Local Hazard Mitigation Plan for the Town of Putney, Vermont

River Road culvert washout – July 29, 2021

FEMA Approval Pending Adoption Date: 3/24/2022

Municipal Adoption Date: 4/6/2022

FEMA Formal Approval Date:

Technical Assistance by the Windham Regional Commission

WINDHAM REGIONAL COMMISSION

Table of Contents

INTRODUCTION AND PURPOSE

This Hazard Mitigation Plan is AN UPDATE to a prior Plan adopted by the Town of Putney on October 8, 2015 and approved by FEMA on November 13, 2015. This is a single jurisdiction plan covering the Town of Putney, Vermont.

The purpose of this plan is to assist the Town of Putney in identifying all of the hazards facing the town and to identify strategies to begin reducing risks from identified hazards.

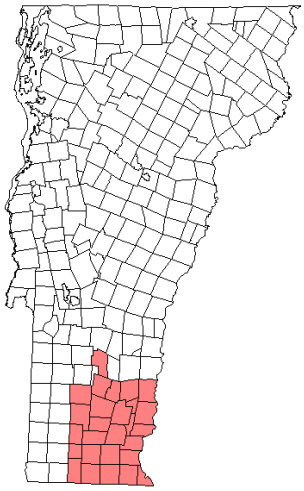
Hazard mitigation is any sustained action that reduces or eliminates risk to people and property from natural and human-caused hazards and their effects. Based on the results of previous Project Impact efforts, FEMA and state agencies have come to recognize that it is less expensive to prevent damage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

Hazard mitigation strategies and measures alter the hazard by: eliminating or reducing the frequency of occurrence; averting the hazard by redirecting the impact by means of a structure or land treatment; adapting to the hazard by modifying structures or standards; or avoiding the hazard by stopping or limiting development. Mitigation could include projects such as:

- Flood-proofing structures
- Tying down propane/fuel tanks in flood-prone areas
- Elevating furnaces and water heaters
- Identifying and modifying high traffic incident locations and routes
- Ensuring adequate water supply
- Elevating structures or utilities above flood levels
- Identifying and upgrading undersized culverts
- Planning for land use for floodplains and other flood-prone areas
- Proper road maintenance and construction
- Ensuring critical facilities are safely located
- Establishing and enforcing appropriate building codes
- Public information

WINDHAM REGION GEOGRAPHY

Situated in Vermont's southeastern corner, the Windham Region consists of 23 towns in Windham County, the neighboring towns of Readsboro, Searsburg, and Winhall in Bennington County, and Weston in Windsor County. The region is bordered by Massachusetts to the south and New Hampshire to the east. At over 920 square miles (590,000 acres), the region accounts for roughly 9.6%of the State's total land area. The Windham Region has several distinctive identities, largely defined by the diverse natural environment.

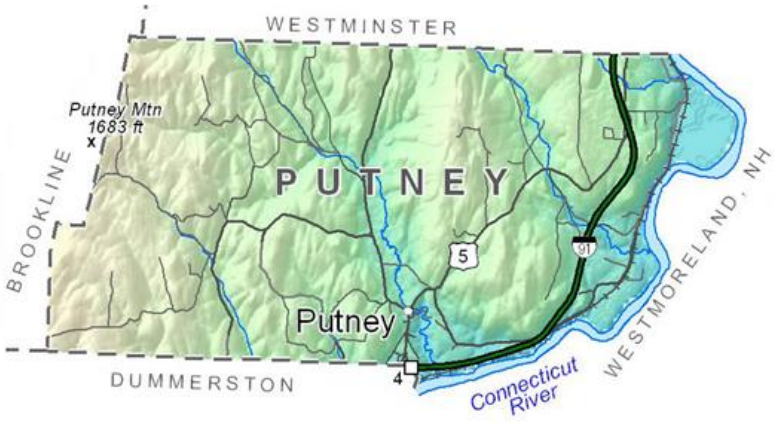


The Region's topography is relatively flat or gently rolling land in the Connecticut River valley in the east, while the western part of the region is characterized by the Green Mountain ridges and peaks with narrow stream valleys. Stratton Mountain is the highest point in the region at 3,936 feet. The lowest point is along the Connecticut River in Vernon, at 200 feet.

In addition to the Connecticut, other major rivers of the region are the Deerfield, Green, North, Saxtons, West, and Williams, all tributaries of the Connecticut. There are two major flood control reservoirs on the West River, Ball Mountain and Townshend, and two major storage reservoirs for hydropower generation on the Deerfield River, Somerset and Harriman.

TOWN PROFILE

Putney is located in Windham County, Vermont. It is approximately 28 square miles (18,000 acres) in size and is bordered by the Vermont towns of Westminster, Brookline, and Dummerston. The Connecticut is Putney's eastern border, across which lies Putney's eastern neighbor of Westmoreland, New Hampshire.



The Town of Putney is a destination community in Vermont, with a very active citizenry interested in the arts, alternative energy, local farming products, education, local issues and proponents of sustainability. Putney also provides a unique sense of tolerance to visitors and newcomers migrating to a new community to make their residence. In 2010, the Putney Conservation Commission conducted a survey completed by 196 people. More than half said they continued to live in Putney because of friends, neighbors and a supportive community. Community ties are strong in Putney. The village of Putney is the town's commercial, civic, and cultural center. The village is not incorporated and thus is part of the larger town of Putney. The local economy includes papermaking, food production, education, crafts, orchards and farms, and retail sales.

Putney has a number of social service agencies serving area residents. Putney Community Cares and the Putney Foodshelf offer services supporting local residents. Along with their day to day operations, these agencies are also concerned with ensuring the people of Putney are cared for during emergencies. There is a good social service basis in the town. In addition, a volunteer mutual aid network (Putney Mutual Aid – neighbors helping neighbors) formed in March 2020 and has worked to coordinate neighbor-to-neighbor support in response to a crisis. This mutual aid network of support helps to match needs and offerings for things like essential rides, food, grocery pickups, caring for loved ones, organizing neighborhood groups and more. Limiting factors for Putney's social service agencies are funding, as in every town, and difficulty getting new volunteers. Existing volunteers get taxed because they can be spread thin. It is difficult to get new people involved. Through the mutual aid network in Putney, volunteers have been connected to area agencies to bolster their volunteer resources during a crisis.

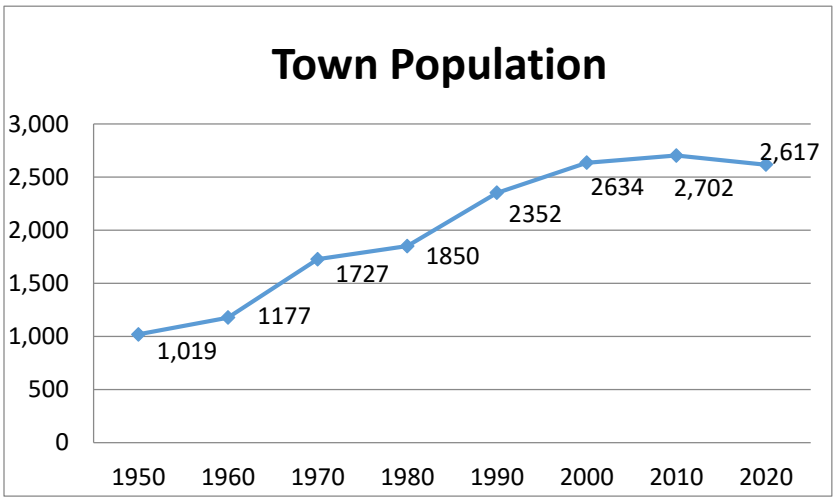
Putney has a rich educational tradition, hosting campuses of Landmark College, The Putney School, Putney Central School, The Grammar School, and The Greenwood School. The Putney School is a boarding school for grades 9-12. The Grammar School is for grades preschool-8th grade. The Greenwood School (ages 10-15) and Landmark College are both specialized in offering curriculums designed specifically for students with dyslexia, attention-deficit disorder, and specific learning or language related disabilities. There is also Putney Central School which is a K-8 public school that also serves as the designated emergency shelter. Putney was past host to The Hickory Ridge School, Putney Antioch, Windham College, and the Experiment in International Living.

Putney is a stand-out community in terms of civic engagement and forward thinking residents who are working to build resiliency in the community. Putney benefits from the initiatives of such groups as Transition Putney, the Putney Conservation Committee and the Putney Energy Committee.

The majority of residential development has occurred as low-density residential development along Class 2 or 3 highways. While development has remained largely scattered throughout the Town over the decades, development has expanded onto some of the previously undeveloped higher elevations of Putney, particularly Bare Hill, Putney Mountain, and East Putney. Putney has several land areas that are being conserved or held as open spaces, either publicly or privately. Agricultural lands are located in the Connecticut River valley, along Westminster Road, West Hill Road, and in several other pockets throughout Town. Agricultural activity chiefly consists of orchards and haying with a few dairy, cow, and sheep operations.

Demographics

The town's total population was 2,617 as of the 2020 census. The population grew slowly between 1950 and 2010, followed by a slight decline between 2010 and 2020. This is shown in the adjacent graph.



The median age in Putney is 54 compared to the state median of 47. The percent of the population over 60 is 39.3%. Overall, Putney has a slightly older population than the state overall.

Natural and Water Features

Putney's topography is marked by two north-south ridgelines, Bare Hill (1,113 feet) in the middle of the town and Putney Mountain (1,660 feet) on the western boundary. Terraces cut by deep ravines run up from the Connecticut River to the base of Bare Hill. The land generally slopes uphill from the Connecticut River, at an elevation of about 230 feet, to the top of Putney Mountain. Major streams in Putney flow into the Connecticut River and include East Putney Brook, Sacketts Brook, and Canoe Brook. These waters are valuable as sources of water supply, recreation areas, flood water absorption areas, habitats for wildlife and vegetation, wildlife travel corridors, and support for economic uses such as agriculture and manufacturing.

Four watersheds have land within Putney: Lower West River, Connecticut River-Dummerston, Sacketts Brook and the Connecticut River watershed. Watersheds collect precipitation and contribute runoff to receiving bodies of water. Though no single brook is entirely located within Putney, all of the major surface water have some headwaters in Putney. Because any land use in a watershed can affect water quality at any point downstream, careful consideration should be given to any development or disturbance in Putney's uplands.

Drinking Water and Sanitary Sewer

The Town has a municipal water system serves most of the village including parts of River Road, Route 5 from River Road to the Dummerston border, and parts of Kimball Hill, Christian Square, Sand Hill Road and Old Depot Road., including the town office, the town library, and the fire department. There are 106 users served by the public water system. The constructed

system includes a well and pump house in the vicinity of Sand Hill road, a 400,000 gallon storage tank in the vicinity of Landmark College campus on River Road and the distribution system. A source protection plan has been implemented to safeguard the well's water supply.

The Town's wastewater system serves much of the Village area, including lands on either side of U.S. Route 5 from the Dummerston boundary to River Road, along River Road to Locust Lane (connecting Landmark College). Service extends up Kimball Hill to just past and including part of Fred Houghton Road, and also extends down Depot Road over I-91 to service the Putney Inn, and several businesses located in the Town of Dummerston, such as the Green Mountain Spinnery and the King Boat Works. There are 147 users served by public sewer.

The remainder of the town's developed properties are served by private drilled wells or springs and private septic systems.

Electric Utility Distribution System

Electric service to approximately 1,347 meters is provided by Green Mountain Power. Outage statistics between 2015 and 2020 are shown below.

	Total Meters that Experienced an Outage	Total Hours Those Meters were Without Power	Total Meters in Town	Avg # of times a customer was without power	Average length of outage (hours)	# Hours the Typical customer was without power
2015	2,574	3,533	1,347	1.91	1.37	2.62
2016	2,996	5,007	1,347	2.22	1.67	3.72
2017	8,016	34,948	1,347	5.95	4.36	25.94
2018	8,575	36,072	1,347	6.37	4.21	26.78
2019	5,037	18,483	1,347	3.74	3.67	13.72
2020	6,362	14,783	1,347	4.72	2.32	10.97
Six Year Average	5,593	18,804	1,347	4.15	3.36	13.96

The results above show that 2017 and 2018 were particularly impacted years for power outages, with those years having the most number of outages and the most amount of hours that the average customer was without power. Power outages are of particular concern for vulnerable populations during cold weather months in Vermont.

There is a vocal component of residents in Putney that are concerned with grid susceptibility and are focused on increasing energy independence and self-reliance in the community. The Putney Energy Committee is a town committee that looks for and works on projects to save energy and raise awareness about climate change, increasing efficiency and building local power generation sources that are not susceptible to grid instability.

The generator at the Putney Central School, which is the emergency shelter in Putney, can power the shelter for a week and a half. There are not backup generators for the sewer plant or the water supply system.

Transportation Network

Putney is served by Exit 4 on Interstate 91, eighteen miles north of the Massachusetts border. US Route 5 and Kimball Hill Road/ Westminster Road are the main roads through the village. The major secondary paved roads include West Hill leading west from the Westminster Road, Old Route 5 in the village area, and River Road traveling east along the river from US Route 5. Roads in Putney generally follow the topography, and settlement patterns have naturally followed roads to facilitate access and maintenance.

There are about 66 miles of town maintained roads in Putney, of which approximately 50 miles are gravel and 16 miles are paved roads. Approximately 40 miles, or 61% of the Town's road mileage, that is hydrologically connected - meaning it is within 100-feet of a water resource (i.e., perennial/intermittent stream, wetland, lake, or pond). Proximity to water resources can make these sections of road more vulnerable to flooding and fluvial erosion.

There are 6 town-owned bridges in the Putney highway network, one short and six long, as well as approximately 700 culverts. Culverts are cleaned twice per year, in spring and fall. Roughly 95% of these serve for water run-off. The remaining 5%, or roughly 30 culverts, are in streams. Culverts of 36 inches or more are regarded by the State as hydraulic, or structure culverts and are under the purview of the State. If work or replacement of these culverts is necessary, the State oversees what needs to be done. Grant money is available if the project warrants funding. The local transportation network is maintained by the Town Highway Department.

Putney is served by public buses through the MOOver, which provides service between Brattleboro and Bellows Falls. There is also a rail line that traverses Putney, which carries passenger and freight rail, though there is no stops in Putney. One bridge is on a town highway and is owned by the railroad.

Public Safety and Emergency Management

Municipal fire protection, fire prevention, and emergency medical services are provided by the Putney Fire Department. A municipal department since May 1, 2001, the Putney Fire Department is a member of the Southwest New Hampshire District Fire Mutual Aid System, which provides dispatch services for the area fire and emergency medical agencies.

Employees of the Fire Department include a full-time Fire Chief and 38 on-call fire and EMS personnel. Of these personnel, over half maintain nationally recognized licensure as Emergency Medical Technicians, including Paramedic, Advanced EMT, EMT, and Emergency Medical Responder levels. Continual in-house training, as well as participation in outside training and education programs maintains the department's competence in the response to, and mitigation of all types of emergency scenarios.

For Paramedic level emergency medical treatment and patient transportation needs, the Town of Putney contracts with Rescue, Inc., in Brattleboro. For any circumstance requiring the need for emergency medical services, Putney Fire Department provides initial response and advanced life support patient treatment until the arrival of Rescue, Inc.

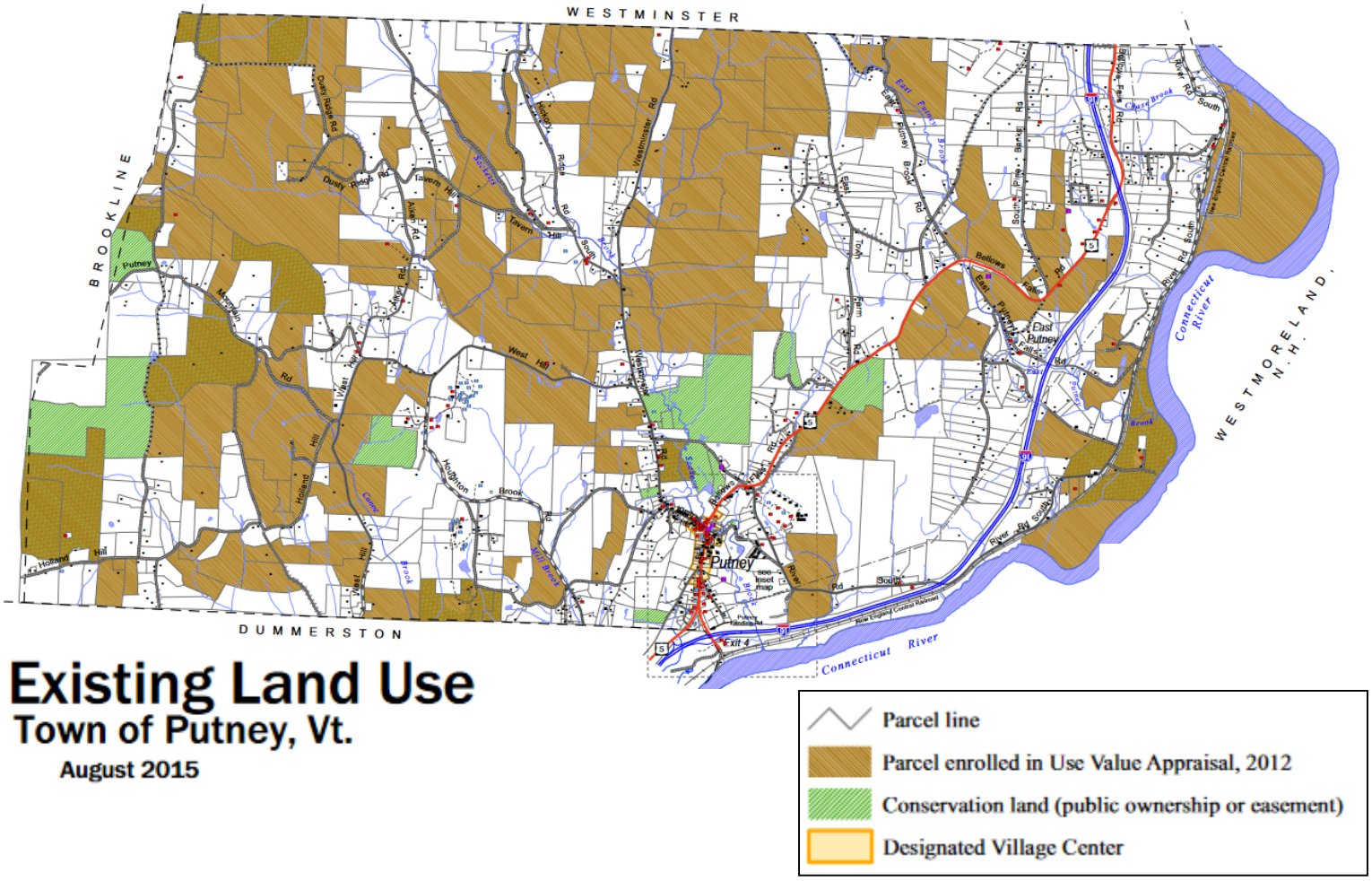
The Fire Department is housed at 20 Carl Snyder Drive. Constructed in 2005, the fire station also houses the Town's Emergency Operations Center, which is a critical element during large scale emergency events and responses. Putney has 66 hydrants: 46 municipal hydrants and 20 dry ones.

The Town of Putney, in accordance with Vermont statutory requirements, maintains an appointed Emergency Management Director. This position has been officially assigned to the Fire Chief and Assistant Fire Chief respectively, as part of the official job descriptions for each.

The responsibilities of the Emergency Management Director includes broad based emergency planning for the Town, specific localized and facility-based emergency planning, maintaining the Local Emergency Management Plan, and this Local Hazard Mitigation Plan, and overall coordination of all emergency services activities during a large-scale natural or man-made event.

For many years Putney has contracted with the Windham County Sheriff's Department for part-time police protection. The Town is also served by the Vermont State Police.

Town of Putney Existing Land Use Map from 2015 Town Plan



PLANNING PROCESS

Plan Developers

Alyssa Sabetto, Emergency Planner with the Windham Regional Commission, assisted the Town with the update. Emergency Management Planning Grant funds from FEMA supported this update.

The core Hazard Mitigation Planning Team members who assisted with the update included Tom Goddard the Fire Chief, Emergency Management Director, Health Inspector, Fire Safety Inspector and E911 Director; Karen Astley the Town Manager, Zoning Administrator and Floodplain Administrator; and the Road Superintendent. The following individuals were a part of the Planning Team who advised on information to be included in the plan and mitigation action development:

- Ann Kerrey - Conservation Commission
- Jane Kolias - Wilson Wetlands Stewardship Committee
- Robin Ekstrom - Planning Commission & Energy Advisory Committee

- Aileen Chute - Selectboard, Planning Commission & Energy Advisory Committee
- Alan Blood - Energy Advisory Committee, Putney Cares
- Ellen Forsythe - Community Member
- Eva Greene - Community Member
- Brad Greene - Community Member
- Janice Baldwin - Community Member
- Tom Hinckley - Conservation Commission
- Gino Palmeri - Conservation Commission
- Brian Harlow – Road Superintendent

Plan Development Process

The 2021 Putney Local Hazard Mitigation Plan is an update to the 2015 single jurisdiction mitigation plan. A summary of the process taken to develop the 2021 update is provided below. The 2015 plan development process was robust. This update process was done in a more expedited fashion as there was timing pressure due to a Federal declaration request for rains on July 29, 2021. The Plan was expired at that point, and the update process and drafting had to be completed within about two months. Additionally, the planning process was entirely virtual as this process occurred during the Covid-19 pandemic.

August 14, 2021: Hazard Mitigation Core Planning Team kick-off meeting. Planning Team discussed what a LHMP is; the benefits of hazard mitigation planning; current plan status; the planning process; outreach strategy; and plan sections. Planning Team meetings were not open to the public.

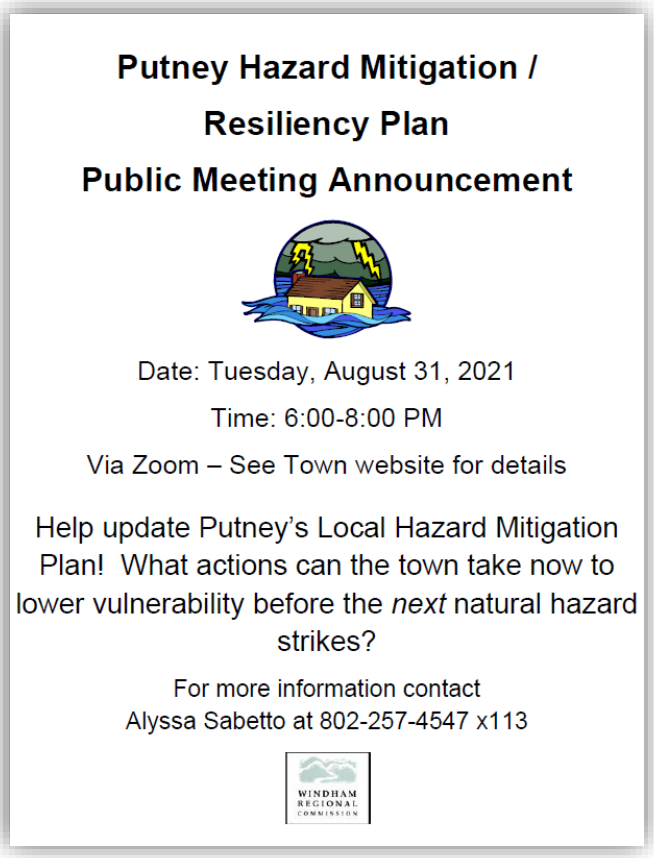
August 2021: Public notice posted on the Town websites/social media (Facebook, Front Porch Forum) that the Town was engaged in hazard mitigation planning and updating their LHMP.

August 26, 2021: Core Planning Team meeting – Confirmed the plan purpose and completed work on updating and confirming the prior Hazard Risk Assessment and identifying assets vulnerable to the highest risk natural hazards. This update and confirmation is a critical milestone in the plan update process.

August 31, 2021: Planning Team meeting at which the updated Hazard Assessment was shared and there was solicitation for mitigation actions to be included in the plan. Completed work on the storm history and assets vulnerable to the highest risk natural hazards. Completion of the hazard identification and risk assessment is a critical milestone in the plan update process.

September 2021: Alyssa Sabetto worked on plan drafting.

Late October 2021: LHMP update draft was submitted to Vermont Emergency Management to



assist the Town in maximizing their Emergency Relief Assistance (ERAF) rate after the July 29, 2021 event.

November 22, 2021: Comments received back from Vermont Emergency Management.

December 2021-January 2022: Alyssa reworked the draft to complete it and address comments received from Vermont Emergency Management. The revised working draft was completed in early January.

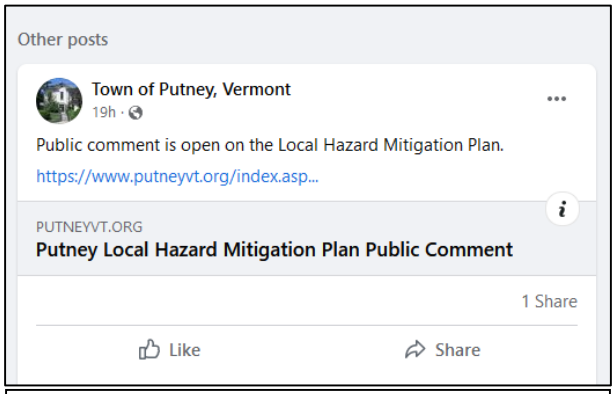
January 5-19, 2022: Working draft LHMP presented via email to plan developers and core planning team for internal town comment for a period of two weeks. Comments were directed to be sent to Alyssa. Alyssa addressed all comments received and revised the draft accordingly.

