Plant Survey of Clam Lake 2025

Courtney Borden, Kalkaska HS - Aspen Evans, Central Lake HS - Jaylea Erickson, Kalkaska HS - Kia Luchenbill, Mancelona HS

What is the Three Lakes Association (TLA)?

- Nonprofit organization focusing on Torch Lake, Clam Lake, and Lake Bellaire.
- Studying the lakes and maintaining environmental engagement and education since 1966.
- The summer internship program, founded in 2003, first project E-coli study.
- Internship is a hands on experience allowing high school students to learn and care about the lakes.

THREE LAKES ASSOCIATION

Lake Bellaire, Clam Lake and Torch Lake

Protecting our Lakes Since 1966

Our Interns

- Each person wrote something memorable about the others
- Courtney - Enjoys playing basketball and running cross country “Coolest thing I have ever done”
- Jaylea - Passed her drivers test this summer and is a part of National Honor Society at her school
- Aspen - Knows a lot about fishing and is very active in 5 different sports
- Kia - Works in a bakery, loves data entry as well as math in general

Our Project

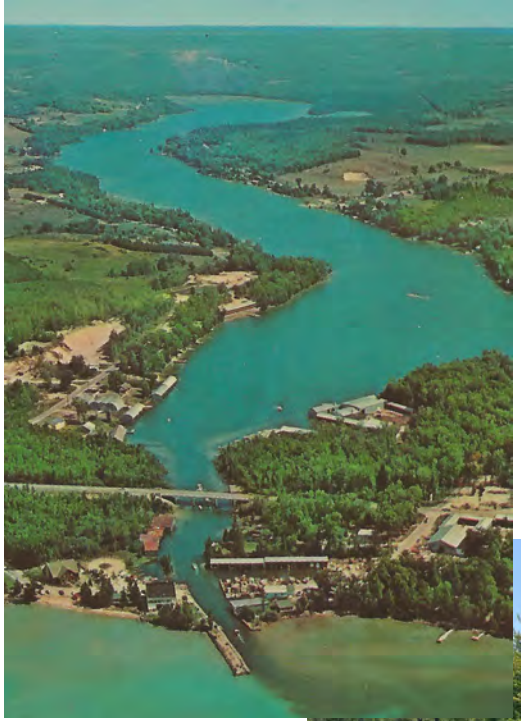
What’s Our Project?

Project Outline

- Plant collection of Clam Lake
- Update 2013 information on Clam Lake
  - The last plant study on Clam Lake was by Tip of The Mitt Watershed Council in 2013
- Learn how to identify plants
  - (invasive species vs. native)
- Led and directed by Jeanie Williams
  - Equipment and assistance by Gary Bart

Clam Lake

- Part of Elk River Chain of Lakes
- 27 feet at its deepest
- 437 acres total
- Between Torch and Bellaire lakes

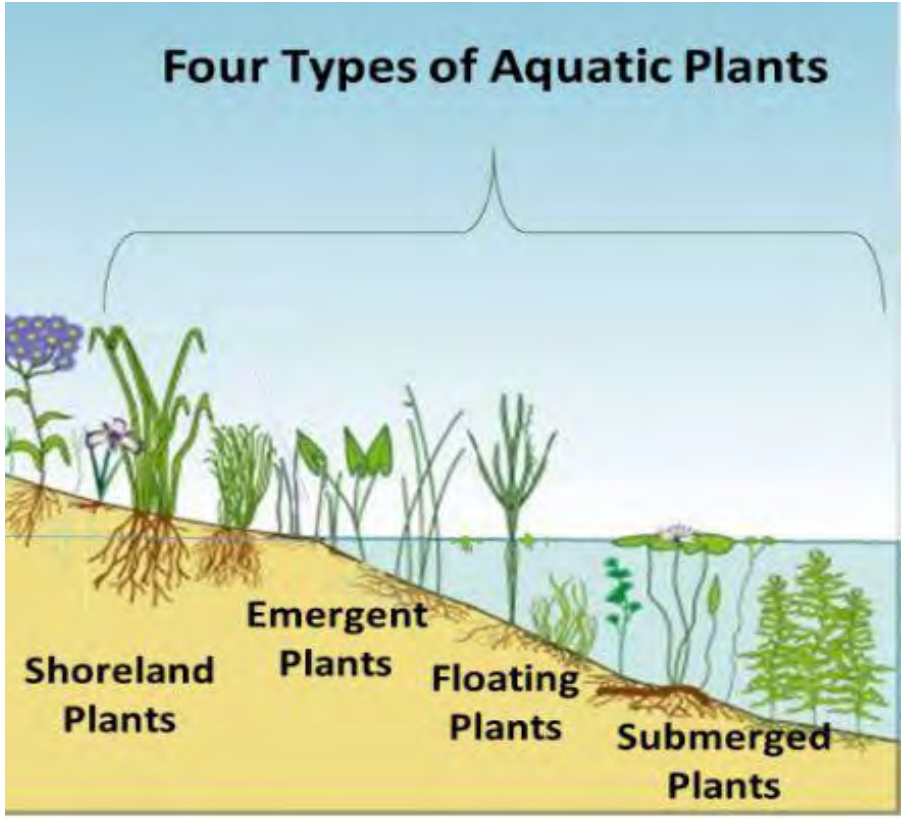


- For those wondering, yes it's good for fishing

Plant Types

- Submergent- plants completely underwater such as muskgrass
- Floating- plants that are visibly floating on the surface of the water, sometimes rooted in the lakebed (Lily pads)

