River Corridor and Floodplain Protection Program
and
Lake Shoreland Management Program

Biennial Report to the General Assembly
Pursuant to Act 110 of 2010 and Act 138 of 2012
January 15, 2019

Vermont Department of Environmental Conservation
Watershed Management Division

VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION
WATERSHED MANAGEMENT DIVISION

Act 110 of 2010, Section 8:

Sec. 8. AGENCY OF NATURAL RESOURCES REPORT

Beginning January 15, 2011 and biennially thereafter, the agency of natural resources shall report to the house committee on fish, wildlife and water resources and the senate committee on natural resources and energy regarding the status of river corridor, shoreland, and buffer zoning within Vermont. The report shall include:

(1) The priority schedule for providing river corridor and buffer maps required by 10 V.S.A. § 1427 and a summary of the implementation of the priority schedule;
(2) A summary of the status of best management practices required under 10 V.S.A. §§ 1425 and 1427 for management of river corridors, shorelands, and buffers;
(3) A summary of the municipalities that have adopted river corridor, shoreland, or buffer zoning bylaws and a summary of the content of such bylaws;
(4) A description of the financial incentives that have been established according to the requirements of 10 V.S.A. §§ 1425 and 1427 for municipal adoption and implementation of zoning bylaws that protect and preserve river corridors, shorelands, and buffers; and
(5) The agency of natural resources' recommendations for statutory changes, regulatory changes, or additional practices that, based on information available to the agency of natural resources, will improve the efficacy of the river corridor management and shoreland management programs and improve the quality of the waters of the state.

Act 138 of 2012, Section 17:

Sec. 17. ANR REPORT ON FINANCIAL INCENTIVES FOR THE FLOOD RESILIENT COMMUNITIES PROGRAM

As part of the biennial report required by Sec. 8 of No. 110 of the Acts of the 2009 Adj. Sess. (2010), the secretary of natural resources shall identify existing state financing programs or incentives that could be amended so that such programs or incentives could be available to municipalities under the flood resilient communities program for the purpose of flood hazard and river corridor protection planning.

River Corridor & Floodplain Protection Program

1. River Corridor and Floodplain Protection - Municipal Bylaw Adoption

Many communities have taken action to protect river corridors and/or floodplains in recent years (Table 1, Figure 1). Since 2008, the number of communities enrolled in the National Flood Insurance Program (NFIP) has increased from 226 to 249. The effort to review and update flood hazard bylaws was required to meet deadlines for new FEMA Digital Flood Insurance Rate Maps (DFIRMs) that were updated in six counties. The DEC Rivers Program used the bylaw update process as an opportunity to educate municipalities on the benefits of adopting regulatory standards that exceed federal minimums.

In 2017 FEMA initiated the process to update DFIRMs through its Risk MAP process in Franklin and Orleans Counties. In addition, FEMA will be initiating DFIRM updates in the Lamoille and Deerfield watersheds in early 2019. The map update and adoption process will increase flood hazard and river corridor bylaw education and technical assistance in affected communities over the next few years.

Outside of the DFIRM adoption process, the Emergency Relief and Assistance Fund (ERAF) Rule, amended in 2012, created financial incentives to adopt river corridor and floodplain protection bylaws. In addition, a few communities have begun or completed a process of joining the NFIP in response to direct experience with flood events and related damage or to qualify at a higher ERAF reimbursement rate (Figures 2 and 3). Many communities in the state have undertaken updates to their municipal plans and/or zoning and have sought to incorporate current standards to prohibit new encroachment in river corridors and floodplains.

A multi-year effort to create enhanced tools culminated in 2018. ANR released its updated model hazard area bylaws[1]. The bylaw update process incorporated input from an external stakeholder working group with representatives from VAPDA, VPA, VLCT, municipal government. The updated model bylaws incorporate the same "No Adverse Impact" framework that is utilized by ANR under the State Flood Hazard Area and River Corridor Rule and Protection Procedure that covers activities exempt from municipal regulation and Act 250.

With FEMA Hazard Mitigation Grant funding support, the program updated the statewide River Corridor map based on incorporation of 2,200 miles of detailed stream geomorphic assessment data. The updated River Corridor layer is published on the ANR Natural Resources Atlas and the Flood Ready Atlas[2], and will serve as the basis for river corridor planning, protection and restoration efforts at both the state and municipal levels.

[1] https://dec.vermont.gov/watershed/rivers/river-corridor-and-floodplain-protection/municipal-assistance
[2] http://anrmaps.vermont.gov/websites/anra5/ , https://floodready.vermont.gov/assessment/vt_floodready_atlas

Lastly, with funding support from the Lake Champlain Basin Program, the Flood Training website and related tools were published[3]. Flood Training provides education, community case studies, and practical tools for municipal officials seeking to better understand floodplain and river corridor issues in their community and determine appropriate actions necessary to enhance flood resilience.

The model hazard bylaws, updated River Corridor map layer, and Flood Training website will be promoted through education and outreach as a package to assist towns with implementing greater floodplain and river corridor protections.

The communities protecting river corridors and floodplains have adopted standards that far exceed NFIP minimum standards (Table 1, Figure 1).

