

AGENDA
Cascade Charter Township
Thornapple River SAD Ad-Hoc Committee
Monday, February 10, 2025
4:30 pm
5920 Tahoe Dr. SE

- | | | |
|----------------|------------|--|
| ARTICLE | 1. | Call the meeting to order |
| ARTICLE | 2. | Approval of the Agenda |
| ARTICLE | 3. | Acknowledge Visitors & Public Comment
(Limited to five minutes per speaker.) |
| ARTICLE | 4. | Approval of the Minutes of the October 14, 2024 Meeting |
| ARTICLE | 5. | Staff Updates <ul style="list-style-type: none">• PLM Contract• Safety & Navigational Marking Project Update• Financial Report |
| ARTICLE | 6. | Draft 2024 Annual Report |
| ARTICLE | 7. | River Maintenance Plan Discussion |
| ARTICLE | 8. | Any Other Business |
| ARTICLE | 9. | Public Comment
(Limited to five minutes per speaker.) |
| ARTICLE | 10. | Adjournment |

MINUTES

Cascade Charter Township
THORNAPPLE RIVER SAD AD-HOC COMMITTEE MEETING
October 14, 2024, at 5:30pm
Cascade Charter Township Office
5920 Tahoe Dr. SE
Grand Rapids, MI 49546

- ARTICLE 1.** The meeting was called to order at 5:30pm.
- Members Present: Scott Rissi, Leann Rowland, Trustee Shipley, Chuck Whitley, Thomas Keith, Michael Wiegand, Jeff Carpenter
Absent: None
Others Present: Township Supervisor Grace Lesperance, Township Manager Jade Smith, Executive Assistant Jessica Stine, Jamiee Desjardins of PLM
- ARTICLE 2. Approve the current Agenda**
- Motion was made by Member Carpenter to approve the agenda as written. Supported by Trustee Shipley. Motion carried.**
- ARTICLE 3. Acknowledge Visitors & Public Comment**
- Township Supervisor Lesperance attended the meeting to discuss the ruling regarding the Gerald R Ford International Airport zoning litigation.
- ARTICLE 4. Approve the Minutes of the June 10, 2024 Meeting**
- Motion was made by Member Rissi to approve the minutes with two grammatical changes. Supported by Trustee Shipley. Motion carried.**
- ARTICLE 5. Summer Water Quality Report-Jaimee Desjardins, PLM**
- Jaimee Desjardins from PLM attended the meeting to discuss the weed management program. She believes the treatments have gone great so far. They are targeting two exotic plants, curly leaf and milfoil. There were three treatments this year; the last two winters have been warm, which has increased the prevalence of weeds on the water. There was an increase in nutrients in the water from 2023 to 2024. Ada has more nutrients in the water than Cascade does due to Cascade being three times as deep and significantly wider than the portions of the river in Ada. There were one to two ft sections of algae growing in the river, but Ada had more algae.
- If the SAD wants to expand the weed program, they could start treating the major inlets. If algae dies in the river, this could be causing the increased amount of nutrients in the river. She did not recommend harvesting in the inlets as they were much smaller clumps of algae. The chemicals used to treat invasive plants only penetrate 0-10 ft deep. Regarding native plants, only a 50ft x 20ft square can be treated along each property. This limit does not apply to invasive plants. They could consider harvesting the

large bayou at Thornapple as there are many boats from that area that are parked in other locations because they can't get into the water in that area.

Manager Smith recommended extending the contract with PLM. Member Rissi agreed because PLM also works with Ada on their section of the river. Member Carpenter suggested rebidding if the price were to exceed the original competitive bid. Members suggested looking at how much the committee still has in the roll after 2025 to see if they are still correcting an appropriate amount.

ARTICLE 6. Financial Report

The financial report was included in the packet and didn't have any recent changes as Viking had not yet completed their contracted work.

ARTICLE 7. MI Natural Shorelines

The committee was still interested in MI Natural Shorelines and requested the information be sent out to the Cascade Thornapple River Association.

ARTICLE 8. Safety & Navigational Marking Project Update

The agreement with Maricaibo and Viking is still in place and the markers will be installed in two to three weeks. Thornapple River SAD residents will be notified when this takes place.

ARTICLE 9. Any Other Business

There were trees down in the river and in the ski course cannot be safely used. Beaverwood would need to be used for tree relocation south of the bridge. Larry's Tree Service, the company used to clear debris in the water earlier in 2024, could only be used south of the highway. The committee was interested in contracting Larry's Tree Service again in the spring of 2025. They considered contracting both companies to relocate debris in the spring, one north and one south in the river. They estimated it would cost approximately \$5,000 per day.

