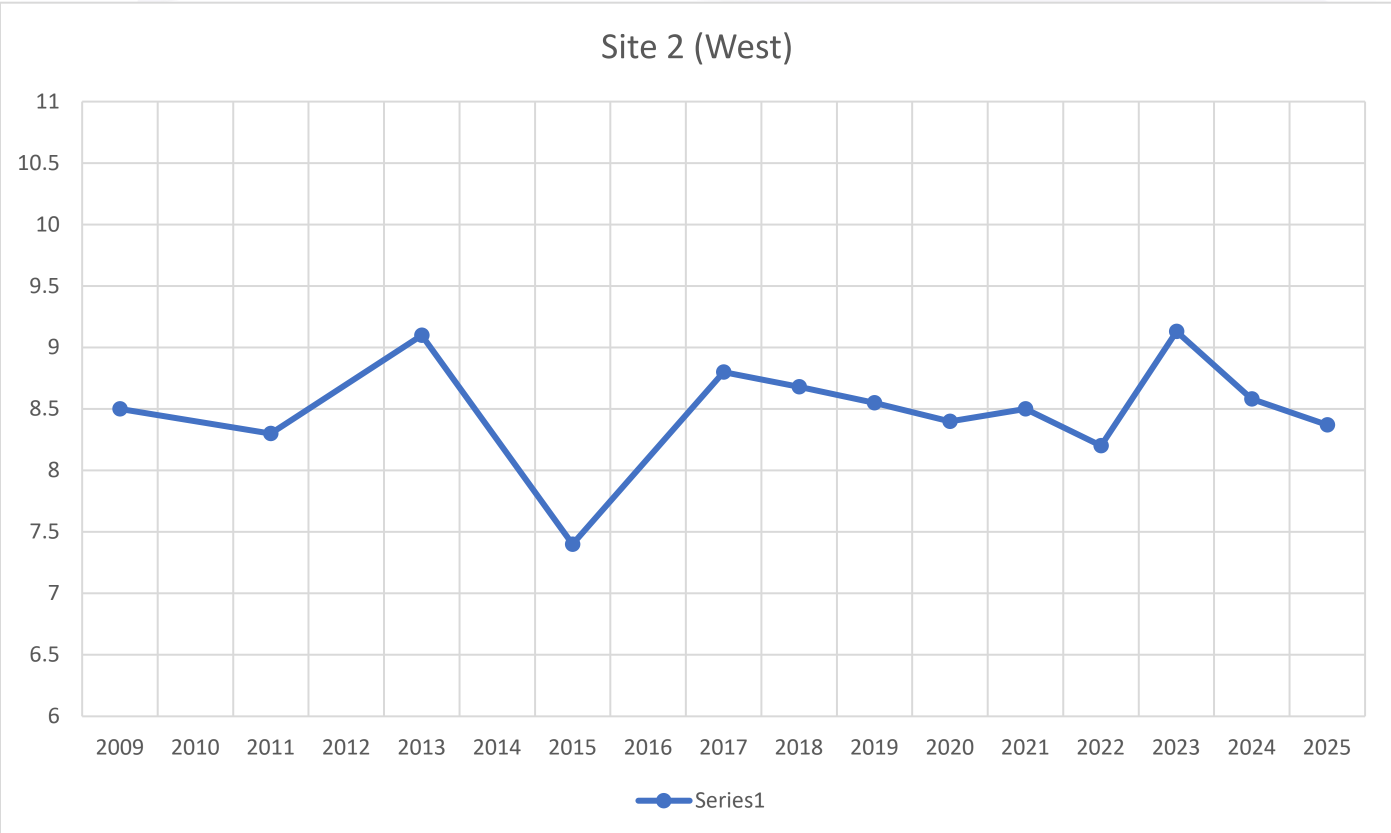
**Alkalinity Trend**



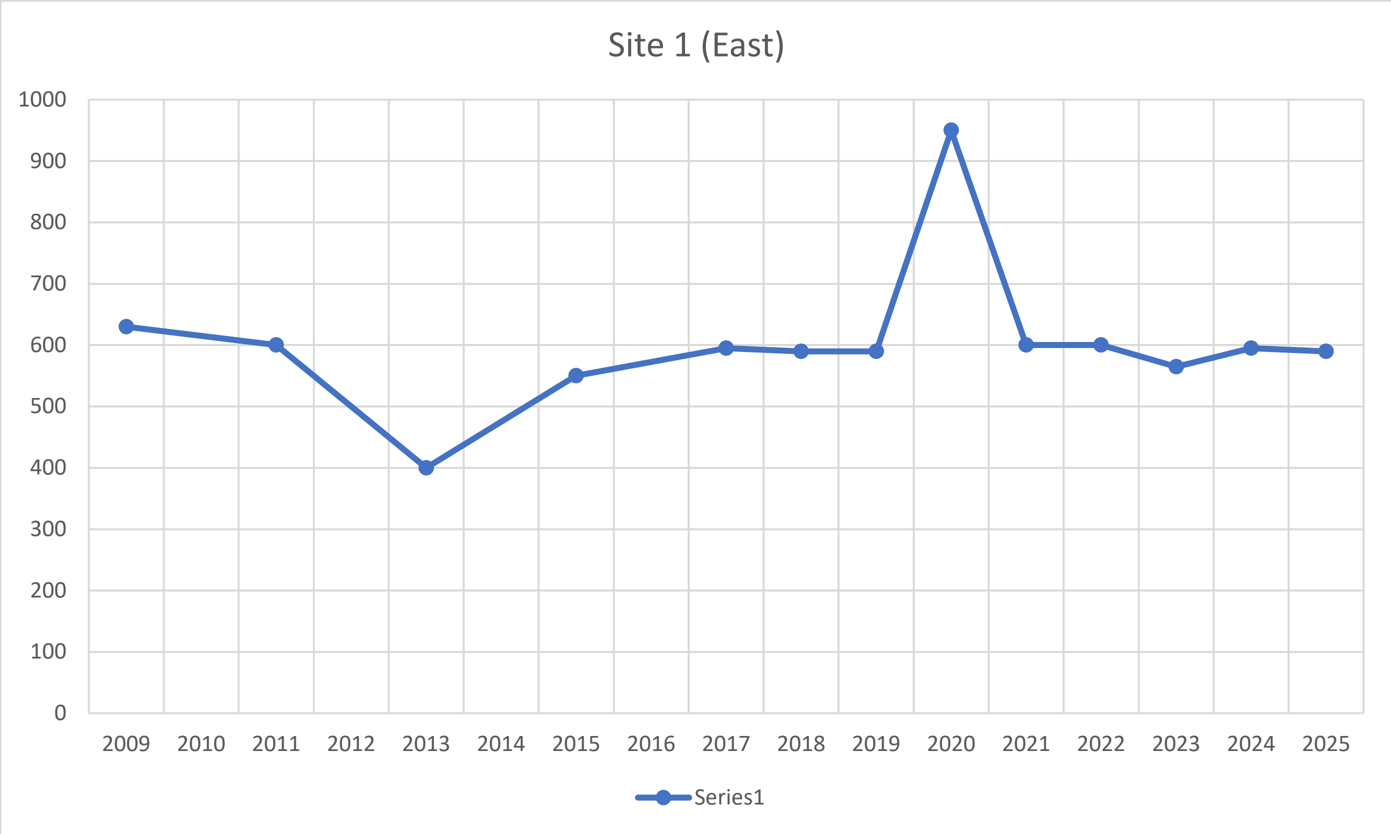



