Report to ALPOA Board on the Findings of the Aquatic Plant Lake Mapping Project December 31st, 2012

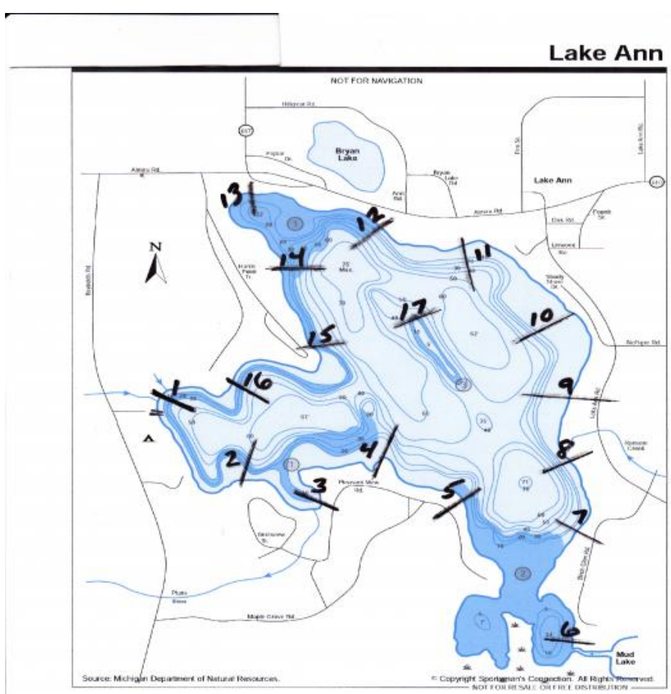
The Invasive Species Committee of Ann Lake Property Owners Association (ALPOA) undertook a mapping of the aquatic plants within Ann Lake this past year. This endeavor consisted of 3 events:

1) Several members of the committee were first trained at Boyne Mountain on plant identification and lake mapping protocols and procedures through the Michigan Lakes and Streams Association and MSU Extension.

2) The committee met to determine the appropriate transects on the lake. The intent was to sample all the ingress and egress points of the lake, both man-made and natural, and then divide the remaining areas of the lake equally.

3) Accompanied by Dr. Jo Latimore, Outreach Specialist from Michigan State's Department of Fisheries and Wildlife, the committee, mapped the entire lake on July 31st of this year.

The committee identified 17 transect points around the lake with the first transect point starting at the Boat Launch and then proceeding counter clockwise around the lake (map below). At each transect point, 4 samples were taken at 3 depths: 1 foot, 4 feet and 8 feet. The following charts illustrate what was found and their densities, shown both by transect location and by plant. In general, Dr. Latimore told us, the lake is in very good shape with quite a diverse population of plant life.



There was, however, one caveat to emerge to that general outlook. The main purpose of the mapping was to determine if there were any invasive plants within the lake. Due to its prevalence in the area, the primary plant of concern was Eurasian Milfoil. NO Eurasian milfoil was found. However, one plant found was at first identified as Starry Stonewort. This plant is classified as 'highly invasive' and was found in relatively deep water, approximately 25 feet at two transect locations. Though the survey protocols do not suggest sampling at depths deeper than 8 feet, due to the steep contours of the lake, rakes were occasionally dropped to these depths at the boat's stern. Two such unintended, deep drops revealed the suspect plant. We were very concerned even though initial identification on the boat was difficult. The plant had all the signature trademarks but, per Dr. Latimore, "we weren't able to find any of the definitive structures - the tiny white "stars" that give it the name *Starry Stonewort* as opposed to its benign, native cousin Nitella. During a meeting at MSU in August with Dr. Latimore, she revealed that even without the signature starry structures, several notable experts she contacted had nevertheless identified the sample as probably Starry Stonewort and she concurred. This concerned us greatly!

The committee informed the Board in August that we may have a non-native, invasive plant in our lake that demands attention. The Committee offered to conduct additional samplings into the fall of the affected areas as well as other areas at similar depths to determine whether this plant is wide-spread or possibly miss-identified. Our amateur identification skills were to be aided by going out later in the year when Starry Stonewort's distinctive, 'starry flowers', their reproductive structures, are most likely to be present. In doing this the Committee promised to determine the presence of this plant at these depths and whether or not it is an invasive algae or native Nitella.

Various members of the Committee and Board went out again in September, October and November to conduct sampling in deeper waters in search of "starry structures" on the suspect plant, as was suggested by our expert network, the Board and common sense. We went out on the lake often in some miserable weather and sampled with rakes depths ranging from 15 to 30 feet. We visited all 15 of the 17 transects with proximate depths of 15 feet or more. We found the suspect plant at several transects, always at approximately 25 feet. Some findings were dense, others sparse.

In each of these occasions the un-aided eye saw none of the determinative 'starry structures' on any sample, at any time. To double-check and add professional scrutiny to these important findings, the committee on each occasion shipped samples back to MSU's Fish and Wildlife Department's algae experts for microscopic evaluation. They reported back to us each time that our field analysis was correct, no reproductive features were found and certainly none with the emblematic starry structures. After our final sample submission it was judged by these experts, with "high confidence," that the plant in question is a native form of Nitella algae. As such it is no threat to our environment, rather it was a good thing to have at these depths in our lake. We were greatly relieved.

What follows later in this report is a series of charts summarizing all of the work noted above. One committee member developed an Excel-based tool to organize our data and display the results in table format, a tool that will make future sampling exercises much easier for information sharing and state reporting requirements. These tables show plant types and densities at all transects and all sampling depths. They are organized both by plant type and locations (the 17 transect points).

For general information, following these charts are pictures of some of the suspect plants we pulled from Ann Lake. Next is a process/decision chart we created to provide a guide to handle this or any similarly alarming findings in the future. Among the positive outcomes from this year's 'fire drill' has been the development of these tools, protocols and lists of experts at identification and eradication of invasive aquatic species. Though we seemed to have avoided a 'bullet' for now, we have found local experts to be on high alert for Starry Stonewort given its prevalence in Southern Lower Michigan and its destructiveness. So should we. These scientists and DEQ experts encouraged our late season scramble to ensure they gave us no *false negative* opinions on this plant. To do so and ignore the threat could have catastrophic consequences for any lake.

Conclusion

The Committee stands behind the work done in generating the data and creating this report. We feel this project should be viewed as having a very positive outcome, establishing a monitoring system and running us through our paces as a committee and as a board should we ever be threatened with invasive species of any kind. This is why we undertook this project, to maintain biotic stability in our lake by first documenting what is there, learning which invasive plants might threaten this stability and developing a system to help us monitor and respond to any threats going forward. As a result of last year's activities we can now confidently state that currently our lake is in very good shape with stable fish and plant populations.

It is the committee's recommendation that additional samplings of this suspect plant need to be taken next year to ensure we do not find those telling reproductive 'stars'. If we find any, these samples need to be sent to MSU for their scientific opinion. If no such observable structures are found on the plant, we do not feel these future samples need to be sent to MSU for evaluation. At the end of this report is one of the better, non-scientific and hence readable articles we've seen on the plant we feared was present. It quotes several noted experts and explains why we and the experts were so concerned. It is included here for no other purpose than to stand as a warning of what could happen and as an instruction for future boards that we need to stay vigilant.