ARTICLE 10. Roundtable Q & A

The committee requested reports from the dam operator. They used to receive reports but that stopped when the dam operation changed to the current operator. Member Whitley believed that the dam operator should send a report to the Township, at the least, but also to the residents.

Member Rissi asked the committee's opinion on digging out the train bridge. This would make the area navigable for contractors. Members suggested that the project would be very expensive, would be unlikely to benefit all SAD members, and the adjacent landowners would be against it.

Members agreed to begin meeting at 4:30pm in 2025.

ARTICLE 11. Public Comment

There was no one who wished to comment at that time.

ARTICLE 12. Adjournment

Motion was made by Member Rissi to adjourn. Supported by Member Keith. Motion carried. The meeting was adjourned at 7:02 p.m.

Approved by the Thornapple River SAD Ad-Hoc Committee - TBD

DRAFT



PLM

LAKE & LAND
MANAGEMENT CORP

October 9, 2023

Cascade Charter Township
Attn: Jade Smith, Township Manager
5920 Tahoe Dr. SE
Grand Rapids, MI 49546

Thank you for the opportunity to submit a proposal to continue to work with your group on the Thornapple River. The following proposal is for your review for the 2025-2027 seasons. To highlight a few of the advantages to working with PLM: All billings are post service/treatment with itemized details. Reports and follow up information are readily available following service. In addition to any scheduled service, PLM is always available for treatment/lake evaluation if something changes unexpectedly. Please review the following proposal and if any changes, additions, or modifications are required to suite your specific program needs, please contact me without hesitation.

PLM Lake & Land Management Corp. is a Michigan based company with a specific focus of lake management in and around Kent County. We have numerous offices throughout Michigan to serve our customers with the fastest response time and a highly educated and experienced staff with the latest technologies available in aquatics.

Management Program for 2025-2027: The primary goal of aquatic plant management in the Thornapple River is the control of exotic aquatic plants. The exotic plant species, Eurasian watermilfoil, should be controlled throughout the river. The abundance of this species should be reduced to the maximum extent possible, and efforts should be made to reduce their recovery after treatment.

Aquatic plant management should preserve species diversity and cover of native plants sufficient to provide habitat for fish and other aquatic organisms. Native plants should be managed to encourage the growth of plants that support the Thornapple River fishery (by creating structure and habitat) provided that they do not excessively interfere with recreational uses of the lake (e.g., swimming and fishing) in high-use areas. Where they reach recreational nuisance levels, management techniques that reduce the stature of native plants without killing them (e.g., harvesting, contact herbicides) should be used whenever possible. Specific areas should be set aside where native plants will not be managed, to provide habitat for fish and other aquatic organisms. Management will also include performing surveys (AVAS surveys when required), pre/post treatment surveys, water quality analysis and algae treatments if required.

Below are the associated costs (on a per acre basis) of products that may be used as part of the aquatic weed management program.

Unit Cost per acre:

Contact Herbicides:

Diquat	\$160.00 (exotics)
Diquat	\$220.00 (hybrid/natives)
Aquathol K	\$180.00 (exotics)
AquaStrike	\$445.00
Flumioxazin 100ppb w/Contacts	\$445.00
Flumioxazin 200ppb	\$575.00

Systemic Herbicides:

Renovate 3 (liquid)	\$400.00
Renovate OTF	\$615.00
ProcellaCOR	\$105.00/PDU

Algaecides:

Copper sulfate/Chelated copper	\$45.00
Chelated copper	\$128.00
SeClear, filamentous algae	\$200.00
SeClear G, SSW Control	\$385.00
Green Clean	\$310.00
Phycomycin	\$130.00

PLM Consulting Services:

Vegetation AVAS Survey	\$575.00
Mid-summer brief checks	No Charge
Water Quality Program	\$925.00
Lake Management Plan	\$770.00
EGLE Permit Fee	~\$1600.00

Estimated Budget for 2025-2027: \$20,000.00 to \$40,000.00

This budget is an estimate and can be adjusted to meet the needs of the residents of the Thornapple River. Any management tool listed is an option and is the suggestion of PLM to meet those expectations. You will only be charged for the actual amount of control required, at the unit per acre prices listed above. All treatments are pending the approval of the Department of Environment, Great Lakes & Energy (EGLE). Treatments must be timed accordingly and conducted during low flow conditions. If native plant control is requested or recommended through the use of herbicides or mechanical harvesting, the high-end budget may be needed.

