



Crystal Shorelines

The newsletter of the Crystal Lake Watershed Fund

UPDATE #15

WINTER 2002

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CLWF & CLA Have Agreed to Join Hands for Cause

This year marks one of the most emotional topics relative to the preservation of the lake and its character for future generations. The issue of a State sponsored and constructed public boat launch ramp has evoked strong reactions. Will the number of new boat parking spaces be ruinous for the present water quality and the extant serenity of the lake?

The CLWF and the CLA have agreed to join hands in reminding the State Government that our two organizations represent upwards of 2500 residents who care deeply about the lake. A decision was made to tabulate a representative cross section of questions and concerns which could be sent to the DNR for their consideration

*Zebra Mussels being examined by
Morgan Hospenthal*

and response. This list was mailed in a letter to the DNR, Parks and Recreation Bureau; the board of directors of CLWF and CLA; and the Benzie Public Record before the October 22, evening public meeting held at the Benzie Central High School. **The following is a copy of the letter; a resolution agreement of the two groups; and the introductory note to Mr. William Boik of the parks department.**

To: Mr. William Boik
State of Michigan Parks Department

Dear Bill:

Here is our short list of suggestions and ideas. Thank you for your time and interest.

Sincerely,
Crystal Lake Watershed Fund Crystal Lake Association
R. William Decker Ron Renner
President President

BE IT RESOLVED THAT:

“The Crystal Lake Association and the Crystal Lake Watershed Fund support open access to Crystal Lake for fishing and recreational activities consistent with retaining the ongoing natural resource of this world class lake. The organizations support the view that the lake should be protected for the benefit of future generations of Benzie County residents and others seeking the beauty of this unspoiled environment.”

Ron Renner: Pres. CLA Bill Decker, Pres. CLWF

“The Michigan DNR has been planning a new boat launch complex on Crystal Lake for several years and have considered several different sites. This year they have chosen a parcel of approximately 30 acres east of Railroad Point, and have completed preliminary drawings.

Many watershed area residents have voiced concerns over the effects resulting from such an installation. The DNR has held one public meeting and plan another, on October 22, 2002 and have invited public input as usual.

The CLWF and CLA seek assurance that the DNR/DEQ will abide by the same rules and regulations as govern public citizen’s endeavors.

With a combined membership of over 2000 residents, the CLWF and CLA have joined together to help provide a response to the many questions and concerns voiced by their members and others. We feel

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CLWF & CLA Have Agreed to Join Hands for Cause

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These concerns warrant more than a brief exposure at a “town meeting”, and therefore we have provided a brief outline of some of the most frequently raised issues for your consideration and response. The items listed are in no particular order and may not cover all the possible subjects.

1. Boat size:
 - Provide a length limitation of 23-24 feet to reduce the danger of large heavy wakes, which may swamp canoes, kayaks and smaller craft, as well as moorings, docks and piers.
 - Heavy wakes near shore can accelerate shoreline erosion. Signage and enforcement of “no wake speed” might help this.
 - Provide rigorous enforcement of no toilet discharges into the lake, and possibly provide a “pump-out” station at the launch site.
 - Prohibit it “camping” i.e., anchoring for the weekend, as many boats may divert to Crystal Lake on stormy days when Lake Michigan is too rough.
2. Hours of operation:
 - Will there be residential compatibility? (Noise and lighting from both parking lot and boat launch ramp; early AM/late PM operations?)
3. An Environmental Impact Statement is mandatory:
 - Many areas will be highlighted requiring changes, and an EIS will overlap many items already on this list. However, this list is written in nontechnical terms to aid understanding.
4. Can you resolve the dispute about the Betsie Trail rights?
5. Observe adequate storm water control to prevent excessive erosion, including retention areas as required.
6. Reconsider the size of the facility:
 - Subjective reasoning is involved here. Local experience suggests that 70-80 spaces would be adequate. Later expansion might be considered, if necessary. For comparison, the Frankfort launch site is about 80 spaces.
 - The implied threat of dredging concerns many. Why not take a few core samples to allay such fears, and at the same time, indicate the rough cubic yardage to be removed, depth, slope gradient, spoil discharge area, and time of channel refilling by natural forces. Who will pay for channel dredging costs, channel markers etc.?
7. Almost everyone is aware of pollution dangers from unburned fuel and oil from 2 cycle engines. This danger will not be eliminated for years, as many of these motors are still in use and will contribute to the pollution of Crystal Lake for some time to come.
8. Boat launches are closer to commercial than residential zoning designation.
 - What about the Crystal Lake overlay district, and the Betsie Trail overlay, which may not permit marina designation?
 - Are there special rules for the DNR/DEQ?
 - Can the DNR/DEQ allow a few parking spaces for trail users?
9. Some invader species have arrived in Crystal Lake through visiting boats:
 - Bilge water, bait wells, trailer frames and careless disposal of bait all contribute.
 - Spraying and other methods are hopelessly inefficient as safeguards.
 - More boats from various locations will likely result in more undesirable species in Crystal Lake and/or accelerate the problems associated with a strained ecology from the invaders we already have.

