KIESER & ASSOCIATES
ENVIRONMENTAL SCIENCE & ENGINEERING

Aquest Corporation

A Summary of Findings from LakeScan™
Guided Surveys and Analysis of:

Lower Straits Lake

Oakland County

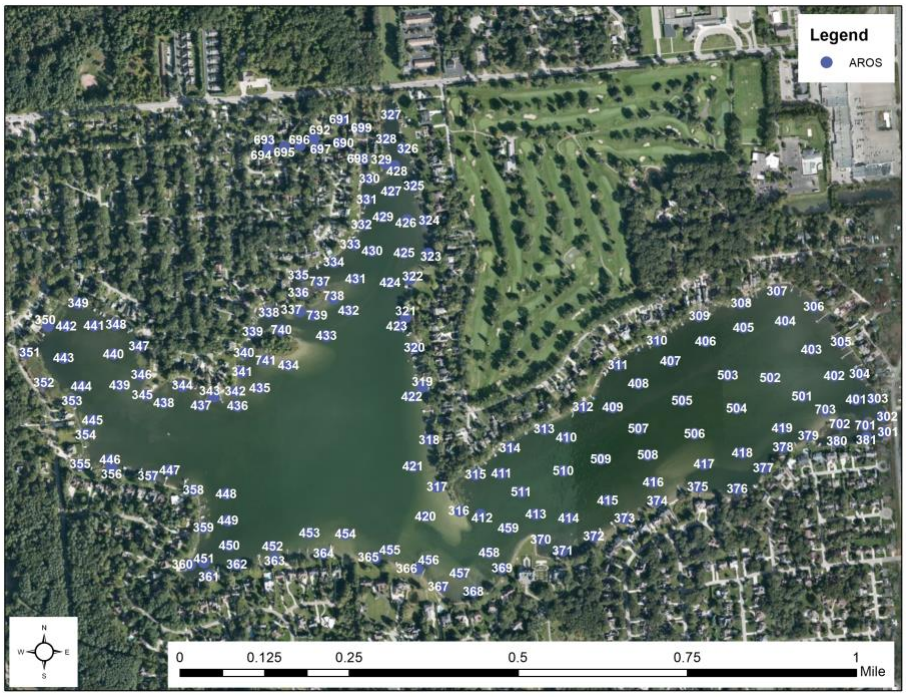
2025 LAKE QUALITY DATA AND ANALYSIS SUMMARY REPORT

2026 MANAGEMENT RECOMMENDATIONS

Submitted by:

Dr. G. Douglas Pullman, Senior Scientist

Aquest Corporation
Kieser & Associates, LLC



LakeScan™

Preface

LakeScan™ provides meaningful assessments of various components of surface water ecosystems or "lake health". It is supported by data analysis and a collection of algorithms that can be used to assess various components of lake ecosystems ranging from open water chemistry, plant and algae communities, critical fisheries habitat and much more. LakeScan™ is a dynamic system that has evolved since it was first developed cooperatively for the assessment of aquatic plant communities by the State of Michigan and Aquest Corp in the early 1990's. The State continues to use that early approach referencing it as the AVAS system.

The data used to create this report was treated and analyzed using the algorithms associated with a new version of LakeScan™ referred to as LakeScan™ 5.0. Most of the changes were made to Category 700 which is focused on submersed aquatic plant communities. There have been considerable advances made in molecular biology and aquatic microbiology in recent years and these demanded that major changes be made to the LakeScan™ system. Those who are familiar with early versions of the system will notice that some metric elements have been suspended and do not appear in this report. Plant species lists have also been modified to address findings related to a review of field observation variations by field personnel and recognizing the role of hybridization in major plant groups. The LakeScan™ 5.0 modifications made to the submersed aquatic plant category represent the biggest change in the system since it was first conceived. These critical changes help to maintain an adaptive approach focusing on providing the most meaningful and relevant assessments of the various systems and mechanisms that make contribute to the function of surface water ecosystems.

This report is divided into three parts, "At a Glance", "Executive Summary", and the main body of the report that begins with the introduction. Each section can stand on it's own, but this does lead to some redundancies since main points needed to be repeated in each section. It is hoped that readers will consume all of the report since the data reported in the main report are critical to understanding the health of the ecosystem. More information on LakeScan™ can be acquired by contacting me directly.

G. Douglas Pullman, Ph.D.

October 2025

Table of Contents

At a Glance …

~ *The Lower Straits Lake Management program is outcome based. This means that the development of management strategies and the outcome expectations are focused on creating and supporting a strong and stable ecosystem that supports a variety of recreational activities and aesthetic perspectives. LakeScan™ monitoring is used to evaluate lake conditions and management outcomes providing empirical data that can be used for numerical and statistical analysis. These data and analysis guide the management team which is comprised of lake resident representatives, lake scientists, township representatives, and intervention contractors (applicators and mechanical device operators).*

~ *Lower Straits Lake lake quality conditions continue to be considered fair in 2025. In recent years, LakeScan™ biodiversity (BioD 60©) values narrowly met expectations; however, the 2024 and 2025 LakeScan™ plant community biodiversity estimates failed to meet these target values. It is encouraging that recent BioD 60© values were still better than the average values from 2010 to present but there is obvious room for improvement. Species richness numbers were consistent with historical values but still missed target values in 2025. Critical habitat (LakeScan™ Morphodiversity) was acceptable and adequate to support a fishery. However, less than optimal lake conditions are certainly and partly responsible the unpredictable rapid rise and decline of nuisance plant conditions in Lower Straits Lake. Better lake conditions create a more stabile ecosystem and provide better predictive capabilities.*

~ *The intensity and area of management intervention (herbicides and harvesting) exceeded levels applied to the lake in recent years by a considerable measure. Nuisance conditions observed in 2024 and 2025 have not been observed in the lake since the early 1990's. Fortunately, a new herbicide combo has provided nearly season-long relief from the nuisance production of watermilfoil and curly leaf pondweed. Mechanical harvesting was used for the removal of a substantial quantity of plant biomass, comprised of watermilfoil and curly leaf pondweed, prior to the Memorial Day holiday. Watermilfoil regrowth was rapid in the last two years and nuisance conditions reappeared by early/mid-June, but were adequately addressed with herbicide applications. The total AROS acres afflicted by invasive watermilfoil was very high in 2024 and 2025. The cost of species selective herbicide controls has exceeded levels seen in recent decades. Harvesting will be suspended in 2026 to divert resources to the surging ebrid watermilfoil problem.*

~ *An aggressive herbicide application approach is once again recommended for the management of exotic and invasive curly leaf pondweed and ebrid watermilfoil in 2026.*

~ *The canals at AROS 600 are managed on an "as needed" basis requiring coordination between canal area residents and the management team. A late season application of a nutrient deactivator was completed in 2024 and had a profound impact on the occurrence of nuisance filamentous algae blooms that have historically created problems in these areas of the lake. Follow-up treatments with nutrient deactivation compounds will be considered for 2026 to buttress the effect first observed in 2025.*

~ *Nuisance water lily growth is managed in the late summer on a rotating basis around the lake perimeter. Approximately 1/3 of waterlily productive areas are treated each year. The program was suspended in 2025 due to budget restraints caused by the extraordinary bloom of ebrid watermilfoil.*

Executive Summary

Lake Condition Review

The overall goal of the Lower Straits Management and Improvement Program is to create stabile ecosystem conditions that provide acceptable and sustainable recreational opportunities, minimize opportunities for hazardous algae blooms, and support a reasonable and rewarding fishery. Extensive LakeScan™ monitoring has been conducted each year, for several decades to provide the empirical data that are fundamental to make certain that the goals of management plan are adequately addressed. The variable nature of lakes and aquatic plant communities demand that the management intervention objectives that are established each year be adaptive and that they address the unique concerns and potential impairments that emerge each summer. Management objectives and decisions are made by consensus agreement of the Lower Straits management team which includes contractors (chemical applicators, harvester operators, etc.), lake resident and township representative(s), with the guidance of professional monitoring and management professionals. The Lower Straits improvement program is based on a "no excuses", outcome-based plan, meaning that management tools are selected each year are tailored to achieve predetermined lake management goals and create a more diverse and stabile ecosystem. All options and technologies are considered within the constraints and confines of available monies, relative value, regulatory and safety concerns, and the expressed needs of the Lower Straits Lake resident community.

Because Lower Straits Lake is shallow, the sediments and large plant communities are the primary determinants of the quality of the lake. Water chemistry measurements were done by Aquest in the past and these data have affirmed this assertion. The large plant community in Lower straits lake is the primary driver of over-all lake conditions and Lower Straits Lake has been afflicted by the presence of both ebrid watermilfoil (Eurasian watermilfoil and hybrids) and curly leaf pondweed since it was first surveyed by Dr. Pullman in 1988. Ebrid watermilfoil suppression is recurrent and the keystone of the management program. Starry stonewort was first identified in the lake in 2006 and it quickly became a nuisance but has not constituted a significant nuisance since 2015. Each year, every possible and permitted management approach is considered to improve conditions on the lake and to provide the best value possible using the funds available to improve the lake ecosystem. For example, a 7-acre area of the lake was reserved for the evaluation of a relatively new aquatic herbicide known as ProcellaCOR in 2021. The outcome of the treatment was very positive, but no better than existing approaches that can be implemented at far less cost. Areas were set aside in 2022 as a demonstration of how mechanical aquatic plant harvesting might be used to enhance the management program by suppressing nuisance conditions prior to the Memorial Day holiday. The assessment revealed mixed results. The total AROS acres afflicted with nuisance ebrid watermilfoil surged in 2024. Levels were nearly as high in 2025. Resources will need to be redirected toward species selective ebrid watermilfoil management in 2026 and mechanical harvesting operations will be suspended.

Despite some of the funding constraints that have existed in many years, the management program has been remarkably successful in suppressing nuisance conditions caused by exotic invasive plant species for most of each summer recreational use season since the late 1980's. Since 1988, primary, annual management objectives have been focused on the selective

management and suppression of nuisance exotic watermilfoil and curly leaf pondweed. These objectives have not only focused on the mitigation of nuisance conditions but have focused on the protection of the 8 to 12 native plant species that are typically found in the lake but provide ecosystem benefits while being largely inconspicuous. Monitoring data show that the quality and habitat value of the Lower Straits submersed plant community has been sustained and generally improved as a consequence of judicious management. The ecosystem has been stabilized by these efforts as the lake has also been improved for recreational pursuits, including fishing. However, there is still room for improvement and continued efforts must be made to improve lake conditions metrics and prevent the rapid swings in nuisance conditions that have been characteristic of the past two years. Despite these considerable efforts, there are still no known means, technologies, or ways to eradicate ebrid watermilfoil, curly leaf pondweed, or starry stonewort once they have become established in a lake.

Management Review 2025 and Projected 2026 Management Recommendations

The exotic invasive species, ebrid watermilfoil and curly leaf pondweed are expected to be present in Lower Straits Lake at the extreme nuisance levels, beginning in early May 2026 as has been observed in recent years. Curly leaf pondweed has emerged much earlier Lower Straits Lake than ebrid watermilfoil for the past several years and has been observed at extreme nuisance levels before ebrid watermilfoil becomes highly conspicuous. A very large-scale herbicide treatment was made in June 2025 to mitigate nuisance conditions. A late season species selective herbicide treatment was made to select acres in the lake in August, 2025. It is hoped that the late season treatments made in 2025 will delay the rise of nuisance conditions in those treated areas and improve treatment outcomes in 2026 as herbicide treatments might be delayed until the second week of June (later treatments = better outcomes). Starry stonewort is another exotic plant that had been a serious problem in the lake in previous years, but nuisance production levels have diminished significantly to the point that it has not a major nuisance since 2015. It is not expected that significant effort will be needed to suppress this one-time nuiance species in Lower Straits Lake.

Every submersed aquatic plant management strategy is species selective because individual plant species are more sensitive to the application of a particular strategy or technology and less sensitive to others. Current herbicide technologies permit the selective management of nuisance species while supporting a diverse submersed aquatic plant community that provides significant ecosystem benefits and utilitarian values. It could be said that management interventions are focused on the suppression of 10% of species that create 90% of the problem. Herbicides are often used because they can precisely target the most notorious weedy species and protect the production of a much larger number of desirable species. Like herbicides, mechanical harvesting is also a species selective lake management tool because different species respond differently to cutting. Mechanical harvesting can encourage the growth of some of the most weedy species because they are more tolerant of cutting. Cutting tolerant species include ebrid watermilfoil, while those plants that are more sensitive to cutting include desirable native Michigan species that are needed to stabilize lake ecosystems. However, when mechanical harvesting is used in the context of an integrated aquatic plant community management plan it can greatly enhance the outcomes of the management program.

Mechanical harvesting was added to the management program to see if it could provide relief from nuisance conditions prior to the Memorial Day holiday and before a time when there would be a reasonable expectation of success from the application of species selective herbicides applied to the lake weeks after the harvesting event. Most of the desirable plant species in Michigan inland lakes do not emerge as early in the growth season as do ebrid watermilfoil and curly leaf pondweed and are too low in the water column to suffer any serious adverse consequences from mechanical harvesting operations when harvesting occurs early in the summer. Unfortunately, the regrowth of nuisance ebrid watermilfoil after mechanical cutting was extraordinarily rapid in Lower Straits Lake and nuisance conditions became extreme prior to the application of species selective herbicides in early June during the past two years. Furthermore, the total number of nuisance ebrid watermilfoil AROS acres was approximately 50% greater than what has been observed in the past 20 years. The expansion of these nuisance conditions placed a considerable burden on the management budget. Rapid regrowth and the costs associated with expanded nuisance ebrid watermilfoil control have resulted in the temporary suspension of the mechanical harvesting component of the lake management program.

There are numerous herbicide and adjuvant combinations that can provide exceptional species selective control of ebrid watermilfoil and curly leaf pondweed. Product pricing has increased modestly in recent years as a consequence of supply chain issues and industry trends. The management team will select the most species selective and cost-effective combination of agents for suppression of ebrid watermilfoil and curly leaf pondweed. The selection of agents and timing of the application will be determined after conditions have been reviewed by the entire lake management team and all options are considered.