February 9, 2022: Draft and several received comments were discussed at a Selectboard meeting. This also provided another comment opportunity.

February 15, 2022: Draft put out for public comment for a period of two weeks. Simultaneously the draft was also shared via email with all surrounding towns for comment opportunity. See appendix for email sent to adjacent towns. Alyssa addressed comments received back and completed the draft LHMP.

February 23, 2022: Draft was discussed at a Selectboard meeting and a public comment opportunity was provided.

March 2022: Revised draft LHMP submitted to Vermont Emergency Management for Approval Pending Adoption.



Facebook post for public comment on the draft

In addition to the local knowledge of Planning Team members and other relevant parties, and information in the 2015 Putney Local Hazard Mitigation Plan, several existing plans, studies, reports, and technical information were utilized in the preparation of this Plan. A summary of these data sources is provided below and specific references are listed in footnotes throughout this Plan.

- 2021 Local Emergency Management Plan
- Floodready VT Community reports and NFIP information
- 2015 Putney Town Plan
- 2015-2020 Green Mountain Power Outage Data
- 2018 State of Vermont Hazard Mitigation Plan
- 2019 American Community Survey Five-Year Estimates
- Putney Flood Hazard Area Regulations
- WRC Local Liaison Reports of Storm Damage
- National Oceanic and Atmospheric (NOAA) National Climatic Data Center's Storm Events Database
- FEMA Disaster Declarations for Vermont

- OpenFEMA Dataset: Public Assistance Funded Project Summaries for Vermont
- U.S. Geological Survey National Water Information System- Stream Gage Data
- FEMA Flood Insurance Rate Maps

Changes Since the 2015 Plan

Putney's Town Plan and land use development regulations aim to guide the direction of growth in a way that is both economically feasible and environmentally acceptable.

As described in the Town Profile section of this Plan, the Town experienced a slight population decline between 2010 and 2020.

According to the Putney Town Manager/Zoning Administrator, the Town issued 40 permits for houses/camps/mobile home replacements, 91 permits for sheds, garages, additions, decks, etc., 30 commercial permits and 48 other type of permits between 2015 and 2021. Ten of these permits are located in the floodplain. The largest new development in this timeframe is the addition of Putney Landing, an affordable housing development in the Village.

Development in Putney since 2015 has not changed the overall vulnerability of the community to natural hazards.

The Town's mitigation priorities shifted a bit. In 2015, the Putney Local Hazard Mitigation Plan was an all-hazards (natural and human-caused) plan. This Plan update focuses exclusively on natural hazards. Changes to the hazards assessed are discussed in the Risk Assessment section of this Plan.

Putney has an active and progressive minded citizenry, including a vocal Energy Committee and Conservation Committee. These groups were involved in both the 2015 and 2021 planning processes. This Plan, however, includes more of a focus on climate change due to input from these groups and individuals and based in part on the increased impacts of climate change on hazard events in the timeframe between these plans.

Putney has made significant progress in completing the mitigation projects identified in the 2015 Plan and that is discussed in the "Mitigation Strategy" section of this Plan.

RISK ASSESSMENT

The risk assessment portion of a Hazard Mitigation Plan contributes to the decision-making process for allocating available resources to mitigation projects. 44 CFR Part 201.6(c)(2) of FEMA's mitigation planning regulations requires local municipalities to provide sufficient hazard and risk information from which to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.

Methodology and Vulnerability Analysis

A vulnerability analysis for each community begins with an inventory of possible hazards and an assessment of the risk that they pose. These are the questions to be answered: How likely is this hazard to occur in my town? How badly could it impact my town? What areas of town would or could be affected by the hazard? This Plan update utilized the 2015 analysis ranking technique in updating the Hazard Assessment table.

The **Likelihood** (frequency of occurrence) is classified as:

- Unlikely: < 1% probability in the next 100 years.
- Possible: 1% to 10% probability in the next year, or at least one chance in the next 100 years.
- Likely: 10% to 100% probability in the next year, or at least one chance in the next 10 years.
- Highly Likely: Near 100% probability in the next year.

The **Potential Impact** (percentage of the town affected) of the hazard is classified as:

- Negligible: < 10% of properties damaged/Minimal disruption to quality of life.
- Limited: 10% to < 25% of properties damaged/Loss of essential facilities/services for up to 7 days/few (< 1% of population) injuries possible.
- Critical: 25% to 50% of properties damaged/Loss of essential facilities/services for > 7 days < 14 days/Major (< 10% of population) injuries/few deaths possible.
- Catastrophic: > 50% of properties damaged/loss of essential facilities/services for > 14 days/Severe (> 10% of population) injuries/multiple deaths possible.

Likelihood:	Potential Impact:
U = unlikely	N = negligible
P = possible	L = limited
L = likely	CR = critical
HL = highly likely	CA = catastrophic

Additional considerations in the discussion were: the impacts of climate change, seasonal weather patterns, what areas of town are likely to be affected the most, the probable duration of the hazard, the speed of onset and amount of warning time considering the existing warning systems available.

The combination of the **Likelihood** and the **Potential Impact** are used to determine the **Vulnerability Ranking** as being HIGH, MODERATE or LOW.

This Plan update focuses exclusively on natural hazards, with the exception of dam failure. Dam failure continues to be a risk in Putney, related to the Sacketts Brook dam, and a failure would likely be linked to a natural hazard risk like flooding and/or fluvial erosion. Non-natural hazards that were included in the 2015 Plan but not in this update are: radiological incidents (Vermont Yankee nuclear power plant in Vernon has closed since 2015), school safety issues (the schools have their own emergency plans outside of the purview of the town), solar flares (not a hazard suitable to be addressed by this plan), hazardous material incident (purpose of this Plan does not fit with this hazard type), power failure (this is addressed in the Town's Local Emergency Management Plan), water supply contamination (the Town has a Water Source Protection Plan that addresses this), structure fire, highway accidents, railroad accidents, air crash, and terrorism. The Town also chose to simplify the assessment by addressing hurricane under both flooding and wind, and addressing tornado under wind. The updated assessment is shown on the following page.

While all the hazards listed in the following table were considered by the core Hazard Mitigation Planning Team for inclusion in this Plan, it is not feasible to study each in depth. The rationale for why extreme temperature (heat and cold), earthquake, hail, drought, and wildfire are not addressed is that they all scored a low or moderate vulnerability ranking, the Town feels they adequately mitigate for the hazards currently, and the town does not choose to or cannot mitigate for these hazards at this time. For hazards that are not profiled in this plan, the reader is directed to the current Vermont State Hazard Mitigation Plan.

This Plan will focus on three high vulnerability natural hazards that were also focused on in the 2015 Plan: Flash Flooding and Fluvial Erosion; Snow, Ice and Winter Storm; and Invasive Species. The only other hazard with a high vulnerability ranking is Infectious Disease Outbreak. Interestingly, this hazard also ranked as high in the 2015 Plan. The Town does not choose to focus on this hazard in this Plan as they have not yet completed an after-action evaluation and report on the current Covid-19 pandemic. Outside of the pandemic, the hazard events that have impacted Putney since 2015 involve flooding and fluvial erosion, ice storms, and the increasing presence and closer proximity of invasive plants and insects.

Climate change is a widely recognized hazard in Putney and it was discussed in the Plan process. Climate change will be addressed in an overarching way as it impacts all hazards. The effects of climate change on the natural hazards addressed in this Plan will be discussed in the hazard profiles. This Plan will briefly discuss the Sackett's Brook Dam, as the failure of the Dam is a concern for the Town, and the Town owns the Dam.

Hazard	Likelihood	Potential Impact	Vulnerability Ranking	Vulnerability Concerns
Flash flood / Fluvial Erosion	**HL**	**CR**	**High**	**Village brooks; Streams and brooks town wide**
Snow / Ice / Winter storm	**HL**	**L**	**High**	**Residences, Businesses, Utilities, Roads and Infrastructure**
Invasive Species	**HL**	**L**	**High**	**Forests throughout the town; Tree canopy in town**
Infectious Disease Outbreak	L	CR	High	Town wide; An after action has not yet been completed for the current Covid-19 pandemic.
Wind	HL	L	Moderate	Town wide
Drought	P	L	Moderate	Concern for both public and private water supplies; Rising concern; Public water supply covers 106 homes and businesses
Wildfire	L	L	Moderate	Structures in and near wooded areas; Putney Mountain is a concern due to hikers and campers
Cold	L	L	Moderate	Generally doesn't get as cold as in the past; Unpredictable winters; People living in unprepared or vulnerable situations is the concern.
Heat	L	L	Moderate	Vulnerable citizens
Earthquake	U	CR	Low	Town wide; fault line under the Connecticut River
Dam Failure	U	L	Low	Sacketts Brook dam; Dam failure would likely be linked to another hazard such as flooding
Inundation Flood	U	L	Low	Lower elevations generally in Connecticut River valley are vulnerable but not highly developed
Landslide	P	L	Low	Increasing number of issues along waterways; most are happening slowly; infrastructure could be affected by some slides in the future; all on private land
Hail	U	N	Low	

HAZARD PROFILES

The following sections include a narrative with a Description, Geographic Area of the Hazard, Impact, Extent, Probability, and discussion of Past Occurrences of three high vulnerability natural hazards affecting Putney.

Flooding / Fluvial Erosion

Description
Flooding is the most widespread and destructive hazard in the United States. Flooding can occur anytime of the year as a result of heavy rains, thunderstorms, tropical storms, hurricanes or Nor'easters. It can result from the overflow of major rivers and their smaller tributaries, or inadequate local drainage. Historically, floods have been a factor in over 80 percent of all federally declared disasters. People living in close proximity to bodies of water such as rivers, lakes, and streams are at greater risk from flooding than those not living in the floodplain. There is a 26 percent chance of experiencing a flood during the life of a 30-year mortgage compared to a 4 percent chance of a fire. Putney has a floodplain ordinance which also regulates River Corridors. This bylaw gives residents access to discount flood insurance through the National Flood Insurance Program (NFIP) and enables the Town to regulate development within the Special Flood Hazard Area (SFHA) and River Corridor.

SFHAs are subject to inundation by the 1% annual chance flood (100-year flood). River Corridors are subject to fluvial erosion and are defined and mapped by the Vermont Agency of Natural Resources (ANR). River Corridor mapping delineates fluvial erosion hazard areas and includes a 50-foot buffer beyond those designated areas. For small streams, a 50-foot buffer from top-of-bank on either side of the waterway constitutes the River Corridor. Maps of these areas can be found at the Town Office or online at the FEMA Map Service Center[1] (SFHAs only) or on the VT ANR Natural Resources Atlas[2] (SFHAs and River Corridors).

Much of the destruction from flooding in Putney is due to fluvial erosion rather than inundation, which is the type of flooding targeted in FEMA mapping. Fluvial erosion is the destruction of river banks caused by the movement of rivers and streams, when stream power overcomes resistance of bed and bank material. This can range from gradual bank erosion to catastrophic changes in river channel location and dimension during flood events. This occurs when the stream has more energy than is needed to transport its sediment load, due to channel alterations or runoff events that increase water speed in the channel, leading to erosion.

Gravity and water power are the forces driving fluvial erosion. Factors that allow the force of gravity to overcome the resistance of earth material to erosion include: saturation by water, steepening of slopes by erosion or construction, alternate freezing or thawing, removal of trees and other vegetation and earthquake shaking. Major erosion events are typically associated with periods of heavy rainfall or rapid snow melt and tend to worsen the effects of flooding that often accompany these events. Associated issues in Putney are related to road cutting and bank erosion for the most part, areas where roads have been built between steep slopes on one side of the road, and slopes to a river or brook on the opposite side.

Bends in the river are prone to movement as part of natural river processes, and their movements can be even more dramatic when manmade impacts and development upstream impinges on these natural stabilizing forces. The interaction of the natural and unnaturally dramatic forces of river movement, combined with the stationary location of the closely located roads is what leads to road damages during heavy weather events. Property owners outside of

[1] https://msc.fema.gov/portal
[2] https://anrmaps.vermont.gov/websites/anra5/

the FEMA floodplain can purchase flood insurance at a lesser expense, and it still covers damages resulting from fluvial erosion in events that damage multiple properties.

Impact

The historic road network of many Vermont towns and villages typically follows waterways, and this is true in Putney. This historic settlement pattern creates vulnerability for the road network, infrastructure and development within and along River Corridors. Typically, every year, in the springtime particularly, the brooks flowing near roadways can cause washouts of the road edges, or worse. Roads near roads tend to experience repeated damages with rain events and spring snowmelt. Streams flow adjacent to: Putney Mountain Road, Hickory Ridge Road, Brook Road, Houghton Brook Road, East Putney Brook Road and East Putney Falls Road. Holland Hill Road, Sand Hill Road and River Road are crossed by streams and Sand Hill Road is adjacent to a Class 2 wetland. River road linkages create vulnerabilities.

Road damage due to flooding or fluvial erosion doesn't usually leave anyone stranded, as there are back ways to pretty much everywhere in town. It does cause inconvenience for locals, though, and expense for repairs by the town. Inundation flooding sometimes occurs after major storms, along the Connecticut River in low areas east of the railroad tracks. Much of this area is FEMA defined SFHA. All of the land in this area is used for agriculture and there are no buildings, so it's not a concern for the town. High water in the Connecticut does back up waterway inlets, pushing some flooding issues up the smaller tributaries. Even during the biggest storm event in memory, however, there was no damage to infrastructure or buildings as a result of flooding. The New Hampshire towns across the river, which have lower banks to the Connecticut, experience more flooding from the river.

Brook Road, along the Sackett's Brook, between South Windmill Hill Road and Tavern Hill Road is an area vulnerable to fluvial erosion. Since 2011, there was an instance where water rushed down both sides of the steep ravine along Brook Road toward the brook and took down a large number of trees which ended up both on the road and in the stream. In addition to water rushing down the steep bank next to the road, Brook Road has the problem of the stream being so close to the road the stream erodes the edges of the road. Alternatives should be considered that would allow this road to be closed.

There are no mapped ice jams in Putney.[3]

Extent

The extent of a flood event can vary from a minor event due to a typical rain event or could be a major event as a result of rapid snow melt in spring, rain on frozen ground, or as a result of a tropical depression or storm. It's important to note that this Plan is looking at flooding data for this section in the light that flooding is the cause of fluvial erosion.

The highest recorded measurement at the nearest stream gauge to Putney (across the river in North Walpole, NH) on the Connecticut River was 43.80 feet, which was measured on March 19, 1936 during the Great Flood. The second highest recording at that gauge was during TS Irene on August 29, 2011 when the gauge measured 31.38 feet. According to the National Weather Service flood stage at that gauge is 28 feet.[4]

Extent for thunderstorms/heavy rain events: The tables below shows the top 10 rain events at a USGS weather monitoring station in nearby Walpole, NH that has records going back to 1885[5].

[3] US Army Corps of Engineers Ice Jam Mapper < http://rsgisias.crrel.usace.army.mil/apex/f?p=524:9:0::NO>
[4] USGS Stream gauge 01154500 Connecticut River at North Walpole, NH http://waterwatch.usgs.gov/index.php.
[5] Data provided by the Northeast Regional Climate Center at Cornell University, 09/16/2021.

These records are then overlapped with results from a weather monitoring station in Putney. Most stations take their observations in the morning (7 and 8am are the most common times), so the precipitation would have fallen between 7am on the previous date to 7 am on the date listed in the table.

The table directly below shows the precipitation records between 2011 (after TS Irene) and currently in 2021. Of note is that the recent disaster declaration for rain on 7/29-30/2021 is the highest ranking precipitation event in the 10-year period. One can see in comparing the results that there is variation in rainfall between Walpole and Putney, though Walpole is the nearest station with long standing historical records, which give context to more recent events.

Maximum 1-Day Total Precipitation for PUTNEY 2.0 WNW, VT (CoCoRaHS)		
Rank	Value	Ending Date
1	4.42	7/30/2021
2	3.75	6/20/2017
3	3.2	9/2/2013
4	2.9	9/30/2015
5	2.73	10/17/2019
6	2.65	2/25/2016
7	2.57	8/14/2016
8	2.52	6/26/2014
9	2.45	7/2/2021
10	2.39	12/1/2020
Period of record: 2011-10-01 to 2021-09-13		

Maximum 1-Day Total Precipitation for WALPOLE, NH 3		
Rank	Value	Ending Date
1	10.21	2006-01-19
2	8.51	2005-10-09
3	5.3	1999-09-17
4	4.6	2014-06-26
5	3.48	2012-05-30
6	3.2	2008-12-12
7	3.1	1985-09-28
8	2.92	1987-06-23
9	2.9	2013-07-03
10	2.85	2008-07-24
Period of record: 1979-01-01 to 2015-02-08		
Maximum 1-Day Total Precipitation for WALPOLE, NH 2		
Rank	Value	Ending Date
1	5.4	1886-10-31
2	5	1888-09-22
3	4	1888-09-18
4	3.43	1976-07-01
5	3.39	1892-05-23
6	3.25	1887-06-23

7	3.12	1954-09-12
8	3.09	1973-08-03
9	3.07	1969-06-16
10	3	1886-11-18
Period of record: 1885-05-02 to 1979-03-31		

To give additional context to this precipitation data, the "Precipitation Frequency Estimates" table below allows one to determine the event frequency based on the rainfall amount. This table puts the July 29-30, 2021 declaration rain event (24-hour value) at between a 10 and 25-year event specifically for Putney. It is important to remember that precipitation levels vary throughout the region.

The table below is specific for Putney, and has the values associated with the size of an event in order to determine the storm frequency[6]. This is for reference. Putney should consider what size event is reasonable to set standards to build to, for both infrastructure and buildings. Some experts advise that towns should be using the 10-year one hour or two-hour frequency estimates to reflect the monsoon type storms that are seen in the region. Infrastructure built for 24 hour events often can't keep up with high intensity storms leading to erosion and street flooding. This should be a consideration in the future.

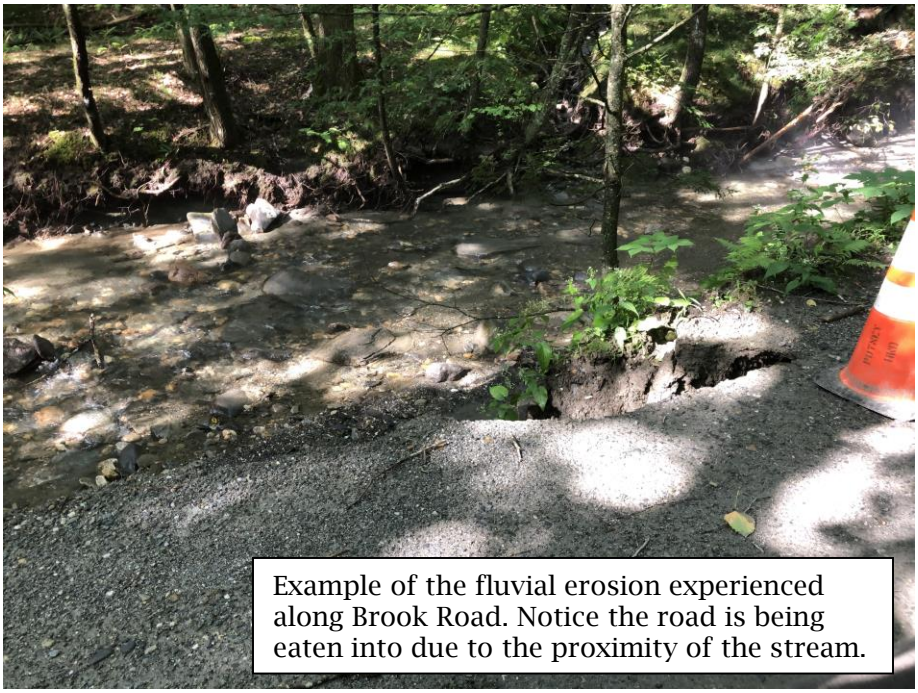
PRECIPITATION FREQUENCY ESTIMATES (in inches)										
by duration for ARI (years):	**1**	**2**	**5**	**10**	**25**	**50**	**100**	**200**	**500**	**1000**
5-min:	0.285	0.335	0.417	0.486	0.581	0.653	0.727	0.807	0.917	1.01
10-min:	0.403	0.475	0.593	0.69	0.824	0.926	1.03	1.14	1.3	1.42
15-min:	0.474	0.559	0.697	0.812	0.969	1.09	1.21	1.35	1.53	1.68
30-min:	0.672	0.791	0.985	1.15	1.37	1.54	1.71	1.9	2.16	2.37
60-min:	0.87	1.02	1.27	1.48	1.77	1.99	2.21	2.45	2.79	3.06
2-hr:	1.12	1.32	1.64	1.91	2.28	2.56	2.85	3.16	3.59	3.93
3-hr:	1.29	1.51	1.89	2.19	2.62	2.94	3.27	3.63	4.14	4.54
6-hr:	1.62	1.91	2.36	2.75	3.27	3.66	4.08	4.55	5.23	5.79
12-hr:	2.02	2.36	2.92	3.38	4.02	4.5	5.01	5.62	6.55	7.34
24-hr:	2.41	2.83	3.52	4.08	4.87	5.44	6.07	6.85	8.07	9.12
2-day:	2.77	3.28	4.13	4.84	5.8	6.52	7.3	8.26	9.74	11
3-day:	3.01	3.59	4.54	5.33	6.41	7.21	8.08	9.13	10.8	12.1
4-day:	3.24	3.86	4.87	5.72	6.87	7.73	8.66	9.78	11.5	12.9
7-day:	3.87	4.56	5.69	6.63	7.92	8.88	9.9	11.1	12.9	14.4
10-day:	4.5	5.23	6.42	7.41	8.76	9.78	10.9	12.1	13.9	15.4
20-day:	6.48	7.27	8.56	9.63	11.1	12.2	13.4	14.6	16.2	17.4
30-day:	8.13	8.96	10.3	11.5	13	14.2	15.4	16.6	18.1	19.2
45-day:	10.2	11.1	12.6	13.8	15.5	16.8	18.1	19.3	20.7	21.7
60-day:	11.8	12.8	14.4	15.8	17.6	19	20.4	21.6	23.1	24.1

The extent of a flood event can vary from a minor event due to a typical rain event or could be a major event as a result of rapid snow melt in spring, rain on frozen ground, or as a result of a tropical depression or storm. Town historians claim that the extent of flooding is such that brooks may breach their banks and flow onto land and down roads.

[6] NOAA ATLAS 14 POINT PRECIPITATION FREQUENCY ESTIMATES: Jamaica, VT <https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=vt> accessed 1/13/20.

In spite of the success of the seven flood control dams built on the Connecticut River, between 1941 and 1961 the North Walpole river gauge recorded significant crests (28 to 31 feet), even though life threatening crests (35-39 feet) have not occurred since the Great Flood on 1936. Crests of 28-29 feet create "minor flooding of some farmland along the river" and "lowland flooding along the Connecticut River" from Walpole, NH (directly across the river from Putney) to the Massachusetts state line, according to local sources.

Extent for fluvial erosion: The biggest area of fluvial erosion in Putney is a 1.14 mile stretch of Brook Road along Sackett's Brook, between South Windmill Hill Road and Tavern Hill Road. The road is threatened in this area, as one example shows in the image to the right. There are no houses on the road. It is used as a bypass/short cut. The Road Superintendent feels 1/3 of the road could be impacted by fluvial erosion, which equates to 243.2 acres that are at risk.



Example of the fluvial erosion experienced along Brook Road. Notice the road is being eaten into due to the proximity of the stream.

Probability

Planning participants in this planning process deemed flooding and fluvial erosion as highly likely hazards in Putney.

Past Occurrences

There have been 19 Presidential Disaster Declarations in Windham County since 1953, with 3 of those occurring since the last Plan update. Of these, 7 were severe storms, 5 were floods, 3 hurricanes, 1 snow event, 1 severe ice storm, and 2 are biological events (both relate to Covid-19 pandemic).[7]

Disaster Declarations for Windham County, VT

Disaster Number	Incident Begin Date	Incident End Date	Declaration Date	Incident Type	Title	Disaster Close Out Date
3567	8/22/2021		8/22/2021	Hurricane	Tropical Storm Henri	
4532/ 3437	01/20/2020		04/08/2020	Biological	Covid-19 Pandemic	
4356	10/29/2017	10/30/2017	01/02/2018	Severe Storm and Flooding	SEVERE STORMS AND FLOODING	
4043	5/20/2011	5/20/2011	11/8/2011	Severe Storm(s)	SEVERE STORMS AND FLOODING	1/14/2020
4022	8/27/2011	9/2/2011	9/1/2011	Hurricane	TROPICAL STORM IRENE	
3338	8/26/2011	9/2/2011	8/29/2011	Hurricane	HURRICANE IRENE	3/10/2014
1816	12/11/2008	12/18/2008	1/14/2009	Severe Ice Storm	SEVERE WINTER STORM	10/15/2014

[7] FEMA tool: Data Visualization: Disaster Declarations for States and Counties: Windham County, VT http://www.fema.gov/data-visualization-disaster-declarations-states-and-counties Accessed 9/15/2021

1698	4/15/2007	4/21/2007	5/4/2007	Severe Storm(s)	SEVERE STORMS AND FLOODING	3/13/2013
1559	8/12/2004	9/12/2004	9/23/2004	Severe Storm(s)	SEVERE STORMS AND FLOODING	1/4/2011
1488	7/21/2003	8/18/2003	9/12/2003	Severe Storm(s)	SEVERE STORMS AND FLOODING	1/4/2011
3167	3/5/2001	3/7/2001	4/10/2001	Snow	SNOW	2/28/2005
1336	7/14/2000	7/18/2000	7/27/2000	Severe Storm(s)	SEVERE STORMS AND FLOODING	6/30/2008
1307	9/16/1999	9/21/1999	11/10/1999	Severe Storm(s)	TROPICAL STORM FLOYD	6/30/2008
1124	6/12/1996	6/14/1996	6/27/1996	Flood	EXTREME RAINFALL AND FLOODING	2/23/2005
1101	1/19/1996	2/2/1996	2/13/1996	Flood	ICE JAMS AND FLOODING	2/17/2005
518	8/5/1976	8/5/1976	8/5/1976	Flood	SEVERE STORMS, HIGH WINDS & FLOODING	4/16/1981
397	7/6/1973	7/6/1973	7/6/1973	Flood	SEVERE STORMS, FLOODING, & LANDSLIDES	11/12/1976
277	8/30/1969	8/30/1969	8/30/1969	Flood	SEVERE STORMS & FLOODING	5/26/1972

Detail on Specific Flooding Events that have Affected Putney and Windham County:
Since 1996, when National Climatic Data Center detailed records start, there have been 45 flood events in Windham County, Vermont. Putney experiences routine spring flooding, but this is not always documented. There have been 10 events added to the detailed records since the last plan update in 2015, with several notable events discussed below[8].

