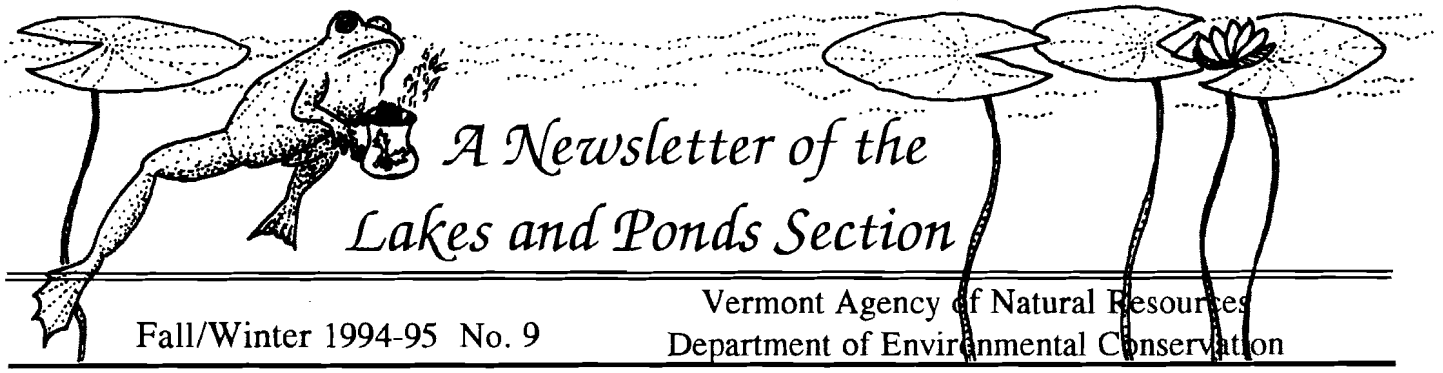
Out of the Blue



Fall/Winter 1994-95 No. 9

Vermont Agency of Natural Resources
Department of Environmental Conservation

Zebra Mussels and Your Plumbing System

An editorial cartoon from the Detroit News depicted a person standing in his bathtub in anticipation of an invigorating shower only to be showered by zebra mussels after turning on the faucet. Could this happen to you? Well, the cartoon is certainly an exaggeration, but some residents who draw water directly from zebra mussel infested waterbodies, like the Great Lakes, have had in fact pieces of zebra mussels come through their faucets. Lakeshore camp and home owners who draw water from a zebra mussel infested lake would be wise to protect the system or to procure an alternative water source before contamination to the system occurs.

Currently, Lake Champlain is the only waterbody in Vermont known to be infested with zebra mussels. The tiny mussels, which are native to eastern Europe, were found in Lake Champlain in July of 1993, just seven years after their introduction to North America via trans-Atlantic boat traffic to the Great Lakes. An ongoing lake-wide monitoring program conducted by the VTDEC and the Lake Champlain Basin Program (LCBP) has found adult zebra mussels as far north as the Burlington boathouse, and volunteer *Zebra Mussel Watchers* have reported the mussels in Cumberland Bay near Plattsburg, New York. While these population densities are still quite low, the expansion of the mussel's range into the broad lake area in such a short period of time forecasts the problems that may lie ahead for the lake and the thousands of people who rely on it for their water supply.

See "Plumbing" page 4

What Happens to Aquatic Animals During the Winter?

Trees that stand tall and thin without their leaves and the chatter of overhead migrating geese remind us of the coming winter season. As terrestrial plants and animals make changes for the winter season, their relatives that live in lakes and ponds, such as turtles, frogs and water plants, also make preparations to survive through the winter.

During fall turn-over, the September winds mix the lake water from surface to bottom, causing a uniform temperature and an even distribution of nutrients throughout the water column. As this event happens, the aquatic life in a lake also undergoes seasonal changes. The metabolic rate of aquatic animals and the photosensitivity of plants is slowed down by the change to shorter day length and colder temperatures. As the daylight and temperature continue to decrease, the aquatic species chemically and physically prepare themselves for the onset of winter.

See "Wintering" page 2

In This Issue...

OUT OF THE BLUE

is produced semi-annually by the Lakes and Ponds Section. Our purpose is to share information on lake environments, water quality and State activities through articles on lake ecology and Section programs. Feel free to let us know what articles you would like to see in future issues. To be placed on the mailing list, or to receive extra copies, please contact:

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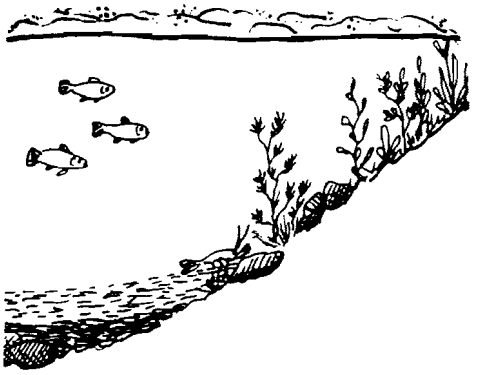
Wintering *(continued from page 1)*

For many years it was thought that all aquatic plants remained dormant during the cold, dark months of winter. Recent research has shown that this circumstance is not the case, and in fact, quite the opposite is true. Scientists observing the growth of 26 aquatic plant species during the winter in Lake George, NY, found that ten species remained active throughout the winter. The plants continued to photosynthesize under the ice during the winter months; however, maximum photosynthetic activity was 10%-20% that of the summer. These winter-hardy plants, including certain species of watermilfoil *(Myriophyllum spp.)*, pondweed *(Potamogeton spp.)*, arrowhead *(Sagittaria sp.)* and waterweed *(Elodea sp.)*, help oxygenate the water and provide winter habitat for fish and wildlife.



"Survival of the fittest" is the rule in the underwater plant community. A plant's ability to get a jump on spring vegetative growth, which may give it a potential competitive advantage over its neighbor, is determined by how well it overwinters. Aquatic plants have several strategies by which they survive the harsh winter climate in Vermont.

Annual plants, like naiad *(Najas flexilis)*, produce an abundance of hard-coated **seeds** before the plants die back completely in late fall. The tough naiad seeds lay in the sediment over the winter and in the spring, they sprout and grow into new plants that will complete their whole life cycle during that growing season. Many other aquatic plants, such as curly-leaf pondweed *(Potamogeton crispus)*, common bladderwort *(Utricularia vulgaris)* and northern watermilfoil *(Myriophyllum sibiricum)*, have special vegetative structures called winter buds or **turions**. These winter-hardy buds develop and mature from August through October in most species. The buds may detach from the plant and disperse around the lake, as is the case for curly-leaf pondweed, or they may remain attached to the plant through the winter. The buds sprout green shoots and grow into new plants starting in mid-winter for curly-leaf pondweed, and continuing into the spring for other species.

Additional overwintering structures include **rhizome roots**, like those seen in the floating-leaved plants white water lily *(Nymphaea* spp.) and spatterdock *(Nuphar* spp.); and **tuber roots**, like those found on wild celery

(*Vallisneria americana*). These underground root structures lack the genetic diversity of seeds and the dispersal ability of turions; however, they are generally larger, with more stored carbohydrates and nutrients to support rapid growth in the spring time.

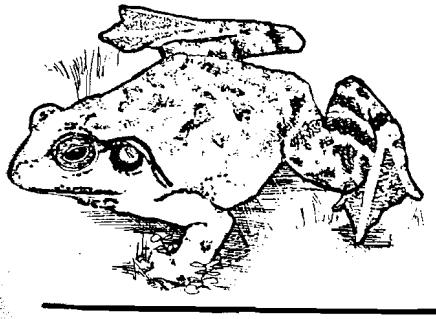
Once spring arrives the new plant growth offers nesting habitat for birds, protection for young fish, and also stabilizes the lake shoreline and bottom from erosion, among other benefits.

