35 years 1971-2006

the Water Column

A Publication of Maine Volunteer Lake Monitoring Program

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Welcome New Monitors!

Inside

New Certified Plant Patrollers at a Screening Survey workshop on Echo Lake

What's Inside

To Contact Us:
24 Maple Hill Road
Auburn, Maine 04210
207-783-7733
vlmp@mainevlmp.org
www.MaineVolunteerLakeMonitors.org

Editorial Staff
Scott Williams
Roberta Hill
Richard Jennings
Jim Entwood, Layout

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President's Message

Bill Monagle
VLMP Board President

Changing Seasons

Well, summer is behind us and another successful lake monitoring season is finished. Here in Maine, we're known for, and blessed with, beautiful lakes and ponds that the rest of the nation can only envy. Our lakes provide us with a source of enjoyment regardless of the time of year, whether you like to swim, boat or go ice fishing. We're also known for having a rather long winter and seasonal swings that have become rather mythical. In our daily lives, we are confronted with having to perform chores to adjust to our changing seasons, be it mowing the lawn, raking leaves, splitting and stacking fire wood, or shoveling snow. Great fun, but someone has to do it!

Your VLMP is also confronted with having to perform chores and make adjustments, in this case to an economic climate as difficult to forecast as Maine weather. For instance, the Brackett Center, our wonderful new home on beautiful Lake Auburn, is in need of several maintenance operations, some of which are costly, and some that the staff may be able to perform with minimal expense. The Building and Maintenance Committee has developed a list of needs, and the Board of Directors will be prioritizing these and identifying potential sources to finance them. To compound matters, support from the Maine DEP and other sources, while providing a stable financial platform for the VLMP over the years, remains uncertain. As a result, the VLMP and the Fund Raising and Development Committee has made the decision to develop a fund raising campaign to ensure that the program continues to be the preeminent volunteer monitoring program in the nation. Rest assured that the Board of Directors and staff are up to the challenge and will continue to serve the state of Maine, with your help, of course. Like raking leaves and shoveling snow, we as an organization have chores to attend to.

I'd like to close by thanking all of you who take to our lakes to collect water quality data to enable Maine to keep a finger on the environmental pulse of our treasured resources; without the volunteer spirit and commitment to the health of our lakes exemplified by the hundreds of volunteer monitors, there would be no VLMP! Now, where's the shovel?

Lakeside Notes

Scott Williams
VLMP Executive Director

The Value of Volunteer Observation

Historically, volunteer lake monitors have been keen observers of what takes place on, and below the surface of Maine's lakes and ponds. Over the years, the VLMP has received a number of inquiries from volunteers with questions regarding various "aquatic phenomena." Some of these observations and questions are recurrent and, to a degree, predictable. A week in summer seldom passes in which VLMP staff are not called upon to help explain the significance of either "lake foam," or yellow pine pollen in the water. Both of these are naturally occurring, and highly visible under certain conditions in our lakes and ponds. More recently, questions concerning metaphyton (a form of filamentous algae) and of bryozoan colonies (especially in 2006 - see article in this issue of *The Water Column*) have increased. It is hard to say why these phenomena draw more attention in one lake than another, and are more or less abundant from one year to the next - if in fact they are.

The extent to which either may be on the increase or decline, is largely unknown. However, based strictly on the number of recent volunteer observations and inquiries, one might be tempted to conclude, for example, that the incidence of metaphyton colonies is on the increase in some Maine lakes. Some believe this to be the case. However, an increase in the number of observations about metaphyton (largely qualitative in nature) could also be due to the fact that the number of volunteer monitors continues to grow, as does the level of knowledge and awareness of the average volunteer. Another factor might be the growing number of observant shorefront property owners on Maine lakes.

Those who seek quick answers concerning changes in the frequency and occurrence of aquatic phenomena are likely to be frustrated, because there is a paucity of data concerning their distribution and abundance. However, one of the most important aspects of the scientific process is patient observation and detailed documentation. Curiosity, a sharp eye, and attention to detail yield information that, over time, may become increasingly meaningful. Enter Maine's volunteer lake monitors and invasive plant patrollers, many of whom have recorded their observations over the years on the "comments" section of their field forms.

So much of what we know about Maine lakes is the result of the efforts of VLMP volunteers. This knowledge is the foundation for protective efforts, not only for individual lakes, but for Maine lakes as a whole. For example, over time, cycles and trends in the Secchi transparency of individual lakes may become more evident, and our confidence in the data that show these changes (or lack thereof) increases with each full season of information. We—everyone who uses VLMP data, including the Maine DEP, the University of Maine, individual lake associations, towns, and many more—are now able to compare and contrast the data for hundreds of lakes and ponds in Maine, thanks to this ongoing effort.

So, when something catches your attention on, or below the surface of your lake, please do make a note of it—providing as much detail as possible, including any historical reference information that you may have. Use the comments section of your field data sheet or, if more room is needed, attach a separate sheet. We're very interested in what you see out there!

