

Vermont Ecosystem Restoration Program (ERP)

Annual Report 2013



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Cover photo: Road shoulder and shoreline restoration work on Lake Fairlee awarded a Vermont Better Back Roads Program grant and funded by VTDEC/ERP. Photo credit: M. Stickney, VTDEC

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Executive Summary

The Ecosystem Restoration Program (ERP) currently provides capital construction grants for projects that control nonpoint sources of water pollution. Nonpoint pollution sources are diffuse sources caused by precipitation or snowmelt that generate erosion or polluted runoff from developed areas, roads, agricultural lands, and logging areas. Nonpoint source pollution delivers excessive amounts of sediment and nutrients to surface waters, and is the leading cause of water quality degradation in Vermont.

The ERP grant funds target high priority actions to reduce sediment and nutrient pollution. A total of 54 grants and contracts worth \$2.3 million of State Fiscal Year (SFY) 2013 funds were awarded to municipalities, non-profit watershed organizations, universities, and consulting firms to improve water quality. **Table 1** summarizes the number of projects and dollars awarded by river basin. **Table 2** summarizes the number of projects and dollars awarded by county. The report provides descriptions of each project implemented and highlights success stories to illustrate program effectiveness in addressing high priority water quality problems across Vermont. Pie charts depict the number of projects and dollars implemented by watershed and by county. **Figures 1-2** summarize the number of projects and dollars awarded by river basin. **Figures 3-4** summarize the number of projects and dollars awarded by county.

In addition to grant implementation, ERP staff and Vermont Department of Environmental Conservation (VTDEC) Watershed Management Division partners work on a variety of water quality initiatives including Lake Champlain restoration efforts under a Clean Water Act requirement referred to as the Total Maximum Daily Load (TMDL) process. Other collaborative projects include the Green Infrastructure and Low Impact Development Strategic Plan, Vermont Better Back Roads Program, St. Albans Watershed Initiative, Stormwater Master Planning, and Illicit Discharge Detection Elimination (IDDE) mapping and assessment.

Table 1. Projects and dollars awarded by each major Vermont watershed, SFY13 funds

River Basin number and name	Number of Projects	Total SFY13 Amount
(01) Batten Kill-Walloomsac-Hoosic	0	\$0
(02) Poultney-Mettawee	0	\$0
(03) Otter, Little Otter, Lewis Creek	9	\$422,337
(04) Southern Lake Champlain	1	\$7,000
(05) Northern Lake Champlain	5	\$235,000
(06) Missisquoi	2	\$79,873
(07) Lamoille	6	\$173,404
(08) Winooski	12	\$407,820
(09) White	1	\$75,000
(10) Ottauquechee-Black	4	\$177,469
(11) West-Williams-Saxtons	2	\$91,020
(12) Deerfield	1	\$25,320
(13) Lower Connecticut	0	\$0
(14) Stevens-Wells-Waits-Ompompanoosuc	1	\$85,400
(15) Passumpsic	2	\$82,500
(17) Lake Memphremagog	2	\$89,163
Multiple Basins ¹	6	\$430,298
TOTAL for SFY13	54	\$2,381,604

Table 2. Projects and dollars awarded by Vermont County, SFY13 funds

County	Number of Projects	Total SFY13 Amount
Addison	6	\$235,617
Bennington	1	\$56,520
Caledonia	5	\$255,975
Chittenden	5	\$220,913
Essex	2	\$25,000
Franklin	6	\$279,050
Grand Isle	1	\$75,000
Lamoille	3	\$69,329
Orange	0	\$0
Orleans	2	\$120,736
Rutland	2	\$136,720
Washington	8	\$193,907
Windham	2	\$59,820
Windsor	5	\$252,469
Multiple Counties ¹	6	\$400,548
TOTAL for SFY13	54	\$2,381,604

¹Most of these projects were applied statewide.

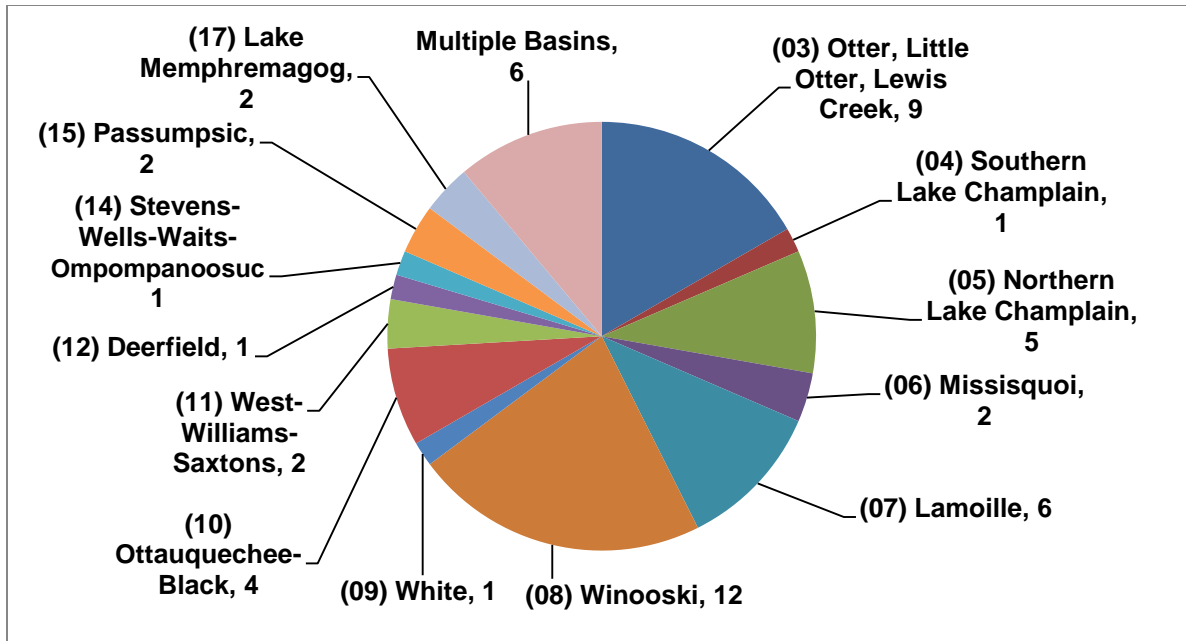


Figure 1. Number of projects awarded with SFY13 Ecosystem Restoration Program Funds by Vermont River Basin¹.

¹ The river basin number (in parentheses) precedes the river basin name, followed by the number of projects.

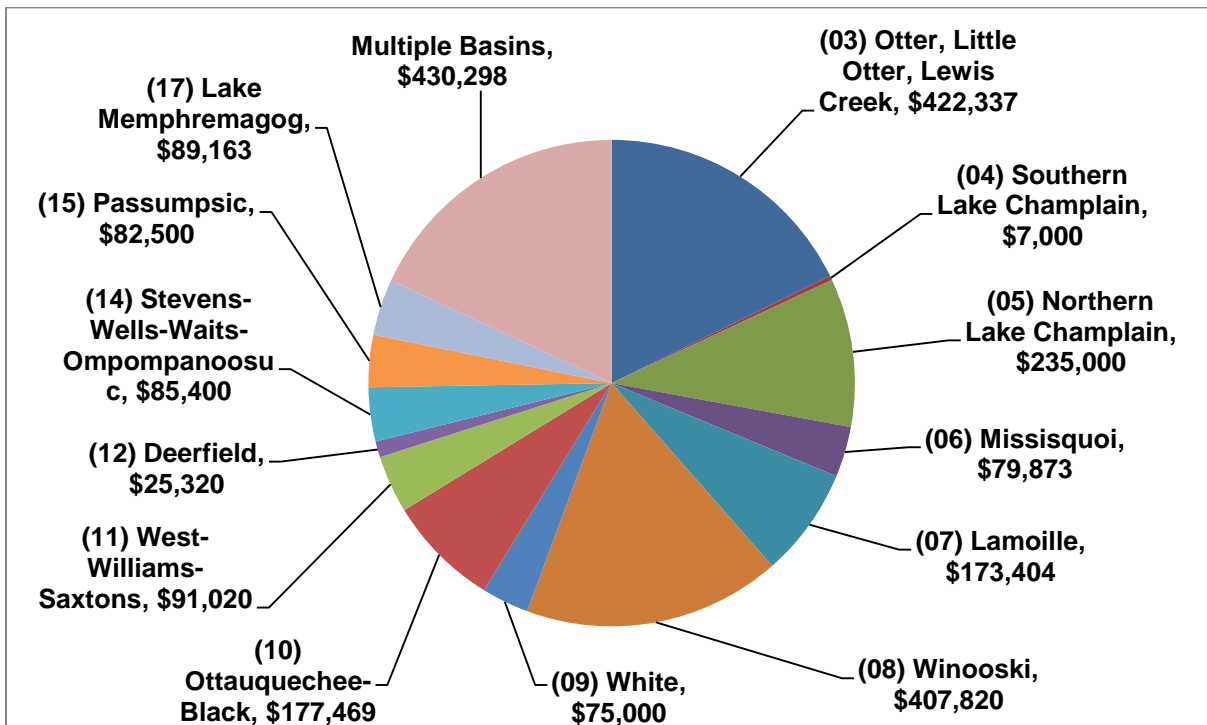


Figure 2. Number of dollars awarded with SFY13 Ecosystem Restoration Program Funds by Vermont River Basin.

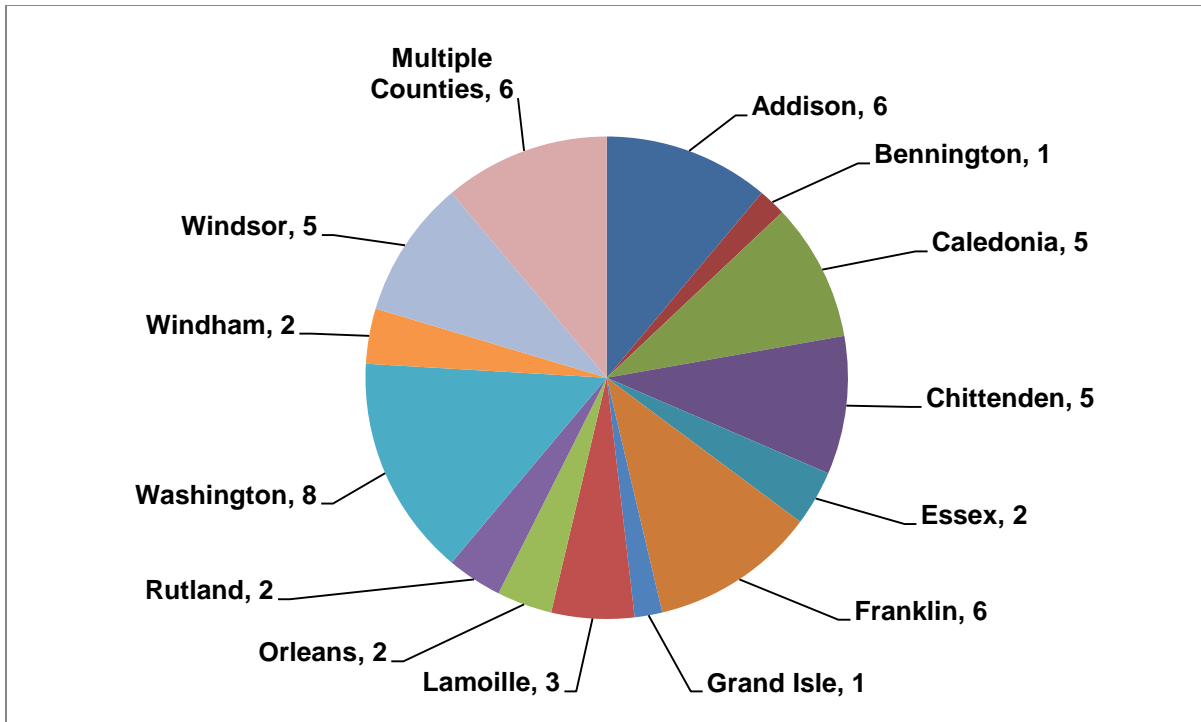


Figure 3. Number of projects awarded with SFY13 Ecosystem Restoration Program Funds by Vermont County.

