Local Volunteers

Monitor and Protect Our Lakes and Streams

During the last 30 years, the Watershed Council has worked with local residents to keep a watchful eye on Northern Michigan's waters. Hundreds of volunteers have graciously devoted time and energy to our volunteer lake and stream monitoring programs, gathering data at 94 sites on 45 different lakes and streams. This priceless information is used by the Watershed Council and others to evaluate the health of our lakes and streams, identify trends, develop watershed management plans, and much, much more. We are continually impressed and thankful for the outpouring of community support and interest in our water quality monitoring programs.

The Tip of the Mitt Volunteer Lake Monitoring Program is our longest standing water quality monitoring program, with data on some lakes spanning nearly three decades. The Watershed Council provides training, equipment, and technical support to volunteers. In return, volunteers provide a wealth of data to the Watershed Council, which we use to assess the water quality and biological productivity of our lakes. Trainings are held each spring prior to sending volunteers into the field. Data are collected from early June through late August. Each week, volunteers venture onto the lake in their personal watercraft to record water transparency and surface temperature. Every other week, they collect water samples for chlorophyll-a analysis. In addition, volunteers on a handful of lakes monitor dissolved oxygen.

The Tip of the Mitt Volunteer Stream Monitoring Program was started in 2004 with just a handful of volunteers, but has grown considerably with nearly 150 people now involved. Volunteers are trained and equipped by Watershed Council staff each spring and fall. A week later, teams of three to six volunteers monitor two stream sites where they collect aquatic insects and other macroinvertebrates. Volunteers gather together a few weeks later to sort and identify the specimens that they collected in the field. Our program identifies most invertebrates to the family level, which provides a fairly clear picture of water quality and stream ecosystem health.

Together, these volunteer water quality monitoring programs generate more data on an annual basis than all other Watershed Council programs and projects. These programs also serve an even greater purpose: they connect people with water. Through a combination of aquatic ecosystem education and immersion, i.e., simply getting their feet and hands wet in these ecosystems on a regular basis, these programs build a connection that instills a strong sense of stewardship. As they become better informed and in touch with our lakes and streams, volunteer monitors often transform into ambassadors, devoted to and sharing their passion for protecting Northern Michigan's waters.

Volunteer Lake Monitoring: Quality Changes Afoot!

The 64 volunteers that helped monitor water quality at 32 stations on 23 lakes during the summer of 2014 shows that the Tip of the Mitt Volunteer Lake Monitoring program (VLM) continues to thrive. Although the number of lakes monitored has hovered around 25 for several years, the program is growing, regardless, as we add additional monitoring sites to some of the large lakes, such as Burt, Mullett, and Charlevoix. Beyond new sites, we are adding monitoring parameters to the program. Although the program started with a singular focus on water transparency, it has gradually expanded to include chlorophyll-a, water temperature, air temperature, phosphorus, and dissolved oxygen monitoring. What is the latest and greatest parameter? Invasive species monitoring.

With support from the Joyce Foundation, we are gearing up to re-introduce the Aquatic Invasive Species Patrol (AIS Patrol). The AIS Patrol was an education and monitoring effort in 2006 to raise awareness and document AIS in Northern Michigan. This year, we plan to utilize existing monitoring programs to bring the AIS Patrol back to life. Volunteers in our lake, stream, and avian botulism monitoring programs will receive additional training to learn to identify, document, and report AIS they encounter while monitoring and recreating on our lakes and streams.

Adapting the VLM program to emerging issues and adding parameters is important, but equally important is collecting quality data. Our staff and others who use volunteer data to assess lake water quality want to

be assured that data are accurate and reliable. To this end, we have spent the last three years developing a Quality Assurance and Protection Plan (QAPP) for the VLM program. For guidance, we looked to the only other volunteer lake monitoring program in Michigan: the Cooperative Lakes Monitoring Program (CLMP). Using their QAPP as a template, we created a version tailored to our program. We are happy to report that the QAPP was approved by the Michigan Clean Water Corps in February 2015.

Other exciting news is AmeriCorps volunteer involvement with our VLM program. In 2014, AmeriCorps volunteer Matt Claucherty joined our ranks, assisting with a large variety of programs and projects, including the VLM program. Matt was so effective in his position and appreciated by staff (AND apparently satisfied with his volunteer experience) that we were able to convince him to sign on for another year. In addition to the other VLM program tasks assigned to Matt, he took the initiative to bring several other AmeriCorps volunteers into the program and assist us with monitoring Huffman Lake in Charlevoix County.

Due to the increase in volunteer numbers and number of monitoring sites, as well as approval of the QAPP, we now present to you vast quantities of quality data from 2014! The following section summarizes monitoring parameters and program results. The complete data collected by volunteers are available at www.watershedcouncil.org.

Secchi Disc

The Secchi disc is a weighted black and white disc used to measure water clarity by lowering it into the water and recording the depth at which it disappears. Water clarity, which is principally determined by the concentration of algae and/or sediment in the water, is a simple and valuable way to assess water quality. Lakes and rivers that are very clear usually contain lower levels of nutrients and sediments and, in most cases, boast high quality waters. Throughout the summer, different algae types bloom at different times, causing clarity to vary greatly. Secchi disc depths range from just a few feet in small inland lakes to over 80 feet in the Great Lakes!

