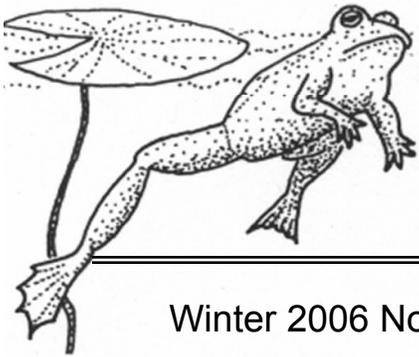
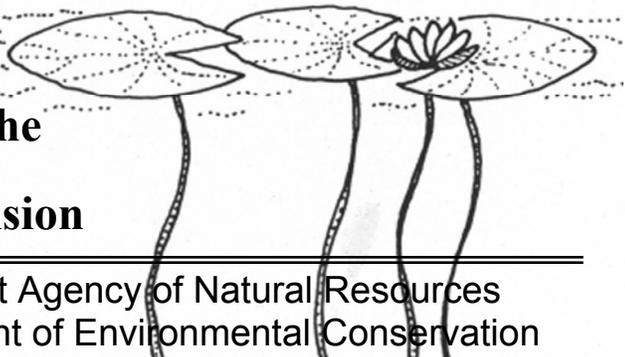


# Out of the Blue



## A Newsletter of the Water Quality Division



Winter 2006 No. 29

Vermont Agency of Natural Resources  
Department of Environmental Conservation

### **Volunteers and Professional Scientists Monitor the Health of Lake Champlain**

The Vermont Lay Monitoring Program completed its 27<sup>th</sup> field season in 2005. Under this citizen-based, volunteer, statewide monitoring program approximately 50 Vermont lakes and 15 stations on Lake Champlain are monitored each summer. On Lake Champlain, the LMP accomplishes three main tasks: describes water quality conditions in terms of nutrient enrichment; builds a database from which to measure any future changes in water quality; and provides an opportunity for public involvement in lake monitoring and protection.

The goals of the LMP compliment those established by the Lake Champlain Long-Term Water Quality and Biological Monitoring Project, a professionally-based monitoring effort started in 1992. The Long-Term Project is conducted by the Vermont Department of Environmental Conservation and the New York State Department of Environmental Conservation with funding provided by the Lake Champlain Basin Program and the two states.

The Long-Term Water Quality and Biological Monitoring Project for Lake Champlain is a comprehensive sampling program designed to detect long-term environmental change in the lake. More parameters are sampled by this program than the total phosphorus, chlorophyll-a, and Secchi water clarity sampled weekly by the Lay Monitors. However, the LMP and Long-Term Project share several sampling sites, thereby

See page 3, "Monitoring Lake Champlain"

### **Stormwater Permits Required for All Projects One Acre or More: Yes, That Means Your New House!**

Vermont, with a healthy natural environment and miles of free flowing water, is known for offering an excellent quality of life. Consequently, it is no surprise that more and more people are choosing to build their homes in Vermont's great landscape. In an effort to maintain and improve the water quality of Vermont's rivers and streams, anyone disturbing more than one acre during construction now will have to obtain a stormwater permit.

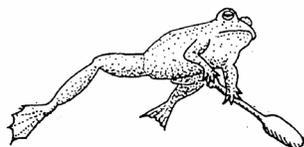
Stormwater runoff is rainfall or snowmelt that flows over the land, often carrying dissolved material and sediment to brooks, rivers and lakes. The volume of stormwater runoff leaving a developed area is typically greater than the amount of runoff leaving a natural, undisturbed area. Stormwater runoff from construction sites can carry from 10 to 20 times more sediment than runoff from agricultural lands and 1000 to 2000 times more sediment than runoff from forested lands! These sediment laden waters can block the amount of sunshine reaching the bottom of a stream, causing the

See page 2, "Stormwater"

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**“Out of the Blue”  
Available on the Web**



*Check out the latest and future newsletter  
issues on the Water Quality Division  
Web Page at  
[www.vtwaterquality.org](http://www.vtwaterquality.org)*

***Out of the Blue***

is produced semi-annually by the Lakes and Ponds Section. Our purpose is to share information on lake, river, and wetland environments, water quality and state activities through articles on aquatic ecology and Division 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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(continued from page 1) — **Stormwater** —

water to appear cloudy. As this sediment settles it can bury submerged plants and any cobblestones, degrading macroinvertebrate and fish habitat, and upsetting the aquatic food chain.

Mandated by Congress under the Clean Water Act, the National Pollutant Discharge Elimination System (NPDES) is a comprehensive two-phased national program for addressing the non-agricultural sources of stormwater discharges which adversely affect the quality of our nation's waters. Vermont's stormwater permit is the state's response to Phase II of the NPDES stormwater program, whereby stormwater from construction activities disturbing more than one acre must be regulated to protect water quality.