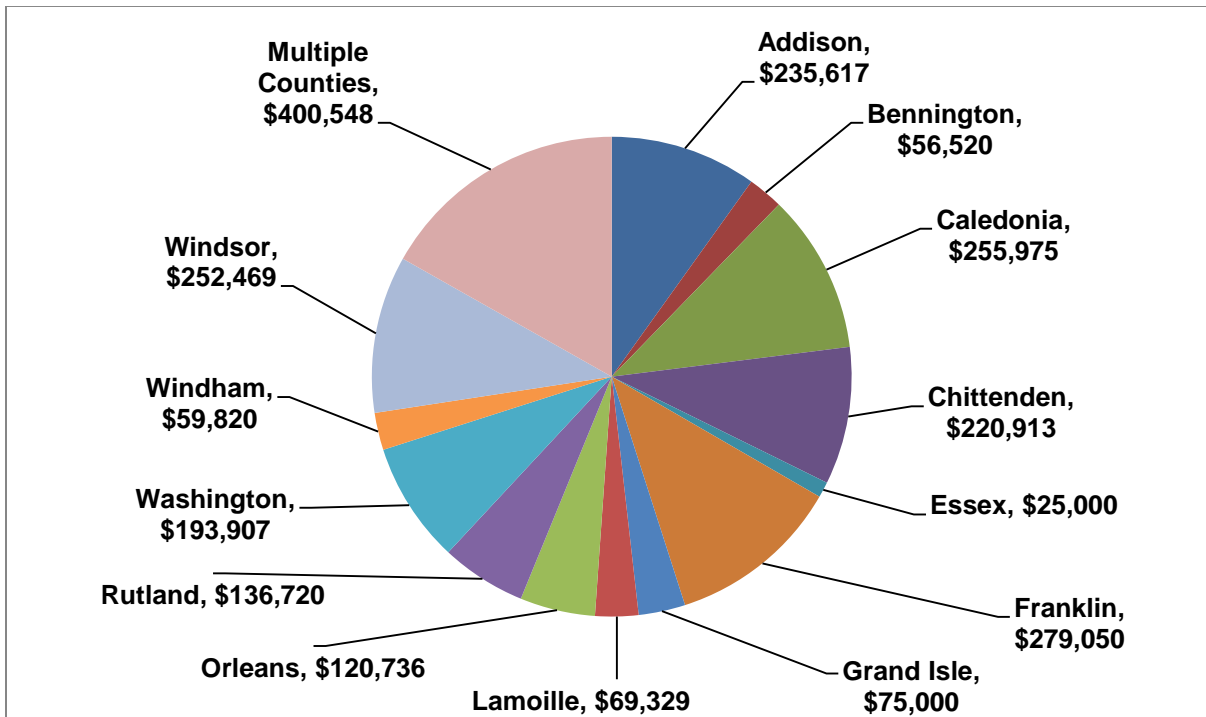


Figure 4. Number of dollars awarded with SFY13 Ecosystem Restoration Program Funds by Vermont County.

Additionally, the number of projects and dollars awarded are summarized by Vermont Department of Environmental Conservation (VTDEC) program or focus, such as Stormwater Program, Green Infrastructure and Low Impact Development (LID), Vermont Better Back Roads Program, Rivers Program, Shorelands, Riparian Areas and Wetlands, Tactical Basin Planning for other nonpoint source pollution control projects, and VTDEC Agriculture (separate from Vermont Agency of Agriculture, Food and Markets report). **Figure 5** summarizes the number of SFY13 dollars spent by general type of project with more detail in the text following.

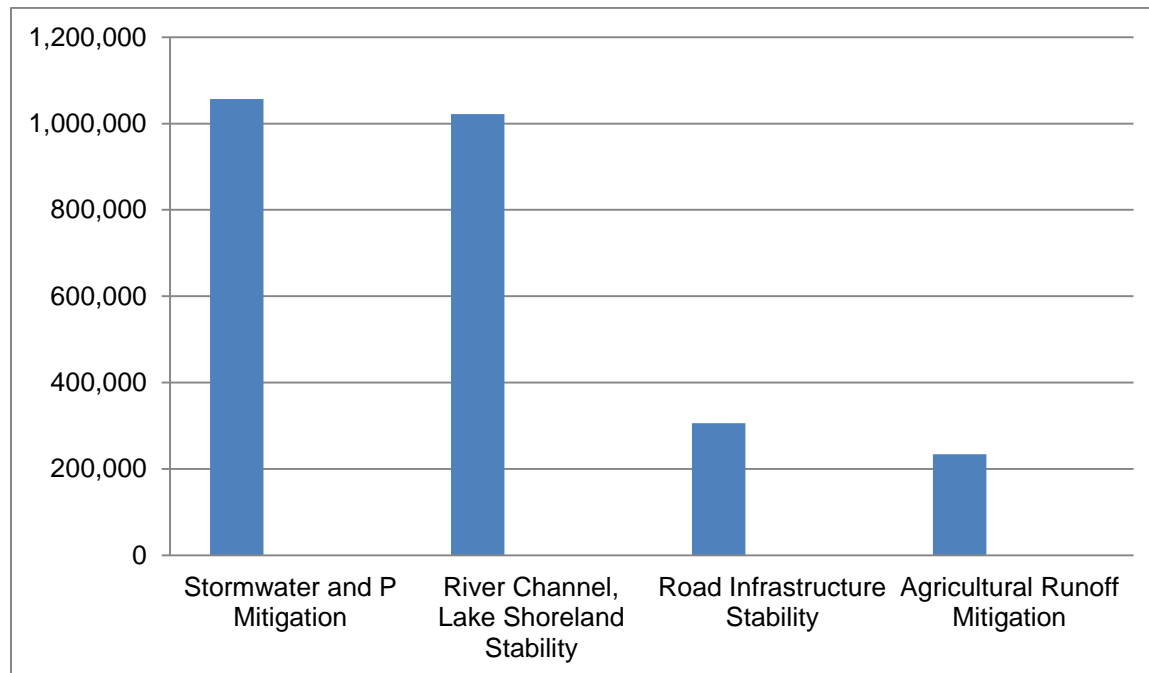


Figure 5. Number of aggregate SFY13 dollars spent by broad project type.

The types of projects funded are summarized as follows:

- Stormwater Chapter:** Fourteen stormwater projects are complete or under implementation for a total of \$643,037 of Ecosystem Restoration Program funds. Examples of these projects include stormwater remediation such as the College Street storm drain retrofits in Burlington, Illicit Discharge Detection Elimination (IDDE) to stormwater drainage systems in Rutland County, and stormwater master planning in Franklin County. The *Vermont Stormwater Management Manual* which provides technical information about stormwater remediation and water quality practices is under revision to incorporate new techniques such as Low Impact Development (LID) practices—revisions which are vital to the usefulness of this manual which is considered out of date.
- Green Infrastructure, Low Impact Development Chapter:** Thirteen Low Impact Development (LID) projects are complete or under implementation for a total of \$31,444 of Ecosystem Restoration Program funds. Examples of these projects include bioretention swales and rain gardens to collect stormwater in St. Albans, parking area stormwater

treatment at a ski area in Washington County, and an ecological LID design program for Lake Iroquois in Chittenden County.

- **Vermont Better Back Roads Chapter:** As described in the Ecosystem Restoration Program milestones chapter, in 2013 \$227,000 of SFY14 ERP funds were combined with \$400,000 of SFY14 Vermont Agency of Transportation (VTrans) funding to award 83 Vermont Better Back Roads Program grants which are either complete or under construction. Aside from this preview, overall results of these projects will be presented in the next annual report. In addition to these better back roads grants, three additional grants were awarded a combined \$78,968 of SFY13 funds for road improvements and culvert upgrades. These projects include culvert assessments for Lewis and Otter Creek, research by the University of Vermont Water Resources Center on sediment and phosphorus contributions from unpaved roads and Winooski River headwaters road erosion assessments.
- **River Management Chapter:** Twelve river management, river restoration or assessment projects are complete or under implementation for a total of \$412,009 of Ecosystem Restoration Program funds. Also, eight projects supporting River Corridor Easements are underway for a total of \$376,413 of ERP funds. These projects cover all geographic regions of Vermont.
- **Shorelands, Riparian Areas and Wetlands Chapter:** Six projects related to shorelands, riparian areas and wetlands are complete or underway for a total of \$233,257. These projects include applying shoreline protecting LakeWise principles, awarding post-Lake Champlain 2011 flooding shoreline restoration grants, planting trees in riparian buffers, and completing assessments to protect wetlands.
- **Other nonpoint source pollution projects:** Six projects related to phosphorus reduction and tactical basin planning are complete or underway for a total of \$382,563. Projects include mentoring crews from the Vermont Youth Conservation Corps to design and implement erosion reduction projects, reducing nutrient loading to Lewis Creek through Pond Brook tributary remediation, reducing phosphorus pollution to Lake Memphremagog, a chemical treatment to control phosphorus in Ticklenaked Pond, and identifying nonpoint source pollution reduction projects through the University of Vermont Water Resources Center.
- **Vermont Department of Environmental Conservation (VTDEC) Agriculture Chapter:** Two important projects are underway using \$223,913 of Ecosystem Restoration Program funds. These projects include the Memorandum of Agreement between Vermont Agency of Natural Resources (VTANR) and Vermont Agency of Agriculture, Food and Markets (VAAFM) to provide technical assistance for small farm operations and research to enhance minimal tillage practices for water quality improvement. Summaries of these specific projects follow. The Vermont Agency of Agriculture, Food and Markets will submit a separate report for their agricultural projects.

Ecosystem Restoration Program (ERP) Milestones Chapter

Introduction

The Ecosystem Restoration Program released the *Water Quality Remediation, Implementation and Funding Report*, commonly known as the Act 138 Report, on January 14, 2013. The Vermont Legislature passed Act 138 in 2012, directing the Agency of Natural Resources to prepare this report. The report was in response to impacts from multiple catastrophic flood events in 2011, economic impacts caused by degraded water quality and water quality improvement plans underway for Lake Champlain, Lake Memphremagog, the Connecticut River, and other polluted waters in Vermont.

