Outlook

UVM Richmond Climate Study

From Robert Burnham Low <Bob.Low@uvm.edu>
Date Mon 3/24/2025 3:08 PM
To Josh Arneson <jarneson@richmondvt.gov>
Cc Rosovsky, Judy <judy.rosovsky@vermont.gov>

1 attachment (17 KB)
UVM Climate Study Josh email.docx;

Josh:

I am writing in Judy's behalf to update you on RCC plans to oversee a UVM Richmond Climate study. RCC seeks your thoughts on proceeding.

I attach my November 2024 email to you summarizing what this is about. Below was your response:

Thanks for sending this along. It seems like it may be something to discuss with the Conservation Commission first and then make a recommendation to the Selectboard. We do not have much staff time to commit to the study. We are currently working on the following flood related projects:

- Two FEMA claims (submission of expenses as well as work on ongoing projects)
- Flood Mitigation Scoping Study with Stone Environmental
- 10 Emergency Watershed Protection Program projects
- Upwards of 10 home buyout applications.
- One home elevation project with the potential for a few more
- Exploring mitigation projects with FEMA.
- Flood proofing projects for the Water and Wastewater Infrastructure.

I outline the above projects to illustrate that we are already doing quite a bit with flood response and mitigation which is taking a decent amount of staff time, so we don't have much time to fit more in. If this is a project that can be run by a committee with minimal staff time, then that could work. But if it needs significant staff support, we will likely not be able to help.

Josh

RCC is at the stage putting together a task force to serve as liaison with Lesley-Ann. Presently it includes at least one RCC member, a member of our Climate Action Committee and a Huntington member of RAFT.

Again, your thoughts on proceeding? Please be sure Judy is copied as I, myself, am not directly involved.

Bob

UVM Climate Study Josh email 11/18/24

Josh:

I am following up on our brief conversation today about the possibility of a UVM Climate Study for Richmond. It would involve students in a class given by Lesley-Ann Dupigny-Giroux, UVM faculty member and State Climatologist. Cathleen Gent may already have bent your ear on this.

I have attached the Highlights pdf the study students did for Underhill so you can see what this is about and what were the deliverables. I understand there is no charge for this, though would be important to confirm.

Here is an excerpt from the Final report to Underhill that explains still further:

> ***CONTEXT FOR THIS REPORT***
>
> *During the Fall 2022 semester, the students enrolled in Climatology and Natural Hazards (GEOG*
> *246), an advanced level climatology course offered in the Department of Geography & Geosciences at the University of Vermont, engaged in a Service-Learning collaboration with the Climate Change Task Force of the Town of Underhill, Vermont. This collaboration grew out of the needs articulated by the Task Force during a presentation made by Dr. Lesley-Ann L. Dupigny-Giroux (Professor of Climatology and the Vermont State Climatologist) on 18 May, 2022.*
>
> *Service-Learning is a reciprocal relationship among students, faculty and an external community*
> *collaborator(s), that is responsive to the needs of the collaborator(s), while enhancing student*
> *learning. The relationship is symbiotic such that all parties benefit by learning from each other.*
> *Service-Learning differs from volunteerism and co-curricular activities. Service-learning activities are directly related to curricular goals, with course assignments tied to the service experiences" (http://www.uvm.edu/~partnerships). During the semester, students in GEOG 246 worked directly with Ms. Sandy Wilmot, Mr. Brad Holden and Mr. Kail Romanoff (Town of Underhill), Mr. Chris Campany (Executive Director of the Windham Regional Planning Commission), Mr. Brian Baldwin and Ms. Canserina Kurnia (ESRI) and Dr. Ned Gardiner (NOAA Climate Program Office & Lead on the U.S. Climate Resilience Toolkit) on a pilot study to apply the Steps to Resilience framework as inputs to the creation of a Climate Action Plan for the Town of Underhill. On 8 December 2022, the course culminated with the class' presentation of our findings and recommendations to the Town of Underhill Committees, Regional Planning Commissions, NOAA Climate Program Office, USDA Natural Resource Conservation Service, State of Vermont Agencies, the Community-Engaged Learning Office and other entities across the University of Vermont.*

The report is organized into the four sections as presented by the class. It opens with a focus on the importance of MASS WASTING events and WATER RESOURCES IMPLICATIONS, followed by ANCILLARY CONSIDERATIONS. It concludes with an exploration of the VEGETATION RESOURCES in the Town of Underhill. At the end of the report is the 2022 NOAA National Center for Environmental Information State Climate Summary for Vermont, which is the federal source of climate change projections and information for the state developed in support of the Fifth National Climate Assessment.