One of the fundamental design considerations for the size of a new boat launch is based on some notion of the carrying capacity of a lake. Thus we hear of rule-of-thumb formulas: one boat per 15 acres etc. On Crystal Lake that would equal 656 boats! We feel this and other formulae cited are not sufficiently refined to arbitrarily add more boats to a given lake. The technical revolution has also affected boats: more power, speed and larger average size has occurred, including wake boarding, knee boarding, tubing, jet skis and the like.

Whereas water skiing tends to use straight travel, wake boarding and tubing operators travel in a purposely random manner, and therefore require much more area to operate safely. Some formulae may be helpful in the future, but at present the rate of change presents too many variables which are very difficult to measure and interpret.

One the criteria to regulate boat density is the size of the lake alone. The reasoning goes that the bigger the lake, the more boats it will take. We disagree based on the explanation that Crystal lake is different than most Michigan lakes. Some of these differences are as follows:

Crystal Lake experiences almost daily, steady, high winds during the warm months due to the differences in water temperature between it and Lake Michigan. This is intensified by the geography of Crystal Lake jutting out into Lake Michigan on three sides. Early surveys found the lake to be named “Cap Lake” referring to the frequency of white caps. These same winds produce high waves and generally force most boaters to the lee shore to avoid the rough water. This action reduces the usable areas of the lake by about one-half.

Another deduction is the observed tendency of boaters to avoid the middle of the lake for most operations. This reduces further the available size of the lake. These concentrating forces tend to influence many boaters to migrate to, and stay in the sheltered side and away from the middle and windward shores.

There are no features, other than fishing, to attract boaters to cruise very much. Absent are islands, deep bays, sharp peninsulas, inlets or outlets of consequence. There is only one commercial fuel dock, which is often unusable due to high winds found there. There are no harbors, moorings, marinas, or food establishments, and few, if any, public beaches.

Altogether then, it would seem that 50-60 boat spaces in addition to the needs for fishermen will be shown to be more than adequate. If experience indicates a greater need, then the launch area can be enlarged.

Again, while southern lakes become warm enough for swimming from May to October, Crystal Lake is usually swimmable only from about July 4th through Labor Day. . . a limited season at best.

We look forward to an early, positive response from your group, trusting that an equitable and prudent course of action will be forthcoming.”

The next activity on the proposed boat ramp will be the preparation of working or engineered drawings of the actual site. This will carry over beyond the first of the year and we anticipate at least one public hearing prior to permit application from the DNR.

Zoning Regulations Enforcement

There has not been much progress in this area. Examples include a continuation of clear cutting and lack of meaningful erosion control. Little interest seems to be shown by local residents in insisting that their elected officials are there to enforce the code instead of looking the other way and granting of variances. (See clear cut photos).

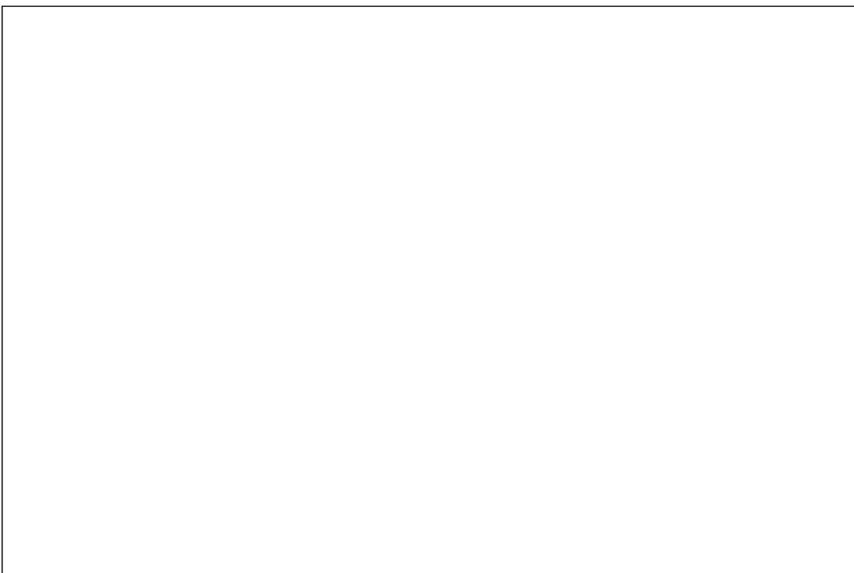
A large challenge to the lake is the increasing development in the surrounding hills. Ruinous reduction of the forest from added roofs, roads, erosion and driveways has already started. Remedial plans have been mentioned and formulated but little or no progress is visible. Plans that depend on a long time period such as five, ten, or twenty years will be far to late. Once the hills are urbanized the damage is done and cannot be undone.