Mechanical Harvesting Program:

Mechanical harvesting is best suited for nuisance native plant species. Mechanical harvesting can be used to provide relief from native plant species if they are causing a recreational nuisance. Harvesting does not kill the plants, but simply reduces it's stature, leaving lower growth for fish habitat and sediment stabilization. PLM will not harvest Eurasian watermilfoil, as this plant spreads by fragmentation.

PLM owns and operates 3 mechanical harvesting machines that operate throughout the state. We will cut down to a maximum depth of five (5) feet and require a minimum of 18 inches of water depth for harvester flotation. Harvested vegetation will be dumped at a predetermined location designated by the client within a ten (10) mile radius of the river. Any cost associated with the disposing of vegetation is the responsibility of the client, i.e., landfill disposing costs. There will be no set-up or breakdown fees of our equipment if a suitable access site is available. Expenses of an unsuitable launch site will be the responsibility of the river. A representative of the client will be required to periodically evaluate workmanship.

Cost of Harvesting: \$300.00/hour with a minimum per cutting of \$2,500.00

Description of Technical Management Services:

On-site Lake Evaluations: Each time a PLM representative is on Thornapple River, to perform a survey, WQ testing, treatment, etc, the following will typically occur: Pre-notice to Lake Representative of schedule (i.e email the week before of estimated date). Following the service, a follow up evaluation to Lake Representative of services provided, condition of lake, future recommendations are made. Arrangement can be made to send information via email or voicemail. This is standard as part of our program to keep Lake Board/Association aware and involved in all decision making and serves as a checks and balances of lake management.

Water Quality Program: The water quality program consists of sampling two sites on the river twice a season, spring and late summer. Parameter such as secchi disc, pH, D.O., conductivity, alkalinity and nutrient sampling of nitrates and total phosphorus give us the ability to monitor lake trends more efficiently. This information will enable us to include the trophic status of your lake. The program also tests your water for Fecal bacteria (E. Coli), in mid-summer at three separate locations, which can determine the condition of your river and if the water is safe for swimming. Reports will be issued annually in the fall.

Surveys: Performing surveys is a vital part of any lake management program. PLM surveys a lake in the spring and fall as well as surveying for pre/post treatments. Lake representatives are welcome to arrange joining PLM for a survey. Depending on the type of survey performed, a cost may apply. An AVAS survey is a more specific survey performed for specific reasons. Performing a fall AVAS survey of the lake will allow for all vegetation within the lake, native and exotic, to be recorded along with density. This data is important in determining management plans and treatment areas. A full understanding of the vegetation growing within the lake can indicate problems within an aquatic environment. Surveys will be supplied to the association upon completion with a breakdown of what the survey indicates.

Meeting Attendance/Presentation: A representative of PLM is available to attend association/board meetings upon request. This request has to be made prior to meeting to allow for conflict in representative's schedule. If conflict in meeting time does arise, alternative dates and times need to be determined between representative and board. Residential concerns can always be brought to the lake association/board and then to PLM or directly to PLM by calling our office.

Contract Period:

Multiple Year Treatment Program 2025-2027: As an incentive to establish a multiple year agreement, the unit cost per acre will increase by 5% or less per year. If total chemical cost increases 10% from the previous year, PLM will only pass on the percentage over 10%. If during the life of the contract, EGLE or other regulatory agencies significantly change the approved treatment procedures, either party may terminate this agreement upon giving ninety (90) days advance written notice thereof.

One Year Treatment Program: Pricing is based on the type and the amount of vegetation or algae present at the time of treatment, as well as, the products applied. Unlike the multiple year program, an agreeable price structure is not contracted into a one-year program. Therefore, an increase in the cost of products, labor, or changes made by EGLE or other regulatory agencies may have a drastic effect on the pricing for following years.

Permit Fee: PLM Lake & Land Management Corp. is responsible for completing and submitting aquatic nuisance permit applications. PLM Lake & Land Management Corp. will send an invoice for the yearly EGLE permit application fee. It is your responsibility to send a check made out to the "State of Michigan" to our office prior to the due date. We must include this check with the EGLE permit application. Waterbodies less than 10 acres, with no outlet and single ownership, may be subject to "permit by rule" conditions, therefore not incurring an actual permit fee.

Posting of Treatment Areas: Posting of shoreline treatment areas is the responsibility of PLM Lake & Land Management Corp. and will be conducted according to EGLE regulations. Due to EGLE guideline changes and specific residential concerns, posting fees may apply. Signs will be attached to thick barked trees, posts or other suitable fixtures already on site. If homeowners wish to have signs posted in designated areas or on specific fixtures they must notify PLM Lake & Land Management Corp., providing lake address, location of property, and where the signs are to be posted. Pictures are the most informative way to relay this information. Notification of alternate posting must be made at least 14 days prior to treatment and additional fees may apply. The removal of posting signs after the restrictions have expired is the responsibility of the homeowner.