The stormwater permit, for all new construction projects that disturb more than an acre, will require the implementation of site specific erosion prevention and sediment control plans. These plans emphasize the stabilization and protection of bare soils to prevent erosion. In addition, stormwater can be directed to areas on site that help to “treat” the runoff before slowly releasing it. Routing runoff to stormwater basins, swales, and vegetated areas are some ways to improve the quality of stormwater leaving a site.

For information on this new permit and what projects will require one, please visit the Stormwater Section's web site at: [www.vtwaterquality.org](http://www.vtwaterquality.org).



**Construction activities stripped this hillside bare of all vegetation and soil stabilization measurements were not adequate. These eroding conditions pollute stormwater runoff. Today, construction projects that disturb an area of one acre or greater will require a permit to prevent construction site erosion.**

providing a double check to the water quality in these locations. Both programs operate under an EPA-approved Quality Assurance Project Plan.

All data for the Long-Term Project is available on the Water Quality Division's web site. All LMP data is available in an annual report and the long-term means are available on the Division's web site.

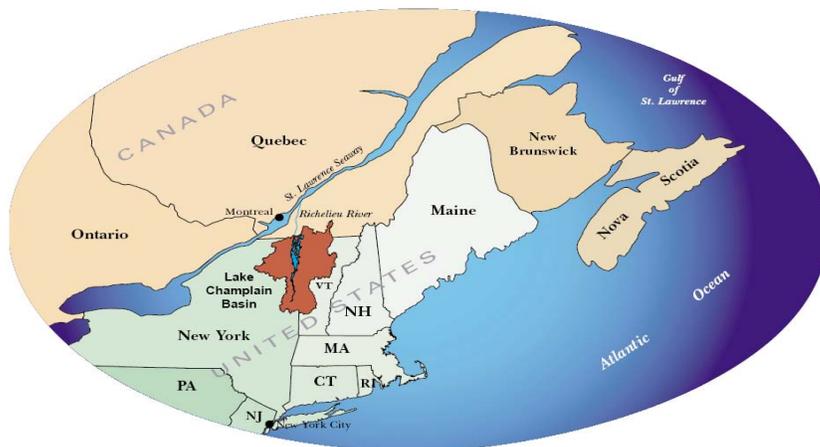
Lake Champlain is one of the largest freshwater lakes in the United States. Although primarily a recreational lake it also serves as a source of drinking water and for the disposal of treated municipal waste water. It also receives non-point runoff from agricultural and developed areas. These activities, among others, have been identified as contributing to recognized, or potential, water quality problems within the lake system. The problems evoking concern are associated with the biological communities of the lake, e.g., algal blooms, depletion of dissolved oxygen, low transparency, contaminated fish flesh, declining fisheries, and invasions of non-native nuisance aquatic species.

The Long-Term Project tracks environmental changes in the lake and provides data to support the development of models to evaluate those changes and assess how well the lake meets water quality standards. While the LMP data also is used to assess how well the lake meets the numerical phosphorus standards, the LMP provides additional valuable services. Through the program, the public is involved in protecting the lake. Monitors will alert the Water Quality Division to unusual lake conditions they might observe. For several years, monitors have been collecting samples for the University of Vermont's and the Lake Champlain Committee's blue-green algae monitoring network. Last summer, LMP Secchi measurements



were used by WCAX, Channel 3, as part of their lake report on Wednesday nights. The LMP provides an opportunity for dedicated citizens to be involved in lake protection and raise public awareness of lake issues.

Together, the LMP and the Long-Term Project cover multiple aspects to monitoring and protecting Lake Champlain, with the LMP involving the public in lake management and the Long-Term Project providing comprehensive data on Lake Champlain's aquatic environment. The benefits of having two on-going and long-term monitoring efforts on Lake Champlain are reliable, credible, comprehensive data and public involvement and awareness in Lake Champlain's current and future condition.



### The Champlain Region Map

This map shows the location of the Lake Champlain watershed relative to the northeastern United States and Canada. A watershed is all the land that drains to a common waterbody, and for Lake Champlain this includes land from New York, Quebec and Vermont.

Map image from the Lake Champlain Basin Program, on the web at: [www.lcbp.org](http://www.lcbp.org)

# Aquatic Nuisance Species

## HIGHLIGHTS

**Eurasian Watermilfoil.** During the summer of 2005, an observant citizen discovered a light population of Eurasian watermilfoil in Gale Meadows Pond in Londonderry and Winhall. VTDEC hand-pulled what was found and involved town officials in future management planning. To date, the invasive plant has been found in 60 lakes and 20 other waterbodies in Vermont.

**Aquatic Plant Trade Industry.** VTDEC staff discovered hydrilla and salvinia, two prohibited plants on the Vermont Agency of Agriculture, Food & Markets noxious weeds list, in a Chittenden County pet shop. For more details, see lead article on page 5.