An excellent publication that provides a quick overview of some of the most commonly observed "stuff" that one is likely to encounter in and on Maine lakes and ponds is entitled: A Field Guide to Aquatic Phenomena, published by the George J. Mitchell Center for Environmental and Watershed Research (University of Maine) and the Maine Department of Environmental Protection. This publication can be viewed at:

www.umaine.edu/waterresearch/FieldGuide/default.htm

Littorally Speaking

The use of Herbicides to Control Invasive Aquatic Plants: Questions and ~~Answers~~ *More Questions…*

By Roberta Hill, Program Director, *Maine Center for Invasive Aquatic Plants*

Twenty-seven waterbodies in Maine are known to be infested with invasive aquatic plants. Variable water-milfoil is the most widespread of these invaders, accounting for twenty-two of the infestations. A hybrid of variable-milfoil is found in two additional waterbodies. The remaining three are all solitary infestations: Hydrilla in Pickerel Pond in Limerick, curly leaf pondweed in West Pond in Parsonsfield, and Eurasian water-milfoil in an unnamed quarry pond in Scarborough.

The increased awareness of existing or new infestations, the alarming rate of advance of some invasive populations, and the significant challenges that arise when one takes on the task of controlling aquatic invaders have all contributed to a growing sense of urgency, perhaps even something more akin to panic. It is not surprising that, in the midst of this deepening climate of concern, the hunt should intensify for the proverbial "silver bullet" that will, if not kill the offending invader once and for all, at least diminish it to the point that it no longer poses a significant threat. It is in this context that some are now asking about the possibility of expanding the use of aquatic herbicides to control the invaders. Some commonly asked questions are "Why can't we just kill the plants with herbicides?" or "Other states routinely use aquatic herbicides to control invasive aquatic plants: Why aren't herbicides more widely used in Maine?"

The purpose of this article is to take a careful look at the prospect of expanding the use of aquatic herbicides in Maine—and to ask some of the questions that will surely arise as we, the citizens of Maine, begin to consider the pros and cons of such a course of action. How are aquatic herbicides currently being used in our state? What is the rationale behind Maine's current "cautious" approach to the use of aquatic herbicides? Are aquatic herbicides safe? Are they effective?

The intention here is not to attempt to provide *answers* to these questions, because to some extent there are no clear answers. Rather, it is to illuminate some of the complexities inherent in the questions themselves, and to suggest the types of questions that should be asked if we wish to ensure the best decisions moving forward—decisions that will not only "get the job done" but get it done in a way that will produce the best outcome not only for us, but also for the native aquatic ecosystems, and for future generations. The primary goal of this article, in other words, is to simply get the ball rolling on a critically important public discussion; one that ultimately may impact all of us who have a special place in our hearts for Maine's lakes, ponds and rivers.

Question 1: How are aquatic herbicides currently being used in Maine? What is the rationale behind Maine's current "cautious" approach to the use of aquatic herbicides?

To treat waters of the State with an herbicide one must apply for, and receive, a waste discharge license from the Maine Department of Environmental Protection. Licenses are approved (or not) on a case-by-case basis. The risks and benefits of using a particular herbicide are weighed against the risks and benefits of not doing so. The risks and benefits associated with alternative methods of controlling the particular infestation must also be considered.

The rationale behind Maine's measured and cautious approach to regulating the use of aquatic herbicides was stated succinctly by Maine Department of Environmental Protection Commissioner, David Littell, in his keynote address at this year's Milfoil Summit: "Herbicides, and all other pesticides for that matter, pose a definite degree of risk for people, for fish, and for the integrity of the aquatic ecosystem which depends on that body of water." Though state officials are currently using aquatic herbicides to control invasive plants in two instances as described below, it is the state's position that the "benefits of using herbicides rarely exceed the risks of very real adverse ecological impacts." Therefore "it is only in extraordinary circumstances that DEP will support the use of herbicides."[1]

Since 2003, Maine DEP has approved and overseen the use of aquatic herbicides in two specific instances—the Hydrilla infestation in Pickerel Pond in Limerick, and the Eurasian

water-milfoil infestation in the unnamed gravel pit in Scarborough. According to Commissioner Littell, both of the infestations are seen as unique. Each represents the only known infestation by that particular species in Maine. Both occur in small ponds less than 50 acres in size, "small enough to manage effectively." Both species are considered extremely serious invaders, widely recognized by biologists as among the "most tenacious, most costly, and most environmentally damaging plant species in North America." Containing these two particular invaders and "preventing any opportunity for them to take hold elsewhere in Maine—is", according to the DEP, " the primary benefit of using herbicide on these two ponds."[2]

Treating Hydrilla in Pickerel Pond with herbicides
photo credit: Maine DEP

Maine DEP's Paul Gregory has explained that the decision to apply herbicides in these two unique situations was something like deciding to treat an aggressive [and in this case highly infectious] disease with chemotherapy, a toxic regimen that interacts with the whole system being treated, not just those parts you are attempting to destroy … "very serious medicine to be used only when all other, less risky treatments have been ruled out as inadequate to the task."

Question 2: Are aquatic herbicides safe?

All herbicides legally used in the United States for controlling aquatic plants must be "registered for use" by the US Environmental Protection Agency (EPA). According to the EPA's own definition, pesticide registration is the "process through which EPA examines the ingredients of a pesticide; the site or crop on which it is to be used; the amount, frequency and timing of its use; and storage and disposal practices. EPA evaluates the pesticide to ensure that it will not have unreasonable adverse effects on humans, the environment and non-target species."[3] It should be noted that the EPA definition does *not* say there will be "no adverse effects." It says that any possible adverse effects will not be "*unreasonable*." So here is one of those niggling complexities that gives rise to more questions…Who gets to define the term "unreasonable"? Under what conditions is an *adverse* effect deemed to "reasonable?"

