# Town of Worcester, Vermont

## 2017 Local Hazard Mitigation Plan

Prepared by the Town of Worcester and

the Central Vermont Regional Planning Commission



Date of Town Adoption: , 2017

_____

Date of Final Approval by FEMA

*Funded in part by a Hazard Mitigation Grant Program grant from the Division of Emergency Management and Homeland Security*

# Town of Worcester, VT
# Hazard Mitigation Plan Update
# February 2017

## Prepared by the Town of Worcester and CVRPC

TABLE OF CONTENTS PAGE #'S TBD

# 1. Introduction

The impact of expected, but unpredictable natural and human-caused events can be reduced through community planning. The goal of this Local Hazard Mitigation Plan is to provide a local mitigation plan that makes the Town of Worcester more disaster resistant.

Hazard mitigation is any sustained action that reduces or eliminates long-term risk to people and property from natural and human-caused hazards and their effects. Based on the results of previous Project Impact efforts, FEMA and State agencies have come to recognize that it is less expensive to prevent disasters than to repeatedly repair damage after a disaster has struck. This Plan recognizes that communities have opportunities to identify mitigation strategies and measures during all of the other phases of emergency management – preparedness, response, and recovery. Hazards cannot be eliminated, but it is possible to determine what the hazards are, where the hazards are most severe, and identify local actions that can be taken to reduce the severity of the hazard.

Hazard mitigation strategies and measures alter the hazard by eliminating or reducing the frequency of occurrence, avert the hazard by redirecting the impact by means of a structure or land treatment, adapt to the hazard by modifying structures or standards, or avoid the hazard by preventing or limiting development.

# 2. Purpose

The purpose of this Local Mitigation Plan is to assist the Town of Worcester in recognizing hazards facing the region and their community and identify strategies to begin reducing risks from acknowledged hazards.

The 2017 Worcester Local Hazard Mitigation Plan is an update of the 2012 plan. The plan underwent review, evaluation, and implementation to reflect changes in development, progress in local mitigation efforts and changes in priorities.

# 3. Community Profile

The Town of Worcester is a small, rural, primarily residential community located in the Northwestern most portion of Washington County. According to the 2010 Census, Worcester has a total population of 891 people living in 413 housing units. The Town's 2008 population was 902, a decrease of about 9% from the 2010 Census. Approximately 17% of Worcester's workforce is employed within the Town, while the remaining 83% work outside of the community.

With over 3,000 feet of topographic relief within its boundaries, Worcester ranks as one of the most rugged communities within Central Vermont. The Worcester Mountain Range dominates the Western third of the town. Vermont Route 12 follows the North Branch River in a North-South direction and provides connection to Montpelier and Morrisville. The Village of Worcester is located along the south eastern section of the town along Vermont Route 12. The Town's limited commercial development is focused primarily within this area, along with its densest residential development. The largest numbers of private residences, however, are widely dispersed throughout the Town's rural lands. This pattern of rural development surrounding a

dense Village is reinforced by the Town Plan. Worcester does not have zoning. As of writing this plan, there are no planned commercial or residential developments for Worcester. In March of 2013 Worcester updated its road standards and follows the Vermont Road and Bridge Standards 2013.

In Worcester, electricity is provided by Green Mountain Power to those residents who are situated along Vermont Route 12. Those in the hills and along other secondary roads are served primarily by the Washington Electric Cooperative. The Worcester community is completely dependent upon groundwater for its domestic water supply and industrial uses, with a storage and distribution system known as Worcester Fire District No. 1 providing service to much of the Village area. Worcester has no public sewage disposal system. The State of Vermont Regional Office issues water/waste water permits for soil based wastewater systems with flows less than 6500 gallons per day, for potable water supplies (water supplies that are not public), and for municipal water and sewer connections.

The Town's fire coverage is provided by the volunteer Worcester Fire Department, which provides support to the inter-municipal Capital Fire Mutual Aid System. During the year of 2015, the Fire Department responded to 18 calls for assistance. Also housed within the Worcester Fire Department is the Worcester Fast Squad, a non-profit corporation which provides medical care under the Vermont Emergency Medical Services system. The Fast Squad works in conjunction with the Montpelier Ambulance Service, which provides emergency transportation within the Town's boundaries. The FAST Squad responded to 21 calls in 2015. In regards to law enforcement, the Vermont State Police provide first response support and the Washington County Sheriff monitors the speed of traffic on Worcester's major thoroughfare.

The Town of Worcester has an approved Local Emergency Operations Plan (LEOP), (formerly known as the Rapid Response Plan), that is updated and adopted annually. The current LEOP was adopted on April 18, 2016 and is due for renewal by May 1, 2017. The town coordinates with the Central Vermont Regional Planning Commission who provides technical support and guidance with the plan update. The town requires the certifying officer to be trained in ICS 402 or ICS 100 at a minimum. It is the policy of the town to have the Chair of the Selectboard serve as the Emergency Management Director (EMD). In conjunction with the LEOP, on May 21, 2012 the town adopted the use of the National Incident Management System (NIMS) as the standard for management and systematic approach involving all threats and hazards, regardless of cause, size, location, or complexity, in order to reduce loss of life, property, and harm to the environment.

The town has a Source Protection Plan for the Worcester Fire District #1 last updated October 2016. In addition to the water supply, there are 8 dry hydrants installed using grant funding from the Rural Resources Water Supply Grant program of the Vermont Association of Conservation Districts. The development of one dry hydrant off the Norton Road is desired to complete the rural water suppression system in the community. Accessing grant funding will be necessary to complete this.

The Doty Memorial School follows the Vermont School Crisis Guide and has an Emergency Evacuation Plan in place. Drills are performed on a regular basis. The current school principal is Matt Young.

The 2007 Town Plan is currently in the process of being updated and revised. The current plan includes a description, discussion, goals, and policies in regards to flooding, groundwater protection, and emergency services. The Town does not have a zoning by-law, but has adopted a Flood Hazard Bylaw (updated in 2010). The town will incorporate the local hazard mitigation plan and flood hazard Bylaw into the Town Plan update. Once the Phase II River Corridor data is released by the State of Vermont, Worcester plans to begin the process of updating the Flood Hazard Bylaw and explore the adoption of a River Corridor Ordinance. The Central Vermont Regional Planning Commission is posed to assist with this effort once the data is released by the state. Worcester participates in the National Flood Insurance Program and enrolled 4/3/1978. There are no repetitive loss properties in Worcester. The current effective map date (FIRM date) is 3/19/2013.

# 4. Planning Process and Maintenance

## *4.1 Planning Process*

The Central Vermont Regional Planning Commission (CVRPC) assisted the town with their Worcester Hazard Mitigation Plan update process. In early February of 2016, CVRPC Transportation Planner Steve Gladczuk contacted the Town Select Board Chair, Roger Strobridge, and sent him Town specific mitigation materials for his review. A kick off meeting was held on March 21, 2016 between Transportation Planner Steve Gladczuk and Selectboard Chair Roger Strobridge. After assessing the material, an initial first draft was developed and Mr. Strobridge and CVRPC staff met with members of the Selectboard at a public meeting held on July 18, 2016. Input from the Selectboard members (Roger Strobridge, Ted Lamb, and Cheri Goldstein), Planning Commission Chair Bill Arrand, Road Commissioner Brian Powers, Fire Chief Will Sutton, and Town Clerk Katie Winkeljohn was collected for incorporation into the draft plan update. After the July 18th meeting, notice of the initial draft plan update was made available on the CVRPC blog and copies of the updated draft plan were available at the Worcester Municipal or CVRPC offices for review and comments. NO comments on this initial draft were received. In the summer of 2016, CVRPC GIS Planner Ashley Andrews conducted a Vulnerability Assessment of the roads using computer generated data analysis and then field verified the information, driving all the roads in the community. CVRPC GIS Planner Ashley Andrews consulted with the Worcester Public Works Commissioner Brian Powers and Road Foreman Tim Cane to identify a list of priority roads with under sized culverts and or erosion issues. This information was used in developing the mitigation strategies.

CVRPC experienced significant changes in staffing with the medical leave in late summer 2016 and then passing on January 4, 2017 of Steve Gladczuk, Transportation Planner. CVRPC reached out to the Town

Clerk and arrangements were made to schedule a status meeting with the Selectboard prior to submitting the final draft to DEMHS and FEMA. A status meeting was called and scheduled for a Selectboard meeting on November 21, 2016. Those in attendance were members of the Selectboard (Chair Roger Strobridge, Cheri Goldstein, Ted Lamb), Fire Chief (Mark "Will" Sutton), Town Clerk (Katie Winkeljohn), CVRPC staff (Laura Ranker, EM Planner and Ashely Andrews, GIS Planner) and members of the public. CVRPC was directed to make edits to the plan based on input gathered at this meeting and then present an updated draft of the plan at the February 6, 2017 meeting of the Selectboard. A final draft plan was presented to the Board of Selectmen on February 21, 2017. The Town Clerk then posted the final draft plan at the Worcester Town Offices, on Front Porch Forum, and on the Worcester Town website for public comment. A copy was also sent to Matt Young, Principal of the Doty Memorial School. The Worcester town website is also linked to the CVRPC website increasing the potential for distribution and the draft plan was posted on the CVRCP website. Front Porch Forum and the town website reach over 500 active subscribers. Copies of the plan were also distributed and made available to the town clerks of all the adjoining municipalities, LEPC #5, and the Agency of Natural Resources Certified Flood Plan Manager, Rob Evans. The specific Town Clerks are: Calais- Donna Fitch Calais.townclerk@gmail.com; Elmore- Sharon Draper sdraper@elmorevt.org; East Montpelier-Terri Conti eastmonttct@comcast.net; Middlesex- Sarah Merriman middlesxtwnclrk@comcast.net; Morristown- Mary Ann Wilson mawilson@morristownvt.org; Stowe- Alison Kaiser townclerk@townofstowevermont.org; Waterbury- Carla Lawrence clawrence@waterburyvt.com; and Woodbury- Diana Peduzzi woodburyclerk@comcast.net. After receiving any public comment, final revisions and edits will be made as necessary and incorporated into the final draft for submittal to DEMHS and FEMA in March 2017.

In the future, the plan may also be shared at informal meetings between local, regional and state officials. Comments will be reviewed by the Select Board and CVRPC Planners until the plan is submitted to FEMA for conditional approval. Public comments submitted will be reviewed by the Select Board Chair (and CVRPC Staff dependent on funding) and attached as an appendix. In the future, the draft plan will be made available during Town Meeting Day and local meetings with State and local officials to allow for more public comment and review. Once the plan is conditionally approved by FEMA, the plan will go before the Select Board for adoption.

Prior to formal adoption by the Selectboard, a Public hearing will be warned on a date to be determined, to get public comment on the final plan. Upon FEMA written notice of FEMA Approval Pending Adoption, the Worcester Selectboard will hold a regular warned public Selectboard meeting to approve and adopted the hazard mitigation plan by resolution. Upon adoption, the Selectboard will submit the adopted plan and certification to DEMHS/FEMA for issuance of the final plan approval letter from FEMA. This plan will expire 5 years from the date of final FEMA approval.

Preparation for the plan review meetings included a review of the Worcester Town Plan, Worcester Local Emergency Operations Plan, 2015 Worcester Town Report, Phase 1 Stream Assessment of the North Branch of the Winooski River, North Branch Corridor Plan, the

2016/2017 Highway Equipment Schedule and the Fire Department Equipment Schedule, the 2008 Worcester Purchasing policy, the 2010 Worcester Flood Hazard Bylaw, and State Forest Management Plan. The Worcester Hazard Mitigation Meetings focused on assessing past mitigation projects and compiling information on its current and future hazard mitigation programs, projects and activities.

Worcester hazard mitigation planning group included the following persons:

- Roger Strobridge, Worcester Select Board Chair
- Cheri Goldstein, Worcester Select Board
- Ted Lamb, Worcester Select Board
- William Arrand, Worcester Planning Commission Chair
- Brian Powers, Worcester Road Commissioner
- Mark "Will" Sutton, Worcester Fire Chief
- Matt Young, Principal Doty Memorial School
- Katie Winkeljohn, Town Clerk
- CVRPC Staff: Steve Gladczuk, Transportation Planner, Laura Ranker, Emergency Management Planner, and Ashley Andrews, GIS Planner.

During the planning process, the town identified its most vulnerable hazards; flash floods, floods and wildfire/forest fire.

## *4.2 Plan Update Process*

The Worcester Local Hazard Mitigation Plan was originally adopted by the Town as an Annex to the Central Vermont Regional Local Hazard Mitigation Plan in October 2005 and received FEMA final approval in January 2006. In 2011, Worcester updated its plan as a standalone Local Hazard Mitigation Plan which was adopted by the Selectboard on November 21, 2011 and received FEMA approval on March 12, 2012. This plan is an update to the March 2012 FEMA approved plan.

The entire plan was updated in this update process.

**General Updates**

- General reorganization/restructuring of the plan according to future FEMA/VEM checklist
- Update of all data and statistics using the 2015 Town Report and US Census Data
- Reevaluation, identification and analysis of all significant hazards identified from the 2011 Plan, including flash flooding and forest fires.
- Acknowledgement of implemented mitigation strategies since 2011 – see matrix below
- Identification of on-going mitigation projects and strategies – see Existing Mitigation Programs, Projects and Activities section
- Identification of new mitigation projects and strategies – see Hazard Mitigation Activity matrix in appendix.
- Update of all hazard data and historical records since 2011 to present day.
- Consideration of changes in development in the community and in development regulations.

**Hazard Analysis Updates**

- New hazards added - Forest Fire & Flash Flooding
- Added location/vulnerability/extent/impact/likelihood table for each hazard to summarize hazard description
- Review of current forest map to identify camps and other areas which are at risk of forest fire
- Review of information on State Forest website and 2010 State Forest Management Plan
- Review of Phase I North Branch Assessment, March 31, 2007 – new information included in flood/flash flood sections
- Review of North Branch Corridor Plan, 2009, – new information included in flood/flash flood and mitigation activities sections
- References to North Branch Corridor Plan 2009 for future flood/flash flood mitigation projects
- Updated federal declarations in flooding/flash flooding occurrences

**Maps**

- Review of 2011 Plan maps - added which combines the Hazard Analysis and Areas of Local Concern Maps in the Hazard Analysis Map. The information is still relevant.
- A Transportation Risk Analysis Map (aka Vulnerability Assessment Map).

