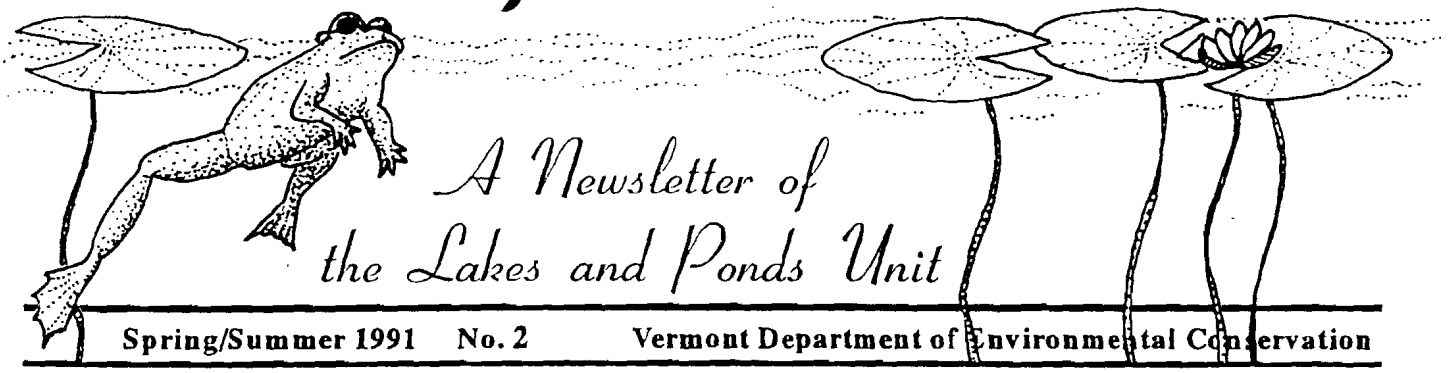
Out of the Blue



A Newsletter of the Lakes and Ponds Unit

Spring/Summer 1991 No. 2 Vermont Department of Environmental Conservation

Battling an Underwater Exotic

Eurasian watermilfoil, or *Myriophyllum spicatum*, as it is known to botanists, is an aggressive, non-native aquatic plant that was introduced to this country from Europe some time between the late 1800's and mid 1900's. It is causing problems not only in Vermont, but in many lakes and waterways across the country. This fast growing plant is rooted in the lake bottom, grows up through the water column, and often forms dense surface mats. Recreational activities such as swimming, boating and fishing can be severely impaired. Milfoil may also significantly alter a lake's natural environment by outcompeting beneficial native aquatic plants and

("Milfoil" continued on page 7)

in this issue...

Aquatic Insects - A Potential Biological Control for Milfoil ?

Many types of control methods have been used in Vermont to try to reduce milfoil growth, including chemical, physical and mechanical means. Biological control methods, however, have not yet been used.

The term ***biological control*** refers to the use of a specific organism to control a pest species. Vegetable gardeners commonly use biological control when they apply the powdered bacterium, BT (*Bacillus thuringiensis*), to their broccoli and cabbage plants to kill leaf-eating cabbage worms. Biological control of aquatic plants may mean the use of insects, fish, fungi, bacteria or other biological organisms to control nuisance aquatic weed growth. Whether the pest is an animal or a plant, the objective of any biological control program is to create a "balanced" situation where the control organism reduces the impact of the pest by keeping it's growth and spread in check. The nuisance species is usually not eliminated, but is maintained at a reduced level. Advantages of biological control, compared to other methods such as mechanical and chemical control, may include lower maintenance costs and fewer environmental impacts. The main disadvantage of biological control is that the introduced organism may cause some unanticipated impact to the lake, causing even greater damage than the original pest.

The Vermont Department of Environmental Conservation (DEC) is involved in a project to investigate the potential of three aquatic insects (2 moths and a weevil) to control Eurasian

("Insects" continued on page 8)

Thank You

Our sincere thanks to all of you who assisted in updating the Lakes and Ponds Unit's mailing list. We appreciate your efforts in returning the updating card inserted in the first issue of Out of the Blue. Thank you for your cooperation!

OUT OF THE BLUE

is produced semi-annually by the Lakes and Ponds Unit. Our purpose is to share information on lake environments, water quality and state activities through articles on lake ecology and Unit 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 call (802) 244-5638, or write:

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AUDIO VISUAL MATERIALS AVAILABLE

The Lakes and Ponds Unit has three slide shows and two videos available for loan to any interested group or individual. All of the items are available free of charge. Each item is described briefly below:

Eurasian Watermilfoil.... A Threat To Our Lakes
A 20 minute slide show with script that discusses the threat of Eurasian watermilfoil in Vermont, what can be done to control milfoil and how lake users can prevent further spread of this nuisance aquatic plant. Three copies are available for loan.

Herbivores
A 30 minute slide show with audio tape will be available this summer on loan for those interested in learning more about the Lake Bomoseen Demonstration Program, a research project initiated to investigate the potential of aquatic insects to control the nuisance aquatic plant, Eurasian watermilfoil.

Vermont Lakes - Neglected or Protected?
A 25 minute slide show including tape or script which explores lake ecology and water quality issues. Focus is on the watershed of a lake and those activities which can degrade water quality. One copy is available for loan.

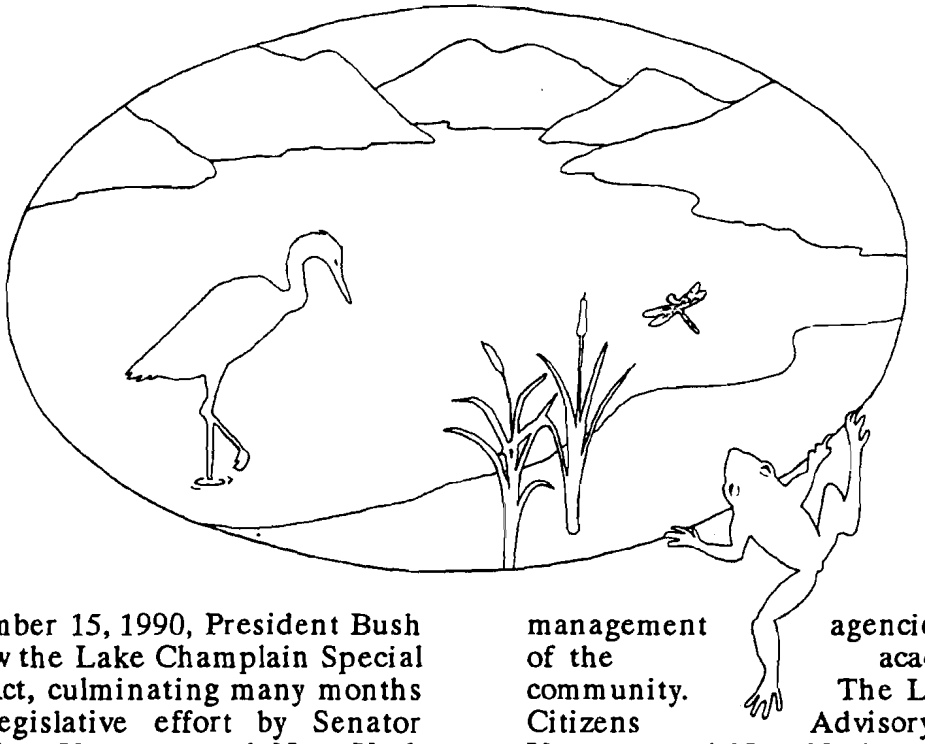
For Your Lake's Sake
A 20 minute video about the land uses around a lake and how they affect water quality by accelerating eutrophication. Although produced in Maine, the video is very pertinent to issues in Vermont and features four high school students investigating a lake in their area. (Excellent for grade levels 7-12.) One copy is available for loan.

