Leopolis Drawdown 2017

A report from the Wisconsin Department of Natural Resources

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Introduction

Leopolis pond is a 3 acre impoundment of the North Branch Embarrass River in Shawano County. More information can be found at https://dnr.wi.gov/lakes/lakepages/LakeDetail.aspx?wbic=301600.

Aquatic Plants

A healthy aquatic plant community provides numerous benefits to the lake ecosystem and to the lake itself. The presence of aquatic plants within the littoral zone serves to help the lake water quality. The plant growth acts to prevent sediment suspension by holding bottom sediments in place and dampening wave action reducing shoreline erosion. Aquatic plants slow the flow of water, allowing already suspended sediments to settle out. Growing aquatic plants serve as structure on what are often flat lake bottoms. In this way, they serve as habitat, and shelter many of the smaller animals such as zooplankton, insects and both small and young fish. They also serve as hunting and grazing points of many of the larger lake animals. They produce oxygen necessary for these animals and absorb nutrients that might otherwise fuel algal growth.

Non-native invasive plants

Most non-native invasive plants in Wisconsin follow the "rarely common, commonly rare" pattern. In most lakes, these plants occur as a small fraction of the total community, never really becoming a problem. Less often these invasive plants will expand rapidly because conditions are right or because the existing plant community is disturbed. When this happens, the invasive plants will outcompete the natives possible resulting in reductions of fish spawning habitat, stunted fish, access limitations for both people and animals, and increased fouling of in-water equipment like motors.

Currently within Wisconsin, there are 3 established non-native invasive aquatic plants: Eurasian water milfoil (EWM), Curly-leaf pondweed (CLP) and Starry Stonewart (SSW). Leopolis Pond does not have CLP or SSW but does have EWM.

Eurasian water milfoil is native to Europe and Asia as its name suggests. It has become widespread throughout the state since its introduction in the early 1900s. EWM is an early growing plant that tends to exist in dense beds that often reach the surface of the water. Once at the surface, EWM will spread on the surface, forming a floating mat that is not only difficult to navigate through but can shade out plants below. The long stems of EWM are also fragile allowing fragments to break off with relative ease. These fragments begin forming roots and settle into a new location, allowing the plant to become established in new areas.

Eurasian Watermilfoil

Curly-leaf pondweed is another European native that is now common throughout the state of Wisconsin. CLP has a unique growth cycle compared to the native plants. It begins growing under the ice in winter, rapidly growing in spring, producing turions in early summer, before dying back in mid to late summer. The turions are a durable and long-lasting reproductive structure that can last for several years and survive chemical treatments. Problems occur when CLP dominates the system because the summer die back often causes as nutrient spike which may fuel an algae bloom, depending on the amount of CLP in the lake.

←Curly Leaf Pondweed

The newest invasive to become established in Wisconsin is Starry Stonewart, a macro-alga related to the native Charas and Nitellas. It has been found in 7 lakes in the southeast part of the state. SSW is another species like EWM that can reproduce from fragments making it relatively easy to spread. SSW also possesses a durable, long lasting structures called bulbils from which it can regrow. The combination of newness, easy fragmentation, and bulbils makes control options limited.

←Starry Stonewort

Drawdowns

Drawdowns can occur with a full or partial temporary removal of the physical barrier. In September 2016, Leopolis pond initiated a full drawdown. In April 2017, the pond was brought back up to full capacity. A drawdown can be very effective when properly conducted with all entities involved. The effects can last for three or more years. A drawdown may allow the sediment to compact. As a driver of disturbance, drawdowns may increase native plant diversity by “flushing” out the dominant Eurasian watermilfoil.

At times, a drawdown may be socially hard to sell. There may be impacts to the existing fishery and other recreation.

Why Monitoring is Important

Monitoring the plant community is an important component in the process given the variability of the many management practices that can be used when dealing with aquatic plants. Pre-treatment monitoring is necessary to determine what is present in the lake before any management takes place. This data acts as a base from which future monitoring results can be compared. Post-treatment monitoring is needed to determine what occurred after a management activity. By combining both pre- and post-treatment monitoring data (using a statistical method called chi-square), it becomes possible to make determinations about the effectiveness of the a given management action. Monitoring also provides an opportunity to look at the impacts a management activity has on non-target species within the lake. Ultimately the goal of monitoring is to improve management decisions with better science.

