National Weather Service Burlington Weather Forecast Office

Virtual Skywarn Presentation - Fall 2023

Robert Haynes - NWS Burlington

Photo: Burlington Airport from Jessica Neiles

Presentation Layout

- What is Skywarn? What does it mean for us?
- Overview of the National Weather Service in Burlington
- Winter Hazards and Safety
- Winter Weather and Winter Storms
- How to Measure Snow and Ice
- Reporting on mPING – Addition of Snow Squalls

Why do we need Spotters?

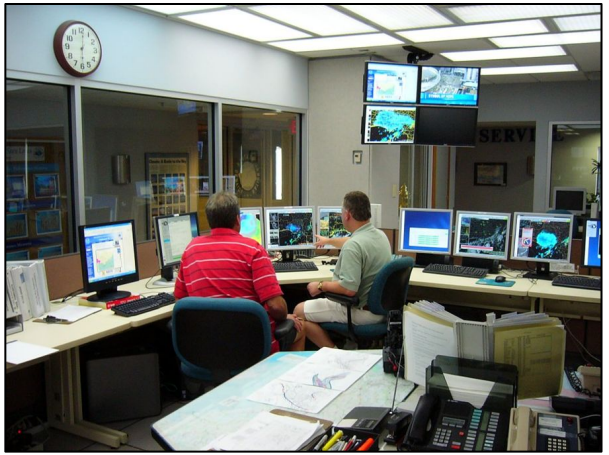
The United States is the most severe weather prone country in the world

A typical year brings:

- 10,000 thunderstorms
- 5,000 floods
- 1,200 tornadoes
- 6 hurricanes
- 500 deaths and 5000 injuries
- $15.0 Billion in Losses
- 98% of all presidentially declared disasters are weather related

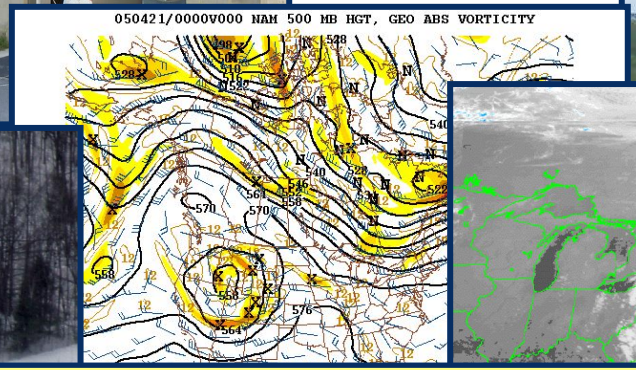
What is Skywarn?

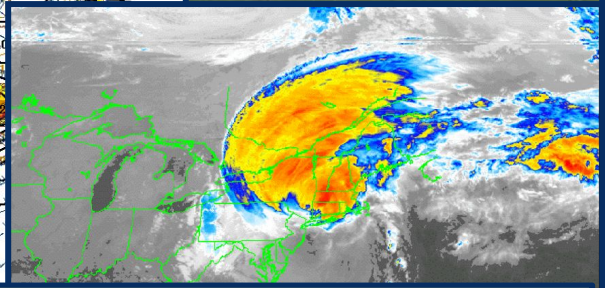
A nearly 60 year old program that trains people to recognize and report severe/hazardous weather to help meteorologists make life-saving decisions



Why Do We Need Spotters?

- ✔ We use all kinds of methods to make weather observations.
  - ✔ *Surface Observations*
  - ✔ *Upper Air Observations*
  - ✔ *Computer Models*
  - ✔ *Satellite Imagery*
  - ✔ *Radar*





But they all have limitations

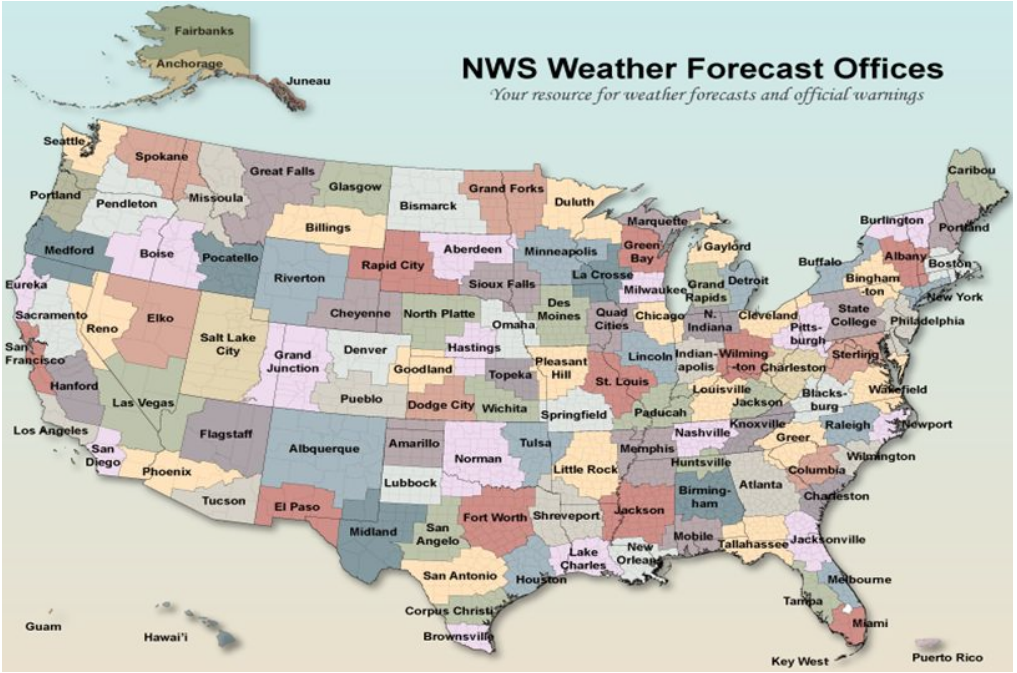
What is the National Weather Service?

NWS Mission

Provide weather, water, and climate data, forecasts and warnings for the protection of life and property and enhancement of the national economy.

NWS Vision

A Weather-Ready Nation: Society is prepared for and responds to weather, water, and climate-dependent events.



NOAA Strategic Plan - Adjusting for Climate Change & Social Science

NOAA STRATEGIC GOAL 02

MAKE EQUITY CENTRAL TO NOAA'S MISSION

As NOAA tackles the climate crisis by building a Climate Ready Nation, it will strive to ensure the needs of the nation's underserved and vulnerable communities are met. To meet this challenge, NOAA is making equity central to every facet of its mission delivery services and is working internally to create a model agency that draws from the full diversity of the nation, where everyone is treated with dignity and respect.

2.1 BUILD A MODEL WORKPLACE.

NOAA is firmly committed to increasing the diversity of its workforce and creating a more inclusive work environment where everyone feels valued, is treated fairly and experiences a true sense of belonging. A key outcome of this plan is to fully integrate diversity, equity, inclusion and accessibility (DEIA) into NOAA's business practices and organizational culture and thereby strengthening NOAA's ability to recruit, hire, develop, promote and retain diverse talent and remove barriers to equal opportunities.

2.2 SUPPORT UNDERSERVED AND VULNERABLE COMMUNITIES.

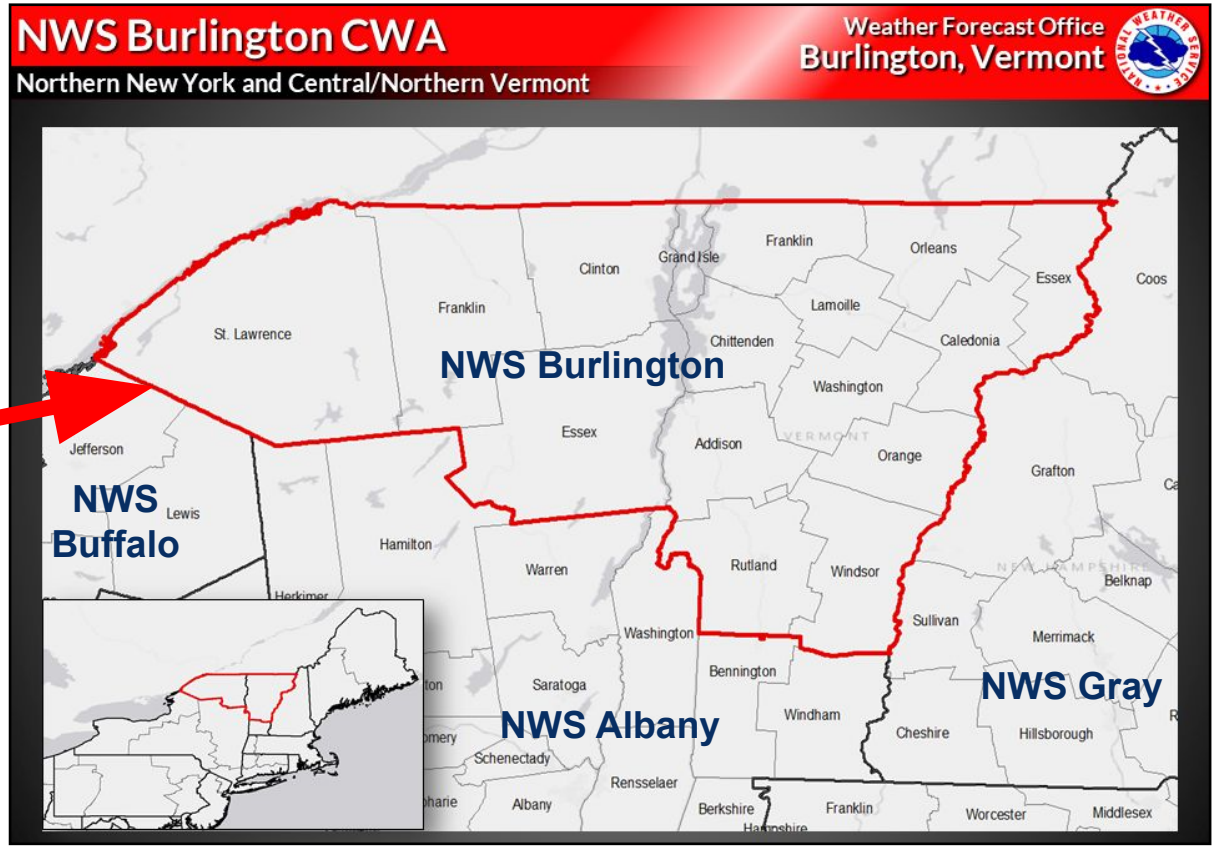
Underserved communities — those that have been systematically denied a full opportunity to participate in aspects of economic, social and civic life — are often disproportionately impacted by increasing extreme weather, water, ocean and climate events. NOAA will expand equity-focused products and tools to address these impacts by leveraging its deep experience in service delivery and regional collaboration and partnerships with underserved communities.

Hierarchy


Western Region
Central Region
Eastern Region
Space Weather Prediction Center
Space Environment Center
Aviation Weather Center
NCEP Central Operations
Climate Prediction Center
Weather Prediction Center
Environmental Modeling Center
Ocean Prediction Center
Storm Prediction Center
Alaska Region
Southern Region
Tropical Prediction Center
Puert Rico
Pacific Region
Regional Offices
National Centers
River Forecast Centers
Weather Forecast Offices

Where Do We Service?

- We service all of Vermont, except Bennington and Windham Counties, and the 4 northernmost counties of New York.



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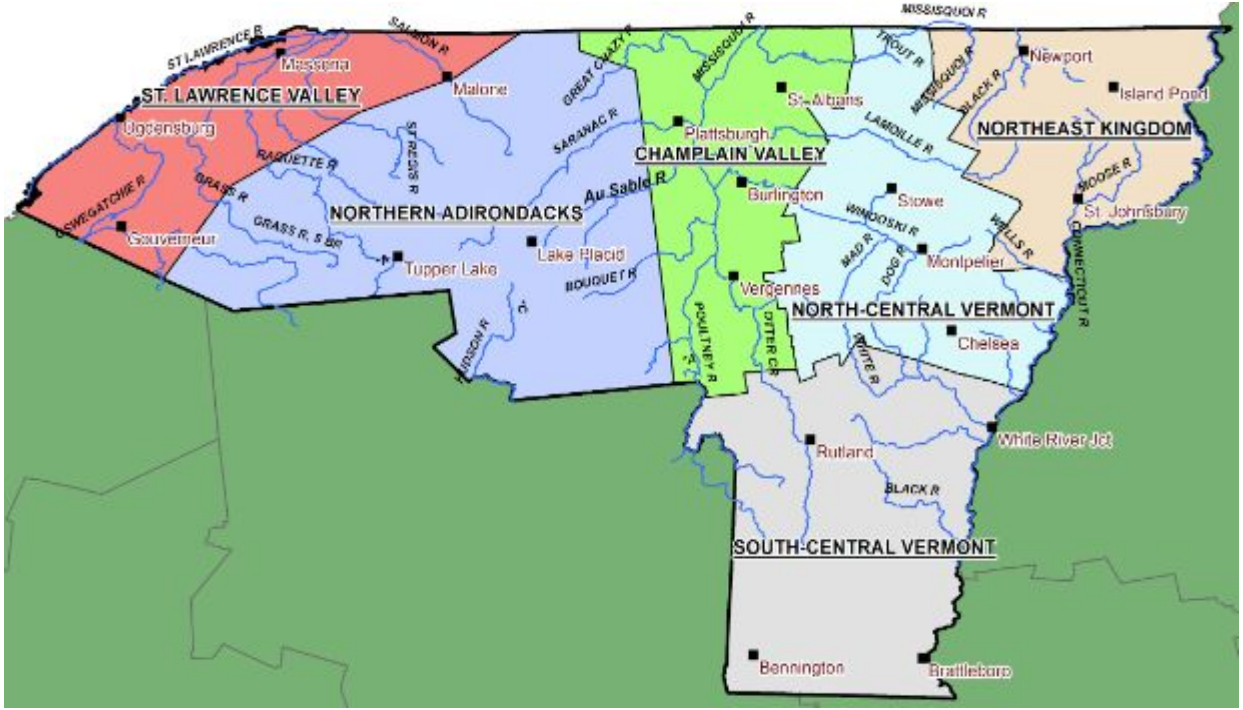


Not Just Meteorologists

Staffing

In addition to meteorologists, we have:

- Senior Service Hydrologist
- Information Technology Officer
- Electronic Technicians
- Administrative Assistant
- Observation Program Leader
- Electronic Systems Analyst

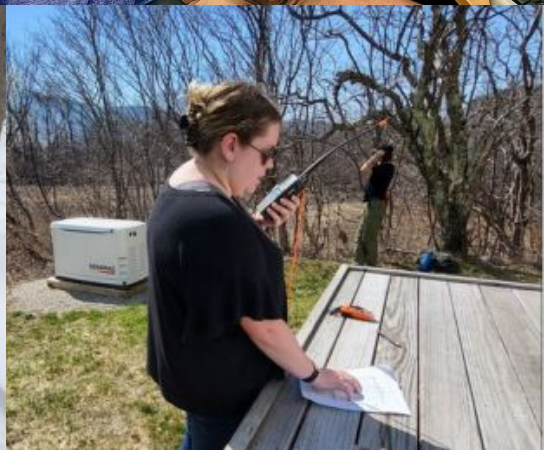
What do we do?

Some of our Duties

- Watch/Warning/Advisory
- Public Forecasts
- Aviation
- Hydrology
- Fire Weather Forecasts
- Marine Forecasts
- Data Management
- Climate Services
- Upper Air
- Hazmat Support
- Systems Management
- Research and Training
- Outreach








VT Heat Vulnerability Index

VERMONT
DEPARTMENT OF HEALTH

Heat Vulnerability Measures

Population Characteristics:

1. % population less than 5 years old
2. % population 65 years old or older

Socioeconomic Characteristics:

3. % population living below Federal Poverty Line
4. % adult population with no high school diploma
5. % adults 65 and older living alone
6. % adult population with no health insurance

Health Conditions:

7. % adults with diabetes
8. % adults with asthma
9. % adults with hypertension
10. % adults who are obese
11. % adults in fair or poor health
12. All-cause mortality, warm season deaths

Environmental Characteristics:

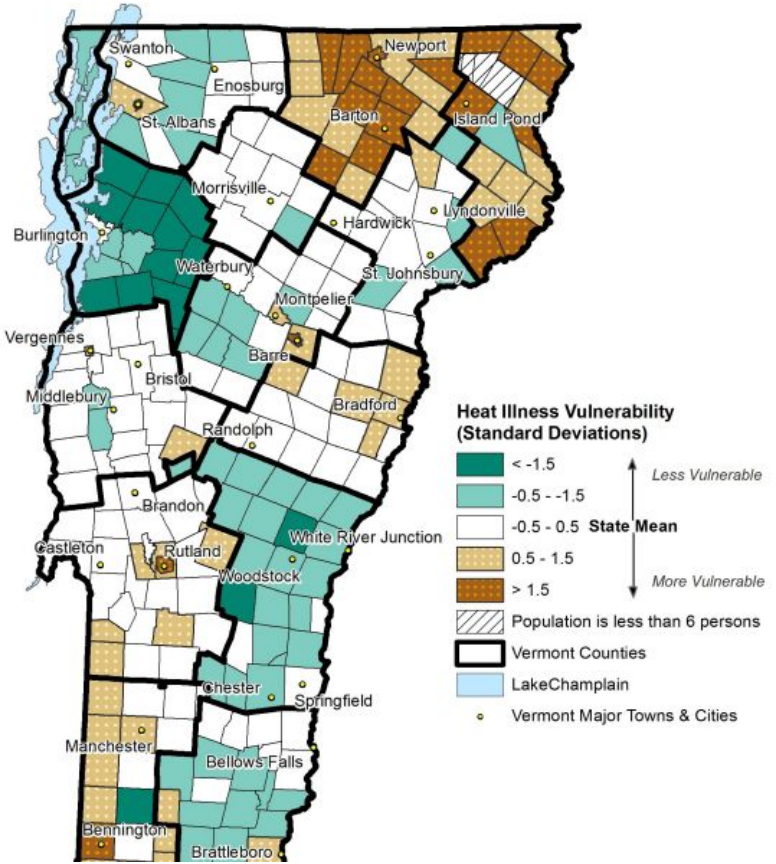
13. Housing units per square mile
14. % covered with Impervious surface
15. % covered by forest canopy

Climate Characteristics:

16. Average number of days per year 87° F or hotter

Observed Heat Illness:

17. Heat-related emergency department visits



VT is getting more diverse

The racial and ethnic makeup of Chittenden County

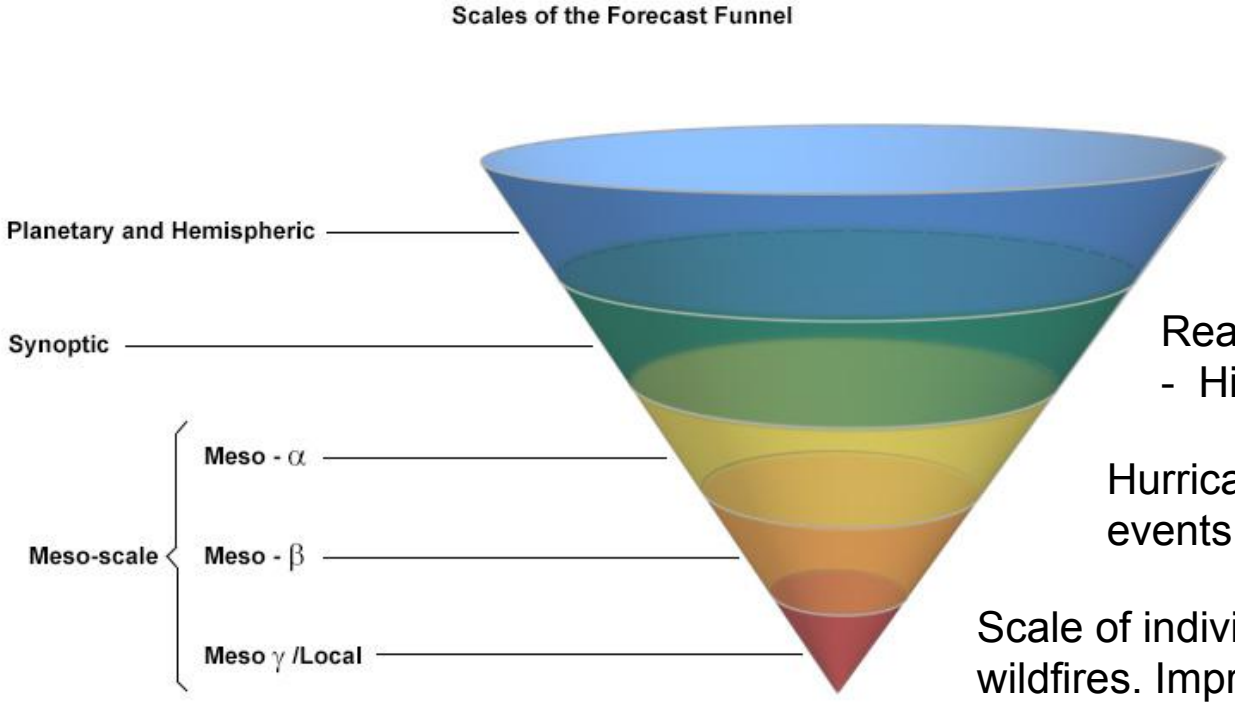
While non-Hispanic white residents remain the largest category, people of color represent an increasing percent of the population.

Category	Population 2020	Change since 2010	Percent change since 2010
White non-Hispanic	142,880	32	0.0%
Hispanic or Latino	4,751	1,895	66.4%
Black or African American	4,757	1,585	50.0%
Asian	7,203	2,835	64.9%
Some Other Race*	762	590	343.0%
Two or more races*	7,630	4,914	180.9%

** changes to how the Census asked about and reported "other race" and multiracial people led to nationwide increases in these two categories.*

Table: Erin Petenko • Source: 2010 and 2010 Dicennial Census • Get the data • Created with Datawrapper

From Global Scale to Your Home



Seasons, monsoons, "Polar Vortex".

Realm of weather patterns
- High and Low pressure.

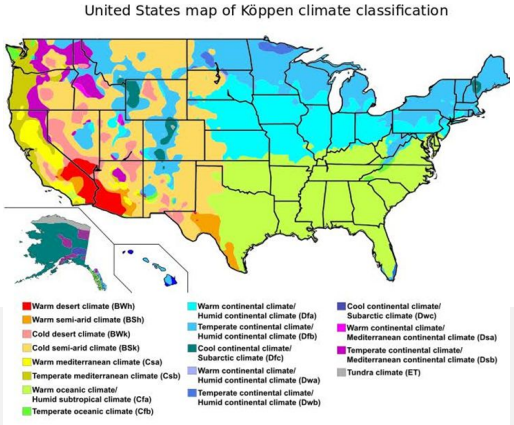
Hurricanes, Derecho events, Fronts.

Scale of individual thunderstorms or wildfires. Impractical to forecast exact detail a week in advance.

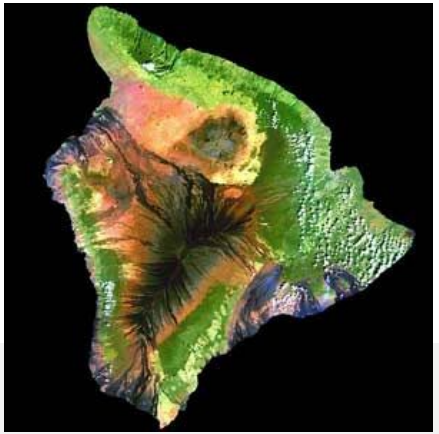
What Exactly Is Weather?

Weather	Climate
Day-to-Day	Long term – (20-40 years)
Fronts and High/Low Pressure	Planetary Circulations
Cold Snap/Heat Wave	Frequency, “Return intervals”

Climate is the baseline or “normal”, and weather describes the day to day conditions.



Climate zones can be tightly packed. For instance, the Big Island of Hawaii has 11 climate zones.



Images: NOAA Scijinks

What Drives Changes in Weather and Climate?

- The Sun - How much and land surface it hits
- Mountains, valleys, oceans, trees, sand
- Chemistry (heat exchange in evaporation or absorption, like with Greenhouse gases)

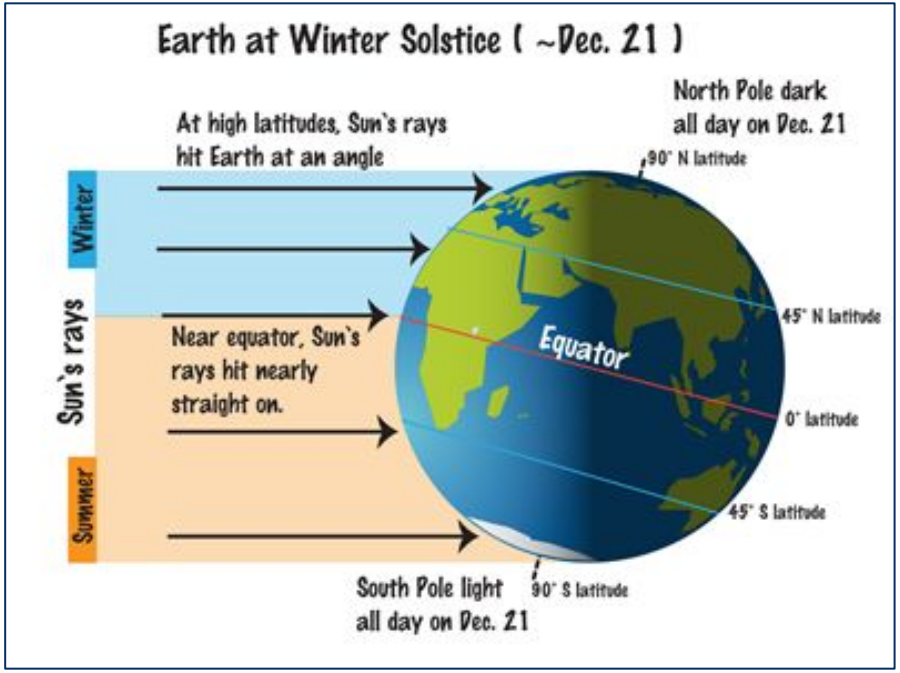


Image: NOAA Scijinks

Days with mean Max T ≥ 85°F in Burlington area

Maximum 1-Year Mean Avg Temperature for Burlington Area, VT (ThreadEx)

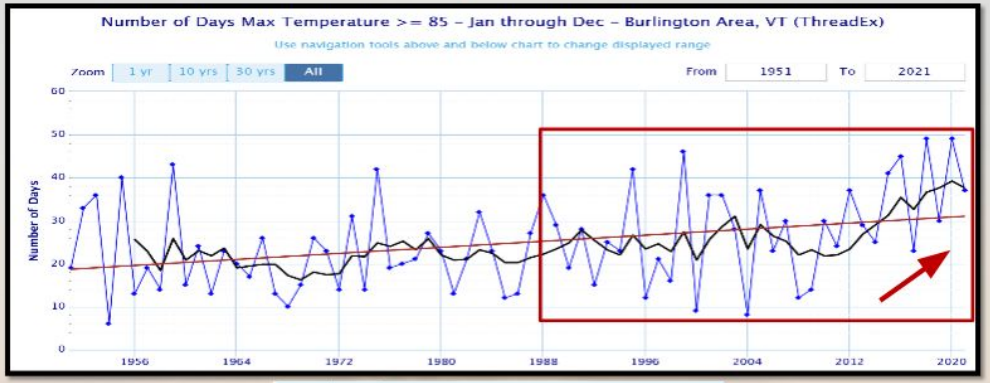
Click column heading to sort ascending, click again to sort descending.

Rank	Value	Ending Date	Missing Days
1	50.0	2012-12-31	0
2	49.5	2021-12-31	0
3	49.5	2020-12-31	0
4	49.3	2016-12-31	0
5	48.8	2017-12-31	0
6	48.7	2022-12-31	0
7	48.4	1998-12-31	0
8	48.2	2006-12-31	0
9	48.1	2018-12-31	0
10	48.1	1898-12-31	1
11	48.1	2010-12-31	0

9 of top 11 warmest years in Burlington's climate history have occurred in the 21st century. In fact, the top 6 warmest years have occurred after 2010.

