

The River as Teacher

By Sharon Francis

THE first chapter of the story is old news. In the dark rainy night of October 8 and 9, 2005, Warren Brook and the Cold River in Alstead, N.H. flooded in a wet rampaging wall of water that took four lives, destroyed numerous homes, tossed vehicles and household items up into trees, tore up roads, tore down power lines, swept away cropland, and reshaped the course of a river that had long been a favorite haven for fish and fishermen, and the centerpiece of a gentle town.

The subsequent two-and-a-half years have seen the uncommon courage of townspeople who rallied to rebuild, and the outpouring of assistance from neighbors, public agencies, state and federal legislators, Gov. John Lynch and many others to repair the devastation,

make the town whole, and try to make the river whole too.

People who work with rivers soon realize that they become students, and the rivers are their teachers. The changeability of a river is part of its fascination. In the case of the Cold River and Warren Brook and what happened in a single heavy rainstorm, the lessons are still unfolding.

LESSON #1

Rivers respond to rainfall, and flashy storms are becoming more frequent.

The rainfall that devastated the Cold River measured over 10 inches in a 36-hour period. The U.S. Geological Survey estimated the peak flood at the discontinued stream gage on the Cold River just above the Drewsville Bridge to be 21,800 cfs, or about 170 per-

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To Build or Not to Build... in the Floodplain, That Is

By Adair Mulligan

MOST people assume that if an action creates a public hazard, there would be a law against it. Most people also know that rivers act according to their own "laws," despite what people would have them do. When it comes to floodplains—the land along rivers where water spreads when flow is high—it's much more practical to define what people can and cannot do there, rather than hope the river obeys.

The legal definition of "floodplain" is specific: the "100-year floodplain" is not, as one might think, the area that floods only once every hundred years, but the area that has a one percent chance of flooding EVERY year. The floodplain is also referred to as the "Special Flood Hazard Area."

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Sean Sweeney photo.

Rivers can carve out new ground when severe flooding occurs, as shown by the Cold River in the aftermath of the October 2005 floods.

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New CRJC Officers

At its April annual meeting, CRJC thanked outgoing president **Cleve Kapala**, recognizing him for his leadership over for the last year.

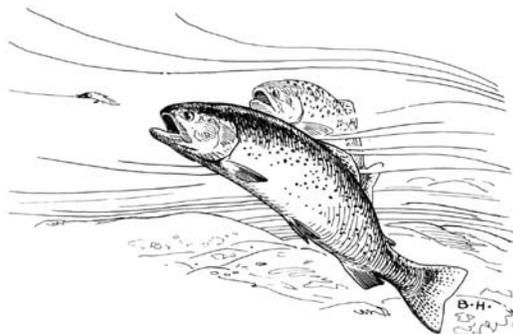
Commissioners welcomed new president **Beverly Major** of Westminster, Vt. She assumes the role after representing agricultural interests on the Vermont Connecticut River Watershed Advisory Commission since 1989. She was also recently honored with the President's Volunteer Service Award, conferred by the EPA, and the Governor's Award for Outstanding Community Service. Major Farm, now run by Beverly's son and daughter-in-law, produces highly regarded sheep milk cheese.

Incoming vice president is **Nancy Franklin**, who represents agricultural interests for New Hampshire. She and her husband own Riverview Farm, a thriving orchard and pick-your-own operation in Plainfield. Franklin has been an active member of the Mount Ascutney Region River Subcommittee.

Secretary **Peter Gregory** is executive director of Two Rivers Ottauquechee Regional Commission. He also serves on the Connecticut River Byway Council steering committee. Peter is a resident of Hartland, Vt. Returning as treasurer is **George Watkins** of Walpole, N.H., a retired chemical engineer who has spent many years in watershed related work.

Franklin will also chair the N.H. Connecticut River Valley Resource Commission. Former N.H. Legislator **Bill Roberts** of Hinsdale, an at-large member of the commission, was elected vice chair, and Watkins was reelected secretary/treasurer.