Benzie County has completed a new Open Space and Natural Resources Protection Plan and has begun the rewriting of its Zoning Ordinances. Among the sections to be rewritten include: Administration, Site Plan, Definitions, and Environmental Provisions. The Overlay District Ordinance that addresses area in the Crystal Lake

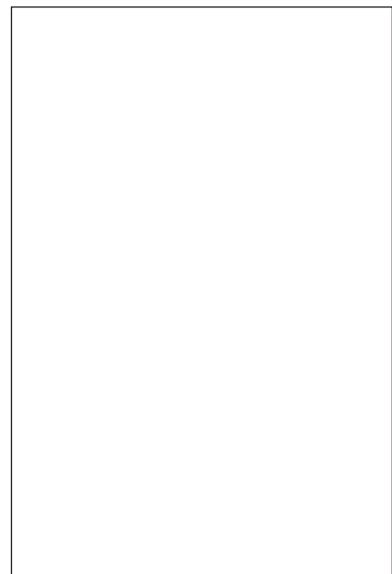
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An example of clear cutting.



Another example of clear cutting causing the erosion problems.



Erosion threatens this landscape.

Lake Level

We were favored by a spread out rainfall over the summer which helps to keep the lake level fairly constant. However, a few minor disagreements about the level need to be dealt with, but not in the form of three separate acts of vandalism on the removable boards which regulate the lake level. The county is planning a tamper proof gate to replace the board system.

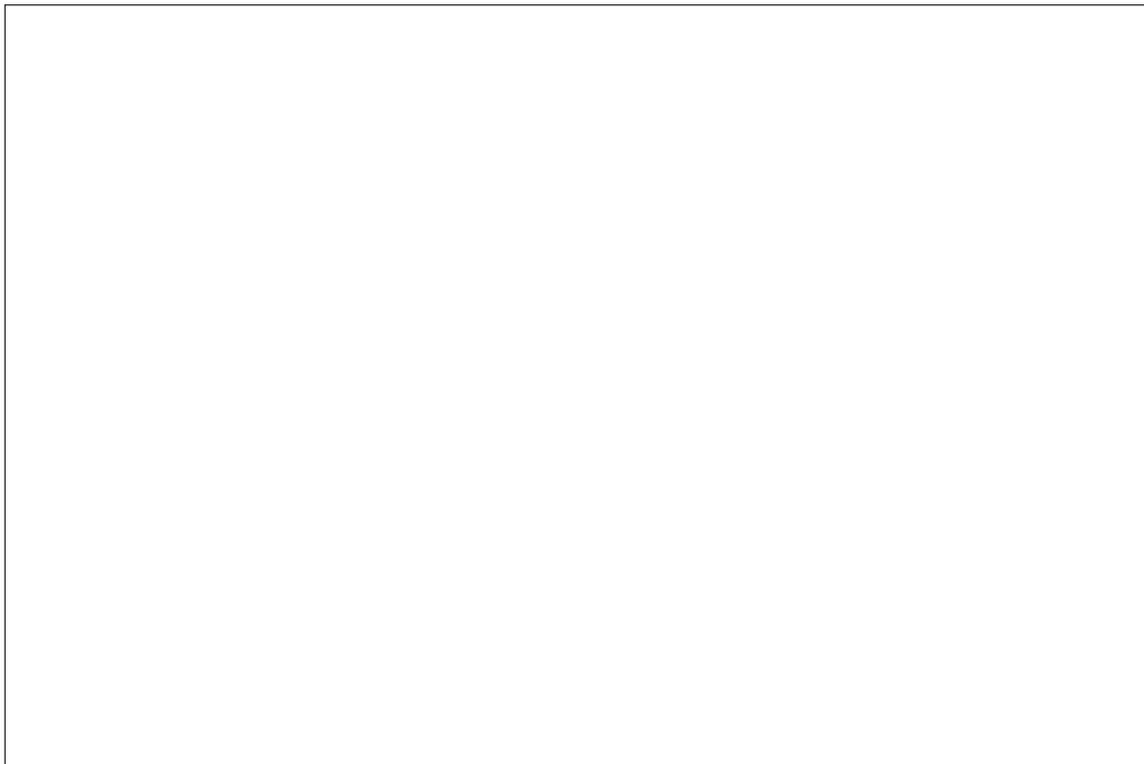
Zebra Mussels - Water Clarity - Water Plants

Most everyone knows by now that zebra mussels, although scattered, can be found all over the lake. As filter feeders they indirectly increase the clarity of the water which in turn allows light to penetrate further into the water which stimulates water plants (weeds) to grow and spread. Most people enjoy the improved visibility* but have not yet encountered the weeds in any quantity. Not long ago weed beds were growing in Crystal from about 12' to about 35' deep. We have observed areas where weeds are now growing in depths approaching 60' and fishing patterns have been changing which would be suggestive of bottom changes which cause fish to seek food elsewhere. One example of this is railroad point, long a choice fishing spot for whitefish

and perch. The best depth was around 35' to 40', but now the fish are being caught in depths up to 60'. And in reduced quantity— indicating a feeding pattern change. Divers report plant growth on the bottom down to about 60'.

