**4-4: Snow Storm**

Strong winter weather can include any of the following, alone or in conjunction:

* **Snow Storms:** a heavy accumulation of snow, which can be accompanied by high wind causing drifting snow, low visibility and hazardous travel.
* **Blizzard:** a storm which contains large amounts of snow and/or blowing snow, with winds in excess of 35mph and visibilities of less than 1/4 mile for an extended period of time (for wind impacts, see: Wind).
* **Ice**: see Ice Storms.
* **Extreme Cold:** see Extreme Cold.

Severe winter storms bring the threat of heavy accumulations of snow, cold/wind chills, strong winds, and power outages that result in high rates of damage and even higher rates of expenditures.

A heavy accumulation of snow, especially when accompanied by high winds, causes drifting snow and very low visibility. Sidewalks, streets, and highways can become extremely hazardous for pedestrians and motorists. Severe winter storms develop through the combination of multiple meteorological factors. In Vermont and the northeastern United States, these factors include the moisture content of the air, direction of airflow, collision of warm air masses coming up from the Gulf Coast, and cold air moving southward from the Arctic.

NOAA’s Weather Predictions Center (WPC) recently unveiled a new prediction tool, the Winter Storm Severity Index (WSSI)[[1]](#footnote-2), to provide an indication of the level of winter event severity and impacts (Table 28). The WSSI does not depict official warnings or exact event timing but provides severity level over a given period. The WSSI currently maintains a 3-day prediction of impacts for the nation, with prototype and experimental systems to display a rolling 24 hr WSSI and a probabilistic WSSI to determine the likelihood of impact, both of which are located on the WPC website.

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| **Table 28: Potential Winter Storm Impacts** |
| **Descriptor** | **General Description of Expected Storm Severity Impacts** |
| No Impacts | Impacts not expected. |
| Limited Impacts | Rarely a direct threat to life and property. Typically results in little inconveniences.  |
| Minor Impacts | Rarely a direct threat to life and property. Typically results in an inconvenience to daily life.  |
| Moderate Impacts | Often threatening to life and property, some damage unavoidable. Typically results in disruptions to daily life.  |
| Major Impacts | Extensive property damage likely, lifesaving actions needed. Will likely result in major disruptions to daily life.  |
| Extreme Impacts | Extensive and widespread severe property damage, lifesaving actions will be needed. Results in extreme disruptions to daily life.  |

The WSSI is broken down into six components that are individually weighted based on the WSSI categories and then summarized into overall severity:

* **Snow Amount:** to depict severity due to total amount of snow or rate of snowfall accumulation. (Adjustments are made based on climatology and urban areas, e.g. 4” of snow in Atlanta is more severe than 4” in Minneapolis.)
* **Snow Load:** to depict severity due to total weight of snow on structures (ie. Powerlines and roofs) and natural vegetation (ie. Trees)
* **Blowing Snow:** to depict severity mainly to transportation due to blowing and drifting snow.
* **Ice Accumulation:** to depict severity of transportation and downed trees/powerlines due to the accumulated ice in combination with wind (see Ice Storms).
* **Ground Blizzard:** to depict severity to mainly transportation of ground blizzards that develop due to a pre-existing snowpack and strong winds.
* **Flash Freeze:** to depict severity primarily to transportation of situations where temperatures rapidly fall below freezing during precipitation, with the presence of liquid water (see Ice Storms).

**Location**

There is no specific region of Vermont that is more vulnerable to snow storms. Snow accumulation is highest at upper elevations of the Green Mountains, including Mt Mansfield, Killington, Mt Ellen, Camel’s Hump, Mt Abraham, Lincoln Peak, Pico Peak, Jay Peak, Bromley, and Stratton Mountain. Orographic lifting caused by the Green Mountains may result in increased snow deposits on the western faces of the Greens. Occasionally the Champlain Valley experiences lake-effect snow as a result of Lake Champlain remaining unfrozen. Only northerly winds are in contact with the North-South oriented lake long enough to generate lake-effect snow, making Addison County most likely to experience lake-effect snow[[2]](#footnote-3).