Water lilies are a critical element in the plant community phyto-architecture that is important for the support of fisheries and ecological stability. MI EGLE policies and regulations constrain the management of waterlilies and limit controls to small 40’ x 40’ areas near boat docks or swimming areas. Selective herbicide treatments are used to manage nuisance waterlily growth in the small areas where controls are permitted. These limited treatments occur in the very late summer and fall when they are most effective and provide treatment for the next summer. Water lily controls were restricted to channels where nuisance growth can restrict boat transit in 2025 due to budget constraints related to the extraordinary bloom of nuisance ebrid watermilfoil.

The canals at AROS 600 are very difficult to manage. As stated previously, they have been and will be treated on an “as needed basis” requiring the cooperation of canal residents who communicate with the management team. Unsightly filamentous nuisance conditions arise unpredictably and quickly in this area of the lake. A newly developed treatment strategy using nutrient deactivation was deployed in 2024 to reduce ecosystem volatility in this area of the lake. Observations of filamentous algae growth made in 2025 revealed conditions that exceeded expectations by a wide margin. The only filamentous algae growth observed in the canals was attached to plant debris and did not originate on the sediments as has been the usual process. Conditions will be closely monitored in 2026 and additional nutrient deactivants may be applied to the canals to reinforce the 2024 treatment outcome.

Thermodynamic conditions are critical considerations for the application of aquatic herbicides and algaecides in the central basin of Lower Straits Lake. This is not normally a primary concern in many lakes but has a dramatic impact on management outcomes in that part of Lower Straits Lake. Extreme herbicide resistance was first noted in 2017. Experience and

guidance from recent scientific literature will be used by the management team in establishing the most effective timing and application methods to provide the best possible management outcomes. New herbicide agents have been introduced that have significantly improved treatment outcomes in recent years. The combination of agents used in 2024 and 2025 provided season long relief from nuisance watermilfoil conditions in 2024 and nearly all-season relief in 2025 except for a few AROS.

LakeScan™ Report on Lower Straits Lake

Introduction

Preface: Lakes are complicated systems. There is no simple way to consider all of the interacting systems within a lake and the impact of watersheds and invasive species invasions on these precious resources. LakeScan™ is a comprehensive system of analysis that is used to properly consider conditions in a lake and make reasonable, scientific and empirically based recommendations for management and improvement of lake ecosystems. All recommendations are based not only on the data presented in this brief report, but are also based on the review of volumes of data collected since the inception of the management program in the late 1980's.

Background: LakeScan™ is a multi-faceted monitoring and analytical system that provides an empirical analysis of lake conditions and critical quality measures. The method includes various assessment categories that include water chemistry, plankton and algae community dynamics, plant community characterization, and fishery related assessments. This analysis provides definitive metrics and relevant perspectives that serve as the basis of management recommendations.

Responsible lake management is measured by results. LakeScan™ monitoring is still the only system available to quantify and enumerate critical ecosystem metrics and conditions in Michigan inland lakes. Limited to the Aquest K&A teams, at this time, Lower Straits Lake has been one of the beneficiary lake communities to receive this type of program service. Not only has the LakeScan™ system been available and employed to provide irrefutable evidence that the lake is being monitored in a meaningful way, but the processes and data generated are also used to discover issues such as the emergence of species hybridity and new plant invasions (starry Stonewort) long before these conditions are typically found in other lakes. These studies allow the evaluation of pre- and post- management intervention outcomes, season-to-season comparisons, critical year-to-year comparisons, and lake-to-lake comparisons and assessments. No lake management program should be conducted without the meaningful empirical evidence to provide meaningful evaluations of the condition of the lake as each management year progresses. Water quality data and mapping are critical components can be a critical component of any lake monitoring plan, but empirical plant community data is foundational for effective plant community management programs.

The Lower Straits program has focused on the maintenance of a desirable large, submersed aquatic plant community for over three decades. Occasionally, water quality parameters (water chemistry and plankton community dynamics) have been evaluated, but considering the inherent qualities of the ecosystem and with limited financial resources, the focus has been aquatic weeds and large plant community improvements. Cost efficiency and values are paramount and the aquatic plant community, LakeScan™ Category 700 metrics are key in the development of Lower Straits Management plan. To invoke a human medicine analogy, one would not necessarily seek out a cardiologist when they have a brain tumor. It could be easily argued that some lake management consultants waste resources on analysis of parameters that are only peripherally related to the primary lake impairments. LakeScan™ provides meaningful and relevant information that is needed to properly manage each lake.

The LakeScan™ method used on Lower Straits Lake calculates a series of metrics representative of the health of the lake ecosystem focused on the nuisance threat presented by invasive and weedy species. The survey data and analysis generated by the LakeScan™ method are used to provide treatment and intervention recommendations, when necessary. Recommendations are made in the context of these data and it is always intended that interventions and actions always result in improvements and ensure no further degradation of the lake ecosystem. Data is reviewed from multiple lake surveys each year and data and observations and in the case of Lower Straits Lake, garnered over more than three decades of data collection and LakeScan™ analysis.

Category 700 Data Collection Methods: Because June and August plant communities can be very different, LakeScan™ analysis involves collecting data over two vegetation surveys (see analysis below). These surveys are based on a system where the lake is first divided into biological tiers (Table 1 and Figure 1) and then further subdivided into Aquatic Resource Observation Sites (AROS; Figure 2). For each survey, field personnel record the density, distribution, and position in the water column of each aquatic plant species or species grouping in each AROS, as well as noting any present nuisance conditions. Early-season surveys are scheduled within the context of applied management interventions to provide additional guidance or assess management intervention efficacy. Scheduling is subject to weather and times of increased boat activity. The late season survey is used to assess the impact of earlier management interventions on the late season plant communities and is occasionally used to direct additional management interventions as may seem appropriate.

Table 1. Biological Tier Descriptions

Tier	Description	Typical Depths	Typical Dominant Vegetation
1	Wetland, Saturated or Sumersed Soils	Shallow and Pooled Water	Emergent Species, Creeping Herbaceous Species
2	Submerged Soils Contiguious to Open Water	Up to 2'	Emergent Species, Dense Floating Leaf Species
3	Lake Near-Shore, Typcially Influenced by Shoreline Trees and Wind and Wave Energy	Shore to 3' to 5'	Submersed, Floating and Floating Leaf Plants
4	Lake Off Shore, Deeper Areas of Modest Slope and Reduced Wind and Wave Actilvity	3' to 8'	Submersed Plants, Some Floating Leaf Plant Species
5	Lake Off Shore Slopping Areas and "Drop Off" Zones	Sloping Areas	Submersed Plants
6	Canals and Channels	1' to 8'	Submersed, Floating and Floating Leaf Plants
7	Lake Islands Near-Shore	Shore to 3' to 5'	Submersed, Floating and Floating Leaf Plants
8	Submersed Shallows not Contiguous with Shoreline	1' to 10'	Submersed Plants

Vegetation Survey Observations: The primary goal of aquatic plant management in Lower Straits Lake, Oakland County, MI, is to preserve, protect, and if possible, improve the biodiversity of the flora and fauna of the lake. Ultimately, conditions should favor critical habitats that support essential ecosystem services and make the lake better for recreation. A valid survey must always include observations collected at each AROS and can be time intensive. Data is collected from boats fitted with specialized equipment and based on observations made visually, with rake-like grapples or hooks (referred to as a Frodis), underwater cameras, and modern side-scan sonar.

Category 100 – Lake and Watershed Characteristics

This section provides an overview of physical and geopolitical characteristics of the lake and its watershed, as well as illustrations of tier layouts (Figure 1) and AROS (Figure 2) used for vegetation surveys. A summary of watershed land-use composition is included in Figure 3. The lake is shallow and all but a few areas are capable of supporting rooted aquatic plant growth.

Location

County: Oakland

Township: Commerce

GPS Coordinates: 42.58356, -83.46297

Morphometry

Total Area: 235 acres

Maximum Depth: 22 feet

Mean Depth 3.8 feet

Watershed Factors

Tributaries: Middle Straits Lake

Water is also pumped into the lake from the Huron River

Outlet type: Dam on northwest corner of the western lobe of the lake

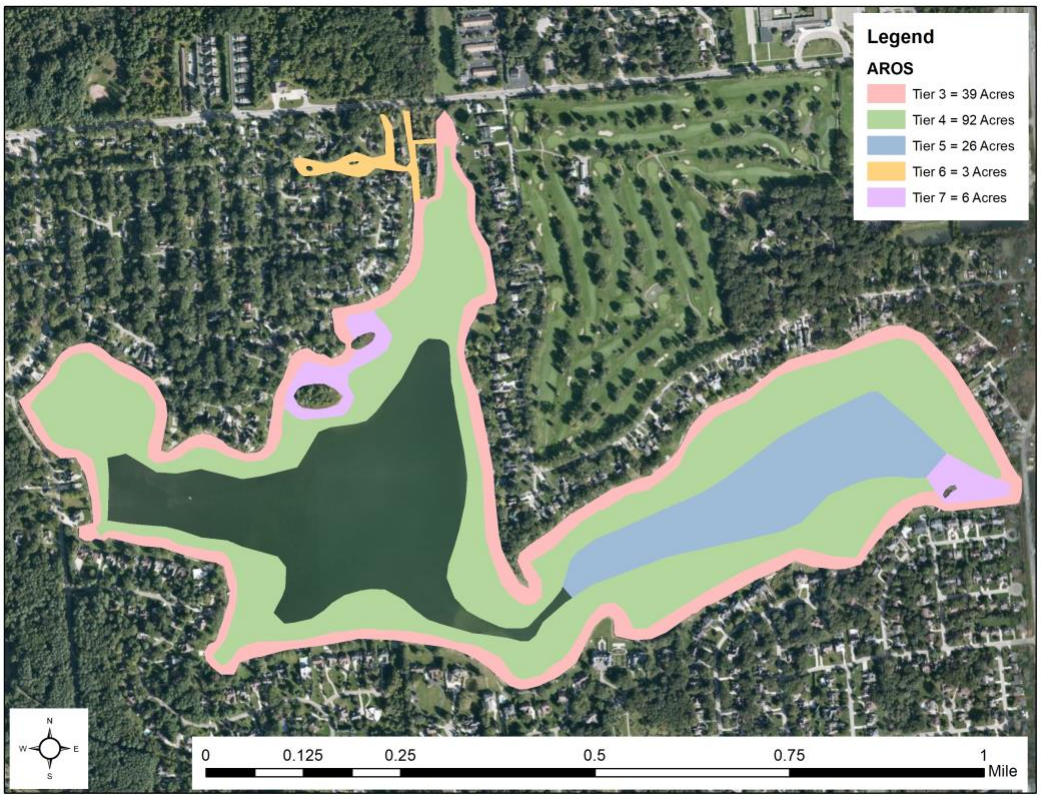


Figure 1. Map of littoral zone biological Tiers. The littoral zone is characterized by parts of the lake that are relatively shallow and can support the growth of rooted and sediment associated higher plants and macrophytic algae. The dark green area is the limnetic or deep area of the lake that too deep to support the production of large plants.

Figure 2. Map of Aquatic Resource Observation Sites (AROS) updated in 2025.

Category 200 – Water Quality

Water quality measurements are acquired occasionally and have been added to the historical record for Lower Straits Lake as points of reference. However, the primary impairments of the lake are related to the invasion of the lake by exotic plant species, and it would be unwise to expend limited resources on professional measures that provide little value to the management program, especially when the occasional findings demonstrate the water quality in the lake is actually reasonably good. However, the Michigan Lakes and Streams Association offers the cooperative lakes monitoring program where basic water quality parameters can be determined at low cost. These data are used to assess the over-all quality of participating Michigan inland lakes. The program requires that a lake resident commit to sampling the lake on a prescribed schedule and by standardized methos. This is highly recommended.

Extensive water quality monitoring was conducted from 1992 to 1993. A wide range of parameters were measured to establish baseline conditions on the lake and to determine key determinants of water quality in Lower Straits Lake. Unsurprisingly, these data revealed water quality conditions in the lake are largely determined by water sediment interactions mediated to a significant degree by vegetation cover and recreational boating activity. It is commonly observed that water transparency and other critical water quality parameter values are influenced and, in some cases, diminished by the suspension of bottom sediments that occurs as a consequence of recreational motor boating activity. These conditions are particularly obvious after weekends. Despite these high levels of cultural and recreational disturbance, nutrient concentrations in the lake do not exceed reasonable levels for a lake in Southeastern Michigan. Based on open water chemistry, the lake would be considered to be moderately productive of suspended algae.

Category 700 – Aquatic Vegetation

This section details findings from the two vegetation surveys that were conducted on the lake. This includes observations, aquatic vegetation mapping, and LakeScan™ analysis metrics as discussed below and presented in various tables and figures.

Preseason LakeScan™ Survey:

The annual pre-season review of lake conditions was conducted on 24 May 2025. It was attended by Aquest and representatives of the resident communities. The township team member, herbicide application contractor and harvesting contractor declined to attend. Harvesting maps were generated previously and were forwarded to the contractor. Treatment maps were generated during this assessment and forwarded to Dave Brown, Solitude for treatment options and dates. The on-going harvesting operations were also reviewed. Curly leaf pondweed had reached maximum production levels by this date but were minor compared to the abundance and density of ebrid watermilfoil. Ebrid watermilfoil had already established nuisance production levels and was even beginning to flower in some parts of the lake. Harvesting operations were in process during the survey and a prodigious quantity of ebrid watermilfoil was being removed from the lake by multiple machines. Plans were made to continue the harvesting operations and for the application of a very large-scale species selective herbicide treatment in the middle of June. The typical filamentous algae blooms were not evident in the canals as an apparent result of the late 2025 nutrient deactivating agent treatment. It was agreed that the canal at AROS 600's would be treated for weeds upon request and as often as needed to respond to unpredictable nuisance weed conditions. Any algae problems that form in the canals would also be addressed following resident requests.

Early-Season LakeScan™ Survey:

The early-season LakeScan™ vegetation survey for Lower Straits Lake was conducted on June 26, 2025. The most common native plant species observed in Lower Straits Lake were *Chara*, hybrid pondweeds, and water lily. Each of these species were observed throughout many of the nearshore AROSs. Due to hybridization, variable pondweed and Illinois pondweed have been "lumped together" and are represented as medium leaf pondweeds. These "native" pondweeds had reached nuisance levels in many AROS in 2020 and some prior years; however, they were not present at nuisance levels in 2024 or 2025. These are generally considered to be desirable plants in Michigan inland lakes. However, the nuisance production of these probable hybrids is a matter of concern and will be watched closely in 2026.