**Aquatic Nuisance Control Permit Program.** Year two of the 2004 Sonar treatments (for control of Eurasian watermilfoil) in Lake St. Catherine, Burr Pond/Lake Hortonia and Star Lake revealed a varied level of maintained control. Burr Pond was the only waterbody exhibiting levels of watermilfoil beyond the level expected to be observed for year two. The reasons for this are being explored by the Co-Permittee (project applicator) and the Sonar manufacturer company (SePRO Corporation) representative. The remaining treated waterbodies were able to manage the re-growth using divers to handpull in the summer months. To effectively evaluate the best follow-up watermilfoil management strategy, the Department meets with the Permittees and Co-Permittees on an annual basis prior to initiation of each phase of the five-year integrated management plan.

**Water Chestnut.** In 2005 water chestnut was discovered for the first time in Missisquoi Bay at the northern end of the lake as well as at two new southern waterbody sites, a small pond in Benson, and at a small private wetland in North Bennington. For the first time in more than six years, 80% of the water chestnut mechanical harvester loads were composted on two farms in Benson, Vermont.

**Zebra Mussels.** Zebra mussel adults continue to be found in only Lake Champlain and Lake Bomoseen. For the second year in a row zebra mussel veligers (larvae), that likely came from Lake Bomoseen, were found in a sample taken from the Castleton River in Fair Haven. Malletts Bay and the Inland Sea have smaller populations of zebra mussels than the south, central, and north-western parts of Lake Champlain.

**Grant-in-Aid.** The 2005 Vermont Grant-in-Aid Program awarded 35 grants to municipalities working on ANS management, often in conjunction with lake associations. Eight of the awards are for projects to prevent the introduction of an ANS into uninfested water bodies. Awarded funds total approximately \$527,000 and are supported by a portion of Vermont motorboat registration receipts and funds from the US Army Corps of Engineers, thanks to the efforts of Senator Leahy. For Aquatic Nuisance Species Grant-in-Aid program information and an application for 2006 (deadline is March 1, 2006), visit the website, [www.vtwaterquality.org](http://www.vtwaterquality.org) and click on Grants.

**Purple Loosestrife Biological Control.** In 2005, school groups and individual volunteers helped to increase the number of beetles (*Galerucella* spp.) released by nearly 20% to 127,807 beetles. Beetles were released at 52 sites covering 184.5 acres in 38 towns. Beetle damage was recorded at 60% of 158 past beetle release sites with 23% showing good or extensive damage, along with reduced flowering. For more information contact the Wetlands Office at 802-241-3770.

### *Good Bye and Good Luck Michael Hauser!*

After 12 years of dedicated work, Michael Hauser, Aquatic Nuisance Species Specialist, is leaving the Water Quality Division. Mike is the author of the ANS Highlights page and will be greatly missed for all his ANS expertise and hard work. Best of luck Mike and safe journeys ahead.

## Cooperative Effort Underway to Protect Vermont Waters from ANS

The VTDEC and the Vermont Agency of Agriculture, Food and Markets (AAFM) have worked cooperatively to annually inspect pet and plant retailers and check on-line distributors for prohibited aquatic plants. This effort has been underway since 2002 with the establishment of a Vermont prohibited plant list. This fall, for the first time, an occurrence of *Hydrilla verticillata* and *Salvinia* spp. was found at a retailer located in Rutland County. Fortunately, both species were in display tanks and were not for sale; the retailer had obtained them within the last year. The hydrilla was given to the retailer from a customer who had relocated to Vermont. The salvinia "hitchhiked" on a plant purchased by the retailer from an out-of-state wholesale distributor. At the time of the inspection, salvinia plants covered the entire surface of six tanks. The retailer voluntarily complied with removal and disposal. No enforcement action was taken by AAFM. For more information on prohibited plant species, visit, [www.vermontagriculture.com/CAPS/invasive/noxiousweeds.htm](http://www.vermontagriculture.com/CAPS/invasive/noxiousweeds.htm)

### *Hydrilla verticillata*

A submersed aquatic plant, hydrilla can grow an inch or more per day and has several dispersal mechanisms, stem fragments, buds, runners and tubers. A significant pest in Florida waters, the plant has recently spread to the northeast and threatens to invade Vermont waters.



### *Salvinia* spp.

Salvinia is a fast-growing aquatic fern that can clog ponds and lakes. Forming mats up to two feet thick, the plant robs oxygen and blocks sunlight needed by other water dwellers.



# Artists Wanted!

## Aquatic Nuisance Species (ANS) Sticker Design Contest

- The Vermont Department of Environmental Conservation is now accepting two-dimensional design entries in a contest to design an Aquatic Nuisance Species sticker for Vermont.
- The purpose of the ANS sticker program is to increase public awareness about invasive aquatic plants and animals that interfere with the recreational potential and ecological health of Vermont's lakes and ponds.