No changes were made to the section pertaining to School Safety.

| 2011 Mitigation Action | 2016 Status |
|---|---|
| Improving drainage within Town and construct controls to prevent contact with water/floating debris | Major fixes on Calais Rd. and Brown Rd. bridges.<br>Major roadwork done on Frazier Rd., Kimball Rd., Norton Rd.<br>7 others roads have had hydraulic studies and fixes performed.<br>Ditching Program implemented on Hampshire Hill, Norton Road and Gould Hill. |
| Develop a post-flood clean up, decontamination, and recovery procedure/plan | Select Board still interested – not yet performed due to lack of funding |
| Remove structures from risk nearest to Minister Brook | Strategy outlined in North Branch Corridor Plan – has not yet been performed due to lack of funding |
| Develop and implement an education program for residents and property owners of flood risk and mitigation activities/programs | Made part of 2010 flood hazard bylaws |

| | |
|---|---|
| "Harden" utility services within the town through the replacement/burying of above-grade utility services and strengthening utility poles/conductor fixtures | Ongoing upgrades of utility poles by both Green Mountain Power and Washington Electric Cooperative; Select Board is still interested in project, but has not happened due to lack of funds |
| Conduct a tree removal/tree trimming program | Taken care of by road crew, but not formally organized. Brush cutting also performed in right-of-ways. Road foreman is still interested in program. |
| Conduct an engineering study on the Town's wind vulnerability | Will no longer be considered due to lack of interested parties. |

**Existing Mitigation Programs, Projects and Activities**

The ongoing or recently completed programs, projects and activities are listed by mitigation strategy and were reviewed during the update process.

Community Preparedness Activities

- Current Local Emergency Operations Plan adopted 4/18/16
- Worcester Fire District #1 Source Protection Plan 10/2016
- Doty Memorial School Emergency Evacuation Plan

Hazard Control & Protective Works

- Maintenance Programs (Culvert Survey & Replacement), last completed 2015
- Participant in the Capital Mutual Aid System, ongoing
- Capital Equipment Plan and Replacement Schedule, annually

Insurance Programs

- Participation in NFIP, enrolled since 4/3/1978, ongoing
- Vermont League of Cities and Towns Liability and Insurance Program, ongoing

Land use Planning/Management

- Flood Hazard Bylaw 2010
- Municipal Plan, 2007, currently under review and update process

Protection/Retrofit of Infrastructure and Critical Facilities

- Dry Hydrant Program, ongoing dependent upon funding grants (8 completed, 1 more to add)
- Worcester Purchasing Policy adopted 2008 (follows VLCT model)

Public Awareness, Training & Education

- Fire safety educational programs for town residents
- CPR & Hazmat Trainings
- School Fire Awareness Week
- FAST Squad
- Town Complex backup generator

## *4.3 Plan Maintenance*

The Worcester Local Hazard Mitigation Plan will be updated and evaluated annually within three months of the Organizational Meeting of the Selectboard. The organizational meeting is typically held on the first Selectboard meeting after Town Meeting Day. Updates and evaluation by the Select Board will also occur within three months after every federal disaster declaration and as updates to town plan/zoning and river corridor plans come into effect. CVRPC will help with updates, or if no funding is available, the Chair of the Select Board will update the plan as needed during the 5 year interim period.

The process of evaluating and updating the plan will include continued public participation through public notices posted on the municipal website, Front Porch Forum, town newsletter and CVRPC newsletter inviting the public to the scheduled Select Board (or specially scheduled) meeting(s). These efforts will be coordinated by the Chair of the Select Board and Town Clerk.

Updates may include changes in community mitigation strategies; new town bylaws and updates to existing bylaws, land use and planning strategies; progress of implementation of initiatives and projects; effectiveness of implemented projects or initiatives; and evaluation of challenges and opportunities. If new actions are identified in the 5 year interim period, the plan can be amended without formal re-adoption during regularly scheduled Select Board meetings.

Worcester shall also consider incorporation of mitigation planning into their long term land use and development planning documents. It is recommended the Town review and incorporate elements of the Local Hazard Mitigation Plan when updating the municipal plan and flood hazard/FEH bylaws. The incorporation of the Local Hazard Mitigation Plan into the municipal plan and flood hazard/FEH bylaws will also be considered after declared or local disasters. The Town shall also consider reviewing future North Branch Corridor planning documents for ideas on future mitigation projects and hazard areas pertaining to the Town of Worcester.

# 5. Risk Assessment

## *5.1 Hazard Identification and Analysis*

The following natural disasters were discussed and the worst threat hazards were identified based upon the likelihood of the event and the community's vulnerability to the event. Hazards not identified as a "worst threat" may still occur. Greater explanations and mitigation strategies of non "worst threat" hazards can be found in the State of Vermont's Hazard Mitigation Plan.

## Hazard Identification Table.

| Hazard | Likelihood [1] | Community Vulnerability[2] | Worst Threat |
|---|---|---|---|
| Avalanche/ Landslide | Low | No | X |
| Dam Failures | Low | No | X |
| Drought | Low | No | X |
| Earthquake | Low | No | X |
| Extreme Cold/Winter Storm/Ice Storm | Med | No | X |
| Flash Flood | Med | Yes | ✓ |
| Flood/Fluvial Erosion | Med | Yes | ✓ |
| High Wind | Low | No | X |
| Ice Jam | Low | No | X |
| Hurricane | Low | No | X |
| Structure Fire | Med | No | X |
| Tornado | Low | No | X |
| Water Supply Contamination | Low | No | X |
| Wildfire/Forest Fire | Med | Yes | ✓ |
| Other – School Safety | Low | Yes | ✓ |
| | | | |

The Town of Worcester identified the following disasters as presenting the worst threat to the community:

- Flooding
- Flash Flooding
- Wildfire/Forest Fire
- School Safety Issues

The Town is interested in focusing a majority of mitigation efforts into reducing impacts from floods and flash floods, as the events occur most frequently, severely and cause the most damage to public and private infrastructure.

Non worst threat hazards include:

- Extreme Cold/Winter Storm/Ice Storm
- Structure Fire

[1] High likelihood of happening: Near 100% probability in the next year.
Medium likelihood of happening: 10% to 100% probability in the next year or at least once in the next 10 years.
Low likelihood of happening: 1% to 10% probability in the next year or at least once in the next 100 years.

[2] Does the hazard present the threat of disaster (Yes)? Or is it just a routine emergency (No)?

Other Hazards with Low Likelihood, and No Community Vulnerability considered are:

- Terrorism
- Nuclear Power Plant
- Infectious Disease
- Severe Thunder Storms
- Hail
- Drought
- Rockcuts
- Invasive Species
- Extreme Temperatures
- Expansive Soils
- Lightning
- Sea Level Rise
- Storm Surge
- Subsidence
- Tsunami

A discussion of each significant hazard is included in the proceeding subsections and a map identifying the location of each hazard is attached (See map titled Hazard Analysis.) Each subsection includes a list of past occurrences based upon County-wide FEMA Disaster Declarations (DR-#) if available, plus information from local records, a narrative description of the hazard and a hazard matrix containing the following overview information:

| Hazard | Location | Vulnerability | Extent | Impact | Likelihood |
|---|---|---|---|---|---|
| Type of hazard | General areas within municipality which are vulnerable to the identified hazard. | Types of structures impacted | **Minimal:** Limited and scattered property damage; no damage to public infrastructure contained geographic area (i.e., 1 or 2 communities); essential services (utilities, hospitals, schools, etc.) not interrupted; no injuries or fatalities.<br>**Moderate:** Scattered major property damage (more than 50% destroyed); some minor infrastructure damage; wider geographic area (several communities) essential services are briefly interrupted; some injuries and/or fatalities.<br>**Severe:** Consistent major property damage; major damage to public infrastructure (up to several days for repairs); essential services are interrupted from several hours to several days; many injuries and fatalities. | Dollar value or percentage of damages. | **High**: 10% to 100% probability within the next year or at least once in the next 10 years.<br>**Medium:** less than 10% to 100% probability within the within the next year or less than once in the next 10 years. |

### *5.2 Worst Threat Hazards*

## A. FLOODING/FLUVIAL EROSION & FLASH FLOODING

History of Occurrences (within Central Vermont, town specific data not available):

| Date | Event | Location | Extent |
|---|---|---|---|
| 2/25/2016 | Flood/Ice Jam | Middlesex | 2-2.5" of rain, 1-3" of ice pack melted, resulted in 2-4' of water on US 2 |
| 6/11/2014 | Flooding | Washington County | Montpelier flood gauge at N.A. |
| 8/2/2013 | Flooding | Washington County | Montpelier flood gauge at 4.23 |
| 11/8/2011 | Flooding | Washington County | Montpelier flood gauge at 4.05<br>DR 4043 |
| 8/28/2011 | Flood/Tropical Storm | Statewide | Winooski Flood gauge knocked out – above 423.3 feet (flood stage is 419 feet) – DR 4022 |
| 5/27/2011 | Flood | Washington County | Winooski flood gauge at 423.3 feet DR 4001 |
| 4/11/2011 | Flood | Washington County | 2-4" of rain and heavy snowmelt, Winooski flood gauge at 421.0 feet DR 1995 |
| 8/2/2008 | Flash Flood | Washington County | 3-5" of rain, not a historical crest in Montpelier |
| 7/11/2007 | Flash Flood | Washington County | 3-6" of rain in 2 hrs – DR 1715, not a historical crest in Montpelier |
| 6/26/2006 | Flood | Washington County | 3-4" of rain, not a historical crest in Montpelier |
| 9/16/1999 | Tropical Storm Floyd | County Wide | Montpelier flood gauge at 9.30 feet, 5-7" rain county wide DR 1307 |
| 6/17/1998 | Flash Flood | County Wide | 3-6" of rain over 2 day period - DR 1228, not a historical crest in Montpelier |

| | | | |
|---|---|---|---|
| 8/5/1976 | Flood | County Wide | Montpelier flood gauge at 12.31 feet – DR 518 |
| 6/30/1973 | Flood | County Wide | Montpelier gauge at 17.55 ft DR 397 |
| 9/22/1938 | Flood/Hurricane | County Wide | Montpelier flood gauge at 14.11 feet |
| 11/03/1927 | Flood | County Wide | Montpelier flood gauge at 27.10 feet |

The most prominent body of water within Worcester is the North Branch of the Winooski River, which originates in Elmore and flows in a southerly direction along Vermont Route 12, finally converging with the Winooski in the City of Montpelier. Several streams originating in Worcester's upland areas converge with the North Branch in the Worcester Valley. Flowing east from the Worcester Range are Minister, Hancock and Catamount Brooks. From the eastern hills flow the Hardwood, Worcester and Russ Pond Brooks.

Two studies have been conducted on the North Branch of the Winooski River and associated tributaries (Minister Brook, Worcester Brook, Hancock Brook, Catamount Brook and Harwood Brook) located in Worcester. The first study is a Phase I Stream Geomorphic Assessment done in 2009. The second 2009 study is the North Branch Corridor Plan which evaluates the condition of the North Branch and larger tributaries and identifies and prioritizes 92 projects to remediate the river. Of these 92 projects, more than half are recommended along the stretches in Worcester. The Corridor Report identifies numerous stretches of the river that are in fair and poor condition due to road or field encroachment on floodplains or banks, highly incised reaches, and increased loads and flows due to surrounding land use activities. Table 33 of the North Branch Corridor Report summarizes all potential projects and their benefits. It would be advisable for the Town of Worcester to begin performing some of the high priority projects in Worcester's stretch of the river corridor to restore the river's health and prevent future flooding events and reduce fluvial erosion. However, implementation is dependent upon identifying viable funding sources and grant awards. In addition, many identified projects involve private property and will require the cooperation and commitment of the private landowner. A matrix of prioritized projects and related maps are attached as an appendix for the Town to reference and to help guide, direct and prioritize future mitigation projects.

The roads and fields most impacted by these waters are the Minister Brook Road, Jim Dawson's field, Downs Road, and "the ledges" and field along Route 12 near the southern loop of the North Branch (see Areas of Local Concern map.) Additional maps of impacted areas and potential future restoration projects can be found in the North Branch Corridor Study.

According to the National Flood Insurance Program, Worcester has 5 structures and 99 properties located within the designated 100-year floodplain. The total loss value for floodplain properties is $18,324,900 based on the median property value of the grand list. There are no recurring loss properties in Worcester. As previous events have made clear, even areas beyond the NFIP

designated 100-year floodplain may be vulnerable to flood related hazards. Channel adjustments with devastating consequences have frequently been documented wherein such adjustments are linked to historical channel management activities, floodplain encroachments, adjacent land use practices and/or changes in watershed hydrology associated with conversion of land cover and drainage activities, within and beyond the NFIP floodplain. There are no future residential or commercial developments planned within floodplain areas. Flood bylaws enacted in 2010 also limit development in flood prone areas.

The Hazard Analysis Map (attached) identifies the Worcester Methodist Church, Doty Memorial School, Fire House, and other government buildings to be outside the designated flood plain, but near the river. The attached Areas of Local Concern map highlights 11 stretches of road or bridges that have experienced either flood-induced washouts and/or significant fluvial erosion.

Within the past 5 years, there have been ongoing road maintenance and repair projects to help mitigate past and help prevent future flooding in Worcester. Route 12 by the North Hancock Brook was rebuilt in summer 2010. Crushed rock for improved drainage and erosion prevention has been placed in several areas – Collar Hill, Gould Hill, Hampshire Hill and Frazier Road off West Hill. In 2007, a flooding event occurred on Brown Road which caused $88,000 worth of damages that the town spent to repair the road.

| Hazard | Location | Vulnerability | Extent | Impact | Likelihood |
|---|---|---|---|---|---|
| Flooding | Route 12, Downs Road, Minister Brook Road, Brown Rd | Municipal infrastructure – bridges, culverts transportation routes along North Branch, Minister Brook, and Worcester Brook. | 327 acres in flood plain, 391 acres in FEH zone | $18, 324,900-possible floodplain damages; $88,000 from 2007 event; continuous funding from general maintenance activities | Medium |

## B. FLASH FLOODING

History of Occurrences (within Central Vermont, town specific data not available. See above Table):

According to FEMA, floods are one of the most common hazards in the United States; this is also the case in Worcester. Flooding occurs when rapidly rising water inundates an area beyond the body of water's normal or accepted channel or basin. Floods can affect a neighborhood, a

community or an entire river basin and it should be noted not all floods are alike. Some floods develop slowly over a period of days due to rain fall or snowmelt; others can develop quickly due to a sudden rain burst and are commonly referred to as flash floods.