Notoriously invasive and exotic species observed during the early-season survey included Ebrid watermilfoil, curly leaf pondweed, and starry stonewort. Curly leaf pondweed was abundant prior to the Memorial Day holiday but had seemingly declined as a result of species targeted herbicide treatment and natural decline that typically occurs in Michigan before the Fourth of July Holiday. Hence, it was not conspicuously present during the survey. Ebrid watermilfoil rebounded quickly after the harvesting operations. Due to the size of the weedy area, the lake had to be divided into two parts for treatment. Most of the lake was treated on 10 June and the symptoms of herbicide exposure on ebrid watermilfoil was profound, but dead and decaying plants remained in the water column for two weeks post treatment. Observers at the LakeScan™ VS 3 survey were able to record this senescent watermilfoil as being present in more than half of the lake AROS. A second herbicide application was made on 24 June and all of the milfoil in the 10 June and 24 June treatments dropped from the water column leaving good conditions for the Fourth of July holiday. Starry stonewort was observed at the greatest

frequency of all the exotic potentially invasive and nuisance species; however, it was not present at nuisance levels anywhere in the lake. It was observed intermixed with *Chara* in the locations where it was found.

Late-Season LakeScan™ Survey:

The late-season LakeScan™ vegetation survey, VS 5, of Lower Straits Lake was conducted on August 19, 2025. *Chara*, waterlilies, and hybrid pondweed were the most abundant native submerged aquatic species. Hybrid pondweed and wild celery were occasionally observed growing at or slightly below the water's surface but did not appear to hinder recreational activities on the lake. Waterlily and spadderdock were widely distributed throughout Lower Straits Lake at varying densities. Occasionally, these species were observed at high densities in front of and around residents' docks which may hamper boat access to the lake. Most instances of this occurred on the southern and eastern shorelines.

Aquatic invasive species observed within Lower Straits Lake included Ebrid watermilfoil and starry stonewort. Curly leaf pondweed was observed at only 1% of the AROS. Ebrid watermilfoil was widely distributed throughout the nearshore but was generally observed at low, non-nuisance densities. It occupied 22% of all AROS. Starry stonewort was the most abundant and widely distributed typical aquatic invasive species observed within Lower Straits Lake; however, it was not observed to be creating any recreational nuisance conditions at the time of this survey. For nearly a decade, starry stonewort has been found intermixed with *Chara* at low densities relative densities.

2025 LakeScan™ Data and Analysis

Four important lake characteristics for defining aquatic plant conditions are presented here for the 2025 annual findings on lake health. 'Richness' metrics are counts of either species or morphology (plant structure) types that were observed in the lake. 'Index' metrics are scores indicative of different aspects of lake health. The range of possible index scores is 1 to 100 with a higher score indicating better conditions in relation to management goals assigned to the lake. Annual metrics are also compared here to last year's metrics and include:

- Species Richness – the number of species or species groups present in the lake.
- BioD60© Index – a measure of the health of the plant community based on the number of species or species groups and the distribution of each across all lake AROS. It is based on the cumulative cover index developed by the State of Michigan and Aquest in the early 1990's that continues to be the standard index used by the State. The BioD 60© metric index is the mean of the total species richness as a percent of the maximum value of 60, the mean number of species at each AROS as a percentage of the optimum level of 30, and the mean density/distribution (cumulative cover) score assigned to each AROS. Numbers are normalized according to the size of the Tier and number of AROS present in each Tier.
- Morphological Richness – the number of distinct plant morphology types present in the lake.
- MorphoD26© Index – reflects the habitat value of vegetation for fish and other aquatic animals and is based on the total number of morphotypes observed at all AROS and how those are distributed throughout the lake. It is very similar to the BioD60© metric except that species are replaced with the various categories of morphotype.

- Perceived nuisance levels (PNL) are determined for each species at each AROS during vegetation surveys. PNL is a subjective value that ranges from 0 to 3 and is based on known plant species characteristic, plant height in the water column coupled to in-field observations of species location within the context of localized lake uses (i.e., surrounds a dock, within the ski lane, in front of the boat launch). Before a PNL is assigned, a species is determined to be either an ecological nuisance, a recreational nuisance, or both. An ecological nuisance is identified as a species that is invasive or non-native to Michigan that seriously threatens the biodiversity of the plant community, ecosystem functions, and overall stability of the lake ecosystem. Recreational nuisance scores are assigned to species that may impair or inhibit boat traffic or swimming ability at the time of the survey. Recreational nuisance can be assigned to both native and invasive/non-native species. PNL 0 is assigned to plant species that are typically native species and do not create a recreational nuisance. PNL 1 indicates ecological nuisance species but do not pose a recreational nuisance because of the threat of extirpation of desirable nearby species. PNL 2 describes emerging recreational nuisance conditions that are not extremely weedy. PNL 3 indicates unequivocal recreational nuisance conditions where boating or other recreational pursuits are seriously impaired. The maximum species PNL value that is found at each AROS during all seasonal LakeScan™ surveys is used for this analysis.

Plant Community Composition, Distribution, and Biomass Production

LakeScan™ lake quality metrics and conditions in Lower Straits Lake were considered to be fair in 2025. The has lake always supported fewer species and less growth than most other lakes in the region. However, viewed from a historical perspective, conditions have improved in Lower Straits Lake since the late 1980's as evidenced by the increase in the percentage AROS occupied by plant growth in recent years. Furthermore, plant production observed in 2025 is still considered good enough to support reasonable fisheries production. Unfortunately, a good portion of the plant community is comprised of weedy species and the total weed infested AROS in 2025 were nearly as great as those observed in 2024. The average density and distribution of all of the species and species groups at all AROS were relatively high in 2025 suggesting that plant productivity in Lower Straits Lake is similar to other nearby weedy lakes even though it supports fewer species.

Species and Morphotype Richness and Seasonality

Historically, the species richness of Lower Straits Lake has been lower than other nearby lakes. Levels observed in 2023 placed it on par with other regional lakes but species richness declined sharply in 2024 and 2025. Sixteen species are typically considered to be an acceptable number for southern Michigan inland lakes and the total number of species observed in Lower Straits Lake in 2025 were much lower that the threshold value. The species composition observed at AROS during the early (VS 3 June) and late (VS 5 August) LakeScan™ surveys were the same. Again, this appears to be related to a decline in species richness since 2023. There is some concern that recent management activities may have contributed to this unfortunate decline. Ebrid watermilfoil can crowd out or extirpate competing and more desirable plant species. The same herbicide combo used in Lower Straits Lake in 2024 and 2025 was also applied to similar lakes but did not result in a decline in species richness during the same years. This may implicate mechanical harvesting as a reason for the decline in species richness since harvesting was not used on these lakes. Even though the a large number of acres were harvested in 2025

and this may suggest that harvesting could not be a possible causal or contributing agent of species richness decline there were other variable that may have also been the cause.

Typically, one third to one half of species present in southeast Michigan inland lakes are only present in June or August and not during both annual vegetation surveys. All of the species observed in Lower Straits Lake were observed during both the LakeScan™ VS3 (June) and LakeScan™ VS5 (August) survey events. This is probably related to the lower species richness found in this lake relative to nearby lakes.

Table 2. Aquatic plant community characteristics related to the number of species observed in the lake during LakeScan™ vegetation surveys conducted in June (VS3) and August (VS5).

Year	2020	2021	2022	2023	2024	2025
Species Total Observed During All Surveys	14	14	12	17	10	10
Total Species Observed During Both Surveys	10	10	9	9	9	10
Species Observed Exclusively During the VS3 Survey	1	1	0	6	0	0
Species Observed Exclusively During the VS5 Survey	3	3	3	2	1	0
Percent Species Observed Both Suveys	71%	71%	75%	53%	90%	100%

Biodiversity, Morphological Diversity and Habitat Quality

Like humans or any organism, lakes are similarly a reflection of various interdependent but clearly different systems. Hence, there is no single metric value that can meaningfully and accurately describe the quality and health of surface water resources from every perspective. The BioD 60© metric value is built upon observations of species richness and the cumulative cover of all plant species and species groups at all lake AROS's and is a good descriptor of plant community ecosystem heath and resilience. The current index provides values ranging from 1 to 100 and higher levels are better. 50 is the target value for Lower Straits Lake and other lakes in the region. Lower Straits Lake missed this target by a small margin during the first survey in 2025 but came even closer to meeting the target value in the late season survey. The average BioD 60© value recorded for both surveys since 2010 was 47 and it is discouraging to see that the values calculated for 2025 still do not meet the target level. Especially since the BioD 60© value in 2023 exceeded the target value if even by a small margin.

Table 3. A primary measure of overall lake health is related to the richness and distribution of aquatic plant species and morphotypes throughout the lake. Species BioD 60© and MorphoD 26© values are computed from observations compiled during LakeScan™ vegetation surveys conducted in June (VS3) and August (VS5).

Target Values and Ranges	Metric		2020	2021	2022	2023	2024	2025
	Species Richness #	VS 3	11	11	9	15	10	10
Typical Target Value 16 Range 0 - 60		VS 5	13	13	12	11	10	11
	Average Species Number per AROS	VS 3	3	3	3	3	2	2
Typical Target Value 4		VS 5	3	3	3	3	2	3
	Mean Density/Distribution at AROS	VS 3	54	54	39	54	43	47
Typical Target Value n/a Range 0 - 100		VS 5	27	27	27	34	26	38
	Tier Weighted BioD 60©	VS 3	51	51	47	58	42	45
Typical Target Value 50 Range 0 - 100		VS 5	46	46	43	49	40	48

The MorphoD 26© target level for this lake is 60 and the lake met and exceeded the target value during both surveys. Despite low species diversity, the lake still supports a diverse range of plant morphotypes. The MorphoD 26© Index value is similar but is based on differing plant morphology rather than plant names. Since aquatic organisms are probably more aware of plant shape, size, and height than what humans have named them, this may be a better index value to consider from an ecological perspective. Higher levels are better. It might be inferred from these data, that Lower Straits Lake is capable of supporting a reasonable and productive fishery.

Table 3 con't. MorphoD 26© values are computed from observations compiled during LakeScan™ vegetation surveys conducted in June (VS3) and August (VS5).

Target Values and Ranges	Metric		2020	2021	2022	2023	2024	2025
	Morpho Richness	VS 3	11	11	9	15	10	10
Typical Target Value 13 Range 0 - 26		VS 5	13	13	12	11	10	11
	Average Morphotype Number per AROS	VS 3	3	3	3	2	2	2
Typical Target Value 3		VS 5	3	3	2	3	2	2
	Tier Weighted MorphoD 26©	VS 3	66	66	60	65	58	60
Typical Target Value 60 Range 0 - 100		VS 5	83	83	82	83	79	83

Nuisance Conditions

The perceived nuisance levels (PNL) in Lower Straits Lake during the early and late season vegetation surveys in 2025 were among the highest recorded in recent years. However, recreational nuisance conditions PNL 2 and PNL 3 were very low during both vegetation community surveys suggesting that the objectives of the lake herbicide treatments were met or exceeded. It is clear from these data that invasive species management efforts are required to maintain acceptable ecological and stability levels and recreational values in the lake to have attained the reasonably good values observed during the 2025 vegetation surveys. The Total PNL 1 AROS values are high because of the prevalence of starry stonewort that has the potential to be an ecological nuisance. However, it is clear from these data, and because it is subdominant to Chara, that it does not grow to a nuisance level of recreational concern and may not represent a significant challenge to desirable plants. It is important to note that starry stonewort is not growing in a manner that it might extirpate desirable rooted submersed plant species. Low BioD 60© and species richness values do not appear to be impacted by starry stonewort production in Lower Straits Lake.

Table 4. The number of AROS where various species nuisance levels were observed in the lake during LakeScan™ vegetation surveys conducted in June (VS3) and August (VS5). Level 1 nuisance levels are where invasive species threaten ecological stability but do not present an ecological nuisance. AROS where the Nuisance level exceeds 1.5 may be considered to harbor recreational nuisance conditions while AROS where the nuisance average exceeds 2.5 unequivocally harbor impediments to common recreation.

Characteristic		2020	2021	2022	2023	2024	2025
Total PNL AROS	VS 3	72%	72%	70%	0%	57%	68%
	VS 5	62%	62%	61%	66%	52%	65%
Total PNL 2 AROS	0	13%	13%	0%	0%	2%	2%
Ecological and Recreational Nuisance Conditions	0	16%	16%	5%	8%	2%	2%
Total PNL 3 AROS	0	4%	4%	0%	0%	1%	13%
Receational Nuisance Potential	0	0%	0%	0%	5%	2%	0%
Total PNL Species	VS 3	5	5	1	0	2	2
Unequivocal Nuisance for Recreation	VS 5	4	4	1	2	3	2

Historical Data and Analysis

Species and Morphotype Richness and Seasonality

The species richness of the Lower Straits Lake submersed plant flora has generally increased in the lake since the late 1980's. Approximately 5 species were common in the lake until 2010 when the number began to increase annually. Sixteen species is a reasonable target for most regional lakes and 2023 marked the first year that Lower Straits Lake nearly met that target level. Unfortunately, species richness declined significantly in 2024 and 2025. Only two

species, watermilfoil and curly leaf pondweed, have created nuisance conditions since 2015, while the remainder of species help to stabilize and improve ecological resiliency.

At least 22 different species or species groups have inhabited Lower Straits Lake since 1988 (when surveys were first conducted by the author of this document). This is fewer than most regional lakes but is considered to be reasonable given the quality of the lake sediments and the extensive shallow areas that are impacted by wave and wind.

The average MorphD 26© metric value since 2010 has been 55.4. Values observed in 2025 were much better than the mean measured over this period and suggest that conditions are good could be improving for the fishery.