The purchase of a sticker also provides a way for individuals to contribute financially to Vermont ANS programs. Revenues from statewide sticker sales will help fund statewide and local efforts to control and prevent ANS infestations. The sticker will be designed and marketed for display on boats, vehicles, trailers, water bottles, windows, tackle boxes, etc., and will be sold for \$10.

- The winning artist will be awarded \$400 and a Vermont State Parks Vehicle Pass, as well as recognition for creating the sticker image, which will be promoted and distributed across Vermont.
- **The contest deadline is March 15, 2006.** Please visit the website ([www.vtwaterquality.org/sticker.htm](http://www.vtwaterquality.org/sticker.htm)) for entry forms and specifications, or contact Sara Mulford at 802-241-3777 in the Lakes and Ponds Section for more information.



## Brown Trout Decline in the Batten Kill River Points to Poor Past Management

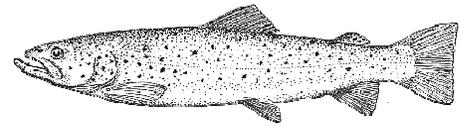
It was clear that the brown trout numbers were down in the Batten Kill watershed, where they had earned the reputation among anglers as “finicky to the point of absurdity” making for a challenging catch. However the reason why this non-native, yet wild trout was diminished remained a mystery. After two years of studying the causes of the trout decline, the results reveal that past river management practices are probably one of the main causes.

The habitat for fish and wildlife in the Batten Kill ecosystem has been significantly altered by channelization and berming.

More than 40 percent of the Batten Kill main stem was straightened, also referred to as channelized, by humans prior to 1900 with considerable straightening occurring on the tributaries as well. Straightening of the river continued through the 1920s. This practice was probably done for a variety of reasons including railroad construction, agriculture, log drives, and flood control.

In the 1970s these channelized river reaches were maintained with berms, a practice that mounds gravel along the river banks. This berming

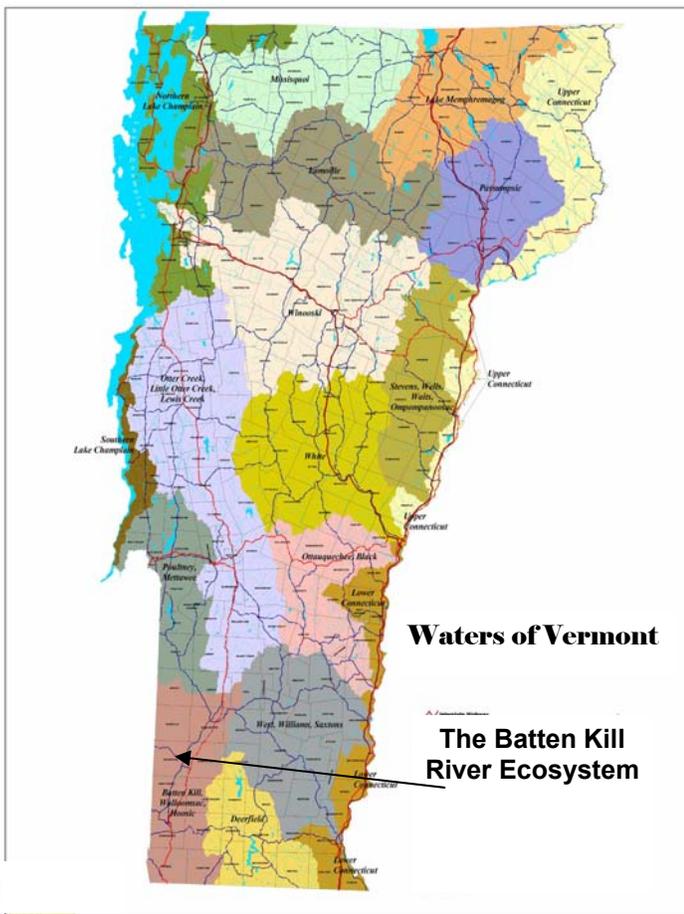
was in response to watershed wide flooding in June 1973 but evidence exists for an earlier berming episode, perhaps following the 1936 flood.



**Brown Trout, *Salmo trutta***

Nearly continuous berming is present along both banks on four of the six tributaries draining from these Green Mountains on the eastern side of the watershed: Mad Tom Brook, Bourn Brook, Lye Brook, and Roaring Branch. Flow confinement by berms on the Green Mountain tributaries prevents flow from accessing the flood plain and the side channels of the alluvial fan, which has eliminated an essential habitat for young Brown Trout. The berms confine flows at nearly twice the bank full depth or more, leaving the tributary channels more erodable under flood flows and therefore devoid of the sediment and debris that forms diverse and complex habitat. Consequently, habitat remains degraded and the channels are unable to return to an equilibrium condition.

