



# the Water Column

Vol. 8, No. 3

Provided free of charge to our monitors and affiliates

Winter 2004

## OUTSTANDING VOLUNTEER CONTRIBUTIONS

WE ARE PRETTY EXCITED ABOUT this edition of the Water Column! Four of the feature articles were written by volunteer monitors. The stories are informative, creative and inspiring, and they underscore the benefits of collaborative ventures. Each article has a different emphasis, but the writers share common motivations and aspirations. Their stories demonstrate clearly that volunteers, through commitment and ingenuity, can and *do* make substantial contributions to our understanding, and ultimately to the protection of Maine lakes and ponds.

*Bob Dunlap* and *Dick Cook* are volunteer monitors on Green Lake in Dedham. Their article explores an interesting relationship between the duration of winter ice cover and dissolved oxygen levels in Green Lake during the late summer. Their observations and conclusions help us understand the complexity of the seasonal variables that influence lake water quality, and their work may inspire volunteers and researchers to look at this phenomenon on other lakes and ponds in Maine. Bob and Dick's research is based on lake data that they have

collected over the years, along with historical information gathered by the Maine DEP and other sources.

*Al Huff's* "Three Aces" article is a unique testimonial to the benefits of synergy. Al has been the volunteer monitor on Kezar Pond in Fryeburg for several years. Recently he became aware of the intertwined nature of the VLMP, Lakes Environmental Association, and the Maine Center for Invasive Aquatic Plants. His involvement with each of these entities, and his interest in protecting water quality has led him on an odyssey, on which he recently identified and documented a rare aquatic plant. Al has experienced the rewards of discovery in the diversity and beauty of lakes and ponds in his own back yard. In a larger sense, he has become aware of the interconnections and availability of technical resources and support for anyone who is interested in learning more about and protecting Maine's water resources.



SCOTT WILLIAMS,  
EXECUTIVE DIRECTOR

collected over the years, along with historical information gathered by the Maine DEP and other sources.

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## VOLUNTEERS

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*Tana McNutt's* story is also one of discovery, creativity and the tangible benefits of collaboration. Her growing sense of awareness of living in a lake watershed community, combined with participation in many conservation-based activities in the area, has helped her recognize the value of the Secchi disk and dissolved oxygen readings that she monitors on Drews Lake in Aroostook County. Tana's level of commitment to protecting local water resources is quite remarkable.

*Rebecca Kurtz* describes another great example of how sounding the alarm about aquatic invaders has resulted in the formation of an effective action network in the Rangeley Lakes region. The VLMP's MCIAP Invasive Plant Patrol training program provided technical guidance to help launch this successful effort through the Rangeley Lakes Heritage Trust. Rebecca's story clearly shows how the public *can* be motivated to step up to the plate and provide a high degree of vigilance when an imminent threat exists. That is consistent with the take-home message concerning this threat to Maine's lakes and ponds. The investments of RLHT, EcoVenture campers, the VLMP and the many Invasive Plant Patrollers in the region are providing big returns for the Rangeley Lakes.

*As exceptional as these stories are, we're willing to bet that many of you are equally involved in efforts to understand and protect the lake that you monitor. If you have a story to tell, please share it, so that we may all benefit from your experiences.*

## 2004 EVENTS

Quest Episode "Bioinvasion"

Maine PBS Feb. 17, 22, 23

Maine Milfoil Summit

Lewiston Feb. 27

Maine Stream Summit

Belfast April 7

Maine Water Conference

Augusta April 21

**VLMP/COLA Annual Meeting  
& Maine Milfoil Summit  
So. Portland June 19**

IPP Advanced Plant ID

Auburn July 22

LakeSmart Workshop

Auburn July 31

For more information on any of these events contact the VLMP:

phone: (207) 783-7733

email: [vlmp@megalink.net](mailto:vlmp@megalink.net)

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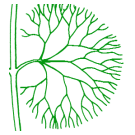
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# W E E D W A T C H E R S



*Keeping an Eye on the Lakes*

by Rebecca Kurtz

**I**NVASIVE PLANT PATROLLERS OF all ages are working to protect the Rangeley Lakes region from the devastating impacts of invasive aquatic plants. 2003 was a very busy year for the new program. Things became especially interesting toward the end of the season when the Rangeley Lakes Heritage Trust (RLHT) received three separate “suspicious milfoil” alerts. The Rangeley Lakes Weed Watchers, ranging in age from 5-year-olds to seniors, have learned to identify invasive plants through a variety of educational programs including the Volunteer Lake Monitoring Program and Maine Center for Invasive Aquatic Plants *Invasive Plant Patrol* workshops.

Sponsors of the education programs include the RLHT, the Town and Plantations, and local lake associations.

The first alert was raised by three young girls who had been swimming in front of their camp on Mooselookmeguntic Lake. Miriam Frisch, Naomi Frisch, and Elyssa Auerfeld, noticed several fragments of plants floating near their dock. Having learned about invasive milfoils while attending EcoVenture, the RLHT summer day camp, the girls became concerned when they noticed that the fragments had feathery-looking leaves arranged around the stem like a bottle brush.

Grabbing a pail half filled with water they scooped up the fragments and rushed to the RLHT office. Pointing out the tell-tale characteristics that they had learned about while playing “*boat inspection relay*” at EcoVenture, Miriam and Elyssa asked, “is it a milfoil?”


Examining the plant in a shallow dish of water, we were able to confirm that it was indeed a milfoil, but much to our relief, *not* one of the invasive species. The fragments were identified as a beneficial native milfoil. We are so pleased our young patrollers were able to identify this plant as a milfoil and bring it here for identification!

Less than 48 hours later, Jack McCormack, an employee of Bald Mountain Camps, produced a second sample of milfoil along with a

few strands of pondweed. Having seen the devastation caused by invasive milfoil in other states, McCormack was extremely alarmed when he saw the plants floating in front of the camps. Once again the suspicious plants turned out to be native milfoil.

Approximately 10 days later a fourth EcoVenture camper reported finding several patches of milfoil on the Cupsuptic River. Megan Crosson, age 10, had been paddling with her puppy “Miss Emily” and her friend Claudia Comstock when she noticed the feathery looking plants growing in three to four feet of water. She alerted RLHT and samples were collected for positive identification by the Volunteer Lake Monitoring Program’s Center for Invasive Aquatic Plants. Fortunately, a thorough examination of the plants revealed that they too were from a native beneficial milfoil.