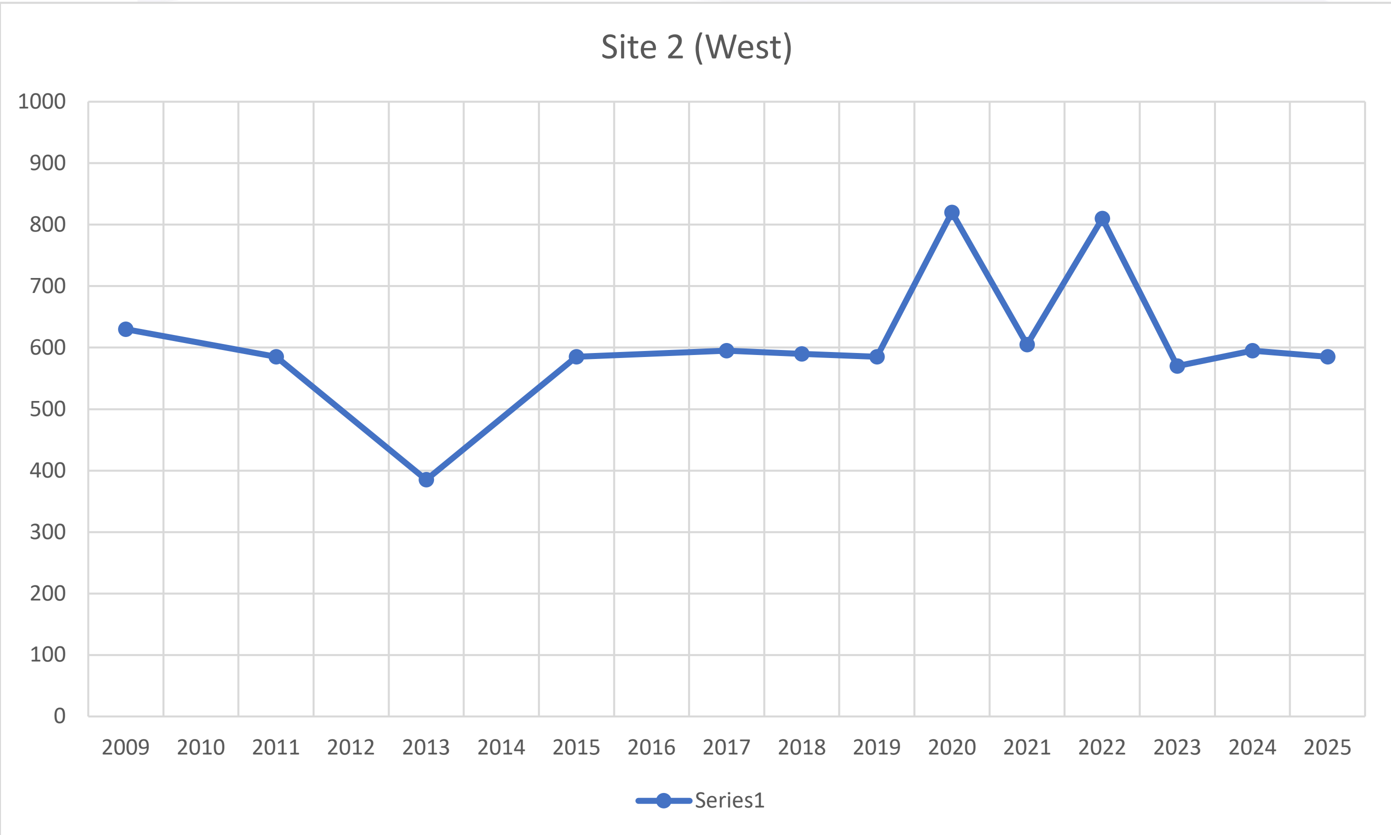
**pH Trend**


Site 1 (East)
11
10.5
10
9.5
9
8.5
8
7.5
7
6.5
6
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025
Series1