Notification of Treatments: It is your responsibility to notify each resident within **100 feet** of the treatment area **at least seven days** in advance, **but no more than forty-five days** prior to the first treatment date, that products will be applied to the lake (with a provided list of addresses from the lake board). This notification requirement **must** be administered to each and every property owner within 100 feet of any treatment area. PLM Lake & Land Management Corp. will provide a tentative treatment schedule and the **Notice** of proposed products to be used during the spring of each year.

Non-Target Species: Please be aware that we only control specific weeds and algae **present** at time of treatment. Emergent vegetation (cattails, bulrush, purple loosestrife, lily pads) and beneficial native plants will not be addressed unless specifically mentioned in the management program. We have no control over future weed or algae growth based on the current chemicals registered for aquatic use in Michigan.

Electronic Treatment Notification: In addition to the above-required notification procedures, the Department of Agriculture allows for electronic notification i.e. email with the contracting entity. Therefore, if the contracting entity is a township, lake board, or municipality, you will also receive the same information that is being distributed to each resident (Posting Sign) prior to the treatment. By signing this agreement with PLM Lake & Land Management Corp and providing us the contracting entity email address, we can legally implement the electronic notification procedure.

Invoicing and Payments: PLM Lake & Land Management Corp. will submit an invoice following treatment that will include the following information; lake and/or pond(s) treated, date of treatment and type of treatment or acres treated. Monies will be due net thirty (30) days after each treatment. The invoice may be subject to a fuel surcharge of up to 3% of the total treatment cost. Interest of 1.25% may be added to your bill for each additional sixty (60) days that payment is not received.

Liability Issues: We are responsible for workman's compensation and liability insurance for the duration of the contracted period. PLM Lake & Land Management Corp. is not responsible for fish loss due to low oxygen levels caused by winter turnover or during warm water conditions.

Please sign, check multiple or one-year program and return one copy of this proposal as our contract by December 15, 2024.
For further clarification or modifications please contact.

Jaimee Desjardins

Jaimee Desjardins, Environmental Scientist
West MI Regional Manager
PLM Lake & Land Management Corp.
616-891-1294 ext 2005
jaimeed@plmcorp.net

For: Thornapple River, Cascade Township

Multiple Year Program, 2025-2027

One-Year Program

Tade Smith

Print Name

1/27/25

Date

[Signature]

Signature

Thornapple River Special Assessment District
Fund Balance Analysis

As of 12-31-23	181,477		
2024 operations	<u>68,155</u>		
As of 12-31-24	249,632		
Viking Marine Construction delayed 2024 work	(31,631)		
2025 budget	<u>-</u>	designed for revenues to equal expenditures	
Potential Fund Bal at the end of FY25	<u><u>218,001</u></u>	FY25 budget: 97,900.00	% fund bal 223%

analyzed 2-5-25



**THORNAPPLE RIVER
SPECIAL
ASSESSMENT
DISTRICT**

**ANNUAL
REPORT**

2024

MEMBERS

THORNAPPLE RIVER SAD COMMITTEE MEMBERS

John Shipley, Trustee
Jeff Carpenter, Cascade Thornapple River Assoc. Rep
Thomas Keith
Scott Rissi
Leann Rowland
Chuck Whitley
Michael Wiegand

TOWNSHIP STAFF ASSISTING THE COMMITTEE

Jade Smith, Township Manager
Dan Zwick, Parks & Facilities Director
Aric Thorne, Township Engineer
Jessica Stine, Executive Assistant

SAFETY & NAVIGATIONAL MARKING PROJECT

The Thornapple River SAD Committee continued 2023 work on the Safety & Navigational Marking Project by receiving approval to install the desired markers from EGLE; the permit will remain open for 5 years. Viking Marine Construction began planning the installation of the markers. The marking of objects/the channel will primarily be between the I-96/M-6 bridges and the CSX railroad bridge. More markers were requested than will be placed as it is easier to modify the placement of approved markers without applying for additional permits. The committee has limited the number of markers to be installed so that site lines to the water remain scenic.

This project was set for completion in late 2024 but came to an abrupt halt due to delays Viking Marine Construction experienced on one of their other projects. By the time they were able to begin work on the Thornapple River, portions of it were frozen, making it unnavigable. Conversations are ongoing, but the project will likely be completed in early to mid-2025, once the ice on the river has melted.