Although pesticide registration is scientifically rigorous it does not guarantee that a product is completely safe. Significant gaps in the research remain. Roy Bouchard, biologist with the Maine Department of Environmental Protection, points to one of the gaps. "I know of very few long-term studies of the effects of herbicide use on ecosystems. Repeated use of herbicides for long term management of aquatic vegetation can fundamentally shift how the system operates, and how the rest of the plant and animal community that depend on aquatic vegetation responds in the long term. Herbicides may not kill organisms such as invertebrates or fish directly, but little is known about what will happen to [these organisms] and their habitat over time."

Part of the problem lies in the fact that for organisms other than humans, the registration process is primarily concerned with "acute toxicity," the study of how much of the product in question it takes to kill this life form or that. When it comes to "sub-lethal effects," especially on creatures other than mammals, very little is known. And what *is* known is not entirely reassuring. Recent studies on endangered Pacific salmon, for example, have suggested there may be sub-lethal or behavioral effects from pesticides. Another problem comes from the way the data is generated. Most of the "effects" are extrapolated from short term, high dose tests conducted on a small number of species. A number of epidemiological studies suggest that the short term animal studies tend to underestimate the effects on humans, and the same studies support the notion that many sub-lethal effects aren't being predicted at all.

Another area where knowledge is scarce surrounds the question of how different compounds interact with each other in the environment. What are the risks to the environment and human health when herbicides applied directly into our water resources are combined with other toxic materials released into the watershed from forestry, agriculture, and home lawn and garden activities? The EPA estimates that there are currently about 87,000 "chemicals in commerce" in the US. Do the math and you will soon understand the complexity inherent in properly assessing all possible interactions between all possible combinations of these chemicals in the environment.

Which begs another question…do we even know which chemicals are already present in our lakes and rivers, and at what concentrations? Following a ten-year national study of rivers and aquifer systems conducted by the EPA and the US Geological Survey (USGS), a report was recently released describing the occurrence of pesticides in our nation's waters. The report concludes that pesticides (a broad group of chemicals that includes herbicides) are "typically present throughout the year in most streams in [developed] areas of the Nation…at concentrations that may affect aquatic life or fish-eating wildlife."[4]

The EPA/USGS study also discovered that detected pesticides seldom occur alone; rather they almost always occur as complex "mixtures." Acknowledging that very little is known about the potential toxicity of such mixtures, the researchers ultimately conclude that "the study of mixtures should be a high priority."

Most stream samples and about half of the well samples contained two or more pesticides and frequently more. The

Continued on page 14

Thank you to our friends and supporters for advancing the VLMP's mission to protect Maine's lakes and ponds.

Associations and Businesses

Bear Pond Improvement Association
Belgrade Lakes Association
Belgrade Regional Conservation Alliance
Boyden Lakes Association
Clearwater Lake Improvement Association
Cold Stream Campowners Association
Damariscotta Lake Watershed Association
Echo Lake Association
Embden Pond Association
Five Kezars Improvement Association
The Groundskeeper
Hancock-Sand Pond Association
Lake Anasagunticook Association
Little Wilson Pond Improvement Association
Pleasant Pond Conservancy
Portage Lake Association
Rangeley Lakes Heritage Trust
Sebec Lake Association
Summer Haven Lakes Association
Tacoma Lakes Improvement Society

Agencies and Foundations

Auburn Water District
Hebron Water Company
Lake Auburn Watershed Protection Commission
Maine Department of Environmental Protection
Portland Water District
Roy Hunt Foundation
Tom's of Maine Foundation
US Environmental Protection Agency

Special thanks to the support from volunteers, individuals, and associations! Your contributions have enabled the VLMP to purchase a new 26 foot pontoon boat. Many new volunteer monitors have offered glowing praise and appreciation for the quality of the training experience we are able to provide on the new boat.

Individuals

Lynda and Bill Allanach
Linda Bacon
Patricia Baldwin
Barbara Barnes
Forrest Bell
Scott Bernardy
Michael Bernstein
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George Bouchard
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Robert Warren
Fred Weston Jr.
Lew Wetzel
Scott Williams
Pixie Williams
Tom Willis
Gordon Wright

New Water Quality Monitors

Certified water quality volunteers like Bill Reynolds (photo above) monitor their lakes twice a month during the field season (May to September) for Secchi transparency and other water quality indicators.

In 2006 the VLMP also trained and certified a new group of volunteers to begin monitoring dissolved oxygen, an important indicator of lake health.

Ken Abloum	Lawry Pond, Searsmont
Bill Bartosch	Mousam Lake, Acton
Brie Begiebing	Sebago Lake, Sebago
Bill Blaine	Bog Lake, Northfield
	Fulton Lake, Northfield
	Long Lake, T19 ED BPP
Martin Blaney	Horseshoe Pond, West Gardiner
Mike Coburn	Prong Pond, Greenville
Susan Eland	Moose Pond, Denmark
	Lovewell Pond, Fryeburg
	Burnt Meadow Pond, Brownfield
Wayne Gautreau	Little Ossipee Lake, Waterboro
Milt Gilmore	Green Lake, Dedham
Jocelyn Hubbell	Lily Pond, New Gloucester
Richard Jennings	Lovejoy Pond, Fayette
Jennifer Jespersen	Hopkins Pond, Mount Vernon
	Minnehonk Lake, Mount Vernon
Liz Larson	Lakes Environmental Association
Katie Manende	Various Lakes
John Kistner	Cross Pond, Morrill
Ed Lajoie	Cross Pond, Morrill
Angela Micucci	Little Sebago Lake, Windham
Thomas O'Neil Jr	Prong Pond, Greenville
Lori Oransky	Colcord Pond, Porter
Haron Ouellet	Sebago Lake, Sebago
John Plummer	Moose Pond, Hartland
Bill Reynolds	Branch Lake, Ellsworth
Mark Rix	Loon Pond, Acton
Karen Robbins	Sewall Pond, Arrowsic
Tricia Rouleau	Various lakes
Noble Smith	Various lakes
Rob Stenger	Damariscotta Lake, Jefferson
Bethany Stetkis	Lake George, Canaan
	Sibley Pond, Canaan
	Oaks Pond, Skowhegan
Michael Thibault	Sennebec Pond, Appleton
Chad Thompson	Sebago Lake, Sebago
Kris Thompson	Pond In the River, Township C
Jay Vreeland	Crystal Lake, Gray
Suzanne Waterman	Androscoggin Lake, Leeds