(continued on next page)



**Straightened channel  
downstream of Roaring Branch**

**What does the name “Batten Kill” mean?  
Batten means luxurious living and  
Kill is the Dutch word for river.**

## What is a Healthy River?

A healthy river system is made of main channels, back-waters, tributaries, wetlands, and terrestrial habitats that function as a whole to contribute to its drainage and flow.

The Affects of Channelization on the Batten Kill River:	The Affects of Berming on the Batten Kill River:
<ul style="list-style-type: none"> <li>• Loss of overhanging bank cover</li> <li>• Loss of pools of varying depths</li> <li>• Increased velocity</li> <li>• Increased erosion</li> <li>• Increased sediment to mainstem</li> </ul>	<ul style="list-style-type: none"> <li>• Wide, shallow, channels with river bottoms that offer limited habitat</li> <li>• No access to alluvial fans</li> <li>• No access to side channels and floodplains</li> <li>• Loss of surface gravel bars</li> </ul>

(continued from page 6)

Today removing berms in many localities would put property at greater risk, although opportunities are being sought far from human development, where berm removal would allow flow to escape onto the alluvial fan surfaces and floodplain. This type of river restoration could improve the brown trout habitat while simultaneously reducing the risk of a berm failure and flood hazard in more populated areas.



A branch of the Batten Kill River

## Analytical Services Available for Volunteer Water Quality Monitoring

It's not too late! Applications are being accepted until **Friday, February 17th, 2006** for the **Volunteer Water Quality Monitoring Analytical Services Partnership**. The VTDEC, through the LaRosa Laboratory, is pleased to make available to interested lake, river and watershed associations, sample analysis partnerships for the upcoming 2006 field season. The purpose of this program is to help volunteer associations and monitoring groups implement new and or ongoing surface water monitoring projects for waters in need of water quality assessment. Please visit the Water Quality Division's web page at [www.vtwaterquality.org](http://www.vtwaterquality.org) or contact Neil Kamman in the Lakes and Ponds Section for more information.

## New Wetland Maps for Towns

The Wetlands staff are visiting town clerk offices this winter to distribute new and improved Vermont Significant Wetlands Inventory (VSWI) Maps. A new color Geographic Information System (GIS) map has been completed for every town in the state. The new maps not only include all of the Class Two and Class One wetlands in each town, but also contain improved geographic and topographic features to facilitate interpretation. Since most activities within a Class Two wetland and its 50-foot buffer zone require a state issued Conditional Use Determination (CUD), the new maps will let citizens understand whether they need to contact the Wetlands Office at 802-241-3770 for a CUD before proceeding with their project. Look for these maps at your town office.

## State of the Lakes



### Solutions at Lake Carmi

Runoff into Lake Carmi is a little cleaner thanks to the Franklin Watershed Committee and a cooperating farmer. Erosion issues on a farm in the Carmi watershed were observed during a stream nonpoint source survey. The Committee volunteered labor and funding to seed and mulch drainage near a barnyard and road bank, and to install drainage pipe in a ditch and cover it over. The Committee spent about 112 hours of work at a total cost of about \$1,000.

Other work aimed at reducing phosphorus input into Lake Carmi conducted by the Watershed Committee includes a septic tank pump-out program and assisting watershed farmers' participation in an Integrated Crop Management program. ICM matches manure spreading to a field's nutrient need and ability to incorporate the nutrients, and reduces the need for chemical fertilizer.



Lake Carmi resident, Ron Danyew, helps to lay out drainage pipe to repair an eroding drainage ditch across a pasture.

### Federation Receives State Grant

The Federation of Vermont Lakes and Ponds (FOVLAP) was recently awarded a \$2,500 grant from the Vermont Agency of Natural Resources via a legislative appropriation. Since the primary purpose of FOVLAP is to educate those interested in maintaining the quality of Vermont lakes and ponds, as well as the communities in which they reside, the grant money will be devoted to the advancement of those objectives.

Some of the items under consideration are: the expansion and additional financial support of the regularly published FOVLAP newsletter; a scholarship to a Vermont high school student who has an interest in further study of water or environmental issues; increased outreach to Vermont's lake associations; and a more comprehensive and enlarged annual lake seminar. The Board of FOVLAP will decide this winter which specific programs to support with this grant money.

### 2006 Vermont Lake Seminar

The 2006 Lake Seminar will be held Friday, June 9<sup>th</sup> in Waterbury. Following the successful 2005 seminar's model, the meeting will offer two concurrent presentations, one on exotic species control and prevention, and one on lake and watershed protection issues. Call the Lakes and Ponds Section at 802-241-3777 to be added to the mailing list to receive a registration form, or email [susan.warren@state.vt.us](mailto:susan.warren@state.vt.us).

