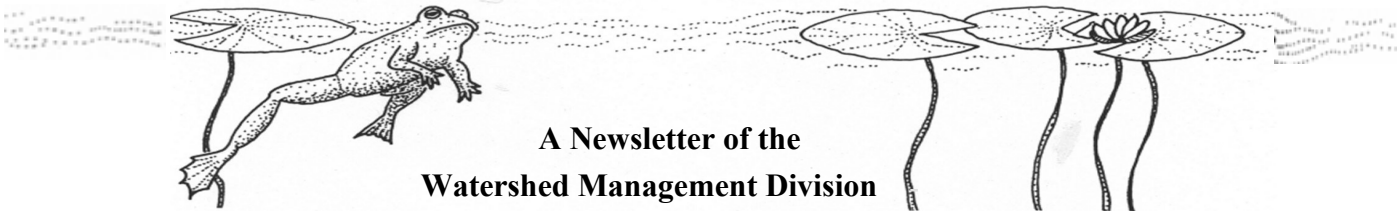
Out of the Blue



A Newsletter of the
Watershed Management Division

Summer 2012 No. 41
Vermont Agency of Natural Resources
Department of Environmental Conservation

Remarkable Resiliency! Stream Macroinvertebrates

Vermont's streams and rivers are full of living creatures. In addition to the widely recognized fish populations, streams are home to a vast community of macroinvertebrates including insects (like dragonflies and mayflies), crayfish, snails, mussels, and worms. Every fall from early September through mid-October, biologists from the Watershed Management Division's Biomonitoring Program collect macroinvertebrates to assess biological integrity (diversity and population of species found in a developed watershed compared to those found in a "natural" or "reference" site), which reveals water quality and habitat conditions. Just as the 2011 monitoring season arrived, so did Tropical Storm Irene. Despite the difficulties caused by the flooding, all the reference monitoring sites were surveyed and monitored. As predicted, there was a dramatic decrease in macroinvertebrate density compared to the average density in the years leading up to Irene. However, something else was discovered that was not expected.

A small group of reference streams, which provide the benchmark for measuring the health of all other streams, are monitored by the Biomonitoring Program every year. These reference streams are a variety of sizes and are found throughout the state, but all of these streams are located in areas that are almost entirely forested and have very little human influence. By monitoring these streams annually, biologists track long-term trends and determine when and if these trends start to change, for example from the effects of climate change. It was expected that in the reference streams, located in areas hit the hardest by Tropical Storm Irene, the biological communities would have undergone drastic changes following the flood scouring.

Across eight reference streams, biologists saw an overall drop in macroinvertebrate density of 76% following the storm. All of the hardest hit streams in

See page 2, "Remarkable Resiliency"

In This Issue

40th FOVLAP Annual Meeting

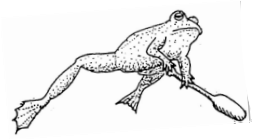
Monday, July 30
8:30am - 3:30pm
Berlin, Vermont

-Steak House, Barre-Montpelier Road-
-$20 fee includes coffee and lunch-

Have a favorite lake? Come learn more about it through this annual meeting of lake associations and individuals who care about Vermont lakes. Charlie Nardozzi, nationally recognized gardening consultant, will present options for restoring lakeshore buffers, including using edible landscaping; plus there will be a panel discussion on lake legislation; etc.
http://vermontlakes.org/

New Report out on the Health of Vermont's Environment
www.anr.state.vt.us/

Out of the Blue
Available on the Web



All issues in color on the web page of the Watershed Management Division
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, please contact:

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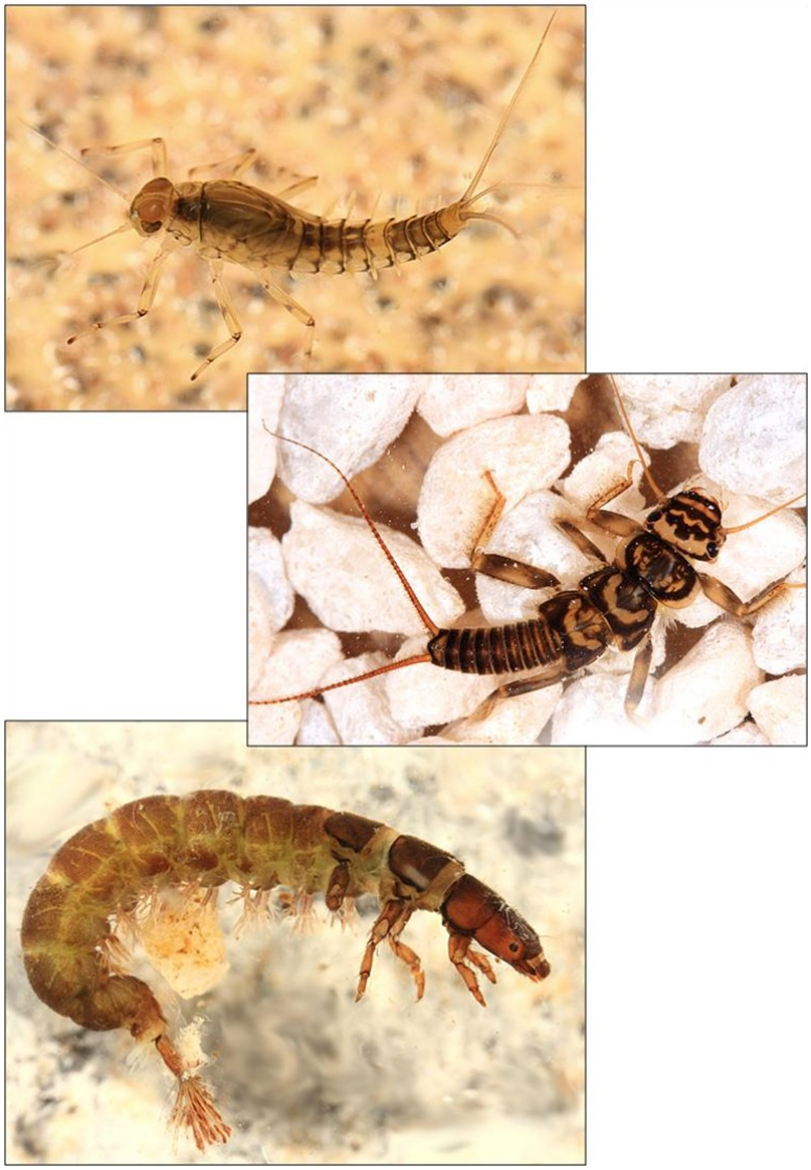
(continued from page 1)