The Act 138 Report outlines a comprehensive set of 19 categories of clean water needs across multiple sectors that include developed lands, agricultural areas, forested areas, river instability, and municipal drinking water and wastewater infrastructure. The report analyzes 16 potential financial tools for generating additional revenue to meet the State's water quality challenges, and evaluates eight options for administering a statewide water quality fund. Part II presents management options for lake shoreland protection.

Although the report does not make recommendations pertaining to financial I tools to support a statewide water quality fund, information contained in the report addresses how to assess the magnitude of need, set funding priorities, evaluate funding options including leveraging local, state, and federal funds, and target actions that will achieve results.

The Act 138 Report is found at the following [link](#):

http://www.watershedmanagement.vt.gov/erp/docs/erp_act138report.pdf

The report was prepared for the Vermont General Assembly in Accordance with Act 138 (2012), Section 19 as follows:

http://www.watershedmanagement.vt.gov/erp/docs/erp_ACT138.pdf

The Ecosystem Restoration Program worked on other priority clean water initiatives, including the restoration of Lake Champlain as part of the new Clean Water Act Total Maximum Daily Load (TMDL) process, the launch of Vermont's Green Infrastructure Initiative and Strategic Plan, the release of guidance material for municipalities and other partners in stormwater management (referred to as the State's master planning guide), and expansion of the Vermont Better Back Roads Program erosion control grants through a Vermont Agency of Transportation (VTTrans) and Vermont Agency of Natural Resources (VTANR) partnership. Accomplishments from 2013 are summarized below.

New Lake Champlain Phosphorus TMDL

Phosphorus pollution is the greatest threat to clean water in Lake Champlain. Phosphorus is a nutrient that stimulates excessive growth of algae in the Lake, turning the water green and making it unsuitable at times for swimming or drinking. Phosphorus is found in eroded sediment

and runoff from farm fields, barnyards, roads, parking lots, from streambanks, and in wastewater discharges.

In 2002, the US Environmental Protection Agency (USEPA) approved a Lake Champlain Phosphorus Total Maximum Daily Load (TMDL) prepared by Vermont and New York. The TMDL placed a cap on the amount of phosphorus allowed to enter Lake Champlain, and allocated that maximum amount among various sources within each major watershed draining to the Lake. In 2011, the USEPA revoked its approval of the Vermont portion of the Lake Champlain TMDL and is in the process of developing a new TMDL.

Phosphorus loading to Lake Champlain is dominated by nonpoint sources. For a TMDL to be approved in this situation, the USEPA must find “reasonable assurances” that the necessary nonpoint source phosphorus reductions will actually occur. Insufficient reasonable assurance was the primary reason given by the EPA for reversing its approval of the 2002 TMDL.

The State of Vermont (Agency of Natural Resources, Agency of Agriculture, Food and Markets, and Agency of Transportation) has been working closely with the USEPA develop a new Lake Champlain Phosphorus TMDL. The VTDEC released “*The State of Vermont Draft Proposal for a Clean Lake Champlain*” (weblink below). This draft proposal identifies a set of policy actions to reduce phosphorus loading from nonpoint sources. Comments on the draft report were due in January 2014.

The DRAFT TMDL proposal may be found at this [link](http://www.watershedmanagement.vt.gov/erp/champlain/):
<http://www.watershedmanagement.vt.gov/erp/champlain/>

Following the release of the draft proposal, USEPA and VTDEC held a series of six public meetings in December 2013 to discuss the proposal for restoring the Lake Champlain Basin. More than 500 Vermonters attended these meetings, which were facilitated by the Lake Champlain Basin Program. The VTDEC, with assistance from VTrans and the regional planning and development agencies, scheduled 12 additional public meetings with municipalities.

Green Infrastructure Initiative

Stormwater runoff, caused by precipitation running off impervious surfaces and developed lands, is a leading cause of surface water pollution in Vermont. Impervious surfaces generate hundreds of thousands of gallons of untreated runoff per year resulting in damage to streambank stability, aquatic habitat and municipal infrastructure. The traditional approach to managing stormwater runoff is with “gray infrastructure,” a network of pipes, storm drains, and concrete tanks where collected runoff is conveyed and then discharged to receiving waters. While this approach is effective at moving water, it does little to mitigate excessive water volume and pollutant loads. This traditional method can cause, and has caused, additional issues downstream from outlets and end-of-pipe structures.

More effective alternative approaches are Low Impact Development (LID) and Green Stormwater Infrastructure (GSI). These methods rely on natural or “green infrastructure” to infiltrate, evaporate and store water in dispersed locations throughout the landscape. This decentralized approach deals with stormwater as close to the source as possible while

promoting groundwater recharge, flow control and filtration. There are other LID and GSI benefits including reduced and delayed stormwater runoff volumes, enhanced groundwater recharge, stormwater pollutant reductions, reduced sewer overflows, additional wildlife habitat and recreational space, and increased land values.

The Green Infrastructure (GI) Coordinator position within VTDEC's Ecosystem Restoration Program plays a critical role in coordinating Vermont's *Green Infrastructure Initiative*, a statewide effort that seeks to increase adoption of LID principles and implementation of GSI practices throughout Vermont. This initiative uses a combination of education, outreach, training, technical assistance, and coordination to accomplish its goals. With the *Green Infrastructure Strategic Plan* as a guiding document, a number of critical tasks were completed including increased training opportunities for design professionals, raised awareness of LID and GSI practices, and increased coordination through the GI round table.

The Green Infrastructure Strategic Plan is found at the following [link](http://www.vtwaterquality.org/stormwater/docs/sw_greeninfrastructureSP.pdf):
http://www.vtwaterquality.org/stormwater/docs/sw_greeninfrastructureSP.pdf
The Green Infrastructure Initiative web page can be found here:
http://www.vtwaterquality.org/stormwater/htm/sw_green_infrastructure.htm

Increase training opportunities for design professionals

Design professionals were afforded a number of opportunities to learn more about LID principles and GSI practices. Webinars included: use of software to model GSI; valuing green infrastructure; Green Infrastructure Portfolio Standard; soil characteristics; and an interagency training on LID and GSI.

Raise awareness of LID principles and GSI practices

The Green Infrastructure Initiative has increased LID principle use, and GSI practices have increased. Between 2012 and 2013, the initiative coordinated numerous presentations to high schools and colleges, municipalities, civic groups, non-profit organizations and professional trade groups. Fact sheets were prepared and distributed on a wide range of GSI topics ranging from infiltration and evapotranspiration to storage and reuse. In addition, the work of the Initiative was featured in a variety of media articles throughout the state, including the Watershed Management blog.

Improved coordination of LID and GSI efforts through the GI Roundtable

While established in 2010, the role of the Roundtable was more clearly defined in 2013 by shifting from an ad hoc group to management by a steering committee with internal working groups. Members of these groups are tasked with moving particular aspects of the strategic plan forward in coordination with ERP's Green Infrastructure Coordinator. The GI Roundtable meetings occur on a quarterly basis. A Google Group was created to support conversations and discussion outside physical meetings. This group currently has 97 participants.

Stormwater Master Planning

In 2013 the Ecosystem Restoration Program published the *Vermont Stormwater Master Planning Guidelines*. These guidelines are meant to assist municipalities manage stormwater better by providing guidance, examples, potential funding sources, and a summary table of stormwater related zoning, mapping and water quality issues. The guidelines are intended to evolve continually and will be updated annually with new information.

The Vermont Stormwater Master Planning Guidelines can be found at this [link](http://www.watershedmanagement.vt.gov/erp/docs/erp_SWMPFinal11-25-13.pdf):
http://www.watershedmanagement.vt.gov/erp/docs/erp_SWMPFinal11-25-13.pdf

Ecosystem Restoration Program staff also completed stormwater geographic information system (GIS) drainage maps for 21 urbanized cities, villages and hamlets in the Lake Memphremagog, Upper Connecticut River, Passumpsic River, Stevens-Wells-Waits-Ompompanoosuc Rivers, and the Poultney River watersheds. A statewide drainage map of all urbanized areas is planned by 2017. These drainage maps depict the extent of storm drainage on both public and private properties to raise awareness about stormwater runoff impacts to Vermont's waterways, and the need for regular drainage system maintenance as well as pollution prevention.

When stormwater drains directly to rivers and streams in pipes without passing through vegetation or over soil, pollutants moving with that water contribute to water quality degradation and an increased risk of flooding. Storm drain system knowledge is a valuable tool for hazardous spill prevention for local fire and police departments. This knowledge also helps municipalities and residents with emergency preparedness for large rainfall events (i.e. tropical storms or hurricanes) or spring snowmelt runoff events. The mapping project provides information, guidance and funding assistance for potential stormwater retrofit and clean up opportunities. By keeping storm drains clean and clear, a great deal of localized flooding and property damage can be prevented. Finally, these maps could be the basis for a local stormwater ordinance or create or enhance a municipal stormwater management program.

Illicit Discharge Detection Elimination (IDDE) mapping in Northeast Vermont

Ecosystem Restoration Program staff completed stormwater geographic information system (GIS) drainage maps for 21 urbanized cities, villages and hamlets in the Lake Memphremagog, Upper Connecticut River, Passumpsic River, and Stevens-Wells-Waits-Ompompanoosuc River watersheds. The maps will assist VTDEC and these communities in the following ways: (1) providing an overall summary of the connectedness of the storm drainage system on both public and private properties to raise awareness about stormwater runoff impacts, and the need for regular drainage system maintenance for pollution prevention and localized flooding prevention; (2) providing a tool for hazardous spill prevention for local fire and police departments; (3) conducting a survey to detect and eliminate illicit wastewater discharges; and (4) providing a planning tool for combined sewer separation projects, stormwater retrofit projects and stormwater master planning. Barton Village, Orleans Village, Bradford Village, Island Pond Village, East Burke Village and Burke Mountain Ski Area, Canaan Village, Beecher Falls Village, Concord Village, Derby Line, Derby Center, Fairlee Village, Groton Village, Lunenburg

Village, Gilman Village, Lyndonville, Newbury Village, Wells River-Boltonville, Newport City, St. Johnsbury, Danville Village, and Norwich Village were mapped as part of this project.

All final reports, GIS data and additional information about the mapping and illicit discharge detection and elimination program can be found at this [link](http://www.watershedmanagement.vt.gov/erp/htm/SW_IDDE_program.htm):
http://www.watershedmanagement.vt.gov/erp/htm/SW_IDDE_program.htm

Vermont Better Back Roads Program

In 2013, the Vermont Better Back Roads Program (VBBR) transitioned from the non-profit Northern Vermont Resource Conservation and Development Council to the Vermont Agency of Transportation (VTTrans) for administration. The VBBR is a grant program created to improve water quality by supporting water quality friendly road management practices. Grants are awarded to municipalities and watershed or road associations to correct physical road conditions that contribute significant amounts of sediment and phosphorus to surface waters. The scope of projects include rock or grass lining ditches to reduce water flow and reduce sediment loss, replacing undersized culverts and stone lining culvert outfalls, restoring vegetation and resloping road shoulders bordering shorelines to slow runoff, and other erosion control practices. Two types of grants are issued, road inventory and capital budget plans that set priorities on which critical problems to address first with limited funds, and also implementation grants to fix problems. The VBBR program strongly advocates that these inventories and cost estimates occur before applying for implementation grants.