AQUATIC VEGETATION CONTROL & WATER TESTING

This year marked the third successful season of weed treatments and river water quality testing by PLM Lake & Land Management Corp (PLM). The appendix includes Water Quality results, including tests for E. coli, conductivity, total dissolved solids, pH, alkalinity, total phosphorus, nitrates, and chlorophyll. The 2024 cutting and removal of weeds went smoothly, and neither the committee nor the Township received negative feedback.

Jaimee Desjardins, the contact for PLM, attended the October 14, 2024, meeting and discussed the company's river observations for the year. Three treatments occurred due to the increased prevalence of weeds caused by the warmth of the previous two winters. Nutrients in the river increased in 2024 over 2023, but this was primarily attributed to clumps of algae dying in the river.

Ada Township experienced an extensive algae bloom again in 2024, but Cascade Township noted only one-to two-foot sections of algae growing in the river. PLM attributed this to the greater width and depth of the Cascade portion of the Thornapple River in comparison to Ada's portion.

PLM's suggestions for expansion of the program included weed treatment in major inlets and harvesting the large bayou at Thornapple River Dr.

PLANNING FOR THE FUTURE

The Thornapple River SAD committee discussed potential future projects to address portions of the river in the SAD that haven't received the benefits outlined in the original benefit's scope. Some of these ideas have included, but are not limited to, working with MI Natural Shorelines on bank stabilization, conducting a sediment management study, continued relocation of hazardous debris, dredging around the CSX train bridge bypass to improve navigability, and investigation on how to decrease nuisance weeds in bayous that are part of the SAD. In early 2025, the committee will begin work on a strategic plan to determine future projects and is committed to informing residents of the SAD about how their assessments are being spent, ensuring their involvement and understanding of the project's progress.

At the January 22, 2025 Township Board meeting, the Board of Trustees approved a three year contract with PLM (2025-2027) to continue river management services.



APPENDIX

Pages 7-8 2024 Water Quality Report: Test Site #1

Pages 9- 10 2024 Water Quality Report: Test Site #2

Page 11 2024 Bacteria Sampling Report

Pages 12-13 2024 Overall Water Quality Measurements

2024 WATER QUALITY REPORT: TEST SITE #1

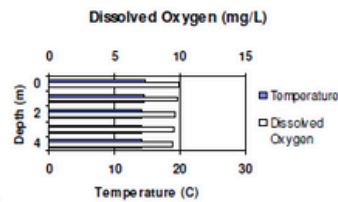


2024003

Customer	Waterbody	Sample Information
Thornapple River Cascade	Thornapple River Cascade	Date: 4/16/2024 Site: #1

On-Site Results

Depth (m)	Temperature (degrees C)	Dissolved Oxygen	
		mg/L	%
0	14.7	9.9	98
1	14.5	9.8	96
2	14.3	9.6	94
3	14.3	9.5	93
4	14.3	9.5	93



Secchi Disk Depth	1.5 meters
Thermocline Depth	meters

Analytical Results

Paramotor	Result	Units	Interpretation
Fecal Bacteria (E. coli)		CFU/100 mL	II/A
Conductivity	456	uS/cm	
Total Dissolved Solids	371	mg/L	Moderate concentration of dissolved salts
pH	8.4	S.U.	Water is slightly alkaline
Alkalinity	237	mg CaCO3/L	Water is very hard
Total Phosphorus	26	ug/L	Moderately phosphorus enriched
Nitrates	1820	ug/L	Nitrogen enriched
Chlorophyll		II/A	

Trophic State Evaluation

	TSI	Trophic Status
Based on Secchi Disk Depth	54	moderately eutrophic
Based on Total Phosphorus	47	mesotrophic
Based on Chlorophyll	II/A	

Conclusions

- Conditions are good for fish growth.
- Minimum dissolved oxygen is adequate for good fish production.
- pH is within acceptable limits.
- Sample is somewhat phosphorus enriched. Create natural buffer between lawn & lakeshore.
- Sample is nitrogen enriched. Consider nutrient abatement measures.
- Repeat LakeCheck in Fall.

- WARNING, condition requires immediate attention.
- CAUTION, condition requires further evaluation.
- OK, condition within acceptable limits.
- NEUTRAL, condition neither good nor bad.

