TLA QUARTERLY
December 2005

President's Letter:

Winter has arrived well ahead of the official solstice. With the early cold weather our bay at the south end of Lake Bellaire has already iced over. The total snowfall has reached 60 + inches, far ahead of last year. Despite winter's early arrival Three Lakes Association continues to work on a variety of projects.

Water quality readings for the Clam Lake and Lake Bellaire Predictive Model are being taken monthly. Plans are underway for our 2006 Summer Education programs. We will celebrate our 40th anniversary at our annual meeting next summer. New grant applications are being written to help underwrite our projects. We are collaborating with Intermediate Lake Association and Elk- Skegmog Lake Association for the expansion, up and downstream, of the modeling project.

The workshop TLA sponsored in November to report on the Torch Lake Water Quality model was a big success. Read all about it in this issue.

Please remember to renew your membership and encourage your friends to join or return to TLA. We need your dollars to continue protecting your watershed. Thanks for your support in 2005.

Merry Christmas and Happy New Year!

Bob Bagley

Summer Interns Receive Scholarships

The Three Lake Association Water Quality Research Team presented Samantha Fox, Lauren Elbert, and Derek Walton with $200 Scholarships at the December 12th meeting of the Elk Rapids School Board. The Scholarships were part of a celebration of achievement for the successful completion of the Internship program. The requirements of the program include more than 60 hours of hands-on water quality research and the preparation of comprehensive research reports. Each Elk Rapids Intern presented a brief synopsis of their research project that involved measuring oxygen and phosphorus in Torch Lake. The students also received .5 of a credit for Independent Studies on their transcripts.

Torch Lake Water Quality Model Report:

On June 1, 2004, Three Lakes Association (TLA) was awarded a $62,000 grant from the Michigan Department of Environmental Quality (MDEQ) to build a predictive water quality model for Torch Lake. This enabling grant plus the following required matching funds for this project represent a $150,000 project:

- $8,000 from seven townships that surround Torch Lake, Lake Bellaire, and Clam Lake.
- $7,000 in donations from a special Dole Family Foundation challenge grant.
- $73,000 in-kind "funds" representing more than 40 volunteers who donated their time.

Great Lakes Environmental Center (GLEC) Lab in Traverse City analyzed hundreds of samples collected by these trained volunteers. The samples, including lake water, groundwater, tributary water, and rainwater water samples were analyzed for total phosphorus content. This information, along with dozens of water quality profile measurements, river and stream flow rate measurements, and historical water quality data were incorporated into a basic water quality modeling framework (Lake2K). This model can forecast changes in the lake's phosphorus concentrations in lake water and water clarity (Secchi disk depths) in response to possible changes in phosphorus loading rates from groundwater, tributaries, and rainwater.

On November 11, 2005, TLA hosted a Workshop at Camp Hayo-Went-Ha to showcase this new model for township officials, watershed management councils, and conservation groups. The following is a summary of Torch Lake findings presented during this Workshop.

- The water clarity and quality of Torch Lake has not changed significantly in the last 30 years.
- The single most important nutrient to Torch Lake is phosphorus and its level, 2.6 ppb (parts per billion), has not changed significantly in the last 30 years. The phosphorus concentrations in Torch Lake are the same near the shore, north and south, and shallow and deep with no measurable differences anywhere in the lake.

- The concentration of phosphorus is similar to that found in other pristine lake systems including the north central part of Lake Michigan. Other naturally occurring components in Torch Lake water, such as calcium, are similar to those found in Grant Traverse Bay, which is also saturated with calcium and slightly alkaline (pH 8.0 to 8.5).

- The water clarity in Torch Lake is determined by a combination of two naturally occurring processes: phytoplankton growth and calcium carbonate precipitation. Seasonal variations in the water clarity can be explained by these two factors. Phytoplankton respond to sunlight, temperature, and phosphorus and calcium carbonate precipitation is regulated by pH (through phytoplankton growth) and temperature.