The 2013 VBBR grant round was the first in two years, and VTTrans contributed \$400,000 in SFY14 state funds and VTDEC contributed \$227,000 in SFY14 state funds for a combined total of \$667,000. The VTDEC funding was linked directly to road improvement priorities in the river basin tactical plans. A new approach for the 2013 grant round included workshops to learn about better back road practices, water quality and how to fill out the applications. This approach resulted in an unprecedented 84 projects funded, with the number of new town applicants from diverse geographic areas and inventory projects tripled. As of December, 75% of these projects are already in place and functioning to improve water quality. Results of these SFY14 projects will be reported in the next annual report.

Developing a consistent inventory process that links elements of stormwater master planning and tactical basin planning is a high priority for 2014. Several requests for proposals with ERP and federal funds are imminent to develop a consistent inventory process that municipalities can easily use to generate lists of priority projects and what they will cost to implement. This information is vital to demonstrate how public funds are being used to correct the most critical projects to water quality improvement.

More information about the Vermont Better Back Roads Program resides at this [link](http://vtransengineering.vermont.gov/sections/environmental/betterbackroads):
<http://vtransengineering.vermont.gov/sections/environmental/betterbackroads>

St. Albans Watershed Initiative

The St. Albans Bay Watershed Initiative was created to place attention on water quality issues plaguing St. Albans Bay. The initiative focuses its efforts on four main areas: rivers, roads, stormwater, and agriculture. The initiative is identifying implementation projects to improve water quality conditions in St. Albans Bay by reducing nutrient and sediment contributions from lands draining directly into the Bay. There are two notable work efforts to report under the initiative: a partnership with the Northwest Regional Planning Commission and another with the City of St. Albans.

Partnership with Northwest Regional Planning Commission

In partnership with VTDEC, Northwest Regional Planning Commission will identify water quality improvement nonpoint source projects using three approaches:

- (1) Evaluation of previously completed water quality improvement documents.** Determine which previously identified nonpoint source water quality projects within the St. Albans Bay watershed are complete and those that remain. (This evaluation does not address agriculturally related reports or projects).
- (2) Potential critical source identification.** Use GIS spatial overlay techniques to identify discrete areas within the St. Albans Bay watershed more likely to generate runoff and erosion and contribute sediment and phosphorus to the Bay. Identification of these potential critical source areas could be extremely useful to focus nonpoint source related implementation efforts in the future.
- (3) Identification/inventory of nonpoint source projects.** The inventory will identify three categories of projects: unpaved town roads, river and stream corridors, and non-Municipal Separate Storm Sewer System (MS4) implementation. Projects identified under this approach will be ranked by priority with respect to relationship to critical source area analysis.

As erosion, sedimentation and nutrient enrichment to the Bay from land use activities are especially acute, Northwest Regional Planning Commission developed a watershed specific focus on land use management to mitigate water quality problems likely resulting in degraded conditions. Under a previous ERP grant, the Northwest Regional Planning Commission already identified 30 prioritized water quality related projects recommended for implementation within the St. Albans Bay watershed.

Partnership with the City of St. Albans

In partnership with VTDEC, the City of St. Albans will develop a flow restoration plan to serve as a guide when defining projects and suitable areas to deploy stormwater runoff controls. These controls will address water quality impairments and reduce hydrology-related impacts affecting the upper Stevens Brook area (headwaters down to and including the City of St. Albans).

Tasks under this effort include:

- Acquire and review existing data including infrastructure, subwatersheds, impervious cover, the Best Management Practice (BMP) Decision Support System (DSS) model, VTDEC permitted site plans, and supporting application information.
- Conduct site inspections to field verify configuration and drainage areas of permitted and non-permitted stormwater systems in the watershed.

- Review potential Best Management Practice (BMP) retrofit opportunities and potential new BMP locations, including opportunities for low impact development (LID).
- Prepare a list of the required BMPs, including a design and construction schedule, a financial plan, regulatory analysis, identification of regulatory assistance, and consideration of third party implementation issues. Prepare concept level designs for each proposed BMP and revise final BMP list based on feedback from project partners.

Portable Skidder Bridge Rental and Education Program

Most of Vermont's Natural Resources Conservation Districts are now renting portable skidder bridges to loggers in an effort to protect water quality during logging operations. Temporary stream crossings used during logging help eliminate discharges of sediment to surface waters. Sediment is the most common water pollutant associated with logging.

Portable skidder bridges are designed as temporary structures for crossing streams during logging. They are becoming widely accepted as a Best Management Practice for controlling nonpoint source pollution associated with logging operations. When properly installed, used, and removed, they create less stream bank and stream bed disturbance compared to other alternatives such as culverts or log-ford crossings. They are also economical since they are reusable, easy to install and can be transported from job to job. If used and maintained properly, they will provide 3-5 years of service. Using portable skidder bridges reduces the risk for sedimentation, channeling and aquatic habitat degradation while allowing loggers to harvest timber in compliance with *Acceptable Management Practices (AMPs) for Maintaining Water Quality on Logging Jobs in Vermont*.

The Portable Skidder Bridge Rental and Education Program started in 2007 with two pilot projects in Lamoille and Rutland counties. This rental program uses a log skidder bridge design developed by the Vermont Department of Forests, Parks and Recreation. The design calls for #1 lumber grade Eastern Hemlock for its strength. Load ratings for various types of logging equipment were determined using American Association of State Highway and Transportation Officials (AASHTO) standards. The use of portable skidder bridges as a method to cross streams when logging is gaining popularity; loggers, landowners and foresters are realizing their environmental and economic advantages.

The statewide portable skidder bridge rental pool has grown from six bridges in 2008 to twenty-four in 2013. The number of rentals has steadily increased from seven to twenty-five during that same time period as more Natural Resource Conservation Districts have started up rental programs. Loggers may rent portable skidder bridges from Conservation Districts offering this program for \$100 a month. The skidder bridges are located at participating sawmills and log yards around Vermont so loggers may pick them up and return them conveniently. Loggers who rent bridges receive an educational packet with guidelines for installation, use and removal of the bridges while following water quality friendly Acceptable Management Practices (AMPs) for forestry. Most Conservation Districts have multiple bridges in their rental pool.

For more information on Vermont's Portable Skidder Bridge Initiative, go to this [link](http://www.vtfpr.org/watershed/initiative.cfm): <http://www.vtfpr.org/watershed/initiative.cfm>

Local Municipal Actions

The Ecosystem Restoration Program provides funding to the Vermont League of Cities and Towns (VLCT) for a part-time Water Resources Coordinator. The coordinator engages and works with municipalities to protect water quality and water resources by enhancing protective zoning regulations and other municipal ordinances. The coordinator is a certified floodplain manager (CFM) with the Association of State Floodplain Managers (ASFPM), Inc.

Accomplishments in 2013 include the following:

- Education and outreach on changes to the Emergency Relief and Assistance Fund (ERAF) rule pertaining to flood damage mitigation incentives, river corridor protection and water quality improvements to town roads. Education and outreach involved organizing sessions on the ERAF rule at the VLCT Town Fair, VLCT Fall Planning and Zoning Forum, presenting workshops at the Town Officers Education Conference (TOEC) series, and individual technical assistance to municipal officials in more than 50 towns.
- Individual technical assistance to ten towns on water resource protection issues including flood hazard regulations, lake shoreland protection standards, riparian buffer standards, low impact development (LID), stormwater management, and construction site standards.
- Participation in more than forty meetings including Ecosystem Restoration Program quarterly meetings, Friends of the Winooski River board meetings, Federation of Vermont Lakes and Ponds (FOVLAP) annual workshop, Association of Vermont Conservation Commissions (AVCC) board meetings, Lake Champlain TMDL focus groups, Land Use Collaborative meetings, Regional Stormwater Education Program (RSEP) meetings, Green Infrastructure Initiative Technical Assistance Committee meetings, and the Shoreland Commission working group.
- Analysis, summary and documentation of more than 50 town municipal zoning, subdivision and flood hazard regulations to determine the strength of local rules intended for water quality protection, lake shoreland protection, aquatic habitat preservation, avoiding growth in areas prone to flood erosion and hazards, stormwater management, and LID and Green Stormwater Infrastructure (GSI) best management practices that reduce the impacts of development.

Stormwater Chapter

The Ecosystem Restoration Program (ERP) SFY13 grant funds are supporting the implementation of 14 stormwater projects totaling \$643,037. Examples of these projects include stormwater remediation work such as the College Street storm drain retrofits in Burlington, Illicit Discharge Detection Elimination (IDDE) to stormwater drainage systems in Rutland County, rain gardens in St. Albans City (**Figure 6**) and stormwater master planning in Franklin County.

Vermont Stormwater Management Manual Revised

The *Vermont Stormwater Management Manual* contains regulatory requirements for the management of stormwater and technical guidance to assist in the design of stormwater treatment practices. The manual currently is under revision to incorporate new techniques such as Low Impact Development (LID) practices—revisions which are vital to the usefulness of this manual which is considered out of date. A team of consultants, including Stone Environmental, Adamant Accord and Horsley Witten, are leading a stakeholder process designed to identify the best approach to incorporate green stormwater infrastructure and LID techniques into the manual, and to improve the overall effectiveness of approved treatments. Several stakeholder meetings occurred in 2013 where participants reviewed leading stormwater manuals used by other states, and evaluated how best to improve Vermont's approach, while maintaining as much of existing structure as possible. The final facilitated stakeholder meeting is scheduled for early 2014. Following the stakeholder meetings, the Stormwater Program will develop a draft revised manual to enter the legislative rulemaking process.

A website that includes process information, schedule, technical resources, and meeting minutes is available at [link](http://www.watershedmanagement.vt.gov/stormwater/htm/sw_manualrevision.htm):

http://www.watershedmanagement.vt.gov/stormwater/htm/sw_manualrevision.htm

Town of Hardwick Stormwater Remediation

This grant supported construction of a bioretention swale and rain garden for the Cherry Street stormwater subwatershed which drains 24.5 acres and has 7.8 acres of impervious surface (31%). The rain garden is expected to remove 54% total suspended solids and 34% phosphorus from stormwater runoff. The University of Vermont (UVM) Extension Office became involved through a companion grant from the Lintilhac Foundation to test a specialized substrate on one side of the garden which may potentially remove more phosphorus than other soil substrates. The UVM Extension Office will continue to monitor phosphorus reduction by the rain garden for two years. The project also supported final design of an underground stormwater treatment network that will treat the North Main Street and Church Street stormwater subwatersheds and provide financial support for stormwater treatment on the South Main Street. *Once constructed all three practices will provide sediment and phosphorus reduction for nearly 20 acres or 15% of the total impervious area of Hardwick Village.*

Town of Williston Stormwater Master Plan Phase II

Williston completed a town-wide stormwater master plan, also called a watershed improvement plan, which includes all water bodies within the town. The plan documents problem areas such as erosion or hydraulically undersized culverts and sets priorities on addressing those problems.