2006 New Certified Invasive Plant Patrollers

Welcome new Certified Invasive Plant Patrollers!

Certified IPP volunteers have committed to survey their waterbody each year and submit their survey results to MCIAP.

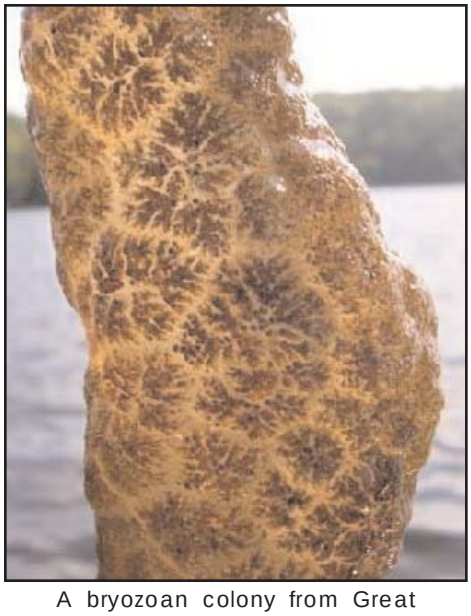
Lance Bagley	Meddybemps Lake, Meddybemps
	Thompson Lake, Oxford
Ellen Bishop	Pitcher Pond, Northport
Kerry Black	Saint George Lake, Liberty
	Lake George, Canaan
Alison Bossie	Nickerson Lake, New Limerick
Judy Bourget	Jimmy Pond, Litchfield
	Buker Pond, Litchfield
	Sand Pond, Litchfield
	Woodbury Pond, Litchfield
	Sand Pond, Litchfield
Virginia Bourne	Branch Lake, Ellsworth
Linda Breslin	Lake George, Canaan
	Saint George Lake, Liberty
Jim Caldwell	Lake George, Canaan
	Saint George Lake, Liberty
Annie Cashon	Pushaw Lake, Old Town
Tori Clark	Various Ponds

James Cook	Pitcher Pond, Northport
	Pitcher Pond, Northport
Janie Crowell	Craig Pond, Orland
Jessica Gianinoto	Buker Pond, Litchfield
	Sand Pond, Litchfield
	Jimmy Pond, Litchfield
	Woodbury Pond, Litchfield
Gail Graves	Schoodic Lake, Lake View Plt
Christine Guerette	Sabattus Pond, Greene
Richard Hargreaves	Porter Lake, Strong
	Porter Lake, Strong
Don Hayes	Branch Lake, Ellsworth
Brandy Hilliard	Buker Pond, Litchfield
	Jimmy Pond, Litchfield
	Woodbury Pond, Litchfield
	Sand Pond, Litchfield
Elaine Holcombe	Mooselookmeguntic Lake, Rangeley
Charlie Hudson	Stevens Pond, Liberty
Jan Ice	Branch Lake, Ellsworth
Jane Jagels	Branch Lake, Ellsworth
Cindi Jay	Ebeemee Lake, T05 R09 NWP
	Schoodic Lake, Lake View PLT
Jake Leithiser	Pushaw Lake, Old Town
	Beddington Lake, Beddington

George Lewis	Branch Lake, Ellsworth
Bill Mann	Round Pond, Livermore
	Round Pond, Livermore Falls
Jeff Melanson	Saint George Lake, Liberty
	Lake George, Canaan
Carole Merrifield	Cargill Pond, Liberty
Joyce Mykleby	Cathance Lake, No 14 PLT
Gail Philippi	Various Lakes
Steve Pierce	Mooselookmeguntic Lake, Rangeley
	Rangeley Lake, Rangeley
Nancy Putnam	Nickerson Lake, New Limerick
Tom Ray	Thompson Lake, Oxford
Sarah Roach	Branch Lake, Ellsworth
Rosemary Robbins	Branch Lake, Ellsworth
Meg Rothberg	Meddybemps Lake, Meddybemps
Frank Roy	Mattaseunk Lake, Molunkus Twp
Susan Rylander	Branch Lake, Ellsworth
Kim Skaves	Branch Lake, Ellsworth
Karen Smith	Meddybemps Lake, Meddybemps
Lea Stabinski	Echo Lake, Fayette
James Stewart	Webb Lake, Weld
Ozro Swett	Webb Lake, Weld
Jackie Tanner	Great Pond, Belgrade
Rick Tidd	Deering Lake, Orient
	Brackett Lake, Weston
Pete Trouant	Meddybemps Lake, Meddybemps
Suzanne Uhl-Melanson	Saint George Lake, Liberty
	Lake George, Canaan
Paul Warren	Echo Lake, Fayette
Ginny Warren	Echo Lake, Fayette
Suzanne Waterman	Androscoggin Lake, Leeds
Ellie White	Little Kennebago Lake, Stetsontown
Kansas Wight	Thompson Lake, Oxford

Yikes! What's That Glob in the Water?