This is proof positive that the local education and prevention program is working and that people of all ages are helping out in the effort to protect our lakes. With continued vigilance and participation from all members of the community, we can protect the future of our lakes.

If you are interested in learning more about the Rangeley Lakes Heritage Trust EcoVenture or the Invasive Plant programs, please contact Rebecca Kurtz at 864-7311 ext 5 or [rkurtz@rlht.org](mailto:rkurtz@rlht.org). 



*Miriam Frisch, age 9 ½, Naomi Frisch age 5, and Elyssa Auerfeld, age 11, hold the sample of native Milfoil they found floating on Mooselookmeguntic Lake near Haines Landing.*

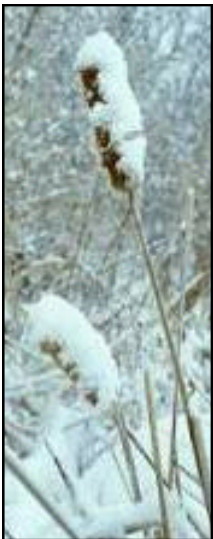


# LITTORALLY SPEAKING

By Roberta Hill

**Life,** whether we are aware of it or not, is dominated by cycles. The water cycle, the nutrient cycle, the cycle of life itself, are all natural processes, fundamental to life on earth, that essentially follow circular trajectories. One of the great joys of exploring the littoral zone is the discovery of the many ways in which nature's cycles, grand and minute, elaborate and simple, are played out in these sun-filled watery places.

The annual cycle of the seasons is one of the most obvious—and most extraordinary—cyclical processes in the littoral zone. In Maine, where environmental conditions vary so sharply from one season to the next, changes in these areas are especially dramatic, and at no time are these conditions so extreme as in the winter. How do aquatic plant communities respond to the shortened days, the decrease in the intensity of the sun's energy, the plummeting air and water temper-



*cattails in winter*

atures, the transformation of the habitat from one that is warm and liquid, to one that is encrusted under a thick layer of ice and snow?

Though each species has its own unique approach to preparing for, and surviving the hardships of winter, there are some common strategies employed. Since most aquatic plants evolved from terrestrial plants, it is not surprising that many of their over-wintering strategies are similar to those of their wild and cultivated upland kin, strategies you may already know well from observing the plants in your garden. Aquatic plants, just like garden plants, can be sorted into groups based upon what they do in response to winter, and how they provide for regeneration the following spring.

**Annuals:** Annual plants, in a matter of speaking, are those that have chosen not to bother with surviving the winter at all. As their name implies, annuals live for one growing season only and must produce viable seed by season's end if they are to ensure a new generation the following year. This strategy has advantages and disadvantages. Seeds are more durable and mobile than rhizomes and rootstalks. They can disperse widely and settle into small openings in the plant cover. Many seeds are able to lie dormant in the sediments for years, awaiting favorable conditions. The product

of sexual reproduction, seeds also provide genetic diversity, helping to ensure the “adaptability” of the species to environmental changes. Energy-wise, however, seed production is costly, and compared to roots and rhizomes, seeds pack away relatively little in the way of energy reserves.

The tiny “seedling-like” waterwort (*Elatine minima*) is a good example of a native annual. The miniature flowers and seed capsules of this plant are produced during the warm summer months, in the leaf axils (where the leaf meets the stem.)



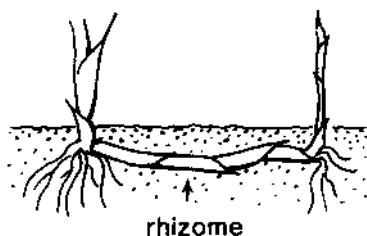
*The tiny waterwort is a native Maine annual (photo courtesy of the Maine Natural Areas Program)*

The ripened seeds drop and settle onto the bottom sediments through the late summer and fall, and there they remain, in a state of dormancy, through the winter. Whereas some seeds of native annuals, like wild rice (*Zizania* spp.) germinate prolifically in disturbed sediments, the key to successful germination for waterwort is a stable, undisturbed bottom and good water clarity.

Of the eleven invasive aquatic plants listed on Maine's watch list, only European naiad (*Najas minor*) is a true annual. The abundant seed production of this invader—tens of millions of *N. minor* seeds per acre have been counted—is a particular torment to those trying to control this plant. During the late summer or early fall, the stems of the naiads become brittle, and the profusely branched stem tips break into small fragments. Seeds remain attached in the leaf axils, and wind and water currents disperse the fragments.

**Perennials:** Most aquatic plant species found in Maine are perennials, plants capable of overwintering, in whole or in part, and surviving three or more years. Some, indeed, are very long-lived; a water-lily bed may be hundreds of years old. Aquatic perennials often form extensive and overlapping rhizome systems, expanding every growing season. These persistent mat-like networks stabilize shoreline and bottom sediments throughout the year, making these plants critical components of the aquatic habitat and important allies in the effort to protect water quality.

Some perennials, like cattails (*Typha* spp.), send new shoots up from their rhizomes late in the growing season that remain dormant in the sediments until spring. Others, blue-flag (*Iris versicolor*) for example, die back to the root or rhizome completely, waiting for spring to send up new growth.



Several perennials persist as “evergreens” through the winter, and continue to photosynthesize at a reduced rate under the ice and snow. Our native common waterweed (*Elodea canadensis*) is a good example of an evergreen perennial. And though it may look rather ragged and drained come spring, the stems (and even stem fragments) of

invasive variable-leaf milfoil (*Myriophyllum heterophyllum*) may also overwinter in this manner, new growth ready come spring, to unfurl from the tip of each blackened stem.

Most perennials that propagate primarily by root division have backup strategies for ensuring long-term success. For example many also produce seeds. Some develop compact vegetative structures called *turions* (also referred to as winter buds) or *tubers*, turion-like structures emerging from subterranean stems. These starchy, densely packed structures have the durability and mobility advantages of seeds, without the high-energy demand or the hit-or-miss nature of sexual reproduction. The highly invasive hydrilla (*Hydrilla verticillata*) sets abundant turions and tubers during the growing season, both structures helping to earn this plant its dubious title of the “perfect weed.” Hydrilla tubers, for example, are unaffected by aquatic herbicides and may remain dormant in the sediments for up to ten years.