July 29, 2021 rains - - Night rain starting about 9:30 pm produced about 4 inches of rain in as many hours. There were 13 roads that were initially closed. River Road South being the highest cost impacted road with the longest closure. Total of approximately $1 million town wide public infrastructure damages. Western half and high terrain areas were hardest hit. Small brooks and ditches along roads were overloaded and eroded.

December 25, 2020 - An area of low pressure tracking from the Great Lakes to Hudson Bay advected in an unseasonably warm air mass into the region from Thursday, December 24 to Friday, December 25, 2020. Rain gradually overspread the region from west to east during the day on December 24 with the steadiest, heaviest rainfall during the overnight hours and early morning hours of December 25. Rain showers continued through the day on December 25 and changed to snow showers during the evening and overnight hours of December 25-26 as colder air returned. The region still dealt with nearly the entire snowpack from the blockbuster winter storm from December 16-17 which dropped 9 inches of snow. While the snow compacted over time, very little water was lost from the snow. Observations concluded that between 1.50 to 3.00 inches of water was in the snowpack prior to this event and most if not all of this snow melted. Rainfall totals in Putney were measured at 2.39 inches (Anderson) to 2.54 inches (Mary Quinn) from local spotters. These amounts do not include the additional 1.50 to 3.00 inches of water that melted from the snowpack. The combination of warm air, rainfall and melting snowpack led to areas flooding across the region. Roads were closed across portions of southern Vermont as a result of flooding with one road being washed out. A tree was also downed onto Interstate 91 in eastern Windham County. Key Impacts: road closures, tree damage, damage to structures.

August 3, 2018 - A slow-moving cold front brought several rounds of heavy rainfall and thunderstorms to eastern New York and western New England. After passing through eastern

[8] NCDC data provided on 8/18/2021 by NOAA's National Centers for Environmental Information (NCEI) Center for Weather & Climate (CWC).

New York, a severe thunderstorm knocked down trees and caused localized flash flooding in the towns of Putney and West Wardsboro, Vermont.

October 29, 2017 - Damaging winds, power outages, heavy rainfall and flooding in the region. As the system departed, strong winds ensued and caused thousands of power outages and trees down across southern Vermont. Total rainfall amounts reported across southern Vermont ranged from 1.07 inches in Bennington to 7.01 inches near Wilmington.

June 19, 2017 Storm - Thunderstorms rolled though in the morning. On June 20 at 7 am, Steve Anderson had a rain gauge reading of 3.75 inches of rain. About $30,000 in damage to Putney roads was estimated by Town Manager, Cynthia Stoddard, and Road Superintendent, Brian Harlow.

September 30, 2015 - A slow-moving cold front approached southern Vermont from the Great Lakes on Tuesday, September 29th. Ahead of this front, a southerly flow out of the Gulf of Mexico allowed plenty of tropical moisture to surge into the region, with an unusually humid air mass in place for late September. As an area of low pressure developed along this boundary, areas of rain showers transitioned into a widespread rainfall during the evening hours, with heavy rainfall falling between the late evening hours and early morning hours on Wednesday, September 30th as the front crossed the region. Rain fell in excess of one half inch per hour at times. The rain finally tapered off by the mid to late morning hours, as the front continued to move away from the area. By the time the rain ended, most areas saw two to four inches of rainfall, with the highest totals around 4.30 inches in Putney. As a result of the heavy rainfall, many roads were inundated with standing water. Although the recent dry conditions and low streamflows prevented many larger rivers from reaching flood stage, some smaller streams and creeks overflowed their banks. One road was reported to be washed away in North Vernon.

July 14, 2014 - As a strong area of low pressure moved across upstate New York on Monday, July 28th, repeated rounds of thunderstorms occurred during the afternoon and evening hours. This led to flash flooding across northern Windham County, as small streams and creeks rapidly overspread their bands. In addition, the Williams River reached flood stage due to the rapid surge in water. Although the worst of the flooding remained north of Windham County in Windsor County, many residents reported this flooding to be the worst seen in the area since Tropical Storm Irene in 2011. Heavy rain from thunderstorms led to flash flooding in Windham. The access road to the Tater Hill Golf Course was washed out as a result of the flooding.

September 12, 2013 - A series of cold front moved towards the region on Thursday, September 12th. Despite some periods of cloudiness, a warm and humid air mass ahead of the approaching boundaries allowed for moderate amounts of instability to be in place. Along and ahead of the boundaries, several lines of showers and thunderstorms developed and moved across the region during the afternoon and early evening hours. In addition to a large amount of cloud to ground lightning, a few of the thunderstorms became severe, with damaging wind gusts. Several trees were downed across the region.
Some areas that received repeated showers and thunderstorms experienced flash flooding as well, with roads washed out and/or closed as a result. The hardest hit areas were within the town of Brattleboro. Two to four inches of rain in a short period of time was reported in the areas that experienced flash flooding.

September 1, 2013 - A moist and humid air mass was in place across the region on Sunday, September 1st. A surface frontal boundary was situated across eastern New York into southern New England during the morning hours. During the day, the frontal boundary slowly lifted northward. With enough instability in place due to daytime heating, some showers and thunderstorms developed along this frontal boundary. The showers and thunderstorms tracked over the same locations during the afternoon hours across southern Vermont. As a result of the

persistent heavy rain, flash flooding occurred in downtown Wilmington. A mudslide also occurred due to the heavy rainfall. By the evening hours, the showers and thunderstorms were located north of the region and beginning to weaken, and the threat for flash flooding ended.

Aug. 28, 2011 – Tropical Storm Irene – The Federally Declared Disaster DR-4022, Tropical Storm Irene, tracked northeast across eastern New York and western New England during Sunday, August 28th, producing widespread flooding, and damaging winds across the region, including Putney. Compared to other towns in the region, Putney, fortunately, did not have as much damage. Rainfall amounts generally averaged 4 to 8 inches. Much of the rain which fell occurred within a 12 hour period, beginning early Sunday morning, and ending Sunday evening. Strong winds also occurred across southern Vermont, with frequent wind gusts of 35 to 55 mph, along with locally stronger wind gusts exceeding 60 mph. The strongest winds occurred from the north to northeast during the morning hours, then from the west to northwest during Sunday evening. The combination of strong winds, and extremely saturated soil led to numerous downed trees and power lines across the region. This also resulted in widespread long duration power outages. In particular, the approximate number of customers affected by power outages included: Windham County, 18000. President Obama to raise the federal match share to 90% from 75% for TS Irene relief, therefore lowering the state and local shares by 7.5% each. Total received from FEMA Public Assistance for damaged infrastructure during Tropical Storm Irene was approximately $100,000.

May 20, 2011 - Showers and thunderstorms developed in a moist and unstable airmass across the region. Storms across a portion of Windham County resulted in flash flooding in the Saxtons River area. A wash out was reported on Bemis Hill Road at Westminster Road south of Saxtons River.

In 2007, a flooding event occurred which was associated with flash floods and inundation flooding over a period of several days in the spring (April 15-21). Rain and snow caused damage to roads and utility lines across Windham County and Putney. Across, the State, nearly 3.6 million dollars was obligated as part of the FEMA Public Assistance Program. Putney had $36,634 in damages from this event.

On June 28, 2006, 3.5-4 inches of rain fell in 45 minutes with the concentration location in the area of upper Route 35. Ponds, ditches, streams swelled, beaver ponds broke out and the gush of water passed through the culvert at Reed Road and down to Brookline Road. Associated flood relief costs were $234,764.93. Beaver dams were taken out due to rain.

June 29, 2005 – On June 29, a backdoor cold front lay east to west through the St Lawrence Valley at daybreak. A weak upper level short wave trough was moving eastward across the Great Lakes. The front drifted a little further south during the day, but stalled over central New England. This boundary and the approaching upper level short wave combined to trigger thunderstorms in the humid and conditionally unstable air mass that covered southern Vermont. Thunderstorms containing heavy rain produced flash flooding in the Putney area of Windham County.

There have been several other Presidentially Declared Disasters in recent years for Windham County including severe thunderstorms and associated flooding. Windham County, including the Town of Putney, experienced nearly constant rain and thunderstorms from the period of July 21 through August 18, 2003. FEMA Declaration DR – 1488 was associated with this event. Many roads were washed out and culverts needed replacing. The following year, another severe period of flooding and thunderstorms, which lasted from the period of August 12- September 12, 2004 engendered Presidential Disaster Declaration DR – 1559. These two events triggered funding from the FEMA Public Assistance Program to flow into Windham County which helped towns pay for work related to cleanup and emergency services work.
FEMA DR 1559 generated about $52,000 worth of damage in Putney..

Tropical Storm Floyd 1999 - The remnants of Hurricane Floyd moved up the eastern seaboard on September 16, 1999 and during the early hours on September 17, 1999. The storm brought both high winds and heavy rainfall to Brattleboro, Dover, Dummerston, Guilford, Putney, Rockingham, Stratton, Westminster and Landmark College, which included a large swath of 3 to 6 inch amounts. Landmark College in Putney lost a culvert on the campus, which had to be replaced. Brattleboro recorded the largest rain total of 5.70 inches during the event. The rain produced significant flooding across the region, which proved destructive. Winds from the passage of Tropical Storm Floyd were estimated to have gusted to over 60 mph, especially over hill towns. The combination of the wind and very saturated ground, produce widespread downing of trees and power lines across much of Southern Vermont. A woman was injured on Tavern Hill in Putney when a tree came crashing down on her Volvo, destroying the vehicle. The rain and wind produced power outages across the region. As many as 2,000 people lost power in Southern Vermont. Total damages for this weather event were $188,235 to public infrastructure. Putney had a total of $25,123 in damages and Landmark College had a total of $44,633.

In the spring of 1987 there was rapid meltdown of snow over frozen ground with 3" of rain flooding the west end of Reed Road.

During 1976, flooding occurred throughout New England as result of Hurricane Belle, causing millions of dollars in damage.

In 1973 there was an extreme rainfall event from June 28-30 that affected all areas of Vermont except the northwest section. Rainfall amounts as much as 6 inches in 24 hours in some locations. This was the largest rain event since the 1927 flood. Highway damage was extensive in the south-central, southeastern, and northeastern areas of the State. The town of Ludlow on the Black River was seriously damaged. Three persons were killed in the 1973 flood, and damage was estimated at $64 million. Sizable crop loss was reported, and damage to State highways was estimated to be $10 million. The entire State was declared a disaster area.[9]

The Vermont Flood of 1927 was the deadliest natural disaster in the history of the State; eighty-four people were killed with over $28 million in property damage. The Spring Floods of 1938, which had an effect on all of New England, caused $113 million in damage, killed 24 people and made 77,000 people homeless. During this flood alone, the main street of Hooksett, New Hampshire was 18 to 20 feet underwater.

Sources Used
Local town knowledge and town records, National Climatic Data Center storm events database, FEMA's Presidential Disaster Declarations search page

Sand Hill Road, the Adjacent Wetland, and Beaver Activity

The Town has four goals for the Sacketts Brook Class 2 wetland surrounding Sand Hill Road: 1. Mitigate village center flooding (including mitigating increased flow pressure on the Town-owned village dam) by assuring the wetland's capacity to store flood waters upstream; 2. Assure that adequate, filtered water reaches the Town's water system from the wetland which is a significant part of the well's Source Protection Area; 3. Maintain wildlife habitat; and 4. Protect Sand Hill Road from significant flood damage. Beavers and their dams have contributed to the Town's first three goals and have not jeopardized the road.

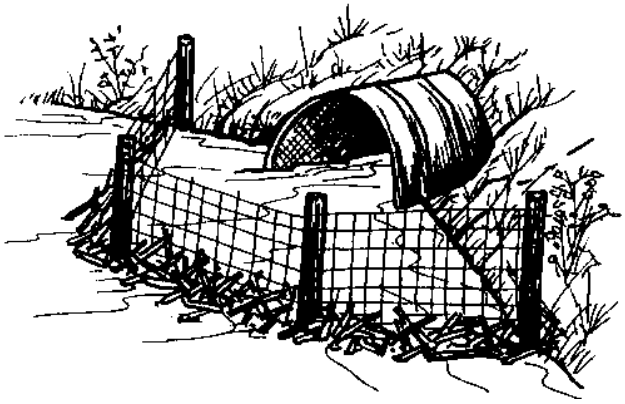
[9] USGS "Vermont Floods and Droughts" information page http://md.water.usgs.gov/publications/wsp-2375/vt/. Accessed 4/3/15.

In 2012, the Town acquired the 26-acre "Wilson Wetland" parcel to help achieve its goals listed above. This parcel abuts the road. The Putney Conservation Commission and its Wilson Wetland Stewardship Committee have worked with the Town to manage beaver activity since then, including working with Vermont Fish and Wildlife to install beaver exclusion fences around two Sand Hill Road culverts in 2013. The members continuously clear the fences and assure that all five wetland culverts are clear to help prevent damage to the road from beaver activity. Also, after obtaining the required Fish and Wildlife approval, they removed a dam beavers had started under the bridge in 2020.

The State and Town have had an informal agreement since the summer of 2012 to protect beavers with the anticipation that beaver dams would slow Sacketts Brook and mitigate bank and streambed erosion. It was hoped that the brook might once again reach its floodplain south of the bridge which would help protect the village. It was also hoped that beaver dams would help restore the wetlands and its ponds. However, since February 2018, beaver dams have often been damaged, sometimes with no apparent natural cause.

In summer 2019, the Town hired an expert to build a "beaver starter dam" to encourage beavers to build again downstream of the Sand Hill Road bridge. The beavers completed the starter dam a few days after its construction. During a rainstorm in October 2019, Sacketts Brook breached one end of the starter dam. In May 2020, beavers built a second dam downstream of the starter dam. Until the destruction of both dams, beginning in June 2020 with a hole punched in the downstream dam and ending in the storm of December 25, 2020 when both washed away, these two dams slowed Sacketts Brook and reduced streambed and bank erosion. Since the storm of December 25, 2020, there have been no functional beaver dams on Sacketts Brook.

One active beaver dam currently exists in the wetland, parallel to Sacketts Brook near the Sand Hill Road bridge. Built in the spring of 2021, it partially refilled the Sand Hill Road pond, though the pond remains shallow and does not reach the road culvert. This new dam held back some July 29 flood water in the pond, preventing it from reaching the bridge.



The schematic above shows a beaver fence. Devises like this are allowing beavers and humans to live together in peace in Putney. Image source: www.usroads.com

Various Uses of Sand Hill Road

The Putney Central School, Hidden Springs Maple, and other Westminster Road destinations can be reached from Route 5 via Kimball Hill/Westminster Road. However, although both routes take about the same time to travel, Sand Hill Road is perceived as a crossroad between Route 5 and Westminster Road; it allows drivers to avoid going through the village center. Sand Hill Road also serves as a local bypass should Route 5 or Kimball Hill be closed due to fire or other emergencies. One such emergency has occurred at the paper mill on Main Street in the village. The road is also used as a bypass on Halloween when Kimball Hill is closed for a few hours for the safety of children trick or treating. Sand Hill Road was heavily used as a local bypass during two weeks in September 2020 when Route 5 was closed so repairs to the village bridge could be completed; the state's official bypass was I-91 between Exits 4 and 5.

Because the road bisects a 100-acre Class 2 wetland, people are on the road watching and photographing birds and other wildlife. Also, people walk, run, and cycle the road for exercise, pleasure, or as a break from work. (Sand Hill Road is part of a suggested walk included in the Town's Trail Guide.)

Sacketts Brook has no floodplain access north of the Putney Central School/Forest for Learning lands. During storms with significant rainfall, much of the brook's fast-flowing water jumps its streambed at every bend in the area behind Putney Central School, rushing through the School's wet meadow which children must cross to reach their outdoor classrooms in the Forest for Learning. The flow dissipates in the wetland floodplain behind Hidden Springs Maple, largely protecting the road. The floods of 2017 and 2021 overwhelmed this floodplain and inundated the road.

Other Beaver Activity in Putney

Locations of other beaver activity, including in the Class 2 Wetland upstream from Holland Hill Road, and attempts at new dams on Black Locust Road, are pointed out on the SFHA/River Corridor maps in the "Flooding and Fluvial Erosion Mapping" of this plan. Also see "Progress Made on Mitigation Actions in Recent Years" section of this plan for a description of all the post-Irene work done on Sand Hill Road in the fall of 2011.

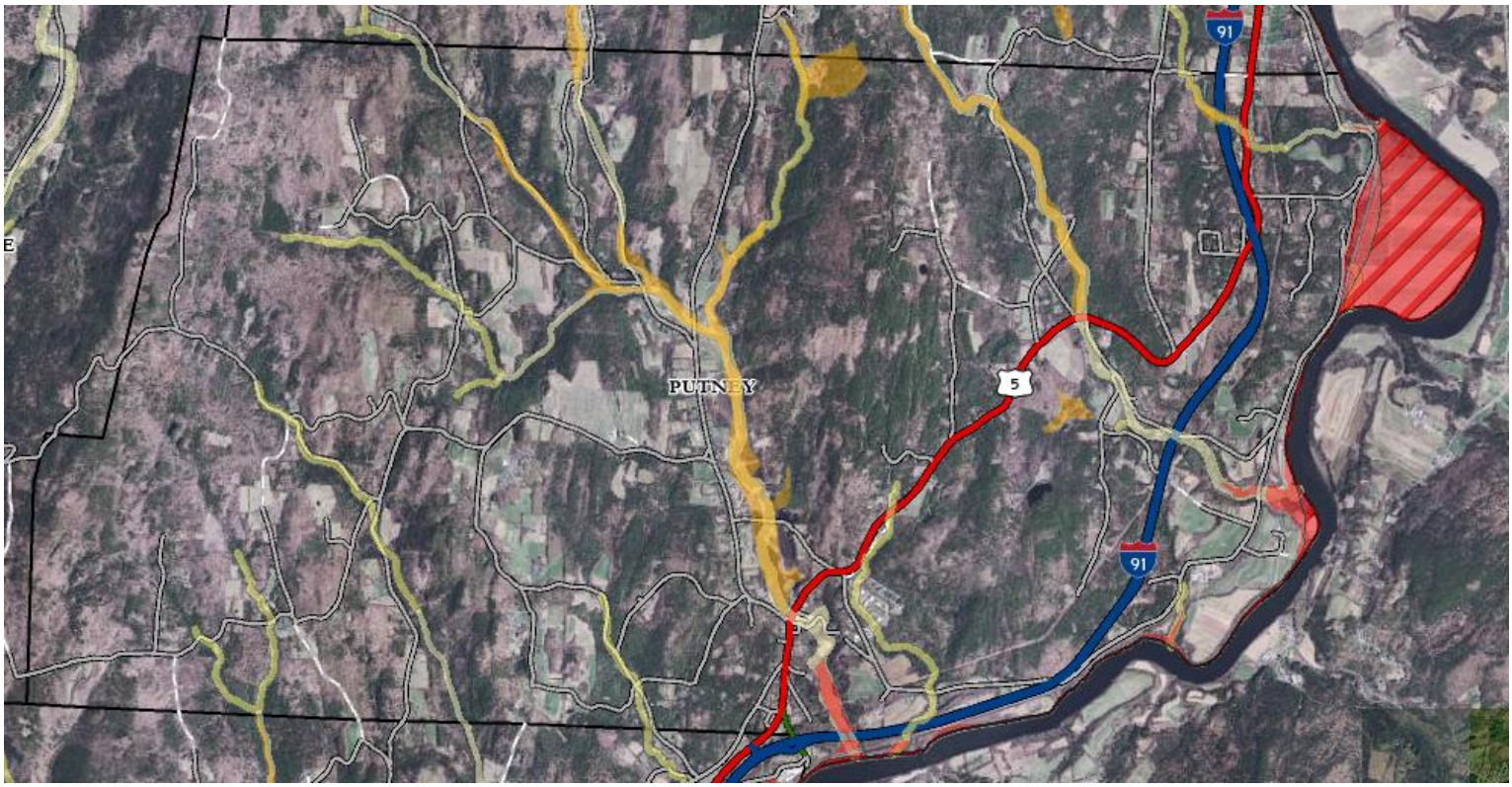
Flooding and Fluvial Erosion Mapping

The following maps were created using the Vermont Agency of Natural Resources 'Natural Resources Atlas' which is an online mapping tool[10]. These maps are snips showing all of the special flood hazard areas (SFHAs) that FEMA has designated in Putney. The SFHAs are shown in orange shading, and the floodways are red shaded. The floodplains shown in these maps are based on the FEMA Flood Insurance Rate Map (FIRM) maps available through the FEMA Map Service Center. The map effective date for the latest FIRM for Windham County is 9/28/2007.

The cream shaded areas on the maps are the Vermont Agency of Natural Resources (ANR) defined River Corridor which lie along streams with watersheds above .5 square miles (there are River Corridors defined for watersheds above .25 square miles, but they are not locally regulated). This area is subject to fluvial erosion. The orange shaded areas are are FEMA SFHA designated A-zones, which are mapped floodplains where base flood elevations have not been determined. Red shaded areas are FEMA SFHA designated AE-zones which do have base flood elevations determined. Floodway is shown in red hatch, and is subject to moving flood waters.

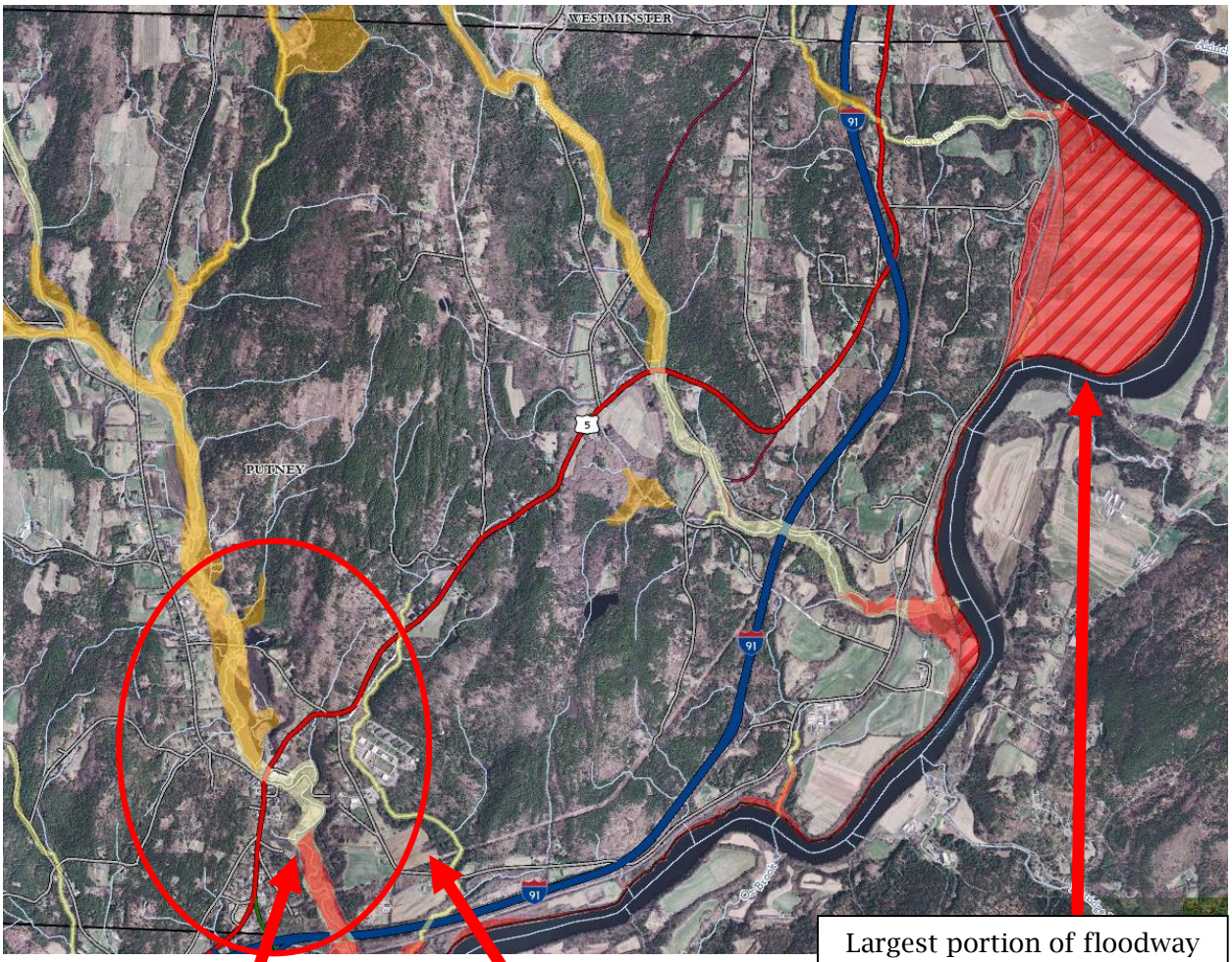
This overall map of Putney shows that the floodplain and fluvial erosion areas that are mapped are primarily along the Sackett's Brook, East Putney Brook and Connecticut River. River Corridor stretches farther up the small streams, as these upland areas can still experience flashy flood hazards.

