

*Town of Reading, Vermont:  
All Hazard Mitigation Plan*

Adopted \_\_\_\_\_

*Prepared by the Town of Reading and Southern  
Windsor County Regional Planning Commission*

**2015-2020**

DRAFT

Town of Reading 2015-2020 All Hazard Mitigation Plan  
\_\_\_\_\_ 2015

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**CERTIFICATE OF ADOPTION**

Town of Reading, VT  
Selectboard

**A Resolution Adopting the  
Town of Reading 2015-2020 All Hazard Mitigation Plan**

WHEREAS, the Town of Reading has worked with the Southern Windsor County Regional Planning Commission to prepare an updated hazard mitigation plan for the town, to identify natural hazards, analyze past and potential future damages due to natural and man-made caused disasters, and identify strategies for mitigating future damages; and

WHEREAS, duly-noticed public meetings were held by the Reading Selectboard on \_\_\_\_\_ to present and receive public comment on the draft Plan; and

WHEREAS, the updated 2015-2020 Reading All Hazard Mitigation Plan was submitted to the Division of Emergency Management and Homeland Security and the Federal Emergency Management Agency for review on \_\_\_\_\_; and

NOW, THEREFORE BE IT RESOLVED that the Town of Reading Selectboard hereby adopts the 2015-2020 Reading All Hazard Mitigation Plan for municipal use and implementation.

Duly adopted this \_\_\_\_ day of \_\_\_\_\_, 20\_\_.

Reading Selectboard:

\_\_\_\_\_  
Chair, Reading Selectboard

\_\_\_\_\_  
Member

\_\_\_\_\_  
Member

\_\_\_\_\_  
Member

\_\_\_\_\_  
Member

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## **1. INTRODUCTION**

The goal of this stand-alone Hazard Mitigation Plan is to help the community identify risks and provide local mitigation strategies it can take to make Reading more disaster resilient.

*What is Hazard Mitigation?*

Hazard mitigation is an action taken to reduce or eliminate the long-term risk to human life and property from both natural and man-made hazards. The work done to minimize the impact of hazard events to life and property is called Hazard Mitigation Planning.

## **2. PURPOSE**

The Federal Emergency Management Agency (FEMA), the Vermont Division of Emergency Management and Homeland Security (DEMHS), and local towns have come to recognize that it is less expensive to prevent disasters than to repeatedly repair damage after a disaster has struck. Hazards cannot be eliminated, but it is possible to determine what the hazards are, where the hazards are most severe, what is most likely to occur and identify what local actions can be taken to reduce the severity of the hazard and reduce their impacts on the community.

Hazard mitigation planning and strategies include the following benefits:

- structural or land improvements
- increased public education and awareness of hazards
- altering the hazard area to remove the hazard occurrence
- reducing the hazard frequency through structure or land treatment
- increased community support for specific actions to reduce future losses
- reduction in financial and physical losses caused by hazard events
- eligibility for hazard mitigation grants and aid
- strengthened partnerships

The Town of Reading All Hazard Mitigation Plan is a stand-alone plan to assist the town in identifying hazards within the town and identify strategies to reduce or eliminate these hazard risks.

Previously, the Town of Reading All Hazard Mitigation Plan was an annex to the Southern Windsor County Regional Planning Commission Multi-Jurisdictional All Hazard Mitigation Plan. The updated plan is intended to serve as a 'stand-alone' plan for the Town of Reading and will focus on the hazards and mitigation programs best suited for the town.

A partial list of revisions that have been made include:

- Reorganization/restructuring of the plan
- Revaluation of hazards using new methodology
- Update of data, tables and charts
- Review and update status of mitigation strategies
- Incorporation of new state initiatives on river corridor and fluvial erosion mitigation
- Identification of current mitigation strategies
- Maps

### 3. TOWN PROFILE

Reading is a small rural community located within Windsor County in southeastern Vermont, bordered by the towns of Bridgewater, Woodstock, West Windsor, Cavendish, and Plymouth. Reading is comprised of three small villages: Felchville, Hammondsville, and South Reading. State highways including VT Routes 44 and 106 connect with large population areas outside of town. Tyson Road, Twenty Mile Stream Road, and Knapp Brook Road are Class 2 town highways that serve as important connections to other communities. Tyson Road is notable as it provides access to South Reading and connects VT Route 106 in Felchville to VT Route 100 in Plymouth.

Reading is characterized by lower-density residential development, small commercial enterprises, and local employment opportunities based on agriculture, forestry, recreation, and other natural resources. The majority of land in Reading is characterized by steeply sloped and relatively inaccessible mountains and narrow stream valleys. There is little flat land, with only a limited amount of land having less than 10 percent slope. Elevations range from 2,600 feet on Long Hill to 700 feet along the banks of the North Branch of the Black River. These and other factors have naturally focused the most intensive development within a few small settlements.

Small and relatively flat corridors along the upper reaches of the North Branch of the Black River and Mill Brook are home to the more developed villages of Felchville and Hammondsville. Outside of these areas of concentrated development, especially along roads leading out of the villages, are lands that were traditionally used for agricultural purposes. Some of this land on the gentler hillsides and upland plateaus is still in use as farmland today, but a significant amount has been converted to residential use, both year-round and seasonal. The village of South Reading has a similar settlement pattern.

Most of the land in Reading, such as the more rugged and inaccessible areas mentioned above and other land such as long-abandoned farms, remains undeveloped and is used mainly for forestry, recreation, and conservation. Much of this land is publicly owned, either as Town or State Forest, and is at elevations above 1,500 feet. The prevailing topography of the land and limited access mean that Reading will likely remain a small community with its most intense development largely confined to the river valley lands along VT Route 106.

**Table 1: Existing Land Use in Reading**

<b>Land Use Class</b>	<b>Acres</b>	<b>Percent</b>
Residential	336	1
Commercial/Public	65	<1
Roads	304	1
Agricultural	1,217	5
Open Space, Non-agricultural	643	2
Forest	23,803	89
Lakes and rivers	112	<1
Wetlands	172	<1
<b>Total</b>	<b>26,652</b>	<b>100</b>

The 2010 U.S. Census Bureau indicates Reading's population to be 666 people, indicating a growth rate of -5.8% percent town wide since the 2000 census. This is lower than the estimated -1.5% percent growth

rate for Windsor County and significantly lower than the 2% growth rate for the state during the same period. Although a decrease in development has occurred, mitigation priorities remain unchanged.<sup>1</sup>

Reading's future growth will likely be influenced by growth in other nearby communities. Reading is close to a number of recreational and tourist destinations, including Ludlow, Woodstock, West Windsor, Plymouth, and Killington, which may continue to pressure growth in seasonal and second-home ownership. The proximity to employment centers in Woodstock, the Upper Valley and Ludlow may lead to increases in future residential development. Natural constraints such as steep slopes, and adopted regulatory tools such as the flood hazard regulations will limit future development in Reading. The 2014 Reading Town Plan encourages future growth in the existing villages, and discourages anything but low-density growth in the more remote areas.<sup>2</sup>

#### **4. PLANNING PROCESS**

The local planning process used to develop this hazard mitigation plan follows guidance by the Federal Emergency Management Agency (FEMA) and the Vermont Division of Emergency Management and Homeland Security (DEMHS). Beginning in the spring of 2014, Southern Windsor County Regional Planning Commission (SWCRPC) staff reviewed the recently adopted 2014 Reading All Hazard Mitigation Plan, which at the time was an annex to the 2012 Southern Windsor County Regional Planning Commission Multi-Jurisdictional All Hazard Mitigation Plan, to identify key areas for updates. The State of Vermont also recently adopted an updated Hazard Mitigation Plan in November of 2013 (Vermont HMP 2013), which was consulted during this update.

##### **4.1 Public Process**

The Town of Reading in partnership with the Southern Windsor County Regional Planning Commission established a plan of completion for the Reading All Hazard Mitigation Plan which included public meetings to discuss and complete the following:

- Complete hazard analysis and hazard extent
- Review hazard history and identify additional data to be included
- Review plan and identify mitigation strategies to address each high hazard
- Review past completed or on-going mitigation projects and actions
- Identify new mitigation projects and actions

##### **4.2 Plan Update Process**

In September of 2014, SWCRPC staff met with the Reading Planning Commission to begin the town process for this plan. Participants discussed the purpose and timeline for updating the plan and groups/individuals that should be invited to meetings and made aware of the plan update. Most were familiar with the process, as the previous plan had been adopted only one year prior. Changes discussed with the Town included new grouping of some hazards, new identified hazards, and new methodology for assessing and scoring each hazard which is described below in Section 5.1- Hazard Identification and

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<sup>1</sup> U.S. Census 2000; 2014 Reading Town Plan

<sup>2</sup> 2014 Reading Town Plan

Analysis. Attendees of the meeting collaborated in creating the hazard analysis seen in **Table 3: Reading Hazard Identification and Analysis** (Sec 5.1). Hazards scoring a 6 or less are not covered in this plan.

In the winter of 2014-2015, SWCRPC staff reviewed and edited the previous version of the Hazard Mitigation Plan and incorporated the new hazard analysis above to continue the rewriting process. Revisions in this plan include updates to the town profile section and all hazard data charts, tables and maps, incorporation of hazard events that occurred since the last plan revision into the hazard analysis, and integration of new relevant reports and documents including the Black River Phase 1 and Phase 2 Stream Geomorphic Assessments, Black River Corridor Management Plan, and available river corridor mapping for the Mill Brook.

Following the draft edits completed by SWCRPC, a publicly noticed meeting of the Hazard Mitigation Committee was held at Reading Town Hall on March 30, 2015<sup>3</sup>. SWCRPC opened the meeting with a review of the prior plan and major changes in the update. Those present, including members of the Town Hazard Mitigation Committee, discussed the current status of each of the Hazard Mitigation and Preparedness Project and Actions identified in the previous plan, updated the list of Resources for Hazard Mitigation and updated some local data. The group reviewed mitigation ideas from the FEMA Mitigation Ideas guidebook, the Black River Corridor Management Plan and earlier planning discussions. New potential future strategies were identified, discussed and selected based on their feasibility and effectiveness in reducing hazard impact.

SWCRPC incorporated input from this meeting into a revised draft plan which was distributed to Planning Commission members for review and comment on April 3, 2015. Planning Commission member comments were incorporated into the draft. This revised draft plan was also distributed to the Cavendish Selectboard for review on April 3, 2015, 10 days prior to their meeting on April 13, 2015. Simultaneously, the revised draft plan was put out for public comment and review by adjacent towns. This was done by posting an electronic copy on the town and SWCRPC websites and having a hard copy of the plan advertised and made available at the town office for public review and comment. The draft was distributed to adjacent towns for comment via email. Yes/No comments were received from the public.

Input was solicited by SWCRPC staff through meetings, email and digital postings in order to reach as many members of the community as possible including members of the Cavendish Planning Commission, Selectboard, Town Manager, Emergency Management, Fire Department Chief, town personnel, and members of the Reading public and surrounding towns. The meeting agendas included a section by section review of the previous plan with an emphasis on identifying the highest hazards facing the town and mitigation actions specific to the town. The previous version of the Reading Hazard Mitigation Plan, and the recently updated SWCRPC Regional Plan and 2015 Reading Town Plan, were provided as examples to facilitate the discussion.

Participants were given an opportunity to voice their concerns and discuss areas of town most likely to be affected by these hazards as well as future goals and mitigation strategies that may be undertaken to reduce the risk of future harm and cost to the town. Changes in priorities, development, and local mitigation efforts were also considered throughout the revision process. The implementation schedule at the end of this document reflects the **2015-2020 Mitigation and Preparedness Actions and Projects** as determined during this process. Following the meetings, SWCRPC staff made the revisions and drafted

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<sup>3</sup> See Sign-in sheet 3.30, Agenda 3.30

this new, updated plan which is available for review at the Reading Town Office and posted on the SWCRPC website ([www.swcrpc.org](http://www.swcrpc.org)). The final adopted Reading Local Hazard Mitigation Plan will also be posted on the SWCRPC website and available at the Reading Town Offices.

**Table 2** below lists the mitigation and preparedness projects and actions from the previous 2014 Multi-Jurisdictional All Hazard Mitigation Plan for Reading. Mitigation actions, listed in order of priority set at that time, are shown here with an additional column to indicate the status of each as identified by the Town. Some not-completed actions have been reevaluated and incorporated into the 2015-2020 Projects and Actions at the end of this document.

**Table 2: Status on Past Plan Mitigation and Preparedness Projects and Actions**

MITIGATION ACTION	TYPE OF ACTION	HAZARD ADDRESSED	RESPONSIBLE PARTY	TIME FRAME	FUNDING SOURCE	STATUS
Create redundant power supply for critical facilities	Mitigation, Preparedness	High Wind Events, Severe Winter Weather	Selectboard, School Board	2013-2016	Town budget, school budget, VEM grant	Complete for Fire Station, Ongoing for Town and school
Upgrade drainage ditches and culverts to better handle water flow	Mitigation	Transportation Disruption, Flooding	Selectboard, Road Foreman	Annual	Town budget, Vtrans structure grant	Approx. 30% have been upgraded-stone-lined, enlarged, Ongoing
Continued hazardous materials training	Mitigation, Preparedness	Hazardous Material Incident	Fire Department, Rescue Squad	Ongoing	Utilizing existing town resources	Annual Re-certification, increased personnel, Ongoing
Construct a sand storage shed	Preparedness	Severe Winter Weather, Transportation Disruption	Selectboard	2014-2016	Town budget	Reconsidered / Not feasible
Review SWCRPC Commodity Flow Study for incorporation into response planning	Mitigation	Hazardous Materials, Transportation Incident	Emergency Management Director, Road Foreman, Selectboard	2013-2014	Utilizing existing town resources	Reconsidered / Not needed
Improve drainage on gravel roads through additional ditching and culverts	Mitigation	Transportation Disruption, Flooding	Road foreman, Planning Commission, SWCRPC	2012-2014	Town budget, HMGP, Vtrans grant	Incorporated in Regular Maintenance, Ongoing
Assess the vulnerability of critical facilities	Preparedness	High Wind, Earthquake, Severe Winter Weather	Selectboard	2014-2016	HMGP	Reconsidered / Not needed

Carry out identified retrofits outlined in the assessment study to ensure long term stability of critical facilities	Mitigation	High Wind, Severe Winter Weather, Earthquake	Selectboard, Emergency Management Director	2014-2016	Town budget, HMGP	Reconsidered / Not needed
Develop a continuity of operations plan for government services during prolonged power outages	Mitigation, Preparedness	Fire, Flood, Severe Winter Weather, Earthquake	Emergency Management Director, Selectboard, SWCRPC	2013-2014	Utilizing existing town resources, SWCRPC EMPG funds	Complete, integrated with Emergency Management Planning
Work with State agencies to update management plans for State Lands located in town to reduce fuel for wildland fires	Mitigation	Wildfire	Selectboard, State Agencies	2014-2016	Utilizing existing town resources	To Be Done
Provide informational materials to at risk residential and commercial structure owners to encourage them to purchase flood insurance	Mitigation	Flooding	Selectboard, Zoning Administrator	2012-2014	Utilizing existing town resources	Complete and made available on ongoing basis, to be expanded to include river corridor

### **4.3 Plan Maintenance Process**

The future method for monitoring and evaluating the Reading All Hazard Mitigation Plan includes annual meetings of the identified Hazard Mitigation Review Committee in partnership with the SWCRPC. The purpose of these meetings will be to continue to identify hazards which may threaten structures and property within the town and to review the mitigation strategies included within this plan. The mitigation strategies will be reviewed annually to ensure that appropriate actions are being followed and budgeted for as necessary. These efforts will be coordinated by the Town Manager. An effort will be made to involve representatives from the Town Selectboard, Planning Commission, Emergency Management, Reading and Volunteer Fire Department, along with local volunteer boards and interested members of the public, including local business owners. In addition, neighboring communities will be pointed to where draft versions can be found for review and comment.