These signs indicate a change in lake fertility but each factor taken alone cannot be described as causal. Rather they illustrate the interdependability of many lake influences which continue. A growing population increases the phosphorous intake to the lake, thus promoting still more growth. Every watershed resident should actively limit any form of phosphorus usage that might enter the lake.

*The visibility in this case refers to shallow water. Secchi Disk Observations from deep water do not indicate a dramatic change in visibility.



“Walkabout” participants

CLWF On the Internet!!!

Please note(!) that we have a new web address (URL). It is **[:http://www.clwf.org](http://www.clwf.org)**

State of the Lake-Water Chemistry

Sample profiles have been taken all year as has been our practice. No remarkable change has been seen except increased clarity. (See page 4 on zebra mussels.)

Septic System Progress

In June of 2002 the Benzie-Leelanau Health Department adopted special regulations involving septic systems. We are gratified that our early efforts with funding and education have been this fruitful. It would appear that the need for better systems is now widely perceived and is providing a multiplicity of new designs.

At least one of these would be very helpful in some of the situations in the Assembly because the drain field is quite small and requires less area, thus sparing many trees and avoiding digging into shrubbery, etc.

A background letter from Bill Crawford (county sanitarian) with an interesting and useful analysis follows:

NEW ALTERNATIVE SEPTIC TREATMENT SYSTEM REGULATIONS APPROVED FOR BENZIE COUNTY

“The Benzie-Leelanau District Health Department adopted special regulations allowing on-site sewage disposal systems for Benzie County in June of this year. These regulations allow many properties that do not meet the traditional prescriptive requirements for conventional system design to have an on-site option. Although all properties will not meet these new minimum standard, a much greater percentage of the previously unsuitable parcels will be eligible for on-site systems.

The regulations were set up to be performance based requirements which limited Biological Oxygen Demand (BOD), Total Suspended Solids (TSS), Organic Nitrogen, and Phosphorous loading. The standards require a higher treatment levels of Nitrogen and Phosphorous in locations within 500 feet of a body of water. In addition, specific monitoring and maintenance agreements are a requirement of permit issuance.

The goal of this regulation is to develop alternatives to holding tank installations and give options to existing home owners who might consider upgrading their septic system if a choice other than holding tanks was available. The fact that approximately 8 million gallons of waste must be disposed of each year from holding tanks and septic tanks in Benzie County has prompted the Health Department to look into a different method of treating the septic tank effluent than the traditional dependence on the soil beneath the

drainfield. This different approach puts the treatment responsibility in a mechanical solution instead of the in place soil.

The first permits will be issued in the near future and will be monitored to insure that proper performance is being met. The Benzie-Leelanau District Health Department looks forward to improved on-site septic system performance from these new alternative systems. The Alternative Treatment System regulation may be obtained from the Health Department by calling (231) 882-4409. Environmental Health Sanitarians will answer questions regarding the regs if you wish to contact them at the same number.”

Permits Issued

For the 2001-2002 year there were 335 septic system permits issued county-wide including 44 upgrades on Crystal Lake in accordance with the County's septic system ordinance. This brings the cumulative total of new or upgraded systems on Crystal Lake since the implementation of the ordinance to 557. The lake will increasingly benefit as the older systems are phased out.

Zoning Regulations Enforcement

(Continued from Page 3)

watershed is not expected to be substantially modified. There will be a discussion on higher versus lower density throughout all the ordinances. We would like to see lower density, i.e. larger lot size per house, in the second and third tiers of the hills around Crystal Lake. This we believe would promote better quality of the water that flows on and through the ground and into Crystal Lake. It would also lessen the apparent continual clear cutting of trees in the hills that has been occurring. Getting a lot density change to a lower level, however, may be very difficult due to property owner expectations. We will be involved in this process and urge you to take an interest in it. Notices of public hearings will be published in the local newspaper. The zoning rewrite process is scheduled to be completed by late summer 2003. Please make your interest clear to your local zoning officials, i.e., enforcement is the only way to secure the desired benefits of any new code.

Crystal Lake “Walkabout”

The **Crystal Lake “Walkabout”** is intended to instill and nurture in young people and adults a sense of awareness of the unique environment of the Crystal Lake Watershed (Benzie County, MI). This is done through an interactive “hands-on” program of science education involving observational monitoring and environmental exploring. It is designed to enhance community awareness of environmental issues, provide educational experiences, and promote future stewardship of water resources. It has been integrated into the curriculum of local schools.