Trend of Summer Mean Maximum Temperatures

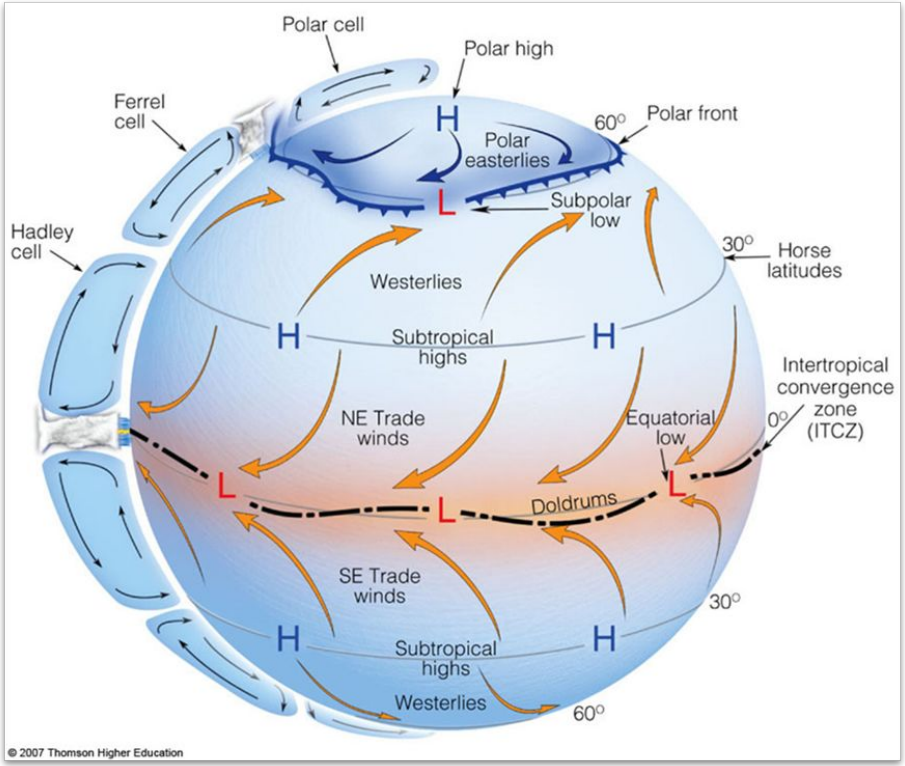
Days ≥ 85°

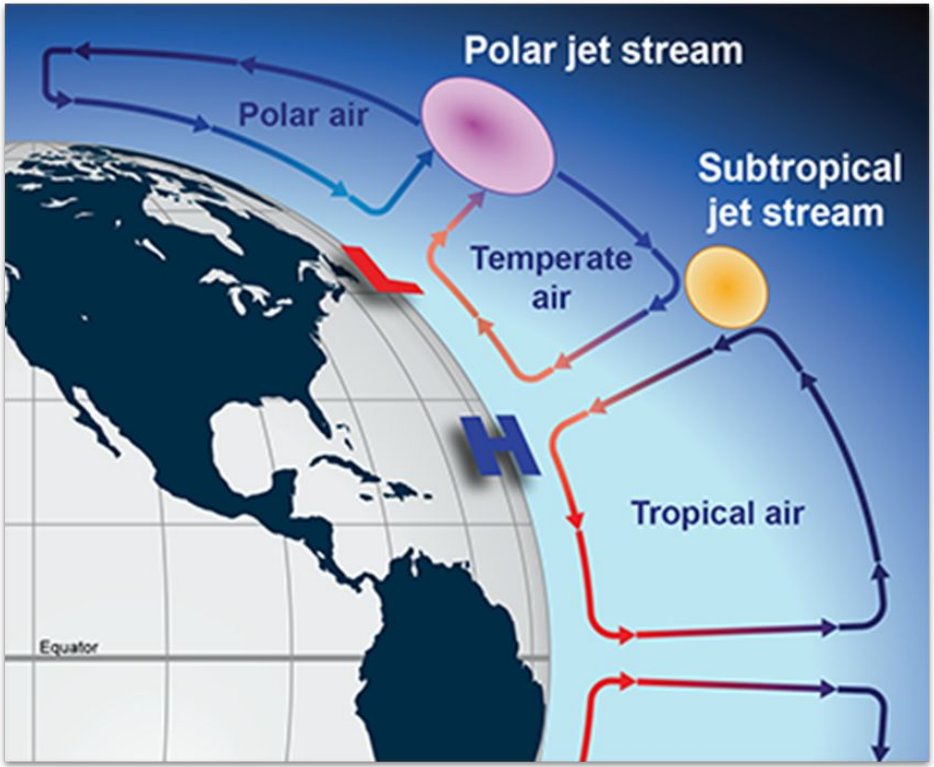


Rank	Year	Number of Days Max Temperature >= 85
1	2020	49
-	2018	49
3	1999	46
4	2016	45
5	1959	43
6	1995	42
-	1975	42
8	2015	41
9	1955	40
10	2021	37
-	2012	37
-	2005	37

6 of the Top 10 have occurred in the last 10 years and **8 out of 10** since 1995

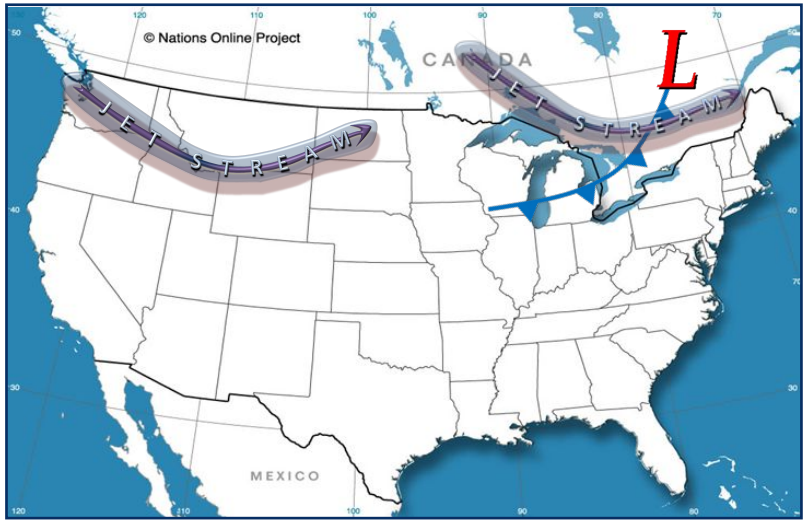
Our Global Circulations



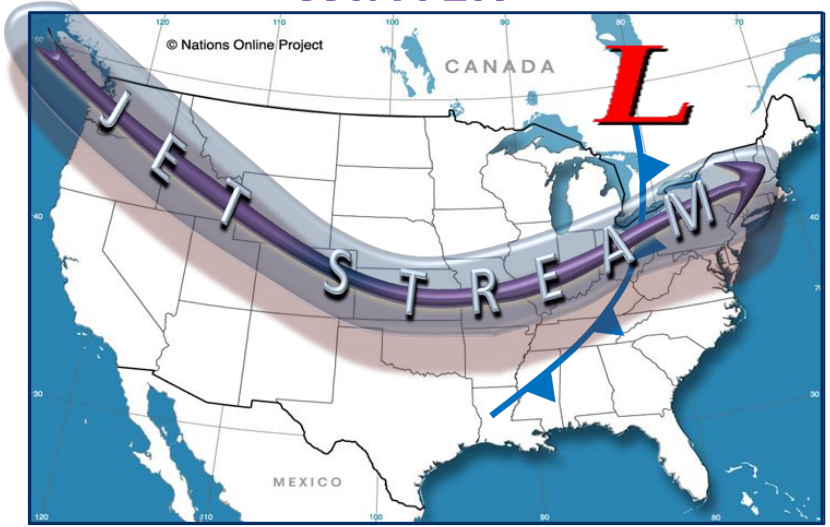


Zooming into a Continental US View

SUMMER

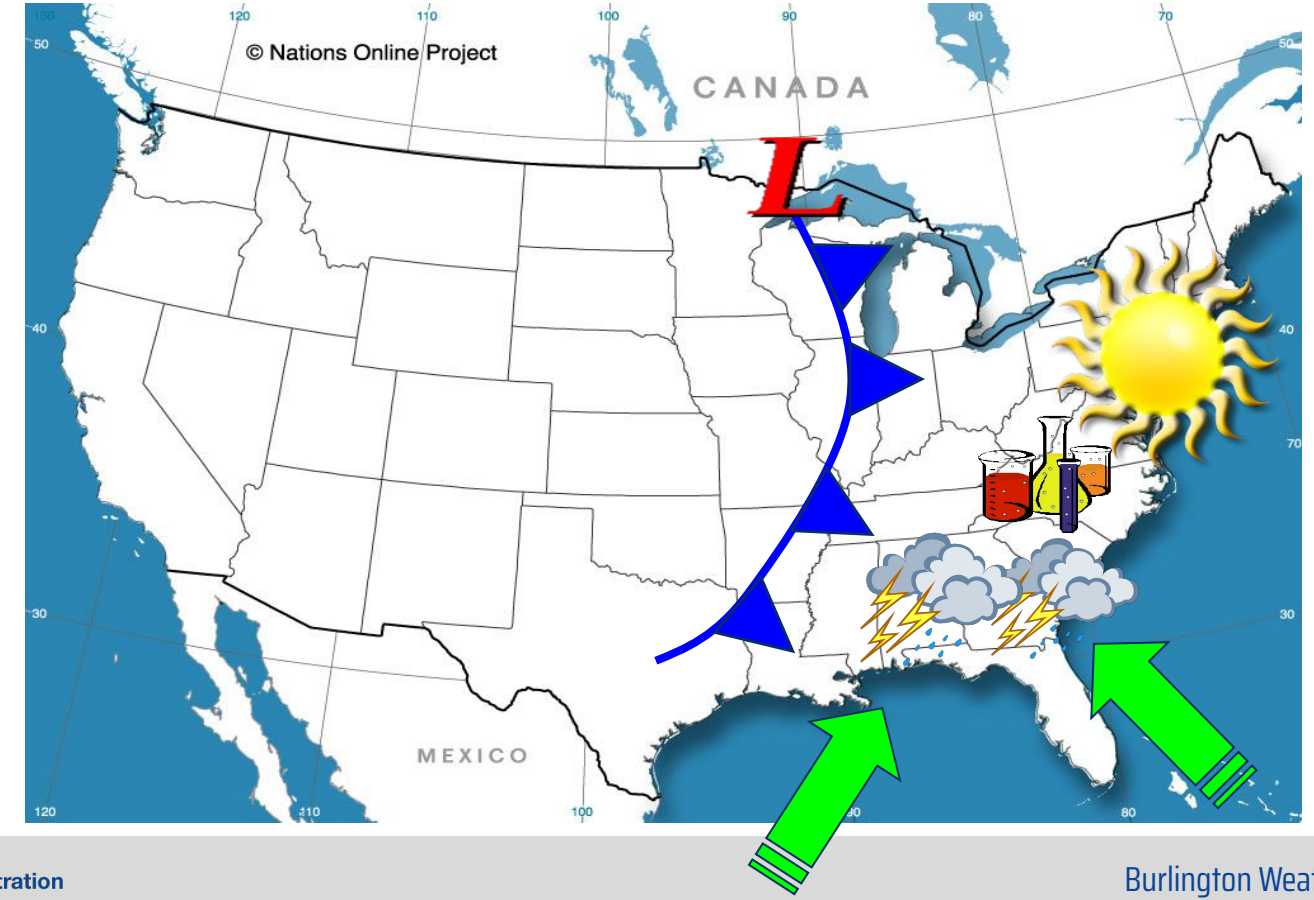


WINTER

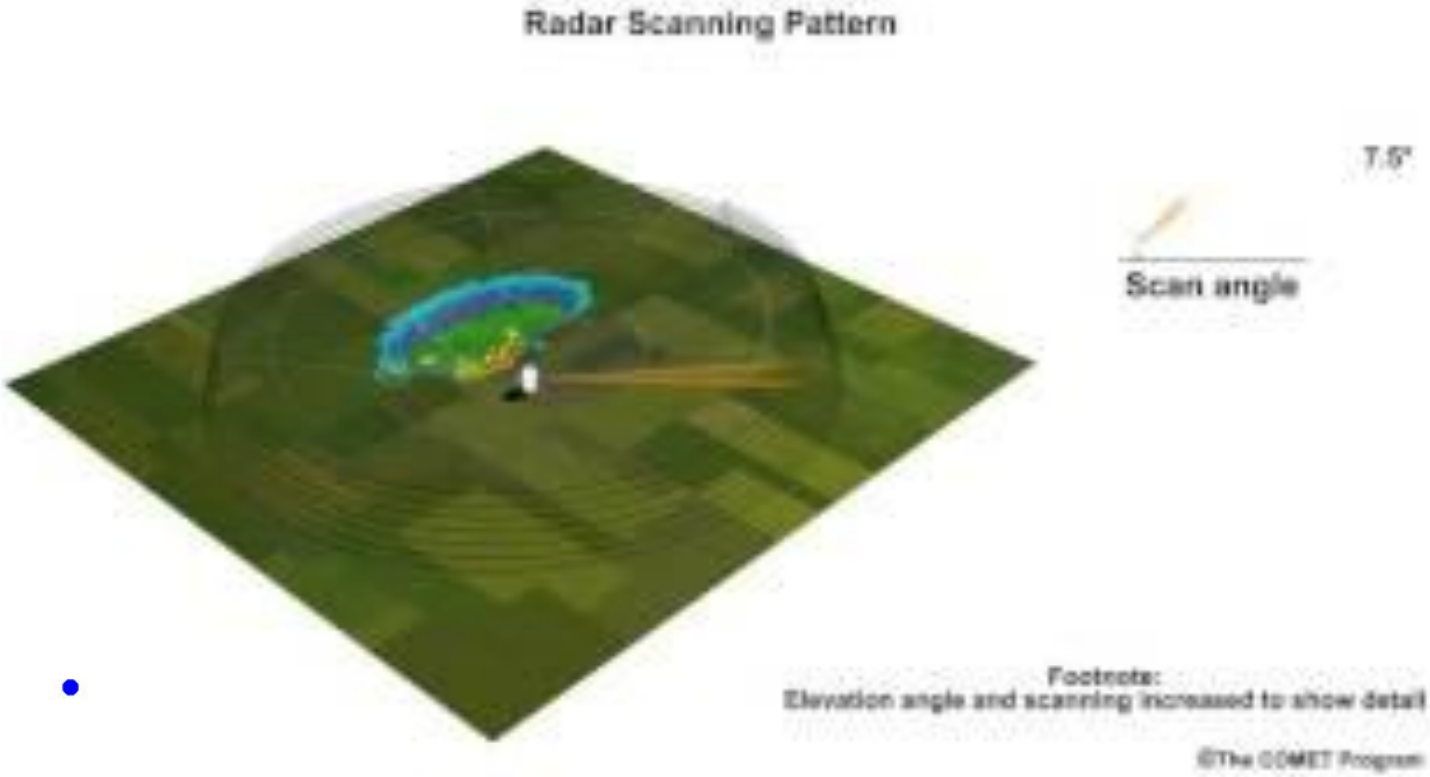


- Changes in solar heating between seasons affects the jet stream and how strong fronts are.

Looking at Regional Weather



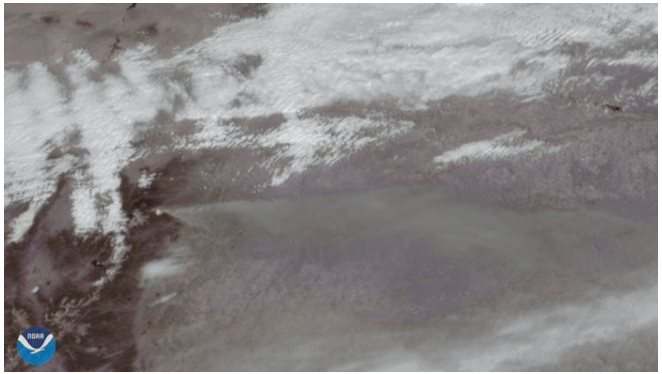
Observing Local Weather: Radar



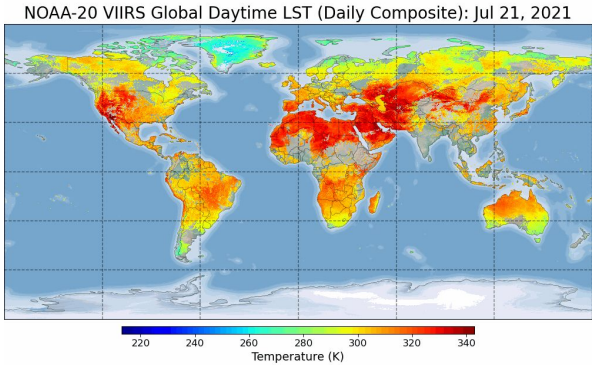
Observing Local Weather: Satellites

Satellites are probably the single most important technological advancement to our understanding of weather and observing Earth's climate.

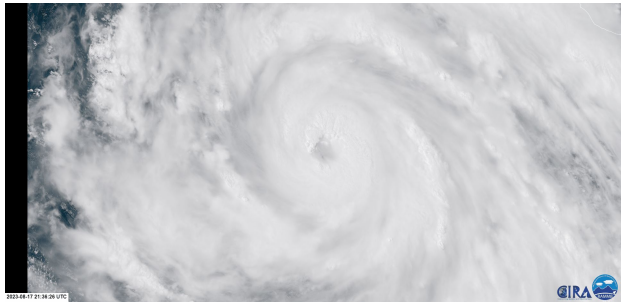
Detecting Fires and Smoke



Measuring Earth's Temperature



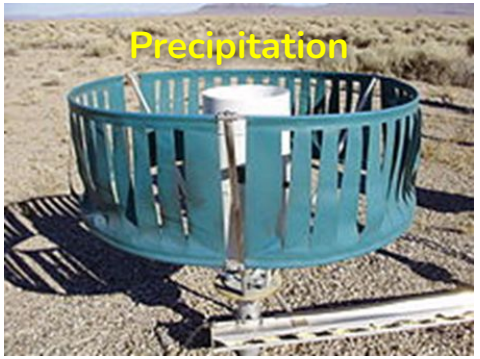
Monitoring Hurricanes



Observing Weather at a Point

- Usually near airports
- Interconnected equipment in open areas
- Made to match standards set by the World Meteorological Organization

Observing Weather at a Point



What's Forecasting Weather Like?

Mona Lisa images accessed via public domain

- Forecasts after 4 days use low resolution models.
- We know some of the details, but other things are hard to distinguish.
- We can sort through different models and where they agree or disagree to get a better idea, and use consensus to tell if something is unlikely to be the real deal.
- And then, when we get within 48 hours or so, we have much more reliable higher resolution, but that sometimes means we have to closely look at minute details!

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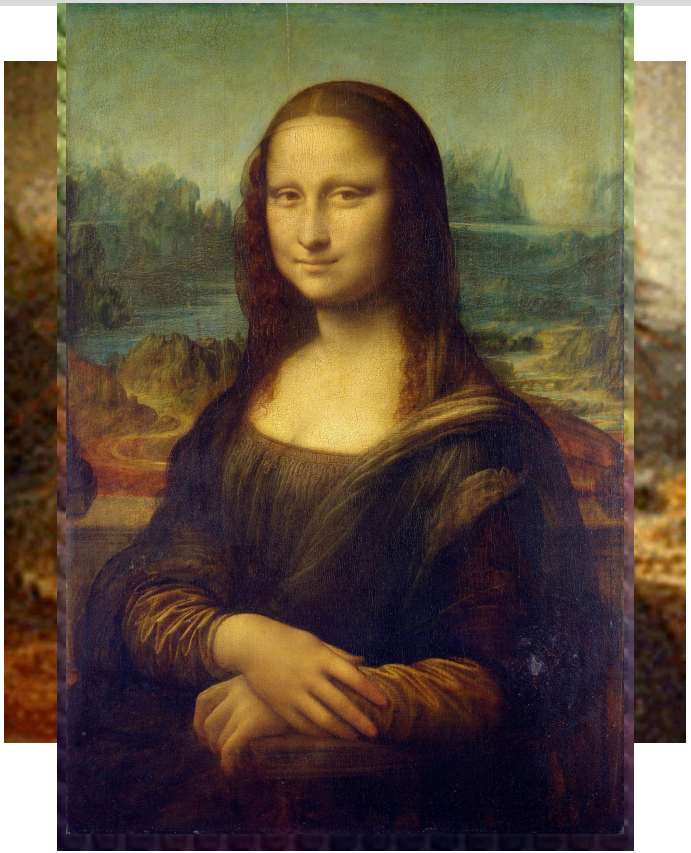
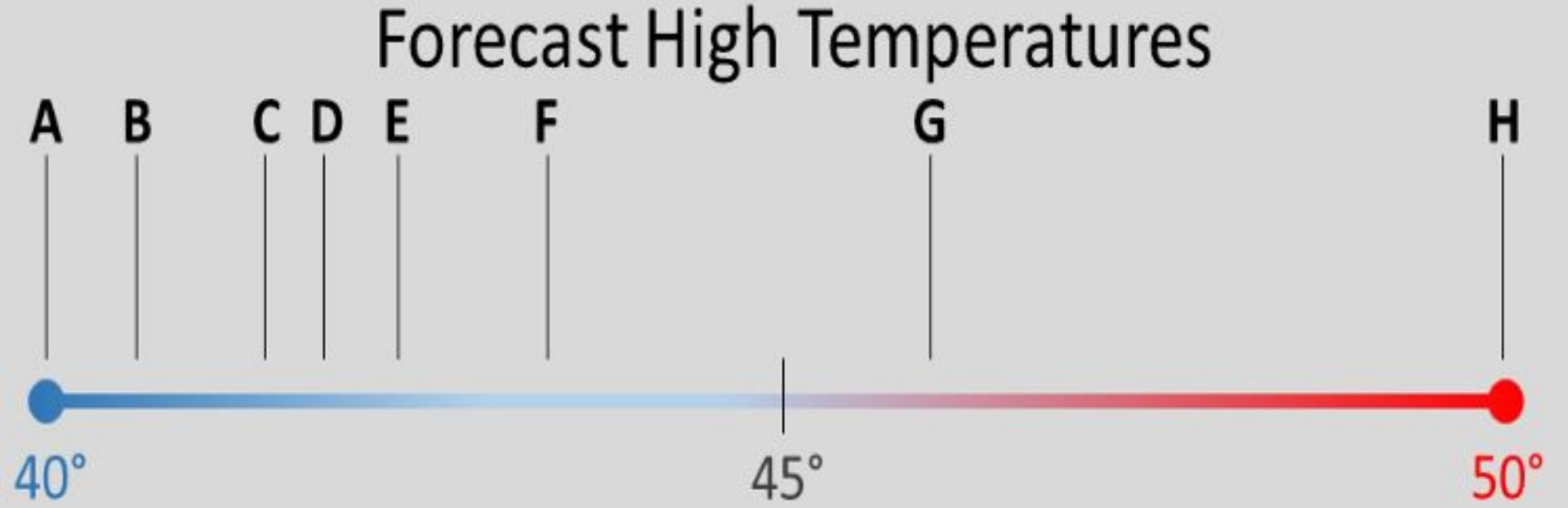


What would forecast for a High Temperature?

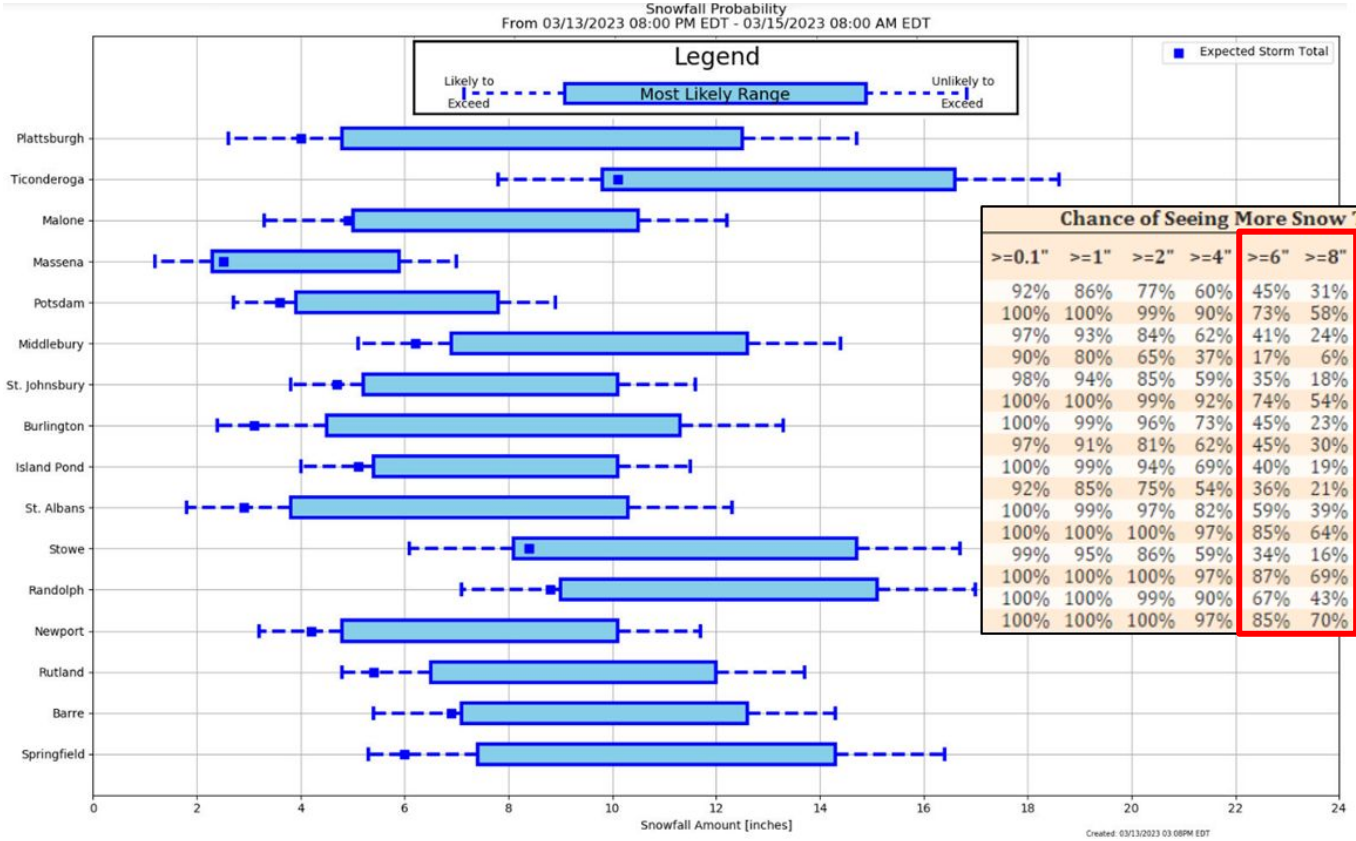
- If each letter is a forecast model, which would be most reasonable to use?



How do you handle forecast range of snow?

This box and whisker shows potential snowfall amounts.

What do you notice?



Chance of Seeing More Snow Than

>=0.1"	>=1"	>=2"	>=4"	>=6"	>=8"	>=12"	>=18"
92%	86%	77%	60%	45%	31%	13%	2%
100%	100%	99%	90%	73%	58%	31%	9%
97%	93%	84%	62%	41%	24%	6%	0%
90%	80%	65%	37%	17%	6%	0%	0%
98%	94%	85%	59%	35%	18%	3%	0%
100%	100%	99%	92%	74%	54%	23%	3%
100%	99%	96%	73%	45%	23%	3%	0%
97%	91%	81%	62%	45%	30%	11%	2%
100%	99%	94%	69%	40%	19%	2%	0%
92%	85%	75%	54%	36%	21%	6%	0%
100%	99%	97%	82%	59%	39%	11%	1%
100%	100%	100%	97%	85%	64%	29%	4%
99%	95%	86%	59%	34%	16%	2%	0%
100%	100%	100%	97%	87%	69%	36%	7%
100%	100%	99%	90%	67%	43%	11%	0%
100%	100%	100%	97%	85%	70%	42%	14%

Mar 14 2023 - A Good Showcase in Probability

Social science research has shown that most partners and the public are receptive to probabilistic information, especially in winter weather situations.

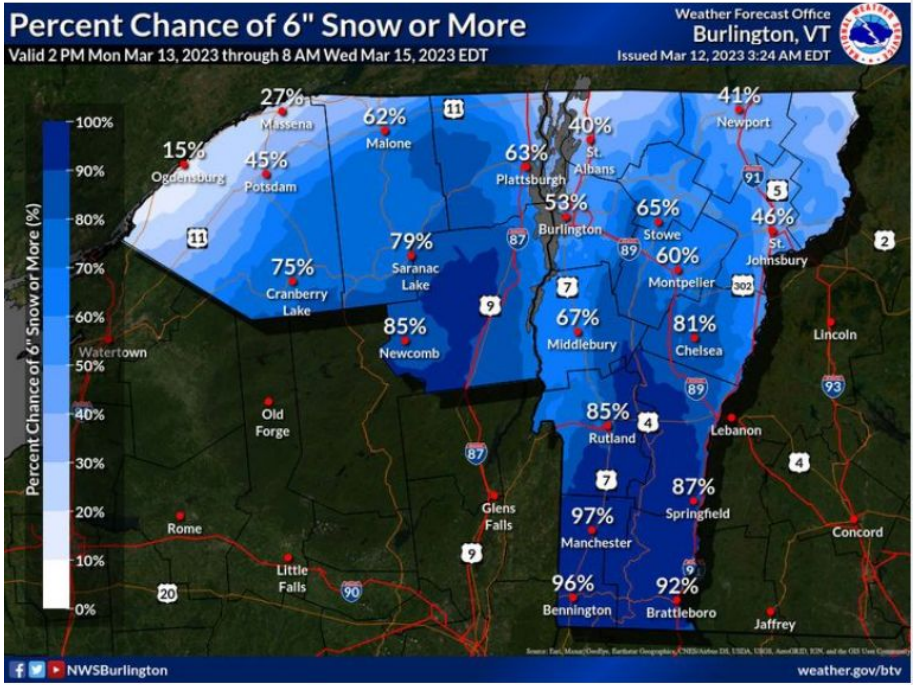
Using probability of exceedance, 90th percentile (reasonable worst case scenario) have shown to be particularly useful for core partners' operations.

It also helps the public understand inherent uncertainty around forecast amounts.

User can determine if they're willing to risk a 50% chance of exceeding snowfall amounts.

US National Weather Service Burlington VT
3d ·

There is a moderate degree of uncertainty with the track of the next storm, expected to bring snow to our area Monday afternoon into Wednesday. With such a wide spread of potential snow totals, here is the percent chance of 6 inches or more. #VTwx #NYwx

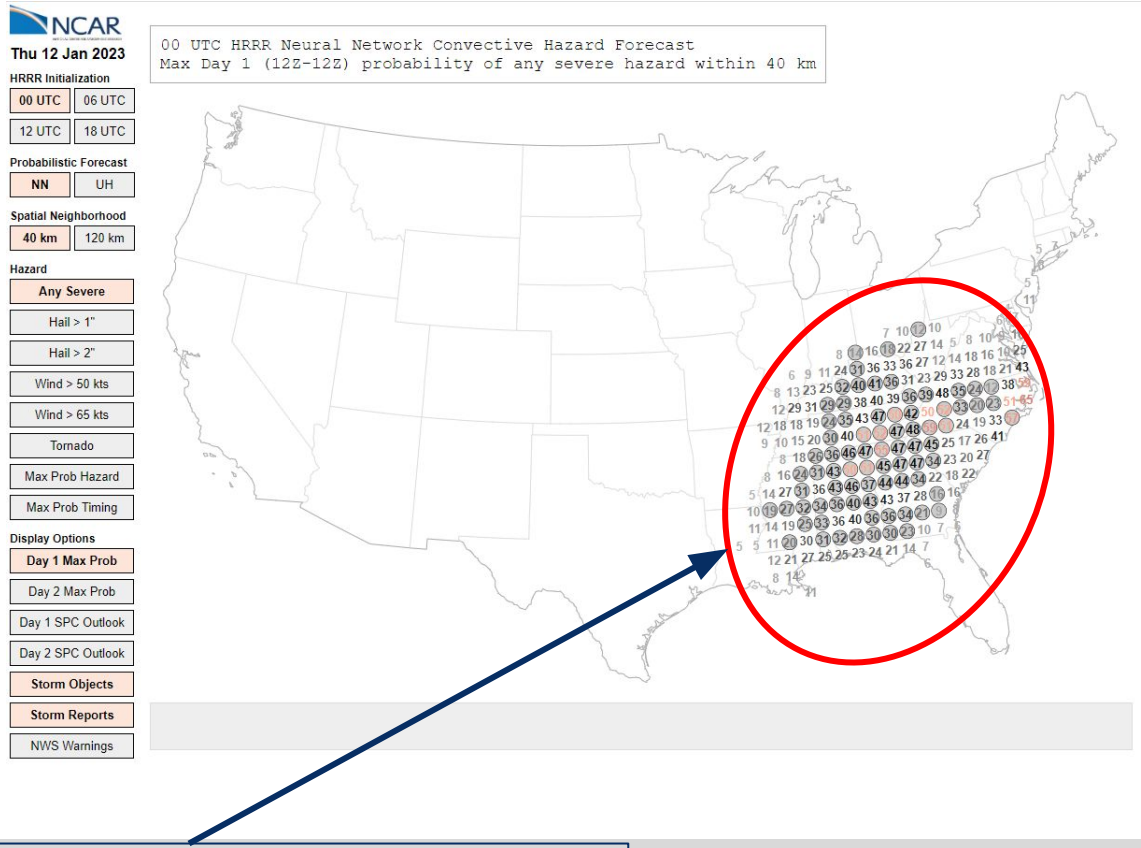


78 5 comments 49 shares

The Technology is Still Growing

AI and Machine Learning will become a part of the weather forecasts of tomorrow.

They can use model data and look back to the past to forecast the chances for severe weather in future cases.



AI detected chances for severe weather

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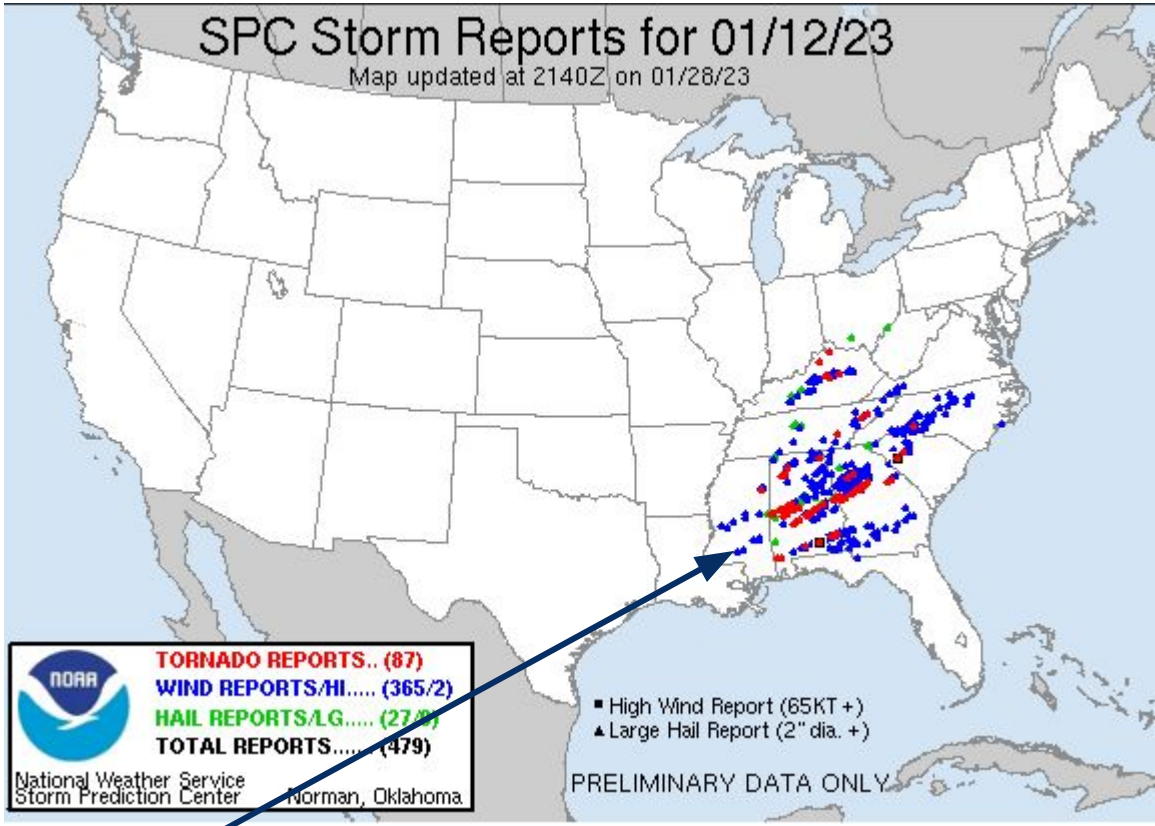

AI detected chances for severe weather

Overview: Skywarn, the NWS, Forecasting

- Skywarn is made up of volunteers trained by the NWS
- The National Weather Service aims to protect life and property, and uses Skywarn to help fill in gaps in radar, satellite, and modeling with ground truth.
- Forecasting starts from a broad scale to establish context → Weather and its impacts are a small piece.
- We reviewed how forecasts are made and how the technology is expanding.