Snow Storm History

* **Blizzard, February 15-17, 1958:** More than 30” of snow and 26 deaths in New England.
* **Blizzard, December 26-27, 1969:** Snow amounts between 18–36” in northwestern Vermont and 45” in Waitsfield. Governor Dean Davis declared a State disaster. Drifts of snow from the storm piled up to 30’ in places.
* **Snow Storm, December 19, 2000 (DR-1358):** Snow amounts between 7-10”. A few reports included: Berkshire: 9.7”, Eden: 8.2”, Jay Peak 8”, St. Johnsbury: 7.1”, and Worcester: 7”.
* **Snow Storm, March, 2001:** A string of storms hit Vermont in March 2001, beginning with 15-30” of snow on March 5-6, 10-30” on March 22, and 10-20” on March 30.
* **Snow Storm, February 14, 2007:** The second heaviest snowfall ever recorded in the month of February. Some areas of Vermont received 28-36” of snow in a 24 to 48-hour period. Heavy snow loads on roofs led to the collapse of at least 10 barns, causing the death of some cows and other livestock. Estimated nearly $3 million in property damage.
* **Snow Storm, January 2-3, 2010:** Burlington experienced the most significant snowfall on record from one event with 33.1” of snow.
* **Winter Snow Totals, 2010-2011:** The winter of 2011 was the second snowiest on record for Vermont, with a total of 128.4” of snow. A March blizzard in Burlington brought 25.8” of snow in two days. The storm closed schools for days, and many people were without power. Driving was hazardous due to a 1” layer of ice beneath several inches of snow.
* **Snow Storm, December 28, 2011:** A strong cold front moved across Vermont during the late morning and afternoon hours accounting for a rapid cool down and localized snow squalls with heavy snow. The western slopes of the Green Mountains saw 5-12” of snow along foothill communities. Near white-out conditions in snow squalls and rapidly freezing roadways accounted for numerous vehicle accidents as well as a closure of I-89 between Richmond and Waterbury.
* **Snow Storm, November 26, 2014:** The storm began late morning November 26 and increased in intensity, falling at rates at or greater than 1” per hour. Snowfall caused slow and difficult travel the day before Thanksgiving. Snow continued through the day and evening with heavy bands at times and tapered off overnight. By the early morning on Thanksgiving, most of southern Vermont saw snowfall of 8-15” with the heaviest amounts across the higher elevations of the southern Green Mountains.
* **Snow Storm, December 9-13, 2014 (DR-4207):** Rain and wet snow moved into Vermont around midday December 9 and changed to a heavy, wet snow during the evening. A band of moderate snowfall impacted much of central and northern Vermont during the afternoon and evening hours of December 10, then scattered snow showers ending on December 11-12. Total snowfall totals across Vermont ranged from 3-6” in Essex County to 12-20” across the Green Mountains into the Champlain Valley. The heavy, wet nature of the snowfall with snow to water ratios of 8:1 or less accounted for snow-loaded trees that resulted in more than 175,000 power outages in the region. This was the 2nd most power outages due to weather in Vermont. Over $4 million in property damages estimated.
* **Winter Storm, January 18, 2015:** Initial precipitation across Vermont was in the form of rain with air temperatures in the 30s to around 40 degrees. After more than a week of temperatures frequently near zero, road sub-surface temperatures were in the teens and 20s. Therefore, as rain fell and dusk approached, wet roads quickly became icy roads and led to numerous vehicle accidents and closures of state and interstate roads. Rain changed to heavy, wet snow across higher elevations. Snowfall totals were 2 to 6 inches across northern Vermont with some locally higher in higher elevations, which led to scattered power outages.
* **Winter Storm, February 2, 2015:** A storm system originating in the American southwest brought widespread snowfall across the state, ranging from 6-12 inches with temperatures hovering near zero degrees. Impacts were felt across the state, with winter road conditions providing hazards of mobility especially for rural regions.
* **Winter Storm, December 29, 2015:** Snow overspread Vermont around midnight on December 29th and ended by mid to late afternoon, changing to sleet and freezing rain before ending. Snowfall amounts across the area was 3 to 7 inches with limited icing. Motor accidents occurred across the region, including a Semi, SUV crash along Route 4 near Killington, VT during the afternoon that resulted in 3 indirect fatalities.
* **Winter Storm, February 12, 2017:** A northern system over the Great Lakes and a southern system over the Ohio River Valley moved eastward over NY and New England, rapidly intensifying. Depositing wet and dense snow at rates of 1-2 inches per hour that clung to trees, weighing them down. In total, 7 to 12 inches of snowfall occurred through most of the local area, with up to 20 over the higher terrain of the Green Mountains.