By Scott Williams



A bryozoan colony from Great Pond in Belgrade, Maine, 2006. Photo by Sarah Melvin.

Meet the Bryozoans

So, you're just about to cast off from shore, on the way to the deep station to take a Secchi disk reading, or to screen the littoral area for aquatic invaders. You glance down into the water, and Yikes…what's that large, shimmering gelatinous glob attached to the boat mooring line!? It looks like an alien pod (although perhaps not as large as the ones in the movies). But it *is* big…maybe even as large as a football. Could it be a giant egg mass—or a mutant pond creature?

Don't worry; what you have discovered is most likely a bryozoan colony, a benevolent phenomenon. Bryozoans (translate: "moss animals") are actually common inhabitants of lakes and ponds, although of the more than 3,000 species worldwide, only about 50 are known to live in freshwater environments. Bryozoans are members of the animal phylum Ectoprocta. The freshwater species are all members of the class Phylactolaemata. Fossil records for the bryozoans extend to more than 500 million years ago.

Bryozoans are colonial water invertebrates that are often interconnected within a gelatinous structure (a.k.a. "the glob"). The colonies are usually found in shallow, protected areas, attached to a substrate, such as the lake bottom, a twig, or a mooring line. The masses may be relatively translucent, or they may be dark green or brown when covered with algae. Within the gelatinous globs are many individuals called "zooids" that can usually be seen with the naked eye. The individual animals are tiny, often less than a millimeter in length, and there may be only a few, or thousands of them in a large colony. Accordingly, the colonies range from very small (millimeters) to as large as a basketball.

Bryozoans are filter feeders; each microscopic zooid pokes a tiny, petal-waving structure (technically, according to Wetzel[1] "lophophore," with a "ciliated tentacular crown") out of the glob and into the water. The waving petals create a very small water current. As zooplankton and algae pass by, they are directed by the current into the mouths of the individual bryozoans. Nutrients and particulate matter are removed from the water in this way. Although it would take a great number of bryozoan colonies to create a noticeable change in the clarity of most lakes and ponds, these tiny creatures do play a role in maintaining the balance of aquatic ecosystems.

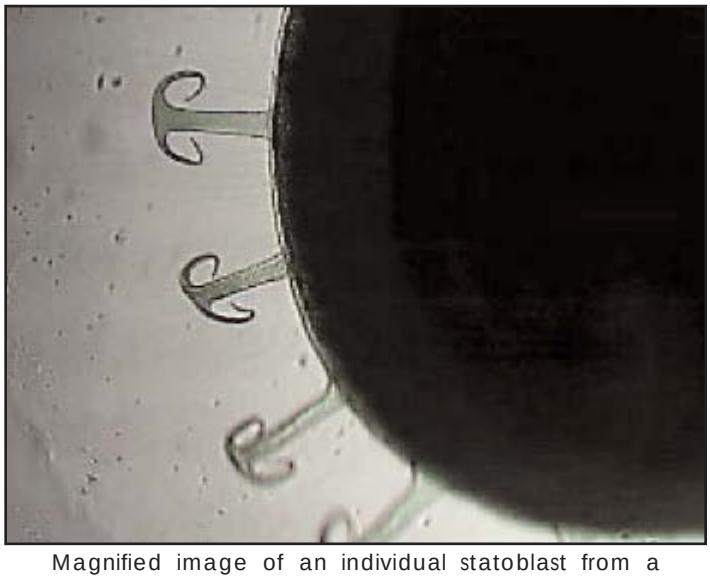
The colonies are often inhabited by a number of algae and non-bryozoan species of invertebrates that are also

common to lakes and ponds, including insect larvae, and protozoans. All of this makes a tasty and nutritious food source for fish, snails, and the larvae of some aquatic insects.

The specific habitat needs of bryozoans seem to vary. For example, some species appear to thrive in cool, but not cold water. Others prefer distinctly warm water temperatures. In both cases, cold water causes the colonies to dissolve and release "statoblasts," buds that can remain dormant for years, tolerating both freezing and drying during the period. The statoblasts may be picked up by creatures that graze in shallow areas, and transported to nearby waterbodies. In addition to producing statoblasts, bryozoans also reproduce non-dormant buds through an asexual process that allows individual colonies to rapidly grow in size during the summer. Individual colonies often break apart as a result of wind and wave turbulence. Each resulting particle becomes a functional clone of the original colony. Obviously, bryozoans have evolved with a number of reproductive strategies! Although the globular colonies may quickly become very large, predation by fish may limit both the shape and size of the bryozoan globs.

Bryozoans have a relatively short life cycle. Most colonies exist for only a few to several weeks, depending on changes in water temperature, predation, and other factors that are less well understood. Although many species of freshwater bryozoans seem to prefer eutrophic (moderate nutrients and algae growth) waters, some are known to thrive in cool, oligotrophic (low nutrients and algal productivity) lakes and ponds. These include species of the genus *Plumatella*, which is known to exist in Maine lakes and ponds. In either habitat, bryozoans can't tolerate contaminated water, and may therefore be useful indicators of overall healthy aquatic ecosystems. Their presence on your mooring line may be telling you something positive about your lake!