- Did not study shoreland or emergent plants although we did track them



Our Goals

- Answer our big questions
  - What is Clam Lake's aquatic plant density and diversity?
  - Do we have any invasive species in this lake?
  - What is the max depth of plant growth in Clam Lake?
- Collect data for future generations of study
- Learn different kinds of plants and learn about our lakes
- Have Fun!

Length of Project

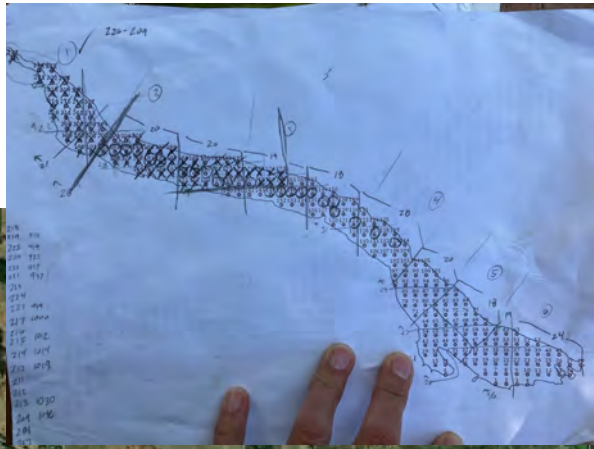
- Met 6 times from July 6th - August 7th in order to collect samples
- 6 separate times for training, plant pressing, and presentation work
- 8:00 AM - 12:30 PM Each day
- Stayed in touch through emails, texts, and phone calls on days we did not meet

Methods

How did we do it?

Where did we go? - Point sampling

- The map was created by Tip of the Mitt
- Sites are 90 meters apart
- 227 points on the map
- Usually 30-40 points a day
- Used a point sample rather than a transect



How do we get the plants?

Rake

- For collecting samples of the plants
- Put sample into bin to identify

Pole

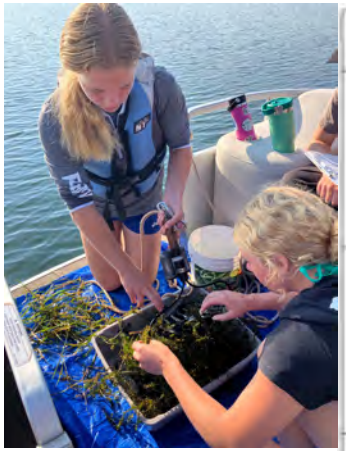
- Shallower than 10 ft of water
- Two twists at the bottom

Rope

- 10 ft or deeper water
- Dragged for a foot at the bottom

Rake Fullness

- Total rake fullness
- Rake fullness for each species
- Scale of 1, 2, or 3
  - 1- plants barely cover tines of rake
  - 2- plants cover rake, tines are still visible
  - 3- rake is overflowing with plants



Fullness Rating	Coverage
1	
2	
3	

Visual Data

- Kept track of plants we saw at sites but didn’t happen to collect with the rake
- Plants got caught on the camera
- Leaned over and grabbed a plant
- Took an unofficial sample with the other rake

Max depth & Inaccessible

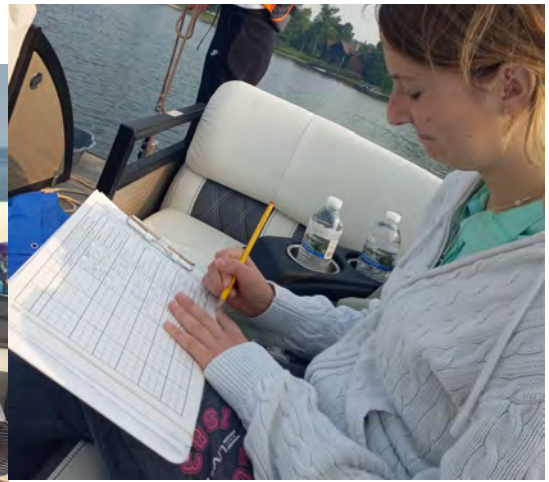
- After finding 3 or more with “no vegetation” at a certain depth we skip that depth
  - Max depth of growth is different for every lake
- Sometimes sights were on land, under a dock, or non navigable due to shallowness
  - Recorded plants that we could identify in the water
  - Took unofficial sample to get a closer look at the plants in the water
  - Took picture where point was located