Awareness
Communication
Escape routes
Safety zones
SAFETY
FIRST
Your Safety is ALWAYS #1

Before Winter Arrives: Preparation

At Home:

- Check your home heating system & make sure it is working properly.
  - Make sure you have a good supply of heating fuel.
- Have your chimney swept clear of soot.
- Purchase a bag of rock salt for slippery/icy sidewalks and walkways.
- If you use a snow blower, fill up your snowblower with gas.
- Replace any snow shovels if they show signs of significant wear and tear.
- Have an extra stock of non-perishable food and bottled water, extra medicine, battery operated radios, flashlights, and extra warm blankets.

All Hazards NOAA Weather Radio
NOAA's National Weather Service

Injuries Due to Ice and Snow:

- About 70% result from vehicle accidents.
- About 25% occur in people caught out in a storm.

Winter Driving Hazards

Keep a winter storm kit in your car in case you get stranded.

Recommended supplies include:

Injuries Due To Ice and Snow:

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About 25% occur in people caught out in a storm.

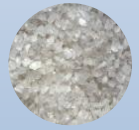
readywisconsin.wi.gov

Blankets / Extra Coats

Non-Perishable Foods

Shovel

Flares



Bag of Sand

Tire Chains

Windshield Scraper

Flashlight

Jumper Cables

5 Things to Know about Winter Weather Forecasts

1 Snow or ice totals can vary greatly over short distances

A heavy snow band may form, dropping more snow in one location while significantly less snow falls just a few miles away.

2 Winter forecasts can change frequently

Forecasts may change as new model data becomes available. Always check weather.gov for the latest information.

3 Focus more on the winter storm's impacts

Don't focus too much on exact numbers, and consider the full range of possibilities.

4 Know your winter weather terminology

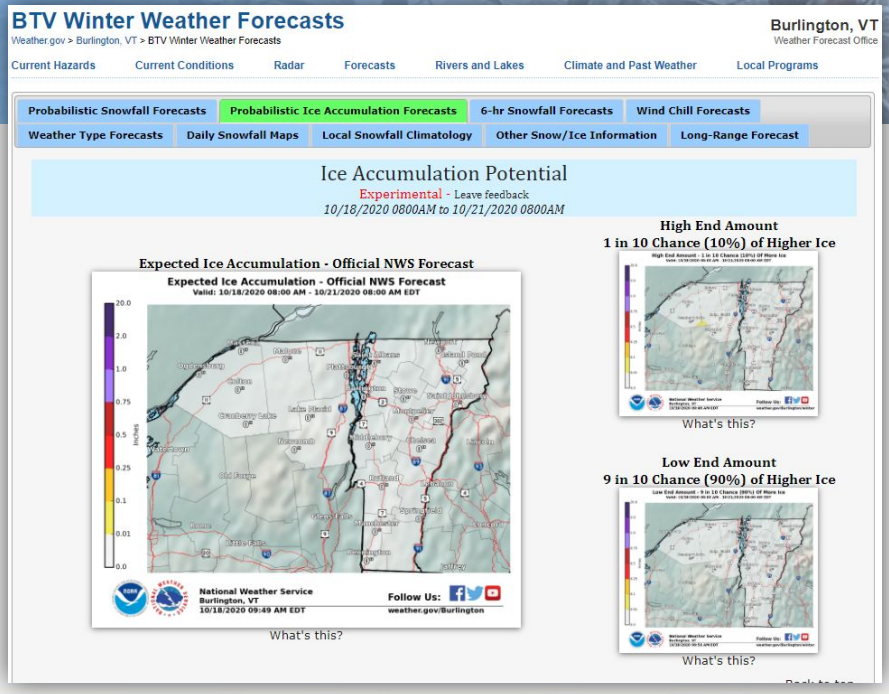
If a Watch is issued, get prepared for hazardous weather. If a Warning or Advisory is issued, take action – hazardous weather is occurring or will occur soon.

5 Rely on a dependable source for weather info

Choose your information sources wisely, and follow a name or organization you know and trust.

For more information on winter weather safety, visit:
weather.gov/winter

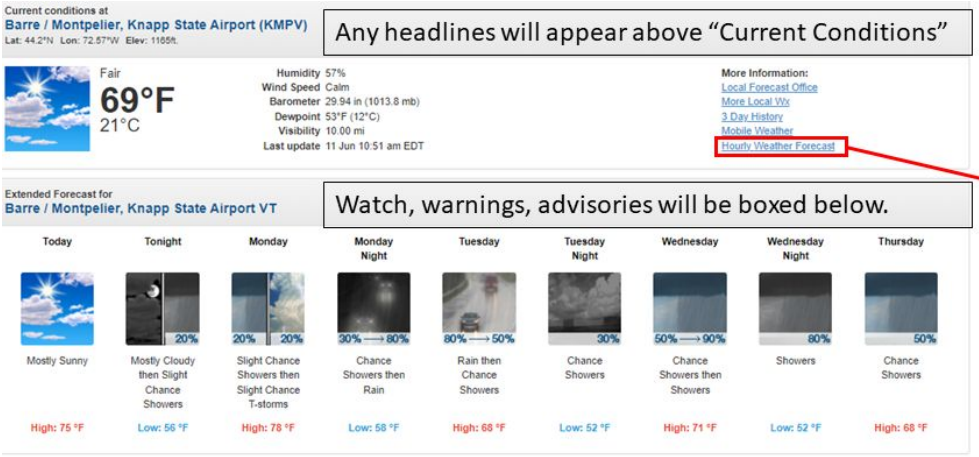
Be a Force of Nature:
Prepare and Stay Safe!
#WinterSafety



Find winter forecasts at www.weather.gov/btv/winter.

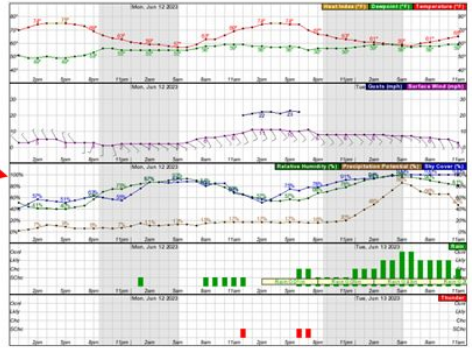
Click through the tabs for snow, ice, wind chill, and other winter related information!

Our Webpage (Point & Click)

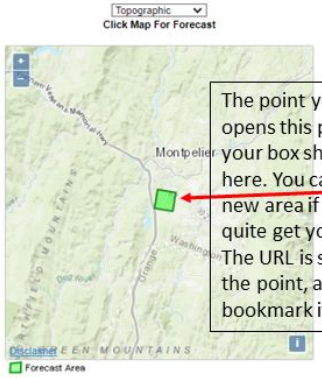


Any headlines will appear above "Current Conditions"

Watch, warnings, advisories will be boxed below.

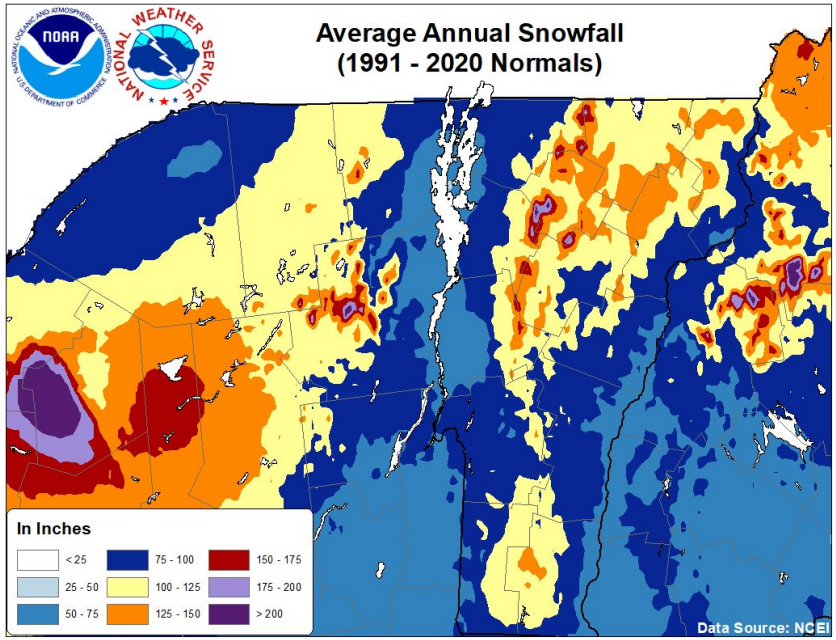


"Hourly Weather Forecast" has a line chart of conditions by the hour (becomes longer farther out).



The point you click opens this page, and your box shows up here. You can click a new area if you didn't quite get your spot. The URL is specific to the point, and you can bookmark it!

North Country Winter Climatology

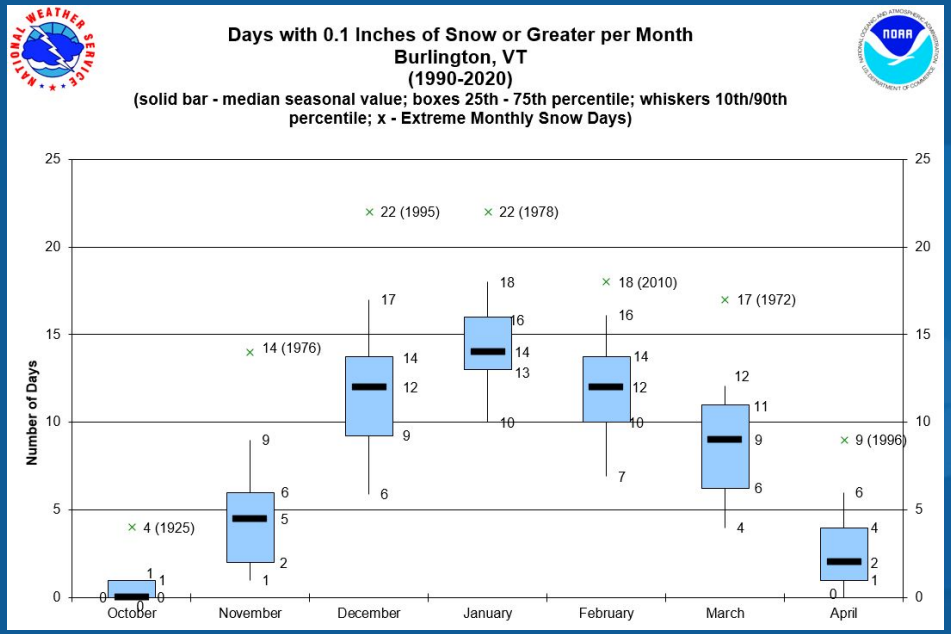


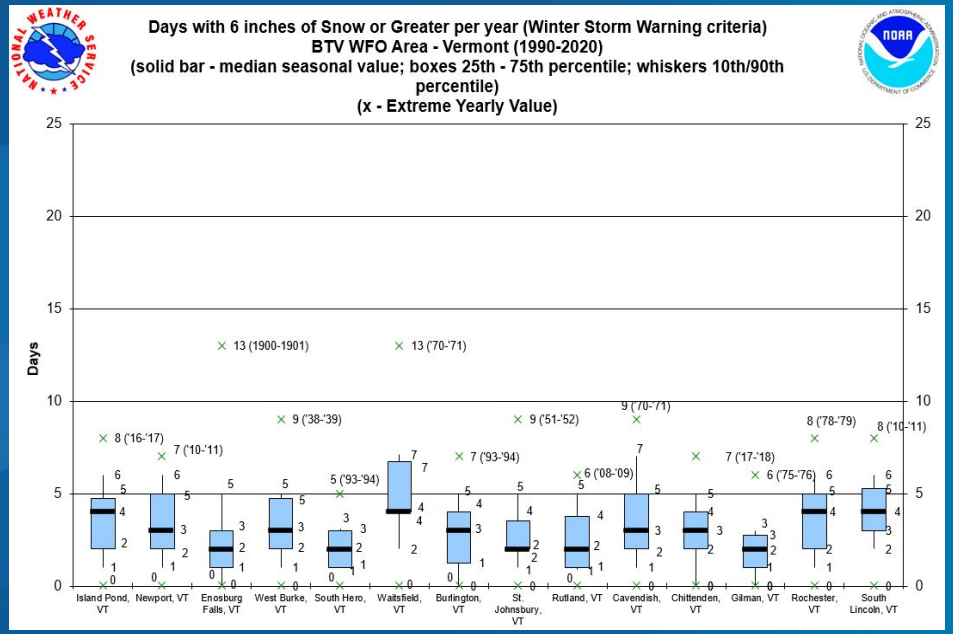
- ~50-100” in the valleys, 100” or more in high terrain.

Coldest Normals	High Temperature	Low Temperature
Burlington, VT	Upper 20s	Lower 10s
Montpelier, VT	Mid 20s	Mid single digits
St. Johnsbury, VT	Mid 20s	Mid single digits
Plattsburgh, NY	Upper 20s	Near 10
Saranac Lake, NY	Mid 20s	Near 0
Massena, NY	Mid 20s	Mid Single Digits

- Mid to upper 20s are common at the peak of the winter (late December/early January.
- Most will see single digits on average.

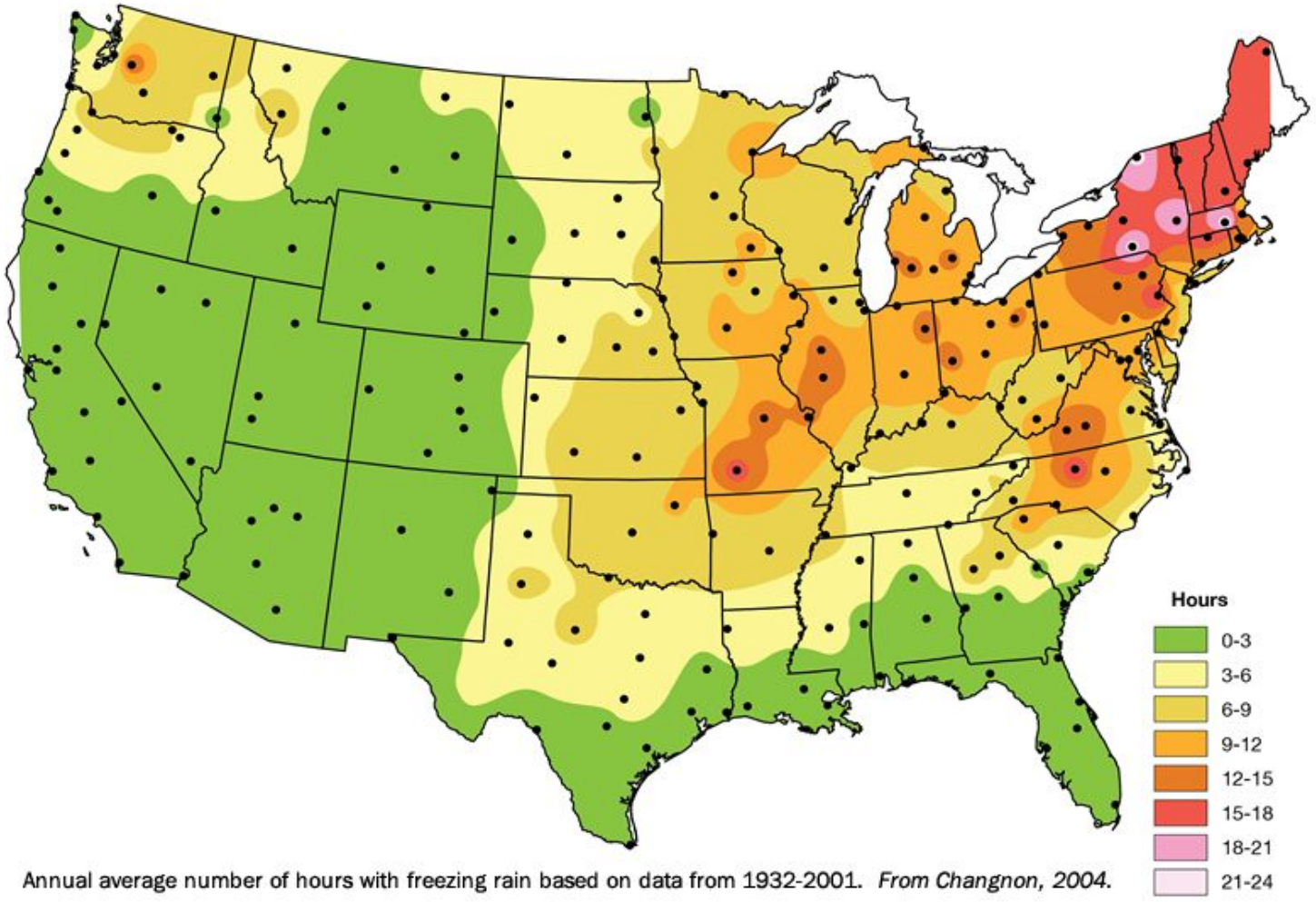
Number of Snowfall Days





- January sees the most “snow days”
- At the extremes, we see 22 out of 30-31 days in the month with snow and as little at 5 to 6 days in a month.

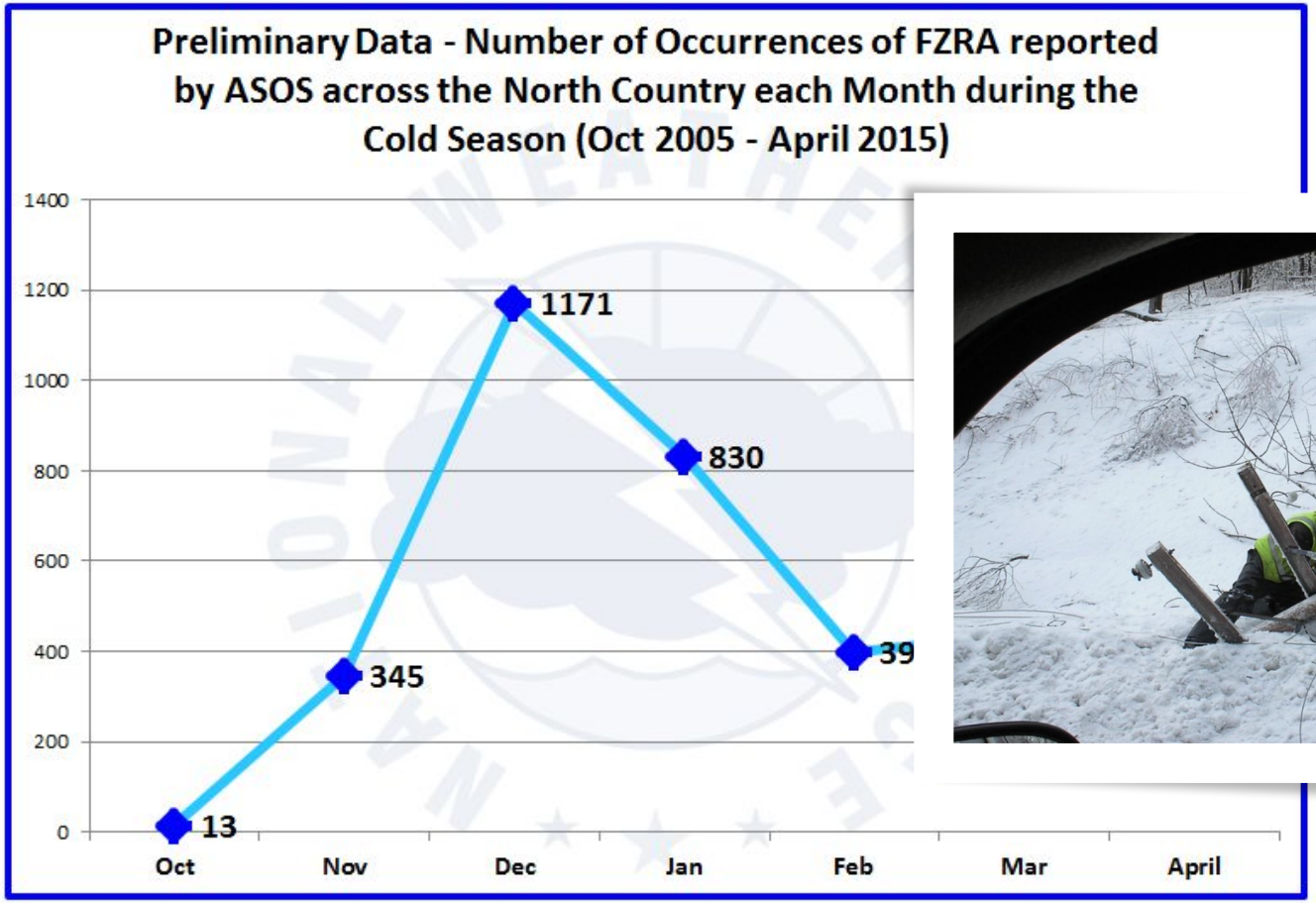
- Usually at least 2 or 3 days with above 6” of snow occurs each season.
- More active years generally see 4 or 5 days with days with more than 6” of snow.



Annual average number of hours with freezing rain based on data from 1932-2001. *From Changnon, 2004.*

New England is prone to freezing rain more than any other part of the country.

North Country Climatology – Monthly Frequency



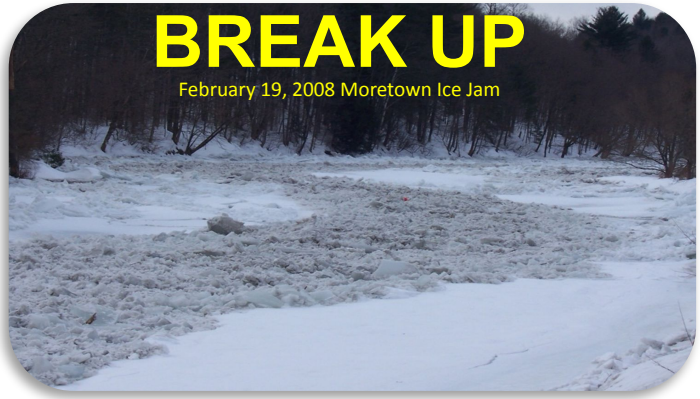
Ice Jams at the Season Shoulders

Freeze-Up Ice Jams

- Occurs early in the season following the first cold snap
- Especially if daily average temperatures will be under 0 °F several days.

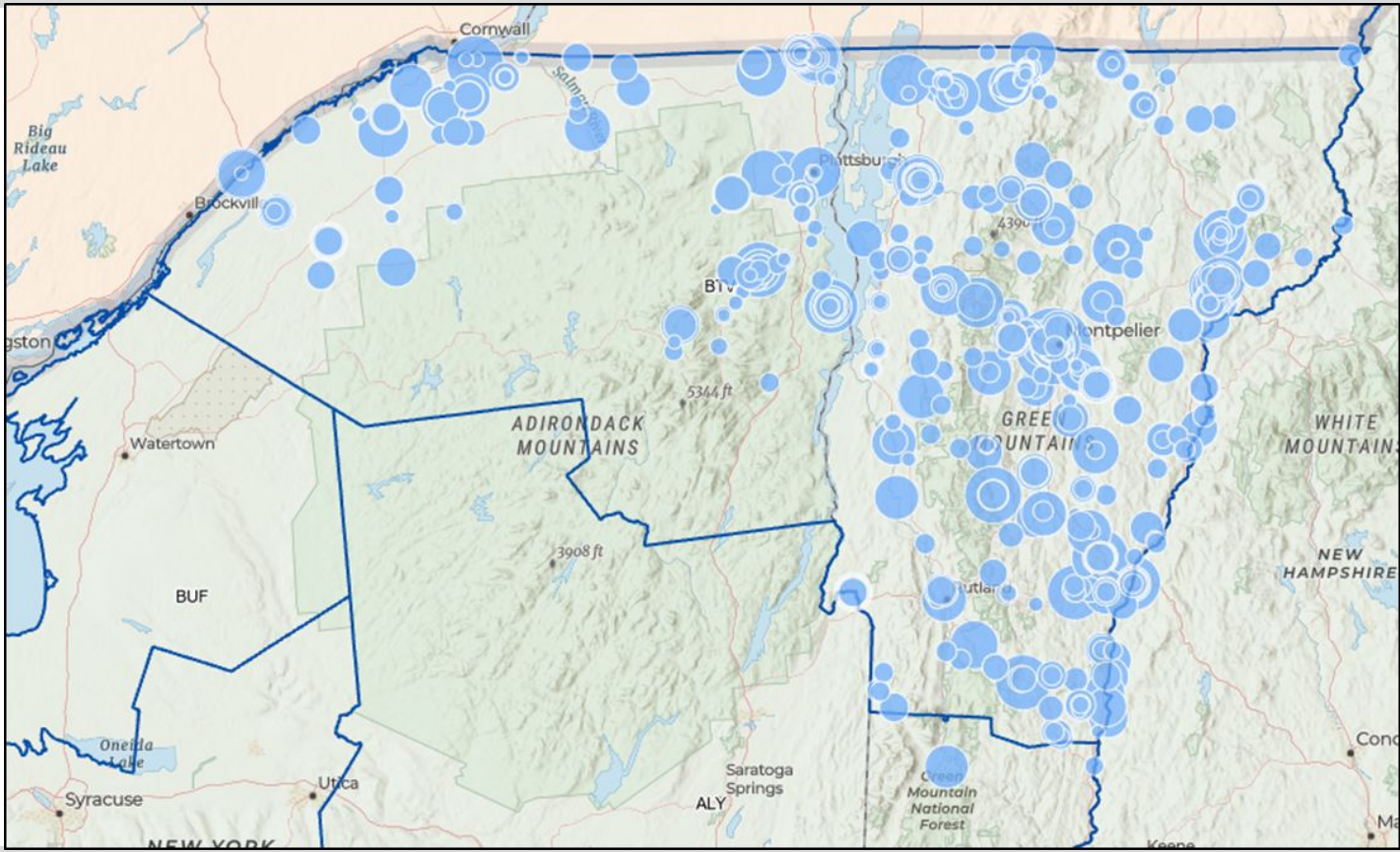
Break-Up Ice Jams

- River rises greater than current ice thickness
- 12 hours of thawing, with at least 6 hours over 40 °F

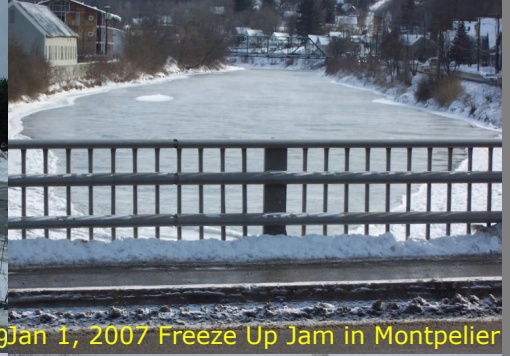


Ice Jams at the Season Shoulders

Northern New York through the St. Lawrence Valley is not as ice jam prone as Vermont, but still happens from time to time.




Missisquoi at East Highgate 02/13/2009


Jan 1, 2007 Freeze Up Jam in Montpelier


Feb 12 2009 Montgomery


Rte 118 West Hill Brook

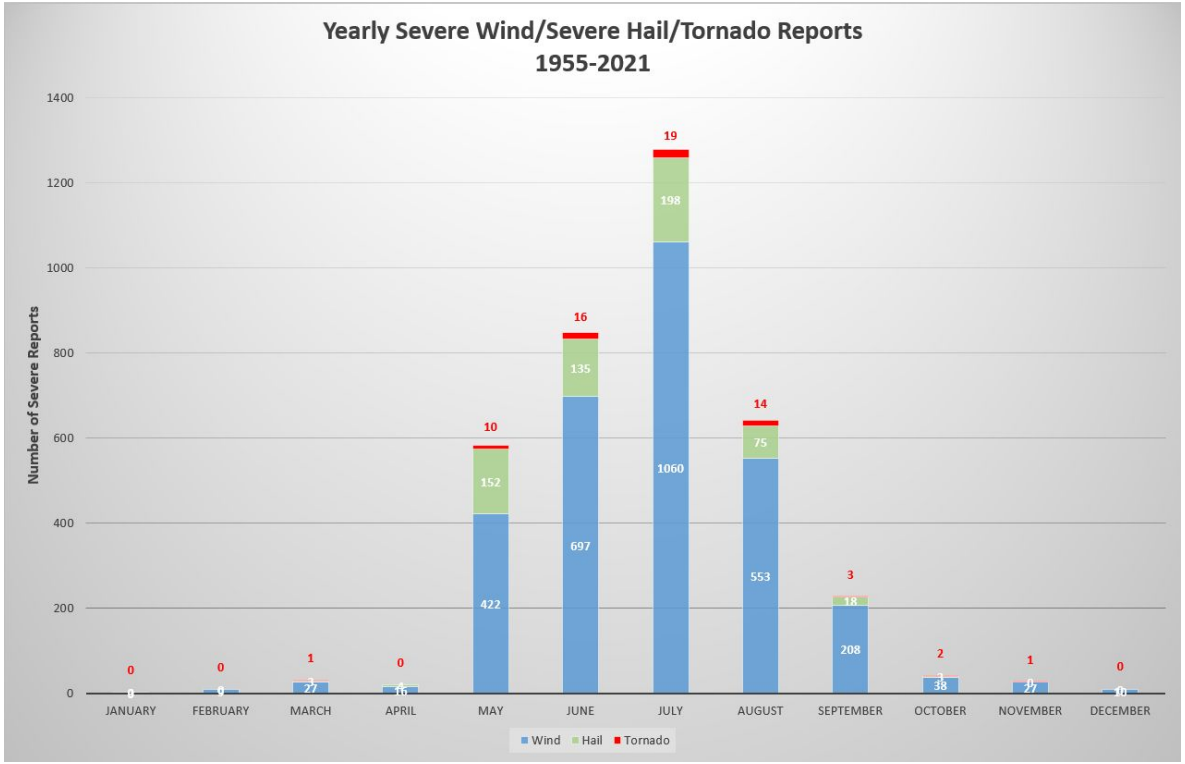

Feb 2, 2010 - Ft Covington


West Hill Brook - Jan 3, 2004

Know the history of flooding in your area. Be prepared to seek higher ground if flood waters approach.

National Weather Service
Burlington
www.weather.gov/btv

Brief Overview of Thunderstorm Types and Hazards

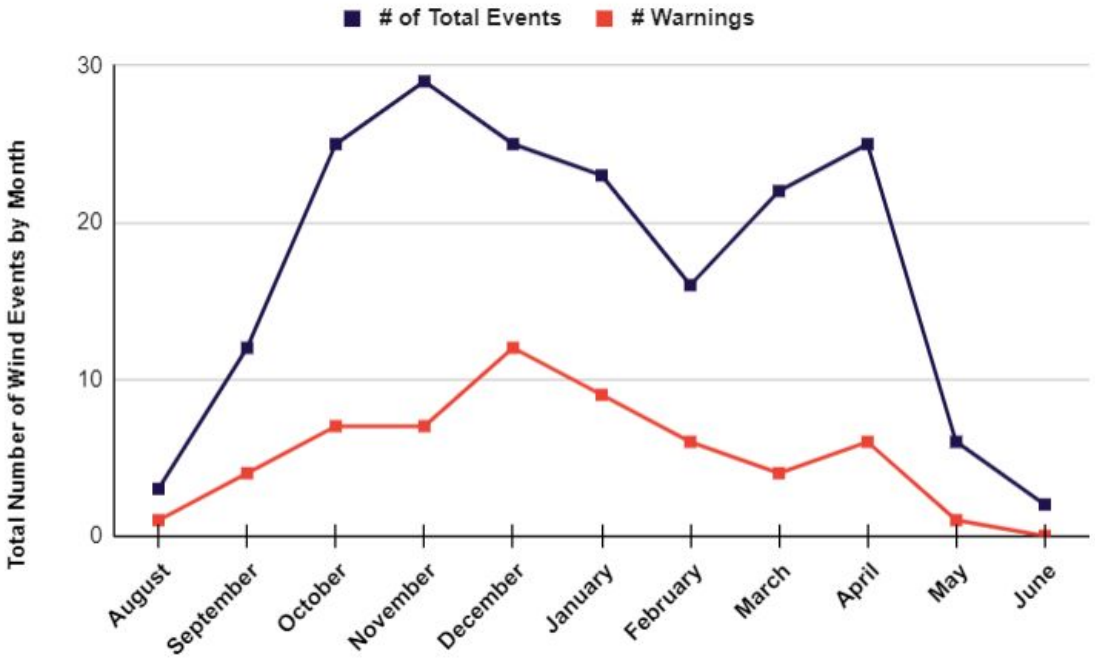


Climatological period of Severe Weather is the height of summer

Why is this so?

