# The Tomahawk Lake Association, Inc
# 2016 Treatment Report

## Introduction:

This report for the 2016 treatment year, addresses the tasks and activities undertaken in the application and monitoring of the chemical herbicide treatment regime addressed in the Tomahawk Lake AIS control grant of 2016 (ACEI – 185-16).

The initial pretreatment AIS survey for the 2016 chemical herbicide treatments was made in early September of 2015. The TLA surveyor was aided in his task with site information provided by the "Sentinels" group (TLA's lake monitoring organization) and by information passed along by lake shore owners and lake visitors. The proposed treatment plan for 2016 included 25.66 acres of Eurasian Water Milfoil (EWM) within 30 polygons:

- 15.42 acres treated with Sculpin G Granular 2,4-D Aquatic Herbicide.
- 10.24 acres treated with DMA IV Liquid 2,4-G Aquatic Herbicide.

As the 2016 late Spring treatment period approached, it became clear that the weather patterns throughout the early-mid spring period had returned to a more typical seasonal progression than in recent years with ice out taking place in early to mid-April, and water warm up progressing at a more normal rate of lake warming. In the prior years the development of the EWM plants (as well as the remaining native plant community) had been slowed dramatically, pushing treatment dates well into early to mid-June. With the return of an earlier spring however, the 2016 chemical treatment applications in the Tomahawk Lake Watershed took place beginning on June 1st and continued through June 3rd, 2016.

## 2016 Post-Treatment Monitoring:

The effects of a chemical treatment to an area within a body of water can be ascertained by examining "before and after" treatment comparisons of the same site locations within those areas following the chemical application. In the case of Tomahawk Lake, the "pre-treatment" data set for 2016 treatments, consisting of the establishment of 30 polygons and the accompanying point intercept sites was collected in August and September of 2015. The "post-treatment" data set was collected in early August of 2016. Both of these surveys followed WDNR protocols, and used the WDNR provided Aquatic Plant Inventory / Excel spreadsheet.

In these surveys, data collection included collection of samples using rake fullness techniques described in the WDNR protocol. EWM and native aquatic plant species presence, and species rake fullness data were collected, as well as water depth and substrate composition type. Points were established and re-visited using latitude and

longitude coordinates, located through the use of sub-meter GPS navigation (Trimble Juno data collector and ArcGIS 10 software.)

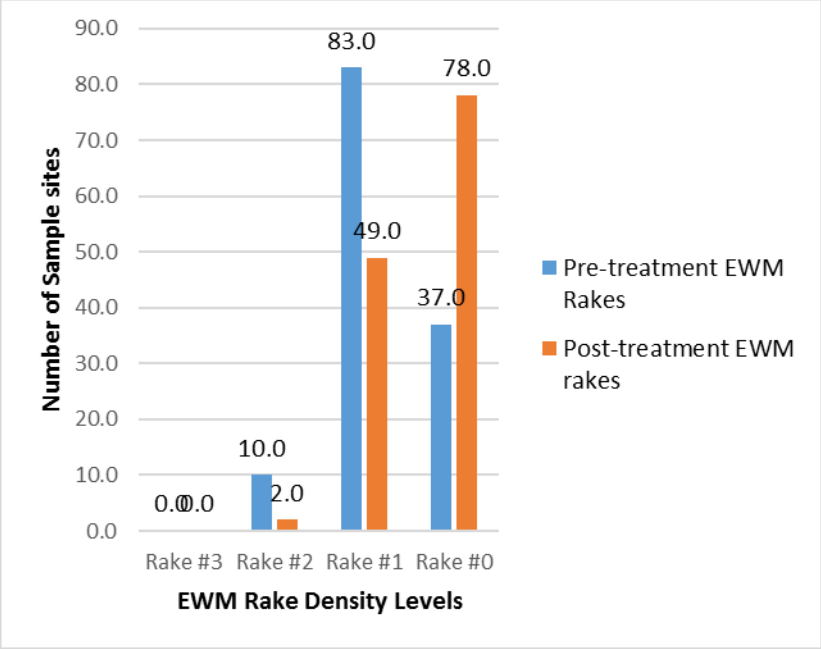
## 2016 Treatment Results:

***Eurasian Water Milfoil changes (EWM):***

In the 2016 Post-Treatment Survey taken in early August, a total of 51 of the 130 points surveyed in sites shallower than the maximum depth of plants contained EWM, representing a Frequency of Occurrence rate of 39.84% of the sampled points. This compares to 93 of the 130 points surveyed in the pre-treatment survey taken in September of 2015 which equates to a Frequency of Occurrence of 73.23%. These percentages indicate a success rate of 65.13% reduction of EWM in infested sites.