Remarkable Resiliency

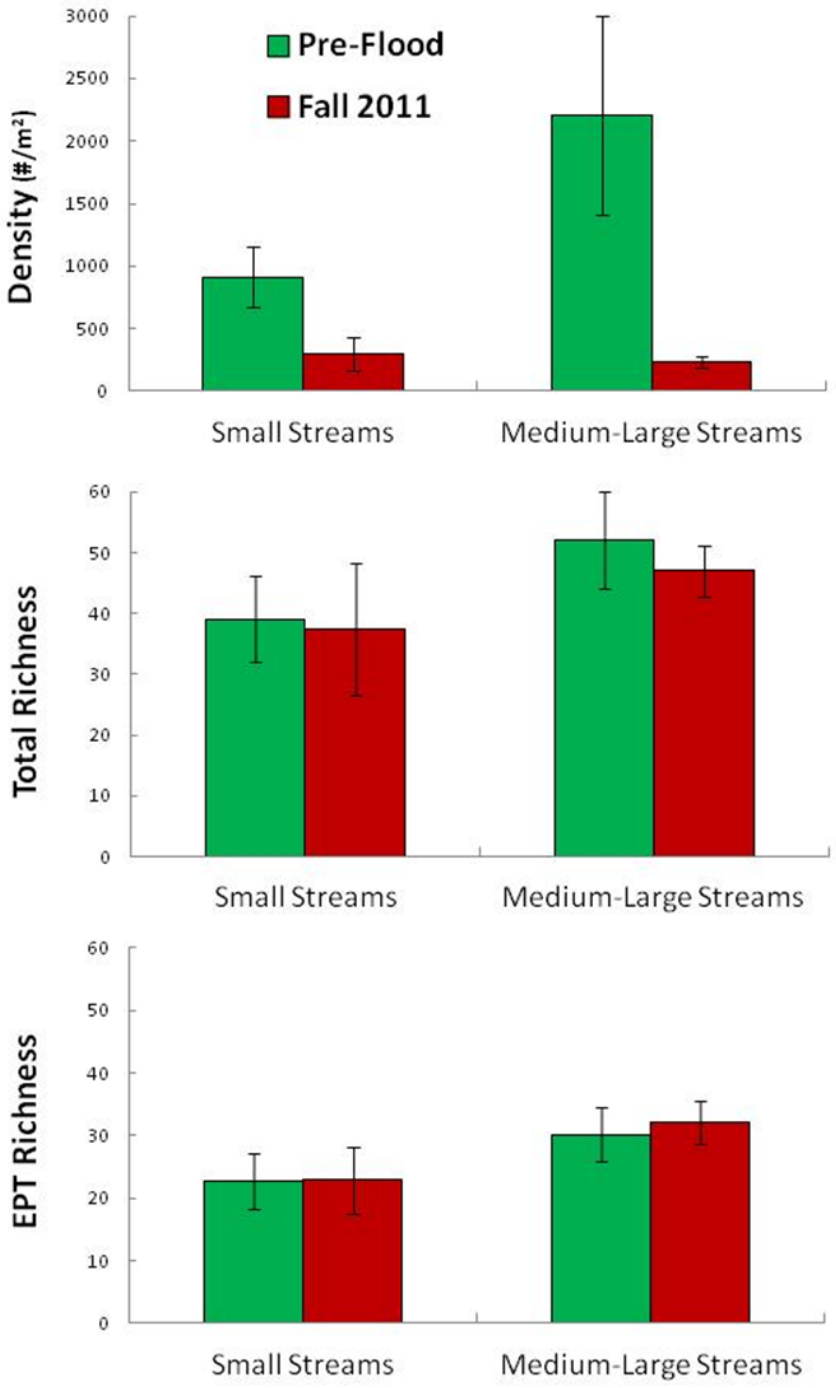
southern Vermont failed to meet the minimum density criteria used by the Watershed Management Division to assess biological integrity as being of good quality. The powerful flood waters were very effective at removing a large proportion of the communities from these streams. **What was not expected was that the number of different species in the streams remained almost the same.** There was only a very slight decline in overall diversity following Irene. In fact, there were a couple streams where slightly *more* abundant EPT species were found, following the flood! (EPT stands for Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies), and represents a group of insects that are sensitive to human disturbance.)



From top to bottom: Larval mayfly (Ephemeroptera: *Baetis tricaudatus*), stonefly (Plecoptera: *Acroneuria carolinensis*), and caddisfly (Trichoptera: *Ceratopsyche sp.*).

Macroinvertebrates have a huge diversity in size, feeding habits, and abilities to tolerate disturbance, and biologists expected that many species would disappear from the stream entirely. **Post Tropical Storm Irene monitoring discovered the flood affected all species equally, decreasing their numbers overall, but allowing representatives from each group to remain in the stream.** This may indicate that the potential for rapid biological recovery is high, and confirms that communities in a natural environment are better suited to survive large disturbances, even those as massive as Irene. This pattern is encouraging, although it is important to consider that this might not be the case for streams already impacted by storm water, agriculture, or other human disturbances. Communities in these types of streams typically have an altered species composition and less diversity, and may be slower to recover.

Biomonitoring Program staff will be headed back out to these reference sites in fall 2012 to assess their recovery, and it is believed that densities will more closely resemble those found in the years before the flood. In fact, at the first reference site visited after Irene, Ranch Brook, sampled again seven weeks later at the end of October 2011, species density had already nearly doubled from that found at the beginning of September. These initial results are a positive sign for the resiliency of the biological communities following the flood, and hopefully the remaining species will be able to propagate and flourish as these stream ecosystems re-stabilize. To learn more about biomonitoring activities in Vermont, please visit our web page at: www.vtwaterquality.org/bass/htm/bs_biomon.htm.