Four Interpretive Sites are selected biennially for the annual “**Walkabout**” from a list of nine Sites, each representing a geographically distinct location with unique hydrology (How water moves about Crystal Lake, tributaries, wetlands, high ridges, dunes, and Lake Michigan.):

- | | |
|---|-----------------------------------|
| A. Crystal Lake (Lake, East End) | E. Crystal Lake (Lake, West End) |
| B. Cold Creek Sediment Basin (Tributary) | F. Betsie Valley Trail (Wetlands) |
| C. Trapp Farm Nature Preserve (Wetlands) | G. Betsie Bay (Bay) |
| D. Railroad Point Natural Area (High Ridge) | H. Pt. Betsie (Dunes-Great Lakes) |

Environmental professionals describe each Site and conduct group activities. In addition to hydrology, other aspects of watershed management are discussed, including: water quality, ecology, land use, zoning, septic tanks, green belts, sustainable development, and watershed management. Protecting the integrity of the Crystal Lake Watershed as a valuable natural resource with its high-quality waters and unique environment is a worthy educational objective.

The Crystal Lake **Walkabout**” has a particular focus on interpreting of environmentally significant sites associated with the Crystal Lake Watershed.

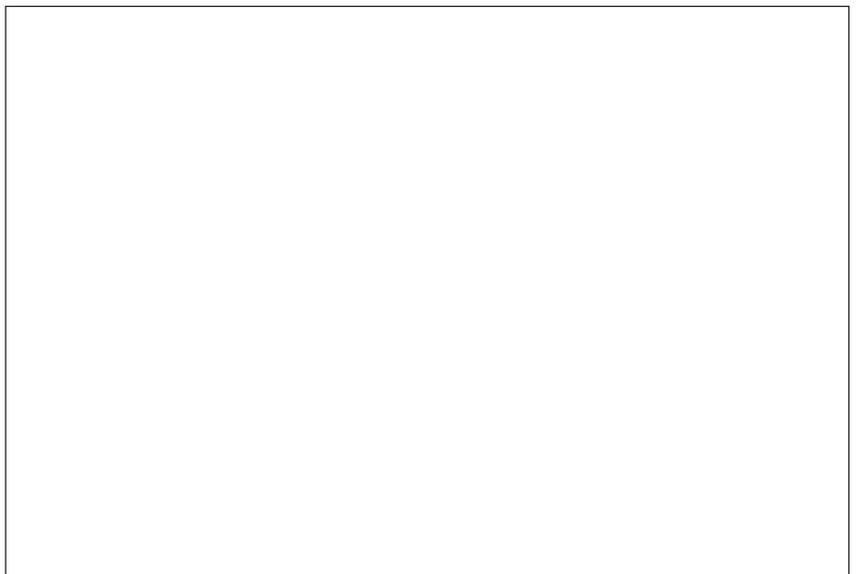
All participants receive a detailed Interpretive Manual containing the familiar Crystal Lake Watershed map and descriptions of the eight interpretive sites, and a colorful commemorative tee shirt. (The text of the Interpretive Manual is available online at www.CLWF.org.)

Cosponsors of the “**Walkabout**”, an annual event since 1997, have included both nonprofit organizations having a local presence in Benzie County. These include: the Crystal Lake Watershed Fund, Inc., (**CLWF**); the Grand Traverse Regional Land Conservancy; the Grand Traverse Band of Ottawa and Chippewa Indians; Crystallaire Camp; The Nature Conservancy; the Friends of the Betsie Valley Trail; the Friends of Betsie Bay; the Friends of Point Betsie Lighthouse(*); the U.S. Coast Guard- Station Frankfort; the Congregational Summer Assembly; the Benzie Conservation District(*); and the MSUE Michigan Groundwater Stewardship Program (*). (*) New in 2002. Educational institutions include: Benzie County Central Schools, Frankfort-Elberta Area Schools, Crystallaire Camp, and the Interlochen Arts Academy. The “**Walkabout**” has been partially funded by the cosponsoring organizations, and by donations, grants, and nominal fees.

The “**Walkabout**” has been presented to more than 1,300 participants representing the general public and visitors, and local educational institutions. The “**Walkabout**” has grown from 40 participants in 1997, 120 in 1998, 160 in 1999, 300 in 2000, and 4440 in 2001. The original “**Walkabout**” addressed a need to provide environmental education on issues specific to the Crystal Lake Watershed to young people in Grades 5-12 (ages 9-19). The program is being expanded to three events in 2002-3. The Summer **Walkabout**” on July 27 was offered to 50 participants from the general public. The Fall **Walkabout**” was presented to 160 8th grade students from Benzie Central Middle School. The Spring “**Walkabout**” is being planned for 200 6th grade students from all Benzie County schools.

Thanks are due to the cooperative efforts of many volunteers who serve as Site Interpreters and in other supportive positions. Special thanks for the Fall 2002 “**Walkabout**” are due to Raquel Huddleston, Science Teacher at Benzie Central Middle School, and to Doug Gibson, Teacher at Lake Ann Elementary School, for their continued dedication. The overall program coordinator is Dr. Stacy L. Daniels of **CLWF**.

Your financial support is needed and will be greatly appreciated by the young people who are already planning the spring outing.