Moreover, a EWM rake fullness rating of 0, 1, 2, or 3 was assigned to each point surveyed, to determine the abundance of EWM at each surveyed point.

**Graph 1: 2016 Pre vs Post Treatment EWM Rake Density Changes Within Treated Polygons**




**Graph #1** represents the change that took place year to year, following the 2016 chemical treatment on June 1-3 of 2016. The graph shows that EWM plant densities were reduced or eliminated in three of the rake density levels. There were no point intercept

samples taken in either the pre or post treatment samples which contained EWM rake densities of 3. Included in the **"2016 Treatment Maps"** appendix are detailed polygon maps showing the EWM rake fullness data for each surveyed point within the treated polygons.

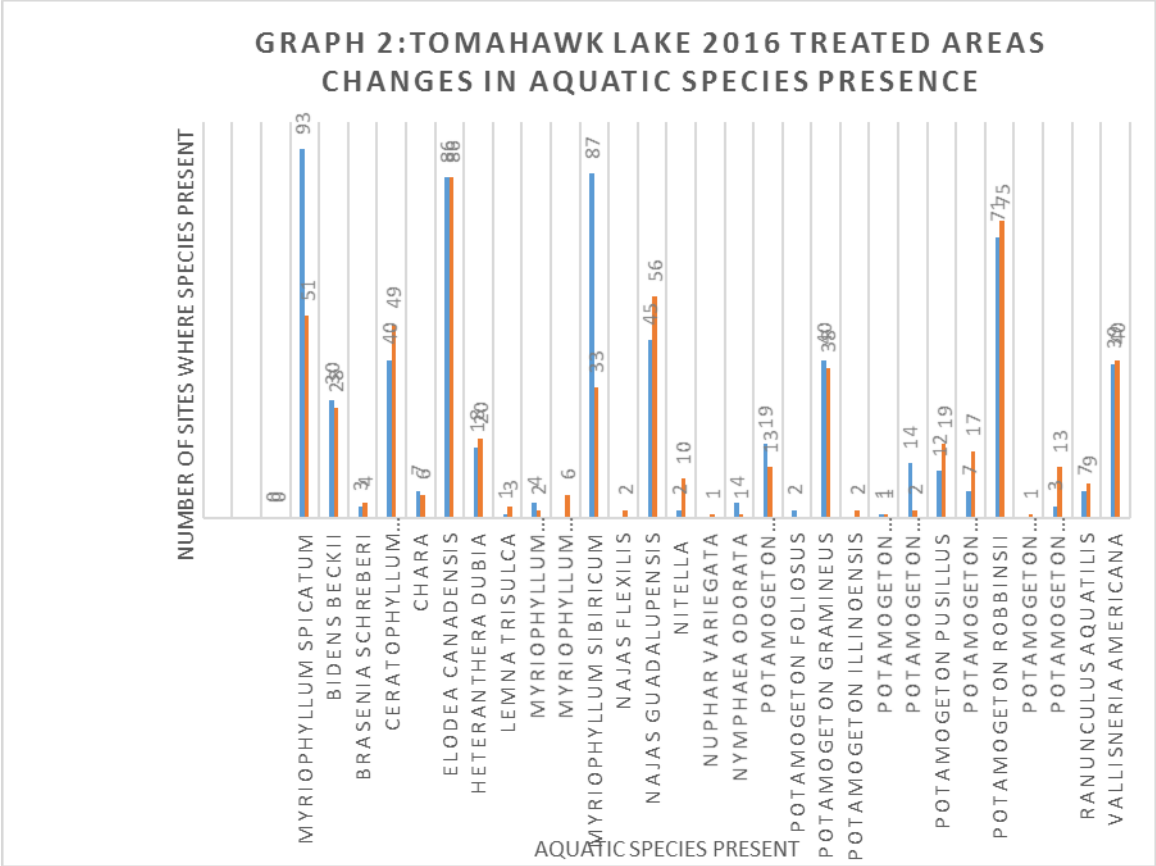
By comparing the pre and post treatment rake toss rating values for EWM for each sample point within each treated polygon, the average EWM rake value change for each polygon can be calculated. By averaging all polygons EWM rake value changes together, an average EWM rake value change for all treated polygons treated can be derived. In 2016, the average EWM rake value rating over all polygons dropped -0.3876 of one rating point. (See **Table 1** in the "Tables & Graphs" appendix of this report.)

