# Winter Weather in VT –
## The Science, Preparation and National Weather Service Headlines





2023 Vermont Emergency Preparedness Conference

Burke Mountain Hotel and Conference Center
21 September 2023

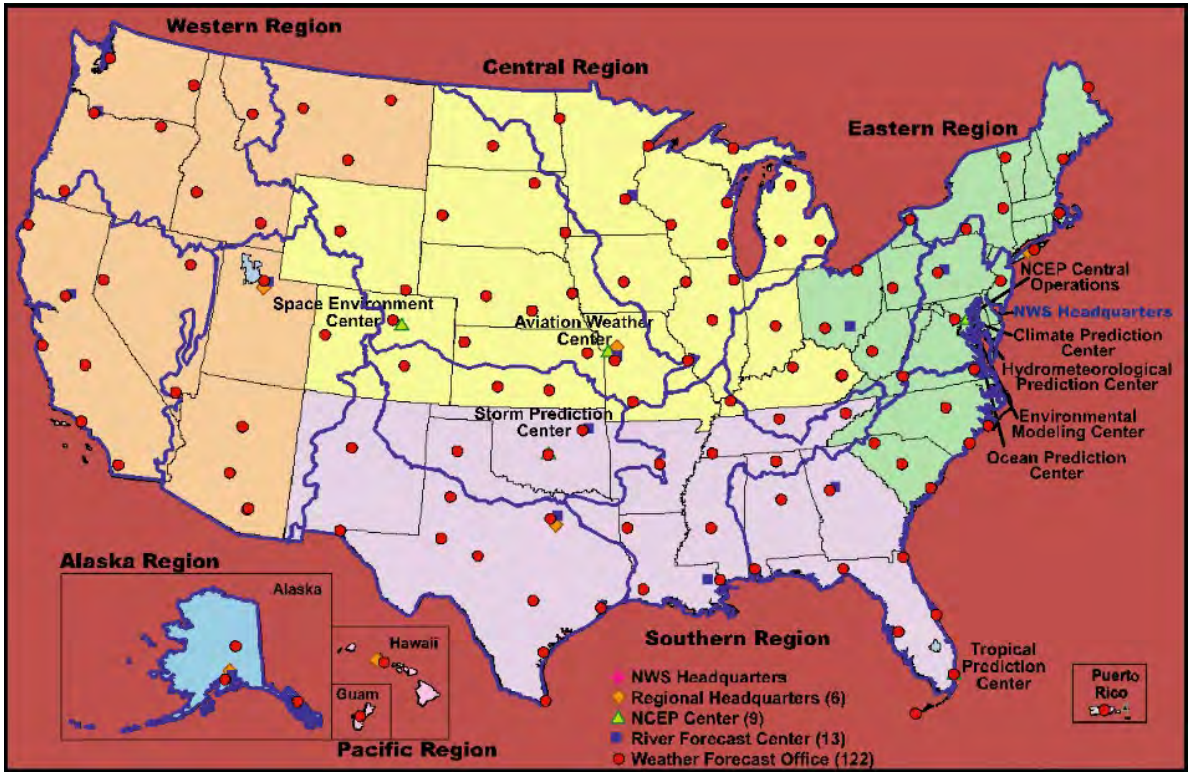
Scott Whittier – scott.whittier@noaa.gov
Warning Coordination Meteorologist
NOAA/NWS/WFO Burlington, VT

# Outline

- **NWS Burlington Introduction**
- **NWS Warning Services**
- **NWS Decision Support Services**
  - Services and Messaging to Support Decision Makers
- **Climatology of  Winter Weather Events and Review of 2022-23 Winter**
  - Nor’easters
  - Freezing Rain / Ice Storm
  - Strong, Localized Damaging Winds

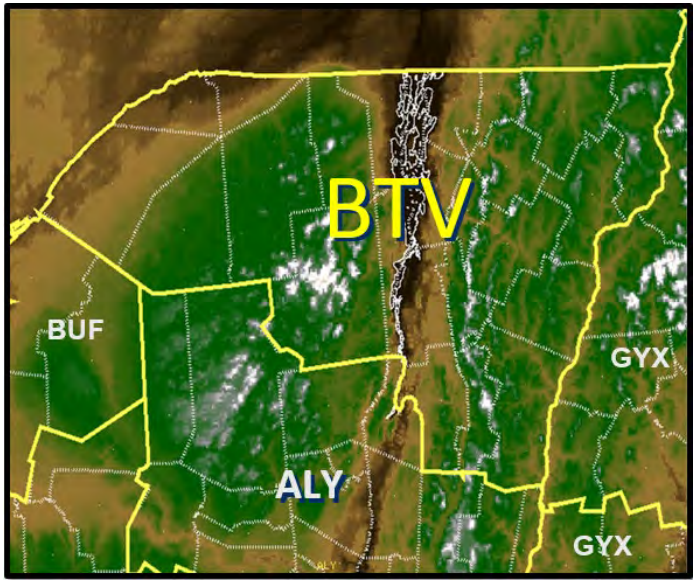
# NWS Office Structure and Mission

*Provide climate, water, weather forecasts, warnings and Decision Support Services to protect life and property.*

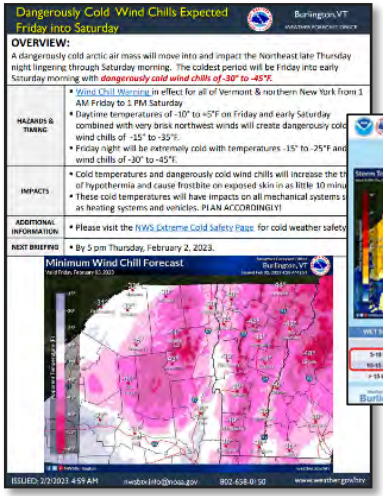



**NWS Burlington** is the State Liaison Office and services all of Vermont except Bennington and Windham counties.

**NWS Albany** services Bennington/Windham counties.



# NWS Headlines and Timeline of NWS Products






**Watch:** Most of the ingredients are there, but still need more as well as increased certainty and time.

**Warning:** ALL ingredients are there in proper measurement and event is imminent.

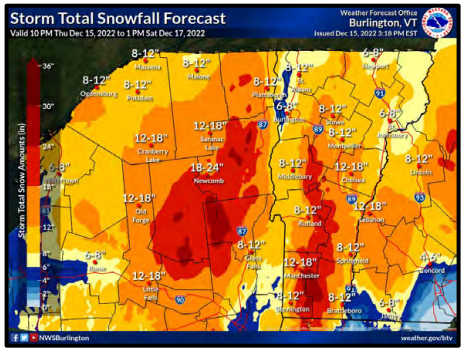

**Event**

# NWS Decision Support Services

## Forecasts and Services:

*What you need, When you need it and in the format(plain language) for the user to understand*

**WHY?! – Forecasts have NO "intrinsic value" alone.**
**They acquire value by people taking the correct, appropriate action to mitigate the hazard.**




Which is more effective?

Forecast

Snow accumulation 4 to 8 inches.

Decision Support Services

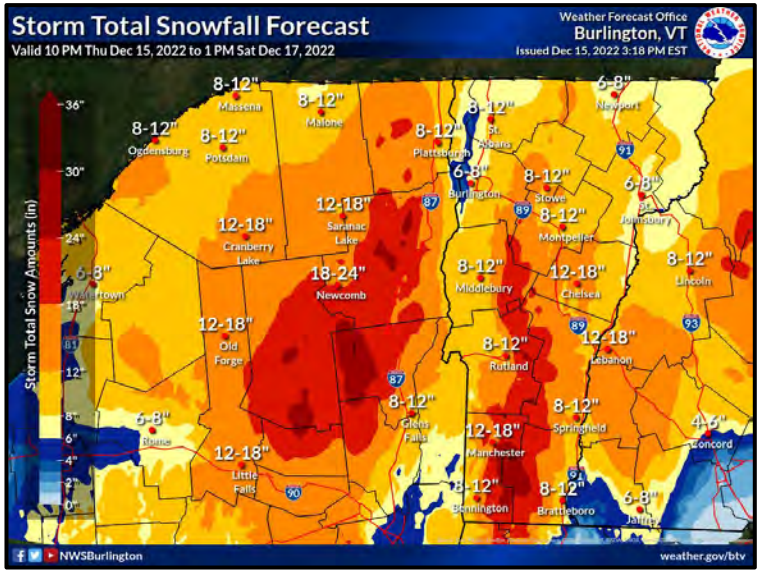
Wet Snow Accumulation of 4 to 8 inches

*Heavy, wet snow will weigh down tree limbs and power lines for possible isolated to scattered power outages*

# Messaging Potential Impacts

## BTV Best Practice

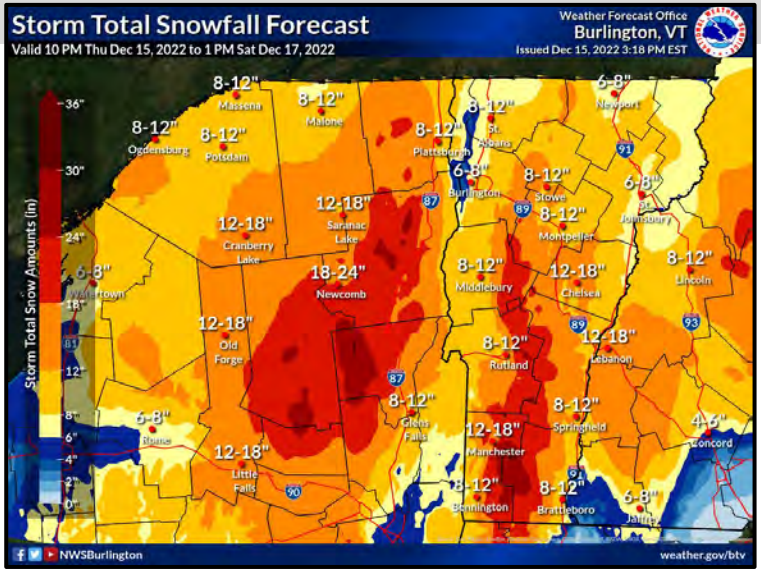
- Rather than just showing a map of Snow accumulation, try to reference that map with the potential impacts for users to plan, prepare and take action if necessary.
- Developed by using decades of NWS storm data and collaborating with KEY partners on storm history and impacts to their operations as well as past research.
- Similar efforts with Strong winds and Ice accumulation potential impacts.




| WET Snow Accumulation | Potential Impacts assuming a Snow/Water Ratio 10:1 or less |
|---|---|
| < 5 inches | Some weighted tree limbs of Conifers and fully leafed trees |
| 5-10 inches (WE .5-1") | Numerous weighted tree limbs and some power lines. Isolated to scattered outages possible. |
| 10-15 inches (WE 1-1.5") | Weighted/snapped tree limbs, especially fully leafed trees. Scattered to Numerous power outages likely. |
| > 15 inches (WE > 1.5") | Numerous downed tree limbs and some snapped trees. Widespread power outages. |

# WET Snow – Potential Impacts (Dec 15-17, 2022)

- ✓ Snow begins late this evening with intervals of heavy snow Friday
- ✓ **Possible power outages with heavy wet snow**
- ✓ Snow may mix with rain at times in the valleys Friday afternoon
- ✓ Low visibilities and poor road conditions will lead to difficult commutes Friday




We have a 8:1 Snow Water Ratio Potential Impact Table as well

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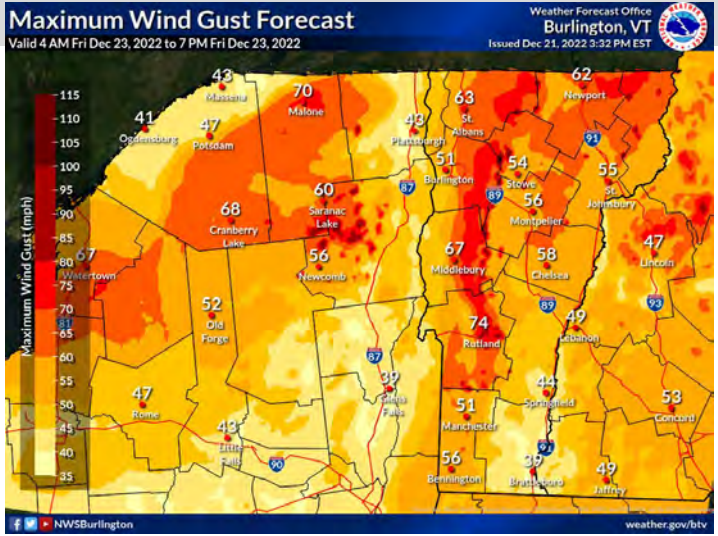
# Strong Winds – Potential Impacts (Dec 23, 2022)

- ✓ Southeast winds increase Thursday night and peak mid-morning to early afternoon on Friday.
- ✓ Widespread gusts of 40-50 mph are expected, with up to 65 mph along the western facing slopes of the higher terrain. Summit winds will gust as high 100 mph.
- ✓ Downed tree limbs and/or trees on power lines will result in numerous to widespread power outages.




| Wind Speeds | Potential Impacts |
|---|---|
| < 35 mph | Little impact |
| 35-45 mph | Possible blowing of unsecured objects, small tree limbs down. Isolated power outages possible. |
| 45-55 mph | Several small and larger limbs and small shallow rooted trees possibly knocked down. Scattered power outages possible. |
| 55-65 mph | Numerous branches, several small trees and a few large trees likely knocked down. Scattered shingle damage possible. Scattered to numerous power outages likely. |
| 65-75 mph | Several larger trees likely knocked down or uprooted. Utility lines possibly down. Scattered structural damage possible due to wind and fallen trees. Numerous to widespread power outages likely. |
| >75 mph | Numerous trees likely knocked down or uprooted. Utility lines likely down. Scattered to numerous structural damage possible due to wind and fallen trees. Widespread power outages likely. |

# Messaging Potential Ice Impacts

- **Elevated Horizontal Ice Thickness** is a direct measurement of the depth of ice on top of a flat object above the surface.
  - The official NWS ice accretion forecast uses this technique

- **Mean Radial Ice Thickness** is a measurement of ice accretion around a circular branch or wire.

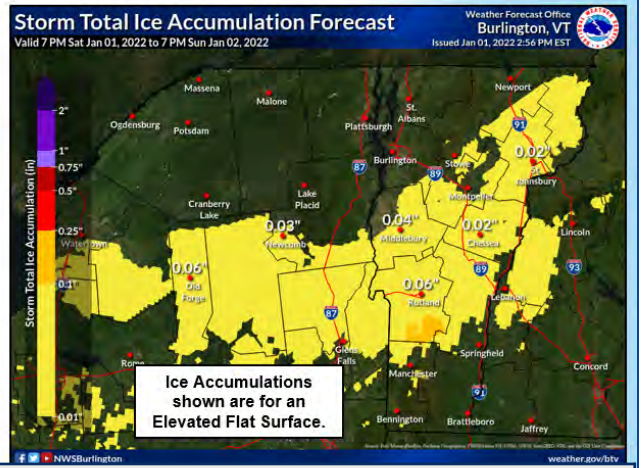
- The conversion between the two methods is to multiple the **Elevated Horizontal Ice Thickness** by 0.4 to get the **Mean Radial Ice Thickness.**

NATIONAL WEATHER SERVICE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

WRN WEATHER-READY NATION

## Ice Accumulation Totals and Potential Impacts

- ✓ Freezing rain will accrete up to a tenth of an inch of ice across mainly central and south-central Vermont and Essex County, New York tonight into Sunday morning.
- ✓ Slippery to hazardous travel is likely, especially on untreated surfaces.