Lake Protection: Everyone Contributes
A 12 minute video produced in Minnesota discussing ways in which shoreline residents can prevent pollution from their properties. One copy is available for loan.

If you are interested in borrowing a video or slide shows, please contact: *Ann Bove, Lakes and Ponds Unit, (802) 244-5638.*

Please note: *Cathy Kashanski was inadvertently ommitted from the "Lakes and Ponds Unit Contacts" listed in the first issue of "Out of the Blue". Cathy works on the Lake Protection Program (with Susan Warren) and can be reached at 244-6951.*

The Lake Champlain Special Designation Act



On November 15, 1990, President Bush signed into law the Lake Champlain Special Designation Act, culminating many months of effective legislative effort by Senator Leahy and other Vermont and New York Congressional delegates. This Act is a major step forward for the environmental management of Lake Champlain.

The first step in implementing the Act will be the convening of a 31 member Lake Champlain Management Conference on June 3, 1991. The Management Conference is composed of the Governors of Vermont and New York, representatives of several federal agencies, selected members of the Vermont and New York legislatures, and representatives from local governments, nongovernmental interest groups, industry, educational institutions, and the general public.

The Lake Champlain Management Conference will oversee the preparation of a Comprehensive Pollution Prevention, Control, and Restoration Plan for Lake Champlain. The Plan must develop corrective actions, compliance schedules, and funding methods addressing the full spectrum of environmental problems on Lake Champlain. The scope of the Plan will include chemical, physical, and biological aspects of the lake's water quality, as well as fish and wildlife, recreational, and economic concerns.

The Management Conference will be advised by a Technical Advisory Committee including specialists from state and federal management agencies and members of the academic research community. The Lake Champlain Citizens Advisory Committees in Vermont and New York established under the 1988 Vermont-New York Agreement on Lake Champlain will continue to function in a public participation role with the Management Conference.

The Lake Champlain Special Designation Act authorizes $25 million to various federal agencies over the next five years to carry out the programs developed under the Comprehensive Plan. However, only $2 million has thus far been appropriated to the Environmental Protection Agency. It is hoped that these initial funds will help get the Management Conference off to an effective start so that the remainder of the authorized funding will follow.

The Vermont Agency of Natural Resources is currently working with the New York Department of Environmental Conservation to prepare joint briefing papers and work plans for the Management Conference on all the major environmental issues facing Lake Champlain. Questions regarding Vermont's involvement with the Lake Champlain Special Designation Act may be addressed to:

Lisa Borre, Lake Champlain Coordinator
Vermont Agency of Natural Resources
103 South Main St., Center Building
Waterbury, VT 05671-0301
(802) 244-1137 or 1-800- 244-9140

Zebra Mussels in The Great Lakes

Reprinted from a fact sheet published by the Michigan Sea Grant College Program, a cooperative program of Michigan State University and the University of Michigan.

Light and dark banded zebra mussels have spread to all of the Great Lakes in just four years and are expected to spread to the rest of the U.S. in a decade. How to fight the invasion of these prolific mussels is being explored from the Great Lakes to the Soviet Union.

Zebra mussels migrated from their native Black and Caspian Seas to Europe via man-made canals. For almost 200 years the mussels have resided in the fresh waters of western and central Europe. With the increased spread of ocean transport, zebra mussels and other exotic species are now able to survive the journey via cargo ship ballast water from Europe to the Great Lakes.

Cargo ships take in ballast water to redistribute weight when cargo is unloaded. The water is loaded in one port and expelled in another, depositing anything present in the water. Researchers believe that the mussels were accidentally transported via ballast water from Europe and introduced into the Great Lakes in 1985 or 1986. First discovered in Lake St. Clair in June 1988, zebra mussels quickly spread to Lakes Erie and Ontario and the St. Lawrence River.

Reproductive Cycle Promotes Spread

The mussels' ability to quickly populate a body of water lies in the fact that one mature female can produce up to 40,000 eggs in one season. Zebra mussel eggs hatch within a few days. The young are microscopic larvae called veligers and can be carried great distances in water currents. Veligers float in the water an average of 8 to 14 days. Recent research indicates that veligers can remain floating for up to 33 days, before they attach to a hard surface.

Veligers must attach to a firm surface or they will die. Those that attach and survive will transform into a double-shelled mussel within three weeks and mature in a year. Threadlike filaments produced by the veligers and adult mussels are used to firmly attach to hard surfaces.

Although the majority of mussels found are thumbnail size, zebra mussels can reach two inches (5 cm) long when fully grown. The mussels live an average 3.5 years but can live as long as five years.

Threat Posed to Great Lakes System

Although the mussels are small, they can cluster together in colonies of thousands per square meter. Any hard underwater surface such as spawning reefs, docks, boat hulls, commercial fishing nets, buoys, water intake pipes, and even other zebra mussels can be covered by layers of mussels in a short time.

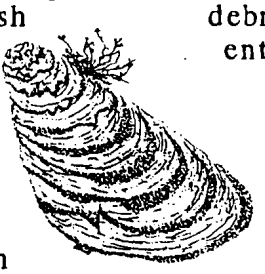
Colonization of spawning reef deprives fish of spawning habitat and could decrease Great Lakes fish populations. Some areas of Lake Erie contain over 30,000 and sometimes up to 70,000 mussels per square meter.

The mussels' ability to filter large quantities of water is believed to increase water clarity. One zebra mussel can filter one liter of water per day, removing suspended plankton from the water. It has been observed that since zebra mussels arrived in Lake Erie, visibility has increased from 4 feet to 12 feet. Still, the negative impact of this exotic species to the Great Lakes is generally thought to far outweigh the positive.

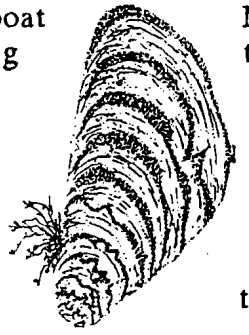
Impact on Industry and Recreation

In addition to Great Lakes ecosystem damage, zebra mussels can also harm industry and recreation. Zebra mussels could cost billions of dollars in damage to U.S. and Canadian factories, water suppliers, power plants, ships, and fisheries in the next ten years. Mussels encrust and clog municipal and industrial water intake pipes, building colonies several layers deep and feed on the steady supply of plankton that flows into pipe openings. Another problem is that when zebra mussels die and decompose they can cause bad tastes and odors in drinking water.

Mussels can ruin Great Lakes recreational activities such as sport fishing, wreck diving, and beach walking. They affect sport fish by colonizing spawning reefs and reducing the plankton food supply. Shipwrecks are another place where mussels colonize. Divers have already reported some wrecks virtually unrecognizable due to mussels. Beach recreation along Lake Erie has also been affected by razor-sharp zebra mussel shells washing ashore in large numbers.

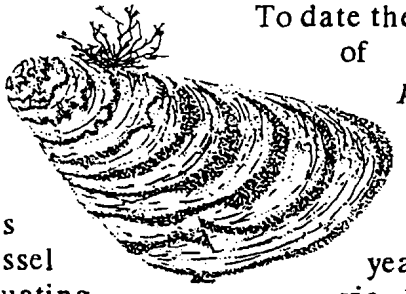


Zebra mussels can accumulate in water intakes of both inboard and outboard boat motors, and grow inside motors, causing engines to overheat. The mussels attach quickly to boat hulls and can impair handling capability, reduce fuel economy, and slow speed.