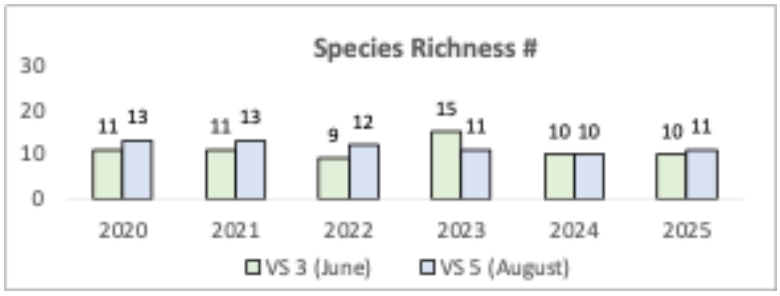


Figure 3. The total number of species or species groups observed in the lake during early (June) and late (August) season LakeScan™ surveys since 2020. Early and late season survey data are paired for each year. Early season survey data are represented by blue bars and late season survey data is represented by green bars.

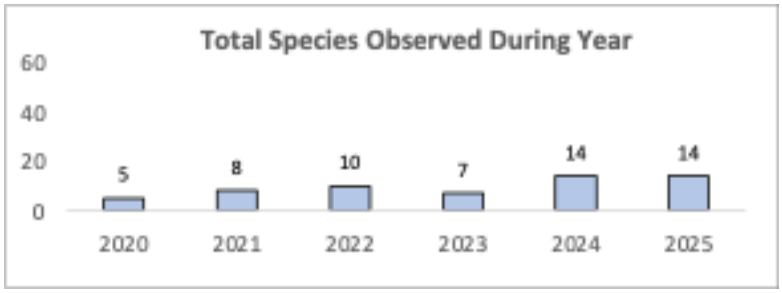


Figure 4. The combined total number of species or species groups observed in the lake from early (June) and late (August) season LakeScan™ surveys since 2020.

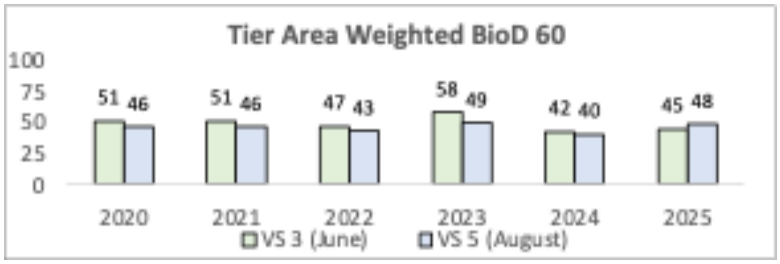


Figure 5. The average species BioD 60© values calculated from observations made during early and late season LakeScan™ vegetation surveys since 2020. Early and late season survey data are paired for each year. Early season survey data are represented by blue bars and late season survey data is represented by green bars.

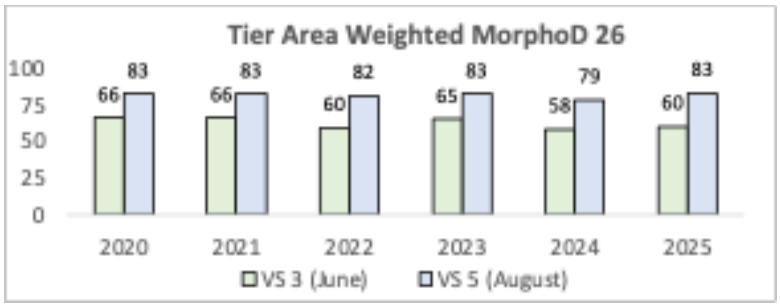


Figure 6. The average species MorphoD 26© values calculated from observations made during early and late season LakeScan™ vegetation surveys since 2020. Early and late season survey data are paired for each year. Early season survey data are represented by blue bars and late season survey data is represented by green bars.

Table 5. The percent AROS occurrence of submersed and floating leaf plant species in Lower Straits Lake from 2010 to present.

	2010 VS 3	2010 VS 5	2011 VS 3	2011 VS 5	2012 VS 3	2012 VS 5	2013 VS 3	2013 VS 5	2014 VS 3	2014 VS 5	2015 VS 3	2015 VS 5	2016 VS 3	2016 VS 5	2017 VS 3	2017 VS 5	2018 VS 3	2018 VS 5	2020 VS 3	2020 VS 5	2021 VS 3	2021 VS 5	2022 VS 3	2022 VS 5	2023 VS 3	2023 VS 5	2024 VS 3	2024 VS 5	2025 VS 3	2025 VS 5
EWMx	28%	28%	66%		46%	53%	71%		62%	52%	63%	23%		44%	39%	41%	46%	22%	55%	22%	55%	22%	65%	28%	6%	53%	35%	34%	59%	30%
BLAD														4%	10%	4%			2%	4%	2%	4%	1%	1%	5%	3%				
CNTL																				2%		2%								
NAID						3%				5%		5%		8%		39%		3%		5%		5%		8%		1%	2%	2%	1%	1%
SpNAD																				1%		1%					1%	1%		
CHARA	58%	55%			48%	34%	46%		88%	51%	44%	74%		41%	42%	39%	50%	67%	59%	74%	59%	74%	65%	54%	57%	61%	60%	54%	73%	78%
NitT														1%																
StSt	56%	56%	81%		53%	34%	58%		88%	48%	67%	24%		29%	39%	36%	48%	5%	42%	43%	42%	43%	60%	48%	57%	47%	42%	36%	24%	55%
Moss																								2%			1%	1%		
CLP			6%				2%				5%				2%				14%	1%	14%	1%						1%	1%	1%
FSP																									2%					
Rich																										18%				
MHPW	28%	28%	71%		29%	60%	30%		11%	31%	37%	53%		31%			48%	35%	54%	57%	54%	57%	41%	29%	38%	4%	13%	11%	16%	28%
BHPW																									3%	4%				
Stuk															10%	2%	11%		2%	1%	2%	1%	3%	1%	18%	6%			3%	
TLP																			4%		4%			1%	8%					
VAL						2%				2%	1%	4%		3%	4%	4%	2%		16%	9%	16%	9%	5%	5%	1%	1%	7%	7%	7%	2%
WL	38%	38%	65%		43%	60%	46%		53%	49%	47%	52%		32%	27%	35%	28%	42%	39%	50%	39%	50%	42%	36%	27%	54%	51%	47%	27%	51%
SPAD														2%	1%	1%			4%	3%	4%	3%	9%	1%	11%				3%	
WSh																									9%					
FLP																									6%					
TLFP																									4%					

Species Dominance

The dominance of individual species is a useful consideration for the development of species selective management approaches to the submersed flora in lakes. These values are based on the cumulative cover of each species or species grouping relative to the other species observed in the lake. The reader will have to expand the image to read values.

Considering the scope and size of herbicide treatments made to the lake each year, it is clear that management objectives have been largely attained since Ebrid watermilfoil is usually not observed to be the dominant species during the early and late season vegetation community surveys.

Table 6. The ranked maximum observed individual species dominance values of species or species groups observed during combined surveys in Lower Straits Lake from 2010 to present. Ebrid watermilfoil values are highlighted in red.

2010		2011		2012		2013		2014		2015		2016		2017		2018		2020		2021		2022		2023		2024		2025	
Species	Dom	Species	Dom	Species	Dom	Species	Dom	Species	Dom	Species	Dom	Species	Dom	Species	Dom	Species	Dom	Species	Dom	Species	Dom	Species	Dom	Species	Dom	Species	Dom	Species	DomV
StSt	71.2	StSt	45.9	WL	35.2	EWMs	40.3	StSt	49.5	CHARA	42.1	EWMs	26.8	CHARA	26.1	CHARA	38.6	CHARA	39.1	CHARA	39.1	CHARA	35.1	CHARA	34.9	CHARA	32.6	CHARA	42.0
WL	59.5	MHPW	38.0	MHPW	33.7	StSt	35.0	CHARA	49.0	StSt	38.7	CHARA	25.6	EWMs	24.3	StSt	29.0	EWMs	31.3	EWMs	31.3	EWMs	34.8	StSt	34.5	WL	27.3	EWMs	32.6
CHARA	58.9	WL	37.5	StSt	32.1	WL	27.9	EWMs	35.7	EWMs	36.5	WL	20.9	StSt	24.3	EWMs	28.3	MHPW	30.4	MHPW	30.4	MHPW	32.6	WL	30.4	StSt	23.5	StSt	30.5
EWMs	54.3	EWMs	36.5	EWMs	31.9	CHARA	27.9	WL	31.6	MHPW	31.4	MHPW	20.2	NAID	24.3	MHPW	27.9	WL	28.4	WL	28.4	WL	23.0	EWMs	29.3	EWMs	20.1	WL	28.3
MHPW	34.2	CLP	7.8	CHARA	29.5	MHPW	19.7	MHPW	19.9	WL	30.9	StSt	19.4	WL	22.5	WL	25.9	StSt	24.5	StSt	24.5	MHPW	21.8	MHPW	22.3	MHPW	8.1	MHPW	16.2
				NAID	6.5	CLP	5.8	NAID	7.3	CLP	7.7	NAID	8.2	BLAD	9.9	Stuk	10.5	NAID	6.3	VAL	10.4	CLP	9.3	SPAD	8.4	Stuk	12.4	VAL	5.7	VAL	5.0
				VAL	5.8			VAL	5.8	NAID	7.7	BLAD	6.8	Stuk	8.8	VAL	6.1			CLP	9.3	NAID	5.6	Rich	11.0	SpNAD	3.0	SPAD	4.9
										VAL	6.9	VAL	6.3	VAL	7.1					SPAD	5.1	VAL	4.4	SPAD	9.6	NAID	2.5	Stuk	4.1
												SPAD	5.4	CLP	5.8					NAID	4.2	Stuk	3.3	WSh	9.2	Moss	1.8	NAID	3.0
												NoIT	1.8	SPAD	5.5					BLAD	3.3	Moss	2.3	FLP	7.2	CLP	1.5	CLP	2.8
																				TLP	3.3	BLAD	1.8	TLP	6.6				
																				Stuk	2.9	TLP	1.5	BLAD	5.7				
																				CNTL	2.5			BHPW	5.2				
																				SpNAD	1.5			TLFP	4.8				
																								FSP	3.6				
																								VAL	2.9				
																								NAID	1.5				

The LakeScan™ DomV© index value is similar to the previous Dom metric value except that the DomV value is modified by the square of the height estimate for each species collected at the time of the two annual vegetation surveys. Despite the high percent occurrence of Starry Stonewort at the AROS observed in each year of record, it has not been ranked as exhibiting the highest DomV metric value since 2014. This is consistent with observations and management plans that have not needed to focus on starry stonewort as a nuisance threat since 2025.

Table 7. The ranked maximum observed individual species DomV© values of species or species groups observed during combined surveys in Lower Straits Lake from 2010 to present. Ebrid watermilfoil values are highlighted in red.

2010		2011		2012		2013		2014		2015		2016		2017		2018		2020		2021		2022		2023		2024		2025	
Species	DomV	Species	DomV	Species	DomV	Species	DomV	Species	DomV	Species	DomV	Species	DomV	Species	DomV	Species	DomV	Species	DomV	Species	DomV	Species	DomV	Species	DomV	Species	DomV	Species	DomV
StSt	35.68	StSt	22.95	WL	17.60	EWMs	20.18	StSt	24.76	CHARA	21.03	EWMs	13.31	CHARA	13.12	CHARA	19.36	CHARA	19.61	CHARA	19.59	EWMs	17.66	CHARA	17.47	CHARA	16.28	CHARA	21.00
WL	30.94	MHPW	19.00	MHPW	16.90	StSt	17.53	CHARA	24.50	StSt	19.34	CHARA	12.81	StSt	12.23	StSt	14.55	EWMs	16.01	EWMs	16.01	CHARA	17.56	StSt	17.23	WL	13.65	EWMs	16.57
CHARA	29.49	WL	18.74	StSt	16.04	WL	13.99	EWMs	17.87	EWMs	18.24	WL	10.49	NAID	12.21	EWMs	14.22	MHPW	15.49	MHPW	15.45	WL	15.18	StSt	11.79	StSt	11.79	StSt	15.26
EWMs	27.37	EWMs	18.31	EWMs	15.98	CHARA	13.98	WL	15.81	MHPW	15.68	MHPW	10.16	EWMs	12.20	MHPW	14.18	WL	14.71	WL	14.71	WL	11.49	EWMs	14.91	EWMs	10.26	WL	14.17
MHPW	17.32	CLP	3.88	CHARA	14.75	MHPW	9.91	MHPW	10.02	WL	15.50	StSt	9.73	WL	11.73	WL	13.43	StSt	12.32	VAL	5.27	StSt	12.30	MHPW	10.92	MHPW	11.13	MHPW	8.10
				NAID	3.27	CLP	2.89	NAID	3.70	CLP	3.85	NAID	4.14	BLAD	4.98	Stuk	5.51	VAL	3.25	CLP	4.64	VAL	5.30	SPAD	4.21	Stuk	6.22	VAL	2.85	VAL	2.50
				VAL	2.89			VAL	2.89	NAID	3.85	BLAD	3.42	Stuk	4.61	NAID	3.16	SPAD	3.03	NAID	2.13	CLP	4.86	NAID	2.79	Rich	5.50	SpNAD	1.52	SPAD	2.45
										VAL	3.46	VAL	3.16	VAL	3.84			NAID	2.13	BLAD	1.67	SPAD	2.53	VAL	2.22	SPAD	4.82	NAID	1.23	Stuk	2.04
												SPAD	2.72	SPAD	3.27					TLP	1.63	NAID	2.13	Stuk	1.66	WSh	4.61	Moss	0.89	NAID	1.52
												NoIT	0.89	CLP	3.03					Stuk	1.44	BLAD	1.67	Moss	1.15	FLP	3.61	CLP	0.76	CLP	1.39
																				CNTL	1.23	TLP	1.63	BLAD	0.89	TLP	3.31			
																				SpNAD	0.76	Stuk	1.44	TLP	0.76	BLAD	2.85			
																						CNTL	1.23			BHPW	2.59			
																						SpNAD	0.98			TLFP	2.39			
																										FSP	1.78			
																										VAL	1.43			
																										NAID	0.76			

Ebrid Watermilfoil Percent Cover and Weighted D/D Data

Ebrid watermilfoil percent cover, weighted D/D values have varied considerably since the mid-1990's. It is critical to remember; however, that LakeScan™ vegetation community surveys occur after the major June herbicide treatment and often reflect the variable rate at which the treated ebrid watermilfoil has dropped from the water column. Despite wide variations in production and nuisance levels, management efforts have been largely successful in the maintenance of acceptable conditions from both recreational and ecosystem sustenance perspectives.