Table 1. Municipal River Corridor and Floodplain Protection Bylaws that Exceed NFIP minimum standards (9/28/2018)

Municipality	Floodplain Protection	River Corridor Protection		Municipality	Floodplain Protection	River Corridor Protection
Averill UTG		Yes		North Bennington	Yes	
Averys Gore UTG		Yes		Northfield	Yes	Yes
Bakersfield	Yes			Norton	Yes	Yes
Baltimore	Yes			Orange	Yes	
Barnard	Yes			Orwell	Yes	
Bennington		Yes		Pawlet	Yes	Yes
Bolton	Yes			Peacham	Yes	Yes
Bradford	Yes			Peru	Yes	
Braintree	Yes	Yes		Plainfield	Yes	
Brandon	Yes	Yes		Plymouth	Yes	Yes
Cabot	Yes			Proctor	Yes	Yes
Cavendish	Yes	Yes		Readsboro	Yes	
Charlotte	Yes			Richford	Yes	
Colchester	Yes			Richford Village	Yes	
Corinth	Yes	Yes		Richmond	Yes	
Danby	Yes	Yes		Ripton	Yes	Yes
Dorset	Yes	Yes		Roxbury	Yes	
East Montpelier	Yes	Yes		Rupert	Yes	Yes
Elmore	Yes	Yes				
Essex	Yes			Sandgate	Yes	
Essex Junction Village	Yes			Shaftsbury	Yes	
Fairlee	Yes	Yes		Sharon	Yes	
Fayston	Yes	Yes		Shelburne	Yes	

[3] https://floodtraining.vermont.gov/

Ferdinand UTG	Yes	Yes		Shrewsbury	Yes	Yes
Granby	Yes			South Burlington	Yes	
Granville	Yes			Stamford		Yes
Guildhall	Yes			Stowe		Yes
Halifax	Yes			Sunderland		Yes
Hinesburg		Yes		Thetford	Yes	
Isle La Motte	Yes			Troy	Yes	
Jeffersonville Village	Yes			UTG	Yes	Yes
Jericho	Yes	Yes		Vernon	Yes	
Kirby	Yes			Waitsfield	Yes	Yes
Landgrove	Yes	Yes		Warners Grant UTG	Yes	Yes
Lewis UTG	Yes	Yes		Warren	Yes	
Lincoln	Yes			Warren Gore UTG	Yes	Yes
Lyndon	Yes	Yes		West Rutland	Yes	
Lyndonville Village	Yes	Yes		Westford	Yes	
Manchester		Yes		Williston	Yes	
Manchester Village	Yes	Yes		Windham	Yes	
Marlboro	Yes	Yes		Winhall	Yes	Yes
Marshfield	Yes			Winhall	Yes	Yes
Marshfield Village	Yes			Winooski	Yes	
Middlesex	Yes			Worcester	Yes	Yes
Milton	Yes					
Montgomery		Yes		**Total** (9/28/2018)	**81**	**43**

2. Incentives for Municipalities to Adopt River Corridor and Floodplain Protection By-laws

Act 138 (2012) created a new *River Corridor Protection* section (10 V.S.A, § 1428) which directs the Secretary of Administration, after consultation with relevant state agencies, to create a Flood Resilient Communities Program and list the existing financial incentives under state law for which municipalities may apply for financial assistance, when funds are available, for municipal adoption and implementation of bylaws under 24 V.S.A. chapter 117 that protect river corridors and floodplains.

Obvious incentives that may motivate municipalities to adopt river corridor and flood hazard bylaws are flood hazard avoidance, public safety improvements, and abatement of water quality and habitat impacts. Continuing the Agency's outreach to municipalities is essential to raise awareness about the important proactive steps that can be taken at the local level to achieve these objectives.