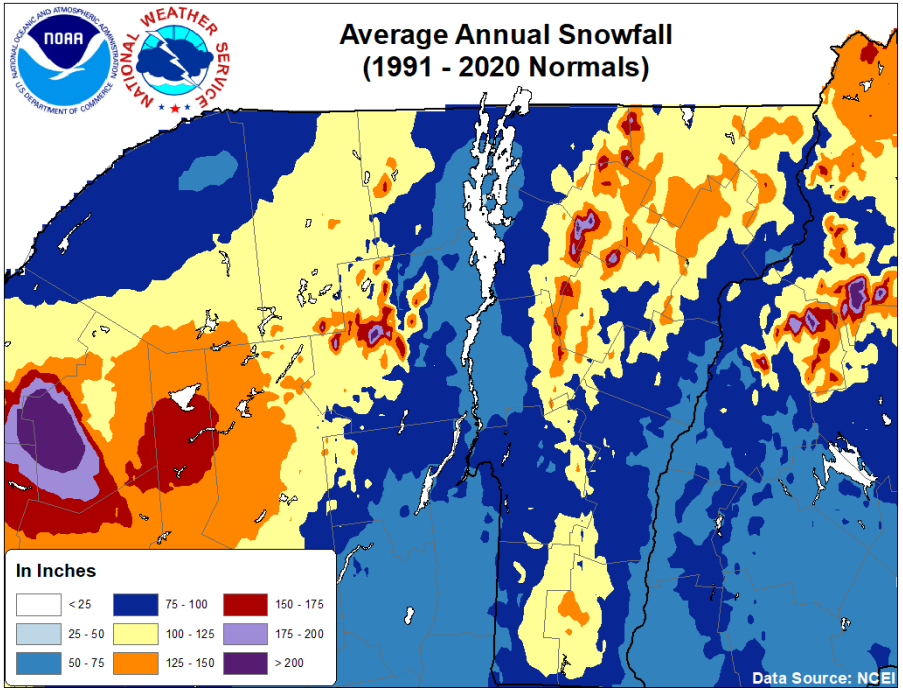

| Ice Accumulation | Potential Impacts |
|---|---|
| Trace to < ¼" FLAT (T to 0.1" Radial) | Slick to Hazardous road and pedestrian surfaces, especially untreated surfaces. |
| 1/4 to 1/2" FLAT (0.1" to 0.2" Radial) | Hazardous, icy road conditions and some weighted tree limbs. Very isolated power outages possible near 1/2" FLAT. |
| 1/2 to 1 inch FLAT (0.2" to 0.4" Radial) | Dangerous road conditions, hanging limbs and Isolated (1/2" FLAT) to Scattered power outages (1" FLAT) possible. |
| 1 to 2 inches FLAT (0.4" to 0.8" Radial) | Scattered (1" FLAT) to numerous (2" FLAT) power outages likely, possibly lasting a few days. Downed tree limbs and utility lines. Very Dangerous road conditions. |
| > 2 inches FLAT (> 0.8" Radial) | Numerous to widespread power outages lasting several days. Downed tree limbs, trees and utility lines, possibly causing structural or vehicle damage. |

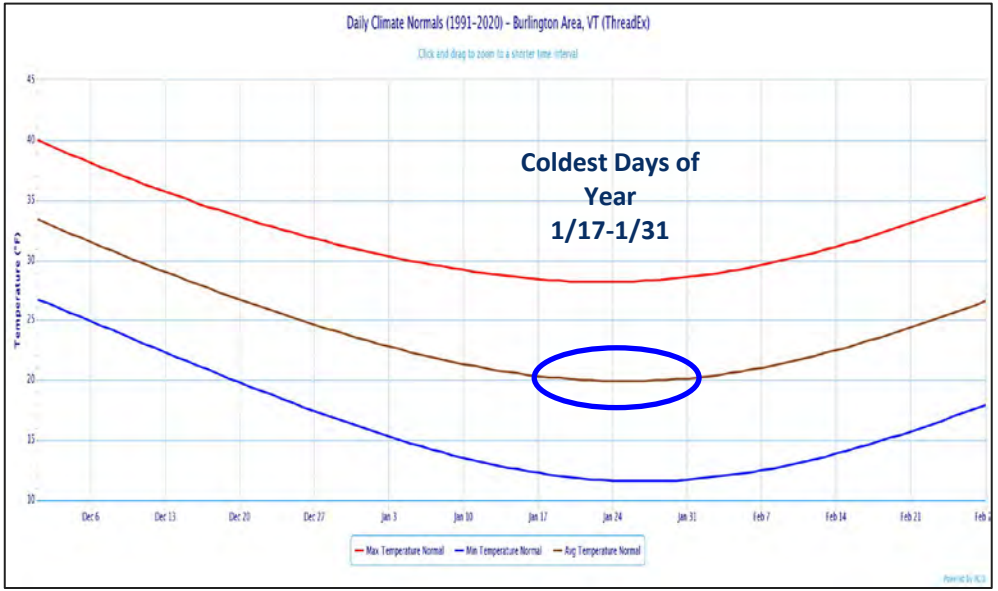
- Winter Climatology and Comparison to Winter 2022-23

- Winter Weather in VT

# Snowfall and Temperature Climatology

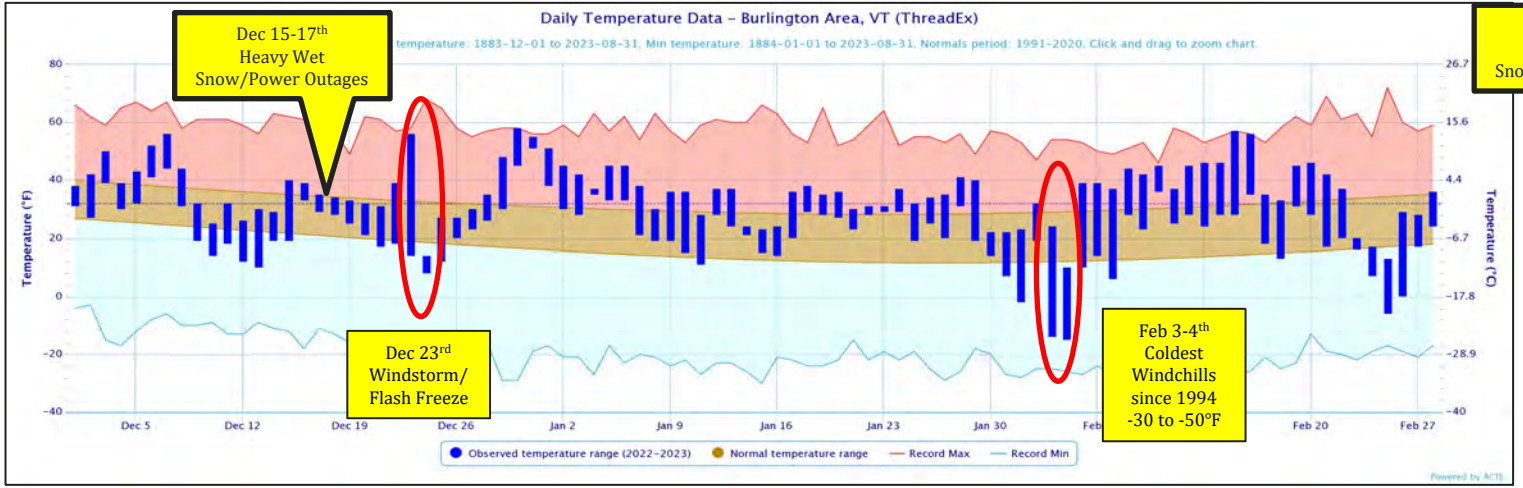
Burlington Int'l Airport (South Burlington) ~ 85 inches



# Winter 2022-23 Temperatures at Burlington, VT

## 3rd Warmest Winter




**Winter – 24.0°F**

| Rank | Season | Mean Avg Temperature |
|---|---|---|
| 1 | 2015-2016 | 30.1 |
| 2 | 2016-2017 | 29.5 |
| 3 | 2022-2023 | 29.0 |
| 4 | 2001-2002 | 28.7 |
| 5 | 2011-2012 | 27.8 |
| 6 | 1932-1933 | 27.5 |
| 7 | 1905-1906 | 27.3 |
| 8 | 1936-1937 | 26.3 |
| 9 | 2019-2020 | 26.1 |
| 10 | 1931-1932 | 25.9 |

+ 5.0 F

**Dec - 28.2°F**

| Rank | Year | Mean Avg Temperature |
|---|---|---|
| 1 | 2015 | 39.2 |
| 2 | 2006 | 32.6 |
| - | 2001 | 32.6 |
| - | 1996 | 32.6 |
| 5 | 1998 | 31.9 |
| 6 | 2021 | 31.8 |
| - | 1982 | 31.8 |
| - | 1923 | 31.8 |
| 9 | 2022 | 31.6 |
| 10 | 1953 | 31.4 |

+ 3.4 F

**Jan - 20.9°F**

| Rank | Year | Mean Avg Temperature |
|---|---|---|
| 1 | 1906 | 31.0 |
| 2 | 1990 | 29.8 |
| 3 | 2017 | 29.7 |
| - | 1932 | 29.7 |
| 5 | 2023 | 29.2 |
| 6 | 1933 | 29.1 |
| 7 | 2006 | 28.2 |
| 8 | 1995 | 27.9 |
| 9 | 1913 | 27.8 |
| 10 | 1937 | 27.6 |

+ 8.3 F

**Feb – 22.9°F**

| Rank | Year | Mean Avg Temperature |
|---|---|---|
| 1 | 1981 | 32.9 |
| 2 | 2018 | 30.6 |
| 3 | 2017 | 29.8 |
| 4 | 1984 | 28.7 |
| 5 | 2012 | 28.3 |
| 6 | 1998 | 27.7 |
| 7 | 1954 | 27.1 |
| 8 | 1925 | 26.9 |
| 9 | 1991 | 26.5 |
| 10 | 2016 | 26.3 |
| 11 | 2023 | 26.1 |

+ 3.2 F

# Types of Winter Storms and Impacts in Vermont

- **Nor'easter**
  - Large amounts of snow, breezy/windy conditions.
  - Wet, heavy snow vs. Powdery dry snow (Dec '22/Mar '23)
  - **Impacts:** Travel and potential power outage.

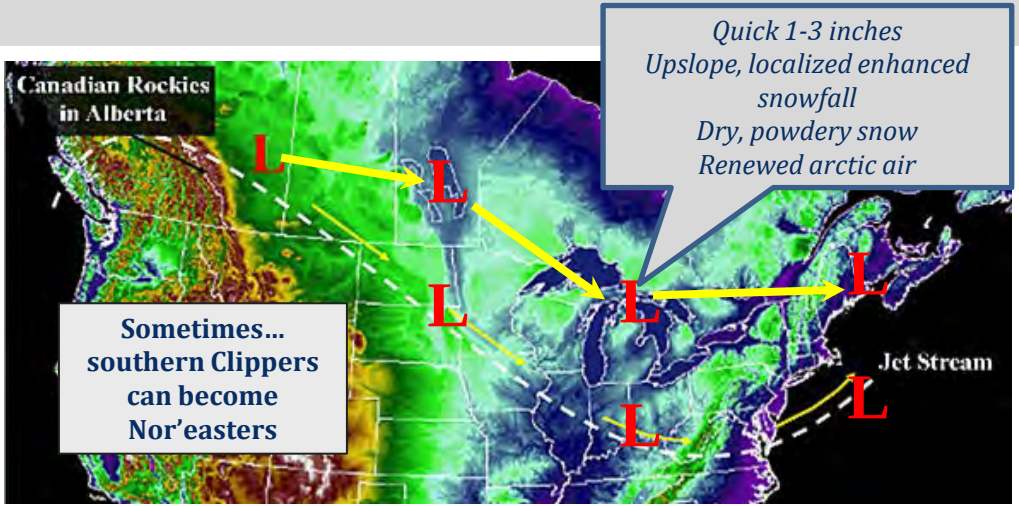
- **Freezing Rain / Ice Storms**
  - Largely travel impacts with accumulations < ¼" radial.
  - Occurs multiple times each winter. (Freezing Rain).
  - Tree/power issues with radial ice accumulation > ¼" , especially ≥ ½" (Ice Storm – every ~10+ years).
  - **Impacts:** Travel and power outages depending on the areal coverage and ice accumulation.