- Phosphorus comes into Torch in approximately equal amounts from rainwater, shallow ground water, and Clam River, the main tributary entering Torch Lake.
- Phosphorus leaves Torch Lake by two routes: primarily (90%) by settling to the bottom where it becomes entrapped in sediment and, secondarily (10%) by flowing out Torch River.
- There are no seasonal changes in the bottom layers of water in Torch where the oxygen levels remain high (>10 mg/l, milligrams per liter) and the temperatures remain low (<40 deg. F) all year.
- Tests show that the phosphorus in the sediment at the bottom of Torch Lake will remain entrapped and not re-enter the lake water as long as the bottom waters stay well oxygenated (greater than 2 ppm) and cold. These same tests also show that even if the bottom water became anoxic, the rate of phosphorus release from the sediment in Torch Lake would be very slow compared to other lakes.
- Phosphorus concentrations in Torch Lake have a calculated half-life for settling to sediment of about two years whereas the flushing time for the lake through Torch River is about 15 to 20 years. Therefore consequences of decisions about land use that could increase the phosphorus loading into Torch Lake may not be detectable for many years.
- The sources of phosphorus entering Torch Lake are both diffuse (rainwater taking phosphorus from the atmosphere), nearby (tributaries from the Chain-of-Lakes watershed), and local (shallow groundwater from fertilizers and septic systems).
- Very local sources of phosphorus from failing septic systems create onshore algae blooms of Cladophora and related algal families, but within a few feet of shore these sources are undetectable.
- It is not known how much of the phosphorus that comes from ground water is caused by septic systems and fertilizer use, but deep ground water (drinking water wells) near the lake shoreline have phosphorous levels about 5 times lower than shallow groundwater (22 ppb versus 4 ppb).
- Possible sources of airborne phosphorus in rainwater include distant contributors such as power plants, widespread sources such as dust from roads and farming, agricultural fertilizer, and local miscellaneous burning including residential heating and forest fires.
- The fraction of direct human-related phosphorus in Torch Lake tributaries is unknown. Possible sources include residential septic systems, agricultural and residential fertilizer use, storm water runoff, commercial land use (golf courses, light industry). Wetlands and greenbelts reduce the impact of the above but their total effect has not been quantified.
- According to tests by others, phosphorus in human waste is not well captured in septic systems, especially in the soil types typical of our area. This phosphorus is

expected to be easily transported through the same sand and gravel that transports shallow ground water. However, up to 85% of the phosphorus in sewage can be captured by advanced sewage treatment systems with tertiary treatment such as the one in Bellaire. Phosphorus retention by advanced types of residential septic systems can be significant.

- Modeling of phosphorus levels in Torch Lake based on current conditions shows that a municipal sewage system in Alden with tertiary treatment would decrease the phosphorus level in Torch Lake by approximately 0.1 ppb (compared to its current level of 2.6 ppb) in a few years. Similarly, if the input phosphorus level increased by 10% each year (an aggressive assumption about population growth), the phosphorus level in Torch could double in about 10 years to about 5 ppb.

- The phosphorus level in Torch Lake is linked to the phosphorus levels in the upper Chain-of-Lakes watershed though Clam River and this part of the system, including the land use within the full watershed must be incorporated into the model for a full understanding of the system and to pinpoint phosphorus control measures.

Future Modeling Activities:

- TLA has already received a second grant from the MDEQ for a follow-on phase of this water quality study to include Lake Bellaire and Clam Lake. Work on this project began in the summer of 2005 and will be completed by March 2007.
- Several workshop participants suggested that this project evolve to include the entire Elk River Chain of Lakes and its watershed. Besides the addition of Lake Bellaire and Clam mentioned above, discussions have begun between TLA and lake organizations representing the rest of the Chain to work on grant or grants for the final phase of this study.
- TLA will continue working with township trustees and planners to manage growth, protect water quality, and find the proper role of our water quality model in planning for the future.
- TLA will hold a scientific peer review of this work, post workshop materials on our website (www.3lakes.com), write a final report for the MDEQ, present these findings in conferences, and publish a research report describing the predictive model for Torch Lake.
- TLA will develop a portable version of the computer model shown in the workshop and a step-by-step procedure for using it that can be incorporated into planning by local governments and by anyone else who has an interest in the future of water quality in our area.