***Native Plant Community Changes:***

The effects of chemical herbicide treatments are felt across the entire plant community to a greater or lesser degree. Because non-target plant species can be negatively affected, a number of precautions are routinely taken to limit the unintended consequences of treatments. These precautions include (but are not limited to) making chemical applications as early as possible, when EWM plants have begun to grow, but before the native plant community has begun to develop. Applications are also made using herbicides which target the desired species, but have no or lesser effects on other species. 2,4-D has a history of effecting dicot plants, while having lesser effects on non-dicots. Finally, the amount of herbicide applied at specific water depths plays an important role in reducing the effects on non-target species as well. It is however important to monitor and evaluate the overall health of the non-target species following each chemical herbicide application. For this reason, the pre and post-treatment surveys taken within the treated polygons call for the collection of data not only for the target species (EWM), but also for all other plants at the treatment sample points. The WDNR provided "Aquatic Plant Inventory Workbook/Excel spreadsheet" provides a uniform method for the collection of this data. 2016 Pre and Post Treatment Aquatic Plant Inventory Workbooks are included in Section 5: Appendices.

Species Presence:

One means of examining the effects of a chemical treatment upon an area is to compare the number of sample sites which include a specific species from before the treatment to those after the treatment. In **Graph #2** below, a species "before & after" comparison is made by use of colored bars. For each species present, the blue bars represent the number of sites where a species was found in the pre-treatment survey done in the fall of 2015, The red bars represent the number of sites where that species was found in the post treatment survey in early august of 2016, following the early June treatment. While minor variations occurred between the majority of plants present, the two species which were effected to the greatest extent were Myriophyllum spicatum -Eurasian Water Milfoil, and Myriophyllum sibericum – Northern Water Milfoil.




Additionally, by inserting this data into the "chi-square" analytical spreadsheet provided by the University of Wisconsin Extension Lakes in Appendix D of its "Aquatic Plant Management Guide" statistical significance of changes in species presence can be established for each species included in the pre & post treatment comparison.

*Table 2 "2016 Tomahawk Lake Chi Square Test for Statistical Significance":*

(found in appendix 2) examines the statistical significance for pre & post treatment presence over the 130-point intercept sites, and notes whether changes in individual plant species presence are significant. Of the 27 species present in the 130 sites, only the species presence of two plants were deemed as "highly significant: Myriophyllum spicatum (target AIS) and Myriophyllum sibericum.

*Table 3 "Statistical Comparison of Aquatic Plant Frequency of Occurrence Pre-treatment (September 2015) vs Post-Treatment (July 2016):*

demonstrates that utilizing changes in "Frequency of Occurrence" as a factor for comparison yields a similar result. (See table 3 in appendix 2). It is interesting to note that among the dicots present in the sample sites, there were only two which were noted as "highly significant". They are Myriophyllum spicatum (target AIS) and Myriophyllum

sibericum. Of the other 8 dicots present within the 130 sites, all but one was deemed as "not significant". Within the 19 Non-Dicots present within the 130 sample sites, 15 of the 20 experienced changes in FOO that were rated as "not significant", with four 4 being deemed slightly significant. Three of those four experienced increases in FOO.

*Table 4: "2016 Pre & Post Treatment Floristic Quality Index Comparisons":*

is also found in appendix 2. This chart utilizes the Floristic Quality Index as a comparative basis for evaluating the effects of the 2016 chemical herbicide treatments on Tomahawk Lake. The chart notes three elements which demonstrate the effects of the 2016 herbicide treatment on the native plant community, within the treated areas:

1. Species presence (N) increased from 23 pre-treatments to 27 post-treatment
2. Mean of the coefficient of conservatisms for the noted species increased from 6.652173913 to 6.66667.
3. Floristic Quality Index increased from 31.90270535 pre-treatment to 34.641 post-treatment.

The increase values of these elements indicate that the 2016 herbicide treatment had a relatively minor but positive effect on the ability of plants more sensitive to disturbance to be able to compete successfully within the samples sites.

Finally, the *Simpson Diversity Index (SDI)* which is computed and reported in the Pre & Post Data Workbook Excel spreadsheet program notes that the SDI increased from pre-treatment to post-treatment surveys:

| | |
|---|---|
| 2016 Pre-Treatment Simpson Diversity Index | 0.91 |
| 2016 Post-Treatment Simpson Diversity Index | 0.92 |

This would indicate that the net effect of the 2016 aquatic herbicide treatment had little significant effect upon the native plant community although the small effect was positive.