The CLWF Science Review Panel

The CLWF Science Review Panel (SRP) is proactive in developing consensus viewpoints by reviewing environmental issues of particular local interest and by providing scientifically sound recommendations where appropriate to the public. This involves continued review of CLWF sponsored studies, and assessment of studies conducted by other responsible organizations that have demonstrated performance in related areas. It is comprised of a cross-section of knowledgeable individuals who have contributed significantly to past studies of Crystal Lake and who have been involved in various environmental activities positively affecting the Crystal Lake Watershed. It includes the directors of all major water quality studies conducted on Crystal Lake since 1969.

Cochairs:

Dr. Stacy L. Daniels, Director of Research, Quality Air of Midland, Inc. and Adjunct Professor of Environmental Engineering, The University of Michigan;

Dr. Tom Osborn, Professor of Earth & Planetary Sciences, The John Hopkins University.

External Reviewer:

Dr. Alfred M. Beeton, Former Chief Scientist of NOAA.

Members:

Dr. John Gannon, University of Michigan, Director of the 1969 Study;

Fred Tannis, Environmental Research Institute of Michigan, Director of the 1978 Study;

John R. Gehring, Benzie Central High School, Director of the 1987 and 1989 Studies;

Heather Rigney, Grand Traverse Regional Land Conservancy;

Jack Randall, Interlochen Arts Academy;

Tom Rohrer, Chief, Surface Water Quality Division, MI DEQ;

Bill Crawford, Benzie/Leelanau District Health Department;

Dr. Eckhardt Dersch, Department of Resource Development, Michigan State University;

Dr. John C. Walton, Department of Civil Engineering, University of Texas at El Paso;

Dr. Richard Whitman, Biological Resources Division, USGS;

Andy Norman, MSU Extension Service;

Dr. Harry Blecker, Crystal Lake Association;

Douglas Gibson, Crystal Lake Elementary School;

Paul Murphy, CLWF Executive Coordinator;

Dr. A. Scott McNaught, Biology Department, Central Michigan University;

Dr. Donald Gatz, Former Chief, Air Quality & Chemistry Branch, Atmospheric Environment Section, Illinois Water Survey.

Dr. Wally Fusilier, Water Quality Investigators.

Dr. Elizabeth B. Rogers, Former TVA & NASA aquatic ecologist.

The collective expertise of the SRP bears directly on the scientific components of several environmental issues having current or potential future impact on the Crystal Lake Watershed. The SRP is proactive in developing consensus viewpoints by reviewing environmental issues of particular local interest and by providing scientifically sound recommendations where appropriate to the public. This involves continued review of CLWF sponsored studies, and assessment of studies conducted by other responsible organizations that have demonstrated performance in related areas.

— Walkabout —
“Fascinated Listeners”

Some of our Accomplishments

Our goal has been to preserve the water quality of Crystal Lake and to do so without great expense to you, its property owners. Your support has permitted us to accomplish the following:

- Write, publish and distribute the book Crystal Lake-Life or Death and yearly updates 1 through 12;
- Conceive and facilitate the adoption by Benzie County of a landmark ordinance requiring inspection and updating of all septic systems in the county;
- Partially fund and promote accredited deep water testing by Benzie High School biology instructor John Gehring and his advanced course students;
- Identify the north branch of Cold Creek as a major contributor of phosphorus into Crystal Lake and start a program in cooperation with the DNR to reduce the flow of nutrients into the Lake by returning the property to a wetland which will function as a giant filter;
- Support the gift of the former Trapp celery farm of Muriel Trapp Cross and Judson Cross to the Grand Traverse Regional Land Conservancy with its stipulation of protection of the water quality of Crystal Lake as a first priority;
- Arrange to have the “Lake Lovers” zero phosphate fertilizer available in many area stores;
- Produce the Crystal Lake Water Quality Monitoring Report by Daniels and Osborn;
- Furnish the pilot study of water plants and their distribution in the lake. Establish the annual Crystal Lake “Walkabout” educational program for young people;
- Furnish an erect entering/leaving Watershed signs on public roads at watershed breaks;
- Purchase and install an electronic level gauge to assist in lake level control.

Crystal Lake Watershed Fund



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Description of Who We Are, Who We Were, and Who We Are Not

The Crystal Lake Watershed Fund, Inc. (CLWF), a nonprofit 501(c)(3) organization, was formed in 1994 upon merging the Clean Water Committee of Crystal Lake (with focus on water quality monitoring) and the Friends of Crystal Lake (with focus on land use and zoning). Like its predecessors over the past 30 years, the **CLWF** actively supports citizen initiatives for water quality monitoring, septic system control, sustainable development, and land conservancy, through education, for watershed management.”. The **CLWF** operates independent of the Crystal Lake Association.

The former Clean Water Committee of Crystal Lake (now merged in the **CLWF**) was instrumental in supporting the Benzie County Public Health Department in developing a model ordinance to ensure that septic tanks in proximity to Crystal Lake and other water bodies in Benzie County comply with the latest standards in design and performance. The **CLWF** is also continuing to work with the Grand Traverse Regional Land Conservancy to limit phosphorus and sediment inputs from Cold Creek into Crystal Lake.