- **Localized High/Damaging Wind Events**
  - Frequent wind gusts in excess of 50 mph (Dec '22)
  - **Impacts:** Power outages depending on intensity and areal coverage

# Types of Winter Storms and Impacts in Vermont

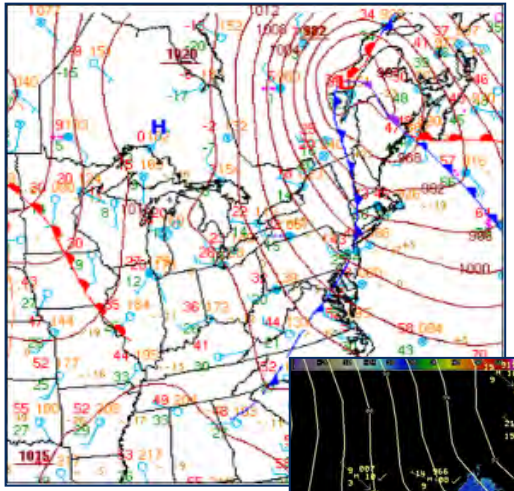
- **"Clipper"**
  - Light amount of snowfall, breezy and much colder with generally an arctic air mass.
  - **Impacts:** Minor travel

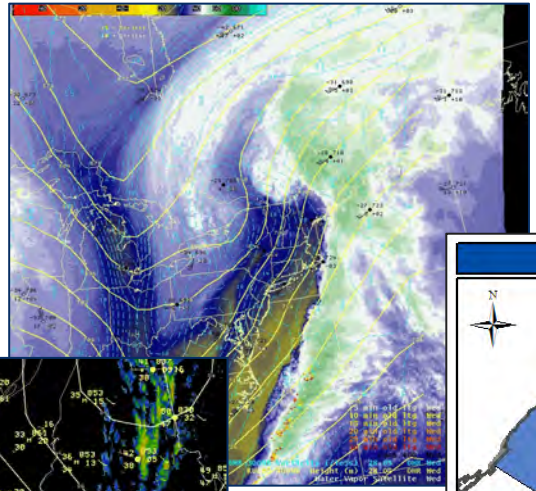
- **Upslope Events**
  - Localized heavy snowfall in the mountain upslope regions.
  - **Impacts:** Minor travel

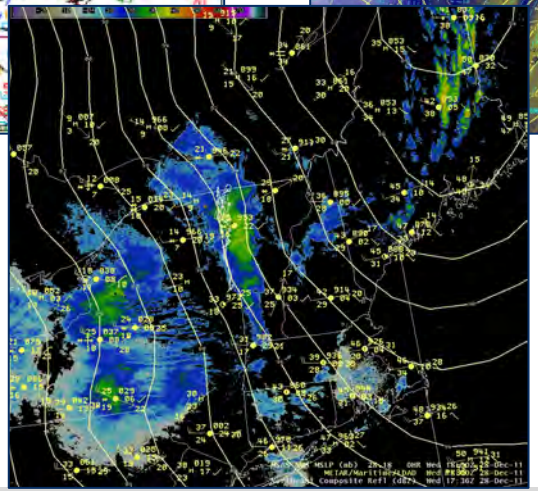


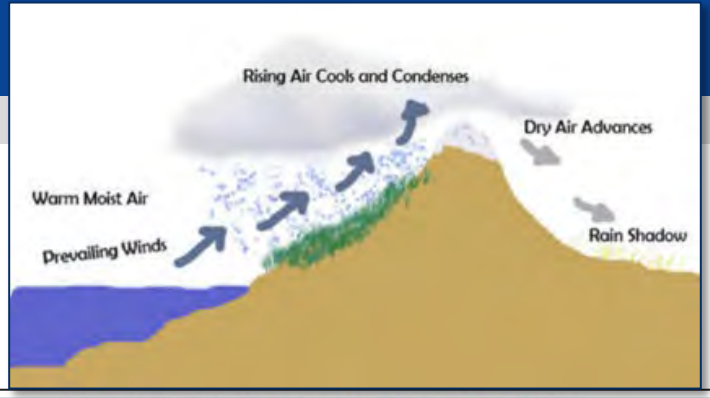

# Upslope Snowfall Event

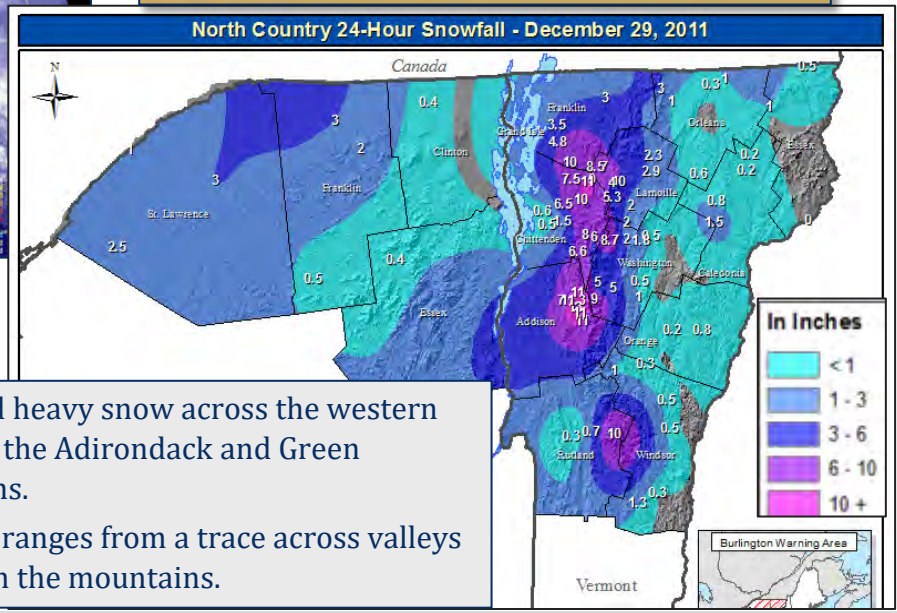
## 28-29 December 2011









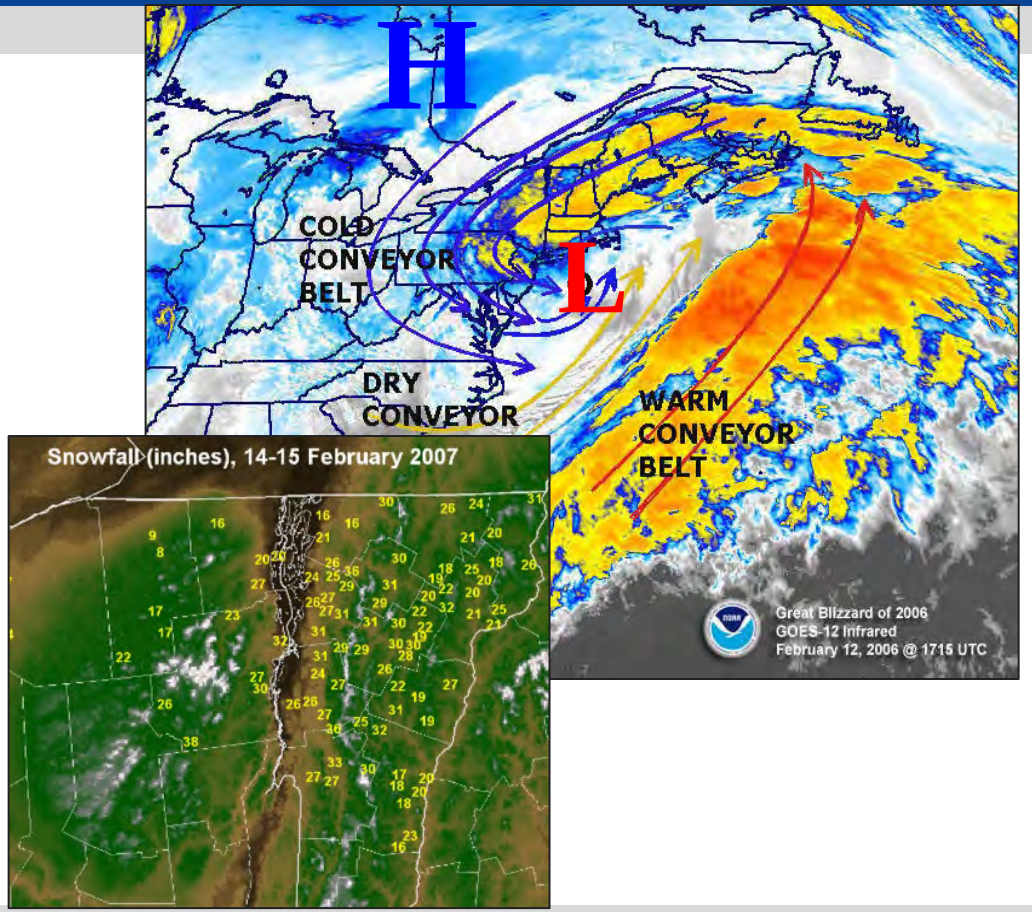




- Localized heavy snow across the western slopes of the Adirondack and Green Mountains.
- Snowfall ranges from a trace across valleys to 12”+ in the mountains.

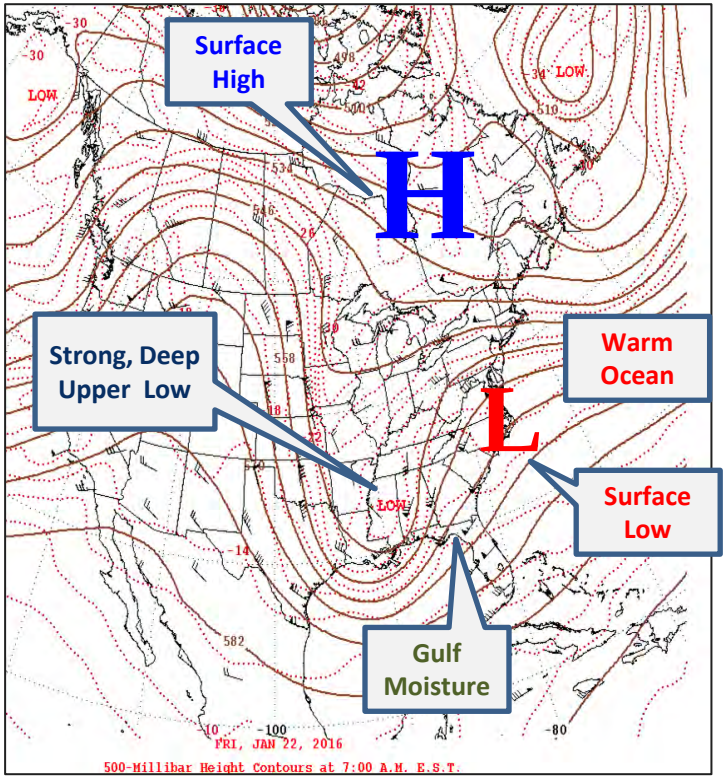
- More In-Depth Look at Impactful Storms
  - Nor’easter  (Dec ’22/Mar ’23)
  - Ice Storm (Jan ‘98)
  - Damaging Winds (Dec ‘22)

# General Nor'easter Characteristics

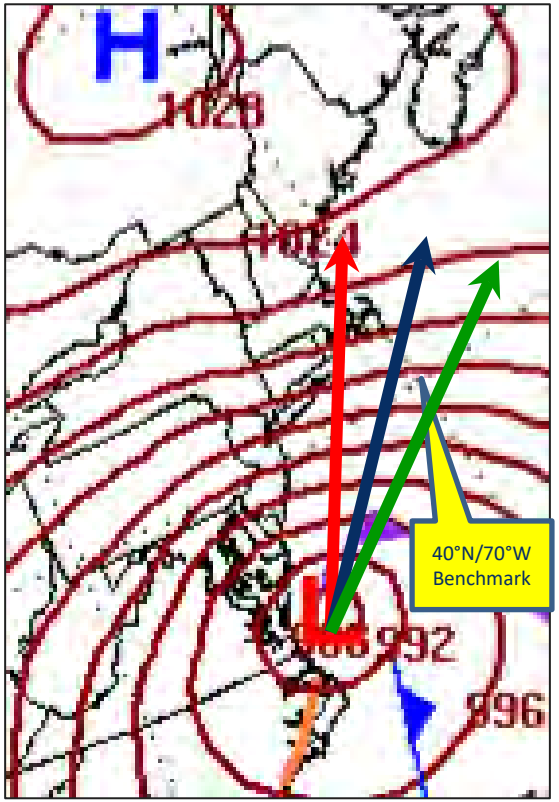
- **Blizzard-like conditions**
  - Strong winds, blowing and drifting snow
    - Visibilities ≤ ½ mile
    - Wind gusts ≥ 25 mph
- **Track along eastern seaboard**
  - Prevailing northeast surface winds
  - Coastal flooding with near hurricane strength
- **Frequency**
  - December through March



# Nor'easter Complexity and Low Tracks

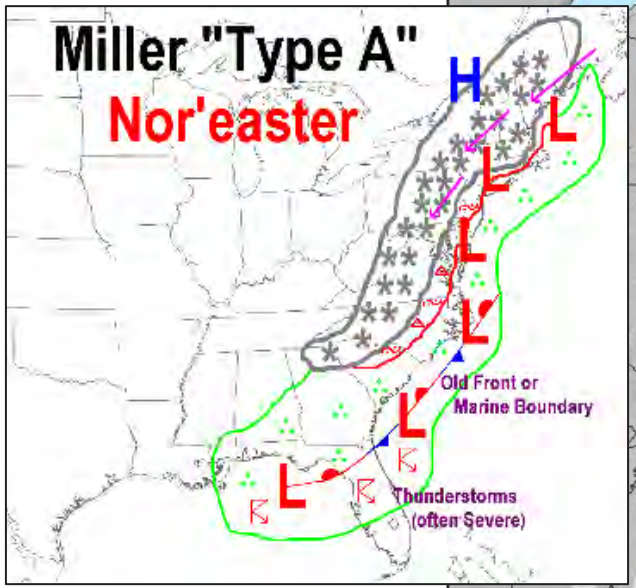


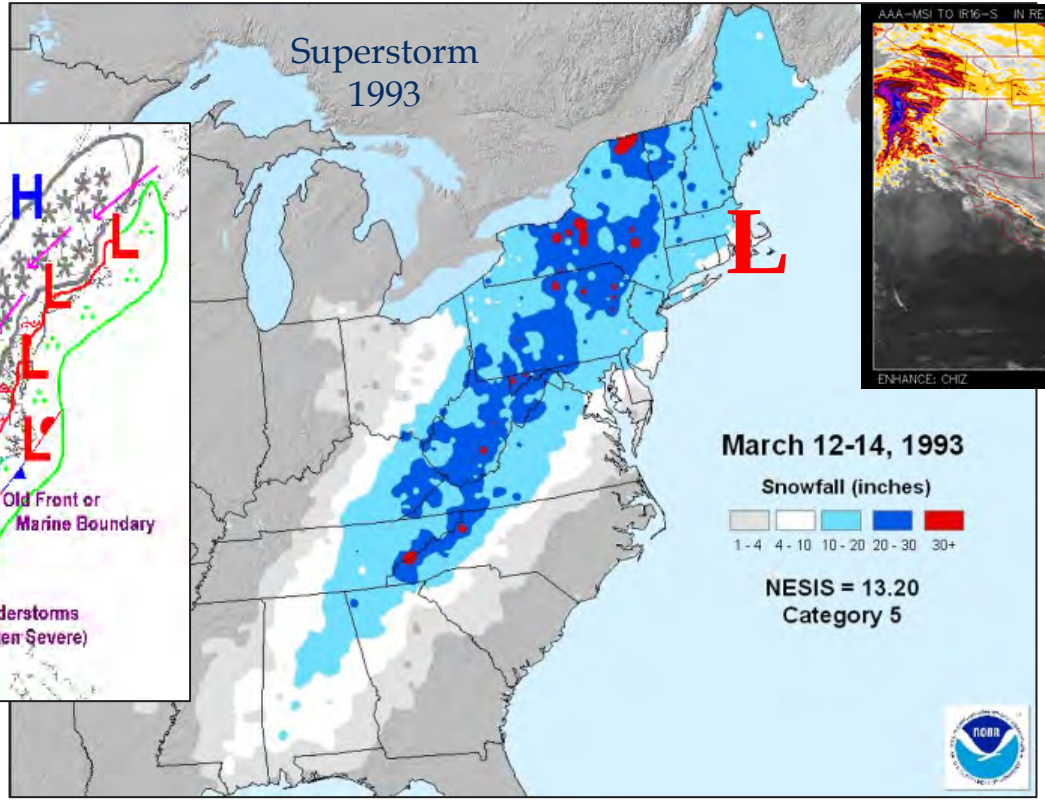

- **Greatest Impact**
  - Impacts ALL of Area
  - Widespread 6-12"+
  - 1-2 feet possible at times
- **Medium Impact**
  - Several inches Northern NY/VT
  - Greatest threat for 6"+ in S/E VT
- **Least Impact**
  - No Snow in North
  - Few inches in southern VT?