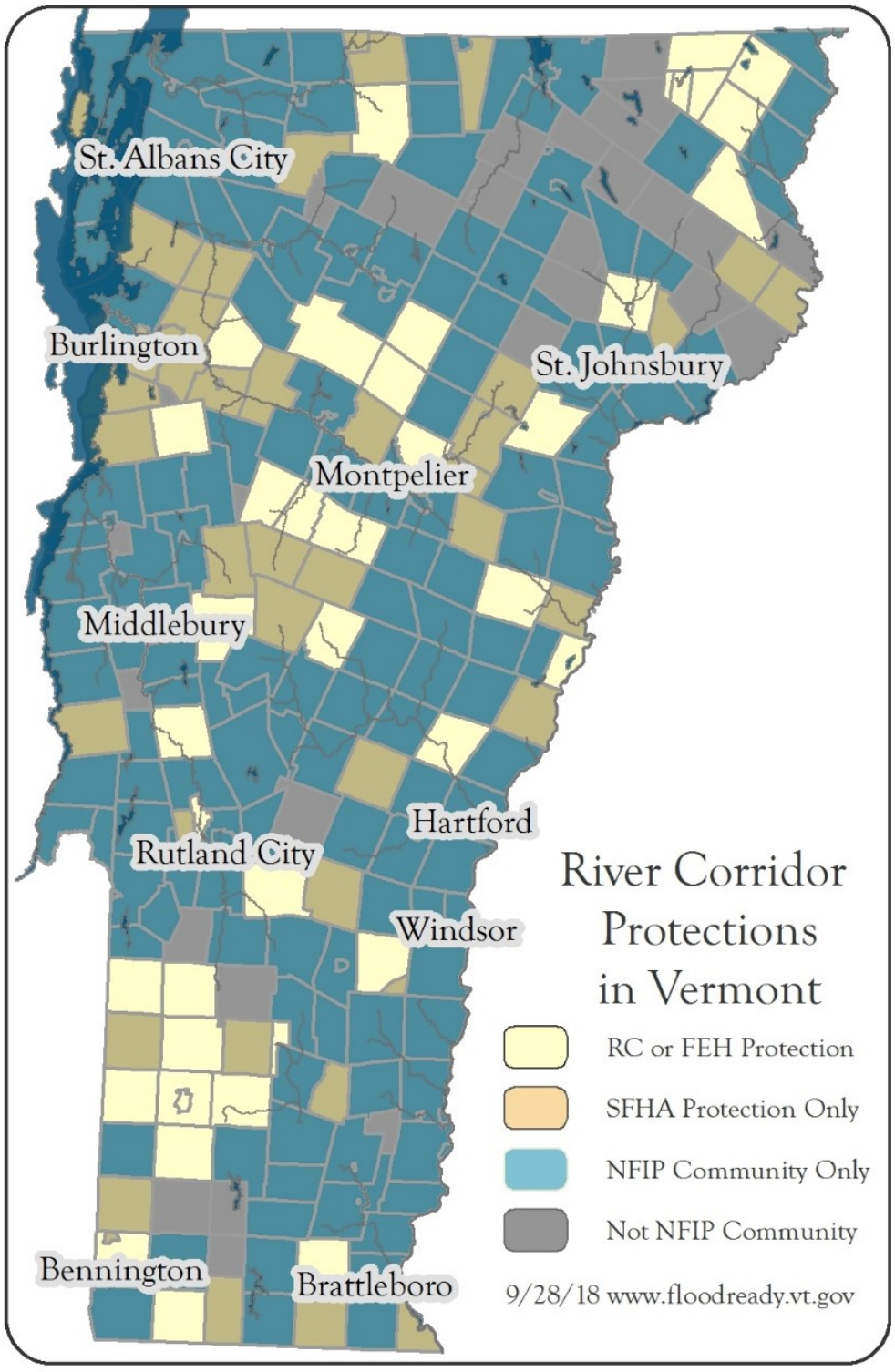


Figure 1. Municipal Bylaws Protecting River Corridors and Floodplains that Exceed NFIP Minimum Standards

Financial incentives to nudge municipalities to adopt river corridor and floodplain protection zoning bylaws include qualifying criteria in grants, pass-through funds, technical assistance, and educational support that encourage municipalities to adopt and implement bylaws that conserve and restore river stability, floodplains, wetland and riparian buffer function. Table 2 below summarizes currently available incentives within the Agencies of Natural Resources and Commerce & Community Development, and the Department of Public Safety for which consideration has been made to incorporate incentives for municipal adoption of river corridor and floodplain protection.

The fundamental standard to qualify for financial incentives is that the local bylaw must be consistent with ANR model hazard area bylaws, which are designed to: (a) achieve and maintain stream equilibrium conditions (i.e., stable, least erosive streams); and, (b) ensure robust floodplain management. Additional standards to qualify for incentives, such as the geographic extent of protection coverage required within a municipality, will be determined in a conference involving at least one representative of the local governing body, at least one representative of the municipal planning commission, and representatives of the DEC Rivers Program. Criteria for consideration will include the history of flood and fluvial erosion damage, stream geomorphic condition, and development pattern within the river corridor and floodplain.

Table 2: Municipal Incentives for River Corridor and Floodplain Protection

AGENCY	GRANT PROGRAM AS POTENTIAL INCENTIVE	Incentive Implemented as:		
		ELIGIBILITY CRITERIA	PRIORITY CRITERIA	ENHANCED STATE MATCH
ANR	Ecosystem Restoration		X	
	Aquatic Nuisance		X	
DEMHS	Hazard Mitigation Grant Program		X	
	Pre-Disaster Mitigation Grants		X	
	Flood Mitigation Assistance Grants		X	
	ERAF			X
ACCD	VT Community Development Program		X	

In addition to the above incentives, numerous state programs have updated their siting criteria acknowledging the importance of avoiding new encroachments in river corridors and floodplains. Recent updates include:

- The DEC Stormwater Management Manual and Guidance
- DEC Onsite Wastewater and Potable Water Supply
- AOT Transportation Enhancement Grant Program
- PSD Renewable Energy Siting Guidance

The Emergency Relief and Assistance Fund (ERAF) is the most significant incentive to encourage communities to become more flood resilient. The 2012 ERAF amendments encourage

municipalities to take four or five flood damage mitigation actions. By doing the first four, the communities could increase their post-disaster support from the State of Vermont from 7.5% to 12.5%. By additionally acting to protect river corridors the communities would be eligible for a 17.5% rate.

Communities Meeting Standard	ERAF Mitigation Actions
90%	1 NFIP Participation
94%	2 2013 Road and Bridge Standards
82%	3 Local Emergency Operations Plan
72%	4 Local Hazard Mitigation Plan
31%	5 River Corridor Protection

The amended ERAF rule went into effect in October 2014 and many communities have responded. Through January 2014 most communities were missing at least one of the four basic mitigation elements and all Vermont communities were qualified for a 7.5% reimbursement rate from ERAF to supplement federal Public Assistance disaster recovery funding. Since then many communities have adopted the 2013 Road and Bridge Standards, prepared a Local Emergency Operations Plan, and have taken other actions as needed (Figure 2). As of late November 2018, nearly a third of communities qualified for highest reimbursement rates (Figure 3).

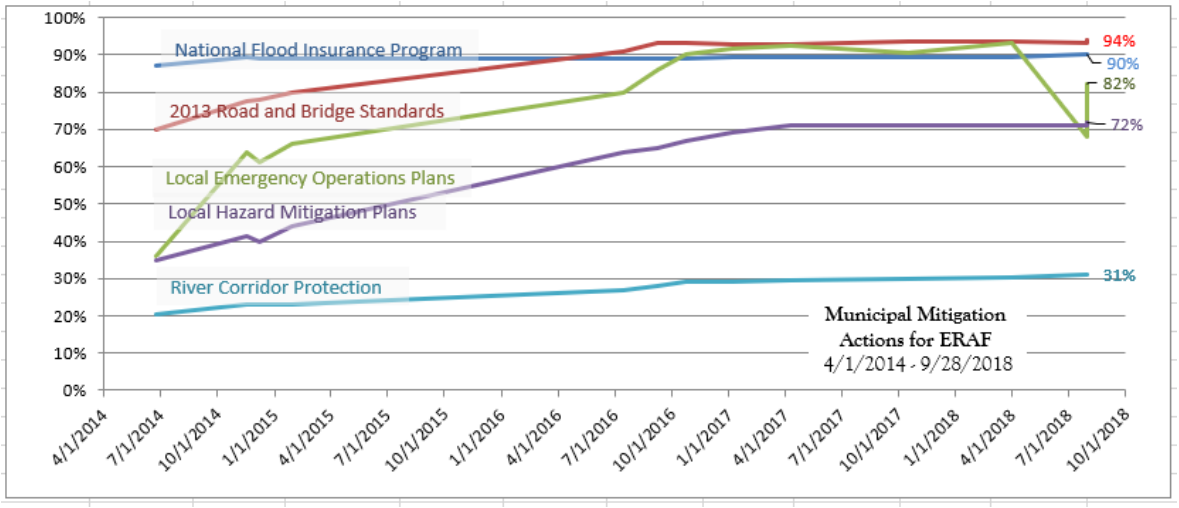


Figure 2.