Board of Directors Approved Goals for 2006:

At the December Board of Directors meeting the following Goals for 2006 were approved,

- **Complete the water quality modeling projects for Torch, Clam, and Bellaire**
- **Continue working with townships to develop water quality standards and encourage use of the predictive water quality model.**
- **Expand our leadership role in the water quality modeling of our watershed.**
- **Continue to improve our public outreach efforts for all our existing programs.**
- **Expand member and volunteer participation in our projects.**
- **Increase our membership to 30% of Torch, Clam, and Bellaire riparians.** (This means doubling our present membership to 800)

We will continue all of our traditional projects, including lake monitoring, summer internships, joint education events with Grass River Natural Area and Torch Lake Protection Alliance, and the famous golf outing at Hawks Eye Golf Course, a joint event with GRNA. We invite you to volunteer some of your valuable time to help with any of these programs. Give us a call at the office, 231.533.4852 or let us know by email at info@3lakes.com and we will find the right task for you.

Membership Report:

Our goal for 2005 was to reach the level of 450 members. The final number for the year was 425 up 100 from the previous year. Although Three Lakes is thrilled to have made these gains, it is imperative that our membership increases in 2006 so that we can continue to fund the water quality projects that are so important to our watershed. Our new goal for the up coming year is 500 members. You could help us reach this goal in three ways. First, make sure to renew your dues for 2006**. If the newsletter address label has been highlighted your dues are not current**. Secondly, please consider going beyond the basic membership. Three Lakes needs your increased support to continue to be the voice for water quality issues. Lastly, bring a friend. We all know friends or neighbors who are not members. Talk to them and let them know the wonderful things we are doing. Encourage them to join. It's in everyone's best interest to be a part of the Three Lakes Association.

Alan Hickman, Membership Committee Chair

What is a Watershed?

A Watershed is something talked about and referred to in many publications. A watershed is a region, or area, drained by a river. Typically ridgelines separate one watershed from another.

Lake Bellaire, Clam Lake, and Torch Lake are within the Elk River Chain of Lakes Watershed, and that 500 square mile area is within the larger Grand Traverse Bay Watershed. The map illustrates the boundaries of these vital areas. Water from many

sources such as, surface runoff from hills or impervious surfaces like parking lots and roads, groundwater seeping through the soil from natural sources or drain fields, or flowing in springs and streams, ultimately ends up in Grand Traverse Bay. Our own watershed, the ERCOL, collects all these sources of water and eventually drains into the Bay at Elk Rapids. This supplies 60% of the water to the Bay.

Whatever we do to affect any of these individual sources of water has an eventual impact on the whole watershed. This is why the Three Lakes Association puts such a high priority on evaluating the water quality of our lakes. The predictive modeling project being funded from our budget and by a State grant, has given us a much better understanding of how various factors affect the water, now and in the future.

When we make a choice about our personal habits that could affect water, we are potentially impacting a huge area and resource. While no single action by any of us is likely to amount to much of an impact, the cumulative effect of the over 100,000 people living within the Grand Traverse Bay Watershed, will make a difference. This is why individual stewardship and wise decision making concerning water is so important.

Ray Ludwa

New Membership Categories for 2006:

- **Basic ($50)** supports newsletters and administrative costs.
- **Donor ($100)** supports the above and ensures the continuation of basic water quality monitoring.
- **Steward ($500)** supports the above plus the high school summer intern program.
- **Benefactor ($1,000)** supports the above and predictive water quality modeling efforts.
- **Life ($2,000)** accomplishes all of the above while assuring future financial stability by growing our endowment, the Three Lakes Watershed Conservation Fund, administered by the Grand Traverse Regional Community Foundation.