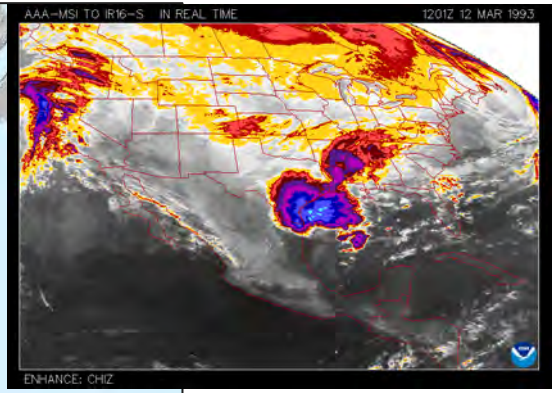


# Two Types of Nor'easters

Origins in the Gulf of Mexico or SE USA and then travels along the coast

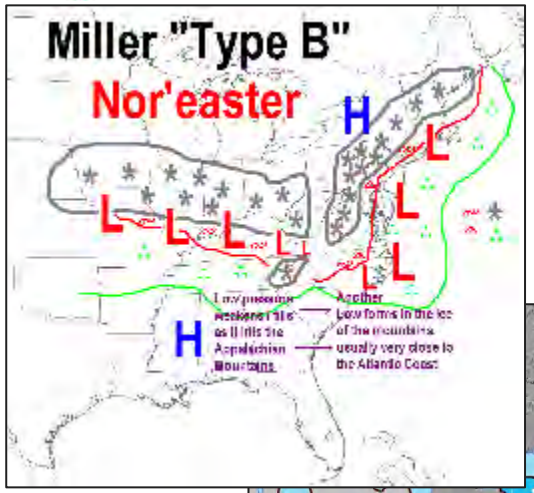


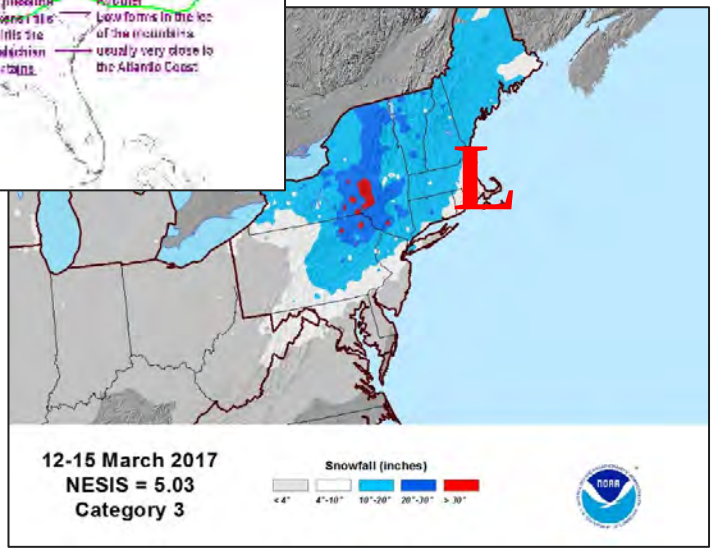



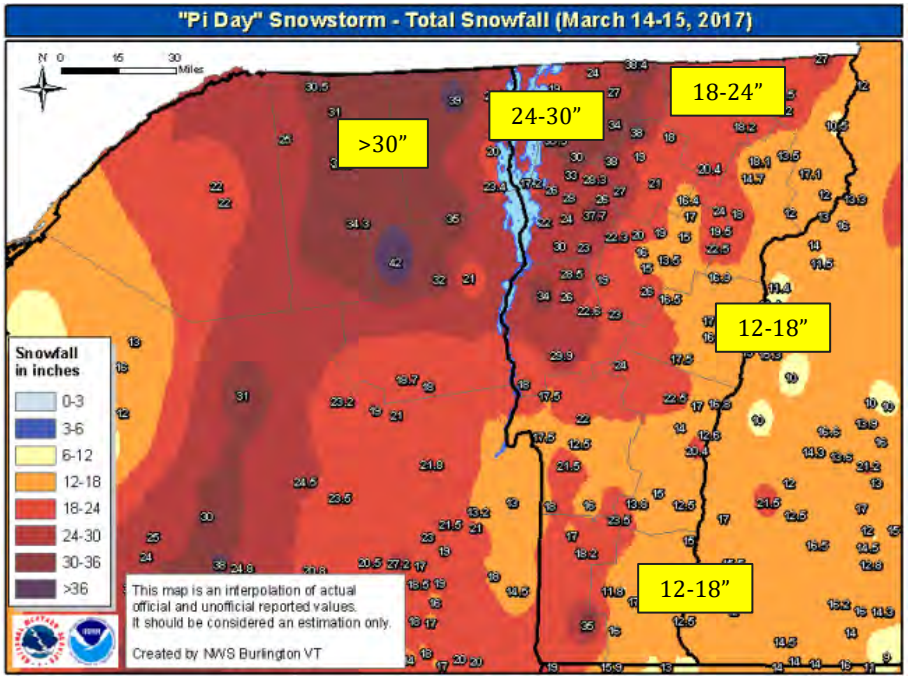
# Two Types of Nor'easters

Origins from the Central Plains and then transfers energy to the Mid-Atlantic coast then moving northeast. (Majority)

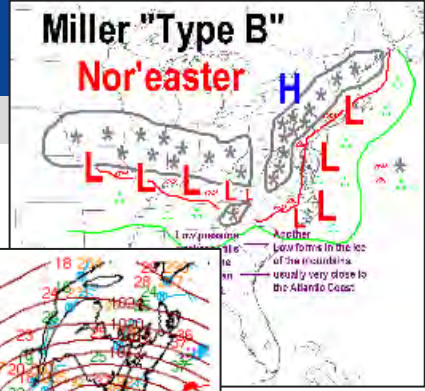


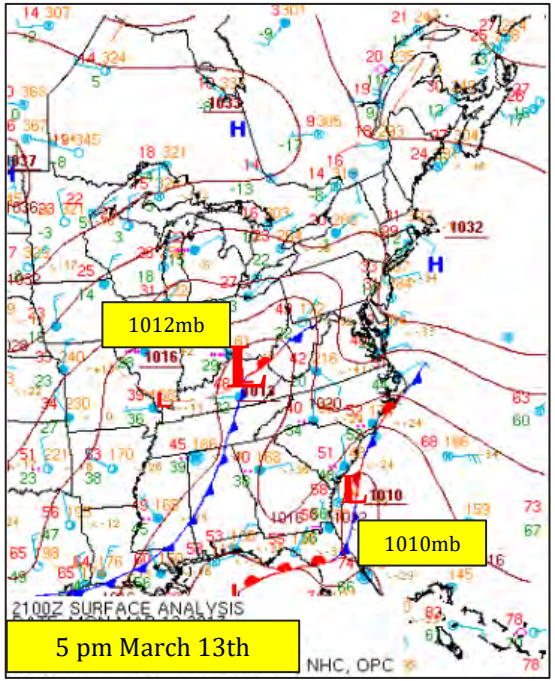




Pi-Day Storm (3/14-3/15) 2017

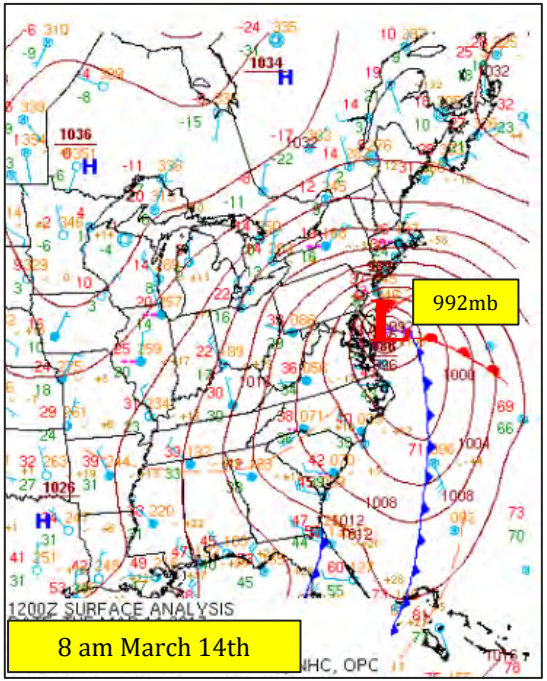


# Pi-Day Storm 2017 (3/14 – 3/15/2017)

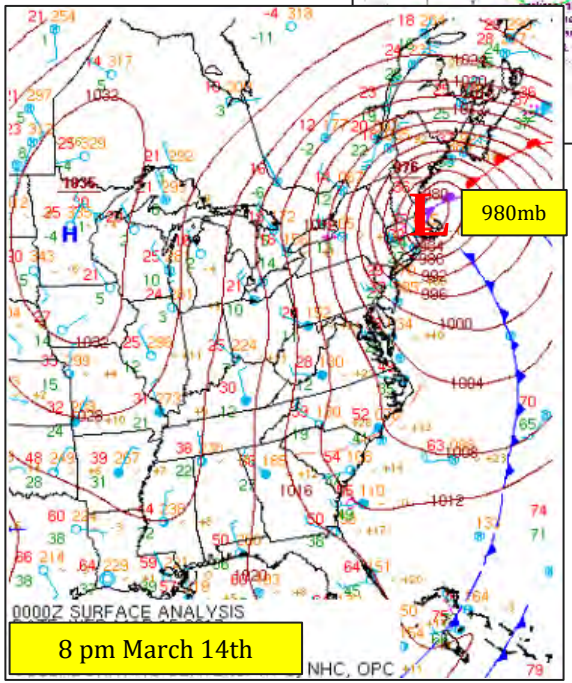



5 pm March 13th



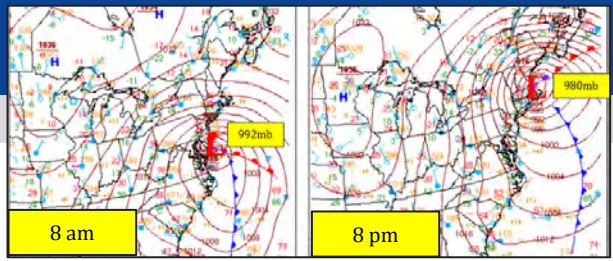

8 am March 14th

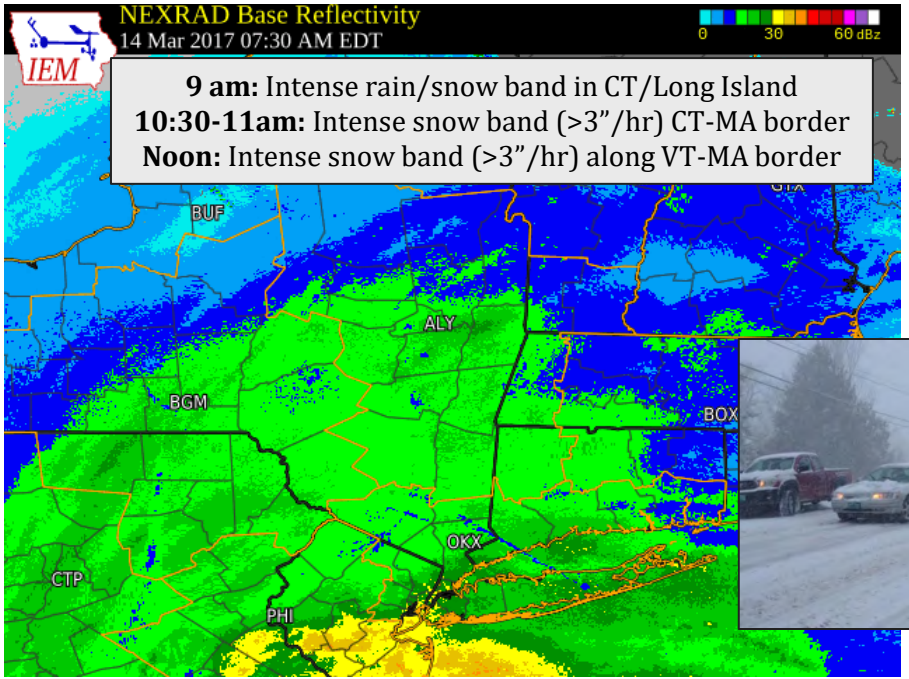



8 pm March 14th

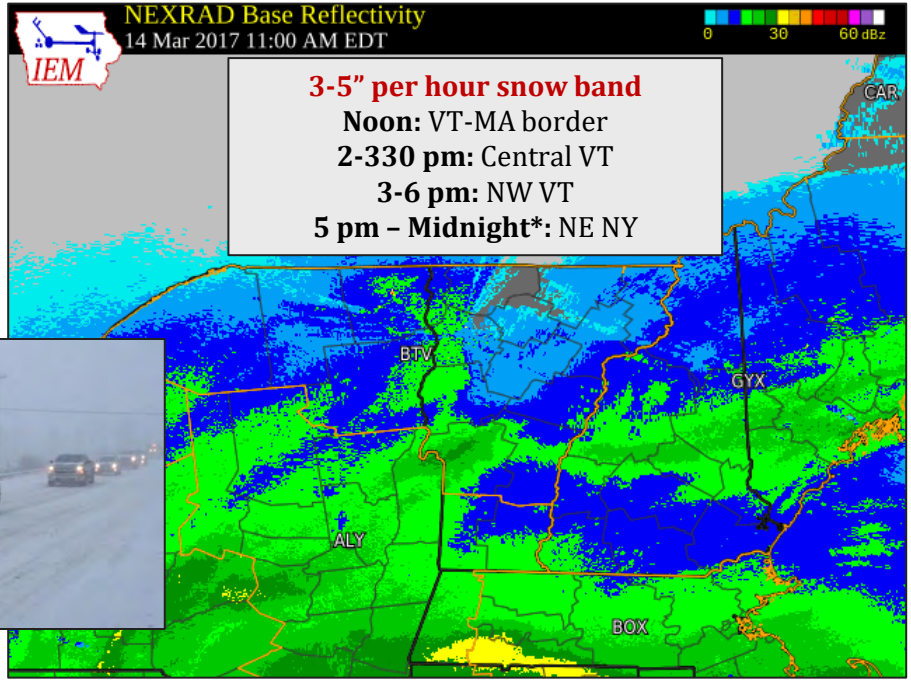
# Pi-Day Storm 2017 (3/14 – 3/15/2017)

**Messaging 1-2+ inch/hr snowfall rates during the afternoon into evening commutes…up to two days in advance.**
**That Day – "Stay off the road!"**




**9 am:** Intense rain/snow band in CT/Long Island
**10:30-11am:** Intense snow band (>3"/hr) CT-MA border
**Noon:** Intense snow band (>3"/hr) along VT-MA border