Myth: All Aquatic Animals Hibernate in the Mud at the Bottom of the Lake

Although during the winter the activity level of cold blooded aquatic animals drops, it does not entirely stop. During a January thaw reptiles and amphibians may get heated up enough to venture out and about. In fact the term **hibernation**, which means to be in a constant inactive state, is more applicable to warm blooded animals than to reptiles and amphibians. Since aquatic animals may experience spurts of activity during the winter, the term **brumation**, which describes a period of reduced activity, is more commonly used to explain their overwintering habits.

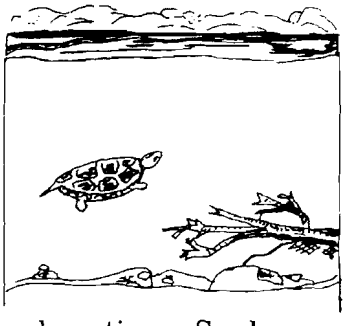
The body temperature of reptiles and amphibians is directly regulated by their environment. A drop in temperature in the fall means a drop in body temperature for these animals and alerts them to head for their overwintering sites. Species like the Wood Frog (*Rana sylvatica*), the Spring Peeper (*Hyla c. crucifer*), the Jefferson Salamander (*Ambystoma jeffersonianum*), the Red-Spotted Newt (*Diemictylus viridescens*) and the American Toad (*Bufo americanus*), are often seen on the first warm spring day even when the ground is still frozen. This occurrence disputes the old idea that all aquatic animals overwinter deep down in the ground or in the lake bottom. But where and how do these animals overwinter?

Recent studies show that Wood Frogs, Spring Peepers and Gray Tree Frogs (*Hyla versicolor*), which overwinter by burrowing down in shoreland leaf litter, do experience some amount of crystallizing and freezing. However, these animals, and many turtle species, produce high levels of glycerol and glucose in their blood and body tissue, which keeps their body cells from freezing completely.



Those species which can not withstand freezing temperatures must overwinter where no ice will form, such as at the bottom of a fast, deep, moving stream, or at the bottom of a lake. When lake drawdowns happen in the fall, for example to try to control nuisance aquatic plants by freezing their roots, winter ice will impact more of the lake, and cold sensitive species such as the Leopard Frog (*Rana pipiens*) could die from exposure to freezing conditions.

When the ice is clear it makes a good viewing scope into the world under the ice. Reptiles like the Painted Turtle (*Chrysemys picta*) and the Snapping Turtle (*Chelydra serpentina*) can be seen swimming by under the ice. These turtles continue their normal activities throughout the winter, including eating and mating. Snakes, on the other hand, are reptiles that do seek an undisturbed land overwintering site, and will stay there until late spring.



Fish respond to the change in lake temperature by building up tolerances to the extreme cold. For instance fish decrease the level of lipids (fats) and slightly increase the level of glucose in their bodies. November is a stressful month for fish because all their bodily functions become accelerated to defend against the cold. Fish with weak and stressed systems, unable to ward off diseases, are the ones that often succumb to springtime fish kills. Although lake fish do remain active throughout the winter, their movements are more restricted than in other seasons.

Since aquatic organisms are equipped with several unique strategies to survive the winter, the biggest threat to winter survival is the loss of habitat. Once safe in a healthy aquatic environment, aquatic species will carry on during the winter, some resting and some not, being guided by the natural changes in temperature and light.

Plumbing *(continued from page 1)*

Water intake pipes make an ideal home for zebra mussels, providing a suitable substrate for the mussels to attach to, protection from predators, and a constant food source. Zebra mussels are filter feeders consuming enormous amounts of plankton, the microscopic plants and animals floating throughout the water column. The flow of raw water through an intake pipe supplies plankton to mussels attached to the end or inside of the pipe.

As the mussel colonies grow, water flow is reduced and water quality decreases. Over time, parts of the colony may become dislodged and the pieces, called **druses**, can be drawn further into the water system. The hard shells damage pumps and plug filtering screens. Mussel feces can be drawn into a water system causing foul odors and taste, presenting a potential health hazard. The situation is compounded by the fact that the zebra mussel's microscopic larval stage, called a **veliger**, can easily penetrate the large-pore filtering screens currently used on most water systems allowing them to be drawn into all parts of the system's plumbing. One encouraging fact for lake residential systems is that in the Great Lakes, small intake pipes (less than 2 inches in diameter) are becoming infested by zebra mussels at a slower rate than larger, industrial-sized pipes. The larger pipes draw in a much greater volume of water and consequently a greater number of veligers. Once an area becomes heavily infested, however, even smaller intake pipes start to become colonized by zebra mussels.

As previously mentioned, most of Lake Champlain currently has only low densities of adult zebra mussels. Biologists expect that the densities will increase substantially over the next few years, but it is not a given. At this point, however, the VTDEC and the Lake Champlain Basin Program strongly encourage lakeshore home owners who draw water from Lake Champlain to, at the very least, thoroughly investigate their particular situation and devise a plan for protecting their water system from zebra mussel contamination. Some Lake Champlain shoreline residents have already installed zebra mussel controls, feeling it is better to be safe than sorry. Home and camp owners who draw water from other waterbodies throughout the state should also stay familiar with this issue to be better prepared lest zebra mussels spread to other lakes.

Controls for Residential Water Systems

Unfortunately, the technology for protecting small residential water systems is still very much in the developmental stages. There is only limited applicable information available from zebra mussel infested areas in Europe, as it is apparently uncommon for individual residents to draw water directly from a waterbody. In the United States and Canada, the nuisance mussels have been primarily impacting larger, industrial-size systems until recently, so most of the control research to date has been geared to those larger systems. Certainly some of the technology is transferable, but much of it is quite sophisticated

Reprinted courtesy, *The Detroit News* and Larry Wright.

and consequently too expensive for the average homeowner. Lakeshore residents are therefore having to break new ground to develop practical, cost effective ways to protect their water systems from zebra mussels.

People on the Finger Lakes of western New York, in particular, have had substantial problems with zebra mussel contamination of small residential water systems. Several types of control systems have been deployed there, but even there the problem is still quite new and the systems have not been subject to long-term field testing. Additionally, each situation is unique so there isn't one, simple solution. Homeowners should carefully evaluate each element of their situation and carefully scrutinize potential control options before devising a plan. Elements to consider include: *level or potential level of zebra mussel infestation within vicinity of the intake; water depth at the intake; type of natural substrate near the intake; daily water demands; seasonal water demands; permit requirements; cost; and current water system design.*

What System Will Work For You?

All of these factors may affect what type of control should be employed. For instance, one effective system, called a buried sand infiltration gallery, involves connecting the end of the intake to a series of perforated pipes that are buried in a sandy lake bottom. The system works like a leach-field in reverse, filtering water down through the sand before it is drawn into the intake pipe. Obviously, it would be difficult to bury such a system on a lake bottom comprised of ledge. An alternative would be to contain the perforated pipes and sand in a frame of some sort placed on top of the lake bottom. It is important, however, to insure that the setup is large enough to meet daily water demands. There are a couple of local companies that manufacture and sell self-contained sand filtration systems, but you will want to be sure that the systems are designed to match your specific needs.