Some aquatic perennials have no roots or rhizomes to “die back” to at all. The duckweeds (*Lemna* spp.)

are examples of *free-floating* native perennials. The tiny but prolific plants are more cold tolerant than many other aquatic vascular plants, and can continue to grow at a normal rate in water temperatures as low as 7° C. In fact solar radiation allows a dense mat of duckweed to generate its own microclimate (with temperatures up to 10° higher than ambient air temperatures.) As temperatures approach freezing, the

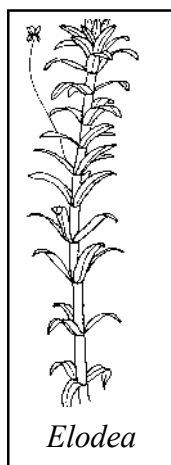


Photo by Prof. Cheryl C. Smart

*Duckweed forming turions*

winter buds of the duckweeds sink to the bottom where they lay dormant until warmer conditions return. In the spring, the buds become buoyant and bob back to the surface, completing their seasonal cycle.

Roberta Hill is Program Director for the Maine Center for Invasive Aquatic Plants.



Sources:

1. Through the Looking Glass A Field Guide to Aquatic Plants, Susan Borman et. al., Wisconsin Lakes Partnership, 1997.
2. Aquatic and Wetland Plants of Northeastern North America, Garret E. Crow and C. Barre Helquist, University of Wisconsin Press, 2000.
3. Flora, Fauna, Earth and Sky: The Natural History of the North Woods <http://www.rook.org/earl/bwca/nature/>
4. U.S. Army Engineer Research and Development Center (ERDC) website [http://www.wes.army.mil/el/pmis/plants/html/najas\\_mi.html](http://www.wes.army.mil/el/pmis/plants/html/najas_mi.html).

# Creating Connections

By Tana McNutt, Monitor for Drews (Meduxnekeag) Lake

VOLUNTEERS IN ACTION

I had no idea that there were people who monitored water on lakes until Kate Albert who was an AmeriCorps volunteer with the Presque Isle DEP came to one of our lake association meetings and spoke about watersheds. She asked for volunteers from Drews Lake, aka Meduxnekeag Lake, in Southern Aroostook County, to do a watershed survey. I volunteered and it was while working with her on the survey that she mentioned the need for a volunteer monitor on our lake.

I was very interested in learning how to check for water clarity and in how to keep our lake clean and environmentally safe. So I told her I would become a volunteer lake monitor. I was trained for secchi depth and two years later was able to train for dissolved oxygen testing, but there were not enough meters available for me to have one to test our lake.

Then at another of our lake association meetings I met Angie Reed with OWL, Organization for Watershed Living. We quickly became good friends since we both had a love of the outdoors and natural waters in particular. Angie suggested writing a grant through OWL to see if she could get a Dissolved Oxygen (D.O.) meter for me. I agreed that if she was successful I would test other small lakes,

and the Meduxnekeag River and be of assistance to the Band of Maliseets Native Americans that live on the river. We met with some members of the Band of Maliseets and they were very agreeable to the plan. She wrote the grant and we were awarded the money for the meter. I am now in possession of a wonderful YSI-55 meter!



*Tana (left) demonstrates her new D.O. meter*

I find it intriguing how my living on a lake has steered me along so many roads that all intertwine. I am on the Board of Directors for our lake association and an agent of record for our dam. From that position I went on to the Planning Board for New Limerick where I dealt with building permits for Shoreland Zoning. Now I am a Selectperson into my fourth year and on the Board of Directors for OWL. Each July, I assist Laurel Pinales, our local veterinarian, with the Loon Count. I am also the secretary for roads, which means I do a yearly letter in April asking for \$50.00 from each property owner to maintain our private roads. We have to

plow them in winter and have them ditched, graded and buy gravel in summer. This is directly related to the lake since we must be very careful that our culverts are ditched correctly and have proper buffers. Any runoff going into the lake can affect the reading I get on the Secchi Disk. So it is a continuous circle all relating back to the quality of the water.

I love monitoring the lake. It takes just a few minutes to paddle or motor out to the spot where I test. Several times people have stopped in their boats to watch what I do and ask questions. I explain what I am doing and why. When talking to people from other lakes I always try to bring up the VLMP to encourage their interest in becoming a monitor. The volunteer monitor for nearby Nickerson Lake is a relative of mine, Paul Porter. He was interested in what I was doing and when the volunteer monitor on his lake had to quit Paul took over. I would like to see every small lake in Maine have a volunteer monitor. I think if we all talk about it in the right places that will happen. 🛶

**2004**

**VLMP/COLA**  
**ANNUAL MEETING**

**JUNE 19**  
**SO. PORTLAND**



# THREE ACES

Volunteer Perspectives

By Alfred Huff, Monitor for Kezar Pond



**P**OKER hasn't ever been my game of choice, but this past summer I realized that I had a hand with three aces. That's pretty good isn't it? This winning hand (1) protects the water quality of Maine's lakes and ponds, (2) protects them from ruin by invasive aquatic plants and (3) provides the thrill of a treasure hunt at the same time.

For several years, the Volunteer Lake Monitoring Program (VLMP) has given me the opportunity, and sometimes the nudge that I need, to paddle my canoe about half a mile into Kezar Pond every couple of weeks to where it's deep enough to get a good Secchi Disk water clarity reading. This is sent to the Lakes Environmental Association (LEA) in Bridgton that acts as VLMP's regional coordinator for water quality measurements for 37 lakes and ponds in our area. I can almost always find a beautiful day to do this and with the mountain views, exercise and satisfaction of helping to preserve Maine's treasures, I can certainly count that as ACE #1.

Due in large part to the dedication and fine work of organizations such as LEA and VLMP, Maine has adopted what many regard as the finest legislation and "action plan" in the country to protect Maine waters from the threat of invasive aquatic plants. As part of this effort, the Maine Center for Invasive Aquatic Plants (MCIAP), established by VLMP, has trained many of us as "plant patrol" volunteers to

recognize the invaders that have decimated water bodies in neighboring states and throughout the country. As a result, Maine has taken early action to prevent their spread.



*Plant patroller Alfred Huff on the look out for invasive plants in Kezar Pond.*

All you have to do to add plant patrolling to the clarity reading trip is to attend an MCIAP training session, get its invasive plant recognition material, and add some plant sample collection gear to your canoe. Then you can use the recommended patrol procedures to paddle around the likely spots like a bounty hunter to find any "bad guys" and enjoy the thrill of the chase and some more outdoors. Ace #2!