**3-5" per hour snow band**
**Noon:** VT-MA border
**2-330 pm:** Central VT
**3-6 pm:** NW VT
**5 pm – Midnight*:** NE NY

# Pi-Day Storm 2017 (3/14 – 3/15/2017)

| Table 1. Top 10 Snowstorms for Burlington, Vermont (Records since 1883) | |
|---|---|
| Date | Storm Total Snowfall Amount |
| January 2-3, 2010 | 33.1" |
| March 14-15, 2017 | 30.4" |
| December 25-28, 1969 | 29.8" |
| March 6-7, 2011 | 25.8" |
| February 14-15, 2007 | 25.7" |
| January 13-14, 1934 | 24.7" |
| March 5-6, 2011 | 22.9" |
| March 13-14, 1993 | 22.4" |
| November 25, 1900 | 20.0" |
| January 25-28, 1986 | 19.7" |

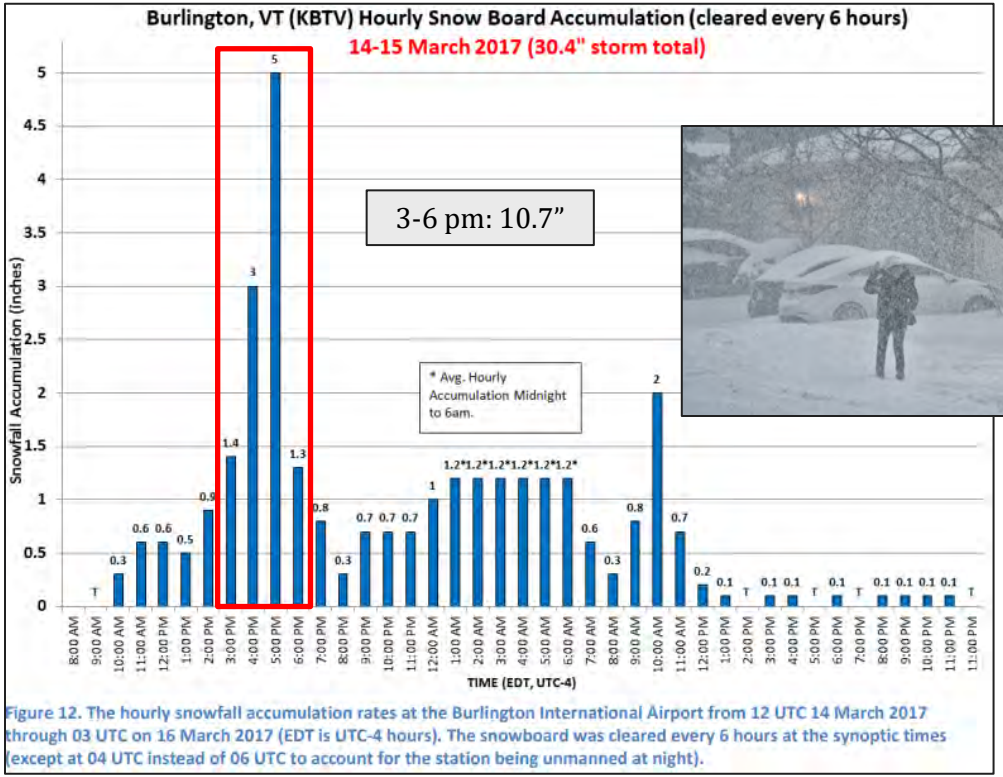
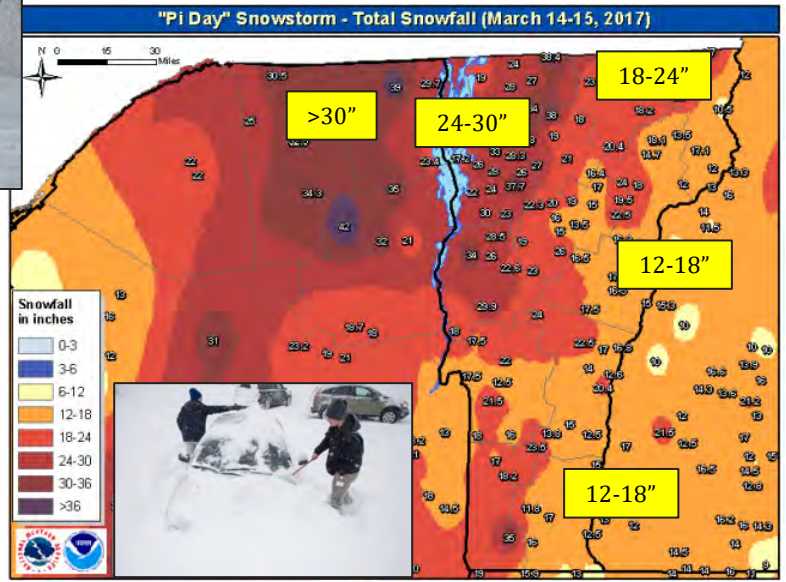
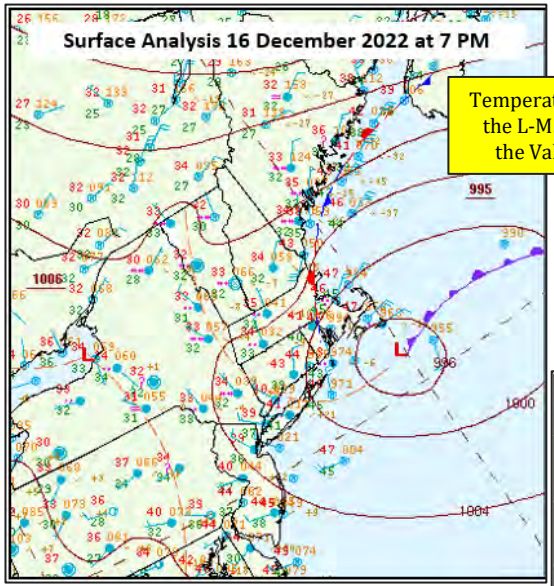



Figure 12. The hourly snowfall accumulation rates at the Burlington International Airport from 12 UTC 14 March 2017 through 03 UTC on 16 March 2017 (EDT is UTC-4 hours). The snowboard was cleared every 6 hours at the synoptic times (except at 04 UTC instead of 06 UTC to account for the station being unmanned at night).

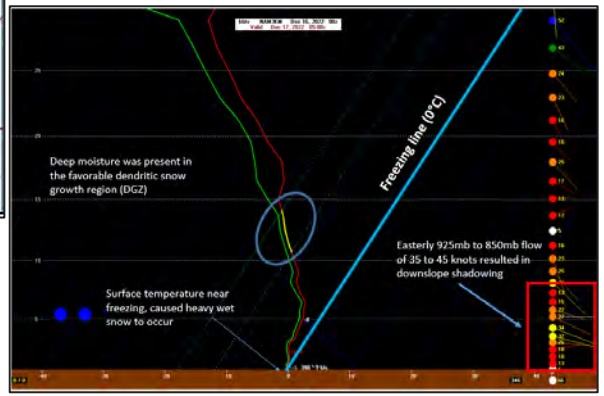


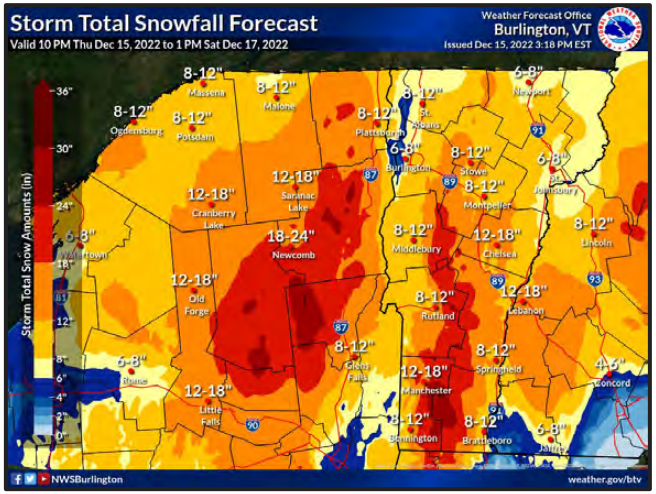
# Early/Late Season WET Snowfalls – Dec 15-17, 2022 / March 14-15, 2023

**WET, Heavy Snow = Power Outages** **DRY, Powdery Snow = Poor visibility, potential drifting**



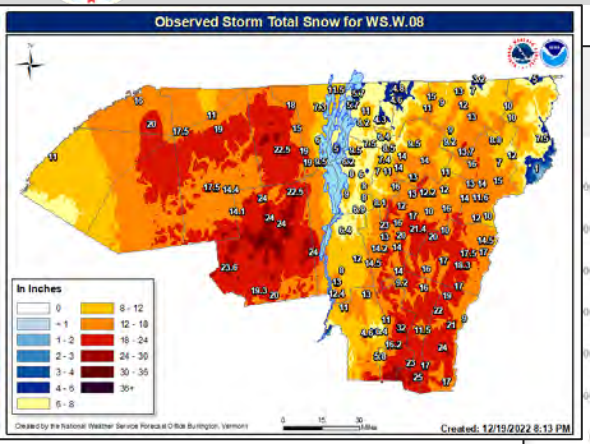

Temperatures in the L-M30s in the Valleys

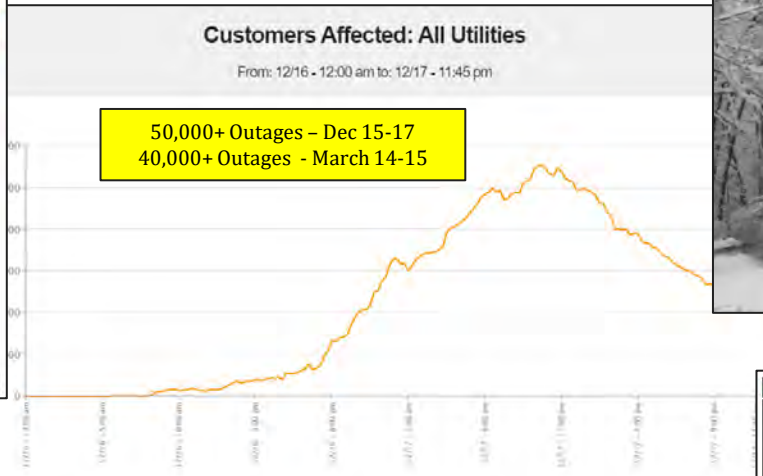




| WET Snow Accumulation | Potential Impacts assuming a Snow/Water Ratio 10:1 or less |
|---|---|
| < 5 inches | Some weighted tree limbs of Conifers and fully leafed trees |
| 5-10 inches (WE .5-1") | Numerous weighted tree limbs and some power lines. Isolated to scattered outages possible. |
| 10-15 inches (WE 1-1.5") | Weighted/snapped tree limbs, especially fully leafed trees. Scattered to Numerous power outages likely. |
| > 15 inches (WE > 1.5") | Numerous downed tree limbs and some snapped trees. Widespread power outages. |

# Early/Late Season WET Snowfalls – Dec 15-17, 2022 / March 14-15, 2023

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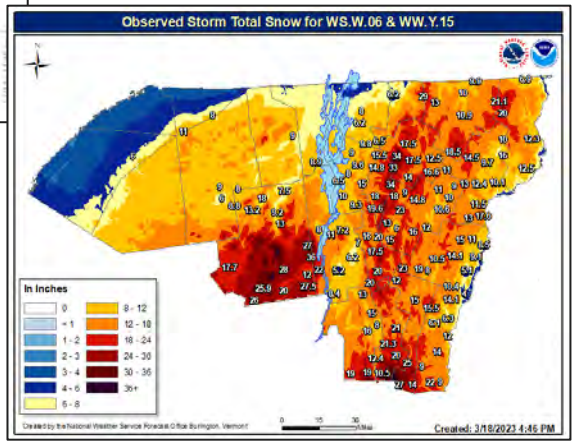
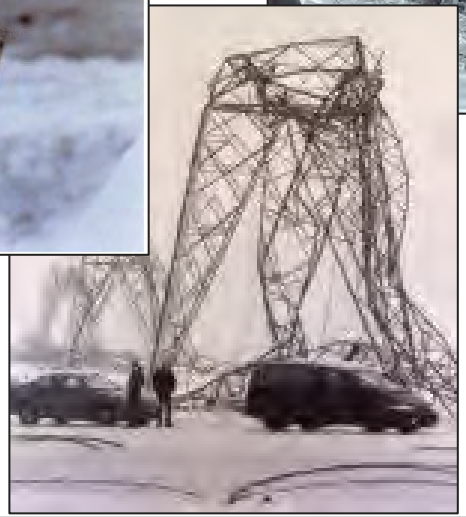
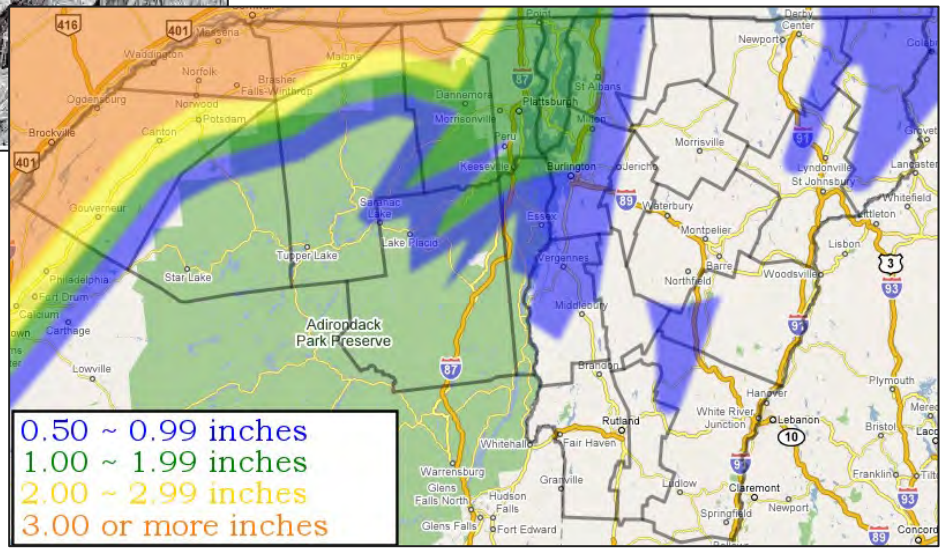