Typical chlorination systems used by many lakeshore residents for water purification will kill zebra mussels, preventing them from entering into the building's plumbing, but the intake pipes still need to be protected to prevent clogging. In some situations a second intake pipe could be installed so that the pipes can be pulled out of the water on a rotational basis, allowing for one pipe to be cleaned while the other is being used without disrupting service. This setup would not protect the water pump however, if the pump is located between the lake and the chlorination system.

Cisterns, shore wells, or drilled wells may be the best long-term option for many lakeshore residents, as they completely preclude zebra mussels. But again, some situations such as shorelines comprised of ledge or poor ground water quality may make these an impractical or costly choice.

There are too many potential control scenarios to cover them all in this article. The VTDEC and the LCBP have free informational literature available to assist homeowners with making the proper choices. Materials include an eleven page residential controls booklet produced by New York Sea Grant, permitting information, a list of contractors who provide zebra mussel related services in Vermont and New York, and current zebra mussel range reports. When developing a plan it is important to bear in mind that most controls have not been subject to rigorous field testing. Be sure to do your homework and ask lots of questions of potential contractors. Also, be sure to check with the VTDEC to learn if your plan requires a permit.

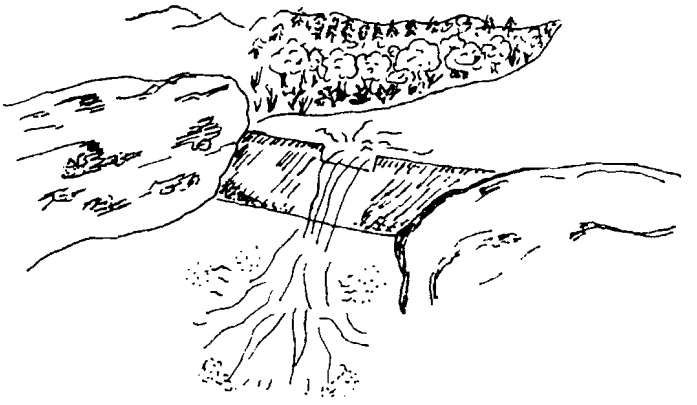
This new challenge of protecting waterbodies and water systems from zebra mussels can best be met by the sharing of knowledge and experiences as new situations arise and ideas are put to test. The VTDEC and the LCBP will continue to do their best to obtain the latest information and to pass it on so that no one will have to take a zebra mussel shower. Contact Michael Hauser, the Zebra Mussel Education and Outreach Specialist at the Lakes and Ponds Section with any questions or to obtain or share information.

Who Controls a Lake's Water Level?

Have you ever wondered about lake water levels...how they were established, who maintains them, and if they can be changed? On lakes without artificial dams, nature controls the water level. Water levels can vary greatly naturally, especially on lakes with large watersheds. Lake Champlain has historically fluctuated as much as ten feet! The water level of other Vermont lakes may vary a foot or more, depending on rainfall, spring runoff, and summer evaporation rates.

More than half of Vermont's lakes and ponds at least 20 acres in size have an artificial dam at their outlet. On these lakes, the dam owner theoretically controls the lake level. However, many dams were built years ago and the original control mechanisms are no longer functional. Although the lake level of these lakes is artificially raised by the dam, the daily water level is now controlled by nature. Dams in Vermont may be owned by private individuals, lake associations, towns, power companies, or the State (VTDEC or VT Fish and Wildlife Department).

On lakes where the dam can still be used to manipulate the lake water level, conflicts occasionally occur between the desires of the dam owner and the desires of lakeshore residents. These conflicts are best resolved by the concerned parties coming to a mutual agreement. In cases where such an agreement cannot be reached, the State has ultimate regulatory authority for lake water levels through the Water Resources Board. The Board consists of five citizens, appointed by the Governor, who are responsible for adopting rules to establish key water resource and wetland management policies. Individuals may petition the Water Resources Board to adopt rules for a specific lake that establish a mean water level or a water level management scheme, such as different summer and winter levels and periodic drawdowns. In the absence of specific Water Resources Board rules, dam owners may manipulate water levels as they wish. However, if an adjacent wetland is affected by changing water levels, a Conditional Use Determination may be required by the State's Wetlands Program, (802) 241-3770. In addition, if an

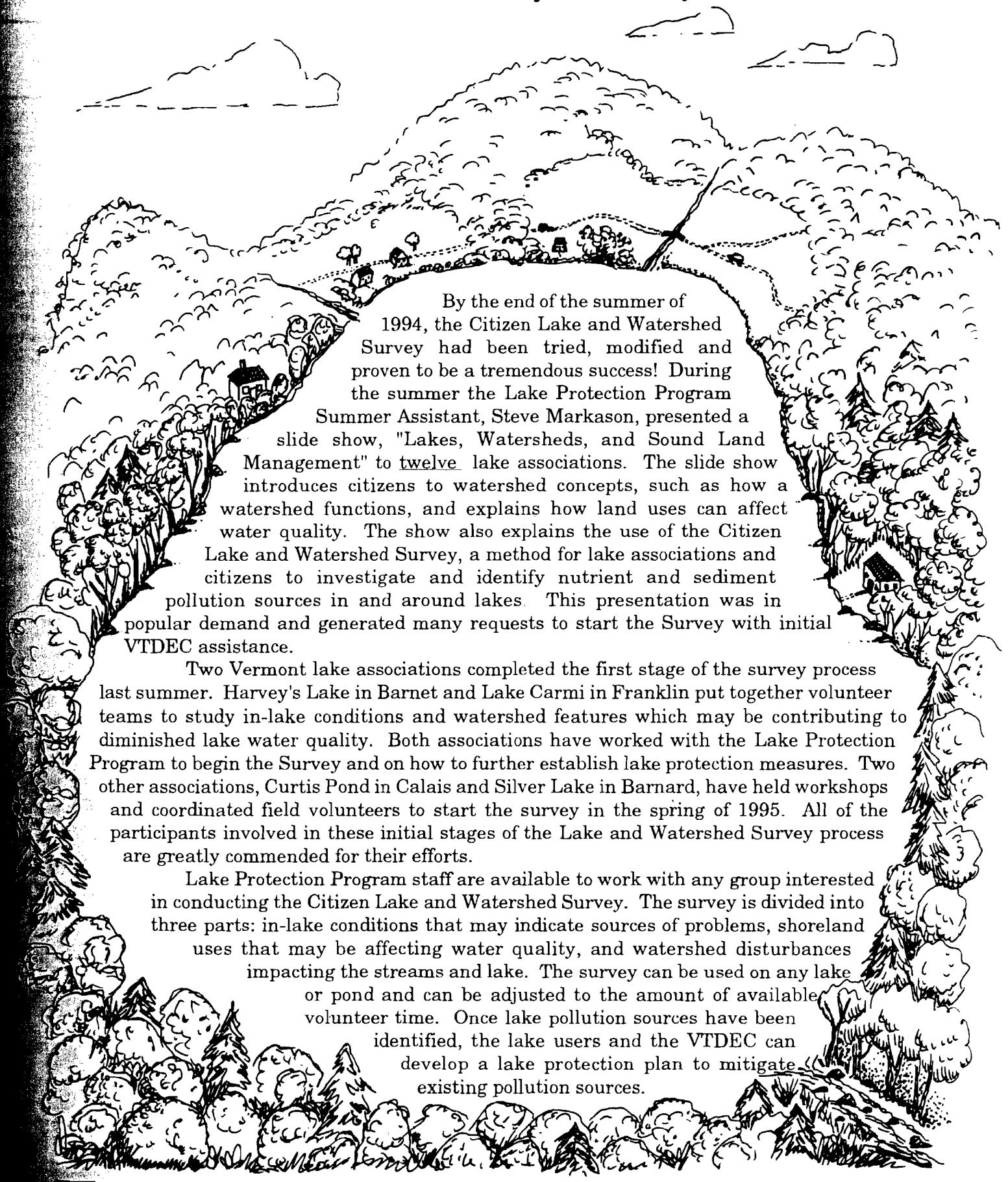


endangered species is threatened, permission may also be needed from the State's Heritage Program.