Methods of Eradication

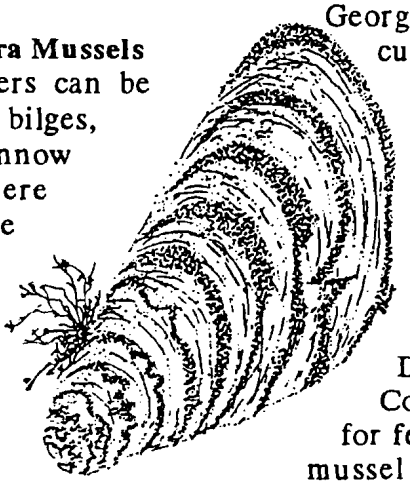
Methods of mussel control such as chlorination, chemical treatment, heat, electrical shock, and sonic vibrations are under experimentation. Though some treatments are effective in controlling the mussels in concentrated areas, experts have yet to find a way to eliminate the mussel on a lake-wide basis.



Researchers around the world are studying the zebra mussel problem. Michigan Sea Grant is currently sponsoring two zebra mussel research projects and evaluating numerous proposals for additional zebra mussel research.

You Can Slow the Spread of Zebra Mussels

Microscopic larvae or veligers can be unknowingly transported in bilges, engine cooling systems, minnow buckets, live wells, and anywhere trapped water exists. Here are some precautions you can take to avoid being a zebra mussel carrier.



- Always inspect your boat and boat trailer carefully before transporting.
- Before you leave the boat launch site, remove from the boat trailer any plant debris where tiny zebra mussels may be entangled.
- Dispose of the mussels in a trash barrel or other garbage container. Do not leave them on the shore where they could be swept back into the lake, or rot and foul the area.
- Drain all bilge water, live wells, bait buckets, and engine compartments. Make sure water is not trapped in your trailer.
- Always use extra caution when transporting baitfish from one lake to another. You could be carrying microscopic veligers. To be safe, do not take water from one lake to another.

WILL ZEBRA MUSSELS SPREAD TO VERMONT?

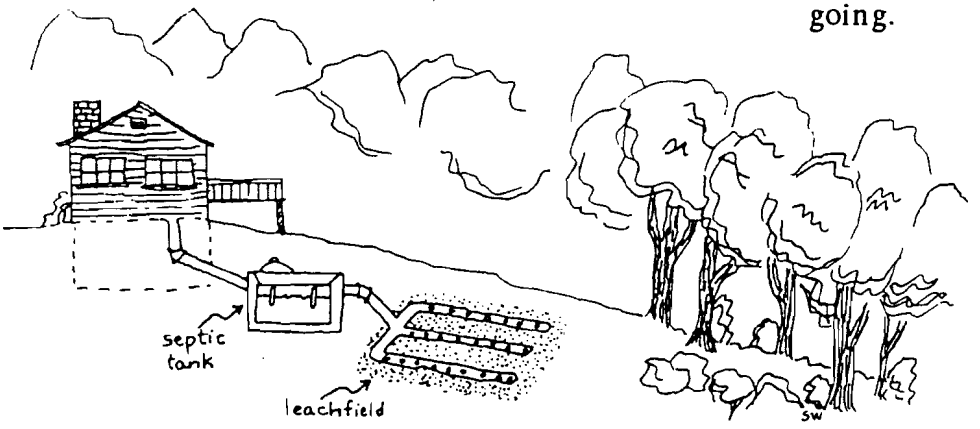
To date there are no confirmed populations of zebra mussels (*Dreissena polymorpha*) in Vermont. Unfortunately, due to their rapid rate of spread, experts predict that they will enter Lake Champlain within the next few years. They are expected to arrive via 1) the Richeleau River which connects to the St. Lawrence River, 2) the LaChute River which connects to Lake George (contrary to rumour, there are currently no confirmed populations of zebra mussel in Lake George), or, 3) the Champlain Canal which connects to the Hudson River. They may also be introduced by people who transport their boats from lakes containing zebra mussels in other states, to lakes in Vermont. The Vermont Department of Environmental Conservation is presently applying for federal funding to prepare a zebra mussel management plan.

Good Shoreland Management

Protecting lakes is everybody's business. Voluntary use of water quality protection measures is needed on properties to guard against pollution. Below is a sampling of best management practices for shoreland owners.

Yards, Lawns and Gardens

- Fertilizer use should be avoided on lawns that are within 100 feet of the lake. The same nutrients that help your lawn grow will increase plant and algae growth in the lake.
- Avoid the use of herbicides and other pesticides.
- Leave a buffer strip of shrubs and trees between a lawn and the lake.



A septic system is made up of a septic tank, which removes solids and grease, and a leachfield which treats the liquid waste.

Septic Systems

Proper use and maintenance is essential to prevent failure of septic systems and protect water quality.

- Find out what kind of system you have and where it is located. Substandard systems should be upgraded as necessary.
- Have your tank inspected and pumped about once every three years.
- Don't use a garbage disposal; it greatly increases the rate of sludge buildup in the tank. Likewise, don't dispose of tampons, sanitary pads, diapers, grease, etc. in a septic system.
- Practice water conservation. By reducing the volume of water entering the system, you allow more time for wastes to receive proper treatment.
- Protect the bacteria in your septic system. Don't put pesticides, medicines, paints, solvents, or strong cleaners into the system.
- Don't use septic system additives. Most of these are more apt to cause failure than to prevent it, regardless of the claims made by manufactures.
- Protect the leach field. Don't allow heavy vehicles to drive over it, and keep trees and shrubs from growing within ten feet of the edge or on top of it.

Runoff

A large percentage of the nutrients and sediments that pollute lakes come from overland flow during a rain storm. Watch the flow patterns during a storm to learn where the runoff from your property is going.

- Check your driveway and paths for signs of erosion and gullies. Stabilize eroding driveway ditches with grass or rocks.
- Do not allow runoff (including driveway and roof runoff) to become channelized and enter the lake directly. Alter runoff patterns so that water is spread out into "sheet" flow and allowed to run through a well vegetated area.
- Seed unvegetated areas.

Buffer strips

There is perhaps no other single measure as important to water quality protection as vegetated buffer strips. A strip of well mixed vegetation (trees, shrubs and ground cover) settles out sediments and allows plants to uptake the nutrients that are contained in storm runoff as a result of the uphill land uses.

- Leave any existing trees and shrubs along the shoreline.
- Use vegetation as a shoreline stabilization measure, rather than walls or other unnatural structures.
- If your camp is set far enough back from the lakeshore, a buffer strip could be partially reestablished. Plant native trees and don't mow the lawn underneath them. Leave pathways or openings for a view, the more vegetation, other than lawn, the better.

Education

Lake residents can organize workshops, educational meetings, and information distribution in order to educate their fellow lake residents about water quality protection. Copies of a pamphlet about lakeshore property management are available from the Lake Protection Program. Contact Susan Warren (244- 5638) or Cathy Kashanski (244-6951) for more information.

Milfoil (continued from page 1)
by reducing the availability of spawning habitat for fish. Because of it's ability to produce extremely dense beds, milfoil has been known to cause water quality impacts in some lakes, such as:

oxygen reduction caused by reduced wave action and water circulation in milfoil beds,
temperature alteration caused by restriction of water movement or development of a steep temperature gradient due to shading by surfacing milfoil beds,
phosphorus loading caused by year-end milfoil plant decay, and
changes in sediment transport and deposition caused by increased sediment entrapment and accumulation of decayed plant material.