Chlorophyll-a

Chlorophyll-a is a pigment found in all green plants, including algae. Water samples collected by volunteers are analyzed for chlorophyll-a to estimate the amount of phytoplankton (minute free-floating algae) in the water column. Higher chlorophyll concentrations indicate greater phytoplankton densities, which reduce water clarity. The chlorophyll-a data provide support for Secchi disc depth data used to determine a lake's biological productivity, but it also helps differentiate between turbidity caused by algal blooms versus other factors, such as sediments or calcite.

Trophic Status Index

Trophic Status Index (TSI) is a tool developed to rank the biological productivity of a lake. TSI values range from 0 to 100. Lower values (0-38) indicate an oligotrophic or low productive system, medium values (39-49) indicate a mesotrophic or moderately productive system, and higher values (50+) indicate a eutrophic or highly productive system. Lakes with greater water clarity and lower phytoplankton densities score on the low end of the scale, while lakes with greater turbidity and more phytoplankton score on the high end.

Oligotrophic lakes are characteristically deep, clear, nutrient poor, and have abundant oxygen. Eutrophic lakes are generally shallow and nutrient rich, which, depending upon variables, such as age, depth, and soils, can be a natural state of a lake. However, nutrient and sediment pollution caused by humans can lead to the premature eutrophication of a lake – referred to as "cultural eutrophication." Cultural eutrophication can lead to nuisance plant growth, problematic algal blooms, water quality degradation, and fish and invertebrate fatalities.

Results from 2014 and Historical Trends

Water transparency data for some lakes stretches back to 1986, providing a long-term view of water quality conditions and trends. Data from Lake Skegemog illustrate the changes that have occurred over time in a number of the region's lakes. The averaged Secchi disc depths in Lake Skegemog have increased from approximately 10 feet in 1992 to over 16 feet 2014 (Figure 2). This trend of increasing water transparency is also well pronounced in Black, Burt, Charlevoix, Douglas, Elk, Michigan, Mullett, Pickerel, and Walloon Lakes. What do all these lakes have in common that might be causing such changes? Invasive zebra mussels.

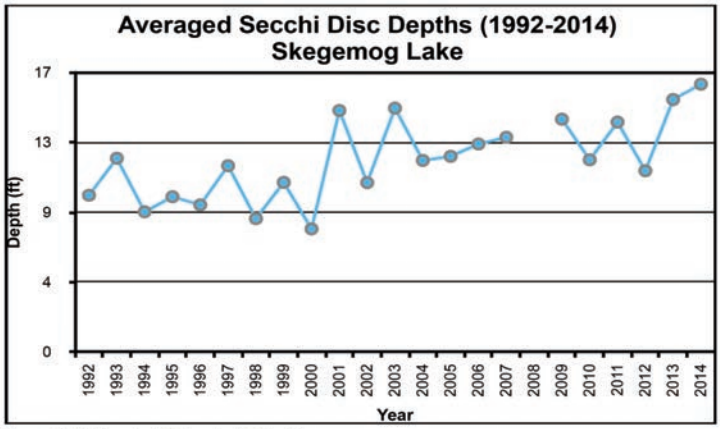


Figure 2. Water clarity trends in Lake Skegemog.

Zebra mussels have turned up in all of the region's largest lakes during the last twenty years, as well as many of the smaller lakes, and caused far-reaching changes in their ecosystems. These invasive mussels are filter-feeders that consume algae and, essentially, clear the water column, which increases water transparency. Unfortunately, zebra mussels are not cleaning the water, but rather filtering out the base of the food chain. This loss of primary productivity (i.e., algae) alters the entire food web, ultimately leading to a reduction in top predator fish populations, such as trout or walleye. Invasive quagga mussels cause the same problems, but are currently limited in distribution to the Great Lakes and Lake Charlevoix.

The loss of primary productivity caused by invasive mussels should also be evident in the chlorophyll-a data, since the data essentially provide a measure of planktonic algae in the water column. In the case of Paradise Lake, volunteer data show a steep decline in chlorophyll-a concentrations after 2002 (Figure 3). It was around this time period that residents noticed an increase in zebra mussel abundance. Other lakes displaying this trend include: Black, Burt, Charlevoix, Michigan, and Mullett. In some lakes where invasive mussels have been present for over 10 years, trends

appear to be reversing with water clarity decreasing and chlorophyll increasing. Anecdotal evidence from residents on these lakes suggests that invasive mussel populations are decreasing, which would explain this trend reversal. It should be noted that data from some lakes with invasive mussels do not show clear trends.

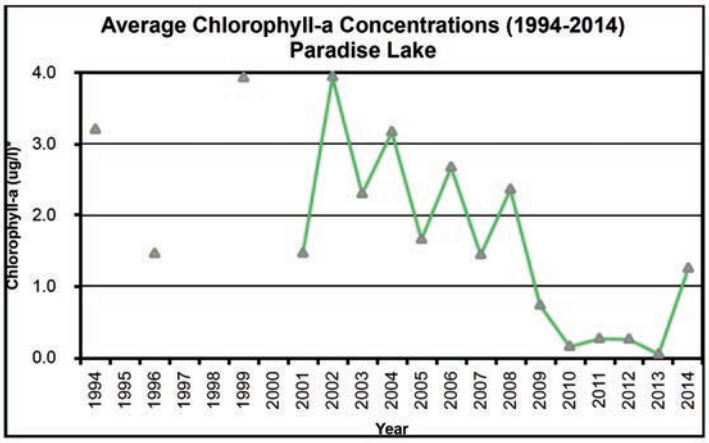


Figure 3. Chlorophyll trends in Paradise Lake.