* **Blizzard, March 14, 2017:** A major Nor’easter developed off the coast of NC/VA during the morning of the 14th and intensified as it moved north-northeast across southern New England during the night into central Maine by the morning of March 15th. Snow developed across Vermont by mid-morning on the 14th and intensified to at least 1 to 3 inches per hour for several hours during the late afternoon, with some areas witnessing rates of 4 to 5 inches per hour for more than one hour, and overnight hours before gradually diminishing late on the 15th. In addition, blizzard to near blizzard conditions developed around the time of the heaviest snowfall and lasted for 3-4 hours within several miles of Lake Champlain and some higher exposed terrain as well. Total snowfall across Vermont was 12 to 36+ inches with northwest Vermont experiencing the heaviest snowfall. Numerous schools, businesses and local government offices closed for March 14th and 15th with numerous vehicle accidents and stranded vehicles.
* **Snow Storm, December 22, 2017:** A quick moving storm system brought snow to Vermont during the morning commute on December 22nd and ending shortly after the evening commute. A widespread 5 to 10 inches of snow fell across central VT. The timing and intensity of the snowfall lead to hundreds of vehicle accidents and blocked highways for several hours.
* **Winter Storm, January 12, 2018:** A warm moist flow followed by an artic front caused an inch or more of precipitation across Vermont in the form of rain, freezing rain, sleet, and snow. Temperatures 25-20 degrees above normal caused significant snowmelt followed by an inch of rain which caused rivers to approach bankfull with several reports of rivers flooding due to ice jams. Some of these rivers included the Winooski near Montpelier Jct, Lamoille at Johnson, Passumpsic near Lyndonville, Missisquoi near Swanton and the Connecticut river near Windsor. Sharply falling temperatures overnight allowed for a flash freezing of roads making for extremely hazardous travel.
* **Winter Storm, January 19, 2019:** Snow began the afternoon of the 19th and ended by early afternoon on the 20th with accumulations of 8 to 16+ inches. Winds developed and increased to 10 to 20 mph with gusts in excess of 30 mph causing considerable blowing and drifting of the snow. Very cold temperatures were experienced as well, with highs of –5 to 15 degrees and lows of 10 to 20 below zero. Strong winds later in the system created wind chills of 20 to 40 below zero. The combination of all these factors created hazardous travel through the 21st as the very cold temperatures prohibited road chemicals from working effectively. This event occurred throughout the state, blanketing most of the state with snow depths of 10-20 inches varying by location. Greater snow depths occurred at high terrain of Bennington and western Windham counties.
* **Winter Storm, March 22, 2019:** Wet snow conditions and eventual brisk winds of 15 to 25 mph with higher gusts at night combined with the snow weighted trees and power lines to cause thousands of power outages to approximately 10,000-15,000 customers. This event was widespread throughout Vermont, with precipitation rates changing as elevation increased (rain early on in the valleys).
* **Snow Storm, February 7, 2020:** System began with light snowfall which later became steadier snowfall mixed with freezing rain and sleet. Later, snow became heavier with rates of 1-2+ inches per hour. This combination made for extremely hazardous travel and led to numerous schools closing, early closings of businesses and state government offices. Approximately 10-20,000 people lost power, especially in the central and eastern parts of the state. Two-day snowfall across the area was generally 10 to 20 inches with icing under 1/4 inch across the southern Champlain Valley.
* **Snow Storm, November 26, 2021:** Rain transitioned into a wet snow beginning at higher elevations around noon and eventually into the Champlain Valley by early evening. Snowfall amounts ranged from a wet few inches in the Champlain Valley with 4 to 8 inches in the some of the higher elevations in the Green Mountains. The wet nature of the snow led to scattered power outages in the foothills.
* **Winter Storm, March 14, 2023:** A winter storm with snow accumulations of up to 11 inches and wind gusts up to 45 mph impacted the entire State of Vermont on the 14th to 15th of March. Temperatures hung around freezing throughout the event period. The heavy wet snow caused trees to fall and lose limbs, blocking multiple roadways and pulling down powerlines causing blackouts across the state. Roadway closures were primarily seen in Windham, Windsor, and Bennington counties. This event was reported to be the worst in five years and activated the State Emergency Operations Center.