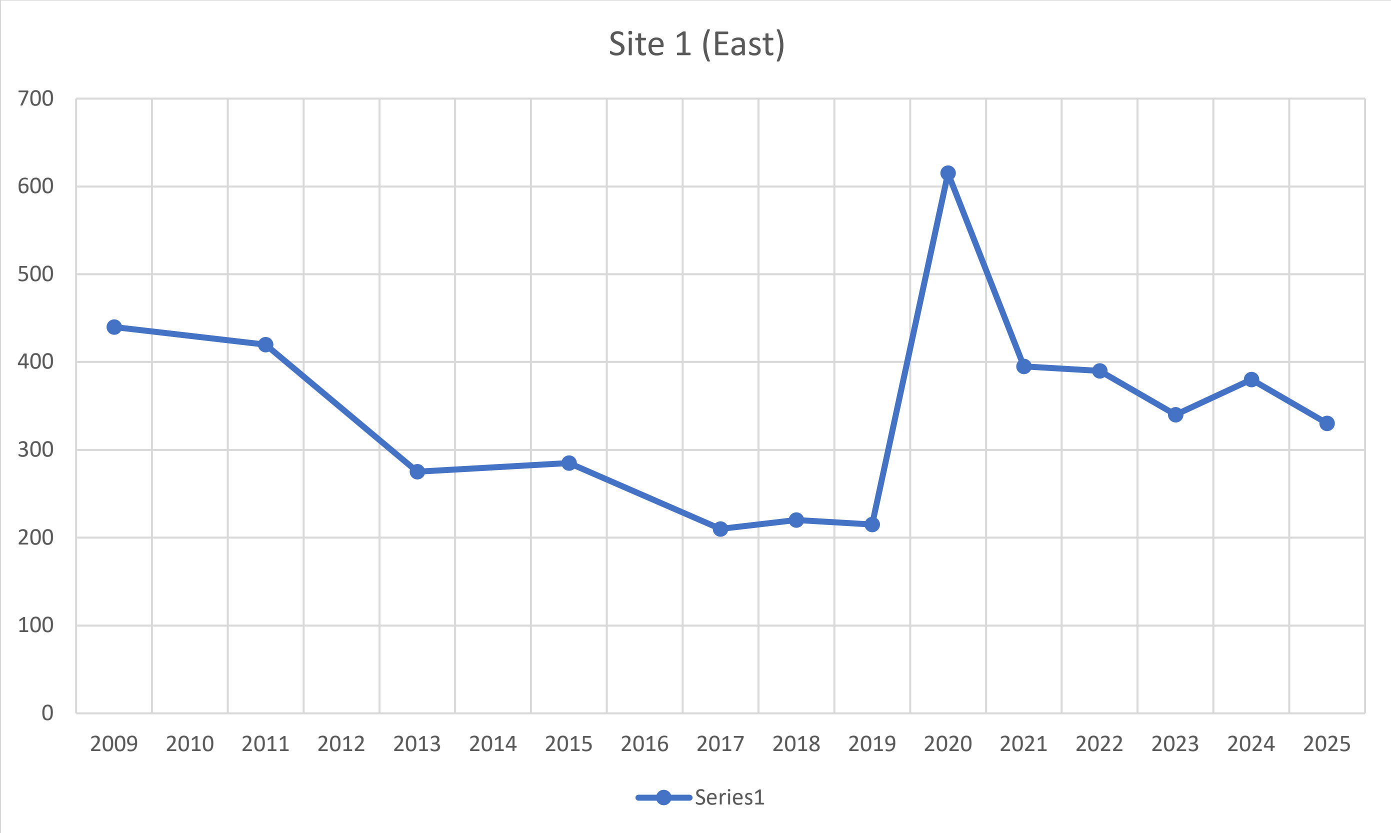

Site 2 (West)
11
10.5
10
9.5
9
8.5
8
7.5
7
6.5
6
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025
Series1