Finally, this Committee also owes a dept of gratitude to Dave Maxson who first pointed out the plant mapping class we all took, which has ultimately led to our project and findings. We also would like to thank the Board for the monetary and moral support provided to this committee and its mission this past year. We believe the money was well spent.

If you have any questions concerning this report or would like additional information on its findings, you can contact the chair of the committee, Kent Taylor, at kent@annlake.org. Other members of the committee are:

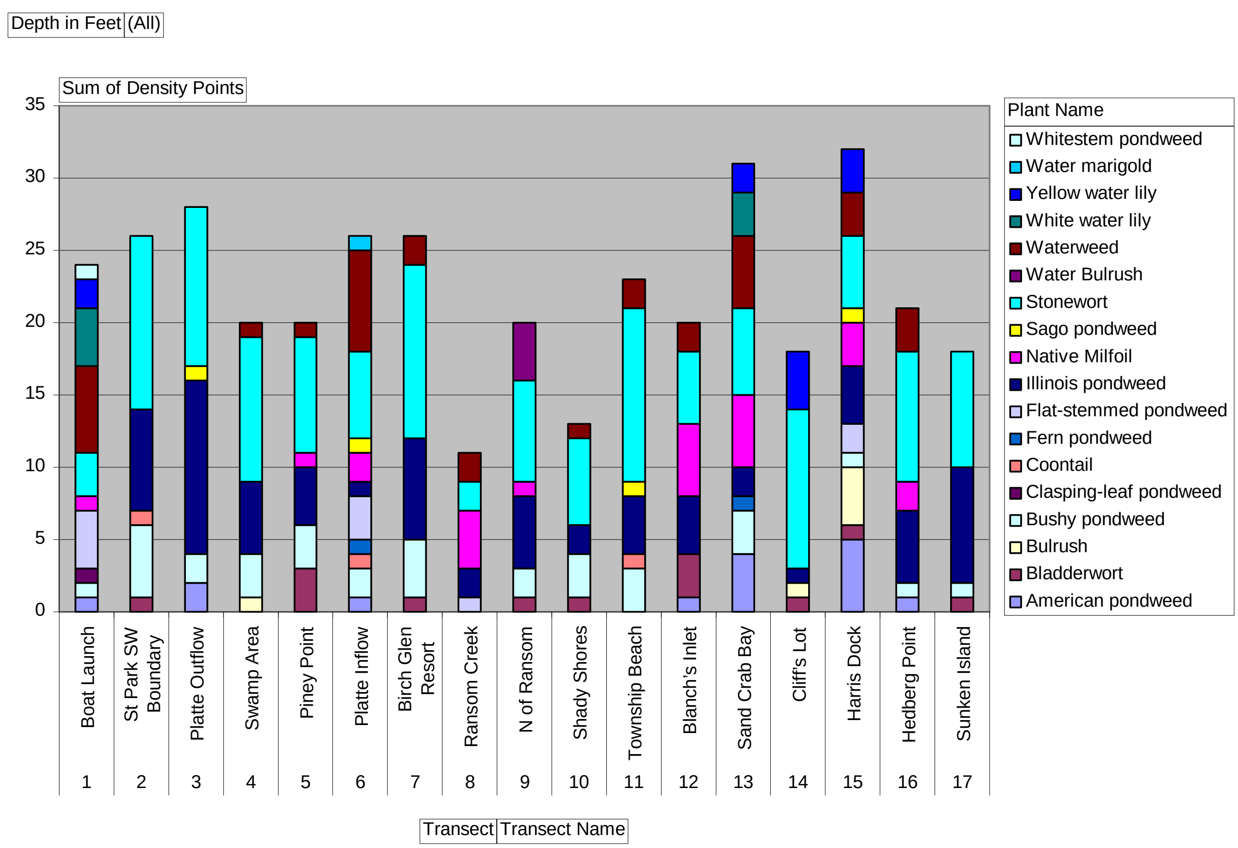
- Kathy Garmes-Taylor
- Ted Keskey
- Dianne Minicucci
- Bethany Onthank
- Drew Peterson

Transect Diversity Charts

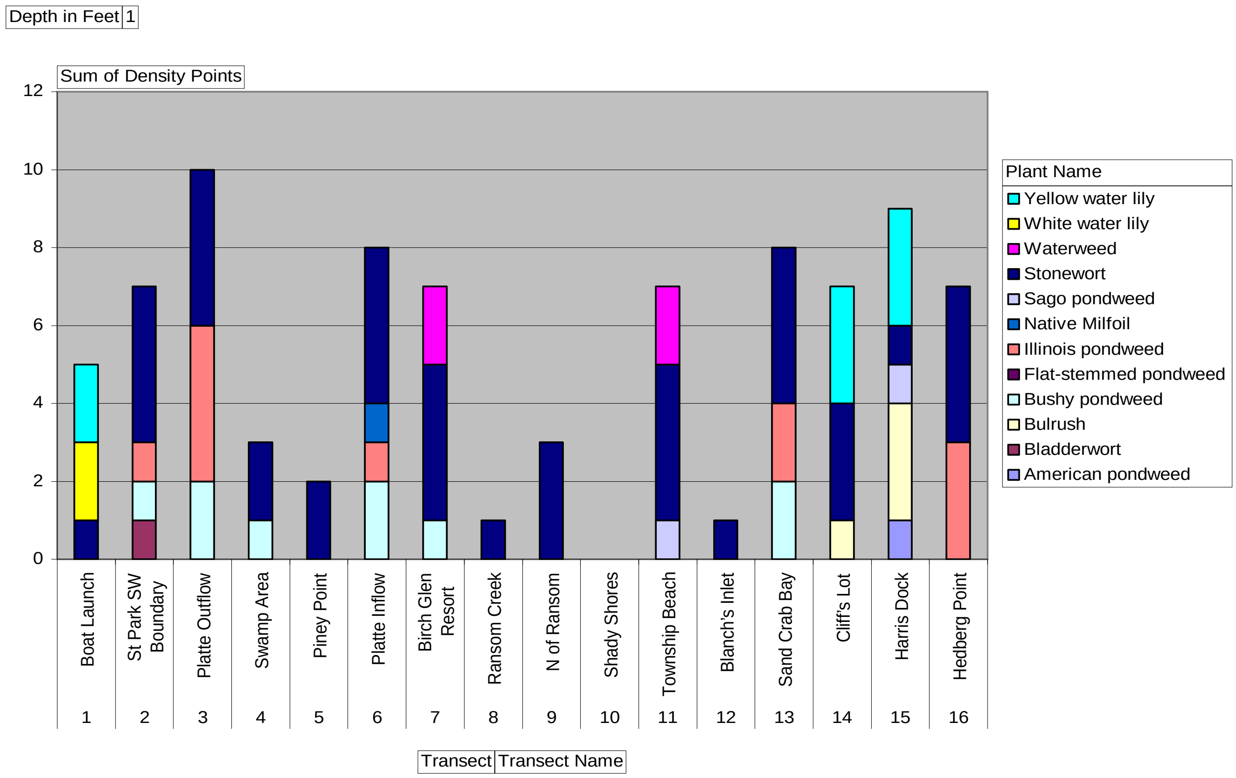
There are 4 charts which show the plants found at each transect location. The first chart shows all plants found. The following charts are for each of the specific depths: 1 foot, 4 feet and 8 feet.