Additional outreach will continue to garner input from community members and businesses which have not been included in previous hazard mitigation planning efforts. The Town of Reading and SWCRPC recognize the importance of public participation in hazard mitigation planning and will continue to provide opportunities for public comment and review during future plan revisions and updates.

The Hazard Mitigation Committee will be responsible for monitoring this plan to ensure that specific mitigation actions are implemented as resources or opportunities become available. This includes the identification and application for additional funding opportunities. The Hazard Mitigation Committee will also be responsible for reviewing the plan to ensure proposed mitigation actions remain in line with current town goals, strategies, and policies.

Four years into the five year plan revision process, the SWCRPC and Local Emergency Planning Committee 3 (LEPC3) will assist the Reading Hazard Mitigation Committee in revising and updating this plan to incorporate issues which have been identified during the ongoing mitigation meetings. The Reading All Hazard Mitigation Plan update process will begin in July 2019 assuming a July 2015 plan adoption, with the first public meeting of the Hazard Mitigation Committee. All public meetings will be warned following town protocols.

Following the meeting, a draft plan will be made available for public comment. The plan will be available on the SWCRPC website [www.swcrpc.org](http://www.swcrpc.org), Reading town website <http://www.readingvt.govoffice.com/>, and paper copies will be available at the town office. A second publicly warned meeting will be held no later than November 2019 in which any substantial revisions gathered during the public input period will be discussed. The SWCRPC will make all necessary edits to the plan and provide the Hazard Mitigation Committee with a revised version for final review. Subsequently, the plan will be sent to the Vermont State Hazard Mitigation Officer for referral to FEMA for Approval Pending Adoption (APA). Following APA, the town may then adopt the Reading All Hazard Mitigation Plan and forward a copy of the adoption resolution for FEMA to complete the plan approval and adoption process.

## **5. RISK AND VULNERABILITY ASSESSMENT**

The following assessment addresses the Town of Reading's vulnerability to all of the hazards identified by the Hazard Mitigation Committee during the hazard analysis. The likelihood of occurrence and impact to the town were used to assess the town's vulnerability to each hazard.

### **5.1 Hazard Identification and Analysis**

A hazard vulnerability assessment for the town began with an inventory of all possible hazards, both natural and man-made. The assessment considers the frequency of occurrence, the anticipated amount of warning time and potential impact to the community of each hazard to determine the relative risk each poses. The ranking methodology used for the analysis ranked the frequency of occurrence, warning time, and potential impact on a scale from 1 to 4, as detailed below the table. The overall hazard score provided is a sum of these scores. For this plan, the hazards which ranked a seven or greater were considered for inclusion and additional information. Some hazards discussed in the previous plan were identified as low vulnerability and rare occurrence to the town. These hazards, which scored below seven, are not covered in the plan but may still occur. The results of this analysis is shown in **Table 3: Reading Hazard Identification and Analysis** on the next page.

A discussion of each of these hazards is given in the proceeding subsections including regional and local data records with a narrative description and its historical impact on Reading.

**Table 3: Reading Hazard Identification and Analysis**

Hazard***	Frequency of Occurrence	Warning Time	Potential Impact	Hazard Score	Section
Flash Flood/Inundation Flood/Fluvial Erosion	3	4	3	<b>10</b>	5.2b
Severe Weather (Thunderstorm, Lightning, High Wind, Hail, and Flooding)*	3	2	2	<b>7</b>	5.2e
Hurricanes/Tropical Storms	3	1	4	<b>8</b>	5.2c
Wildfire	2	4	2	<b>8</b>	5.2a
Bushfire	3	4	3	<b>10</b>	5.2a
Structural Fire	4	4	3	<b>11</b>	5.2a
Dam Failure**	3	3	3	<b>9</b>	5.2f
Ice Jams	3	3	2	<b>8</b>	5.2d
Extreme Cold/Snow/Ice Storm	4	1	2	<b>7</b>	5.2i
Microbursts	3	4	3	<b>10</b>	5.2c
Hazardous Material Spill	3	4	2	<b>9</b>	5.2g

\* Note: We have defined 'Severe Weather' to include two or more of the above hazards

\*\* Including private and beaver ponds which have been the source of previous flooding in town.

\*\*\* The following hazards were considered but ranked below 7 and are not detailed or addressed in this plan

- Tornado
- Transportation Incidents
- Drought
- Water Supply Contamination
- Earthquake
- Landslide/Mudslide/Rockslide

## Methodology Used For Hazard Analysis

- Frequency of Occurrence
  - 1 = Unlikely
    - <1% probability of occurrence in the next 100 years (less than 1 occurrence in 100 years)
  - 2 = Occasionally
    - 1-10% probability of occurrence per year, or at least 1 chance in the next 100 years (1 to 10 occurrences in 100 years)
  - 3 = Likely
    - >10% but <100% probability per year (at least 1 chance in the next 10 years)
  - 4 = Highly Likely
    - 100% probable in a year (annual occurrence)
- Warning Time
  - 1 = More than 12 hours
  - 2 = 6 – 12 hours
  - 3 = 3 – 6 hours
  - 4 = None / Minimal
- Potential Impact
  - 1 = Negligible
    - Isolated occurrences of minor property damage, minor disruption of critical facilities and infrastructure, and potential for minor injuries
  - 2 = Minor
    - Isolated occurrences of moderate to severe property damage, brief disruption of critical facilities and infrastructure, and potential for injuries
  - 3 = Moderate
    - Severe property damage on a neighborhood scale, temporary shutdown of critical facilities, and/or injuries or fatalities
  - 4 = Severe
    - Severe property damage on a town-wide or regional scale, shutdown of critical facilities, and/or multiple injuries or fatalities

## 5.2 Detailed Hazard Analysis

While the town may be affected by many hazards, the detailed hazard analysis and potential loss estimates listed in this plan have been identified as having a ‘high’ likelihood of occurrence within Cavendish. The types of hazards having the greatest impact can be gleaned from **Table 3**, a listing of **FEMA Disaster Declarations for Windsor County** since 1990.

Less significant hazards did not have occurrence frequencies or levels of impact that would necessitate a more detailed level of analysis. Human losses are also not calculated in this plan, but may be expected to occur depending on the type and severity of the hazard.

The following hazards have been identified as having a ‘high’ total impact score based on the methodology above:

<u>SCORE</u>	<u>HAZARD</u>
11	Structural Fire
10	Flash Flood / Inundation Flood / Fluvial Erosion
10	Microbursts
10	Brush Fire
9	Hazardous Material Spill
9	Dam Failure
8	Hurricanes/Tropical Storms
8	Ice Jams
8	Wildfire

When possible, previous occurrence data specific to Reading has been provided, however, for all high hazards this was not possible and the best available information has been provided. Throughout the life span of this Reading All Hazard Mitigation Plan, both the town and the SWCRPC will strive to continually gather local hazard information.

**Table 4: Federal Disaster Declarations for Windsor County VT**

Federal Disaster Declarations: Windsor County 1990 – 2015 (2/13)		
FEMA Disaster Number	Date of Declaration	Description
4207	February 3, 2015	Severe Winter Storm
4140	August 2, 2013	Severe Storms and Flooding
4120	June 13, 2013	Severe Storms and Flooding
4066	June 22, 2012	Severe Storm, Tornado, and Flooding
4043	November 8, 2011	Severe Storms And Flooding
4022	September 1, 2011	Tropical Storm Irene
4001	July 8, 2011	Severe Storms And Flooding
1995	June 15, 2011	Severe Storms And Flooding
1951	December 22, 2010	Severe Storm
1790	September 12, 2008	Severe Storms and Flooding
1784	August 15, 2008	Severe Storms, Tornado, and Flooding
1778	July 15, 2008	Severe Storms and Flooding

1715	August 3, 2007	Severe Storms and Flooding
1698	May 4, 2007	Severe Storms and Flooding
1559	September 23, 2004	Severe Storms and Flooding
1488	September 12, 2003	Severe Storms and Flooding
1428	July 12, 2002	Severe Storms and Flooding
1358	January 18, 2001	Severe Winter Storm
1336	July 27, 2000	Severe Storms And Flooding
1307	November 10, 1999	Tropical Storm Floyd
1228	June 30, 1998	Severe Storms and Flooding
1184	July 25, 1997	Excessive Rainfall, High Winds, Flooding
1124	June 27, 1996	Flooding
1101	February 13, 1996	Storms and Flooding
1063	August 16, 1995	Heavy Rain, Flooding
990	May 12, 1993	Flooding, Heavy Rain, Snowmelt
938	March 18, 1992	Flooding, Heavy Rain, Ice Jams
875	July 25, 1990	Flooding, Severe Storm

**a) Structural Fire and Wildfire/Brush Fire**

Fires, including structure fires, brushfires and wildfires, were identified during the hazard analysis and vulnerability assessment as relatively high hazards to the Town of Reading with scores of 11, 10 and 8, respectively.

**Structural fires** were specifically identified as having the highest possible risk to the town, with a Score of 12, due to their high probability of occurrence, short warning time and potential for catastrophic loss. Structure fires are common throughout Vermont during the winter months as residents heat their homes with wood or wood pellet burning stoves. With little or no warning, these fires can affect a single residential structure or spread to other homes, businesses or apartment complexes and can result in loss of property and life.

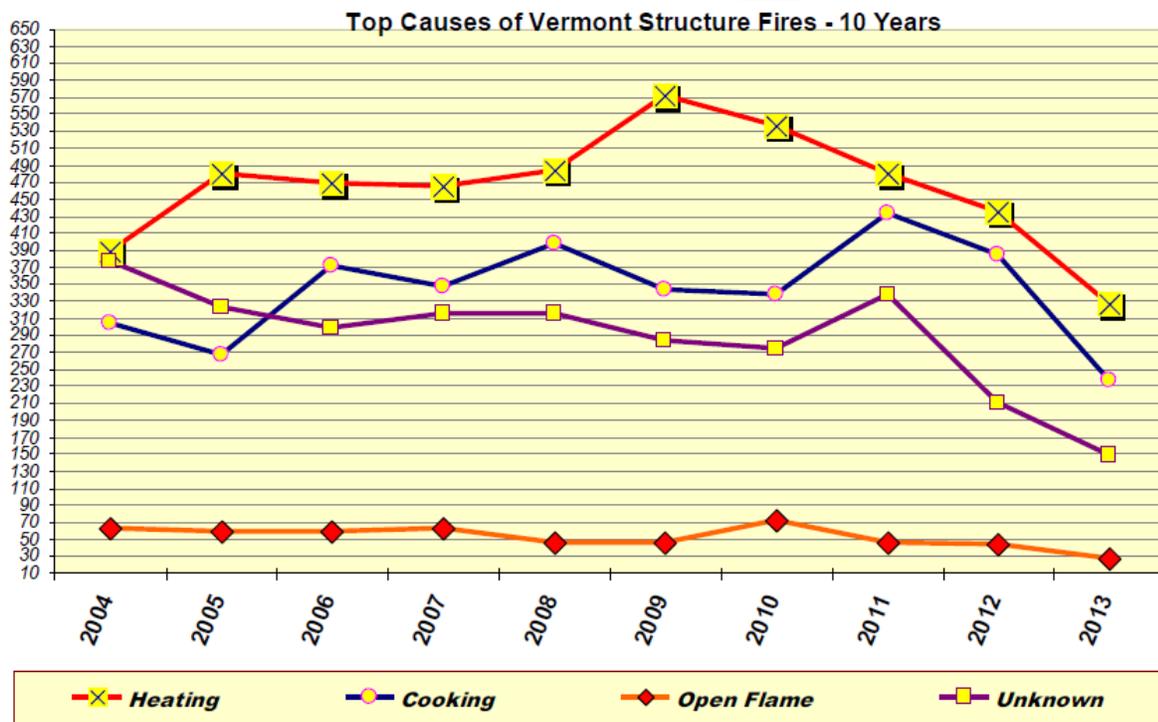
In Vermont, during 2013, there were 45,689 emergency incidents to which fire departments responded. National Fire Protection Association (NFPA) estimates show, while residential structure fires account for only 25 percent of fires nationwide, they account for a disproportionate share of losses: 83 percent of fire deaths, 77 percent of fire injuries, and 64 percent of direct dollar losses.

According to the 2013 Vermont Annual Fire Marshal Report, although the fire death rate in Vermont has improved significantly over the past few years, historically, it has been disproportionately high based on population. This is due, in part, to the large percentage of residents that live in small rural communities where emergency response time is delayed. Other characteristics of Vermont that lend toward greater loss from fire compared to other states are-

- 2<sup>nd</sup> highest percent of housing built before 1940
- 7<sup>th</sup> coldest state
- 2<sup>nd</sup> oldest median age where elderly are at higher risk
- 1<sup>st</sup> for per capita use of wood for heating

In 2013, Vermont reported a total of 2,739 incidences relating to structure and wildland (forest and brush) fires, 77% of which were structural fires. The leading cause of structure fires in Vermont are the result of heating incidents (39%) followed closely by cooking incidents (28%). Windsor County reported a total of 315 related fires, 73% of which were structure fires. Fires can be caused by improperly disposing of ashes with live coals from wood stoves or by faulty electrical wiring. The most significant common factor in fire fatalities in Vermont continues to be the absence of a functioning smoke detector in the sleeping area of residential structures.

