The Four Seasons

National Weather Service Burlington, VT

VOLUME VI, ISSUE II

SUMMER 2020

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Letter from the Editors

Welcome to the Summer 2020 edition of The Four Seasons, a quarterly newsletter issued by the National Weather Service in Burlington, VT. In this edition, we'll look at the abnormally dry start to the summer. Next, we'll discuss the potential simplification of hazards from the NWS, and we want to hear your feedback in a nation-wide survey on how we can best present our hazards to you. We'll take a look at some memorable weather events that occurred this July and then answer some of your questions on tropical events in the North Country. Finally, we'll highlight one of our longtime COOP observers who was recently presented a prestigious award. Thanks for reading and we hope you enjoy the newsletter.

Considerable Dryness Affects the Region

-John Goff

The spring and summer of 2020 could be characterized as one of only scattered, sporadic rainfall. While some areas have received more regular, beneficial rainfall during this period, large portions of Vermont and northern New York have seen precipitation deficits continue to increase. Among the hardest hit areas has been the St. Lawrence Valley where current precipitation departures are running several inches below climatological norms. In fact, Massena, NY experienced their

Minimum 91-Day Total Precipitation for MASSENA INTL AP, NY

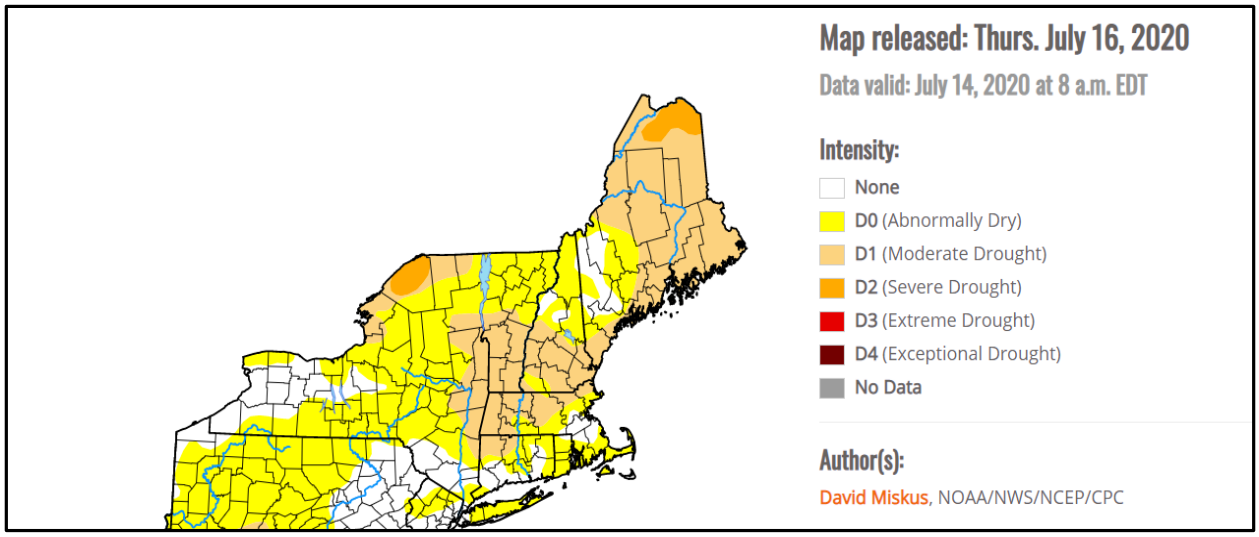
Click column heading to sort ascending, click again to sort descending.

Rank	Value	Ending Date	Missing Days
1	3.09	2020-06-30	0
2	3.62	1965-06-30	0
3	4.55	1955-06-30	0
4	4.56	1950-06-30	0
5	5.14	1999-06-30	0
6	5.65	1966-06-30	0
7	5.71	1959-06-30	0
8	5.88	2001-06-30	0
9	6.18	1997-06-30	0
10	6.24	1964-06-30	0
Period of record: 1948-08-01 to 2020-07-17			

Figure 1. Top ten driest periods of record at Massena, NY (April 1 – June 30, period of record 1948 - present)

...Continued from Page 1

driest April-May-June period on record (since 1948) which put added stress on local agriculture. Exceptional dryness continues in this area as of mid-July. Other areas of significant dryness persisted across portions of the Champlain Valley and southern Vermont. During times of exceptional dryness, the National Weather Service coordinates with many regional and national agencies, the U.S. Dept. of Agriculture, Northeast Regional Climate Center and agricultural extension programs to name a few. Through this process its role is to provide pertinent hydrometeorological information and data to water managers, local, state and federal agencies and the media. On July 10, 2020 the National Weather Service in Burlington, VT issued a Drought Information Statement highlighting current drought severity, impacts and forecasts in our area.