### 2006 Annual Meeting of the Federation of Lakes and Ponds

The 2006 Annual Meeting of the Federation of Vermont Lakes and Ponds will be held Monday, July 24<sup>th</sup> in Montpelier. The meeting is a great way to hear about the lake work other associations are involved in and to discuss common problems and solutions. Additionally, the meeting will feature talks on current lake-related issues. To be placed on the mailing list of the Federation write to the Federation at PO Box 421, Waterbury VT 05676 or contact Susan Warren at the Lakes and Ponds Section at 802-241-3777.

## Tips on Replanting a Lake Shoreline

The importance of natural shoreline vegetation along lakeshores cannot be over-stated. Leafy cover provides shoreline stability and wildlife habitat, and offers scenic and privacy benefits. It also is a source of woody and leaf debris to the lake that benefits lake ecology.

Property owners of any size lot, small and large, can increase the amount of vegetation to add some of the above benefits. Below are some practical suggestions for improving the lakeshore area.

- Narrow your access to the lake or dock, and plant shrubs and trees along the remaining bank. This type of woody strip on the bank can prevent erosion and avoid the need for a retaining wall.
- If an existing retaining wall is failing, consider replacing it with a vegetated bank instead. A drawing of a simple design from the publication "Replacing Old Walls with New Banks" is available by contacting the Lakes and Ponds Section.
- Identify areas of lawn along the shore for planting patches of trees and shrubs. Do not mow under the plantings, rather let them develop a duff (decomposing vegetation) and ground-cover layer. The wider the band of natural vegetation along the shore, the more runoff filtering benefit.
- Prune trees and shrubs to make openings through which to see the lake.
- Plant native species already found in your region of Vermont.
- Plant "replacement" trees and shrubs before the current ones get old and start falling down.

- If trees, branches or leaves fall in the lake, leave them there if possible. (They provide important habitat for fish and smaller lake life.) If you can, identify part of the in-lake area off your property that can "go wild" and keep an adjacent part cleared out for swimming and boating access.

### Four Options for Obtaining Native Plants:

1. The easy way – stop mowing and see what grows in. Then prune out species you do not want and encourage those you do.
2. Transplant from farther uphill on your property. This approach ensures you use plants that are hardy to the area. Transplant in spring before budding out begins, or late fall after leaf fall. Smaller plants are more likely to survive than larger ones.
3. Contact your Natural Resources Conservation District for springtime plant sale information and vegetation management tips. Many Districts offer native trees and shrubs at very low prices during a springtime plant sale. The plants are usually "bare root" which means they must be planted immediately and watered for several weeks. Visit the website [www.vacd.org](http://www.vacd.org) for locations of District offices.
4. Purchase plants from a local nursery. Potted plants, while more expensive, start out larger and have a higher survivability rate. "Sources of Native Plant Material in Vermont," a listing of nurseries that carry native stock is available at [www.vtwaterquality.org](http://www.vtwaterquality.org) under the Wetlands Section or by calling 802-241-3770. This publication also includes a listing of appropriate native plants.

Neighbor groups or lake associations are invited to contact the Lakes and Ponds Section to schedule a "shore walk." These walks can offer shoreland management tips and discuss possible ways to increase the leafy growth along the shore. Please call Susan Warren at 802-241-3794, or visit the Lakes and Ponds web page for copies of handouts on shoreland management.



## Hut, Hut, Hut, Hike: Potash Brook Gets a TMDL Plan!

Potash Brook and its watershed are located in Chittenden County, in the municipality of South Burlington, encompassing an area of approximately 7.13 square miles and draining to its mouth at Shelburne Bay in Lake Champlain.

Biological monitoring of the fish and macroinvertebrate communities from 1987 to 2004 shows impaired stream conditions, meaning aquatic life is poorly supported in Potash Brook and its watershed. The biological monitoring program relies on data from reference sites to help define biological community goals for a given stream type and Potash Brook failed to meet its established water quality goals. As a result of these poor water quality conditions, in November 2005, the Water Quality Division completed a Total Maximum Daily Load (TMDL) plan for Potash Brook.

The Federal Clean Water Act mandates that TMDL plans be written for impaired waterbodies. These plans identify the watershed pollutant load reduction necessary for a waterbody to meet and maintain compliance with the Vermont Water Quality Standards.