2024 WATER QUALITY REPORT: TEST SITE #1

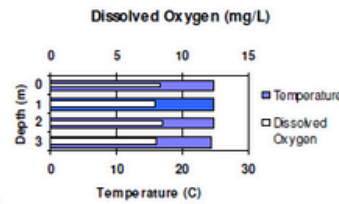


2024016

Customer	Waterbody	Sample Information
Thornapple River Cascade	Thornapple River Cascade	Date: 8/29/2024
		Site: #1

On-Site Results

Depth (m)	Temperature (degrees C)	Dissolved Oxygen	
		mg/L	%
0	24.8	8.3	77
1	24.8	7.9	73
2	24.8	8.5	78
3	24.5	8.1	76



Secchi Disk Depth	1.5 meters
Thermocline Depth	meters

Analytical Results

Parameter	Result	Units	Interpretation
Fecal Bacteria (E. coli)		CFU/100 mL	I/A
Conductivity	526	uS/cm	
Total Dissolved Solids	406	mg/L	Moderate concentration of dissolved salts
pH	8.4	S.U.	Water is slightly alkaline
Alkalinity	245	mg CaCO3/L	Water is very hard
Total Phosphorus	17	ug/L	Moderately phosphorus enriched
Nitrates	1190	ug/L	Moderately nitrogen enriched
Chlorophyll		I/A	

Trophic State Evaluation

	TSI	Trophic Status
Based on Secchi Disk Depth	54	moderately eutrophic
Based on Total Phosphorus	41	mesotrophic
Based on Chlorophyll	I/A	

Conclusions

- Conditions are good for fish growth.
- Minimum dissolved oxygen is adequate for good fish production.
- pH is within acceptable limits.
- Sample is somewhat nutrient (N and P) enriched. Adopt appropriate lakeshore landscaping and lawn care practices.
- REPEAT LakeCheck NEXT YEAR!

- WARNING, condition requires immediate attention.
- CAUTION, condition requires further evaluation.
- OK, condition within acceptable limits.
- NEUTRAL, condition neither good nor bad.

2024 WATER QUALITY REPORT: TEST SITE #2

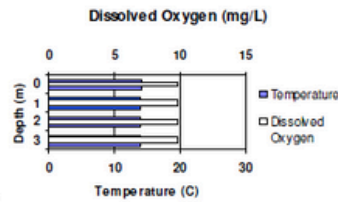


2024004

Customer	Waterbody	Sample Information
Thornapple River Cascade	Thornapple River Cascade	Date: 4/16/2024 Site: #2

On-Site Results

Depth (m)	Temperature (degrees C)	Dissolved Oxygen	
		mg/L	%
0	14.2	9.8	96
1	14.0	9.8	96
2	14.0	9.8	96
3	14.0	9.8	95



Secchi Disk Depth	1.8 meters
Thermocline Depth	meters

Analytical Results

Parameter	Result	Units	Interpretation
Fecal Bacteria (E. coli)		CFU/100 mL	II/A
Conductivity	536	uS/cm	
Total Dissolved Solids	374	mg/L	Moderate concentration of dissolved salts
pH	8.4	S.U.	Water is slightly alkaline
Alkalinity	242	mg CaCO ₃ /L	Water is very hard
Total Phosphorus	20	ug/L	Moderately phosphorus enriched
Nitrates	1870	ug/L	Nitrogen enriched
Chlorophyll	II/A		

Trophic State Evaluation

	TSI	Trophic Status
Based on Secchi Disk Depth	52	moderately eutrophic
Based on Total Phosphorus	43	mesotrophic
Based on Chlorophyll	II/A	

Conclusions

- Conditions are good for fish growth.
- Minimum dissolved oxygen is adequate for good fish production.
- pH is within acceptable limits.
- Sample is somewhat phosphorus enriched. Create natural buffer between lawn & lakeshore.
- Sample is nitrogen enriched. Consider nutrient abatement measures.
- Repeat LakeCheck in Fall.

- WARNING, condition requires immediate attention.
- CAUTION, condition requires further evaluation.
- OK, condition within acceptable limits.
- NEUTRAL, condition neither good nor bad.

2024 WATER QUALITY REPORT: TEST SITE #2

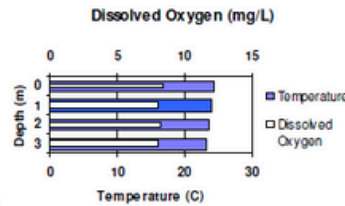


2024017

Customer	Waterbody	Sample Information
Thornapple River Cascade	Thornapple River Cascade	Date: 8/29/2024 Site: #2

On-Site Results

Depth (m)	Temperature (degrees C)	Dissolved Oxygen mg/L	%
0	24.5	8.4	77
1	24.0	8.1	71
2	23.6	8.2	73
3	23.2	8.1	72