Major will chair the Vermont Connecticut River Watershed Advisory Commission. **Joe Sampson**, a former select board member from Bradford and at-large member of the commission, is vice chair, and Gregory is secretary/treasurer. 🌿



New LRS members

THE Upper Valley River Subcommittee will miss the energetic participation of Lebanon's **Nicole Cormen**, who has recently been elected to the city council, and **Jeff Mathias** of Norwich. The City of Lebanon appointed **David Jorgensen** to replace Cormen. **Lou-Anne Conroy** of Lyme, a N.H. Audubon volunteer on a nighthawk nesting project, also joins the Subcommittee.

Other local river subcommittees have welcomed several other new members. Canaan, Vt. has appointed **Tom Caron** to the Headwaters Subcommittee. Tom is the owner of Tall Timber Lodge on Back Lake in Pittsburg.

Newbury, Vt. has appointed **Jim Doig** and Dalton, N.H. has appointed **Vic St. Cyr** to the Riverbend Subcommittee. Vic is a member of the board of selectmen and has been associated with the Gilman paper mill for many years.

There are seats open for residents from these currently unrepresented towns: **Clarksville, N.H.**, and **Lemington, Ryegate, Norwich, Hartland, Weathersfield, and Vernon, Vt.** Second members are also needed for **Littleton, Piermont, Cornish, and Walpole, N.H.** and **Brattleboro, Vt.** Citizens interested in joining the local river subcommittee in their area should contact their board of selectmen. For more information, contact Adair Mulligan, CRJC's conservation director, at adair.mulligan@crjc.org or 603-795-2104. 🌿

CRJC Volunteers Win EPA Awards

CRJC commissioners and local river subcommittees members, have been honored with the President's Volunteer Service Award for their work on water quality, recreation, and other river related issues.

The awards were given by EPA Administrator Stephen L. Johnson in a ceremony on Earth Day, held at Faneuil Hall in Boston. Incoming CRJC President Beverly Major and Conservation Director Adair Mulligan accepted the awards on behalf of the commissioners and the LRS members.

LRS members have logged numerous volunteer hours reviewing permits, advising CRJC on local issues, helping shape river-related work by state and federal agencies, and writing the regional chapters of the Connecticut River Management Plan. Congratulations for much deserved recognition! 🌿

CRJC and Partners Win EPA Targeted Watershed Assistance Grant

CRJC is pleased to announce that the Tri-State Connecticut River Watershed Initiative has been selected by EPA for a major grant to benefit the Connecticut River, the only New England watershed chosen in a national competition. The Pioneer Valley Planning Commission of Massachusetts will lead the project in cooperation with CRJC, Franklin County Regional Council of Governments, the United States Geological Survey, Massachusetts Water Watch Partnership, and a broad interstate coalition of 18 organizations.

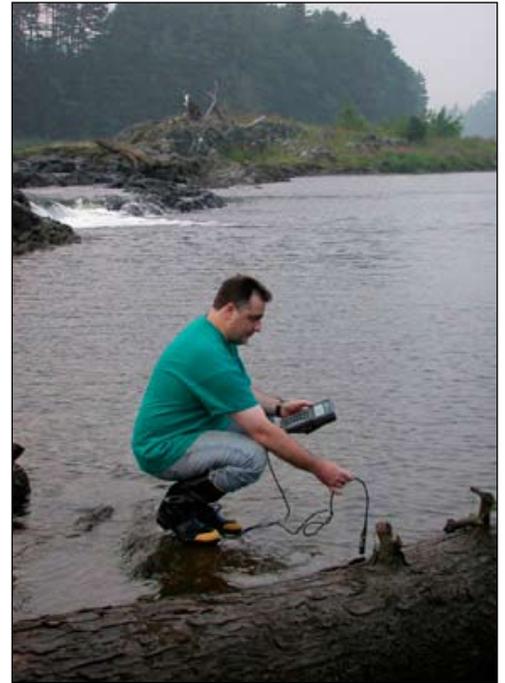
The project involves work in New Hampshire, Vermont, and Massachusetts to address water quality problems in the river, particularly due to bacteria and organic chemicals from industry, combined sewer overflows, agricultural runoff, and storm water. These impairments prevent the river from achieving state/federal water quality standards for recreation, wildlife habitat and safe consumption of fish. Additional water quality impairment stems from erosion and sedimentation.

Key to the project is an innovative information technology-oriented public outreach campaign that includes a Web-based virtual watershed tour highlighting water quality problems and project sites.