These graphs show the results of three community variables at eight streams: macroinvertebrate density (the number of animals collected in a sample), richness (total number of species found), and EPT richness. "EPT" stands for Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies), and represents a particular group of insects that are well known to trout fisherman and sensitive to human disturbance. The graph presents results from four small reference streams and four medium-to-large reference streams. **Overall, density numbers decreased post Tropical Storm Irene, but the number of different species in each stream remained the same.**

Lessons from Lake Champlain and the Floods of 2011

All that water had to go somewhere. Most of Vermont's largest rivers are part of the Lake Champlain drainage basin, so naturally Lake Champlain was severely affected by the floods of 2011. Record high lake levels for the date were set on 48 consecutive days during the heavy spring runoff between April and June — and then again for 37 more days in September and October after Tropical Storm Irene. The high water and wave action eroded lakeshore soils never before exposed to such forces and created unusual plumes of sediment more commonly associated with the mouths of rivers than with lakes.

Lake Champlain's tributary rivers raged with turbid, brown water during these events. The rivers carried high concentrations of suspended sediment and phosphorus washed off upland soils and eroded from streambanks. Phosphorus, a major component of fertilizers, is of special concern because it promotes excessive growth of algae in lakes — events known as algae blooms.

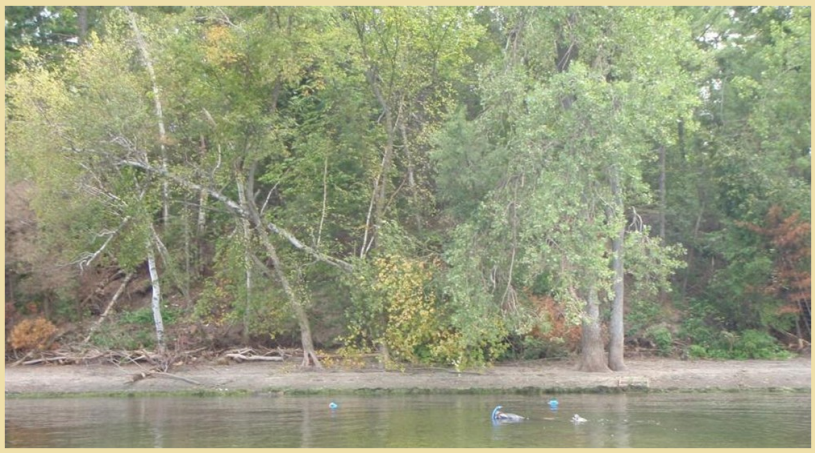
Rivers like the Winooski and the Missisquoi each delivered about 400 metric tons of phosphorus to Lake Champlain during 2011, more than twice their average annual amounts. About two-thirds of this phosphorus arrived during the 2011 spring runoff of April and May. Tropical Storm Irene accounted for another nine to 13 percent.

Much of the phosphorus in these rivers came from developed land and farmland — from manure, other fertilizers, and soil exposed to erosion. But recently we were able to confirm another very important source of phosphorus in our rivers. This year, two studies of the Missisquoi River watershed confirmed that erosion of stream banks contributes 40 to 50 percent of all the sediment and phosphorus delivered to the river.

This finding has enormous implications for our Lake Champlain cleanup efforts. It means we must find better ways to achieve long-term stability in our river channels by allowing them to regain their natural shapes and functions. Armoring stream banks with riprap only transfers the erosive power of the water elsewhere in the river system and does little to help the lake.

As expected, the lake's water quality suffered significantly this past year. Average phosphorus and algal concentrations were the highest recorded and water clarity readings were greatly reduced as well. Despite this degradation, there were few encouraging signs elsewhere.