Putney Overall:



[10] https://anrmaps.vermont.gov/websites/anra5/

Eastern Putney:

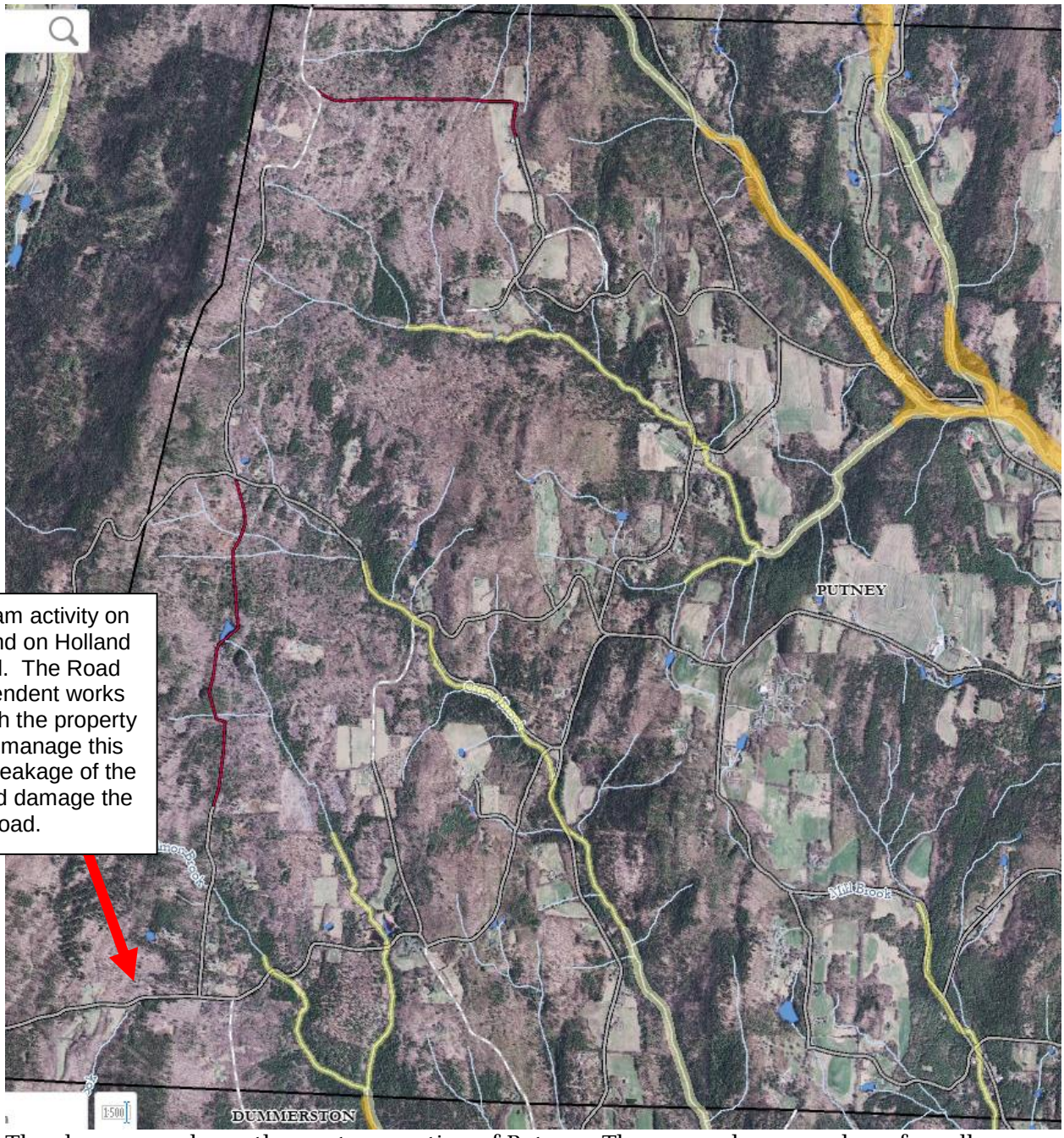


Location of Sackett's Brook dam in downtown Putney

Village area is encircled

Largest portion of floodway in Putney, which lies along the Connecticut River

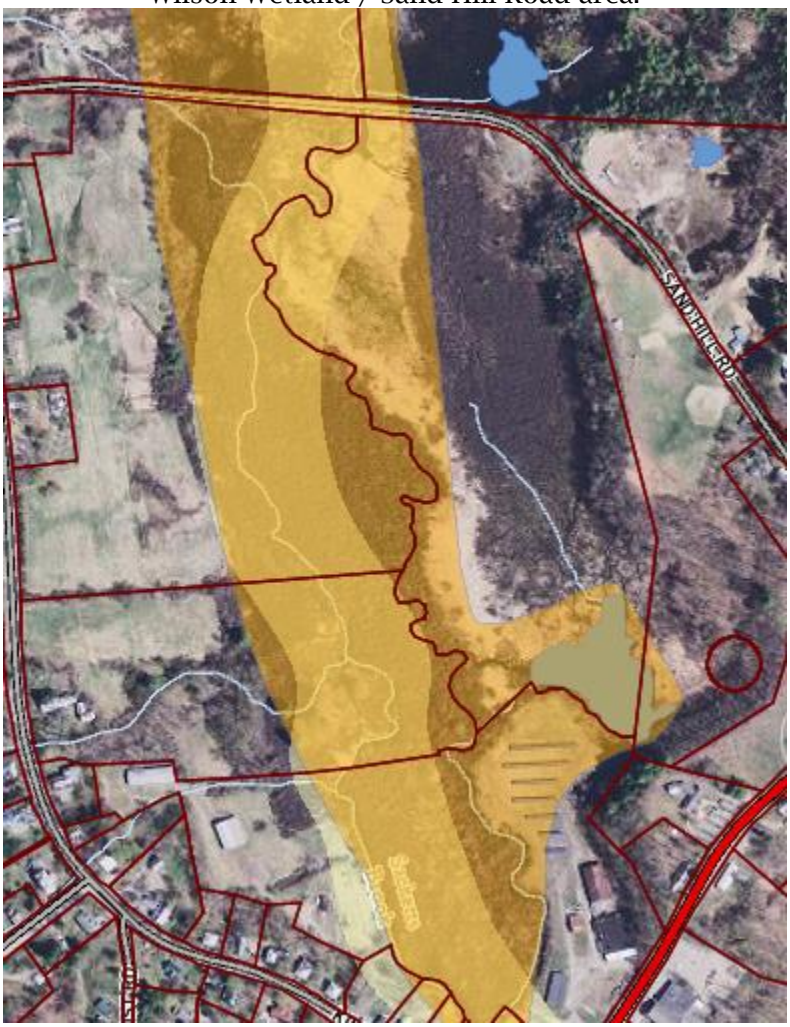
Looking more closely at the eastern half of Putney, shown above:
The red hatched area is the floodway. This area is where moving floodwaters are prone to go. Within the oxbow bend of the Connecticut, this entire area up to River Road is a floodway. This is agricultural land. There are also areas of floodway along the Connecticut and extending up East Putney Brook. SFHA extends up Sackett's Brook to the dam in downtown Putney. The orange areas on the map are inundation flood zones, A zones according to FEMA. The mapped River Corridor extends along East Putney Brook. River Corridor extends up all of the streams that also have floodplain, with additional areas in River Corridor.



Beaver dam activity on private land on Holland Hill Road. The Road Superintendent works closely with the property owner to manage this dam. A breakage of the dam would damage the road.

The above map shows the western portion of Putney. There are a large number of small streams throughout the town.

Wilson Wetland / Sand Hill Road area:



The above map shows a detailed view of the Wilson Wetland / Sand Hill Road area. This is the road that saw significant damage during Irene. The road was then raised, and four 24" culverts were placed under it. Beaver activity at two of the culverts is being mitigated by using beaver exclusion fencing to keep the beavers from plugging the culverts and thus damaging the road.

Sackett's Brook Dam

Located within Putney Village, the Sackett's Brook Dam was originally constructed in order to impound a water supply capable of providing water to Putney Paper for manufacturing processes, and a significant source of water for fire protection within the village. The town owns the dam and insures it.

The earthen dam is encased in concrete, and impounds approximately 1,000,000 gallons of water. The dam is biannually drained, dredged, inspected and resurfaced. The dam is critical for fire protection for the village, and that is the reason it was installed. The dam also contains the water source for the village via Sackett's Brook. At this same time, the dam structure is inspected by local officials in order to determine its overall integrity, and whether repairs or maintenance are required. When necessary, any required repairs are completed, which have historically included resurfacing of the dam face with concrete, servicing of the primary drain mechanism, and patching of the dam areas surrounding the discharge main servicing Putney Paper.

With regard to hazard planning, a sudden failure of the dam, and subsequent rapid release of the impounded water supply is believed to pose a moderate threat to human life, and a significant threat to property along the immediate downstream water way. In the event of such a sudden failure, the subsequent loss of water supply to the paper mill would certainly have a significant financial impact for the mill; and would dramatically decrease the firefighting water supply capabilities serving the village. There has been no dam failure mapping or planning done for Sackett's Brook Dam. This is a concern and something the town should consider engaging in.

Winter Storm / Ice Storm

Description and Geographic Area of Hazard

The Region has a long history of severe winter storms and blizzards and usually experiences at least one or two Nor'easters each year with varying degrees of severity. There have been 138 winter weather/ice storms in eastern Windham County since 1996.[11] A typical event begins as a low-pressure system that moves up the Atlantic Coast, into the Canadian Maritimes, dumping heavy snow across parts of Vermont. Snowfall accumulations are generally three to six inches in the valleys and 6 to 12 inches in the mountains. Winter storms and ice storms can cause power lines to fail, damage trees and impede access to homes and businesses.

Heavy wet snows of early fall and late spring, as well as ice storms, often result in loss of electric power, leaving people without adequate heating capability. The other threat from winter storms is downed trees, resulting in power failures and impassable roads or driveways. An ice storm crossed the region in December of 2008 causing widespread downed trees and power outages in Windham County. The total cost of damages across the region surpassed the one-million-dollar statewide threshold triggering a Presidential Disaster Declaration DR-1816. Damage across the region consisted of roads being blocked for shorts periods of time due to downed trees and utility lines. Thousands lost power for varying lengths of time and several shelters were opened in Windham County. Compared to neighboring southern New Hampshire communities, Putney and Windham County fared relatively well from the damage inflicted by the ice storm.

Impact

Heavy wet snows of early fall and late spring, as well as ice storms, often result in loss of electric power, leaving people without adequate heating capability. The other threat from these storms is downed trees, resulting in power failures and impassable roads or driveways. During these times, local emergency plans are enacted, and steps are taken to decrease the impacts on citizens, and restore accessibility in as timely a fashion as possible. The worst roads in Putney for ice are Holland Hill Road and Putney Mountain Road, both of which are at a higher elevation.

Power failure is a common event in Putney and can occur anywhere in town. Power failures are typically the result of power lines damaged by high winds or heavy snow/ice storms. Power failures may also result from disruptions in the New England or national power grid, as indicated by the widespread power outages in 2003. Dead or dying trees in close proximity to power lines pose a particular threat for power failure.

Damage from heavy 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).

[11] National Climatic Data Center, 1996-2021, provided via email 8/18/2021.

There are no mapped ice jams in Putney.[12]

Extent
The severity or magnitude of winter storm to occur in southeast Vermont can range from moderate to very severe. The southeastern region of VT typically receives over 60 inches of snowfall per year, and most Vermonters are prepared to handle large amounts of snowfall. Putney experiences significant snow storms every year but according to the town they are manageable. During the major snowfall of winter 2010-2011, where the region received well over 100 inches of snow, the biggest problem was that snow never melted off during the season, only accumulated, making it difficult to find space to store the mounds of snow. Snow amounts are not necessarily a problem for Vermonters, but heavy, wet snow, or the event of rain on snow or frozen ground, are usually very problematic.

Seasonal Snowfall records per the Burlington, VT Weather Service (this graph did not change between 2015 and 2021 updates of this Plan):

Burlington, Vermont

Top 10 Seasonal Snowfall Totals

Winter (Dec-Feb)

Highest			Lowest		
Rank	Snowfall	Year(s)	Rank	Snowfall	Year(s)
1	103.4"	2007-08	1	18.4"	1912-13
2	97.9"	2010-11	2	20.4"	1979-80
3	96.9"	1970-71	3	21.9"	1928-29
4	90.1"	2009-10	4	23.6"	1936-37
5	81.7"	1965-66	5	24.0"	1898-99
6	80.7"	2003-04	6	25.0"	1904-05
7	80.0"	1957-58	7	25.6"	1940-41
8	79.4"	2008-09	8	26.3"	2011-12
9	78.6"	1946-47	9	27.0"	1900-01
10	75.7"	1969-70	10	27.4"	1960-61

Probability
The plan participants in Putney deem winter storm / ice storms to be highly likely any given year. Every winter there is a weather related incident where people in town will lose power for a few days.

Past Occurrences
The Region has a long history of severe winter storms and blizzards and usually experiences at least one or two Nor'easters each year with varying degrees of severity. There have been 209 winter/ice storms in the Region since 1996.[13] There have been three winter storms in recent history in Windham County that were Disaster Declarations:

- Ice Storm (DR-1201) – January 6-16, 1998
- Snowstorm (EM-1358) – December 16-18, 2001
- Winter Storm (DR-1816) – December 11-18, 2008

LOCAL EVENTS
February 1, 2021 - Moderate to heavy snow developed to the northwest of a slow-moving coastal low on February 1st. The snow was light initially during the morning and afternoon

[12] US Army Corps of Engineers Ice Jam Mapper < http://rsgisias.crrel.usace.army.mil/apex/f?p=524:9:0::NO>
[13] National Climatic Data Center, 1996-2014 storm events database < http://www.ncdc.noaa.gov/stormevents/>

hours of the 1st, but an area of heavy snow expanded northwestward during evening, with snowfall rates of one inch per hour observed at times. The snow moved north of the region by the morning of the 2nd. Storm totals ranged from 7 to 17 inches. The snow prompted numerous school closures and delays. Key impacts: transportation delays, school closures.

March 23, 2020 - A late season snowfall impacted southern Vermont on Monday, March 23rd, 2020. This was brought on by an anomalously cold air mass interacting with a coastal low pressure system. Snowfall totals ranged from six to ten inches across Bennington and Windham Counties.

December 29, 2019 - A complex winter storm brought a mix of rain, snow, sleet and freezing rain to the region from the evening of Sunday, December 29th, lingering through the morning of Tuesday, December 31st, 2019. Moderate accumulations of ice impacted portions of southern Vermont during this time frame. There were approximately 3,500 people without power across the state due to a combination of icy conditions and strong winds bringing down trees and power lines.

February 13, 2014 - This precipitation moved from south to north across the region for the overnight hours. In addition, lightning and thunder accompanied the precipitation in a few areas as well. The precipitation tapered off from west to east during the morning hours on February 14th, as the storm moved northeast towards eastern New England and Atlantic Canada. By the time snow ended, 8 to 21 inches of snow was reported in southern Vermont.

December 27, 2012 - Snow, heavy at times, fell across much of southern Vermont from the evening of the 26th into the day on the 27th. Total storm snowfall amounts varied greatly from just a few inches in downsloped valley areas to 27 inches in the Green Mountains. In addition, southeast winds were strong and gusty, especially across the high terrain. Woodford gusted to 43 mph and Bennington Airport gusted to 46 mph. This storm resulted in very slow travel during the holiday season, especially on the evening of the 26th and morning on the 27th.

February 29, 2012 - A complex multi-part long duration (24 to 36 hour) storm blanketed southern Vermont with 8 to 16 inches of snow and sleet Wednesday, February 29th and Thursday, March 1st with lower amounts of 4 to 8 inches across southeastern Bennington County.

Feb. 25, 2011 - A storm system produced a widespread swath of heavy wet snow across southern Vermont during the day Friday. Snowfall rates of 1 to 2 inches per hour occurred, beginning during the early morning hours, and persisting until late afternoon. Snowfall amounts of 12 to 17 inches occurred across much of southern Vermont. The heavy wet snow created treacherous travel conditions for both the morning and evening commutes on Friday, and also led to numerous school and business closings.

Jan. 19, 2011 - Snow and sleet accumulations across southern Vermont varied from 3 to 9 inches, with ice accumulations of up to a half of an inch.

Jan. 12, 2011 - Heavy snow fell across southern Vermont with snowfall accumulations ranging from 14 inches up to 3 feet. A mesoscale snowband set up across the western New England, including southern Vermont, Wednesday morning resulting in snowfall rates of 3 to 6 inches an hour.

January-February 2010 - The snow fall during this time was severe, averaging over 100 inches throughout the region, to include the Town of Putney. There were a number of large storms during this timeframe. No reported dollar amount of damage.

December 11, 2008 - A significant mix of snow, sleet and freezing rain occurred from Thursday afternoon into early Friday afternoon. Snow and sleet amounts of 1 to 3 inches fell, along with ice accretion of one half to three quarters of an inch from freezing rain, leading to widespread downed trees, tree limbs and power lines. The hardest hit areas included Bellows Falls and Brattleboro. In Bellows Falls, one tree reportedly fell through the roof of a house. Several areas of Putney were out of power for between 4 and 10 days. Some towns in the region experienced outages for several weeks. Putney received money from FEMA for damages caused by this ice storm in the amount of $18,889.90

November 22, 1997 - A low pressure system south of Long Island on November 22, 1997 produced heavy wet snow across southern Vermont. Snowfall averaged 4 to 8 inches in Bennington and Windham Counties. The heavy wet snow downed trees and power lines, which produced scattered power outages. The power outages were most widespread in Windham County.

March 2, 2007 - A significant mixture of snow, sleet and freezing rain began early Friday morning, and ended Friday evening. Snowfall accumulations of 6 to 10 inches fell during this storm, with 10 inches reported at Putney, and 6 inches at Brattleboro. In addition, ice accretions of up to one half inch occurred from freezing rain, mainly within sheltered valley locales.

March 31, 1997 - This system produced rain across Bennington and Windham Counties during the morning hours of March 31. The rain changed to heavy wet snow by early afternoon. Snowfall amounts were highly elevation dependent. Some specific snowfall totals included: 12 inches at Shaftsbury and 13 inches at Peru in Bennington County and 23 inches at West Wardsboro and 12 inches at Grafton in Windham County. The wet snow brought down many trees and power lines causing widespread power outages and road closures. Some areas remained without power for several days. Route 9, between Bennington and Brattleboro was closed for much of the night. $750,000 of damage in Windham County.

Nov. 26, 1996 - On November 26, a low pressure system brought a combination of snow and freezing rain to southern Vermont. Over Bennington and Windham Counties, snow and heavy freezing rain downed trees and power lines and caused numerous accidents. Across southern Vermont approximately 10,000 customers lost power.

Jan. 2, 1996 - A major winter storm developed over the Gulf coast states on January 2nd and tracked northeast along the eastern seaboard during January 3rd. Heavy snow fell across southern Vermont with the average snowfall ranging from 10 to 12 inches.

Sources used
Local town knowledge and records, National Climatic Data Center, CRREL Ice Jam Database, FEMA's Presidential Disaster Declarations search page, Burlington, VT Weather Service historic weather events page

Invasive Species: Plants and Insects

Invasive plant species are a region-wide hazard; however, each location will be confronted with a distinct mix of invasive species that thrive under the particular ecological conditions of that place. Each invasive species has a different potential to spread to other areas based on the rate at which it spreads and the ecological suitability of the ecosystem that it is expanding into.

An invasive species can be defined as **an exotic species whose introduction into an ecosystem in which the species is not native and causes or is likely to cause environmental**

or economic harm or harm to human health[14]. Another definition is **an exotic species that colonizes both disturbed and undisturbed habitats**[15]. For an example of the second definition not being met, Coltsfoot (*Tussilago farfara*) is usually only found in disturbed areas in Rockingham, mainly on the edges of unpaved roads. Thus, it is not considered invasive here, since it is rare in undisturbed woods.

In contrast. Burningbush (*Euonymus alatus*), an invasive shrub often planted in local yards, has its seeds carried by birds to nearby woods, where they grow well in those undisturbed areas, crowding out native plants. The homeowner with them in their yard may not realize this spread is happening. (See photo)

Keep in mind that "exotic" may be hard to define. For example, Black locust (*Robinia pseudoacacia)* is native to the US, mainly in and near the Ohio River Valley, but it is not native to Vermont. It was brought here by settlers who planted it mainly to use for fence posts. It spreads rapidly to undisturbed woods, so it is considered invasive in Vermont.

Invasive Plant Species

In the absence or near absence of natural predators or controls, invasive non-native plants are able to spread quickly and out-compete native plants. Invasive plant species can create monocultures, which often provide poor habitat for native animals that have not evolved with the non-native species, resulting in degraded habitat value and increased vulnerability. The invasive plant issue really escalated in the early 1990's. Invasive plants tend to thrive in disturbed areas. Within the Windham region, they are more prolific in the towns along the Connecticut River than they are to the west, because the eastern towns are more populated, contain major transportation routes such as I-91 and the rail corridor, which serve as vectors for their expansion, and tend to have significant land disturbance. Some of these plants were originally planted because of their positive aspects such as their ability to grow in difficult growing conditions, long growing season length, their large seed production and their ornamental value. These same reasons are a big part of why they have become invasive.

Heavy travel corridors like I-91 and US Route 5 in Putney are also highways for the spread of invasives. Waterways and riparian areas are also corridors that invasives can overtake and spread along.

Particular invasive plant concerns for Putney are: Glossy buckthorn which is present throughout Putney; Multiflora rose in the village area; Japanese barberry which is curtailing proper forest regeneration after logging; and Japanese knotweed along the banks of East Putney Brook and the Connecticut. The Putney Conservation Commission monitors and removes invasive from town owned lands, as time and funding allow. The town was recently gifted a 55-acrea parcel of land from resident, Nat Hendricks. This parcel was logged and it is now covered with glossy buckthorn. The town hasn't yet decided how they will utilize the land, but they will have to manage the buckthorn for the health of the forest there.

Particular invasive plant concerns for town owned land in Putney have been listed below by the Putney Conservation Commission (PCC)[16]. The PCC deals with invasive plant species on its Conservation Sites. Only one site – the Wilson Wetland Preserve—has a formal plan for controlling invasive plants. That plan is part of the Wilson Wetland Stewardship Plan completed in March of 2016 and available on the Town website.

Wilson Wetland Preserve (WWP) – 26.6 acres

[14] (USDA) https://www.nrcs.usda.gov/wps/portal/nrcs/detail/ct/technical/ecoscience/invasive/?cid=nrcs142p2_011124
[15] CT Invasive Plant Working Group, https://cipwg.uconn.edu/criteria-for-listing/
[16] Email sent from Town Manager on 8/27/2021.

Phragmites – The northern edge of a dense phragmites stand was cut down and covered in 2018. Covers were removed in 2020 showing some success. Small shoots were weed whacked this summer. Long-range plan is to help native shrubs to grow in the cleared location. In 2019 Landmark student Sam Koslowsky, working under professor Tom Hinckley, mapped the extent of phragmites infestation (dense and light) in an extensive report. Information will allow better planning.

Common buckthorn, vtinvasives.org

Buckthorn – With phragmites under some control, some buckthorn could be double girdled to test this new approach to removal discovered by retired forester Lynn Levine.

Wild (Poison) Parsnip –PCC has removed wild parsnip from Sand Hill Road for 8 years. This makes the road safer. It has reduced regeneration of parsnip substantially. However, waterborne seeds have entered the meadow below. They have been removed for any three years; a few are often missed!

Reed Canary Grass – Goldenrod, Joe Pye, Boneset and other native wild flowers have come up, successfully competing with the Reed Canary Grass. No further action is planned.

Purple loosestrife – Monitoring over time indicates that purple loosestrife is controlled by higher water levels. Draining of the wetland and pond near Sand Hill Road due to damage to a beaver dam, has resulted in an extensive, dense resurgence at that spot. There is no loosestrife between the town well and Wilson Pond; there was a large stand when water levels there were low. We are hoping beaver will restore a dam down stream of Sand Hill Road.

Purple loosestrife, vtinvasives.org

Management strategies on Town land:

Beatrice Aiken – (11 acres)
The PCC weeds out garlic mustard, celandine, and other invasive plants along the Beatrice Aiken's Old Route 5 road frontage. The interior needs renewed work at this time.

Bare Hill Conservation Site (27 acres)
A few small buckthorns were removed from the black gum swamp about 4 years ago during a drought. The buckthorn never recovered. For some reason, they do not do well in the swamp. They are established along the site's west side right-of-way trail. There are currently no plans to remove them.