- More daytime heating – greater atmospheric instability
- Bermuda high usually allows moisture from the Gulf of Mexico advance northwards.
- While areas like Florida don't get fronts in the summer, we can still get weak frontal boundaries that help storms develop.

Gusty Winds Are Common in Fall through Spring



Strong Wind Gusts (greater than 45 mph) become increasingly common - posing risk of frostbite and power outages in cold

Why is this so?

- Extratropical cyclones are stronger in winter
- Temperature contrast at transition of seasons increases winds

Extreme Wind Chills

Wind Chill Chart

Wind (mph) \ Temperature (°F)	Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5		36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10		34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15		32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20		30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25		29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30		28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35		28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40		27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45		26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50		26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55		25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60		25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

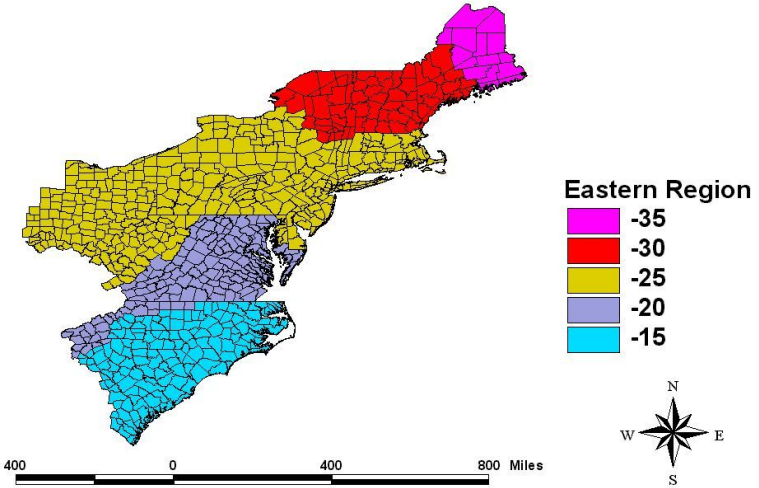
Frostbite Times: 30 minutes | 10 minutes | 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph)

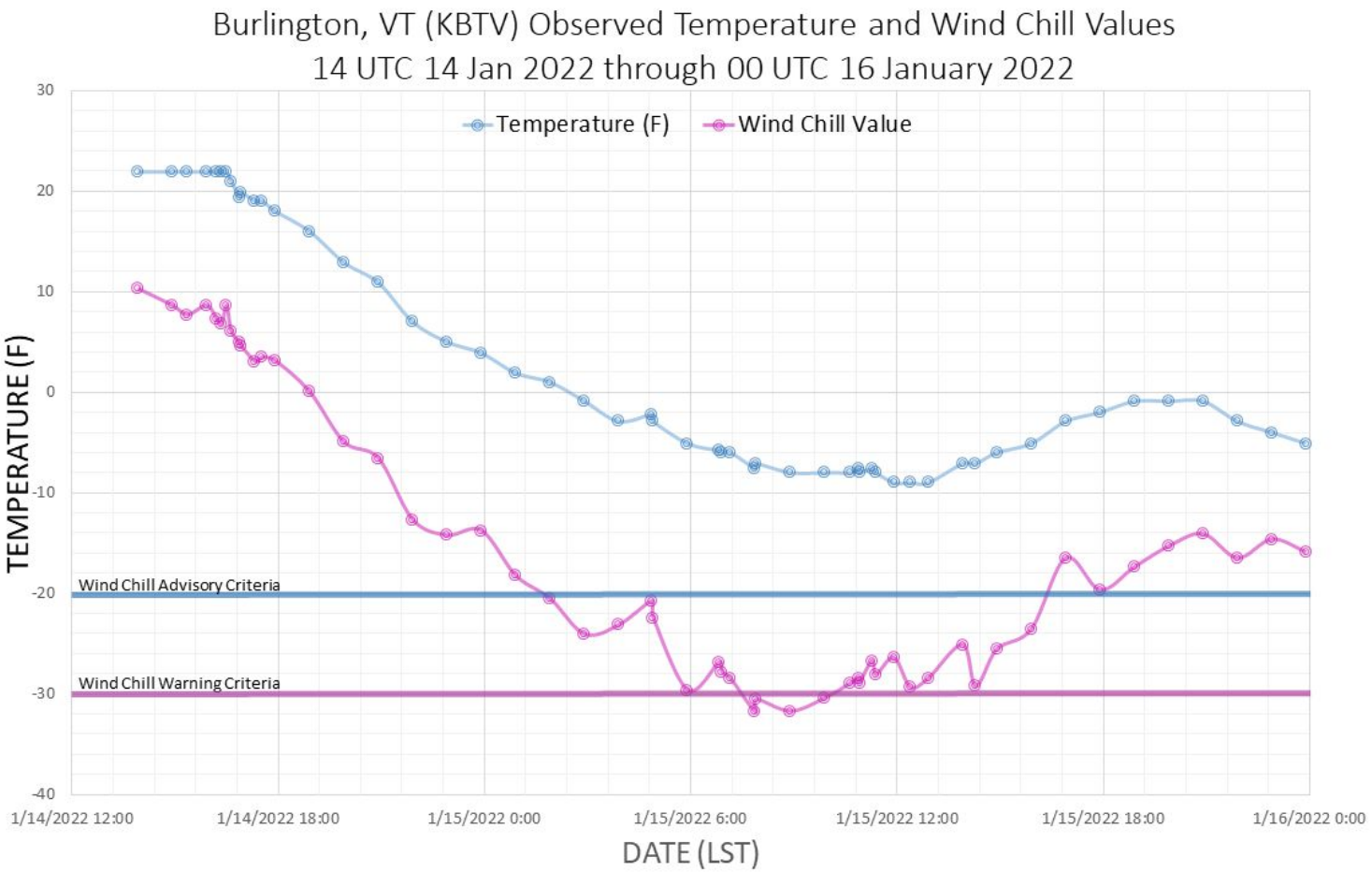
Effective 11/01/01

Wind Chill Warning Criteria



Extreme Wind Chills

Wind (mph)	
Calm	40
5	36
10	34
15	32
20	30
25	29
30	28
35	28
40	27
45	26
50	26
55	25
60	25



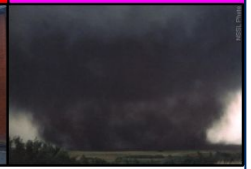
Storm Prediction Center Outlooks

Understanding Severe Thunderstorm Risk Categories

THUNDERSTORMS (no label)	1 - MARGINAL (MRGL)	2 - SLIGHT (SLGT)	3 - ENHANCED (ENH)	4 - MODERATE (MDT)	5 - HIGH (HIGH)
No severe* thunderstorms expected	**Isolated severe thunderstorms possible**	**Scattered severe storms possible**	**Numerous severe storms possible**	**Widespread severe storms likely**	**Widespread severe storms expected**
Lightning/flooding threats exist with <u>all</u> thunderstorms	Limited in duration and/or coverage and/or intensity	Short-lived and/or not widespread, isolated intense storms possible	More persistent and/or widespread, a few intense	Long-lived, widespread and intense	Long-lived, very widespread and particularly intense





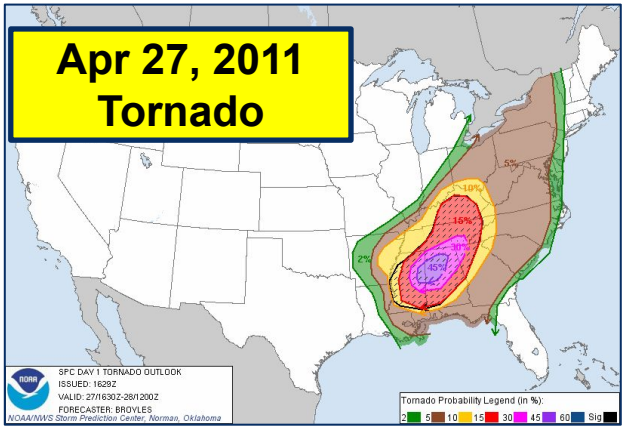
* NWS defines a severe thunderstorm as measured wind gusts to at least 58 mph, and/or hail to at least one inch in diameter, and/or a tornado. All thunderstorm categories imply lightning and the potential for flooding. Categories are also tied to the probability of a severe weather event within 25 miles of your location.

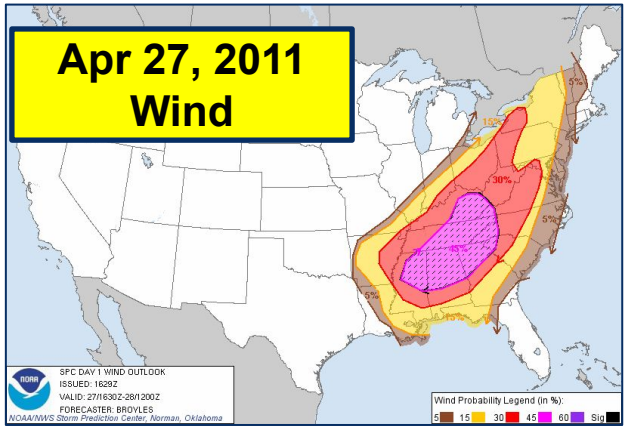
National Weather Service

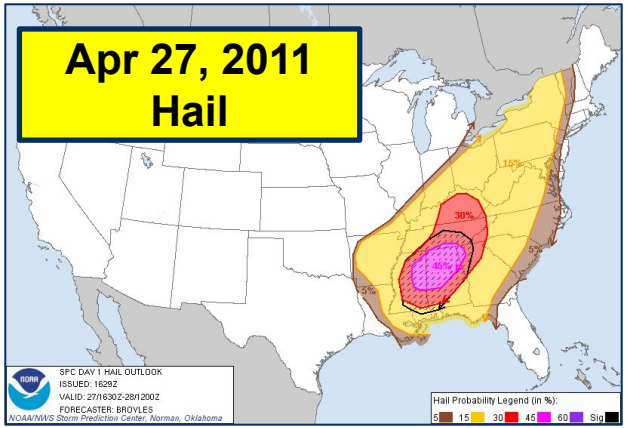
www.spc.noaa.gov

Storm Prediction Center Outlooks

Each outlook is subdivided into different threat categories for tornadoes, wind, and hail. As of Spring 2020, this now includes Day 2 Severe Weather Outlooks as well!







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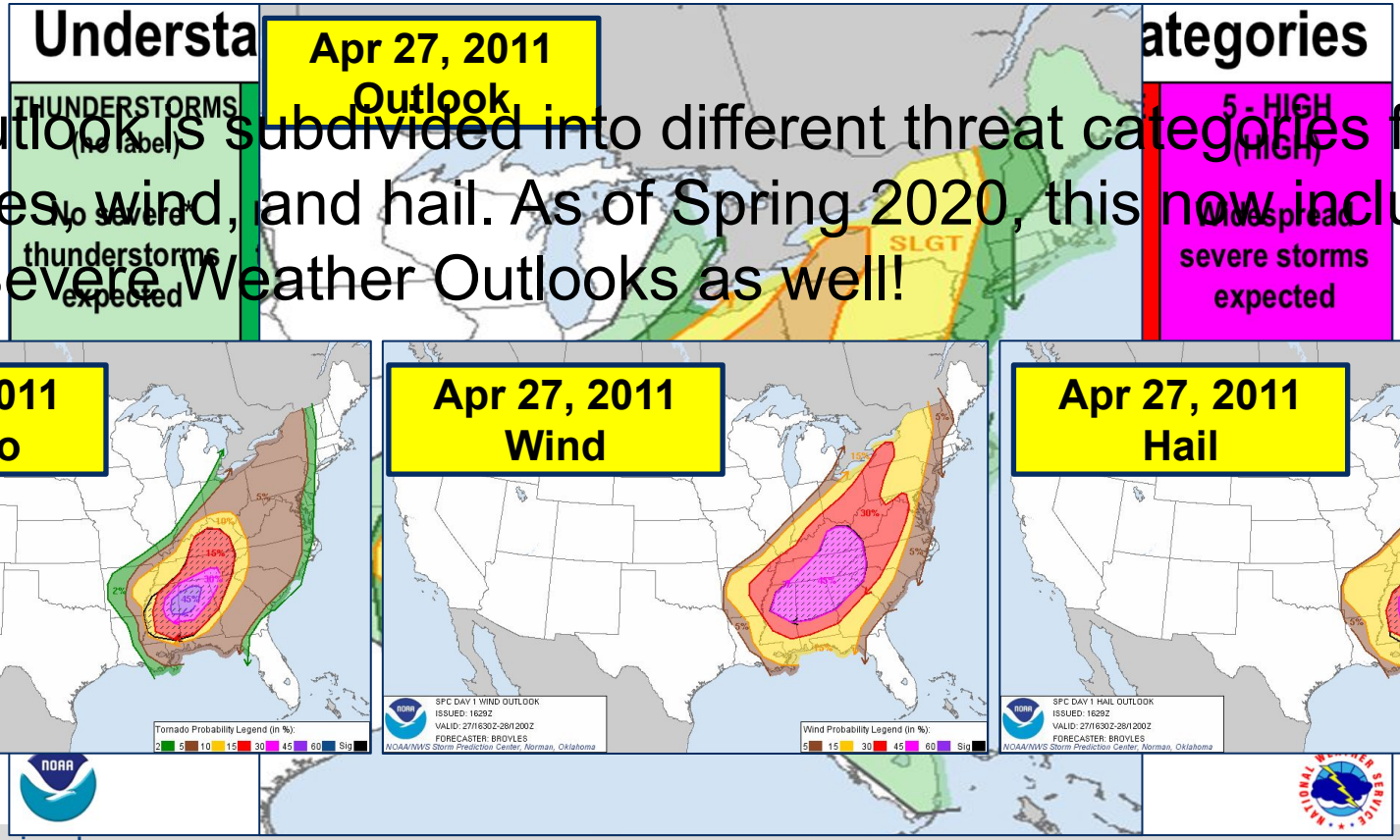
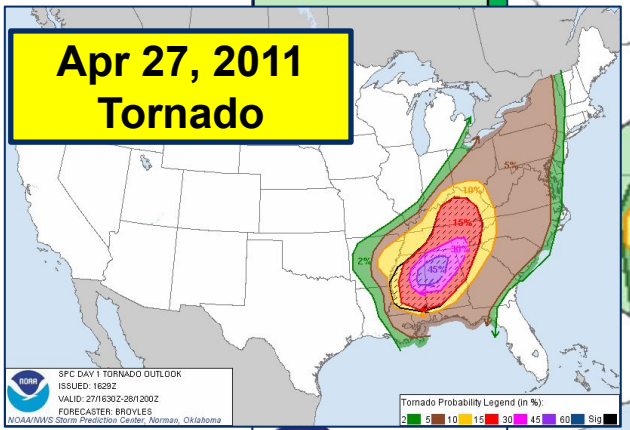
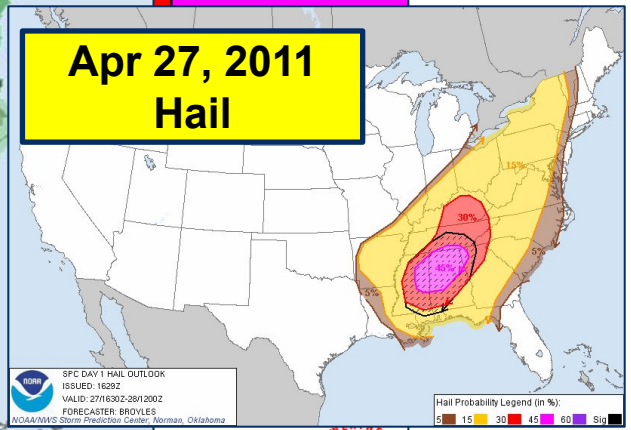
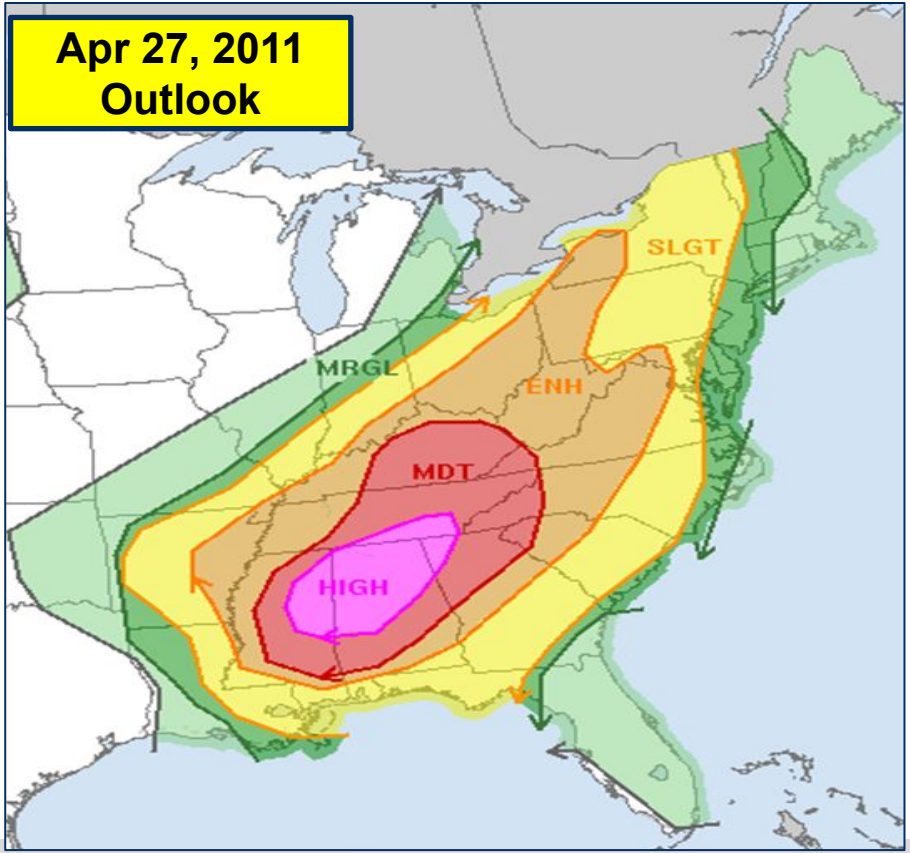






Storm Prediction Center Outlooks

They all combine into this map, showing the scaling risks for severe weather.



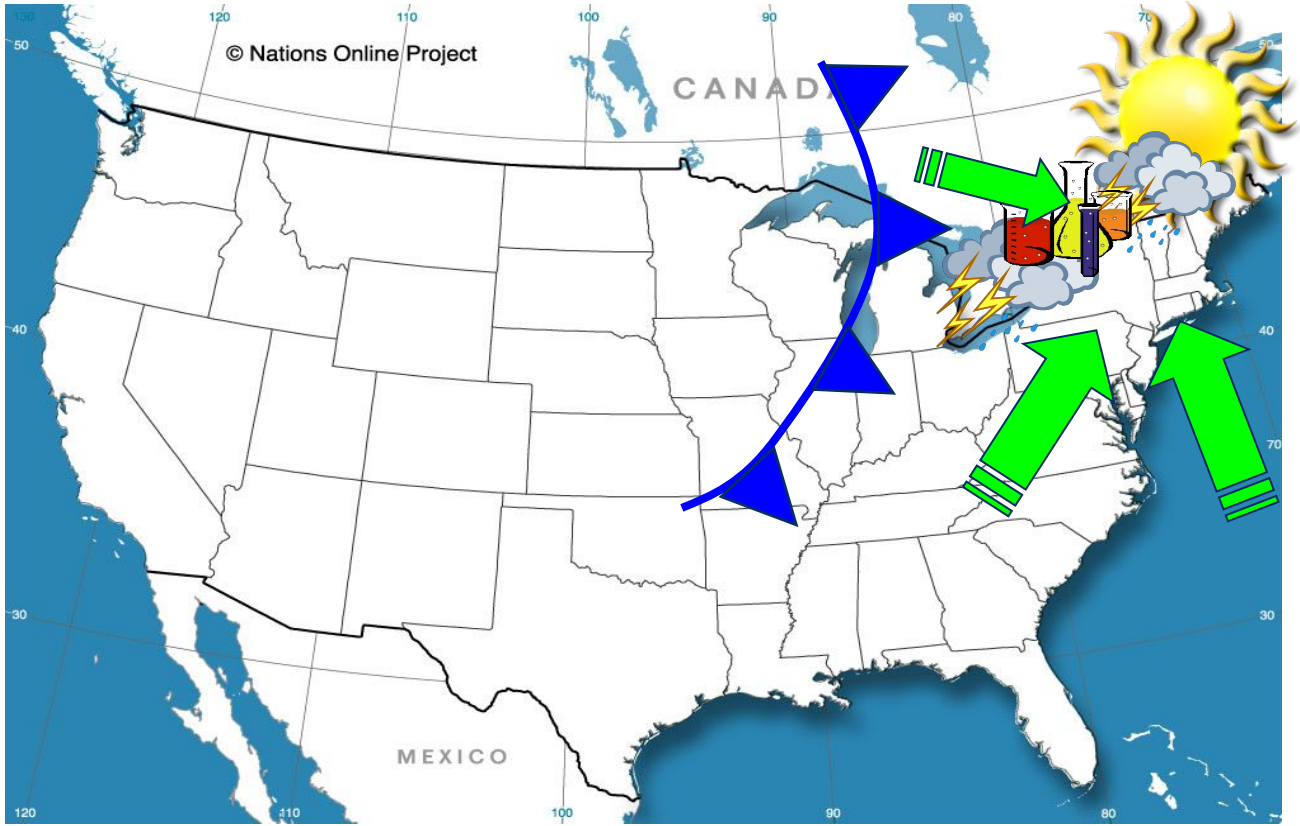
Thunderstorm Ingredients

At the minimum, thunderstorms need **3** things

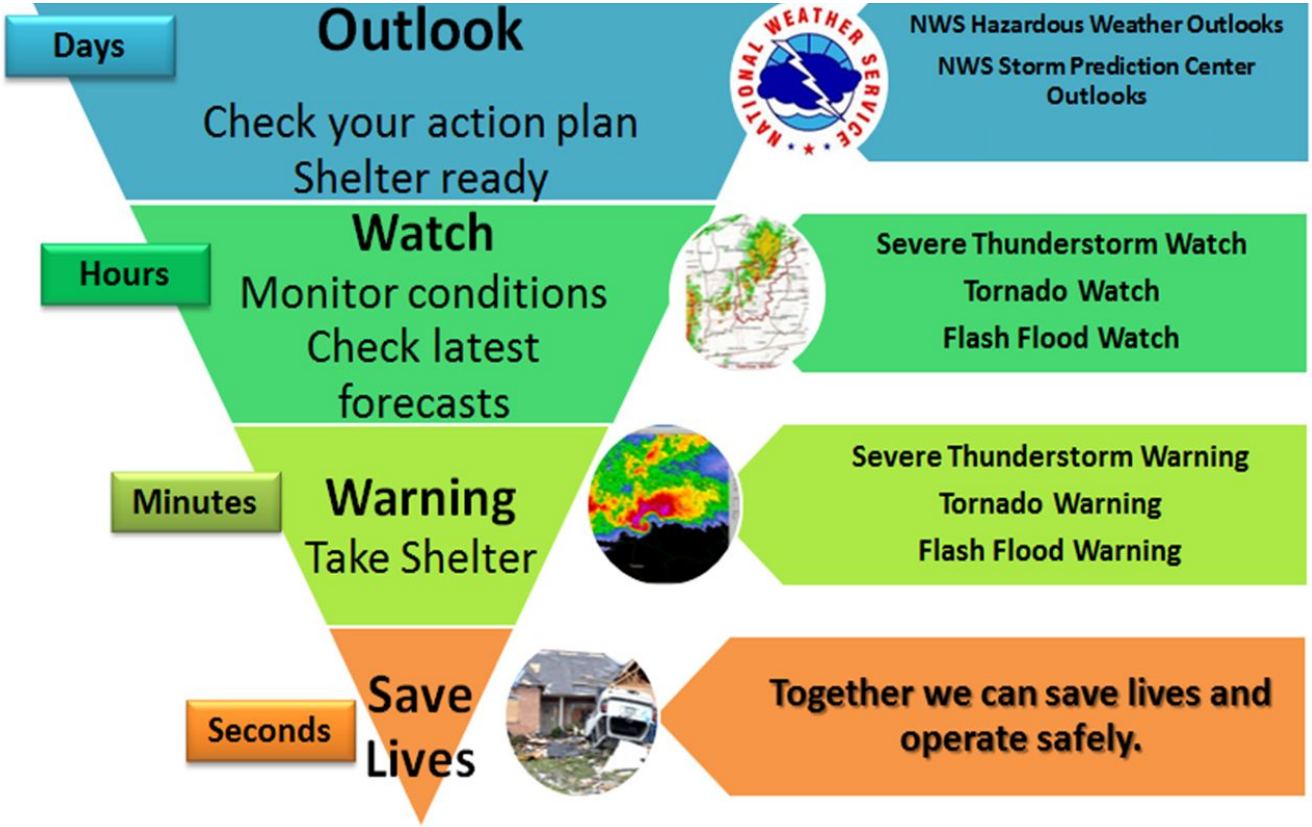
1. Moisture
2. Atmospheric Instability
3. Fronts/Air Meeting
4. *To become severe, storms need something extra*

- A variety of other factors can combine to make storms more or less organized
- Generally, the more shaped and less amorphous, the greater the severe threat.

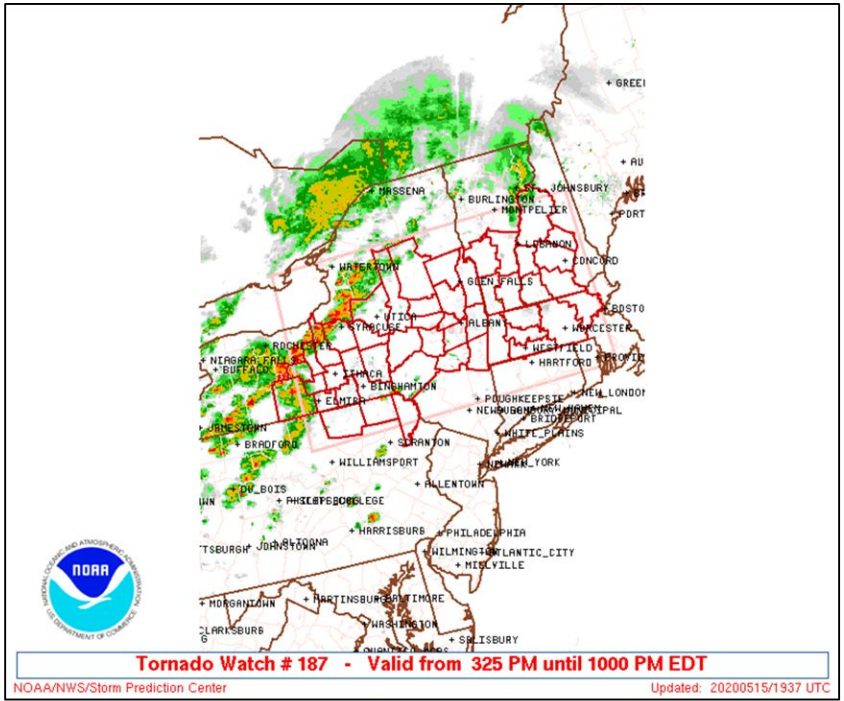
Thunderstorm Development 101



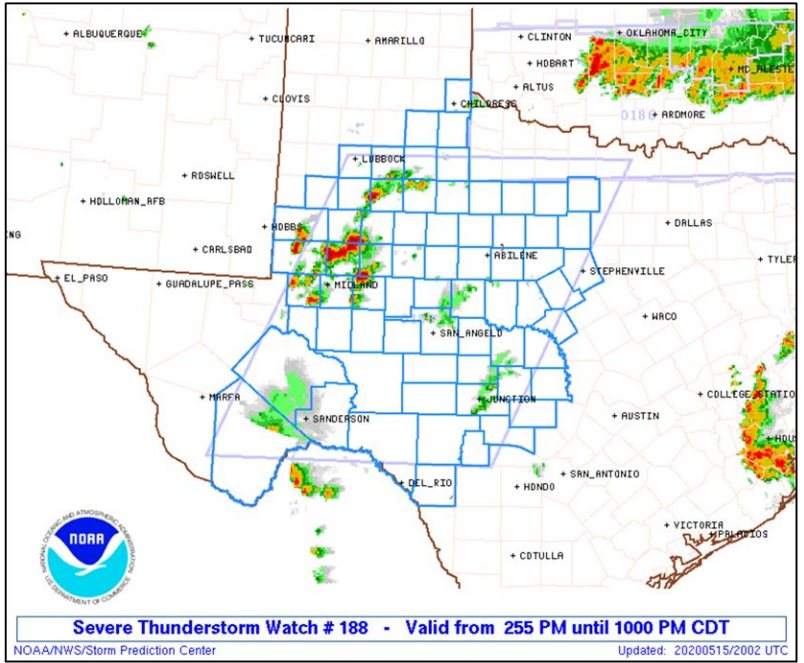
Messaging Evolves As We Get Closer to Severe Weather Events



Tornado Watch vs Severe Thunderstorm Watch



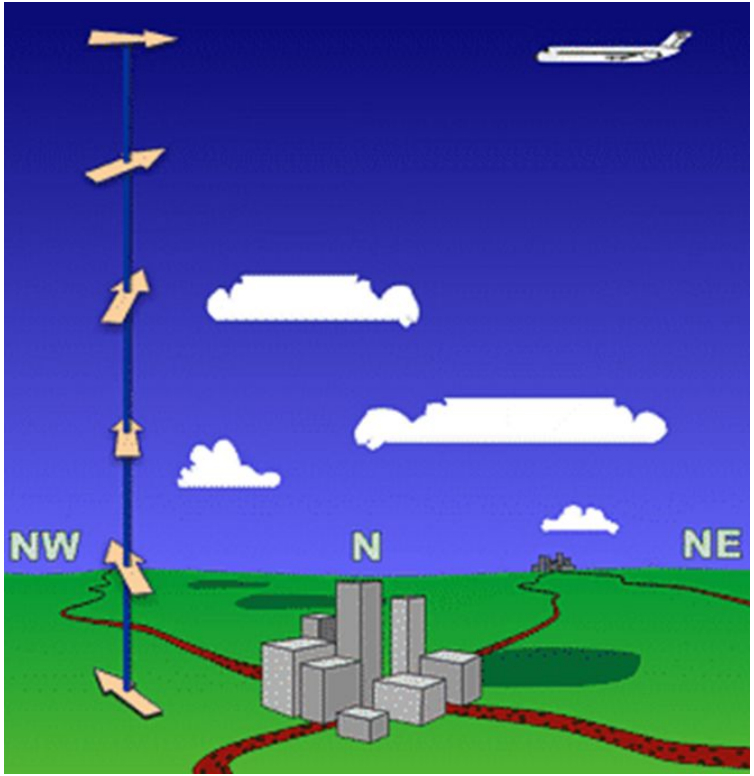
Hazard	Tornadoes	EF2+ Tornadoes	Severe Wind	65 kt+ Wind	Severe Hail	2"+ Hail
Likelihood	Moderate	Low	High	Low	Moderate	Low



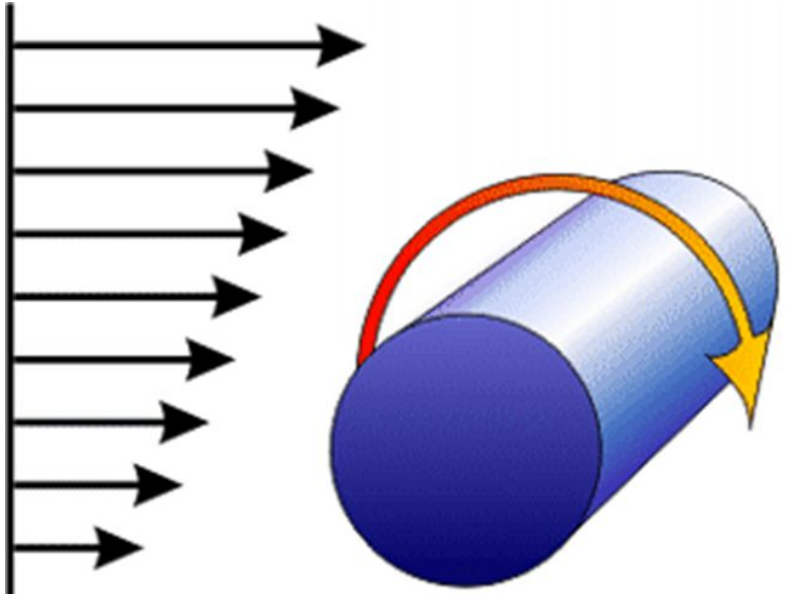
Hazard	Tornadoes	EF2+ Tornadoes	Severe Wind	65 kt+ Wind	Severe Hail	2"+ Hail
Likelihood	Low	Very Low	High	Moderate	Moderate	Moderate

The main difference is whether tornado threat is moderate or low. Other hazards may be more important!