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| **Table 29: Top 20 Greatest Snowstorms in Burlington (NOAA)** |
| **Rank** | **Snowfall** | **Month/Year** |  | **Rank** | **Snowfall** | **Month/Year** |
| 1 | 33.1” | January 2-3, 2010 |  | 11 | 19.1” | March 16,-17, 1937 |
| 2 | 30.4” | March 14-15, 2017 |  | 12 | 18.8” | December 14-15, 2003 |
| 3 | 29.8” | December 25-26, 1969 |  | 13 | 18.7” | March 12-13, 2014 |
| 4 | 25.8” | March 6-7, 2011 |  | 14 | 18.6” | January 19-21, 2019 |
| 5 | 25.7” | February 14-15, 2007 |  | 15 | 18.3” | December 6-7, 2003 |
| 6 | 24.7” | January 13-14, 1934 |  | 16 | 17.8” | January 3-4, 2003 |
| 7 | 22.9” | March 5-6, 2001 |  | 17 | 17.8” | February 4-5, 1995 |
| 8 | 22.4” | March 13-14, 1993 |  | 18 | 17.7” | March 3-4, 1994 |
| 9 | 20.0” | November 25, 2000 |  | 19 | 17.2” | February 6-8, 2008 |
| 10 | 19.7” | January 25-28, 1986 |  | 20 | 17.1” | February 25-26, 1966 |
| *Data Source:* [*www.weather.gov/media/btv/climo/extremes/top20snow.pdf*](http://www.weather.gov/media/btv/climo/extremes/top20snow.pdf) |

Snow Storm Trends

The Steering Committee considered the probability of a plausibly significant snow event has a probability of Highly Likely, with minor impacts to the built environment and the economy, moderate impacts to people, and negligible impacts to the natural environment.

[Fig 37, federally declared ice and snow disaster PA expenditure]

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| **Table 30: Snowfall Extremes by Vermont County — 1-Day, 2-Day and 3-Day Storms** |
| **County** | **1-Day** | **Amount** | **2-Day** | **Amount** | **3-Day**  | **Amount** |
| Addison | 3/14/1933 | 25.6” | 2/25/2010 | 28.0” | 3/14/1993 | 28.2” |
| Bennington | 3/14/1984 | 37.0” | 3/14/1984 | 38.0” | 3/5/1947 | 46.0” |
| Caledonia | 2/25/1969 | 33.0” | 2/26/1969 | 34.5” | 2/26/1969 | 35.5” |
| Chittenden | 2/14/2007 | 25.3” | 1/3/2010 | 35.3” | 1/3/2010 | 37.6” |
| Essex | 12/7/2003 | 24.0” | 12/8/2003 | 43.0” | 12/9/2003 | 43.0” |
| Franklin | 3/14/1993 | 24.0” | 3/16/2017 | 33.0” | 3/16/2017 | 33.0” |
| Grand Isle | 3/7/2011 | 19.0” | 3/15/2017 | 25.0” | 3/15/2017 | 25.0” |
| Lamoille | 3/15/2017 | 28.0” | 3/16/2017 | 37.1” | 2/16/2007 | 36.0” |
| Orange | 3/13/2014 | 24.5” | 12/8/2003 | 26.0” | 12/22/2008 | 29.2” |
| Orleans | 2/5/1995 | 42.0” | 2/6/1995 | 48.0” | 2/6/1995 | 48.0” |
| Rutland | 12/7/2003 | 25.0” | 12/18/2020 | 32.8” | 12/18/2020 | 32.8” |
| Washington | 3/14/1993 | 31.0” | 12/28/1969 | 36.0” | 12/29/1969 | 44.0” |
| Windham | 12/19/1986 | 34.0” | 12/19/1986 | 34.5” | 3/5/1947 | 41.0” |
| Windsor | 3/14/1984 | 30.0” | 12/12/2020 | 40.0” | 12/4/1942 | 41.0” |
| *Source:* [*https://www.ncdc.noaa.gov/snow-and-ice/snowfall-extremes/VT*](https://www.ncdc.noaa.gov/snow-and-ice/snowfall-extremes/VT) |