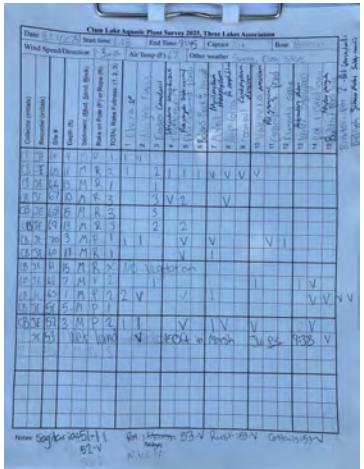
Site #53 inaccessible

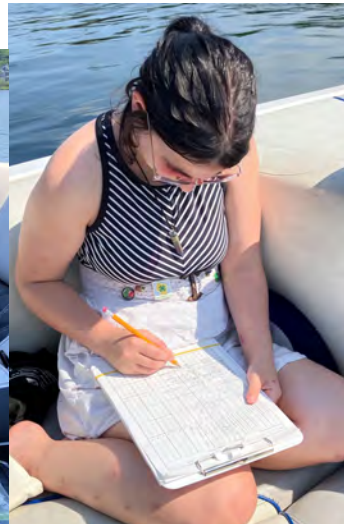



Data sheets

- After the rake we identify the plants
- Collected time,weather, depth, species, rake fullness, site number, collector, and the sediment type
- Used Google Forms to insert the data into a spreadsheet







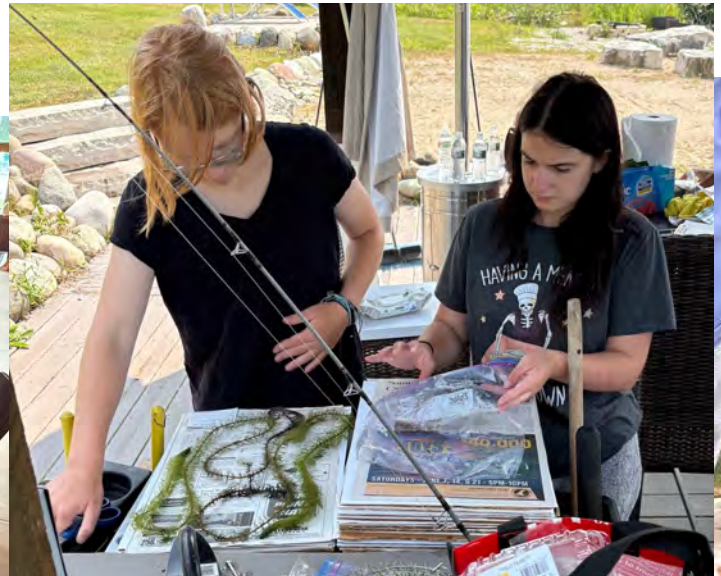
Vouchers

- While identifying plants, we kept vouchers
- Vouchers of plants are kept to confirm our findings
- Vouchers are samples of plants that we kept in bags with water
- Once we returned to land, we photographed each plant we kept
- We tried to press at least one of each species of plant we found
- In the future, we can look at the pictures or pressings



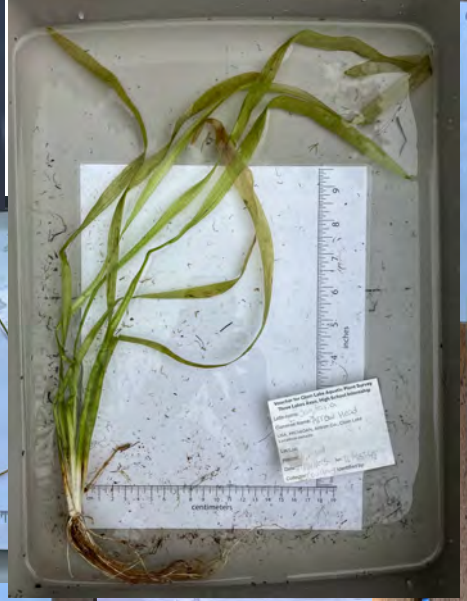

The Press

- Used for keeping the samples long term
- Flattens, dries, presses, and preserves the plants
- Mounted the plants onto a piece of herbarium paper for preservation




Naiad
Najas Flexilis
centimeters


inches


centimeters


Potamogeton natans
Floatingleaf Pondweed
centimeters


centimeters

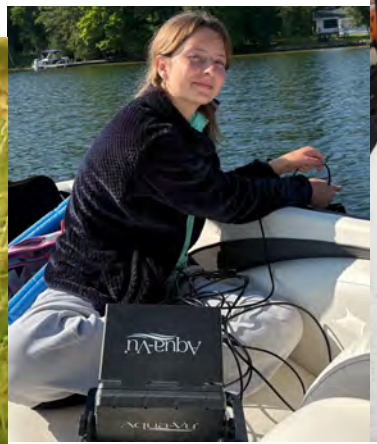

Site #2
TLAES-95
inches


Site #21
TLAES-104
alternate


inches

Camera

- Used to take underwater videos
  - 10-15 seconds of every spot with vegetation
- Put camera into water and lowered to bottom
- Looked at monitor to see if there was vegetation
- Mainly used by Izzy



Identification

- Used some different books to help us identify plants
- Identified by using pictures and descriptions of different features that they have
    - Whorls, leave shape and size, leaves alternating vs in line, etc.
- Will be talking to experts for remaining unknown plants