The chart below depicts the top causes of Vermont Structure Fires over a 10 year period, which clearly shows Vermont heating is the number one cause of structure fires followed by cooking.<sup>4</sup>



**Wildland Fires**, which include forest, brush, crop or grassland fires, are relatively uncommon events in the State of Vermont, particularly large wildfire events. A wildfire is defined as *‘An unplanned, unwanted wildland fire including unauthorized human-caused fires, escaped wildland fire use events, escaped prescribed fire projects, and all other wildland fires where the objective is to put the fire out.’*<sup>5</sup>

The State Hazard Mitigation Plan’s analysis of wildfire threat states that *“Wildfire conditions in Vermont are typically at their worst either in spring when dead grass and fallen leaves from the previous year are dry and new leaves and grass have not come out yet, or in late summer and early fall when that year’s growth is dry”*.

In addition to precipitation, a particular town’s vulnerability to large wildfires is directly related to the proportion and continuity of acreage that is forested, pasture and cropland. In Reading, this represents 96% of total town land cover (See **Table 1** and **Map 1: Current Land Use**). It can be anticipated that small

<sup>4</sup> 2013 Vermont Fire Marshal Annual Report

<sup>5</sup> 2013 Vermont Fire Marshal Annual Report

brush and wildfires will continue to occur throughout the Town of Reading at a similar rate in coming years, however, given the current land cover and correct seasonal conditions the threat of a large wildfire remains.

Both structure fires and wildfires are reported in the annual Vermont State Fire Marshal report which provides yearly fire statistics from reporting departments and by county. See **Table 5** for Windsor County Fire Response Statistics. **Table 6** shows local fire statistics, both responses and incidents. Note that mutual aid is included under total responses which is significantly higher than the number of fire incidents occurring in the Town of Reading.

*Firewise*, a community outreach program through the National Fire Protection Association provides guidance, resources, and training on protecting homes and property from wildfire hazards. The *Firewise* program “teaches people how to adapt to living with wildfire and encourages neighbors to work together and take action now to prevent losses.” The Firewise website ([www.firewise.org](http://www.firewise.org)) is an excellent resource for literature and community mitigation actions to follow. Also, the Annual Fire Marshal Report offers informational resources for property owners.

**TABLE 5: ‘Annual Report of the State Fire Marshal’ for Windsor County<sup>6</sup>**

YEAR	Windsor County		
	Structure Fire Responses	Wildland Fire Responses	Total
2009	177	68	245
2010	181	70	251
2011	181	70	251
2012	201	101	302
2013	229	86	315
2014	na	na	

**TABLE 6: ‘Reading Fire Department Annual Responses and Fire Incidents<sup>7</sup>**

YEAR	READING FIRE DEPARTMENT RESPONSES			READING FIRE INCIDENTS		
	Structure	Wildland	Total	Structure	Wildland	Total
2007	15	6	21	5	3	8
2008	12	9	21	4	3	7
2009	5	7	12	2	3	5
2010	9	1	10	2	1	3
2011	10	4	14	3	4	7
2012	11	5	16	3	4	7
2013	12	3	15	3	0	3
2014	12	1	13	2	0	2

<sup>6</sup> Vermont Annual Report of the State Fire Marshal

<sup>7</sup> Reading Fire Department

## **b) Flash Flood/Flood/Fluvial Erosion**

Flash floods and Fluvial Erosion are significant natural hazard events in the Town of Reading, and Windsor County, including inundation flooding events and ice jams. The town is susceptible to both flash flooding, frequently caused by summer thunderstorms and spring snow runoff, and the fluvial erosion which often accompanies these events due to the narrow stream valleys and steeply sloped topography. The damage from spring flooding events can vary greatly depending upon the amounts of precipitation, snow cover, spring melt, soil saturation, existing erosion and topography.

**Flash flooding** typically occurs during summer when a large thunderstorm or a series of rain storms result in high volumes of rain over a short period of time. Higher-elevation drainage areas and streams are particularly susceptible to flash floods. The National Weather Service describes a flash flood as:

*“A flood caused by heavy or excessive rainfall in a short period of time, generally less than 6 hours. Flash floods are usually characterized by raging torrents after heavy rains that rip through river beds, urban streets, or mountain canyons sweeping everything before them. They can occur within minutes or a few hours of excessive rainfall. They can also occur even if no rain has fallen, for instance after a levee or dam has failed, or after a sudden release of water by a debris or ice jam”.*<sup>8</sup>

The 2012 SWCRPC Multi-Jurisdictional All Hazard Mitigation Plan provides a detailed history of past flooding. **Table 4** above shows FEMA Disaster Declarations for Windsor County from 1990-2015. The table shows that, of the 28 disaster declarations for Windsor County, 25 were related to flooding. Not all of these events had an impact on Reading and some less severely than on other towns.

The Federal Emergency Management Agency (FEMA) has designated floodplain areas along the North Branch Black River tributary, Mill Brook, and other small streams and river tributaries. Vermont Agency of Natural Resources has recently mapped river corridors for these stream segments along with special flood hazard areas which can be found on-line.<sup>9</sup> However, floodways for Reading have not yet been mapped (See **Map #3: Water Resources**). Currently, Reading is a participatory, non-sanctioned member of the National Flood Insurance Program and regulates development in the floodplain through the enforcement of the regulations as stated in the Town of Reading Zoning Ordinance, Section 5.5 Flood Hazard Review, adopted July 16, 2007.

Infrastructure and structures within the narrow stream valleys receive drainage from the higher elevations and are often the most vulnerable to damage from flash flooding. These structures are concentrated in the communities of South Reading on the North Branch Black River, Hammondsville on the Mill Brook and Felchville at the confluence of the North Branch Black River and Knapp Brook. Although flash floods are not frequent events, hazards posed can be significant as seen with the state-wide flooding from Tropical Storm Irene in the summer of 2011.

The areas of high population concentration and services, namely the Villages of Hammondsville, and Felchville, are either within or surrounded by floodplains. A significant flood event in this area would disrupt evacuation routes, and could impact many residences, special population areas, and hazardous

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<sup>8</sup> National Weather Service <http://www.srh.noaa.gov/mrx/hydro/flooddef.php>

<sup>9</sup> The ANR FLOOD READY link below shows river corridors overlays comparable to FEH zones

[http://maps.vermont.gov/ANR/Html5Viewer/Index.html?configBase=http://maps.vermont.gov/Geocortex/Essentials/ANR/RES T/sites/Focus\\_on\\_Floods/viewers/FocusOnFloodsHTML/virtualdirectory/Resources/Config/Default](http://maps.vermont.gov/ANR/Html5Viewer/Index.html?configBase=http://maps.vermont.gov/Geocortex/Essentials/ANR/RES T/sites/Focus_on_Floods/viewers/FocusOnFloodsHTML/virtualdirectory/Resources/Config/Default)

waste storage sites. (See Map 1: Current Land Use and Hazardous Waste Sites) As major routes in the town transverse floodplains and floodways, they are susceptible to wash out during high flow events.

Damage from spring and 100-year floods are influenced by the following factors:

- Estimated number of residential buildings in the 100-year flood zone: 9 structures in town are within the 100-year floodplain as mapped by FEMA.
- Estimated number of commercial buildings in the 100-year flood zone: 2 structures in town are within the 100-year floodplain as mapped by FEMA.
- Estimated number of bridges and culverts within Reading from the Vermont Online Bridge and Culvert Inventory Tool is 18 bridges (10 Town, 8 State) and 606 Town culverts.

As described in the Reading Town Plan, Tropical Storm Irene caused extensive flooding throughout the Town on August 28 and 29, 2011, resulting in extensive damage to the community's transportation infrastructure, several residences, and personal and public properties. During the storm, Reading had 15 roads that were damaged by flooding or completely washed away. Two Town bridges were destroyed and many culverts were washed out. Large tracts of land were severely eroded and, approximately, 10 homes were damaged and many more experienced flooded basements with furnace damage. Numerous private culverts and bridges also failed and required either replacement or repair. The total damage sustained by the Town of Reading is estimated at \$1.95 million. See **Map 5: Road Network Damage from Tropical Storm Irene** for post Irene road damage.

The flood also had significant effects on streams, ponds and wetlands with impacts on their very character and the natural values and services these waters provide the people of the Town and environment. Flood waters realigned stream channels laterally, streambeds were downgraded as well as aggregated, and large quantities of wood (whole trees, limbs, etc.) were introduced as a result of streambank erosion of adjacent riparian woodlands. During this impact, Reading had several road closures of which some sections remain closed today and have now been grassed over.

The failure of bridges and culverts in Reading, as well as other towns throughout southern Vermont, during Tropical Storm Irene, was primarily due to their being undersized and incapable of handling the 100-year flood frequency stream flow event. Undersized culverts restrict stream flow, particularly during high flow events, resulting in increased streambed scour and bank erosion both up and downstream of the crossing. Blocked culverts compromise the structural integrity and safety of the road crossing and may result in damage to adjacent properties.

Tropical Storm Irene demonstrated the importance of not allowing residential and commercial structures in floodplains and river corridors. These areas were inundated during the flood and were depositional sites for sediments and debris transported downstream during the event. While agricultural uses were negatively affected by flooding, losses were temporary and relatively less costly than if floodplain development had been permitted.<sup>10</sup>

A synopsis from the 2011 Town of Reading Annual Report of the flash flood damage caused by Tropical Storm Irene in August, 2011, is given in the Tropical Storm section 5.2c.

**Fluvial Erosion** is erosion caused by rivers and streams, and can range from gradual bank erosion to catastrophic changes in river channel location and dimension during high flow conditions. While some flood losses are caused by inundation (i.e. waters rise, fill, and damage low-lying structures), most flood losses in Vermont are caused by "fluvial erosion". Reasons are Vermont's geography, extreme climate,

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<sup>10</sup> 2014 Reading Town Plan

deep snows, destructive ice jams and intense rainstorms. Centers of commerce in villages and towns became concentrated along river banks, forests were cleared, and many rivers moved or channelized to accommodate this development rendering them unstable and prone to fluvial erosion.<sup>11</sup>

Fluvial erosion is often associated with flash flooding and can result in catastrophic damage to property and infrastructure when a rapid adjustment of a stream channel occurs. Severe damage from fluvial erosion caused by Tropical Storm Irene was exacerbated due to undersized culverts and bridges and has widened river beds and stripped river banks bare of natural vegetation making them more susceptible to additional erosion and landslides.

Reading, like many other towns within Southern Windsor County, is at risk for fluvial erosion hazard flooding events. Stream geomorphic assessments for the Black River and, most recently, for the Mill Brook, have been completed and River Corridor Protection Areas have been mapped and are available online at the Vermont Agency of Natural Resources.<sup>12</sup> Designated River Corridor Protection Areas delineate those areas where development is subject to erosion hazard risks and are also referred to as Fluvial Erosion Hazard (FEH) Zones. Within Reading, river corridor areas have been mapped for the North Branch Black River and its tributaries- Twenty-mile Stream, Alder Meadow Brook and Darby Brook; and for the Mill Brook and its tributaries- Bailey Brook and Reading Hill Brook.

SWCRPC is in the process of providing information on fluvial erosion hazard and river corridor bylaws to local zoning officials and municipalities

Some options for mitigating fluvial erosion hazards include:

- Environmentally-friendly river restoration techniques
- Natural channel design
- Remove or relocate threatened structures
- Erosion and landslide hazard maps
- Limiting new investments in river corridors
- Meet with State Geologist to inspect landslide activity and receive structural appraisal of landslide damaged embankments
- Fluvial erosion/river corridor bylaws

### Reading Watershed Background

The Town of Reading is comprised, primarily, of two regional local basins which drain to the Connecticut River Drainage Basin. It is home to the headwaters of the North Branch Black River, a sub-watershed of Basin 10, Ottauquechee River-Black River, and to the headwaters of Mill Brook, a sub-watershed of Basin 13, Lower Connecticut River. The Black River Watershed Phase 1 and Phase 2 Stream Geomorphic Assessments were completed in 2007 and 2010, followed by the Black River Corridor Management Plan, compiled in 2011 by Southern Windsor County Regional Planning Commission, and a Basin 10 Water Quality Management Plan in 2012. The Mill Brook Phase 1 Geomorphic Assessment was completed in 2006 and Phase 2 is expected to be completed this spring. These watershed assessments and management plans focus primarily on hazard mitigation, local water quality and resource conservation. It should be noted that the recommendations outlined in these documents to address these concerns are

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<sup>11</sup> Municipal Guide to Fluvial Erosion Hazard Mitigation, Vermont Agency of Natural Resources

<sup>12</sup> The ANR FLOOD READY link below shows river corridors overlays comparable to FEH zones

[http://maps.vermont.gov/ANR/Html5Viewer/Index.html?configBase=http://maps.vermont.gov/Geocortex/Essentials/ANR/RES/T/sites/Focus\\_on\\_Floods/viewers/FocusOnFloodsHTML/virtualdirectory/Resources/Config/Default](http://maps.vermont.gov/ANR/Html5Viewer/Index.html?configBase=http://maps.vermont.gov/Geocortex/Essentials/ANR/RES/T/sites/Focus_on_Floods/viewers/FocusOnFloodsHTML/virtualdirectory/Resources/Config/Default)

intertwined, as strategies for protecting or improving water quality also serve to minimize the impact of hazard events.

Although only 6.2% of the Basin 10 land area is developed, much of this development is typically found in valleys and along waterways which is the case for Reading. Areas of concentrated population and services, namely the Villages of South Reading, Hammondsville, and Felchville can be found within the narrow stream valley floor with sections that lie either within floodways, Special Hazard Flood Zones, River Corridors/Fluvial Erosion Hazard areas or floodplains (**Map#5: Water Resources**). A significant flood event in this area would disrupt evacuation routes, and could impact many residences, town services, and hazardous waste storage sites (**Map #4: Current Land Use and High Hazard Waste Sites**).