# Ice Storm – January 1998

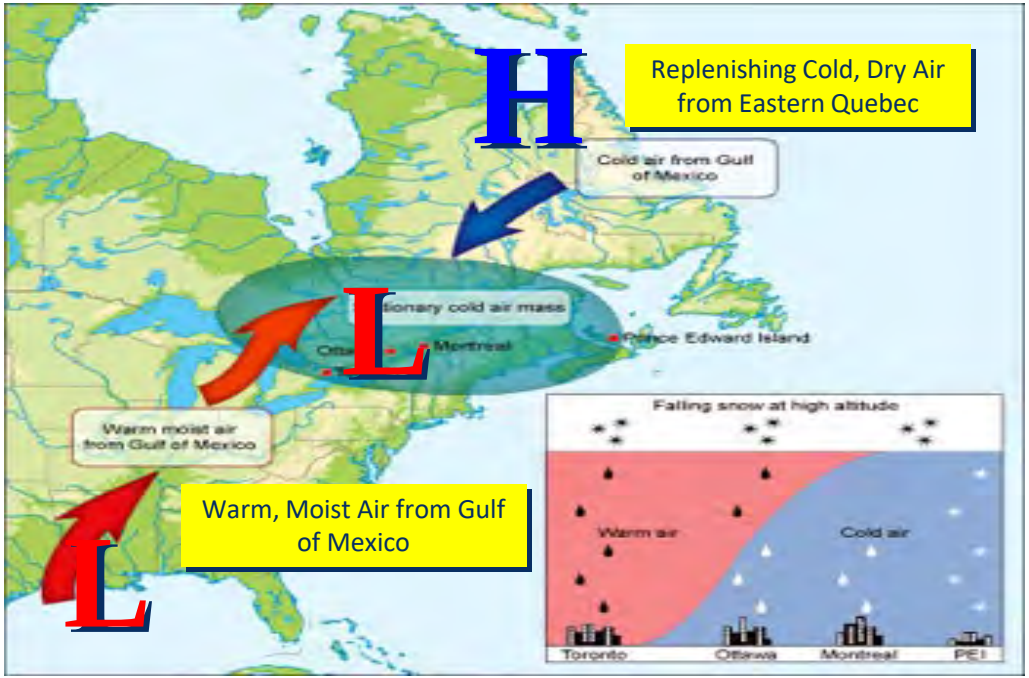
https://www.weather.gov/media/btv/events/IceStorm1998.pdf

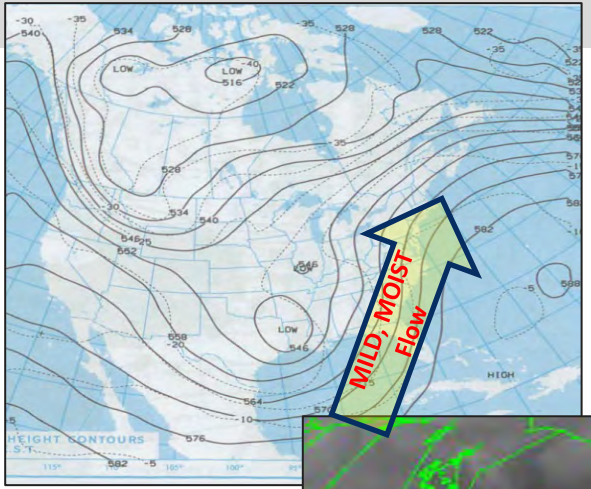


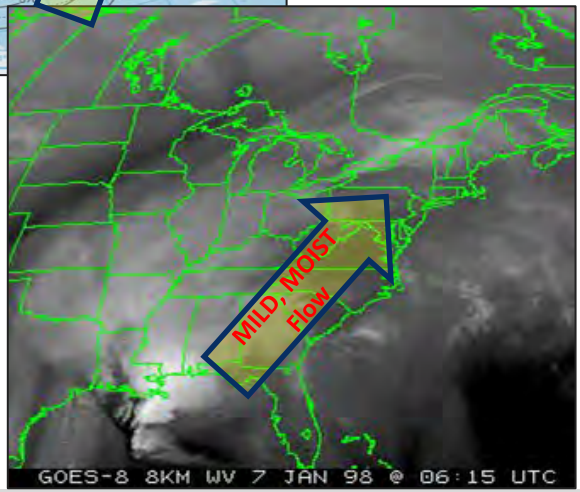


# Synoptic Overview - January 7-10, 1998

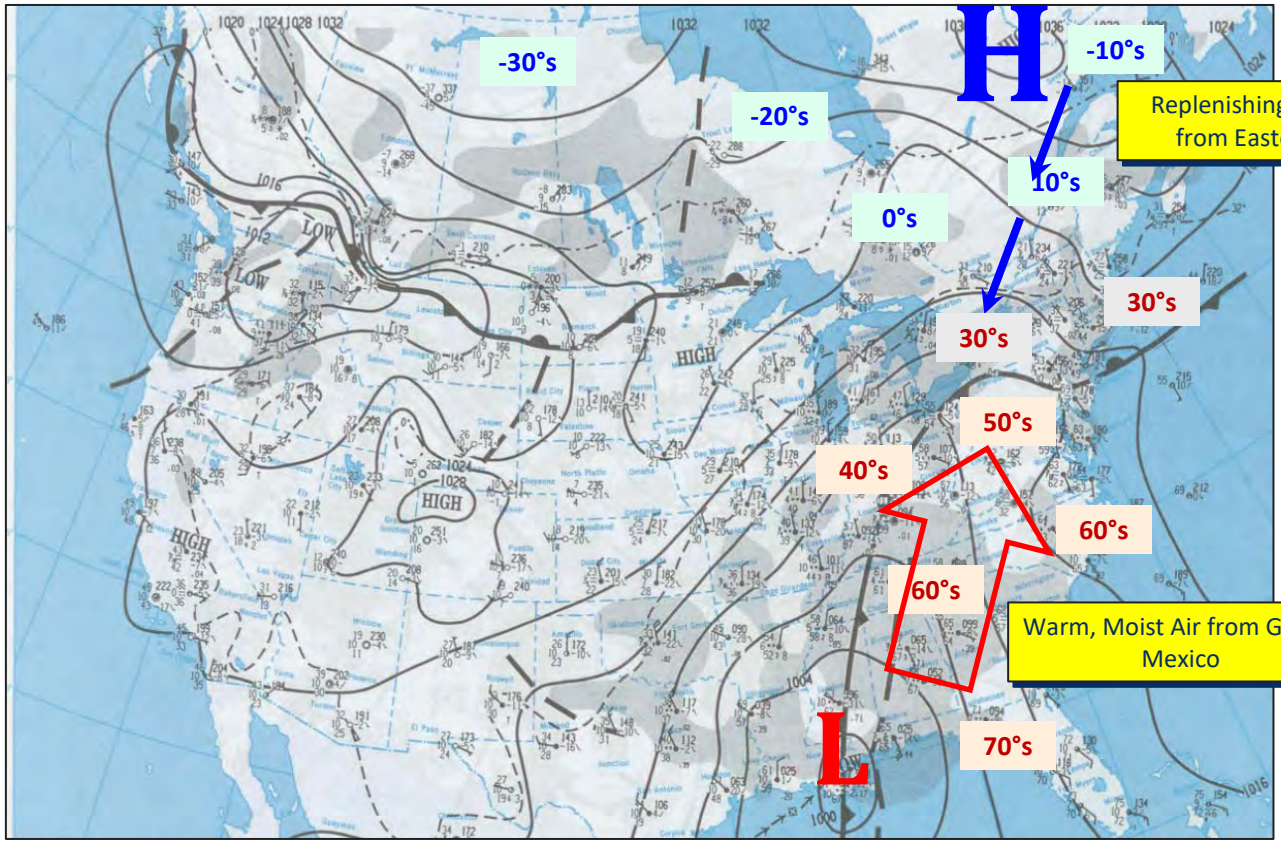
**ICE Storms are the least frequent winter hazard in VT/NY.**
**Ice Storm of 1998 is likely a 50-100 year Event.**



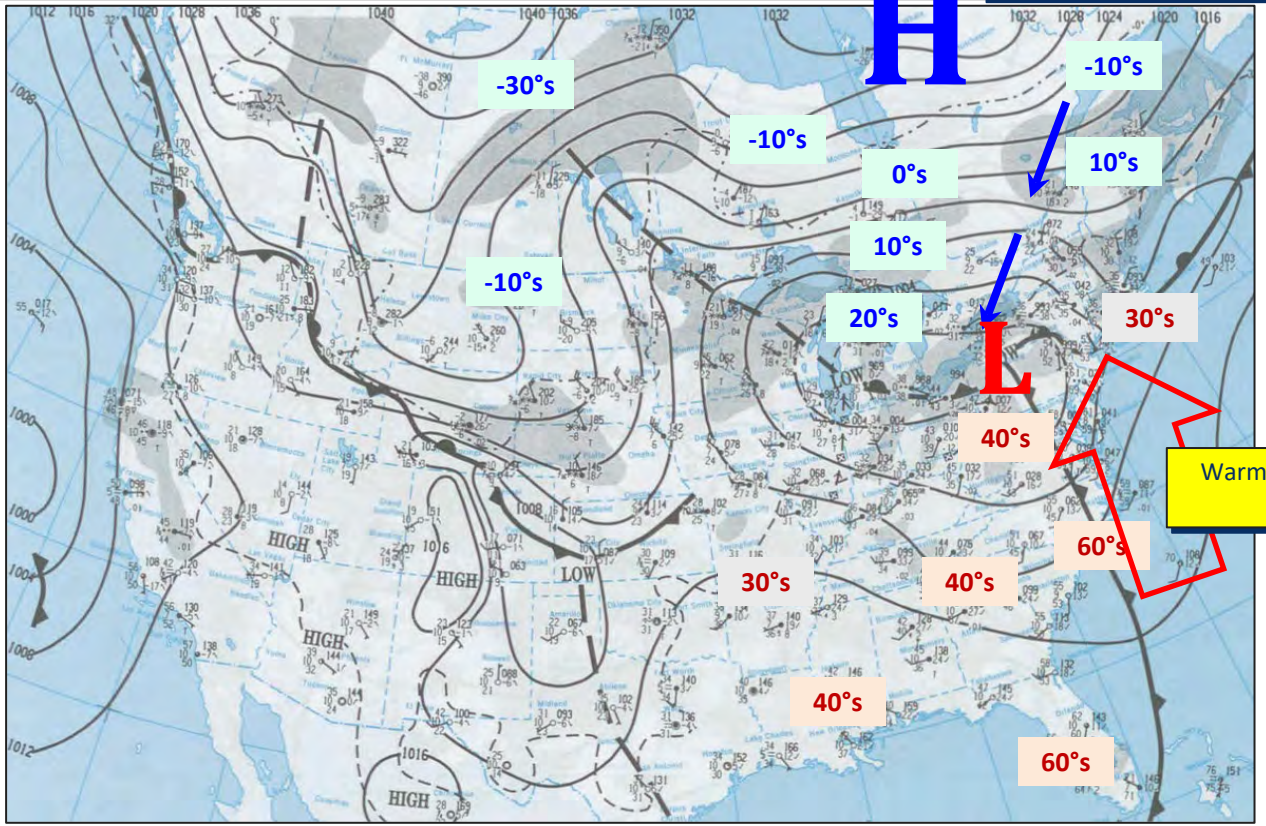



# Surface Map - January 7, 1998

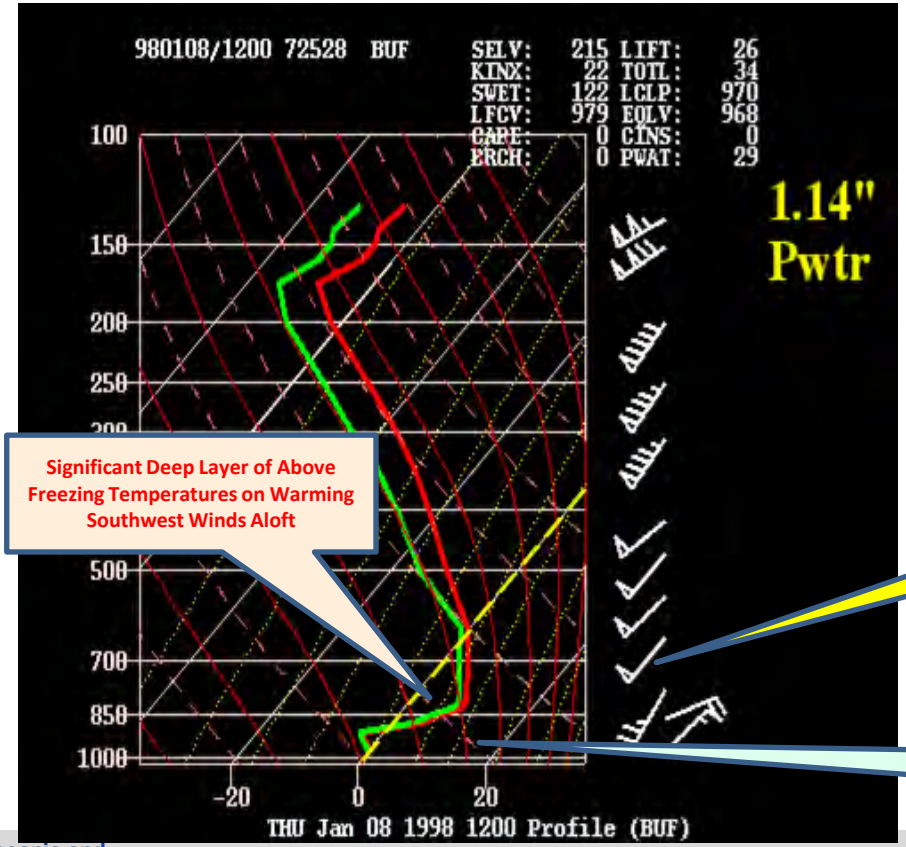


# Surface Map - January 9, 1998

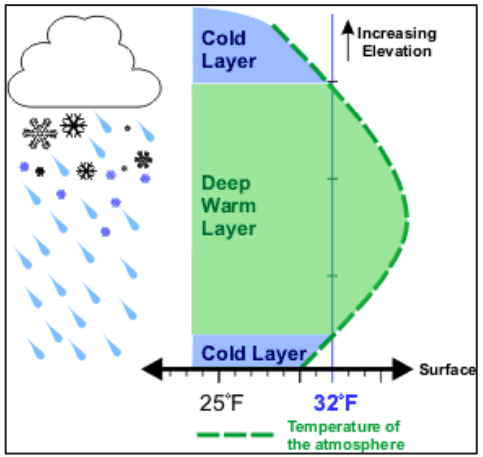


# BUF Sounding

## Vertical Temperature Profiles for Determining Precipitation Type




Significant Deep Layer of Above Freezing Temperatures on Warming Southwest Winds Aloft