Trends in some lakes monitored by volunteers are inexplicable or absent altogether. Thumb Lake (AKA Lake Louise) in western Charlevoix County is a case in point. Secchi disc depths gradually decreased from over 25 feet in 1990 to 15 feet in 1999, and have stayed in the range of 15′ to 20′ since then (Figure 4). However, averaged chlorophyll-a data are erratic, rising and falling throughout the last 25 years with no clear pattern (Figure 5). It would appear something changed in the lake that increased turbidity in the 1990s independent of algae blooms. Are there more sediments in the water? Is calcite precipitating out of the water column at higher rates? We are still uncertain as to what caused the change.

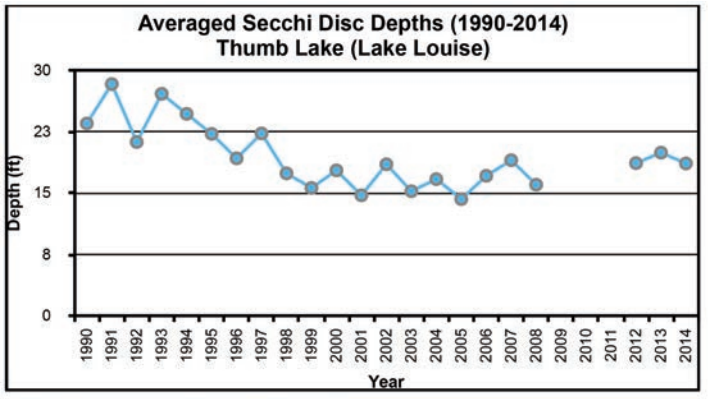


Figure 4. Water clarity trends in Thumb Lake.

Both chlorophyll and transparency data are useful in assessing the trophic status (biological productivity) of a lake. Since we do not have chlorophyll data for the early years of the program, we calculate trophic status index scores based on Secchi disc depths and, therefore, see the same trends: lakes with invasive mussels have experienced declining TSI scores becoming less biologically productive over time. We present TSI score, as well as averaged Secchi depths and chlorophyll-a concentration, to the right so that you can see the biological productivity of your favorite lake(s) and make comparisons with others (Table 2).