Please use the form below to renew your Three Lakes Membership:

Basic_____ Donor_____ Steward_____ Benefactor_____ Life_____

Michigan Riparian Magazine Subscription ___ (Please include an additional $10)

Total Amount Enclosed: $_____

Name: _____

Summer Postal Address: (Street, P.O. Box)_____

Township: _____ Town: _____Zip:_____

Summer Phone: _____

Winter Postal Address: (Street, P.O. Box)_____

City: _____ State: _____ Zip:_____

Winter Phone: _____

Email: _____

May we include your name in our newsletter donor list? Yes ____ No ____

Three Lakes Association is a 501(c)(3) corporation. Your dues and other contributions are tax deductible. Gifts, memorials, and bequests can also be made to the Three Lakes watershed Conservation Foundation administered by the Grand Traverse Regional Community Foundation. Michigan residents receive a 50% state tax credit for contributions to this fund. Call for further information.

To join Three Lakes Association please return this form with your check to:

THREE LAKES ASSOCIATION
P.O. Box 689
Bellaire, MI 49615

Executive Director's Corner:

After allowing the adrenalin levels to return to normal and mulling over what I think we accomplished with the November 11 Workshop, it's time to summarize my thoughts and share them with you. "If you build it, they will come" certainly applies to our water quality modeling workshop. There were 72 reservations made with an additional 11 people appearing at the door, some of whom were accidentally omitted from the reservation list (mea culpa). In attendance were 13 representatives from all eight townships surrounding our three lakes, one Antrim County Commissioner, three Antrim Conservation District reps., three members of the MDEQ, eight members of three major watershed partners, one US Geological Survey representative, five businesses (three of which are land-use engineering firms), 21 lake association members from five different lake associations, two teachers, one summer intern, two news reporters, and a North Michigan Environmental Action Council board member. What a diverse audience!

Milestone 1: TLA has successfully delivered 95% of our contractual obligation to the DEQ for the Phase 1 modeling of Torch Lake. The final 5% will be wrapped up by December 31, 2005. Two years of very hard work and thousands of volunteer hours has come to fruition. Congratulations to all who had a part in this magnificent project. This is a job very well done.

The following are some of the signals sent by the Torch Lake modeling project and the workshop:

Signal 1: The Michigan Department of Environmental Quality knows that TLA is a credible, science-based advocacy organization able to deliver the finest modeling product within our budget limitations.

Signal 2: Our partner townships and the County know that TLA is a credible, science-based advocacy organization that has wisely invested the tax payers money and that we will continue to work with local officials on ways to incorporate the model into the decision-making process.

Signal 3: Early returns coming in from representative participant Evaluation Forms indicate a high level of satisfaction in our ability to present a professional workshop.

Signal 4: Elk-Skegmog and Intermediate Lake Associations both know that TLA will assist them in preparing grant applications and provide technical support as they go forward to model their portion of the Chain of Lakes Watershed. TLA representatives will be meeting with ILA reps Nov 28th to begin this process.

Signal 5: Great Lakes Environmental Center, our modeling subcontractor, understands the significance of this project to all of our partners.

Signal 6: TLA has a huge momentum as we continue to fulfill our mission. Tell your friends and neighbors what we have done and what we will be doing. Encourage them

to join TLA.

Again, my sincere thanks to all who have made this project a great success.

Best wishes to all for the New Year,

Tim Hannert

Do You Have Magnetic Rocks?

It all started when we were drilling a groundwater well for our Nutrient-Based Water Quality Model project on Paul Patchen's property on the west side of Torch Lake. As we were finishing up, Paul asked me if I knew a lot about Torch Lake. I know when I'm being set up for a question I can't answer, but didn't flinch. "Sure I know a lot of stuff about Torch." I answered confidently. Then Paul asked, "What do you know about this magnetic sand I have on my beach?" And after thinking for a few minutes I said, "What's magnetic sand?" I knew I was on shaky ground from the start, my air of assurance eroding quickly. So Paul showed me a dark streak in the sand on his beach, told me it was magnetic, and thought that, perhaps, it had been left from an old construction project. I put a small sample in a plastic bag, went home, stuck it on my desk, and forgot about it for a month or so. However, after having it clutter up my workplace for enough time, I took it out and examined it with my refrigerator magnet (Sonny's Market). Sure enough it was magnetic, but only the really dark grains, not the "normal" light-colored quartz ones. Then, being a good scientist, I looked at it under a microscope and, low and behold, the dark and light grains were identical in shape – oval and smooth. So, they were really parts of the beach sand, not construction debris – probably. This is what I told Paul. Then I went on-line to discover that magnetic sand is relatively common in the great lakes area, mostly in the UP and is usually magnetite, an iron-bearing mineral. I told Paul he must be living on an iron mine dropped by the glaciers.