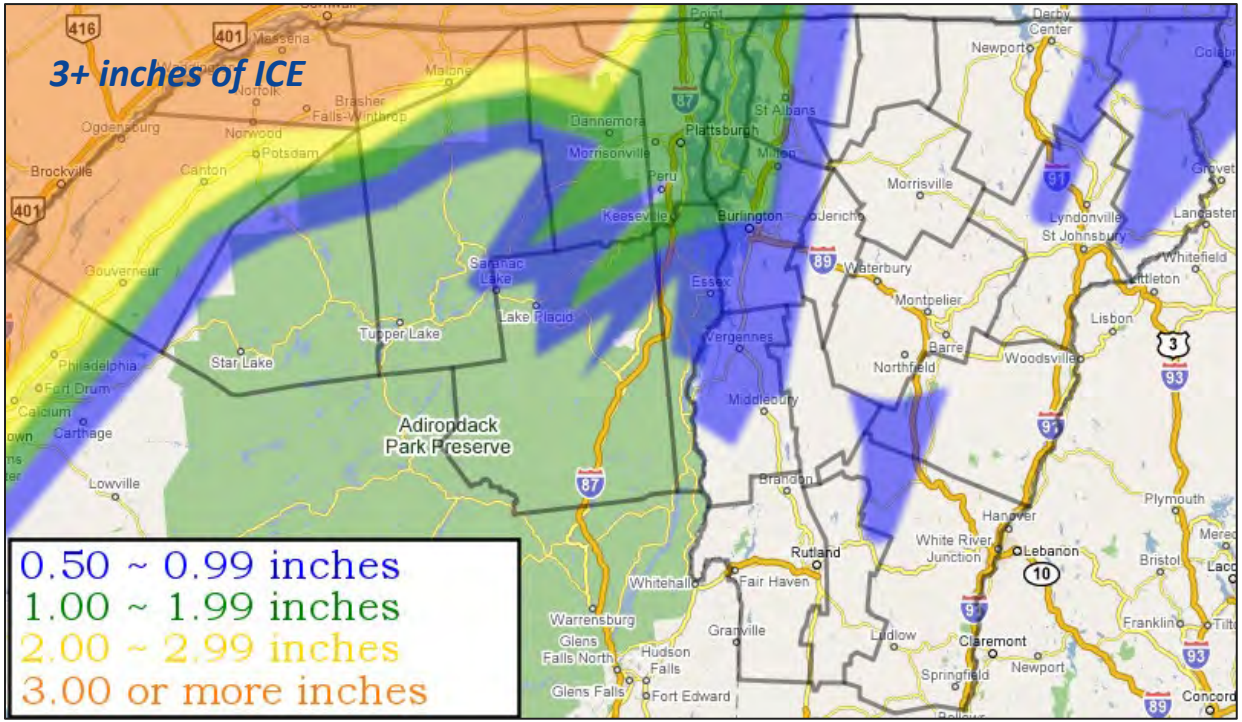



Strong Winds above 8000 feet with Mild/Warm Air and Deep Moisture

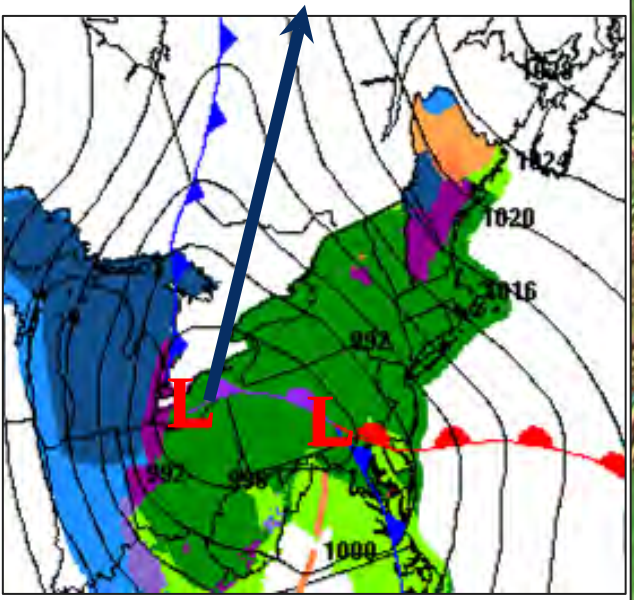
Moderately COLD Northeast Winds in the lowest 1000-1500 feet

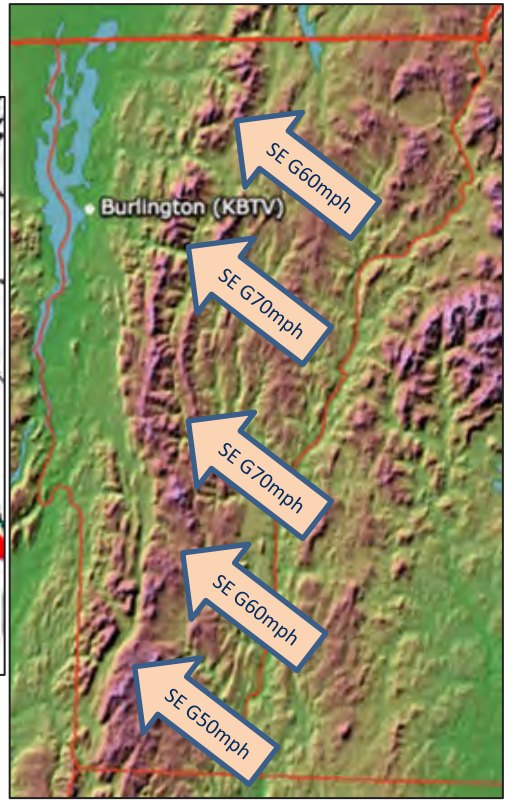
# Ice Storm – January 1998

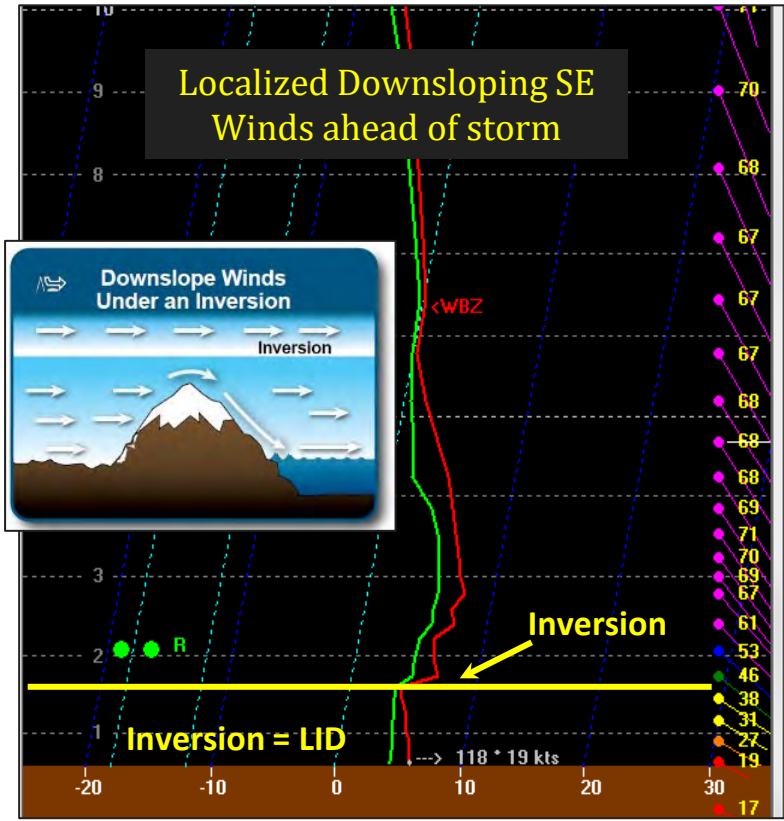
http://www.weather.gov/media/btv/events/IceStorm1998.pdf

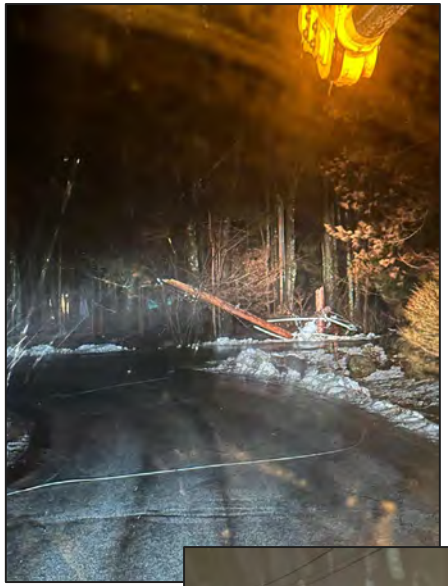
# Climatology/Ingredients of Downsloping Damaging Winds



# December 23, 2022 Wind and Flash Freeze



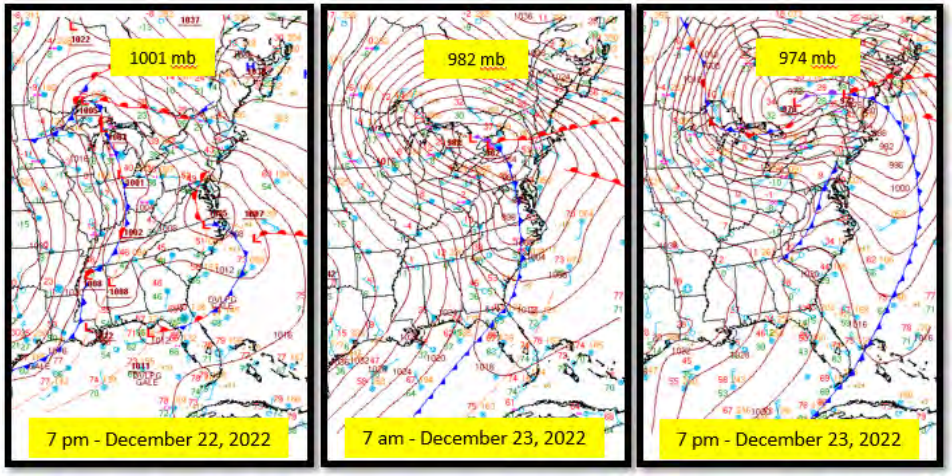
Strong to damaging winds of 50-65 mph on Friday.

Rapidly falling temperatures and flash freeze likely Friday afternoon/evening.

Vermont State Police
@VTStatePolice

VSP responded to 73 weather-related crashes from 12:01AM Friday to 11:59PM Sunday: 32 Friday, 21 Saturday, 20 Sunday. Eleven involved reports of injuries; 21 occurred on Vermont's two interstates. As always, remember to slow down, leave extra time, increase following distance.

# December 23, 2022 Wind

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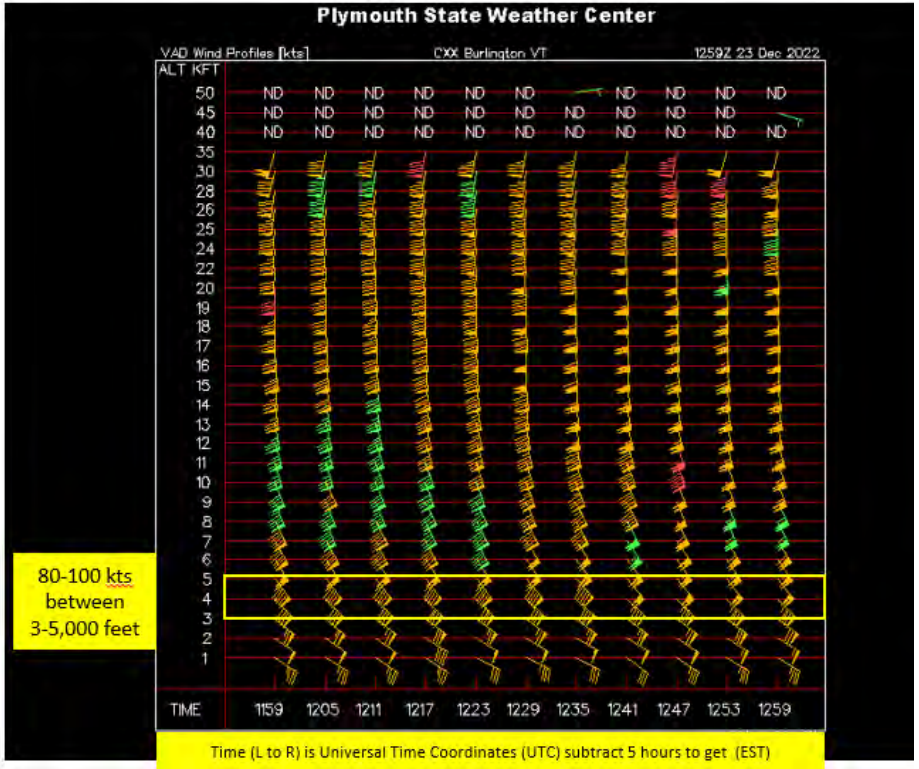
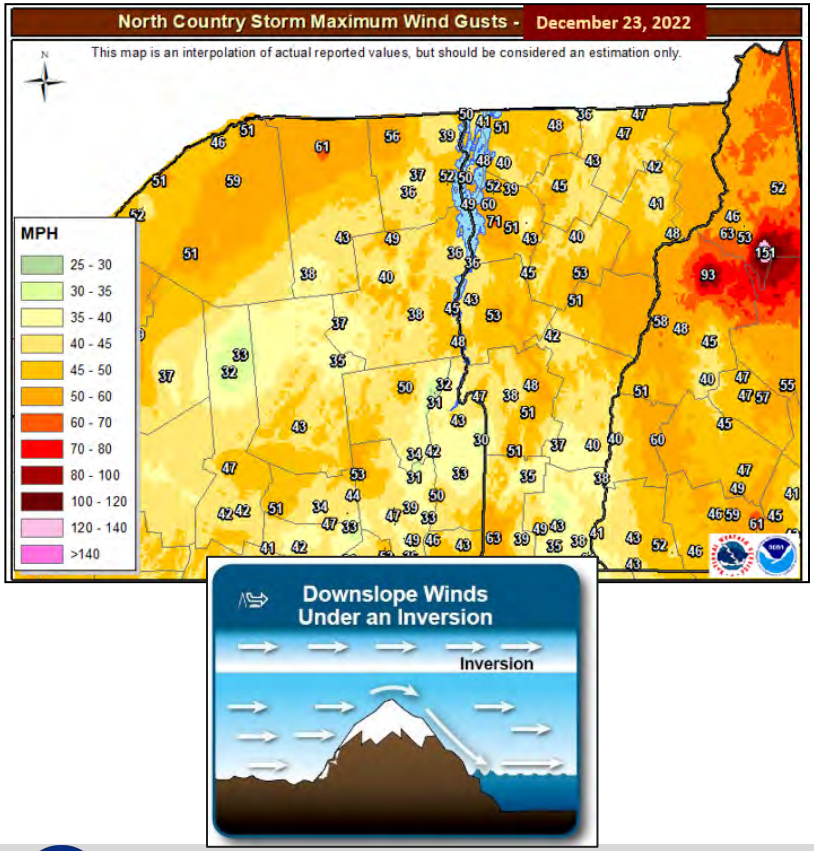