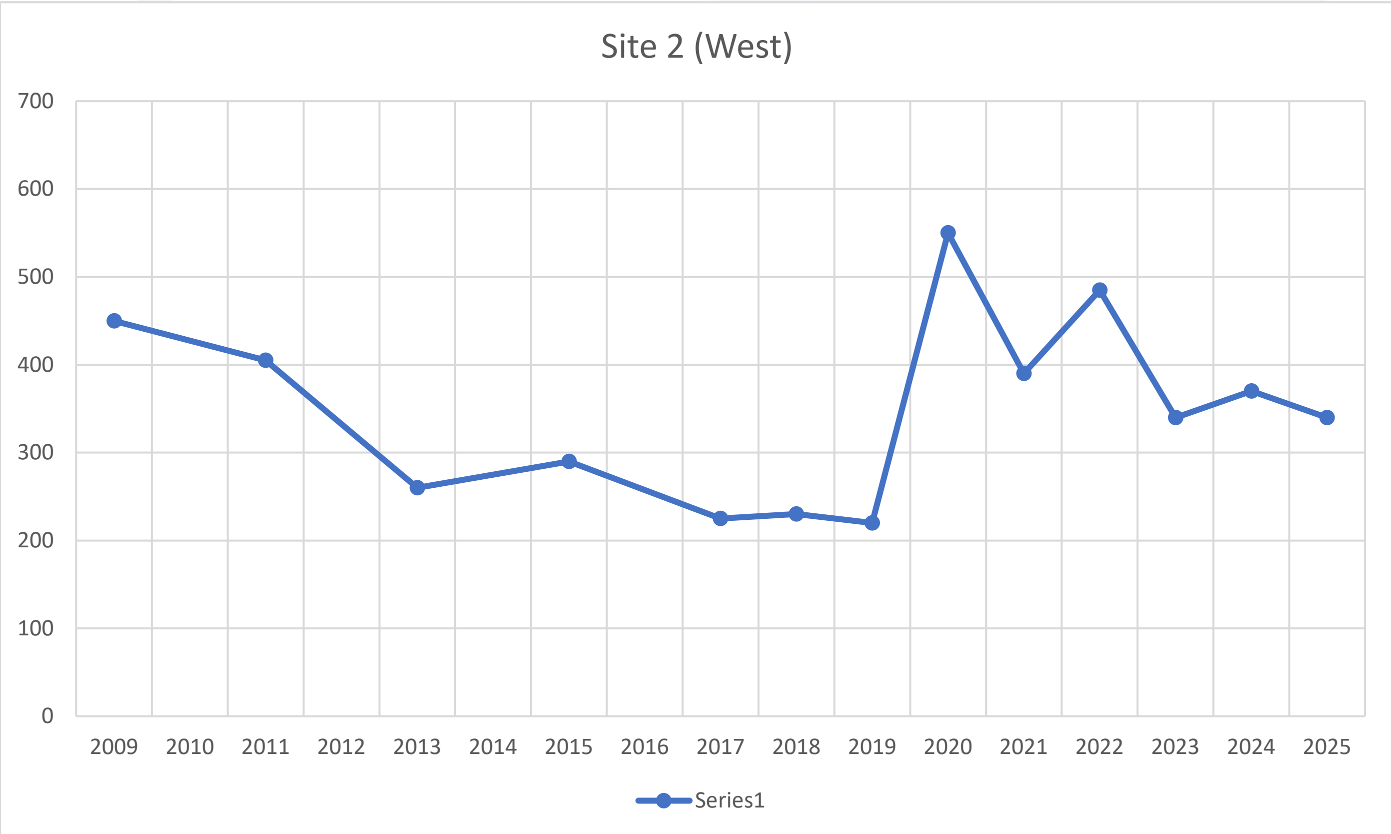
**Conductivity Trend**



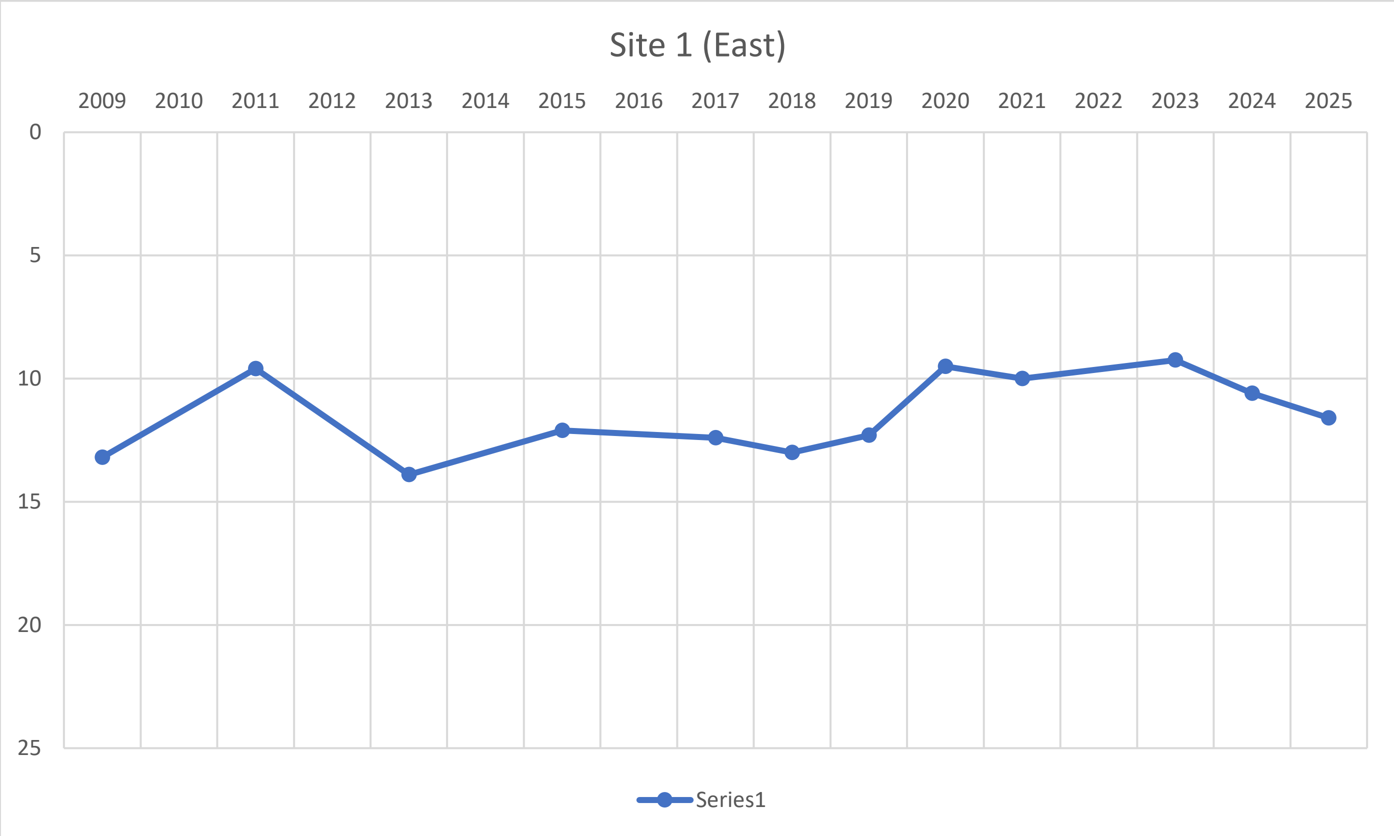



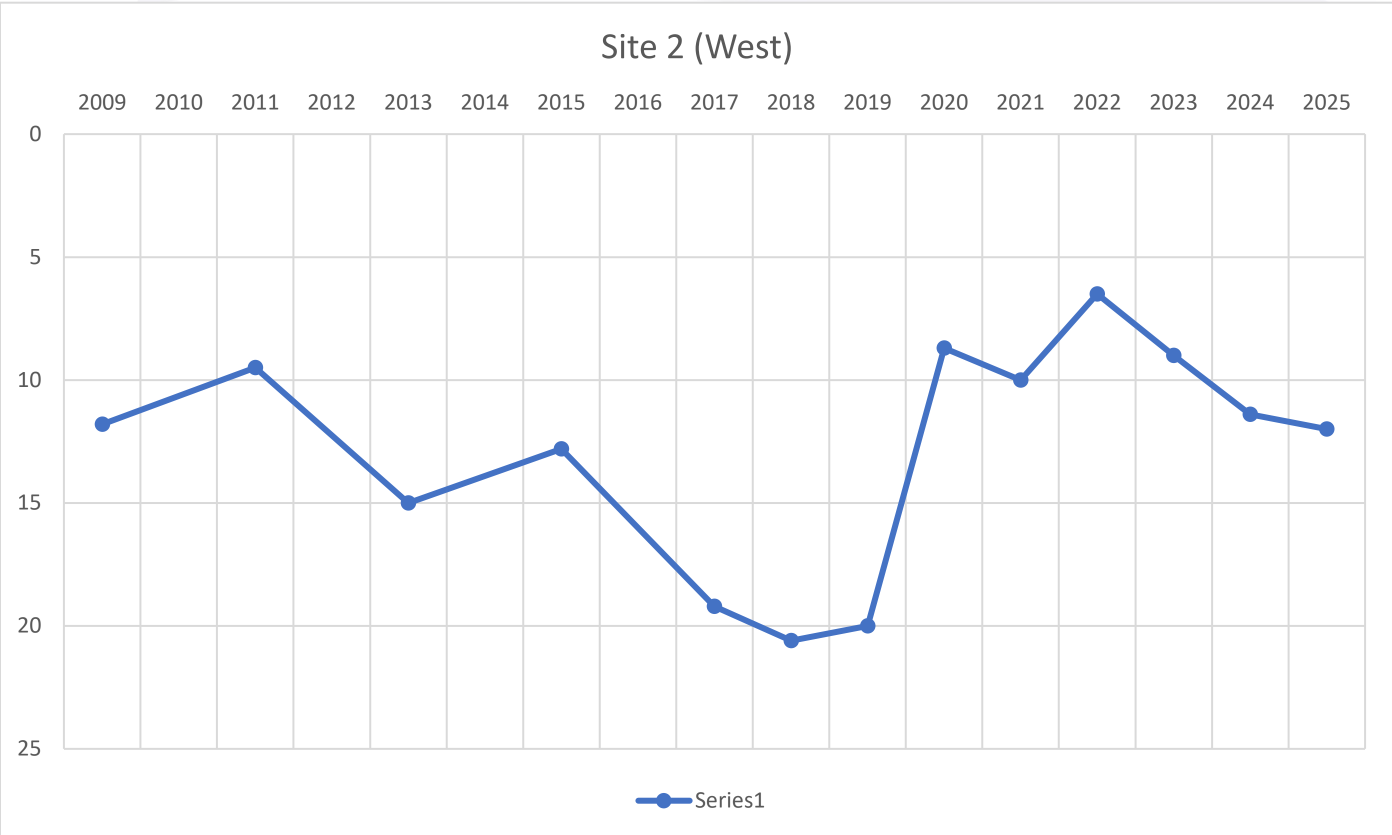
## Total Dissolved Solids Trend



**Secchi Disk Trend**



**Phosphorus Mitigation**

There exists a couple of products that directly capture and remove phosphorus from a waterbody. One set of products will strip the phosphorus from the water column and cap the sediments from internal releasing phosphorus back into the water. A couple examples of this are Allum and Phoslock. Another product that accomplishes a similar strategy is EutroSORB. EutroSORB is a line of multiple products that is designed to capture soluble reactive phosphorus. Each product in the EutroSORB line accomplishes the capture of phosphorus through different means. For instance one product is a large bag filled with the ingredient that is designed capture phosphorus. Water flows through the bag, and phosphorus in the water will bind with the ingredient and settle inside the bag. Once the binding capacity is near its limit, you remove the bag, thus removing the bound phosphorus, and replace a new bag to start the process over. Because of this process, the water entering the lake contains much less available phosphorus for algae to use. Other products help bind phosphorus that is already in the water column, and another product blocks internal loading of phosphorus from sediments.