As destructive flood waters during Irene poured into the Otter Creek from tributaries like Mendon Brook and the Neshobe River, flow rates measured at the river gauge in Rutland spiked quickly at over 18,000 cubic feet per second. But, 40 river miles downstream in Middlebury, this torrent was spread out over many days and barely exceeded 6,000 cubic feet per second at its peak.



Two adjacent shorelines with similar slopes on Malletts Bay, summer 2011. Th
degrade aquatic habitat, also lead to the unstable bank conditions, caus
Natural vegetation stabilizes lake shores the best (and is free!) while

Extensive wetlands and floodplains along Otter Creek between Brandon and Middlebury soaked up the floodwaters like a sponge and released them more slowly in a way that moderated the damage to property downstream and lessened the impact on Lake Champlain.

Other rivers like the Winooski and the Missisquoi, which have far less access to floodplains and fewer wetlands along their courses, behaved very differently during Irene. Here, flow rates peaked nearly three times higher at downstream gauges, compared with rates measured upstream. Phosphorus concentrations in the Winooski and the Missisquoi measured soon after Irene were considerably higher than levels recorded in Otter Creek, probably because of greater streambank erosion at these extreme flows.

The sediment and phosphorus delivered to Lake Champlain during 2011 will eventually either

settle to the bottom or drain out via the Richelieu River. In shallow bays where the water is flushed out fairly quickly, this process is already well underway although some of the phosphorus in the bottom sediments could return to the water to fertilize algae growth next summer. In the deep region of the main lake, it may take another year or two before these pollutants dissipate from the water.

How can we protect the lake from the inevitable storms and floods of the future? **Lakeshore buffered by natural rock and vegetation can resist erosion and provides better habitat, as well. Property owners seeking to repair damaged shoreline should consider using these lake-friendly methods.** There's nothing engineered better to stabilize a bank than the roots of a tree.

e shore with natural vegetation replaced by lawns, which sing massive erosion and water quality problems. protecting aquatic habitat and water quality.

And what are the lessons from Otter Creek? **Rivers with adjoining wetlands and access to their natural floodplains are far more resilient to flooding. That is why we seek to restore wetlands and reestablish floodplains as part of our watershed management programs.** Such areas moderate the erosive force of rivers during floods and result in cleaner water downstream. Almost certainly, properties in Middlebury were spared damage during Irene because of the wetlands and floodplains along Otter Creek. These natural ecosystems are integral features of all waterways and play a critical role in flood resiliency.

Good Web Resources:

•*Living in Harmony with Streams: A Citizen's Handbook to How Streams Work,* by Friends of the Winooski River, www.winooskiriver.org

•*The Shoreland Stabilization Handbook for Lake Champlain and Other Inland Lakes,* by the Northwest Reg.Plan.Com., www.nrpcvt.com/Reports/ShorelineHandbook.pdf

The Vermont Lake Wise Program

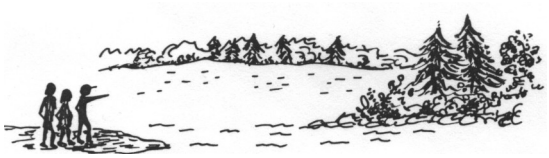
The goal of Lake Wise is to improve or maintain water quality and in-lake and on-shore wildlife habitat by encouraging lake friendly landscaping practices.

The Lake Wise Program is offered through the Vermont Lakes and Ponds Section to provide trainings in lake friendly shoreland management to Lake Associations and shoreland property owners. Through Lake Wise, participants will receive technical assistance to evaluate and for advice on specific landscaping practices to fix erosion and polluted runoff, while improving lake quality and wildlife habitat.

Lake Wise participants meeting criteria for lake-friendly maintenance practices in four categories (driveway; structures and septic systems; recreation areas; and shorefront) receive the "Lake Wise Award and Beautiful Sign," which can be proudly displayed on the property. Lake Associations are also awarded, depending on the percentage of shoreland owners participating in Lake Wise.