To read the charts, the plants found are shown in the top to bottom order depicted in the key. For example, at the first transect, the Boat Launch, the plants found are: American Pondweed, Bushy Pondweed, Clasping Pondweed, Flat-stemmed Pondweed, Native Milfoil, Stonewort, Waterweed, White Water Lily, Yellow Water Lily, and White Stem Pondweed. The most common plants found in the lake were Stonewort (native) and Illinois Pondweed (also native). Using these 2 plants as reference points, it will help you determine the other plants found at each transect.

Lake-wide Plant Densities - All Depths

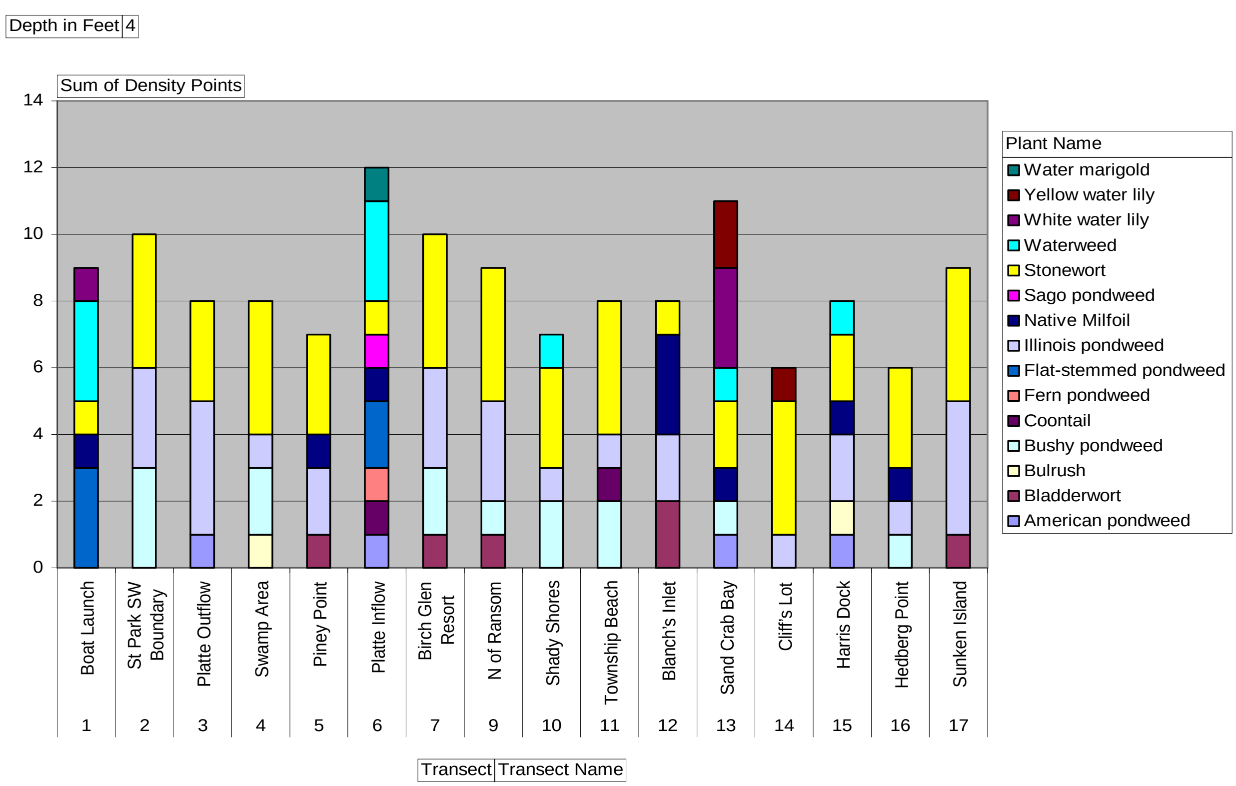


Plant Densities at 1 Foot Sorted by Transect

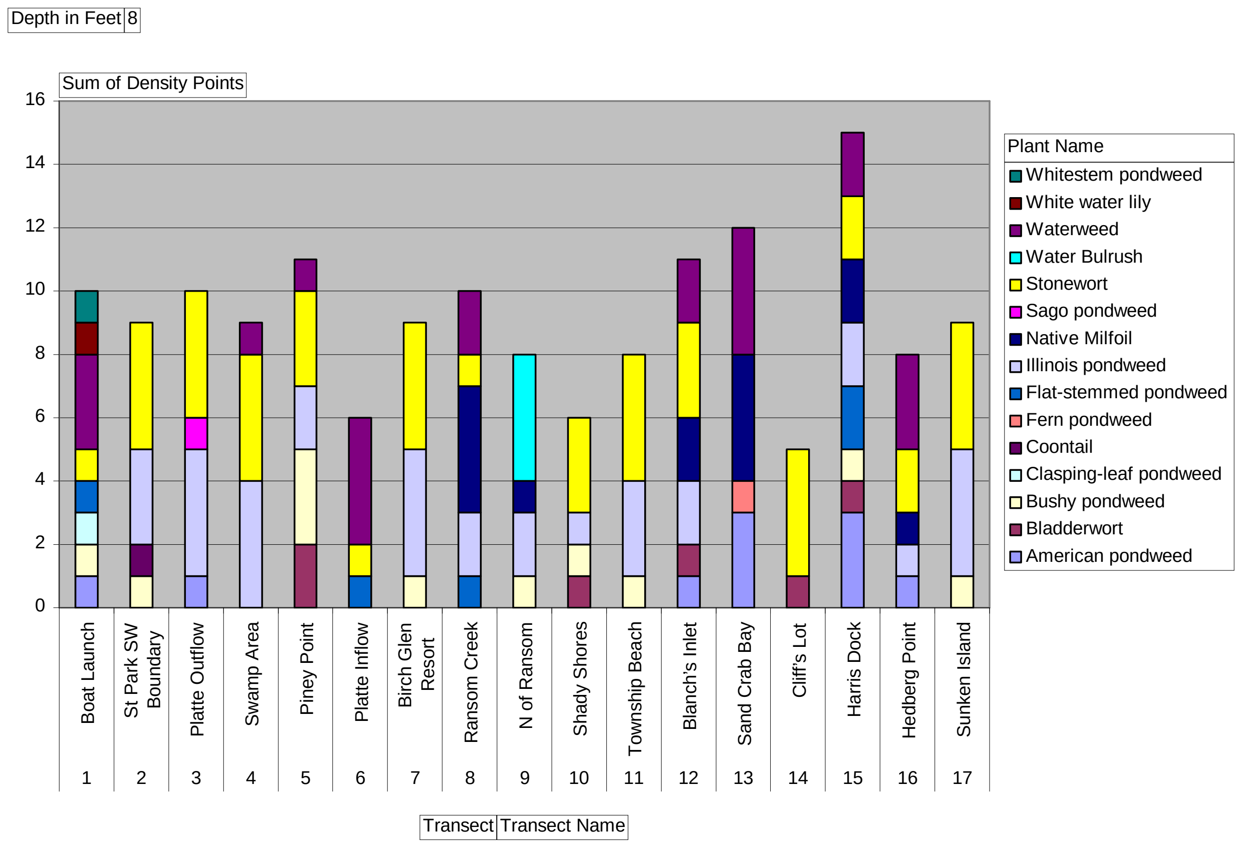


No plants were found at the 1 foot depth at the Shady Shores transect. We were unable to sample at the 1 foot depth on the Sunken Island. Stonewort was found at every transect at the 1 foot depth.