Lakeshore residents planning shoreline projects often hear the term **mean water level** used in reference to the State's jurisdiction along the lakeshore. A lake's mean water level is defined by a general Water Resources Board rule as the customary level of the lake from June 1 to September 15. For many lakes and ponds with dams, the mean water level is established by the average depth of water flow over the dam's spillway. Actual historical records of lake water levels are helpful in determining the mean water level of lakes with no dams or with transient beaver dams. If a shoreline project is upland of a lake's mean water level, the State does not have jurisdiction under the Shoreland Encroachment Program (although some projects may fall under Act 250 jurisdiction). If a project extends beyond the shoreline of the lake at mean water level, the State's Shoreland Encroachment Program has jurisdiction and a permit may be needed.

If you have questions about the mean water level at the lake or pond you frequent, the VTDEC's Shoreland Encroachment Program may have the information you need. If you would like to find out why the water level on your lake is manipulated the way it is, check with the dam owner. The Town Clerk should have a record of who owns the dam, or the VTDEC's Public Facilities Division at (802) 241-3737 may know the owner.

Watershed Surveys Underway



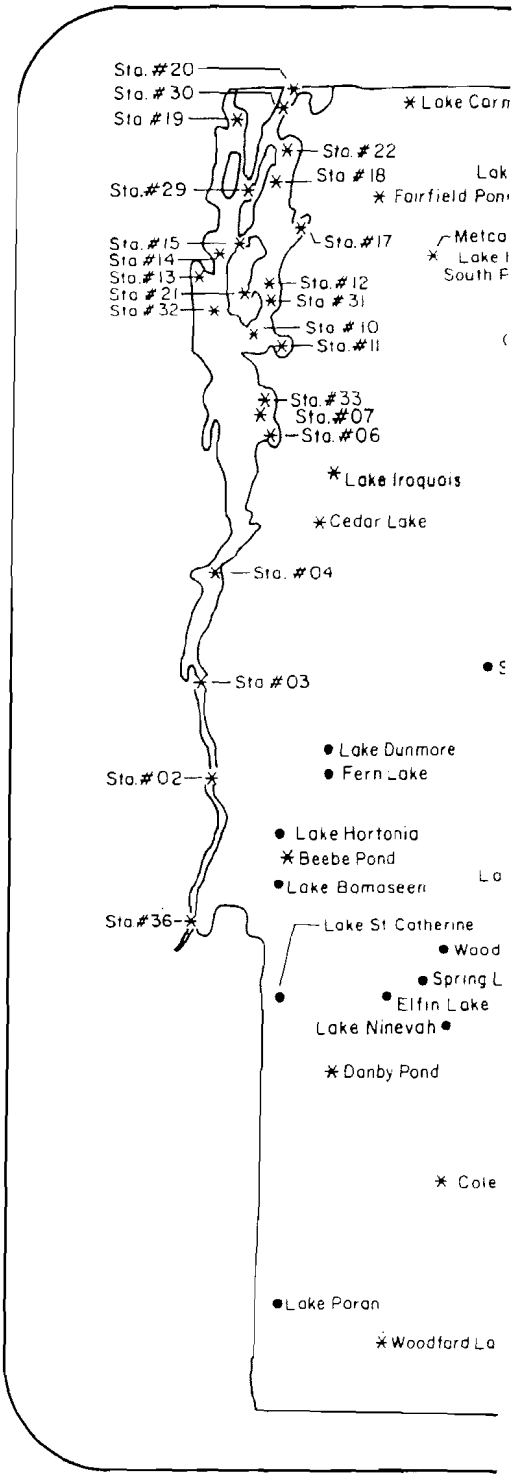
By the end of the summer of 1994, the Citizen Lake and Watershed Survey had been tried, modified and proven to be a tremendous success! During the summer the Lake Protection Program Summer Assistant, Steve Markason, presented a slide show, "Lakes, Watersheds, and Sound Land Management" to twelve lake associations. The slide show introduces citizens to watershed concepts, such as how a watershed functions, and explains how land uses can affect water quality. The show also explains the use of the Citizen Lake and Watershed Survey, a method for lake associations and citizens to investigate and identify nutrient and sediment pollution sources in and around lakes. This presentation was in popular demand and generated many requests to start the Survey with initial VTDEC assistance.

Two Vermont lake associations completed the first stage of the survey process last summer. Harvey's Lake in Barnet and Lake Carmi in Franklin put together volunteer teams to study in-lake conditions and watershed features which may be contributing to diminished lake water quality. Both associations have worked with the Lake Protection Program to begin the Survey and on how to further establish lake protection measures. Two other associations, Curtis Pond in Calais and Silver Lake in Barnard, have held workshops and coordinated field volunteers to start the survey in the spring of 1995. All of the participants involved in these initial stages of the Lake and Watershed Survey process are greatly commended for their efforts.

Lake Protection Program staff are available to work with any group interested in conducting the Citizen Lake and Watershed Survey. The survey is divided into three parts: in-lake conditions that may indicate sources of problems, shoreland uses that may be affecting water quality, and watershed disturbances impacting the streams and lake. The survey can be used on any lake or pond and can be adjusted to the amount of available volunteer time. Once lake pollution sources have been identified, the lake users and the VTDEC can develop a lake protection plan to mitigate existing pollution sources.

Lay Monitors Take Action Beyond Monitoring

The Vermont Lay Monitoring Program (LMP), a citizen volunteer lake water quality sampling program, completed sixteen years of sampling at the close of this past summer! The program met its goals of continuing to build long term water quality databases on many lakes, inviting new lakes into the program, and keeping lake residents informed about water quality protection. Since the major cause of water quality problems to Vermont lakes is increased nutrient loading, the LMP is designed to sample the effects of this loading by measuring the concentrations of phosphorus and chlorophyll-a (the green pigment in algae and in plants) and taking Secchi disk water clarity readings. After 16 years of collecting data to measure nutrient enrichment in lakes, monitors have been asked to determine new LMP activities that would put their long term data into action.



Putting LMP data into action on most lakes means choosing actions that help to maintain lake phosphorus and chlorophyll-a concentrations at the same or slightly lower levels than they are at currently. Fortunately many Vermont lakes have not yet been affected by major pollutants to a large degree and do not need to undertake lake restoration work. To best protect these lakes, the LMP data tells us to implement "protection" actions that help maintain Vermont's lake water quality as it is today.

Effective lake protection actions require the involvement of folks that live and work in a lake's watershed, as well as lakeshore residents. Everybody in the lake watershed should learn to use good land management practices, such as personal property erosion control, when and how to fertilize a lawn and where to locate manure piles. Many Lay Monitors have gone beyond monitoring, and have started to implement lake protection actions. The following examples show several actions that monitors have taken.

Martha and David Sirjane, **Spring Lake** (Shrewsbury) Lay Monitors, initiated a revegetation project by planting a dozen trees along an eroded lake bank. The roots of the new trees will help to stabilize the shoreline while the trunks create a physical barrier, like a fence, directing foot traffic back to the path and away from the bank.