"This multi-faceted project is a creative approach to bringing key recommendations of our *Connecticut River Management Plan to life*," said Adair Mulligan, CRJC Conservation Director. "We look forward to working with and learning from our downstream partners."

In the northern river valley, CRJC will work with several local organizations, including the Hartland, Vt. Conservation Commission. In a section of the river popular for kayaking but polluted by combined sewer overflows from Lebanon and White River Junction, CRJC and volunteers will conduct extensive bacteria monitoring to alert recreational river users of health conditions. Results will provide data for decision makers to address sewage overflows, storm water and other contamination sources. Volunteers are needed; please contact CRJC if you are interested in participating. In Colebrook, N.H., CRJC will plant an extensive riparian buffer along a restored section of riverbank to protect a well-known coldwater fishery.

Also as part of the project, Vermont's Southern Windsor County Regional Planning Commission will conduct an innovative storm-water management financing program, and New Hampshire's Upper Valley Lake Sunapee Regional Planning Commission will work with area communities to use smart growth tools to protect public water supplies. EPA initiated the Targeted Watersheds Grant Program in 2002 to encourage successful community-based approaches to protect and restore the nation's watersheds. 🌿



Dan Burke of the EPA checks water quality at Summer Falls on the Connecticut River.

END FREE RIDE FOR INVASIVES

INVASIVE plants don't exactly hitch a ride into town, but they can be introduced inadvertently in construction material used by town and state highway departments. The N.H. Department of Transportation has just produced a control manual for invasive plants, containing information about best management practices to reduce the likelihood of introducing invasive plants into new areas via maintenance and construction activities.

This action fulfills a recommendation of the new Water Resources chapter of the Connecticut River Management Plan, which is: *Transportation agencies and road crews*

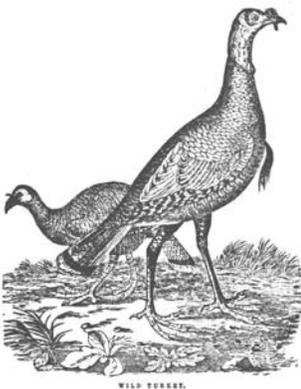
should make efforts not to transport fragments of invasive plants during road construction projects, and consult agriculture departments about best practices for dealing with invasive species, including ways to sanitize spoils before disposal. New Hampshire's Roads Scholar Program and Vermont's Better Back Roads Program offer special training for road crews on this issue.

N.H. DOT is now preparing hard copies for its staff, and also planning training sessions. The manual can be found at: <http://www.nh.gov/dot/bureaus/environment/documents/BMPsforRoadsideInvasivePlants.pdf>. 🌿



Special Places Dollars and Sense

The Dollars and Sense of Saving Special Places is a lively new presentation examining the effects of growth, the cost benefits of natural areas, the economics of land use, and funding sources for land conservation projects in New Hampshire communities. Contact Sharon Hughes at UNH Cooperative Extension about having a trained volunteer make the Power Point presentation in your community. Call 603-862-1029, or e-mail Sharon.Hughes@unh.edu.



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cent of the 500 year flood. The frequency of a flood of this magnitude is not known; however, it is certainly in the thousands of years. Two additional lives were lost when a road bridge washed out on the Little Sugar River in Unity, N.H. that same weekend. Academic researchers are documenting an increase in the intensity of storm events. Michael Simpson, professor of environmental studies at Antioch New England in Keene, will publish a study soon on the relationship of changing climate and local water infrastructure.

LESSON #2

Culverts can become flood culprits if not of sufficient size. Simpson observes a troubling pairing of trends. "We cannot consider the increase in frequency and duration of storms without also recognizing that increasing development across the landscape has been occurring simultaneously and is impairing natural flows," he says. Culverts that might have been adequately sized for normal rainfall 20 years ago may not be able to handle tomorrow's storms. Smart culvert sizing depends upon the potential runoff from the watershed upstream.

LESSON #3

Rivers naturally choose a winding course downward through their valleys, but restrictions in their pathway—such as undersized bridges and culverts—can force a rapidly rising river to jump its bank and intensify damage downstream.

In the case of Warren Brook, the 12-foot-diameter Cooper Hill Road culvert became a restriction, unable to accommodate rapidly pooling floodwaters upstream. The culvert and the embankment above it blew out and let loose a wall of water 15 to 20 feet above the stream channel. That peak flow of water was 2.6 times the average daily discharge of the entire Connecticut River nearby at North Walpole. The wall of water overwhelmed everything in its path.