Plants Densities at 4 feet Sorted by Transect



Plants Densities at 8 Feet Sorted by Transect



The Nitella alga which we feared may be Starry Stonewort was found at a depth of approximately 25 feet at 2 locations, State Park South West Boundary and Shady Shores and several others in subsequent samplings.

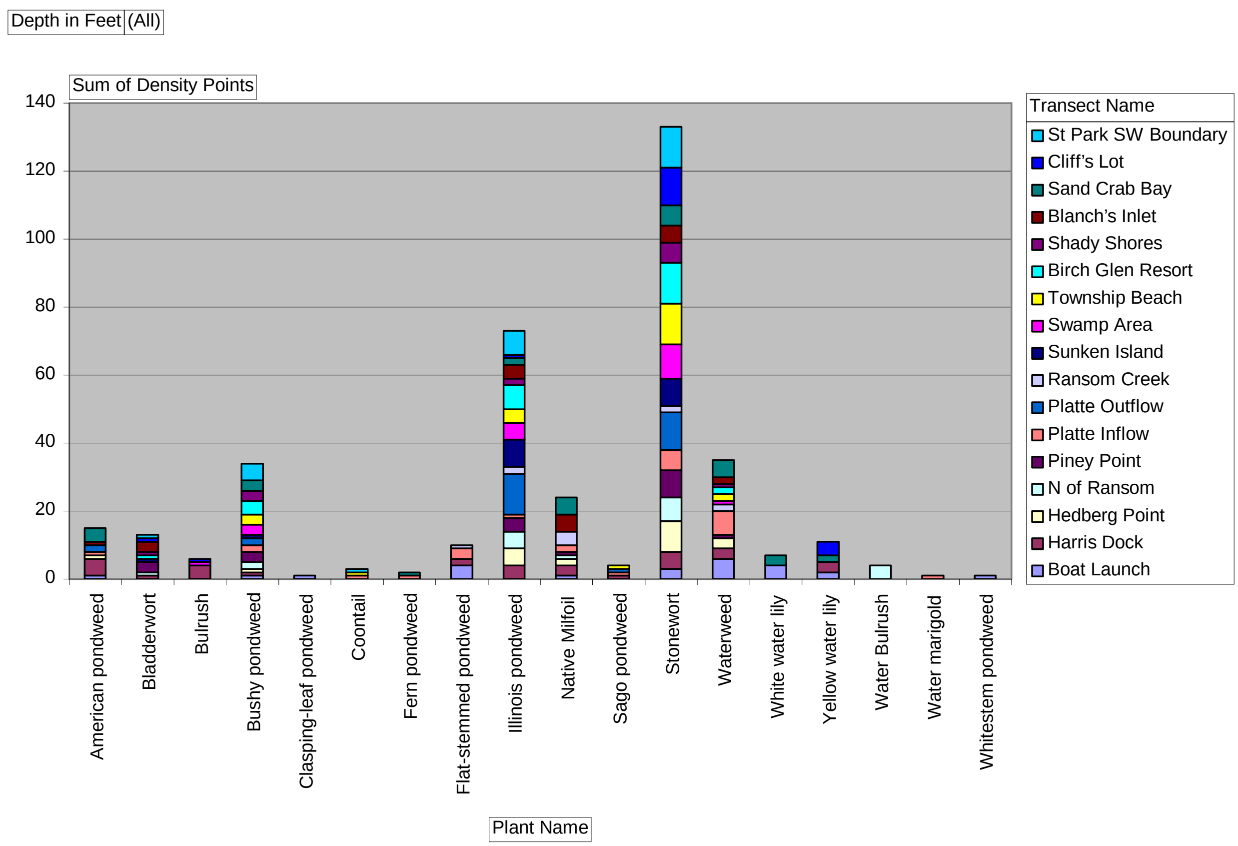
Plant Location Charts

There are 4 charts which show each transect at which a specific plant is found. The first chart shows all plants found. The following charts are for each of the specific depths: 1 foot, 4 feet and 8 feet.

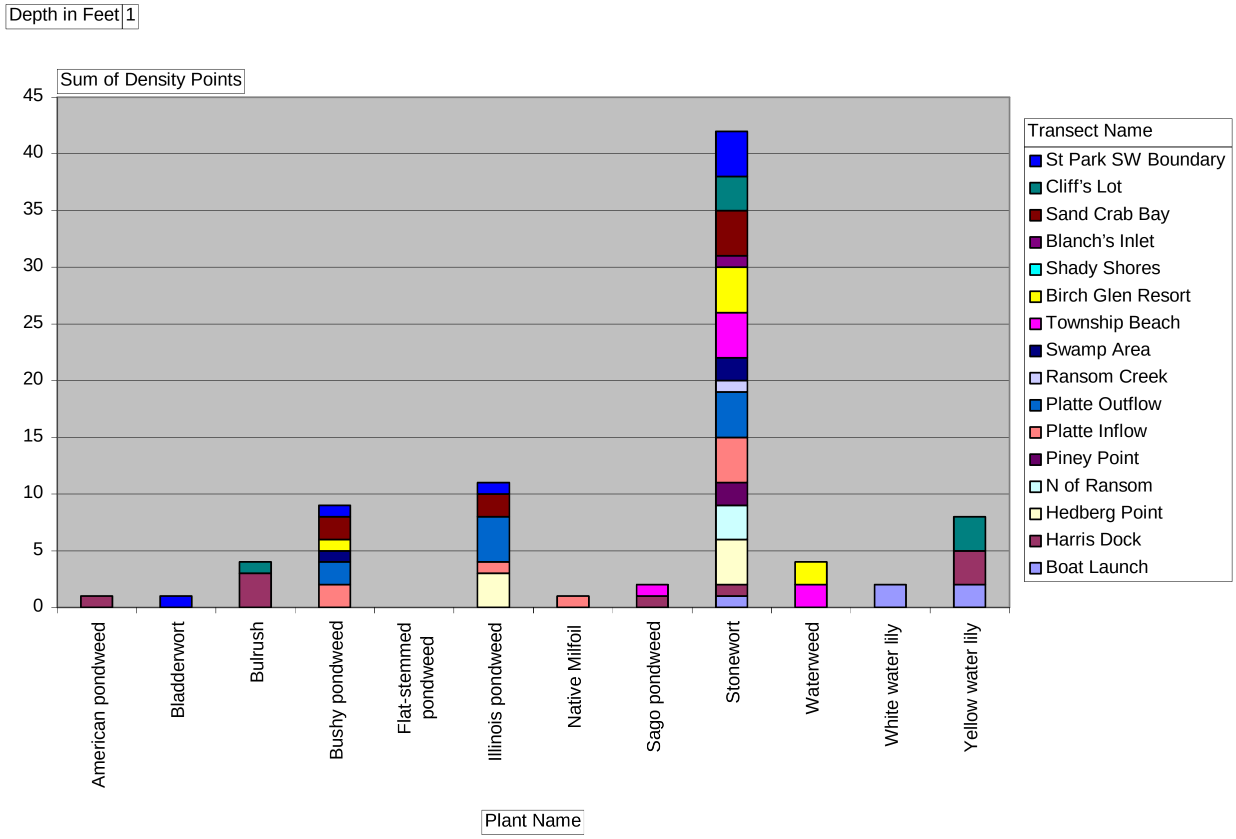
There were a total of 19 plants found in Lake Ann. Not all plants are found at each depth. For instance, white and yellow water lilies are only found at 1 foot.