Sacketts Brook Conservation Site (one-quarter acre)
The area is brush hogged once or twice a year. A large multiflora rose was removed a few years ago. An invasive plant check needs to be done.

"Donated Town Land" (55 acres)
In fall 2016 Landmark College students, supervised by Dr. Andrew Stein, did base line habitat surveys of the land Nat Hendricks donated to the Town in December 2015. A middle, southern

section of the land had been cleared some years ago. It is now white pine with an understory of almost nothing but buckthorn. The white pines are tall, but have thin diameters and small crowns. Most is weevilled, and some have "red rot" fungus. County forester at the time, Bill Guenther, said it was not worth harvesting. Situated among the pines, the buckthorn has to be dealt with by hand. The new approach of double girdling might make this feasible if we can find enough volunteers.

Putney Town Forest (134 acres)
PCC does not manage the Putney Town forest.

Seven groups of invasive plants found in the region, listed below, are thought to pose the highest threat to native plants and/or hard infrastructure[17]. Barberry is also a human health threat (Lyme disease).

Common name	**Latin name**	**Locations**	**Threats**	**Control**
Japanese Knotweed	*Fallopia japonica*	Banks of all 3 rivers and many brooks	Can grow through asphalt, into basements, and block trails; more likely to wash out than natives	Mowing (endless), repeated cutting & digging (3-10 years), mesh?
Asiatic (Oriental) bittersweet	*Celastrus orbiculatus*	Roadsides, other disturbed areas	Can cover utility poles, buildings, trees; displaces natives	Excavation including roots
common and glossy (European) buckthorn	*Rhamnus cathartica & R. frangula*	Clearcuts, woodland edges	Prevents regrowth of native trees	Excavation including roots
Japanese & Common barberry	*Berberis thunbergii & B. vulgaris*	Planted shrub, escapes to woods	Increases deer mice which harbor deer ticks with Lyme disease	Excavation including roots
Burningbush	*Euonymus alatus*	Planted as ornamental, birds spread seeds to woods	Displaces native shrubs	Excavation including roots
Amur, Morrow's, Tartarian, and Bell's honeysuckle	*Lonicera mackii, morrowii, tatarica, x bella*	Planted as ornamental, birds spread seeds to woods	Displaces native shrubs	Excavation including roots
Water chestnut	*Trapa natans*	Albees Cove and nearby, CT River	Displaces native aquatic plants, can block boat traffic	Hand pulling from paddle craft

[17] This list was provided by the Rockingham Conservation Commission via Peter Bergstrom, email dated 8/31/2021.

Elevations generally below 1,500 feet (which includes most of Putney) are most susceptible to invasive species, although any land with some sort of major disturbance (from wind, water, logging, or land clearing and development) could potentially host them. Invasives tend to come up early and flower early, allowing them to get established before native plants have the chance. It may be possible to slow down or even halt the spread of these species by identifying and removing plants as soon as they appear. Early detection is the key. This detection can be aided by educating residents about the identification of and problems caused by invasive species

Invasive vines can cover utility poles and make servicing the lines, transformers, and junction boxes on them very difficult.

Preventing the spread of invasive plants is something that everyone can assist with. The first step is to not plant non-native plants on your property and to remove invasives that exist. Additionally, it is important that when soil is disturbed, to plant native cover before invasives have a chance to establish themselves. Proper disposal of non-native vegetation is critical to avoid its spread, safely burning the material when possible. Avoid transporting non-native plants, including firewood and garden debris, as this is critical to prevent the spread of non-native seeds and insects. Mowing roadsides from the north to the south can also help prevent the migration of invasive seeds on-site[18].

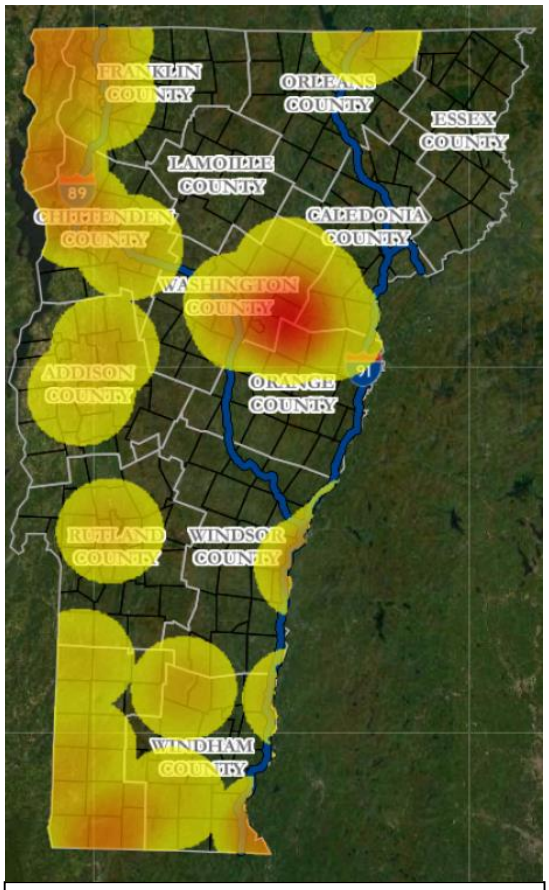
VTinvasives.org is a great resource for towns interested in engaging in activities around invasives, including using their template to develop a custom invasive species plan for your town. The idea is to continue to create as much awareness as you can so residents know who to call when they see things. The sooner an outbreak is found, the better the chances of containment. Bio-controls are being worked out currently but aren't yet a solution. Insect pests are often found first by concerned citizens, members of the Conservation Commission, arborists and foresters.

Top Invasive Forest Pests and their Impacts

Non-native invasive species cause irreversible impacts on tree health, forest composition, and biodiversity. Three non-native insects which currently threaten Vermont are the emerald ash borer (EAB), Asian longhorned beetle (ALB) and hemlock wooly adelgid (HWA). Hemlock wooly adelgid is currently present throughout the state. Initially discovered in Orange County in February 2018, Emerald ash borer (EAB) has been spread quickly and as of this writing been determined the in orange areas on the map. Asian longhorned beetle are within fifty miles of Vermont's border. Over half of the trees in Vermont are host species of one of these three invasive insects.[19]

[18] Vermont Fish and Wildlife Department: Wildlife Action Plan. Developed 11/22/05. Accessed 3/2/15. http://www.vtfishandwildlife.com/library/reports_and_documents/vermonts_wildlife_action_plan/_/_report/7_appendix/k_invasive_ex otic_and_pest_species.pdf

[19] vtinvasives.org (accessed 2/20/15)



Map provided by VTinvasives.org and current as of 8/24/2021.

Emerald ash borer (shown above)

Emerald ash borer (EAB), *Agrilus planipennis*, is an exotic beetle that was discovered in southeastern Michigan near Detroit in the summer of 2002. The larvae feed in the cambium between the bark and wood, producing S-shaped galleries that girdle and kill branches and trees. Emerald ash borer probably arrived in the United States on solid wood packing material carried in cargo ships or airplanes originating in its native Asia. It first came into Detroit and killed off all the ash trees in the city, which had been planted after the city's elm trees had been killed by Dutch elm disease. The United States Department of Agriculture Animal and Plant Health Inspection Service (APHIS) does inspections at ports and terminals, but only inspects about 7% of materials coming into the US. Emerald ash borer has spread rapidly in the United States, killing millions of trees. Emerald ash borer has been confirmed in nearby New Hampshire, putting Rockingham within a 10-mile area of an active infestation. EAB has also been confirmed in other towns within the Windham Region. Putney is very near to what VTinvasives.org calls the "Slow the Spread Movement". Carefully planning and managing the movement of infested or potentially infested material will slow the spread and provide greater protection for uninfested forests. EAB is currently present in 33 states (most recently in Maine).

White ash is one of the ten most common tree species in Vermont, so this insect will have a major impact in Vermont. EAB only feeds on Ash trees, but that is 7% of Vermont's tree species. EAB can travel faster than Asian longhorned beetle. EAB is often moved around on firewood that people transport. Eradicating the insect on wood requires heating it to at least 140 degrees or higher for greater than 60 minutes.

Signs and Symptoms: Symptoms and signs include D-shaped adult exit holes, bark splitting, serpentine frass-filled (sawdust-like waste) feeding galleries, wood pecker feeding, crown dieback, and epicormic shoots (whips growing off the trunk and branches). Many of these symptoms and signs are similar to other insects and diseases of ash.

Blonding with pecked holes on ash trees is a sign of EAB infestation.

EAB essentially girdles the ash trees, killing them. It lives between the inner bark and the wood, so it isn't that deep. Woodpeckers like feeding on EAB, but the woodpecker population isn't large enough to significantly impact the EAB population. Also the woodpeckers don't generally detect the insects in the trees until they have been present for about two years, which is too late to save the tree. One of the best diagnostic methods for detecting EAB is called "blonding". "Blonding" is a clear symptom of EAB infestation. It occurs when woodpeckers, while foraging for the succulent EAB larvae, flake off outer layers of bark, revealing the lighter or blond-colored inner layers of bark.[20]

A native ground-nesting wasp, *Cerceris fumipennis*, is providing a handy solution to the EAB detection problem. This wasp will prey on the adult emerald ash borers (as well as related native beetles) and carry them, paralyzed, back to its burrow. The paralyzed beetle is then stored underground as food for the wasp's larva. Purple traps have been placed in Rockingham by the State ANR to catch the EAB for early detection; none have been detected thus far.

Hemlock woolly adelgid

The hemlock woolly adelgid (HWA), *Adelges tsugae*, is a tiny insect from east Asia that attacks forest and ornamental hemlock trees. It feeds on young twigs, causing needles to dry out and drop prematurely. Trees may die in four to six years. Some survive, but with sparse foliage, losing value as shelter for wildlife and their ability to shade streams.

The HWA first arrived in the southeast U.S. and spread to the northeast through the Long Island Sound. Sustained cold leads to kill off of the adelgid insects. Mortality rates of even 91%, however, can still lead to population growth through the warm season because they reproduce asexually so it only takes one for the population to expand. The HWA mortality rate shifts each year based on temperature patterns throughout the year, especially cold winter temperatures cause die off.

HWA has been found in several locations in Putney. It was first found on Aiken Road and several trees have been treated on that road. It is not that widespread of an issue in Putney. In the Windham region, it was initially found in Brattleboro and the Guilford area. It is now found in 14-15 Windham Towns, and has been recently found in Springfield in Windsor County. It has not been found in Weston, Winhall, Somerset, Searsburg or Readsboro. HWA is moving south to north in lower elevations first, and is mostly throughout southern Vermont at this point. Dead or dying hemlocks are a sadly regular sight in the region. It was first found at the SIT campus in 2010 and is now found throughout the town of Brattleboro.

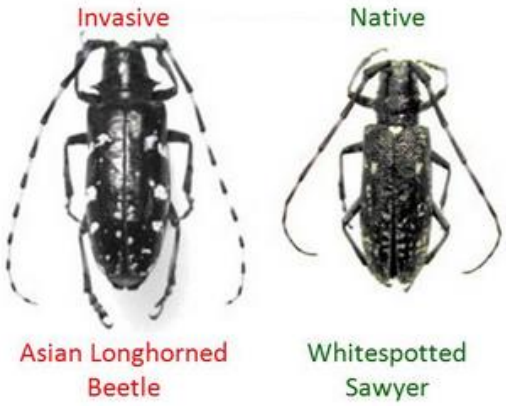
Hemlock trees and even whole stands are showing signs of decline, but trees in Vermont have not been reported to have been killed from HWA alone. Foresters have been watching infested

[20] University of New Hampshire Cooperative Extension – Blonding on Ash trees information sheet. <http://extension.unh.edu/resources/files/Resource004103_Rep5824.pdf> Accessed 3/2/15.

trees for eight years, and the trees haven't been killed yet most likely because winter temperatures kill off enough of the HWA to give the tree a temporary reprieve. HWA does weaken the trees to the point that other secondary stresses, such as funguses and disease, may result in their mortality. Another pest, Hemlock elongate scale was found recently for the first time in Guilford, Vernon and Brattleboro.

Asian longhorned beetle[21]

The Asian longhorned beetle (ALB), *Anoplophora glabripennis*, is an invasive insect that feeds on certain species of hardwood trees, eventually killing them. Also known as the Starry Sky or Sky Beetle, the ALB is native to eastern Japan, and Korea. It was brought to the US, to New York City first, in packing material from Asia. ALB attacks a variety of native hardwood species, including maple, birch, elm, poplar, horse chestnut and willow. ALB prefers maples and does not like trees in the oak family. Upon hatching, the larvae tunnel through the heartwood of a host tree until fully grown. They then burrow out of the trunk as adult beetles. This process weakens the wood, making it prone to breakage, and can cause tree health to decline. Outbreaks of this beetle pose a severe threat to even perfectly healthy trees in both forests and urban and suburban landscapes. The beetle has caused tens of thousands of trees to be destroyed in Illinois, Massachusetts, New Jersey, New York and Ohio. Trees that aren't destroyed by people trying to prevent the spread are usually killed by the pest within a couple years. About half of Vermont's trees are susceptible to Asian longhorned beetle. This insect will have a major impact if it becomes established in Vermont.



Signs and Symptoms of Infestation: Oval to round wounds on the bark where the females have chewed out a site to deposit their eggs. Round emergence holes in the trunks and branches of trees. Piles of coarse sawdust at the base of trees.

The closest area to the Windham region that has the pest is Worchester County, Massachusetts in 2008. And they have an active quarantine and public notification campaign about the pest.[22] They are having to destroy every host tree, infected or not, and will be replanting in the oaks. Boston had a small outbreak which they believe was caught in time. New York and Ohio also have quarantines in affect in their boundaries to prevent the spread. ALB has not been detected in upstate NY or in NH. It is difficult to spot infected trees from the ground, so inspectors need to climb trees. To treat wood for transport it needs to be heated to at least 160 degrees for longer than 75 minutes.

Impact

The impacts of invasive species have ripple effects that go on and on. Hemlock is a foundation tree species, and when it goes away invasive plant species tend to take over, causing wildlife habitat and water quality to decrease. Deer use hemlock stands to winter over in because of the cover a healthy tree provides, so there could be a detrimental impact to the deer population, and hunting, caused by the loss of hemlock. Hemlocks provide shade to waterways, so their

[21] http://www.maine.gov/dacf/php/caps/ALB/ALBdamagepics.shtml
[22] http://www.worcesterma.gov/city-manager/asian-longhorned-beetles. Accessed 3/2/15.

loss could mean warmer streams and lower water quality, potentially impacting aquatic life. The hemlock isn't a comparatively very valuable wood product, but it is used for logging and wood products, so there are economic threats to its loss. The large deer population is causing the loss of new trees to regenerate the forest hardwoods, thereby leaving vulnerability for invasives to come in.

Ash logs are more valuable than hemlock logs, but the bigger concern with the loss of ash is the cascading ecological impacts. There are over 40 arthropod obligate species that are threatened by the loss of ash trees (they depend on ash for their survival), and ripple effects of the loss of these arthropods and the interrelationships aren't even fully known at this point. Ash is a valuable tree for wood products and logging, so the economic impacts could be severe. Not to mention, the cost to towns for removing dead or dying trees, and the aesthetic and community open space impacts caused by their loss. Ash trees are about 12% of the forest cover in Vermont, and there are pockets of lots of ash in Putney. Putney has done a partial ash tree survey, 53 miles or 80% of the roads were completed, to know where vulnerable trees are located. They have not completed an EAB plan. Interested private citizens can obtain purple traps for assistance with early detection of EAB on their property.

The loss of maple trees to ALB, could mean a devastation to the maple industry, which is a big industry in Vermont, including in Putney. A lot of people sugar in Putney, not all commercial, but it is a big activity in Putney. Economic impacts could be great. Sap can't be used once a maple is treated with insecticide, and the lag time before it can be used again is unknown. Fall foliage tourism is a big draw for visitors to Vermont and this would be big loss of "leaf peepers" who are a big drive of the economy for the area.

Common sense policies related to preventing the spread of invasive species:

1. No one should plant or move highly invasive plants in or out of Putney, including any part of the plants, either alive or apparently dead.
2. Safe methods (mechanical, if possible) to remove these highly invasive plants should be used where they threaten either natural or hard (human) infrastructure. The safety of using glyphosate to remove Japanese knotweed and other invasive plants is still unclear.
3. No one should move firewood in or out of Putney, since it may include invasive insect pests (EAB, ALB, HWA, and others).

Probability
As mentioned earlier in this section, emerald ash borer and hemlock wooly adelgid are currently known to be present in the state of Vermont. Asian longhorned beetle has been found within fifty miles of Vermont's border. Putney's proximity to a known EAB infestation area makes them highly susceptible to EAB. HWA has been confirmed in Putney and 13-14 other towns in the Windham region. Additionally, certain invasive plant species are present in every town in the region.

Extent
Over half of the trees in Vermont are host species of one of these three main pests, so the potential impact is great. EAB only feeds on Ash trees, which are 7% of Vermont's tree species and a strong component of beech/birch forest stands. Southeastern Vermont has primarily white ash and green ash, while black ash is less common here, they are found more so to the north. Green ash is common in urban environments because they are good shade trees and do well in an urban setting. Newfane is an example of a town in the Windham region that has planted a lot of green ash trees, so they are particularly vulnerable to EAB.

Ash planted on roadside rights of way have the highest potential for infestation of EAB. There is the potential for hundreds of dead Ash trees along roadways throughout the state and near extinction of Ash trees. The current mortality rate is 99.8% of trees. Cutting dead trees is a very hazardous activity and the potential for a lot of dead trees along road ways is a concern for protecting public safety and infrastructure. Green Mountain Power expects EAB to severely impact their grid over time, so they are proactively removing vulnerable Ash trees near their power lines in confirmed affected areas. Areas that haven't been confirmed must contract for tree removal for trees they are concerned with.

Being proactive is key for stopping, or at least curtailing, the spread when pests are detected. Inventories of roadside ash trees are a good thing for towns to do now. Training road crews to identify threats and who to alert of outbreaks is also a good idea. Numerous towns (including Brattleboro) in Vermont have developed EAB preparedness plans. Ash trees can be treated to prevent EAB, and weighing the cost of proactive treatment versus removal of dead trees and replacement is something a community must weigh.

There are EAB insecticides that are registered for use in VT and they are fairly effective at protecting trees, but they have to be applied to each tree individually so this isn't practical to protect all ash trees in a forest environment, but is a good option for an urban tree canopy. Additionally, trees have to be retreated every one to two years because of the insect's life cycle. ALB eradication is to cut and chip all the trees that are infested. There is another insecticide that works for ALB, but it is only effective if the tree is treated before the larvae burrow too deeply into the wood beyond the tree's vascular system. The ALB larvae spend a lot of time in the interior wood, out of the vessel system of the tree so they aren't exposed to the insecticide.

The worst example of the potential impact of ALB infestation in the U.S. is Worchester County, Massachusetts. This problem has been going on since 2008, although upon detection it was well established, as much as 15 years went by before it was discovered. The Massachusetts ALB Cooperative has confirmed a regulated area of 110 square miles, which has been expanded over time from the original 17 square miles considered infested. This area is under strict regulation by order of the Commonwealth of Massachusetts, no one can cut, move, harvest, carry, transport or ship firewood, green lumber and other material within or outside of the affected area unless authorized. These are significant restrictions, so the impact of ALB detection should be taken very seriously as it affects numerous hardwood species.

ALB can be eradicated when discovered early. It is usually found in industrial settings, because it usually arrives in pallets from an Asian shipment. ALB is now being moved around through human activities, especially through the movement of firewood. It is easier to detect ALB than EAB because the ALB is larger.

Invasive plants are also a threat to the ecology and economy of Putney. Invasive plants are present in Putney. Long-standing and spreading forest threats in the Windham Region are glossy buckthorn, purple loosestrife, Japanese barberry, multi-flora rose, Japanese knotweed, cow parsley, and garlic mustard, and Asiatic bittersweet. There are more and more invasive plants moving up along roadways and waterways from lowland areas. All threaten forest regeneration, and multi-flora rose and Asiatic bittersweet can destroy mature trees. Smaller invasive plants such as garlic mustard, purple loosestrife, and goutweed present a threat to native herbaceous plants. The health threat posed by Japanese barberry should be noted: According to Jeffrey Ward, Chief Scientist at the Connecticut Agricultural Experiment Station, a forest infested with Japanese barberry harbors an average of 120 black-legged ticks per acre while a forest without barberry harbors an average of only 10 black-legged ticks per acre. Black-legged ticks are known to transmit the causal agents of several diseases, including Lyme disease. TS Irene spread a lot of invasive plants around the region through the transport of seed material from various sources, including flood waters. Logging, and particularly clear cutting, create areas that are particularly susceptible to invasives. Logging is a frequent

occurrence in Putney as approximately 8% of the town is in the Current Use program. Logging is recognized as an important industry in Putney and statewide.

VTinvasives.org is a great resource for towns interested in engaging in activities around invasives, including using their template to develop a custom invasive species plan for your town.[23] The idea is to continue to create as much awareness as you can so residents know who to call when they see things. The sooner an outbreak is found, the better the chances of containment. Bio-controls are being worked out currently but aren't yet a solution. Insect pests are often found first by concerned citizens, arborists and foresters. Putney's tree warden, Billy Harlow, was a member of the road crew. He is not affiliated with the Putney Conservation Commission. No one on the Conservation Commission is a trained first detector. Insect pests are often found first by concerned citizens who pay attention to these things, rarely by professionals.

Sources Used
Invasive plant lists from Peter Bergstom of the Rockingham Conservation Commission, send 8/21/2021; Email with VT State Forester Jim Esden on 2/21/20 (802-885-8822 or jim.esden@vermont.gov); Email with Windham County Forester Sam Schneski on 2/21/20 (sam.schneski@vermont.gov); Interview with Windham County forester Bill Guenther on 3/2/15 (802-257-7967 or bill.guenther@vermont.gov); Interview with First Detector Jordan Fletcher on 4/29/15; VT Fish and Wildlife website; VTinvasives.org; Cerceris.info webpage; Maine Forest Service webpage[24]; Images courtesy of Google images and Maine Forest Service.

ASSESSING VULNERABILITY

National Flood Insurance Program (NFIP) Participation and Compliance

The National Flood Insurance Program (NFIP) is a voluntary program organized by FEMA that includes participation from 20,000 communities nationwide and 247 Vermont towns and cities. Combined with floodplain mapping and floodplain management at the municipal level, the NFIP participation makes affordable flood insurance available to all homeowners, renters, and businesses, regardless of whether they are located in a floodplain.

The NFIP was instituted in 1968 to make flood insurance available in those communities agreeing to regulate future floodplain development. As a participant in the NFIP, a community must adopt regulations that: 1) require any new residential construction within the FEMA designated floodplain to have the lowest floor, including the basement, elevated above the 100-year flood elevation; 2) allow non-residential structures to be elevated or dry flood proofed (the flood proofing must be certified by a registered professional engineer or architect); 3) require anchoring of manufactured homes in flood prone areas. The community must also maintain a record of all lowest floor elevations or the elevations to which buildings in flood hazard areas have been flood proofed.