Then there are the "good guys." The Maine Department of Conservation has begun a comprehensive program called "Beginning with Habitat" that is dedicated to identifying and preserving vital habitats for plants and animals

throughout the state. It includes classifying and recording rare species so that they may receive special attention in what are designated as "Focus Areas." Many of these species are found along the shores of our lakes and ponds and the search is best done leisurely by canoe. A little more study with some of the plant guides suggested by VLMP and you're ready to go.

We are all excited when we make a new discovery, and I was thrilled to have one of the plants I encountered: Narrow leaved goldenrod (*Euthania tenuifolia*) recorded as a rare plant by the state in its permanent record. You don't need to discover something rare to make your day though. Try viewing the cardinal flowers or the giant sundews at The Five Kezar Ponds, or the marvelous carnivorous pitcher plants at Holt Pond. For a stunning assortment of fresh-water sponges, try Cold Rain Pond. I've been lucky to make countless such discoveries while paddling slowly around many of LEA's 37 lakes and ponds. My luck grew by leaps and bounds after I met Norm Wight, Master Maine Guide and naturalist. Like the postman that goes for a walk on his day off, Norm jumps into a canoe on his. In his 90<sup>th</sup> year, he's still doing it. We, with our wives, have taken picnic lunches and paddled many shores with cameras, benefiting from Norm's marvelous knowledge and ability to identify and record the findings and events of the day. For my money, you can't find a better ACE # 3 than that. 🐾

# CORRELATION OF LATE SUMMER HYPOLIMNION OXYGEN CONCENTRATIONS WITH ICE-OUT DATES FOR GREEN LAKE, MAINE

By Robert D. Dunlap and Richard C. Cook  
Monitors from Green Lake

Bob Dunlap and Dick Cook have been measuring water temperature and dissolved oxygen concentrations in Green Lake in Dedham since 1996. They have compared their lake monitoring findings to historical data for the lake, and concluded that over time, late summer dissolved oxygen levels have declined.

It is well understood that the enrichment of lakes over time with the nutrient phosphorus, and organic matter from their watersheds, leads to an increase in algal growth. This process is exacerbated by watershed development. Ultimately, algae and other organic matter in the water decompose, and in that process dissolved oxygen is consumed. The rate at which this relatively slow process occurs varies from one lake to the next, depending on a myriad of factors, including the shape and depth of the lake basin, land uses in the watershed, soil geochemistry and others.

The authors of this article have focused their attention on another important influence on lake water quality variability: the weather. Their observations about the relationship between winter ice cover and summer dissolved oxygen levels in Green Lake are very interesting, and their conclusions are striking. They underscore the importance of the weather as an important driving force in the function of lake ecosystems. And they portend the potential negative effect on lakes from global climate change.

While it may not be possible for individuals to influence the effects of weather on lakes, there is no question that watershed conservation practices have a positive effect on lake water quality.

~ Scott Williams

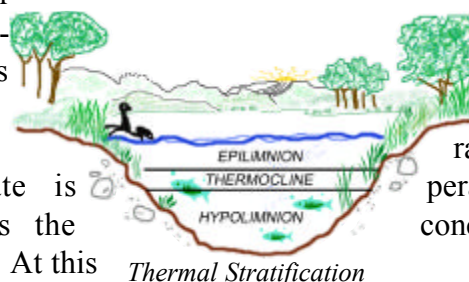
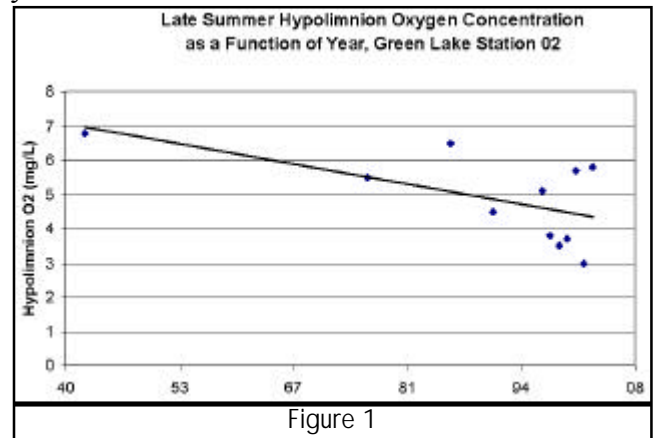
WE HAVE BEEN MEASURING the temperature and oxygen concentration as a function of the lake depth twice monthly during summers at two Green Lake sample stations since 1996. Our late summer average hypolimnion oxygen concentrations at sample station 2 in 1998, 1999, 2000, and 2002 were 3.8, 3.5, 3.7, and 3.0 mg/L respectively, which are below the historic average of similar measurements at this station. We are concerned about low oxygen concentrations because values above 5 mg/L are considered necessary to support a healthy cold-water salmonoid fishery. Our data

are shown in Figure 1, along with historic data dating back to 1942. The 1942 measurements were reported by Fuller and Cooper (1) and the measurements in 1976, 1986, and in 1991 were made by the Maine Department of Environmental

Protection (2). Linear regression analysis of all of the data shown in Figure 1 gives a Pearson correlation coefficient of 0.61. The decreasing late summer hypolimnion oxygen concentrations with time is real.

The ice-out date is when ice leaves the lake in the spring. At this

time, the lake water is saturated with air at a temperature close to zero degrees centigrade. The concentration of oxygen is nearly constant at about 13 mg/L from the lake surface to the lake bottom. As the water temperature increases, everything that grows in the lake begins to grow faster; much of the oxygen leaks into the atmosphere because air is less soluble in warm water than in cold water. Some of the oxygen is metabolized by zooplankton and other members of the animal kingdom, and it also reacts with organic matter from deceased biota.



Thermal Stratification

In late June or early July, the water in the lake separates into three layers, a process called thermal stratification. The surface layer, called the epilimnion, about 10 meters for Green Lake, is maintained at a rather uniform temperature and oxygen concentration because

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## About the Authors

Robert Dunlap and Dick Cook have been monitors on Green Lake since 1996. Robert Dunlap is University of Maine Professor Emeritus of Chemistry.