It is nearly impossible to eradicate ebrid watermilfoil from afflicted lakes once it has become established, but maintenance efforts can be employed to dramatically improve lake conditions. A very wide range of control agents have been used with varying degrees of success through the decades and the management team continues to entertain new approaches that are affordable, provide good value, result in rapid "knock-down", and season-long control. It appears that the weed supports a protective outer layer or microbiome that confers varying degrees of protection from aquatic herbicides. This resistance can be overcome with herbicide combinations that are specifically formulated to mitigate against the protective effect of the microbiome.

The pre-season survey conducted by the management team in late May revealed more acres of ebrid watermilfoil requiring treatment during the past two years than has been necessary for nearly three decades. In fact, the Lower Straits AROS map had to be amended to include more

AROS in deeper water since ebrid watermilfoil was observed in these expanded areas. Roughly 50% more AROS were afflicted with nuisance ebrid watermilfoil growth in 2024 and 2025 than had ever been observed previously.

It is only possible to speculate why ebrid watermilfoil has expanded so dramatically in Lower Straits Lake in the last two years. It is known that mechanical harvesting may cause ebrid watermilfoil to spread and expand the area covered in infested lakes by fragmenting the plant. These fragments can float to colonize other parts of the lake. However, ebrid watermilfoil has been present in Lower Straits Lake for more than 40 years and it was believed that it had colonized all of the possible AROS where it could survive and thrive. It seems illogical to assume that the enhanced dispersal of ebrid watermilfoil fragments as a consequence of mechanical harvesting could exceed the impact of 40 years of recreational boating on the spread of ebrid watermilfoil to new areas in the lake. However, it may have been a contributing factor if the cuttings or ebrid watermilfoil dissemules were to settle upon disturbed sediments. Recent Minnesota studies have demonstrated that wake boats are capable to disturbing sediments as deep as 15'. Since ebrid watermilfoil can thrive on disturbed sediments it is possible that the combination of wake boat activity and increased production of ebrid watermilfoil fragments by harvesting conspired to increase the AROS acres infested with nuisance ebrid watermilfoil in 2024 and 2025. Furthermore, little is known about the role of ebrid watermilfoil seed germination on lake sediments. Sediment disturbance is known to facilitate the germination of some pondweed seeds. It is possible that sediment disturbance caused by wake boats helped to facilitate the germination of ebrid watermilfoil seeds and may also be a contributing factor to the extreme nuisance conditions.

Early season surveys are usually conducted just after the June selective herbicide application and milfoil is often in some stage of decline when the survey is completed. The survey conducted in 2025 was performed after treatment, but the dead nuisance ebrid watermilfoil milfoil lingered in the water column and was quite evident during the VS 3 survey. The damaged "zombie" ebrid watermilfoil did drop from the water column before the Fourth of July holiday but was still noted and recorded as present during the June survey. Obviously, the percent occurrence of ebrid watermilfoil at the AROS saw much lower before the Fourth of July holiday.

The most disturbing statistic is that ebrid watermilfoil was found in nearly one third of the AROS during the late season survey. This would suggest that nuisance conditions could be significant in the early part of 2026. An early September herbicide application was made to a limited number of acres to test the possibility that late season herbicide treatments may inhibit nuisance milfoil production in May of the following year. The outcome of the test will be evaluated in May 2026.

Select Species Data

The following figures provide data on the percent AROS occurrence, the species dominance, and the vertical dominance of Ebrid watermilfoil in Lower Straits Lake since 2010. The reader is reminded that surveys are conducted at various times after treatment and these figures should not be interpreted as a reflection of nuisance conditions.

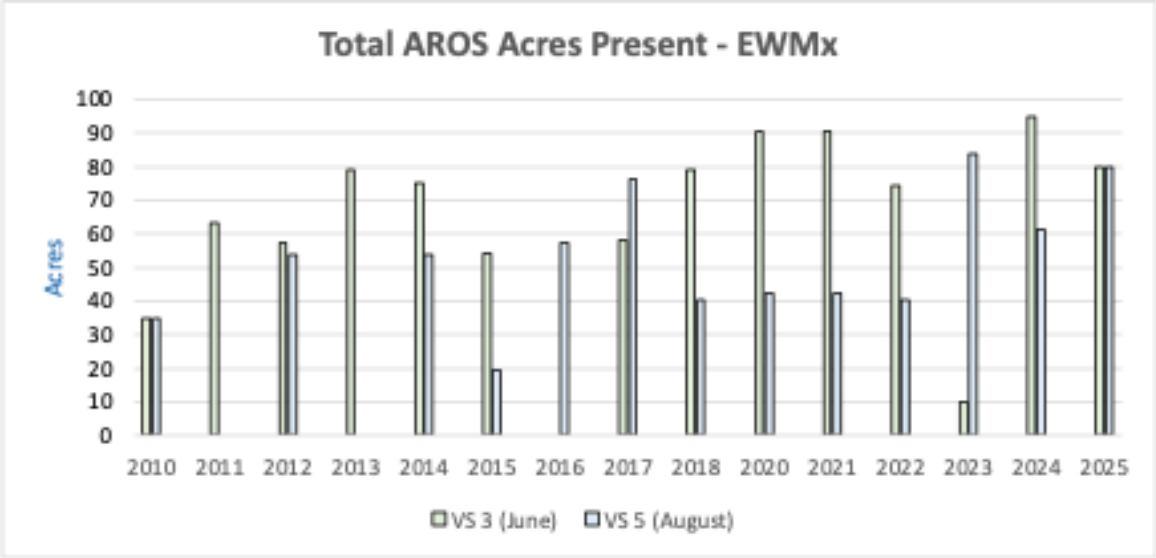


Figure 7. The percentage of all AROS where ebrid watermilfoil was observed during early (June) and late (August) LakeScan™ surveys performed during selected years since 2010. Data from early and late season surveys are paired by year.

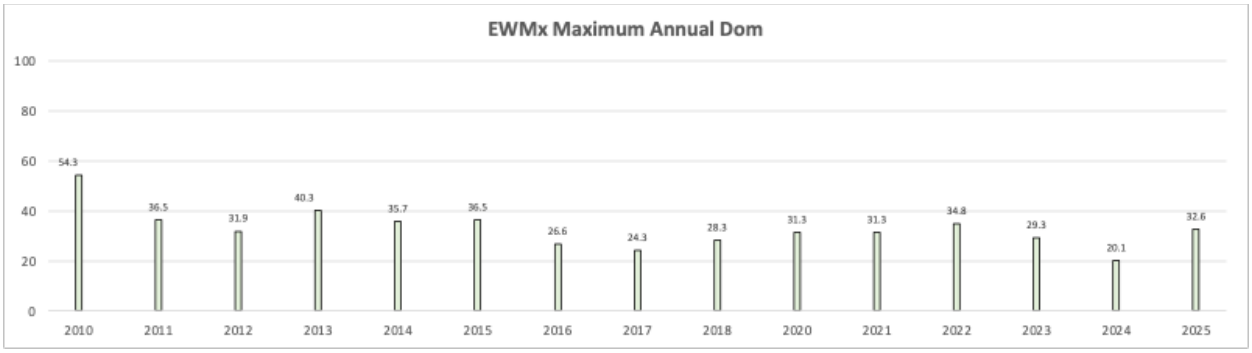
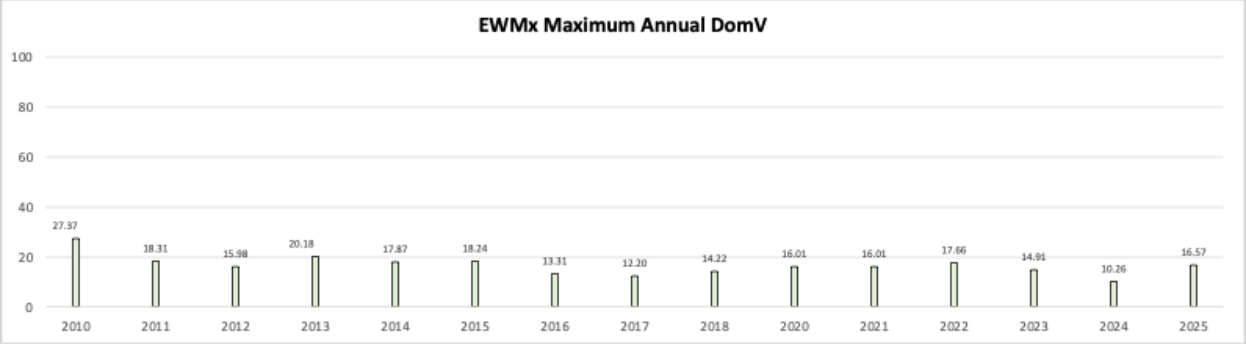


Figure 8. The maximum annual DomV or dominance value of Ebrid watermilfoil in Lower Straits Lake since 2010.



. Figure 9. The maximum annual DomV or dominance value of Chara in Lower Straits Lake since 2010.

The highly invasive and exotic plant (an alga), starry stonewort was first observed in the lake in 2006. For the next decade it contributed to the development of expansive nuisance conditions. Recently, it is found in a high percentage of AROS; however, the nuisance production of starry stonewort has subsided. It is currently found as an inconspicuous part of the low-growing bottom flora of the lake where it is observed intermingled with a close taxonomic relative, chara. During the past decade, it has been more conspicuous during the late season surveys than the early season surveys. This trend of increasing percent cover but transition from nuisance to non-nuisance production levels has been observed in numerous other lakes. Together starry stonewort and chara assemblages provide substantial ecosystem benefits to the lake. The trending spread of chara to an increasing number of AROS over the past several years is a positive indication that the weed maintenance program is achieving its goals. Figure 14 would suggest that a DomV value of less than 20 is associated with non-nuisance production.

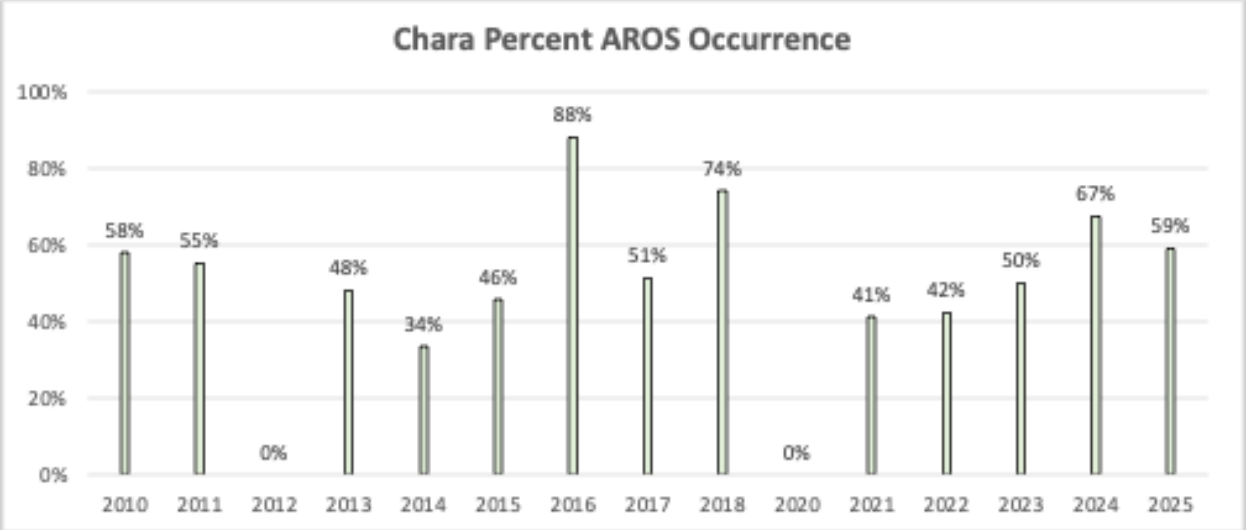
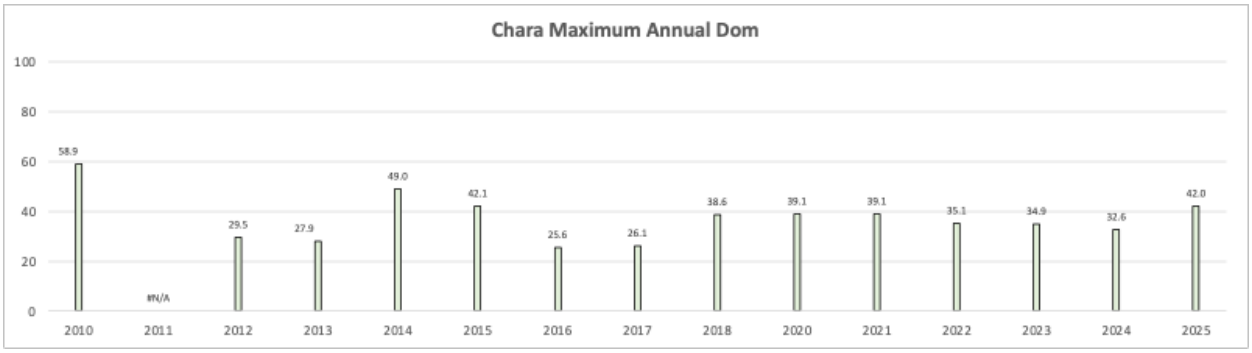
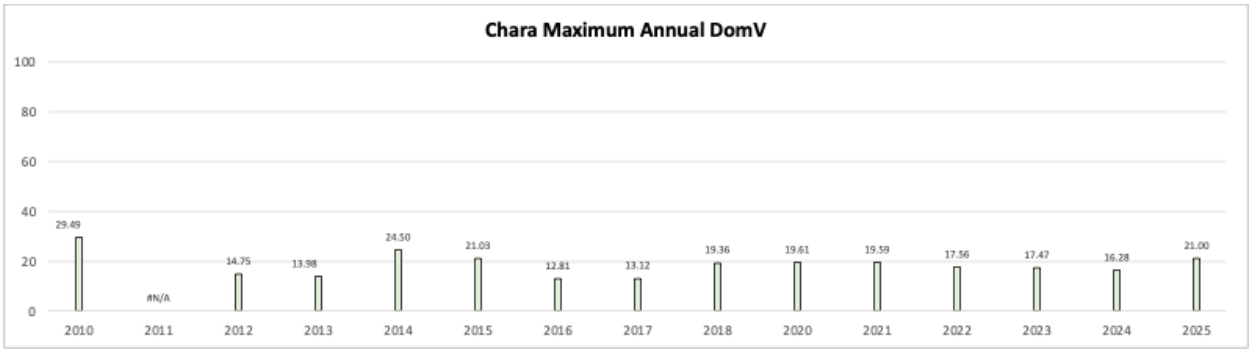


Figure 9. The percent occurrence of Chara at all AROS observed during LakeScan™ surveys conducted during selected years since 2010. Early and late season surveys are paired by year where early season survey data are depicted in blue and late season survey data is depicted in green.