Dr. Lesley-Ann L. Dupigny-Giroux

The current plan would be for a core group to get together at the turn of the year to organize. From Leslie-Ann:

> *Service-learning (as this type of teaching is called), involves a lot of discussion ahead of time with the community partner to identify what exactly is needed and in what format. I then take all of that and redesign my class to create activities and exercises that will lead the students to work through how best to meet these needs. With Richmond being close to UVM, student visits to the town would allow for an in-depth, on the ground understanding of what recommendations could be brought forward. All of this culminates in a presentation and written report at the end of the semester (December).*
>
> *We can put a pin to circle back around in the New Year to do a deep dive into what this collaboration could look like.*

As someone who looks quite closely at Climate-related affairs, I am really impressed at what came out and how it helped Underhill.

Key will be to understand the degree to which Town staff would be involved. I understand at this point that it would be not be a great deal other perhaps than interviews. However, I would anticipate that Town Committees such as our Conservation Commission and the Climate Action Committee would be involved. Let me know if you want further clarification here.

I will be interested in your thoughts and the degree to which our Selectboard should be involved should this be a go.

Best,

Bob

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Final report to the Climate Change Task Force, Town of Underhill
Summary of student presentations - 8 December, 2022

Instructor of record: Dr. Lesley-Ann L. Dupigny-Giroux

Climatology & Natural Hazards (GEOG 246)

Department of Geography & Geosciences

Chapter 1. Hazard Assessment Report

A geologic characterization of Underhill is given as a prelude to an analysis of “mass wasting”, a term similar to landslides. The point is that Underhill geology and surficial soils along with slope and heavy precipitation events, make it a prime candidate for future mass wasting. The underlying quartzitic schist, containing weak minerals like biotite, and strong minerals like quartz would result in mass movements when the schist breaks along weak biotite mica planes.

Analyzing past events and more recent events using historic documents and tools available through “Flood Ready Vermont” website, students found that areas where rivers are left to naturally meander have less threat from fluvial erosion. One solution to reducing dangerous situations is to limit excessive development and encroachment into natural river corridors.

Mass wasting events are often triggered by precipitation events, and freeze thaw events may also be involved. If the slope is sufficiently steep, gravity can move debris and what follows is

creep, mudflow or a landslide. The VT Agency of Natural Resources (ANR) has an inventory of landslides including mapped historic events. Of the 3,049 mass movements, 700 were in Chittenden County. The Town of Underhill has 6% of all mass movements in Chittenden County: 44 slides, slumps or failures.

Students then used climatology to look at relationships between these mass movements and weather conditions. The surficial geology in Underhill is composed of glacial till. These are unconsolidated grains that are easily affected when water is added. The soils formed are dominated by Lyman-Marlow soils. When saturated, these soils transmit water easily. As heavy precipitation events increase with climate change, the opportunities for mass movement will increase. Although natural mass movements are unlikely to directly affect Underhill residents scattered across the landscape, areas of disturbance such as creation of new driveways, logging or sugaring roads, or other soil-related developments are more likely to be affected.

They offer recommendations on materials and methods to stabilize soils in vulnerable areas (something most excavators and highway crews would use). They recommend that ANR provide biannual updates for areas with historic mass movement sites. They recommend an Outage Management System and Emergency Response Teams that can provide shelters close to mass wasting-vulnerable areas, like along the Brown's River. These individuals would be on call during climatic events that may affect the electric grid.

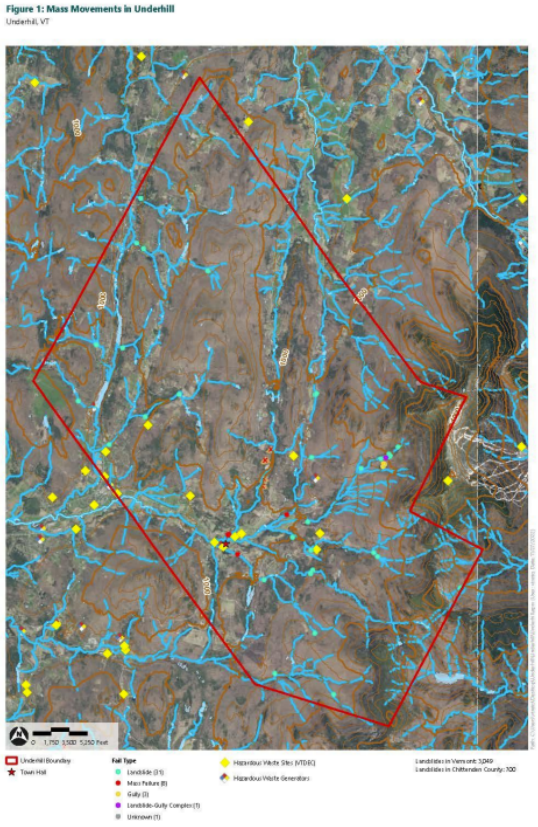

Figure 1. Overview of Underhill, VT showing documented mass wasting events by type, Underhill Town Hall, hazardous waste sites and generators, and landfills. (VT ANR, 2022)