The Phase 2: Stream Geomorphic Assessments summarized in the Black River Corridor Plan have identified locations and site specific projects within Reading where protection opportunities exist to provide room for natural river channel movement and fluvial geomorphic stability. The assessments found some of these reaches of river to be moderately to extremely sensitive to storm events. Several reaches of river in Reading were classified as “very high” priority and were found to have a “moderate or major departure from equilibrium<sup>13</sup>.”

The Black River Corridor Plan outlines watershed, town and local level strategies for future river corridor management. The overarching strategy is to protect the river corridor by giving the stream/river the space needed to find its own natural equilibrium which will minimize, in the long run, hazards related to flooding, flash flooding, fluvial erosion and ice jams. Identified protection strategies relevant to hazard mitigation are listed below, some of which have been considered for inclusion in this Hazard Mitigation Plan by the Reading Hazard Mitigation Committee:

- Allow floodwaters to access their natural floodplains
- Preserve/restore channel-contiguous wetlands
- Stabilize stream banks and establish vegetative buffers
- Establish a local River Corridor overlay district & buffer
- Remove or replace Infrastructure including bridges, culverts and dams
- Incorporate hazard mitigation into local waterway regional planning regulations

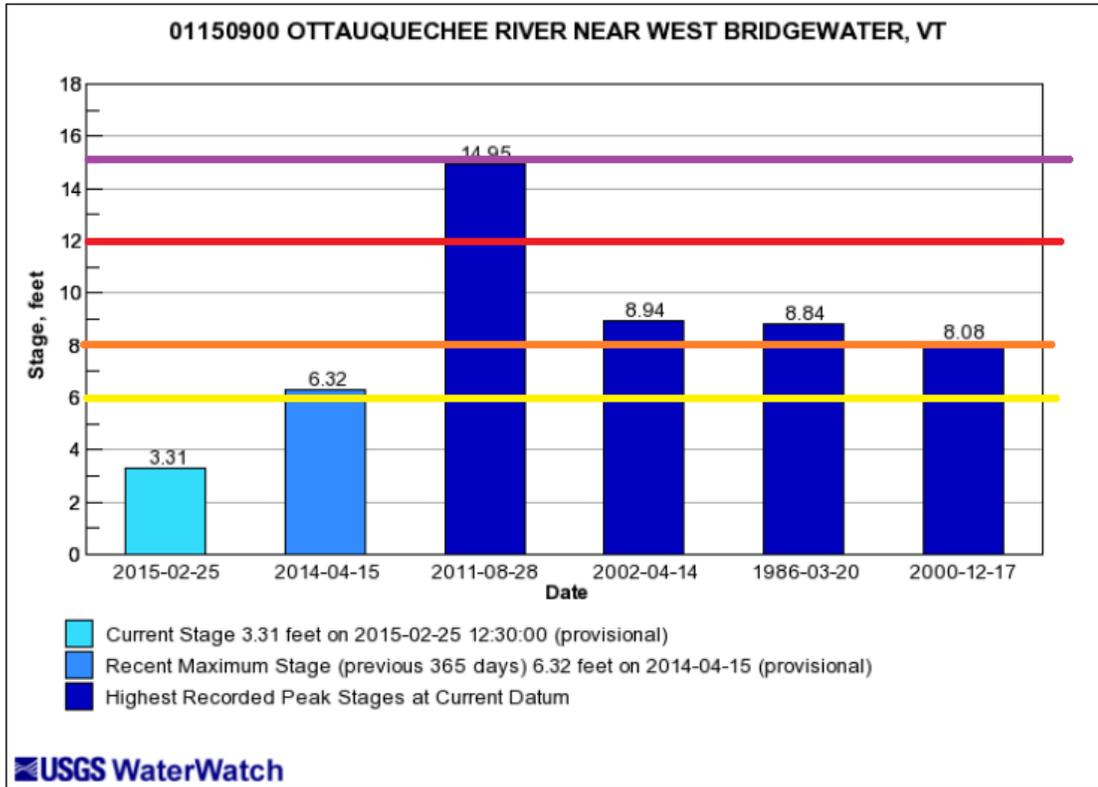
The USGS maintains a river gauge on the Ottauquechee River in West Bridgewater, site #01150900, located within Basin 10, northwest of the Town of Reading and is the closest daily monitored gauge location unimpeded by instream structures. The information obtained from the USGS for this gauge site is described below. While this data is not specific to the Town of Reading, it may be used to estimate the worst case flooding scenario for Reading as these towns are located in close proximity and share similar topographical characteristics.

The bar chart below is a “Flood Tracking Chart’ for gauge site #01150900 from USGS WaterWatch (<http://waterwatch.usgs.gov>) which displays historic peak data for gauge height, or stage (height of the water in the stream above a reference point). National Weather Service Flood Levels are shown. Note the gauge height approached Major Flood Stage during Tropical Storm Irene.

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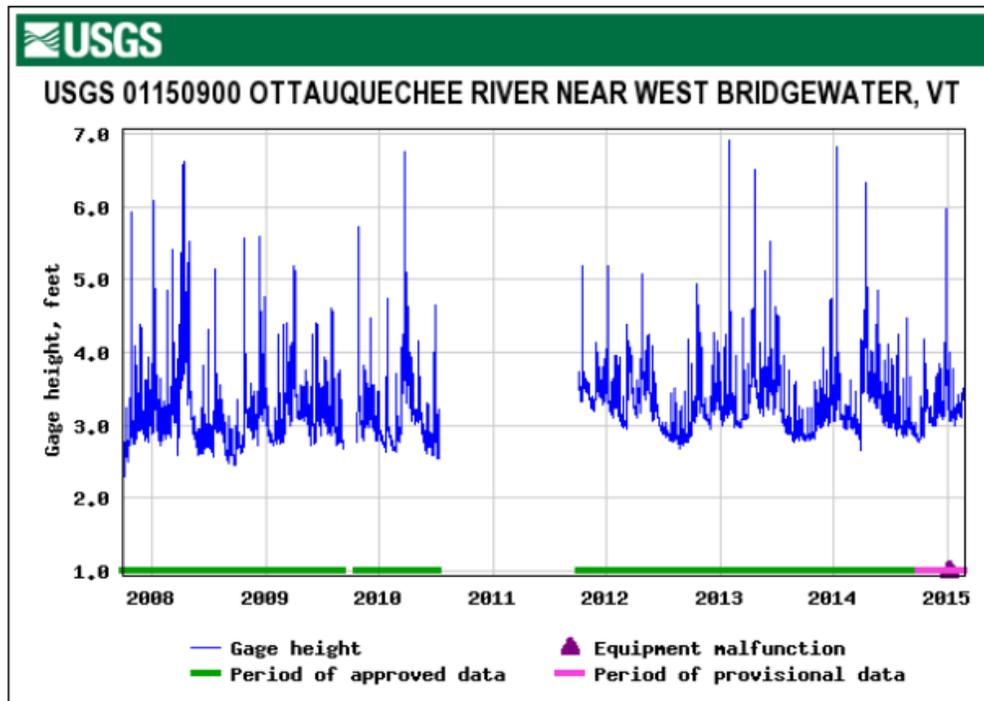
<sup>13</sup> 2011 Black River Corridor Management Plan

<sup>11</sup> National Weather Service <http://www.srh.noaa.gov/mrx/hydro/flooddef.php>



Major Flood Stage:	15
Moderate Flood Stage:	12
Flood Stage:	8
Action Stage:	6

The graph below plots historical daily gauge height since 2008 obtained from the USGS National Water Information System (<http://waterdata.usgs.gov/nwis/si>). Although daily data was not available during 2011 it can be seen from this graph that levels during periods of spring melt exceed Action Stage or 6 feet above reference height.



\*\* The site was discontinued during WY2011 due to a lack of funding, hence the missing data. USGS did survey and publish a peak stage and discharge for West Bridgewater. The peak for TS Irene was 14.95 ft and 9,070 cfs. The discharge was computed on basis of a contracted-opening and flow-over-road measurement of the peak flow. US Geological Survey, New Hampshire-Vermont Office

The table below was extracted from a 2014 USGS Scientific Investigations Report on flood analysis of the Ottawaquechee River (<http://pubs.usgs.gov/sir/2014/5214/>). Discharge or streamflow is the volume of water flowing past a given point in the stream in a given period of time. The table compares data during Tropical Storm Irene to AEP flood levels. According to this chart Irene flood levels were comparable to .2% AEP or a “500-yr flood”.

**Table 5.** Stages and water-surface elevations for the streamgage at USGS Ottawaquechee River near West Bridgewater, Vt. streamgage (sta. no. 01-150900), with corresponding discharge estimates at the USGS Ottawaquechee River at North Hartland, Vt. streamgage (sta. no. 01-151500).

[AEP, annual exceedance probability; %, percent; ft, feet; NAVD 88, North American Vertical Datum of 1988]

Location	10% AEP flood	2% AEP flood	1% AEP flood	0.2% AEP flood	Tropical storm Irene flood
Streamgage 01150900 at Ottawaquechee River near West Bridgewater, Vt.					
Stage, in feet above streamgage datum of 1,148.59 feet NAVD 88	10.96	12.65	13.28	14.73	14.95
Elevation, in feet above NAVD 88	1,159.55	1,161.24	1,161.87	1,163.32	1,163.54
Discharge, in cubic feet per second	2,140	3,910	4,960	8,390	9,070
Corresponding estimated unregulated discharge at streamgage 01151500 at Ottawaquechee River at North Harland, Vt.					
Discharge, in cubic feet per second	18,700	34,300	43,400	72,200	38,200

\*From USGS Scientific Investigations Report 2014-5214: ‘Analysis of Floods, Including the Tropical Storm Irene Inundation, of the Ottawaquechee River Vermont’ by Robert H. Flynn

The following are helpful definitions of “River Corridor” and have been used by the State of Vermont:

"River Corridor" means the land area adjacent to a river that is required to accommodate the dimensions, slope, planform, and buffer of the naturally stable channel and that is necessary for the natural maintenance or natural restoration of a dynamic equilibrium condition, ..., and for minimization of fluvial erosion hazards, as delineated by the Agency of Natural Resources in accordance with river corridor protection procedures. 10 V.S.A. Chapter 32 § 752. Definitions

The river corridor includes the channel; floodplains and the adjacent land; and the area identified in many communities as the Fluvial Erosion Hazard Area (FEH). The purpose of the zone is to identify the space a river needs to re-establish and maintain stable “equilibrium” conditions. In other words, if the river has access to floodplain and meander area within this corridor, the dangers of flood erosion can be reduced over time. <sup>14</sup>

### c) Hurricanes/Tropical Storms

Hurricanes and Tropical Storms are infrequent event in Windsor County and Vermont. More often, Vermont experiences localized **Micro-bursts** and wind shears that tend to knock down trees and blow the roofs off barns and other structures. Another major problem is widespread power outages from downed trees. This is a function of Vermont’s very rural nature with a large segment of its population living in remote locations dependent upon long extensions of the power grid. Prior to Tropical Storm Irene in August, 2011, Vermont was impact by Tropical Storm Floyd in November, 1999.

Reading was not impacted by flooding from most of the storms identified in **Table 4: Federal Disaster Declarations for Windsor County VT**. This is likely due, in part, to the fact that Reading is home to the headwaters of local watersheds with a relatively high proportion of elevated areas where these rivers are born, and is less vulnerable to build up of downstream flows compared to neighboring towns. After Tropical Storm Floyd in 1999, Reading was impacted by a localized rainstorm in August, 2009; Tropical Storm Irene in July, 2011; and a localized storm in July, 2014. Tropical Storm Irene was the most severe of these.

*The 2011 Town of Reading Annual Report states that “...on August 27<sup>th</sup> and 28<sup>th</sup> 2011 Hurricane Irene hit the area. In a very short period of time on Sunday there were 26 roads in Reading that sustained some level of damage. The damage ranged from minor washouts to a complete washout of the Curtis Hollow Road and culvert in the northwest corner of the Town. The Selectmen would like to extend their sincere appreciation to everyone that called and or appeared and offered help starting at 7:00AM on Monday morning. In addition we wish to thank everyone who could not leave or access their homes for their understanding and patience while we started the process of getting roads passable again. By Wednesday evening August 31<sup>st</sup> we had every road in Town open, except Archer Road and Curtis Hollow, so that homes could at least be reached in an emergency. It was late October before homeowners could drive to their homes on Curtis Hollow and December 27<sup>th</sup> when the Archer Bridge was opened. There were a few in Town who lost property, buildings or had flooded basements, and our thoughts are with you. Thankfully there were groups of individuals who pitched in and helped homeowners wherever possible. We were very fortunate that no one sustained serious personal injuries.”*

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<sup>14</sup> ([http://floodready.vermont.gov/flood\\_protection/river\\_corridors\\_floodplains/river\\_corridors#What\\_is\\_an\\_FEH\\_or\\_RCPA](http://floodready.vermont.gov/flood_protection/river_corridors_floodplains/river_corridors#What_is_an_FEH_or_RCPA))

Tropical Storm Irene brought much devastation to the Town of Reading which is described in detail under Flooding (Section 5.2a).

d) **Ice Jams**

Though not identified as a high hazard, ice jams may be a secondary event of flooding and threaten many of the same properties located within the FEMA Special Flood Hazard Area. When broken river ice begins to flow downstream, ice can build up against bridge abutments, undersized structures, and other obstructions to create a temporary dam impounding water which has the potential to flood surrounding areas. Ice jams threaten many of the same properties as inundation flooding and the damage can be expected to be similar.

Ice jams are common in New England and occur during winter and spring months when river ice begins to break up and flow downstream. Such ice flows can build up against bridge abutments or other obstructions and create a temporary dam impounding large volumes of water that have the potential to flood the surrounding areas and damage infrastructure, including the many bridges within the town. The loss of a bridge could disrupt transportation corridors and isolate residential areas. The most devastating winter floods have been associated with a combination of heavy rainfall, warm temperatures, rapid snowmelt and resulting ice jams. Winter weather with less than average snowfall can result in greater ice buildup on streams and rivers, potentially resulting in greater ice jam damage.

There is one recorded ice jam on the Black River in Reading that occurred in January of 1996 by the US Army Corps of Engineers, Cold Regions Research and Engineering Laboratory (CRREL). Many additional ice jams have occurred in town, historically, but have not been recorded.