As the summer wore on, on we drilled more wells, and I found more dark streaks on other beaches on Torch. In fact several friends reported that they had magnetic sand on their beaches too. A bell should have gone off in my tiny brain at that point, but I was busy didn't think more about it for another few months. Then while pondering the future of Torch Lake one evening, I typed "strong magnet" into the eBay search engine. For $20 a magnet was offered that was 2" in diameter and would lift a large dog (if it were magnetic). A week later a box arrived by Fed Ex to reveal a small Neodymium Iron Boron magnet with a warning tag. "Finger Hazard – Do Not Let Children Use This Magnet." It lifted all the iron frying pans in my kitchen at once.

This would be a real tool for research. I tied it to a piece of rope, went out on my own beach, and trolled through the sand. After removing all the nails and staples left over from my own house construction, I was left with a cup full of fine black sand grains, all magnetic, and similar to the one's at Paul's house. However, mine had not been sifted by the waves and were randomly mixed in with the dry sand on my beach.

Now for the neat part… Why stop at sand? What about those pebbles that make up a lot of the beach? It took another half hour to fill another cup with black pebbles up to about 2" in diameter from the edge of the water. Okay, what about bigger rocks? I knew just the spot – the Torch Bay Nature Preserve on the Bay has a lot of rocks about 1" in diameter. So I trolled the Preserve Beach with my new magnet. About 20% of the black rocks were magnetic, some stronger than others, but the largest that the magnet would pick up on its own was about 3" in diameter. And furthermore, on my way off the beach I noticed that one of the boulders keeping vehicles off the beach was also black. It was magnetic too! My sister has a black rock in her fireplace – also magnetic.

Magnetic sand and rocks appear to be relatively common in our area, but probably not enough for a mine. A flexible refrigerator magnet can pick up beach sand but isn't strong enough for larger pieces. For that you need a real magnet like mine. Try out eBay.

If anyone else has a question about Torch, call me any time. But remember Paul waited six months for his answer.

Norton Bretz

40th Anniversary

2006 marks the forty-year anniversary for our organization. Plans are underway for a special celebration at our annual meeting this next summer. We will have an up-to-date TLA history compiled by the Bushnells available for all current 2006 members. Look for the annual meeting details in the next edition of the Quarterly.

The Ghost of Snowflake Bentley is Alive and Well and Living On Stover Road

Wilson Bentley lived in Jericho, Vermont in the early part of the twentieth century. He was a mild-mannered bachelor farmer with a passionate avocation of photographing snowflakes. Everyone thought he was crazy until universities began buying copies of his photographs. His book, "Snow Crystals" remains as a monument to his persistence and creativity. My 5-year-old granddaughter, who has listened to the Snowflake Bentley story many times, and I, both consider Mr. Bentley to be one of our heroes. So it came to pass, out yonder in the Cedar River Valley just east of Bellaire, neighbors sighted an old bearded man trying to capture snowflakes on a piece of black velvet. If the right one landed on the cloth, the temperature was cold enough, the humidity high enough, and his cold, stiff hands steady enough, he would transfer the fragile crystal to the special microscope equipped with one of those whiz-bang digital cameras. The thoroughly chilled camera, while chronically complaining of low batteries, would occasionally produce a most amazing picture of one of Mr. Bentley's wondrous snow crystals. Crazy? Probably. Having fun? Definitely! Thank you Mr. Bentley.

Tim Hannert