*Bob Dunlap sailing on Green Lake*



*Richard Cook measures wind speed on Green Lake*

it is being stirred by the wind. The bottom layer is called the hypolimnion. The temperature of this layer is reasonably constant. The corresponding oxygen concentration, however, decreases during the summer months because oxygen, trapped in this layer by stratification, is consumed by the various biological and chemical processes going on in the lake.

The ice-out date is the beginning of the more rapid growing season for the lakes biota. When the ice-out date is late, the lake's growing season is short; when the ice-out date is early, the lake's growing season is long.

From Green Lake ice-out data since 1935, compiled by Raymond Jenkins (3), the earliest ice-out date is March 29, and the latest ice-out date is May 7. This amounts to a difference in the lakes growing season of 38 days! When the lake's growing season is short, more oxygen is left over in the hypolimnion layer in the late summer; when the lake's growing season is long, less oxygen is left over in the hypolimnion layer. One year ago, we measured a late summer oxygen concentration of 3.0 mg/L in the hypolimnion stratum at sample station 02. The ice-out date for 2002 was April 6. In the spring of 2003, the ice-out date was April 29 and we found the corresponding hypolimnion oxygen concentration on August 27 to be 5.8 mg/L.

In Figure 2, we plot the differences between the measured and average of

late summer hypolimnion oxygen measurements and the differences between modified ice-out dates and the average of modified ice-out dates against the corresponding years when the measurements were made. The modified ice-out date is the ice-out date in Julian days divided by 30.

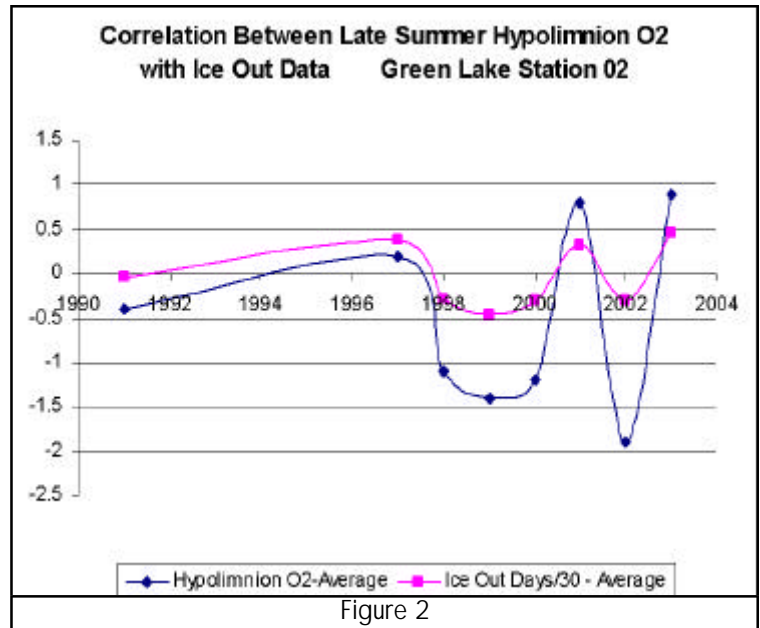


Figure 2

The correspondence between these separate and different kinds of measurements is amazing with a correlation coefficient of 0.74; early ice-out dates correspond to low late summer hypolimnion oxygen concentrations; late ice out dates correspond to high late summer hypolimnion oxygen concentrations. This suggests that when we compare any kind of measurement in the lake from one year to any other year, we should use a time scale that has its ice-out date for that particular year as the origin. In Figure 3, we show the late summer hypolimnion oxygen concentrations plotted against the difference between the date that the measurement was made and the ice-out date for that particular year. Linear regression gives a correlation coefficient of 0.94 with a standard deviation of 0.2 for the oxygen concentrations.

continued on page 10

# I C E - O U T

continued from page 9

## GLOSSARY OF TERMS

### Dissolved Oxygen (D.O.) -

The amount of oxygen dissolved in the water. The D.O. concentration in water is affected by the water temperature, water quality, and other factors. Organisms living in the water use this oxygen to breathe.

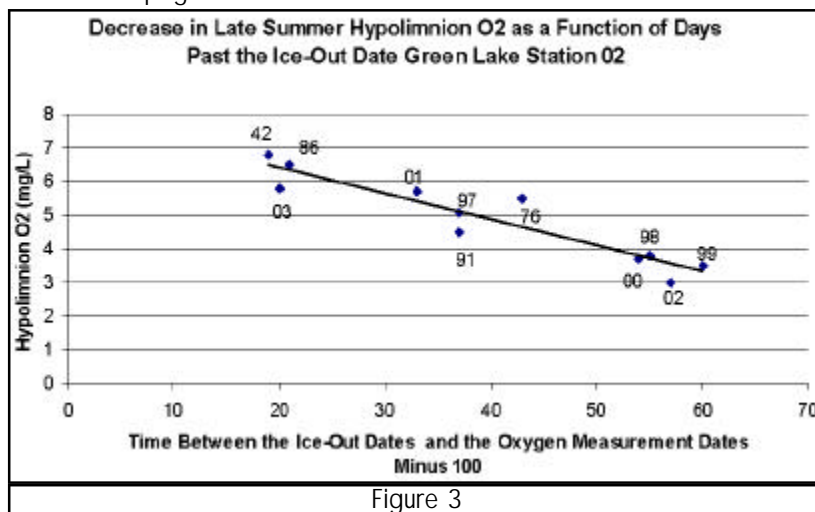
**Hypolimnion** - The deepest layer of water in a lake or deep pond, when the water body is stratified by temperature and density differences.

**Ice-Out Date** - When the ice leaves the lake in the spring.

**Zooplankton** - See Lake Lingo (page 14.)

Also shown in Figure 3 are the years during which the measurements were made. In 1942, 1986, and 2003, the ice-out dates were late, and the late summer hypolimnion oxygen concentrations were high. In the years 1998, 1999, 2000, and 2002, the ice-out dates were early, and the late summer hypolimnion oxygen concentrations were low. Figure 3 also demonstrates the remarkable conformity in our oxygen data acquired over a period of 60 years by several investigators using different instruments and methods. Fuller and Cooper used the Winkler wet chemical method. We are using a YSI Model 50b temperature and oxygen meter with a YSI Model 5739 membrane electrode.