Williston is currently working on the first project in a residential subdivision (Oneida Acres) with funding assistance through this grant. A final report is due in 2014.

Rutland County Illicit Discharge Detection and Elimination (IDDE) project

The Rutland Natural Resources Conservation District (RNRCD) is completing an assessment of stormwater outfalls in the towns of West Rutland, Proctor, Castleton, Fair Haven, Poultney, Benson, and Wallingford. The study seeks to find and eliminate any cross connections between the stormwater system and the municipal wastewater system. Of 224 outfall pipes assessed to date, 20 suspected discharges have been located. A number of these discharges have been confirmed as sanitary wastewater or industrial wastewater discharges. A final report is due this winter 2014.

Collaborative Vector-Jet Catch Basin Cleaner Purchase

The Town of Morristown, in collaboration with Johnson, Waterbury and Richmond, is purchasing a trailer mounted catch basin cleaner with a water jet and vacuum. A catch basin collects stormwater and allows sediment to drop out of the water column before leaving the catch basin. The sediments and other materials need to be routinely cleaned out. An ERP grant is financing the purchase along with a grant from the Vermont Agency of Transportation. The catch basin cleaner unit will allow these towns to better maintain their stormwater and sewer infrastructure which will reduce emergency maintenance costs and reduce sediment, nutrients, bacteria, and toxins from entering state waterways. A final report is due next fall 2014.

Franklin County Stormwater Master Plan Development

The Friends of Northern Lake Champlain received a grant to develop stormwater master plans for Sheldon and Fairfield, which raises the number of Franklin County towns with stormwater master plans to eight. Most of these towns are located within the Missisquoi River watershed. Grant funds were also utilized to construct two priority erosion control projects already identified in stormwater master plans for Enosburg Falls and Georgia. These stormwater master plans direct funding and implementation to the most important projects that will reduce water pollution. A final report is due this winter.

Lamoille Stormwater Improvement Project

The Lamoille Natural Resources Conservation District was awarded a grant to develop two stormwater retrofits in Morrisville and one stormwater retrofit in Hyde Park Village. Parking lots at Peoples Academy High School and Copley Hospital will be modified to provide better on-site stormwater treatment and infiltration. A section of Main Street in Hyde Park Village is also being studied for a possible retrofit. A final report is due next summer 2014.

Optimizing Stormwater Treatment Retrofit Locations for the College Street Storm Drain

The Ecosystem Restoration Program is providing \$35,000 for a map of priority stormwater infrastructure retrofits and will generate conceptual engineering drawings for the highest priority retrofits on College Street in Burlington. This project serves the dual purpose of protecting the state's water quality and supporting green infrastructure stormwater retrofits in the College Street storm drain watershed to reduce sediment and phosphorus discharges to Lake Champlain. To date, Burlington has developed a watershed map for College Street, identified potential retrofits; screened and prioritized preliminary retrofit locations and types for conflicts; engineering feasibility; and calculated water quality benefits and costs.

Northfield Stormwater Remediation Project Development

The Central Vermont Regional Planning Commission (CVRPC) used results of a previously funded ERP project for comprehensive stormwater mapping in the Village. The stormwater

mapping included retrofit possibilities at target locations. Working closely with the stormwater report, spatial data, and recommendations for site retrofits to accommodate stormwater treatment, CVRPC will design one large stormwater project and other small, low impact stormwater mitigation projects within Northfield. The CVRPC has identified project locations and received landowner maintenance agreement.

Stormwater Mitigation Practices at Kenyons Hardware and Farm Supply in Northfield

The Friends of the Winooski River used \$25,870 to implement the Kenyons Hardware and Farm Supply stormwater mitigation project in Northfield. This project will serve to design and partially install stormwater mitigation practices to protect and restore the Dog River in the Winooski River watershed. Friends of Winooski has completed a design for swale improvements, reshaped an unpaved area and installed permanent infiltration practice for an existing swale.

Stormwater Reduction in Moon Brook in Rutland City

The goal of this project is stormwater reduction in Moon Brook through the design and installation of a gravel wetland in the Southern Boulevard development in Rutland City. Previously, a consultant designed a system to reduce peak flows that actually exceed the level of treatment necessary. As a result of this design, the project became cost-preclusive as was evident in the construction bid process. After further review, VTDEC determined that a redesign is necessary due to the amount of area to be treated, and the degree of treatment required by the TMDL. A redesign is underway.

Figure 6. *The Vermont Youth Conservation Corps (VYCC) installed this Rain Garden in St. Albans City with ERP funding.*
Photo credit: VYCC



Green Infrastructure and Low Impact Development Chapter

The ERP SFY13 funds are supporting 13 Low Impact Development (LID) projects for a total of \$31,444. Examples of these projects include bioretention swales and rain gardens to collect stormwater in St. Albans, parking area stormwater treatment at a ski area in Washington County, and an ecological LID design program for Lake Iroquois in Chittenden County. **Figures 7 and 8** are examples of green infrastructure along a parking lot and a rain garden.

St. Albans City Green Streets Paired Watershed Monitoring Project

This contract with the private consulting firm Stone Environmental, Inc. encompasses the fourth and final year of stormwater flow monitoring for two residential neighborhoods in St Albans City. One neighborhood has been retrofitted with three raingardens constructed in the median between the sidewalk and the street. The project will document flow reductions provided by those raingardens compared to a nearby control watershed and provide justification to support future installations of additional green stormwater infrastructure treatments in the public right-of-way. A final report is due next spring 2014.

Mad River Glen Stormwater Mitigation Project

The Friends of the Mad River received \$18,000 to develop a conceptual plan for mitigating erosion, sedimentation and elevated discharge levels from the Mad River Glen Ski Area parking lot. The parking lot, located on Vermont Route 17 in Waitsfield, drains into the Mill Brook via catch basins and highly eroded drainage channels. The parking area surface continually erodes and delivers sediment and elevated discharges to the Brook. To date, Friends of Mad River has conducted numerous meetings with landowners and stakeholders, acquired and reviewed existing information, and compiled an existing conditions plan, which includes a technical memo summarizing potential conflicts with the on-site wastewater system configuration. In the coming months, they will complete hydrologic and hydraulic modeling. The modeling will lead to the conceptualization of three different design options with design selections made in 2014.

Lake Iroquois Ecological Low Impact Development Design

The Lake Iroquois Recreation District (LIRD) developed an ecological landscape design for the Lake Iroquois public beach. The project will reduce erosion of road and beach sediments into the lake, serving the dual purpose of protecting the state's water quality while providing safe, orderly and healthful swimming and recreational conditions for member town residents at the north end of Lake Iroquois. The LIRD has completed the design as well as a poster that will explain the ecological benefits of the work.

The Low Impact Development (LID) Design report may be found at this [link](http://www.town.williston.vt.us/index.asp?Type=B_BASIC&SEC=%7b862668AC-7CE1-4629-BA5E-ECC60DAA18A3%7d):
http://www.town.williston.vt.us/index.asp?Type=B_BASIC&SEC=%7b862668AC-7CE1-4629-BA5E-ECC60DAA18A3%7d



Richmond parking lot bioretention area.



Richmond parking lot permeable paver blocks.

Figure 7. These Green Stormwater Infrastructure (GSI) projects were implemented in Richmond in 2013. These installations improve the stability of a small tributary to the Winooski River. Photo credit: VTDEC



Figure 8. This rain garden was installed in 2013 by Chamberlin School children and their teacher with assistance from the Winooski Natural Resources Conservation District through an ERP grant. Photo credit: VTDEC

Vermont Better Back Roads Program Chapter

As described in the Ecosystem Restoration Program milestones chapter, the \$227,000 of ERP funds were combined with \$400,000 of Vermont Agency of Natural Resources (VTrans) funding to award 83 Vermont Better Back Roads (VBBR) Program grants which are either complete or under construction. In addition to these better back roads grants, three additional grants were awarded a combined \$78,968 related to road improvements and culvert upgrades. These projects include culvert assessments for Lewis and Otter Creek, research being conducted by the University of Vermont Water Resources Center on sediment and phosphorus contributions from unpaved roads, and Winooski River headwaters road erosion assessments. **Figure 9** is an example of rock and fabric lining a roadside ditch to reduce water velocity and trap sediment.

Bridge and Culvert Assessments for Geomorphic Compatibility and Aquatic Organism Passage in the Lewis and Otter Creek Watersheds

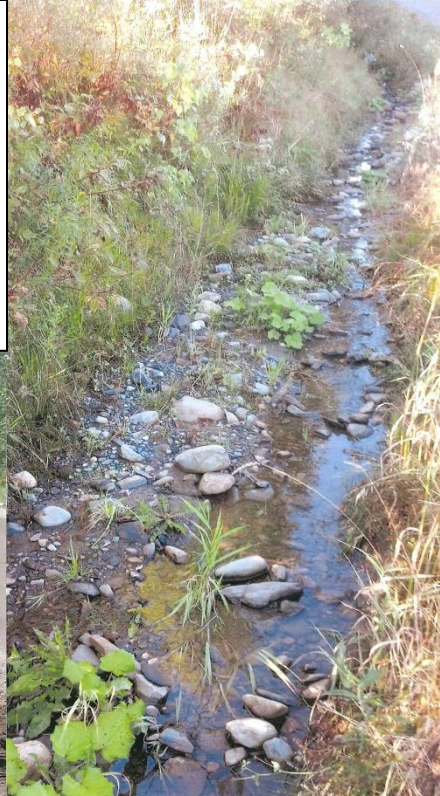
This project will complete a bridge and culvert inventory for geomorphic compatibility and aquatic organism passage, and also set priorities for implementation projects in the Lewis and Otter Creek Watersheds. The Nature Conservancy recently received additional funding from the Vermont Department of Fish and Wildlife to hire Redstart Consulting. Redstart Consulting is assessing geomorphic compatibility as well as aquatic organism passage. Assessment information will be shared with towns and regional planning to provide technical assistance and identify funding mechanisms for retrofit or replacement.

Winooski Headwaters Integrated Field Assessment

The Friends of the Winooski River used \$36,000 to implement the Winooski Headwaters Integrated Field Assessment, which will identify and prioritize implementation projects to improve water quality and restore and protect the Winooski River Watershed. The Friends worked with the towns of Plainfield, Marshfield and Cabot. They have already met with town selectboards to explain the project and expected outcomes including a list of recommendations for how to address water resource problems and protect town infrastructure. They have completed two-thirds of the assessment work including culvert assessment, road erosion and location of illicit discharges.