Vermont currently has thirty lakes with some degree of milfoil growth, ranging from heavy, lakewide infestations to small, isolated populations. Vermont's Eurasian Watermilfoil Control Program focuses on managing the growth of milfoil in certain lakes that have well established populations, stopping or slowing the spread of milfoil in lakes where it has been recently introduced, and preventing the spread of milfoil to new lakes. Program goals are accomplished through research, monitoring, control projects and public education (see elements outlined below).

A few highlights of the 1990 Milfoil Control Program include: 1) an investigation of milfoil control using diver-operated suction harvesting, silicone bottom barriers and herbivorous aquatic insects (see article on page 1); 2) sampling of a lake's aquatic plant population to determine plant recovery two years after an overwinter drawdown; 3) milfoil handpulling on six lakes, three of which were newly discovered populations; 4) milfoil searches on ten lakes; 5) milfoil surveys on twelve lakes; and, 6) milfoil watchers training for individuals from sixteen lakes.

Elements of Vermont's Eurasian Watermilfoil Control Program

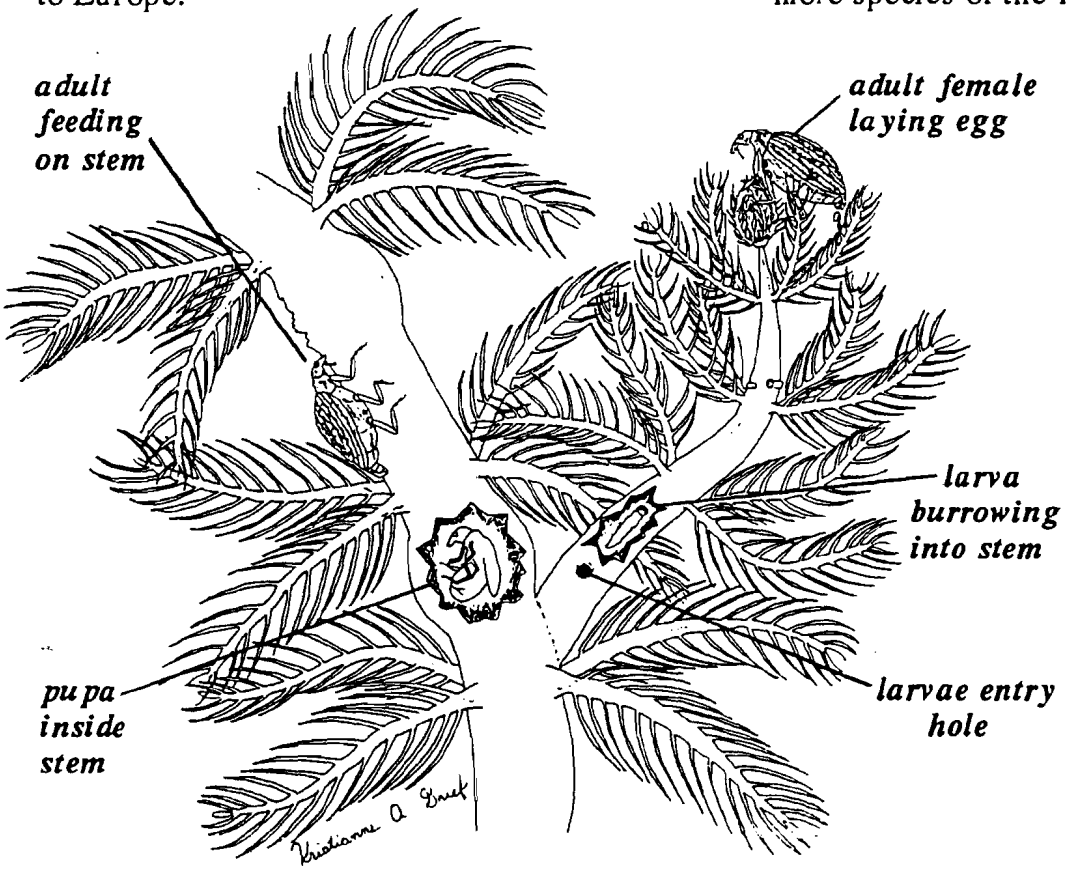
Research	Monitoring	Control Projects	Public Education
⊕ review and evaluate all existing control methods	⊕ conduct lake surveys to monitor milfoil populations	⊕ provide technical assistance and/or coordination of control projects on lakes with well established milfoil populations	⊕ participate in public meetings
⊕ test feasibility of new methods through special demonstration projects and field trials	⊕ conduct lake searches to detect new milfoil populations	⊕ conduct control projects designed to contain or remove new localized "pioneer" milfoil populations	⊕ ensure statewide media coverage
⊕ provide technical and financial support for university research	⊕ monitor and document control projects		⊕ install and maintain boater warning signs at accesses.
	⊕ maintain computer data base		⊕ prepare/distribute educational materials
			⊕ train milfoil watchers

Insects (continued from page 1)
watermilfoil. While it may seem unlikely that these tiny insects could actually have a noticeable impact on milfoil, there is some evidence to suggest that this may be possible.

In August of 1989, DEC staff discovered a dramatic decline in Eurasian watermilfoil growth in Brownington Pond, located in the towns of Brownington and Derby in northeastern Vermont. The once dense milfoil population that infested the near-shore zone in 1986 had mysteriously declined to the point where only one small plant bed remained. Three species of ***herbivorous*** (plant-eating) aquatic insects were found in the sole remaining bed. Two of the insects discovered in Brownington Pond, the weevil, *Eurhychiopsis lecontei*, and the moth, *Parapoynx badiusalis*, are native to North America. The third insect, a moth called *Acentria nivea*, is believed to be native to Europe.

Dr. Sallie Sheldon, an aquatic ecologist at Middlebury College, has been hired as the DEC's Principal Investigator to design and carry out the research needed to determine the potential of these three insects to control Eurasian watermilfoil. Funding for the project was obtained through a five year grant from the U.S. Environmental Protection Agency's Clean Lakes Program, with matching funds being provided by the DEC, Middlebury College and the U.S. Army Corps of Engineers. Researchers from the Freshwater Institute (Rensselaer Polytechnic Institute) in NY, the University of Vermont and Castleton State College are also involved in the project.

Through extensive field and laboratory work, the researchers hope to determine 1) which factor(s) contributed to the Brownington Pond milfoil decline, and 2) whether or not it is feasible to use one or more species of the insects to control milfoil in Lake Bomoseen and other Vermont lake without causing impacts to native aquatic plants. The researchers are conducting experiments to determine the life history of the insects, assess the feeding effects of the insects on plant growth, determine the insects' plant preferences, assess the impacts of fish populations on the insects and quantify densities of herbivores needed to control milfoil.