In conclusion, the 2016 chemical treatment on Tomahawk Lake did have a positive effect in reducing the levels EWM infestation within the treated areas. The "Frequency of Occurrence" for EWM was reduced by 65.13% within the treated polygons, and the remaining EWM plant density within all treated polygons was reduce by .3878 of one rating point. The effects of the treatment within the native plant community, as measured by the noted comparative tests were all neutral to slightly positive in nature.

## 2017 Aquatic Invasive Species Management Discussion

In early September 2016 the TLA surveyor performed an EWM infestation pretreatment survey to establish potential polygons to include in the preliminary recommendation to the WDNR for chemical treatment of EWM in the spring of 2017. In the performance of the survey the TLA surveyor utilized the UW extension lakes aquatic plant management guide protocols. The surveyor used a number of inputs from various sources with which to locate areas of infestation

- Results from the 2016 post-treatment survey
- EWM infestation maps developed from two 2016 Sentinel surveys
- EWM sightings reported by Lake shore owners and lake visitors
- The surveyor's local knowledge of past locations of infestation
- Hydraulic Conveyor System staff input

The TLA surveyor traveled to all locations to assess EWM infestation levels, and where warranted map polygons for potential treatment. The surveyors decision-making process was based upon his experience in recognizing expanding EWM development and estimating the risk (both short-term and long-term) in not controlling the infestation through the use of chemical herbicides. Later the surveyor aided by TLA's GIS mapping consultant constructed detailed maps that were included in the treatment proposal for the following spring. Over a period of several days the TLA surveyor identified a total of 14.86 acres of EWM within 15 polygons that he recommended for chemical treatment in May 2017. Following the completion of the AIS assessment survey and subsequent point intercept survey as required for the initial pretreatment point intercept survey required for chemical treatments in May 2017, the surveyor made an appointment to meet with Kevin Gauthier of the WDNR on October 7, 2016 to discuss the aquatic invasive species management plan for Tomahawk Lake in 2017.

Over the course of this three-hour meeting Kevin laid out the new WDNR position on the use of chemical herbicides for the control of aquatic invasive species in Oneida, Vilas and Forest County lakes requesting chemical spot treatments (polygons of less than 5 acres). The DNR position for chemical herbicide use for spot treatments was that no chemical treatment permits for systemic or contact herbicides would be issued for spot treatments in 2017. Kevin supported this change in policy by citing a number of scientific studies undertaken by the University of Wisconsin which questioned the overall effectiveness of chemical herbicide treatments to small areas due to rapid dispersion of the applied chemical herbicides outside of the polygon areas. Additionally, Kevin introduced information from these studies which indicate that the use of chemical herbicides over extended periods of time have had a negative effect upon successful fish reproduction. In addition, other studies both ongoing and completed were introduced that showed the extensive buildup of chemical herbicide residue in the pour water regions of the water column in study lakes where repetitive chemical treatments have been made over time. While Kevin did say that while some of the studies were ongoing that it appeared that the preponderance of evidence shows that the continued use of chemical herbicides to control aquatic invasive species has a negative effect on the aquatic environment and places the aquatic ecosystem at risk. Kevin indicated that a number of lakes systems throughout his area of responsibility would be subject to this chemical herbicide ban.

Finally, Kevin introduced a WDNR theory which says that Eurasian Water Milfoil if left untreated will seek an infestation equilibrium over time within the littoral zone of approximately 10%. He supported this theory with comparative charts of a number of northern lakes infested with Eurasian water milfoil of which some had received chemical

treatments over time while others had not. The rate of infestation in these two sets of lakes were remarkably similar.

*TLA 2017 Recommendation:*

Given the constraints upon the use of Chemical Herbicides within small spot treatment areas, the 2017 TLA recommends following strategy for controlling AIS within the Tomahawk Lake watershed for 2017:

1. Continue to monitor aquatic invasive species aggressively in 2017 and in the future.
2. Continue the use of the Hydraulic Conveyor System to remove aquatic invasive species in areas of high risk which meet the original criterion established at the inception of the hydraulic conveyor system operation.
3. Consider expanding the hydraulic conveyor system role in removing AIS targeted areas where increased infestation rates have created a" nuisance" situation.
4. Continue to review the aquatic invasive species conditions within the watershed with the WDNR on an ongoing basis.
5. Continue to control Purple Loosestrife infestations through introduction of bio-controls (Loosestrife beetles).

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