. Figure 10. The maximum annual Dom or dominance value of Chara in Lower Straits Lake since 2010.



. Figure 11. The maximum annual DomV or dominance value of Chara in Lower Straits Lake since 2010.

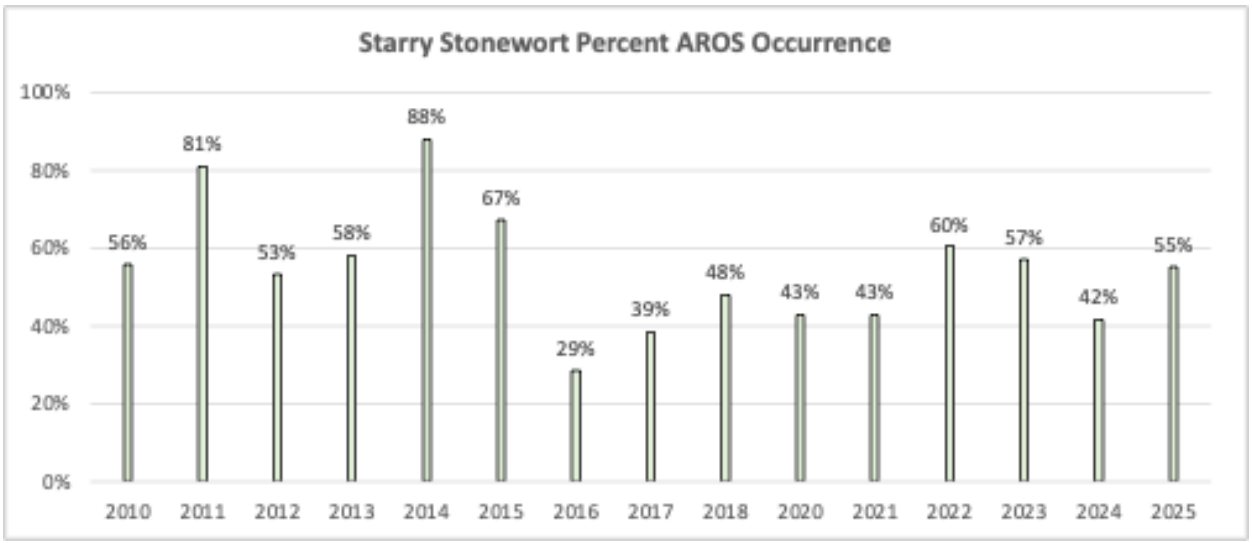
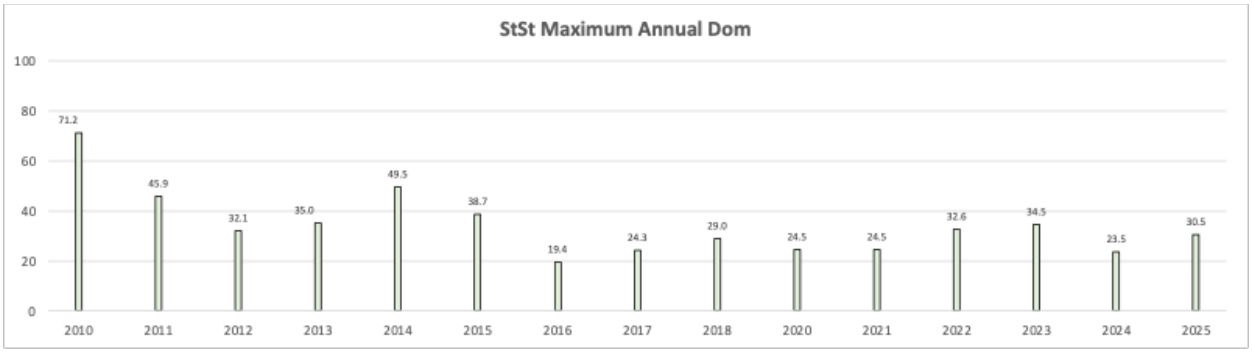
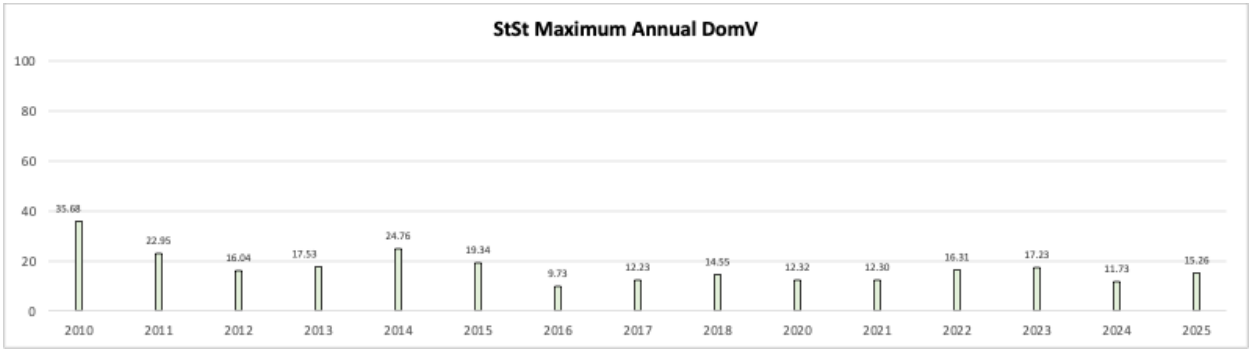


Figure 12. The percent occurrence of starry stonewort at all AROS observed during LakeScan™ surveys conducted during selected years since 2010. Early and late season surveys are paired by year where early season survey data are depicted in blue and late season survey data is depicted in green.



. Figure 13. The maximum annual Dom or dominance value of Chara in Lower Straits Lake since 2010.



. Figure 14. The maximum annual DomV or dominance value of Chara in Lower Straits Lake since 2010.

Native pondweeds have produced nuisance conditions in some years, but they have not in produced problems in recent years. The European scientific literature has provided convincing evidence that hybridization of pondweeds is common and that naming conventions may be difficult to applied during field surveys. Furthermore, some of the emerging hybrids may be present at significant nuisance levels. Consequently, many of the pondweeds have been lumped into functional groupings based on leaf size for the purpose of field surveys. Further molecular analysis is needed to justify this move, but practicality and cost demand that the groupings be made. Pondweed monitoring is increasing in importance since hybrids can become weedy.

The production of medium leaf pondweeds has varied since the late 2010's but the percent AROS cover has remained relatively constant in the past five years. The medium leaf pondweed DomV has steadily declined in recent years. This decline coincides with the initiation of harvesting operations. Most native pondweeds are much more sensitive to mechanical control impacts than are the weedy species, ebrid watermilfoil and curly leaf pondweed. These data recommend further investigation because the loss of desirable pondweed growth can be a detriment to over-all lake quality condition. These considerations will be primary when formulating management plans for 2026.

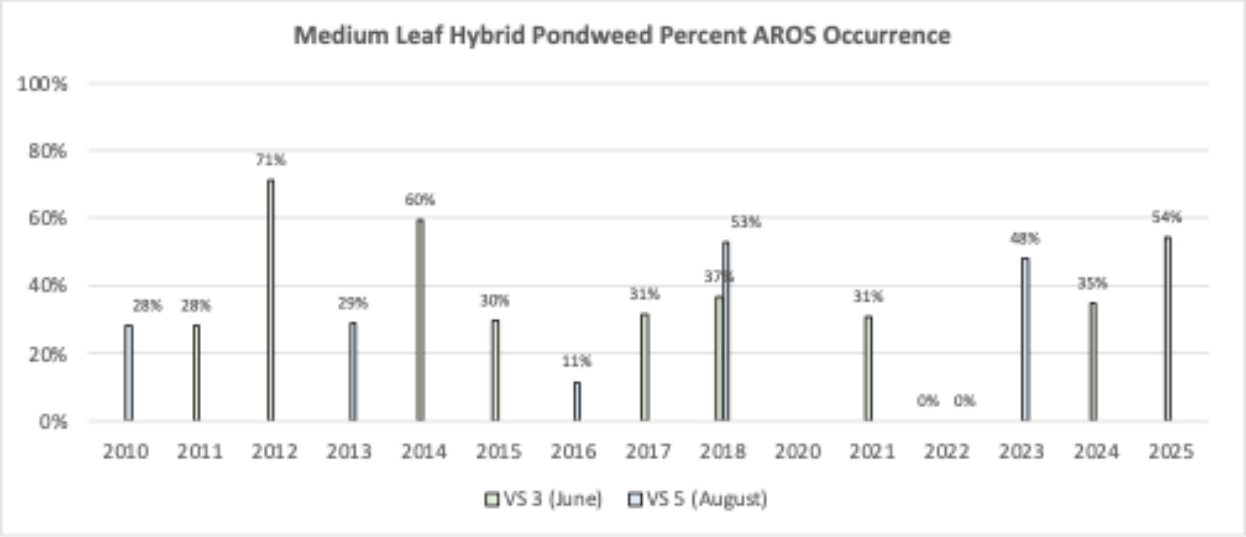


Figure 11. The percent occurrence of medium leaf pondweed at all AROS observed during LakeScan™ surveys conducted during selected years since 2010. Early and late season surveys are paired by year where early season survey data are depicted in blue and late season survey data is depicted in green.

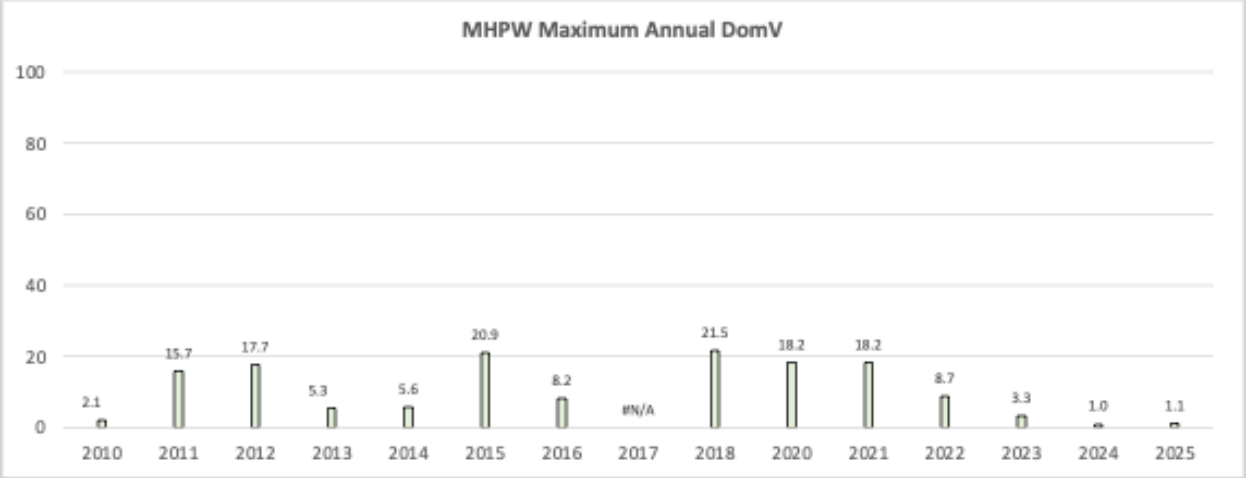


Figure 12. The maximum annual DomV or. Dominance of medium leaf pondweed at all AROS observed during LakeScan™ surveys conducted during selected years since 2010

Category 750 – Lake Management

There are several species that typically become a nuisance in Michigan's inland lakes (See Appendix B). These species are usually targeted for very selective control to prevent them from becoming an aesthetic or recreational nuisance and to protect desirable plants that are a necessary part of lake floras. Of the 11 species or species groups observed in Lower Straits Lake in 2025, only two were present at significant nuisance levels. This section includes an analysis on nuisance conditions in the lake, as well as a description of any management actions that were taken.

Ebrid watermilfoil and its hybrids have been the primary nuisance in Lower Straits Lake since at least the mid 1980's. It does not create the same level of nuisance conditions that it did prior to the early 1990's but still remains a significant in lakes afflicted by its presence.

It has hybridized with a native milfoil and Lower Straits Lake was the lake was among a select few where hybrids were identified through molecular testing in 2003 by Aquest and researchers at the University of Connecticut. Since it is very difficult to distinguish between Eurasian watermilfoil and its hybrids and because the consequences of nuisance production do not differ significantly in many cases, Eurasian watermilfoil and hybrids are referred to collectively as ebrid watermilfoil. The epithet "ebrid" has been selected since the more common epithet "hybrid" could also be applied to other hybridized watermilfoils. Again, it is important to note that nuisance conditions caused by ebrids range from non-nuisance to conditions that nearly rival those created by Eurasian watermilfoil and observed in the late 1980's. Ebrid watermilfoil management has been and continues to be the primary annual objective of the plant management program for Lower Straits Lake. More can be found about this species in the appendix attached to this document.

Curly leaf pondweed and starry stonewort are similar ebrid watermilfoil because they are also non-native or exotic species that were introduced to North America from other continents. Curly leaf pondweed nuisance levels and production vary considerably from year to year. It can create the same level of nuisance conditions that are common with ebrid watermilfoil, but not every year. It is nearly always found associated with ebrid watermilfoils. Fortunately, it is very sensitive to nearly all EPA registered aquatic herbicides and this makes selective management easy for the protection of desirable plant species and improvement of submersed plant communities. The selective control agents applied to lakes for the management of ebrid watermilfoil simultaneously suppress nuisance production of curly leaf pondweed. Curly leaf pondweed is an early season plant and completes most of its life cycle prior to the Fourth of July holiday and is rarely a nuisance after that holiday.