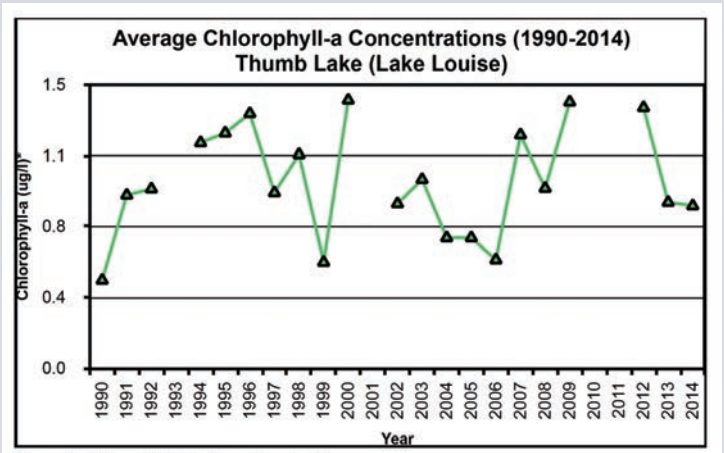


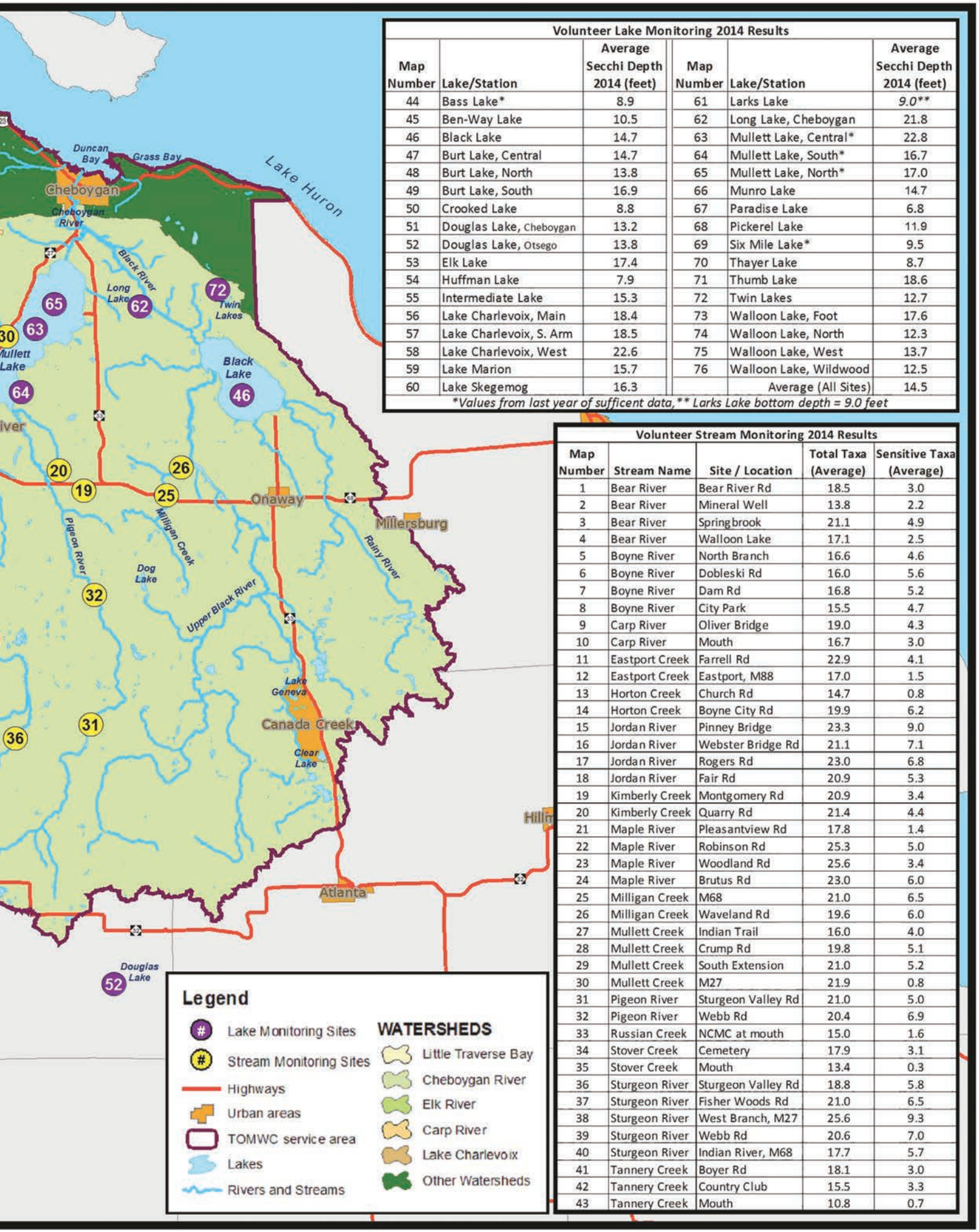
Figure 5. Chlorophyll data from Thumb Lake.

Table 2. 2014 Volunteer Lake Monitoring Data

Lake/Station	TSI Score 2014*	Secchi Depth 2014 (feet)*	Chlorophyll-a 2014 (ug/l)*
Ben-Way Lake	43	11	2.65
Black Lake	39	15	0.79
Burt Lake, Central	38	15	*i*
Burt Lake, North	40	14	0.64
Burt Lake, South	37	17	0.69
Crooked Lake	46	9	1.03
Douglas Lake, Cheboygan	40	13	1.50
Douglas Lake, Otsego	39	14	2.13
Elk Lake	36	17	0.44
Huffman Lake	48	8	*i*
Intermediate Lake	38	15	1.94
Lake Charlevoix, Main	35	18	0.53
Lake Charlevoix, S. Arm	35	19	0.77
Lake Marion	40	16	1.08
Lake Skegemog	37	16	0.87
Larks Lake	23	*i*	0.75
Long Lake, Cheboygan	33	22	0.46
Mullett Lake, Central	37	16	0.34
Mullett Lake, North	37	16	*i*
Mullett Lake, South	38	16	0.69
Munro Lake	38	15	1.30
Paradise Lake	50	7	1.25
Pickerel Lake	42	12	1.36
Six Mile Lake	43	11	2.32
Thayer Lake	46	9	2.44
Thumb Lake	35	19	0.86
Twin Lakes	41	13	1.18
Walloon Lake, Foot	36	18	0.83
Walloon Lake, North	42	12	1.28
Walloon Lake, West	40	14	0.14
Walloon Lake, Wildwood	41	13	0.55

**all scores are seasonal averages, i=insufficient data, ug/l=micrograms per liter or parts per billion.*


Tip of the Mitt Volunteer Monitoring Progams
2014 Sample Sites
Lake Michigan
Grand Traverse Bay
Little Traverse Bay
Mackinaw City
French Farm Lake
O'Neal Lake
Carp River
Paradise Lake
Wycamp Lake
Lancaster Lake
Munro Lake
Larks Lake
Douglas Lake
Maple River
Pellston
Crooked River
Burt Lake
Alanson
Harbor Springs
Round Lake
Crooked Lake
Pickerel Lake
Petoskey
Tannery Creek
Bear River
Sturgeon River
Susan Lake
Horton Creek
Charlevoix
Lake Charlevoix
Walloon Lake
Silver Lake
Nowland Lake
Lake Marion
Spring Brook
Boyne City
Boyne Falls
Deer Lake
ThumbLake
Huffman Lake
Vanderbilt
East Jordan
Ellsworth
Ellsworth Lake
Six Mile Lake
Boyne River
Eastport Creek
Hanley Lake
Central Lake
Jordan River
Gaylord
Intermediate Lake
Bellaire
Lake Bellaire
Torch Lake
Clam Lake
Thayer Lake
Elk Lake
Elk Rapids
Mancelona
Lake Skegemog
Traverse City
Kalkaska