Figure 9. The Town of Albany received a Vermont Better Back Roads grant to line an eroding ditch with filter fabric and rock. The project will reduce water runoff velocity and collect sediment before it enters surface waters. Two photos above are BEFORE work began and two photos below are DURING and AFTER work began.

Photo credit: Town of Albany



River Management Chapter

Ecosystem Restoration Program (ERP) SFY13 funds support twelve river management, river restoration or assessment projects and eight river corridor easement projects, for a total of \$412,009. Also, eight projects supporting River Corridor Easements are underway for a total of \$376,413. Combined funding for restoration, assessment and easement projects is \$788,422.

Upper Lamoille Floodplain Restoration

The Caledonia County Natural Resource Conservation District (CCNRCD) received two grants in 2013. The CCNRCD continues to help Caledonia County communities collect Stream Geomorphic Assessment (SGA) data and use that data to become more flood resilient. In 2013, CCNRCD worked with a landowner along the mainstem of the Lamoille River in Hardwick to provide greater floodplain access and buffer planting for improved water quality. The CCNRCD received \$17,800 to remove 1,900 feet of berm and plant trees along the Lamoille River. The project is complete and is a success story about reconnecting a large floodplain area to the river.

SUCCESS STORY – Upper Lamoille Floodplain Restoration

The Caledonia County Natural Resource Conservation District (CCNRCD) and the Lamoille County Regional Planning Commission have received a number of ERP grants over the years to develop river corridor plans and implement projects with local municipalities and landowners. The Lamoille River Corridor Planning process identified a berm and floodplain access opportunity. Working with the VTDEC Northern River Scientist, VTDEC River Basin Planner for the Lamoille River, and the landowner, CCNRCD developed a comprehensive project to remove the berm and plant the area after construction. They received a 2013 ERP grant for \$17,800 to implement the project. The landowner assisted with the project through volunteer time and materials.

*The project removed the 1,900 foot long berm that was nearly 3 feet above the height of the streambank, effectively restoring 18 acres of floodplain access. The project also restored a vegetated buffer, with the assistance of local school groups (**Figure 10**).*

The project highlights how farmers can help maintain valuable floodplain access and water quality benefits to nearby rivers. The land is conserved with the Vermont Land Trust which provides long term protection and floodplain functions to the area. This important project was an exciting opportunity to use ERP funds for implementation that will have long lasting benefits to the river, landowner and community.



Figure 10. Tree planting along the Lamoille River with schools helped restore floodplain functions. Photo credit: VTDEC

Ottauquechee Tributaries Restoration Preliminary Design

The project involves channel restoration to address damages sustained from Tropical Storm Irene. It entails re-opening a flood chute, removing a berm and restoring riverbank and river bed. The project is located on Pinney Hollow Brook in Plymouth, and is adjacent to a Federal Emergency Management Agency (FEMA) buyout property.

Bethel & Stockbridge River Corridor Planning - Mid White / Third Branch White River Phase 2 Stream Geomorphic Assessment

The purpose of this project is to conduct a Phase 2 Stream Geomorphic Assessment of selected reaches of the mainstem White River and Third Branch White River in Bethel. This area was hit particularly hard during Tropical Storm Irene in 2011, and there is much recovery work needed to improve the stability of rivers that were impacted by this storm event and subsequent channel management activities. To date, field work has been completed and quality assurance review of the data has been initiated. This project will result in the creation of a river corridor plan which will identify restoration and conservation projects that will help enhance river corridor and floodplain function and the town of Bethel's resilience to flooding.

Mill Brook Phase 1 and Phase 2 Stream Geomorphic Assessment

The purpose of this project is to conduct a Phase 1 and Phase 2 Stream Geomorphic Assessment of Mill Brook in the towns of Reading, West Windsor and Windsor. To date, the Phase 1 Stream Geomorphic Assessment has been initiated and filed work for the Phase 2 Stream Geomorphic Assessment is anticipated to begin in spring 2014. This project will result in the creation of a River Corridor Plan which will identify restoration and conservation projects to enhance river corridor and floodplain function. The Town of West Windsor has expressed interest in using this information to guide town efforts to improve river stability and increase flood resilience.

Great Brook Stream Geomorphic Assessment and Landslide Hazard Analysis

The purpose of this project is to conduct a Phase 2 Stream Geomorphic Assessment of selected reaches of the Great Brook and to conduct a landslide hazard analysis. To date, field work and quality assurance of the Stream Geomorphic Assessment data is complete and developing a River Corridor Plan for all of Great Brook is underway. The landslide hazard analysis is also underway and expected to be complete in early 2014. This project will result in the creation of a River Corridor Plan which will specifically identify restoration and conservation projects that will enhance river corridor and floodplain function and the Town of Plainfield's resilience to flooding. It will also result in a combined river corridor and landslide hazard map – *the first of its kind in Vermont* - to adequately describe fluvial erosion hazards in a watershed that is particularly susceptible to landslides. The Town of Plainfield will use this information to increase stream stability and increase the town's resilience to flooding. A companion project (below) is developing an alternatives analysis of options.

Great Brook Gully Study in Plainfield

The purpose of this project is to conduct an alternatives analysis of the MacLauren Gully in the vicinity of Great Brook in Plainfield. This massive gully (**Figure 11**) that started to form in response to a Natural Resource Conservation Services farm drainage project in the 1960's (**Figure 12**) has been identified as the single largest sediment contributor to Great Brook. To date the analysis has been completed and the grant is in the process of closing out. The preferred alternative to arrest the gully formation process would employ dual strategies of retaining runoff on site to reduce peak flows and hard armoring with rock the head of the gully to prevent head-cutting. Future steps will require discussions with landowners and investigation of

potential grant funds to move the project to the implementation phase. A companion project is to develop *the first of its kind landslide hazard map* for Great Brook.



Figure 11. *The MacLauren Gully on Great Brook in Plainfield began with a farm drainage project in the 1960s and has continued to grow larger. The first of its kind in Vermont landslide hazard map was created with ERP funds to determine a preferred alternative to arrest gully formation.*

Photo credit: VTDEC

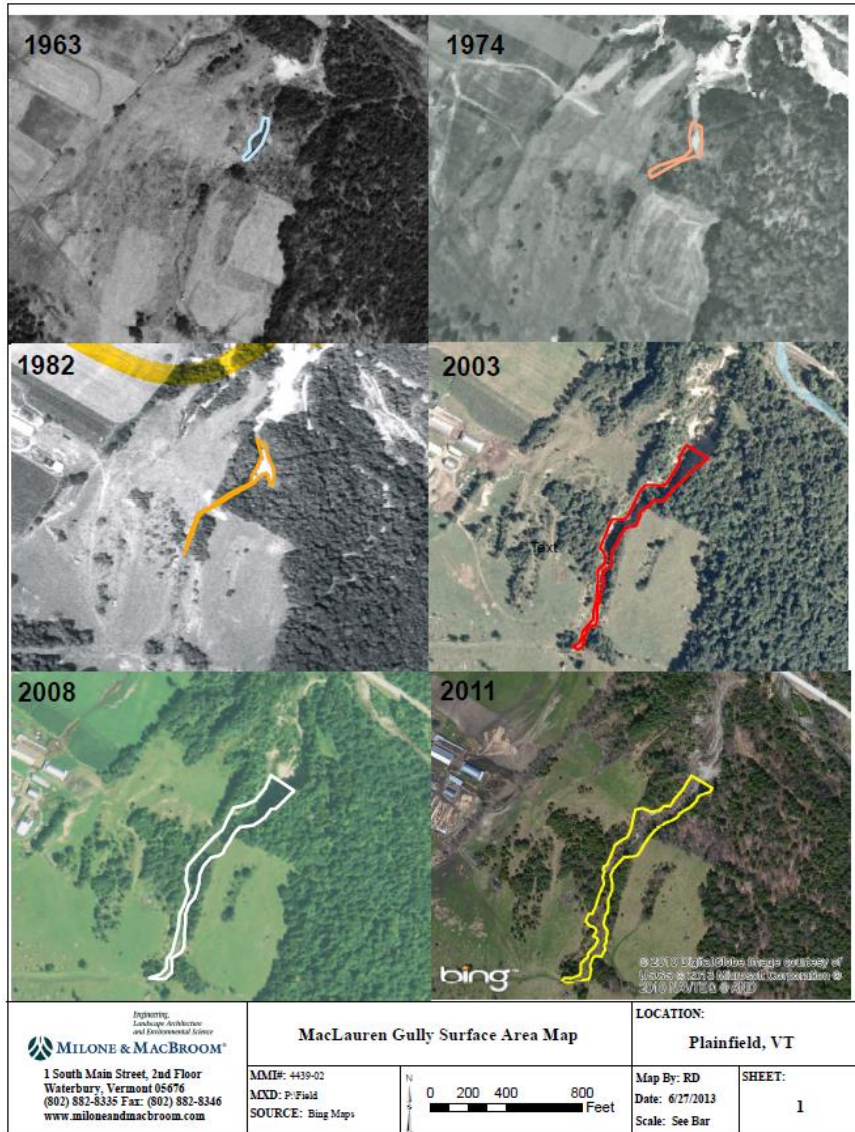


Figure 12. This series of maps shows how the MacLauren Gully began in 1963 and has continued to erode and expand significantly in the last 50 years. This project resulted in the first of its kind in Vermont landslide hazard map.

Credit: Milone and MacBroom, Inc.

Passumpsic Phase II Stream Geomorphic Assessment and Flood Resilience

The Caledonia County Natural Resources Conservation District (NRC) received an assessment and flood resiliency grant for \$66,500. Working with the Towns of Danville, Burke and Lyndon, Stream Geomorphic Assessment (SGA) data in the Passumpsic watershed were collected in 2013. In early 2014 meetings with the towns will occur to share the data and determine opportunities to improve water quality and mitigate and avoid flood hazards in the communities.

Leach Stream Phase I Stream Geomorphic Assessment Date Revision

The Essex County Natural Resource Conservation District (ECNRC) was awarded \$9,000 to collected Stream Geomorphic Assessment data on Leach Stream. The data and report are complete and will be used in the current Tactical Basin Planning effort to implement project opportunities along Leach stream.

Winhall River and Wardsboro Brook Phase II Stream Geomorphic Assessment

The Windham Regional Planning Commission is collecting field geomorphic data on the Winhall River and Wardsboro Brook. These rivers were prioritized for assessment due to the erosion hazard experienced during Tropical Storm Irene. Collecting the stream geomorphic data will provide information needed to identify restoration projects and reduce future flood hazards.

Williams River Phase 1 Stream Geomorphic Assessment

The Williams River Phase 1 stream geomorphic assessment is complete and additional ERP funding will complete a Phase 2 field based assessment. The field assessment is expected to be collected over the next two summers. Completing the geomorphic assessment will provide baseline information and lead to project identification and implementation.

Green River Phase I & II Stream Geomorphic Assessment and River Corridor Plan

Phase 1 stream geomorphic assessment data were already collected and Phase II data will be collected this summer 2014 on the Green River. Completing the geomorphic assessment will provide baseline information and lead to project identification and ultimately stream restoration in the river corridor plan.