Life Cycle of the Weevil, Eurhychiopsis lecontei

adult → egg → larvae → pupa → adult

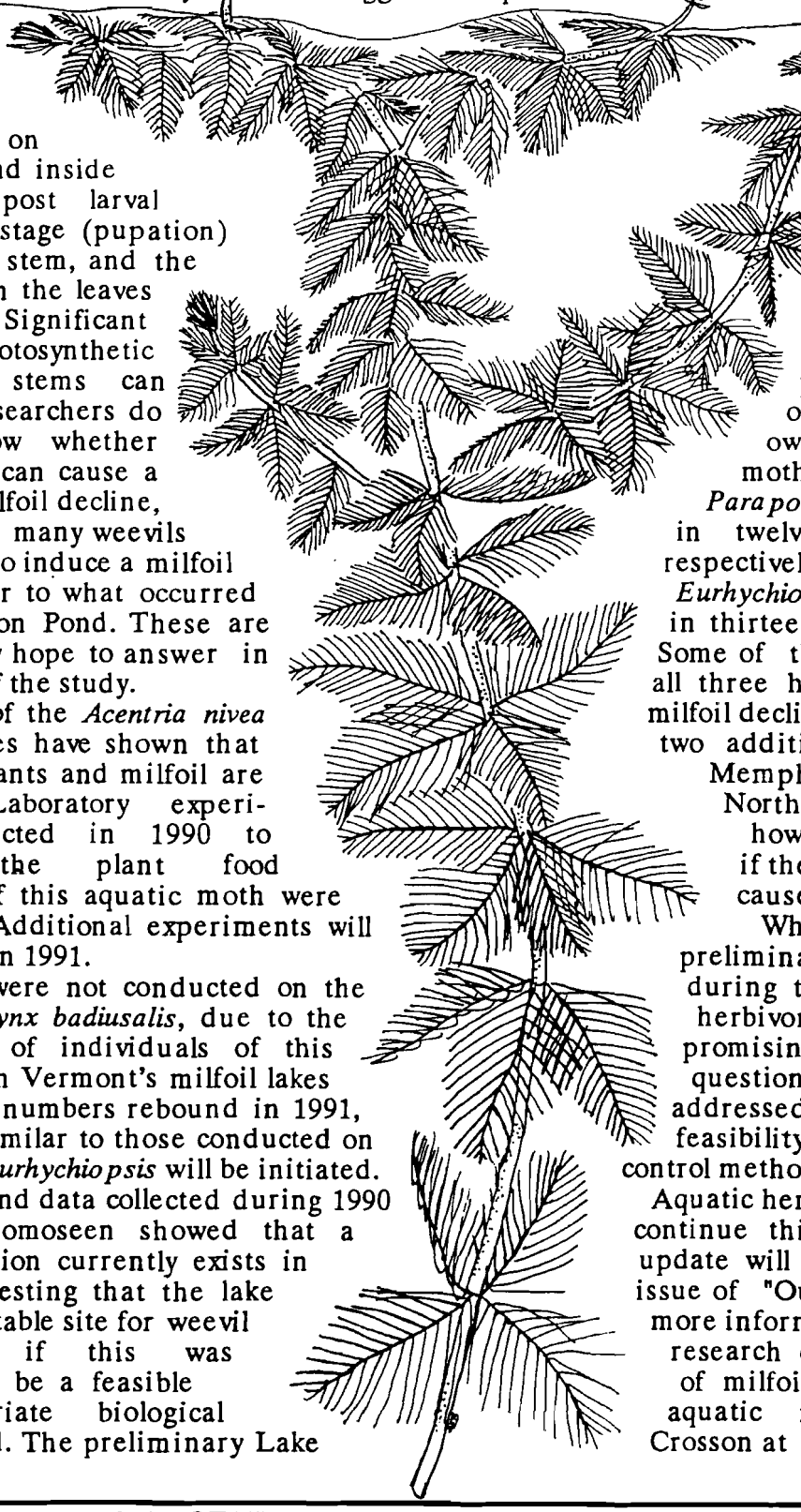
While the cause(s) of the milfoil decline in Brownington Pond have not yet been fully determined, preliminary results from the data collected in 1990 suggest that

weevils, and possibly other herbivores, did play a role in the decline. Initial results from the weevil feeding and life history studies on Brownington Pond indicate that this weevil species is closely associated with Eurasian watermilfoil. The adult female lays her eggs on milfoil, when the larvae hatch out they feed on milfoil tips and inside stems, the post larval development stage (pupation) occurs in the stem, and the adults feed on the leaves and stems. Significant damage to photosynthetic tissue and stems can occur. The researchers do not yet know whether weevils alone can cause a substantial milfoil decline, and if so, how many weevils it would take to induce a milfoil decline similar to what occurred on Brownington Pond. These are questions they hope to answer in future years of the study.

Results of the *Acentria nivea* feeding studies have shown that both native plants and milfoil are consumed. Laboratory experiments conducted in 1990 to determine the plant food preferences of this aquatic moth were inconclusive. Additional experiments will be conducted in 1991.

Studies were not conducted on the moth, *Parapoynx badiusalis*, due to the low numbers of individuals of this species seen in Vermont's milfoil lakes in 1990. If its numbers rebound in 1991, experiments similar to those conducted on *Acentria* and *Eurhychiopsis* will be initiated.

Background data collected during 1990 from Lake Bomoseen showed that a weevil population currently exists in the lake, suggesting that the lake would be a suitable site for weevil introductions if this was determined to be a feasible and appropriate biological control method. The preliminary Lake Bomoseen data also showed that herbivore damage was much more significant in unharvested areas versus harvested areas. This finding is not too surprising, since mechanical harvesting removes the top portion of the milfoil plants which is where the weevils live.



Extensive herbivore searches in other milfoil lakes in Vermont have revealed that the three herbivores have already established populations throughout the state on their own. The larvae of the moths, *Acentria* and *Parapoynx*, have been found in twelve and six lakes, respectively. The weevil, *Eurhychiopsis*, has been found in thirteen lakes in Vermont. Some of the milfoil lakes have all three herbivores. Apparent milfoil declines have occurred in two additional lakes (Lake Memphremagog and North Montpelier Pond); however, it is not known if the herbivores were the cause of the declines.

While some of the preliminary data collected during the first year of the herbivore study has been promising, many complicated questions still need to be addressed with respect to the feasibility of this biological control method.

Aquatic herbivoire research will continue this summer and an update will appear in the next issue of "Out of the Blue". For more information on Vermont's research on biological control of milfoil using herbivorous aquatic insects, call Holly Crosson at 244-5638.

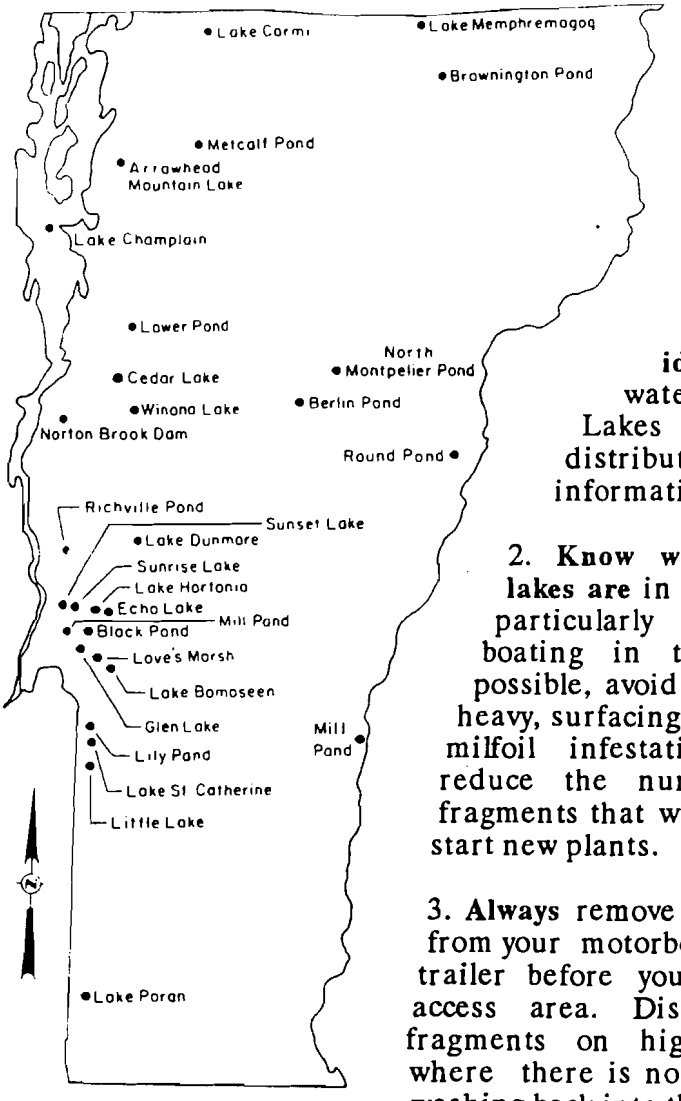
Eurasian Watermilfoil Spread Prevention and Early Detection: Crucial Elements To Deter Invasions

It is easy to become discouraged about the threat Eurasian watermilfoil poses to Vermont's lakes and ponds; one need only make a summer visit to a lake heavily infested, add up the costs of annual control, contemplate the ease with which this prolific invader spreads, or count the number of lakes already known to be infested. There is a glimmer of hope, however. Past experience in Vermont has clearly demonstrated the value of early detection and the importance of spread prevention measures in deterring lakewide Eurasian watermilfoil invasions.