Secchi Disk Depth	1.5 meters
Thermocline Depth	meters

Analytical Results

Parameter	Result	Units	Interpretation
Fecal Bacteria (E. coli)		CFU/100 mL	II/A
Conductivity	523	uS/cm	
Total Dissolved Solids	404	mg/L	Moderate concentration of dissolved salts
pH	8.4	S.U.	Water is slightly alkaline
Alkalinity	252	mg CaCO3/L	Water is extremely hard
Total Phosphorus	21	ug/L	Moderately phosphorus enriched
Nitrates	1240	ug/L	Nitrogen enriched
Chlorophyll	II/A		

Trophic State Evaluation

	TSI	Trophic Status
Based on Secchi Disk Depth	54	moderately eutrophic
Based on Total Phosphorus	44	mesotrophic
Based on Chlorophyll	II/A	

Conclusions

- Conditions are good for fish growth.
 - Minimum dissolved oxygen is adequate for good fish production.
 - pH is within acceptable limits.
 - Sample is somewhat nutrient (N and P) enriched. Adopt appropriate lakeshore landscaping and lawn care practices.
 - REPEAT LakeCheck NEXT YEAR!
-
- WARNING, condition requires immediate attention.
 - CAUTION, condition requires further evaluation.
 - OK, condition within acceptable limits.
 - NEUTRAL, condition neither good nor bad.

2024 BACTERIA SAMPLING REPORT



Bacteria Sampling Report

Waterbody:
Thornapple River

Thornapple River Cascade

Date Sampled:
7/23/2024

Location	<i>E. coli</i>	Total Coliforms	Interpretation
1	12		● Water meets bacteriological standards for safe swimming.
2	32		● Water meets bacteriological standards for safe swimming.
3	52		● Water meets bacteriological standards for safe swimming.

Bacterial counts are expressed as the number of Colony Forming Units per 100 milliliters (CFU/100mL).

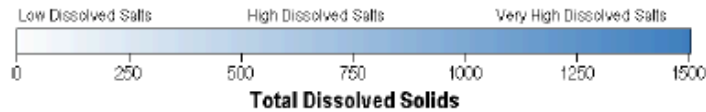
For full body contact recreation (including swimming) counts of *E. coli* should not exceed 130 (CFU/100mL) as a monthly geometric mean of at least five samples per the State of Michigan standard, or single samples should not exceed 298 (CFU/100mL) [235 CFU/100mL in a designated bathing beach area] per Federal (EPA) guidelines.

Current recreational water quality standards do not rely on Total Coliform counts.

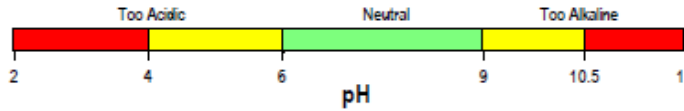
2024 OVERALL WATER QUALITY MEASUREMENTS



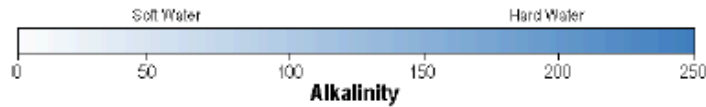
Conductivity and Total Dissolved Solids (TDS) measure the total amount of material dissolved in the water. Higher values indicate potentially richer, more productive water, whereas lower values indicate potentially cleaner, less productive water. Localized increases in conductivity and TDS may indicate inputs of groundwater or other nutrient-enriched water. [Note: Human activities that result in nutrient pollution (e.g., fertilizer runoff) can increase the productivity of algae and other organisms without raising conductivity/total dissolved solids very much. If nutrient pollution is occurring, the total phosphorus concentration is a much better indicator of potential productivity.]



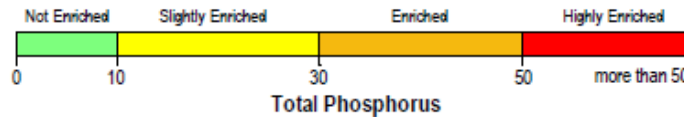
pH describes the balance between acids and bases in the water. Neutral values of pH (between 6 and 9) are desirable. Low pH values typically result either from the growth of bog vegetation (such as peat moss), acid precipitation ("acid rain"), or acid runoff (as in acid mine drainage). Excessive growth of certain plants and algae can raise pH values above 9.0 or 10.0.



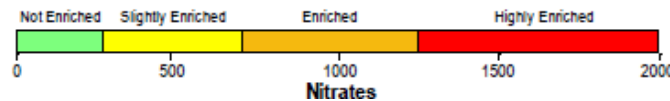
Alkalinity measures the concentration of carbonates and bicarbonates in the water. These compounds and other ions associated with them make water "hard". High alkalinity lakes are hardwater lakes, while low alkalinity lakes are softwater lakes. Different kinds of plants, algae, and other aquatic organisms live in hardwater than in softwater. Alkalinity also influences the effectiveness of some herbicides and algicides. Alkalinity is a basic characteristic of water, but is neither inherently good nor bad.