Volunteer Lake Monitoring 2014 Results

Map Number	Lake/Station	Average Secchi Depth 2014 (feet)	Map Number	Lake/Station	Average Secchi Depth 2014 (feet)
44	Bass Lake*	8.9	61	Larks Lake	*9.0***
45	Ben-Way Lake	10.5	62	Long Lake, Cheboygan	21.8
46	Black Lake	14.7	63	Mullett Lake, Central*	22.8
47	Burt Lake, Central	14.7	64	Mullett Lake, South*	16.7
48	Burt Lake, North	13.8	65	Mullett Lake, North*	17.0
49	Burt Lake, South	16.9	66	Munro Lake	14.7
50	Crooked Lake	8.8	67	Paradise Lake	6.8
51	Douglas Lake, Cheboygan	13.2	68	Pickerel Lake	11.9
52	Douglas Lake, Otsego	13.8	69	Six Mile Lake*	9.5
53	Elk Lake	17.4	70	Thayer Lake	8.7
54	Huffman Lake	7.9	71	Thumb Lake	18.6
55	Intermediate Lake	15.3	72	Twin Lakes	12.7
56	Lake Charlevoix, Main	18.4	73	Walloon Lake, Foot	17.6
57	Lake Charlevoix, S. Arm	18.5	74	Walloon Lake, North	12.3
58	Lake Charlevoix, West	22.6	75	Walloon Lake, West	13.7
59	Lake Marion	15.7	76	Walloon Lake, Wildwood	12.5
60	Lake Skegemog	16.3		Average (All Sites)	14.5

**Values from last year of sufficent data, ** Larks Lake bottom depth = 9.0 feet*

Volunteer Stream Monitoring 2014 Results

Map Number	Stream Name	Site / Location	Total Taxa (Average)	Sensitive Taxa (Average)
1	Bear River	Bear River Rd	18.5	3.0
2	Bear River	Mineral Well	13.8	2.2
3	Bear River	Springbrook	21.1	4.9
4	Bear River	Walloon Lake	17.1	2.5
5	Boyne River	North Branch	16.6	4.6
6	Boyne River	Dobleski Rd	16.0	5.6
7	Boyne River	Dam Rd	16.8	5.2
8	Boyne River	City Park	15.5	4.7
9	Carp River	Oliver Bridge	19.0	4.3
10	Carp River	Mouth	16.7	3.0
11	Eastport Creek	Farrell Rd	22.9	4.1
12	Eastport Creek	Eastport, M88	17.0	1.5
13	Horton Creek	Church Rd	14.7	0.8
14	Horton Creek	Boyne City Rd	19.9	6.2
15	Jordan River	Pinney Bridge	23.3	9.0
16	Jordan River	Webster Bridge Rd	21.1	7.1
17	Jordan River	Rogers Rd	23.0	6.8
18	Jordan River	Fair Rd	20.9	5.3
19	Kimberly Creek	Montgomery Rd	20.9	3.4
20	Kimberly Creek	Quarry Rd	21.4	4.4
21	Maple River	Pleasantview Rd	17.8	1.4
22	Maple River	Robinson Rd	25.3	5.0
23	Maple River	Woodland Rd	25.6	3.4
24	Maple River	Brutus Rd	23.0	6.0
25	Milligan Creek	M68	21.0	6.5
26	Milligan Creek	Waveland Rd	19.6	6.0
27	Mullett Creek	Indian Trail	16.0	4.0
28	Mullett Creek	Crump Rd	19.8	5.1
29	Mullett Creek	South Extension	21.0	5.2
30	Mullett Creek	M27	21.9	0.8
31	Pigeon River	Sturgeon Valley Rd	21.0	5.0
32	Pigeon River	Webb Rd	20.4	6.9
33	Russian Creek	NCMC at mouth	15.0	1.6
34	Stover Creek	Cemetery	17.9	3.1
35	Stover Creek	Mouth	13.4	0.3
36	Sturgeon River	Sturgeon Valley Rd	18.8	5.8
37	Sturgeon River	Fisher Woods Rd	21.0	6.5
38	Sturgeon River	West Branch, M27	25.6	9.3
39	Sturgeon River	Webb Rd	20.6	7.0
40	Sturgeon River	Indian River, M68	17.7	5.7
41	Tannery Creek	Boyer Rd	18.1	3.0
42	Tannery Creek	Country Club	15.5	3.3
43	Tannery Creek	Mouth	10.8	0.7

10-YEAR ANNIVERSARY

of the Tip of the Mitt Watershed Council

Volunteer Stream Monitoring Program!!

What began as a one-creek program in 2004 has transformed into one of the largest volunteer stream monitoring programs in Michigan! With nearly 150 volunteers on our list and 43 monitoring sites, we are the third largest program in the State. Only the Huron River Watershed Council and the Clinton River Watershed Council in southeastern Michigan have larger programs. To what do we owe this success? To our volunteers, of course, and their passion for monitoring and protecting our streams, learning ecosystem dynamics of the aquatic world, and joining ranks with others who have similar interests.

There are a handful of dedicated volunteers that have been with us since the beginning. Time and again, they wade into the streams to sample or pick through invertebrate-laden petri dishes in the lab. They are the foundation upon which we have built this highly successful program, diligently monitoring year after year, teaching the skills they have acquired to others, and sharing their enthusiasm for our streams and the critters that reside within. What keeps these energized volunteers ticking… and picking (bugs)? Let's ask them…

Roy Tassava, a property owner on Mullett Creek where he has led monitoring teams since 2005, shares his enthusiasm for the program: "Finding all the different varieties and especially the sensitive aquatic invertebrates in a small clear-water stream is a thrill." Roy adds, "I've had many different folks helping with the collecting, from kids to retirees, male and female, and all get excited and work hard. You name it and we have probably caught it!"