According to the 2018 National Climate Assessment, there is an observable increase in the frequency of the most severe winter storms in the Northeast since observations began in 1950[[3]](#footnote-4). While the frequency of heavy snowstorms has increased over the past century, there has been an observed decline since 2000 and an overall decline in total seasonal snowfall.

The National Centers for Environmental Information within NOAA manage data pertaining to snow coverage across the country[[4]](#footnote-5). Due to rising minimum temperatures and a shortening winter season, snow cover on the ground has also seen significant decreases. Seven weather stations, located in Bethel, Burlington International Airport, Cavendish, Newport, Rochester, Rutland and St. Johnsbury have consistently recorded the number of days with greater than 1” of snow cover since 1963. The results (Figure 38) indicate that this number is trending downward, with the most significant decreases occurring in the past decade.

Vulnerability

People

There are no standard loss estimation models or methodologies for the winter storm hazards. Potential losses from winter storms are, in most cases, indirect and therefore difficult to quantify. The impacts of snow and ice storms are typically felt by rural residents and those with low access or mobility first. Snow can cause extensive disruptions to transportation and connection between people and services, including a disruption in communication infrastructure. People in rural areas are particularly at risk of being cut off. Transportation becomes extremely difficult, with a decline in visibility combined with road surface conditions that can put motorists in danger. Heavy snow can immobilize a region and paralyze a city, stranding commuters, closing airports, halting the flow of critical supplies, and disrupting emergency and medical services. The weight of snow can bring down trees and power lines, cutting off power to homes and businesses needed for electric heating system, lights, and life support equipment. Homes with generators or propane-based heating systems can lead to carbon monoxide poisoning if not properly ventilated[[5]](#footnote-6). Snow accumulation can trap carbon monoxide in ventilation systems and redirect it into a home. Homes may be isolated for days, sometimes requiring emergency personnel to navigate hazardous conditions for wellness checks on vulnerable populations. In the mountains, heavy snow can lead to avalanches.[[6]](#footnote-7)

Built Environment

The structural impacts of snow can vary in severity, with even minimal snow accumulation causing disruption. One of the greatest impacts on infrastructure from snow is the downing of powerlines, causing widespread blackouts. Industries that rely on power to function can be severely impacted by loss of power, such as dairy farmers who need power in order to milk the cows. Under certain circumstances large quantities of snow on the roofs of buildings can cause them to cave in, potentially trapping people inside or damaging property. Homes with flat or low-pitched roofs, including many manufactured housing units, are at greatest risk of snow load caused collapses. Dangerous conditions due to snow on roadways and other transportation infrastructure can disrupt key supply lines throughout the State.

Natural Environment

The impacts of snow and ice storms to the natural environment can be extensive for both flora and fauna. Accumulated heavy snow can weigh down trees, causing limbs to break off and fall. Our natural environment is more adapted to these changes, whereas urban landscaping often faces unique challenges of soil compaction, shallow root systems, and impervious surfaces that interact with winter weather differently than less disturbed environments. Soil compaction and underlying infrastructure can prevent urban tree roots from moving lower towards sources of groundwater and places that don’t freeze during the winter. As a result, prolonged exposure to frost can impact the hydraulic conductivity for street trees by breaking these columns resulting in air filled conduits. Expanding air bubbles during temperature fluctuations can further impact tree health[[7]](#footnote-8). Species selected for planting along town and city streets are encouraged to be native species that are suited for the local climate as well as being adapted to conditions often found along roads[[8]](#footnote-9). In the Green Mountains, rapid accumulations of snow after a snowfall can cause avalanches to occur[[9]](#footnote-10). While uncommon in the Northeast, avalanches are not impossible with one occurring March 14th, 2018, at Smugglers Notch in Cambridge[[10]](#footnote-11). Avalanches can pose a risk to the natural environment by destroying vegetation within their paths.