The preponderance of low late summer hypolimnion oxygen concentrations in recent years is most certainly due to the warming trend in our local climate as is indicated by the shortening of the ice-out dates. The rate of



decrease in the hypolimnion oxygen concentrations at Green Lake is almost identical to the rate of shortening of the ice-out dates. The ice-out dates for several Maine and New England lakes have been decreasing for the past 100 years (4, 5, 6.) Hodgkins and coworkers (5) have correlated the decrease in ice-out dates with our warming local climate. Also the average temperatures of the ocean at Boothbay harbor and Georges Basin have been increasing at the rate of 2 and 2.5 centigrade degrees per 100 years (7.)

We wish to acknowledge and thank the Green Lake Association for supporting this project. One of us (RD) wishes to acknowledge and thank Glenn Hodgkins, U.S. Geological Survey, Augusta, ME, for helpful discussions.

## References:

- 1 John I. Fuller and Gerald P. Cooper, Fish Survey Report No. 7, 1942, Maine Department of Inland Fisheries and Game, Augusta, ME 04333
- 2 Personal Communication, Roy Bouchard, Maine Department of Environmental Protection, State House Station 17, Augusta, ME 04333
- 3 Raymond Jenkins, Dedham Historical Society, Dedham, ME 04429
- 4 Glenn A. Hodgkins and Ivan C. James, USGS Open File Report 02-34, 2002, Augusta ME 04333
- 5 Glenn A. Hodgkins, Ivan C. James and Thomas G. Huntington, Int. J. Climatol. 22: 1819-1827 (2002)
- 6 John J. Magnusen, et al. Science 289, 1473-1476 (2000)
- 7 Personal Communication, University of Maine Department of Marine Science

# LAKE LEADER INSTITUTE CALL FOR PARTICIPANTS

**T**HE University of Maine Cooperative Extension (UMCE) is the major educational outreach program of the University of Maine, with offices statewide. Our Watershed Stewards Program provides twenty hours of research-based scientific information on watershed land use practices to protect lake water quality. Programs have been held in six Maine counties, for eleven lake groups, with over 250 participants. In return, each Steward volunteers at least twenty hours in lake stewardship activities. Results of an intensive program evaluation indicate that our Stewards have a statistically significantly higher knowledge level about lake processes and threats compared with lakefront landowners on the same lakes who did not participate in our programs (Jemison et al., 2004). We also learned that Stewards spend more time in pollution prevention activities. Our program evaluation indicated one key weakness that keeps our Stewards from complete success. We found that Stewards are not transferring their knowledge to other landowners on their lakes. The evaluation data suggest that they do not have the confidence to approach their neighbor, and they do not have outreach skills to communicate their needs. We found that other lakefront landowners are concerned about lake water quality, but are not aware of the Stewards as a local community resource.

To address this need, we will offer a series of Lake Leader's Institutes, to train Leaders in effective outreach techniques, so they are able to engage more of the lakefront community in protection efforts. The Lake Leader's Institute will be held June 3-5, 2004, on the University of Maine campus. All participants will receive training in:

- ▶ Leadership Styles/Methods
- ▶ Conflict Resolution
- ▶ Local Political Process – how it works
- ▶ Working with the Press
- ▶ Working in Groups

Breakout sessions (at least one person from each group will attend each) will focus on building organizational capacity, effective outreach, and educational lake event planning.

We are now seeking participants for the Lake Leader's Institute. Applications are available online at:

[www.umaine.edu/waterquality/lakeleaders](http://www.umaine.edu/waterquality/lakeleaders), or from Laura Wilson at 581-2971 (toll-free in Maine: 1-800-870-7270). **Selection of participants for the pilot program will be made by April 15; notifications will be mailed before the end of April.** Priority will be given to lake groups that send three or more participants, for groups including a graduate of the UMCE Watershed Stewards Program (however, you do NOT

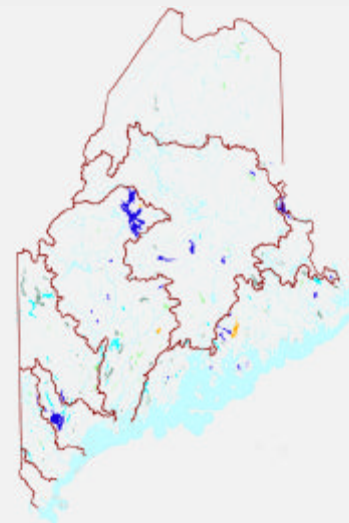
## SO YOU THINK YOU KNOW MAINE LAKES?

*Question:* What is the legislative designation for Maine lakes that are protected by state law, and that are in the public domain?

*Answer choices:*

- A. Grand Pond
- B. Great Lake
- C. Great Pond
- D. Gross Pond

If you think you know the answer, call or email the VLMP office. The first correct respondent will receive a gift certificate to L.L. Bean.



need to be a Watershed Steward to attend!), and for individuals with the support of their lake association/group. Three participants ensure that one person will be able to attend each breakout session, and bring that expertise back to the group. Estimated costs are \$150 per person to defray housing expenses – discounts for multiple participants may be available.



# Special Thanks!

**VOLUNTEERS** from the VLMP Board of Directors, Maine DEP, Invasive Plant Patrollers, and Volunteer Lake Monitors gathered on October 18th to prepare the Woodbury Brackett Environmental Center for the big move. Crews worked all morning inside painting windowsills, removing old carpets and cleaning the exposed hard wood floors. David Gregory, a retired carpenter, donated his skills in removing sections of sheetrock in the kitchen.



*David Gregory and Scott Williams assess leak damage in the kitchen ceiling*

Outside our landscapers mowed the overgrown grass, pruned the many trees and renovated the gardens. Buried under several inches of sod they discovered two beautiful slate walkways!



Then on moving day more volunteers stepped up to help, lending



*Will Reid and Clyde Walton tame the wild Solomon's Seal in the garden*

their knees, backs, and vehicles to a grueling one day transfer of offices. We are truly grateful for their generous time and hard work. The move would not have been possible without their help.