Chapter 2. Underhill Hazard Mitigation: Water Resources

Risks from flash flooding, winter storms, drought and groundwater depletion and infrastructure damage is the focus of this chapter.

The recent increase in average annual precipitation of 7.5 inches since the 1990's is expected to continue. Precipitation is also expected to become more variable, with a 15% yearly increase in extreme precipitation events with greater than 1 inch of daily rainfall. At the same time, prolonged droughts and rising temperatures have fundamentally altered our freshwater habitats as well as our relationship to water use. Looking forward, the risks posed by hydrometeorological hazards will change, especially with regards to flooding, droughts and severe winter storms.

As the headwaters of Chittenden County, Underhill's 51 square miles has a responsibility to preserve water resources. As Underhill is exposed to varying weather situations, residents need to be familiar with the impacts, risks and mitigation strategies to ensure resilience. They consider differences in vulnerabilities within the Underhill community.

Objectives 1. Understand the effect of climate change on water-resource-related hazard events in Underhill 2. Identify those most vulnerable to water-resource-related hazard events 3. Assess the need for a drought hazard management plan and determine what would need to be included 4. Prioritize and plan for infrastructure improvements, background, and sources 5. Determine the roads that are the most vulnerable to flooding 6. Investigate Key groundwater source areas in Underhill flats and Underhill Center 7. Research well-water and individual wastewater issues in Underhill 8. Expose the importance of taking a multi-hazard approach in planning.

Social Vulnerability. They used the Health Departments Social Vulnerability Index which uses 16 measurements to characterize socioeconomics, demographics, and housing/transportation susceptibility. The vulnerability index for Underhill shows that it is impacted by: per capita income, education, crowding (the % of housing units with more than one person per room), disability, vehicle availability, and more. These will weigh into an individual's resilience, their ability to recover once out of the bounds of a given threshold. The physical infrastructure in a community and the frequency of infrastructure success or failure weighs into how reliable these resources are. Access to recovery resources differs based on race/ethnic relations, socioeconomic status, age, health conditions, historical legacy, language and linguistics, and more. In Underhill, those who are most vulnerable include: those under the age of eighteen, those in overcrowded homes, those who lack insurance, and those ages five and older who don't speak English "well".

They recommend that when creating a hazard mitigation plan, or when aiming to increase Underhill's resilience and reliability, focusing on providing care for families with children and/or in multigenerational homes, peoples who struggle with understanding English, those without insurance, and anyone of a low socio-economic status should be of high priority.

Other vulnerabilities in Underhill include homes and infrastructure in floodplains, especially those who don't have proper insurance; those who rely on well water due to short term droughts; and residents in areas where roads, culverts and other infrastructure may be compromised by storms.

% College Age 18-24	6.40
% Living in Poverty	2.58
% Unemployed	1.57
Income per capita	42,494
% No HS Diploma	1.06
% No Insurance	7.01
% Children Age 0-17	22.96
% Elderly Age 65+	14.61
% Disabled	7.38
% Single Parents	19.88
% Minority	6.07
% Limited English	0.62

Figure 5: VT's SVI stats for Underhill, VT

Road Infrastructure

Increasing the resilience of Underhill's transportation network to flooding was analyzed using the Vermont Transportation Resilience Planning Tool (TRPT), which quantifies the vulnerability of road segments, bridges, and culverts to floods and erosion. Vulnerability is evaluated based on a structure or road segment's vulnerability to inundation, erosion, and deposition from a 10-year, 50-year, or 100-year flood. The report offers a good description of all the factors included in the analysis and ratings.

They found 2 road sections that were high risk to all three flood levels. These were a section of Route 15 and a section of Pleasant Valley Road. The section of Route 15 also contained a culvert that was rated as high risk to all three flood levels, and the section of Pleasant Valley Road contained a bridge that was at high risk to a 100-year flood. Both Sections of the road were rated moderately to highly vulnerable, and highly critical to local and regional travel. They offer detailed techniques that could reduce vulnerability and especially focus on restoring riparian buffers.