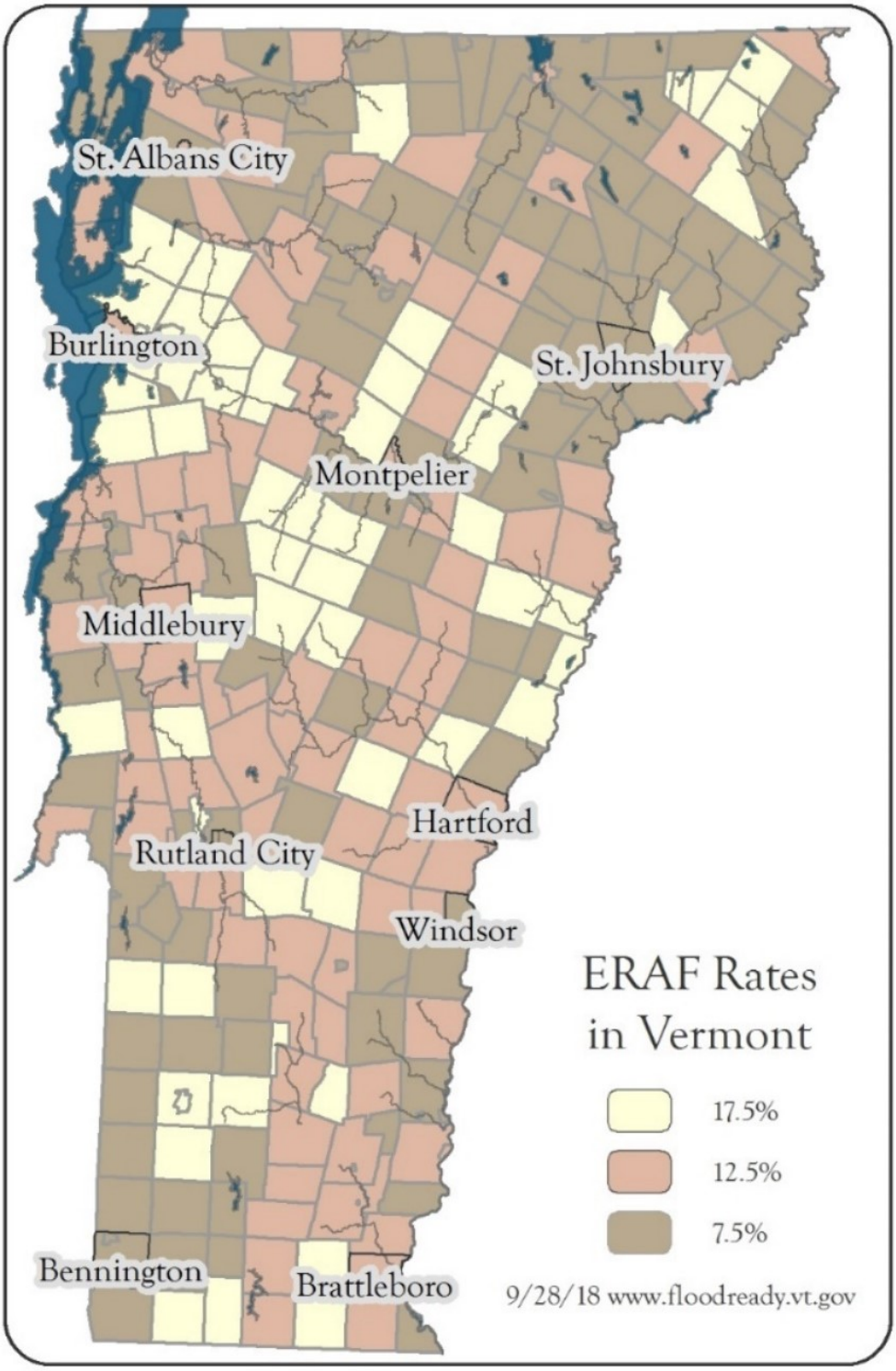


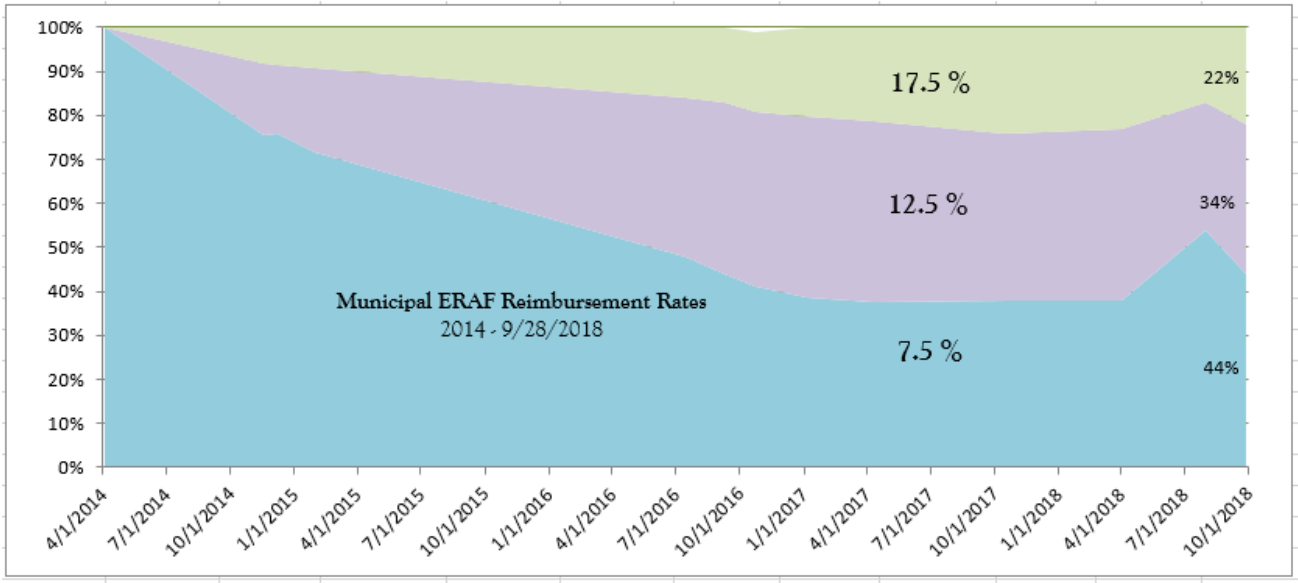
Figure 3. ERAF Reimbursement Rates

The primary responsibility for administering the ERAF fund is delegated to the Public Assistance program at Vermont Emergency Management.

One of the primary tools used for this effort has been the public "ERAF Tracking" efforts of ANR using Flood Ready Vermont www.floodready.vermont.gov a professionally designed application of the State of Vermont template.

Flood Ready Vermont focuses on the needs of community leaders including select board members and planning commissioners as well as regional and professional planners. A summary of current municipal actions for ERAF can be found on the Community Reports page of the Flood Ready Vermont website. The website also features breaking news, a list-serve, the Flood Ready Atlas, and information to support planning and funding for flood resilience.

In addition to Flood Ready Vermont, the River Corridor and Floodplain Protection section of the Rivers Program has technical material posted online at: http://dec.vermont.gov/watershed/rivers/river-corridor-and-floodplain-protection to provide support to communities managing their river corridors and floodplains.



The State Hazard Mitigation Plan was approved by FEMA in November 2018. A priority action in the plan is to establish a working group to evaluate ERAF and determine if any amendments are needed to bolster the efficacy of the program.

3. State Agency Progress Towards Enhanced Flood Resilience.

State agencies have continued to develop planning and technical assistance programs that promote floodplain and river corridor protection and support implementation of the State Hazard Mitigation Plan.

ANR – In addition to the tools described above, the Rivers Program continues to support enhanced flood resilience through multiple regulatory jurisdictions that implement robust

standards and provides a tremendous amount of technical assistance to internal and external stakeholders in support of hazard mitigation projects, including river and floodplain restoration. Throughout much of 2017 and 2018, the Rivers Program assisted Vermont Emergency Management in the drafting of the flood hazard sections of the State Hazard Mitigation Plan, which is required for the state and communities to access FEMA hazard mitigation grants.

VTrans completed the Vermont Transportation Flood Resilience Planning Tool in 2018. The project uses river corridor and floodplain function to identify flood and fluvial erosion vulnerabilities of state and municipal road and stream crossing infrastructure. The project will also recommend floodplain and river corridor protection as important means for mitigating flood and fluvial erosion risks. The tool is accessed here: https://roadfloodresilience.vermont.gov/#/map