The following ice jam events have been recorded by the US Army Corps of Engineers, Cold Regions Research and Engineering Laboratory (CRREL):

- |   |         |              |                             |
|---|---------|--------------|-----------------------------|
| ▪ | 01/1990 | Chester      | Williams River              |
| ▪ | 03/1992 | West Windsor | Mill Brook                  |
| ▪ | 03/1992 | Windsor      | Mill Brook                  |
| ▪ | 03/1992 | Windsor      | Connecticut River           |
| ▪ | 01/1996 | Chester      | Williams River              |
| ▪ | 01/1996 | Reading      | Black River                 |
| ▪ | 01/1996 | Springfield  | Black River                 |
| ▪ | 01/1999 | Chester      | Williams River              |
| ▪ | 12/2000 | Windsor      | Connecticut River           |
| ▪ | 12/2000 | Chester      | Williams River (2 ice jams) |
| ▪ | 01/2001 | Windsor      | Connecticut River           |
| ▪ | 12/2003 | Springfield  | Connecticut River           |

e) **Severe Weather**

For the purposes of the Windsor All Hazard Mitigation Plan, severe weather is defined as being two or more of the following hazards occurring together: thunderstorms, power failure, high wind, lightning, hail, and flooding. Flooding is described in greater detail above, this section of the hazard analysis will focus on non-flood events.

**Power failure** is a common secondary hazard caused by severe weather and has an annual frequency within Windsor. Power outages can occur on a town wide scale and are typically the result of power lines damaged by high winds or heavy snow / ice storms but may also result from disruptions in the New England or national power grid as indicated by the widespread outages in 2003. Dead or dying trees in proximity to power lines pose a particular threat for power failure as these trees are often brought down by triggering events such as winter storms.

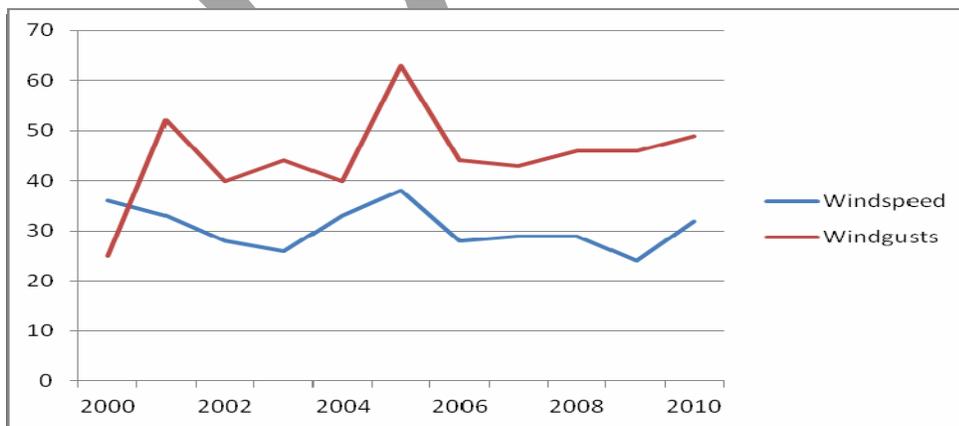
Potential loss estimates are difficult to predict for power failures as they are typically isolated in geographic area and short in duration. Therefore, power failures often have only minimal impact to people and property. Power failures usually result in minor inconveniences to residents however, longer duration events may result in the loss of perishable items and business losses. Power outages in winter months may result in the loss of home heating, ruptured water pipes and the resulting structural damage. The loss of home heating may be a contributing factor to the increase in structure fires during the winter months.

The Town of Reading has acquired back-up power generation for the Firehouse which is the Emergency Operating Command Center, and will continue to pursue back-up power generation for the two emergency shelters, including an Emergency Operation Center (EOC) located at the town offices and the local school.

**High winds** can result from hurricanes, tropical storms, summer *thunderstorms*, and tornadoes. The 2013 Vermont Hazard Mitigation Plan does not delineate high winds as a separate hazard, the plan states '*high winds pose a threat to the safety of Vermont's citizens and property.*' The National Weather Service issues wind advisories when sustained winds of 31-39 miles per hour are reached for at least one hour or gust between 46-57 miles per hour. Damage from summer thunderstorms in Reading has been historically limited in both scope and cost. The Beaufort Wind Scale shown below can be used to predict damage based upon wind speeds.

The following graph displays a historical record of the maximum wind speeds recorded in Reading. Over the past decade, the highest recorded windspeed approached 40 miles per hours with gusts reaching over 60 miles per hours.

**Figure 1: Maximum Windspeed (mph) Reading Vermont 2000-2010<sup>15</sup>**



<sup>15</sup>Historical windspeed data from Wunderground: <http://www.wunderground.com/>

**Lightning** is a giant spark of electricity in the atmosphere between clouds, the air, or the ground<sup>16</sup>. In the early stages of development, air acts as an insulator between the positive and negative charges in the cloud and between the cloud and the ground. As lightning can strike up to 50 miles away from a thunderstorm, can carry up to 100 million volts of electricity, and can reach temperatures upward of 50,000 degrees Fahrenheit it proves extremely hazardous to human life. Lightning can also damage infrastructure, plants, and property, and can start forest fires. Lightning is the most unpredictable weather-related event. According to the National Weather Service, lightning is the first thunderstorm hazard to arrive and the last to leave.

**Tornadoes** have the potential to cause more significant damage but occur rarely in our area and their effects, although severe, are very local in extent. The State of Vermont Hazard Mitigation Plan states that “Overall, Vermont has averaged less than one tornado per year since 1950. This ranks the state as 47th out of the 50 states for tornado frequency.” The largest tornado that has occurred within 50 miles of the Town of Reading occurred in 1998 and registered as an F3 tornado, with wind speeds over 158 miles per hour<sup>17</sup>. The vast majority of tornadoes that have occurred in our region had wind speeds of less than 113 mph. There are no reported deaths from tornadoes in our region. No high wind hazard areas have been identified or mapped in our region. Cost estimates for high wind events are difficult to predict due to the large range of impacts they can have upon an area.

Beaufort Wind Scale		
Classification Number	Wind Speed	Land Conditions
6	25 to 31 mph	Large branches in motion; whistling in telephone wires
7	32 to 38 mph	Whole trees in motion; inconvenience felt walking against wind
8 to 9	39 to 54 mph	Twigs break off trees; wind generally impedes progress
10 to 11	55 to 73 mph	Damage to chimneys and TV antennas; pushes over shallow rooted trees
12 to 13	74 to 112 mph	Peels surfaces off roofs; windows broken; mobile homes overturned; moving cars pushed off road
14 to 15	113 to 157 mph	Roofs torn off homes; cars lifted off ground

For the purposes of the Hazard Mitigation Plan, the scale is only shown above wind force 5; Data from NOAA

The largest tornado to have occurred within 50 miles of Reading occurred in 1998 and registered as an F3 tornado, with wind speeds over 158 miles per hour<sup>18</sup>. The majority of tornadoes that have historically occurred within the region have wind speeds of less than 113 miles per hours. There are no reported

<sup>16</sup> NOAA.gov

<sup>17</sup> <http://www.homefacts.com/tornadoes/Vermont/Windsor-County/Windsor.html>

<sup>18</sup> Homefacts: <http://www.homefacts.com/tornadoes/Vermont/Windsor-County/Windsor.html>

deaths from tornadoes nor have high wind areas been mapped within the region. Cost estimates are difficult to predict due to the large range of impacts that they can have upon an area.

Using the Reading wind data from **Figure 1**, the likely magnitude for future high wind events will fall between 40 and 50 miles per hour or Beaufort scale number 8-9 and will likely result in downed trees, power lines, and small damage. The possibility does remain for larger high wind events such as the 1998 F3 tornado on the Enhanced Fujita Scale.

**Hail** is a form of precipitation that falls as pellets of ice. The pellets can range in size from balls typically 5–50 mm in diameter on average, though can be much larger during severe occurrences. Hail can be especially damaging to crops, homes and cars, and large hailstones can be deadly to livestock and people caught outside during an event.

**f) Dam Failure**

Dams are manmade structures built to impound water. Dams are built for many purposes including water storage for potable water supply, livestock water supply, irrigation, or fire suppression. Dams can also be built for recreation, flood control and hydroelectric power. Dams may also be multifunction, serving two or more of these purposes. Dam failure is when the structure is breached and potentially can cause inundation of downstream areas and property. Dam failures can occur at any time in a dam’s life; however, failures are most common when water storage for the dam is at or near design capacity. At high water levels, the water force on the dam is higher and several of the most common failure modes are more likely to occur. Correspondingly, for any dam, the probability of failure is much lower when water levels are substantially below the design capacity for the reservoir.

In Reading, there are only 2 dams in the Knapp Pond area identified on **Map 3: Water Resources**. However, historically, it has been beaver dams and a number of private ponds with vulnerable dams that have been a major cause of town flooding.

**g) Hazardous Materials Spill**

The Vermont Agency of Natural Resources Spills Database includes the most comprehensive listing of hazardous materials spills. Table 6 shows reported spills within the Town of Reading, since the year 2010.

<b>Table 6: Vermont Agency of Natural Resources - Spills Database; Since 2010 in Reading</b>			
<b>Date</b>	<b>Address</b>	<b>Quantity</b>	<b>Material</b>
2010	384 Weld Cemetery Rd	75 gallons	Gasoline
2011	Hagen Hill Rd	2 gallons	Hydraulic fluid
2011	Route 106	1 gallon	Unknown
2011	Route 106	Unknown	Motor oil
2011	736 Main St.	15 gallons	#2 Fuel oil
2012	Route 106	5 gallons	Hydraulic Fluid
2013	2327 Route 106	10 gallons	Gasoline
2015	608 Route 106	1 gallon	Gasoline

The US Department of Transportation lists three hazardous materials incidents that have occurred in Windsor County since 2000. Only one of the incidents, occurring in 2014, was classified as serious, causing

\$1,785,000 worth of damage when a tanker truck rolled over on Route 11 in Chester near the Middle Branch-Williams River, and ruptured, releasing 2,470 gallons of gasoline into the surrounding soils.

VT Route 106, the major hazardous material transportation corridor, runs through the Village of Felchville and near the North Branch of the Black River and Mill Brook. Within the Village, significant densities of residential and commercial structures are within close proximity to the highway. A chemical spill on VT Route 106 could impact water quality. There are a number of critical facilities near these primary hazardous materials routes, including the:

- Elementary School
- Shelter
- Town Hall
- Fire Department

**Transportation Incidents** received a hazard score below 8 and are not addressed in this plan. However, a significant threat to the town posed by transportation incidents is the potential for releasing hazardous materials into the surrounding area, including rivers and streams which typically run alongside major roadways.

***h) Extreme Cold/Snow/Ice Storms***

Winter storms and blizzards, with snow, ice, and freezing temperatures in varying combinations, are fairly commonplace in Reading and occur town wide. Heavy wet snows of early fall and late spring, as well as ice storms, can result in property damage and in loss of electric power, leaving people without adequate heating capability. Power loss is often the result of downed trees, which can also disrupt traffic and emergency response by making roads and driveways impassable.

A winter storm is considered severe when there is a possibility of:

- Six or more inches of snow fall at a given location within 48 hours,
- There is property damage, injuries or deaths, or
- An ice/glaze storm which causes property damage, injuries or death.

A *Nor'easter* is a large weather system traveling from South to North, passing along, or near the Atlantic seacoast. As the storm approaches New England and its intensity becomes increasingly apparent, the resulting counterclockwise cyclonic winds impact the coast and inland areas from a northeasterly direction. The sustained winds may meet or exceed hurricane force. The Dolan-Davis Nor'easter Classification Scale is utilized to determine the severity of Nor'easters:

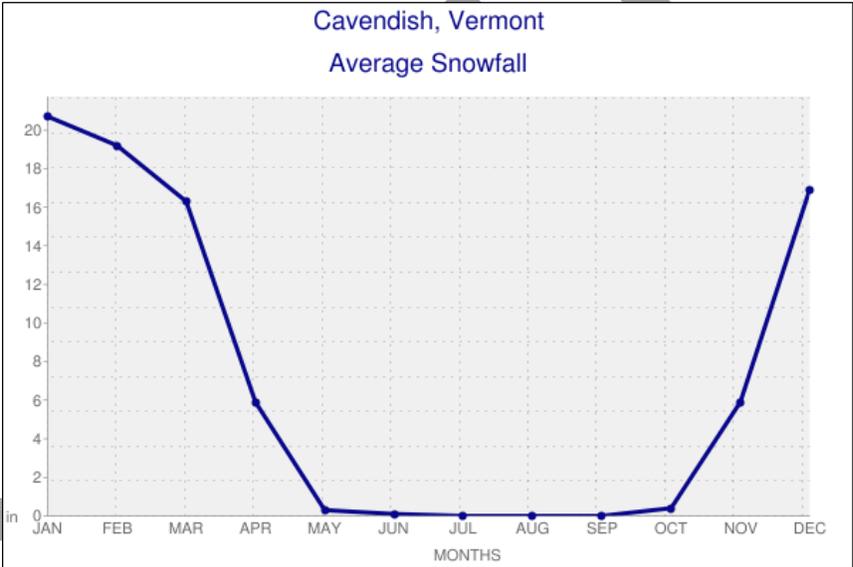
**The Dolan-Davis Nor'easter Classification Scale**

CLASS	% OF STORMS	AVERAGE RETURN INTERVAL	AVERAGE PEAK WAVE IN FEET	AVERAGE DURATION IN HOURS
1 WEAK	49.7	3 DAYS	6.6	8
2 MODERATE	25.2	1 MONTH	8.2	18
3 SIGNIFICANT	22.1	9 MONTHS	10.8	34
4 SEVERE	2.4	11 YEARS	16.4	63

5 EXTREME	0.1	100 YEARS	23.0	96
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*Blizzards* are defined by the National Weather Service as “sustained winds or frequent gusts of 35 mph or greater (and) considerable falling and/or blowing snow reducing visibility frequently to 1/4 mile or less for a period of three hours or more<sup>19</sup>.” Damage from blizzards snow and ice storms can vary depending upon wind speeds, snow or ice accumulation, storm duration, and structural conditions (such heavy snow and ice accumulation on large, flat roofed structures). The following figure shows average monthly snowfall amounts for Cavendish, which is just south of Reading. Reading residents can expect at least 60 pounds of weight per square foot on their infrastructure during winter months.