Additional road segments that are rated as high risk for at least 2 flood levels include a section of River Road, a section of Poker Hill Road, a section of Irish Settlement Road, and an additional section of Pleasant Valley Road.

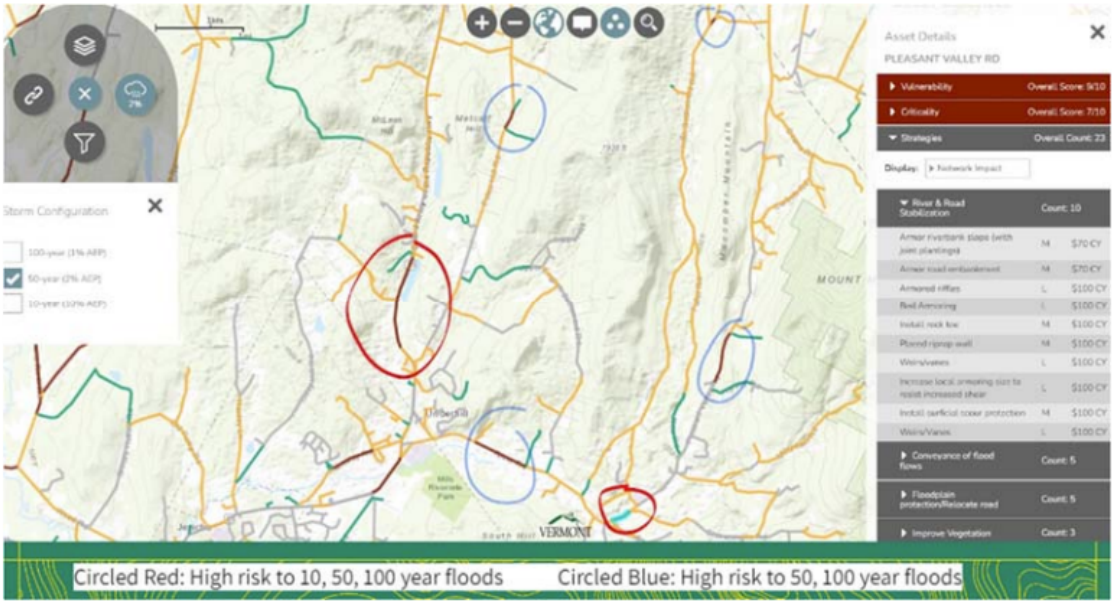

Figure 4: Map showing road segments of high risk to floods with 10, 50 and 100 year return intervals (red) and 50, and 100 year return intervals (blue).

Drought

Although increased precipitation is a major focus of resilience planning for Underhill, short-term planning for short-term droughts should also be included. As temperatures increase, the rate of evaporation, and evapotranspiration by plants, will increase. In a short amount of time, what seemed like abundant precipitation can be followed by drought. The impacts to natural systems, stream flow and water temperature, forest growth and plant survival will all be impacted. For residents of Underhill, having adequate tree cover for shading soil moisture, adequate undeveloped areas for groundwater recharge, and water conservation efforts will all be important.

Vermont does not have a hazard mitigation plan for droughts. The students recommend that Underhill begin monitoring water, establishing a communication infrastructure and develop a water management plan. For monitoring, they recommend the weekly updates from the U.S. Drought Monitor. For communication, they stress keeping the public informed, but also having residents with private wells keep the Town apprised when their well dries up (they suggest using a crowdsourced drought map for VT). And they suggest looking at recommendations from NH and MA for drought management strategies for private wells. These include various water saving devices for homes, and resources available for financial assistance.

Groundwater Supply

Impervious surfaces decrease the ability of soils to infiltrate water leading to increased runoff and depleted aquifers. Land use can therefore play a major role in groundwater recharge and drought impacts. Underground aquifers require recharge areas, zones where water can infiltrate

through soil into the aquifer. Under state law, towns must provide a source protection plan outlining the conservation of groundwater and provide general areas where groundwater recharge can occur. In Underhill, the Source Protection Area for the Underhill Jericho Water District extends from Mt. Mansfield down to Underhill Flats.