Total Phosphorus measures the total (organic and inorganic, dissolved and particulate) amount of phosphorus in the water. Phosphorus is usually the plant nutrient (i.e., fertilizer) that controls the amount of algal growth in lakes and ponds. Most Midwestern lakes have more phosphorus and more algae than is desirable, so lower values are generally better, though very unproductive water bodies typically support little fish production.

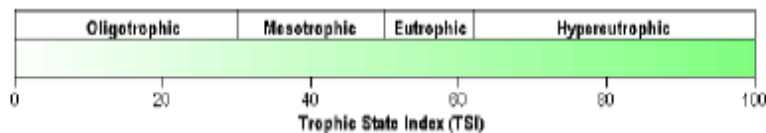


Nitrate measures the total inorganic amount of nitrogen in the water. Nitrogen is the plant nutrient (i.e., fertilizer) most likely to control the amount of rooted plant growth in lakes and ponds. Most Midwestern lakes have more nitrogen and more rooted plant growth than is desirable, so lower values are generally considered better.

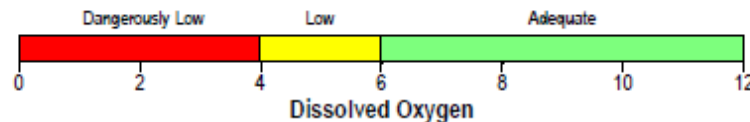


2024 OVERALL WATER QUALITY MEASUREMENTS

Trophic State Indices calculate the trophic status of the waterbody. Waterbodies are classified as oligotrophic, mesotrophic, eutrophic or hypereutrophic depending on the overall amount of plants, algae and other organisms the waterbody supports. Lakes of different trophic states vary in a number of chemical characteristics and support different types of organisms (see the enclosure “Lake Trophic States and Eutrophication”). Thus the trophic state of a waterbody provides a wealth of information concerning the types of organisms living in the waterbody, the processes likely to occur there and the kinds of problems to be expected. Trophic State Index values can be calculated from a number of variables. LakeScan calculates Carlson’s Trophic State Index (TSI) from total phosphorus, Secchi disk depth and chlorophyll (separate TSI values are calculated for each of the variables that was measured as part of your LakeCheck package).

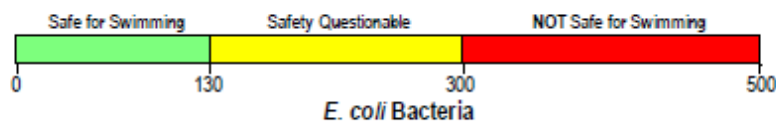


Dissolved Oxygen is a measure of the amount of oxygen dissolved in the water. Oxygen is needed by fish and other aquatic organisms to allow them to “breathe” underwater. Plants and algae produce oxygen by photosynthesizing during the day and use oxygen for respiration at night.



Temperature provides information about the kinds of fish that can grow in a lake, information necessary for interpretation of other parameters, and information about the extent to which a lake is stratified into layers having water of different temperatures. If the lake is stratified, the thermocline depth tells how deep the surface layer of warm water is.

Fecal Indicator Bacteria (*E. coli*) measurements count the number of live fecal indicator bacteria in the sample. These bacteria are considered reliable indicators of fecal contamination—when they are found in a pond or lake, it is very likely that the water is being contaminated by animal feces. Contamination can potentially be derived from a number of sources, including failed septic systems, agricultural runoff, or waterfowl or wildlife droppings.



- *E. coli* counts of 300 (CFU/100 mL) and above in a single sample are considered to represent conditions that are **UNSAFE** for swimming and other body contact recreation.
- *E. coli* counts of 130 (CFU/100 mL) and above averaged (using a geometric mean) over measurements made during a 30-day period are considered to represent conditions that are **UNSAFE** for swimming and other body contact recreation. When values of 130 (CFU/100 mL) or higher but less than 300 are encountered, LakeCheck rates the safety of the water for swimming as questionable.
- *E. coli* counts below 130 are considered safe for swimming and other body-contact recreation

We recommend prompt retesting whenever Fecal Indicator Bacteria counts exceed 100 (CFU/100 mL) to determine whether contamination is an ongoing problem. If frequent contamination is detected, steps to identify and eliminate the source of contamination are highly recommended.