No one knows how many lakes would now be infested if it were not for the extensive information and educational efforts of the Department of Environmental Conservation and concerned lake residents, lake associations, and citizens. What is known, however, is that early detection and spread prevention efforts have delayed, and may ultimately have prevented, lakewide milfoil infestations.

Black Pond in Hubbardton and Lake Dunmore in Salisbury and Leicester are success stories that document both the value of discovering a poulation before it can become widely established and the importance of implementing spread prevention measures. Milfoil was detected in these lakes in the early stages of infestation. Control and spread prevention measures were implemented immediately. Although milfoil was discovered in Black Pond in 1987 and in Lake Dunmore in 1989, the populations in both lakes have not spread lakewide.

Listed below are activities that groups or individuals can implement to help prevent lakewide Eurasian watermilfoil infestations. By implementing one or all of these activities, you may be protecting a lake you care about from an invasion by Eurasian watermilfoil.



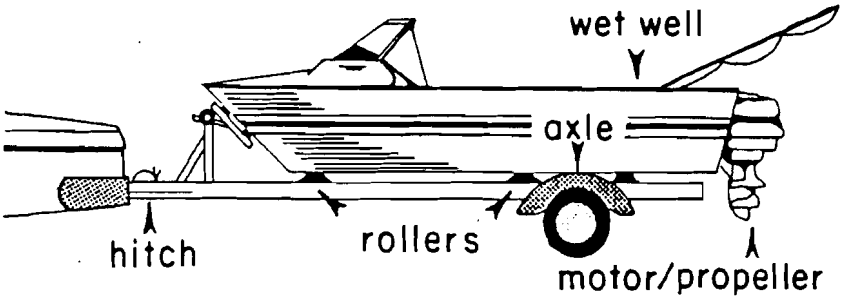
Known Locations of Eurasian Watermilfoil Populations in Vermont (September 1990)

1. Learn to **identify** Eurasian watermilfoil. The Lakes and Ponds Unit distributes identification information.

2. **Know where the milfoil lakes are** in Vermont and be particularly careful when boating in them. If at all possible, avoid boating through heavy, surfacing Eurasian watermilfoil infestations. This will reduce the number of milfoil fragments that will be available to start new plants.

3. **Always** remove plant fragments from your motorboat propeller and trailer before you leave a lake's access area. Dispose of the fragments on high, dry ground where there is no danger of them washing back into the lake.

4. If your lake does not have Eurasian watermilfoil, or has only a small, isolated population, participate in the "**Milfoil Watchers**" program and conduct at least two or three milfoil searches a summer (see the "Calendar of Events" section on page 16). Suggestions on how to conduct a search are available from the Lakes and Ponds Unit.



Check boating equipment before leaving a lake's access area

5. Keep a supply of **milfoil pamphlets and identification posters** on hand to distribute to new lake association members and other lake users. Copies are available from the Lakes and Ponds Unit.

6. Present the Department of Environmental Conservation's **milfoil slide show**, "Eurasian Watermilfoil....A Threat To Our Lakes", to lake associations and others wishing to learn more about milfoil. Copies are available on loan from the Lakes and Ponds Unit.

7. **Post milfoil information** at lake access areas. A bulletin board with a protective front (glass or plexiglass) will prevent tampering or destruction from the elements.

8. **Metal warning signs**, asking boaters to remove plant fragments from their boats and trailers, have been posted at the access areas of all infested lakes and many noninfested lakes. If you are aware of a down or missing sign on any of these lakes, please notify the Lakes and Ponds Unit.

9. Institute a volunteer program to **meet boaters** at your lake's access area, pass out milfoil literature and describe the threat this plant poses to Vermont's lakes.

10. **Report** any suspected Eurasian watermilfoil population in your lake immediately to the Lakes and Ponds Unit.

11. **Share your knowledge with others!** Public participation in Eurasian watermilfoil control and prevention is essential in combating this nuisance aquatic plant.

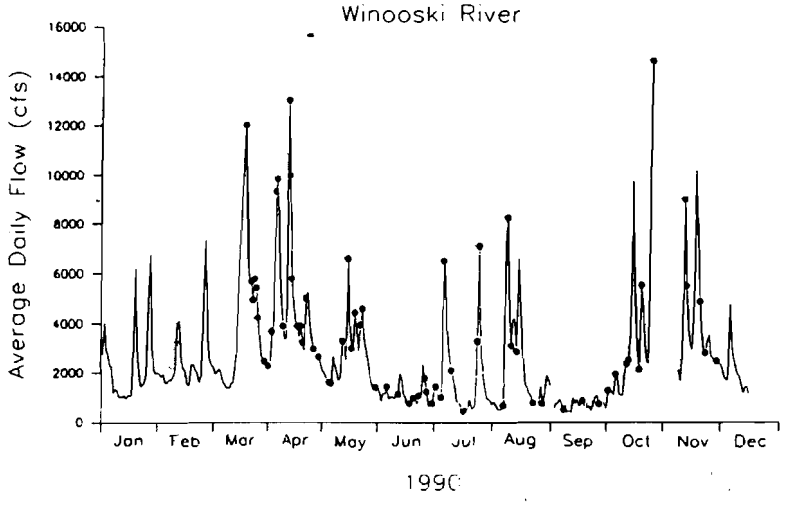
METAL BOATER WARNING SIGN posted at lake access areas

The Lake Champlain Phosphorus Study - An Update

The Lake Champlain Phosphorus Study is a two year study which began in January 1990 to determine the amount of phosphorus entering the lake from all sources. The results of the study will be used to determine where resources should be expended to most effectively reduce phosphorus inputs to the lake.

Phosphorus is often referred to as a "limiting nutrient". This is because in comparison to the other important elements needed for plant growth (carbon, hydrogen, oxygen, nitrogen, and sulfur) it is the least abundant, and most commonly limits biological productivity. Studies have shown that lakes enriched with nitrogen and carbon alone will not cause algal blooms, but if phosphorus is added in conjunction with these elements, a bloom occurs. It is this nutrient's ability to stimulate the growth of algae and aquatic plants that makes its control so important for Lake Champlain.

A major component of the Lake Champlain study involves the sampling of 33 tributary rivers and streams in Vermont, New York, and Quebec. The rivers selected each drain areas greater than 10 square miles. The Winooski River drainage area is the largest (1092 sq.m.) and the Stonebridge River drainage area is the smallest (11 sq.m.).



Provisional, average daily flow record for the Winnooski River during 1990 showing the days (dots) on which samples were obtained.