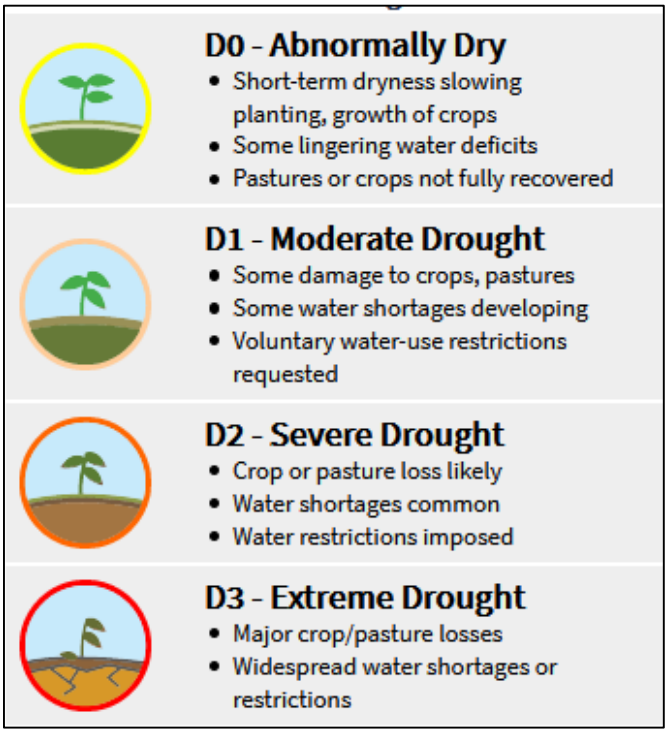


Figure 2 (above). United States Drought Monitor Map for Northeastern US valid 16 July, 2020

Looking forward in time, the most recent three month outlook for August, September and October (ASO) issued by the NOAA's Climate Prediction Center on July 16 suggests higher probabilities for warmer than normal temperatures, and equal chances of above or below normal precipitation. Given current trends in dryness, a return of steadier, more regular rainfall episodes would be welcome.

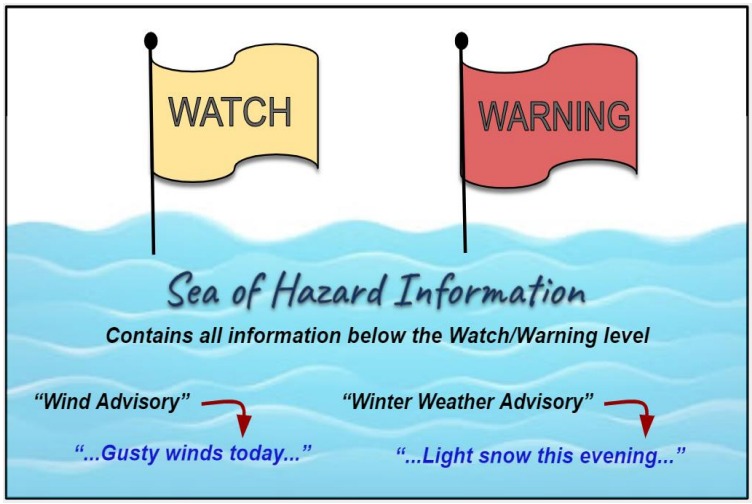
Hazard Simplification: Should Advisories Go Away? We Want To Hear From You!

-Maureen Hastings

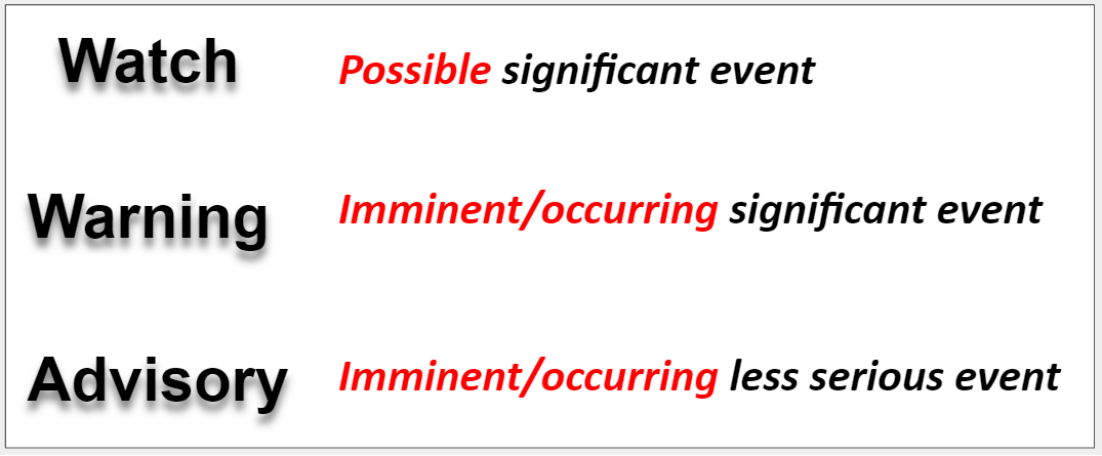
Do you know the difference between a Watch and a Warning? How about a Warning and an Advisory? In spite of decades of use, many people still don't understand our watch, warning, and advisory (WWA) system of headlined products. In order to simplify our system and lessen confusion, the National Weather Service has implemented a process called Hazard Simplification, or for short, Haz Simp.