ACCD has developed materials to promote enhanced flood resilience. Many of these materials are available on their dedicated webpage "Planning for Tomorrow's Flood" https://accd.vermont.gov/community-development/flood

BGS – Using a 2015 FEMA Hazard Mitigation Grant is identifying all state facilities located with Flood Hazard Areas and River Corridors. The Department will by using this mapping exercise to begin the development of mitigation strategies for flood-prone state buildings.

In late 2016, ANR and Vermont Emergency Management worked with the US Army Corps of Engineers to establish a Vermont Silver Jackets Team. The Silver Jackets program pulls together multiple state and federal agencies with the goal of leveraging partner resources to achieve the state hazard mitigation objective. Federal Partners include the US Army Corps Engineers, the US Geological Survey, the National Weather Service, and the Natural Resources Conservation Service. State partners include ANR, VEM, ACCD, and VTrans. The team charter is here: https://vem.vermont.gov/sites/demhs/files/Silver%20Jackets%20Charter.pdf

The Vermont Silver Jackets team is currently implementing or developing the following projects: Flood inundation mapping in Montpelier tied to the National Weather Service flood forecasting system; Emergency action planning and new hydraulic modelling on the Whetstone Brook in Brattleboro; and ice jam analysis and outreach for Johnson and Swanton.

4. A Functioning Floodplain Initiative

Vermont's extensive stream geomorphic assessments identify stream straightening and deepening, and the consequent loss of flow dissipation in adjacent floodplains and wetlands, as the primary causes of stream instability and erosion. Tens of millions in public and private dollars are spent on an average annual basis in Vermont trying to keep streams and rivers contained. The decades of effort to reduce inundation flooding by blocking floodplains and draining the land has significantly increased fluvial erosion.

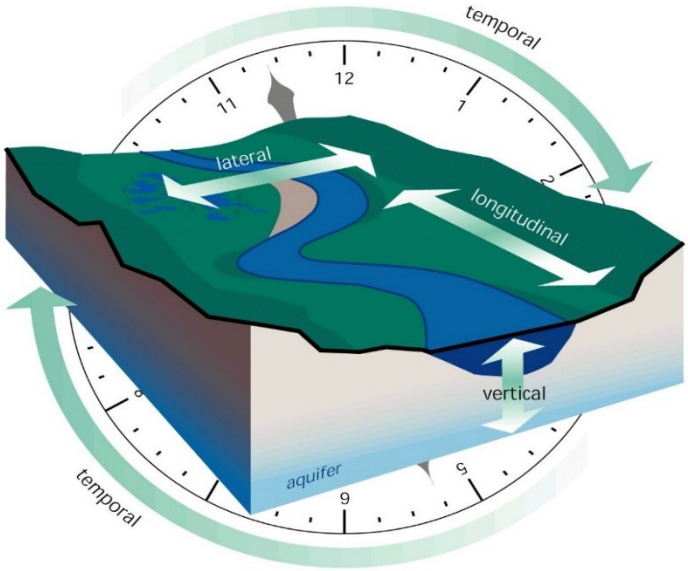
The socio-economic drivers that led to these drainage practices have been the settlement of riversides for arable land and development of mill works and roadways. While villages along

rivers may only be sustainable if certain river segments remain disconnected and structurally controlled, thousands of river disconnections have become derelicts of the past. These represent opportunities to restore river processes to their natural, connected state in a way that benefits Vermont's social, economic, and environmental well-being over time.