**Average Monthly Snowfall Cavendish, Vermont**



*Ice Storms* are defined by the National Weather Service as “occasions when damaging accumulations of ice are expected during freezing rain situations. Significant accumulations of ice pull down trees and utility lines resulting in loss of power and communication. These accumulations of ice make walking and driving extremely dangerous. Significant ice accumulations are usually accumulations of ¼" or greater.”<sup>20</sup>

Ice storms have a significant impact on Northern New England, with high elevation locations being the most severely impacted. Multiple sources state that a ¼ inch of ice accumulation from an ice storm can add 500 pounds of weight on the lines between two power lines. In the winter of 1997-1998, a severe ice storm in Reading caused major disruption with a week-long power outage.

**6. MITIGATION PROGRAM**

**6.1 Goals and Strategies**

<sup>19</sup> National Weather Service Glossary  
<sup>20</sup> National Weather Service Glossary

The following sections detail the mitigation goals, strategies, and potential mitigation actions which the town has identified to aid in the reduction of threats posed by the hazards detailed in this plan. The implementation schedule that follows is a table of actions that the town has targeted for implementation during the five year cycle of this plan.

The newly adopted 2014 Reading Town Plan has made significant strides, compared to earlier plans, in supporting hazard mitigation, either directly or indirectly. The following goals, policies, and recommendations, are currently incorporated in the recent Reading Town Plan:

- The Town shall work with the Vermont Department of Forest, Parks, and Recreation as well as the Vermont Fish and Wildlife Department to update management plans for State lands located in Reading.
- Protect and conserve critical natural resources that include but are not necessarily limited to deer wintering areas, wildlife travel corridors, streams, wetlands and vernal pools, and natural communities.
- Protect and enhance Reading's scenic landscape and rural character.
- Research and adopt as appropriate zoning bylaws that protect aquatic and riparian habitats from development and contribute to improved flood resiliency, including but not limited to more effective stream protection buffers.
- Encourage adoption of Vermont Better Back Roads Program road maintenance practices that protect stream, ponds and wetland water quality while reducing long-term Town highway maintenance costs.
- The widening or straightening of state highways within the town shall be discouraged. The Town shall encourage growth to take place along roadways that are capable of supporting the growth in their present condition.
- Expand the subdivision regulations in the Town's Zoning Ordinance to protect farmland, forestland, open space, floodplains, and wildlife habitat.
- Protect important ridgelines within Town from development that adversely alters the natural character of these landscape features. Strengthen the zoning bylaws and design standards to avoid, minimize and/or mitigate development impacts.
- The Town shall give careful consideration to the fragile and scenic nature of steep slopes (over 25%) and ridgelines when determining what kinds of development are appropriate in these sensitive areas.
- Support efforts that protect and conserve forest lands identified as critical habitats and natural communities via acquisition or easements and that will be managed in accordance with a forest-wildlife management plan. The Vermont Department of Forests and Parks offers assistance to private landowners interested in conducting sustainable forest management.
- Review development within all flood hazard and river corridor protection areas in order to mitigate risks to public safety, critical infrastructure, historic structures and municipal investments.
- Coordinate with Agency of Natural Resources and the Southern Windsor County Regional Planning Commission in developing a stream geomorphic assessment of the Mill Brook.
- Consider additional strategies to mitigate flood and erosion risks, such as adopting standards that go beyond NFIP minimums and additional mechanisms to reduce erosion risks within river corridor protection areas.
- Rare and irreplaceable natural areas within the Town shall be protected from development activities and uses that threaten their biological integrity and ecological value. Development in and around these areas may be limited in scope and intensity; soil erosion and pollution of water resources must be controlled in these areas.

- The Town recognizes the importance of healthy native forest ecosystems to the forestry economy, and therefore encourages the application of Acceptable Management Practices in all silvicultural projects within the Town. Sustainable and sensible logging practices are encouraged.
- The Town should encourage landowners to conserve and properly manage woodlands utilizing education and awareness of State resources or through the assistance of a Town sponsored Conservation Commission.
- Revise zoning bylaws where necessary and consider the use of subdivision regulations to require that residential development be configured in a manner that preserves scenic resources, meadowland and fragile features and be clustered such that the majority of development activity is located on the least sensitive portion of the land.
- Develop landscaping and site design standards in the zoning bylaw for commercial and industrial development.
- Adopt a junk and junk car ordinance and appoint an official to enforce the ordinance and impose fines for violators.
- The sustainable development and use of land-based resources, such as farming and forestry, consistent with other goals and policies of the Town Plan shall be encouraged.
- The Town shall work with the Upper Valley Land Trust or the Vermont Land Trust to assess and implement easement programs to preserve agricultural and ecologically sensitive land.
- Use farming methods that prevent water pollution, prevent soil erosion and degradation, and protect public health and safety.
- Cluster development shall be encouraged where appropriate and be consistent with Reading Town Plan.
- The development of multi-family housing, especially the conversion of older, larger homes in the villages, shall be encouraged and be consistent with Reading Town Plan.
- To promote a stronger town center in Felchville, Reading should consider improvements that suggest a town green or park.
- Expand the existing cell phone and emergency services communication coverage throughout Reading consistent with the concerns of the Utilities and Facilities Chapter of the Plan.
- The Town may wish to reconsider sidewalks in Felchville.
- The Planning Commission should study the adequacy of parking in town for all purposes.
- Industrial uses shall not have an undue adverse impact on neighboring properties and property values; public facilities and services; drainage, surface and groundwater supplies; or other natural, cultural, historic or scenic features in the vicinity of the operation.
- The Town will ensure that new construction of electrical transmission or distribution lines take into consideration impacts on natural, scenic, and historic resources and shall not adversely impact fragile soils.
- The siting and design of all new communications towers and other facilities (including support, maintenance, and access facilities) shall be done such that impacts on wildlife habitat and travel corridors, wetlands, rivers and streams, and other natural, scenic and historic resources of the Town are minimized or avoided.
- Develop an inventory of erosion sites on gravel roads and implement ways to mitigate erosion problems at these sites.
- Shared access points, including driveways, shall be encouraged on Route 106 outside village centers.
- The Town shall work with the Regional Planning Commission to maintain a viable regional transportation plan.

- The Town shall incorporate road maintenance and improvement guidelines described in the Better Back Roads Program and the current VTRANS Bicycle and Pedestrian Design Handbook to the extent practicable.
- Maintain the highway system in a safe condition and according to the Vermont Local Road and Bridge Standards.
- Improve traffic speed enforcement.
- Explore options to improve visibility at VT106 and Tyson Road intersection.
- Develop an inventory of erosion sites on gravel roads and implement ways to mitigate erosion problems at these sites.
- Improve road maintenance practices to protect surface waters from road run-off and sedimentation.
- Seek out state and federal programs that address the water quality issues of road runoff from paved and unpaved roads into nearby waterways.
- Designate Felchville as a “Village Center” through the Vermont Downtown Program in order to be eligible to reduce speed limits to 25 mph.
- Road development, maintenance and improvement projects shall preserve the natural and cultural resources of the Town, such as stone walls, tree canopies, streams, and wetlands.

## 6.2 Existing Programs

The following policies, programs, and activities supporting hazard mitigation are currently in place and are being implemented in the Town of Reading.

Currently, the town participates in the NFIP program and will continue to regulate floodplain use through the Town of Reading Zoning Ordinance, including floodplain management, last amended and adopted on July 16, 2007. Along with the Zoning Regulations, the town has adopted the FEMA floodplain maps, last amended by FEMA in 2007.

Continued enforcement of these regulations by the Reading Administrative Officer will maintain the town’s compliance with the NFIP. The Administrative Officer is charged with implementing these regulations and advising residents on floodplain development. Future developments should be encouraged not to develop in floodplain areas or to build to FEMA standards, maintaining the town residents’ ability to purchase flood insurance. Roads and bridges should be constructed and/or rebuilt to mitigate future flooding events and ice jams damage to protect public investment and infrastructure.

The following authorities, policies, programs, and resources related to hazard mitigation are currently in place and/or being implemented in the Town of Reading in addition to the NFIP. These programs reduce the effects of hazards to new and future buildings, infrastructure, and critical facilities by preventing their location in identified hazard areas and ensuring that infrastructure and buildings are designed to minimize damage from hazard events. The Committee analyzed these programs for their effectiveness and noted any improvements that may be needed.

**Table 7: Existing Reading Resources for Mitigating Hazards: Authorities, Policies and Programs**

Resource	Description	Effectiveness in implementing HM Goals	Opportunities for Improving Effectiveness
Town Plan	Plan for coordinated town-wide planning for	Revised and re-adopted in 2015. Includes additional Hazard Mitigation goals,	Plan is updated on a five year cycle, the future revisions will consider and incorporate

	land use, municipal facilities, etc.	policies and recommendations	additional hazard mitigation goals and policies
Basic Emergency Operations Plan	Basic municipal procedures for emergency response	Outlines procedures for call-outs, evacuations, etc.; last adopted in 2014; currently being updated	Plan is reviewed every year following town meeting; statewide template can restrict additional functionality
LEPC 3 All Hazards Resource Guide	Outlines resources available to town in emergency situation	Effective through providing data and resources to town first responders, currently being updated	Could be revised to include resources specific to Reading
Mutual Aid – Emergency Services	Agreement for regional coordinated emergency services	Effective in providing emergency support during atypical events	Reading mutual aid agreements are formalized
Mutual Aid – Public Works	Agreement for regional coordinated emergency highway maintenance services	Effective in providing additional highway support during atypical events	Reading mutual aid agreements are formalized
Road Standards	Design and construction standards for roads and drainage systems	Effective through continued use and implementation	Continued implementation of standards is needed for effectiveness
Subdivision Regulations	Regulates the division of land, standards for site access and utilities	Effective through their continued implementation	Continued updates and enforcement are important for effectiveness
Zoning/Flood Regulations	Regulates development in and out of known hazard areas	Effective through their continued implementation and enforcement	Continued updates and enforcement are critical to continued effectiveness
National Flood Insurance Program (NFIP)	Provides ability for residents to acquire flood insurance	Effective, Reading is compliant with current NFIP program	Flood maps should be revised as needed, consider Community Rating System
Maintenance Programs	Bridge & Culvert Inventory	Effective at tracking and planning for infrastructure upgrades	All inventories should be updated when possible
Access Permits	Regulates driveway access along town-maintained roads	Effective in limiting the number of road access points, thereby reducing the potential for traffic incidents	Continued enforcement of access permit regulations is needed
Local Emergency Planning Committee 3	Volunteer organization involved in regional hazard mitigation efforts	Effective and important contributor in the hazard mitigation planning process	Greater participation from Reading at the regional level would be beneficial
Southern Windsor County RPC	Regional organization working to further emergency management and hazard mitigation goals	Effective in assisting towns in the adoption of new/updates plans and regulations	The RPC should focus on improving the planning process and identify additional sources of historical hazard data

River Corridor Planning tools	Process for identifying stressors to watersheds	Effective at assessing potential mitigation projects within Reading	Can be used to inform future mitigation actions
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### 6.3 Mitigation Strategies, Actions and Projects

The Reading Hazard Mitigation Committee discussed a number of the mitigation strategies identified above. Many projects identified in the previous Hazard Mitigation Plan are still ongoing and/or are still relevant. In most cases, the past identified strategies have been left in place because of their ongoing and cyclic nature, for example, the incorporation of strategies into the town capital budget and planning documents.

The following identified programs, projects and activities are future mitigation strategies for the Town of Reading. These mitigation strategies have been chosen by the town as the most appropriate policies and programs to lessen the impacts of potential hazards.

**Table 8: 2015-2020 Mitigation and Preparedness Actions and Projects for Implementation**

MITIGATION ACTION	TYPE OF ACTION	HAZARD ADDRESSED	RESPONSIBLE PARTY	TIME FRAME	FUNDING SOURCE	HAZARD SCORE
Create redundant power supply for critical facilities-Town and School	Mitigation, Preparedness	High Wind Events, Severe Winter Weather	Selectboard, School Board	2015-2020	Town budget, school budget, VEM grant	10
Upgrade drainage ditches and culverts to better handle water flow	Mitigation	Transportation Disruption, Flooding	Selectboard, Road Foreman	Ongoing Annually	Town budget, Vtrans structure grant	10
Continued hazardous materials training	Mitigation, Preparedness	Hazardous Material Incident	Fire Department, Rescue Squad	Ongoing Annually	Utilizing existing town resources	9
Improve drainage on gravel roads through additional ditching and culverts	Mitigation	Transportation Disruption, Flooding	Road foreman, Planning Commission, SWCRPC	Ongoing Annually	Town budget, HMGP, Vtrans structure grant	10
Assess the vulnerability of critical facilities in River Corridor	Preparedness	Flood, Erosion	Selectboard	2015-2017	HMGP	10
Implement identified mitigation measures outlined in the assessment study to ensure long term stability of critical facilities above	Mitigation	Flood, Erosion	Selectboard, Emergency Management Director	2015-2020	Town budget, HMGP	10

Work with State agencies to update management plans for State Lands located in town to reduce fuel for wildland fires	Mitigation	Wild Fire	Selectboard, State Agencies	2015-2020	Utilizing existing town resources	8
Provide informational materials to at risk residential and commercial structure owners within River Corridor	Mitigation	Flood, Erosion	Selectboard, Zoning Administrator	2015-2017	Utilizing existing town resources	10
Implement annual awareness program for residents in early fall on the hazards of home heating and chimney fires.	Mitigation	Structure Fire	Fire Department, Emergency Management Director	2015-2020 Annually	Utilizing existing town resources	10
Review "FireWise" program, determine effectiveness for Reading	Mitigation, Preparedness	Structure Fire	Fire Department, Emergency Management Director	2015-2016	Utilizing existing town resources	11
Work with SWCRPC to actively seek funding opportunities for Hazard Mitigation	Mitigation	All	Selectboard, SWCRPC	2015-2020	Utilizing existing town resources	all
Work with SWCRPC to Update Flood Hazard Regulations	Mitigation	Flood, Erosion	Selectboard, SWCRPC, Planning Commission, Zoning Administrator	2017-2020	SWCRPC, Utilizing existing town resources	10