80-100 kts between 3-5,000 feet

# December 23, 2022 Wind

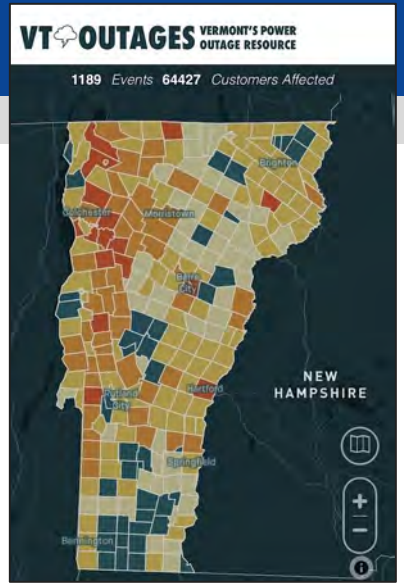


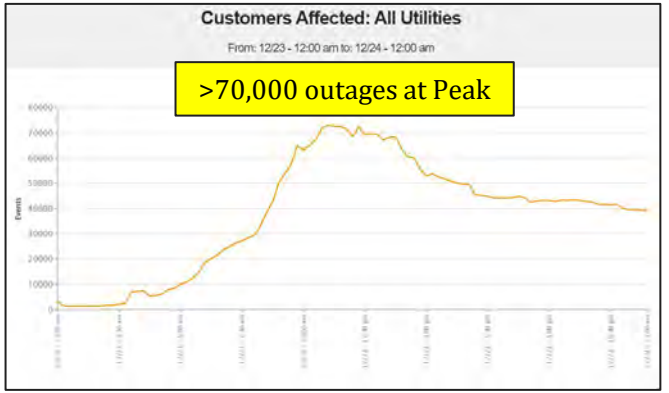




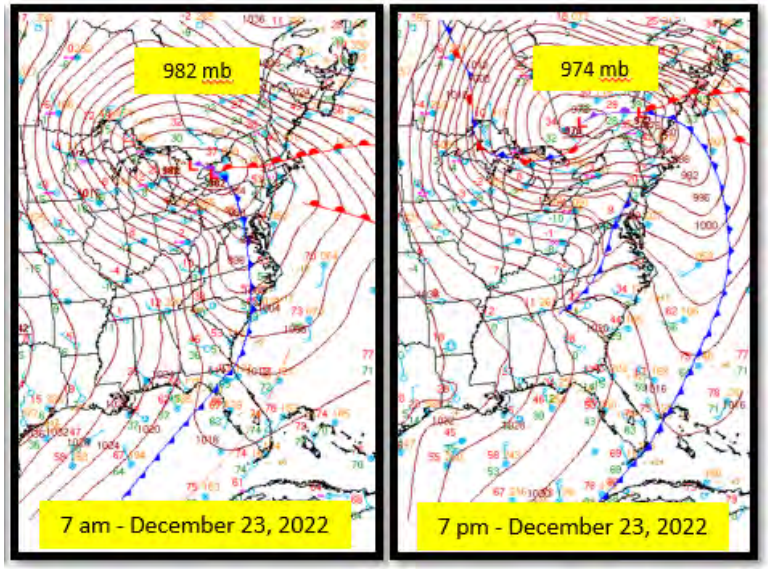
## Mount Mansfield Observations

| Date/Time (L) | Temp. (°F) | Wind Chill (°F) | Wind Direction | Wind Speed (mph) |
|---|---|---|---|---|
| Dec 23, 10:40 am | 37 | 22 | ESE | 43G58 |
| Dec 23, 10:35 am | 37 | 22 | ESE | 46G80 |
| Dec 23, 10:30 am | 37 | 20 | ESE | 59G77 |
| Dec 23, 10:25 am | 36 | 19 | ESE | 60G94 |
| Dec 23, 10:20 am | 36 | 20 | ESE | 53G79 |
| Dec 23, 10:15 am | 36 | 20 | ESE | 50G75 |
| Dec 23, 10:10 am | 36 | 19 | ESE | 55G79 |
| Dec 23, 10:05 am | 35 | 18 | ESE | 55G77 |
| Dec 23, 10:00 am | 35 | 19 | ESE | 50G70 |
| Dec 23, 9:55 am | 34 | 17 | ESE | 53G87 |
| Dec 23, 9:50 am | 34 | 16 | ESE | 59G101 |
| Dec 23, 9:45 am | 33 | 13 | ESE | 73G101 |
| Dec 23, 9:40 am | 33 | 13 | ESE | 70G110 |
| Dec 23, 9:35 am | 33 | 12 | ESE | 78G113 |
| Dec 23, 9:30 am | 33 | 13 | ESE | 76G104 |
| Dec 23, 9:25 am | 33 | 13 | ESE | 70G102 |
| Dec 23, 9:20 am | 33 | 14 | ESE | 67G114 |
| Dec 23, 9:15 am | 33 | 13 | ESE | 70G106 |
| Dec 23, 9:10 am | 33 | 13 | ESE | 72G107 |
| Dec 23, 9:05 am | 33 | 13 | ESE | 71G130 |
| Dec 23, 9:00 am | 33 | 15 | E | 56G114 |
| Dec 23, 8:55 am | 33 | 15 | E | 55G112 |
| Dec 23, 8:50 am | 33 | 13 | E | 75G107 |
| Dec 23, 8:45 am | 33 | 13 | E | 71G103 |
| Dec 23, 8:40 am | 33 | 13 | E | 71G89 |
| Dec 23, 8:35 am | 33 | 14 | E | 67G86 |
| Dec 23, 8:30 am | 33 | 13 | E | 72G101 |
| Dec 23, 8:25 am | 33 | 14 | E | 65G99 |
| Dec 23, 8:20 am | 33 | 12 | E | 85G118 |
| Dec 23, 8:15 am | 33 | 14 | E | 61G84 |
| Dec 23, 8:10 am | 33 | 13 | E | 68G95 |
| Dec 23, 8:05 am | 33 | 13 | E | 71G92 |
| Dec 23, 8:00 am | 33 | 13 | E | 68G89 |



# December 23, 2022 Flash Freeze

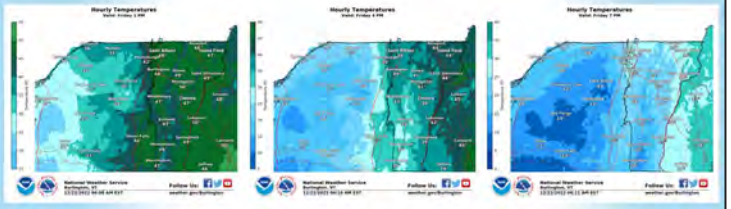



Strong to damaging winds of 50-65 mph on Friday.

Rapidly falling temperatures and flash freeze likely Friday afternoon/evening.

## Rapidly Falling Temperatures Friday

- ✓ Temperatures will rapidly fall below freezing between 1-7 PM Friday from west to east.
- ✓ The potential for a flash freeze appears likely at this time with rapidly falling temperatures and rain changing to snow.



## Flash Freeze Likely This Afternoon

- ✓ Temperatures will rapidly fall below freezing between 1-7 PM today from west to east.
- ✓ Flash freeze is likely with rapidly falling temperatures and rain changing to snow.

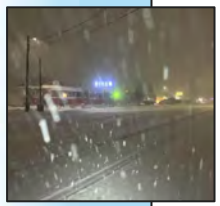
Hourly Temperature Forecast (F)

12/23
Fri

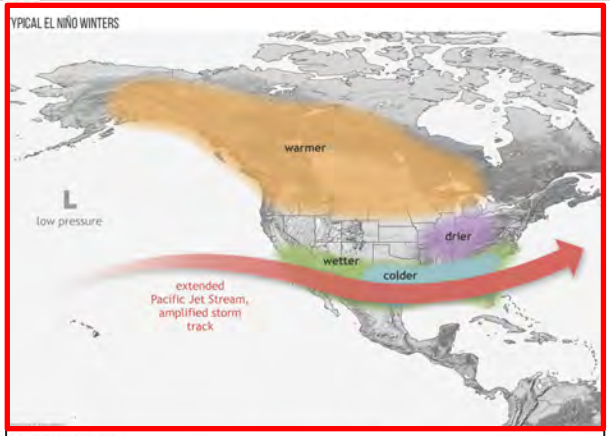
| | 11am | 12pm | 1pm | 2pm | 3pm | 4pm | 5pm | 6pm | 7pm | 8pm | 9pm | 10pm | 11pm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Burlington | 47 | 47 | 47 | 45 | 42 | 36 | 33 | 29 | 26 | 23 | 20 | 18 | 16 |
| Cambridge | 48 | 49 | 48 | 47 | 45 | 43 | 37 | 31 | 28 | 24 | 21 | 17 | 15 |
| Jericho | 48 | 49 | 48 | 46 | 44 | 41 | 36 | 29 | 27 | 23 | 20 | 18 | 16 |
| Lake Placid | 44 | 44 | 41 | 37 | 32 | 25 | 22 | 17 | 15 | 12 | 9 | 7 | 6 |
| Malone | 44 | 44 | 42 | 39 | 32 | 27 | 25 | 21 | 19 | 16 | 15 | 14 | 13 |
| Massena | 41 | 41 | 40 | 36 | 32 | 28 | 26 | 23 | 21 | 19 | 18 | 16 | 16 |
| Middlebury | 51 | 51 | 49 | 46 | 43 | 39 | 34 | 28 | 27 | 23 | 20 | 18 | 15 |
| Milton | 49 | 50 | 49 | 47 | 44 | 41 | 36 | 30 | 27 | 24 | 22 | 18 | 16 |
| Montpelier | 48 | 49 | 48 | 47 | 45 | 43 | 37 | 30 | 27 | 22 | 19 | 16 | 13 |
| Newport | 45 | 46 | 46 | 46 | 46 | 45 | 40 | 36 | 35 | 29 | 24 | 21 | 18 |
| Plattsburgh | 45 | 45 | 45 | 43 | 41 | 36 | 32 | 28 | 25 | 22 | 20 | 18 | 17 |
| Rutland | 50 | 49 | 47 | 45 | 42 | 38 | 33 | 26 | 25 | 21 | 18 | 15 | 14 |
| Saint Albans | 48 | 48 | 47 | 47 | 44 | 41 | 36 | 30 | 27 | 25 | 22 | 19 | 17 |
| Saint Johnsbury | 46 | 48 | 48 | 48 | 47 | 45 | 40 | 36 | 34 | 28 | 24 | 21 | 18 |
| Springfield | 50 | 49 | 45 | 44 | 43 | 40 | 35 | 29 | 27 | 23 | 20 | 17 | 15 |
| Stowe | 46 | 47 | 47 | 46 | 45 | 43 | 37 | 31 | 27 | 22 | 20 | 17 | 15 |
| Waterbury | 47 | 48 | 48 | 46 | 45 | 42 | 36 | 30 | 28 | 23 | 20 | 17 | 14 |
| Williston | 48 | 49 | 48 | 46 | 44 | 41 | 35 | 29 | 27 | 23 | 21 | 17 | 15 |

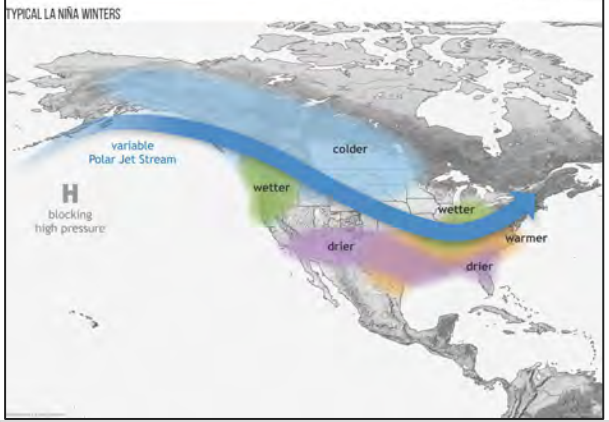
*Table values in °F
**Created: 4 am EST Fri 12/23/2022
***Values are maximums over the period beginning at the time shown.

Don't see your city? Check out weather.gov/forecastpoint

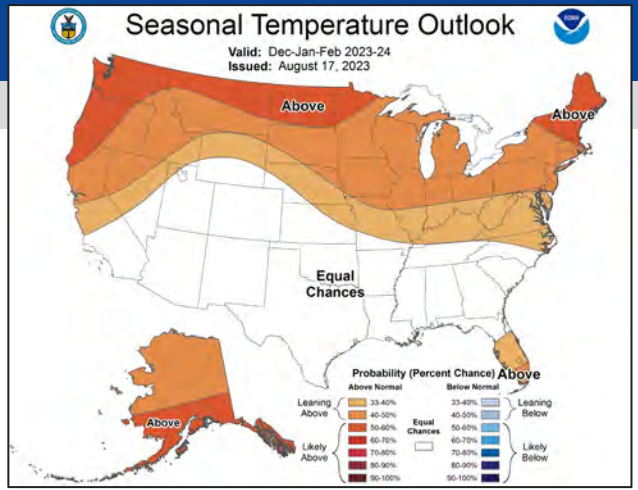


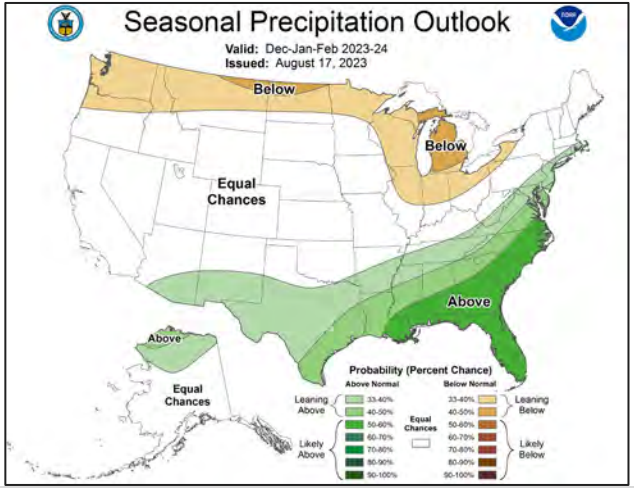
# Winter 2023-24?




| Rank | Season | Mean Avg Temperature | |
|---|---|---|---|
| 1 | 2015-2016 | SE | 30.1 |
| 2 | 2016-2017 | WL | 29.5 |
| 3 | 2022-2023 | WL | 29.0 |
| 4 | 2001-2002 | N | 28.7 |
| 5 | 2011-2012 | ML | 27.8 |
| 6 | 1932-1933 | NA | 27.5 |
| 7 | 1905-1906 | NA | 27.3 |
| 8 | 1936-1937 | NA | 26.3 |
| 9 | 2019-2020 | N | 26.1 |
| 10 | 1931-1932 | NA | 25.9 |



# Questions?

- NWS Burlington webpage – www.weather.gov/btv
- NWS Burlington Winter Webpage - www.weather.gov/btv/winter


- **If you need to reach a forecaster 24/7**, then please use the following contacts. 802-658-0150 or nwsbtv.info@noaa.gov
- Scott Whittier – scott.whittier@noaa.gov