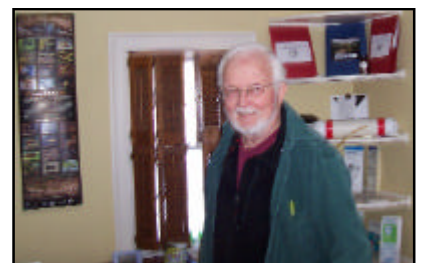
*Susan Breau and Jessie Mae MacDougall discover a slate walkway in the lawn*



*Paul Gregory paints windowsills in the living room*

## **SALUTE TO THE CREW:**

- Roy Bouchard
- Susan Breau
- Dan Buckley
- George Cross
- Mary Jane Dillingham
- Paul Gregory
- Aubrie Gridley
- Tom Hannula
- Richard Jennings
- Ralph Johnston
- Jessie Mae MacDougall
- Gerry Nelson
- Meg Nelson
- Will Reid
- Margot Siekman
- Clyde Walton
- Keith Williams



*Richard Jennings has volunteered many hours developing the VLMP Outreach Center*

**Special thanks to William Holman for donating a lawnmower and to Ken Holt for donating a microwave and tea set.**



# Address and Telephone Number for the VLMP and MCIAP



24 Maple Hill Road  
Auburn, Maine 04210  
(207) 783-7733

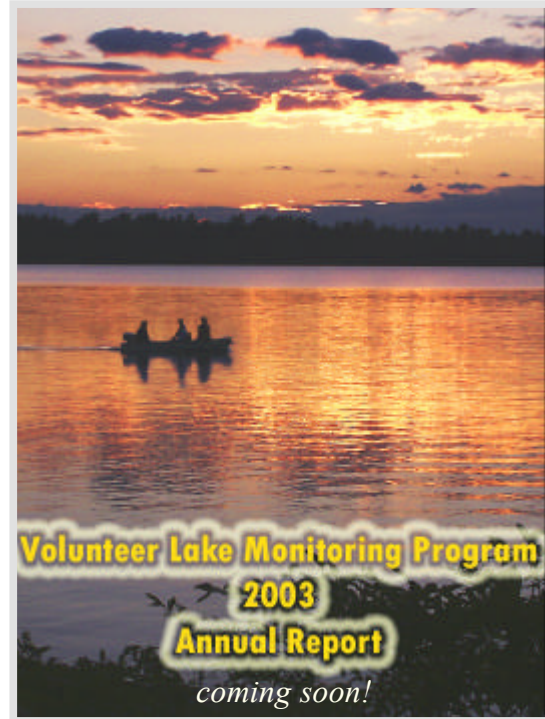
## PHOTO CONTEST RESULTS

Congratulations to **David Hodsdon** for submitting the winning photo that will appear on the cover of the 2003 Annual Report.

Many excellent photographs were submitted. It was a challenge to make the final selection.

We would also like to recognize the beautiful entries from: Ruth Cyr, Betty Hutchinson, Lila Minkowsky, Gerry Nelson, and Teg Rod.

You can see some of photos on the VLMP website. Just follow the Lake Photos link off of the Volunteer Page.

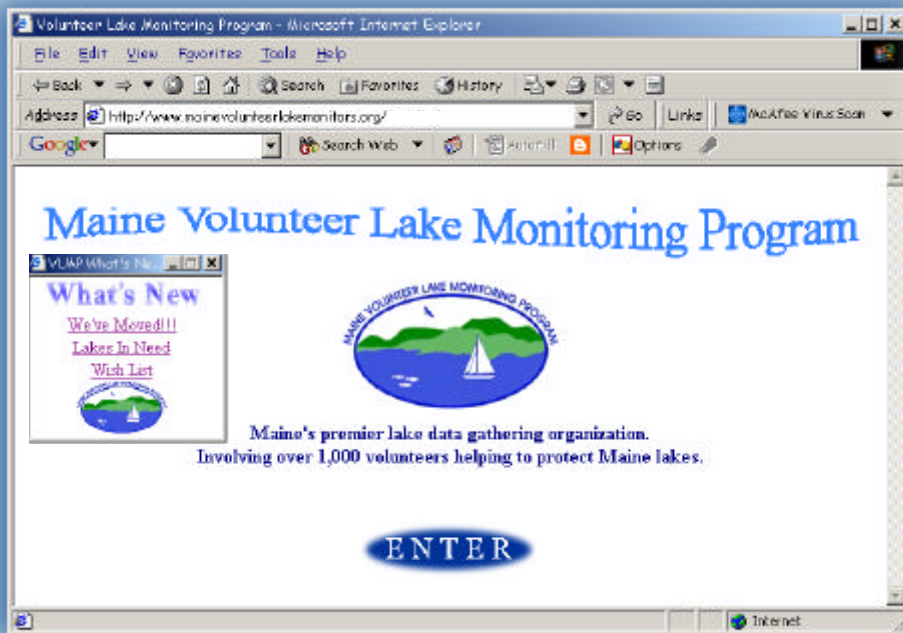


*Check out this beautiful color photo by David Hodsdon on the VLMP website*

[www.MaineVolunteerLakeMonitors.org](http://www.MaineVolunteerLakeMonitors.org)

Check out the new updates to the VLMP website including:

- ▶ List of lakes in need of volunteers
- ▶ Wish list of donations and volunteer help
- ▶ Expanded site for the Maine Center for Invasive Aquatic Plants
- ▶ Directions to the Brackett Environmental Center
- ▶ New images including a photo album of Maine lakes





# QUALITY COUNTS!

Feel like surfing?

How about surfing without leaving the comfort of home?

If this sounds like a winter distraction that strikes your fancy, we've got a mission for you!

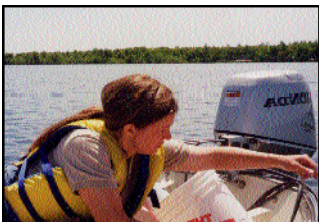
To frame this mission, I'll start with the word *quality*. One definition for quality per Webster is "the degree of excellence which a thing possesses." We all like our clothes, our cars and especially our food to be of a certain, preferably high quality. And we each have our own 'yardsticks' with which to measure that quality. For example, unless the date on the milk is at least 10 days in the future, I won't buy it. The VLMP, DEP and EPA are forever stressing the importance of quality assurance and quality control in the collection and entering of lake data. But data attributes are not the only aspect of lake information that deserves attention of this sort.

This is where we need you! About 30 volunteers are needed to build a new 'yardstick'. For the past 6-7 years, the data collected by volunteers in the VLMP have been posted on the PEARL web site, maintained by the Senator George J. Mitchell Center for Environmental and Watershed Research. This site is about to have a makeover and we need some site users or potential site users to help define how the site should look and what it should provide. In a nutshell, you must be willing to visit a list of 4-5 sites in addition to the PEARL site, and then answer some questions about what you like, what works well, what is confusing, etc.