Economy

The cost of snow removal, repairing damages, and the loss of business can have severe economic impacts on cities and towns. For Class I highways in Vermont, winter maintenance (which includes salt application rates, cost per centerline mile of plowing, and hourly cost of plowing) was totaled to around $6,400 per mile[[11]](#footnote-12). This study accounted for only the Class I highways, leaving significant costs for local roadways for towns to pay for. In 2010, the town of Jericho spent $14,969 on winter maintenance and grading for 7/10ths of a mile for a gravel road[[12]](#footnote-13). With roughly 55% of Vermont roads being dirt or gravel, this can become a significant expenditure for the State and towns[[13]](#footnote-14). With automotive transit being a major aspect of society, snow accumulation blocking or hindering travel can increase commuting and travel times or preventing it entirely, impacting business success. Vermont has prominent agricultural and forestry industries that focus mainly on dairy products/other livestock products[[14]](#footnote-15) and maple sugaring respectively[[15]](#footnote-16). Winter storms and cold snaps can increase stress on livestock, potentially leading to a loss of livestock if extreme. Heavy snow on the limbs of trees, both sugaring and orchard, can damage stock and hurt associated businesses.

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| **CLIMATE CHANGE** Climate change continues to alter the natural processes of our environment, including the hazards we face. The frost-free season in Vermont is projected to decrease, with observed declines of three weeks since 1960[[16]](#footnote-17). Winter in Vermont has been reported to be warming 2.5 times faster than the global average annual temperatures since 1960[[17]](#footnote-18). Warming is having a direct impact on typical winter weather conditions including pond and lake ice reduction, freeze thaw cycle changes, ice dams, decreasing snowpacks impact on soil and roots, and shifting agricultural production times. Changes in snow accumulation patterns due to climate change can also impact the soil profile. As snowpack thickness declines over the years, the insulating layer of heat that snow provides against winter air is removed, leaving the ground at a higher risk of freezing. Additionally, the layer of snow often acts as habitat for burrowing species such as mice that may not be able to dig through the frozen ground, and a decline in snowpack can put those populations at risk. Expected reductions in snow cover leave the exposed ground more vulnerable to freezing during extreme cold events, which can cause significant impacts to building infrastructure (see: Extreme Cold), and also lead to decreased tourism revenues across the State (see: Extreme Heat).Warmer winters are also impacting vital Vermont industries such as maple sugaring. The process of maple sugaring requires a narrow window of temperatures for sap to flow, typically when temperatures swing below freezing (at or below 0°C / 32°F) at night and above freezing during the day. This has historically taken place between Town Meeting Day and April of each year. However, sugar maple trees now begin releasing their sap approximately 8.2 days earlier and stop producing usable sap 11.4 days earlier than they did 40 years ago - a trend coinciding with regional climate changes recorded over the same time period[[18]](#footnote-19). This can be a problem for producers who use historic sap flow initiation dates to determine when they should tap their trees, meaning shifting start times can cause producers to miss out on key sap runs. Sugar maples are also faced with shifting habitat ranges that are distinguished by decreased snowpack which creates a deeper frost layer, dramatically reducing the ability of the sugar maple to take up water and nutrients through frost damaged roots[[19]](#footnote-20). Changes in snow accumulation and the decreasing length of the frost-free season can significantly impact Vermont’s ski and snowboarding industry. Alpine ski resorts throughout the State typically rely on winter snow deposits to sustain operations, but with the proportion of precipitation falling snow decreasing resorts must either adapt or face losses. The industry can offset some of the decrease in snowfall by creating artificial snow on their trails, however this is both expensive and is still reliant upon cold conditions. As winter temperatures continue to warm at rates faster than the rest of the year, the ability to maintain successful and profitable ski resorts gets increasingly more difficult. Ensuring that resorts are operable during the end of year holiday season has been getting worse as the first snow has continued to come later into the season. The end of year holiday can generate as much as one third of a ski resort’s annual revenue, so losing it can severely impact business models[[20]](#footnote-21).  |

Snow Storm Current Capabilities and Mitigation

State facilities and individual towns are generally well prepared to deal with winter storms. VTrans winter maintenance road crews are experienced and well-equipped to keep highways open and municipal road crews are also generally well-prepared to maintain local roads.