A concerted effort was made in 1990 to sample the 33 tributaries as often as possible. The Winooski River alone was sampled 71 times between March and December. It was assumed that the tributaries would carry a significant load of phosphorus during peak flow conditions, i.e. during spring runoff and heavy rain events. Therefore an effort was made to sample most frequently during peak flow. The graph at the bottom of the page shows the daily flow of the Winooski River during 1990 at the United States Geological Survey gaging station in Essex. The dots indicate days when phosphorus samples were collected. It can be seen that, beginning with ice out in March, the Vermont Department of Environmental Conservation was very successful in "capturing" events during peak flow periods. Analysis of the data has shown that less frequent sampling during low flow periods (June and September of 1990) would not have significantly reduced the accuracy of the phosphorus loading estimate calculated by the study. In 1991, the emphasis will be to sample the tributaries during high flow periods only.

Preliminary data analysis suggest that the majority of phosphorus is entering Lake Champlain from the largest tributaries. The amount of phosphorus carried into the lake by a river (the "phosphorus load") is influenced by the river's drainage area size and flow, and the land use practices in the drainage area. The Winooski River enters the lake between Burlington and Colchester and is the largest river entering Lake Champlain. The Stonebridge River enters in Milton and is the smallest river sampled in the study. When comparing the phosphorus load of the Winooski River with that of the Stonebridge, the Winooski River contributed 206 times more phosphorus to Lake Champlain in 1990. Non-point sources of phosphorus such as precipitation inputs are inconsequential compared to non-point sources resulting from land use practices in the drainage areas of the large rivers.

The Fall newsletter will highlight the results of lake sampling and provide insight into the phosphorus contributions of individual tributaries to overall Lake Champlain water quality. For additional information on this program contact Jim Kellogg or Eric Smeltzer at 244-5638.

Dive Club Volunteers its Services in Vermont

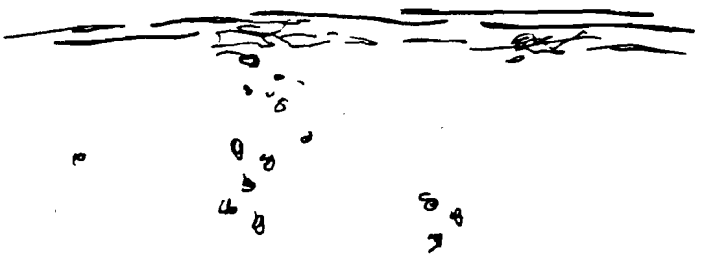
The New England Aquarium Dive Club (NEADC), a 500 member organization of scuba divers throughout New England, has formed a non-profit, informal network of environmentally conscious scuba divers called the Divers' Environmental Survey (DES). DES is volunteering diving services to any interested Vermont lake group.

Why would a group of scuba divers volunteer their time to dive in Vermont's lakes and ponds? Scuba divers frequently encounter alarming circumstances underwater that may be entirely unknown to the non-diver. They've seen clouds of subsurface pollution hovering in the water column and areas on lake bottoms that resembled a landfill. DES believes that if more people "on the surface" were aware of what was happening underwater, they would take the necessary steps to alleviate the problem.

In other states, DES has focused its volunteer efforts on conducting underwater lake "surveys", relating what they have seen to the group that requested the dive. DES divers methodically explore a certain area of a lake or pond and objectively report what they observe. On June 2, 1991, approximately 40 DES divers will explore selected sites in Lake Winnipesaukee in New Hampshire. Several lake associations will provide boats to transport divers to the sites and remain nearby while the survey is conducted. What the divers see underwater will be recorded and compared to subsequent dives over a five year period.

DES is also interested in clean-up type operations in a lake and Eurasian watermilfoil control or spread prevention work.

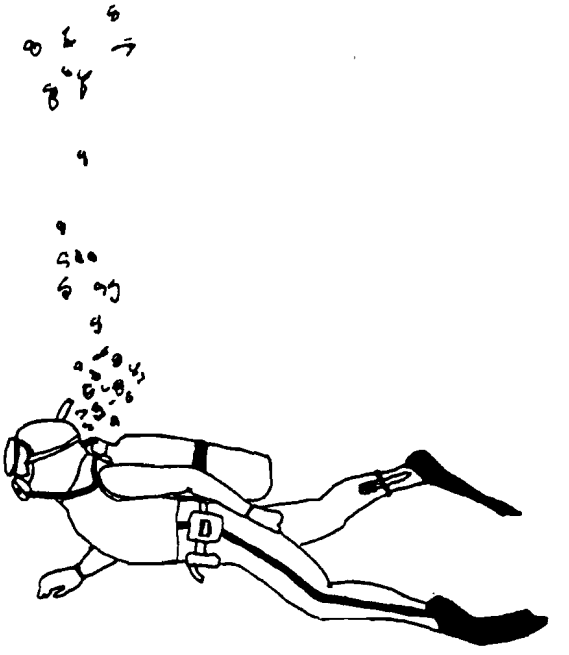
The Department of Environmental Conservation has been in contact with DES in hopes of having the volunteer group

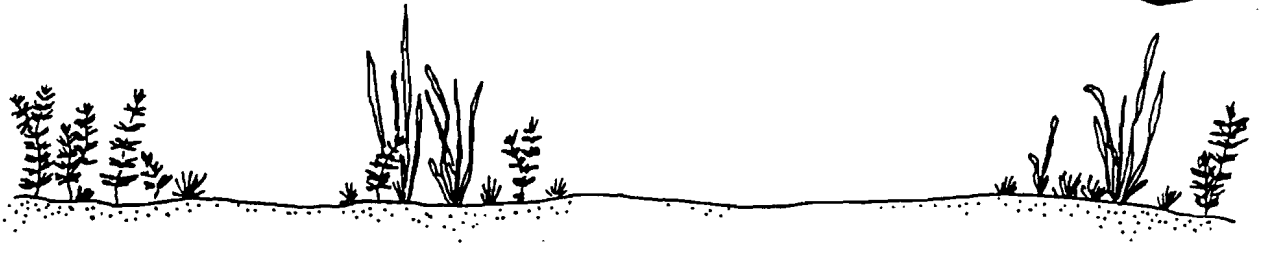


assist the Department with someunderwater projects in Vermont this summer. Projects under consideration include milfoil searches and handpulling activities for small, new milfoil populations in Sunset Lake in Benson/Orwell and Lake Dunmore in Salisbury/Leicester.

Anyone interested in obtaining more information on DES, or scheduling a lake survey or project on their lake, should contact:

Divers' Environmental Survey
P.O. Box 294
Billerica, MA 01821-0294





LAKE LINGO

Best Management Practice (BMP) - in lake and stream management - actions which are considered best to control erosion, runoff, nutrients, pesticides or toxic substances.

Non-point source pollution - pollution from a diffuse area (as opposed to a discharge pipe which is a point source), that enters lakes via runoff, groundwater or tributary streams. Examples: soil erosion, septic system pollution and manure runoff.

Erosion - the loosening and subsequent transport of soil away from its native site. Erosion often results from the removal of vegetation, which holds soil in place.

Groundwater - water that lies beneath the earth's surface. Groundwater is found in water-filled layers of sand, gravel, clay or cracked rock.

Leach field - an area underground where perforated pipe is laid and surrounded with crushed stone. A leach field may serve as a disposal field, absorbing sewage from a septic tank in a septic system. See diagram on page 6.

Septic System - an underground sewage system with two parts, a septic tank and a leach field. See diagram on page 6.

Reading This May Save You Money!

Summer is here! It is the time of year when many think of beginning work on outside projects. Are you considering building a dock, retaining wall, boat ramp or possibly bringing in sand to create a beach area near your home or camp? Each year people engage in these activities without realizing that some are not allowed and others require encroachment permits. Fines for altering shorelines without a permit can go up to $25,000 (first violation).