Aquatic Plant Community

Point Intercept Methodology

The point intercept (PI) survey is the standard method adopted by the Department of Natural Resources to look at plant communities within lakes. Point Intercept surveys are implemented by creating a grid over the lake using GIS software. The grid size will vary based on the littoral area and shape of the lake to ensure adequate coverage of probable plant habitat. Each point on the grid is then entered in a GPS unit so that each point can be reliably returned to within the margin of error of the GPS unit.

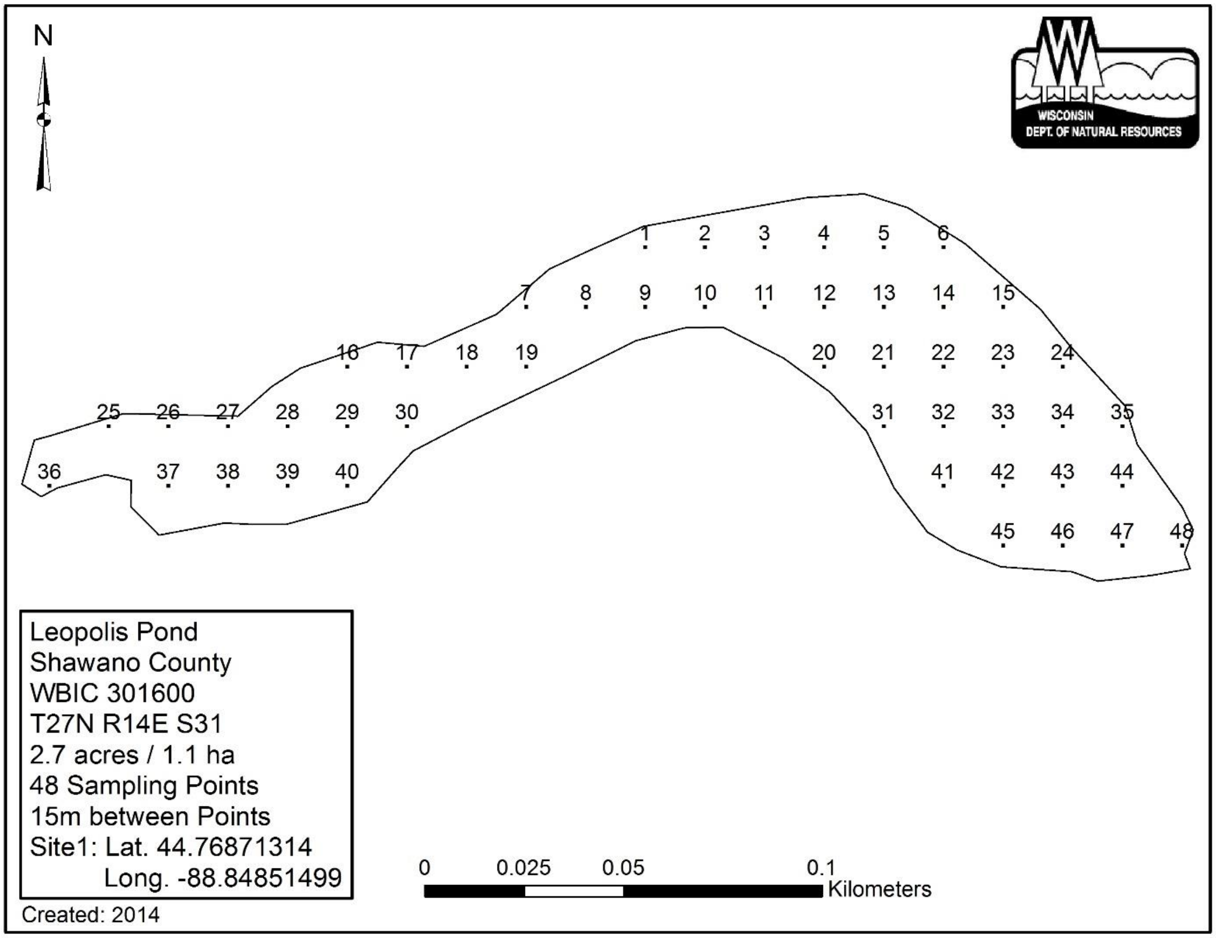

Figure 1.

Each point on the lake is then sampled using a double headed rake. The rake is dropped to the lake bottom, twisted or dragged and whatever is caught on the rake is then pulled up. The rake is then given a numerical value of 0, 1, 2 or 3 based on the amount of plants on the rake. Each plant is identified to the lowest taxonomic level possible and give a separate 1, 2 or 3 value based on how much of that species is present on the rake. All species and values are then recorded to be entered into a spreadsheet for analysis.