According to the State of Vermont Hazard Mitigation Plan, updated November 2013, "recent studies have shown most flooding in Vermont occurs in upland streams and road drainage systems that fail to handle the amount of water they receive. Due to steep gradients, flooding may inundate these areas severely, but only briefly." Flash flooding in Worcester most often occurs in areas where tree roots and branches block the path of the water. These areas are located along Downs Road and Minister Brook Road where tree growth is close to the edge of the waters. The town flooding bylaw follows the NFIP minimum guidelines to limit flooding of structures nearby. In 2007, a flooding event occurred on Brown Road which caused $88,000 worth of damages.

The North Branch Corridor Plan identifies several areas in Worcester where roads/field encroach the river's floodplain. Also identified in the Plan are structures which constrict the flow of the River and Minister Brook. Minister Brook has 2 private undersized structures over it which constricts the flow of the brook. These structures are located between Route 12 and Minister Brook Rd. Several berms along the Brook also limit access to the floodplain. Similar conditions are occurring on the Worcester Brook as well. Table 33 in the North Branch Corridor Plan outlines remediation actions for each stretch of the North Branch and its tributaries. It would be advisable for Worcester to implement high priority projects to reduce future impacts of flooding and restore the overall health of the North Branch. However, implementation is dependent upon identifying viable funding sources and grant awards as well as garnering cooperation and commitment from the private landowners.

| Hazard | Location | Vulnerability | Extent | Impact | Likelihood |
|---|---|---|---|---|---|
| Flash Flood | Along North Branch, Upper Minister Brook, Worcester Brook, Downs Road | Municipal infrastructure, private property transportation routes, undersized culverts and bridges | 327 acres in flood plain, 391 acres in FEH zone | $88,000 - 2007 event; continuous funding from general maintenance activities | Medium |

## C. WILDFIRE/FOREST FIRE

C.C. Putnam State Forest is approximately 13,000 acres and covers roughly 1/3 of the western portion of Worcester and is shown as conserved land on the attached Hazard Analysis Map. This forest is located in the Worcester Range and spans across 5 adjoining towns. The protection of

C.C. Putnam State Forest is essential in protecting the water quality of the region as it is located in the headwaters of the Winooski watershed.

The State of Vermont does have a Forest Management plan in place which addresses forest fire concerns. The 2010 State Forest Management Plan includes several goals regarding forest fire prevention. The Plan states that although the risk of forest fire is low in the State of Vermont, that the State still performs controlled burns on a small scale during the spring season. To help prevent local forest fires, the State works with local planning commissions to develop Community Wildlife Protection Plans. These plans help towns to identify and mitigate wildfire risk. A common mitigation measure prescribed in the plan is through controlled burns with onsite State support.

The Forest Division also runs the Town Forest Fire Warden program. This program requires towns to have appointed fire wardens. In Worcester, the Fire Warden is Steven Lang. The forest fire program focuses on prevention, fire awareness and fire fighter safety.

Access to the State lands from the town is VERY limited. In the Forest are roughly 20 private camps. To date, there have been no occurrences of forest fire; however, given the limited access to the forest itself and water resources in the forest, the ability to put out a large fire quickly and efficiently is limited. The greatest threat of a forest fire comes from human error – such as smoking and improper campfire etiquette. However, lightning is also a threat as the forest is very dense and is said to contain dense undergrowth. Although Worcester has no large or small scale developments planned in the future, encroachment on forest lands presents greater threats of forest fire. A buffer between future residential development and forest land should be maintained to reduce the threat of forest fire and also protect important watershed areas. To date there have been no wild fires within Worcester.

| Hazard | Location | Vulnerability | Extent | Impact | Likelihood |
|---|---|---|---|---|---|
| Wildfire/Forest Fire | State Forest lands | Private camps | 13,000 acres of State Forest | $2 million ($100,000/house x 20) | Medium |

## D. SCHOOL SAFETY

Worcester's elementary school children attend Doty Memorial School, located on Calais Road near the center of the Village. Constructed in 1978, the school serves approximately 80 children from Kindergarten thru 6th grade.

The boiler for the School's furnace is located on the second floor. The Town mitigation meeting highlighted the location of the School's boiler as a potential hazard, given that a leak could cause a dangerous situation. The boiler has not had any history of defects.

The School suffered a bomb threat in 1999. The threat was deemed to be a prank, but the threat to the community is genuine as the School contains the Town's highest population density.

The Doty Memorial School Emergency Evacuation Plan addresses the following threats: bomb, fire, weather related closings, and general disaster emergencies. Doty Memorial School follows the Vermont School Crisis safety guidelines.

| Hazard | Location | Vulnerability | Extent | Impact | Likelihood |
|---|---|---|---|---|---|
| School Safety | Doty Memorial School | Municipal infrastructure, transportation routes. | Boiler room and adjacent rooms | $500,000 | Medium |

### E. LOCAL AREAS OF CONCERN

The Community Meeting provided input on Local Areas of Concern (Map Attached). Eleven roads or bridges within the Town have been highlighted for their susceptibility to flood hazards. Among them are two sections of Eagle Ledge Road, Bridge # 4 on the Calais Road, Bridge #13 on the Norton Road, two sections of Vermont Route 12, washouts at two points on Minister Brook Road, the intersection of Hancock Brook Road and Hampshire Hill Road and flooding at Downs Road.

## *5.3 Non "Worst" Threat Hazards*

### A. EXTREME COLD/WINTER STORM/ICE STORM

History of Occurrences (county wide)

Snow and/or ice events occur on a regular basis. Recent significant events have included:

| Date | Event | Location | Extent |
|---|---|---|---|
| 12/9/2014 | Winter storm | County wide | 6-24" of snow, widespread power outages |
| 3/12/2014 | Winter storm | County wide | 12-24" of snow |
| 3/19/2013 | Winter storm | County wide | 6-14" of snow |
| 12/26/2012 | Winter storm | County wide | 9-18" of snow |
| 2/24/2012 | Winter storm | County wide | 3-36" of snow |
| 11/23/2011 | Winter storm | County wide | 5-12" of wet snow |
| 3/6/2011 | Winter storm | County wide | 12-18" of snow, 10,000 customers lost power statewide |

| | | | |
|---|---|---|---|
| 2/23/2010 | Winter Storm | County wide | 20" of snow and 50,000 customers lost power statewide |
| 2/22/2009 | Winter Storm | County Wide | 16" of snow, 30 mph wind gusts |
| 2/1/2008 | Winter storm | County wide | 3-7" of snow and ice ¼-1/2"thick, 50 mph wind gusts |
| 2/14/2007 | Winter storm | County wide | 22" of snow |
| 2/14/2006 | Winter storm | County Wide | 30" of snow |
| 1/4/2003 | Winter storm | County wide | 19" of snow |
| 3/5/2001 | Winter storm | County wide | 15-30" of snow |
| 12/31/2000 | Winter storm | County wide | 10" of snow |
| 1/15/1998 | Winter storm | County wide | 10-12" snow (not a DR in Washington County) |
| 12/29/1997 | Winter storm | County wide | 21" of snow |
| 12/7/1996 | Winter Storm | County wide | 12" of snow |
| 3/21/1994 | Winter storm | County Wide | 5-11" of snow |
| 11/1/1993 | Winter storm | County wide | 15" of snow |
| 1/3/1993 | Freezing Rain | Statewide | ¼-1/2" freezing rain |

A winter storm is defined as a storm that generates sufficient quantities of snow, ice or sleet to result in hazardous conditions and/or property damage. Ice storms are sometimes incorrectly referred to as sleet storms. Sleet is similar to hail only smaller and can be easily identified as frozen rain drops (ice pellets) that bounce when hitting the ground or other objects. Sleet does not stick to wires or trees, but in sufficient depth, can cause hazardous driving conditions. Ice storms are the result of cold rain that freezes on contact with the surfaces coating the ground, tress, buildings, overhead wires and other exposed objects with ice, sometimes causing extensive damage. Periods of extreme cold tend to occur with these events.

One of the major problems associated with ice storms is the loss of electrical power. Major electric utility companies have active, ongoing programs to improve system reliability and protect facilities from damage by ice, severe winds and other hazards. Typically, these programs focus on trimming trees to prevent encroachment of overhead lines, strengthening vulnerable system

components, protecting equipment from lightning strikes and placing new distribution lines underground.

Other major problems include closed roads and restricted transportation.

By observing winter storm watches and warnings, adequate preparations can usually be made to lessen the impact of snow, ice and sleet, and below freezing temperature conditions on the Town of Worcester. Providing for the mass care and sheltering of residents left without heat or electricity for an extended time and mobilizing sufficient resources to clear broken tree limbs from roads, are the primary challenges facing community officials. Worcester should plan and prepare for these emergencies. That planning and preparedness effort should include the identification of mass care facilities and necessary resources such as cots, blankets, food supplies and generators, as well as debris removal equipment and services. Doty Memorial School is the town shelter. The Barre Auditorium in Barre, Vermont serves as the Regional American Red Cross Shelter for Central Vermont when activated by the State of Vermont in a declared disaster and has the ability to shelter pets.

| Hazard | Location | Vulnerability | Extent | Impact | Likelihood |
|---|---|---|---|---|---|
| Winter Storm/Ice Storm | Town Wide | Utilities, trees, roads, old/under insulated structures | 18+" snow in March 2011 storm, depends on severity | 5-10% damages –routine emergencies | Medium |

### B. STRUCTURE FIRE

Although many structures in Worcester are less than 100 years old, many residents heat their homes with wood or pellet burning stoves. The remoteness and distance from fire and emergency services of many homes also increases the likelihood of a home being completely, opposed to partially, destroyed by a fire. To date, there have been no large structure fires.

| Hazard | Location | Vulnerability | Extent | Impact | Probability |
|---|---|---|---|---|---|
| Structure Fires | Town Wide | Wood structures, especially older than 100 yrs, homes that use wood burning stoves for heat | Less than 1 house/year | $150, 000 per home based on median grand list value | Med |

# 6 Mitigation

## *6.1 Town Plan (proposed update 2016/2017) Goals that Support Local Hazard Mitigation*

- To ensure that the nature and degree of land resource uses do not have negative impacts on the quality of the land and the resources or on adjoining property values
- To ensure swift and adequate emergency and health services

- To provide a transportation infrastructure that will enable the quick, efficient and safe movement of people, goods and services

Worcester's town plan will be updated in 2016/2017. The Town in interested in adding goals which related to mitigation planning such as:

- To take actions to reduce or eliminate the long-term risk to human life, property, and the environment from natural hazards.

Specific hazard mitigation strategies related to goals of the Plan include:

- Ensure existing and future drainage systems are adequate and functioning properly.
- Preserve and prevent development in areas where natural hazard potential is high.
- Ensure that all residents and business owners are aware of the hazards that exist within Worcester and ways they can protect themselves and adequately insure their property.
- Ensure that emergency response services and critical facilities functions are not interrupted by natural hazards.
-

## *6.2 Proposed Hazard Mitigation Programs, Projects and Activities*

Hazard mitigation programs, projects and activities that were identified for implementation at the Town mitigation planning meetings:

<u>Flooding and Flash Flooding</u>

- Replacement and upgrade of bridges and culverts on Minister Brook Road, Jim Dawson's field, and Downs Road.
- Perform high priority corridor planning projects as outlined in the North Branch Corridor Plan after careful consideration of realistic priority, funding availability, and cooperation and commitment from private landowners when applicable.
- "Harden" utility services within the Village area and to Doty School through the replacement/burying of above-ground utility services.
- Extend Fluvial Erosion Hazard zone in the next review of flooding bylaw or river corridor ordinance.

<u>Forest Fire</u>

- Work with State Forest, Parks and Recreation, Vermont Association of Conservation Districts and the CVRPC to develop alternative water supplies in State Forest for wildfire suppression purposes.
- Remove taller and dead trees from land surrounding camps in State Forest.

School Safety

- Continue to perform routine inspections on the boiler.
- Retrofit and strengthen boiler room to better contain an explosion.
- Participate in the DEMHS School Crisis Planning and be familiar with and access the resources available of the DEMHS School Crisis Planning website. (DEMS is the Vermont Division of Emergency Management and Homeland Security)

NFIP

- Work with elected officials, CVRPC, the State and FEMA to assess the town's understanding of and needs under the NFIP and promote educational trainings and workshops for town officials and landowners to promote the program and ensure compliance under it.

The Hazard Mitigation Activities Matrix (Attached) lists mitigation activities in regards to local leadership, possible resources, implementation tools, and prioritization. Prioritization was based upon the economic impact of the action, the Community's need to address the issue, the action's cost, and the availability of potential funding. The action's cost was evaluated in relation to its benefit as outlined in the STAPLEE guidelines.

Worcester understands that in order to apply for FEMA funding for mitigation projects that a project must meet FEMA benefit cost criteria. The Town must also have a FEMA approved Hazard Mitigation Plan that is current.

A High prioritization denotes that the action is either critical or potential funding is readily available and should have a timeframe of implementation of less than two years. A Medium prioritization is warranted where the action is less critical or the potential funding is not readily available and has a timeframe for implementation of more than two years but less than four. A Low prioritization indicates that the timeframe for implementation of the action, given the action's cost, availability of funding, and the community's need to address the issue, is more than four years.