Don't have your summer project cost more than it needs to! Obtain proper permits before beginning work along shorelines. Contact Andy Rouleau (244-5638) for more information on which activities are allowable and for permit applications.

Working Together on Lake Memphremagog

In September 1989, the governments of Quebec and Vermont signed an agreement to form the 6 member Quebec-Vermont Lake Memphremagog Working Group. The objectives of the group are three-fold:

1) review the principal problems concerning water quality and the general lake environment,
2) determine the possible extent to which both governments can collaborate on managing the problems including data collection and environmental monitoring, and,
3) propose ways both governments can work together to increase knowledge about and improve the environmental management of Lake Memphremagog.

The Governor of Vermont and the Premier of Quebec each appointed 1 citizen, 1 state/provincial official, and 1 local official to the group.

Publications Available from the Lakes and Ponds Unit

- "Eurasian Watermilfoil....A Threat To Our Lakes." (General milfoil pamphlet, Revised 1991)
- Milfoil identification posters, describing key characteristics, on sturdy cardboard or waterproof paper
- A Guide to Vermont's Common Aquatic Plants
- A Key to Common Vermont Aquatic Plant Species
- A List of Water Quality Educational Tools
- A Guide to Buying Lakeshore Property in Vermont
- Planning for Lake Water Quality Protection - a guide for towns and lake associations about local options for protecting lake quality.

Coming Soon!

"For Your Lakes Sake", a pamphlet explaining how lakes are affected by land use and how homeowners can protect water quality. Contact Susan Warren at 244-5638 this summer to receive copies.

The Public Trust Doctrine What is it?

The "public trust doctrine" has been the subject of considerable discussion in Vermont in the past year. The public trust doctrine has its roots in English common law, which allowed the king to hold title to the sea and sea bed. The conveyance of this title by the king was always subject to an overriding right of the general public to use the sea and sea bed for navigation, commerce and fishery. Parliament has the authority and responsibility to protect the public's right to use the sea and sea bed.

Following the American Revolution, each state inherited both the rights possessed by the king and the rights and obligations held by Parliament. At this time the public's right to use the sea was extended beyond salt water to *all* navigable waters in a state. This inherited responsibility means that the State of Vermont must hold the state's navigable waters and the lands underlying these waters in trust for the public.

Each state has a different public trust doctrine, defined by the state legislature and ultimately by the state courts. In Vermont, there have been few court cases to help define the public trust doctrine. Two recent ones, the so-called Burlington Waterfront case and the Williams Point Yacht Club case, have interpreted the doctrine relatively strictly. There is now a question whether the state is violating its responsibility to protect the public's rights under the public trust doctrine when it issues permits to private individuals to use or encroach upon public waters for private purposes (i.e., seawalls, private docks, marinas, etc.). Both the Legislature and the Vermont courts are currently considering decisions related to this matter. What is ultimately decided could have a significant impact on the way Vermont's public waters will be used in the future.

Water Testing Guide

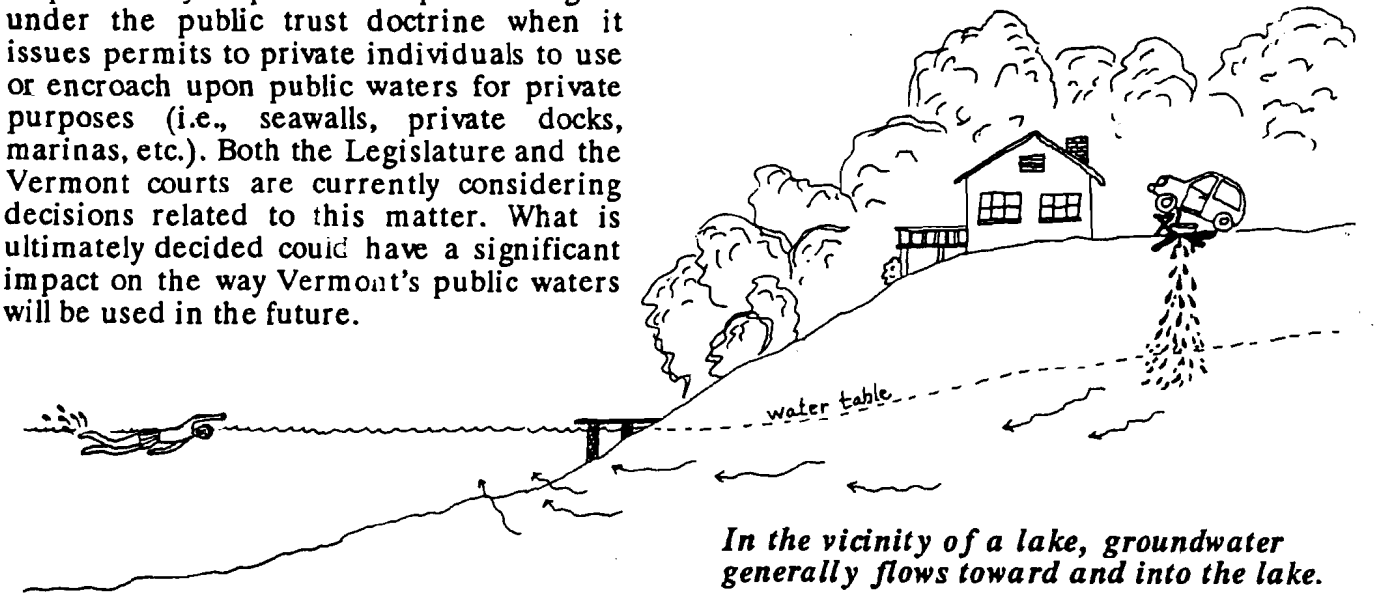
The Vermont Department of Health sells water testing kits for bacterial contamination ($8- $14), common organic solvents ($78), and 22 different inorganic chemicals ($7 each). Call the Vermont Department of Health at 863-7336 or 1-800-464-4343 (Toll free in Vermont) to obtain a water testing guide/order form.

Out of Sight and Into Groundwater

Used motor oil poured into a ditch, spread over gravel, or dumped into a hole and covered up in your backyard may be out of sight but it has not disappeared. Over time it will leach down through the soil and may enter groundwater, contaminate wells or seep into lakes and ponds. Landfills are no longer an option for disposing of oil; on July 1, 1990 it became illegal to place motor oil in landfills.

So where can you responsibly discard your used oil? Jiffy Lube and Nappa Service Centers currently accept used oil for recycling. There are also 10 Solid Waste Management Districts in Vermont which maintain used oil collection tanks for "do-it-yourselfers".

If you change your own oil, take the time to dispose of it properly at a used oil collection site. For information on the oil collection tank near you call the Vermont Recycling Hotline toll free 1-800-932-7100.



In the vicinity of a lake, groundwater generally flows toward and into the lake.

LAKES AND PONDS CALENDAR OF EVENTS

The Lakes & Ponds Unit has scheduled three **MILFOIL WATCHERS** training workshops to be held regionally in June. Milfoil Watchers represent a network of volunteers who assist the Unit in searching for Eurasian watermilfoil.

June 18 at 7:00 pm in Room 113, at the Rutland High School on Library Avenue in Rutland.

June 19 at 7:00 pm in 101 Stanley Hall at the State office complex in Waterbury.

June 20 at 7:00 pm in the Police Training Room of the Newport City Offices in Newport.

For more information, call Ann Bove at 244-5638.

VT Department of Environmental Conservation
Water Quality Division
Lakes and Ponds Unit
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Waterbury, VT 05671-0408

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