Navigation

- Moving point to point was often the hardest part
- Wind and flowing water moved boat around
- Improved as the day went on
- Gary and the boat captains used GPS to navigate to the next point

Other Struggles

- There were some days when it was a little windy
- In the beginning we didn’t know yet what to do at an inaccessible point
- There was one safety incident, but then we immediately fixed protocol
- Occasionally something would fall into the water but we would turn around and retrieve it
- For bigger a bigger rake fullness, it sometimes took longer to identify the plants

Two full bins - not done identifying

Results

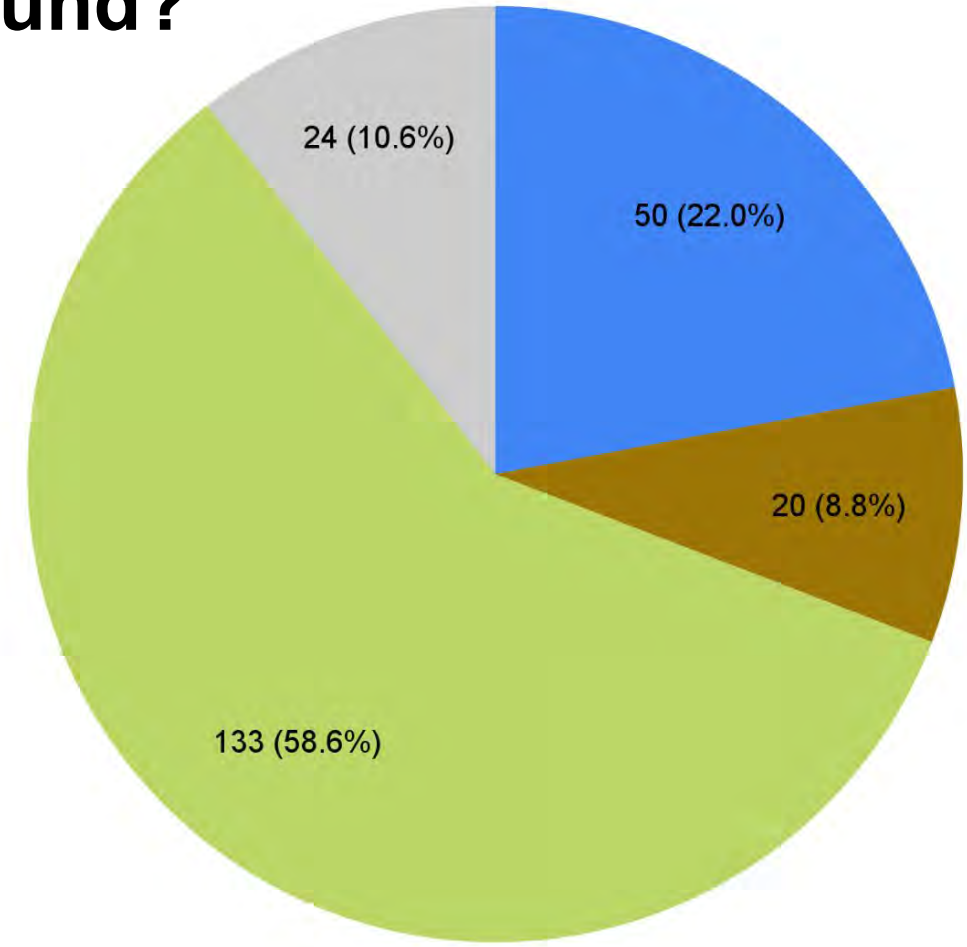
What did we find?

Where were plants found?