The volunteer monitoring experience of Brian Kozminski, an avid trout angler that currently monitors the Boyne River, includes "over the years, getting out, meeting new people in our community, from Petoskey's Tannery Creek, getting poison ivy behind Glen's, finding a little brook trout off Boyer Road, crawling back to some beaver dam locale off Camp Ten Road, and going places less travelled all in the name of finding bugs… Are you kidding? It's the most rewarding and fun thing I do!"

It's the most rewarding and fun thing I do!"

Long-term volunteer and former Watershed Council staff, Doug Fuller, notes that our program has "helped bring the importance of streams, both large and small, and the perils facing them into focus. I've been glad to play a small role in the success of your program." Especially rewarding is knowing that volunteers enjoy long-term benefits from the program as exemplified by Doug's reflection that "whenever I canoe or kayak on Northern Michigan's streams, I enjoy imagining the hidden pageant of life taking place below."

Volunteer stream monitors collect aquatic insects and other macroinvertebrates that are used to assess stream ecosystem health. Community diversity and species sensitivity are key factors in determining water quality. A variety of pollution-sensitive stoneflies, mayflies, and caddisflies portrays a healthy ecosystem and high water quality while a sample with only pollution-tolerant aquatic worms and midges reveals a stream ecosystem that is likely suffering. Results of the biological monitoring performed by volunteers usually show healthy stream ecosystems and excellent water quality. Fortunately, healthy streams are the norm in Northern Michigan, primarily because agricultural and urban land cover is quite limited. However, there are stream sections in or near urban areas where low aquatic macroinvertebrate diversity has been documented.

STREAM REPORTS

Stream ecosystem health is assessed using three measurements of diversity: 1) Total Taxa = the total number of macroinvertebrate families found at a site; 2) EPT taxa = the number of families in three pollution-sensitive insect orders (mayflies, stoneflies, and caddisflies); and 3) Sensitive Taxa = the number of highly sensitive macroinvertebrate families. Scores for each sample site are averaged using data from all monitoring events and are presented in Table 1. Each river or creek is graded based on a system developed by Watershed Council staff that utilizes all three index scores. The higher the grade, the better the water quality.

Water Quality Grading System*

A = Excellent
B = Good
C = Moderate
D = Poor
E = Very Poor

**Grades based on system that utilizes all three index scores.*

Bear River: Grade = B

Currently, five sites are monitored in the Bear River Watershed. Springbrook, which drains the southeastern watershed and is fed by springs from Chandler Hills, has the greatest diversity among Bear River sites. Volunteers from Petoskey High School have found moderate to high diversity at Bear River Road, which is located on the county line at about mid-watershed. In contrast, the sites at Melrose Township Park by Walloon Lake, the mouth of Russian Creek near North Central Michigan College, and Mineral Well Park in Petoskey show much less diversity. Lower diversity at Melrose Township Park may be due to warmer waters draining from Walloon Lake and a lack of streambank vegetation, whereas Russian Creek and Mineral Well Park sites are probably affected by polluted stormwater runoff from adjacent agricultural and urban areas.

Boyne River: Grade = A

Four sites are monitored on the Boyne with help from the Friends of the Boyne River, including the South Branch at Dobleski Road, the North Branch on Thumb Lake Road, mid-river at Dam Road, and near the mouth in Boyne City. Elevated water temperatures from impoundments created by dams and stormwater runoff from urban and agricultural areas are the primary stressors to the Boyne River ecosystem. Total diversity scores rarely surpass 20, but consistently high EPT and sensitive family diversity at all sites show why the Department of Natural Resources includes the Boyne on its list of "Blue Ribbon" trout streams.

Carp River: Grade = TBD
Due to water quality concerns by Emmet County, the Carp River to the southwest of Mackinaw City was added to the program in 2013. Volunteers, including a few county employees, monitor two sites: upstream at Oliver Road and downstream at Wilderness Park Drive. Although more data are needed to rate river ecosystem health (at least three years of data are required), preliminary results indicate that the Carp River is doing well.

Eastport Creek: Grade = B
Eastport Creek drains into the north end of Torch Lake near the intersection of US-31 and M-88. It has been monitored at two sites since 2005. Biological data from the upper reaches at Farrell Road show a diverse and healthy macroinvertebrate community. Conversely, data from the M-88 site reveal potential problems in lower section of the creek. Low diversity at M-88 is probably related to residential development, which tends to increase the levels of stormwater pollution and habitat degradation in streams.

Horton Creek: Grade = B
Horton Creek flows south from its headwaters near Little Traverse Bay into Lake Charlevoix at Horton Bay. Low diversity scores from the upstream site at Church Road are, at least in part, due to sluggish flow as the creek winds through wetland areas. However, nutrient and sediment pollution from agriculture could also be impacting the creek's macroinvertebrate communities. Macroinvertebrate diversity is much greater downstream at the Boyne City Road site, where stream flow is much faster and the stream bottom contains a wider variety of materials including gravel, rock, and wood.