Starry stonewort was also an exotic nuisance plant in Lower Straits Lake, but like so many invasive species, its impact on lake floras has diminished over time to a level where it is not generally considered a nuisance in most AROS. It has not required significant management attention in Lower Straits Lake for 10 years.

All of the AROS that were harvested in 2025 were also treated with herbicides.

Herbicide efficacy is compromised by drift in TmtZ that are less than 5 acres. A very small number of areas that were smaller than 5 acres were treated in 2025 and most of those TmtZ were found in the canal at the north end of the lake.

Herbicide costs have been increasing in recent years as a consequence of supply chain issues and industry consolidations. The cost of treatment in 2025 was the highest on record.

Table 8. A historical review of the number of AROS that were treated once or more times during the management year, number of TmtZ acres treated that were less than 5 acres in size and the annual cost of treatment.

	2020	2021	2022	2023	2024	2025
Total AROS Treated:	50	45	74	89	89	108
1 Time:	50	45	74	89	89	108
2 Times:	48	53	44	35	56	37
3 Times:	0	11	2	0	0	0
Total Lake Acres Treated	119	90	100	110	191	158
TmtZ < 5 acres			17.99	22.56	3.29	1.44
TmtZ > 5 acres	119	90	81.68	87.29	187.26	156.28
Annual Cost of Treatment	$35,630	$42,953	$24,108	$42,754	$61,167	$67,432

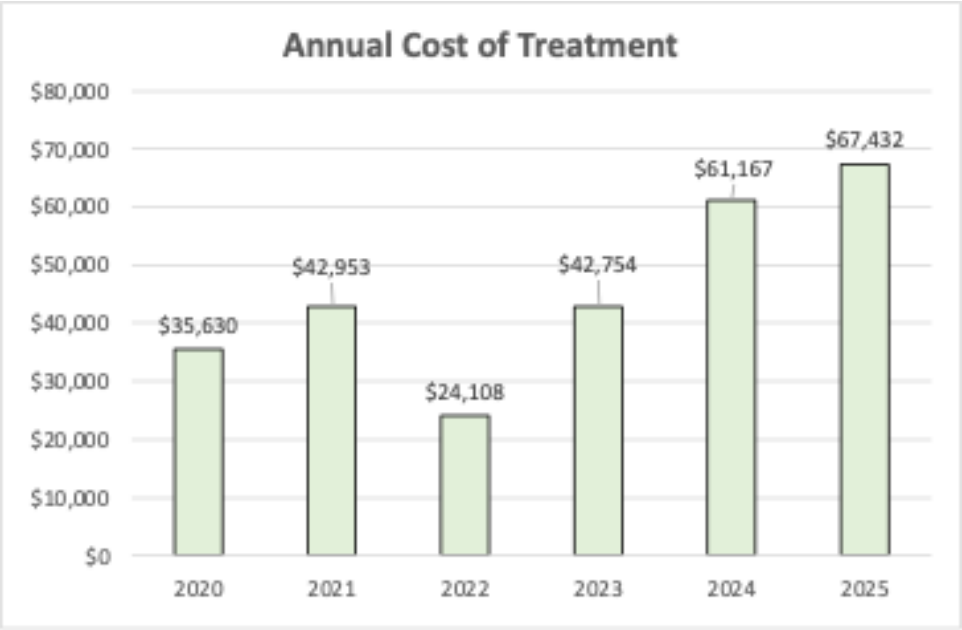


Figure 13. The annual const of weed management (maintenance).

The overall goal of the Lower Straits Management and Improvement Program is to create stabile and sustainable ecosystem conditions that are necessary to provide acceptable and sustainable recreational opportunities, including fishing. Extensive LakeScan™ monitoring is conducted each year to make certain that the goals of management plan are adequately addressed. The variable nature of lakes and aquatic plant communities demand that the management intervention objectives that are established each year be adaptive. Management objectives and decisions are made by consensus agreement of the Lower Straits management contractors (chemical applicators, harvester operators, aeration installers, etc.), lake resident and township representative(s), with the guidance of professional monitoring and management professionals. The Lower Straits improvement program is outcome-based, meaning that management tools are selected to achieve the lake management goals and create a more diverse and stabile ecosystem. All options are considered within the constraints and confines of available monies, relative value, regulatory and safety concerns, and the expressed needs of the Lower Straits Lake resident community.

Lower Straits Lake has been afflicted by the presence of both ebrid watermilfoil and curly leaf pondweed since it was first surveyed by Dr. Pullman in 1988. Starry stonewort was first identified in the lake in 2006. Each year, every conceivable management approach has been considered to improve conditions on the lake and to provide the best value possible using the funds available to protect and improve the lake ecosystem. Despite some of the funding constraints that have existed in some years, the management program has been remarkably successful in suppressing nuisance conditions caused by these three invasive species for most of each summer recreational use season since the late 1980's. Monitoring data show that the quality and habitat value of the Lower Straits submersed plant community has been sustained and generally improved as a consequence of judicious management. However, conditions seem to be declining in the past several years based on key metric analysis and declining dominance of medium leaf pondweeds. Still, the ecosystem has been stabilized by these efforts as the lake has also been improved for recreational pursuits, including fishing.

Table 8. Notable submersed aquatic vegetation events since the beginning of LakeScan™ monitoring.

Year	Event Description
1988	Beginning of Lake Monitoring and Management Guidance Program
1991	Emergence of 2,4-D resistant watermiloil Aquest develops autumnal applciation of fluridone (Sonar) aquatic herbicide stategy. Applied to lake on 03 December 1991.
1993	Combinations of contact aquatic herbicides developed with Aquatic Services and used to manage nuisance watermilfoil and curly leaf pondweed.
1999	Unusually dense watermilfoil challenges the management program
2003	Aquest and University of CT researchers confirm that a hybrid Euasian watermilfoil and northern water milfil inhabit Lower Straits Lake. Among first 3 lakes in Michigan where deterimination is made
2006	Starry stonewort detected in Lower Stratits Lake
2007	Novel strategy to use contact herbicides and chelated coppers developed by Aquest, University of Michigan, and Aquatic Services to address challenging water milfoil control. Different management agents and combos are used each year. Strategy developed by Aquest and Aquatic Services to manage starry stoneowrt
2019	Water milfoil herbicide resistance reaches an extreme level and nuisance conditions (partially degraded plants) persist well into the plrimary use season (July). This trend is observed in many Michigan inland lakes. A progressive and partial lake water lily management program is initiated for selected sites throughout the lake.
2021	Limited trial of ProcellaCOR, a relativelly new herbicide, for the suppression of ebrid watermilfoil.
2022	Initiated mechanical weed harvesting trial for ebrid watermilfoil and curly leaf pondweed manaagement to extend recreation season.
2025	Largest percent AROS cover of ebrid watermilfoil detected since late 1980's and early 1990's. Ebrid watermilfoil treatment area acres exceed 100 acres in both 2024 and 2025. Condtitions lead to suspension of mechanical harvesting operations in 2026 upon recomendation of resident consensus.

Each year, nuisance conditions caused by the relative abundance of noxious and invasive species have varied so the final management strategy decisions are not made until a pre-management season inspection is made around the Memorial Day Holiday. The pre-season surveys are conducted in late May, and this is when management objectives are established to provide outcomes consistent with the overall management goal. Conditions are also monitored throughout the recreational use season and adjustments are made to include late-season interventions when they have been necessary to sustain ecosystem integrity and recreational values.

The number of acres and cost to address nuisance milfoil production has increased dramatically in the past few years. The total number of acres that required selective herbicide treatment jumped over 50% in 2023 and 2024. The dominance of a critical native pondweed has also declined significantly during this time which suggest that the current management program must be adapted to more nuisance acres, and it must also provide outcomes that are more species selective.

The selective suppression or eradication of exotic invasive species has always been an objective of the management program. Late season applications of nuisance species selective phenoxy herbicides and fluridone have been used to suppress or eradicate ebrid water milfoil in Lower Straits Lake in previous years. Various combinations of State and Federal approved and registered herbicides and algaecides have also been used each year to ameliorate the adverse impacts of unrestrained invasive species growth. Despite these considerable efforts, there are still no known means or ways to eradicate ebrid watermilfoil, curly leaf pondweed, or starry stonewort once they have become established in a lake.

Management Review 2025

Harvesting: Mechanical aquatic plant harvesting was added to the management program on a trial basis in 2022. Harvesting events were conducted during in late May with the intent to remove curly leaf pondweed and ebrid watermilfoil biomass and ameliorate nuisance conditions that form near the important Memorial Day Holiday. Ostensibly, the strategy was applied to expand the recreational “use” season in the lake around this key holiday. Expectations were that conditions would be improved for boating for several weeks in the early summer, but that there would be substantial regrowth of cut plants that would require subsequent, herbicide mediated species selective control efforts. It should be noted that curly leaf pondweed was present at higher-than-normal production levels during the initial harvesting events in both 2022, 2023, but was largely inconspicuous in 2024 and 2025.

The total nuisance milfoil acres treated during the past several decades rarely exceeded 100 acres. Unfortunately, ebrid watermilfoil has spread to cover significantly more acres that have been witnessed in the lake since the late 1980’s. The total nuisance milfoil acres treated in 2022 was similar to all previous years; however, the acres expanded dramatically in 2023 to 110 acres. 191 acres of nuisance ebrid watermilfoil were treated in 2024 and 158 acres were treated in 2025. Mechanical harvesting is an outstanding tool for the management of nuisance native pondweeds and hybrids; however, the literature does not generally support its use for nuisance watermilfoil management because it can spread vegetative fragments and seed to infest other areas of harvested lakes resulting in the expansion of nuisance coverage.

Furthermore, watermilfoil is far more tolerant of cutting than desirable native plants and the practice can provide a substantial competitive advantage to milfoil causing it to dominate the flora. This is analogous to using a lawn mower in the terrestrial landscape where milfoil is like grass that tolerates cutting and can quickly regrow while native plant are like tomatoes that may survive a single cutting but will not tolerate repeated cutting – giving up ground to grasses. The goal of the Lower Straits management plan is to stabilize the ecosystem by supporting good biodiversity and quality plant communities that inhibit toxic algae blooms and support vibrant fisheries. It was believed that since ebrid watermilfoil had been present in the lake for up to 50 years, it had already inhabited all of the AROS that would support its production. Furthermore, harvesting was restricted to late May when beneficial native pondweeds were still dormant and would not be impacted by cutting. The harvesting program succeeded in providing a few additional weeks of good conditions for recreation. But the percent occurrence of ebrid watermilfoil at the lake AROS expanded dramatically during the years that harvesting has been deployed.

Lake resident responses to harvesting have been mixed. Many correctly believed that the cutting depth was not sufficient to provide good extended control and nuisance relief in 2022, but this complaint was not as common in 2023, 2024 or 2025. Other residents complained that broken plant parts (flotsam) were creating nuisance conditions on shorelines. However, the amount of flotsam was no greater than that associated with typical mechanical plant harvesting operations and seemed to be well within reasonable expectations. Overall, resident response to the trial harvesting program could be described as “tepid”. Operational improvements are possible, but the cost to provide marginally better recreational conditions near the Memorial Day Holiday needs to be reconsidered. The expansion of ebrid watermilfoil coverage has come to a point where the management budget cannot properly address the problem while diverting management funds to harvesting. Management in 2026 will focus on selective management of ebrid watermilfoil and attempt to suppression production to the levels observed before 2023.

Herbicides: Warm winters have encouraged earlier curly leaf pondweed production than normal in Lower Straits and other SE Michigan inland lakes. Winter 2024/2025 was a more typical winter where there was much more ice and snow. Ebrid water milfoil completely dominated the May submersed flora covering far more acres than normal. It is unreasonable to believe that harvesting can provide season-long control of ebrid watermilfoil since it is able to rebound quickly from harvesting/cutting. A species selective herbicide combo treatment was used and provided relatively weed-free conditions until the Labor Day holiday. A select number of AROS were treated in early September to see if the late season treatment would reduce production and delay the onset of nuisance conditions in early 2026. This will be evaluated in May 2026. An early June treatment with species selective herbicides is indicated for 2026 as per the history of weeds on the lake. Should ebrid water milfoil resurge in August, an additional species selective herbicide treatment may be required to maintain acceptable conditions. Current conditions do not allow for any predictions on the scope or size of the anticipated 2026 treatment.

The Canals: Ebrid watermilfoil, curly leaf pondweed, wild celery, starry stonewort and unsightly filamentous algae blooms all afflict the canals (AROS 600’s) at completely unpredictable times during the course of the submersed plant growing season. Hence, residents report conditions to the management team and appropriate responses are implemented, depending on the timing and nature of the nuisance condition. Given the nature

and rapid development of nuisance conditions that typically form in the canals, extraordinary efforts may be applied to these AROS to ameliorate these impairments. A nutrient binding product containing lanthanum was applied to the canal in late summer 2024. It dramatically impeded the rapid and unpredictable blooms of filamentous algae in the canals in 2025. One of the key reasons for preventing filamentous algae blooms from forming is related to concerns for low oxygen conditions that occur in the warmest months. Low oxygen levels have precluded treatment of the canals with herbicides because of the threat of fish kills. These can occur as a consequence of oxygen depression that can follow herbicide treatments as the treated vegetation decays. Hence, late summer treatment must be approached cautiously. It is clear that lanthanum treatments will help to mitigate the need for mid- and late-summer algaecide treatments.

Waterlilies: Waterlilies normally wax and wane from year to year because of the presence of a wide range of herbivores and possibly pathogens. However, they have continued to grow at increasing nuisance levels in Lower Straits Lake in recent years. Each year, nuisance waterlilies are treated in the late summer to provide good conditions for the subsequent years. Approximately 1/3 of areas afflicted by nuisance waterlily growth are treated each year. The areas treated cycle around the lake from year to year, and again at around 1/3 of the total waterlily nuisance area. Expansive nuisance ebrid watermilfoil production stressed management budgets in 2024 and 2025. Water lily treatments were not completed in 2024 and were applied to only channels and canals in 2026. The future of these treatments will be considered again in 2026.