Total of 227 Sites

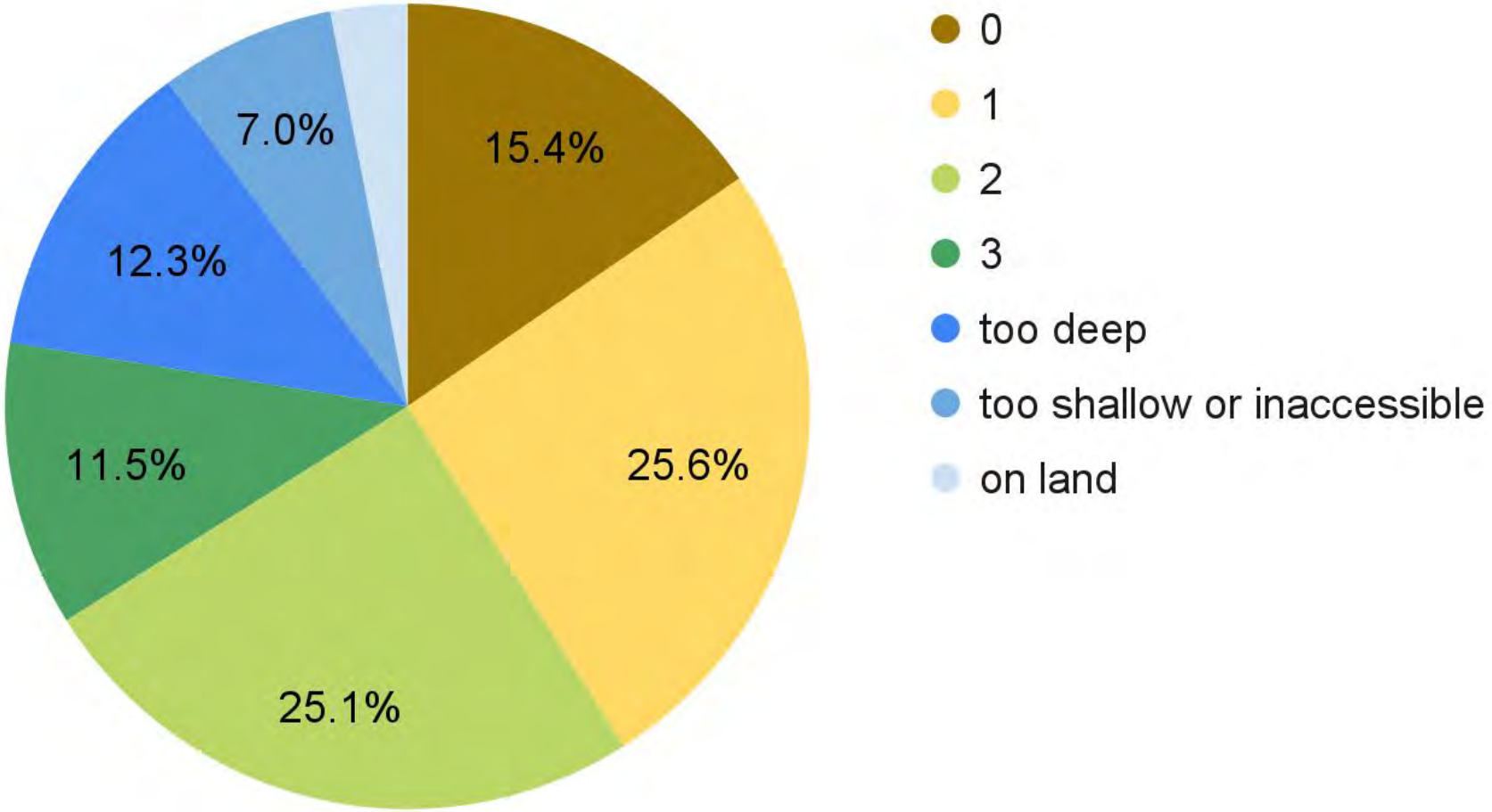
Deepest point with vegetation: 18 ft

147 vegetated sites (65%)