**Attachments**

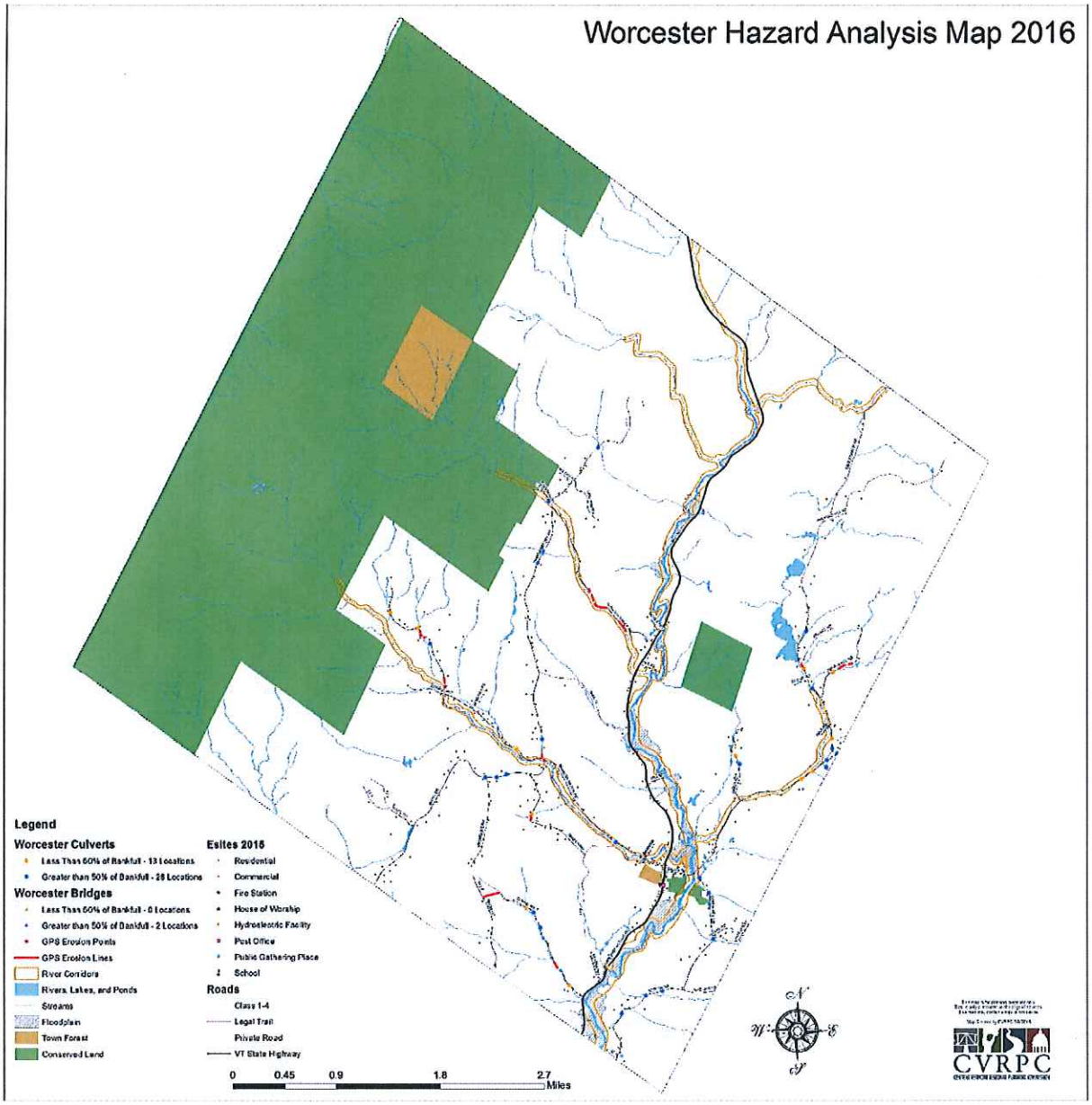
E. Hazard Mitigation Strategy Matrix
F. Hazard Analysis Map
G. Transportation Risk Analysis Map (aka Vulnerability Assessment Map)
H. Certificate of Adoption

Appendix A. North Branch Corridor Projects – Table 33.

## A. Hazard Mitigation Strategy Matrix

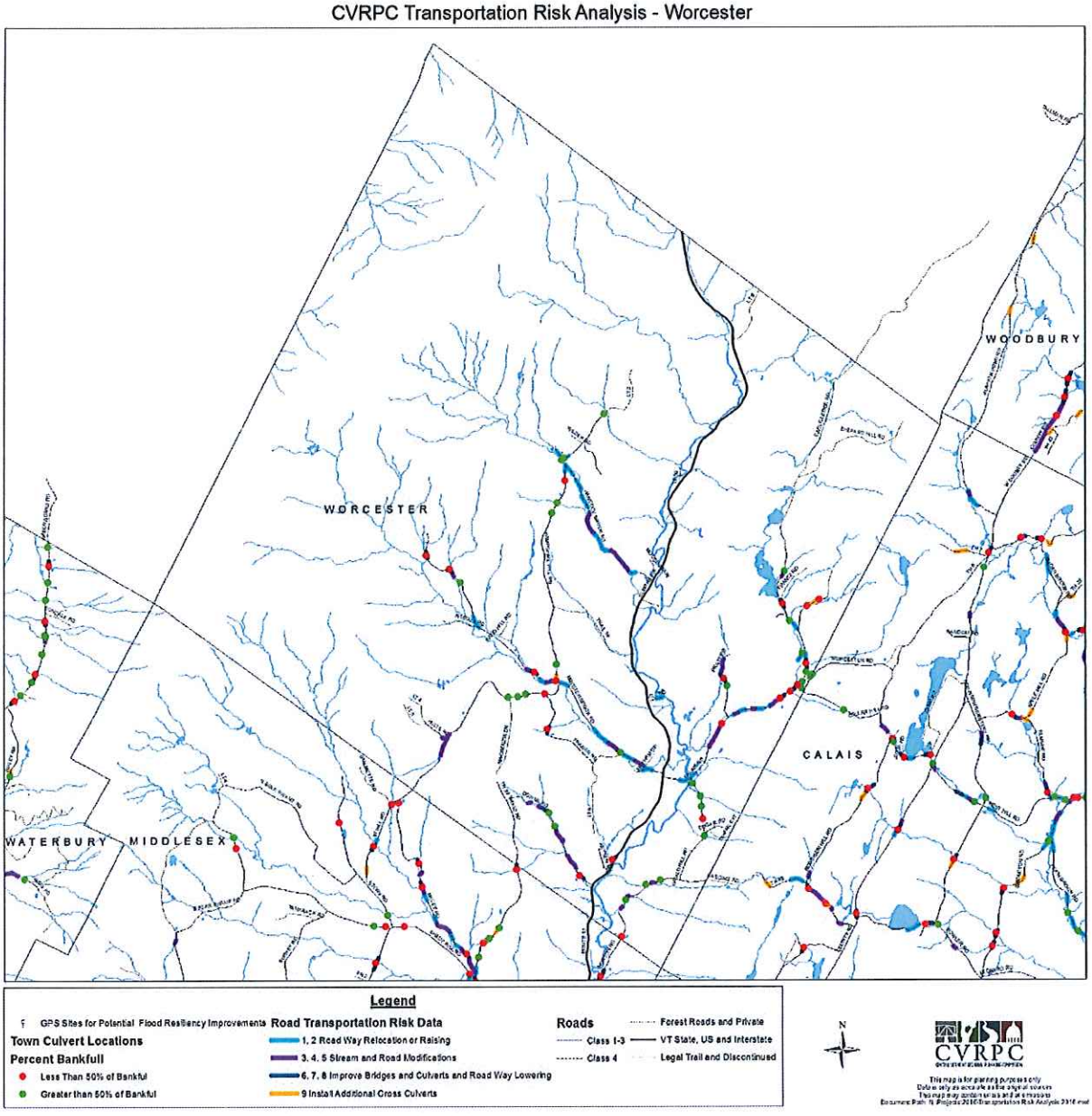
| Mitigation Action | Local Leadership | Prioritization (High, Med) | Possible Resources | Time Frame |
|---|---|---|---|---|
| Replacement and upgrade of Minister Brook Rd, Jim Dawson's field, Downs Rd bridges and culverts | Select Board, Planning Commission, Fire Chief | High | HMPG<br>DOD Flood Controls Projects | 1-3 years |
| Perform high priority corridor planning projects as outlined in the North Branch Corridor Plan | Planning Commission, Conservation Commission, S B, VT RMP, NRCS, FWR, F&W | High | PDM-C<br>HMGP | 2-4 years |
| "Harden" utility services within the town through the replacement/burying of above-ground utility services. | Select Board | Low | EMGP | 4-5 years |
| Extend Fluvial Erosion Hazard zone next review of flooding bylaw | Planning Commission Select Board | Med | EMGP | 3-5 years |
| Work with State to develop alternative water supplies in State Forest for wildfire suppression purposes | Planning Commission VT ANR | Med | EMGP | 2 years |
| Remove taller and dead trees from land surrounding camps in State Forest | VT ANR | Low | EMGP | 3-5 years |
| Perform routine inspections on the boiler | School Board | High | Town Budget | Yearly |
| Retrofit and strengthen boiler room to better contain an explosion | School Board | Low | EMGP | 5 years |
| Work with elected officials, the State and FEMA to provide education and training on the NFIP to ensure compliance and understanding of the program by the Worcester community. | Select board | Med | HMGP | 1-3 years |
| Hampshire Hill Rd, Norton Rd, Hancock Brook Rd, Downs Rd, Ira B Rd, Eagle Ledge Rd, Harris Hill Rd, Gould Hill Rd, Ledge Rd, Minister Brook Rd, Culvert, Ditch, Stream Erosion | Select board | High | Town Budget | 1-3 years |

B. Hazard Analysis Map



## C. Transportation Risk Analysis Map

CVRPC Transportation Risk Analysis - Worcester



**CERTIFICATE OF ADOPTION**

**<<DATE>>**

**TOWN OF Worcester, Vermont Selectboard**

**A RESOLUTION ADOPTING THE Worcestser, Vermont 2017 Local Hazard Mitigation Plan**

WHEREAS, the Town of Worcester has historically experienced severe damage from natural hazards and it continues to be vulnerable to the effects of the hazards profiled in the **2017 Worcester, Vermont Local Hazard Mitigation Plan,** which can result in loss of property and life, economic hardship, and threats to public health and safety; and

WHEREAS, the Town of Worcester has developed and received conditional approval from the Federal Emergency Management Agency (FEMA) for its **2017 Worcester, Vermont Local Hazard Mitigation Plan (Plan)** under the requirements of 44 CFR 201.6; and

WHEREAS, the **Plan** specifically addresses hazard mitigation strategies, and Plan maintenance procedures for the Town of Worcester; and

WHEREAS, the **Plan** recommends several hazard mitigation actions (projects) that will provide mitigation for specific natural hazards that impact the Town of Worcester with the effect of protecting people and property from loss associated with those hazards; and

WHEREAS, adoption of this **Plan** will make the Town of Worcester eligible for funding to alleviate the impacts of future hazards; now therefore be it

RESOLVED by Town of Worcester Selectboard:

1. The **2017 Worcester, Vermont Local Hazard Mitigation Plan** is hereby adopted as an official plan of the Town of Worcester;

2. The respective officials identified in the mitigation action plan of the **Plan** are hereby directed to pursue implementation of the recommended actions assigned to them;

3. Future revisions and **Plan** maintenance required by 44 CFR 201.6 and FEMA are hereby adopted as part of this resolution for a period of five (5) years from the date of this resolution; and

4. An annual report on the process of the implementation elements of the Plan will be presented to the Selectboard by the Emergency Management Director or Coordinator.

IN WITNESS WHEREOF, the undersigned have affixed their signature and the corporate seal of the Town of Worcester this ____ day of _____ 2017.

_____

Selectboard Chair

_____

Selectboard Member

ATTEST_____Town Clerk

_____

Selectboard Member

**Appendix A – North Branch Corridor Projects Table 33,** Pages 1 – 19.

Appendix A.

# North Branch of the Winooski River Corridor Plan

## Washington County
## March 2009

**Prepared for:**

**Central Vermont Regional Planning Commission**
**29 Main Street, Suite 4**
**Montpelier, VT 05602**
**and**
**Friends of the Winooski River**
**P.O. Box 777**
**Montpelier, VT 05601**

**Prepared by:**

**The Johnson Company, Inc.**
**100 State Street**
**Montpelier, VT 05602**

**Table 33: Corridor Planning Project and Strategy Summary Table North Branch - Winooski River- Washington County, VT**

| Project # (Figure #) | Project Type | Reach/Segment Condition-Sensitivity | Site Description including Stressors and Constraints | Project or Strategy Description | Technical Feasibility & Priority | Other Social Benefits | Cost | Land Uses Conversion & Landowner Commitment | Potential Partner Commitments |
|---|---|---|---|---|---|---|---|---|---|
| 1 (18) | Restore Incised Reach | M03B - Poor - Extreme | Highly incised reach (ratio of 2.0). Increased flows and load due to historic land use activities. Influenced by upstream dam. Reach currently undeveloped forest/North Branch Nature Center | Active floodplain resotration to restore sediment/nutrient retention function and reduce future erosion hazards. Ideally combined with river corridor protection (see project # 52). | Feasible; river corridor undeveloped, high watershed priority | Wildlife habitat improvement, possible demonstration project for other reaches, sediment and nutrient retention | Design/permitting costs, construction costs, possible easement transactions and buffer planting costs | Fields to floodplain | VT RMP, NRCS, F&W, FWR, CVRPC |
| 2 (22a, 22b) | Restore Incised Reach | M08A - Poor - Very High | Highly incised reach (ratio of 1.8), Impacted by downstream Wrightsville dam. Corridor currently undeveloped bordered by Route 12 and Norton Road | Active floodplain resotration to restore sediment/nutrient retention function and reduce future erosion hazards. Ideally combined with river corridor protection (see project # 53). | Feasible; river corridor undeveloped, high watershed priority | Wildlife habitat improvement, possible demonstration project for other reaches, sediment and nutrient retention | Design/permitting costs, construction costs, possible easement transactions and buffer planting costs | Forest and shrub/sapling converted to floodplain | VT RMP, NRCS, F&W, FWR, CVRPC |
| 3 (22a, 22b) | Restore Incised Reach | M08B - Poor - Very High | Highly incised reach (ratio of 1.9), Impacted by downstream Wrightsville dam. Corridor currently undeveloped bordered by Route 12 and Norton Road | Active floodplain resotration to restore sediment/nutrient retention function and reduce future erosion hazards. Ideally combined with river corridor protection (see project # 54). | Feasible; river corridor undeveloped, high watershed priority | Wildlife habitat improvement, possible demonstration project for other reaches, sediment and nutrient retention | Design/permitting costs, construction costs, possible easement transactions and buffer planting costs | Forest and shrub/sapling converted to floodplain | VT RMP, NRCS, F&W, FWR, CVRPC |
| 4 (25) | Restore Incised Reach | M11A - Fair - High | Highly incised reach (ratio of 1.6). Increased flows and load due to historic land use activities. Reach currently undeveloped pasture/cropland | Active floodplain resotration to restore sediment/nutrient retention function and reduce future erosion hazards. Ideally combined with buffer planting and river corridor protection (see project #s 61 and 48). | Feasible; river corridor undeveloped, high watershed priority | Wildlife habitat improvement, possible demonstration project for other reaches, sediment and nutrient retention | Design/permitting costs, construction costs, possible easement transactions and buffer planting costs | Pasture and Hay/Crop to floodplain | VT RMP, NRCS, F&W, FWR, CVRPC |
| 5 (25) | Restore Incised Reach | M11C - Fair - Very High | Highly incised reach (ratio of 1.9). Increased flows and load due to historic land use activities. Reach currently undeveloped pasture/cropland | Active floodplain resotration to restore sediment/nutrient retention function and reduce future erosion hazards. Ideally combined with buffer planting and river corridor protection (see project #s 62 and 49). | Feasible; river corridor undeveloped, high watershed priority | Wildlife habitat improvement, possible demonstration project for other reaches, sediment and nutrient retention | Design/permitting costs, construction costs, possible easement transactions and buffer planting costs | Pasture and Hay/Crop to floodplain | VT RMP, NRCS, F&W, FWR, CVRPC |