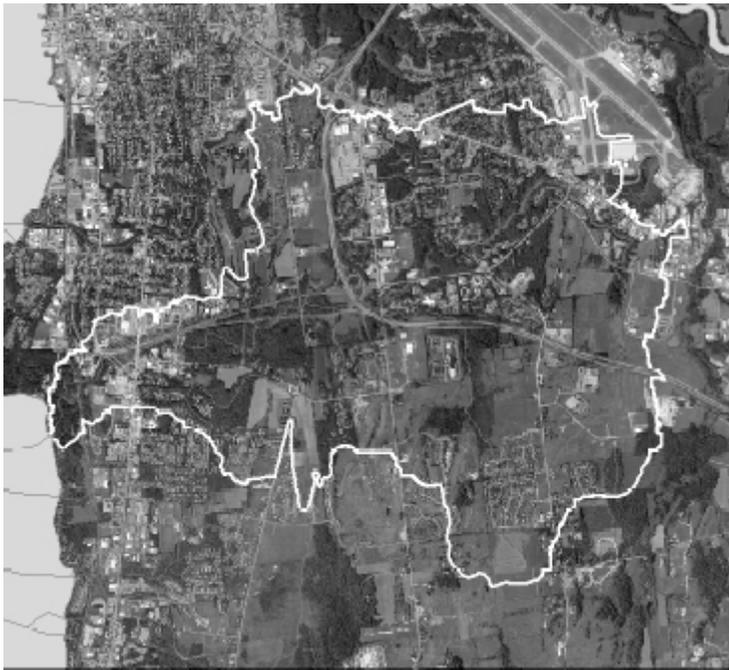
The TMDL for Potash Brook points out that this urban brook is impaired by multiple impacts associated with excess stormwater runoff. Stormwater runoff is precipitation that does not infiltrate into the soil and often occurs because development has decreased the available permeable ground for water to infiltrate.

Stormwater runoff causes problems to urban streams, such as Potash Brook, in two major ways. First, it picks up sediment and other associated pollutants and carries them directly to the brook, exceeding the "total maximum daily load" of pollutants that the waterbody can accommodate. Secondly, all the paved and unpaved roads, parking areas, roofs, driveways, and walkways in the Potash Brook watershed have caused changes in the hydrology of the watershed. These impervious surfaces cause a greater volume of water at a greater velocity to enter Potash Brook, compounding the problems of this urban, confined stream.

This change in hydrology, namely higher high flows and lower low flows, has a substantial effect on in-stream habit. The high flows can negatively alter the sediment dynamics in the stream by causing bank erosion. The lack of low flow during dry weather can limit habitat available for aquatic animals. The Potash Brook TMDL sets hydrologic targets for the stream in order to address all the impacts from stormwater runoff.

The TMDL for Potash Brook establishes a high flow and a low flow target for stream flows, and stormwater loading targets which will be the basis for future stormwater permitting in the Potash Brook watershed. In other words, there is now a hydrologic target established in Potash Brook that will better allow the stream to come into compliance with the Water Quality Standards. Implementation of this target will spell out the necessary stormwater controls needed in the watershed to restore it and protect it from future stormwater runoff problems.

Potash Brook's TMDL is the first written for a Vermont urban, impaired watershed. A copy of the plan is available under the Stormwater Section on Water Quality Division's web page at [www.vtwaterquality.org](http://www.vtwaterquality.org). For more information, please contact Tim Clear in the Water Quality Division at 802-241-3770.



**Potash Brook stormwater impaired watershed, South Burlington, Vermont**



## Assessing A Lake's Trophic State

Most lakes naturally contain aquatic plants and algae. The amount of plant and algae life a lake can support is referred to as the lake's "productivity." Plants and algae require nutrients for growth; the more nutrients in a lake, the more plants and algae it supports. Nutrient concentrations increase over thousands of years through a natural aging process called eutrophication. Eutrophication is a continuous process, which can be divided into three broad phases, or "trophic states"- oligotrophic, mesotrophic and eutrophic.

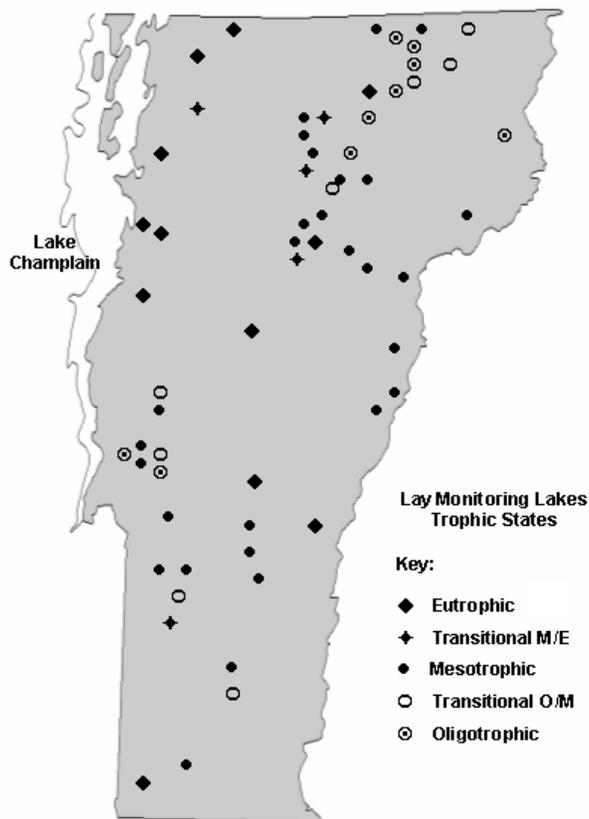
Although eutrophication is a natural process, human land use activities can greatly accelerate the process by contributing excessive nutrients to waterbodies through failing septic systems, shoreline erosion, fertilizer and roadway runoff, farming and logging practices and many other point and nonpoint sources. Establishing a lake's trophic state through monitoring helps document if and when land use practices impact the lake's water quality. Monitoring programs also work to identify potential pollution sources to help protect the lake's water quality. The map on the right shows the trophic states of Vermont lakes monitored under the Lay Monitoring Program.