To read the charts, the transects found are shown in the order depicted in the key. The transects are NOT listed in the key in the order they were sampled.

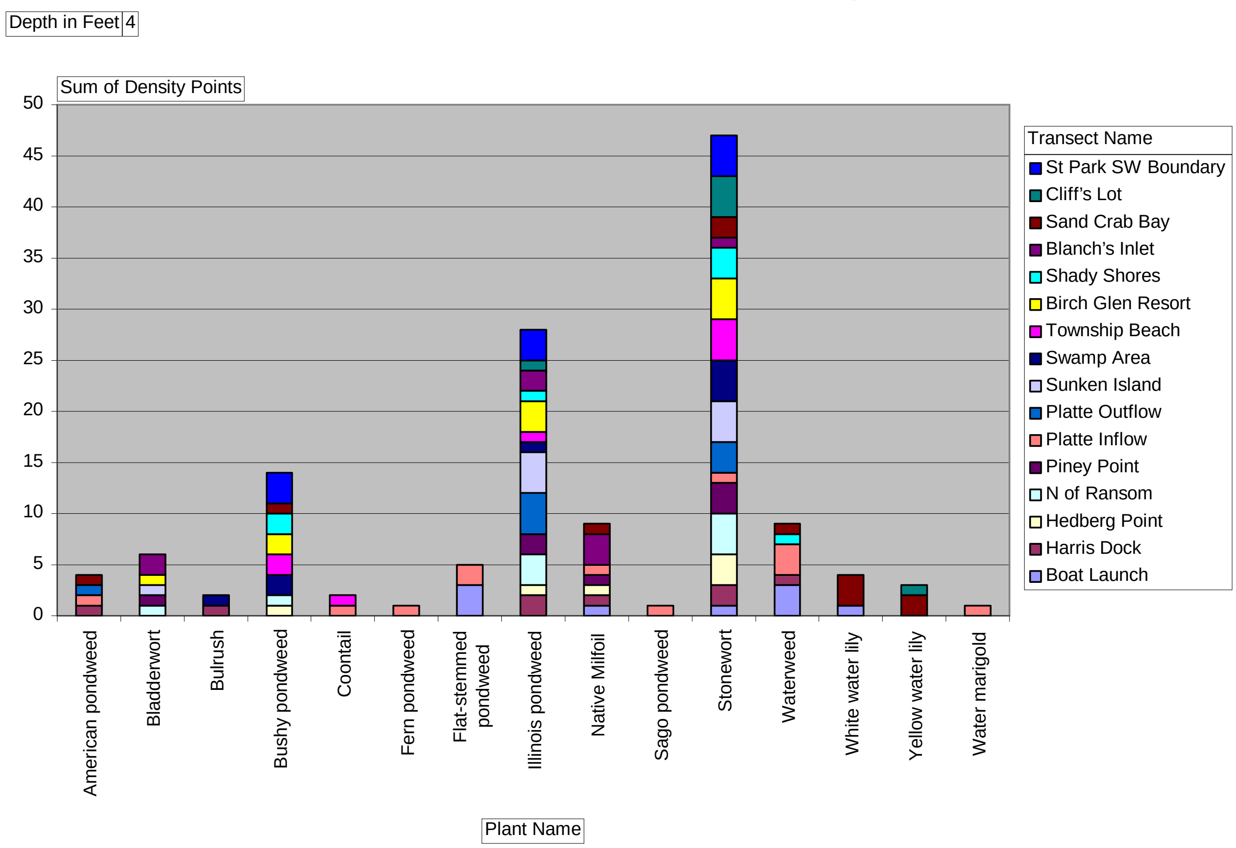
Lake-wide Plant Densities Sorted by Species



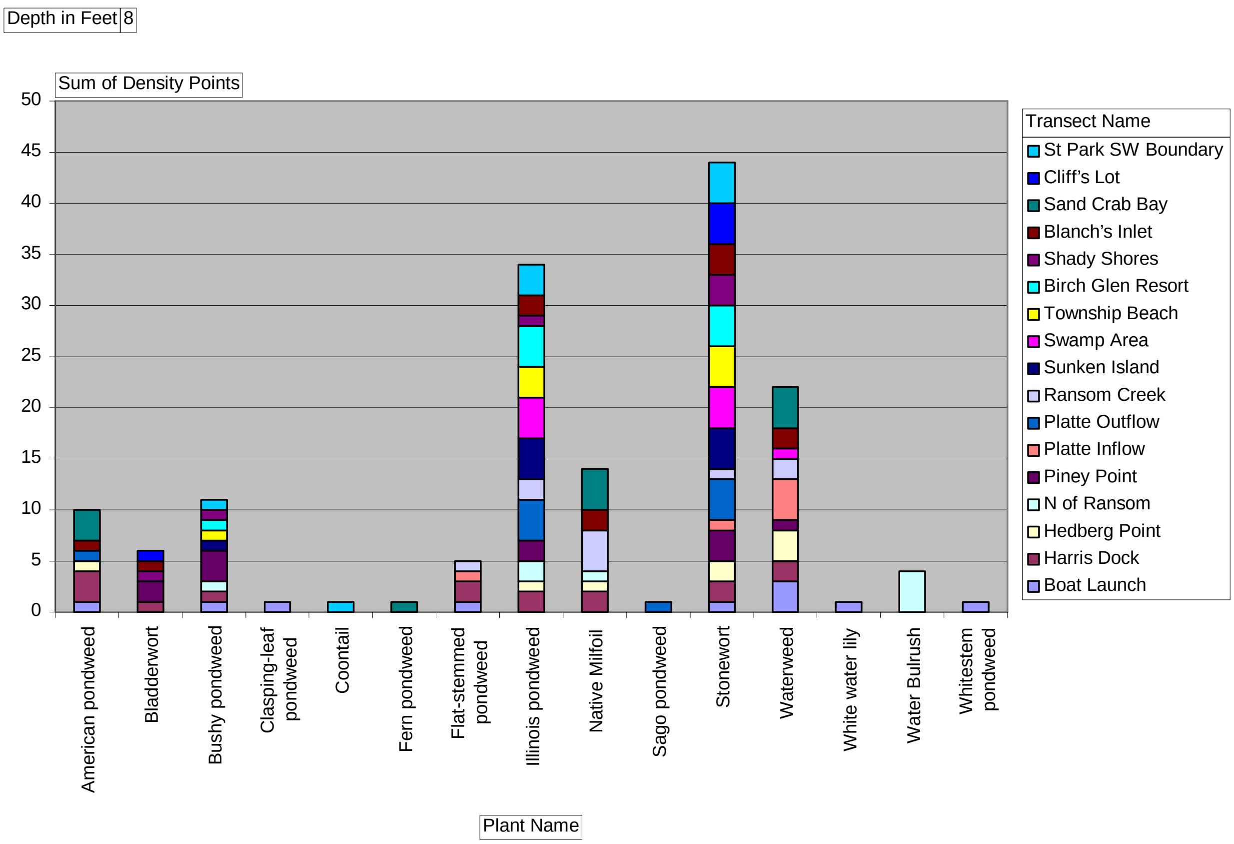
Plants Densities at 1 foot Sorted by Species