A PI survey should be conducted both before and after a management activity This level of repeatability is what allows for accurate comparisons of plant data at the same point from multiple time frames. The most common time for surveys to be conducted is mid to late summer. This is to ensure that most of plant species are actively growing and most likely to possess their identifying characteristics. Surveys may be conducted earlier or later but some species are more likely to be missed or misidentified. Examples of the field gear and collection techniques are below.

Point Intercept Survey Information

The data obtained from the Point Intercept survey is analyzed and used to produce several values for an objective assessment of vegetative quantity and quality. Species richness or number of species identified and rake fullness are two measures that are obtained simply by doing the Point Intercept survey. From these two data sets, geolocated maps of each species can be created. Maps for both pre- and post-treatment can be used to visually represent changes in the plant community.

Another useful metric which is easily obtained is the Floristic Quality Index (FQI). The FQI is determined by dividing the sum of all the coefficients of conservatism (CoC) by the number of species found to obtain the mean CoC. The coefficient value between 0 – 10 are assigned to each plant species based on how tolerant they are to disturbance/pollution, with the most tolerant being 0's and the least tolerant being 10's. The mean CoC is then multiplied by the square root of the number of species to obtain the FQI value. The higher the FQI value, the more intact/better quality the system is.

Percent frequency of occurrence (FoO) is another value that is useful value when looking the plant community. FoO is an estimate of how often a given species will appear at a vegetated site within the lake. It is determined by dividing the number of sites the species was found at, by the total number of sites with vegetation then multiplying by 100.

The values obtained in the pre- and post-treatment are compared to each other to see what has changed. To determine which changes are statistically significant, the values are run through the Chi-square test. The Chi-square test compares the data to see how well it fits the population. It is calculated by using the following formula $X_i^2 = \Sigma (O_i - E_i)^2 / E_i$ or post-treatment value minus the pre-treatment value, square the difference, then divide by the pre-treatment value. A result is then compared against the 0.05 value from a chi-square p-values table. If $X^2 > p$ then we reject the null hypothesis that the two value are the same.

Aquatic Plant Community

In 2014, 48 sites were sampled with an average depth of 3.9 feet (figure 2 and 3). In 2017, 46 sites were sampled with an average depth of 3.6 feet (figure 2 and 4). Although this difference was not statistically significant (p>0.05), the number of muck sites decreased from 31 in 2014 to 22 in 2017 (figure 5 and 6).The total number of sites with Eurasian watermilfoil dropped from 17 sites in 2014 to 2 sites in 2017. The total number of sites with flatstem pondweed dropped from 18 sites in 2014 to 8 sites in 2017.