The students did research to look at where the recharge potential is high and the existing population is low. This then would constitute important groundwater recharge areas within the SPA. Those areas with low slope without impervious areas offer the greatest recharge potential Within the Scenic Preservation Zoning District, and the Soil and Water Conservation District, impervious surface cover was lowest. Although the largest area with low slopes was within the Water Conservation District, this district also had the greatest area of impervious surfaces. Protection of targeted recharge areas within the Scenic Preservation Zone and the Soil and Water Conservation Zone may be advisable. In addition, settlements along River Rd. should be re-zoned out of the water conservation district to reflect the existing communities there. This would allow stricter regulations along the margins of the district, areas where impervious development is limited, and minimum lot sizes could be made higher and allow for development where it is already occurring.

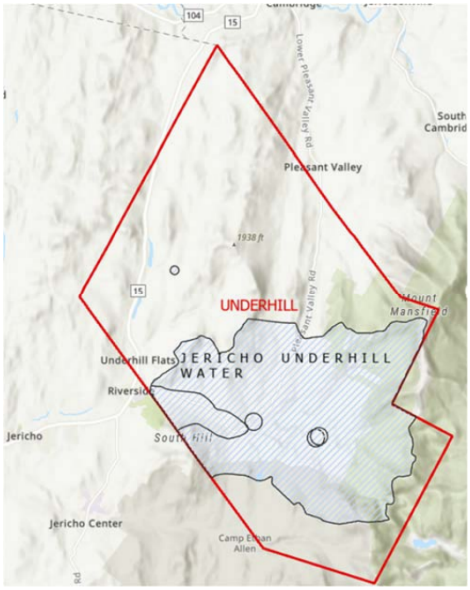

Figure 7: Spatial Extent of Jericho-Underhill Source Protection Area

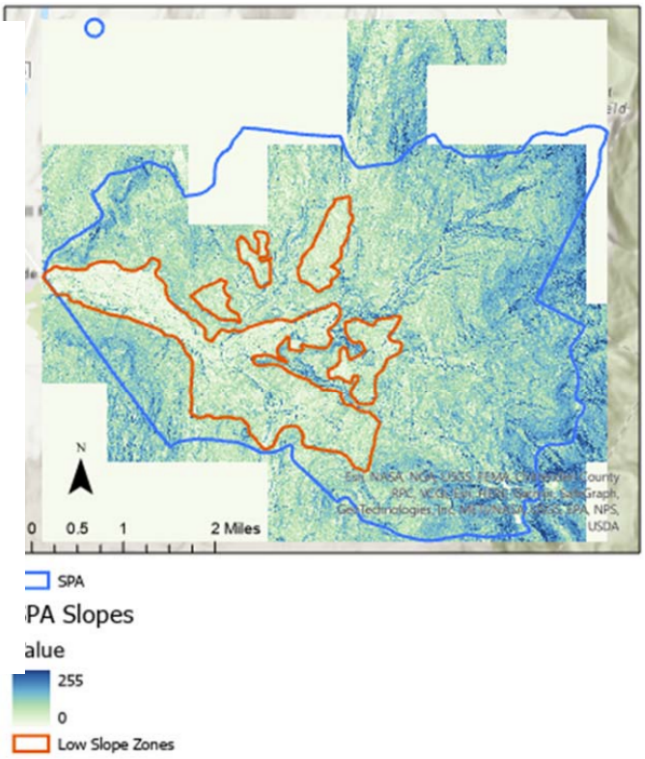

Figure 9: Low Slope Zones Drawn Based on Underhill Slopes

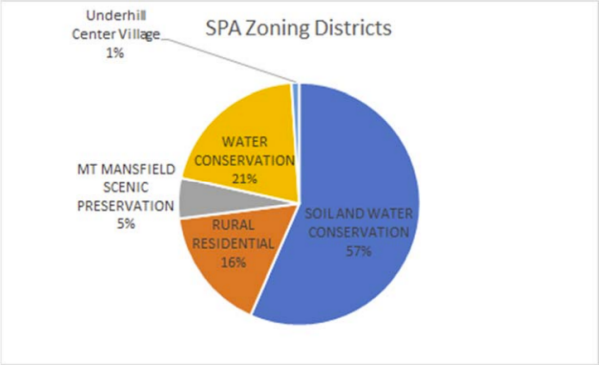

Figure 8b: Percent of the Source Protection Area by Constituent Zoning District

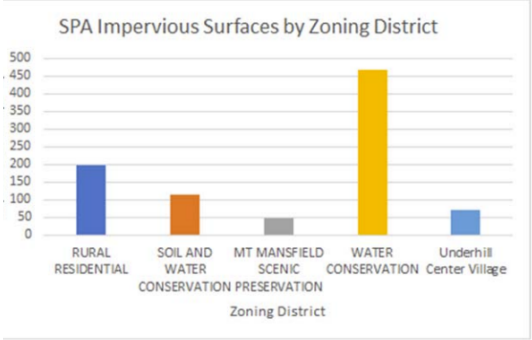

Figure 8c: Impervious Area within each Zoning District Contained in the Source Protection Area