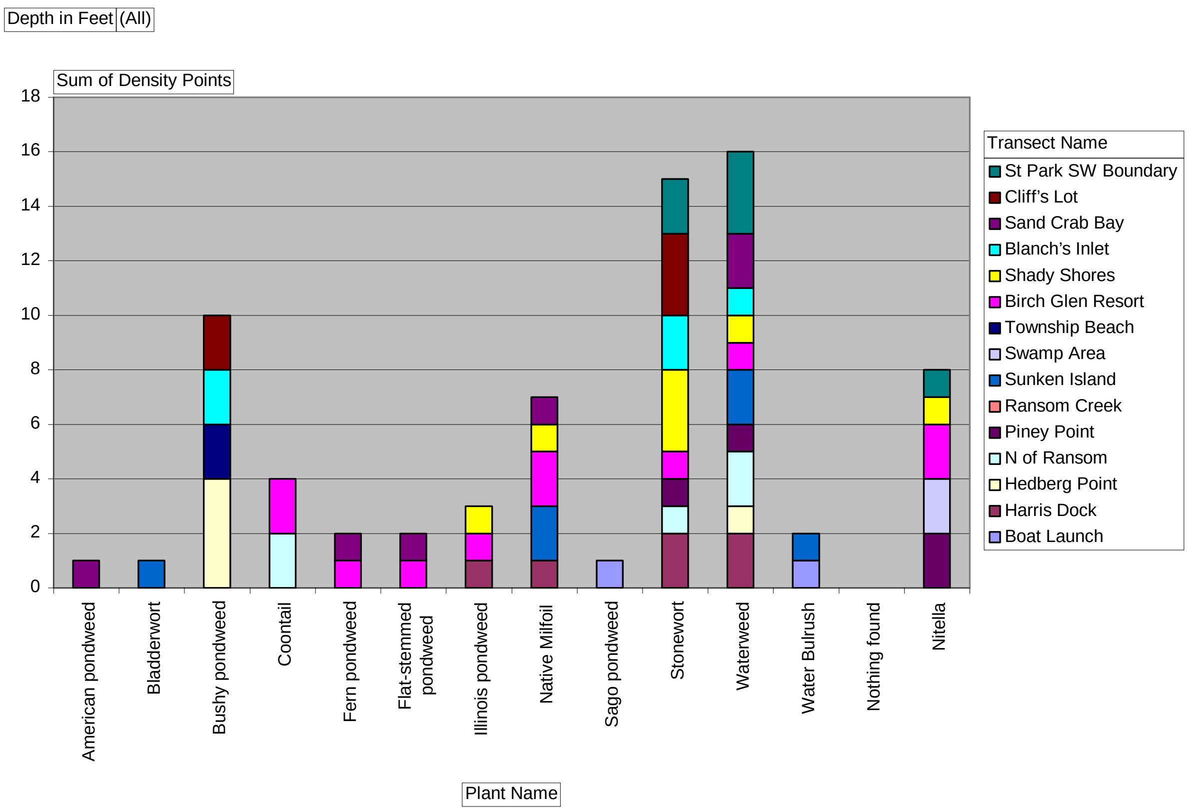
Plant Densities at 4 Feet Sorted by Species



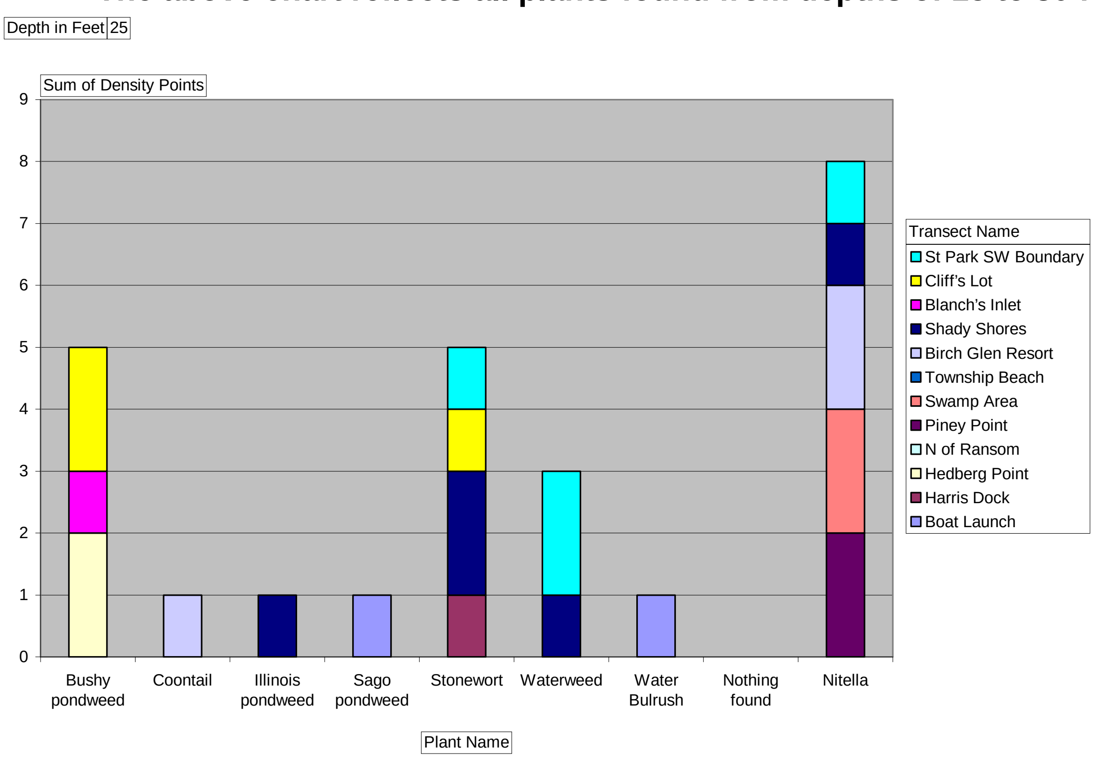
Plants Found at 8 feet Sorted by Species



Following charts reflect combined findings from 3 days of deep sampling in September, October and November



The above chart reflects all plants found from depths of 15 to 30 feet.