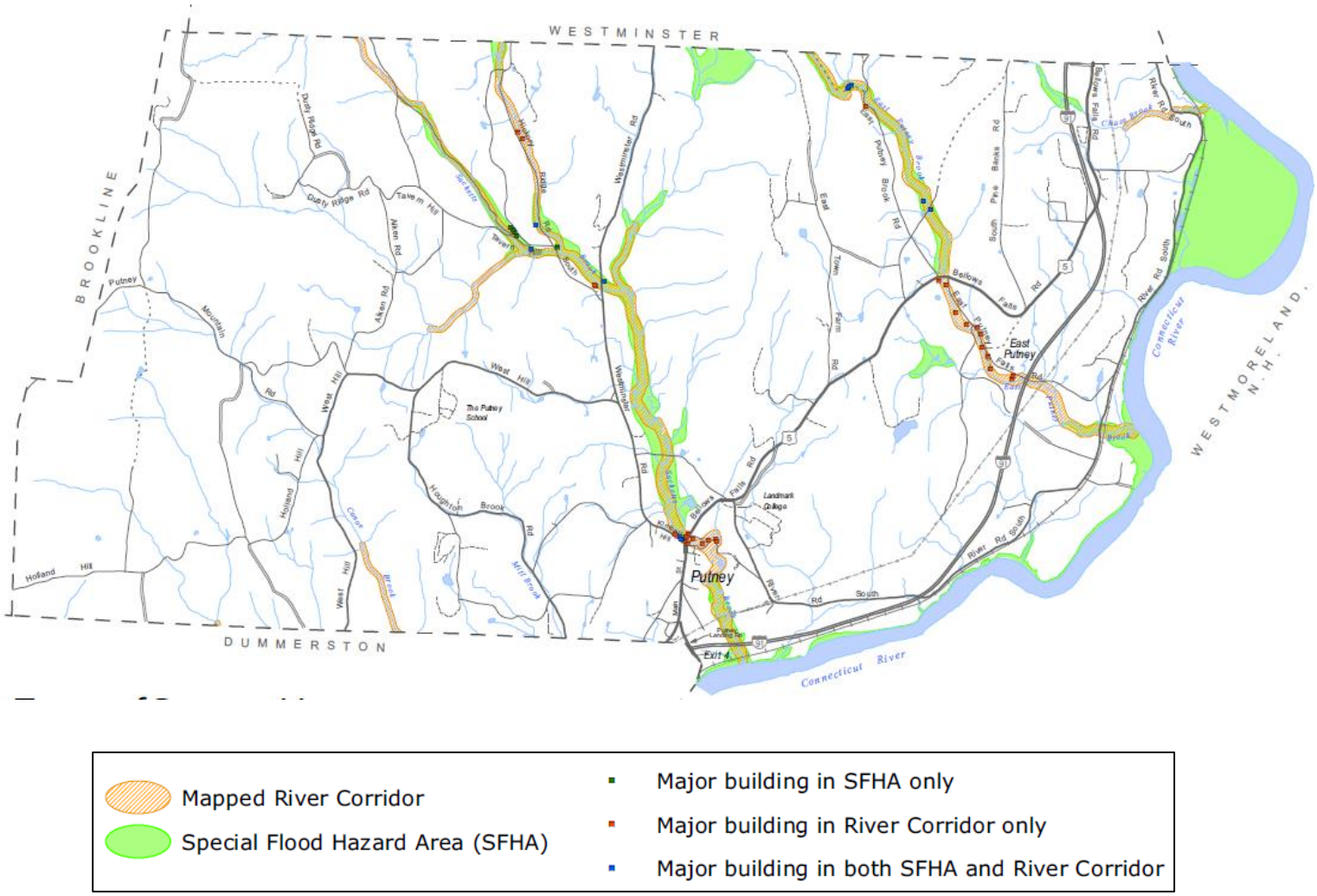
In return for adopting floodplain management regulations, the federal government makes flood insurance available to the citizens of the community. In 1973, the NFIP was amended to mandate the purchase of flood insurance as a condition of any federally regulated, supervised or insured loan on any construction or building within the FEMA designated floodplain. In 2012, Congress passed the Biggert-Waters Flood Insurance Reform Act to reduce subsidies for structures built before the NFIP was instituted (called pre-FIRM structures). Over 50 percent of

[23] < http://www.vtinvasives.org/tree-pests/community-preparedness>
[24] http://www.maine.gov/dacf/mfs/forest_health/invasive_threats/index.htm

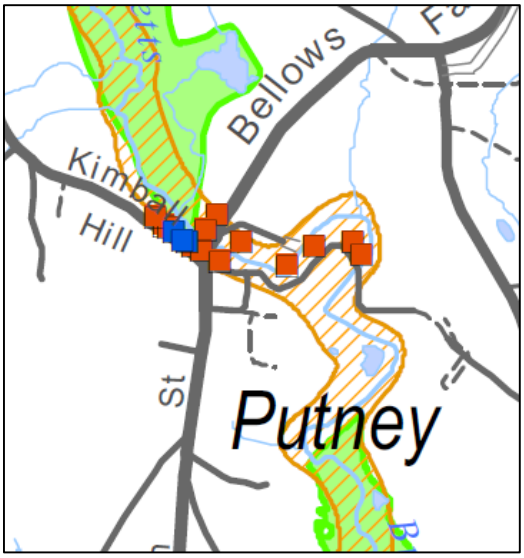
Vermont's NFIP policies are pre-FIRM, which means that flood insurance premiums for many will increase over the ensuing years.

While the NFIP floodplain management criteria are administered by states and communities through their floodplain management regulations, FEMA's role is to provide technical assistance and to monitor communities for compliance with the minimum NFIP criteria. Putney joined the NFIP on September 18, 1985 and is a member in good standing (CID 500134). The latest floodplain ordinance was adopted in 2018 and is within the zoning ordinance. The latest Flood Insurance Rate Maps (FIRMs) and Flood Insurance Study (FIS) referred to in the development of this plan have an effective date of September 28, 2007.

The Town works with the elected officials, Windham Regional Commission, the state and FEMA to correct any compliance issues and prevent further NFIP compliance issues through continuous communications, training and education. Since the last Plan, Putney worked with the Windham Regional Commission to update their flood hazard bylaw to include regulation of River Corridors.



The latest record indicates that there are five (5) active NFIP policies in Putney. These policies have a total value of $1,215,000[25]. There has been one NFIP claim filed in Putney since 1978, though no payouts. There are 16 structures in the SFHA, but no critical or public facilities. Those 16 structures represent 2% of the structures in Putney. Only 26% of structures within the SFHA have active flood insurance policies. Of note and for comparison, there are 40 structures in the River Corridor (4% of the structures in Putney), of these 11 are also in the SFHA. The map here shows the location of the affected structures is in the Village area, along East Putney Brook, and on Hickory Ridge Road South and Tavern Hill Road. The inset map here shows the Village area. The red squares indicate the building is in the River Corridor only (which most here are) and the blue indicate that the building is in both the SFHA and the River Corridor.



The Floodplain Administrator in Putney is within the duties of the Town Manager, who also serves as the Zoning Administrator. The Floodplain Administrator reviews all development to determine if it is located in any floodplain or river corridor boundaries, if so, the Administrator reviews the application to ensure that all relevant regulations are proposed to be adhered to and does any needed inspections before working with the Development Review Board or issuing a permit. ANR has 30-days to review all applications in floodplain or river corridor boundaries and may offer comment to the town. ANR review opportunity is required before the town can issue a permit, and serves as a second technical review of applications which can assist the town in deciding whether to issue or deny a permit.

Repetitive Loss Properties

Putney has no repetitive loss properties.[26] A Repetitive loss structure is an NFIP-insured structure that has had at least 2 paid flood losses of more than $1,000 each in any 10-year period since 1978.[27] Severe repetitive loss (SRL) structures are NFIP-insured buildings that, on the basis of paid flood losses since 1978, meet either of the loss criteria described in the SRL section. SRL properties with policy effective dates of January 1, 2007 and later will be afforded coverage (new business or renewal) only through the NFIP Servicing Agent's Special Direct Facility (SDF) so that they can be considered for possible mitigation activities. An SRL property is defined as a residential property that is covered under an NFIP flood insurance policy and:

- That has at least four NFIP claim payments (including building and contents) over $5,000 each, and the cumulative amount of such claims payments exceeds $20,000; or
- For which at least two separate claims payments (building payments only) have been made with the cumulative amount of the building portion of such claims exceeding the market value of the building.
- For both (a) and (b) above, at least two of the referenced claims must have occurred within any ten-year period, and must be greater than 10 days apart.

[25] NFIP policy report, updated June 26, 2018: https://floodready.vermont.gov/sites/floodready/files/documents/cisrpt_NFIP%206.26.18.PDF
[26] Repetitive loss report, updated June 26, 2018: https://floodready.vermont.gov/sites/floodready/files/documents/cisrpt_RL%206.26.18.PDF
[27] https://www.fema.gov/national-flood-insurance-program/definitions

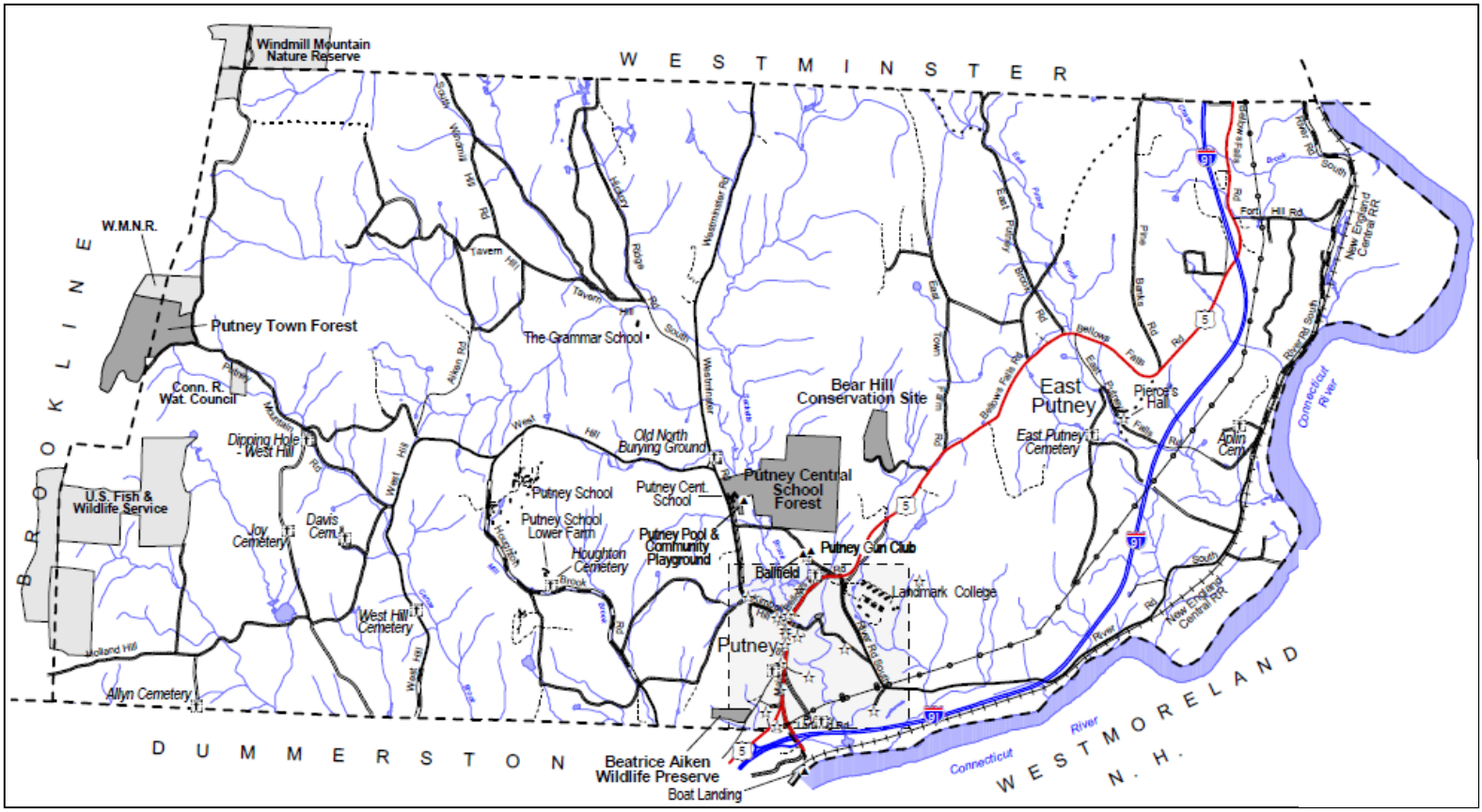
Community Facilities in Putney

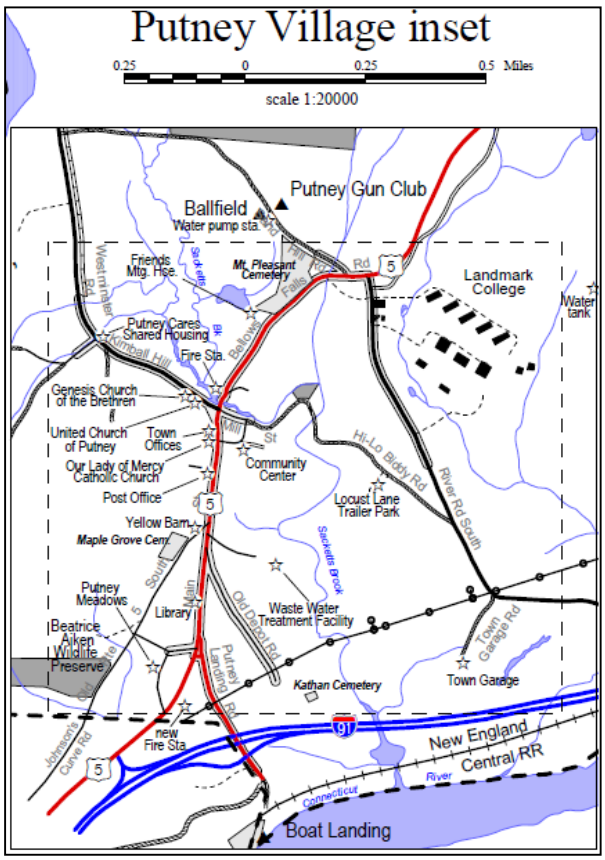
Mapping analysis shows that no community facilities or utilities are located in the floodplain.[28]

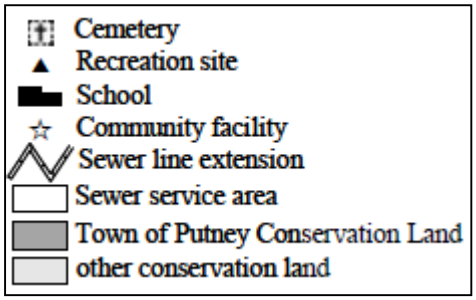
Critical Facilities	Community Gathering Places
1. Putney Fire Department – 14 Main Street 2. Putney Town Hall – 127 Main Street 3. Putney Wastewater Treatment Facility – 23 Treatment Plant Road 4. FairPoint Communications Building – 9 Christian Square 5. Putney Department of Public Works – 19 Town Garage Road 6. Putney Paper Company – 3 Mill Street 7. Putney Water Department – 39 Sand Hill Road 8. US Route 5 9. Interstate 91 10. Landmark College – River Road South 11. Putney Elementary School – 182 Westminster Road 12. Putney Grammar School – 69 Hickory Ridge Road South 13. The Putney School – 418 Houghton Brook Road 14. The Greenwood School – 14 Greenwood Drive 15. Town Cemeteries 16. Railroad corridor (in the floodplain)	1. Putney Co-op -- 8 Carol Brown Way 2. General Store -- 4 Kimball Hill Rd. 3. Friend's Meeting House – 17 Bellows Falls Road 4. Library – 55 Main Street 5. Community Center – 10 Christian Square 6. Putney Inn – 53 Putney Landing Road 7. Pierce's Hall – 121 East Putney Falls Road 8. Putney Meadows Apartments – 17 Carol Brown Way

[28] GIS mapping query was run to see if an overlap existed between the community facilities shown on the "Community Facilities and Utilities Map" from the 2011 Putney Town Plan and the FEMA defined SFHA.

Town of Putney Community Facilities and Utilities Map from 2011 Town Plan







Development Trends and Town Capabilities

While Putney is a vibrant town, there is little new development on an annual basis. This is like many of the small towns in southeastern Vermont. Zoning applications are up in Putney for changes of use, subdivisions and additions to existing structures, but few for new construction. The biggest new development since 2015 is Putney Landing, a multi-family apartment style affordable housing development in the Village.

Number of zoning permits that have been issued between 2015 and current for:

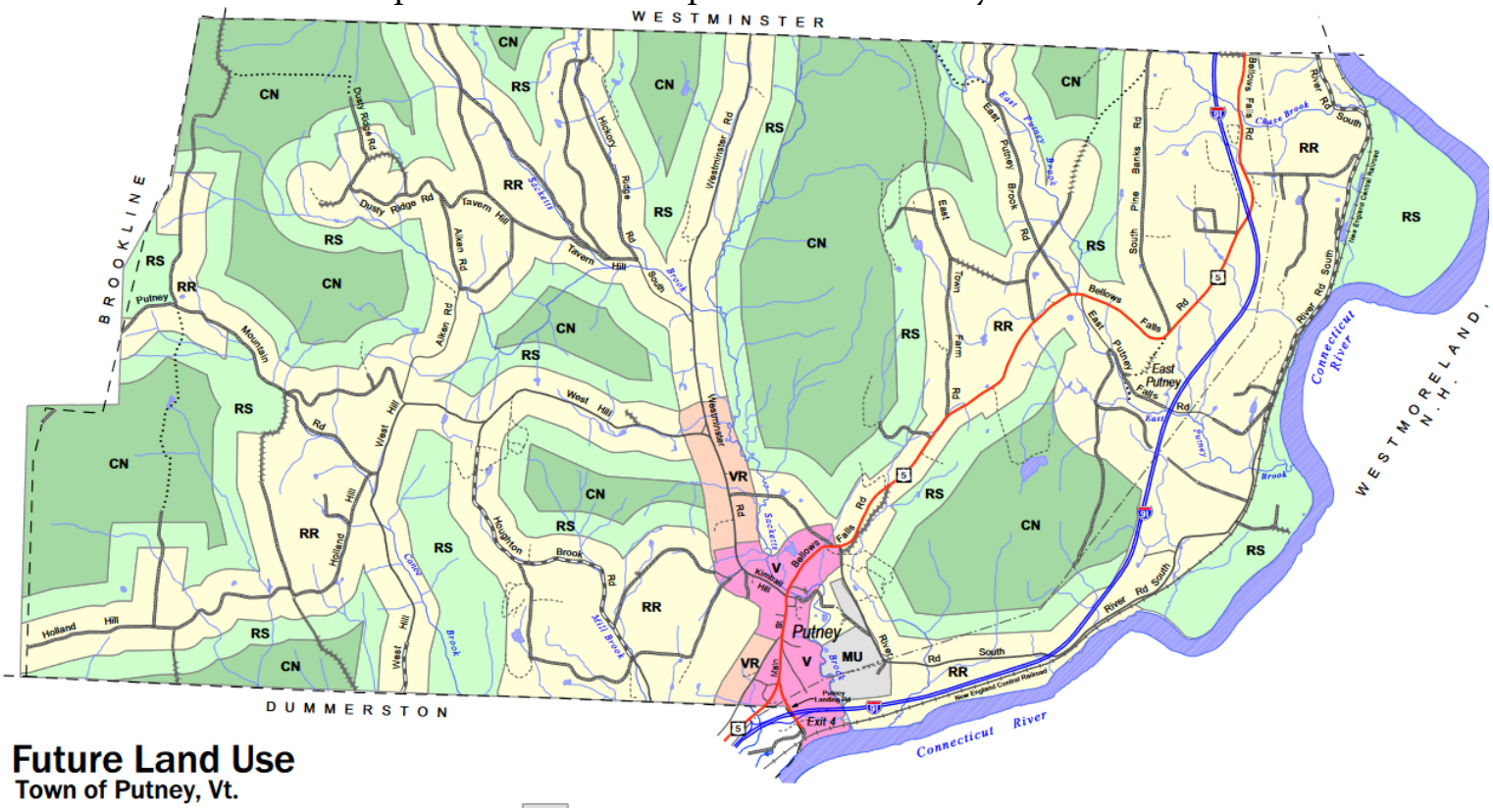
- houses/camps/mobile home replacement - 40
- sheds, garages, additions, decks, etc. - 91
- commercial permits - 30
- other types - 48
- Of these, how many are in the floodplain? 10

Since 2015, the Town has updated their floodplain regulations contained in the zoning bylaw. This substantial update, done in partnership with the Windham Regional Commission, added the regulation of river corridors to the regulations. This new level of regulation adds the controls needed to ensure that future vulnerable development is considered and put in place in a less vulnerable way for lands near waterways even outside of the SFHA.

Putney sees itself as a relatively safe community. There is not significant fear of natural or manmade hazards. The development pattern lends itself to safety and there is not a big concern with flooding because there are not a lot of homes or buildings in the floodplain, or that have seen damage. When new development applications come into town, there is consideration of their vulnerability, connection to existing development, and hazard impacts. The connected development pattern of the village center aids in keeping the community engaged and connected. The town is very active and things get done in Putney. Putney thinks progressively about development issues. The town has public water for the village only, which serves about 120 households. Public sewer also serves the village. The Putney Town Plan emphasizes development pattern that is consistent with maintaining a vibrant village center and preserving outlying undeveloped areas as much as possible.

For a town of its small size, Putney has a good amount of resources and capabilities. There is a full-time town manager, a full-time assistant to the town manager, a six-person full-time highway crew, three selectboard members, a planning commission, and a conservation commission. For police protection, Putney contracts with the sheriff department to have one full-time officer that exclusively serves Putney. Putney has a full-time fire chief/health officer, and a volunteer fire department. For emergency medical support, Putney contracts with Rescue Inc. The nearest hospital is the Brattleboro Memorial.

Proposed Land Use Map from 2015 Putney Town Plan



MITIGATION STRATEGY

Goals

The Hazard Mitigation Goals from the prior plan were reviewed by the Hazard Mitigation Planning participants during meetings for the development of this plan. Participants suggested the following additions, where are highlighted in green.

- Reduce the loss of life and injury resulting from all hazards.
- Reduce the impact of hazards on the town's water bodies, natural resources, and historic resources.
- Reduce the economic impacts from hazard events.
    - Minimize disruption to the road network and maintain access,

    - Mitigate financial losses incurred by municipal, residential, industrial, agricultural and commercial establishments due to disasters,
    - Ensure that community infrastructure is not significantly damaged by a hazard event.
    - Being proactive in implementing any needed mitigation projects for public infrastructure such as roads, bridges, culverts, municipal buildings, etc.
- Encourage hazard mitigation planning to be incorporated into other community planning projects, such as the Town Plan, Capital Improvement Plan, Zoning Bylaw and the Local Emergency Management Plan.
- Work to ensure that there are sustainable backup power sources for the town's public water and sewer systems.
- Consider and incorporate climate change resilience into town initiatives where possible.
- Ensure that members of the general public continue to be part of the hazard mitigation planning process.

The above highlighted in green are the changes and additions made during the plan update process. These changes, as well as what has not changed, reflect the priorities of the Town. The Town is more action based in addressing climate change and planned for longer term power outages in this Plan versus the prior Plan, and this change is reflected here. Overall, their commitment to resilience remains strong.

Relevant Town Policies that Support Mitigation

The most recent Putney Town Plan was adopted in 2015. It was considered in the development of this plan because it reflects the goals and ideas of Putney. The below was taken directly from the Putney Town Plan[29]:

Fire Protection and Emergency Services Policies
1.1 Ensure that the Putney Fire Department has the resources, facilities, equipment, and training necessary in order to function successfully and provide an appropriate and sustained level of customer service relative to all fire department activities.

Emergency Planning Policies
1.1 Maintain and update the State Basic Emergency Operations Plan and Municipal Emergency Operations Plan.

1.2 Maintain and update the Single Jurisdiction Hazard Mitigation Plan.

1.3 The Town should continue to support and participate with community, regional, and state organizations and agencies in order to ensure adequate emergency planning and response capabilities.

1.4 The Town should ensure the Emergency Management Director(s) have the appropriate resources and infrastructure necessary in order to maintain an appropriate level of planning and response capabilities.

Natural Resources Policies
1.1 Encourage preservation of the Town's natural and scenic areas.

1.2 Encourage land stewardship practices on all Town-owned lands that minimize trail damage on these lands.

[29] Putney Town Plan available on the Town website <http://www.putneyvt.org/files/docs/Town_Plan1.26.11.pdf>

1.4 The Conservation Commission will continue to implement the management plans that exist for Putney's public lands, including the Bare Hill Conservation Site (27 acres), the Beatrice Aiken Conservation Site (11 acres), the Sacketts Brook Conservation Site (0.25 acres) and the Wilson Wetland Preserve (26 acres). It will coordinate with the Putney Central School Forest Committee which manages the PCS Forest (164 acrres) and with the Putney Mountain Association that manages the Town Forest (49 acres in Putney and 85 acres in Brookline). *Note: As of the writing of the Local Hazard Mitigation Plan, the former School Forest is now owned and managed by the "Forest for Learning" nonprofit.*

1.6 The Conservation Commission should develop recommendations for consideration by the Selectboard and Planning Commission to protect large tracts of undeveloped land.

Water Resource Policies

2.7 The Conservation Commission shall consult with the Planning Commission to identify existing riparian buffers and develop recommendations for amendments to the Zoning Regulations defining the size and conservation of these buffers.

2.8 The Conservation Commission should educate landowners about the critical role of riparian buffers in conservation of water quality and aquatic wildlife habitat.

Flood Resilience

The Putney Town Plan contains an extensive section on Flood Resilience that the reader is encouraged to review. Mitigation related policies are listed here:

Flood Resilience Policies

3.1 It is the policy of the town to foster the protection and restoration of river corridors, floodplains, wetlands, and upland forested areas that attenuate and moderate flooding and fluvial erosion.

3.2 It is the policy of the Town to protect floodplains, river corridors, land adjacent to streams, wetlands, and upland forests through adoption and administration of flood hazard area regulations governing development in designated Special Flood Hazard Areas and River Corridors, in order to reduce the risk of flood damage to infrastructure, improved property, people, and the environment.

3.3 New development in identified flood hazard, fluvial erosion, and river corridor protection areas should be avoided. If new development is to be built in such areas, it should not exacerbate flooding and fluvial erosion.

3.4 The protection and restoration of geomorphic equilibrium, floodplains and upland forested areas that attenuate and moderate flooding and fluvial erosion should be encouraged.

3.5 Flood emergency preparedness and response planning are encouraged.

Flood Resilience Priorities for action

3.1 Town officials will become familiar with Flood Insurance Rate Maps (FIRMs) that delineate areas that could be inundated by water during flooding. (Selectboard, Development Review Board, Zoning Administrator).

3.2 Town officials will become familiar with ANR River Corridor maps that delineate the land area adjacent to streams and rivers that are required to accommodate a stable channel. (Selectboard, Development Review Board, Zoning Administrator)

3. 3 The Town will pursue a flood resilience management approach whose essential components are to identify and map flood and fluvial erosion hazard areas based on studies and maps provided by the Vermont ANR Rivers Program, and designate those areas for protection to reduce the risk of flood damage to infrastructure and private property.

3.4 The Planning Commission, with the Conservation Commission and public participation, will update the Flood Hazard Areas Overlay District to include regulation of river corridors, and include provisions for advance notification of and specific limits on new development activities in identified flood hazard areas, fluvial erosion areas, and/or River Corridors, based on regulatory templates developed by the ANR DEC Rivers Program.