River Corridor Easements Section

Memorandum of Agreement with Vermont Fish & Wildlife Department on Lewis Creek

The Lewis Creek Streambank property is a 323-acre area of conserved land owned by the Vermont Fish & Wildlife Department (VTFWD) to protect streamside habitat and provide access along the stream. The ERP funds supported the acquisition of an easement on the Lewis Creek Mainstem.

Black River Easements

Preliminary landowner negotiations are underway for three parcels that will be either purchased in fee or have easements placed on them with buffers planted. This project will provide much needed flood storage between the villages of Cavendish and Proctorsville upstream of the “Cavendish Chasm” (**Figure 13**) created by Tropical Storm Irene.



Figure 13. Catastrophic Black River flooding from Tropical Storm Irene in 2011 created an area now referred to as the “Cavendish Chasm.” Three easements underway will provide significant flood storage between Cavendish Village and Proctorsville which are upstream of the chasm.

Photo credit: VTDEC

River Corridor Easement on the Zuaro Parcel on the Dog River in Northfield

The purpose of this project is to conserve 8.7 acres of important river corridor in perpetuity through a river corridor easement on a parcel of land owned by the Zuaro family in Northfield. This parcel is situated upstream of Northfield Village, which is highly susceptible to flooding and experienced extensive damage during Tropical Storm Irene in 2011. Conservation of this parcel will ensure that there will always be some floodplain access and floodwater and sediment storage upstream of an area known to be prone to flood hazards.

Saunders/Bristol Flats Easement Acquisition

The partnership among the Town of Bristol, Vermont Rivers Conservancy, Vermont Housing and Conservation Board, and other federal and state partners resulted in the conservation of more than 40 acres of river corridor, floodplain and agricultural land. The property will provide flood attenuation for surrounding areas, and will also offer public access.

Jeffersonville Easement Acquisition

Jeffersonville Village, with technical assistance from VTDEC and financial assistance from ERP and the Vermont Housing and Conservation Board, is purchasing a river corridor easement on a floodplain within the village that experiences flooding on a frequent basis. The project will enhance Jeffersonville's future flooding resilience and provide water quality benefits.

Upper Missisquoi River Easement Acquisition

The Vermont River Conservancy received a grant of \$40,573 to protect river corridors using easements in the Upper Missisquoi. The ERP funds leveraged federal US Department of Agriculture support, as part of the Conservation Reserve Enhancement Program (CREP) to restore native vegetation to the entire river corridor area. The closing for the corridor is scheduled for early 2014.

River Corridor Easement on the Davis Parcel, Third Branch White River in Bethel

This project will conserve 20 acres of river corridor in perpetuity through a river corridor easement on the Third Branch White River in Bethel. The parcel is situated just upstream of Bethel Village (**Figure 14**), which experienced extensive damage during Tropical Storm Irene in 2011. Conservation of this parcel will ensure some floodplain access and floodwater and sediment storage upstream of an area known to be prone to flood hazards.

SUCCESS STORY – Dog River & Third Branch White River corridor easements

*Bethel Village and Northfield Village are vulnerable to impacts from flooding. Ecosystem Restoration Program (ERP) funds secured river corridor easements on the Dog River and Third Branch White River, upstream of Bethel and Northfield (**Figure 15**), respectively. The projects will improve the towns' resilience to future flooding by protecting river corridor and floodplain function upstream.*

River corridor easements are an extremely cost-effective tool for increasing flood resilience, especially when compared to repetitive costs associated with repairing damages to infrastructure in vulnerable locations after floods. By allowing a river to adapt to landscape changes over time and passively achieve a stable state of dynamic equilibrium, multiple benefits are achieved. Benefits include improving water quality by reducing in-stream sources of sediment loading, and improving instream and riparian habitat by maintaining a minimum of 50 feet of native woody vegetation.

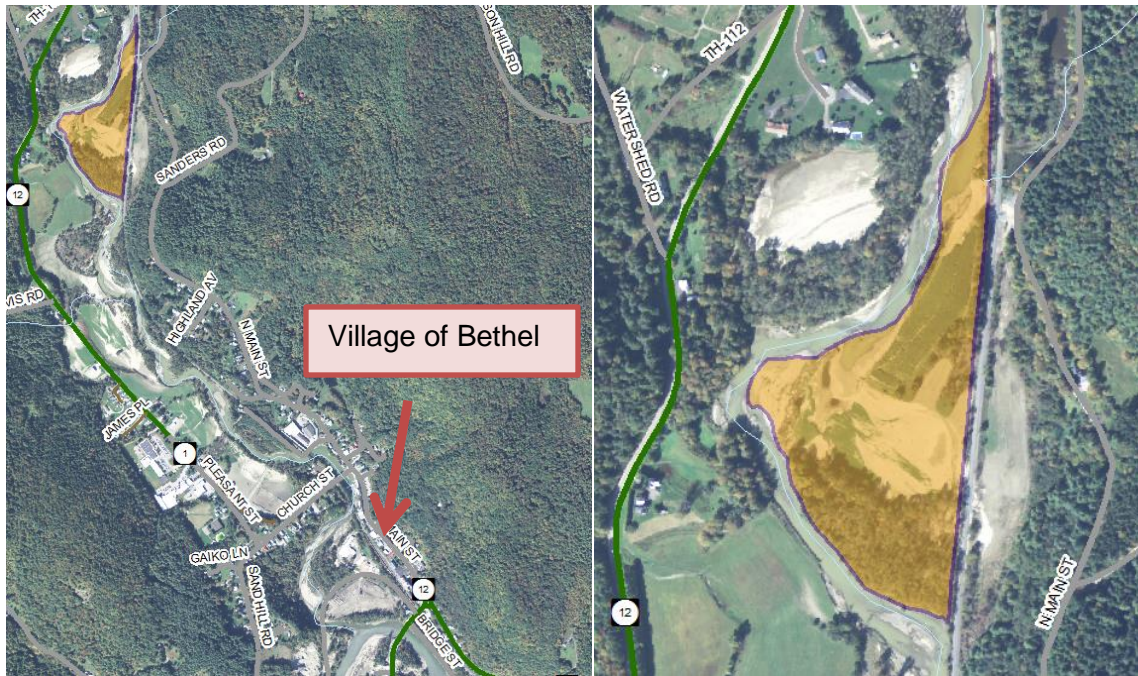


Figure 14. Dog River corridor easement upstream of Bethel Village with a closeup.

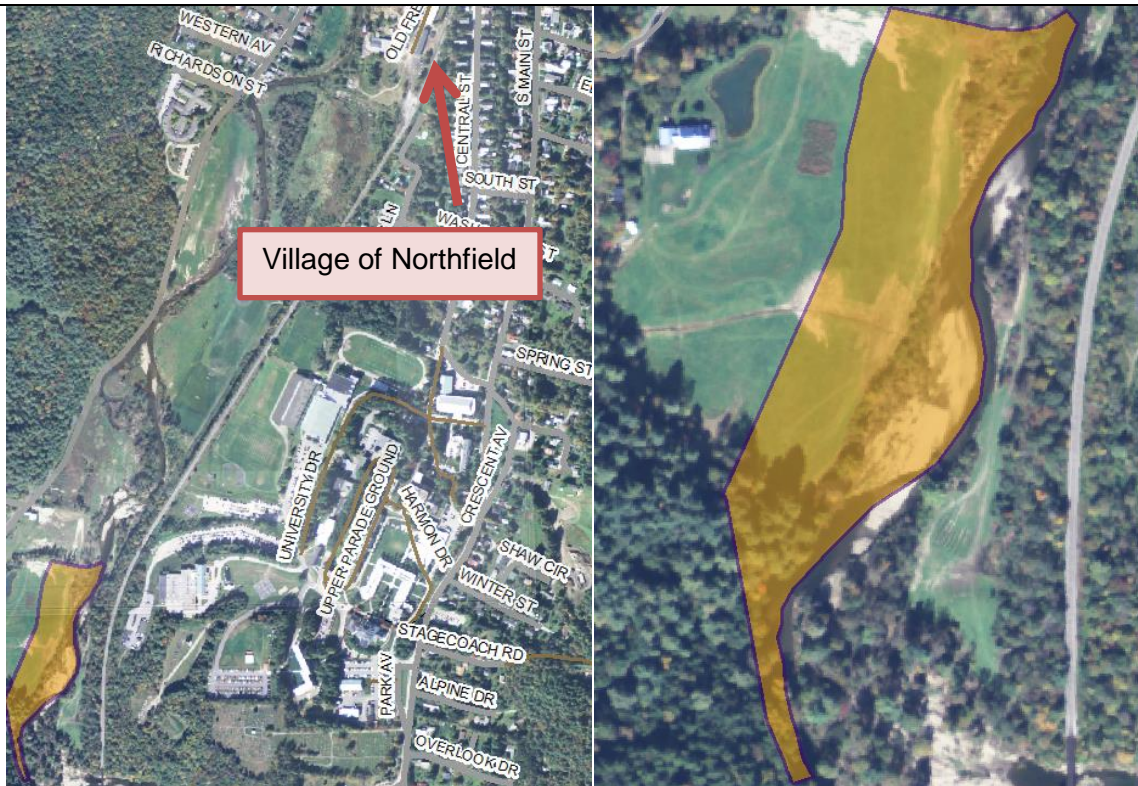


Figure 15. Third Branch White River corridor easement upstream of Northfield Village with a closeup. Upstream river protection results in downstream flood resilience. Photo credit: VTDEC

Shorelands, Riparian Areas, Wetlands Chapter

The Ecosystem Restoration Program (ERP) SFY13 funds are supporting six projects related to shorelands, riparian areas and wetlands for a total of \$233,257. These projects include applying shoreline protecting LakeWise principles, awarding post-Lake Champlain flooding 2011 shoreline restoration grants, planting trees in riparian buffers, and completing assessments to protect wetlands. Summaries of specific projects follow.

Lake Carmi LakeWise Shoreline Stabilization

In 2013, the Franklin Watershed Committee launched a shoreland outreach effort to Lake Carmi residents by offering technical assistance for improving aquatic habitat and water quality through vegetating shores and managing stormwater runoff. During 2013, five shoreland owners earned the LakeWise Award with best management practices in the categorical areas of driveway, recreation area, shoreland, and septic structures. Other shoreland owners are receiving assistance to improve their properties in order to make them more lake friendly and ultimately to earn the Lake Wise Award. Efforts to better manage lakeshores along Lake Carmi will continue into 2014.