This Plan has identified a mitigation strategy to develop resilient design and construction standards (see: Mitigation Strategy) in the form of auditing existing building codes, which would include standards for snow loading and ice accumulation. Additionally, several strategies aimed at increasing public knowledge about hazards and mitigation, supporting frontline communities and coordinating hazard mitigation mapping must consider snow and ice storm events during implementation.

This Plan also includes a strategy to identify and protect vulnerable structures and critical infrastructure, with an action to provide technical assistance to utilities in long-range planning for transmission and distribution line upgrades and relocation to improve resilience, which would include impacts due to ice events and snow loading. Additionally, this strategy includes an action to adapt the VTrans Methods and Tools for Resilience project (2018 SHMP subgrant) for use in mapping utilities and identifying vulnerabilities. This strategy also proposes the identification and evaluation of the feasibility of rural energy systems in coordination with utilities and RPC work under Act 174. This strategy also works towards increasing the capacity of the Public Service Department to maximize the utilization of federal funds towards utility resilience implementation work. In addition to other actions that broadly apply to many other hazards, the plan is coordinating a State Energy Security Plan identifying the interdependency of other systems on the grid and additional risk analysis requirements.

1. <http://www.wpc.ncep.noaa.gov/wwd/wssi/wssi.php> [↑](#footnote-ref-2)
2. <https://www.lakechamplaincommittee.org/learn/news/item/nature-note-lake-champlains-snow-globe> [↑](#footnote-ref-3)
3. <https://nca2018.globalchange.gov/chapter/2#key-message-8> [↑](#footnote-ref-4)
4. <https://www.ncdc.noaa.gov/cdo-web/datatools> [↑](#footnote-ref-5)
5. <https://www.healthvermont.gov/sites/default/files/documents/pdf/English_CO_Safety_Tips.pdf> [↑](#footnote-ref-6)
6. <https://disasterphilanthropy.org/resources/extreme-cold/> [↑](#footnote-ref-7)
7. <https://www.frontiersin.org/articles/10.3389/fpls.2016.00867/full> [↑](#footnote-ref-8)
8. <https://vtrans.vermont.gov/sites/aot/files/highway/documents/environmental/VTrans%20Landscape%20Guide.pdf> [↑](#footnote-ref-9)
9. <https://www.weather.gov/safety/winter-snow> [↑](#footnote-ref-10)
10. <https://www.burlingtonfreepress.com/story/news/local/2018/03/15/according-alert-areas-where-avalanches-may-greater-risk-orleans-lamoille-washington-eastern-fran/427399002/> [↑](#footnote-ref-11)
11. <https://vtrans.vermont.gov/sites/aot/files/planning/documents/planning/Class%20I%20Town%20Highways%20White%20Paper.pdf> [↑](#footnote-ref-12)
12. <https://www.ccrpcvt.org/wp-content/uploads/2016/02/SkunkHollowRoad_RevisedReport_20110602.pdf> [↑](#footnote-ref-13)
13. <https://www.burlingtonfreepress.com/story/news/local/2015/03/15/march-vermont-mud-eye/24783751/> [↑](#footnote-ref-14)
14. <https://ustr.gov/map/state-benefits/vt> [↑](#footnote-ref-15)
15. <https://extension.psu.edu/maple-syrup-production> [↑](#footnote-ref-16)
16. <https://climatechange.vermont.gov/vermont-today> [↑](#footnote-ref-17)
17. <https://www.uvm.edu/news/gund/vermont-getting-warmer-and-wetter-climate-change-study> [↑](#footnote-ref-18)
18. <https://vt.audubon.org/news/end-maple-maple-sugaring-amid-changing-climate> [↑](#footnote-ref-19)
19. <https://www.themaplenews.com/story/study-shows-declining-winter-snowpack-is-hurting-the-sugar-maple/231/> [↑](#footnote-ref-20)
20. <https://anr.vermont.gov/sites/anr/files/specialtopics/climate/documents/VTCCwhitepapers/VTCCAdaptRecreation.pdf> [↑](#footnote-ref-21)