Jordan River: Grade = A+
The Friends of the Jordan River help coordinate volunteer monitoring at four sample sites. Upstream to downstream, sites include Pinney Bridge, Webster Bridge Road, Rogers Road, and Fair Road. Pristine conditions throughout most of the Jordan River Watershed, and limited development along the river's edge, explain the high macroinvertebrate diversity that regularly turns up in the volunteer's biological assessments. The Jordan is currently tied with the Sturgeon River as record holder for the greatest number of sensitive families, with 11 found at both Pinney Bridge and Webster Bridge Road!

Kimberly Creek: Grade = A
Kimberly Creek flows through Afton, on M-68 to the east of Indian River, before converging with the Pigeon River just upstream of Mullett Lake. Upstream at Montgomery Road, the creek has little riparian vegetation due to residential development, but volunteer monitoring shows that healthy macroinvertebrate diversity persists. From Montgomery Road, the stream flows through agricultural lands and a mining quarry, but data from the downstream site at Quarry Road show that the stream ecosystem continues to flourish.

Maple River: Grade = A−
The Maple River drains a large area that includes Pleasantview Swamp, Larks Lake, Douglas Lake, Munro Lake, and the Village of Pellston. The East and West Branches of the river converge at Lake Kathleen and the river then flows southeast until emptying into Burt Lake. High diversity at three of four sites monitored by volunteers (Robinson Road, Woodland Road, and Brutus Road), testify to the exceptional water quality in the Maple River. The low macroinvertebrate diversity at Pleasantview Road could be natural due to slow flow and warmer water temperatures, but could also indicate impairment.

Milligan Creek: Grade = A
Milligan Creek, an important tributary of the Black River near the village of Tower on M-68, was added to our program based on recommendations by DNR fisheries biologists. EPT and sensitive families are generally found in abundance, indicating a healthy stream ecosystem at both the M-68 and Waveland Road sites. The Waveland Road site is unique among sites monitored in the program in that the stream bottom is lined with exposed bedrock.

Mullett Creek: Grade = A−
Mullett Creek flows from its headwaters near Riggsville Road and the University of Michigan Biological Station into the northwest side of Mullett Lake. From upstream to downstream, volunteers monitor sites at Indian Trail, Crump Road, South Extension Road, and the mouth at M-27. Fast flow, cool water temperatures, high dissolved oxygen levels, and complex in-stream habitat contribute to the high sensitive species diversity at the upper sites. In the lower reaches of Mullett Creek, slopes decrease considerably and the channel widens. This results in sluggish flow, warmer water temperatures, and lower dissolved oxygen levels, which is reflected in the low sensitive species diversity found near the creek mouth.

Pigeon River: Grade = A
The Pigeon River begins just northeast of Gaylord, flows through the heart of Pigeon River Country, and eventually makes its way to Mullett Lake. Three dam failures during the last 60 years at Song of the Morning Ranch have had severe negative impacts on fish and other aquatic life throughout much of the Pigeon River. Following the last incident in 2008, the courts ordered a drawdown of the impoundment, which was carried out in 2014. We added two sites in the Pigeon River to our program in 2011 to assess impacts and recovery related to releases from the dam. Monitoring sites are located to the east of Vanderbilt at Sturgeon Valley Road and to the east of Wolverine on Webb Road. Although initial diversity scores were low in 2011, strong EPT and sensitive family diversity since then indicate that the Pigeon has recovered from the 2008 release and weathered last year's drawdown.

Stover Creek: Grade = C−
Monitored since 2004, Stover Creek holds the distinction of being the first stream to be included in our program. However, it also holds the distinction of having the lowest sensitive taxa diversity in our program with an average of 0.3 sensitive taxa found at the creek mouth. A half mile upstream, at the Brookside Cemetery site, there is much higher macroinvertebrate diversity. In part due to the problems exposed by volunteer monitoring, the Watershed Council recently completed the Stover Creek Restoration and Management Plan. A variety of surveys and assessments performed during development of this plan identified specific problems ranging from streambank erosion to polluted runoff from commercial, residential, and recreational (golf course) areas. The plan provides 25 recommendations for restoring and protecting the creek, such as streambank stabilization and stormwater Best Management Practice (BMP) installation. Following implementation of these recommendations, we hope to see macroinvertebrate diversity increase in Stover Creek. Read more about the plan on page 3.

Sturgeon River: Grade = A+
The Sturgeon River is known for its fast flows, dropping rapidly from headwaters in Gaylord and Huffman Lake (West Branch), converging in Wolverine, and flowing through Indian River where it empties into Burt Lake. Volunteers monitor four sites on the Sturgeon: upstream at Sturgeon Valley Road, on the West Branch on M-27, in Wolverine, and at Fisher

Woods Road near Indian River. In terms of diversity index scores, the Sturgeon and Jordan Rivers are remarkably similar, which we attribute to the pristine status of their upper watersheds. However, the Sturgeon River is experiencing greater residential development in its lower section, which threatens to degrade the river ecosystem. Threats such as riparian development and streambank erosion are currently being documented and assessed by the Watershed Council as part of the Burt Lake-Sturgeon River Watershed Management Plan development. Last summer, we documented approximately 150 streambank erosion sites in the lower Sturgeon River!