What is Wind Shear



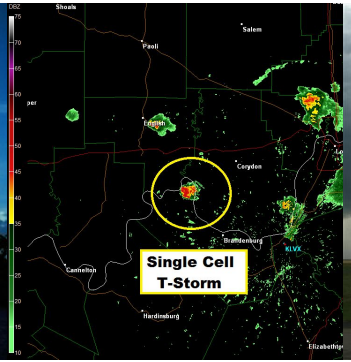
Directional Shear - Ideal for supercells

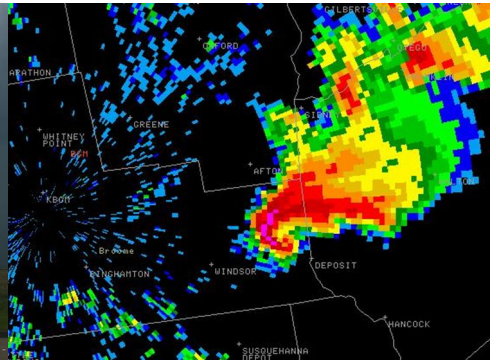


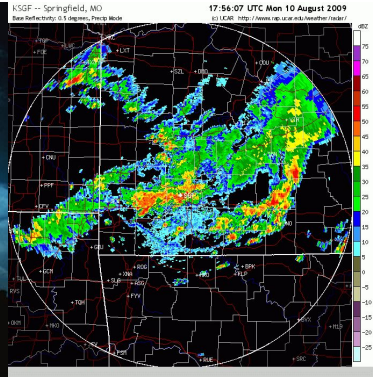
Unidirectional shear or “Speed Shear”

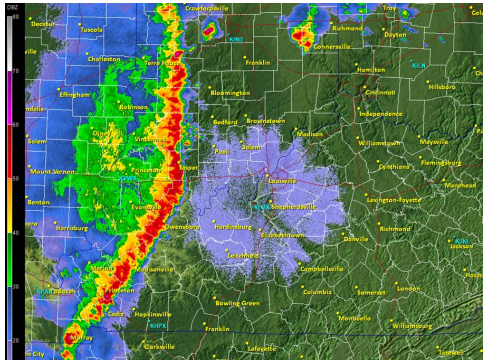
Ideal for producing squall lines

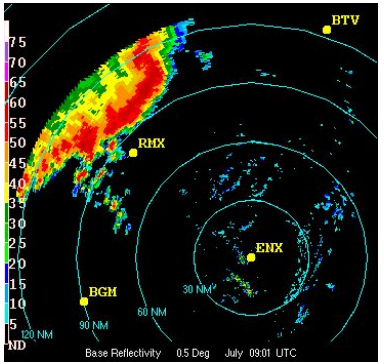
Environment Gives Storm Many Shapes and Sizes





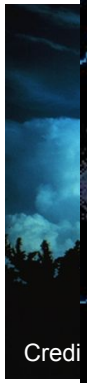


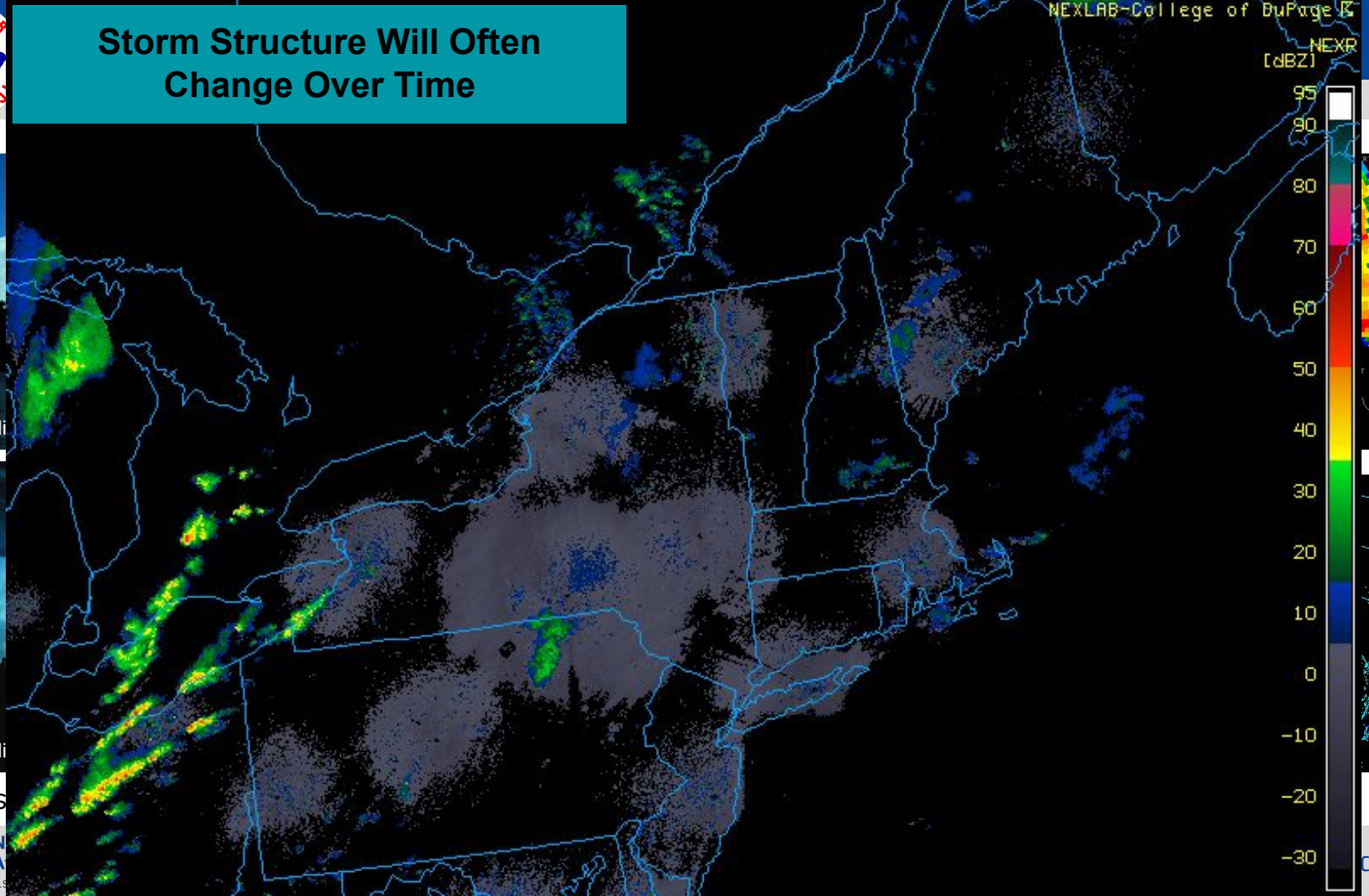


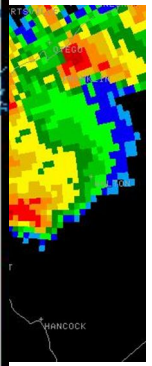


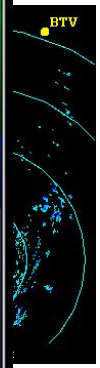
A storm's structure on radar gives us a general clue of what it's capable of.

Storm Structure Will Often Change Over Time









A s

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Warning Criteria

Severe Thunderstorm Warning

- Thunderstorm wind gusts ≥ 58 mph & or:
- Hail ≥ 1 inch in diameter

Tornado Warning

- Doppler Radar indicated rotation
- Confirmed reports of a tornado

Flash Flood Warning

- 6 inches or more of flowing water over roadways
- A rapid rise in water that is a threat to life & property

Convective Warnings - Severe, Flash Flood, & Tornado

WIND SPEED ESTIMATE	DESCRIPTION
25-31 mph	Large branches in motion; whistling heard in telephone wires
32-38 mph	Whole trees in motion; inconvenience felt walking against the wind
39-54 mph	Twigs break off trees; wind generally impedes progress
55-72 mph	Damage to chimneys and TV antennas; pushes over shallow rooted trees
73-112 mph	Peels surfaces off roofs; windows broken; light mobile homes pushed or overturned; moving cars pushed off road
113-157 mph	Roofs torn off houses; cars lifted off ground

Dime/Penny	0.75 inches
Nickel	0.88 inches
Quarter	1.00 inches
Half Dollar	1.25 inches
Ping Pong Ball	1.50 inches
Golf Ball	1.75 inches
Hen Egg	2.00 inches
Tennis Ball	2.50 inches
Baseball	2.75 inches
Tea Cup	3.00 inches
Grapefruit	4.00 inches
Softball	4.50 inches

Tiered Impact Based System

Wording gets stronger the greater the threat to life.

Also includes:

- Tornadoes
- Flash Floods
- Snow Squalls

Thunderstorm
Damage Threat Categories

Considerable / Destructive Tags

Thunderstorm Damage Threat (tag category)	Wind	Hail diameter	WEA?
Base (no tag; default)	58 mph (60 mph will appear in the warning)	1.00 inch (U.S. quarter)	NO
Considerable	70 mph	1.75 inch (golfball)	NO
Destructive	80 mph	2.75 inch (baseball)	YES

Impact Based Severe Thunderstorm Warning Example

Tag Information at the end of the warning

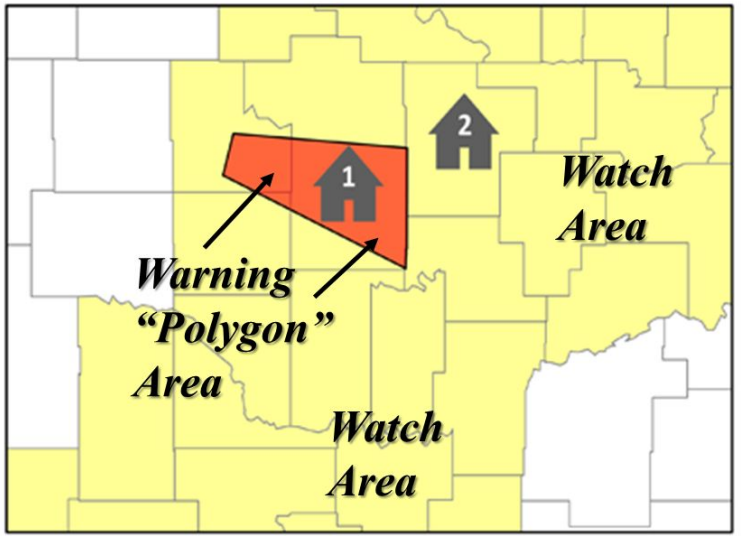
```
TORNADO...POSSIBLE
THUNDERSTORM DAMAGE THREAT...CONSIDERABLE
HAIL THREAT...RADAR INDICATED
MAX HAIL SIZE...1.00 IN
WIND THREAT...OBSERVED
MAX WIND GUST...70 MPH
```

WIRELESS EMERGENCY ALERTS CAPABLE

How Do We Know When Wx. is Hazardous

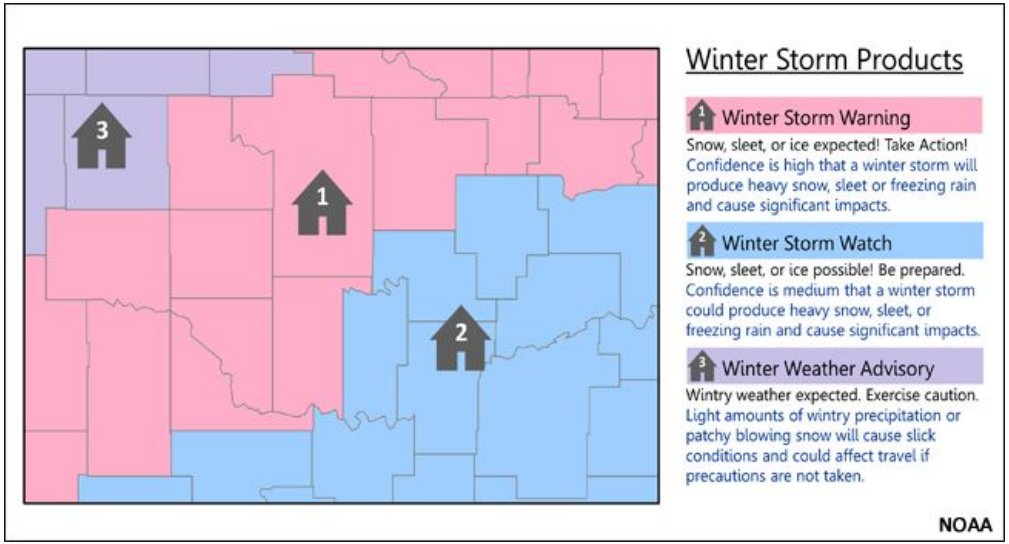
Image from VT Dept of Health

SUMMER



How Do We Know When Wx. is Hazardous

Image from VT Dept of Health



WINTER

Overview: Climatology, Thunderstorms

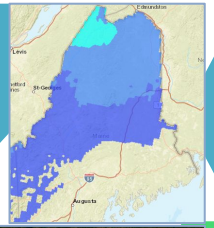
- Our thunderstorm climatology is mostly June/July/August, but not unheard of in winter
- Do ingredients (heat, shear, fronts, moisture) come together? Our outlooks focus on that, storm evolution transitions to radar.
- Freezing rain peaks in December here
- December-February are our snowiest months
- Ice jams are most likely at the tails of winter, and are more likely in Vermont
- September through May is typically our “windy” season

Messaging Evolves As We Get Closer to Winter Storms

3-7 Days

Outlook

Determine risk and need for any preparations

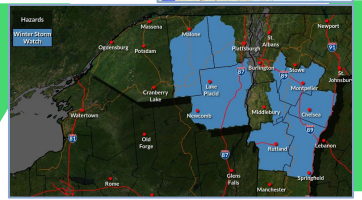


NWS Hazardous Weather Outlooks
Weather Prediction Center Snowfall Forecasts

1-3 Days

Watch

Consider Changing Plans

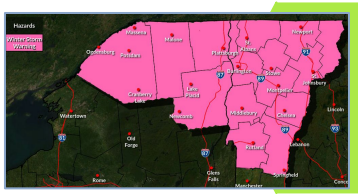


Winter Storm Watch (Snow > 7”)
Ice Storm Watch (Ice > 0.5”)
At least medium confidence

0 - 2 Day

Warning

Complete plans



Winter Storm Watch (Snow > 7”)
Ice Storm Watch (Ice > 0.5”)
At least high confidence

Day 0

Know the road before you go!

Monitoring for any spot of particular heavy snow. Check local 5-1-1 for traffic. Have emergency kit ready if utilities fail

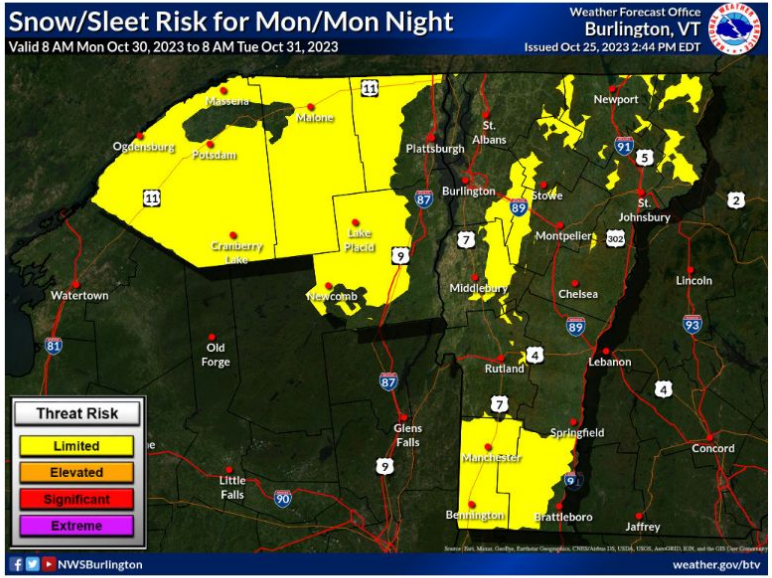
Messaging Winter Storms

Warning Type	Criteria
Winter Storm	•7” or more of snow •Significant mixed precipitation
Ice Storm	•0.50” of ice
Blizzard	•Visibility less than ¼ mile •Sustained wind or frequent gusts greater than 35 mph •Must last for 3 or more continuous hours
Extreme Cold	•Wind Chill or Temperatures below -30F
High Wind	•Wind gusts 58mph or greater •Sustained winds 40mph or greater

Graphical Hazardous Weather Outlook

Experimental Graphical Hazardous Weather Outlook

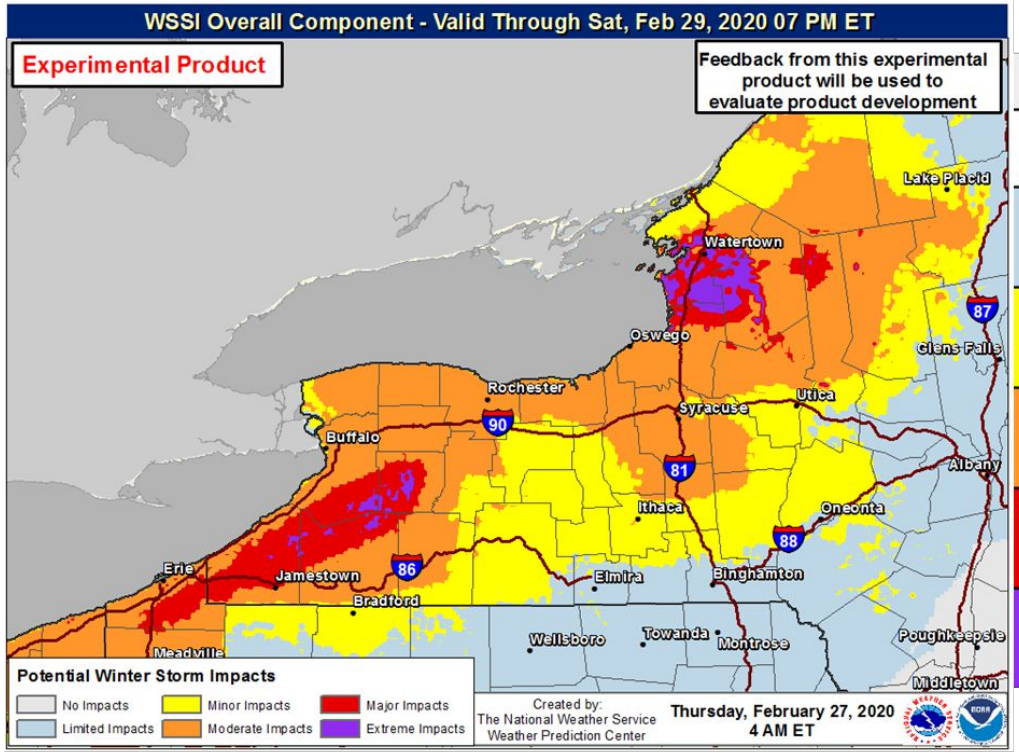
Weather Forecast Office Burlington, VT
Updated: October 25th 2023, 5:02:05 pm



24 Hr Hazard Risks	Tonight	Thu	Fri	Sat	Sun	Mon	Tue
Severe Thunderstorm							
Tornado							
Thunderstorm Wind							
Hail							
Lightning							
Excessive Rainfall							
Wind							
Fog							
Fire Weather							
Excessive Cold							
Ice Accumulation							
Snow/Sleet							

Risk Level	Category	Definition
	None	No snow or sleet.
	Limited	Light snow and/or sleet accumulation will result in locally hazardous travel conditions, especially on bridges, overpasses, and untreated or secondary roads.
	Elevated	Considerable snow and/or sleet accumulation will cause significant travel disruptions.
	Significant	Heavy snow and/or sleet accumulation will result in widespread travel disruptions.
	Extreme	Extreme snow and/or sleet accumulation will result in widespread, prolonged travel disruptions.

Winter Storm Severity Index (WSSI)



Potential Winter Storm 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, life saving actions needed. Will likely result in major disruptions to daily life.

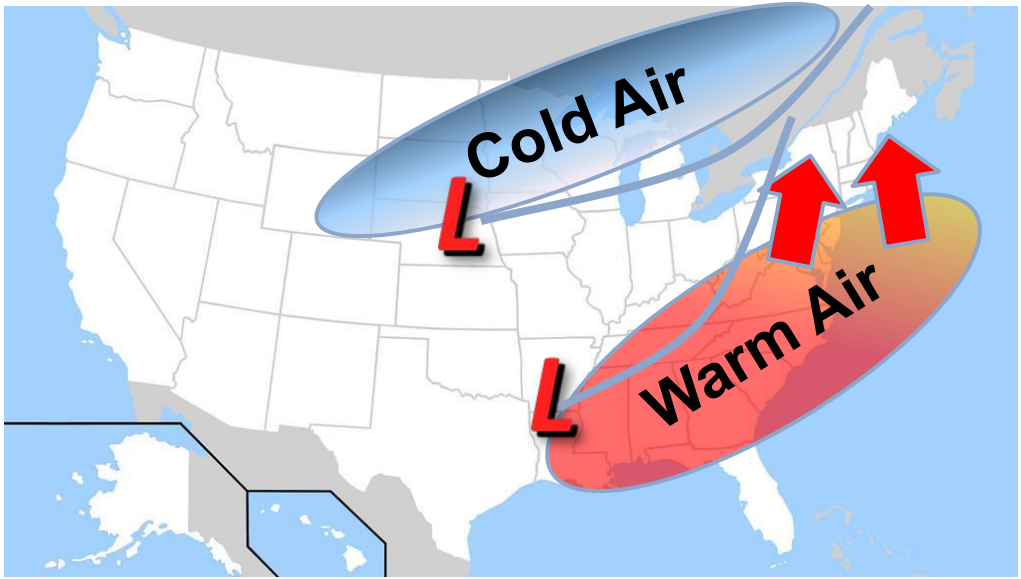
Extreme Impacts
Extensive and widespread severe property damage, life saving actions will be needed. Results in extreme disruptions to daily life.

Winter Storm Severity Index (WSSI)

WSSI Component	Purpose
Snow Amount Index	Impact to transportation from total amount of snow and snowfall rate
Snow Load Index	Impact from weight of snow and potential damage to trees and powerlines
Blowing Snow Index	Impact of blowing and drifting snow on transportation
Ground Blizzard Index	Impact of pre-existing snow combined with very strong winds on transportation
Flash Freeze Index	Impact on transportation in situations where temperature falls rapidly below freezing during or just after precipitation
Ice Accumulation Index	Impact of ice accumulation on transportation and also tree and powerline damage

Where's the Low Tracking?

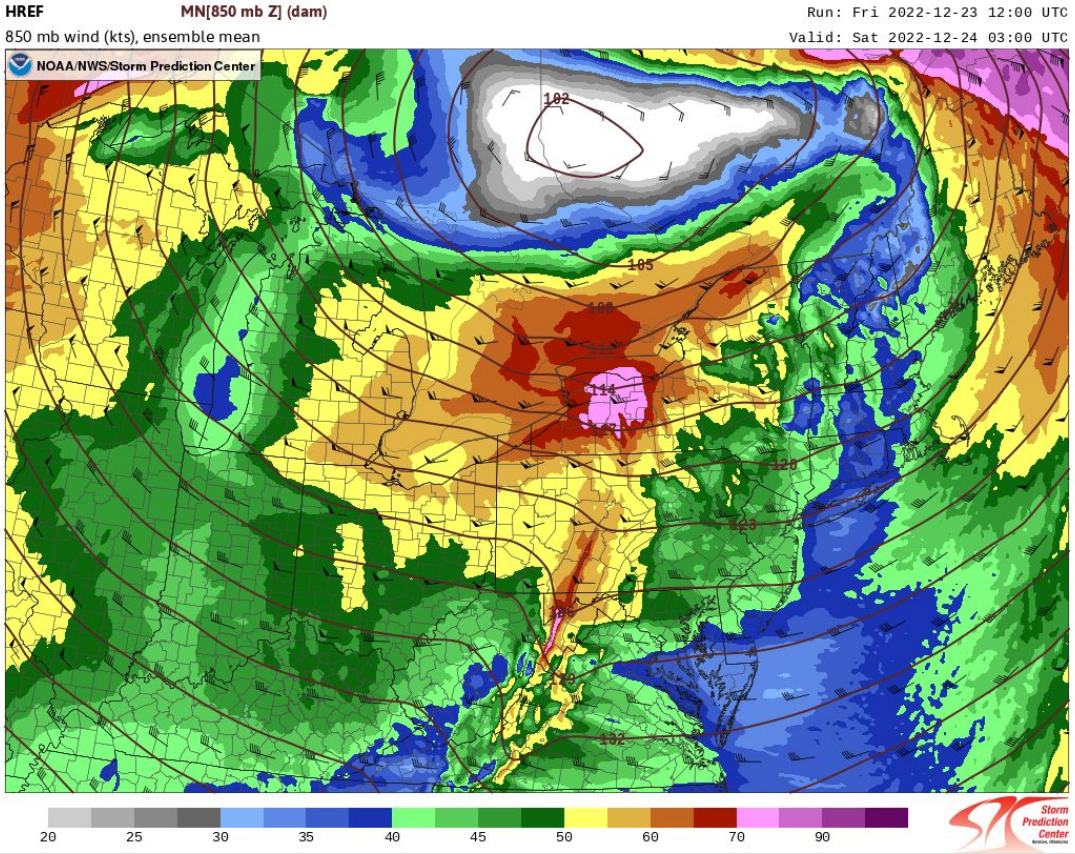
Determines wind fields, which affects whether warm air from the south lifts into our region.



If the track is north of our region, too much warm air will limit chances for wintry weather, but is more favorable for severe weather!

Blizzard of December 2022

- Severe blizzard conditions northeast of Lake Erie and Lake Ontario
- Continuous blizzard conditions for 2 days, followed by more heavy snow and gusty winds
- Zero visibility and frigid wind chills
- Very high loss of life in Western NY



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Dec 24, 12:27 pm	12	6	77	-10	SSW	31G43 0.25	Hvy snow
Dec 24, 12:04 pm	12	6	77	-10	SSW	31G39 0.50	Snow
Dec 24, 11:53 am	12	5	73	-10	S	30G39 0.25	Hvy snow
Dec 24, 11:41 am	12	5	73	-9	SSW	29G47 0.50	Snow
Dec 24, 11:14 am	12	6	77	-10	SSW	31G44 0.25	Hvy snow
Dec 24, 11:01 am	11	6	80	-11	SSW	31G46 0.25	Hvy snow
Dec 24, 10:53 am	11	5	76	-11	SSW	30G38 0.50	Snow
Dec 24, 9:53 am	10	5	80	-13	SSW	31G45 0.25	Hvy snow
Dec 24, 8:53 am	10	6	84	-12	SSW	30G47 0.25	Lt snow, Freezing Fog
Dec 24, 7:53 am	10	5	80	-12	SSW	28G39 0.25	Hvy snow
Dec 24, 7:19 am	10	6	84	-12	SSW	29G39 0.25	Lt snow, Freezing Fog
Dec 24, 7:04 am	10	7	87	-10	SSW	23G38 0.50	Lt snow, Freezing Fog
Dec 24, 6:53 am	10	7	87	-12	SSW	29G41 0.25	Snow, Freezing Fog
Dec 24, 5:53 am	11	7	84	-10	SSW	28G37 0.25	Snow, Freezing Fog
Dec 24, 4:53 am	11	8	88	-10	SSW	26G38 0.25	Snow, Freezing Fog
Dec 24, 3:53 am	13	10	88	-10	SSW	35G49 0.25	Snow, Freezing Fog
Dec 24, 2:53 am	14	11	87	-7	SSW	30G40 0.25	Snow, Freezing Fog
Dec 24, 2:22 am	13	10	88	-9	SW	31G46 0.25	Snow, Freezing Fog
Dec 24, 2:14 am	13	10	88	-8	SSW	29G40 0.50	Snow, Freezing Fog
Dec 24, 2:06 am	13	10	88	-7	SSW	25G48 0.50	Snow, Freezing Fog
Dec 24, 2:04 am	13	10	88	-9	SSW	33G48 0.25	Snow, Freezing Fog
Dec 24, 1:53 am	13	10	88	-8	SSW	29G38 0.50	Snow, Freezing Fog
Dec 24, 1:43 am	13	9	84	-7	SSW	26G45 0.50	Snow, Freezing Fog
Dec 24, 12:53 am	13	9	84	-8	SW	30G45 0.25	Hvy snow, Freezing Fog
Dec 23, 11:53 pm	12	9	87	-10	SSW	30G39 0.25	Hvy snow, Freezing Fog
Dec 23, 11:16 pm	12	9	87	-7	SSW	23G37 0.25	Hvy snow, Freezing Fog
Dec 23, 10:53 pm	12	9	87	-9	SSW	29G40 0.25	Hvy snow, Freezing Fog
Dec 23, 9:53 pm	13	10	88	-8	SSW	28G37 0.25	Hvy snow, Freezing Fog
Dec 23, 9:10 pm	16	14	92	-1	SSW	20G32 0.50	Snow, Freezing Fog
Dec 23, 8:53 pm	18	15	88	-1	SW	26G43 0.25	Hvy snow, Freezing Fog
Dec 23, 8:17 pm	18	15	88	-1	SW	30G44 0.25	Hvy snow, Freezing Fog
Dec 23, 8:07 pm	18	16	92	-1	SW	29G40 0.50	Snow, Freezing Fog
Dec 23, 7:53 pm	19	16	88	0	SW	30G41 0.50	Snow, Freezing Fog
Dec 23, 7:22 pm	19	16	88	0	SW	31G40 0.75	Lt snow, Mist
Dec 23, 7:06 pm	20	16	84	3	SW	24G47 1.50	Lt snow, Mist
Dec 23, 6:53 pm	20	17	88	1	SW	31G45 0.50	Snow, Freezing Fog
Dec 23, 5:53 pm	21	19	92	4	SW	25G40 0.75	Lt snow, Mist
Dec 23, 5:24 pm	22	20	92	5	SW	28G40 2.00	Lt snow, Mist
Dec 23, 5:11 pm	22	20	92	5	SW	26G51 1.75	Lt snow, Mist
Dec 23, 4:53 pm	22	20	92	4	SW	31G43 1.00	Lt snow, Mist
Dec 23, 4:33 pm	23	22	96	5	SW	33G44 1.00	Lt snow, Mist
Dec 23, 4:06 pm	24	22	91	6	SW	32G43 0.25	Snow, Freezing Fog
Dec 23, 3:53 pm	24	23	96	7	SW	30G43 1.00	Lt snow, Mist