←Flatstem Pondweed

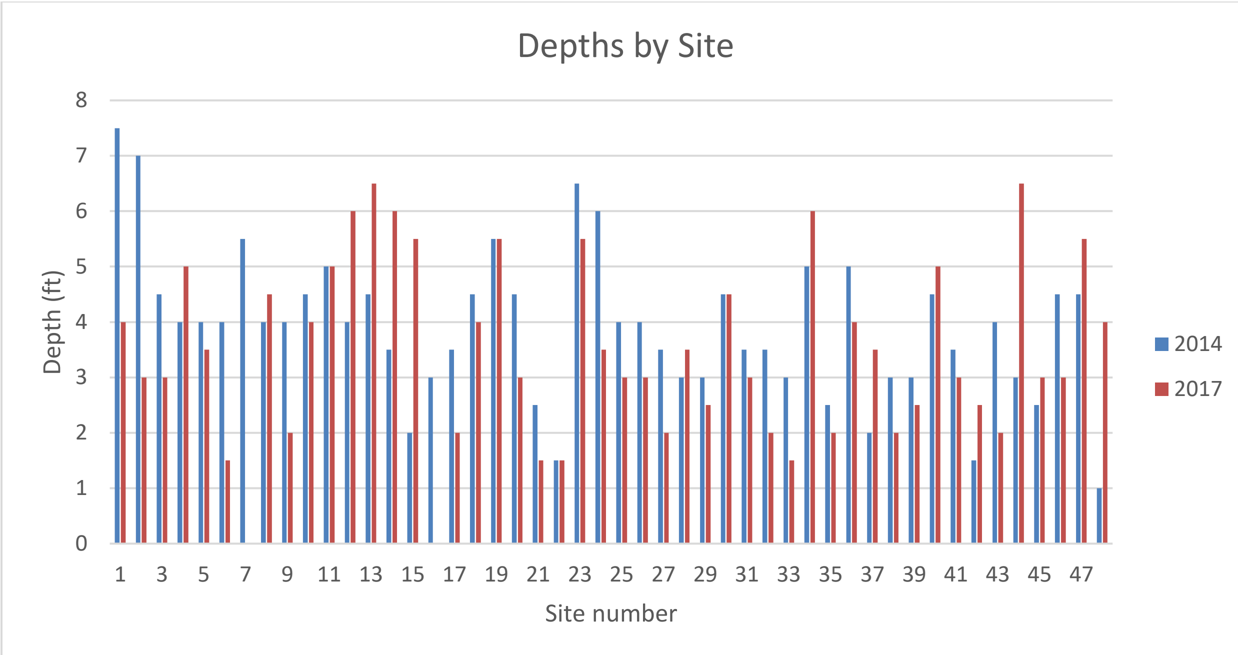

Figure 2. (Refer to figure 1 for the locations of the sites)

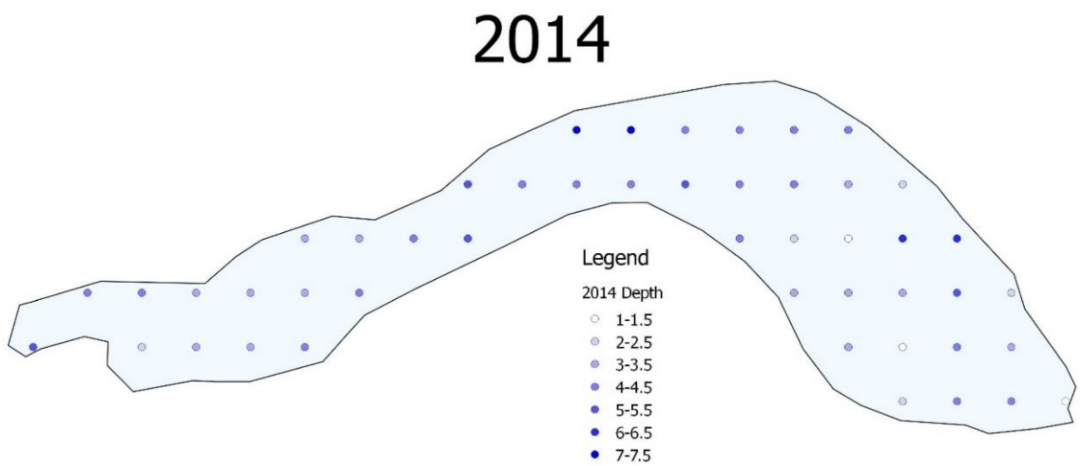

Figure 3.