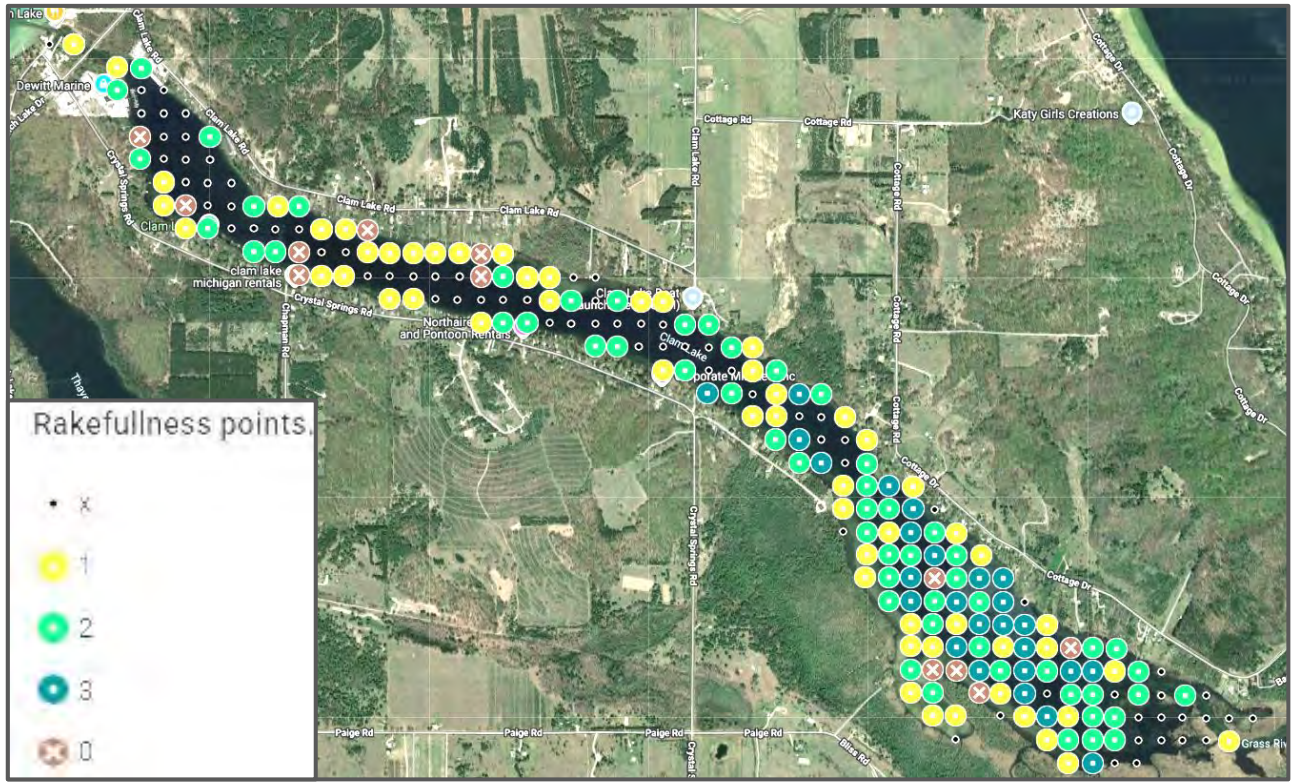


- 19 feet or deeper (no veg)
- 18 feet or less without vegetation
- 18 feet or less with vegetation
- unable to visit (too shallow, nonnavigable/wetland, docks, on land, skipped)