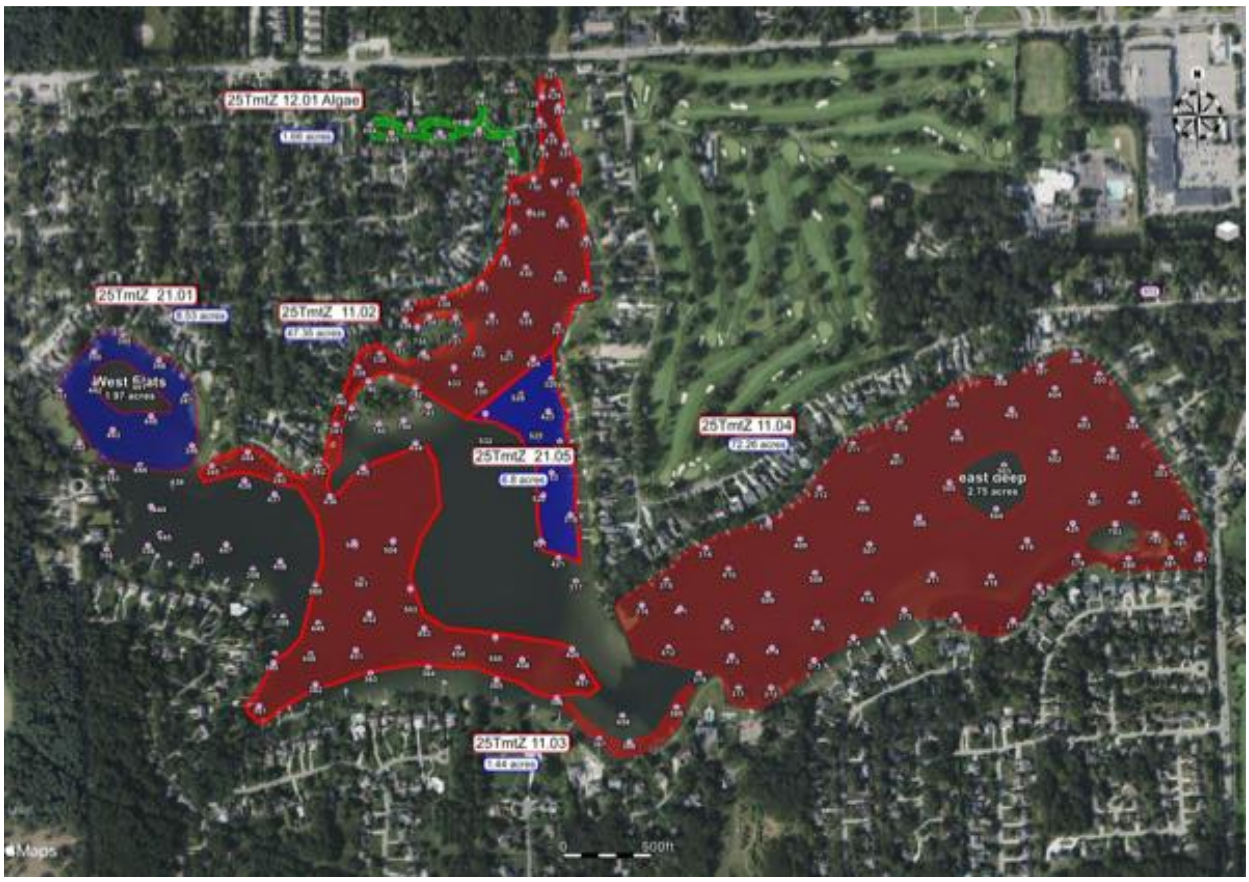


Figure 14. Aquatic herbicide application treatment zones (TmtZ), 2025.

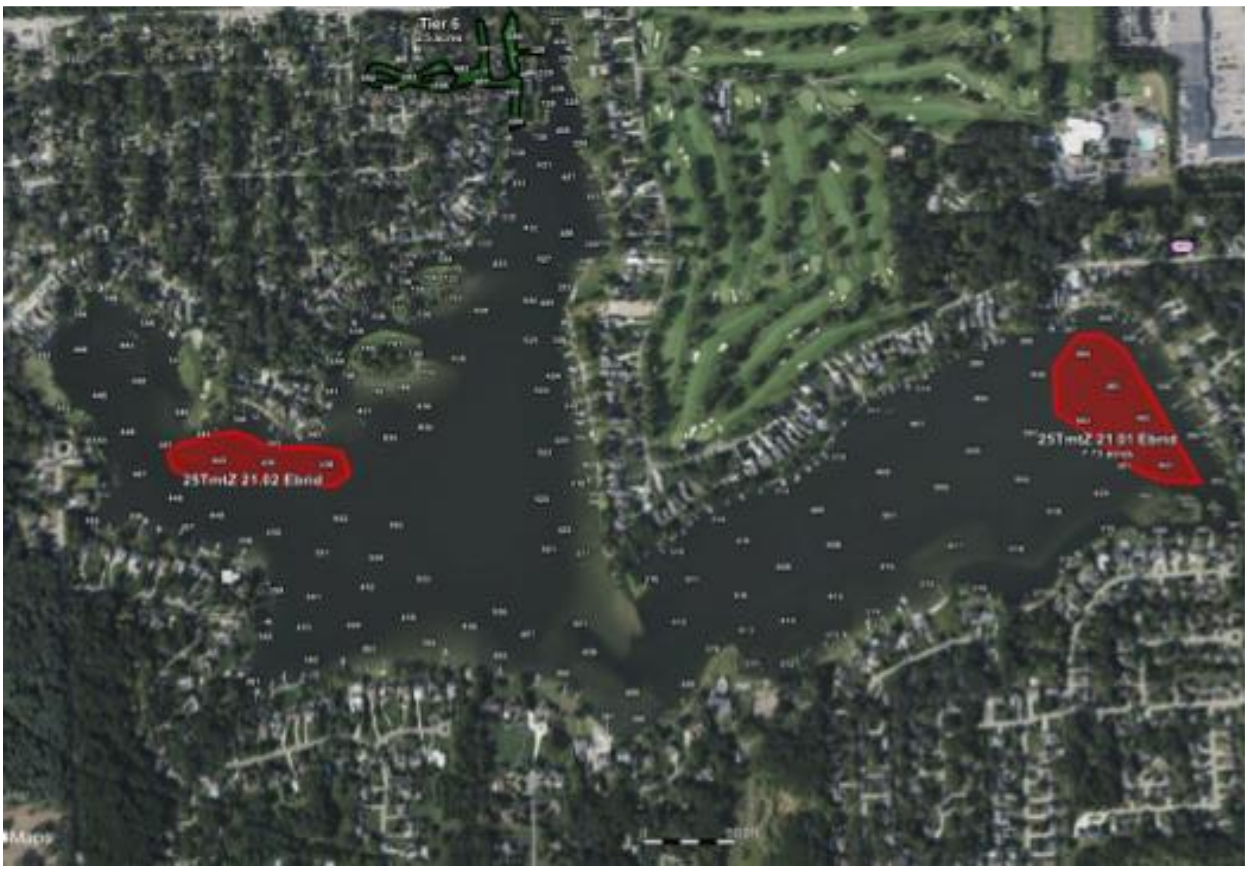


Figure 14. Aquatic herbicide application treatment zones (TmtZ) early September, 2025.

References

Michigan Department of Environmental Quality. 2006. “Part 4-Water Quality Standards.” Water Bureau, Water Resources Protection. Available online at: http://dmbinternet.state.mi.us/DMB/ORRDocs/AdminCode/302_10280_AdminCode.pdf.

US Geological Survey. 2012. “Water Quality Characteristics of Michigan’s Inland Lakes, 2001-10.” Scientific Investigations Report 2011–5233. Available online at: https://pubs.usgs.gov/sir/2011/5233/.

Appendices

Appendix A: Blue Green Algae

Blue green algae blooms are becoming increasingly common in Michigan. Blooms can appear as though green latex paint has been spilled on the water or resemble an oil slick in enclosed bays or along leeward shores. Blue green algae blooms are usually temporal events and may disappear as rapidly as they appear. Blue green algae blooms are becoming more common for

a variety of reasons; however, the spread and impact of zebra mussels has been closely associated with blooms of blue green algae.

Figure A1: Example blue green algae images from the 2020 LakeScan™ field crew.

Blue green algae are really a form of bacteria known as cyanobacteria. They are becoming an important issue for lake managers, riparian property owners and lake users because studies have revealed that substances made and released into the water by some of these nuisance algae can be toxic or carcinogenic. They are known to have negative impacts on aquatic ecosystems and can potentially poison and sicken pets, livestock, and wildlife. Blue green algae can have both direct and indirect negative impacts on fisheries. Persons can be exposed to the phytotoxins by ingestion or dermal absorption (through the skin). They can also be exposed to toxins by inhalation of aerosols created by overhead irrigation, strong winds, and boating activity.

Approximately one half of blue green algae blooms contain phytotoxins, and this is determined through lab testing. It is recommended that persons not swim in waters where blue green algae blooms are conspicuously present. Specifically, persons should avoid contact with water where blooms appear as though green latex paint has been spilled on the water, or where the water in enclosed bays appears to be covered by an “oil slick”. Pets should be prevented from drinking from tainted water. Since blue green algae toxins can enter the human body through the lungs as aerosols, it is suggested that water containing obvious blue green algae blooms not be used for irrigation in areas where persons may be exposed to it.

Blue green algae are not very good competitors with other, more desirable forms of algae. They typically bloom and become a nuisance when resources are limiting or when biotic conditions reach certain extremes. Some of the reasons that blue green algae can bloom and become noxious are listed below:

TP and TN: The total phosphorus (TP) concentration in a water resource is usually positively correlated with the production of suspended algae (but not rooted plants, i.e. seaweed). Very small amounts of phosphorus may result in large algae blooms. If the ratio of total nitrogen (TN) to total phosphorus is low (<20), suspended algae production may become nitrogen limited and noxious blue green algae may dominate a system because they are able to “fix” their own nitrogen from atmospheric sources. Other common and desirable algae are not able to do this.

Free Carbon Dioxide: All plants, including algae, use carbon dioxide in photosynthesis. Alkalinity, pH, temperature, and the availability of free carbon dioxide are all closely related and inter-regulated in what can be referred to as a lake water buffering system. Concentrations of

these key water constituents will shift to keep pH relatively constant. Carbon dioxide is not very soluble (think about the bubbles of carbon dioxide that escape soda pop). The availability of this essential substance can be in short supply in lake water. Many blue green algae contain gas “bubbles” that allow them to float upward in the water column toward the water surface where they can access carbon dioxide from the atmosphere. Consequently, blue green algae that can float have a competitive advantage in lakes where carbon dioxide is in low supply in the water. This is also why blooms form near the surface of the water.

Biotic Factors: Zebra mussels and zooplankton (microscopic, free-floating animals) are filter feeding organisms that strain algae and other substances out of the lake water for food. Studies have shown that filter-feeding organisms often reject blue green algae and feed selectively on more desirable algae. Over time, and given enough filter feeding organisms, a lake will experience a net loss in “good” algae and a gain in “bad” blue green algae as the “good” algae are consumed and the “bad” algae are rejected back into the water column. This is one of the most disturbing factors associated with the invasion and proliferation of zebra mussel. Lakes that are full of zebra mussel may not support the production of “good” algae and experience a partial collapse of the system of “good” algae that are necessary to support the fishery.

Appendix B: Common Aquatic Invasive Species

Eurasian Watermilfoil and Hybrids (Ebrids):

Background: Anecdotal evidence suggests that hybrid milfoil has been found in Michigan inland lakes for a long time (since the late 1980’s). University of Connecticut professor Dr. Don Les was the first to determine that there were indeed, Eurasian watermilfoil and northern

watermilfoil hybrids in Michigan based on samples sent to his Connecticut lab by Dr. Douglas Pullman, Aquest Corp. in 2003. Experience has proven that it is usually not possible to determine whether the milfoil observed is either Eurasian or hybrid genotype. However, because they play such similar roles in lake ecology, they are simply “lumped together” and referred to collectively as ebrid milfoil. Ebrid milfoil is a very common nuisance in many Michigan inland lakes.

Management: Lake disturbance, such as weed control, unusual weather, and heavy lake use can destabilize the lake ecosystem and encourage the sudden nuisance bloom of weeds, like ebriid milfoil. Ebrid milfoil is an ever-present threat to the stable biological diversity of the lake ecosystem. Species selective, systemic herbicide combinations have been used to successfully suppress the nuisance production of ebrid milfoil and support the production of a more desirable flora. However, it is becoming much more resistant to all herbicidal treatment. This resistance can be easily defeated with the use of microbiological system treatments. This is done with only a minor increase in cost. Milfoil community genetics are dynamic, not static, and careful monitoring is needed to adapt to the expected changes in the dominance of distinct milfoil genotypes. Some of these genotypes may be more herbicide resistant than others and treatment strategies must be adjusted to remain effective in different parts of the lake.

Figure B1: Example Eurasian Watermilfoil and Hybrids images from the 2020 LakeScan™ field crew.

Starry Stonewort

Background: Starry stonewort invaded North American inland lakes after becoming established in the St. Lawrence Seaway/Great Lakes system. It has probably been present in Michigan’s inland lakes since the late 1990’s but was not positively identified until 2006 by Aquest Corporation in Lobdell Lake, Genesee County, MI. Since then, it has been discovered in lakes

all over Michigan. It is truly an opportunistic species that will bloom AND crash and impose a very significant and deleterious impact on many ecosystem functions. Bloom and crash events are unpredictable and can happen at any time of the year. In some years starry stonewort can become a horrendous nuisance while it can be inconspicuous in others. It can comingle with other similar species and be very difficult to find when it is not blooming.

Management: Starry stonewort is capable of growing to extreme nuisance levels. It is easy to kill, but very difficult to treat. It grows so rapidly that mechanical methods of control are strongly discouraged. First, starry stonewort can regrow so rapidly after cutting that it can be nearly impossible to keep up with the nuisance production of this fast-growing plant. Mechanical controls can also help to disperse and spread starry stonewort throughout inland lakes when the plant is fragmented. It is even more disturbing that desirable plant species are more susceptible to mechanical control strategies than starry stonewort and mechanical controls can thereby select for the dominance of starry stonewort over a much more desirable flora. Starry stonewort is susceptible to most selective algaecides, but the dense mats of vegetation are very difficult to penetrate and provide reasonable biocide exposure. Consequently, multiple algaecide applications may be required to “whittle down” dense starry stonewort growth if the mats reach sufficient height.

Figure B2: Example starry stonewort images from the 2020 LakeScan™ field crew.