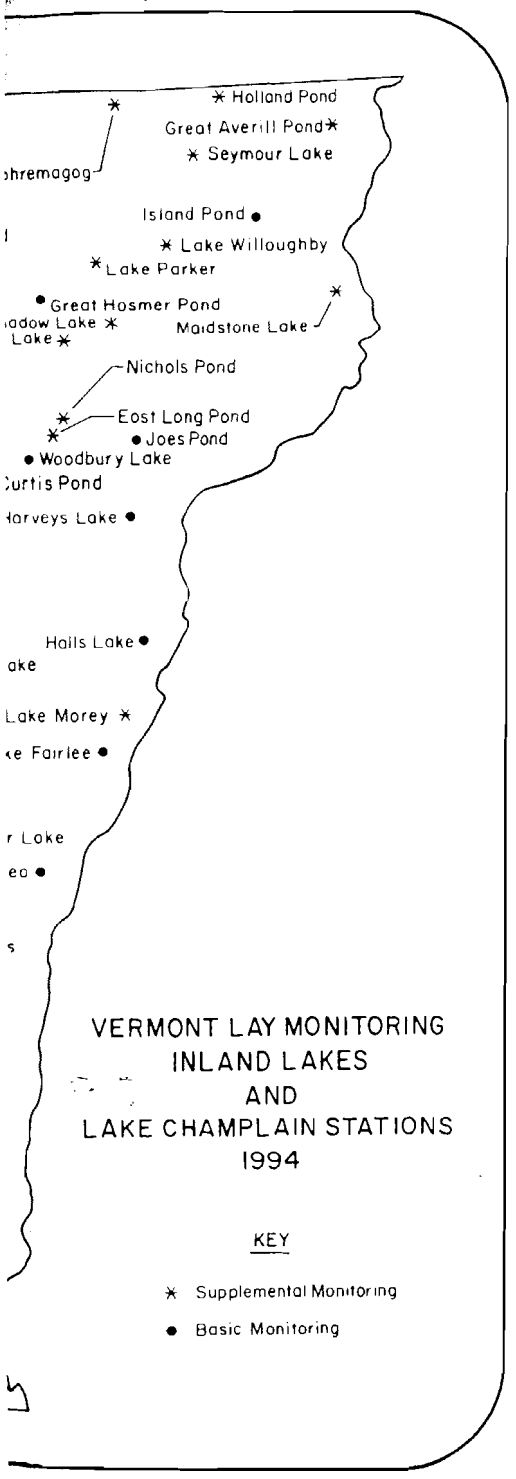
Many new lawns now occupy the shoreland along **Cole Pond** in Jamaica. Sherry Clark, the Lay Monitor, has been meeting with Cole Pond Association members to collectively revegetate the shoreline of one area, which was recently clear cut and planted entirely with a lawn. On Sherry's own property an example of a healthy buffer strip stands out well. She has planted a blend of native species with ornamental appeal as well as practical value, such as the blueberry bush.

After the 1994 sampling season, Roy Hill, **Lake Willoughby's** Monitor, wrote an article for *The Westmore Association, Inc. Newsletter* explaining the benefits of planting a shoreline buffer strip. Roy also arranged for a local plant nursery to make available the recom-mended plants used for shoreland buffer strips at a reduced price.

When Warren Steadman, the Lay Monitor for Fish Bladder Island and Sand Bar stations on **Lake Champlain,** noticed that his neighbor had hired a bulldozer to clear out some brush around his property and to open up a path to the waterfront, he respectfully

gave his neighbor some literature on the value of maintaining a buffer strip. His neighbor appreciated the tip and conducted the work without disturbing the shoreline and potentially impairing the water quality.

Last summer Chris Owen, the **Holland Pond** Lay Monitor, helped organize the Holland Pond Association, which has now strengthened Holland Pond's lake protection efforts.



Other lake protection actions started by monitors include: keeping active guard over nesting loons, initiating lake associations' funding of port-o-let toilets at the public access areas, and participating in milfoil and zebra mussel watch programs. Congratulations to all the Lay Monitors for completing the sixteenth LMP sampling season and for initiating lake protection activities which put LMP data into action. To find out more about the Lay Monitoring Program and if the lake you frequent has or needs a Lay Monitor, please contact Amy Picotte, the LMP Coordinator.

Profile of Fairfield Pond Lay Monitor, Tom Benoure

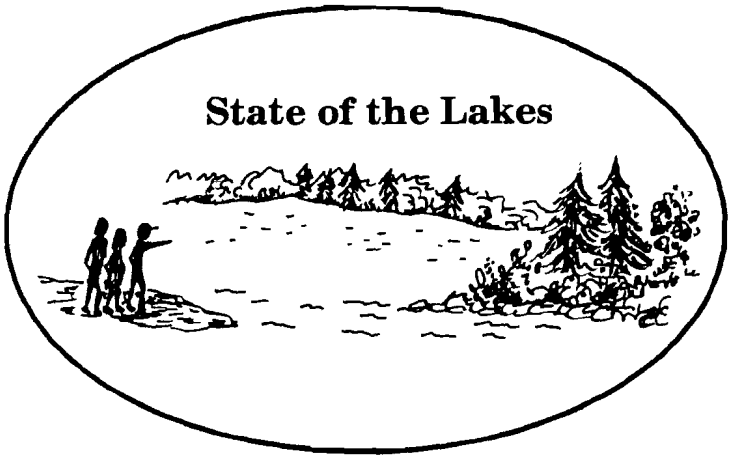
So you think living on a lake during the summer is nothing more than ultimate relaxation? In the case of Tom Benoure, most of his time is spent either collecting lake samples, overseeing the lake association or controlling the spread of Eurasian watermilfoil.

For the past two summers, Tom and his wife, Gloria, have retreated in the evenings with their three daughters, Kimberly, Mary Joe and Amy, to their cabin on Fairfield Pond. During the days Tom is busy dairy farming, while Gloria runs a child day care program from their home in St. Albans. The lake cabin has been used by Tom's family for three generations and has always given the Benoure's a feeling of serenity. Tom is actively involved today in protecting the lake to preserve the experience for future generations.

Besides collecting weekly lake samples since 1991 as the Fairfield Pond Lay Monitor, for the last two summers Tom has led a hard fight to control a pioneer infestation of Eurasian watermilfoil. Many of his summer evenings were spent searching and marking new locations of milfoil, handpulling discovered plants, organizing lake association members, and developing a diver operated suction harvester to control dense milfoil growth. In addition, during 1988-1991, Tom was the volunteer coordinator for the Fairfield Pond Diagnostic Study, a project which investigated sources of phosphorus to the pond.

Another impressive feature about Tom's actions to protect Fairfield Pond is his membership in the North American Lake Management Society (NALMS). In NALMS' newsletter, *Lake Line,* Tom has read about lake tests and protection programs used in other states. He has made suggestions to the Lay Monitoring Program based on information received from NALMS.

Although Tom and his family would probably prefer to return to their lake cabin for a relaxing summer evening, instead they spend many dedicated hours working for the protection of Fairfield Pond.