LESSON #4

The Cold River Local Advisory Committee, established under the N.H. Rivers Management and Protection Act, was a voice of good sense and experience, at a time when the community was trying to understand what had gone wrong and how to put Humpty Dumpty River back together again. For example, the committee noted that well-meaning rescue crews who came to help remove debris had cut trees that had survived the flood and whose roots were holding the riverbank. Several property

owners said their riverside trees had deflected damaging debris from upstream, and had helped keep their land from washing away.

The Cold River Advisory Committee was able to make a convincing case for a wide enough span to prevent a future constriction when the N.H. Department of Transportation began developing plans for replacing the Route 123 double-arch bridge over the Cold River close to its confluence with the Connecticut in Walpole.

Since 2000, the advisory committee has been measuring the health of the Cold River. Its biological monitoring helped establish a baseline for understanding the effects of the 2005 flood. Turbidity had been negligible before the flood, but now is significant after rain events. In another measure of biological health, Warren Brook has less than half the number of macroinvertebrates found before the flood.

LESSON #5

The N.H. Rivers Management Program developed the analysis needed for river restoration. The state's Department of Environmental Services pooled funding from its own budget with that of the state's Department of Transportation, the Natural Resources Conservation Service, and N.H. Fish and Game Department to hire Horizons Engineering to undertake a fluvial geomorphic analysis of 19 miles of the Cold River, Warren Brook, and Bowers Brook to examine each section, or reach of river (37 in all) to identify how best to restore natural river equilibrium and minimize future erosion. The study recommended appropriate restoration measures for each river reach, and identified the newly incised channel of Warren Brook as a top priority because it will continue to erode and send river-clogging sediment downstream unless the brook is significantly stabilized.

LESSON #6

When it comes to public spending, human emergencies understandably have a far stronger claim than the needs of a river, and engineering practice does not yet follow river science. The Natural Resource Conservation Service took the lead in a major effort to find federal funds that could undo the devastations of October 2005. With significant help from the New Hampshire Congressional delegation, funding came through the Emergency Watershed Protection Program, set up to respond to emergencies created by natural disasters. NRCS interprets the focus of that program as protecting property, not restoring natural stream flow

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and habitats, according to NRCS engineer Ed Hanzalek, who spoke at an October, 2007 Soil and Water Conservation Society program about the Cold River. Thus the \$5.2 million of federal funds received and spent in Alstead went primarily to armoring riverbanks with riprap, rebuilding Route 123, and restoring private property to the extent possible when so much had washed away.

LESSON #7

Restoration investments can be made over time. In 2008, Warren Brook is still impaired. With additional funds, DES is developing a restoration project for a 700-foot section of the brook upstream of Griffin Hill Road. "So long as a water body is impaired, we can access funds under the Clean Water Act to restore it," says Steven Couture, DES Rivers Coordinator. "The trick," he adds, "is to find the 40 percent required matching funds, and we are looking at creative ways to do so."

LESSON #8

Fish return as habitat heals. Before the flood, New Hampshire's Fish and Game Department fish habitat biologist John Magee had counted 139 fish and at least 10 different species in one area of Warren Brook near its confluence with the pristine Cold River. Ten months after the flood, he could find only three fish in the same location and it is likely that they had entered Warren Brook from the Cold River. Remarkably, a small population of blacknose dace, creek chub and white sucker survived the flood in nooks of shelter upstream from the Cooper Hill culvert. Also discovered in this location was a relatively large adult wild brook trout.

Two years after the flood, the fish community of the Cold River included Atlantic salmon, blacknose dace, creek chub, common shiner, white sucker, wild brook trout, longnose dace, longnose sucker, and slimy sculpin. The Cold River and the tributaries to Warren Brook are sources of new fish to Warren Brook, but according to Magee, repopulation will take many years. "The fish community is not healthy, but appears to be in the early states of recovery, or at least attempted recovery," he observes. The density of fish remains very low. While the recovering river does not have the trees and shrubs that once shaded its margins, the 30,000 seedling trees and shrubs planted by NRCS are starting to grow. In places, banks are still prone to erosion and sedimentation, but conditions are improving for both people and fish, and both are making the best of their altered homes. 🌿

Sharon Francis is executive director of CRJC.