**Table 33: Corridor Planning Project and Strategy Summary Table North Branch - Winooski River- Washington County, VT**

| Project # (Figure #) | Project Type | Reach/Segment Condition-Sensitivity | Site Description including Stressors and Constraints | Project or Strategy Description | Technical Feasibility & Priority | Other Social Benefits | Cost | Land Uses Conversion & Landowner Commitment | Potential Partner Commitments |
|---|---|---|---|---|---|---|---|---|---|
| 6 (37a, 37b) | Restore Incised Reach | T2.02 - Poor - High | Highly incised reach (ratio of 2.0). Increased flows and load due to historic land use activities and encroachments. Corridor currently mostly undeveloped with Minister Brook Road and some residential development | Active floodplain resotration to restore sediment/nutrient retention function and reduce future erosion hazards. Ideally combined with river corridor protection,dam and berm removal, and buffer planting (see project #s 47, 57, 58, and 69). | Mostly feasible; river corridor mostly undeveloped (except along road), high watershed priority | Wildlife habitat improvement, possible demonstration project for other reaches, sediment and nutrient retention | Design/permitting costs, construction costs, possible easement transactions and buffer planting costs | Fields and forest to floodplain | VT RMP, NRCS, F&W, FWR, CVRPC |
| 7 (27a, 27b) | Restore Incised Reach | M13A - Fair - Very High | Highly incised reach (ratio of 1.9). Increased flows and load due to historic land use activities and encroachments. Corridor currently mostly undeveloped forest and pasture. Bedrock grade control located upstream | Active floodplain resotration to restore sediment/nutrient retention function and reduce future erosion hazards. Ideally combined with river corridor protection and buffer enhancement (see project #s 50 and 67). | Feasible; river corridor undeveloped, high watershed priority | Wildlife habitat improvement, possible demonstration project for other reaches, sediment and nutrient retention | Design/permitting costs, construction costs, possible easement transactions and buffer planting costs | Feasible; river corridor mostly undeveloped, high watershed priority | VT RMP, NRCS, F&W, FWR, CVRPC |
| 8 (27a, 27b) | Restore Incised Reach | M13C - Poor - High | Highly incised reach (ratio of 1.6). Increased flows and load due to historic land use activities and encroachments. Corridor currently mostly undeveloped forest and pasture, bedrock grade control located downstream | Active floodplain resotration to restore sediment/nutrient retention function and reduce future erosion hazards. Ideally combined with river corridor protection and buffer enhancement (see project #s 51 and 68). | Feasible; river corridor undeveloped, high watershed priority | Wildlife habitat improvement, possible demonstration project for other reaches, sediment and nutrient retention | Design/permitting costs, construction costs, possible easement transactions and buffer planting costs | Feasible; river corridor mostly undeveloped, high watershed priority | VT RMP, NRCS, F&W, FWR, CVRPC |
| 9 (26) | Restore Incised Reach | M12B - Fair - Very High | Highly incised reach (ratio of 1.6). Increased flows and load due to historic land use activities and encroachments. Corridor currently mostly undeveloped forest except around Elmore road bridge, bedrock grade control located downstream | Active floodplain resotration to restore sediment/nutrient retention function and reduce future erosion hazards. Ideally combined with river corridor protection (see project # 55). | Feasible; river corridor undeveloped, high watershed priority | Wildlife habitat improvement, possible demonstration project for other reaches, sediment and nutrient retention | Design/permitting costs, construction costs, possible easement transactions and buffer planting costs | Feasible; river corridor mostly undeveloped, high watershed priority | VT RMP, NRCS, F&W, FWR, CVRPC |
| 10 (36) | Corridor Protection | T2.01A - Fair - High | Alluvial fan portion of Minister Brook, Highly incised with future adustments expected, Highly sensitive reach, dominated by forest and pasture/crop land, protection needed to allow for future adjustment and return to sediment/nutrient attenuation | Protect existing river corridor to prevent channel management and allow for further adjustments | Feasible, river corridor undeveloped forest and ag land, high watershed priority | Possible wildlife habitat improvement, possible demonstration project for other reaches, retain sediment and nutrient retention | Possible easement transaction costs | Ag and forest land to buffer | VT RMP, NRCS, F&W, FWR, CVRPC |

**Table 33: Corridor Planning Project and Strategy Summary Table North Branch - Winooski River- Washington County, VT**

| Project # (Figure #) | Project Type | Reach/Segment Condition-Sensitivity | Site Description including Stressors and Constraints | Project or Strategy Description | Technical Feasibility & Priority | Other Social Benefits | Cost | Land Uses Conversion & Landowner Commitment | Potential Partner Commitments |
|---|---|---|---|---|---|---|---|---|---|
| 11 (26) | Corridor Protection | M12A - Fair - Very High | Reach not currently incised with active widening and aggradaiton, Incised segment B upstream providing increased flow and sediment with future adustments expected, Highly sensitive, dominated by forest residential/lawn, protection needed to allow for future adjustment and continued sediment/nutrient | Protect existing river corridor to prevent channel management and allow for further adjustments and continued sediment attenuation | Feasible, river corridor undeveloped, high watershed priority | Possible wildlife habitat improvement, possible demonstration project for other reaches, retain sediment and nutrient retention | Possible easement transaction costs | forest land to buffer | VT RMP, NRCS, F&W, FWR, CVRPC |
| 12 (23a, 23b) | Corridor Protection | M09B - Fair - Very High | Reach moderately incised (1.4) with active widening and aggradaiton, Highly sensitive, dominated by forest and hay, protection needed to allow for future adjustments | Protect existing river corridor to prevent channel management and allow for further adjustments | Feasible, river corridor undeveloped, high watershed priority | Possible wildlife habitat improvement, possible demonstration project for other reaches, retain sediment and nutrient retention | Possible easement transaction costs | forest and hay fields to buffer | VT RMP, NRCS, F&W, FWR, CVRPC |
| 13 (24) | Corridor Protection | M10C - Fair - Very High | Reach moderately incised (1.3) with active widening and aggradaiton, Highly sensitive, dominated by forest and hay, protection needed to allow for future adjustments | Protect existing river corridor to prevent channel management and allow for further adjustments | Feasible, river corridor undeveloped, high watershed priority | Possible wildlife habitat improvement, possible demonstration project for other reaches, retain sediment and nutrient retention | Possible easement transaction costs | forest and hay fields to buffer | VT RMP, NRCS, F&W, FWR, CVRPC |
| 14 (33) | Corridor Protection | T1.01A - Good - Moderate | Alluvial Fan portion of Martins Brook, Reach currently stable, but very sensitive with likely future adjustments. Important sediment and nutrient attenuation area, dominated by forest and shrub/sapling, protection needed to retain sediment and nutrient attenuation function | Protect existing river corridor to prevent channel management and allow for further adjustments | Feasible, river corridor undeveloped, high watershed priority | Possible wildlife habitat improvement, possible demonstration project for other reaches, retain sediment and nutrient retention | Possible easement transaction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC |
| 15 (39) | Corridor Protection | T3.01A - Poor - Very High | Alluvial Fan portion of Worcester Brook, Reach currently experiencing widening, aggradation and planform adjustments, Important sediment and nutrient attenuation area, dominated by forest and shrub/sapling, protection needed to retain sediment and nutrient attenuation function | Protect existing river corridor to prevent channel management and allow for further adjustments | Feasible, river corridor undeveloped, high watershed priority | Possible wildlife habitat improvement, possible demonstration project for other reaches, retain sediment and nutrient retention | Possible easement transaction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC |

**Table 33: Corridor Planning Project and Strategy Summary Table North Branch - Winooski River- Washington County, VT**

| Project # (Figure #) | Project Type | Reach/Segment Condition-Sensitivity | Site Description including Stressors and Constraints | Project or Strategy Description | Technical Feasibility & Priority | Other Social Benefits | Cost | Land Uses Conversion & Landowner Commitment | Potential Partner Commitments |
|---|---|---|---|---|---|---|---|---|---|
| 16 (19) | Corridor Protection | M04 - Fair - Very High | Reach moderately incised (1.3) with active aggradaiton, Highly sensitive to future adjustments, dominated by hay fields, Route 12 in small portion of corridor, protection needed to allow for future adjustments | Protect existing river corridor to prevent channel management and allow for further adjustments | Feasible, river corridor undeveloped except for Route 12 in upstream end, high watershed priority | Possible wildlife habitat improvement, possible demonstration project for other reaches, retain sediment and nutrient retention | Possible easement transaction costs | Hay fields to floodplain and buffer | VT RMP, NRCS, F&W, FWR, CVRPC |
| 17 (29) | Corridor Protection | M15A - Good - High | Reach currently stable but highly sensitive to future adjustments due to alluvial fan from Hardwood Brook (T6.01), dominated by hay and crop, protection needed to allow for future adjustments and retain sediment and nutrient attenuation | Protect existing river corridor to prevent channel management and allow for further adjustments | Feasible, river corridor undeveloped hay and crop land, high watershed priority | Possible wildlife habitat improvement, possible demonstration project for other reaches, retain sediment and nutrient retention | Possible easement transaction costs | Hay fields to floodplain and buffer | VT RMP, NRCS, F&W, FWR, CVRPC |
| 18 (18) | Corridor Protection | M03A - Fair - Very High | Reach currently moderately incised with active aggradation, highly sensitive to future adjustments with highly incised M03B upstream, dominated by shrub/sapling, protection needed to allow for future adjustments and regain sediment and nutrient attenuation | Protect existing river corridor to prevent channel management and allow for further adjustments | Feasible, river corridor undeveloped shrub/sapling, high watershed priority | Possible wildlife habitat improvement, possible demonstration project for other reaches, retain sediment and nutrient retention | Possible easement transaction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC |
| 19 (45) | Corridor Protection | T6.01 - Fair - Very High | Alluvial Fan portion of Hardwood Brook, Reach currently experiencing aggradation and planform adjustments, Important sediment and nutrient attenuation area, dominated by forest and sparse residential development, protection needed to retain sediment and nutrient attenuation function | Protect existing river corridor to prevent channel management and allow for further adjustments, Ideally combined with corridor protection for Reach M15A (project #17) | Feasible, river corridor mostly undeveloped forest, high watershed priority | Possible wildlife habitat improvement, possible demonstration project for other reaches, retain sediment and nutrient retention | Possible easement transaction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC |
| 20 (42) | Corridor Protection | T4.01 - Fair - High | Alluvial Fan portion of Hancock Brook, Reach currently experiencing aggradation and planform adjustments, Important sediment and nutrient attenuation area, dominated by forest and sparse residential development, protection needed to retain sediment and nutrient attenuation function | Protect existing river corridor to prevent channel management and allow for further adjustments | Feasible, river corridor mostly undeveloped shrub/sapling, high watershed priority | Possible wildlife habitat improvement, possible demonstration project for other reaches, retain sediment and nutrient retention | Possible easement transaction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC |

**Table 33: Corridor Planning Project and Strategy Summary Table North Branch - Winooski River- Washington County, VT**

| Project # (Figure #) | Project Type | Reach/Segment Condition-Sensitivity | Site Description including Stressors and Constraints | Project or Strategy Description | Technical Feasibility & Priority | Other Social Benefits | Cost | Land Uses Conversion & Landowner Commitment | Potential Partner Commitments |
|---|---|---|---|---|---|---|---|---|---|
| 21 (25) | Corridor Protection | M11B - Fair - Very High | Reach currently not incised and experiencing aggradation and widening adjustments, important sediment and nutrient attenuation area sandwiched between incised segment A and C, dominated by pasture, protection needed to retain sediment and nutrient attenuation function | Protect existing river corridor to prevent channel management and allow for further adjustments, Ideally combined with buffer/fencing project (#59), and restoration of segments A/C (#4, 5) | Feasible, river corridor mostly pasture, high watershed priority | Possible wildlife habitat improvement, possible demonstration project for other reaches, retain sediment and nutrient retention | Possible easement transaction costs | Pasture to possible buffer | VT RMP, NRCS, F&W, FWR, CVRPC |
| 22 (41) | Corridor Protection | T3.03B - Fair - Very High | Reach currently slightly incised (1.2) and experiencing widening and planform adjustments, dominated by pasture, protection needed to retain/improve sediment and nutrient attenuation function | Protect existing river corridor to prevent channel management and allow for further adjustments, Ideally combined with buffer/fencing project (#60) | Feasible, river corridor mostly pasture, high watershed priority | Possible wildlife habitat improvement, possible demonstration project for other reaches, retain sediment and nutrient retention | Possible easement transaction costs | Pasture to possible buffer | VT RMP, NRCS, F&W, FWR, CVRPC |
| 23 (41) | Corridor Protection | T3.03A | Reach not fully assessed, currently dominated by wetland and beaver dams, provides sediment and nutrient storage as well as wildlife habitat, corridor protection needed to retain these assets | Protect existing river corridor to prevent channel management and allow for further adjustments, Ideally combined with protection of upstream segment as well project (#22) | Feasible, river corridor undeveloped, high watershed priority | Possible wildlife habitat improvement, possible demonstration project for other reaches, retain sediment and nutrient retention | Possible easement transaction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC |
| 24 (34) | Corridor Protection | T1.02B | Reach currently slightly incised (1.1) and experiencing aggradation and planform adjustments, dominated by pasture on left and Shady Rill Road on right, protection needed to retain/improve sediment and nutrient attenuation function | Protect existing river corridor on right to prevent channel management and allow for further adjustments, Ideally combined with buffer planting project (#78) | Feasible, river corridor undeveloped on left, medium watershed priority | Possible wildlife habitat improvement, possible demonstration project for other reaches, retain sediment and nutrient retention | Possible easement transaction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC |
| 25 (23a) | Corridor Protection | M09A - Good - High | Reach currently not incised and relatively stable, dominated by mix of forest and hay, protection needed to retain sediment and nutrient attenuation function | Protect existing river corridor to prevent channel management and allow for future adjustments | Feasible, river corridor undeveloped, medium watershed priority | Possible wildlife habitat improvement, possible demonstration project for other reaches, retain sediment and nutrient retention | Possible easement transaction costs | Forest/Hay to buffer/floodplain | VT RMP, NRCS, F&W, FWR, CVRPC |