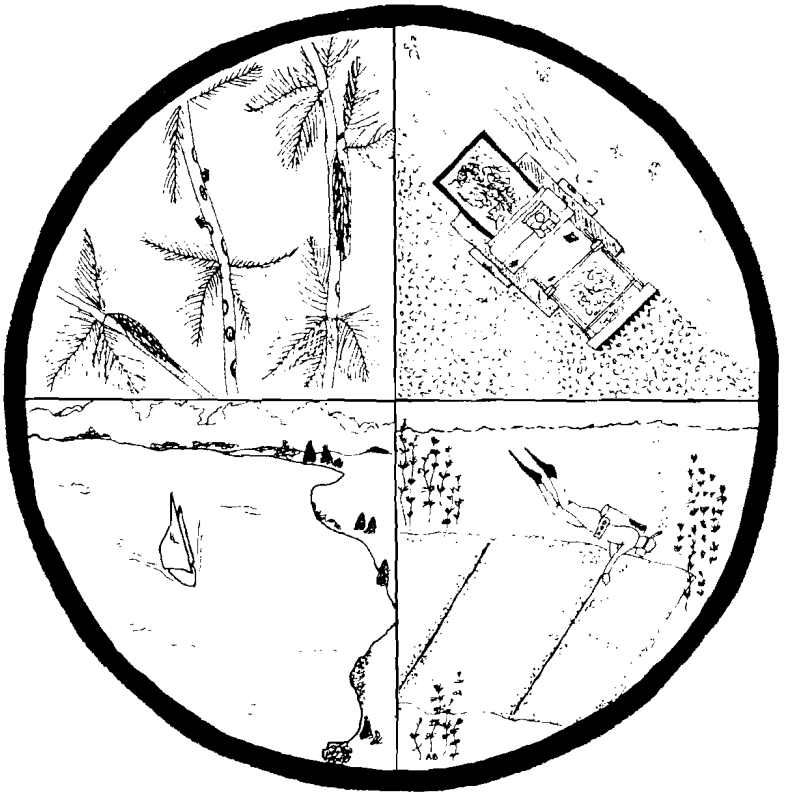
Lake Association Wages Successful Milfoil Battle

In the continuing battle against Eurasian watermilfoil, the Lake Dunmore-Fern Lake Association approached the challenge from a new angle in the 1994 summer season. Five years after a pioneer watermilfoil population was confirmed in Lake Dunmore (Fern Lake is uninfested), the association hired a full time, two person crew to oversee the milfoil control program. Zack Hayden and John Dick, two college students from Vermont, took on this role and began a twelve week effort by first surveying the lakes to search and map out any locations of milfoil colonization. This step provided them with the necessary information to develop a data base to track the milfoil infestation and monitor eradication efforts throughout the summer and in subsequent years.

Next, the crew devoted a large amount of time to developing a public outreach and education program. Volunteers were organized and supervised for weekly handpulling sessions. John and Zack expanded the shoreline watch network and developed and distributed a local *Shoreline Watch Guidebook*. The guidebook helped to coordinate efforts by including general information on milfoil infestations, specific areas monitored by volunteers and lists of the watch network contacts. By September 1st, over seventy percent of Lake Dunmore's shoreline was covered by the watch network. In addition, the public boating access was staffed at peak weekend hours to educate and offer assistance in searching boats and trailers for watermilfoil fragments. John and Zack found this educational outreach service especially valuable for out-of-state boaters who often had little or no previous awareness of the milfoil problem.

By the middle of August, the crew was finding only occasional young plants or newly rooted fragments; the watermilfoil infestation on Lake Dunmore had been contained! Due to the hard work of John and Zack and to the contributions and enthusiasm of the lake users both in this summer's and in past years' handpulling efforts, the watermilfoil control program has been highly successful.

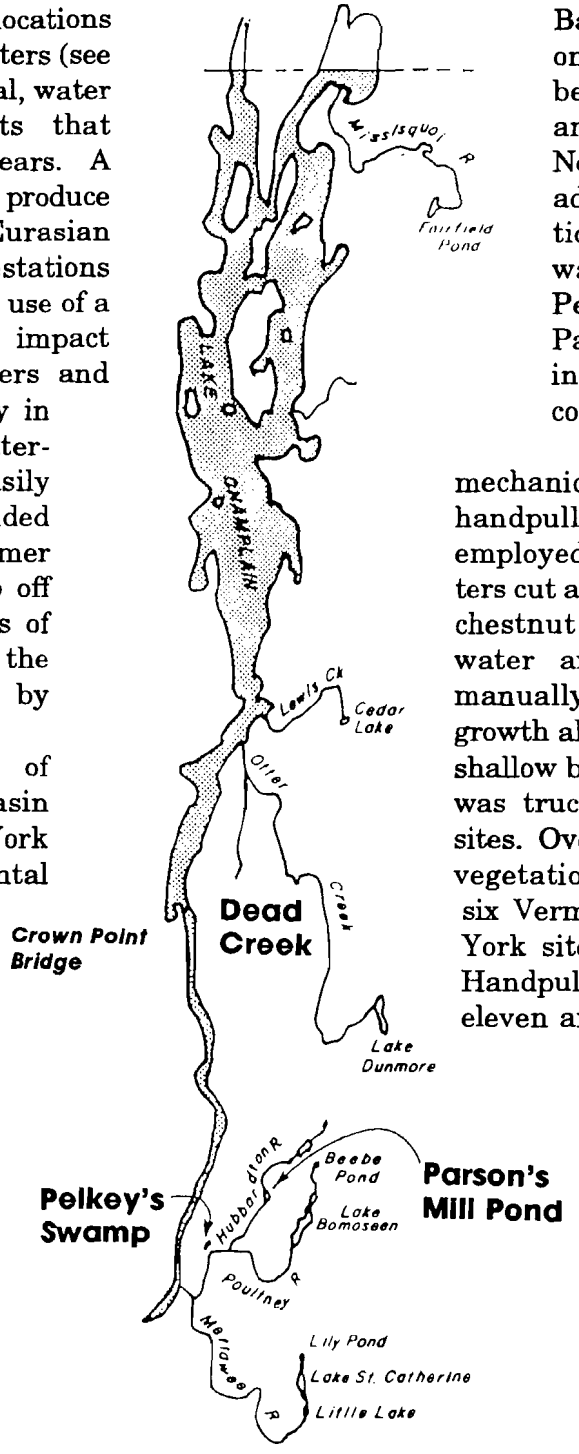
The Lake Dunmore-Fern Lake Association recognizes the importance of maintaining a watermilfoil control program in future years. This past summer's effort required extensive mapping and documentation, and the formal establishment of handpulling and shoreline watch programs. With these programs now in place for Lake Dunmore and Fern Lake, the association would entertain a proposal to "share" resources, such as a milfoil crew, in a cooperative program with a neighboring lake interested in establishing similar control measures. Interested lake groups should contact Jeff Wallin at (802) 247-3468.



— Water Chestnut Control in Lake Champlain Marks Thirteen Years —

While the spotlight continues to follow Eurasian watermilfoil control programs in Vermont, efforts have also been ongoing for the control of another invasive exotic aquatic plant. Water chestnut, *Trapa natans L.*, is a nonnative species introduced into Lake Champlain in the 1940's. The plant has been found primarily south of Crown Point in Lake Champlain, although recently several other locations have been identified in nearby waters (see map). An extremely prolific annual, water chestnut produces barbed nuts that remain viable for up to twelve years. A single plant has the potential to produce 300 nuts in one year! Like Eurasian watermilfoil, water chestnut infestations can severely limit the recreational use of a lake. Water chestnut can also impact wetlands, beaches, sluggish rivers and other habitats in **any** waterbody in Vermont. However, unlike watermilfoil, water chestnut is easily controlled with harvesting provided the work occurs during the summer before the nuts mature and drop off the plant. After several of years of mechanical harvesting at one site, the plant can often be controlled by handpulling.