Spring is Here – So's Didymo

THE tiny but highly invasive and destructive alga, *Didymosphenia geminata*, "Didymo" for short, and popularly called "rock snot," was first reported in the upper Connecticut River last summer. It is still here, and anglers and boaters must take precautions to prevent its spread. Coating the rocky river bottom in a slimy, ugly mat, Didymo has the potential to alter the river's food chain and ultimately reduce the fish population.

Felt-soled waders are a prime culprit in spreading Didymo, but they are far from the only one. Anything that comes into contact with infected water can carry it – including boats, fishing gear, sandals, and bathing suits. Scrub everything with hot soapy water – and let soft items like clothes soak for 30 minutes.

For more information, check CRJC's Web site: www.crjc.org/didymo.htm. 🌿

Survey Helps Shape CRJC Five-Year Plan

IN revising its five-year strategic plan, CRJC conducted a survey of representatives of its various constituencies, ranging from town officials to recreational business owners to state agency staff. Here are highlights from the survey responses:

Our **programs in river related work are well known**, and fewer respondents were aware of our work giving historic preservation advice and technical support.

Respondents said the **most pressing issues** facing the Connecticut River watershed today involve land use and development - poorly planned and cumulative impact, particularly along the river where there are insufficient setbacks, lack of riparian buffers, and insufficient protection for floodplains.

CRJC activities in the next five years should focus on implementing the river management plan and facilitating conservation of shorelines and floodplains along the Connecticut and tributaries. Working with towns to update their zoning and master plans was also rated a high priority, as were landowner education, comment on river related permits, and restoring the Partnership Program.

There is still time to complete the survey, and we value your ideas. E-mail Rebecca Brown at Rebecca.brown@crjc.org for the link to the on-line CRJC Strategic Plan Survey. 🌿

GO TO THE SOURCE

The 1936 "Report of Special Commissioner Appointed to Locate and Mark the Boundary Between the State of Vermont and State of New Hampshire at the Points Specified Herein" is now available on-line. It provides the information for determining the N.H.-Vt. state boundary along the Connecticut River. Find it through the N.H. Department of Environmental Services at http://des.nh.gov/wetlands/documents/nh_vt_boundary_report.pdf



To Build or Not to Build

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A Natural Sponge

A floodplain is the holding place built by the river over millennia. It works like a natural sponge where in times of high flow, the river can spread out, slow down, drop sediment and nutrients, and allow excess water to be absorbed into the land and eventually back into groundwater. This action, over thousands of years, has created the fertile agricultural lands for which the Connecticut River valley is so famous.

“If we keep building in floodplains, we use up the sponge,” says Steve Stocking, a member of CRJC’s Upper Valley River Subcommittee. As owner of Birch Meadow Farm in Fairlee, Vt., he owns plenty of floodplain land.

“You best not be building in those floodplains,” agrees Guildhall farmer Richard Martin, a member of the Riverbend Subcommittee. “Mother Nature doesn’t like it.”

Dollars vs. Sense

Together, these two farmers, who are also floodplain landowners and river subcommittee members, point at the crux of the floodplain issue. These wide, flat expanses of land look inviting to developers, especially in towns where other flat, easily developable land is hard to find. But as Martin observes, “Now, money talks more than common sense.”

Most towns along the Connecticut and other rivers in both New Hampshire and Vermont allow building in floodplains. If the town is enrolled in the National Flood Insurance Program, it merely has to require that buildings be “flood-proofed.” This may include placing construction on a pile of fill material raised one foot above the 100-year flood level, or designing ways for floodwater to move through a basement. While these construction techniques may save a building, they do not help prevent floods. Indeed, floodplain development can make flooding worse.

A Control Issue? Experts Weigh In

The Vermont Department of Environmental Conservation held a timely and intensive exploration of these issues with the Vermont Law School’s Land Use Institute last October. The Northeast Conference on Flood Hazards, Liabilities and Opportunities brought more than 200 concerned river planners from New Hampshire, Vermont and Massachusetts to South Royalton, Vt.