More information about the LakeWise Program, which awards shoreline landowners who manage their shorelands sustainably can be found at this [link](http://www.watershedmanagement.vt.gov/lakes/htm/lp_lakewise.htm):

http://www.watershedmanagement.vt.gov/lakes/htm/lp_lakewise.htm

More information about lake shoreland protection options can be found at this [link](http://www.anr.state.vt.us/dec/waterq/lakes/docs/lp_act138shorelandreport.pdf):

http://www.anr.state.vt.us/dec/waterq/lakes/docs/lp_act138shorelandreport.pdf

Lake Champlain Shoreland Restoration Mini-grants

This \$75,000 grant to Northwest Regional Planning Commission (NRPC) represents the second year of funding to implement non-structural shoreline restoration projects after catastrophic flooding on Lake Champlain in 2011. The mini-grants to landowners cover the costs of designs and implementation by pre-approved consultants specializing in water quality friendly shoreline restoration. Projects are guided by the *Shoreline Stabilization Handbook for Lake Champlain and other Inland Lakes* by NRPC which incorporates vegetative controls (**Figure 16**) into the overall designs. The VTDEC provided technical assistance to both the NRPC and consultants through the design and implementation phase. In 2013, six shoreline projects were implemented and four were designed. In 2014, another six projects are anticipated to be designed and completed. See photo and success story below for an example.

The *Shoreline Stabilization Handbook for Lake Champlain and other Inland Lakes* may be found at this [link](http://nsgd.gso.uri.edu/lcsg/lcsg04001.pdf): <http://nsgd.gso.uri.edu/lcsg/lcsg04001.pdf>



Figure 16. *This shoreland restoration project occurred after catastrophic flooding on Lake Champlain in 2011. By re-vegetating the shore with native live tree stakes and fiber mats, the bank is better stabilized than the neighboring shoreland area that utilized solely stone riprap.*
Photo credit: Northwest Regional Planning Commission

SUCCESS STORY – Lake Champlain Shoreland Restoration Projects

During the historic 2011 high waters on Lake Champlain, significant erosion damage occurred to shorelands, especially in the Lake Champlain Islands. Many shorelands eroded significantly where little or no vegetation was in place to hold the bank together. By re-vegetating shorelands with native live tree stakes, fiber mats and other vegetative materials, previously eroded shorelands are better stabilized than areas that were treated solely with heavy, large stone (riprap). Tree and plant roots, unlike other materials, stabilize shorelands effectively and sustainably from high waters, wind, wave, and ice action. Vegetated shorelands also provide filtration for stormwater runoff and protect aquatic habitat with branches and canopy shade effects. Ecosystem Restoration Program funds supported both project design and implementation for nearly two dozen projects in the past two years. Project design and implementation are guided by the Shoreline Stabilization Handbook for Lake Champlain and other Inland Lakes (see link above) which incorporates vegetative controls into the overall designs.

Missisquoi Watershed Trees for Streams

The Missisquoi River Basin Association (MRBA) received \$39,300 to implement the Missisquoi Watershed Trees for Streams project. The project will increase and enhance riparian buffers along the Missisquoi River and its tributaries, serving the dual purpose of protecting water quality and maintaining the ecological integrity of the Missisquoi River system.

More information can be found at the following [link](http://www.watershedmanagement.vt.gov/lakes/htm/lp_lakewise.htm):
http://www.watershedmanagement.vt.gov/lakes/htm/lp_lakewise.htm

Essex and Caledonia Trees for Streams

In 2013 the Essex County Natural Resources Conservation District Trees for Streams program planted more than two and a half acres of riparian buffers along the Connecticut River in Guildhall and Maidstone, on the East Branch Passumpsic River in East Burke, and at the community garden along the Passumpsic River in St. Johnsbury. The program was done in partnership with the Caledonian County Natural Resource Conservation District which coordinated the buffer planting projects in the Passumpsic River watershed. Nine volunteers from Guildhall Elementary School, 40 community volunteers from Burke, nine students from St. Johnsbury Academy and NorthWoods Stewardship Center assisted in the planting efforts.

Town of Bristol for Saunders Riparian Buffer

This project conserves more than 40 acres of river corridor, floodplain and agricultural land via a river corridor easement, which will provide flood attenuation for surrounding areas, and will also offer public access. The project involved a partnership among the town, Vermont Rivers Conservancy, Vermont Housing and Conservation Board, and other federal and state partners. The second phase of the project is to establish a riparian buffer along the New Haven River in Bristol.

Cultural Resources Assessment for Wetland Reserve Program

Ducks Unlimited, Inc. received a \$25,967 grant to leverage federal funds that protect three wetlands located within the floodplain of the Lemon Fair River in Bridport. A combined total of 298 wetland acres were protected in perpetuity under a conservation easement through the Wetland Reserve Program (US Department of Agriculture Natural Resources Conservation Service Funds).

Statewide Trees for Streams

This grant will allow the Vermont Association of Conservation Districts (VACD) to deliver a statewide Trees for Streams program in collaboration with Vermont's 14 Natural Resources Conservation Districts, leveraging federal resources of the US Fish and Wildlife Service (USFWS). The VACD will plant a minimum of 20 acres of buffers (**Figure 17**) in targeted watersheds to improve water quality and enhance riparian and aquatic habitats along Vermont's streams, rivers and lakes. The USFWS will expand VACD's reach by providing matching support for the purchase of trees and other project materials.



Figure 17. *Volunteers planted more than 5,500 feet of riparian buffer on the Huntington River, a tributary to the Winooski River, for a total of 5.2 acres of woody vegetation replanted. Photo credit: VTDEC*

Other priority nonpoint source phosphorus control projects

The Ecosystem Restoration Program (ERP) SFY13 funds supported six additional priority projects for a total of \$382,563. Projects include dispatching the Vermont Youth Conservation Corps to design and implement erosion reduction projects, reducing nutrient loading to Lewis Creek through the Pond Brook Tributary remediation, reducing phosphorus pollution to Lake Memphremagog, applying a chemical alum treatment to control phosphorus in Ticklenaked Pond, and leveraging federal funds managed by the University of Vermont Water Resources Center.

VYCC Water Quality Project

Over many years, VTDEC has partnered with the Vermont Youth Conservation Corps (VYCC), to clean up sediment and nutrient pollution while educating the next generation of young environmental leaders. Every year, VYCC work crews, under the leadership of experienced and VYCC-trained crew leaders, work with the regional basin planners in areas identified as high priorities. For several years prior to 2010, VYCC relied on the watershed coordinators to do the majority of the planning and design for this work. The VYCC crews would then come in at appointed times to execute the project. Beginning in 2010, VTDEC shifted from having planners conduct the design work to having VYCC design them independently. Under the direction of VYCC Operations with funding from ERP, VYCC's crew leaders now obtain technical assistance from VTDEC watershed coordinators and other technical staff to design and execute priority projects identified in the VTDEC Tactical Basin Plans (**Figure 18**). Technical and financial assistance from VTDEC are enabling VYCC to train the next generation of environmental stewards. This revised approach of working with VYCC provides an efficient and cost-effective service-learning opportunity for Vermont's youth--a win-win situation.



Figure 18. Before and two weeks after implementation: a bioengineering fix to a seriously eroding brook in Williston is taking hold. VYCC conducted the work.

Photo credit: VTDEC



Pond Brook Tributary Remediation

Monitoring and assessment data show that Pond Brook Watershed is the largest contributing tributary for nutrient loading in the Lewis Creek watershed. The ERP funding is leveraging federal funding of the Natural Resource Conservation Service to target highest priority nutrient and sediment sources in the watershed. The most noteworthy of these projects is taking place on an organic vegetable farm in Monkton, where five erosion gullies were identified, which to date have discharged in excess of 6,900 cubic feet of soil due to headcutting erosion. The partners expect to complete the stabilization of the first two gullies by summer 2014, and will then address the remaining three gullies.

Phosphorus Reduction in Lake Memphremagog Basin

The Orleans County Natural Resources Conservation District ERP project focuses on phosphorus reduction in the Lake Memphremagog Basin. The project included planting more than four acres of buffers along the Black River and Ware Brook (working with the NorthWoods Stewardship Center) along with six lakeshore buffer planting projects on Lake Willoughby, Echo Lake, Pensioner Pond, Crystal Lake, and Seymour Lake.

Ticklenaked Pond Internal Treatment

The Town of Ryegate received an Ecosystem Restoration Grant to complete an internal alum treatment of Ticklenaked Pond which is impaired due to elevated phosphorus levels and regular algae blooms which have limited recreational use. The town hired a consultant to conduct the treatment, which is planned for 2014.



Figure 19. *Portable skidder bridges are temporary structures for crossing streams during logging. They are widely accepted as a Best Management Practice for controlling nonpoint source pollution associated with logging operations. When properly utilized, they create less stream bank and stream bed disturbance compared to alternatives such as culverts or log-ford crossings. They are economical as they are reusable, easy to install and can be transported easily.*

Photo credit: VT Department of Forests, Parks & Recreation

Vermont Department of Environmental Conservation Agriculture Chapter

The Ecosystem Restoration Program (ERP) SFY13 funds support two agricultural projects in partnership with the Vermont Agency of Agriculture, Food and Markets (VAAF), for a total of \$223,913. The projects focus on reducing runoff at small farm operations and enhancing minimal tillage practices for water quality improvement. Summaries of these specific projects follow. The Vermont Agency of Agriculture, Food and Markets will submit a separate report for their agricultural projects.

Small Farms Project

The ERP funds leverage additional resources and funding from VAAF and the Vermont Association of Conservation Districts (VACD) to support best management practice (BMP) implementation at small farms. The VACD will be contacting up to 35 farms and implementing a minimum of nine best management practices.

A video of this collaboration may be found at the following [link](#):

Small Farms Making a Difference, Water Quality Improvement Success Stories – video:

<http://www.youtube.com/watch?v=Z0S94k-2FCI>

The VACD is engaged in nine water quality improvement projects funded through a 2013 ERP grant. Conservation practices supported for these projects include livestock exclusion, development of stream crossings, clean water diversion, construction of laneways, and heavy use area improvements. The following table lists the towns reached and types of projects and practices supported by Vermont Association of Conservation Districts (VACD).

**Small Farm Best Management Practices Implemented by VACD
January 1 – September 30, 2013**

Town	Conservation practice	Implementation	Status
Guildhall	Livestock exclusion	1,300' fencing	complete
Lowell	Clean water diversion, stream crossing	Gutters, fencing, streambank reinforcement, animal trail	complete
Chelsea	Clean water diversion	146' Gutters	in progress
Fair Haven	Animal trail	95 ' of animal trail	in progress

Benson	Stream Crossing, exclusion	3 stream crossings, 2160' fencing	partially completed
Benson	Water source and runoff/sediment remediation	Culvert restoration, sedimentation remediation	in progress
Benson	Stream crossing, exclusion	2 stream crossings, 3,170' fencing	in progress
Benson	Stream crossings, exclusion	8,000' fencing, 3 stream crossings	committed
Fair Haven	Clean Water Diversion	Catch basin, concrete slab, 55' gates, 8 stream crossings, 146'+ gutters, 95'+ animal trail, 18,200' fencing and gates	complete

Enhancing Minimal Tillage for Water Quality

The UVM Extension is using a \$74,000 ERP grant to implement reduced tillage cropping systems. The project will build on current and similar UVM Extension initiatives to implement and demonstrate reduced tillage systems that successfully incorporate annual and perennial crops, cover crops and manure injection systems into a sustainable forage production system. Increased interest in reduced tillage has been evident over the last three years with more than 425 farmers participating in six reduced tillage outreach events.