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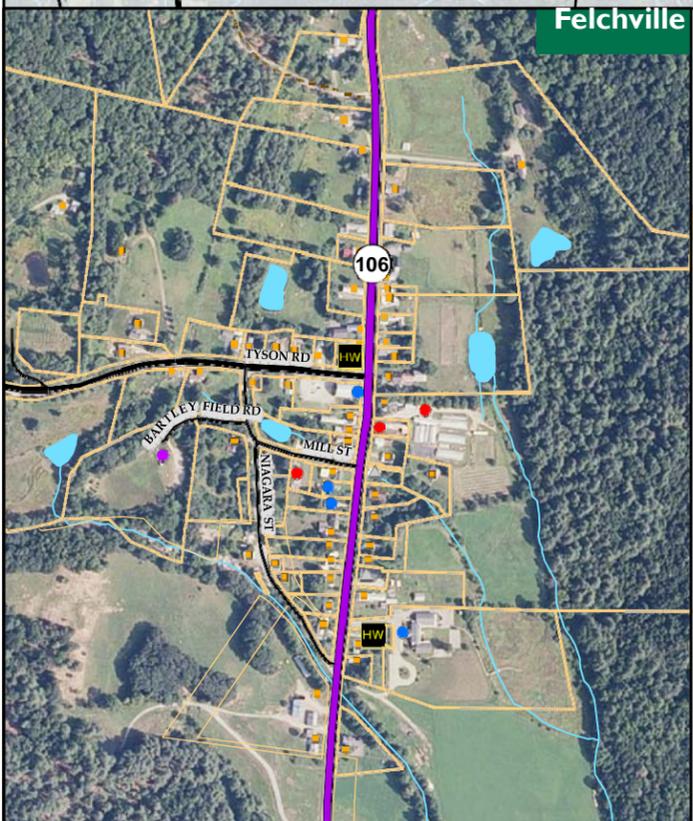
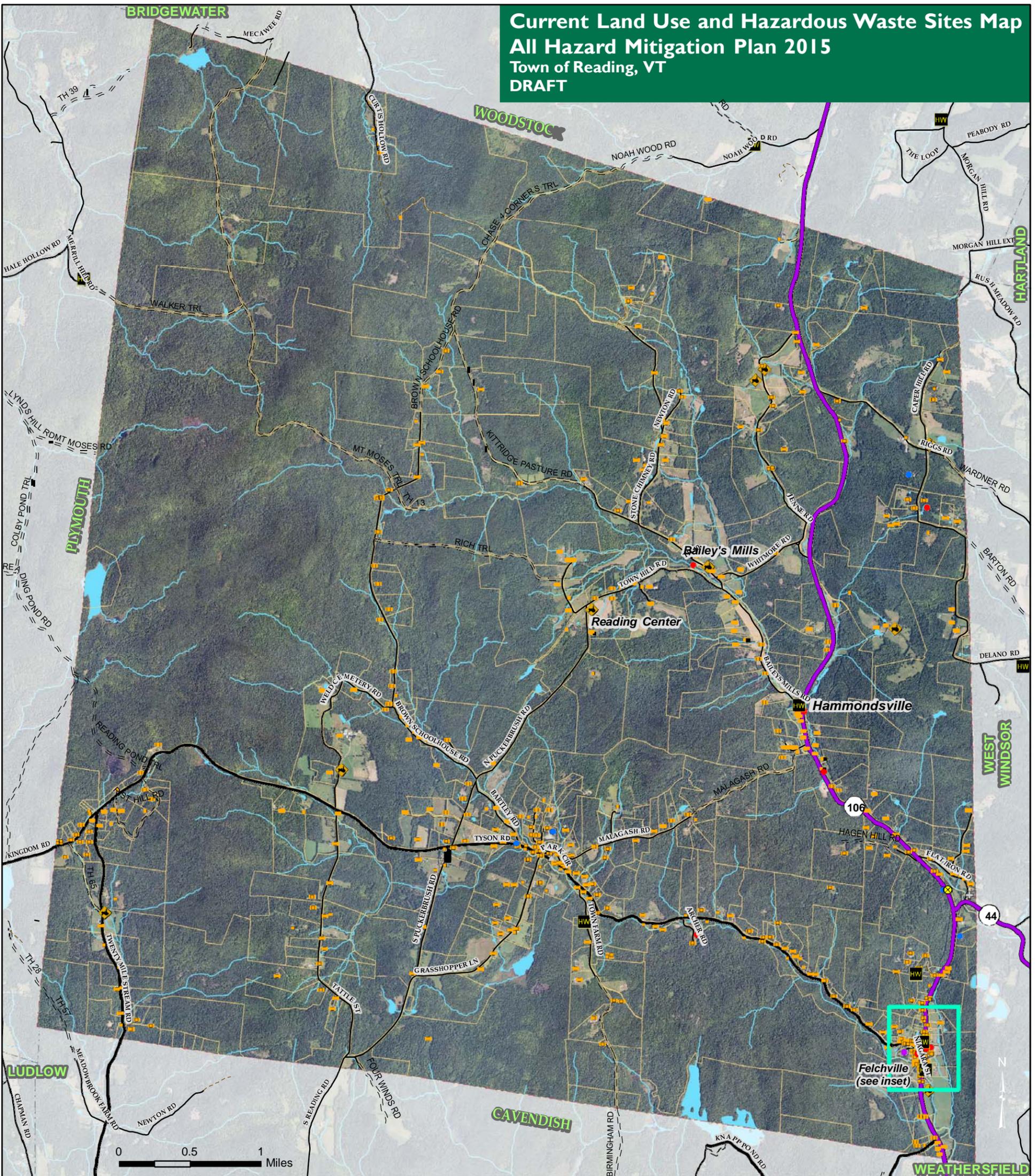
**Appendix**

# Current Land Use and Hazardous Waste Sites Map

## All Hazard Mitigation Plan 2015

### Town of Reading, VT

#### DRAFT



#### Land Use

- Residential
- Commercial
- Industrial
- Civic building
- ▲ Church
- Public gathering place
- + Cemetery
- ◆ Farm

#### Hazardous Waste Site

- HW Hazardous Waste Facility Status Fully
- Regulated Generator
- Conditionally Exempt Generator

#### VT State Highway Class

- 2 Town Highway Class
- 3 Town Highway Class
- 4 Town Highway Private
- Road/Legal Trail Parcels (Reading only)
- Town Boundary
- ~ River or Stream
- Lake or Pond

There are no hazardous waste facilities that are out of business or with unknown status.

Data Sources: Buildings with land use (Vermont E911 2011 with Town Plan 2014 input), Farms (Town 2013 and Southern Windsor County Regional Planning Commission 2013), Roads (VT Agency of Transportation 2014), Hazardous Waste Facilities (VT Dept of Environmental Conservation 2006), Hazardous Waste Sites (VT Dept of Environmental Conservation 2012), Roads (VT Agency of Transportation 2014), Rivers and waterbodies (VT Hydrographic Dataset 2008), Town Boundary (Southern Windsor County Regional Planning Commission using Parcels 2011), Aerial (National Agricultural Imagery Program 2009)

VT State Plane, Meters, NAD 83

Data depicted on this map are for planning purposes only and are based on best available information. Some of the data do not line up.



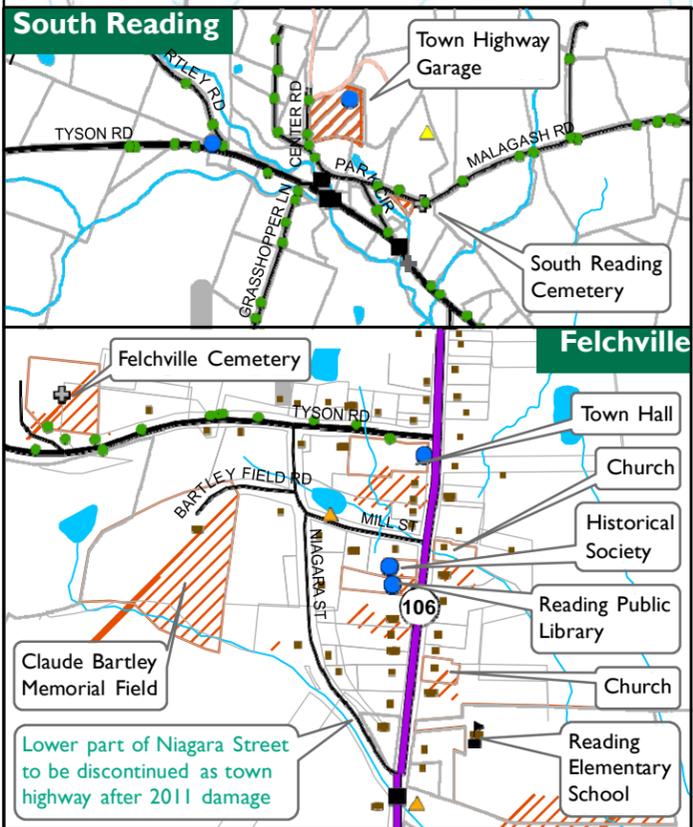
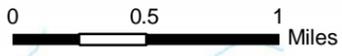
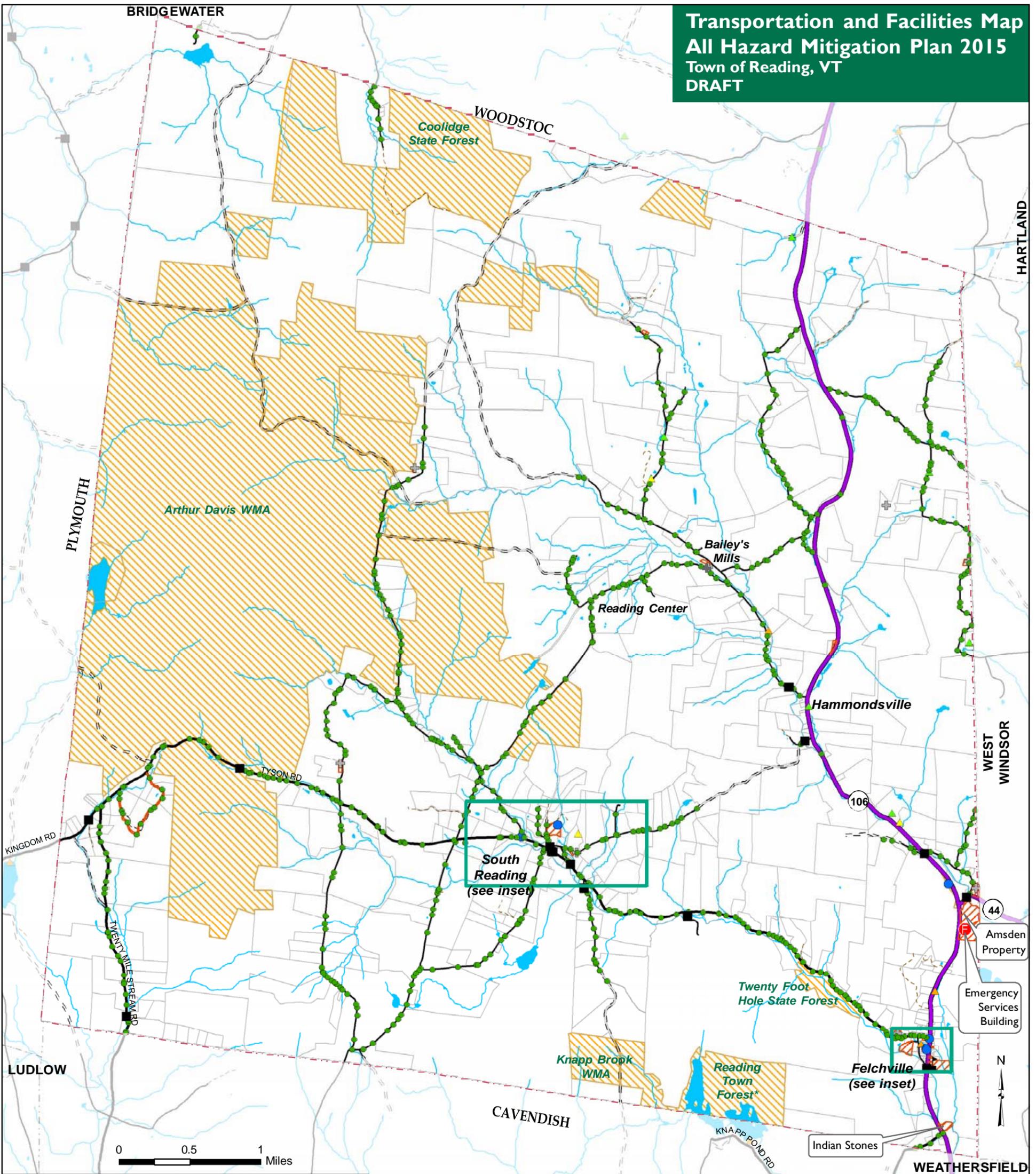
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# Transportation and Facilities Map

## All Hazard Mitigation Plan 2015

### Town of Reading, VT

#### DRAFT



- Emergency Services Building
- Elementary School
- Town Hall and other Civic Buildings
- Building (on Felchville map only)
- Bridge or Very Large Culvert
- Culvert
- Cemetery Dry
- Hydrant Municipal
- Hydrant Other
- Hydrant
- State Owned land
- Tax Exempt Land
- VT State Highway Class 2
- Town Highway Class 3
- Town Highway Class 4
- Town Highway Private
- Road or Legal Trail
- River or Stream
- Lake or Pond
- Town Boundary

The Town does not have any of the following: airport, railroad, pressurized hydrants, transmission line, telecommunication facilities, police stations, hospitals or health centers.