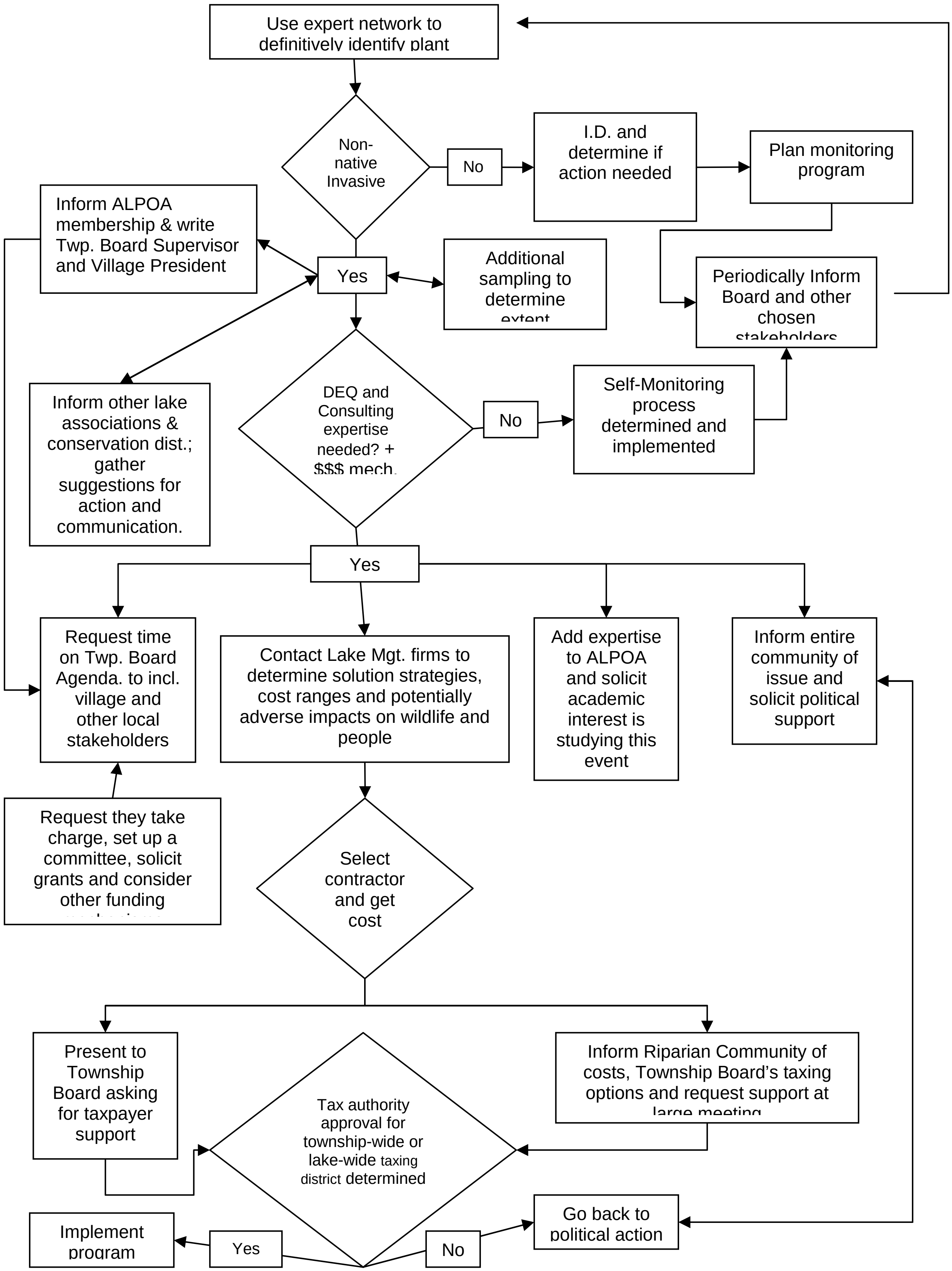


Nitella was only found at depths of approximately 25 feet.
The above chart reflects all findings at this depth.

Photos of suspect plant now identified as native Nitella

Photos by Drew Peterson 9/8/.2012

Decision Flow Chart for Future Use



This article indicates why we need to continue deep water sampling.

Foreign algae could be 'greatest challenge' for lake management

Published in Oakland Lakefront

An article by Angela Niemi

Aggressive. Dominant. Threatening. These typically aren't the words associated with algae found in lakes, and yet they accurately describe starry stonewort — a plant-like algae that has the potential to be the greatest challenge to lake management efforts in recent years.

Starry stonewort (*Nitellopsis obtusa) is not native to the United States, and like many aquatic invasive species, it's believed that starry stonewort earned free passage to America as a stowaway in the ballast water of ships entering the Great Lakes.*

The aggressive algae species is originally a native of Europe and is even considered a threatened species in the United Kingdom. Yet, over the past three decades in Michigan, it has proven itself to be a hardy and invasive opportunist.

"It's the most aggressive aquatic plant ever observed in Michigan and is able to outcompete all other Michigan plant species, including all invasive and current alien species such as watermilfoil, fanwort, and curlyleaf pondweed," wrote Dr. Doug Pullman in his article "A Decade of Starry Stonewort in Michigan: Observations and Operational Management Considerations," which he co-authored with Gary Crawford.

Pullman was the first to positively identify starry stonewort in a Michigan inland lake. In February 2006, he identified the species in Lobdell Lake in Genesee County. Since then, starry stonewort has been found in Michigan lakes throughout the Lower Peninsula, spreading from Mason County to Wayne County. At least nine Oakland County lakes have been invaded by starry stonewort since 2008. Those lakes include Indianwood Lake in Orion and Oxford townships, Sears Lake in Milford Township, Softwater Lake in Springfield Township, Lower Straits Lake in Commerce Township, Williams Lake in Waterford Township, Kent Lake in Milford and Lyon townships, Tipsico Lake in Rose Township, Big Lake in Springfield Township, and White Lake in Highland and White Lake townships.

Dick Pinagel, president of the Michigan Aquatic Managers Association (MAMA) and owner of Aqua-Weed Control, Inc., said he believes starry stonewort is spreading even further throughout Oakland County.

Starry stonewort was first discovered in North America in the St. Lawrence River back in 1978. In 1986, it was found in Lake St. Clair. Although it wasn't positively identified in a Michigan inland lake until 2006, anecdotal evidence suggests that it has been present in inland lakes since the 1990s.

"It may have been present in several southeastern Michigan lakes as early as 1999 but was thought to be a 'super weedy chara,'" Pullman explains in his article.

A case of mistaken identity is plausible since starry stonewort resembles the native plant-like macro algae called chara — both look like generic green weeds.

"Starry stonewort is also a macro algae. It's rootless — although sometimes it can be loosely rooted to the bottom," Pinagel said. "It's a charoid algae. It's very similar to chara."

Both chara and starry stonewort lack roots; however, they have structures called rhizoids that are used for nutrient absorption and to provide support and stability. Both species also resemble terrestrial plants because of their stem-like and leaf-like structures.

Yet, starry stonewort differs from the native chara in several important ways.

First off, the rhizoids of starry stonewort resemble stars — hence the colloquial name of the species. While they have been observed to be present on all parts of the algae at all times of the year, they are usually common on the algae structures closest to the sediment in late fall and early spring, according to Pullman.

"They look like there are little flowers on it. They look like stars," said Pinagel. "Once you've gotten used to the structure of it, it's easily identifiable."

Another defining characteristic of the species is the presence of a tan colored "bulbil" at the base of each cluster of branches. The branches themselves are another identifier of starry stonewort because they have a more irregular branching pattern compared to other charoid algae found in Michigan which tends to lend them a more "disheveled" appearance.

Starry stonewort also tends to be a lighter green color than its similar algael counterparts. It also produces orange colored oocytes that can be easily detected with the naked eye.

Another identifying characteristic of starry stonewort may be its ability and even its affinity to grow at great depths.

"Unlike other Michigan charoids, starry stonewort can grow to remarkable heights and depths," Pullman wrote.

Added Pinagel, "It can grow in deeper water — usually 10 to 12 feet. Chara typically doesn't do that. Starry stonewort has been seen to grow 8 feet tall in some areas."

In Waterford Township's Williams Lake, for example, starry stonewort has been observed growing at a height of 7 feet at a depth of 27 feet. Pullman hypothesizes that it most likely is capable of growing at even greater depths.

However, it's really starry stonewort's intangibles that set it apart from other charoid species.

"Starry stonewort is much more aggressive, denser, and hardier. It's really a beast of a plant," Pinagel said.

"It may easily represent the greatest challenge to lake management professionals, regulators, recreational users and the biological integrity of inland lakes in the history of lake management in Michigan," Pullman wrote.