### Trophic States

**Oligotrophic-** Referred to as "young" lakes, characterized by deep, clear water; low nutrient enrichment; little algae growth (low productivity); few aquatic plants; bare sand or rock along most of the shoreline (little mud); and often supporting cold-water fish species.

**Mesotrophic-** Referred to as "Intermediate" lakes, characterized by moderate nutrient enrichment; moderate algae growth; moderate aquatic plant growth; moderate sediment accumulation over the lake bottom; and usually supporting warm water fish species.

**Eutrophic-** Referred to as "old" lakes, characterized by high nutrient enrichment; abundant algae growth (high productivity); extensive aquatic plant beds; extensive sediment accumulation on the lake bottom; and supporting exclusively warmwater fish species.



### Index Ranges for Parameters to Assess Trophic State as Determined by the Vermont Lay Monitoring Program\*

Trophic State	Secchi disk water clarity (meters)	Chlorophyll-a concentration (µg/L)	Total phosphorus (µg/L)
Oligotrophic (sparsely enriched)	> 5.5	0-3.5	0-7.0
Mesotrophic (moderately enriched)	3.0-5.5	3.5-7.0	7.0-14
Eutrophic (very enriched)	0-3.0	> 7.0	> 14

\*Ranges in this table are those established by the Vermont Lay Monitoring Program and used to assess trophic state. Index ranges vary from state to state.

Thanks to Lay Monitors, like the Maidstone Lake crew to the left, enough years of data have been provided to document the trophic state of many Vermont lakes. Maidstone Lake is an oligotrophic lake located in Maidstone (northeastern Vermont).

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Vermont Agency of Natural Resources  
Department of Environmental Conservation  
Water Quality Division  
Lakes and Ponds Section  
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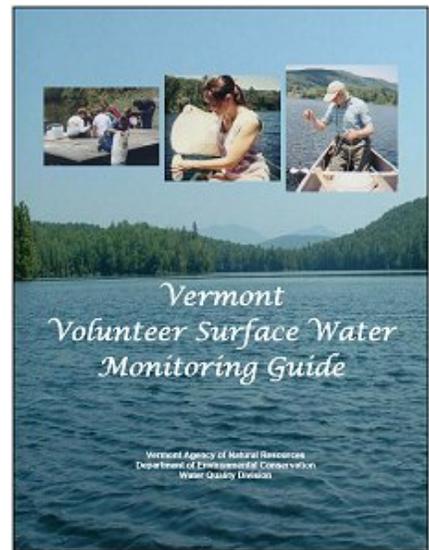
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### **New! A Guide for Volunteer Monitoring**

The *Vermont Volunteer Surface Water Monitoring Guide* walks groups and organizations through the steps of designing an appropriate monitoring program for lakes, streams, rivers and wetlands. This Guide also celebrates and highlights past and ongoing efforts of volunteer monitors and their programs in Vermont. The Water Quality Division is grateful to past and current volunteers and hopes this Guide will refresh their enthusiasm and inspire new groups to develop programs. The Guide is available in color on the Water Quality Division's web page. For a hard copy, please contact Amy Picotte in the Lakes and Ponds Section at 802-241-3777.



### **Vermont to Host Nonpoint Source Conference**

**17<sup>th</sup> Annual Northeast Regional Nonpoint Source Conference: "New Perspectives on Protection"**  
**May 22 – 24, 2006 at the Wyndham Hotel in Burlington, Vermont**

The Vermont Department of Environmental Conservation and the New England Interstate Water Pollution Control Commission invite you to attend this regional nonpoint source conference. It will begin with a keynote address by Ms. Alice Outwater, author of *Water: A Natural History*, and continue with a series of presentations on stormwater management, stream geomorphology, watershed management and emerging technologies for agricultural runoff control. Additionally, field trips are planned for the afternoon of May 23rd. For more information, visit the web sites of the Vermont Water Quality Division, [www.vtwaterquality.org](http://www.vtwaterquality.org) and the New England Interstate Water Pollution Control Commission, [www.neiwpcc.org](http://www.neiwpcc.org), or contact Rick Hopkins in the Water Quality Division at 802-241-3770.