The former Friends of Crystal Lake (now merged in the **CLWF**) was supportive of efforts by Township and County zoning boards to work with local land owners and builders to promote reasonable and consistent land use regulations which ensure that future development is sustainable and compatible with the desirable environmental qualities unique to the Crystal Lake Watershed.

Funding the cost of our educational and water study programs as well as our operational cost has generally been accomplished by contributions from individual supporters. We are a non-profit organization comprised almost entirely of unpaid volunteers. We have stepped up our efforts to address land use regulations and zoning enforcement issues that you see in this and previous newsletters. Land use has a direct bearing on our primary interest of the water quality of Crystal Lake. When we place this type of emphasis on land use, however, it requires legal assistance which requires additional funding. This is money well spent since bad practice and irregularities must be challenged in order that we operate on a controlled, rule of law basis. We need your usual and now additional support in the form of a tax deductible donation to continue. Please feel free to offer any comments or suggestions as well. Your donation should be sent to:

**CRYSTAL LAKE WATERSHED FUND, INC. P.O. Box 104,
Beulah, MI 49617**

Telephone/fax number 231-882-5149.

SCIENCE PAGE

For those interested in more detail

Update #15 ~ December 2002

Water Quality Monitoring and Environmental Science Program

The CLWF Water Quality Monitoring and Environmental Science Program has involved cooperative studies among local volunteers, resident experts, student interns, academic faculty, and governmental officials. The CLWF Program has been integrated jointly or in parallel with programs of local, state, and Federal governments, academic institutions, professional societies, and limnological consultants.

The Program consists of ten elements encompassing physical, chemical, and biological monitoring and science. Water Quality Monitoring includes: routine sampling and analysis for physical parameters, such as temperature and Secchi disk depth (water clarity); and chemical parameters, such as dissolved oxygen, and phosphorus and nitrogen nutrients. Environmental Science includes: nonroutine special studies, such as biomonitoring of Cold Creek, sediment analysis, and lake and stream level gaging. Several elements are highlighted in this report.

Lake & Stream Level Gaging

The CLWF has continued to apply state-of-the-art probes for monitoring water level and temperature in Crystal Lake every 10 minutes. These data are compared with weekly levels as determined by the Benzie County Drain Commission (BCDC). The legally established levels of the Lake are: summer at 600.25 feet (May 1 - Oct 31) and winter at 599.75 feet (Nov 1 - Apr 30).

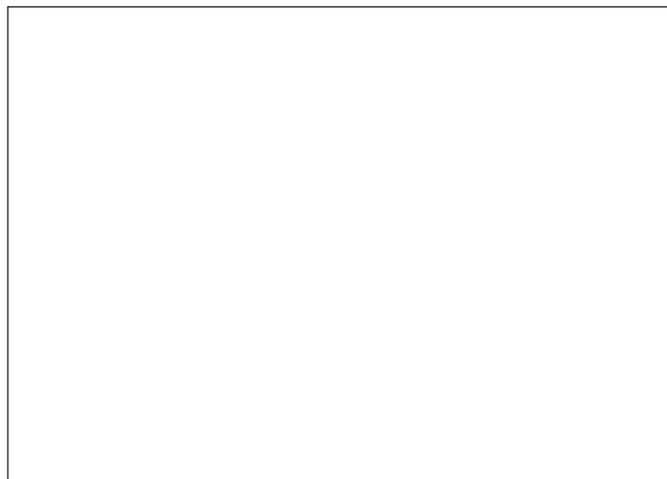
A major rain event was recorded by the CLWF gauge on August 21-22, 2002. Beginning about 7 PM, a very heavy rain fell on the region and continued over a four-hour period. The Lake level rose 0.44 feet (5.28 inches)! During this time, 3.44 in of rain were recorded at the Beulah weather station as reported to the Midwestern Regional Climate Center. Shortly thereafter, the Platte River crested at about three feet (!) above its level of the previous day.

This torrential downpour amounted to 1,400,000,000 (billion) gallons of water falling directly on the Lake or flowing into the Lake from the immediate surrounding watershed. This corresponds to about 0.58 % of the total amount of water in Crystal Lake (242,000,000,000 gal). A net increase of 0.38 feet was measured by the BCDC between 8/19 to 8/23. Before this event, the Lake was 0.21 feet below the summer legal limit; after this event it was 0.17 feet above the summer legal limit. This represents one of the most dramatic changes in Lake level ever recorded in the past 40 years.

Biomonitoring of the Cold Creek Watershed

The environmental health of a stream is evaluated in part by the type and diversity of its benthic invertebrates (insect larvae). Biomonitoring of Cold Creek, the major subwatershed for Crystal Lake is the subject of a volunteer monitoring project funded by MI DEQ and directed for the CLWF by Stacy Daniels. The project involves a screening evaluation of benthic invertebrate communities and stream habitat, and (ii) additional monitoring of chemical and physical parameters. The three wadeable branches of Cold Creek and the Cold Creek Sediment Basin are being sampled in 2002-3.