This past summer the VLMP received more than the usual number of inquiries from volunteers about bryozoans, although in most cases, the observers were not aware of what they had seen, and were concerned that the giant globs were an indication that their lake might have a problem. But the bottom line is that these tiny animals are both normal, beneficial to ecosystem stability, a good source of food for other lake residents, and they may be helpful indicators of uncontaminated water. So if you see a bryozoan colony, while it would be best to leave it in place, try taking a closer look at these interesting creatures with your viewing scope. The more that we understand about our lakes and ponds, and the flora and fauna that are essential to their function and health, the better position we are in to be effective long-term monitors and stewards.



Magnified image of an individual statoblast from a bryozoan colony. Photo credit: Sarah Melvin

Could a bryozoan colony be confused with metaphyton? Perhaps, since both could be similar in size and color - which might range from greenish-yellow to brown. But metaphyton clouds (pillows) have little or no substance when poked with a stick, or removed from the water, whereas bryozoan colonies are more solid (though gelatinous), and will hold their form (more or less) when removed from the water. Beyond this, bryozoans are fauna (tiny animals in this case), and metaphytpon are flora (algae), although, to make things a little more confusing, bryozoan colonies often contain algae, and metaphyton clouds often contain trapped zooplankton and other critters.

Special thanks to Sarah Melvin for providing the excellent photos of bryozoan colonies from Great Pond in Belgrade.

References:
1. Wetzel, Robert G.; Limnology, 2001; Academic Press

For additional information:
www.millermicro.com/bryozoa.html
www.umaine.edu/waterresearch/FieldGuide/default.htm

Experiences of a Maine Milfoil Diver

By Jackey Bailey
VLMP Special Projects Coordinator for Invasive Aquatic Plants

Suction Dredge Diving

It's 8:30am and I head out to Little Sebago to start my day of diving. Arriving at the dock, I see the captain is there already. I lug down my diving gear and hop aboard the pontoon boat affectionately known as the HIPPO I. Captain Jim refuels the boat and I grab a few more onion bags and away we go.

Today's plan starts with a sweep of swamp cove and then to the Narrows. As we cruise out to our first destination I don my wetsuit and start getting my gear together. Swamp cove is an area we have been in before but just when we think we got them all, those darn milfoil plants crop up again. We arrive and I strap on the air system and jump in. This style diving is quite nice, no tanks and buoyancy vest, just my weight belt and the little harness for the regulator.

I swim around to the back of the boat and connect the Anaconda - the name of the long tube that I will use as the "suction" for the milfoil. This thing is 50 feet long and about 6 inches in diameter. When it's turned on the force of the suction carries the milfoil plant up to the boat and through a chute where they are deposited in onion bags. I have to be careful while using the Anaconda as I have had my arm sucked up the tube before and it took quite a bit of strength and pulling to get it back out!

I begin in the cove by locating the buoys put out by local camp owners that have spotted milfoil plants, and survey an area around the buoy to make sure I have it all. After 8 buoys it looks like the cove is clear…for now. Over 100 bags have come out of this cove alone, but we are gaining. Once the first round of plants was removed there was sunlight and room for any dormant plants to shoot up. The cove has a lot less milfoil than the first time I dove here. That day I just hovered in place, carefully removing the plants by digging into the substrate to get the roots as well as the plant and then sending them up the anaconda. We sucked up tons of plant material that day. Now it's just a few plants speckled throughout the area. We wrap up with Swamp Cove and put the buoys back on the dock just in case other plants are found so they can be marked.

I climb back on the boat and off we head to the narrows. Aptly named, this is a narrow section of the lake that links the upper basin to the middle basin. Lots of boat traffic and lots of milfoil. Once we are anchored in place I jump in and grab the Anaconda and start sucking up the milfoil. There is a lot more here and it keeps us busy for the rest of the day. At one point as I am swimming along something catches the corner of my eye. At first I think it is a strange

The Little Sebago Lake Association has several divers that help remove invasive hybrid milfoil from the lake using a volunteer built suction harvester aboard the HIPPO I (photo above). As water is sucked up by the divers it is fed through a system of onion bags and screens (photo right) to remove the plant fragments.

shaped piece of wood then I realize it is a HUGE turtle! She must be 2 feet long! I have never seen such a huge turtle in a lake. What a beautiful site. She turns her head slightly as if to check out what I am doing but doesn't move. Being that size I am sure she is not afraid of too much. I decide to keep sucking milfoil AWAY from her direction. Just in case. After a few hours at this site the day is winding down. I unhook the Anaconda and we roll it back up onto the boat and head for home. It wasn't a bad day, 23 onion bags full of milfoil.