**Table 33: Corridor Planning Project and Strategy Summary Table North Branch - Winooski River- Washington County, VT**

| Project # (Figure #) | Project Type | Reach/Segment Condition-Sensitivity | Site Description including Stressors and Constraints | Project or Strategy Description | Technical Feasibility & Priority | Other Social Benefits | Cost | Land Uses Conversion & Landowner Commitment | Potential Partner Commitments |
|---|---|---|---|---|---|---|---|---|---|
| 26 (39) | Corridor Protection | T3.01B - Fair - High | Reach currently slightly incised (1.2) and experiencing aggradation and planform adjustments, dominated by mix of forest and shrub/sapling with Calais Road on left edge of corridor, protection needed to retain sediment and nutrient attenuation function | Protect existing river corridor to prevent channel management and allow for future adjustments | Feasible, river corridor mostly undeveloped (Calais Road on left edge), medium watershed priority | Possible wildlife habitat improvement, possible demonstration project for other reaches, retain sediment and nutrient retention | Possible easement transaction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC |
| 27 (17b) | Corridor Protection | M02B - Fair - Very High | Reach currently slightly incised (1.1) and experiencing aggradation, dominated by mix of forest and residential, protection of undeveloped portions needed to prevent further encroachment and retain sediment and nutrient attenuation function | Protect existing undeveloped portion of river corridor to prevent channel management and retain sediment and nutrient attenuation function, and allow for future adjustments | Feasible, river corridor mostly undeveloped (Calais Road on left edge), medium watershed priority | Possible wildlife habitat improvement, possible demonstration project for other reaches, retain sediment and nutrient retention | Possible easement transaction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC |
| 28 (31) | Corridor Protection | M17 - Good - High | Reach currently not incised and relatively stable, dominated by mix of forest and shrub/sapling, protection of undeveloped corridor needed retain sediment and nutrient attenuation function | Protect existing undeveloped river corridor to retain sediment and nutrient attenuation function, and allow for future adjustments | Feasible, river corridor undeveloped, medium watershed priority | Possible wildlife habitat improvement, possible demonstration project for other reaches, retain sediment and nutrient retention | Possible easement transaction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC |
| 29 (32) | Corridor Protection | M18B - Fair - Very High | Reach currently moderately incised (1.3) and experiencing widening, aggradation and planform adjustments, dominated by mix of forest and shrub/sapling, protection of undeveloped corridor needed retain/restore sediment and nutrient attenuation function | Protect existing undeveloped river corridor to retain sediment and nutrient attenuation function, and allow for future adjustments | Feasible, river corridor undeveloped, medium watershed priority | Possible wildlife habitat improvement, possible demonstration project for other reaches, retain sediment and nutrient retention | Possible easement transaction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC |
| 30 (28) | Corridor Protection | M14A - Fair - Very High | Reach currently not incised and experiencing widening, aggradation and planform adjustments, dominated by forest, protection of undeveloped corridor needed to retain sediment and nutrient attenuation function | Protect existing undeveloped river corridor to retain sediment and nutrient attenuation function, and allow for future adjustments | Feasible, river corridor undeveloped, medium watershed priority | Possible wildlife habitat improvement | Possible easement transaction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC |

**Table 33: Corridor Planning Project and Strategy Summary Table North Branch - Winooski River- Washington County, VT**

| Project # (Figure #) | Project Type | Reach/Segment Condition-Sensitivity | Site Description including Stressors and Constraints | Project or Strategy Description | Technical Feasibility & Priority | Other Social Benefits | Cost | Land Uses Conversion & Landowner Commitment | Potential Partner Commitments |
|---|---|---|---|---|---|---|---|---|---|
| 31 (28) | Corridor Protection | M14B - Fair - Very High | Reach currently not incised and experiencing widening, aggradation and planform adjustments, dominated by forest, protection of undeveloped corridor needed to retain sediment and nutrient attenuation function | Protect existing undeveloped river corridor to retain sediment and nutrient attenuation function, and allow for future adjustments | Feasible, river corridor undeveloped, medium watershed priority | Possible wildlife habitat improvement | Possible easement transaction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC |
| 32 (33) | Corridor Protection | T1.01B - Fair - High | Reach currently slightly incised (1.1) and experiencing aggradation, dominated by forest, protection of undeveloped corridor needed to retain sediment and nutrient attenuation function | Protect existing undeveloped river corridor to retain sediment and nutrient attenuation function, and allow for future adjustments | Feasible, river corridor undeveloped, medium watershed priority | Possible wildlife habitat improvement, possible demonstration project for other reaches, retain sediment and nutrient retention | Possible easement transaction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC |
| 33 (35) | Corridor Protection | T1.03A - Fair - High | Reach currently not incised and experiencing aggradation, dominated by mix of forest residential with road located on left edge of corridor, protection of undeveloped portion of corridor needed to retain sediment and nutrient attenuation function | Protect existing undeveloped portion of river corridor to retain sediment and nutrient attenuation function, and allow for future adjustments | Feasible, river corridor mostly undeveloped, roadway located along left edge of corridor, medium watershed priority | Possible wildlife habitat improvement, possible demonstration project for other reaches, retain sediment and nutrient retention | Possible easement transaction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC |
| 34 (26) | Corridor Protection | M12C - Fair - Very High | Reach currently moderately incised and experiencing aggradation and widening, dominated by forest, protection of undeveloped corridor needed to allow adjustments and regain sediment and nutrient attenuation function | Protect existing undeveloped portion of river corridor to allow channel adjustment and regain sediment and nutrient attenuation function | Feasible, river corridor undeveloped, medium watershed priority | Possible wildlife habitat improvement, possible demonstration project for other reaches, regain sediment and nutrient retention | Possible easement transaction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC |
| 35 (24) | Corridor Protection | M10A - Fair - Very High | Reach currently moderately incised (1.5) and experiencing aggradation, dominated by forest, but influenced by presence of dam downstream, protection of undeveloped corridor needed to allow adjustments and regain sediment and nutrient attenuation function | Protect existing undeveloped portion of river corridor to allow channel adjustment and regain sediment and nutrient attenuation function | Feasible, river corridor undeveloped, low watershed priority | Possible wildlife habitat improvement, possible demonstration project for other reaches, regain sediment and nutrient retention | Possible easement transaction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC |

**Table 33: Corridor Planning Project and Strategy Summary Table North Branch - Winooski River- Washington County, VT**

| Project # (Figure #) | Project Type | Reach/Segment Condition-Sensitivity | Site Description including Stressors and Constraints | Project or Strategy Description | Technical Feasibility & Priority | Other Social Benefits | Cost | Land Uses Conversion & Landowner Commitment | Potential Partner Commitments |
|---|---|---|---|---|---|---|---|---|---|
| 36 (32) | Corridor Protection | M18A - Good - High | Reach currently relatively stable, dominated by forest with roadway along left edge of corridor, protection of undeveloped corridor needed to allow for possible future adjustments and retain sediment and nutrient retention | Protect existing undeveloped portion of river corridor to allow for channel adjustment and retain sediment and nutrient attenuation function | Feasible, river corridor undeveloped, low watershed priority | Possible wildlife habitat improvement, possible demonstration project for other reaches | Possible easement transaction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC |
| 37 (35) | Corridor Protection | T1.03B - Good - Moderate | Reach currently relatively stable, dominated by forest, naturally a transport system so limited sediment and nutrient retention capabilities, protection of undeveloped corridor needed to allow possible future adjustments | Protect existing undeveloped river corridor to allow for future channel adjustments | Feasible, river corridor undeveloped, low watershed priority | Possible wildlife habitat improvement, possible demonstration project for other reaches | Possible easement transaction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC |
| 38 (29) | Corridor Protection | M15B - Good - Moderate | Reach currently relatively stable, dominated by forest, naturally a transport system so limited sediment and nutrient retention capabilities, protection of undeveloped corridor needed to allow possible future adjustments | Protect existing undeveloped river corridor to allow for future channel adjustments | Feasible, river corridor undeveloped, low watershed priority | Possible wildlife habitat improvement, possible demonstration project for other reaches | Possible easement transaction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC |
| 39 (34) | Corridor Protection | T1.02C - Fair - High | Reach currently relatively stable with minor widening and aggradation, dominated by forest with roadway along right edge of corridor, naturally a transport system so limited sediment and nutrient retention capabilities, protection of undeveloped corridor needed to allow possible future adjustments | Protect existing undeveloped river corridor to allow for future channel adjustments | Feasible, river corridor undeveloped, low watershed priority | Possible wildlife habitat improvement, possible demonstration project for other reaches | Possible easement transaction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC |
| 40 (38a) | Corridor Protection | T2.03A - Fair - Very High | Reach currently not incised and experiencing aggradation and planform adjustments, dominated by forest on right and residential on left, protection of undeveloped portion of corridor needed to allow for possible future adjustments and retain sediment and nutrient retention | Protect existing undeveloped portion of river corridor to allow for channel adjustment and retain sediment and nutrient attenuation function | Feasible, river corridor undeveloped on right, low watershed priority | Possible wildlife habitat improvement, possible demonstration project for other reaches | Possible easement transaction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC |

**Table 33: Corridor Planning Project and Strategy Summary Table North Branch - Winooski River- Washington County, VT**

| Project # (Figure #) | Project Type | Reach/Segment Condition-Sensitivity | Site Description including Stressors and Constraints | Project or Strategy Description | Technical Feasibility & Priority | Other Social Benefits | Cost | Land Uses Conversion & Landowner Commitment | Potential Partner Commitments |
|---|---|---|---|---|---|---|---|---|---|
| 41 (38b) | Corridor Protection | T2.03B - Fair - Low | Reach currently not incised and experiencing aggradation and planform adjustments, dominated by forest, segment naturally a transport reach so sediment and nutrient retention minimal, protection of undeveloped portion of corridor needed to allow for possible future adjustments | Protect existing undeveloped portion of river corridor to allow for channel adjustment | Feasible, river corridor undeveloped, low watershed priority | Possible wildlife habitat improvement, possible demonstration project for other reaches | Possible easement transaction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC |
| 42 (30a, 30b) | Corridor Protection | M16B - Fair - High | Reach highly incised (1.6), but contains several bedrock grade controls, dominated by forest, protection of undeveloped corridor needed to allow for possible future adjustments | Protect existing undeveloped river corridor to allow for channel adjustment | Feasible, river corridor undeveloped, low watershed priority | Possible wildlife habitat improvement, possible demonstration project for other reaches | Possible easement transaction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC |
| 43 (40) | Corridor Protection | T3.02A - Fair - High | Reach moderately incised (1.4) and experiencing aggradation and planform adjustments, dominated by forest with road on right edge of corridor, reach naturally a transport system so sediment and nutrient retention minimal, protection of undeveloped corridor needed to allow for possible future adjustments | Protect existing undeveloped river corridor to allow for channel adjustment | Feasible, river corridor undeveloped, low watershed priority | Possible wildlife habitat improvement, possible demonstration project for other reaches | Possible easement transaction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC |
| 44 (43) | Corridor Protection | T4.02 - Good - Moderate | Reach currently relatively stable, dominated by forest, segment naturally a transport reach so sediment and nutrient retention minimal, protection of undeveloped portion of corridor needed to allow for possible future adjustments | Protect existing undeveloped river corridor to allow for channel adjustment | Feasible, river corridor undeveloped, low watershed priority | Possible wildlife habitat improvement, possible demonstration project for other reaches | Possible easement transaction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC |
| 45 (44) | Corridor Protection | T4.03 - Fair - Very High | Reach currently relatively stable and experiencing minor aggradation and widening, dominated by forest, segment naturally a transport reach so sediment and nutrient retention minimal, protection of undeveloped portion of corridor needed to allow for possible future adjustments | Protect existing undeveloped river corridor to allow for channel adjustment | Feasible, river corridor undeveloped, low watershed priority | Possible wildlife habitat improvement, possible demonstration project for other reaches | Possible easement transaction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC |

**Table 33: Corridor Planning Project and Strategy Summary Table North Branch - Winooski River- Washington County, VT**

| Project # (Figure #) | Project Type | Reach/Segment Condition-Sensitivity | Site Description including Stressors and Constraints | Project or Strategy Description | Technical Feasibility & Priority | Other Social Benefits | Cost | Land Uses Conversion & Landowner Commitment | Potential Partner Commitments |
|---|---|---|---|---|---|---|---|---|---|
| 46 (36) | Corridor Protection | T2.01B - Fair - High | Reach currently incised due to berms and human encroachments, also aggrading, dominated by crop and commercial land protected by berms, corridor protection only feasible if combined with berm removal in downstream portion of segment to restore floodplain access | Must be combined with berm removal (project # 56) to be viable project | Feasible if combined with berm removal (project #??), low watershed priority as stand alone project | Possible wildlife habitat improvement, possible demonstration project for other reaches | Possible easement transaction costs | Crop land to floodplain | VT RMP, NRCS, F&W, FWR, CVRPC |
| 47 (37a, 37b) | Corridor Protection | T2.02 - Poor - High | Reach highly incised with aggradation and widening, influenced by berms and human encroachments, corridor protection only feasible if combined with berm removal and active floodplain restoration (project #?? and ??) | Must be combined with berm removal (project # 58) and floodplain restoration (project #6) to be viable project | Feasible if combined with berm removal and floodplain restoration projects, low watershed priority as stand alone project | Possible wildlife habitat improvement, possible demonstration project for other reaches | Possible easement transaction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC |
| 48 (25) | Corridor Protection | M11A - Fair - High | Reach highly incised (1.6) with aggradation and widening, corridor protection only feasible if combined with active floodplain restoration (project #4) | Must be combined with floodplain restoration (project #4) to be viable project | Feasible if combined with floodplain restoration project, low watershed priority as stand alone project | Possible wildlife habitat improvement, possible demonstration project for other reaches | Possible easement transaction costs | possible crop to floodplain | VT RMP, NRCS, F&W, FWR, CVRPC |
| 49 (25) | Corridor Protection | M11C - Fair - Very High | Reach highly incised (1.9) with aggradation and widening, corridor protection only feasible if combined with active floodplain restoration (project #5) | Must be combined with floodplain restoration (project #5) to be viable project | Feasible if combined with floodplain restoration project, low watershed priority as stand alone project | Possible wildlife habitat improvement, possible demonstration project for other reaches | Possible easement transaction costs | possible Hay to floodplain | VT RMP, NRCS, F&W, FWR, CVRPC |
| 50 (27a) | Corridor Protection | M13A - Fair - Very High | Reach highly incised (1.9) with aggradation and widening, corridor protection only feasible if combined with active floodplain restoration (project #7) | Must be combined with floodplain restoration (project #7) to be viable project | Feasible if combined with floodplain restoration project, low watershed priority as stand alone project | Possible wildlife habitat improvement, possible demonstration project for other reaches | Possible easement transaction costs | Possible pasture to floodplain | VT RMP, NRCS, F&W, FWR, CVRPC |

**Table 33: Corridor Planning Project and Strategy Summary Table North Branch - Winooski River- Washington County, VT**

| Project # (Figure #) | Project Type | Reach/Segment Condition-Sensitivity | Site Description including Stressors and Constraints | Project or Strategy Description | Technical Feasibility & Priority | Other Social Benefits | Cost | Land Uses Conversion & Landowner Commitment | Potential Partner Commitments |
|---|---|---|---|---|---|---|---|---|---|
| 51 (27b) | Corridor Protection | M13C - Poor - High | Reach highly incised (1.6) with aggradation and widening, corridor protection only feasible if combined with active floodplain restoration (project #8) | Must be combined with floodplain restoration (project #8) to be viable project | Feasible if combined with floodplain restoration project, low watershed priority as stand alone project | Possible wildlife habitat improvement, possible demonstration project for other reaches | Possible easement transaction costs | Possible pasture to floodplain | VT RMP, NRCS, F&W, FWR, CVRPC |
| 52 (18) | Corridor Protection | M03B - Poor - Extreme | Reach highly incised (2.0) with aggradation and widening, corridor protection only feasible if combined with active floodplain restoration (project #1) | Must be combined with floodplain restoration (project #1) to be viable project | Feasible if combined with floodplain restoration project, low watershed priority as stand alone project | Possible wildlife habitat improvement, possible demonstration project for other reaches | Possible easement transaction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC |
| 53 (22a) | Corridor Protection | M08A - Poor - Very High | Reach highly incised (1.8) with aggradation and widening, corridor protection only feasible if combined with active floodplain restoration (project #2) | Must be combined with floodplain restoration (project #2) to be viable project | Feasible if combined with floodplain restoration project, low watershed priority as stand alone project | Possible wildlife habitat improvement, possible demonstration project for other reaches | Possible easement transaction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC |
| 54 (22b) | Corridor Protection | M08B - Poor - Very High | Reach highly incised (1.9) with aggradation and widening, corridor protection only feasible if combined with active floodplain restoration (project #3) | Must be combined with floodplain restoration (project #3) to be viable project | Feasible if combined with floodplain restoration project, low watershed priority as stand alone project | Possible wildlife habitat improvement, possible demonstration project for other reaches | Possible easement transaction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC |
| 55 (26) | Corridor Protection | M12B - Fair - Very High | Reach highly incised (1.6) with aggradation and widening, corridor protection only feasible if combined with active floodplain restoration (project #9) | Must be combined with floodplain restoration (project #9) to be viable project | Feasible if combined with floodplain restoration project, low watershed priority as stand alone project | Possible wildlife habitat improvement, possible demonstration project for other reaches | Possible easement transaction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC |

**Table 33: Corridor Planning Project and Strategy Summary Table North Branch - Winooski River- Washington County, VT**

| Project # (Figure #) | Project Type | Reach/Segment Condition-Sensitivity | Site Description including Stressors and Constraints | Project or Strategy Description | Technical Feasibility & Priority | Other Social Benefits | Cost | Land Uses Conversion & Landowner Commitment | Potential Partner Commitments |
|---|---|---|---|---|---|---|---|---|---|
| 56 (36) | Berm Removal | T2.01B - Fair - High | Lower portion of segment dominated by hay and crop fields protected by berms. Upper portion confined by valley wall, roadway, and residential/commercial development. Berm removal along fields would re-establish floodplain conection. | Berm removal to re-establish floodplain connection. Ideally combined with river corridor protection (#46) and buffer planting (#64). | Feasible; medium watershed priority | Wildlife habitat improvement, possible demonstration project for other reaches, reduce nutrient inputs, re-establish floodplain connection | design/permitting costs, landowner negotiations, construction/demo costs | hay fields to floodplain | VT RMP, NRCS, F&W, FWR, CVRPC |
| 57 (37a and 37b) | Dam Removal | T2.02 - Poor - High | Reach currently highly incised, 2 old dams (1 at upstream end, the other at downstream end) no longer in use represent channel constriction. Removal of these dams would restore flow/sediment regime of reach. | Dam removal to re-establish floodplain connection. Ideally combined with active floodplain restoration (#6) to re-establish floodplain connection and restore flow/sediment regime. | Feasible; medium watershed priority | Wildlife habitat improvement, possible demonstration project for other reaches, restore flow/sediment regime | design/permitting costs, owner negotiations, construction/demo costs | None | VT RMP, NRCS, F&W, FWR, CVRPC |
| 58 (37a and 37b) | Berm Removal | T2.02 - Poor - High | Reach currently highly incised, two berms located along left bank near hay/crop fields. Removal of berms would restore floodplain access when combined with active floodplain restoration (#6). | Berm removal to re-establish floodplain connection. Ideally combined with river corridor protection (#47) and active floodplain restoration (#6). | Feasible; medium watershed priority | Wildlife habitat improvement, possible demonstration project for other reaches, reduce nutrient inputs, re-establish floodplain connection | design/permitting costs, landowner negotiations, construction/demo costs | hay/crop fields to floodplain | VT RMP, NRCS, F&W, FWR, CVRPC |
| 59 (25) | Buffer Enhancement/ Cattle Exclusion | M11B - Fair - Very High | Reach not incised with active aggradation, corridor dominated by pasture with cows in stream channel. | Tree/buffer planting project to reduce nutrient inputs, fencing and appropriate cow crossing needed, ideally combined with corridor protection project (see project #21) | Feasible; high watershed priority | Wildlife habitat improvement, possible demonstration project for other reaches, reduce nutrient inputs, improve water quality | Planting/fencing design and installation, possible CREP payments | pasture to buffer | VT RMP, NRCS, F&W, FWR, CVRPC |
| 60 (41) | Buffer Enhancement/ Cattle Exclusion | T3.03B - Fair - Very High | Reach slightly incised with minor widening and planform adjustments, corridor dominated by pasture with cows/horses in stream channel. | Tree/buffer planting project to reduce nutrient inputs, fencing and appropriate crossing needed, ideally combined with corridor protection project (see project #22) | Feasible; high watershed priority | Wildlife habitat improvement, possible demonstration project for other reaches, reduce nutrient inputs, improve water quality | Planting/fencing design and installation, possible CREP payments | pasture to buffer | VT RMP, NRCS, F&W, FWR, CVRPC |

**Table 33: Corridor Planning Project and Strategy Summary Table North Branch - Winooski River- Washington County, VT**

| Project # (Figure #) | Project Type | Reach/Segment Condition-Sensitivity | Site Description including Stressors and Constraints | Project or Strategy Description | Technical Feasibility & Priority | Other Social Benefits | Cost | Land Uses Conversion & Landowner Commitment | Potential Partner Commitments |
|---|---|---|---|---|---|---|---|---|---|
| 61 (25) | Buffer Enhancement/ Cattle Exclusion | M11A - Fair - Very High | Segment highly incised with active aggradation and widening, corridor dominated by crop and pasture with cows in stream channel. | Tree/buffer planting project to reduce nutrient inputs, fencing and appropriate cow crossing needed, ideally combined with active floodplain restoration project (see project #4) | Feasible; high watershed priority | Wildlife habitat improvement, possible demonstration project for other reaches, reduce nutrient inputs, improve water quality | Planting/fencing design and installation, possible CREP payments | crop to buffer | VT RMP, NRCS, F&W, FWR, CVRPC |
| 62 (25) | Buffer Enhancement | M11C - Fair - Very High | Segment highly incised with active aggradation and widening, corridor dominated by hay with little to no buffer. | Tree/buffer planting project to reduce nutrient inputs, ideally combined with active floodplain restoration project (see project #5) | Feasible; high watershed priority | Wildlife habitat improvement, possible demonstration project for other reaches, reduce nutrient inputs, improve water quality | Planting design and installation, possible CREP payments | Hay to buffer | VT RMP, NRCS, F&W, FWR, CVRPC |
| 63 (19) | Buffer Enhancement | M04 - Fair - Very High | Segment moderately incised (1.3) with mix if hay and residential in corridor. Several areas of buffers less than 25 feet. | Tree/buffer planting project to reduce nutrient inputs. | Feasible; medium watershed priority | Wildlife habitat improvement, possible demonstration project for other reaches, reduce nutrient inputs, improve water quality | Planting design and installation, possible CREP payments | Hay to buffer | VT RMP, NRCS, F&W, FWR, CVRPC |
| 64 (36) | Buffer Enhancement | T2.01B - Fair - High | Segment not incised with active aggradation, bordered by mix of hay, crop, and commercial/residential development. Area along fields with little to no buffer. | Tree/buffer planting project to reduce nutrient inputs. Ideally combined with berm removal project (#56) | Feasible; medium watershed priority | Wildlife habitat improvement, possible demonstration project for other reaches, reduce nutrient inputs, improve water quality | Planting design and installation, possible CREP payments | Hay to buffer | VT RMP, NRCS, F&W, FWR, CVRPC |
| 65 (23a and 23b) | Buffer Enhancement | M09A - Fair - Very High | Segment not incised and generally stable, bordered by mix of forest and hay. Area along right bank with little to no buffer. | Tree/buffer planting project to reduce nutrient inputs. | Feasible; medium watershed priority | Wildlife habitat improvement, possible demonstration project for other reaches, reduce nutrient inputs, improve water quality | Planting design and installation, possible CREP payments | Hay to buffer | VT RMP, NRCS, F&W, FWR, CVRPC |

**Table 33: Corridor Planning Project and Strategy Summary Table North Branch - Winooski River- Washington County, VT**

| Project # (Figure #) | Project Type | Reach/Segment Condition-Sensitivity | Site Description including Stressors and Constraints | Project or Strategy Description | Technical Feasibility & Priority | Other Social Benefits | Cost | Land Uses Conversion & Landowner Commitment | Potential Partner Commitments |
|---|---|---|---|---|---|---|---|---|---|
| 66 (23a and 23b) | Buffer Enhancement | M09B - Fair - Very High | Segment moderately incised (1.4) with active widening and aggradation, bordered by mix of forest and hay. Area along right bank with little to no buffer. | Tree/buffer planting project to reduce nutrient inputs. | Feasible; medium watershed priority | Wildlife habitat improvement, possible demonstration project for other reaches, reduce nutrient inputs, improve water quality | Planting design and installation, possible CREP payments | Hay to buffer | VT RMP, NRCS, F&W, FWR, CVRPC |
| 67 (27a) | Buffer Enhancement | M13A - Fair - Very High | Segment highly incised (1.6) with active aggradation and planform adjustments. Corridor dominated by mix of forest and pasture with ~2,300 of no buffer on left and 400 feet on right. Ideally combined with active floodplain restoration project (#7). | Tree/buffer planting project to reduce nutrient inputs. | Feasible; low watershed priority, should be combined with active restoration (#7) to prevent future loss of plantings | Wildlife habitat improvement, possible demonstration project for other reaches, reduce nutrient inputs, improve water quality | Planting design and installation, possible CREP payments | pasture to buffer | VT RMP, NRCS, F&W, FWR, CVRPC |
| 68 (27b) | Buffer Enhancement | M13C - Poor - High | Segment highly incised (1.6) with active widening, aggradation and planform adjustments. Corridor dominated by pasture on left with ~200 of no buffer. Ideally combined with active floodplain restoration project (#8). | Tree/buffer planting project to reduce nutrient inputs. | Feasible; low watershed priority, should be combined with active restoration (#8) to prevent future loss of plantings | Wildlife habitat improvement, possible demonstration project for other reaches, reduce nutrient inputs, improve water quality | Planting design and installation, possible CREP payments | pasture to buffer | VT RMP, NRCS, F&W, FWR, CVRPC |
| 69 (37a and 37b) | Buffer Enhancement | T2.02 - Poor - High | Segment highly incised (2.0) with active aggradation, widening, and planform adjustments. Corridor dominated by forest with hay in lower end, ~1,100 of no buffer on left. Ideally combined with active floodplain restoration project (#6). | Tree/buffer planting project to reduce nutrient inputs. | Feasible; low watershed priority, should be combined with active restoration (#6) to prevent future loss of plantings | Wildlife habitat improvement, possible demonstration project for other reaches, reduce nutrient inputs, improve water quality | Planting design and installation, possible CREP payments | hay to buffer | VT RMP, NRCS, F&W, FWR, CVRPC |
| 70 (29) | Buffer Enhancement | M15A - Good - High | Segment not incised and generally stable. Corridor dominated by forest and crop with ~500 feet of no buffer. | Tree/buffer planting project to reduce nutrient inputs. | Feasible; low watershed priority, | Wildlife habitat improvement, possible demonstration project for other reaches, reduce nutrient inputs, improve water quality | Planting design and installation, possible CREP payments | crop to buffer | VT RMP, NRCS, F&W, FWR, CVRPC |