The U.S. Army Corps of Engineers, Lake Champlain Basin Program, VTDEC and New York State Department of Environmental Conservation have contributed over two million dollars to control water chestnut by mechanical harvesting and handpulling since the control program initiation in 1982. The goal of the harvesting program is to prevent the northward spread of the plant into other areas of Lake Champlain. In 1994, the thirteenth year of water chestnut control, the control program cost of over $88,000 was shared by the VTDEC, Army Corps of Engineers and the Lake Champlain Basin Program.



The 1994 Water Chestnut Control Program

Twenty two sites in southern Lake Champlain were targeted for mechanical control measures in 1994. These areas were located between Fields (Kellogs) Bay and Benson Landing on the Vermont shore and between Bulwagga Bay and Herricks Bay on the New York shore. Three additional small infestations on neighboring waterbodies, Dead Creek, Pelkeys Swamp and Parsons Mill Pond, were included in the 1994 control project.

During 1994, three mechanical harvesters and two handpulling crews were employed. Mechanical harvesters cut and removed dense water chestnut beds from the deep water areas and work crews manually handpulled chestnut growth along the shoreline and in shallow bays. The cut vegetation was trucked to upland disposal sites. Over 490 harvester loads of vegetation were removed from six Vermont sites and five New York sites on Lake Champlain. Handpulling occurred at another eleven areas on the lake and on Dead Creek, Pelkeys Swamp and Parsons Mill Pond for a total of 599 handpulling hours.

In addition, during the 1994 season a modified airboat with attached cutter bars was field tested for the first

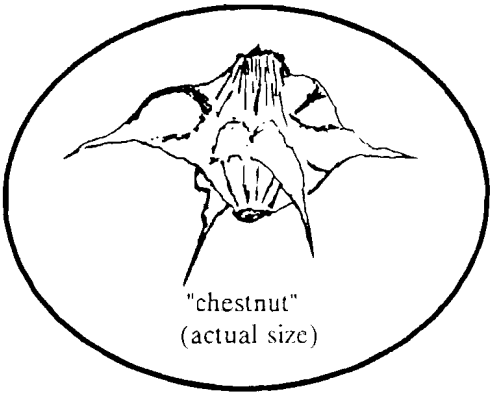
Continued on the next page

Chestnuts *(continued from page 11)*

time in Vermont. This new system involves cutting plants early in the season before nut development, eliminating the transportation of the cut material to shore. A second cutting is also necessary. Although success of the airboat method depends on two cuttings, so far it seems to be more cost effective. Other benefits include greater speed in reaching harvesting sites and the ability to work in very shallow water. Additional testing must take place in 1995 before a final decision can be made about the efficiency of the airboat control method.

Essex High School Juniors Help Harvest!

VTDEC's 1994 control program was fortunate in having some additional help from an Essex High School Exotic Plants Study Group. This group of six juniors spent a long, hot July day handpulling water chestnut in one of six



targeted sites in Dead Creek. Thanks to their help, this area of the creek was completely cleared of water chestnut!

Control Program Can Work!

The Water Chestnut Control Program has been successful at reducing the major infestations of chestnut in Lake Champlain south of the Crown Point Bridge; many areas that once supported monocultures of water chestnut are today free of nuisance levels. However, water chestnut has become established north of Crown Point and moved outside of Lake Champlain. Continued VTDEC control efforts, as well as increased citizen awareness and participation in control and spread prevention measures, are all necessary for future water chestnut management to succeed.

Weevil Rearing: A Success for Second Summer

During the last two summers, the Vermont Department of Agriculture's laboratory greenhouse has been turned into a watery home for milfoil and weevils. The Vermont Department of Environmental Conservation is using the greenhouse to rear a native aquatic weevil, *Euhrychiopsis lecontei*, which feeds on Eurasian watermilfoil. The weevils are being introduced to Vermont lakes to try to cause a reduction in milfoil. They are housed in glass aquaria and plastic tanks from June through August each year.

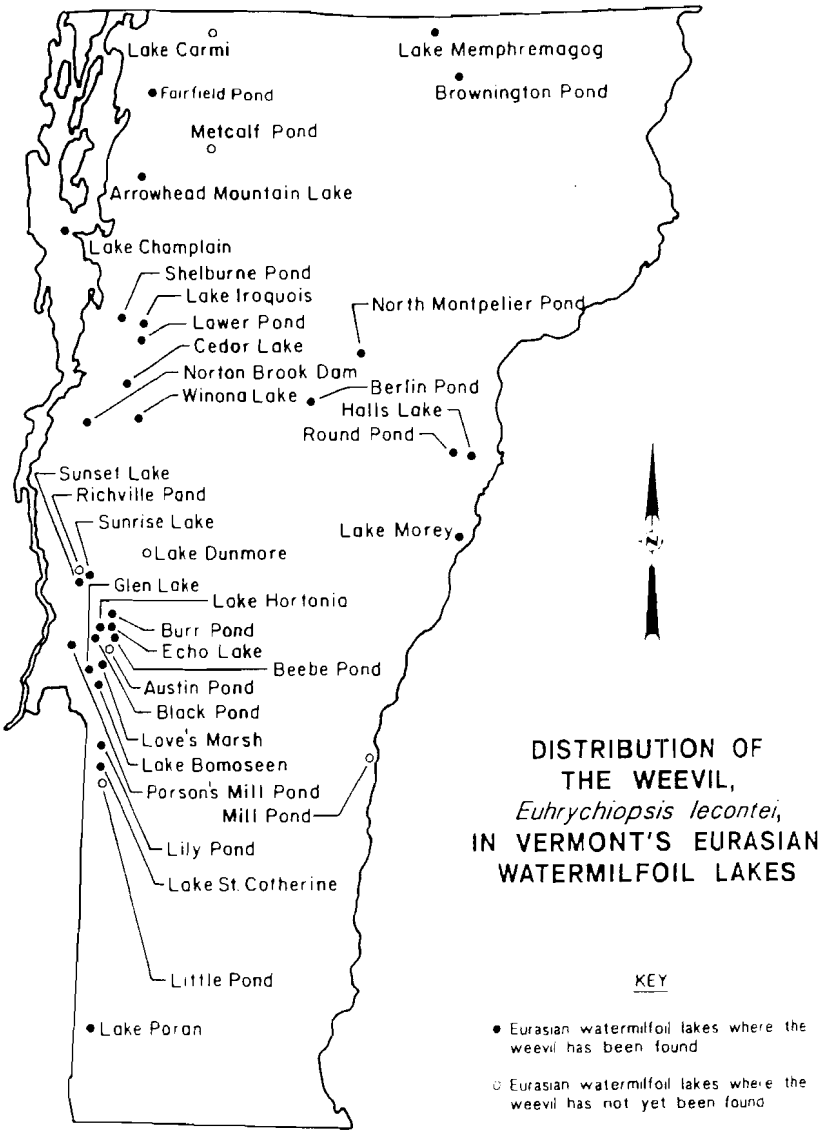
Field collection at Berlin Pond and Winona Lake of weevil adults for rearing stock, and weevil rearing in the lab was even more successful this year than in 1993. A total of 17,878 weevils were introduced to two lakes, more than 7,000 over last year's total. Most of the weevils that were introduced were in the larval stage (76%), but adults (14%) and eggs (9%) were also introduced. Weekly weevil introductions by the VTDEC and Middlebury College researchers were made on Lake Bomoseen throughout the summer. A total of 15,266 weevils were placed at three sites on that lake. Norton Brook Reservoir received 2,612 weevils through July; however, introductions at this site were discontinued due to a lack of positive results. Unlike the observations at the Bomoseen introduction sites, little evidence of surviving weevils and weevil feeding damage was seen on the Norton Brook Reservoir milfoil plants. This experience points out how difficult it will be to predict how well weevils may work in a given lake.