'User-friendliness' of a web site is a challenging attribute to address. An individual's perception of a site's friendliness is influenced by numerous factors, for example, the number of sites they've visited, their familiarity with the information presented on the site, their level of comfort with computers, and the questions that lead them to the site. We'd like to receive input from folks with a variety of perspectives to provide feedback to PEARL developers. So

we need a range of folks from 'novice surfers' to experts, from volunteers that have only recently become interested in water quality issues to folks that studied such issues in depth years ago.

If you have some time and have a computer that is less than 4 years old with a reasonably fast Internet connection, we could use your help. To volunteer for this mission, please contact Jim at the VLMP office by phone (207-783-7733) or email (vlmp@megalink.net) before March 10<sup>th</sup>. Thanks!



Linda Bacon, Maine DEP QA/QC Advisor seeks volunteer feedback for the PEARL website



# L A K E

# L I N G O

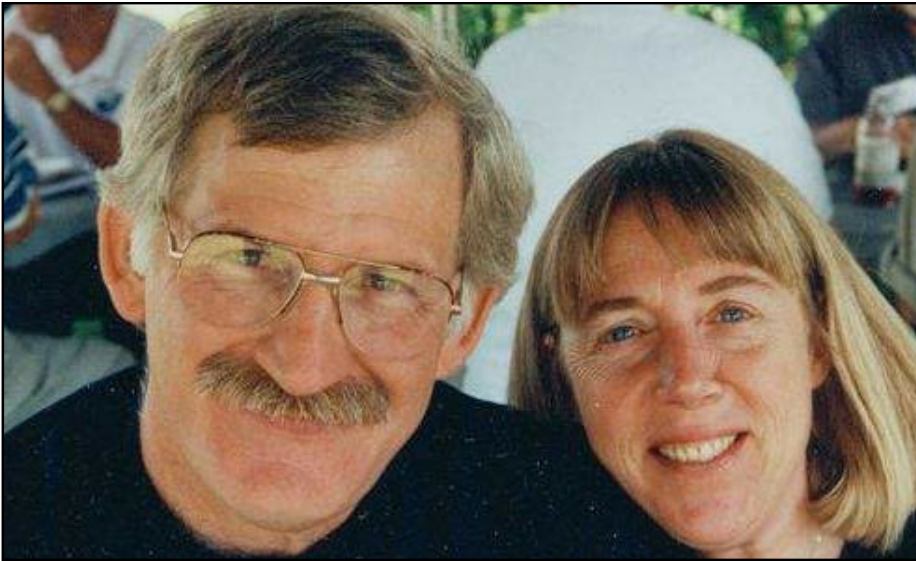


## Plankton:

The word plankton is derived from the Greek *planktos*, meaning to drift or wander. Plankton are minute plant and animal communities that passively float (or swim weakly) in the open water region of lakes and ponds. These tiny, often microscopic, "wanderers" can be sorted into two groups: planktonic plants, collectively referred to as "phytoplankton" (also called algae) and planktonic animals called "zooplankton." Plankton communities are subject to the effects of wind and wave action and water currents, but are capable of regulating their vertical location in the water column to some degree. Planktonic algae are the major "producers" and the base of the food web in lake and pond ecosystems.

For most lakes and ponds, Secchi disk transparency readings represent the abundance of plankton in the water column, although other factors such as silt and natural water color may also influence water clarity. This estimation of the abundance of phytoplankton and zooplankton in the water column is a measure of lake *productivity*, which can be used to determine a lakes' *trophic state*.





*David and Eileen Burnell at the 2003 VLMP Annual Meeting. We applaud their outstanding contributions to Maine lakes and wish them well in their new home in New Hampshire.*

## MOVING ON

Eileen and David Burnell started monitoring Watchic Lake in 1977 during the early years of the VLMP. For more than a quarter century they reliably collected water quality data, and used the information to help inform and educate landowners in their lake watershed about the threats of nonpoint source runoff, efficient septic system practices and invasive aquatic plants.

Their son, Shawn, began monitoring the lake with them soon after he was born. He continued to do so through his college training as an environmental engineer. The Burnells worked with a Bonney Eagle High School Biology teacher, hosting water quality monitoring sessions on the lake and allowing students the opportunity for hands-on experiences in lake assessment, protection and management.

When the VLMP went through the transition from state government to a freestanding nonprofit organization, David and Eileen were on a strategic planning committee to facilitate the change, eventually serving on the VLMP Board of Directors. In 1996 the Burnells were awarded the State of Maine Lake Conservation award, and last November they were honored at a celebration of Watchic Lake for their commitment and dedication to protecting and preserving the lake.

The Burnells recently relocated to New Hampshire. It is difficult to fathom the long-term benefits to Maine lakes and ponds from such committed individuals. We are extremely grateful for their efforts, and for the opportunity to have known and worked with them. They will always be welcome visitors to all Maine lakes.

## NEW TO THE VLMP

Jim Roby-Brantley, Program Assistant

*Jim is from western New York where he graduated from the State University of New York at Geneseo with a degree in physics and a minor in environmental studies. In 2001 he served with AmeriCorps as the Volunteer Coordinator for the Maine Department of Transportation (MDOT.) He has also worked in landscaping and education.*



*Jim is the new VLMP Program Assistant. Stop by the office and you'll meet Jim and his dog Max.*

Working for the VLMP is very exciting for me. During my AmeriCorps service as the MDOT Volunteer Coordinator I was drawn to the community of volunteers working to protect Maine's environment. There is a great satisfaction in being part of such a generous dedicated group.

My favorite part of the job so far is meeting and working with so many great people. I feel like I have been accepted into the extended family of volunteers and organizations working to protect Maine lakes.



MAINE VOLUNTEER LAKE  
MONITORING PROGRAM  
24 MAPLE HILL ROAD  
AUBURN, MAINE 04210



*the Water  
Column*

**PLEASE ADD MY NAME TO YOUR MAILING LIST.**

**PLEASE REMOVE MY NAME FROM YOUR MAILING LIST.**

Help the VLMP conserve paper. If you would like your name removed from our mailing list, let us know.

**PLEASE UPDATE MY CONTACT INFORMATION.**

Name: \_\_\_\_\_

Organization: \_\_\_\_\_

Address: \_\_\_\_\_

Street

Town/City

State

Zip

E-mail (optional): \_\_\_\_\_