- Average Rake Fullness: 1.91

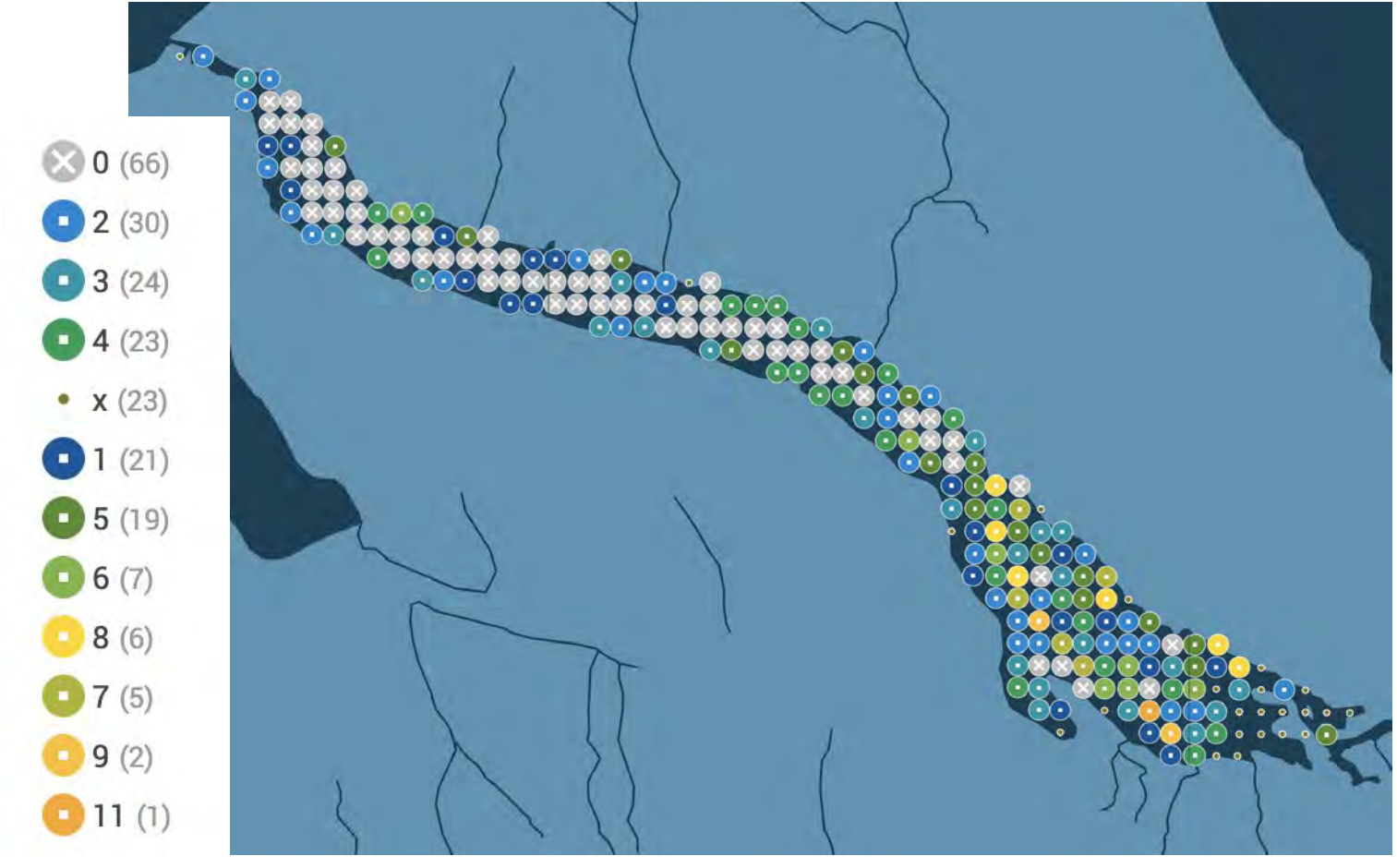


Total Rake Fullness of Sites in Clam Lake

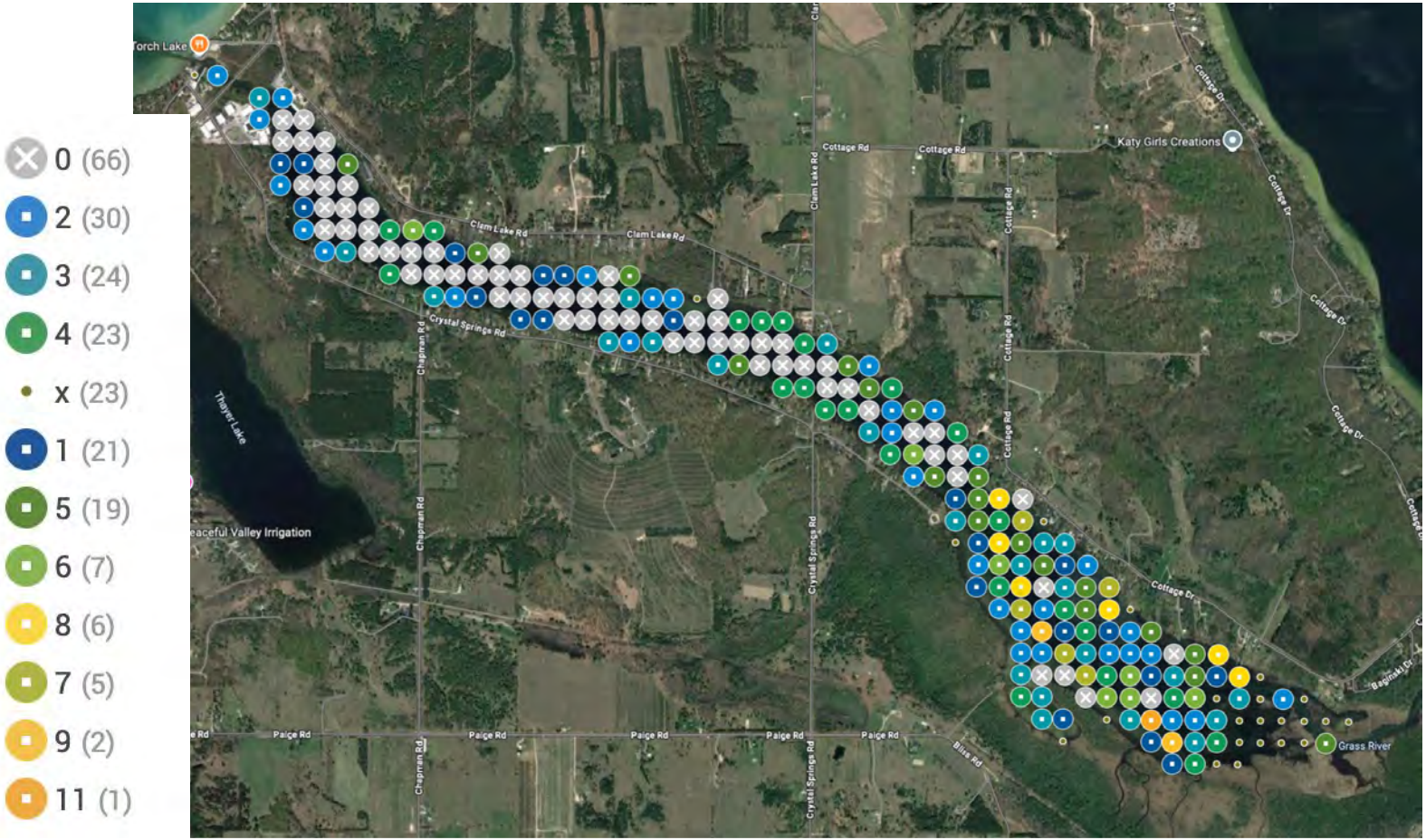


South end is more densely vegetated

Map of Species Diversity



Map of Species Richness(satellite)



How many plants were found?

- 27 submerged and floating species
- 2.91 species per site
- One sample retrieved 9 different species!

Species collected on the rake	
Latin name	**Common name**
Bidens beckii	Water marigold
Ceratophyllum demersum	Coontail
Chara sp.	Muskgrasses
Elodea canadensis	Common waterweed
Heteranthera dubia	Water star-grass
Myriophyllum heterophyllum	Various-leaved water-milfoil
Najas flexilis	Slender naiad
Nitella furcata	Forked nitella
Nuphar variegata	Spatterdock
Potamogeton amplifolius	Large-leaf pondweed
Potamogeton burchtoldii	Burchtold's pondweed
Potamogeton friesii	Fries' pondweed
Potamogeton gramineus	Variable pondweed
Potamogeton natans	Floating-leaf pondweed
Potamogeton pusillus	Small pondweed
Potamogeton richardsonii	Clasping-leaf pondweed
Potamogeton zosteriformis	Flat-stem pondweed
Ranunculus sp.	Water crowfoot
Sagittaria sp.	Arrowhead
Schoenoplectus subterminalis	Water bulrush
Stuckenia pectinata	Sago pondweed
Utricularia vulgaris	Common bladderwort
Vallisneria americana	Wild celery