3.5 The Development Review Board will regulate any new development in identified flood hazard areas, fluvial erosion hazard areas, and/or River Corridors to:
(1) - minimize and prevent the loss of life and property, the disruption of commerce, the impairment of the tax base, and the extraordinary expenditures and demands on public service that result from flooding and;
(2) - ensure that development does not exacerbate flooding and fluvial erosion, and extend these provisions to development activities that might increase the amount and/or rate of runoff and soil erosion from upland areas.

3.6 The Town will further pursue a flood resilience management approach by implementing their Local Hazard Mitigation Plan and other strategies for restoring the stream geomorphic equilibrium conditions and enhancing the emergency preparedness that will mitigate the risks to public safety, critical infrastructure, historic structures, and municipal investments.

3.7 The town should continue to be in touch with Trans-Canada regarding their plans for impoundment releases from the Bellows Falls dam during a major flood.

Wetland policies

5.1 Riparian buffers should be protected to ensure water quality, to provide protected wildlife habitat, and to conserve the natural drainage patterns of running surface waters.

5.2 Significant wetlands and vernal pools should be protected from development by maintaining an undisturbed, naturally vegetated buffer strip sufficient to ensure the integrity of the habitat.
Priorities for action:

Wetland priorities for action
5.1 The Conservation Commission should map existing riparian forest cover throughout the town. Target these existing, forested riparian areas in open space planning and land and easement acquisition programs.

5.2 The Conservation Commission should inventory Putney's wetlands and vernal ponds, especially the unique wetland areas along Sacketts Brook, Putney Book, and the Connecticut River.

5.3 The Conservation and Planning Commissions shall investigate methods to protect riparian buffers and wetlands, including reviewing existing Zoning regulations.

Wildlife Habitat Policies

6.1 Ensure protection of fish and wildlife habitats; areas hosting species identified as endangered or threatened by Natural Heritage, state or federal agencies; rare and fragile areas; wetlands and vernal pools; shorelands; flood hazards area; aquifer recharge areas; steep slopes; ridgelines; essentially undeveloped forest lands which have limited access to an improved public road; and regionally significant scenic corridors from development that would have an undue adverse effect on the resource.

6.2 Identify and protect rare and fragile habitats, and areas hosting species identified as endangered or threatened by VT Natural Heritage Program or other state or federal agencies.

6.4 Educate landowners about the importance of wetlands, vernal pools, seeps and springs.

6.5 Encourage landowners to maintain large blocks of forest habitat to foster plant and wildlife diversity and travel corridors.

6.7 The Conservation Commission should identify important mast stands--oak, hickory, beech (these trees need 40 years to reach nut producing age) and soft mast and encourage best management practices for logging operations.

7.1 Control the spread of invasive species and reduce their existing populations.

7.2 Promote the use of native species.

Priorities for action

7.1 The Conservation Commission should inform residents of the problem and provide information on how to identify, report and control invasive species on their land.

7.2 The Conservation Commission should coordinate with the Vermont Nature Conservancy to present a workshop on best management practices to prevent the spread of invasive plants along road edges.

7.3 The Conservation Commission should suggest that local nurseries carry native plant species.

Mitigation Progress since the Last Plan

The following table lists all of the actions in the prior Plan, and the updated status on each.

	Action	Project Priority	Current Status	Notes
1	Installation of a new upsized box culvert on Hickory Ridge Road to replace culvert #7	High	Completed April 2016	Box Culvert
2	Holland Hill Road Culvert #19 replace with box culvert or buried upsized round culvert	High	Completed Nov 2018	Box Culvert
3	Houghton Brook Road culvert #21 replace with box culvert	Medium	Completed Aug 2019	Box Culvert
4	Parkman Wood Road culvert #4 upsize	Medium	Not Started	Included in updated mitigation action table.
5	West Hill Road embankment stabilization	High	Completed Aug 2019	Retaining Wall

	Action	Project Priority	Current Status	Notes
6	Update culvert inventory	High	Completed Dec 2019	Mapping Completed
7	Update SFHA bylaws to include River Corridors	High	Completed May 2018	Adopted Regulations
8	Education to homeowners about the need to keep culverts clean. Provide assistance with how to go about getting driveway culverts cleaned out.	Medium	Not Started	Town Manager changes were an impediment. This is included in updated Table.
9	Installation of beaver fence on remaining culvert on Sandhill Road.	High	Not Started	Low Water Level; Not Necessary any longer.
10	Brook Road waterway improvements	Medium	In Progress	Fixed landslide; Should have a plan; Included in updated Table.
11	Installation of baffle in beaver dam on Sacketts Brook	High	NA	Lower Dam is gone; Wetland Changing
12	Put in a power connection between the generator and the sewage pump at Putney Central School. Ensure that generator is adequate and doesn't need to be replaced.	Medium	Not Started	This is included in updated Mitigation Action Table.
13	Installation of photovoltaic backup power source for the town well.	Medium	Not Started	Energy Committee disbanded; Power outage concern not deemed enough to justify cost at current time
14	Produce and distribute educational material to residents on the proper use of generators.	High	Education continues via various fire department initiatives; ongoing effort	Disbursement of educational materials and information initiated by the Fire Department Fall 2015; Education continues via various Department initiatives and is included in updated Table.
15	Inventory ash trees along roadways and inoculate ash trees in important locations	Medium	Partially completed	Inventory completed; 53 miles of road, 80% of the town; Included in updated Table.
16	Host an early detector training	Medium	Did Not Happen	All PCC members trained to detect Emerald Ash Borer signs; Included in updated Table.
17	Develop an invasive species management plan for publicly owned land in Putney	Medium	In Progress	Formal Plan for Wilson Wetlands only. Specific plans are in updated Table.
18	Hold meetings with all of the local schools and industrial facilities to	High	Continued contact and	Planned to continue, but not listed in

	Action	Project Priority	Current Status	Notes
	discuss emergency planning and protocol		planning updates with all facilities	updated Mitigation Action Table.
19	Produce and distribute educational material for citizens about emergency kits, the location of the emergency shelter, sheltering of animals in emergencies and VTAlert sign-up.	High	Partially completed	VT Alert was completed; the rest is planned to continue and is part of updated Table.
20	Creation of VTAlert list-serve for residents for notification during emergencies	High	Completed and Ongoing initiative	Alert System for Public

In addition to the above, the Town has been proceeding with Grants in Aid projects required by VTrans. Holland Hill, Tavern Hill, Hi Lo Biddy and a couple of other roads have been completed since 2017 when the program began.

Development of Mitigation Actions and Projects

The Putney Hazard Mitigation Planning participants identified the following hazard mitigation activities based on an evaluation of hazard event vulnerability not addressed by existing hazard mitigation initiatives and the feasibility of new activities.

Mitigation actions are listed in priority order by hazard. Actions were prioritized by the plan participants. These are new actions so any shifts in prioritization of actions came out through the multi-year plan development process. The following criteria were used in establishing project priorities. The ranking of these criteria is largely based on the best available information and best judgment as many projects are not fully scoped out at this time. Prioritization was done during the meetings for the plan development in discussions among participants and guided by WRC's Emergency Planner. Actions relating to future development were considered, but the plan participants did not find them to be feasible at this time due to lack of political will/community support.

- Does the action reduce damage?
- Does the action contribute to community objectives?
- Does the action meet existing regulations?
- Does the action protect historic structures or structures critical to town operations?
- Can the action be implemented quickly?
- Is the action socially acceptable?
- Is the action technically feasible?
- Is the action administratively possible?
- Is the action politically acceptable?
- Is the action legal?
- Does the action offer reasonable benefits compared to its cost of implementation?
- Is the action environmentally sound?

Cost-Benefit Analysis

As part of public involvement discussions, there was a rough cost/benefit analysis done for each action listed in the table and those results are shown in the table. The below cost and benefits tables address the priorities for the mitigation strategies that are stated in the Mitigation Actions Table. This was how the mitigation actions were assessed by the Hazard Mitigation Planning participants. Priority was assessed somewhat independently of

cost/benefit and was based more on the perceived need of each action and availability of funding, versus what the action costs and benefits.

At the time of applying for FEMA's PDM-C, FMA or HMGP grant programs, each project listed below will undergo full benefit-cost analysis (BCA) methodology, version 5.1 or higher to maximize savings. Whenever possible, Putney will utilize 406 mitigation funding.

Cost Estimates

High	= >$100,000
Medium	= $25,000 – 100,000
Low	= < $25,000

Benefit Estimates

High	Public Safety
Medium	Infrastructure/ Functionality
Low	Aesthetics/ General Maintenance

Mitigation Actions Table

MITIGATION ACTIONS									
HAZARD(S) ADDRESSED	**ISSUE DETAIL**	**ACTION**	**LEAD PARTY**	**PARTNER-SHIPS**	**Start/ Complete TIMELINE**	**POTENTIAL FUNDING**	**MITIGATION / PREPAREDNESS**	**PRIORITY**	**Notes / Status**
Flooding / Fluvial Erosion	Town Manager plans to put out a brochure/mailing to property owners.	Education to homeowners about the need to keep culverts clean. Provide assistance with how to go about getting driveway culverts cleaned out.	Town Manager	Town staff	2021-2022	Town funding	M	High	This has been expedited due to July 2021 storms.
Flooding / Fluvial Erosion	Road is 20 feet across and culvert is 16 feet by 4 feet wide. Culvert is too short. On upstream end of culvert there is a wide dispersement of water.	Parkman Wood Road culvert #4 Installation of a new upsized corrugated round pipe culvert	Town Highway Dept.	Town Manager	Start Summer 2022; Complete Fall 2023	Vtrans Structures grant; Better Back Roads grant; Town match	M	High	Hydraulic study completed. Funding being sought.
Flooding / Fluvial Erosion	Culvert undersized and there is a beaver pond at this location.	Holland Hill Road Culvert #15 replace with box culvert or buried upsized round corrugated culvert	Town Highway Dept.	Town Manager	Start Summer 2024; Complete Fall 2025	Vtrans Structures grant; Better Back Roads grant; Town match	M	High	Request to conduct Hydraulic Study by VTrans
Flooding / Fluvial Erosion	Major connector paved road to Westminster. High traffic as the Putney Central School and Hidden Springs are in this area. Culvert is undersized and rusty.	Westminster Road culvert #21 Installation of a new upsized corrugated round pipe culvert	Town Highway Dept.	Town Manager	Start Summer 2023; Complete Fall 2024	Vtrans Structures grant; Better Back Roads grant; Town match	M	High	Request to conduct Hydraulic Study by VTrans

MITIGATION ACTIONS									
HAZARD(S) ADDRESSED	**ISSUE DETAIL**	**ACTION**	**LEAD PARTY**	**PARTNER-SHIPS**	**Start/ Complete TIMELINE**	**POTENTIAL FUNDING**	**MITIGATION / PREPAREDNESS**	**PRIORITY**	**Notes / Status**
Flooding / Fluvial Erosion	Bypass connector paved road to Dummerston and Brookline. Culvert undersized.	West Hill Road to replace culvert #1 Installation of a new upsized corrugated round pipe culvert	Town Highway Dept.	Town Manager	Start Summer 2024; Complete Fall 2025	Vtrans Structures grant; Better Back Roads grant; Town match	M	High	Request to conduct Hydraulic Study by VTrans
Flooding / Fluvial Erosion	The water supply is fed by Sacketts Brook watershed; Sacketts Brook wetland and ponds hold water, including flood waters, which recharge the town well's aquifer. Wetland plants and soils filter water. Village is downstream and could be in danger of flooding without mitigation assistance to correct Brook's detachment from its floodplain.	Meet with ANR Stream Engineer to discuss issues on Sacketts Brook and develop plan to mitigate head-cuts and incision. Overall goal is to reconnect Sacketts Brook with the floodway and stabilize the erosion issue. When the water flows it hits the bank and comes back towards the bridge, stream is widening and getting deeper, and sides of bank are eroding (roots are visible). There is a lot of silt in the waterway.	Conservation Commission / Wilson Wetlands Committee	Forest for Learning	2021 meeting with ANR to develop actions	Flood Resilient Communities Fund	M	Medium/ High	As soon as a grant is received, the hope is to hire a professional for study. Will be submitting an application for grant funding in January 2022
Flooding / Fluvial Erosion	Steep grade on paved road;	Priest Drive culvert at the base of that road	Town Highway Dept.	Town Manager	2023-2024	Grants	M	Medium/ High	On radar; paving scheduled 2021 but pushed back because of July 29, 2021 storm.

MITIGATION ACTIONS									
HAZARD(S) ADDRESSED	**ISSUE DETAIL**	**ACTION**	**LEAD PARTY**	**PARTNER-SHIPS**	**Start/ Complete TIMELINE**	**POTENTIAL FUNDING**	**MITIGATION / PREPAREDNESS**	**PRIORITY**	**Notes / Status**
Flooding / Fluvial Erosion	4 different locations along the waterway, along turns, the banks have been eaten away and the runoff from road above has washed down over the bank, causing slides.	Brook Road waterway improvements	Road Superintendent	ANR	2024-2026	Town Budget and Grant funding	M	Medium	Fixed landslide; Should have a plan
Flooding / Fluvial Erosion	Private property owners are not necessarily covered by flood insurance	Join the Community Rating System	Town Manager	Selectboard	2022-2023	None	P	Medium	Contact Brattleboro speak with Brian Bannon regarding how this program works through a zoning lens
Flooding / Fluvial Erosion	Annual training required	Continue training for Floodplain Administrator	Town Manager	Fire Chief	2022-2023	None	P	Medium	Some training. Seek more training.
Flooding / Fluvial Erosion	storm damage created by high water in Sacketts Brook	structural retrofits or protections for the general store or the paper mill?	Fire Chief	Town Manager	2024-2025	MPG	P	Medium	

MITIGATION ACTIONS									
HAZARD(S) ADDRESSED	**ISSUE DETAIL**	**ACTION**	**LEAD PARTY**	**PARTNER-SHIPS**	**Start/ Complete TIMELINE**	**POTENTIAL FUNDING**	**MITIGATION / PREPAREDNESS**	**PRIORITY**	**Notes / Status**
Flooding / Fluvial Erosion	Steep slope erosion	develop a steep slopes development restriction in town zoning to protect roads/streams	Planning Comm	consultant	2023-2025	MPG	M	Medium	Research benefits and impact if this is instituted
Flooding / Fluvial Erosion	Climate Change/High water incidents could potential threaten dam	Develop a plan for handling a dam failure, to include failure mapping.	Fire Chief	Town Manager	2023-2024	Grant	M	Medium	Dam holds back water for fire protection and water source. There is one or two separate plans in other Emergency Management Plans
Flooding / Fluvial Erosion	Culverts are undersized and rusty.	Houghton Brook Road culvert #12, 13 and 18 replace with box culvert or corrugated round pipe	Town Highway Dept.	Town Manager	Start Summer 2025; Complete Fall 2026	Vtrans Structures grant; Better Back Roads grant; Town match	M	Medium	Request to conduct Hydraulic Study by VTrans
Flooding / Fluvial Erosion	Culvert is undersized and rusty.	River Road culvert #20 replace with box culvert or corrugated round pipe	Town Highway Dept.	Town Manager	Start Summer 2025; Complete Fall 2026	Vtrans Structures grant; Better Back Roads grant; Town match	M	Medium	Request to conduct Hydraulic Study by VTrans
Snow and Ice Storm	If Putney should have no power the pump station would not be able to operate	Install emergency power connection between the generator and the sewage pump at Putney Central School.	School administrative staff and Town Selectboard	Town Manager	2023-2025	Capital Plan Budget	M	Medium/ High	Town Manager is seeking grant funding and putting in capital plan budget.

MITIGATION ACTIONS									
HAZARD(S) ADDRESSED	**ISSUE DETAIL**	**ACTION**	**LEAD PARTY**	**PARTNER-SHIPS**	**Start/ Complete TIMELINE**	**POTENTIAL FUNDING**	**MITIGATION / PREPAREDNESS**	**PRIORITY**	**Notes / Status**
Snow and Ice Storm	Storms create outages from ice storms and wind	Discussion with GMP about utility undergrounding possibilities in Putney	Town Manager	Energy Committee	2022-2024	None	M	Low	How much utility is underground in Putney and what?
Invasive Species	Invasive species threatening Ash Trees in Vermont.	Complete the inventory of ash trees along roadways	Conservation Commission	County Forester / Local schools	2022-2023	Volunteer Time	P	Medium	Inventory completed for 80% of the town roads; map has been created of the hundreds of ash trees
Invasive Species	Inventory partially complete	Present completed ash tree survey results from Conservation Commission study to the selectboard and discuss options for handling the issue (include "slow the spread")	Conservation Comm	Brian Young, PhD, consultant, Landmark College Professor	2021-2022	AVCC grant already in PCC donations account to pay consultant	P	Medium	PCC and Brian Young can present to Selectboard upon Town request.
Invasive Species	Develop plans for Bear Hill conservation site and Beatrice Aiken conservation site	Update, or prepare new, management plans, including invasive species management plans, for these publicly owned lands in Putney	Conservation Commission	Selectboard, Town Manager	2022-2025	Volunteer time and potentially grants	P	Medium	In progress; Formal Plan for Wilson Wetlands completed.
Invasive Species	Training/Education for community members to recognize Emerald Ash Borer	Host a first detector training	Conservation Commission / Tree Warden	ANR	2022	Volunteer time and ANR funding	P	Low	All survey volunteers were trained to detect Emerald Ash Borer signs

MITIGATION ACTIONS									
HAZARD(S) ADDRESSED	**ISSUE DETAIL**	**ACTION**	**LEAD PARTY**	**PARTNER-SHIPS**	**Start/ Complete TIMELINE**	**POTENTIAL FUNDING**	**MITIGATION / PREPAREDNESS**	**PRIORITY**	**Notes / Status**
Power Failure / All hazards	If Putney should have no power for days the pump station would not be able to operate and provide a water source for residents.	Install solar power with backup battery capacity or a diesel powered generator to serve the Sandhill pump station. This would pump water to the storage tank if there was an extended power outage.	Selectboard	Town Manager	2023-2024	Grants; Capital Budget	M	Medium	Requesting quotes for generator and looking at other alternatives for secondary power.
Power Failure / All hazards	If Putney should have no power for days the pump station would not be able to operate and provide a water source for residents.	Install solar power with backup battery capacity or a diesel generator to serve the wastewater treatment plant.	Selectboard	Town Manager	2023-2024	Grants; Capital Budget	M	Medium	Requesting quotes for generator and looking at other alternatives for secondary power.

Implementation of Mitigation Actions / Capabilities

Barriers to Implementation:

1. Aging population with little in-migration of younger residents
2. Limited population base, though this also lowers risk
3. Not a lot of industry or commercial entities in Putney
4. Transportation projects can get drawn out for 2-3 years between getting an engineering study, getting engineering design work completed, and getting funded.
5. Turnover within town boards and difficulty finding replacements or new members makes taking on longer term project difficult.
6. Putney Fire Department is small and volunteer, and recruitment is difficult.
7. Limited tax base to draw funds from for major projects. Raising funds is a burden.
8. Environmental permitting and state regulatory requirements are often difficult for volunteers and town employees to understand and comply with.

Capabilities to build upon for implementation:

1. 6 full-time road crew staff
2. 11 full-time town staff
3. Paid Emergency Management Director, who is also the Fire Chief
4. Putney does regulate development in the River Corridor through its floodplain zoning, which controls development of this hazardous area.
5. Active Conservation Commission in town
6. Active Social Service base in the community to assist those in need
7. Grant writing capacity among town staff is limited.
8. Second homeowners are not as high as in some other towns in the region, which means there is more local community mindedness.
9. Selectboard with lots of local knowledge
10. Well-functioning EOC and emergency plans in place
11. Set-aside fund for road repairs
12. Windham Regional Commission assistance when needed
13. Zoning Board of Adjustment exists per NFIP requirement.
14. Contingency fund exists to fund unexpected expenses
15. Residents are generally the hearty and self-sufficient type

Recognizing that there is no place that doesn't have barriers to overcome in project implementation, Putney should focus on engaging around emergency management at the town level. There are a limited number of committed volunteers and staff who make this town function well. They are invested and plan to remain in the area. The Town has a hard time recruiting new volunteers. They are located along I-91 and Route 5, which are major travel corridors of the region, yet many residents live on back dirt roads that can be difficult to access during certain times of the year. This lends to a "do it yourself" mentality that serves Putney positively.

The town looks to and works closely with the Windham Regional Commission. They look to the Regional Plan policies for guidance on land use decisions which influence their town plan policies and goals. The town works closely with VT Department of Environmental Conservation Agency of Natural Resources and the Army Corps of Engineers when performing any work in streams or rivers. Additionally, the town adopts the latest VTrans Road Standards for road/culvert/bridge improvement projects. With the support of these agencies and the Windham Regional Commission, Putney is capable of carrying out all of the mitigation actions outlined in the plan.

PLAN MAINTENANCE PROCESS

Monitoring, Evaluating, and Updating the Plan – Yearly Review

Once the plan is approved and adopted, the Emergency Management Director in Putney, along with interested and appointed volunteers, will continue to work with the Windham Regional Commission to monitor, evaluate, and update the plan throughout the next 5-year cycle. The plan will be reviewed annually at an April Selectboard meeting along with the review of the town's Local Emergency Management Plan (LEMP). This meeting will allow town officials and the public to discuss and track the town's progress in implementing mitigation actions and determine if the town is interested in applying for grant funding for projects that can help mitigate future hazardous events; e.g., bridge and culvert replacements, road replacements and grading, as well as buying out any repetitive loss structures that may be in the Special Flood Hazard Area, and revise the plan as needed. Windham Regional Commission's (WRC) emergency planner will assist the Putney Town Manager with this review, as requested by the Town. Progress on actions will be kept track using a table that WRC will provide to the town EMD to update. There will be no changes to the plan, unless deemed necessary by the Town. If so, the post disaster review procedure will be followed.

Plan Maintenance – 5 Year Update Process

The Hazard Mitigation Plan is dynamic. To ensure that the plan remains current and relevant, it is important that it undergo a major update periodically as required in 44 CFR § 201.6(c)(4)(i). This update process will be thorough and occur every five years. Participants outlined below will work with the Emergency Planner at the Windham Regional Commission (WRC) in accordance with the following procedure:

1. The Putney Selectboard will appoint a team to convene a meeting of the Hazard Mitigation Stakeholder Group. The Town Manager will chair the Stakeholder Group, and other members should include local officials such as Selectboard members, EMD, fire chief, zoning administrator, constable/police chief, road commissioner, Planning Commission members, Conservation Commission, health officer, etc. The Town Manager will work with the Windham Regional Commission Emergency Planner and be the point person for the Town.

2. The WRC Emergency Planner will guide the Stakeholder Group through the update process. This update process will include several advertised public meetings. At these meetings the Stakeholder Group will use the existing plan and update as appropriately guided by the WRC Emergency Planner to address:
   - Update of hazard events and data gathered since the last plan update.
   - Changes in community and government processes, which are hazard-related and have occurred since the last review.
   - Changes in community growth and development trends and their effect on vulnerability.
   - Progress in implementation of plan initiatives and projects.
   - Evaluation of the plan for its effectiveness at achieving its stated purpose and goals.
   - Incorporation of new mitigation initiatives and projects.
   - Effectiveness of previously implemented initiatives and projects.
   - Evaluation of unanticipated challenges or opportunities that may have occurred between the date of adoption and the date of the report, and their effect on capabilities of the town.

- Evaluation of hazard-related public policies, initiatives and projects.
- How mitigation strategy has been incorporated into other planning mechanisms
- Review and discussion of the effectiveness of public and private sector coordination and cooperation.

3. From the information gathered at these meetings, and other interactions the WRC Emergency Planner has with the Town, along with data collected independently during research for the update, the WRC Emergency Planner will prepare the updated draft in conformance with the latest FEMA Region 1 *Local Hazard Mitigation Plan Review Crosswalk* document.

4. The Selectboard will review the draft report. Consensus will be reached on changes to the draft. Emphasis in plan updates will be put on critically looking at how the plan can become more effective at achieving its stated purpose and goals.

5. Changes will be incorporated into the Plan by the WRC Emergency Planner.

6. The Selectboard will notify the public that the draft is available for public comment and review. The Town will advertise and make available the draft plan for provide comments both electronically and in hard copy. The draft plan will simultaneously be distributed electronically to adjacent towns for review and comment.

7. Public and adjacent town comments will be incorporated by the WRC Emergency Planner. The final draft will be provided to the Emergency Committee for final review and comment, with review comments provided to the Committee and incorporated into the plan.

8. WRC Emergency Planner will finalize the plan with any remaining comments from the Emergency Committee and submit electronically to VEM and FEMA.

9. The Plan will be reviewed by the VEM State Hazard Mitigation Officer (SHMO) and FEMA Region 1.

10. SHMO and FEMA comments will be addressed in the plan by the WRC Emergency Planner.

11. The plan will be resubmitted as needed until the plan is approved pending adoption. Once the plan is approved by FEMA, it will be ready for adoption.

12. The Selectboard will adopt the plan and distribute to interested parties.

13. The final adopted plan will be submitted by the WRC Emergency Planner to VEM and FEMA.

14. FEMA will issue final approval of the adopted plan and the five year clock will begin again.

Post-Disaster Review/Update Procedure

Should a declared disaster occur, a special review will occur amongst the Selectboard, the Emergency Management Director, the WRC Emergency Planner, and those involved in the five-year update process described above. This review will occur in accordance with the following procedures:

1. Within six months of a declared emergency event, the town will initiate a post disaster review and assessment. Members of the State Hazard Mitigation Committee will be notified that the assessment process has commenced.