Vermont communities – from Bennington to Brattleboro, Stowe to Montgomery, and Brandon to Barre City – are improving their flood resilience while restoring connectivity and the natural functions of rivers and floodplains. Efforts to reduce damages from flooding and erosion in these villages and downtowns, and to reconnect rivers and floodplains statewide, will reduce the cost of flood recovery over time. Communities will also enjoy enhanced riverside recreation and the improved water quality and fish and wildlife habitat that result from river and floodplain restoration.

From 2015 to 2018, over **1,500 projects and practices** were completed in Vermont to reconnect natural flows from upstream to downstream and between streams and their floodplains. For every project implemented, there are two others for which a DEC river engineer, river scientist, or floodplain manager reviews or provides on-site technical guidance. More often, Rivers Program staff seek a mutually agreeable solution that will lead to a less erosive river overall, where it has room to move and flood with minimal damage to infrastructure. In the past four years, the Program also provided nearly 2,100 hours of outreach and education to 7,100 Vermonters, including Rivers and Roads, floodplain management, and flow management trainings.

The Four Types of River Connectivity



In Stream Corridor Restoration: Principles, Processes, and Practices, 10/98.
Interagency Stream Restoration Working Group (FISRWG)(15 Federal agencies of the US).

Inspired by this public involvement and the growing urgency to build resiliency to climate change, an innovative application of the natural and social sciences is being pursued in Vermont through a *Functioning Floodplain Initiative.* The goal of the initiative is to shift annual public and private expenditures from post-flood stream channelization and structural stormwater practices to the reconnection of streams and rivers with functioning floodplains and wetlands. The strategic divestiture and restoration of key floodplains and riparian wetlands to reduce flood damage and attenuate storm-related sediment and nutrient loads will be accelerated over the next several years, with:

A. Floodplain Functions Mapping: Using remote sensing, field, and modelling data[4] develop four base map products (*a) Floodplain (Vertical-Lateral) Connectivity; b) Stream (Longitudinal-Temporal) Connectivity; c) Floodplain-Channel Hydrology and Hydraulics; and d) Floodplain Wetlands, Soils, and Geology*), that will facilitate the evaluation of the ten natural floodplain functions[5] and associated socio-economic values.

B. Socio-Economic Evaluations and Public Outreach: Develop, using ARC-GIS, those metrics that would allow the public to see and understand the existing status and potential value of functioning floodplain, wetlands and equilibrium (stable-least erosive) stream conditions in their watershed and the benefit-cost of strategic restoration and protection practices.

C. Strategic Floodplain/Wetland Restoration and Protection Practices: Utilize floodplain functions base maps and socio-economic data to identify key watershed opportunities to reconnect rivers and floodplains and restore the natural landscape processes that attenuate floods, stormwater, sediments, and nutrients.

While many reconnection projects will involve active restoration, rivers are constantly working toward balance and connectivity—with or without human intervention. Therefore, avoidance strategies form a strong foundation for river restoration. As rivers keep working, they are "passively" restored by limiting, avoiding, or removing encroachments. River corridors represent areas, defined independent of varying flood stages, where land conservation creates a low effort, low cost pathway to restored rivers and floodplains.

[4] Research is either underway or conceptualized (seeking additional funding) to provide the correlations between modelled floodplain and channel hydraulics data, the erosion and deposition of sediments (and nutrients), and more readily available stream geomorphic data. With these relationships, Vermont may be able to infer hydraulic characteristics with less expensive remote sensing and field collected data.
[5] Ten natural floodplain functions include: 1) maintaining water quality, 2) connecting organisms, 3) moving materials, 4) mitigating flood stage, 5) dissipating energy, 6) stabilizing riverbanks, 7) groundwater exchange, 8) accommodating movement, 9) habitat mosaics, 10) carbon storage

Lake Shoreland Management Program

As part of the biennial Act 110 and Act 138 reporting, the Shoreland Management Program is providing this 2019 update on shoreland management and protection for Vermont lakes.

Typical shoreland development prior to the 2014 Shoreland Protection Act

Background

Act 110 of 2010 required the Agency of Natural Resources to establish a Lake Shoreland Management Program to "aid and support municipalities in adopting municipal shoreland bylaws." In 2013, the Shoreland Management Program provided the Legislature with a Report on Shoreland Protection and Restoration Management Options,[6] which led to passage of the Shoreland Protection Act in 2014 (Act 172).

Today, the Lake Shoreland Management Program is comprised of both regulatory and voluntary programs to protect and restore Vermont's 800 lakes. These programs aim to restore and protect natural shorelands and water quality by requiring and promoting lake friendly best management practices for shoreland development.

Shorelands with native plants are essential for healthy lakes

Shoreland Conditions

For lakes to be resilient to human activity on the land and to climate changes, their first line of defense is a well-vegetated shore. Unfortunately, data show that, in Vermont, sites developed before the 2014 Shoreland Protection Act have 96 percent fewer trees along the shores than undeveloped sites, and that cleared shores pose the greatest threat to Vermont lakes.[7] According to a U.S. Environmental Protection Agency study of lakes across the country, the health of Vermont lakes is less than both the northeast region and the national average in terms of percent of shoreland that is either in fair or poor condition, as measured by the extent of clearing, lawns, and development near the shoreline.[8]

When a lake's natural vegetation is removed and replaced by lawns and impervious surfaces, fish and wildlife habitat degrade, shores erode, and stormwater increases and flows untreated into a lake, putting the lake at greater risk for water quality problems such as algae blooms.