KOGS

Blizzard of December 2022

- Severe blizzard conditions northeast of Lake Erie and Lake Ontario
- Continuous blizzard conditions for 2 days, followed by more heavy snow and gusty winds
- Zero visibility and frigid wind chills
- Very high loss of life in Western NY

Dec 25, 2:55 am	16	12	85	-2	S	21G30 0.50	Lt snow
Dec 25, 1:55 am	14	12	92	-5	SSW	24G32 -0.25	Lt snow
Dec 25, 12:55 am	14	10	85	-5	SSW	23G33 0.25	Lt snow
Dec 24, 11:55 pm	12	10	92	-7	S	22G29 0.25	Lt snow
Dec 24, 10:55 pm	12	10	92	-7	SSW	23G30 0.25	Lt snow
Dec 24, 9:55 pm	12	10	92	-6	SSW	20G36 -0.25	Lt snow
Dec 24, 8:55 pm	12	10	92	-8	S	26G37 -0.25	Lt snow
Dec 24, 7:55 pm	12	10	92	-6	S	21G39 -0.25	Lt snow
Dec 24, 6:55 pm	14	12	92	-4	S	22G31 -0.25	Lt snow
Dec 24, 5:55 pm	12	10	92	-7	S	22G33 -0.25	Lt snow
Dec 24, 4:55 pm	12	10	92	-5	S	17G28 -0.25	Lt snow
Dec 24, 3:55 pm	12	9	85	-8	SSW	26G37 -0.25	Lt snow
Dec 24, 2:55 pm	12	10	92	-7	S	22G32 -0.25	Lt snow
Dec 24, 1:55 pm	12	9	85	-7	S	22G35 -0.25	Lt snow
Dec 24, 12:55 pm	12	9	85	-7	S	23G31 -0.25	Lt snow
Dec 24, 11:55 am	12	9	85	-6	S	21G32 -0.25	Lt snow
Dec 24, 10:55 am	10	7	85	-10	S	24 -0.25	Lt snow
Dec 24, 9:55 am	10	7	85	-10	S	23G33 -0.25	Lt snow
Dec 24, 8:55 am	10	9	92	-9	S	22G29 -0.25	Lt snow
Dec 24, 7:55 am	10	7	85	-8	S	20G37 -0.25	Lt snow
Dec 24, 6:55 am	9	7	92	-12	S	23G35 0.25	Lt snow
Dec 24, 5:55 am	10	9	92	-10	S	23G31 0.25	Lt snow
Dec 24, 4:55 am	12	10	92	-5	S	17G30 -0.25	Lt snow
Dec 24, 3:55 am	12	10	92	-6	SSW	20G28 -0.25	Lt snow
Dec 24, 2:55 am	18	16	92	3	SW	15G33 0.25	Lt snow
Dec 24, 1:55 am	18	16	92	0	SW	22G36 -0.25	Lt snow
Dec 24, 12:55 am	18	16	92	-1	SW	28G45 -0.25	Lt snow
Dec 23, 11:55 pm	18	16	92	0	SW	24G41 -0.25	Lt snow
Dec 23, 10:55 pm	18	16	92	-1	SW	26G49 -0.25	Lt snow
Dec 23, 9:55 pm	18	14	85	-2	SW	29G43 0.50	Lt snow
Dec 23, 8:55 pm	18	12	79	-1	SW	28G45 2.00	Lt snow
Dec 23, 7:55 pm	18	14	85	-2	SW	31G47 0.75	Lt snow
Dec 23, 6:55 pm	19	12	73	2	SW	24G39 5.00	Haze
Dec 23, 5:55 pm	21	16	79	6	SW	20G47 2.50	Lt snow
Dec 23, 4:55 pm	21	19	93	4	SW	25G40 0.50	Lt snow
Dec 23, 3:55 pm	23	21	93	7	SW	23G37 -0.25	Lt snow
Dec 23, 2:55 pm	25	21	86	9	SW	26G44 0.75	Lt snow

KMSS

Blizzard of December 2022

- Severe blizzard conditions northeast of Lake Erie and Lake Ontario
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- Zero visibility and frigid wind chills
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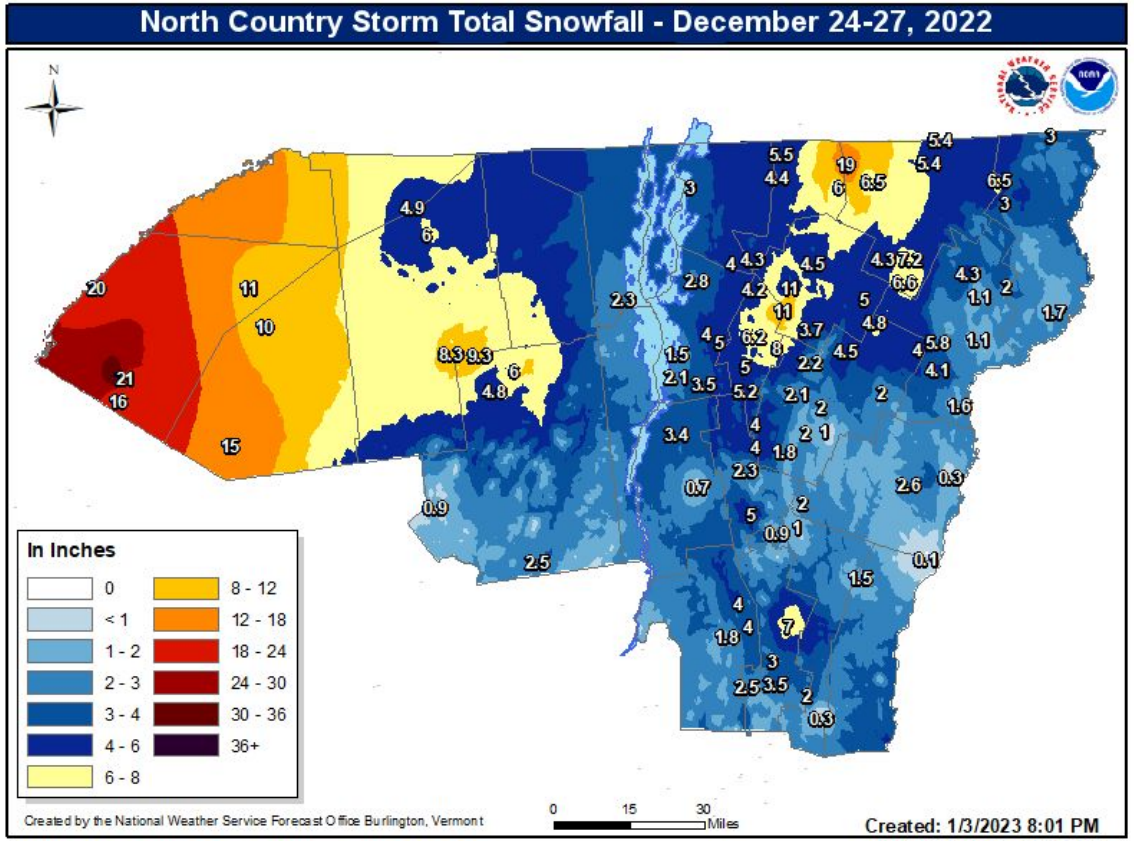
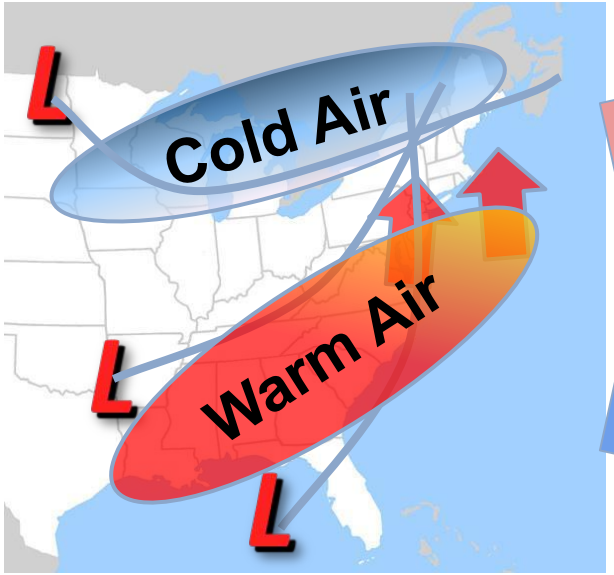


Where's the Low Tracking?

We are more likely to see mixed precipitation if the low passes overhead. In summer, low pressure tracking overhead tends to produce high amounts of rain (Irene, July 2023 Floods)



Shallow cold air or warm advection is strong

A quick transition from snow to freezing rain or rain.

Deep cold air or warm advection is weak

A slower transition from snow to wintry mix.

Role of Terrain in Freezing Rain

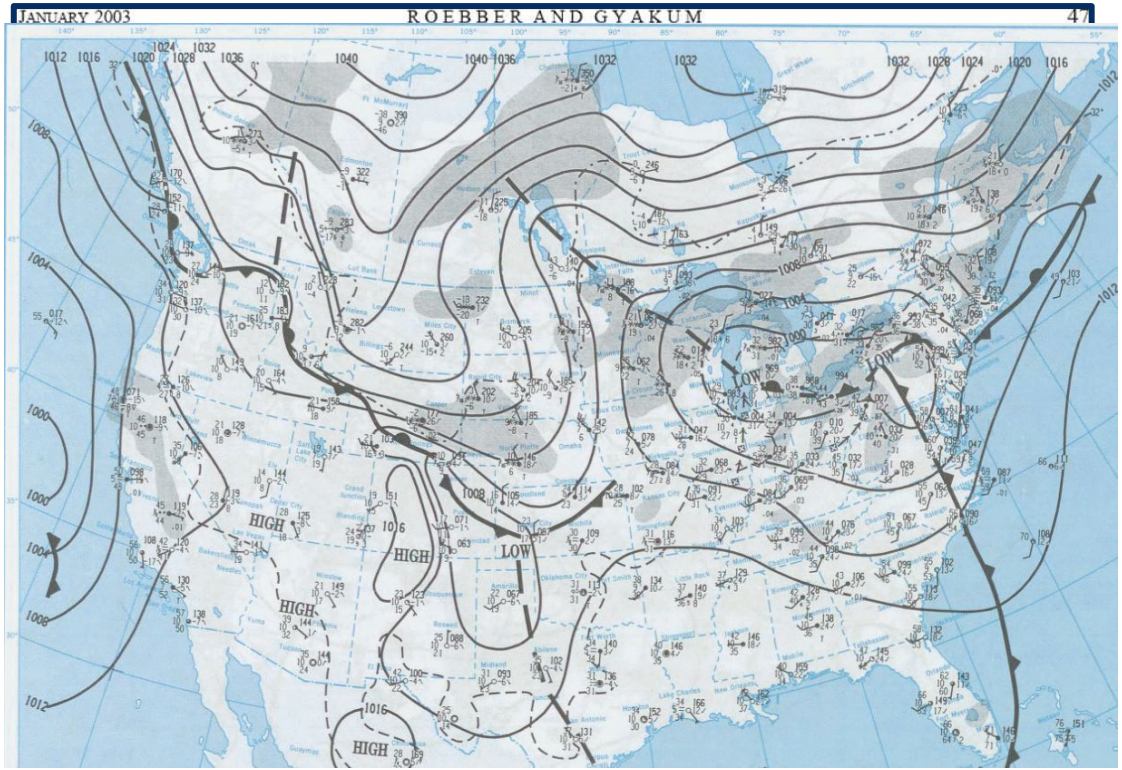
Terrain often causes surface cold fronts to have difficulty pushing past the Adirondacks and Greens.

Cool, dense north winds remain locked in place.

Further aloft, winds aren't impeded as much by friction, terrain and temperatures warm above freezing faster than at the surface.

This can make freezing rain occur in the lower valleys, of which the St. Lawrence Valley is most susceptible.

Role of Terrain in Freezing Rain



- Terrain often causes surface cold fronts to have difficulty pushing past the Adirondacks and Greens.
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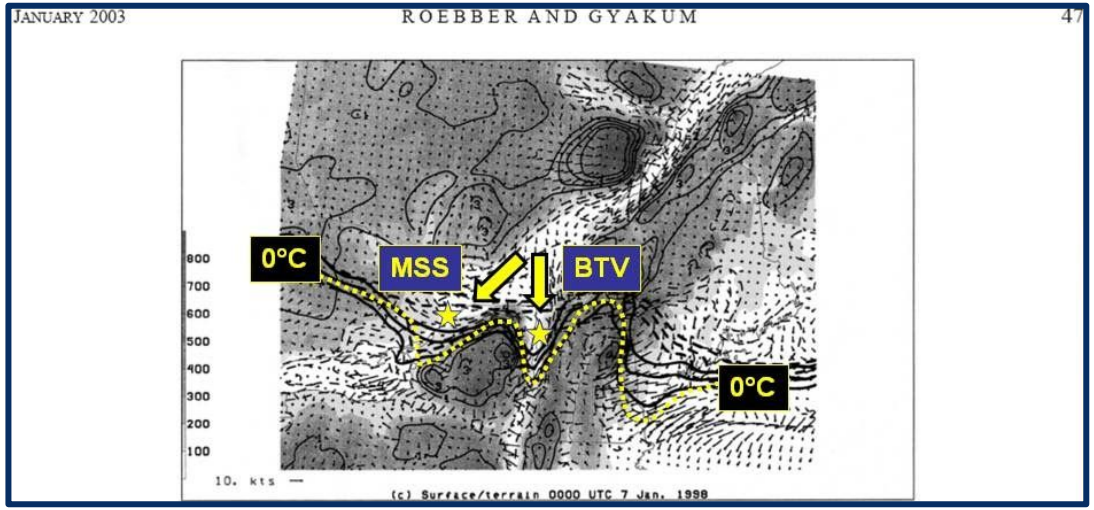
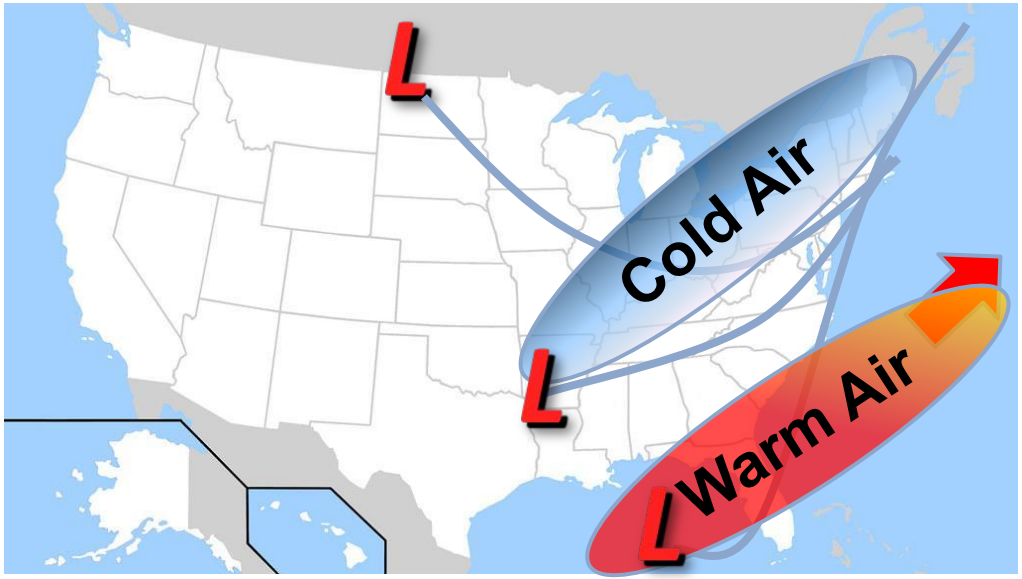
Role of Terrain in Freezing Rain



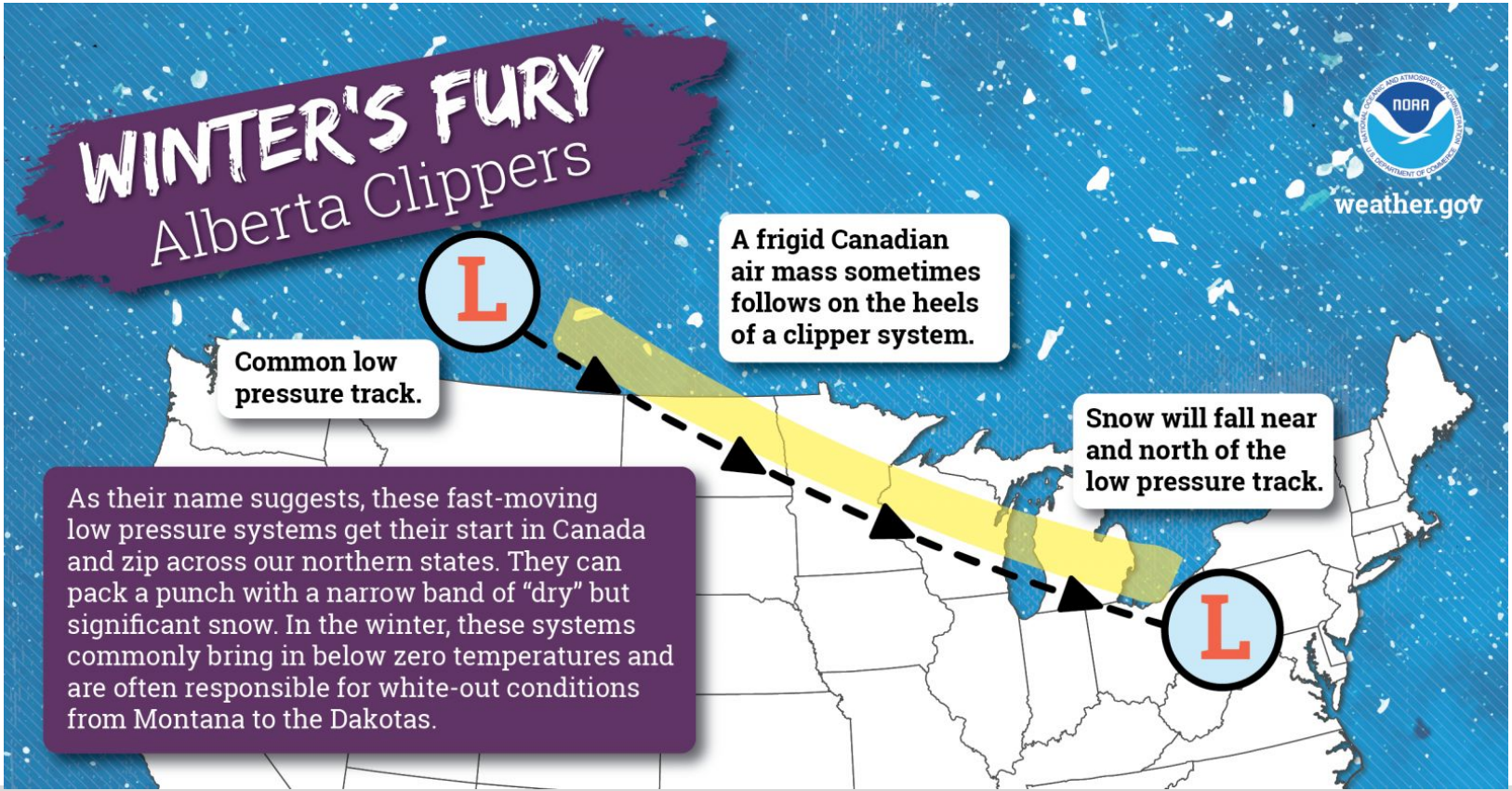
- Terrain often causes surface cold fronts to have difficulty pushing past the Adirondacks and Greens.
- Cool, dense north winds remain locked in place.
- Further aloft, winds aren't impeded as much by friction, terrain and temperatures warm above freezing faster than at the surface.
- This can make freezing rain occur in the lower valleys, of which the St. Lawrence Valley is most susceptible.

Where's the Low Tracking?

If the low tracks to our south, warm air intrusion is unlikely. Too far south, and we miss out on precipitation. But just right, and we can get heavy snow (cool, rain in summer/early fall).



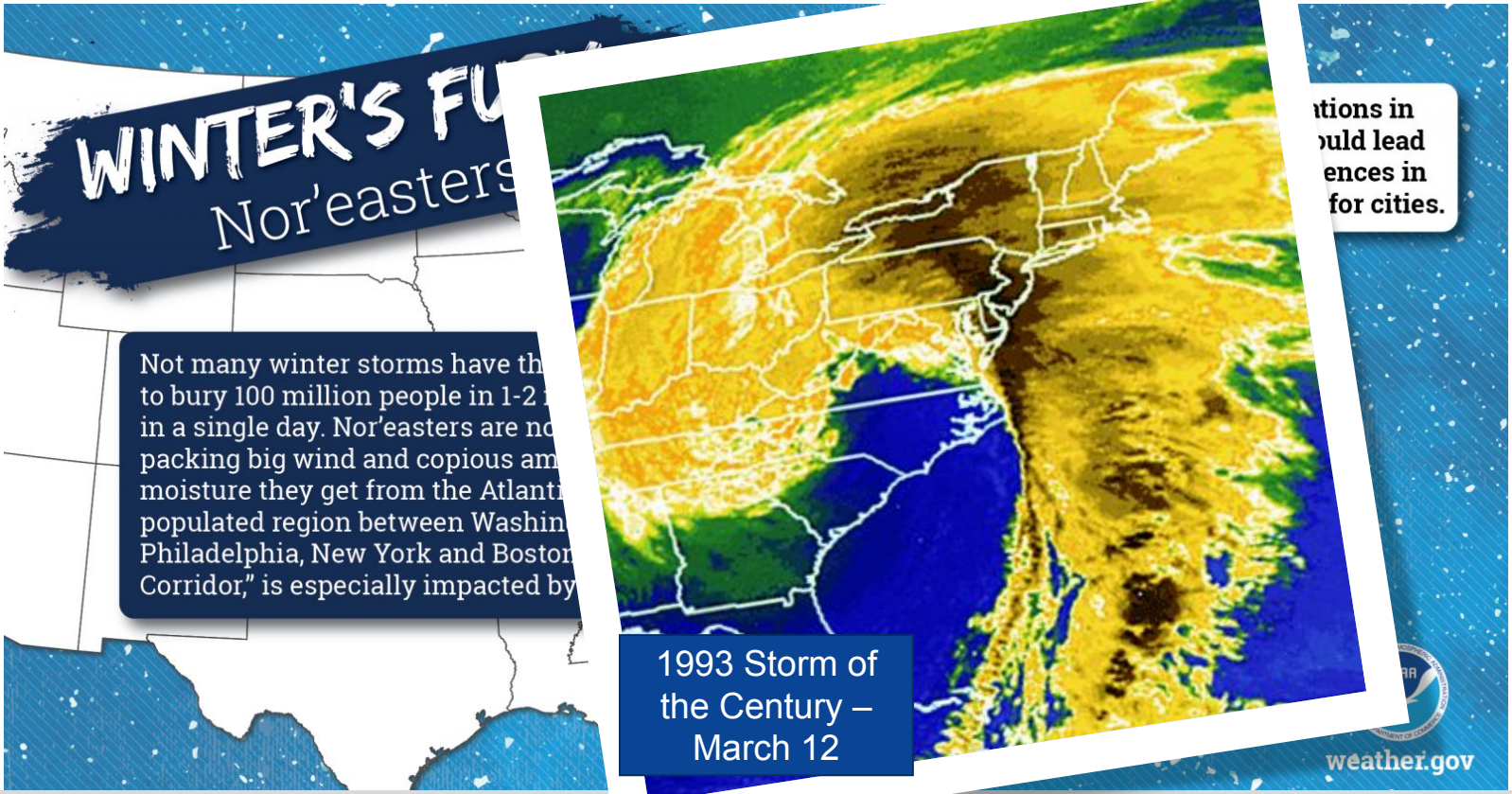
Alberta Clippers



Nor’easters


WINTER'S FURY
Nor'easters
Snow will fall to the west of the low pressure track.
Small variations in the track could lead to big differences in snow totals for cities.
L
Not many winter storms have the potential to bury 100 million people in 1-2 feet of snow in a single day. Nor'easters are notorious for packing big wind and copious amounts of moisture they get from the Atlantic. The heavily populated region between Washington D.C., Philadelphia, New York and Boston, the "I-95 Corridor," is especially impacted by Nor'easters.
Common low pressure track.
1993 Storm of the Century – March 12
weather.gov

Nor’easters


WINTER'S FU
Nor'easters
Not many winter storms have th
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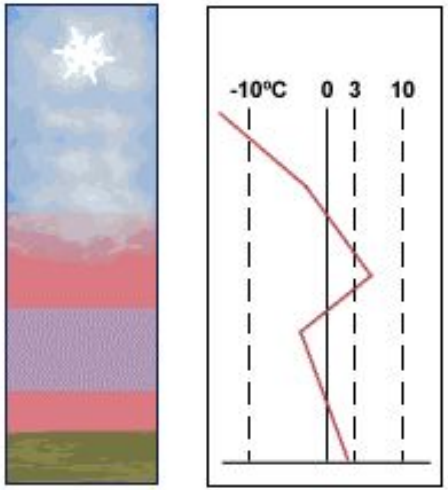
moisture they get from the Atlanti
populated region between Washin
Philadelphia, New York and Bosto
Corridor," is especially impacted by
tions in
uld lead
ences in
for cities.
1993 Storm of the Century – March 12
weather.gov

What precipitation type will it be?

Precipitation Type and Temperature Profile: Rain



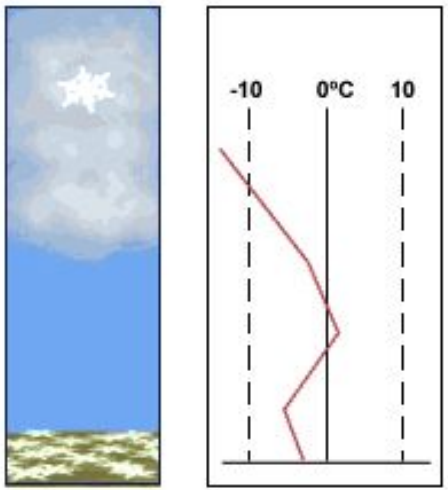
Ice Producing Layer:
T < -10°C, producing ice

Warm Layer:
if 1°C < T < 3°C partial melting
if T > 3°C total melting

Near Surface Cool Layer:
if T surface >> 0°C melting whether entering as ice or mix

©The COMET Program

Precipitation Type and Temperature Profile: Snow



Ice Producing Layer:
T < -10°C, producing ice

Warm Layer:
T < 1°C or not present

Near Surface Cold Layer:
T < 1°C

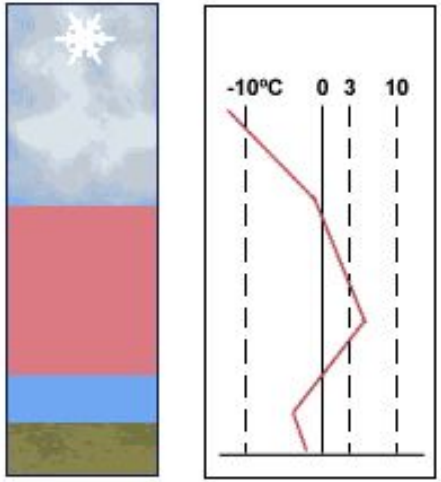
©The COMET Program

Snow dendrites falling into too much warm air will generally transition to rain

Snow dendrites can survive if it's only just above freezing.

What precipitation type will it be?

Precipitation Type and Temperature Profile: Freezing Rain



Ice Producing Layer:
T < -10°C, producing ice

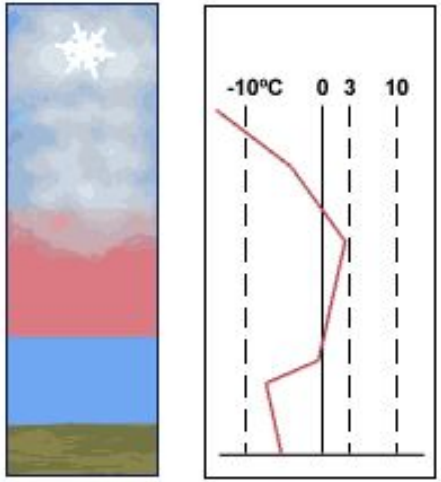
Warm Layer:
T > 3°C melting all ice

Near Surface Cold Layer:
if -6°C < T < 0°C for < 750 m
if T < -6°C for > 750 m, ice pellets can form

©The COMET Program

So if a snow dendrite falls into a large and very warm layer. It becomes rain mid-air. If there is not enough cool air near the surface, then water droplet freezes on contact with the surface.

Precipitation Type and Temperature Profile: Ice Pellets/Sleet



Ice Producing Layer:
T < -10°C, producing ice

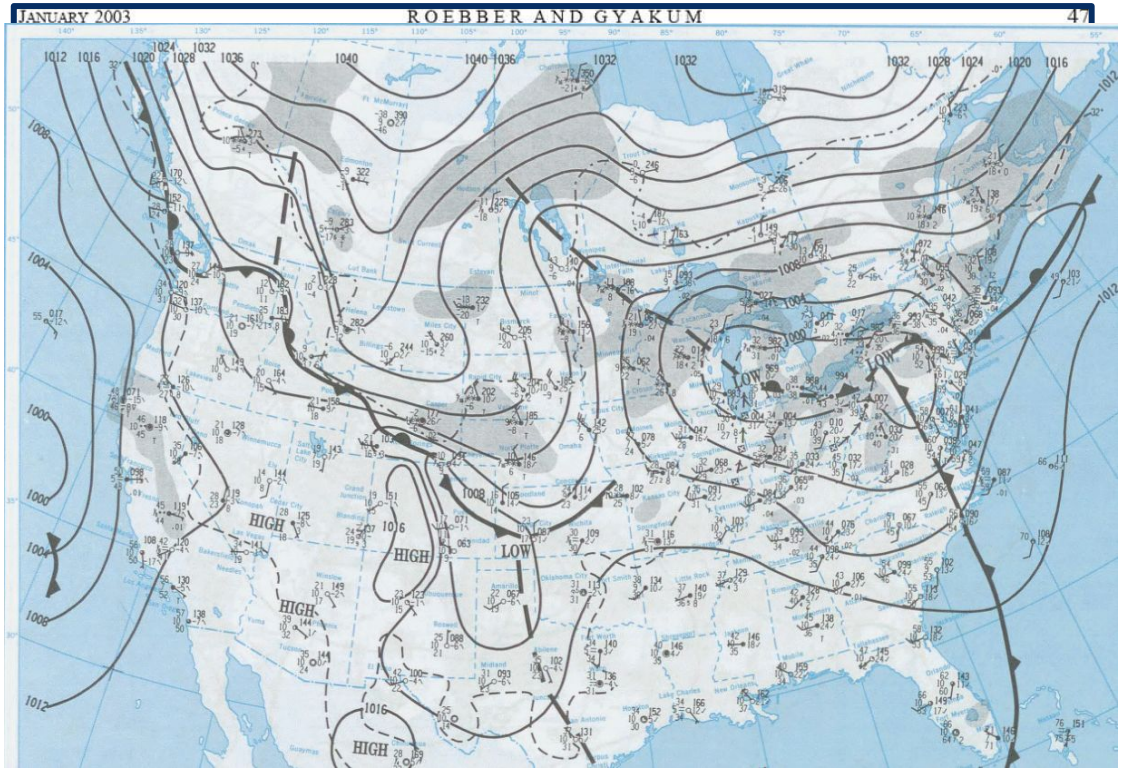
Warm Layer:
1°C < T < 3°C partial melting with potential mix

Near Surface Cold Layer:
if T < 0°C refreeze partially melted
if T < -6°C for > 750 m, ice pellets from liquid

©The COMET Program

But if there is enough cold air between the then water droplet and the surface, then it re-freezes before reaching the surface and falls as sleet.