Jackey Bailey on Little Ossipee River Flowage (Lake Arrowhead) surveying for milfoil re-growth

Research Diving

Today I get to work on my research sites. I am traveling up to Shagg Pond, near Woodstock. I meet Chris, who heads the University of Maine's diving program and helps me out with my research. It's quite a drive to the site but one of the most beautiful locations. I am fortunate that a local camp owner allows me to use their lake front yard as a staging area. We pull the gear from our vehicles and walk down to the waterfront. The setting is amazing. A small pond surrounded by rolling mountains. We put on our tanks and diving gear and slide off the dock into the water. This is the muckiest lake of all my research sites. With all the diving gear on we sink up to our knees in the organic sediment under us. Once it is deep enough we swim out to the plots. Today I have to remove the milfoil from one of the plots. When we reach the edge of the plot we sink down 8 feet until we hover just above the pond bottom and begin by wrapping the long milfoil fronds around our upper arms - we call this the spaghetti method. Then, we dig our fingers into the sediment under the plant roots and gently pull them up careful to remove the entire root ball. After the removing 5-6 plants the area around me gets very mucky and I can barely see my hand in front of my face. As I move forward to a clear patch I keep seeing quick darting movements behind me. I turn and see five good size catfish hanging by my feet. I keep working and at one point a catfish swims right at me. I had to swish my hand around in front of him in order to stop him from crashing into my facemask. By the time I make it all the way around the plot, I have 15 catfish following me. My fish-tourage! (You know fish + entourage.) All the sediment suspended in the water has caused a catfish feeding frenzy. We finish pulling the milfoil and haul the very full (and heavy) bags back to the shore. It has taken us about 6 hours to get the milfoil completely removed from the site and we are tired.

Shagg Pond near Woodstock contains one of the variable milfoil infestations that Jackey Bailey is researching.

Benthic Mat Diving

Benthic mat day at Lake Auburn is always interesting. I meet my fellow diver Jim and we lug the canoe and our gear down to the lake. We have to paddle over to the wetland where we are putting down a fabric bottom barrier (a.k.a.: benthic mat) to cover the milfoil. After gearing up we load some of the mats on the canoe and swim beside the canoe out to the infested area. Jim and I work quickly unloading the mat from the canoe and placing it over the infested area, then rolling it out. After about five mats, I notice that there is something wriggling in the water. As I look closer I see that they are small black leeches. Yuck! Thankfully I am wearing a wetsuit, gloves and hood. We place 20 mats and head back to shore. As I climb out of my wetsuit and booties I notice a couple smudges on my foot. They turn out to be a couple of leeches which had not fully attached so I flicked them off. Ewww. Sometimes I wonder what I am thinking mucking around in leech-infested areas. At least I didn't get a leech on my lip like another milfoil diver I know. Oh well! All in the day of the life of a milfoil diver. Another day of fighting the spread of milfoil is done.

The VLMP offers training for certified divers in manual removal of variable milfoil each summer through the Maine Center for Invasive Aquatic Plants.

> potential effects of contaminant mixtures on people, aquatic life, and fish-eating wildlife are still poorly understood and most toxicity information, as well as water-quality benchmarks used in the study, has been developed for individual chemicals. The common occurrence of pesticide mixtures, particularly in streams, means that the total combined toxicity of pesticides in water, sediment, and fish may be greater than that on any single pesticide compound that is present. Studies of the effects of mixtures are still in early stages, and it may take years for researchers to attain major advances in understanding the actual potential for effects. Our results indicate, however, that studies of mixtures should be a high priority.[5]

This call for a better understanding of the "potential effects" of herbicides—and in particular the potential effects of herbicides on public health—has been voiced here in Maine as well. Roughly one third of Maine's citizens get their drinking water from "surface waters" of the State (lakes, ponds and rivers). What impact, if any, would loosening the restrictions on the use of aquatic herbicides have upon Maine's drinking water supply? Echoing some of the concerns described above, the Maine Water Utilities Association (MWUA) has taken a clear position on the issue.

> Like all surface waters in the state, [those that serve as] water supplies are threatened by the spread of invasive aquatic plants. As drinking water suppliers, our primary concern is for potential impacts that the spread of these organisms could have upon human health and the long-term safety of the drinking water supply.
>
> …The use of aquatic herbicides to control invasive plant infestations has become common [in the United States]. Despite the advertisements that claim these products leave "no residue" and have shown "no adverse effects," there are still many questions left unanswered about the long-term health risks associated with these agents, for both humans and wildlife.[6]

In making its case, MWUA points to another outstanding gap in the research concerning the safety of aquatic herbicides.

> One significant question yet to be answered is whether or not the chemicals currently used to control aquatic plants are endocrine disruptors. Endocrine disruptors are synthetic chemicals that interfere with the operation of the endocrine system, the system of hormones that regulates an organism's development, growth, reproduction and behavior. Because they may interfere with reproductive function, the adverse affects of these compounds may not be immediate but, instead, passed from one generation to the next…
>
> …At present, the research focused on the effects of these compounds on human endocrine systems is incomplete and inconclusive. According to the EPA, "there currently is not enough scientific data available on most of the estimated 87,000 chemicals in commerce to allow us to evaluate all potential risks.[7]

After consideration of the potential, as yet unknown risks associated with the use of aquatic herbicides, MWUA argues for erring on the side of caution, taking the position that "No herbicides should be used in a public drinking water supply."[8] And if aquatic herbicides are to be used in the *watershed* of a public drinking water supply, MWUA suggests the following conditions should apply:

1. The compound to be used has undergone adequate testing to determine the short and long-term health effects on human health, including the compound's potential to disrupt endocrine systems.
2. The chances for total eradication by this method are excellent, reducing the need for repeated applications.
3. All water utility customers are properly notified of the intended action, given an opportunity to comment, and concerns can be adequately addressed.[9]

Question 3: Are aquatic herbicides effective?

There is a good deal of research and numerous case studies supporting the claim that aquatic herbicides are effective tools in controlling or "knocking back" aquatic plants. But *eradication* of invasive aquatic plant species by *any* means, including by the use of herbicides, is rare indeed.