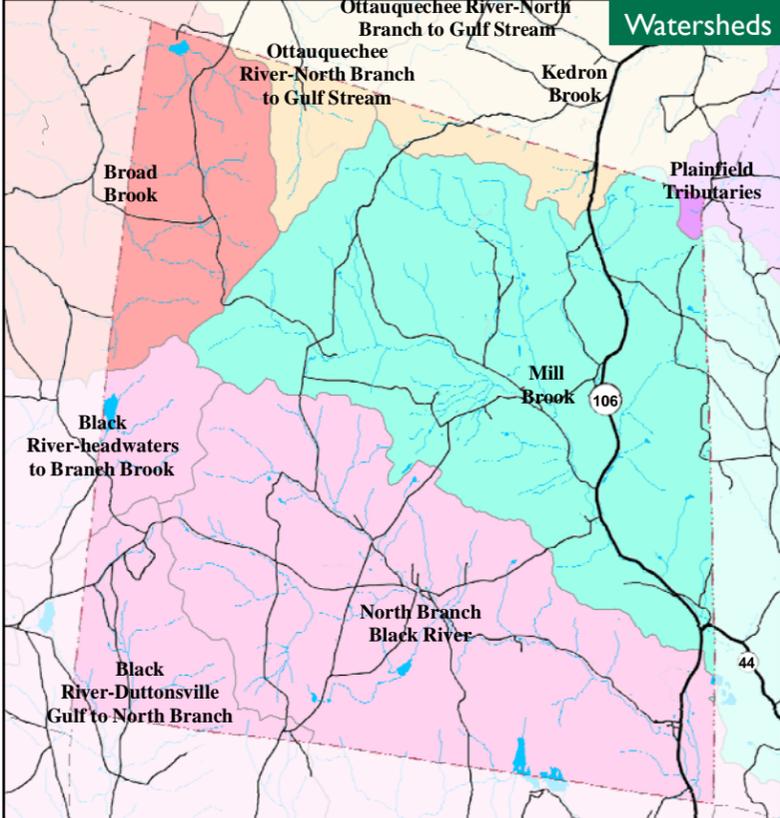
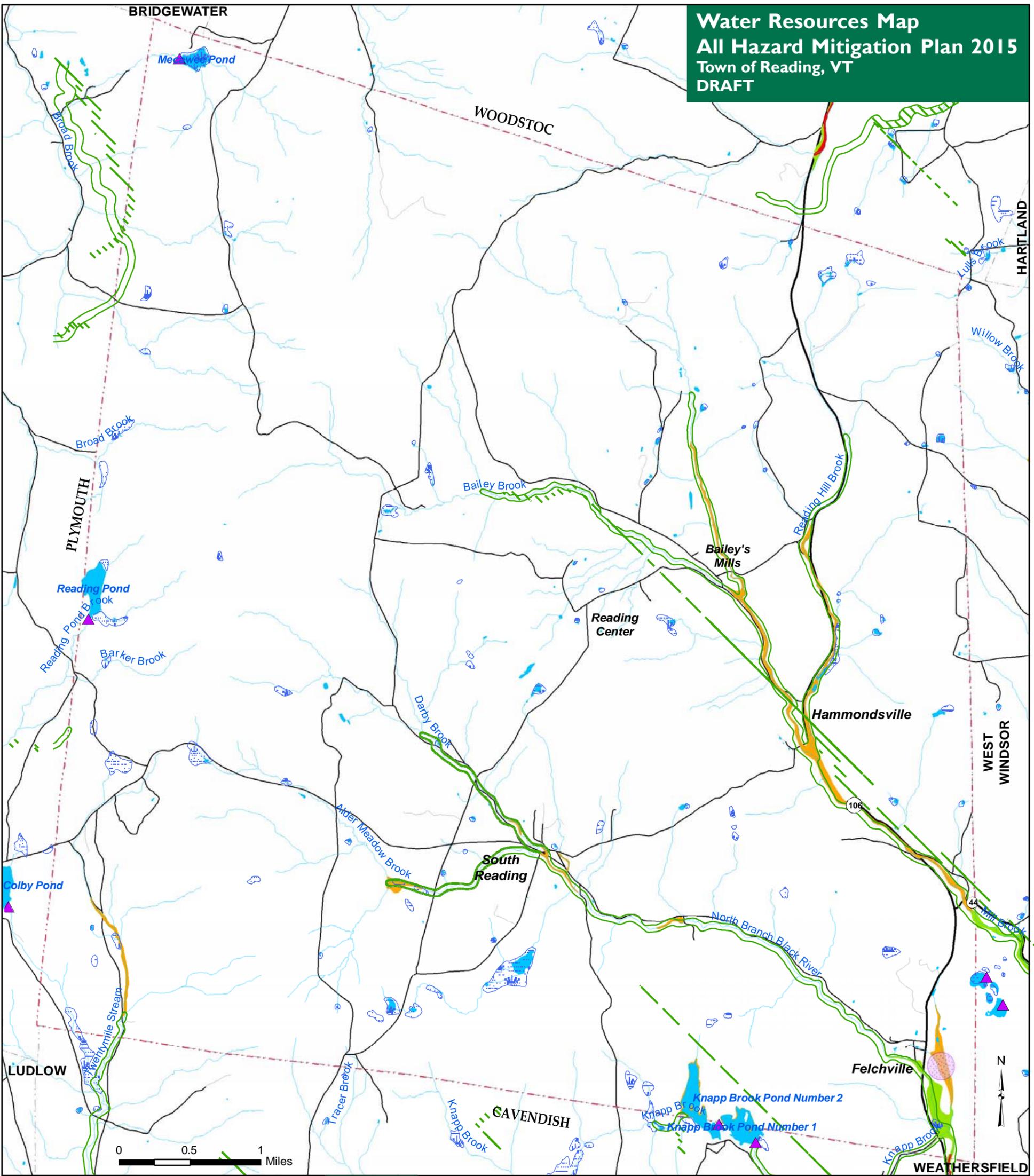
Data Sources: Airports (VT Agency of Transportation 2014), State Bridges and Large Culverts (VT Agency of Transportation 2014), Local Bridges and Culverts (SWCRPC and Town 2013), Roads (VT Agency of Transportation 2014), Railroads (VT Agency of Transportation 2014), Telecommunications Tower (Natural Resources Board 2007 and refined by SWCRPC 2013), Electric Transmission Line Corridor (VT Center for Geographic Information 2003 and refined by SWCRPC 2013), Hydrants (Vermont E-911, April 2013), Buildings (Vermont E911 2011 with Town Plan 2014 input), Town and state owned land (Terramap 2011), Conserved Public Lands (UVM 2010), Rivers and waterbodies (VT Hydrographic Dataset 2008), Parcels (Terramap 2014), Town Boundary (Southern Windsor County Regional Planning Commission using Parcels 2011).

VT State Plane, Meters, NAD 83  
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Map last revised: February 5, 2015

**Water Resources Map**  
**All Hazard Mitigation Plan 2015**  
 Town of Reading, VT  
 DRAFT



**Watersheds**

Dam	River or Stream
River Corridor Protection Area	Lake or Pond
Floodway (Zone AE)	State Highway
Floodplain (Zone A)	Town Highway
Floodplain (Zone AE)	Other Roadway (eg Private)
Wetland	Town Boundary
Surface Water Protection Area	
Groundwater Protection Area	

**Notes:**  
 The groundwater protection area is for the Elementary School well. There are no surface water protection areas within town. There are no mapped Class 3 Vermont significant wetlands within town. There is no floodway identified by FEMA within town.

**Data Sources:** Dams (VT Agency of Natural Resources 2008), Floodplain and Floodway (Special Flood Hazard Areas) (Federal Emergency Management Agency 2008), River Corridor Protection Area (VT Agency of Natural Resources, January 2, 2015), Wetlands (VT Significant Wetlands Inventory) (VT Agency of Natural Resources 2010), Groundwater Protection Area (also known as Wellhead Protection Areas) (VT Agency of Natural Resources 2011), Surface Water Protection Area (VT Agency of Natural Resources 2010), Roads (VT Agency of Transportation 2014), Rivers and waterbodies (VT Hydrographic Dataset 2008), Town Boundary (Southern Windsor County Regional Planning Commission using Parcels 2011).

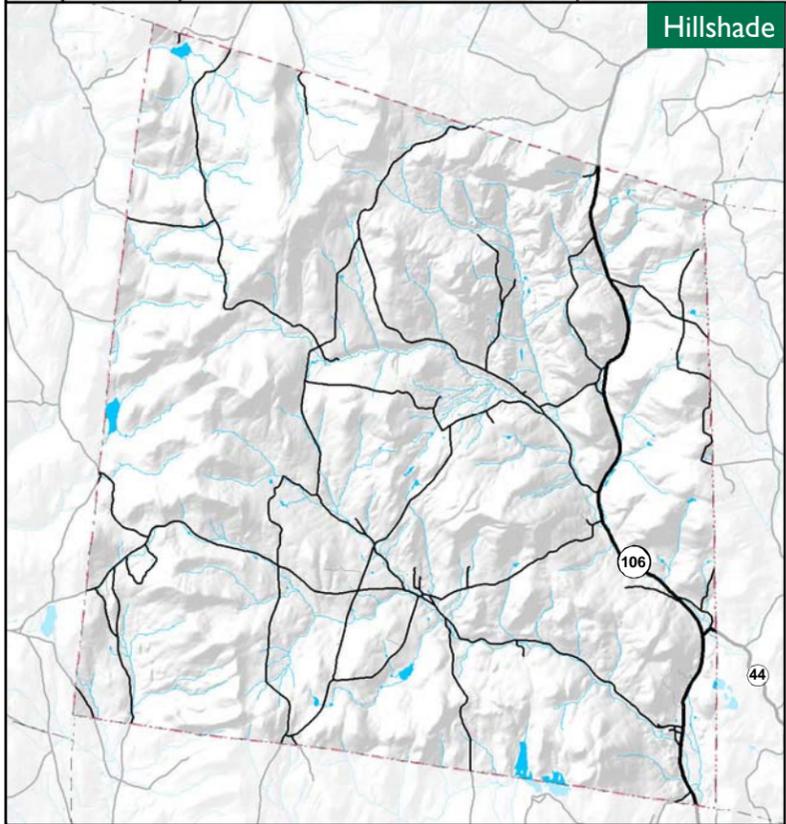
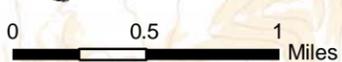
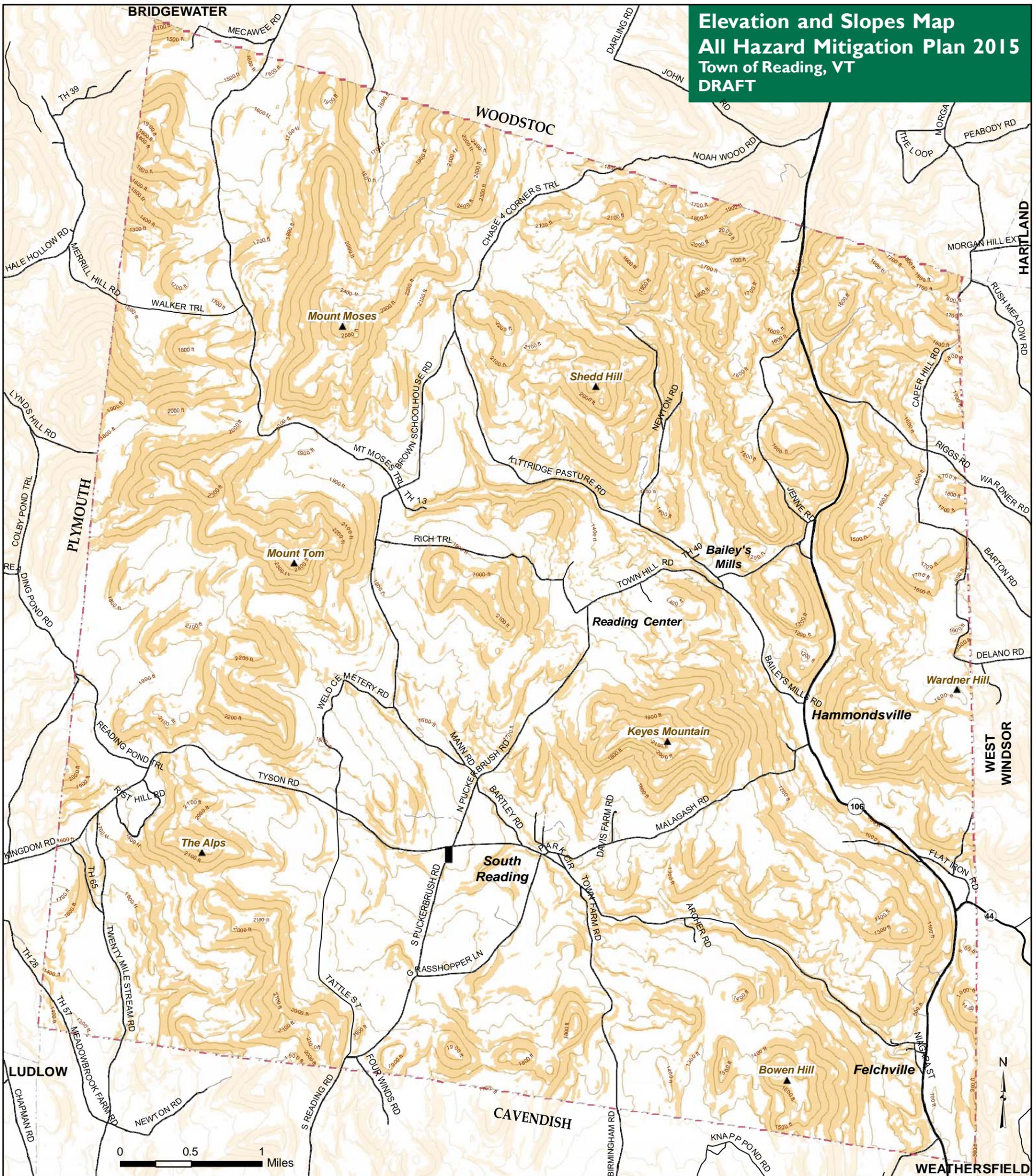
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SOUTHERN WINDSOR COUNTY  
 REGIONAL PLANNING COMMISSION  
 P.O. Box 320, Ascutney, VT 05030  
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**Elevation and Slopes Map**  
**All Hazard Mitigation Plan 2015**  
 Town of Reading, VT  
**DRAFT**



- ▲ Summit
- ~ 100 ft Contour Line
- Steep slopes (24% and above)
- State Highway
- Town Highway
- Other Roadway (eg Private)
- ⋯ Town Boundary

VT State Plane, Meters, NAD 83  
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 planning purposes only and are  
 based on best available information.  
 Some of the data do not line up.

Data Sources: Summits (Unknown Source), Contours, steep slopes and hillshade (derived from 10m Digital Elevation Model, US Geological Survey/ VT Center for Geographic Information 2012), Roads (VT Agency of Transportation 2014), Rivers and waterbodies (VT Hydrographic Dataset 2008), Town Boundary (Southern Windsor County Regional Planning Commission using Parcels 2011).



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# Road network damage from Tropical Storm Irene in Reading, Vermont