Naturally vegetated lakeshores reduce pollution, protect property and fisheries, improve recreation, and greatly contribute to the economy.[9]

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[6] https://dec.vermont.gov/sites/dec/files/wsm/lakes/Lakewise/docs/lp_act138shorelandreport.pdf

[7] Kellie Merrell, Eric Howe and Susan Warren, "Examining Shorelines, Littorally," *Lakeline* 29:1 (2009): 8–13.

[8] U.S. Environmental Protection Agency, *National Lakes Assessment: A Collaborative Survey of the Nation's Lakes* (EPA 841-R-09-001, 2010).

[9] Vermont Act 138 Legislative Report, Part II: Lake Shoreland and Restoration Management Options (2013).

Lakes and Ponds Permitting

Two different permits help protect lakes by guiding shoreland development practices: Lake Encroachment and Shoreland Permitting.

Shoreland Permitting

The Shoreland Protection Act (Chapter 49A of Title 10, §1441 et seq.) regulates shoreland development within 250 feet of a lake's mean water level for all lakes greater than 10 acres in size. The intent of the Act is to prevent degradation of water quality in lakes, preserve habitat and natural stability of shorelines, and maintain the economic benefits of lakes and their shorelands. The creation of new impervious surface (e.g. new development or redevelopment) or cleared area (e.g. removal of vegetation) within 250 feet from mean water level may require a permit or registration. A helpful summary[10] of the Shoreland Protection Act describes the types of activities that are jurisdictional to the Shoreland Protection Act and the standards of the Act. If a shoreland property owner proposes a jurisdictional activity, such as tree removal or an expansion of an existing structure, and the standards of the Act cannot be met, the shoreland owner will be required to implement best management practices.

Lake Encroachment Permitting

Lake Encroachment Permits are issued under 29 V.S.A. Chapter 11 (Management of Lakes and Ponds), which regulates encroachments in public waters. "Encroach" means to place or cause to be placed any material or structure in any lakes and ponds which are public waters or to alter, or cause to be altered, the lands underlying any waters, or to place or cause to be placed any bridge, dock, boathouse, cable, pipeline, or similar structure beyond the shoreline as established by the mean water level of any lakes and ponds which are public waters. The goals of this program are to minimize encroachments into public waters, ensure that encroachments do not adversely affect the public good, and that encroachments are consistent with the Public Trust Doctrine. To ensure that these goals are achieved, projects are reviewed based on how the encroachment may impact water quality, fish and wildlife habitat, aquatic and shoreline vegetation, navigation and other recreational and public uses, including fishing and swimming, consistency with the natural surroundings and consistency with municipal shoreland zoning ordinances or any applicable State plans. Any project that proposes work at, below, or beyond mean water level may require a Lake Encroachment permit.

Implementation

The Management of Lakes and Ponds (Lake Encroachment) went into effect on March 22, 1968 and the Shoreland Protection Act (Act) went into effect on July 1, 2014. The Lake and Ponds Management and Protection Program (Program) hit the ground running by pairing the new Act with extensive outreach efforts. Outreach efforts have and continue to be used as a tool to better educate the public on the scientific reasons for why the Act was passed as well as promoting the Act to ensure the public knows when they do or when they do not need a permit. In addition to promoting the Act, outreach efforts have given the Program an opportunity to revitalize public awareness of Lake Encroachment.

To improve the rollout of the new Act, three regions for the state were formed. Each region has a regional permit analyst working on both Lake Encroachment and Shoreland Permitting to provide shoreline property owners one contact for shoreline development projects. This

[10] https://dec.vermont.gov/sites/dec/files/wsm/lakes/docs/Shoreland/ShorelandProtectionActSummary_2272017.pdf

helped shoreland property owners as one permit analyst is now able to discuss projects on land as well as in the water. This combined permitting approach has brought a greater awareness of the regulations to the public and has created a more consistent decision-making process.

Aquatic Nuisance Control

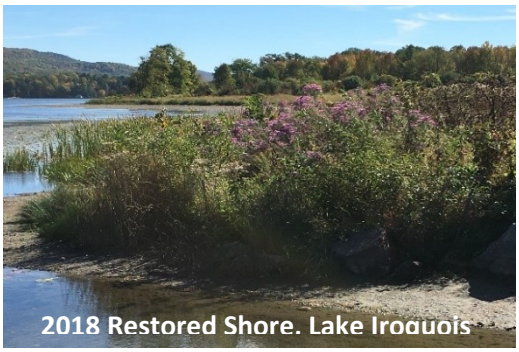
In addition to the Act bringing new life into Lake Encroachment, promoting the intent of the Act, which is to prevent degradation of water quality in lakes, preserve habitat and natural stability of shorelines, and maintain the economic benefits of lakes and their shorelands, has brought the discussions of how Aquatic Nuisance Control (10 V.S.A. Chapter 50) is implemented into the fold. While the Act espouses the value and importance of shoreline vegetation by protecting any removal of vegetation within the protected shoreland area, Aquatic Nuisance Control does not directly promote the value and importance of protecting aquatic vegetation within the lake's littoral zone. As the Program continues to develop its Regulatory Program, it is anticipated that the public good assessment that is conducted for reviewing Aquatic Nuisance Control projects will incorporate an up-to-date and modern approach to valuing and protecting our waters, similar to that used for Lake Encroachment.