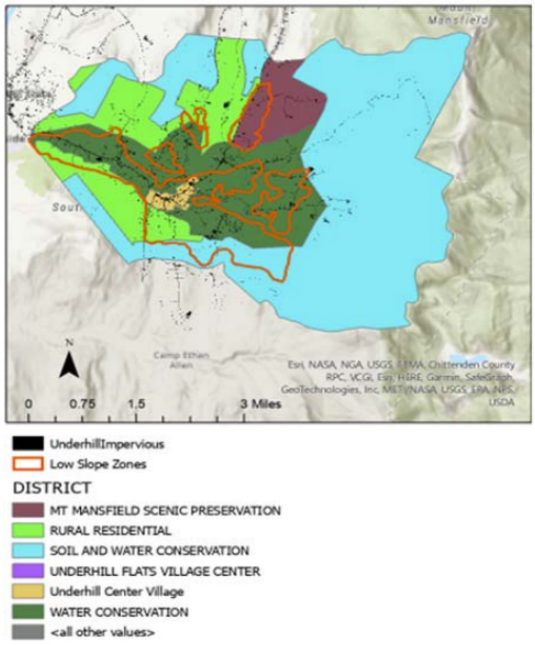

Figure 10: Impervious Surfaces Overlaid on Low Slope Zones, Zoning Districts within the Source Protection Area

Flash Flooding

It is predicted that Vermont will experience more frequent heavy precipitation events with more rain and less snow in winter. Additionally, the heaviest 0.1% of precipitation events (3 inches of rain or more) will increase in frequency from once every seven years to once every two to three years.

Flash flooding occurs when the amount of precipitation exceeds the absorption capabilities of the soil, resulting in surface soil runoff that increases in velocity as it moves downstream.

Underhill is at a high risk of flash flooding due to the surrounding mountainous terrain. Mountains with steep slopes, such as Mt. Mansfield, often cause more damage as they are particularly prone to flash flooding and produce floods of higher velocity.

National Flood Insurance Program (NFIP), which can be purchased by individuals in towns which comply with FEMA guidelines. Participation in this program allows communities to apply for federal assistance in the event of flood disasters.
Improving infrastructure is one of the best ways for towns to prepare for natural hazards. In small communities with limited resources, infrastructure is frequently replaced to the same standards that led to its failure. It is important to effectively allocate resources towards increasing the resilience of our infrastructure, whether this be through reinforcing existing structures, fortifying riverbeds and banks, or making design modifications. Building on floodplains and river corridors (including driveway bridges or culverts) increases exposure to flood hazards, and means that infrastructure developed in these areas must be constructed to a higher standard. Mad River Valley has a document with recommendations and concerns about flooding.

Winter weather, while generally warmer, will include more intense storms with more snowfall, rain, and freezing rain, and strong winds. In particular, cold air damming, which is where wind traps cool air against a mountain and allows precipitation to continue for extended periods of time. Hazardous snowfall and freezing rain can affect roads and infrastructure, resulting in road closures and isolation of vulnerable individuals, loss of power and telecommunications, and other property damages.

Increasing the resiliency of existing infrastructure to mitigate the impacts of winter storms will be important. Many of Underhill's main travel routes are along waterways. Emergency guidance was offered such as accessing the Vermont 2-1-1 Resource Directory and finding fuel payment assistance during winter months.

Chapter 3. Human Health, Drought and Riparian Buffers

This chapter includes the importance of riparian buffers as a mitigation tactic for precipitation and flooding hazards, historical hazards and future drought issues in Vermont, and how these natural hazards that Vermont experiences may affect human health.

The students identify the major hazards in Underhill, flooding, extreme weather events, drought and disease (Covid-19, Lyme disease) and suggest 1-2 actions for the town that would mitigate human impacts.

They identify current strategies that prepare residents for hazards: floodplain insurance, emergency services, snow removal, culvert monitoring and others. They caution that we have not considered the human experience, the damage and how it affects people especially those at higher risks.People living in Underhill have a keen sense of awareness of the environment

which can be beneficial to resilience. The students identify risks in 3 categories: Access, Weather and Climate Change, and Disease.