Part of the reason for this challenge is the algae's ability to outcompete all surrounding species, especially as it forms dense mats of vegetation able to completely cover the bottom of a lake.

"It grows so dense and thick — Brillo pad-type thick," Pinagel said.

According to Pullman, when the algae grows densely together and dominates all other vegetation, it forms irregularly spaced "pillows" of vegetation at varying heights as opposed to a mat of uniform height. This marks the stage before starry stonewort invasion reaches the pinnacle of its invasion, which Pullman refers to as "packing."

"'Packing' is used to refer to a starry stonewort population that has filled all available habitat and has moved upslope and downslope into areas that do not appear to be ideal but are still adequate for growth," Pullman wrote in his article.

Although it has been documented both in the United Kingdom and in Michigan that starry stonewort prefers deeper, less turbulent waters, it is able to colonize shallower environments.

Starry stonewort also has the ability to inhabit a wide variety of lake environments. It has been observed thriving in either clear water or dark water systems and so far doesn't seem to show a preference for full shade or sun.

While it doesn't really thrive in boat lanes or high energy shorelines, it will grow in these areas "when it has colonized or filled virtually all of the habitable area of the lake," according to Pullman's observations.

The ability to colonize in boat lanes may contribute to starry stonewort's capacity to spread from lake to lake.

Starry stonewort is easily fragmented, and boat traffic could result in significant fragmentation, causing starry stonewort to float to the surface.

"This type of fragmentation has been implicated in the dissemination of other alien species in Michigan such as the invasive milfoils," Pullman wrote.

Another likely vector for starry stonewort transmission between lakes could be waterfowl since the oocytes of starry stonewort can be easily transported on bird feathers.

Boat trailers may also aid in the spread of this non-native species — the oocytes can be transported on aquatic plant debris, as well, which can get caught on boat trailers.

Public launch sites are typically associated with the spread of alien species, as boats travel from lake to lake. However, while this may have contributed to the spread of starry stonewort, Pullman maintains that waterfowl and other animals may be the main culprit as the non-native algae has become established in lakes that don't have a public access site.

With its ability to colonize virtually any lake environment, starry stonewort has proven to be a challenge both ecologically and recreationally.

Ecologically, it presents several problems — including a decrease in the biodiversity of plants in lakes infiltrated by starry stonewort.

"It is extremely obvious in all of the infested lakes that the biomass of competing species has declined significantly in every lake where starry stonewort has spread and come to dominate the lake flora," Pullman states in his article.

"It's like throwing a thick tarp across the lake bottom. Very few plants will grow through (starry stonewort) when it has become dense like that," Pinagel said. "There has been a shift among aquatic species seen in lakes with starry stonewort. Most plants in the lakes are seeing diminished growth."

However, not only is starry stonewort able to outcompete plants and other algae for space and nutrients, the species is able to change the bio-geochemistry of sediment, inhibiting further plants from colonizing the area after it has been eliminated.

By acting like a commercial benthic barrier, starry stonewort allows for the accumulation of phytotoxins which render the sediment inhospitable for plant growth until the conditions change.

Yet, while starry stonewort seems to suppress most rooted plants growth, there are a few certain rootless plant species that seem to thrive in starry stonewort's presence. These include rootless bladderworts and coontail.

And although it outcompetes most other native species, it also outcompetes other invasive species.

"We have definitely seen a decrease in some of the other aquatic invasive species," Pinagel said.

David Cornwell, the riparian representative for Pontiac Lake's improvement board, agrees. He said the lake improvement board has been fighting starry stonewort in Pontiac Lake regularly over the past few years.

"There are both positive and negative consequences to everything you do," he said. "The positive of treating starry stonewort is that you get rid of what can be a massive Brillo pad under the water. You can be effective killing it off, but in the short run it allows for other weeds to prosper more fully. Both chara and starry stonewort tend to retard other weed growth, but when you remove either one of those two you get all other kinds of weeds."

Another seemingly silver lining to the starry stonewort invasion is increased water clarity.

"Water clarity definitely improves with the presence of starry stonewort," Pinagel said. "Since it derives nutrients from the water column as opposed to the soil, it serves as a giant filter."

Pullman also attributes the increased water clarity to the ability of the upper parts of the dense algae mats to compete effectively with phytoplankton for nutrient resources.

It also appears as if starry stonewort shares a friendly relationship with another invasive species — the zebra mussel. Starry stonewort appears to be the favorite substrate of zebra mussels, which also have proven to have a favorable filtering impact on water clarity.

While starry stonewort seems to have been able to form some positive relationships between other species, the same can't be said for its impact on fish habitats.

"Many fisheries have concerns with the effect of the growth of starry stonewort on the fish spawning areas," Pinagel said.

By forming a thick, dense mat, starry stonewort directly impacts the spawning habitat of some fish because the mat acts as a physical barrier to the areas optimal for nest creation. This results is a reduction of the nesting area and consequently a decrease in the number of nests. This leads to the complete elimination of spawning activity in the area of infestation and leaves fish to compete for suboptimal spawning habitats.

Starry stonewort may also pose a threat to lake fauna whose survival depends on their intimate association with the lake bottom — such as logperch, darters, various minnow species, native clams, and other invertebrates. Threats to these creatures could further decrease a lake's biodiversity and potentially affect the lake's overall ecological well-being.

However, starry stonewort doesn't just pose ecological problems but recreational ones, as well.

Anglers have become frustrated because the algae commandeer the necessary spawning and living habitats of game fish.

"Reports of angler frustration such as an inability of being able to locate black crappies because the stumps have disappeared beneath the mat of starry stonewort or that bass are more difficult to catch because of the disappearance of certain weed beds are becoming more commonplace in our lake management practice," Pullman wrote.

Another recreational issue is the quality of the boating experience since boats can become tangled in starry stonewort mats.

“It can definitely impact boating as when it nears the surface it can make getting through it very difficult,” Pinagel said.

Between the recreational and ecological issues, lake management of the algae is almost a must.

Mechanical harvesting has been used to control starry stonewort but with little success. Because the algae is capable of producing a large amount of biomass in a relatively small area, starry stonewort is able to cause a mechanical harvesting machine to fill to capacity very quickly, slowing down the harvesting process.

Fortunately, starry stonewort has proven to be highly sensitive to common copper- and endothall-based algaecides. In fact, accordi to Pullman, starry stonewort seems to be even more susceptible than most common Michigan charoid species.

However, that doesn’t mean that there aren’t challenges posed in managing the non-native algae.

“It’s hard to control. As it’s so dense and thick and grows so tall, we normally are only treating the top layer, and while we can impact the top layer, it normally grows back so quickly that in many cases it’s like we did nothing. So it requires a very aggressive treatment regiment,” explained Pinagel, whose company, Aqua-Weed Control, was one of the first companies in the area to recognize the algae and begin treating it.

“We’ve had partial success with treating starry stonewort, but we are still experimenting with the treatment schedule and regimen to fine tune it,” he said.

Other herbicides have also been found to be successful in hindering starry stonewort growth, in particular when coupled with Cultrine Ultra.

While there have been measures discovered to counteract this intimidating foe, it still remains one of the most challenging non-native species facing lake managers — at least until an even more competitive and dominant species comes along.

“It’s another invasive plant to throw into the mix,” Pinagel said. “Unfortunately, there are probably more to follow.”