

8. Resilience

Objectives

1. Build and sustain a high level of community resilience in Putney.
2. Mitigate potential flood and erosion hazards and increase the community's resilience to flooding and other disasters.
3. Prevent increased flood and erosion hazards resulting from irresponsible land use and development practices.
4. Improve or maintain natural riparian functions along streams and rivers in Putney to prevent or minimize future flood and fluvial erosion hazards.
5. Encourage more property owners to purchase flood insurance for buildings within the Special Flood Hazard Area (SFHA).

Policies

1. Maintain eligibility for the highest level of ERAF funding from the state.
2. Maintain eligibility for the National Flood Insurance Program by implementing federal/state regulations on development within mapped flood hazard areas.
3. Limit development in proximity to rivers and streams.
4. Encourage property owners to maintain woody vegetation along the banks of rivers and streams.
5. Discourage property owners from removing tree cover at higher elevations and on steeper slopes to prevent further intensification of downslope flooding or erosion during severe storms.
6. Guide new residential development away from sites that are remote from community services, difficult to access or at higher risk of damage from severe storms.
7. Support organizations that provide shelter, medical assistance, and other support services to Putney residents during disasters or emergencies.
8. Support regional initiatives to improve preparedness for future disasters and emergencies.
9. Support local renewable energy generation and decentralized power systems that can reduce dependence on grid-provided power, which is commonly disrupted during disasters and emergencies.

Actions

1. Continue to maintain a current, adopted Hazard Mitigation Plan.
2. Continue to participate in the Local Emergency Planning Committee.
3. Provide a suitable local facility where residents can safely shelter and access needed services during a disaster or emergency.
4. Require all new development to adequately manage stormwater to prevent damage to public infrastructure.

5. Adopt road and driveway standard that ensure all new development meets minimum requirements for emergency access.
6. Require that utilities installed to serve new development be placed underground.
7. Continue to monitor the health of and remove diseased hazard trees within public rights-of-way.

call-out box

[Community resilience is a measure of the sustained ability of a community to utilize available resources to respond to, withstand, and recover from adverse situations].

Putney's landform is dominated by two north-south ridgelines, Bare Hill (1,113 feet) in the center of town, and Putney Mountain (1,660 feet) on the western boundary. 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.

Putney has significant areas of land under conservation held either publicly or privately. Agricultural lands are found along the Connecticut River, along Westminster Road, West Hill Road, and in several other pockets throughout Town. Agricultural activity consists mostly of orchards and haying with a dairy farm that is part of the Putney School. The settlement pattern is defined by a village in the southeastern corner, giving way to predominantly low-density single dwelling unit residential development.

There is a municipal water and wastewater system serving the village and Landmark College allowing for multi-unit residential development in the village. Most new housing units in the village in the past ten years have been in multi-unit buildings.

Hazard Areas

Flood plain management

Putney participates in the FEMA National Flood Insurance Program (NFIP) which sets engineering and construction or building standards for development in the special flood hazard area (SFHA). In 2021 Putney amended the zoning bylaw to regulate development in the river corridor, an area subject to fluvial erosion (rather than inundation). Overall Putney has managed to limit conflict between buildings and flood hazard well. There are approximately 17 structures in the SFHA and approximately 40 in the River Corridor area (13 are in both). Data from FEMA maps and the E911 program show that 19 dwelling units are within 50 feet of a mapped stream.

[sidebar: definition of fluvial erosion]

River Corridors

Flooding is the most likely and most destructive hazard for a community in the United States. The NFIP program is operated by FEMA, its purpose is to address impacts caused by inundation flooding, which is more commonplace across the country. The geology and topography of Vermont compel an additional regulatory response to reduce the impact of fluvial erosion. In Vermont fluvial erosion events are common and occur when riverbanks are destroyed by the movement of streams. The process can range from gradual bank erosion to catastrophic realignments of the river channel during flood events. 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. Following the widescale impact of Tropical Storm Irene in 2011 the Vermont River Management Program developed a program that first mapped river corridors throughout the state (see Floodplain and River Corridor map page xx). The

purpose of the river corridor is to establish a zone where the stream can move within in its floodplain reestablishing equilibrium conditions and habitats. This approach avoids wherever possible the straightening and berming of rivers to prevent the channel from moving.

As the climate crisis continues the frequency and intensity of fluvial erosion events are also increasing. This hazard pattern presents challenges to communities such as Putney where the existing road network of roads in narrow valleys has evolved from an era when settlements relied on stream water for power generation and waste removal and upland areas were harvested for timber and cleared for grazing of livestock, not low-density residential use.

[table/sidebar of total rainfall increases in past 5 years]

Putney's enrollment in the River Corridor program further restricts development in the designated area to prevent more conflicts and damage to private and public property. Part of the benefit of participation in this program is more support from the state for the Town of Putney to repair vital infrastructure when the county experiences more than \$1 million in damage due to a storm event.

Road Network

In Putney conflict occurs where roads (typically unpaved) have been built between steep slopes and a stream. 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. Brook Road is repeatedly impacted by fluvial erosion events, directly by Sacketts Brook undercutting the roadbed and tree fall triggered by slope failures on both walls of the narrow valley, making the road impassable.