**Table 33: Corridor Planning Project and Strategy Summary Table North Branch - Winooski River- Washington County, VT**

| Project # (Figure #) | Project Type | Reach/Segment Condition-Sensitivity | Site Description including Stressors and Constraints | Project or Strategy Description | Technical Feasibility & Priority | Other Social Benefits | Cost | Land Uses Conversion & Landowner Commitment | Potential Partner Commitments |
|---|---|---|---|---|---|---|---|---|---|
| 71 (24) | Buffer Enhancement | M10C - Fair - Very High | Segment moderately incised (1.3) with active aggradation. Corridor dominated by forest and hay with ~500 feet of no buffer. | Tree/buffer planting project to reduce nutrient inputs. | Feasible; low watershed priority, | Wildlife habitat improvement, possible demonstration project for other reaches, reduce nutrient inputs, improve water quality | Planting design and installation, possible CREP payments | hay to buffer | VT RMP, NRCS, F&W, FWR, CVRPC |
| 72 (39) | Buffer Enhancement | T3.01A - Poor - Very High | Segment not incised with active widening and aggradation. Corridor dominated by forest and residential (lawn/field) with ~350 feet of no buffer. | Tree/buffer planting project to reduce nutrient inputs. | Feasible; low watershed priority, | Wildlife habitat improvement, possible demonstration project for other reaches, reduce nutrient inputs, improve water quality | Planting design and installation | field/lawn to buffer | VT RMP, NRCS, F&W, FWR, CVRPC |
| 73 (33) | Buffer Enhancement | T1.01B - Fair - High | Segment slightly incised (1.1) with active aggradation. Corridor dominated by forest and public picnic area with ~700 feet of little to no buffer. | Tree/buffer planting project to reduce nutrient inputs. | Feasible; low watershed priority, | Wildlife habitat improvement, possible demonstration project for other reaches, reduce nutrient inputs, improve water quality | Planting design and installation | field/lawn to buffer | VT RMP, NRCS, F&W, FWR, CVRPC |
| 74 (20) | Buffer Enhancement | M05 - Good - High | Segment not incised and generally stable. Corridor dominated by forest and residential (lawn/field) with ~800 feet of little to no buffer. | Tree/buffer planting project to reduce nutrient inputs. | Feasible; low watershed priority, | Wildlife habitat improvement, possible demonstration project for other reaches, reduce nutrient inputs, improve water quality | Planting design and installation | field/lawn to buffer | VT RMP, NRCS, F&W, FWR, CVRPC |
| 75 (17a and 17b) | Buffer Enhancement | M02B - Fair - Very High | Segment slightly incised (1.1) but generally stable. Corridor dominated by forest and residential (lawn/field) with ~1,400 feet of little buffer. | Tree/buffer planting project to reduce nutrient inputs. | Feasible; low watershed priority, | Wildlife habitat improvement, possible demonstration project for other reaches, reduce nutrient inputs, improve water quality | Planting design and installation | field/lawn to buffer | VT RMP, NRCS, F&W, FWR, CVRPC |

**Table 33: Corridor Planning Project and Strategy Summary Table North Branch - Winooski River- Washington County, VT**

| Project # (Figure #) | Project Type | Reach/Segment Condition-Sensitivity | Site Description including Stressors and Constraints | Project or Strategy Description | Technical Feasibility & Priority | Other Social Benefits | Cost | Land Uses Conversion & Landowner Commitment | Potential Partner Commitments |
|---|---|---|---|---|---|---|---|---|---|
| 76 (35) | Buffer Enhancement | T1.03A - Fair - High | Segment not incised with active aggradation. Corridor dominated by forest and residential/hay with ~900 feet of little buffer. | Tree/buffer planting project to reduce nutrient inputs. | Feasible; low watershed priority, | Wildlife habitat improvement, possible demonstration project for other reaches, reduce nutrient inputs, improve water quality | Planting design and installation | lawn/hay to buffer | VT RMP, NRCS, F&W, FWR, CVRPC |
| 77 (38a and 38b) | Buffer Enhancement | T2.03A - Fair - Very High | Segment not incised with active aggradation. Corridor dominated by forest and residential (lawn/fields) with ~800 feet of little buffer. | Tree/buffer planting project to reduce nutrient inputs. | Feasible; low watershed priority, | Wildlife habitat improvement, possible demonstration project for other reaches, reduce nutrient inputs, improve water quality | Planting design and installation | lawn/field to buffer | VT RMP, NRCS, F&W, FWR, CVRPC |
| 78 (34) | Buffer Enhancement | T1.02B - Fair - High | Segment slightly incised (1.1) but generally stable. Corridor dominated by forest and hay with ~400 feet of little buffer. | Tree/buffer planting project to reduce nutrient inputs. | Feasible; low watershed priority, | Wildlife habitat improvement, possible demonstration project for other reaches, reduce nutrient inputs, improve water quality | Planting design and installation | hay to buffer | VT RMP, NRCS, F&W, FWR, CVRPC |
| 79 (32) | Buffer Enhancement | M18A - Good - High | Segment not incised and generally stable. Corridor dominated by Route 12 on left and forest on right with ~700 feet of little buffer along road. | Tree/buffer planting project to reduce nutrient inputs. | Feasible; low watershed priority, | Wildlife habitat improvement, possible demonstration project for other reaches, reduce nutrient inputs, improve water quality | Planting design and installation | road right of way to buffer | VT RMP, NRCS, F&W, FWR, CVRPC |
| 80 (38b) | Replace Undersized Structure | T2.03B - Fair - Low | Segment not incised but with active aggradation. Corridor dominated by forest and residential development. Bridge crossing Kimball Road undersized with structure width/channel width ratio of 71%. | Replace undersized structure with adequately sized one | Feasible, river corridor mostly undeveloped, Town owned structure, overall low watershed priority | Aquatic habitat improvement, possible demonstration project for other reaches, reduce erosion associated with undersized structures | Design/permitting costs, construction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC, Town of Worcester |

**Table 33: Corridor Planning Project and Strategy Summary Table North Branch - Winooski River- Washington County, VT**

| Project # (Figure #) | Project Type | Reach/Segment Condition-Sensitivity | Site Description including Stressors and Constraints | Project or Strategy Description | Technical Feasibility & Priority | Other Social Benefits | Cost | Land Uses Conversion & Landowner Commitment | Potential Partner Commitments |
|---|---|---|---|---|---|---|---|---|---|
| 81 (27a) | Replace Undersized Structure | M13A - Fair - Very High | Segment highly incised (1.9) with active aggradation. Corridor dominated by mix of forest and pasture. Privately owned bridge undersized with structure width/channel width ratio of 73% | Replace undersized structure with adequately sized one | Feasible, river corridor mostly undeveloped, privately owned structure, overall low watershed priority | Aquatic habitat improvement, possible demonstration project for other reaches, reduce erosion associated with undersized structures | Design/permitting costs, construction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC, |
| 82 (45) | Replace Undersized Structure | T6.01 - Fair - Very High | Reach not incised with active aggradation. Corridor dominated by mix of forest and residential. Town of Worcester owned bridge undersized with structure width/channel width ratio of 58% | Replace undersized structure with adequately sized one | Feasible, river corridor mostly undeveloped, Town of Worcester owned structure, overall low watershed priority | Aquatic habitat improvement, possible demonstration project for other reaches, reduce erosion associated with undersized structures | Design/permitting costs, construction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC, Town of Worcester |
| 83 (44) | Replace Undersized Structure | T4.03 - Fair - Very High | Reach not incised with active aggradation and widening. Corridor dominated by mix of forest. Privately owned bridge undersized with structure width/channel width ratio of 64% | Replace undersized structure with adequately sized one | Feasible, river corridor mostly undeveloped, privately owned structure, overall low watershed priority | Aquatic habitat improvement, possible demonstration project for other reaches, reduce erosion associated with undersized structures | Design/permitting costs, construction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC, |
| 84 (42) | Replace Undersized Structure | T4.01 - Fair - High | Reach not incised with active aggradation. Corridor dominated by mix of forest and residential. Town of Worcester owned bridge undersized with structure width/channel width ratio of 75% | Replace undersized structure with adequately sized one | Feasible, river corridor mostly undeveloped, Town of Worcester owned structure, overall low watershed priority | Aquatic habitat improvement, possible demonstration project for other reaches, reduce erosion associated with undersized structures | Design/permitting costs, construction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC, Town of Worcester |
| 85 (37a and 37b) | Replace Undersized Structures | T2.02 - Poor - High | Reach highly incised (2.0) with active aggradation, widening, and planform adjustments. Corridor dominated by mix of forest and residential. One private structure and one Town of Worcester owned bridge undersized with structure width/channel width ratios of 53% and 68%. | Replace undersized structures with adequately sized ones | Feasible, river corridor mostly undeveloped, Town of Worcester owned structure, overall low watershed priority | Aquatic habitat improvement, possible demonstration project for other reaches, reduce erosion associated with undersized structures | Design/permitting costs, construction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC, Town of Worcester |

**Table 33: Corridor Planning Project and Strategy Summary Table North Branch - Winooski River- Washington County, VT**

| Project # (Figure #) | Project Type | Reach/Segment Condition-Sensitivity | Site Description including Stressors and Constraints | Project or Strategy Description | Technical Feasibility & Priority | Other Social Benefits | Cost | Land Uses Conversion & Landowner Commitment | Potential Partner Commitments |
|---|---|---|---|---|---|---|---|---|---|
| 86 (17a) | Replace Undersized Structure | M02A | Reach not fully assessed due to high urbanization and corridor encroachments, Cummings Street bridge undersized with structure/channel width ratio of 80% | Replace undersized structure with adequately sized one | Feasible, City of Montpelier owned structure, overall low watershed priority | Aquatic habitat improvement, possible demonstration project for other reaches, reduce erosion associated with undersized structures | Design/permitting costs, construction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC, City of Montpelier |
| 87 (34) | Replace Undersized Structure | T2.01B - Fair - High | Reach not incised (1.1) with aggradation and planform adjustments. Corridor dominated by mix of residential and commercial space. Private snowmobile bridge located mid-reach undersized with structure/channel width ratio of 68%. | Replace undersized structure with adequately sized one | Feasible, privately owned structure, overall low watershed priority | Aquatic habitat improvement, possible demonstration project for other reaches, reduce erosion associated with undersized structures | Design/permitting costs, construction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC |
| 88 (40) | Replace Undersized Structure | T3.02B - Fair - High | Reach not incised with planform adjustments. Corridor dominated by mix of forest and residential. Town of Worcester owned bridge on Calais Road undersized with structure width/channel width ratio of 77%. | Replace undersized structure with adequately sized one | Feasible, river corridor mostly undeveloped, Town of Worcester owned structure, overall low watershed priority | Aquatic habitat improvement, possible demonstration project for other reaches, reduce erosion associated with undersized structures | Design/permitting costs, construction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC, Town of Worcester |
| 89 (40) | Replace Undersized Structure | T3.02A - Fair - High | Reach moderately incised (1.4) with widening, aggradatio, and planform adjustments. Corridor dominated by mix of forest and residential. Privately owned bridge mid-reach undersized with structure width/channel width ratio of 85%. | Replace undersized structure with adequately sized one | Feasible, river corridor mostly undeveloped, Privately owned structure, overall low watershed priority | Aquatic habitat improvement, possible demonstration project for other reaches, reduce erosion associated with undersized structures | Design/permitting costs, construction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC |
| 90 (39) | Replace Undersized Structures | T3.01A - Poor - Very High | Reach not incised with active aggradation, widening, and planform adjustments. Corridor dominated by mix of forest and residential. Two private structures undersized and in need of replacement. | Replace undersized structures with adequately sized ones | Feasible, river corridor mostly undeveloped, privately owned structures, overall low watershed priority | Aquatic habitat improvement, possible demonstration project for other reaches, reduce erosion associated with undersized structures | Design/permitting costs, construction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC |

**Table 33: Corridor Planning Project and Strategy Summary Table North Branch - Winooski River- Washington County, VT**

| Project # (Figure #) | Project Type | Reach/Segment Condition-Sensitivity | Site Description including Stressors and Constraints | Project or Strategy Description | Technical Feasibility & Priority | Other Social Benefits | Cost | Land Uses Conversion & Landowner Commitment | Potential Partner Commitments |
|---|---|---|---|---|---|---|---|---|---|
| 91 (39) | Replace Undersized Structures | T3.01B - Fair - High | Reach slightly incised with active aggradation, widening, and planform adjustments. Corridor dominated by mix of forest and residential. One old bridge abutment and Pratt Road bridge undersized and in need of replacement. | Replace undersized structures with adequately sized ones | Feasible, river corridor mostly undeveloped, Town of Worcesterand privately owned structures, overall low watershed priority | Aquatic habitat improvement, possible demonstration project for other reaches, reduce erosion associated with undersized structures | Design/permitting costs, construction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC |
| 92 (32) | Replace Undersized Structure | M18A - Fair - Very High | Reach moderately incised (1.3) with widening, aggradatio, and planform adjustments. Corridor dominated by forest. Privately owned bridge at upstream end of reach undersized with structure width/channel width ratio of 93%. | Replace undersized structure with adequately sized one | Feasible, river corridor mostly undeveloped, Privately owned structure, overall low watershed priority | Aquatic habitat improvement, possible demonstration project for other reaches, reduce erosion associated with undersized structures | Design/permitting costs, construction costs | None | VT RMP, NRCS, F&W, FWR, CVRPC |