The Vermont Lake Wise program is modeled after the successful Maine Lake Smart Program, and many details are still being worked on, including those who will be trained to help evaluate shoreland properties for Lake Wise Certification. Property owners requesting an assessment of their property will be given advice on how to make their shoreland living more lake friendly and eventually pass the Lake Wise standards. Stay tuned for more information about Lake Wise and how you can introduce this program at your lake. Contact Amy Picotte for more information at: Amy.Picotte@state.vt.us.

State of the Lakes



New!

Vermont Cyanobacteria (Blue-green algae) Guidance

In cooperation with the Vermont Department of Health, the Watershed Management Division has produced a guide for towns to use in recognizing cyanobacteria blooms (toxic algae) and evaluating the risk they pose. The Watershed Management Division and the VDOH have worked together for years sampling and identifying cyanobacteria blooms in northern Lake Champlain, analyzing samples for the presence of toxins, and issuing detailed weekly health advisories as necessary. However, program expenses were high, and a more efficient method of working with communities on additional lakes was needed.

The new guidance first helps community members sort out lake occurrences that are either not algae blooms at all (e.g. pine pollen accumulations in the spring) or are green or other kinds of algae blooms that do not pose a health risk. These occurrences are described as Category 1 or Low Health Risk.

Category 1: Examples of green algae growth which does not pose a health risk.

Second, if cyanobacteria are present but in low numbers, it is a Category 2 situation, where toxins may be present, but at low concentrations. In this case the situation can be monitored and people and pets should avoid visible scums.

Category 2: Examples of low numbers of cyanobacteria indicating a situation that warrants monitoring.

Category 3 is a situation where cyanobacteria are present in large numbers and cover an extensive area. In this case, the bloom may pose a risk to people and animals, and contact should be avoided. Since sampling for toxin presence can take a day or two, and the bloom may dissipate or be blown elsewhere, the guidance focuses on the importance of informing people and communities to avoid swimming (for dogs too) or having other water contact until the bloom has entirely died off.

Category 3: Example of a cyanobacteria bloom that poses a risk to people and animals and contact should be avoided.

To view the new guidance, visit: http://healthvermont.gov/enviro/bg_algae/documents/BGA_guide.pdf. Or, contact Angela Shambaugh for questions at angela.shambaugh@state.vt.us.

(These photos appear in color on the web version of Out of the Blue at www.vtwaterquality.org)

HIGHLIGHTS Aquatic Invasive Species

Water Chestnut Management Program

This summer marks the 31st year of the Water Chestnut Management Program, which controls water chestnut spread in Lake Champlain and in 22 other waterbodies. Low lake levels this season may hinder access to some infested sites, but handpulling water chestnut is already underway in a number of sties. Mechanical harvesting of water chestnut in Lake Champlain will run for at least six weeks, starting July 9th. As part of the water chestnut control work, the VTDEC partners with the Lake Champlain Basin Program, The Nature Conservancy, the US Fish and Wildlife Partners Program, the US Army Corps of Engineers, and the New York State Department of Environmental Conservation.

VIP Workshops Offered

Learn about the aquatic invasive species of greatest concern and how to identify them by becoming a Vermont Invasive Patroller. The Lakes and Ponds Section, in partnership with the Federation of Vermont Lakes and Ponds, will be holding two Vermont Invasive Patrollers workshops this summer. Additionally, participants will learn about cyanobacteria (also known as blue-green algae) and the characteristics of a cyanobacteria bloom. Cyanobacteria, a common native algae in Vermont, can produce toxins harmful to human health.

- **Friday, July 20th, 9:00am – 4:00pm, Lake Morey Resort, Fairlee**. There is a workshop fee of $35 per person, which includes lunch. Register by July 13th.
- **Wednesday, August 15th, 10:00am – 5:00pm, Community College of VT, Newport**. Register by August 8th.

Contact Bethany Sargent, the VIP Program's new coordinator, at Bethany.Sargent@state.vt.us or by phone at (802) 338-4819.

Newton School Checks for Invasive Crayfish

This past school year, students in grades K through sixth grade at the Newton School in Strafford investigated the crayfish species that can be found in their town. Although fortunately, they didn't find the rusty crayfish, they were concerned about it because it's a highly invasive species that disrupts river food webs and threatens fish spawning grounds.