Through discussing the water quality and sediment characteristics, it was identified that most of the phosphorus used by vegetation and algae in Avon Lake was coming from the sediment. Therefore we utilized a product, Eutrosorb G, that will help remediate this. Eutrosorb G has a high efficiency lanthanum modified bentonite formulation that is designed to eliminate phosphorus being released from the sediment. Due to the cost of the planned project, it needed to completed over two years. Therefore, half of the treatment was completed in 2025 and the remainder will be finished in 2026.

**2026 Avon Lake Management Recommendations**

The 2026 recommendations will follow largely with what was recommended in 2025.

Vegetation surveys and treatments should continue in 2026. Early detection of invasive species is key to have any chance of eliminating the species from the lake. As there is already an established community of curly leaf pondweed that exists throughout Avon Lake, continued early treatments must be done. This will help prevent curly leaf from spreading further. Native vegetation and algae should only be controlled as necessary to alleviate nuisance conditions. Having both native vegetation and algae in a lake is beneficial to its overall health.

Eurasian watermilfoil should be targeted systemically if it is observed again during the spring of 2026. Preventing its establishment in Avon lake is the goal as a systemic herbicide is available.

Due to the phragmites and purple loosestrife being treated around the lake, dead stalks should be cut/removed this winter. We can then monitor any new regrowth this summer and treat accordingly as the year progresses. As the rhizomes (roots) of the phragmites are vast and tough underground, this may occur.

Water quality is also important to continue. It is important to track trending as well as identify any abrupt changes that may occur. The data at this time does not indicate any alarming indices that needs further inspection.

The phosphorus mitigation plan should continue this season. This would potentially help suppress green and blue-green algae growth on the lake, leading to fewer necessary treatments.

We do not have evidence at this time that bacterial augmentation treatments will eliminate any substantial amount of sediment. The lack of organic content and an already low estimated thickness of muck hinder the treatments' effectiveness. Continued use would be to prevent any further accumulation however, rather than eliminating what is there.

Please keep in mind that we are a fully integrated lakes management company offering solutions including but not limited to mechanical harvesting, herbicide control, dredging, bio-augmentation, and aeration. Savin Lake Services also offers a complete range of water quality testing, depth contour mapping, individual property solutions, and even aquatic plant density reporting.

We look forward to working with Avon Lake next year.

Sincerely,

Matthew Novotny

Matthew Novotny
Operations Manager