

Flood Resilience

Introduction

Flood events are Vermont's most frequent and costly type of natural disaster. There are two types of flooding that impact communities in Vermont: inundation and flash flooding. Inundation is when water rises onto low lying land. Flash flooding is a sudden, violent flood which often entails fluvial erosion (stream bank erosion). The combination of flash flooding and fluvial erosion cause the most flood-related damage in the state. According to the Vermont Division of Emergency Management and Homeland Security, the state incurred costs of more than \$850 million from Tropical Storm Irene in August of 2011. Prior to and since Irene, Vermont has experienced more frequent and severe flooding and will likely continue to in the future.

Mapping Flood Hazard Areas

To meet the new state requirement of identifying flood hazard and fluvial erosion areas and designating areas to be protected, maps are an essential aid. Because the methods of mapping inundation and fluvial erosion corridors differ significantly, river corridor maps are a critical addition to existing flood hazard maps. The National Flood Insurance Program (NFIP) was created by the Federal Emergency Management Agency to address inundation hazards. Flood insurance rates are based on Flood Insurance Rate Maps (FIRMs) or Digital Flood insurance Rate Maps (DFIRMs) which delineate areas of the floodplain likely to be inundated during a flood. These are identified as a Special Flood Hazard Area (SFHA) or with a 1% annual chance of flooding. Town participation in NFIP is voluntary. In Vermont, two thirds of flood damages occur outside of federally mapped flood areas.

Chittenden has 18 structures in the Special Flood Hazard Area (SFHA). Just 3 of those structures located in the SFHA are insured for flooding.

Vermont's River Corridor and Floodplain Management Program, developed by the Vermont Agency of Natural Resources (ANR), delineates

areas subject to fluvial erosion. River corridor maps are designed with the recognition that rivers are not static. Development in the river corridor and stream channel engineering over time have increased channel instability. While these management practices may create the illusion of stability, these engineered channels when tested by a high flow cannot be maintained. Special mapping and geomorphic assessments can identify fluvial erosion hazard areas along rivers.

Stream Geomorphic Assessment (SGA) has been done on various water bodies that run through Chittenden. Phase 1 and 2 SGA was completed on the Upper Otter Creek in 2005 and 2009, respectively. Phase 1 SGA has also been done on the Otter Creek Watershed Tributaries, completed in 2009. Additionally, a River Corridor Plan was created for the Upper White River in 2007.

These studies and plans are vital in determining river and stream alterations, which affect water flows and could potentially lead to future flood damage. The SGAs and River Corridor Plans suggest potential remediation actions that can be taken to reduce the risk of future flood damage including, planting stream buffers, stabilizing stream banks, removing berms, removing structures and restoring incision areas. Unmapped River Corridors/Fluvial Erosion Hazard (FEH) Areas of Chittenden should be included in this Municipal Plan as they become available.

History of Flooding

A number of significant flooding events have occurred in Chittenden in the last fifteen years alone, as indicated in the flood history table below. County-wide FEMA Disaster Declarations (DR-#) are included where applicable.

August 9, 2013: Flooding of Otter Creek, which reached 4.33 feet, caused damage to Mountain Top, River, and Wildcat Roads.

August 31, 2011: Tropical Storm Irene caused intense flooding and \$189,778 in damages to Wildcat, River, and Dugway Roads (DR 4022).

April 14-15, 2002: Flooding caused \$69,596 in damages to Mountain Spring, Casey, Wildcat, and Dam Roads.

December 17, 2000: Up to 3 inches of rain falling on a frozen ground caused flash flooding and \$29,187 in damages (DR 1358).

July 31, 2000: Heavy rain caused flash flooding and \$6,052 in damages to roads (DR 1336).

September 16-21, 1999: Tropical Storm Floyd brought heavy rain and wind. The town received \$3,933 from FEMA for damages (DR 1307).

Flood Hazard Area Regulations

Chittenden adopted its most recent Bylaw Flood Hazard Area Regulations on August 22, 2011. These regulations comply with state law and allow the town to meet the requirements of the NFIP. River Corridors have not been incorporated into the town's flood hazard regulations. Chittenden's flood hazard regulations could exacerbate flooding and fluvial erosion by allowing new development and fill in Special Flood Hazard Areas.

The current flood hazard regulations, since they do not include river corridor protection, do not qualify the Town for favorable (17.5%) state reimbursement rates after disasters as established in the Emergency Relief and Assistance Fund (ERAF) rule.

Local Hazard Mitigation Plan and Local Emergency Operations Plan

The Chittenden Local Hazard Mitigation Plan (LHMP) was adopted in 2004 as an Annex to the Rutland Region All-Hazards Mitigation Plan, however the plan has since expired. Since June of 2013 the Town has been working to update the LHMP to a single jurisdictional plan, and the LHMP is currently under FEMA review. Chittenden maintains an up-to-date Local Emergency Operations Plan (LEOP), which was last adopted on April 13, 2015. The LEOP encourages flood preparedness and identifies a process for response planning, and must be updated annually by May 1.

NFIP Participation

The town's Flood Insurance Rate Map and Flood Insurance Study were first published in September of 1985. The Rutland County DFIRM became effective in August 2008; hydrology and hydraulics were updated in the DFIRM. Chittenden joined the National Flood Insurance Program in 1985.

Lands that Minimize Flooding

There are natural features which protect against flood damage. These should be protected at all costs. Riparian buffers, for example, reduce flood hazards and stabilize stream banks, attenuate floods, provide aquatic and terrestrial habitat and wildlife corridors, filter runoff, absorb nutrients and pollutants, and shade streams to keep them cool. Wetlands, by acting as a natural "sponge," also prevent flood damage and are a vital component for maintaining the ecological integrity of land and water. In addition, upland forests also moderate flood impacts and attenuate flood impacts by mitigating the effect of steep slopes and gravity, which amplifying water velocity in rivers and streams. Watershed and River Corridor assessments aid communities in making knowledgeable and strategic decisions about how to best protect, manage, and restore natural watershed resources.

Goals

- The citizens, property and economy, and the quality of the town's natural resources are protected by using sound planning practices to address flood risks.
- The Town of Chittenden is able to recover from flooding quickly and in a manner that improves flood resilience for the future.
- Development in the town occurs in a manner that does not worsen flooding, and natural river functions are restored.

Objectives

- Protect river corridors and restore natural river functions.
- Reduce flooding vulnerabilities by flood-proofing or removing structures in flood areas, discouraging construction in flood hazard areas, and reducing impervious surfaces.
- Work with Green Mountain Power to reduce the risk of flooding from the dam, and improve warning systems and response.
- Continue hazard mitigation planning, emergency operations planning, and public education.

Tasks

1. Explore updating the town's flood hazard area regulations to protect river corridors and meet standards in the current Vermont flood hazard area regulation model #6, as mapping and stream geomorphic assessment becomes available.
2. Work with RRPC, ANR, and landowners to pursue lessening flood risk by reconnecting river channels to historic floodplains, such as through intentional lowering of stream banks and/or raising river channels.
3. Work to develop more consistent, accurate and thorough identification of wetlands areas through the use of

best available data, as funding is available.

4. Support the Chittenden Emergency Management Committee to pursue flood hazard mitigation efforts and continue to improve emergency response capacity.
5. Encourage homeowners to purchase flood insurance, especially for those not in mapped Special Flood Hazard Areas.
6. Work closely with GMP regarding controlled water release, emergency action planning, and warning sirens.