Access. Our transportation network relies on access to commerce in towns to our west, accessed by Route 15. Therefore, all our Underhill roads that funnel to Route 15 are valuable to our well being. There are immediate needs such as emergency support, electricity, access to food and medical care. The population most at risk would be those over 65 (19% of Underhill) or those who live along single-access routes prone to isolation.

Weather and Climate Change.

Rising temperatures and changing rainfall patterns may increase the frequency of both floods and drought. The Town zoning maps will need continual updating to accurately capture changes in floodplains as river courses evolve. As these maps change, residents need to be made aware so that if flood insurance is needed, they can be prepared.

Drought has direct and indirect consequences. It will directly affect groundwater and aquifer recharge, making some private water systems fail. The Town would be wise to consider ways to monitor this to prepare for these water shortages. Indirectly, dry, snowless winters will affect our local winter recreation economy, and the pleasure residents have in sledding, skiing, skating, snowmobiling. This therefore will indirectly affect mental health.Steps to take?

Disease
Longer growing seasons and warmer temperatures increase the season for disease carrying insects and ticks, and contribute to poor respiratory air quality. Children, the elderly, sick, and those with financial challenges will be most affected. Pre-existing vulnerabilities have put residents at higher risk for diseases such as Covid-19.

Solutions
Recommendations include monitoring, zoning (?), and holding events that bring people together, and bring people into closer relationships with nature. They mention the value of the Old Fashioned Harvest Market as one event. Community gardens, especially where the food would be used in schools, and permaculture programs.

Drought monitoring using the US Drought Monitor data would allow Underhill to know when to begin water conservation or other management strategies. They stress the importance of protecting those areas where water infiltration is best so that groundwater recharge can be maximized.

Riparian buffers are essential for preventing or reducing erosion and flood damage. These areas allow stormwater infiltration, water velocity reductions, and soil stabilization. Minimizing erosion reduces the amount of sediment in streams. Where riparian areas are restored, the greater water infiltration and dispersal results. Many roads in Underhill run parallel with stream systems and are at risk for fluvial erosion unless riparian areas are present.

Riparian forests can be a significant source of carbon sequestration. Taking steps to regenerate riparian buffers so that forests return can be a way of jump starting carbon sequestration. Buffer widths of 30-150 feet were highly effective. The students created a map of highly vulnerable buffers along main travel corridors (Underhill Ctr, Underhill Flats, and Route 15). In addition, continual monitoring of riparian buffers to spot problem areas.

Figure 12: Map of Underhill Center and Underhill Flats with important, vulnerable Riparian Buffers highlighted in red

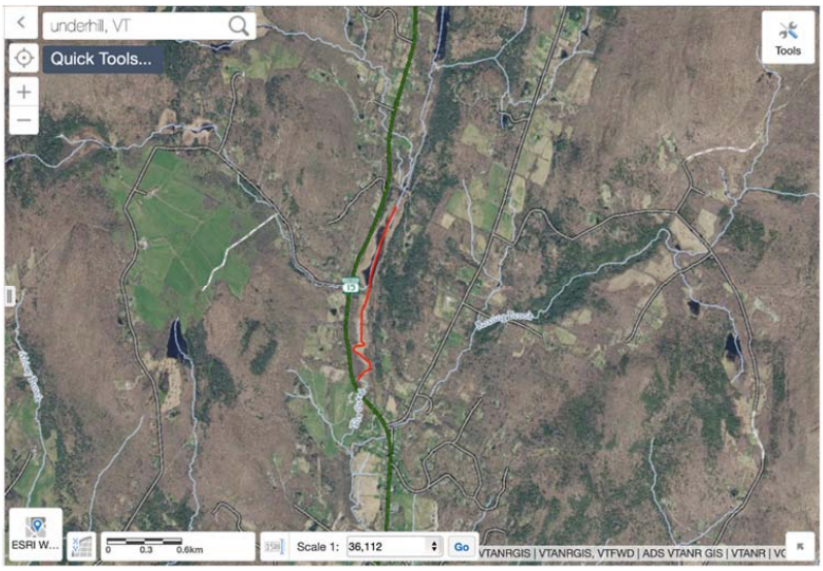

Figure 13: Map of VT Rt. 15 with important, vulnerable riparian buffers highlighted in red.

Other recommendations: Seasonal monitoring for Lyme disease; air quality monitoring especially with western forest fire smoke; publicize heating and cooling centers for occasion use during extreme temperatures; connect young volunteers with elderly to install air conditioners or winterize homes; create a Water Resource Index to keep track of water levels throughout town; establish emergency water supply tanks.