The Newton School crayfish investigation was designed to promote collaboration and peer learning among schools in the Orange-Windsor Supervisory Union (OWSU). It is part of a regional program called *Monitoring the White River*, which was developed by the White River Partnership and Verdana Ventures LLC with funding from the Wellborn Ecology Fund of the New Hampshire Charitable Foundation. The 3-school OWSU collaboration includes 6th graders from Chelsea Public School, 7th graders from Tunbridge Central School, and Newton's 3/4th graders. OWSU's website (http://www.owsu.org/) describes this crayfish monitoring collaboration.

The rusty crayfish, identifiable by red bands on its claws, has invaded the White River and other tributaries of the Connecticut River. It is also found in ponds and lakes within the White River watershed.

In May, Newton School students, assisted by Chelsea's 6th graders, set traps to catch crayfish in two local habitats: the town's swimming pond and the West Branch of the Ompompanoosuc River. The Newton traps caught many fish and one crayfish. Further trapping is planned, fueling student inquiry and building a foundation for authentic learning, while providing good information about the spread of the rusty crayfish. For more information, please contact Jenna Guarino at jguarino556@gmail.com.

New Surface Water Quality Reports: Insightful and Useful

The Watershed Management Division's Monitoring, Assessment and Planning Program (MAPP) has issued several important reports.

2012 Water Quality Integrated Assessment Report

This report takes a comprehensive look at Vermont's surface water quality by relating monitoring data and information to Vermont's water quality standards, to produce a Statewide water quality assessment. The report concludes that aquatic life and swimming uses are fully maintained on 89% of assessed rivers and streams, and 62% of inland lake acres. The report also describes the assessment of nearly 40 important wetlands, documents beach closure records statewide, and outlines the expenditure of over $32 million in point and non-point pollution control infrastructure in the past two years. In the report, readers will find many details about Vermont's surface waters and the management programs in place to protect and restore them.

Four New Watershed Management Basin Plans

MAPP has recently issued new Watershed Management Basin Plans for these major watersheds: Otter Creek; Winooski River; Ottauquechee/Black; Lake Memphremagog/Coaticook. These plans, approved by Secretary Markowitz and Commissioner Mears after considerable public comment, outline the condition, stresses, and management approaches for individual surface waters in the basins, and identify prioritized actions to remediate or protect certain waters. These plans, prepared in accordance with Vermont's Surface Water Management Strategy, provide important guidance to individuals and groups who are interested in applying for remediation or protection funding under several grant programs. Further, they identify waters that are candidates for reclassification to a higher level of protection under the Vermont Water Quality Standards.

During 2012, MAPP's planners are actively finalizing plans in the Missisquoi River Basin, and preparing new "Tactical Basin Plans" for the White, Deerfield, and South Lake Champlain watersheds. Readers can find the Water Quality Integrated Assessment Report, review the Basin Plans, and obtain contact information for basin planners at www.vtwaterquality.org.

Watershed Management Ecosystem Restoration Grants

funds for backroad, shoreline stabilization, river corridor and other projects

Proposals Due August 15th!

http://www.anr.state.vt.us/dec/waterq/grants.htm

Winooski River, photo by Linda Boudette

Congratulations Lay Monitors!

Thank you **Andy Dales,** Caspian Lake Lay Monitor, for representing the Lay Monitoring Program at the Green Mountain Citizen Scientist Award Ceremony. Andy Dales was also recognized this spring as the recipient of the Bob Arnold Lake Protection Award by the Agency of Natural Resources for his all around, outstanding stewardship of Caspian Lake.

The LMP welcomes **Bethany Sargent** as the new Program Coordinator. Bethany joins the Lakes and Ponds Section with a Bachelor of Science from Michigan State University, a Masters of Science from UVM, and a decade of watershed work, most recently with the UVM Sea Grant Program. **Amy Picotte** looks forward to continuing to partner with Lay Monitors and Lake Associations through Lake Wise, the new shoreland program (see page 5).