Case in point: Hydrilla in the state of Florida. Hydrilla, now in more than 40% of Florida's public waters, is reported to be the most abundant submersed aquatic plant in the state. Despite one of the most aggressive (and expensive) invasive plant management programs in the country, involving an extensive use of aquatic herbicides, this "worst of the worst" invader appears in more Florida waterbodies every year.

Hydrilla infestation in Pickerel Pond, 2002
photo credit: MCIAP

One of the challenges of Hydrilla, is that the herbicides commonly used to control it do not affect Hydrilla seeds, tubers and turions (small vegetative buds capable of reproduction) and repeated applications are needed to control regrowth. The Hydrilla in Pickerel Pond, for example, has been treated with fluridone (the herbicide of choice for this invader) for four years running. It is not yet known how many additional treatments may be needed before the "tuber bank" in the sediments will be depleted to the point that regrowth can be handled by manual control methods alone.

Another problem with respect to the efficacy appears to be the result of a phenomenon known as "herbicide resistance." When a plant loses its sensitivity to an herbicide over time through the process of genetic selection, it is said to have become "resistant" to that herbicide. We have been aware of this phenomenon for decades in agricultural systems, so it is not really surprising to learn that evidence is now mounting to show that some aquatic plant species are developing a similar resistance.

An article in the spring 2006 issue of *Aquatics,*[10] the journal of the Florida Aquatic Plant Management Society, reports that some Hydrilla populations in Florida have developed resistance to fluridone; meaning that the herbicide is no longer effective in controlling Hydrilla in these lakes. The authors suggest various strategies for minimizing the potential for resistance, including: avoiding the repeated use of herbicides that kill plants by way of the same "mode of action," alternating the types of herbicides used, and using other non-herbicide methods, such as mechanical and/or manual control, when feasible.

What is the extent of aquatic herbicide resistance nation wide? What are the possible implications of this resistance over time? As for the suggestion that "alternating herbicides" may be one solution to the resistance problem, how does this strategy square with the USGS/EPA caution regarding "herbicide mixtures"? Again, there are many questions to be asked, and limited data with which to answer them.

There seems little doubt that the discussion and debate concerning the question of the "proper" use of aquatic herbicides in Maine will be with us for some time. It is a discussion worthy of careful attention, thoughtful consideration and widespread involvement.

When you come to a difficult crossroad, it is always a good idea to take a few steps back where you can ponder the longer and broader view. Maine proudly claims that ours is the state where life is "as it should be." One assumption inherent in that claim is that we have an environmental condition that sets us apart from other states, and our unique environmental heritage is something to be valued and protected. The shorelines of most of Maine's lakes and streams are vastly different, aesthetically and ecologically, than shorelines in most other states in our country. This is in part due to the fact that we have had less development pressure. But it also stems from having the advantage of learning from the experiences of others who have already borne those higher pressures. Maine's Shoreland Zoning codes, almost unique in the nation, are a prime example of benefits reaped from lessons gleaned from "away." Maine's cautious approach to the use of aquatic herbicides is another example.

Which brings us back full circle to one of the original questions asked here, "Other states routinely use aquatic herbicides to control invasive aquatic plants. Why aren't herbicides more widely used in Maine?" Perhaps the best way to answer this question is to pose another…"Just because other states allow the widespread use of herbicides (as well as significant alterations of shoreline and wetland habitat etc.) *is* that a good reason for Maine to follow suit?"

Alternative (non-chemical) methods of controlling invasive aquatic plants currently being used in Maine will be the topic of the next *Littorally Speaking*. (Also, please see *Experiences of a Maine Milfoil Diver* on page 12 of this issue of the Water Column.) In the meantime, please help us keep the discussion moving forward. What do you think about this important issue? We welcome your perspective, your ideas and yes… your *questions*!

Notes:

1. *Keynote Presentation at the Seventh Annual Maine Milfoil Summit* by Commissioner David P. Littell, Maine Department of Environmental Protection. Text of the commissioner's speech is available on the Maine DEP website at http://mainegov-images.informe.org/dep/pubs/2006%20milfoil%20summit.pdf
2. Ibid.
3. EPA website www.epa.gov/pesticides/regulating/registering
4. *Pesticides in the Nation's Streams and Ground Water*, 1992-2001," Circular is available at http://pubs.usgs.gov/circ/2005/1291 or by calling 1-888-ASK-USGS.
5. Ibid.
6. *Maine Water Utilities Position Paper on Invasive Aquatic Plants*, January 2002.
7. Ibid.
8. Based on MWUA recommendations, Maine law now states that "Chemical control agents may not be used on a water body that is a public water supply without the prior written consent of each public water supplier using that water body" (38 MSRA section 1865) http://janus.state.me.us/legis/statutes/38/title38sec1865.html
9. *Maine Water Utilities Position Paper on Invasive Aquatic Plants*, January 2002.
10. *Aquatic Plant Resistance to Herbicides*, Tyler J. Koschnick, W.T. Haller and M.D. Netherland, Aquatics, Spring 2006/Vol. 28, No. 1, p. 4-9.

For additional information on Hydrilla resistance, see *Pegging a Troublesome Change in Hydrilla*, available on the United States Department of Agriculture (USDA) website at www.ars.usda.gov/is/AR/archive/nov05/hydrilla1105.htm.

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Maine Volunteer
Lake Monitoring Program
24 Maple Hill Rd
Auburn, Maine 04210

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