Roads that are linked to streams are known as 'hydrologically connected'. Putney has 36 miles of such roads; 1.5 miles are at high risk of erosion and 10 miles are at moderate risk of erosion. There are 527 inventoried culverts on Putney town roads of which 38 are in poor condition and 77 are in fair condition. Private or Class 4 roads that may not be readily accessible to emergency vehicles in all seasons serve 25 percent of Putney homes. Thirty percent of homes in Putney can only be accessed from one vehicular route putting them at higher risk of being cut off during a storm, disaster or accident resulting in road closure or damage.

Ice Storms

Putney like the rest of the region tends to experience its worst ice storms at the start and end of winter. These usually result in electric power outages and roads made impassable by downed trees and ice. Due to their higher elevation Holland Hill and Putney Mountain Roads are the most vulnerable. The ongoing climate crisis is pushing temperatures higher which in turn increases the volume of water vapor in the atmosphere. This is experienced on the ground in the form of more large-scale ice storms or heavy wet snow impacting a landscape and infrastructure suited to a different climate. The issue is exacerbated now by the frequency of rain-on-snow events which can make flood risk both more difficult to predict and compound the impact of potential flooding from rapid snow melt alone. We are now realizing that these climate changes pose a growing challenge for an ageing somewhat physically isolated population and a small-town system of government with limited ability to mobilize in response to emergencies.

Invasive Species

More insidious hazards that challenge the resilience of the landscape include a range of invasive plants and bugs that are transforming the physical environment. These too are a manifestation of the climate crisis. Invasive plants and bugs have the most impact below 1,500 feet in elevation and typically spread along roadways and streams. The Putney Conservation Commission has long been active in removing a range of invasive plants including the Town Forest, Wilson Wetland Preserve, Beatrice Aiken Preserve, Bare Hill, Sacketts Brook Conservation site and a parcel donated to the town.

The forests are also threatened by three species of bug acclimating to Vermont: The Emerald ash borer (EAB) the Asian longhorn beetle (ALB), and the hemlock woolly adelgid (HWA). Over 50 percent of Vermont trees are host species to these bugs. These bugs place the forest under increasing pressure, as more stands of mature trees are lost the areas becomes more vulnerable to invasive plant species moving in opportunistically. The wider habitat impacts include reductions in deer herds, heating streams, lower water quality and loss of trees suitable for logging and forest products. The ALB attacks maple trees which could be potentially devastating to the Putney maple industry. The town has undertaken a partial survey of Ash trees (53 miles or 80 percent of roads were completed) to locate vulnerable trees and ensure they do not fall on electric power lines or across roads.

Communication

Our dispersed, low density settlement pattern is dependent on; high levels of public road maintenance, extensive pole strung electricity grid, 4WD private vehicles, and modern communication equipment (internet, mobile phones). This settlement pattern is now revealing vulnerabilities in the face of rapid climate change and other factors. The town's ability to respond to widespread disruptions is limited and the communication systems we now depend on for any such response need a functioning power grid. Both our communication networks and power grid systems are increasingly susceptible to hacking and manipulation by malign interests. While many residents have woodstoves and back-up generators for electricity individuals and the community are less prepared for communications disruptions.

Infectious Disease Outbreak

Putney began experiencing the covid-19 pandemic in early 2020. The devastating global impact of this disease continues as SARS-Cov-2 continues to mutate and immunization programs are implemented with widely varying levels of success. In the United States, it has resulted in 102,247,392 confirmed cases with 1,111,342 all-time deaths, the most of any country, and the twentieth-highest per capita worldwide. The COVID-19 pandemic ranks first on the list of disasters in the United States by death toll; it was the third-leading cause of death in the U.S. in 2020, behind heart disease and cancer.

Vermont and Putney's immediate experience of the pandemic is still being gathered and analyzed. Data collection for covid-19 in Vermont is aggregated at the county level to avoid inadvertent release of personal data. To date Vermont has experienced a mortality rate of 145.8 people per 100,000 of total population compared to 344 per 100,000 of population for the USA. Windham County has significantly lower rates of vaccination than Chittenden — the best performing county in Vermont. This raises questions concerning the community's ability to survive future large-scale infectious disease outbreaks. The 2022 Putney Hazard Mitigation Plan was written during the pandemic and prior to the Town completing an after-action evaluation, and therefore excludes the topic from discussion. Moving forward there is a need for all public agencies to rethink their approach to public health crises of this magnitude. [has the evaluation been done?]

Mitigation Plan

Putney worked with WRC to complete its last update to the Hazard Mitigation Plan in April 2022 and approved by FEMA in the same month. The plan uses a standard format for municipalities in Vermont using data drawn from a vulnerability analysis to develop a plan to mitigate against the most likely hazard events which cause the most damage to public and private property and the most risk to human life. The implications of the unfolding climate crisis informed much of the work contained in the latest plan. The emphasis is on the experience of flooding and its causes (including ice/snowstorms) and the steps the community is taking to become more resilient. The plan focuses on risks posed to physical assets in the context of the climate crisis. A more comprehensive understanding of resilience now acknowledges the stress imposed on people surviving traumatic events and the unequal experience of these stressors by

marginalized groups. This chapter has provided a broader discussion than simply “encouraging flood resilient communities” as called for by statute because the range of hazards are more numerous and complex and involve important ongoing discussions of what makes a strong community.