2. This post disaster review and assessment will document the facts of the event and assess whether existing Hazard Mitigation projects effectively lowered community vulnerability/damages. New mitigation projects will be discussed, as needed.

3. A draft After Action Report of the review and assessment will be distributed to the Stakeholder Group.

4. A meeting of the Stakeholder Group will be convened by the Selectboard to make a determination of whether the plan needs to be amended. If the Stakeholder Group determines that NO modification of the plan is needed, then the report is distributed to local communities.

5. If the Stakeholder Group determines that modification of the plan IS needed, then the Stakeholder Group drafts an amended plan based on the recommendations and forwards to the Selectboard for public input.

6. The Selectboard adopts the amended plan after receiving approval-pending-adoption notification from FEMA.

Continued Public Participation

Maintenance of this plan and implementation of the mitigation strategy will require the continued participation of local citizens, agencies, and other organizations. To keep the public aware of and involved in local hazard mitigation efforts, the town will take the following measures:

- Provide hazard mitigation information at Town Meeting
- Schedule and advertise a planning meeting each year, soon after Town Meeting
- Seeking participation from key players in addition to general public interest:
    - Select board
    - Planning Commission
    - Public Works
    - School
    - Fire & Rescue
    - Emergency Mgt/ 911 Coordinator
    - Town Manager
    - Conservation Commission
    - Social service agencies
- Post the hazard mitigation plan on the town website
- Selectboard will review past hazard mitigation committee members and consider whether new members should be added. Representatives of local businesses, nonprofits, academia, etc. should especially be considered.
- Notify the public of committee meetings through town bulletin board, town website, fire department website, IPutney, local newspapers, Facebook, Front Porch Forum, etc.

Incorporation of Mitigation into Other Town Planning Mechanisms

The following policies, programs and activities related to hazard mitigation are currently in place and/or being implemented in the Town of Putney. The Hazard Mitigation Planning participants, especially the Town Manager, analyzed these programs for their effectiveness and

noted improvements needed. Putney uses all of the tools listed below to help plan for current and future activities with the town. For example: the Local Emergency Operation Plan has a contact list that is used for response purposes in the case of a hazard event, and is updated every year after Town Meeting. The latest Town Road and Bridge Standards are followed by the town and Putney is currently updating their culvert inventory (2015). In the development of this plan, the latest re-adopted 2011 Town Plan was used.

As Putney goes through the update process for the planning mechanisms outlined in the table below, they will look to the Hazard Mitigation Plan's Table of Actions and Risk and Vulnerability Assessments to help guide land use district decisions, and guide goals and policies for those districts. They have agreed to this. At the Town Meeting every March, policies and action items in the Town Plan are reviewed and integrated into hazard mitigation as needed. The Local Emergency Management Plan contact list is updated after Town Meeting each year, including updates to vulnerable geographic locations, as well as locations of vulnerable populations. Updates to each of the planning mechanisms outlined in the table below are handled by the identified by the responsible party identified in the table. There is no timeframe for updating the below referenced plans and regulations to better incorporate hazard mitigation, however, as each document is updated the hazard mitigation plan will be reviewed for incorporation. The goals of this hazard mitigation plan will be incorporated in the upcoming town plan update to ensure that emergency preparedness and mitigation planning efforts are included in the Town Plan, with particular attention to including the projects in the Mitigation Actions Table. This will assist with ensuring that this plan is utilized and project follow-through occurs.

During the plan update of the Town Plan, Putney will address flood resiliency and preparation. The hazard mitigation plan will be considered and incorporated as appropriate in the next town plan update. Utilization of the prior LHMP in Putney was limited in terms of incorporating it into other town planning mechanisms. This was due to a number of things, from staff turnover, volunteer turnover, lack of understanding of the plan, and the pandemic that happened between then and now. The town did take the big step to update their flood hazard bylaw to include river corridors, which was an identified policy update in the last plan. Additionally, the town plan update done in 2015 did include a lot of information on flood resilience which is now a required element of town plans in Vermont. The LEMP is updated yearly and was updated last in 2021. Other mitigation/emergency planning related documents and their status are outlined in the below table:

Type of Existing Protection	Description	Effectiveness/Enforcement/Hazard that is addressed	Gaps in Existing Protection/Improvements Needed
Town Plan	Plan for coordinated town-wide planning for land use, municipal facilities, etc.	Flood resiliency is being addressed	Town Plan was updated last in 2015 and does address flood resilience
Local Emergency Management Plan	Municipal procedures for emergency response	All hazards response plan for EOC purpose	Updated and adopted annually after Town Meeting; last updated in 2021.
School Emergency Response Planning	There are five schools in Putney: Landmark College, The Putney School, Putney Central School, The Grammar School, and	The fire chief and the schools have various plans depending on school and have had various exercises depending on school.	The EMD/Fire Chief is works with Windham Southeast Supervisory Union for their schools and he will expand that plan to the private

	The Greenwood School	Fire Chief/EMD works with each school with what they want to do for emergency planning. He is a facilitator for as much as the school wants to do.	schools. Schools maintain and update their own Emergency Response Plans per state regulations. The Town's LEMP states this.
Mutual Aid – Emergency Services	Agreement for regional coordinated emergency services	Keene (NH) Mutual Aid – written agreement/contract for Fire/Ambulance and HazMat, 911 services	None identified
Road Standards	Design and construction standards for roads and drainage systems	Adopted the latest 2019 Vtrans Town Road and Bridge standards	None identified
Subdivision Regulations	Regulates the division of land, standards for site access and utilities	9/26/2007	None identified
Sewage Regulations	Ordinance covers the towns municipal sewer system.	The Town has a waste water system with its own ordinance. The state regulates on lot sewage systems.	None identified
Flood Hazard Area and River Corridor Regulations	Regulates development in FEMA flood hazard areas and ANR River Corridors	Flood Hazard and River corridor regulations in place. Updated in 2017.	None identified
Site Plan Review (SPR)	Site development standards for conditional use development	Town Zoning Regulations	None Identified
Maintenance Programs	Bridge & Culvert Inventory	2015 was last update	Update planned for 2022
Building Code	Regulates building construction standards	State building codes for commercial and apartment buildings. Inspections are only done for fire safety.	Town doesn't have its own code.
Zoning Regulations	Regulates development	First adopted in March 1978	They were last updated in May 2021. No gaps identified.

APPENDIX

1. Adoption Resolution
2. Email sent to adjacent towns for comment on the draft plan
3. Email sent to town officials and plan participants for comment on the draft plan
4. Flyer posted at various locations around Putney asking for comment on the draft plan
5. Town website ad with draft plan for public comment
6. Town website ad for August 31,2021 Hazard Mitigation Plan update virtual public meeting
7. August 31, 2021 meeting agenda
8. Flyer ad for August 31,2021 Hazard Mitigation Plan update virtual public meeting

1. Adoption by the Local Governing Body

Certificate of Adoption
Town of Putney, VT
Selectboard

A Resolution Adopting the 2021 update of the *Local Hazard Mitigation Plan for the Town of Putney, VT*

WHEREAS, the Town of Putney, VT has worked with the Windham Regional Commission to identify natural hazards, analyze past and potential future damages due to natural disasters, and identify strategies for mitigating future damages; and

WHEREAS, The Town of Putney, VT Local Hazard Mitigation Plan analyzes natural hazards and assesses risks within the community; and

WHEREAS, the Town of Putney, VT Local Hazard Mitigation Plan recommends the implementation of action(s) specific to the community to mitigate against damage from natural hazard events; and

WHEREAS, the Town of Putney, VT authorizes responsible agencies to execute their responsibilities to implement this plan for the purposes of long term risk reduction and increased community resiliency and;

WHEREAS, the Town of Putney, VT will follow the Plan Maintenance Process outlined in this plan to assure that the plan stays up to date and compliant; and

NOW, THEREFORE BE IT RESOLVED that the Town of Putney, VT adopts the updated *Town of Putney Local Hazard Mitigation Plan* as well as future revisions and maintenance required by 44 CFR 201.6 and FEMA for a period of five (5) years from the date of this resolution.

Duly adopted this 6 day of April, 2022.

Selectboard

Aileen Chute, Chair

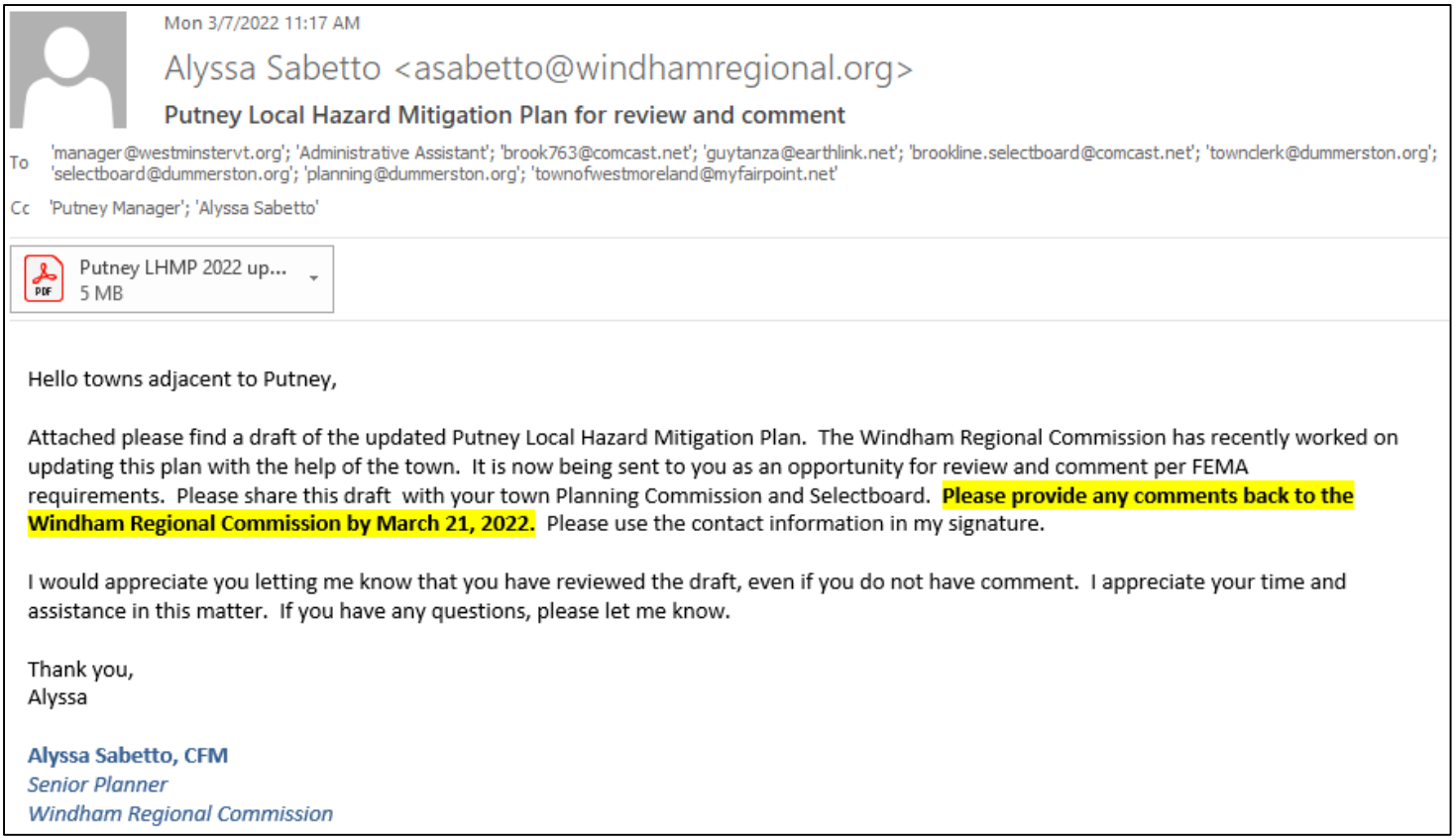
Joshua Laughlin, Vice Chair

Eric McGowan, Clerk

ATTEST

Karen Astley, Town Manager

2. Email sent to adjacent towns for comment on the draft plan



Mon 3/7/2022 11:17 AM

Alyssa Sabetto <asabetto@windhamregional.org>

Putney Local Hazard Mitigation Plan for review and comment

To 'manager@westminstervt.org'; 'Administrative Assistant'; 'brook763@comcast.net'; 'guytanza@earthlink.net'; 'brookline.selectboard@comcast.net'; 'townclerk@dummerston.org'; 'selectboard@dummerston.org'; 'planning@dummerston.org'; 'townofwestmoreland@myfairpoint.net'

Cc 'Putney Manager'; 'Alyssa Sabetto'

Putney LHMP 2022 up...
5 MB

Hello towns adjacent to Putney,

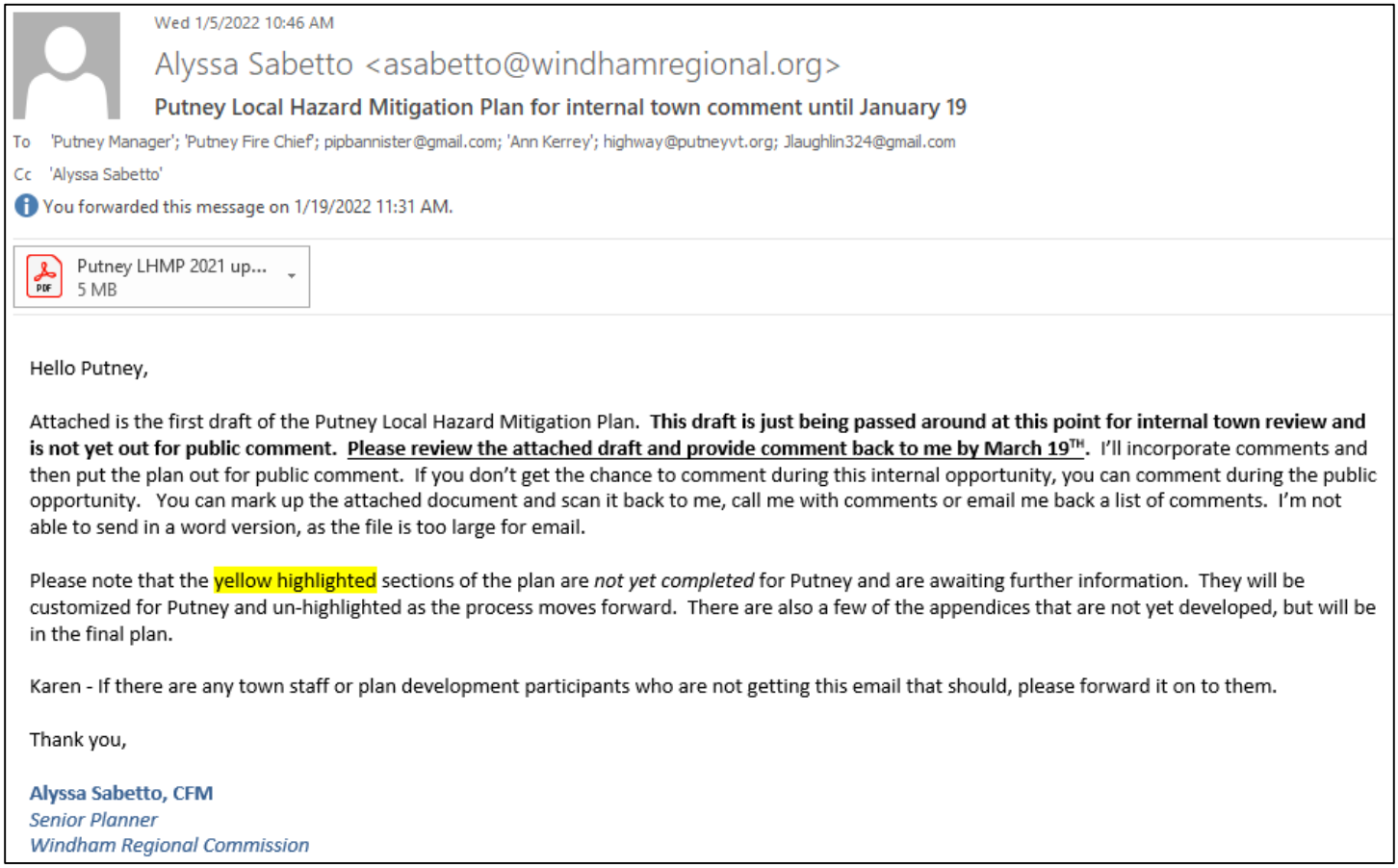
Attached please find a draft of the updated Putney Local Hazard Mitigation Plan. The Windham Regional Commission has recently worked on updating this plan with the help of the town. It is now being sent to you as an opportunity for review and comment per FEMA requirements. Please share this draft with your town Planning Commission and Selectboard. **Please provide any comments back to the Windham Regional Commission by March 21, 2022.** Please use the contact information in my signature.

I would appreciate you letting me know that you have reviewed the draft, even if you do not have comment. I appreciate your time and assistance in this matter. If you have any questions, please let me know.

Thank you,
Alyssa

Alyssa Sabetto, CFM
Senior Planner
Windham Regional Commission

3. Email sent to town officials and plan participants for comment on the draft plan



Wed 1/5/2022 10:46 AM

Alyssa Sabetto <asabetto@windhamregional.org>

Putney Local Hazard Mitigation Plan for internal town comment until January 19

To 'Putney Manager'; 'Putney Fire Chief'; pipbannister@gmail.com; 'Ann Kerrey'; highway@putneyvt.org; Jlaughlin324@gmail.com

Cc 'Alyssa Sabetto'

You forwarded this message on 1/19/2022 11:31 AM.

Putney LHMP 2021 up...
5 MB

Hello Putney,

Attached is the first draft of the Putney Local Hazard Mitigation Plan. **This draft is just being passed around at this point for internal town review and is not yet out for public comment.** **Please review the attached draft and provide comment back to me by March 19TH.** I'll incorporate comments and then put the plan out for public comment. If you don't get the chance to comment during this internal opportunity, you can comment during the public opportunity. You can mark up the attached document and scan it back to me, call me with comments or email me back a list of comments. I'm not able to send in a word version, as the file is too large for email.

Please note that the yellow highlighted sections of the plan are *not yet completed* for Putney and are awaiting further information. They will be customized for Putney and un-highlighted as the process moves forward. There are also a few of the appendices that are not yet developed, but will be in the final plan.

Karen - If there are any town staff or plan development participants who are not getting this email that should, please forward it on to them.

Thank you,

Alyssa Sabetto, CFM
Senior Planner
Windham Regional Commission

4. Flyer posted at various locations around Putney asking for comment on the draft plan

Putney Hazard Mitigation Plan

PUBLIC COMMENT PERIOD

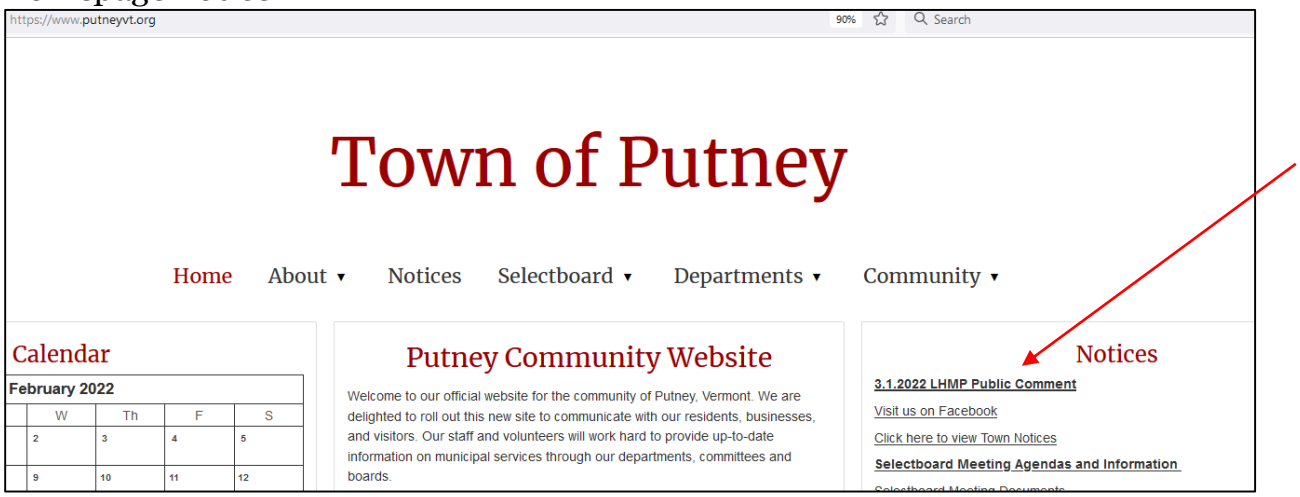
The draft Putney Hazard Mitigation Plan is now available for public review on the town website: www.putneyvt.org. A hard copy is available at the Town Office Monday-Thursday from 9:00am-4:00pm.

The Plan will be available for comment until March 1, 2022.

Anyone who would like to comment on the plan should contact Alyssa Sabetto at the Windham Regional Commission. She can be reached via phone at 802-257-4547 x113 or email at asabetto@windhamregional.org. We encourage your review and participation!

5. Town website ad with draft plan for public comment

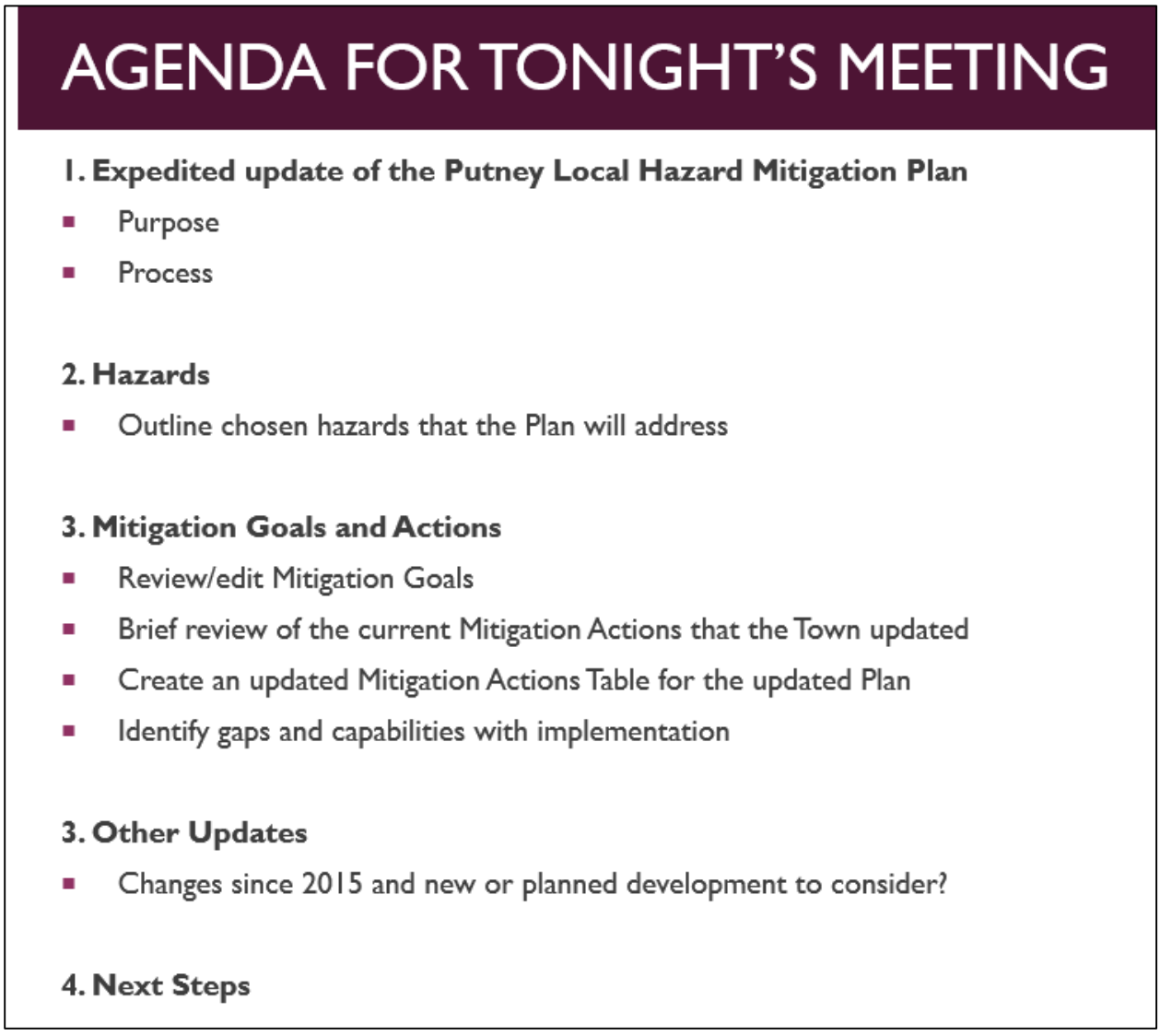
Homepage notice:



Within the Notices:

6. Town website ad for August 31,2021 Hazard Mitigation Plan update virtual public meeting

7. August 31, 2021 meeting agenda



8. Flyer ad for August 31,2021 Hazard Mitigation Plan update virtual public meeting

Putney Hazard Mitigation / Resiliency Plan Public Meeting Announcement

Date: Tuesday, August 31, 2021

Time: 6:00-8:00 PM

Via Zoom – See Town website for details

Help update Putney's Local Hazard Mitigation Plan! What actions can the town take now to lower vulnerability before the *next* natural hazard strikes?

For more information contact
Alyssa Sabetto at 802-257-4547 x113

WINDHAM REGIONAL COMMISSION