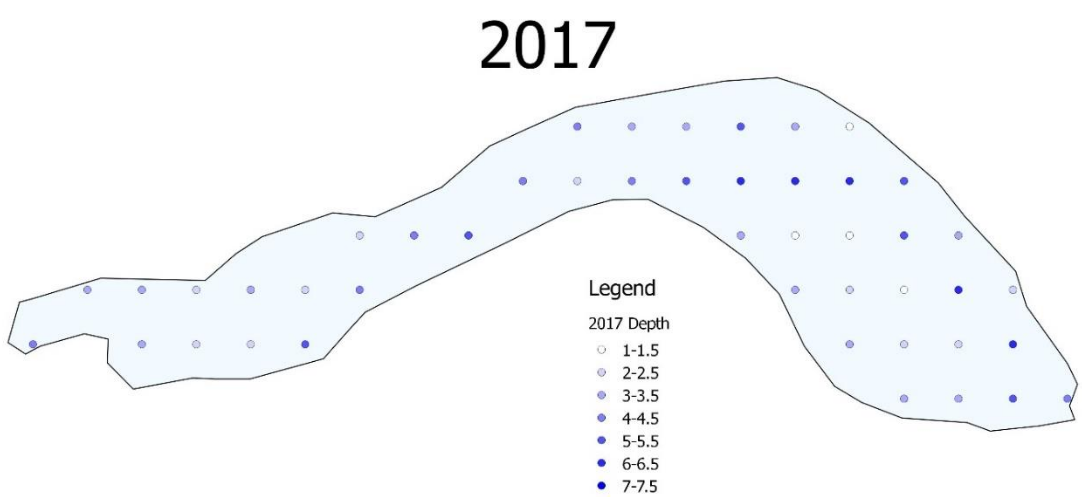

Figure 4

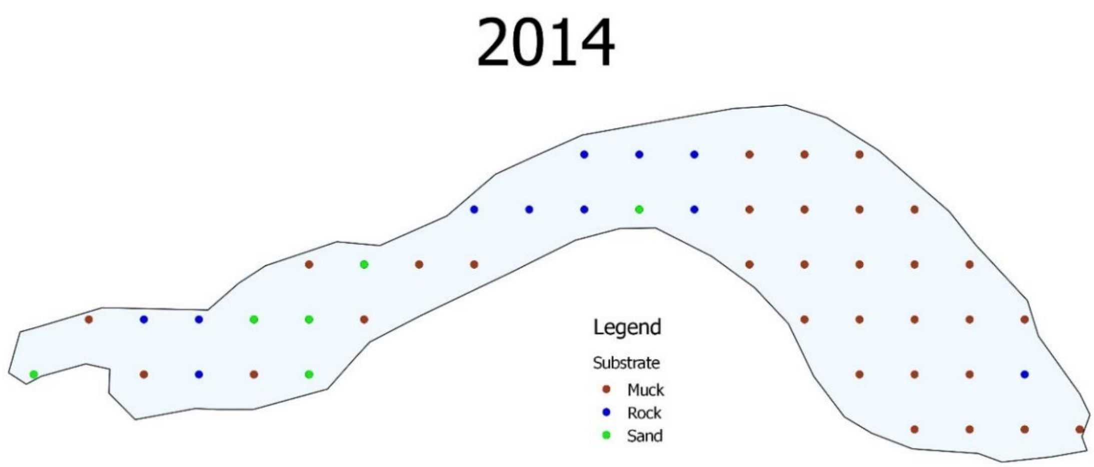

Figure 5

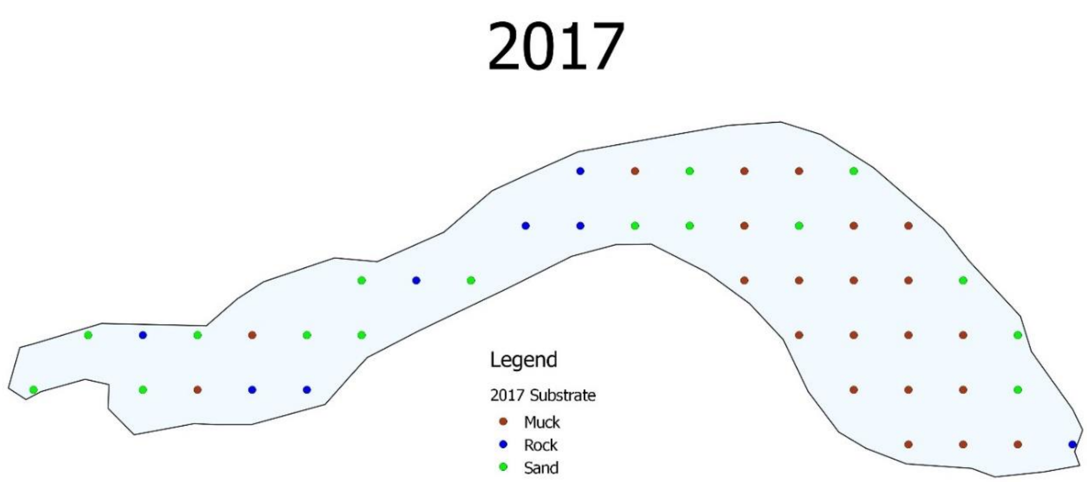

Figure 6

Conclusions and Recommendations

As mentioned in the opening paragraph, a complete project consists of a pre-treatment Point Intercept survey the year before the control action, the control action, and a post-treatment Point Intercept survey the year of and the year after the control action, and updated bathymetry. Once the control action has been implemented, it is important to "stay on top of it" and this can be done by Integrated Pest Management, which is utilizing many different control methods, including DASH, harvesting, and/or hand pulling. Again, it is also important to use long term data collection to help guide management actions over time. For example, if the long term data indicates that the native plants are declining significantly or the water quality is degrading, then a different form of management will be needed.

It is suggested that a drawdown occur in Leopolis Pond every 5 years. However, it would be beneficial to engage all stakeholders of the lake to come up with an agreeable method.