“A flood is never a disaster until people get in the way,” observed conference organizer Barry Cahoon of Vermont’s River Management Unit. He reminds that exposure to floods is increasing because increased storm-



Wondering what to do with spent CFLs?

While saving a lot in energy use and carbon emissions, compact fluorescent bulbs (CFLs) contain mercury. Disposing of them properly when they burn out is essential. True Value Hardware stores, in conjunction with the N.H. Department of Environmental Services, are collecting the bulbs for proper disposal. Your local transfer station may also accept CFLs. For more information, including a list of transfer stations and hardware stores taking the bulbs, check the DES Web site, www.des.state.nh.us/factsheets/co-co-19.htm.

water loading from development is causing river channels to enlarge, and because of more frequent severe precipitation events associated with climate change.

“Climate change is reshuffling the deck and changing all the rules,” Cahoon said. “We need to prepare for this terrifying inevitability.” He advises that towns need an active approach to managing flooding rather than trying to control it.

Property Rights and Hazard Prevention

Some people associate restrictions on floodplain development with a taking of private property rights. Attorney Edward Thomas reviewed the law at the conference, noting that courts give deference to hazard-based regulations. He observed that because building in a floodplain can shift floodwaters elsewhere, it creates a nuisance, and therefore is not a protected right, especially as other value remains in the land.

Keynote speaker John Echeverria, executive director of the Georgetown Environmental Law and Policy Institute, agreed and advised that governments can adopt floodplain development standards that are stricter than the minimums required by FEMA as long as they are fair and objective.

Maps Show River Out of Equilibrium

Many local officials have doubts about the accuracy of their floodplain maps. One New Hampshire select board member described them as “something out of Disney.” Barry Cahoon has raised another reason to question the maps.

“Most of these maps were originally done in the 1970s, when many rivers had been brought out of an equilibrium condition,” he says, referring to the straightening and other means of “controlling” rivers. His team estimates that up to 70 percent of the stream miles in Vermont have been channelized or straightened to accommodate roads, the railroad, agriculture, and development.

“A river at equilibrium minimizes flood hazard and maximizes the ecological, social, and economic value to the community,” Cahoon told the gathering. “For a river out of equilibrium? We’ll end up fighting that river for millions of dollars.”

That’s because laws of physics tell scientists that a river naturally seeks an equilibrium state, and will shift its course toward that path, regardless of what has been built in the way.

Informed Choices by Towns

Towns are often faced with difficult choices about where to permit development and where to prevent it. CRJC’s new Water Resources Plan recommends that the first choice should

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Every Drop Counts

Progress on the Connecticut River Corridor Management Plan

🌿 **Hartford, Vt.** set an example for other river towns by passing a new **surface water protection regulation**. It calls for a riparian buffer of at least 100 feet from the top of the bank of the Connecticut, Ottauquechee and White rivers, and a minimum of 30 feet from other streams, brooks, ponds, lakes, and reservoirs in town. The regulation also addresses docks. CRJC assisted Hartford planners and the conservation commission in finding language and dimensions.

🌿 **Thetford, Vt.** is taking strong steps toward a new **floodplain development ordinance**, after a proposal for a new home on prime agricultural land deep within the floodplain stirred local concern. The town hosted a well-attended public workshop on floodplain development issues, presented by staff of Vermont's River Management program and CRJC.

🌿 **The Society for Protection of New Hampshire Forests** has embarked on an effort to purchase and **protect 2,100 acres and five-plus miles** of Connecticut River

shoreline in Clarksville, N.H., opposite Indian Stream. The Headwaters Subcommittee's draft recreation and water resources plans helped document the value of the project, which has won funding from New Hampshire's LCHIP program and from the Upper Connecticut River Mitigation and Enhancement Fund.

🌿 **N.H. Department of Transportation and the Northwoods Stewardship Center**, assisted by CRJC, have built an attractive **public fishing and canoe access** at the Stratford-Maidstone Bridge, at very low cost. The design includes a riparian buffer and uses the large stones from the original abutment to frame steps to the water. Public access at this historic bridge was a recommendation of the 1997 plan.



The new canoe access at the Stratford-Maidstone Bridge.

🌿 **TransCanada** has conducted a major project to **remove invasive species**, particularly honeysuckle, from Herrick's Cove in Rockingham, Vt., a designated Important Bird Area. The company consulted with Green Mountain Audubon in planning the project. The company has also begun **improvements to recreational facilities** at Moore and Comerford Reservoirs.