Visuals only (all were collected to verify ID)	
Latin name	**Common name**
Nitella sp.	Nitella (not furcata)
Nymphaea odorata	White water lily
Potamogeton praelongus	White-stem pondweed
Potamogeton strictifolius	Stiff pondweed

Frequently Occurring Plants

Muskgrass, *Chara sp.*

Found in 53% of samples with an average rake fullness of 1.34

Wild Celery, *Vallisneria americana*

Found in 38% of samples with an average rake fullness of 1.20

Common waterweed,
Elodea canadensis
Found at 36% of sites with an average rake fullness of 1.56

Various-leaved water-milfoil,
Myriophyllum heterophyllum
Found at 27% of sites with an average rake fullness of 1.69

Flat-stem Pondweed,
Potamogeton zosteriformis
Found at 26% of sites with an average rake fullness of 1.24

Simpson Diversity Index
Clam Lake = 0.9

- A measure of how likely two random plants from the lake will be different
- Higher numbers are more diverse
- On a scale of 0-1

Conclusions

What Does it Mean?

Conclusion

- 27 different species of plants were found
  - Clam Lake is extremely diverse in plant life
  - South end has the most plant density and the most plant diversity
  - More diverse because less used by people, shallower
- 65% of the lake is vegetated
- Max depth of plant growth was 18 feet
- No invasive species were found on Clam Lake in 2025
  - Great progress on getting rid of Eurasian Water Milfoil
  - The diversity and density of plants may help prevent establishment of invasive species
- Estimated 26 hours on the water and 26 more working on everything else
  - A lot of time went into this project and into protecting our lake

Our Impact

- We are able to see what normal looks like for Clam Lake in 2025 to so we can detect any change
- Can help people see what this lake was like in 2025 so they can make decisions about the lake
- Helps people find information about other lakes that it is connected to. In this case, Lake Bellaire and Torch Lake
- Comparison to Torch lake

Impact on our Students

- Kia loved data entry, but not the field work
- Jaylea learned the plants easily, but the field work was tedious for her
- Aspen liked the physical aspects and the animals, she was the turtle counter
- Courtney LOVED it, more please

Why should you care?

- Brings in money for surrounding towns from tourists and seasonal residents.
- Home to many fish and aquatic animals
- Provides recreational activities that everyone enjoys
- Historical landmark from lumbering era, used to transport logs
- We live here and the quality of the water impacts our entire environment
- Plants benefit us and the animals living in or around the water

What else can we do?

- Full report will be on TLA website along with this project
- Campaigns- be wise don't fertilize, clean drain dry
- Donate to TLA on their website!

Acknowledgements

- Summit Village Beach Club for allowing us to work inside on our project
- Tip of the Mitt Watershed Council: esp Emily Johnson and Noah Jansen
- Funders: Gerrit Lee Wierda Memorial Fund, Antrim Women's Alliance, Dole Family Foundation

TLA Assistance

- Lois Maclean for allowing us to do this project, and encouraging us
- TLA Board for approving of the project and expending the resources needed to complete it

Huge Thanks to Isabelle Borden

- Interned in 2023, looking for quagga mussels in Torch Lake.
- Donated her time this year to help with underwater camera work
- Extremely funny and very smart. She works very hard and is going to college for environmental engineering

Captains

Brian woke us up with music and took us to lunch at Dockside

Art Took us out for training day and learned with us

Mark always made sure we had snacks and water

Leaders

- Jeanie Williams is very well respected and loves to learn. She took so much time out of her day just to look at different species so we were able to identify them as well
- Gary Bart was very easy to communicate with as well as our sole navigator. He won the “Michigan Lottery” to go bull elk hunting this year after 30 years of entering
- We could not have done this without our two wonderful leaders

Additional Support

- Teri Lemke, Mark’s wife, made sure we had food while putting data together
- Carla Bart, Gary’s wife, brought necessary supplies
- Mike Bart, Gary’s brother, filled in for absent team member and took great photos!

Questions?

Back Matter (Tables and things that got cut)

Rake fullness	Number of sites	Percentage
3	26	11%
2	57	25%
1	58	26%
0	35	15%
too deep	28	12%
too shallow or inaccessible	16	7%
on land	7	3%

- Deepest point with vegetation: 18 ft
  - 22% of all sites (50 sites) exceeded vegetated depth
- 153 sites were less than 18 ft deep
- 133 sites less than 18 ft had vegetation
- 87% of accessible sites shallower than 18 ft were vegetated

203 Accessible sites (89%)

- 50 sites too deep (22%)
- 153 in growth zone (74%)
- 133 of 153 had vegetation
- 87% of accessible sites within the growth zone were vegetated

147 Vegetated sites (65%)

- 133 accessible sites
- 14 inaccessible sites
- 67% of all in-lake sites (excludes terrestrial,147/218)

24 Inaccessible sites

- 14 too shallow or inaccessible (all had vegetation)
- 9 terrestrial
- 1 at dock (no vegetation)