Results from the quantitative sampling effort done at the weevil introduction sites on Lake Bomoseen by Middlebury College researchers during the summer of 1994 are not yet available. Visual observations made by the VTDEC at the sites over the summer indicated that weevil damage to milfoil was present at all three sites but was greatest at the Cedar

Mountain site on the west shore. Some milfoil plants in shallow water appeared to be starting to collapse.

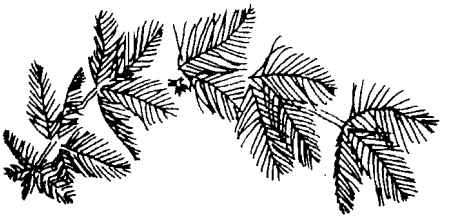
In Search of Weevils

Since the discovery of this native weevil in Brownington Pond in 1989, the VTDEC has been conducting weevil searches on milfoil lakes around the state. In 1994, weevils were found in four new lakes: Burr Pond, Halls Lake, Lake Hortonia and Shelburne Pond. Weevils have now been documented to be present in thirty of the thirty-seven lakes with milfoil. Weevils have been sighted in at least three areas of Lake Champlain: Malletts Bay, Potash Bay and along the Milton shore. Button Bay was checked in 1994 but no weevils or weevil damage to milfoil was seen. On Lake St. Catherine, an unharvested milfoil area of the northwest shore of Little Lake was checked for the presence of weevils but none were found and no damage was seen on the milfoil plants. High naturally occurring numbers of weevils were found in the north end of Lake Morey in Fairlee and in Lower Pond in Hinesburg. Considerable weevil-induced damage to milfoil plants was noted at some sites on both of these lakes.



Weevil Research Funding

Now that the five-year weevil research grant is coming to a close, the VTDEC has been investigating new funding sources to be able to continue the project. Inquiries made to EPA regarding the possibility of future funding have been encouraging. An EPA Region I official in Boston said there may be additional funds available in 1995 and beyond. The VTDEC is planning on submitting a proposal to EPA to expand the scope of the project. In the meantime, the VTDEC has requested a grant extension from EPA in order to use project funds that will be left over from the original grant period which officially ends February 28, 1995. The left over funds, which amount to approximately $50,000, will be used to run the State's weevil rearing lab in Waterbury and to continue the weevil introduction program so additional selected lakes can receive weevils over the next year. Middlebury College's work for the VTDEC under the Lake Bomoseen Demonstration Program grant ends in February of 1995.



Legislature Funds Nuisance Aquatic Plant Control Projects

The 1993 Vermont Legislature passed a law that increased motorboat registration fees beginning with motorboats registered in 1994 and continuing through March 1, 1997. The law allocates the collected fees as follows: 15% to the Department of Public Safety for enforcement and a boater safety education program; 50% to the Department of Fish and Wildlife for access areas, pump out stations and to match federal funds; 10% to the Department of Agriculture, Food and Markets for mosquito control; and 25% to the Department of Environmental Conservation for aquatic nuisance control.

The Department of Environmental Conservation is using part of these funds to provide grants-in-aid to municipalities and state agencies for nuisance aquatic plant control programs. This past summer the Department of Environmental Conservation awarded over $62,000 to twelve municipalities to assist with the control of nuisance aquatic plants in lakes located in their towns. All these municipalities implemented projects to control Eurasian watermilfoil, except for one group, which battled a nuisance native plant population. The Department had not been able to offer financial assistance through a grants-in-aid program since 1989.

To learn more about financial assistance through the Department's grants-in-aid program, contact Vicky Barney or Ann Bove at (802) 241-3777.

The Lakes and Ponds Section Warmly Welcomes Four New Arrivals:

Brendan Warren Shepard, son of Susan Warren and David Shepard born July 1, 1994!

Abigail Isabella Hunt, daughter of Tim and Val Hunt, born July 19, 1994!

Marley Elizabeth Hauser, daughter of Michael Hauser and Liz Soper, born August 5, 1994!

Aren James Kellogg, son of James Kellogg and Lori Parsons, born August 25, 1994!

The Lakes and Ponds Section Bids Farewell:

to Kitty Enright and Steve Markason, who have both moved on to new adventures. Anyone who had the pleasure of working with either of them will understand how much they will be missed.

Lake Lingo

Buffer strips- *vegetated areas between a lake, stream or wetland and human activity (land disturbance). Buffer strips stabilize shoreland, preventing erosion; filter out sediments and pathogens from runoff; provide shade for the aquatic organisms; and are wildlife habitat.*

Metabolic- *the physical and chemical processes that enable an organism, like a frog, to maintain life functions throughout different circumstances, such as during changes in seasonal weather.*

Photosensitivity- *a plant's response to the intensity and length of light.*

Turion- *winter buds on aquatic plants.*

Brumation- *a state of inactivity.*

Monocultures- *the occurrence of one species dominating a certain habitat. For example, the dominance of water chestnut in a particular waterbody area.*

Druse- *a clump of zebra mussels.*

Northeast Conference on Non-Indigenous Aquatic Species

DATE: January 25, 1995 (9:00am-5:00pm)
PLACE: Radisson Hotel and Conference Center - Cromwell, CT
CONTACT: Nancy Balcom
CT Sea Grant Marine Advisory Program
1084 Shennecossett Road
Groton, CT 06340-6097
(203) 445-8664

Recently Made Available

Hot off the Press: Wetland Activity Guide

Available to interested educators - the *Wetland Activity Guide: Information and Activities For Teaching About Vermont Wetlands.* This 104 page guide includes background wetland information and 20 plus hands-on activities for children 7 through 14 years old (grades 3-8). For a copy of the new Wetland Activity Guide, contact Cathy Kashanski at the Water Quality Division, (802) 241-3770.

Drawing by Libby Walker Davidson

Open for Public Review: The Lake Champlain Draft Plan

The Lake Champlain Basin Program released *Opportunities For Action*, the draft Pollution Prevention, Control and Restoration Plan for Lake Champlain. The draft Plan addresses specific problems facing the lake today and presents options to protect the lake for future generations.

Through a comprehensive public involvement process over the past three years, eleven key areas of concern have been identified and presented in the draft document. The public will now have an opportunity to review the draft prior to public meetings, scheduled for late this winter. Public input will be used to set priorities for the Final Plan which will be competed in 1995.

The Lake Champlain Basin Program (LCBP) is the umbrella organization which coordinates the activities of numerous agencies and organizations being carried out under the auspices of the Lake Champlain Special Designation Act of 1990.

To obtain a copy of the draft Plan (400 pages) or the information packet (25 pages), contact the LCBP at (802) 372-3213 or 1-800-468-5227.

"It's True"

Why Does Ice Float?

Unlike other substances, water reaches its greatest density as a liquid at 39 degrees Fahrenheit. When water cools below this temperature, it remains on the surface. As ice forms it floats on the surface, because it is less dense than water! Fortunately, because of these properties, many winter recreational adventures, like ice skating, can be enjoyed.

From all of us at the Lakes and Ponds Section:

Seasons Greetings and A Happy New Year!

Vermont Agency of Natural Resources
Department of Environmental Conservation
Water Quality Division
Lakes and Ponds Section
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Waterbury, VT 05671-0408

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