🌿 The **Hinsdale Historical Society** has launched an ambitious project to **protect the Col. Ebenezer Hinsdale Farm**. The first frame dwelling in the town, it was built c. 1759 with timbers from Fort Hinsdale (1742), and includes the only known true Connecticut River style front doorway north of Massachusetts. The property also includes 37 acres of valuable wildlife habitat and shoreline along the Connecticut River and a small tributary. CRJC is assisting with the conservation project.

🌿 Citizens of **Lebanon, Enfield, Canaan** and other watershed communities are considering nominating the **Mascoma River** into the N.H. Rivers Management and Protection Program.

🌿 The **Cheshire County Farm** in Westmoreland, N.H. is the subject of a **drinking water source protection plan** being prepared by the Granite State Rural Water Association, which has referred to the subcommittee's draft water resources plan. 🌿

To Build or Not to Build

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be to avoid new development anywhere in the floodplain, as some towns have already voted to do. However, while adding to existing development in a heavily settled area of the floodplain, such as a historic village, still invites flood damage, it may be a better use of the land to continue to develop there than to allow new development in undeveloped agricultural floodplains. In the former setting, additional development can be built to minimize flood damage and the loss of flood storage balanced with mitigation from new compensatory storage. In the case of undeveloped floodplains, especially agricultural settings, towns should strive to prohibit new development, both to prevent a public nuisance and to protect the integrity of this land use in addition to its vital flood storage function.

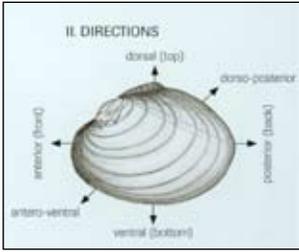
Two Rivers-Ottawaquechee Regional Commission has just developed a series of six useful fact sheets for communities on floodplain management. Topics include "Living with Inadequate Maps" and "Protecting Property Rights to Reduce Liability." You can view them at www.trorc.org/wq_flood.html. 🌿

Adair Mulligan is conservation director for CRJC.

Shoreland Changes Effective July 1

New Hampshire's revised Comprehensive Shoreland Protection Act, which goes into effect in July, includes a better defined, easy to measure Natural Woodland Buffer. For more information, see www.des.nh.gov/cspa.

New Guide to Connecticut River Mussels



The book includes sophisticated drawings by Nedeau of each mussel's shell, as well as habitat photos, river maps showing the reach of known habitats, and photographs of live mussels.

FRESHWATER *Mussels and the Connecticut River Watershed* by Ethan Nedeau is an exhaustively researched and beautifully illustrated guide to mussels found in the Connecticut River basin. It is a welcome tool for resource agencies, conservation commissions, biologists, and schools with active ecological studies programs.

Twelve species of freshwater mussels occur in the watershed, and eight of them receive state or federal protection due to their rarity. The first half of the book focuses on the biology and ecology of freshwater mussels, the status of each species and relevant threats, and steps we can all take to protect and restore mussels and the Connecticut River itself. The second half of the book profiles each mussel species, including how to identify them, specifics of their biology and ecology, their range within the watershed, and specific conservation concerns.

Nedeau is the principal of Biodiversity LLC, an environmental consulting and communications company based in Amherst, Mass. He has conducted freshwater mussel studies

throughout the Connecticut River watershed and New England. He envisions the book as a way to introduce people of all backgrounds to an important piece of the aquatic biodiversity of the Connecticut River basin.

"The vitality of freshwater mussel populations is inextricably linked to decisions of individual landowners, citizens, town governments, and other people who may not even be aware that freshwater mussels exist," Nedeau writes. He hopes the book will bring more attention to protecting aquatic habitats and educate people about the link between a healthy landscape and healthy lakes and rivers.

The book is published by the Connecticut River Watershed Council, with financial support from CRJC's Partnership Program, among other funders. Due to the expense of publishing, supplies are limited. A shipping fee of \$5.00 is charged for any mailed copies; CRWC will mail a single copy to each requester and those wishing to obtain additional copies should make a special request. Please contact CRWC at www.ctriver.org or (413) 772-2020 ext 207 to request a copy. 

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