Role of Terrain in Freezing Rain

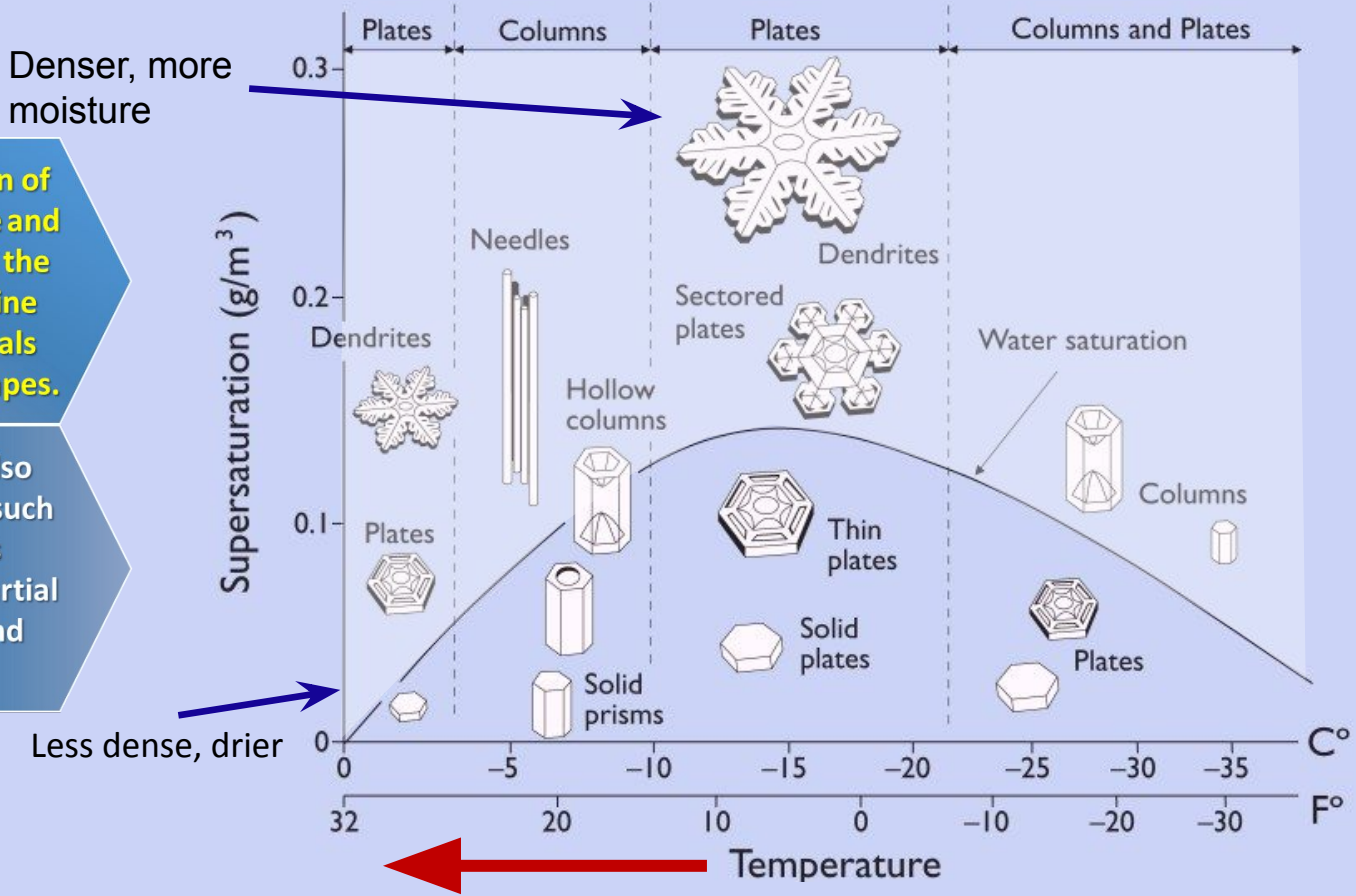


- Terrain often causes surface cold fronts to have difficulty pushing past the Adirondacks and Greens.
- Cool, dense north winds remain locked in place.
- Further aloft, winds aren't impeded as much by friction, terrain and temperatures warm above freezing faster than at the surface.
- This can make freezing rain occur in the lower valleys, of which the St. Lawrence Valley is most susceptible.

Snowflakes are collections of crystals held together as they melt warmer air.

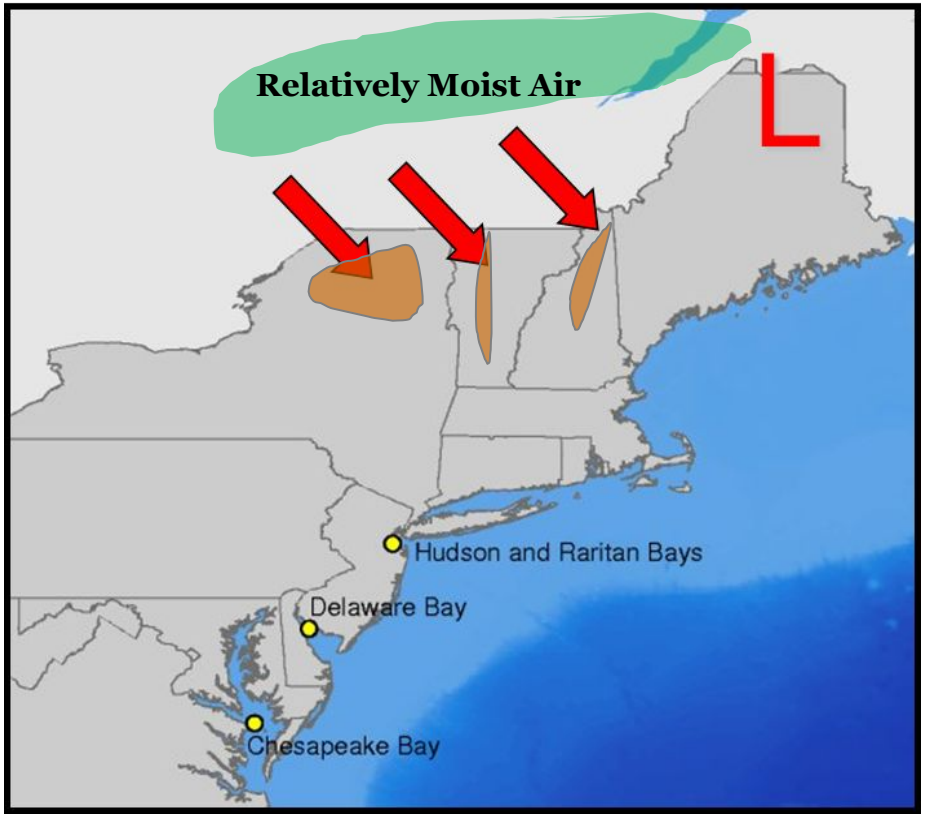
Combination of temperature and humidity of the air determine snow crystals different shapes.

They are also affected by such things as collisions, partial melting and riming.



Once low pressure is east

- Localized heavy snow across the western slopes of the Adirondack and Green Mountains
- Snowfall ranges from a trace across valleys to several feet in the mountains



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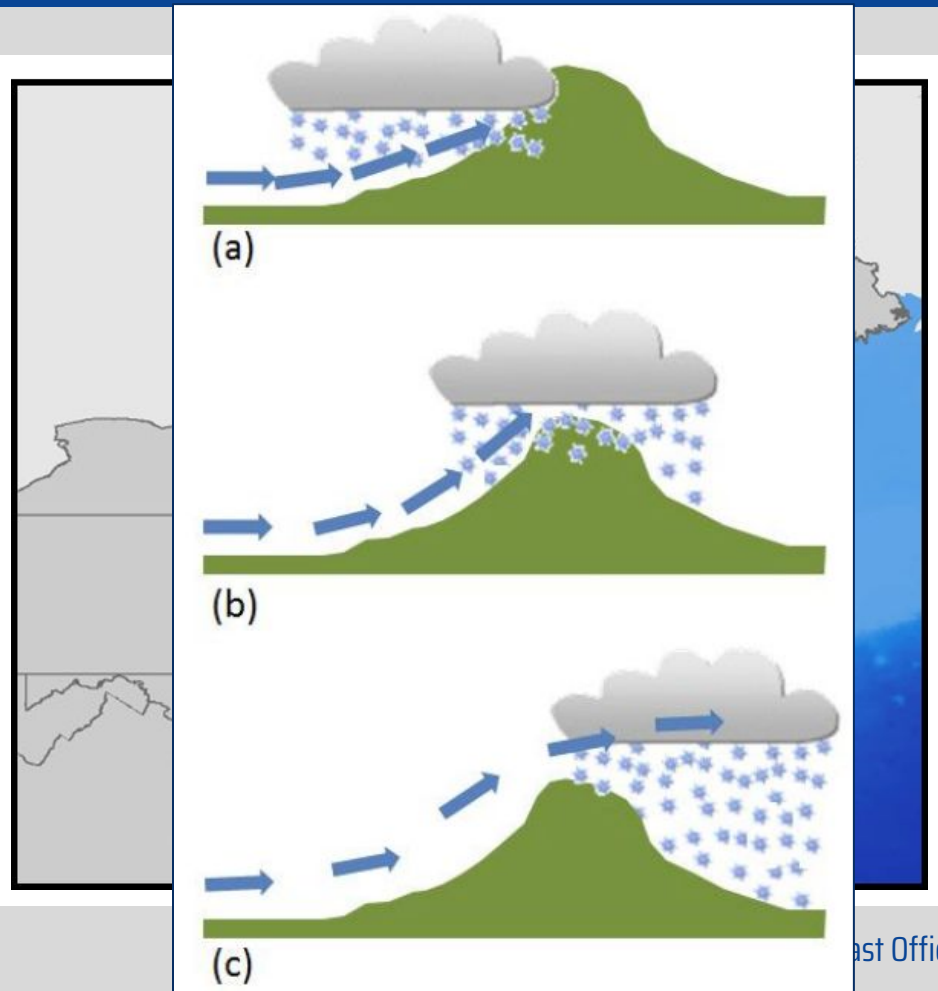
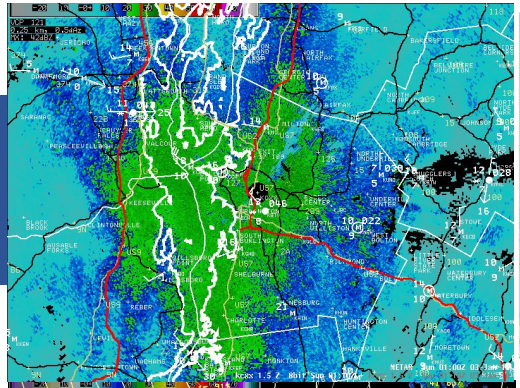
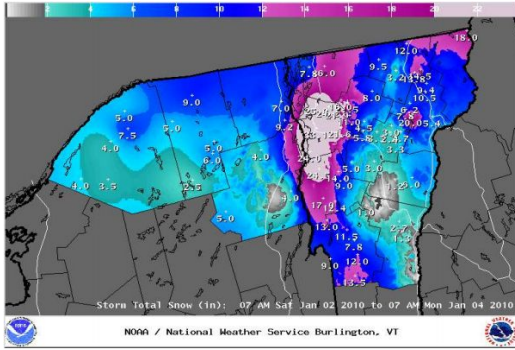


Once low pressure is east

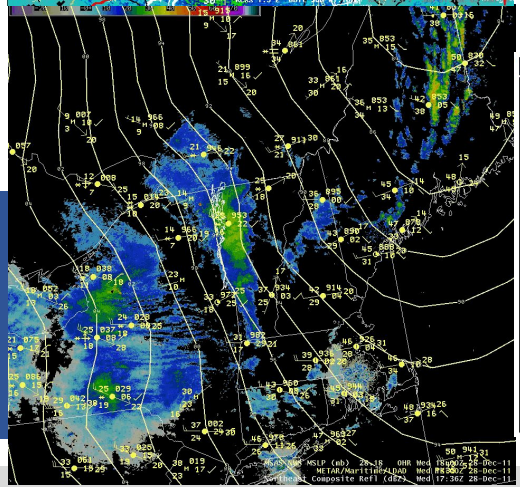
- These upslope events depend on the winds, atmospheric stability, and relative moisture.
- More stable – Snow trapped in lower elevations at foothills
- Less stable – Snow favored over the peaks

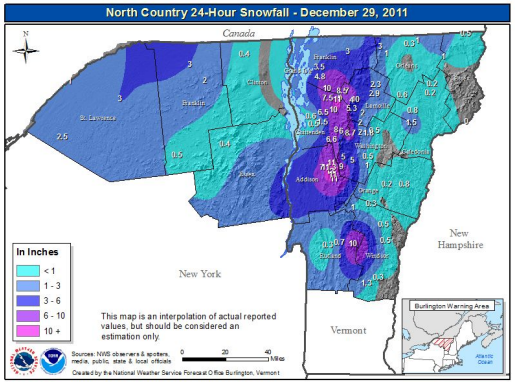
Blocked Flow – Jan 3, 2010





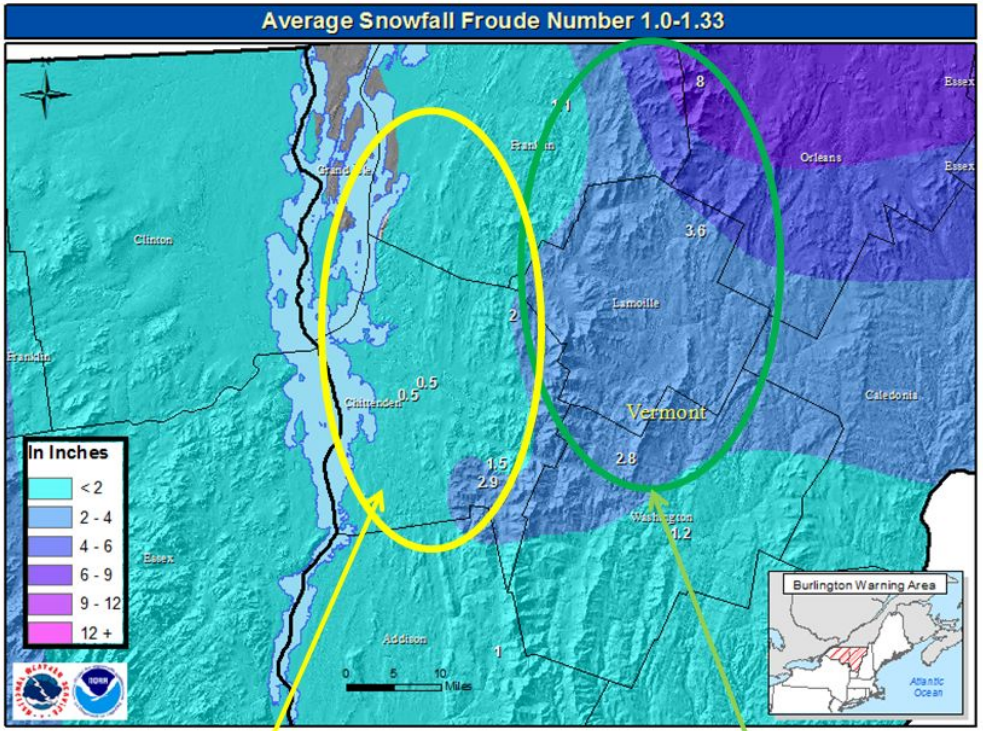
Semi-Blocked Flow– Dec 28, 2011





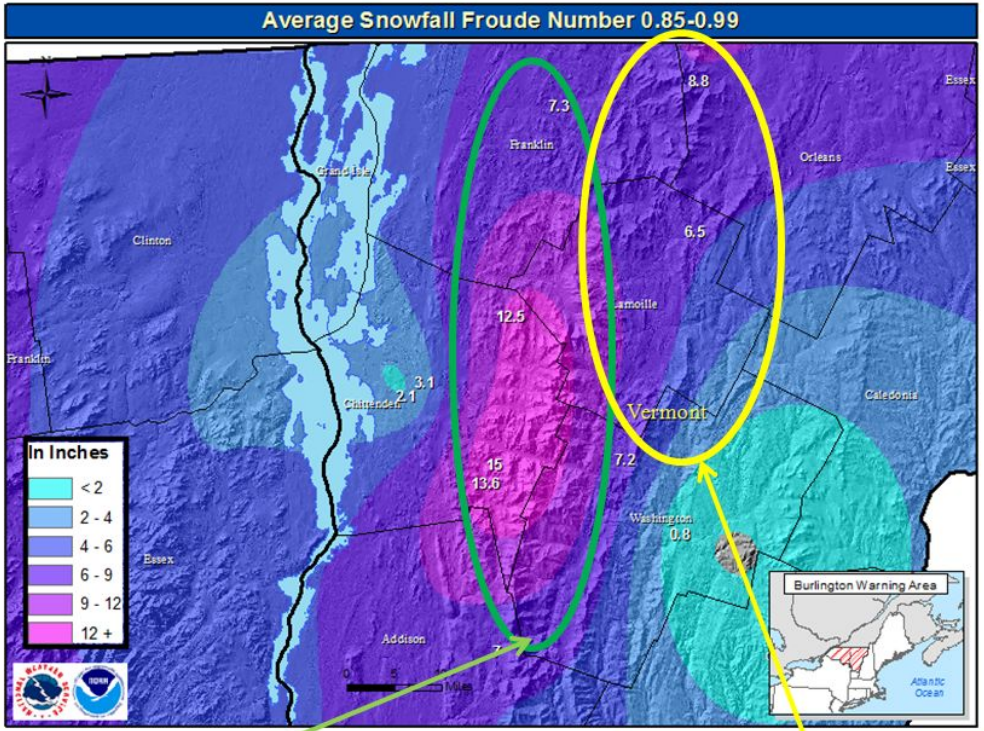
Upslope Snow

UNBLOCKED



Upslope Snow

SEMI-BLOCKED

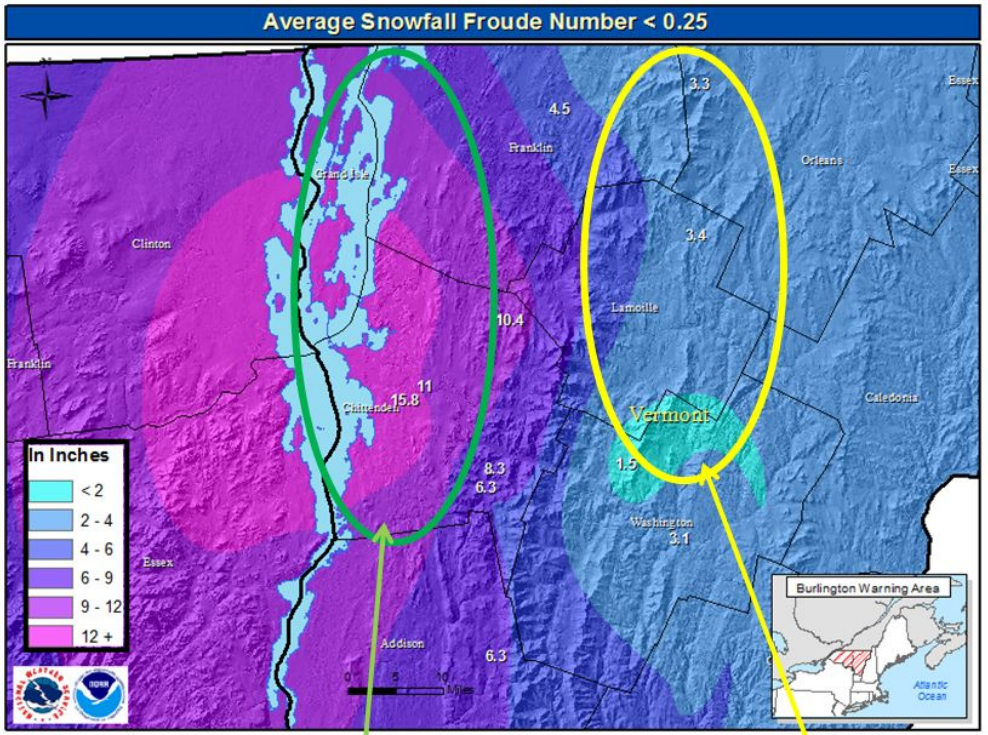


Heaviest Snow Western Slopes, Minimal Champlain Valley

Significant Snow Eastern Peaks

Upslope Snow

BLOCKED

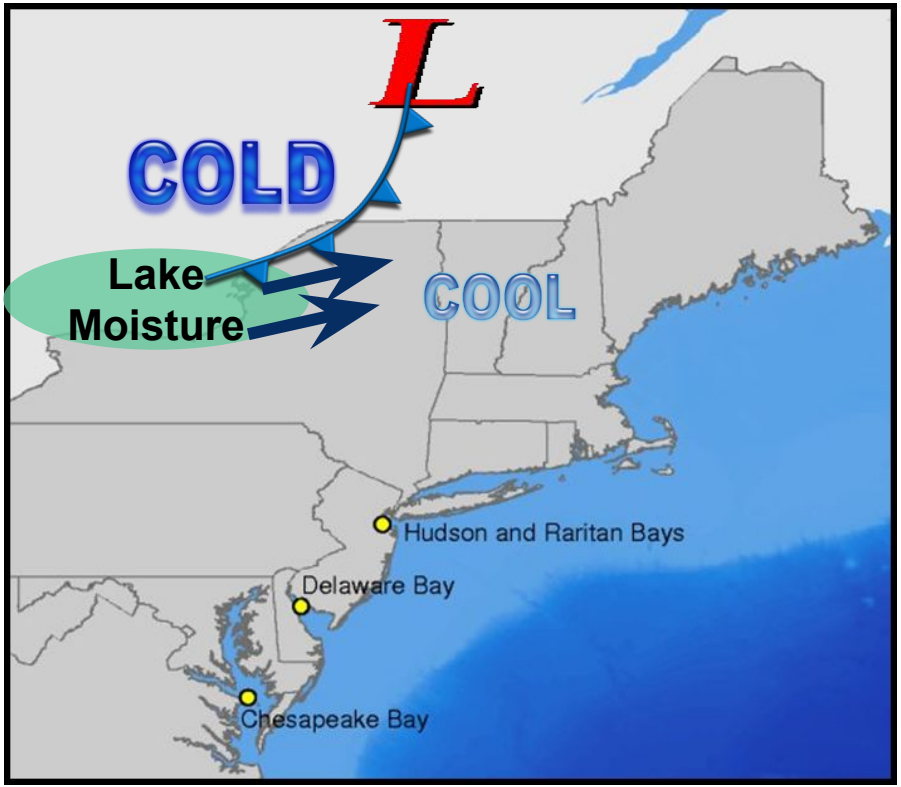


Heaviest Snow Backed up into Champlain Valley

Minimal Snow Eastern Peaks

Snow Squalls

- Typically occurs with a cold front during winter, but can happen with scattered snow showers
  - Like a blizzard bundled into 30 minutes
  - Strong, gusty winds > 35 mph
  - Heavy snow greatly reduces visibility
  - Rapid onset can catch motorists by surprise



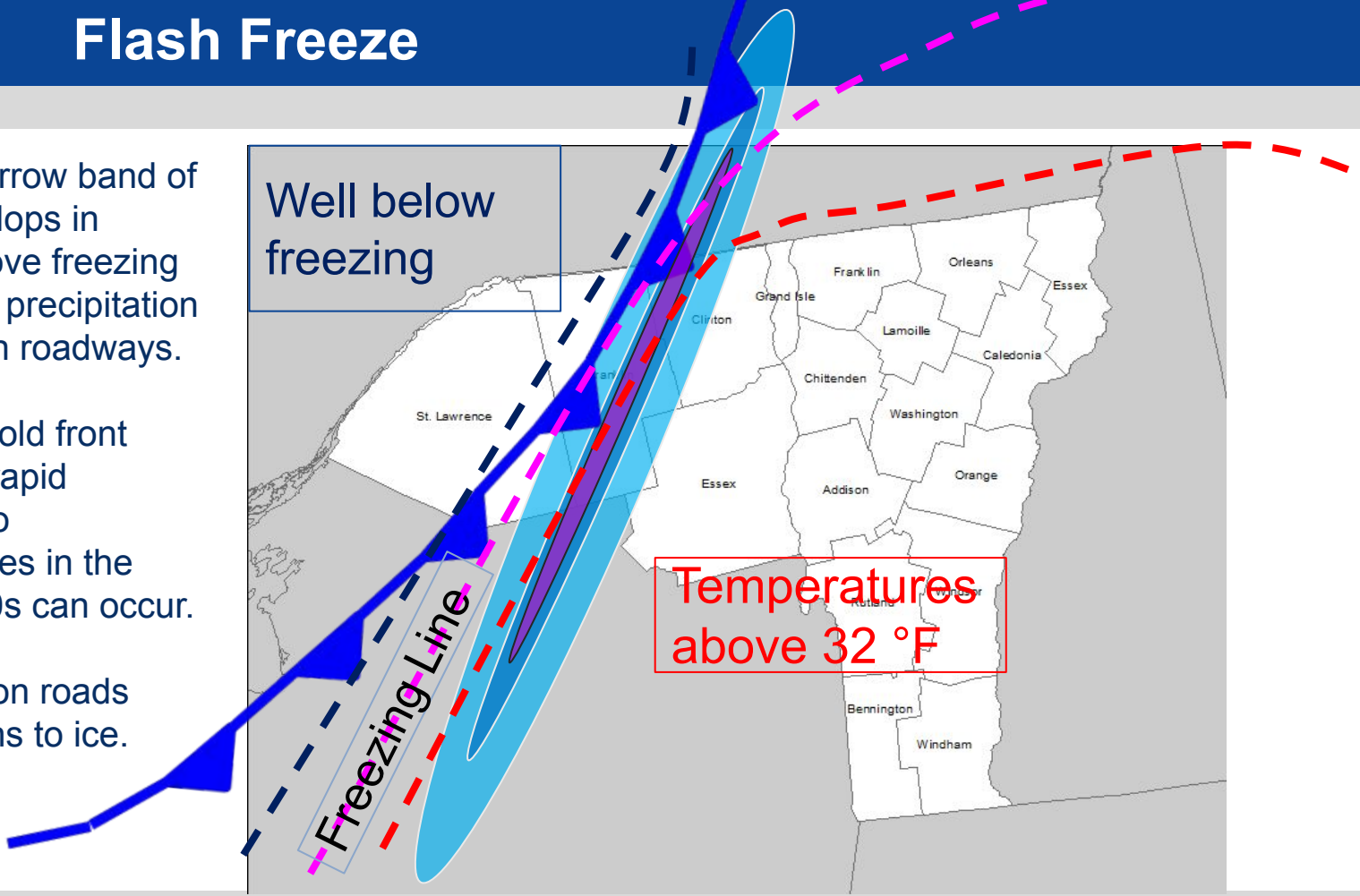

1776 THE GREEN MOUNTAIN BOYS 1946 VERMONT AIR NATIONAL GUARD

Flash Freeze

When a narrow band of snow develops in slightly above freezing conditions, precipitation can melt on roadways.

Once the cold front passes, a rapid transition to temperatures in the teens or 20s can occur.

Any liquid on roads quickly turns to ice.

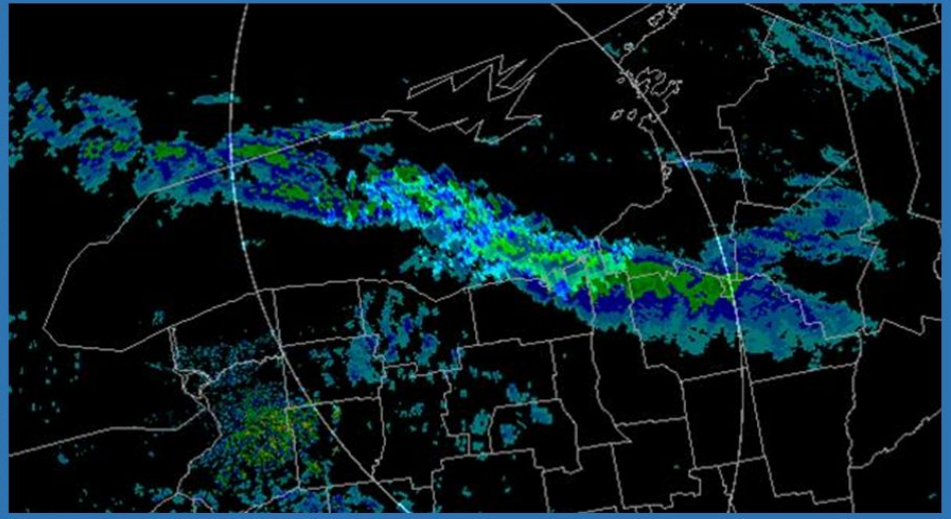


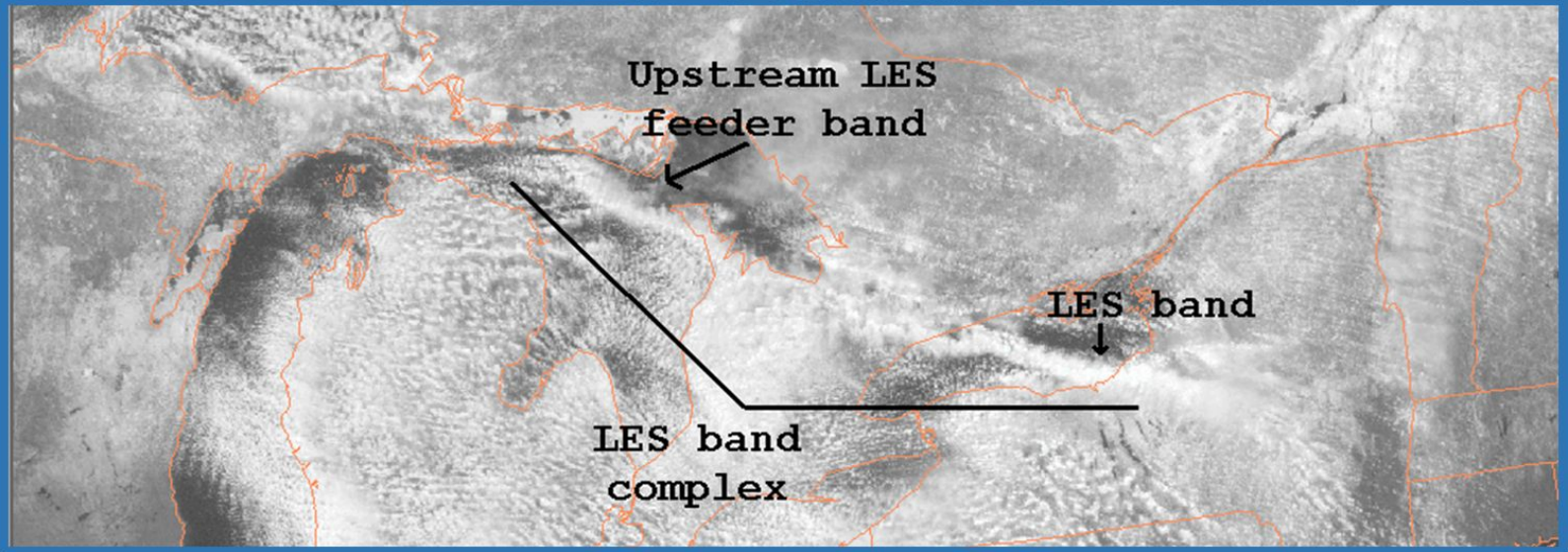
Blizzard

A blizzard means that the following conditions are expected to prevail for a period of 3 hours or longer:

- Sustained wind or frequent gusts to 35 miles an hour or greater; and
- Considerable falling and/or blowing snow, reducing visibility frequently to less than ¼ mile

NATIONAL WEATHER SERVICE BURLINGTON





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Office

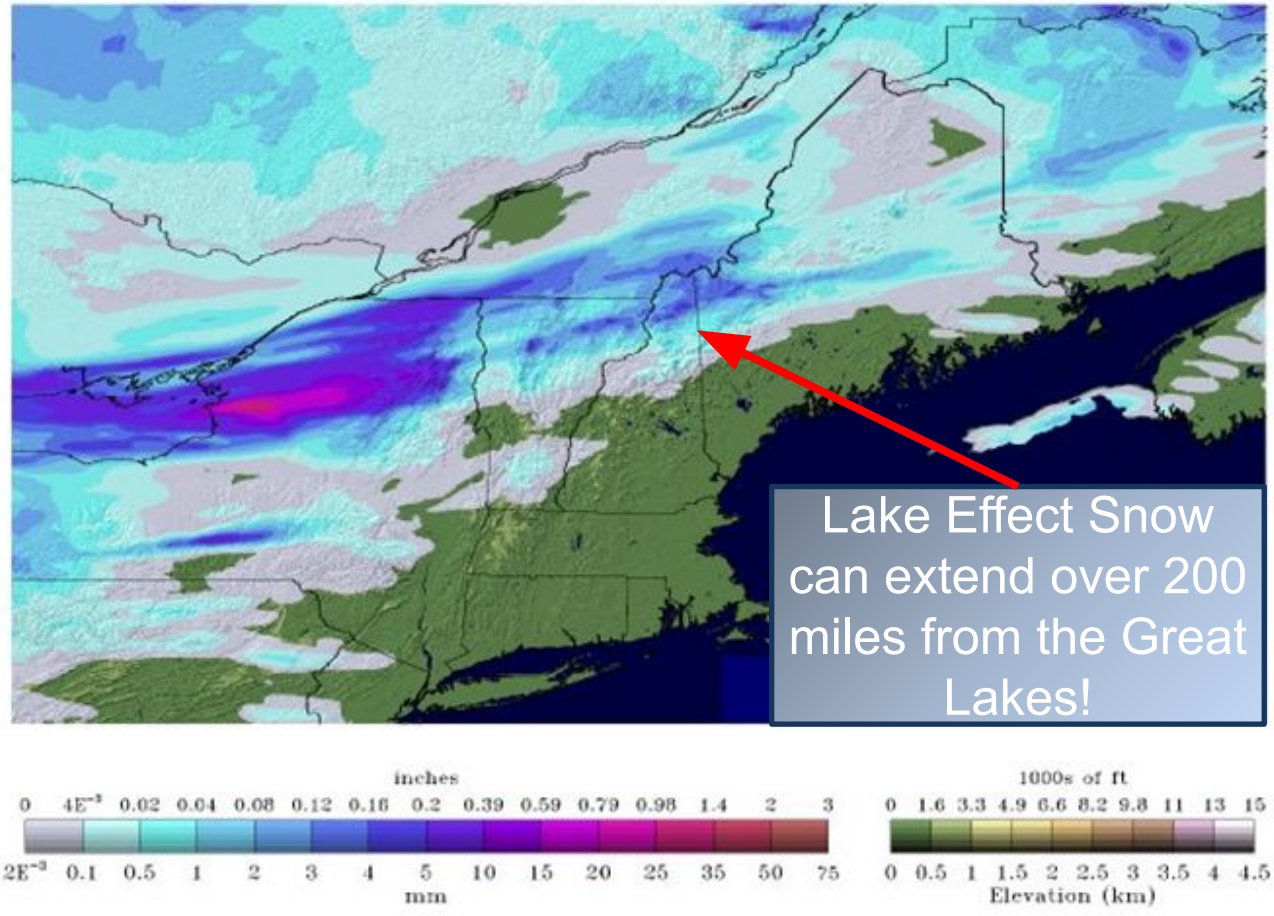
NATIONAL WEATHER SERVICE BURLINGTON

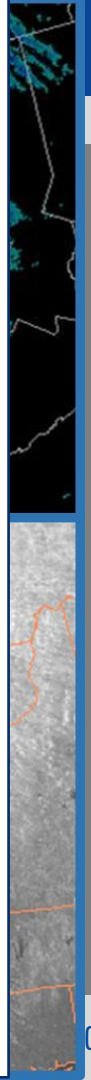
National Snow 2019-2020 Analysis

OWP OFFICE OF WATER PREDICTION

Scaled Snow Precipitation

24-Hour Total Ending 2020-02-29 06 UTC





Overview: Winter Patterns and P-Type

- The Low Track is really important to forecasting precipitation type
- Our terrain affects where freezing rain is most likely and the location of where wrap around (bonus) snow takes place
- Snow squalls come with many hazards in 30-60 minutes that can quickly catch a motorist off-guard
- Blizzards focus on a period of 3 or more hours of intense snow, poor visibility, and gusty winds
- Lake effect, though not extremely prevalent, easily makes it into our area.