Tannery Creek: Grade = B-

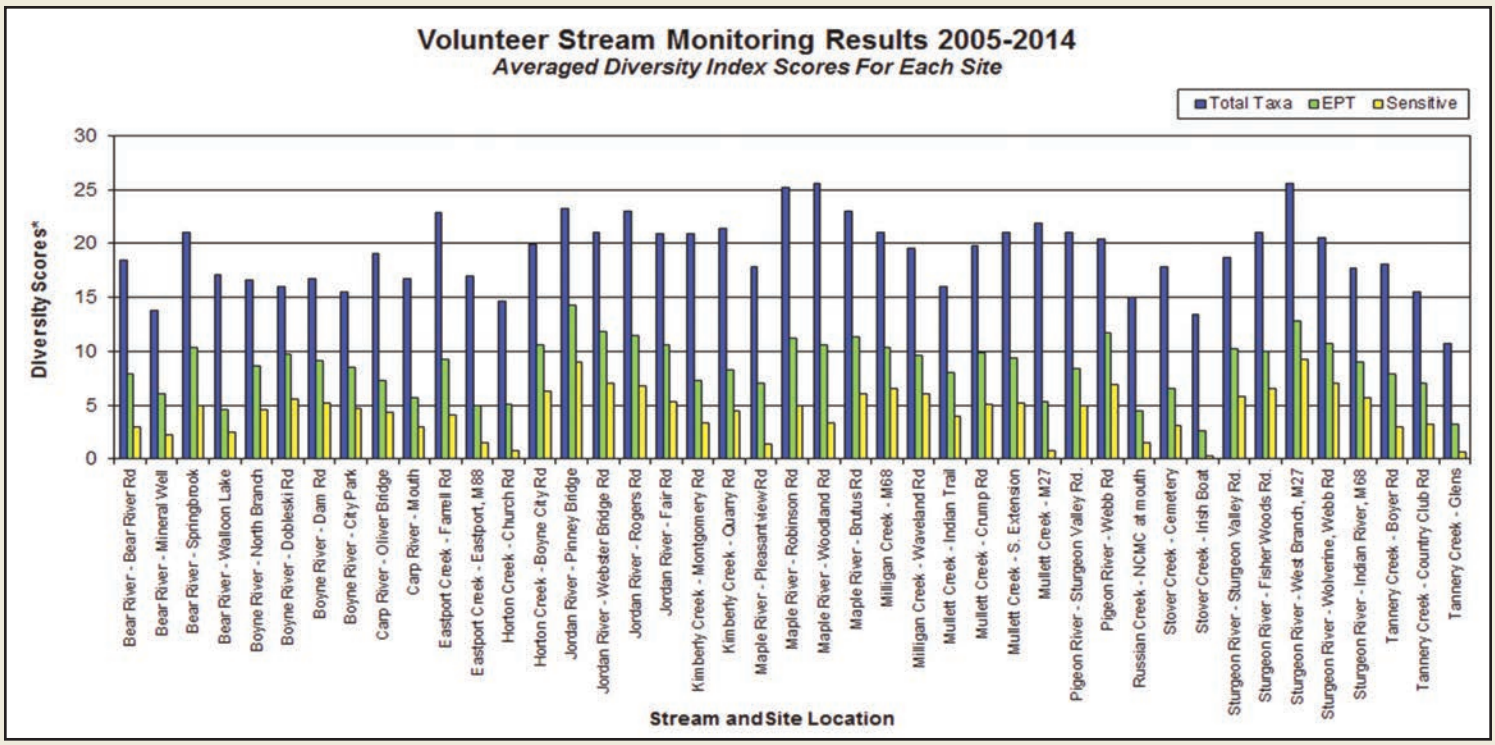
Tannery Creek flows into Little Traverse Bay from a deep valley just east of Petoskey. Volunteers monitor the creek at three sites: upstream at Boyer Road, mid-stream at Country Club Road, and downstream near the mouth. Macroinvertebrate diversity is quite low at the mouth, likely a result of polluted runoff from the adjacent urban area. Similar to Stover Creek, volunteer data fomented the development of a watershed management plan for Tannery Creek, which was completed by University of Michigan Master's project students two years ago. Recommendations from this plan will be incorporated into the updated Little Traverse Bay Watershed Protection Plan in the next few years. Thereafter, the Watershed Council and partner organizations will have more leverage for acquiring funding to implement plan recommendations and bring Tannery Creek back to health.

Thank You Volunteers!

We cannot thank our volunteers enough for the critical role they play in helping protect the lakes and streams of Northern Michigan, but we try: thank you, thank you, THANK YOU! If you would like to get involved or would like additional information, please contact program coordinators, Kevin Cronk and Dan Myers, at (231) 347-1181.

Table 1. Averaged diversity scores for rivers and creeks.

Stream Name	Total Taxa Average	EPT Taxa Average	Sensitive Taxa Average
Bear River	17.1	6.7	2.8
Boyne River	16.2	9.0	5.0
Carp River	17.8	6.5	3.7
Eastport Creek	20.0	7.1	2.8
Horton Creek	17.3	7.9	3.5
Jordan River	22.1	12.0	7.0
Kimberly Creek	21.2	7.8	3.9
Maple River	22.9	10.0	4.0
Milligan Creek	20.3	10.0	6.3
Mullett Creek	19.7	8.1	3.8
Pigeon River	20.7	10.1	5.9
Stover Creek	15.6	4.6	1.7
Sturgeon River	20.7	10.5	6.8
Tannery Creek	14.8	6.0	2.3
ALL STREAMS	19.0	8.3	4.3



Look for Avian Botulism Monitoring results in our upcoming summer newsletter.