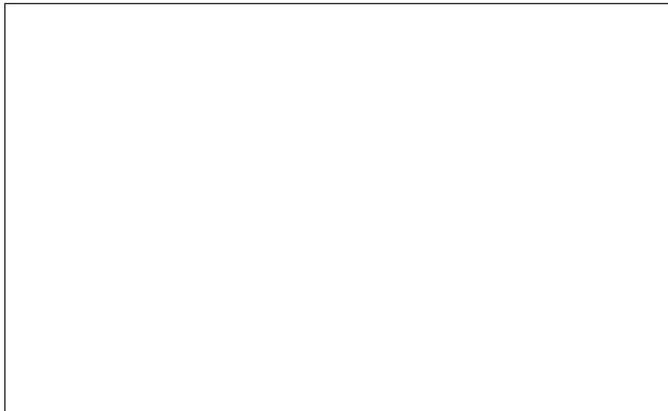
Special thanks are extended to Paul Murphy of CLWF and Abby Mehan of the Grand Traverse Regional Land Conservancy GTRLC for their long hours of wading Cold Creek and "picking critters" from dishes under microscopes, and to Elizabeth Rogers-Hill for her assistance in describing use of the equipment and identification of benthic invertebrates during Crystal Lake Walkabouts in 2002. Preliminary results indicate that Cold Creek is "biologically healthy".



Paul Murphy taking samples from Cold Creek.

(Continued on next page)

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Paul Murphy testing samples taken from Cold Creek



More testing of samples taken from Cold Creek are put under the glass for a closer inspection by Abby Mehan of GTRLC

Chemical Monitoring of the Crystal Lake Watershed

Chemical monitoring of the Crystal Lake Watershed is done to establish baseline values and to determine trends in various water quality parameters. Since 1993, the **CLWF** has been used a Hydrolab® multiprobe to measure depth, temperature, dissolved oxygen, pH, conductivity, redox, and turbidity, at deepwater sampling locations. In addition, samples have been collected for analyses of nutrient phosphorus and nitrogen species, and other param-

eters. The **CLWF** has participated in the Cooperative Lakes Monitoring Program (CLMP) coordinated by Michigan Lake & Stream Associations (ML&SA) in partnership with MI DEQ. This program includes measurements of Secchi depth (water clarity), total phosphorus, and chlorophyll a. Parallel samples are also collected and analyzed by the Michigan Water Research Center at CMU. A collaborative program involving partnership between the **CLWF** and the Interlochen Arts Academy was completed with a joint poster presentation at the ML&SA Annual Meeting in 2002. More detailed side-by-side samplings are also done by **CLWF** and Water Quality Investigators, Inc., whose President, Dr. Wally Fusilier, is a member of the **CLWF** SRP and an original member of the 1970 Gannon study team, and author of the 1998 study (*) sponsored by **CLWF**.

(*) Fusilier, W.E., Water Quality Study 1998, Crystal Lake, Benzonia, and Lake Townships, Benzie County, Michigan, sponsored by the **CLWF**, Water Quality Investigators, Dexter, MI, 1998, 28pp.

Sediment Analysis

Sediment is made up of fine solid particles that are suspended in water, and settle to the bottom of the Lake. Sediment sources in the Watershed include: (a) runoff from the land, esp. from land cleared of trees and vegetation, and paved areas, and (b) natural chemical precipitation in the Lake itself.

Because the Lake is filled with water of relatively high hardness and high pH, some precipitation of calcium carbonate (scale) is expected. This fine sediment is similar to the marl layers formed in geological times and found beneath surrounding hills (ancient dunes) and in the deep bottom of the Lake itself. Calcium carbonate may clog water pipes if excessive, but it is actually a good thing for lakes since it “buffers” (moderates any pH changes) and removes soluble phosphates which would otherwise be nutrients for algae and aquatic plants.

In 1998, the **CLWF** collected samples of sediment from the bottom of Crystal Lake at its deepest point (165 feet). They are comprised of a fine gray sediment with very little odor and no evidence of anoxic conditions. Thermogravimetric analyses performed by Impact Analytical have confirmed that they are comprised of about 2/3 sand, 1/3 marl, and a small amount of organic matter. In 2002, the **CLWF** collected samples near the proposed boat launch near Railroad Point. Visually these samples were mostly sand to the extent that they flowed out of the core sampler.

Core analyses are important for dating sediments and establishing baselines of physical conditions and chemical compositions. Since 2000, researchers from the Departments of Geological Science and Zoology at Michigan State University have been collecting and analyzing sediments from several Michigan lakes as part of an independent study on inland lake sediment trends funded by MI DEQ. Analyses of sediment cores has included: lead-210 dating, sedimentation rate determinations, and sediment composition (22 elements and selected organic compounds). In 2001, Crystal Lake (Benzie Co.) was added to the study which also included Crystal Lake (Montcalm Co.) Results are expected to be presented at a **CLWF** meeting in 2003.