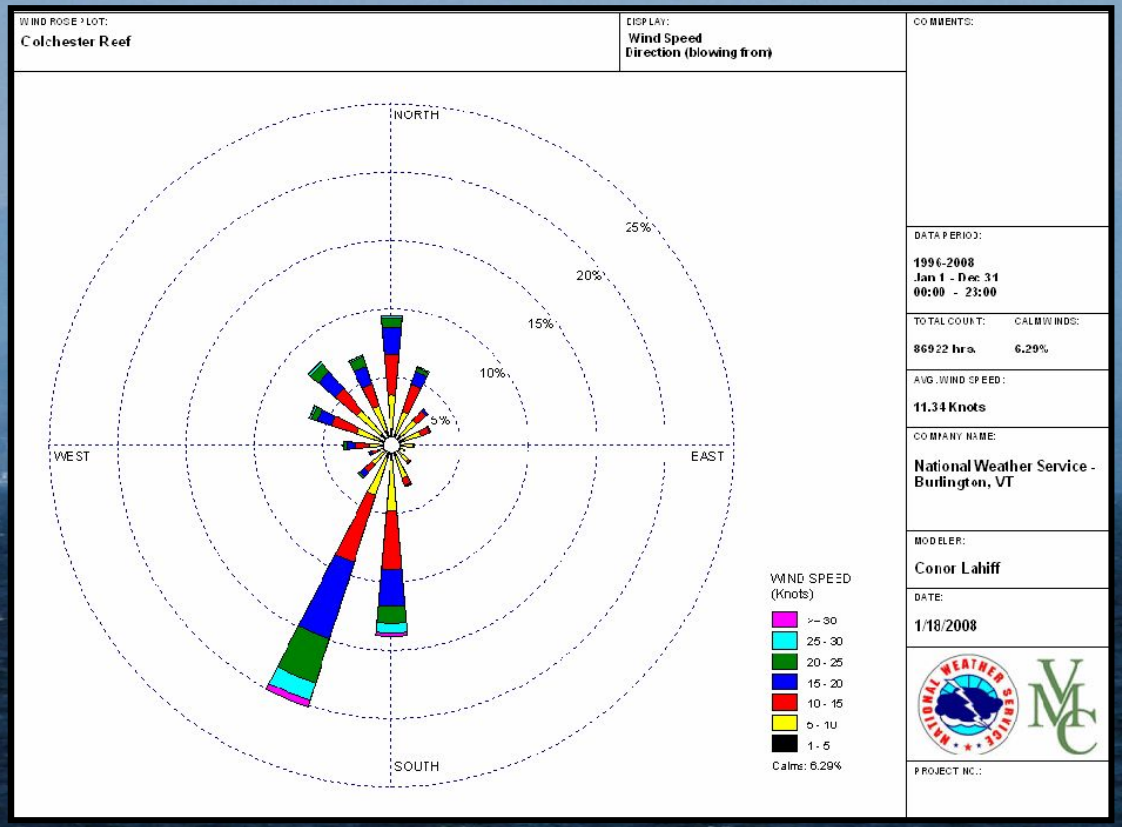
Forecasting Winds for Lake Champlain

- Marine forecasting It's all about mixing potential

1. Less friction over water winds greater
2. Is water temperature warmer or colder than air?
   A. Water/air temperature profile governs mixing
   B. Cool air atop warm air more unstable
3. Channeled flow Winds accelerate through the Champlain Valley (Bernoulli Principle)

Forecasting Winds for Lake Champlain

- Channeled flow
  - Winds tend to blow north/south due to valley topography
  - Winds become channeled and stronger in the valley than surrounding areas



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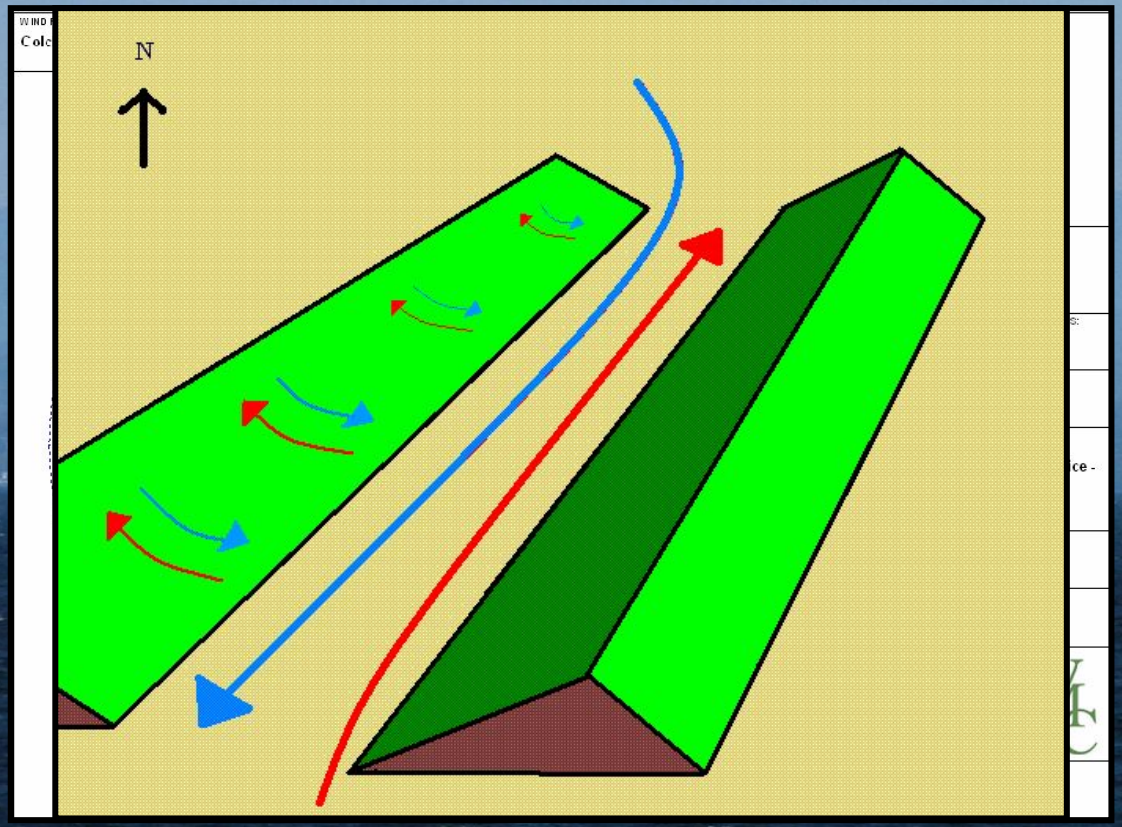
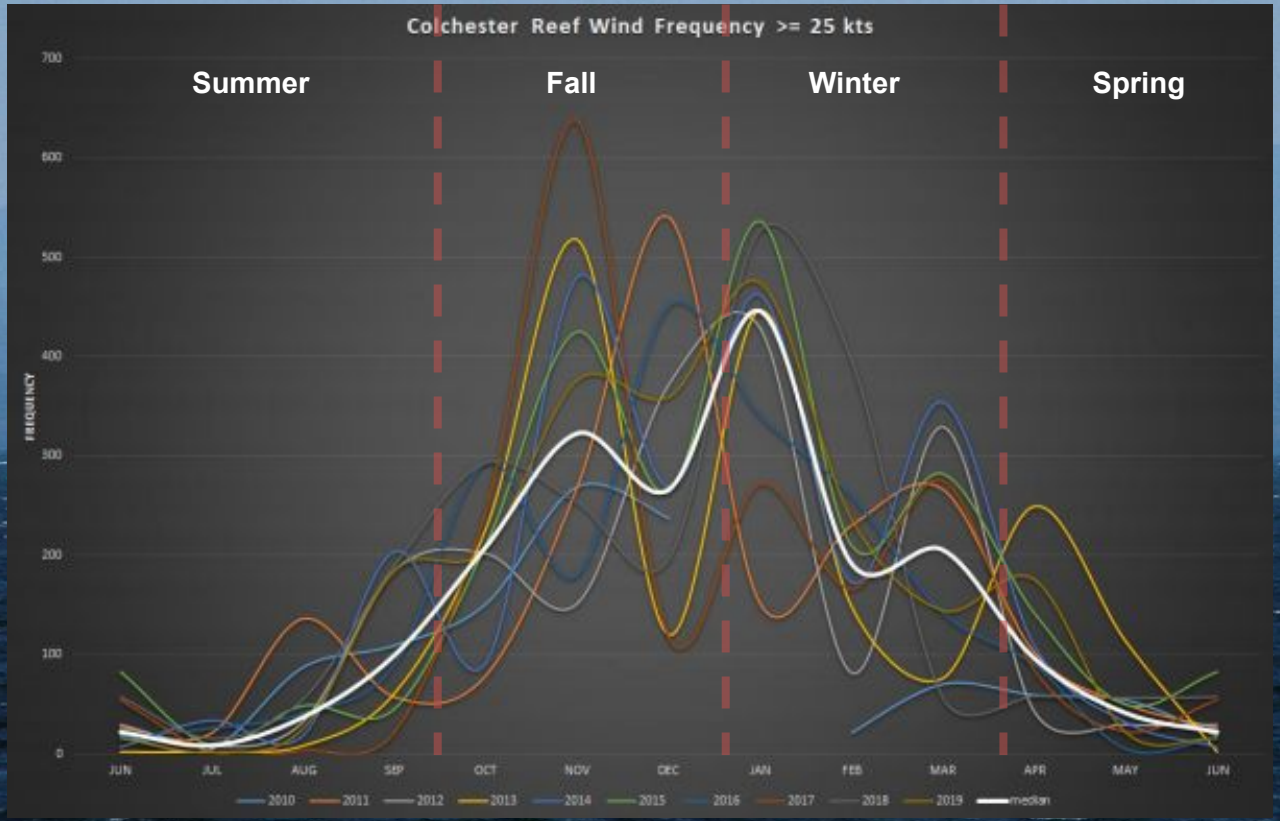


Forecasting Winds for Lake Champlain

Seasonal Temperature and Stability Profiles Near Large Bodies of Water			
Season	**Relative Sea Surface Temperature**	**Relative Air Temperature**	**Boundary Layer Stability**
Winter	Cool	Cold	Unstable (Strong Winds)
Spring	Cold	Cool	Stable (Weak Winds)
Summer	Cool	Warm	Stable (Weak Winds)
Fall	Warm	Cool	Unstable (Strong Winds)

Forecasting Winds for Lake Champlain



What exactly is snowfall?

- Snowfall: Accumulation of new snow and sleet in the last 24 hours before settling and compaction.
- Usually measured on a board or clean surface off the ground.

- Snow Depth: Average depth of snow (including old snow and ice) that remains on the ground at observation time.
- Measures whatever is on the ground.

Snow Measurement Guidelines

- Official method is to measure total depth of snow on the board every six hours
- Then wipe clean and start process over
- Individual hourly rates may be reported, but the total snowfall for any given event is the summation of the six hourly totals.
- Take an average of measurements on the board.

– ***Snow board with snow stake***

You may want a colorful flag to find your board!

Snow Measurement Guidelines Contd.

- An example of an appropriate snow measuring site
  - Open But Semi-Protected, Away from Trees/Buildings
- Ideally, use a snow stake to measure depth or a snowboard.

Here's the basics of how to get the most consistent reporting!

Measuring Snow: Planning

- Know the best spot to measure snow – away from trees or buildings.

Measuring Snow: Planning

- Know the best spot to measure snow – away from trees or buildings.

NOAA Photo Library

Snow Depth

- Snow stakes are the best method for observing changes in snow depth each day.
- Ideally, pick an open spot.
- It should represent the general vicinity well.

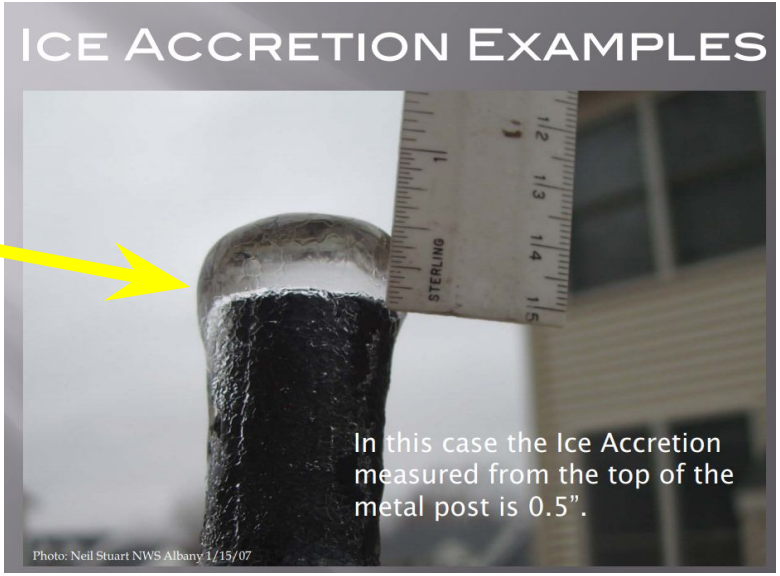
Snow Depth – When there's open ground

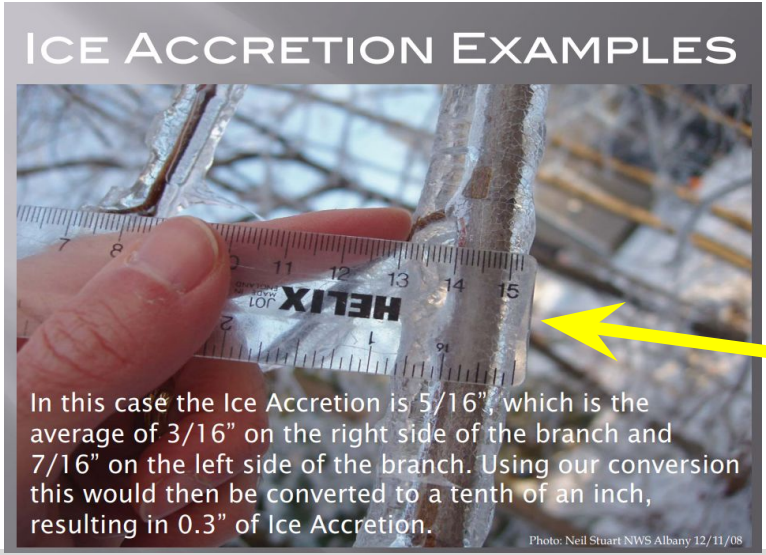
- Take an average. If half has 2.0" and half is open, report 1.0".

- If the ground is mostly open, report a trace.

Ice Measurement

Either pick a flat surface

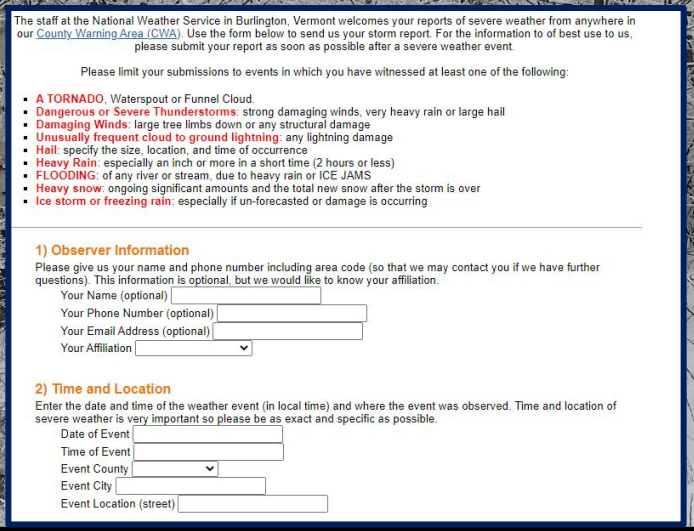




Or use a tree branch

Submitting Reports to NWS Burlington

- Fill out a web form at weather.gov/btv/stormreport.
- Give us a call at 802-862-2475 (Hit * key).
- Use social media – We're on Facebook and Twitter.



The staff at the National Weather Service in Burlington, Vermont welcomes your reports of severe weather from anywhere in our County Warning Area (CWA). Use the form below to send us your storm report. For the information to of best use to us, please submit your report as soon as possible after a severe weather event.

Please limit your submissions to events in which you have witnessed at least one of the following:

- **A TORNADO**, Waterspout or Funnel Cloud.
- **Dangerous or Severe Thunderstorms**: strong damaging winds, very heavy rain or large hail
- **Damaging Winds**: large tree limbs down or any structural damage
- **Unusually frequent cloud to ground lightning**: any lightning damage
- **Hail**: specify the size, location, and time of occurrence
- **Heavy Rain**: especially an inch or more in a short time (2 hours or less)
- **FLOODING**: of any river or stream, due to heavy rain or ICE JAMS
- **Heavy snow**: ongoing significant amounts and the total new snow after the storm is over
- **Ice storm or freezing rain**: especially if un-forecasted or damage is occurring

1) Observer Information

Please give us your name and phone number including area code (so that we may contact you if we have further questions). This information is optional, but we would like to know your affiliation.

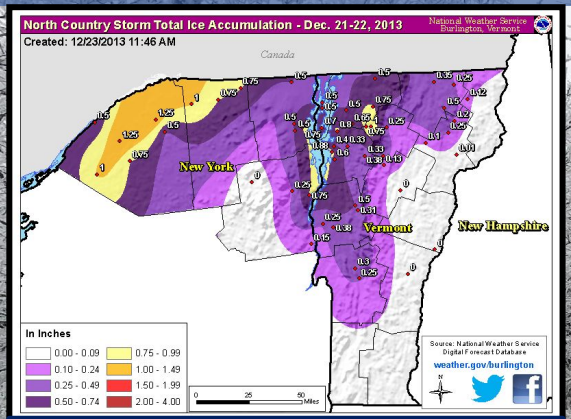
Your Name (optional)
Your Phone Number (optional)
Your Email Address (optional)
Your Affiliation

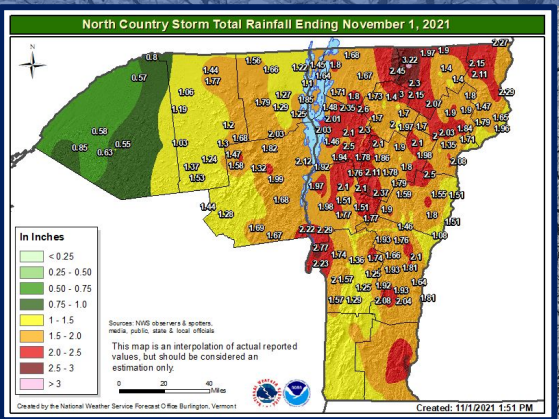
2) Time and Location

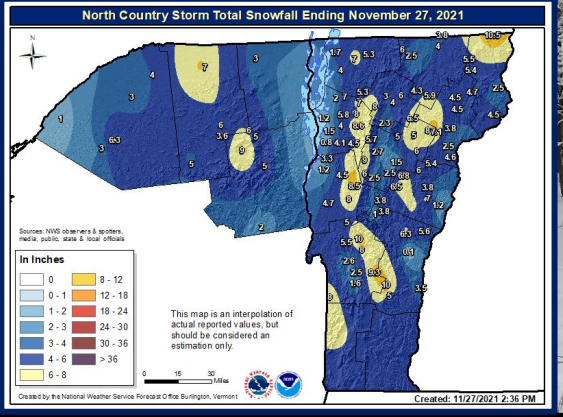
Enter the date and time of the weather event (in local time) and where the event was observed. Time and location of severe weather is very important so please be as exact and specific as possible.

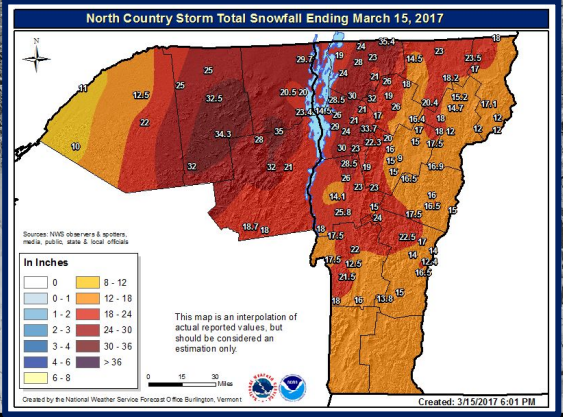
Date of Event
Time of Event
Event County
Event City
Event Location (street)

Your reports help make these maps









Overview: Rec Forecast, Measuring Winter Precipitation

- Winter is the gustiest time period on Lake Champlain
- Have a good site to measure snow and use a board if possible to gain the most accurate measurement
- Don’t measure at an angle!
- Try to measure ice off a flat surface, it’s easier and aligns with the National Weather Service measurements (though radial has its uses).
- Your reports help highlight terrain features and microclimates!

Reporting Methods

- By Phone (1-800-863-4279) - unlisted
- By Social Media (FB/Twitter)
- By Amateur Radio (WX1BTV - 145.110 MHz Whiteface Repeater)
- By our storm report page (https://www.weather.gov/btv/stormreport)
- By mPING (https://mping.ou.edu/static/mping/access.html) - access via iPhone or Google Store - and select your weather observation.
- Share with us your photos!

How to get alerts

- NOAA Weather Radio
- Alerts through your phone (WEA)
- TV Broadcasts/Media Outlets
- Social Media works, but in very busy weather, we may not be able to monitor!

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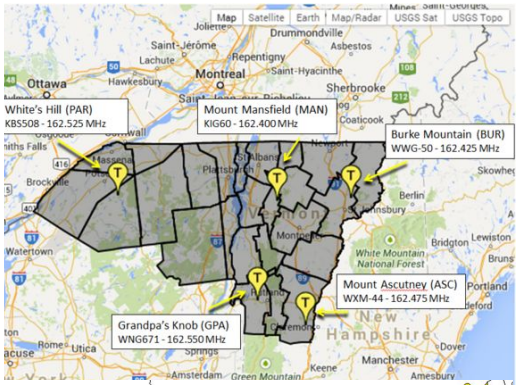
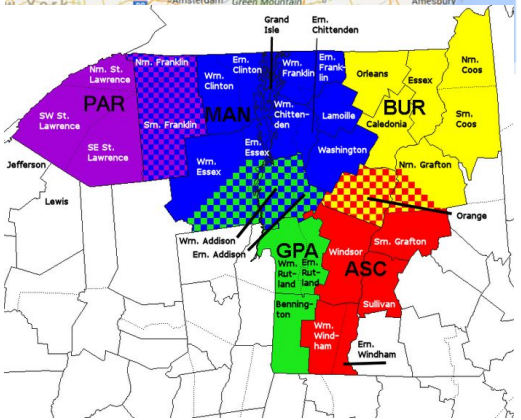


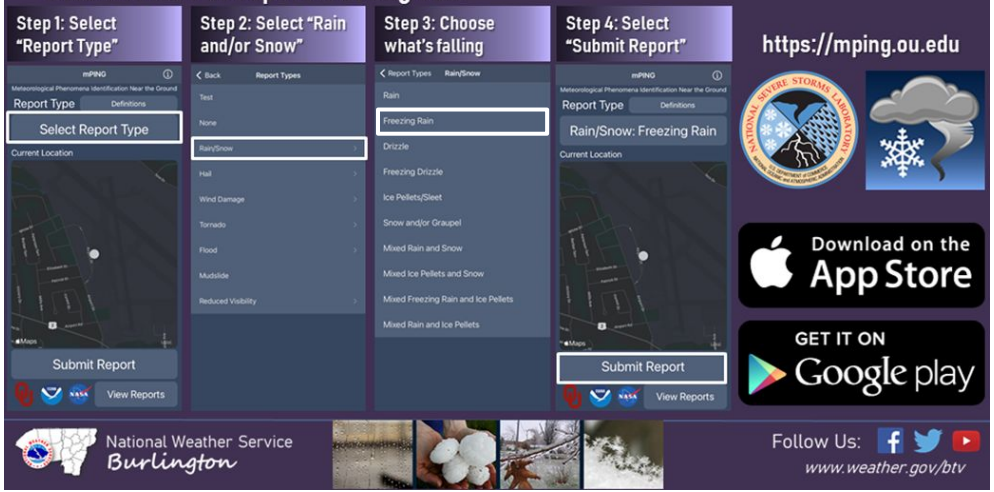


mPING

Submit reports with the tap of your finger!

Use the mPING App to record the weather at your location

- Download the free app
- Tell us when precipitation begins, changes, or ends where you're at!
- Support research as a citizen scientist – report as often as you would like
- Below is how to report freezing rain



https://mping.ou.edu

Download on the App Store

GET IT ON Google play

National Weather Service Burlington

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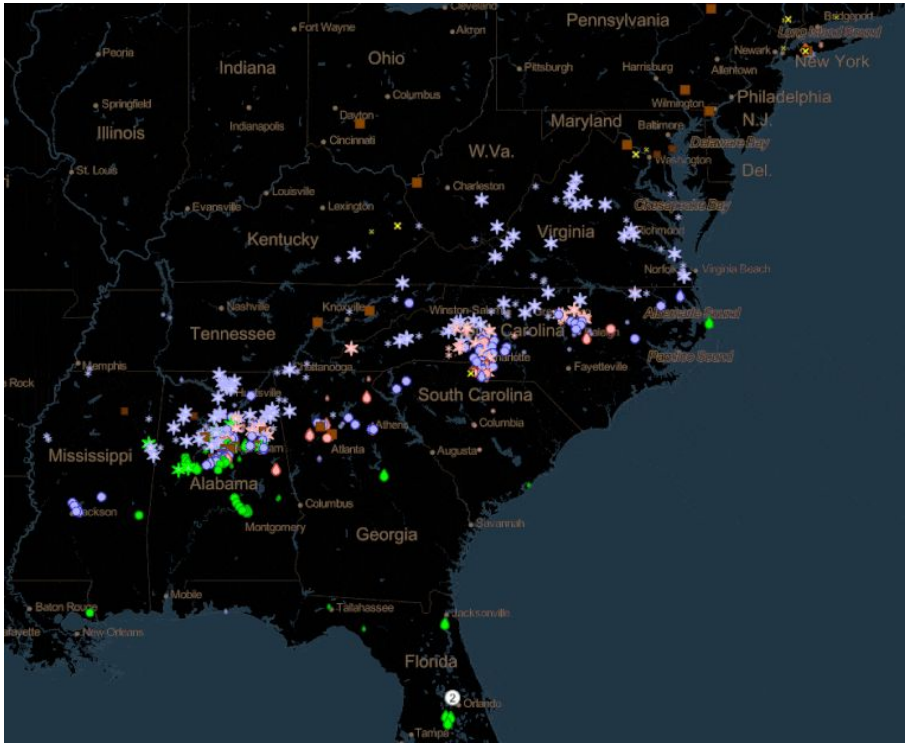

Reporting

- Funnel Clouds and Wall Clouds
- Tornado or Waterspout
- Heavy Rain/Snow (> 1 inch per hour)
- Hail, Damaging Winds, Flooding
- Weather Related Injuries or Deaths
- Changing precipitation types

NWS Burlington

COOP vs CoCoRaHS vs Skywarn

The Cooperative Observer Network (COOP)

Who: Dedicated volunteers or contractors able to report daily

What: Provide long-running daily climate reports, managing station records, equipment requirements

How often: Daily

Where: Siting is critical

Community Collaborative Rain, Hail, and Snow Network

Who: Community volunteers eager to report weather

What: Focus on rain, snow, and hail with specific gauge equipment

How often: Daily

Where: Siting is important

Skywarn Spotter Network

SKYWARN
WEATHER.GOV

Who: Volunteer network trained by the NWS

What: Focus on severe weather spotting, but also measuring other weather phenomena

How often: As often as desired

Where: Wherever you are

For more info, contact marlon.verasamy@noaa.gov, seth.kutikoff@noaa.gov, robert.d.haynes@noaa.gov, or scott.whittier@noaa.gov

Summary

- A reliable Skywarn Spotter provides ground truth and potentially life-saving information (downed trees or lines/funnel clouds/heavy rain/wind damage)
- Winter hazards include
  - Ice Jam Flooding
  - Winter Storms with Heavy, Snow, or Ice
  - Strong winds that can down trees and cause power outages
- Your safety should come first. Never put yourself in harms way to provide us info. Winterize your vehicle and be prepared for cold in case you get trapped in it.

Thanks for your attendance!

Robert Haynes – robert.d.haynes@noaa.gov

If you are interested in becoming a Spotter – email me or call our office to inform us that you have completed the course. You will be given our unlisted Spotter Number.

Please provide a: Name, Address (or lat/lon), Phone Number

Web:
http://www.weather.gov/btv/stormreport

Toll-Free Spotter Line
1-800-863-4279

E-mail:
nws.er.btv.operations@noaa.gov

Facebook:
https://www.facebook.com/NWSBurlington

Twitter:
https://twitter.com/NWSBurlington

YouTube:
https://www.youtube.com/NWSBurlington