Chapter 4. Forest Management to Improve Resilience of Underhill Forest Resources

Forests are of high public value and as such, their management should include community values and ecological priorities. As climate change progresses, Vermont will see an exponential increase in human populations (and animal populations?). Vermont will have to properly provide living space without destroying the surrounding environment. In Underhill the increase in population is causing people to move further away from developed villages and into forestland. This diminishes healthy ecosystems as core forest blocks are fragmented. Apart from zoning regulations, suggested steps include: restoring riparian buffers, maintaining sugar maple stock, controlling invasive species, and monitoring soil health. This will improve carbon sequestration and increase biodiversity.

Carbon sequestration in forests requires trees and vegetation to be living and growing. Timber harvesting, while removing carbon stored in wood, can be extended to longer harvesting cycles, prolonging carbon sequestration until growth has slowed. They recommend a 90-year harvest cycle.

Underhill should monitor for non-native invasive species with the potential to disrupt forest health. Economically valuable trees such as sugar maple could be protected if there is early detection of invasive pests. Likewise, damage to plants along riparian buffers could be mitigated if monitoring shows invasive pests invasions. These invasive species can be plants or animals that cause long-term health for ecosystems.

Soil health runs parallel with tree health. Nutrients such as calcium are important for tree resilience and tree health is often linked with calcium levels (especially sugar maple health). Abundant organic matter improves soil porosity allowing for increased water retention.

A healthy riparian zone contains a diversity of plant life including understory vegetation, shrubs and a tree canopy. Woody debris and roots help secure river and stream banks. In addition to erosion control, these natural buffers offer indispensable habitat and migration corridors for wildlife. Controlling development in riparian areas is the most critical factor. When restoring riparian areas it is suggested that drought tolerant plants be among the selection for planting. This will improve survival during drought periods. In addition, avoiding planting species extremely vulnerable to invasive pests, such as ash and elms. Some suggested species are: black willow, cottonwoods, dogwoods, silver maple, red maple, elderberry, (balsam fir), and white cedar. These species are successful in wetland systems with moist soils. Drought

intolerant species are black willow and cottonwood. White cedar and silver maple are drought tolerant mid-canopy trees, and red maple is a slightly drought tolerant high canopy species. The students provide a guide to the progression when installing or restoring riparian areas.

Maple sugaring is reliant on local weather conditions. As winters become shorter, the sugaring industry must adapt to these conditions or production will decrease.Data shows that trees are beginning the sugaring season 8.2 days earlier and stopping production 11.4 days earlier than they did 40 years ago. Sugar maple health depends on soils that are neither too dry nor too wet. Climate change could reduce growth by increasing the frequency of dry and well periods. Sugar maple also relies on a high amount of soil nutrients. These two factors can lead to stressful conditions, tree dieback, and potential reduction of maple syrup production. Climate projects under a low emission scenario predict that by 2071, 55% of sugar maples across Vermont will experience moderate to severe climate driven stress, and this increases to 84% of trees under a high emission scenario.

In New England, forest fire is thought to be less important hazard for sugar maple compared to insect infestations. The fire intervals in presettlement forests was 230 to 4,970 years. With increasing frequency of drought this may impact the frequency of wildfires.

Winter rain events are another source of potential tree hazards as the rain freezes on contact with surfaces, tree branches accumulating ice, and this weight causing limbs and trucks to break. Sunscald is another injury especially for young trees. (Not mentioned is the serious injury to tree roots during freeze-thaw events with a lack of snow cover).

Serious non-native invasive tree pests for Vermont include: the emerald ash borer (EAB), the Asian longhorn beetle (ALB), the southern pine beetle (SPB), and the hemlock wooly adelgid (HWA). The State has monitoring programs for all these pests. The ALB is the largest threat to maples since this beetle prefers these trees. There has not been any detections of ALB in Vermont, and the nearest sighting has been in northern Massachusetts. One of the most damaging diseases found in Vermont are beech bark disease. This disease is spread by the beech scale, a species expected to increase as the climate warms. Another disease, dutch elm disease, has seriously reduced this riparian zone species. Plantings of disease tolerant elms is part of a national conservation plan.

Volunteer Forest Pest First Detectors is an effective program run by the Vermont Urban and Community Forestry program that trains members of the public to report infestations in their communities. The students recommend Underhill participate and promote this program.

Other methods to reduce pests are: reduce the spread through firewood movement, educate residents about invasive plants so they are not including them in plantings, find early detections of invasive plants and remove them before they are a serious problem. Use of the iNaturalist mapping software can help with identification and treatment.

Highlights created by Sandy Wilmot, February 22, 2023