VT Agency of Natural Resources staff get trained in bioengineering methods in 2015 to install fiber coir rolls to stabilize an eroding shore at the Lake Iroquois Fish and Wildlife Access Area in Williston

Natural Shoreland Erosion Control Certification Voluntary Training

Section Four of the Shoreland Protection Act (Act 172) requires the Lake Shoreland Management Program to offer a voluntary training in shoreland erosion control practices. After three years of running the Natural Shoreland Erosion Control Certification program, more than 400 contractors, designers, town and regional planners, engineers, shoreland owners, consultants, and others who work along shorelands have voluntarily attended the day long training and earned their Certification in shoreland best management practices. In 2018, in accordance with the reporting requirements for the Shoreland Protection Act, Section Four (Act 172), the Vermont Natural Shoreland Erosion Control Certification Report[11] was submitted to the House Committee on Natural Resources, Fish and Wildlife and the Senate Committee on Natural Resources and Energy. The report recommends continuing to offer the

2015 Installation, Lake Iroquois



2018 Restored Shore, Lake Iroquois

[11] https://dec.vermont.gov/sites/dec/files/wsm/lakes/Lakewise/docs/lp_2018_NSECC_LegislativeReport.pdf)

NSECC training as a voluntary program and within three years to revisit whether to mandate this training in Vermont.

The NSECC program offers a one-day, high quality, classroom training in lake science and shoreland management practices and has received a 100 percent recommendation rating by all participants. Recertification occurs after three years from the year the certificate was first earned. Vermont is not the first state to offer such trainings in shoreland Best Management Practices, as many other states, for example, Maine, mandate all those who disturb soil within 250 feet of surface waters to be certified in their program for erosion control practices. Natural Resources staff in Maine report that their mandatory erosion control training is effectively minimizing stormwater runoff and protecting water quality, and contractors required to take this training also report on positive outcomes from earning their certification in erosion control.

In addition to the classroom NSECC course, several field training days have been offered to NSECC Professionals for learning new bioengineering methods to stabilize eroding shores. Consultants from Michigan who have decades of experience installing these practices have helped run these projects and teach Vermont contractors these lake friendly stabilization techniques. An instructional video on the installation method for two bioengineering practices[12], filmed at a training day Brighton State Park on Island Pond, is available on the Lakes and Ponds website.

NSECC Training Day for bioengineering methods. Encapsulated soil lifts reestablish a gently sloped shore along Cedar Mountain Road on Lake Bomoseen, allowing native plants to root and stabilize the bank and road edge, while filtering and treating runoff before it enters the lake.

The next round of the NSECC course will take place at the annual November trainings in 2019. Plans are underway to offer a field training day for NSECC professionals during the 2019 summer. An updated list of the Professionals Certified through the NSECC program[13] is available on the Agency of Natural Resources web site and preference for all the Clean Water Initiative funding is given to these contractors when working along shorelands.

[12] https://www.youtube.com/watch?v=GCHt1v6sOeY
[13] https://dec.vermont.gov/sites/dec/files/wsm/lakes/Lakewise/docs/NSECC_CertifiedProfessionalsByTown.pdf

The Lake Wise Program

Lake Wise staff offer technical assistance with establishing a no-mow zone to protect the property, water quality and habitat

The Lake Wise Program offers technical assistance to shoreland owners for managing stormwater runoff and protecting natural shorelands and water quality. Shoreland property owners who exemplify lake friendly development can earn the beautiful Lake Wise Award Sign to display from their shore in recognition of their outstanding shoreland management and to help teach others what healthy shoreland development looks like.

Participants in the Lake Wise Program may take a few years to make the improvements to earn the Award, for example to establish a buffer with a "no mow zone," or by installing waterbars in the driveway to prevent erosive conditions.

Three years later:
No-mow zone has renaturalized this shore and property earned the Lake Wise Award

As stated in the background section, Vermont lake shores are in a state of restoration due to extensive shoreland clearing and conversion to lawn. The most important best management practice for lake protection is a naturally vegetated shore. Lake Wise teaches how to manage shores according to the Shoreland Protection Act's Vegetation Protection Standards and still enjoy a view and access to the lake. Revegetating shorelands frames in views, builds resiliency along the shore, filters stormwater, and provides critical wildlife habitat like shade for aquatic life and insects for song birds and fish.

Vegetative BMPs like raingardens, swales, or buffer plantings help restore native plants along the shore, which is the most important practice for all shoreland owners to learn. Lawns offer no benefit to water quality or wildlife and are the greatest threat to lake conditions. The Lake Wise Award signs show case what healthy shoreland development looks like and based on what social sciences teach us, should lead to a new trend for shoreland management.

In 2017, the first two Gold Lake Awards were earned by Echo Lake in Charleston and Seymour Lake in Morgan. The Gold Lake Status means more than 15 percent of shorelands are participating in Lake Wise practices to better protect water quality and habitat. A short you-tube video of the Gold Lake Award was made[14] to inspire more lake groups to follow suit.

The Lake Wise Program will continue to partner with shoreland owners and the NSECC Professionals to improve shoreland conditions and protect water quality.

Year	Site Visits	Lakes Visited	Signs Awarded	BMP's Completed
2013	76	16	38	17
2014	23	6	6	9
2015	31	14	17	15
2016	43	12	14	5
2017	110	24	38	19
2018	109	25	23	45
Totals	392			111

Through Lake Wise Assessments, solutions (BMPs) are matched with problem areas to improve shoreland management and better protect the lake. The program is growing at the rate it is staffed, which means there is a waiting period for some before they can participate.

Lake Wise participant installs infiltration stairs to prevent erosion direct foot traffic down a single pathway, minimizing compaction and trampling of the shore

2016 ice push damage to a cleared shore. Turf grass is not a native species, offering zero wildlife benefits and its shallow roots do not stabilize or protect shoreland property

2018 shoreland stabilization project with native plantings builds property resiliency against storms while filtering stormwater and providing pollinator species habitat

[14] https://www.youtube.com/watch?v=rZuw_LWXZtk