Hazard Simplification's initial efforts started back in 2011, but the project formally began with full social science engagement in 2014. The agency has held numerous focus groups, case study surveys, workshops, and testbeds with our core partners and users, including emergency management, broadcast media, and the general public. Some of the key findings from these efforts include:

- General agreement that there are too many WWA products and product text can be confusing.
- While there is a broad range of understanding of the current WWA system, "Advisory" is, in general, the least understood term. Many people have either not heard of the term or misinterpret its meaning.
- The terms "Watch" and "Warning both begin with "Wa". This leads some people to confuse the two terms. In addition, some people also confuse "Watch" and "Advisory" with each other.



- There were numerous suggestions for change, from enhancing the current system by changing the "Advisory" term to blowing the system up entirely using new terminology and language.
- General support for consolidating and/or eliminating some products and improving product formatting, with bullets, colors, and who, what, where, and when details.



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Winter Weather Advisory Example

Current

...WINTER WEATHER ADVISORY IN EFFECT FROM 4 AM TO 11 AM CST SATURDAY...

* WHAT...Snow expected. Total snow accumulations of up to one inch in northernmost areas of Cherokee County.

* WHERE...Northern Cherokee County.

* WHEN...From 4 AM to 11 AM CST Saturday.

* IMPACTS...Plan on slippery road conditions.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

Slow down and use caution while traveling. The latest road conditions for the state you are calling from can be obtained by calling 5 1 1.

Proposed

...Light snow accumulations from 4 AM to 11 AM CST Saturday...

* WHAT...Snow expected. Total snow accumulations of up to one inch in northernmost areas of Cherokee County.

* WHERE...Northern Cherokee County.

* WHEN...From 4 AM to 11 AM CST Saturday.

* IMPACTS...Plan on slippery road conditions.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

Slow down and use caution while traveling. The latest road conditions for the state you are calling from can be obtained by calling 5 1 1.

To address these issues, the Haz Simp project has embarked on two main paths: Repair and Revamp. The Repair phase, which has already begun, incorporates relatively minor adjustments to our current system. These include consolidating and simplifying the current products, thereby reducing the number of WWA products and improving formatting and including easy-to-understand language. For example, on October 2, 2017, the NWS reformatted all Winter products into a new bulleted format, consisting of clear, concise What, Where, and When language. In addition, the Winter Storm Watch, Lake Effect Snow Watch, and Blizzard Watch were all consolidated into a simple Winter Storm Watch product.

The Revamp phase is just now getting underway, with the NWS gathering feedback on their proposed changes (more on how you can help with this in a bit). In this phase, the NWS aims to streamline and simplify NWS hazard messages. Currently, the NWS uses three primary headline terms to alert the public and partners of hazardous weather events: Watch (significant event possible), Warning (significant event happening or about to happen), and Advisory (less significant event happening or about to happen). In addition to these, the NWS also uses other headline terms to provide information on lower level threats. These include the Special Weather Statement, which is most commonly used to communicate hazards that don't reach the three levels mentioned above. The proposed new system would have only two primary headline terms: Watch and Warning. So, we would only "raise the flag" for major events that require users to Prepare (Watch) or Act (Warning) for significant hazards that threaten life and/or property. The current lesser headlines – Advisory and Special Weather Statement – would be discontinued. In their place, the NWS would use plain language statements to convey information for less significant events that aren't reaching Watch or Warning levels.

Want to learn more about Hazard Simpiflication? Please visit
https://www.weather.gov/hazardsimplification/

The NWS is now actively collecting feedback on this proposal from the public with the release of a public survey. Any decision to move forward will be heavily based on this feedback, as well as feedback from our forecasters and partners. We encourage everyone to take this survey and make your voice heard! The survey is open until August 21, 2020 and can be taken at this link: https://www.surveymonkey.com/r/HazSimpFinal

July 14th Flash Flooding Event

-Rebecca Duell

On the morning of July 14th, 2020, a slow moving mesoscale convective vortex (MCV) developed over eastern Vermont and New Hampshire, dumping over three inches of rain in parts of eastern Vermont. The MCV was essentially just a slow moving circulation of heavy rain with some embedded thunderstorms. As the system pivoted over the region, prolonged heavy rainfall led to the issuance of several flash flood warnings in Vermont.

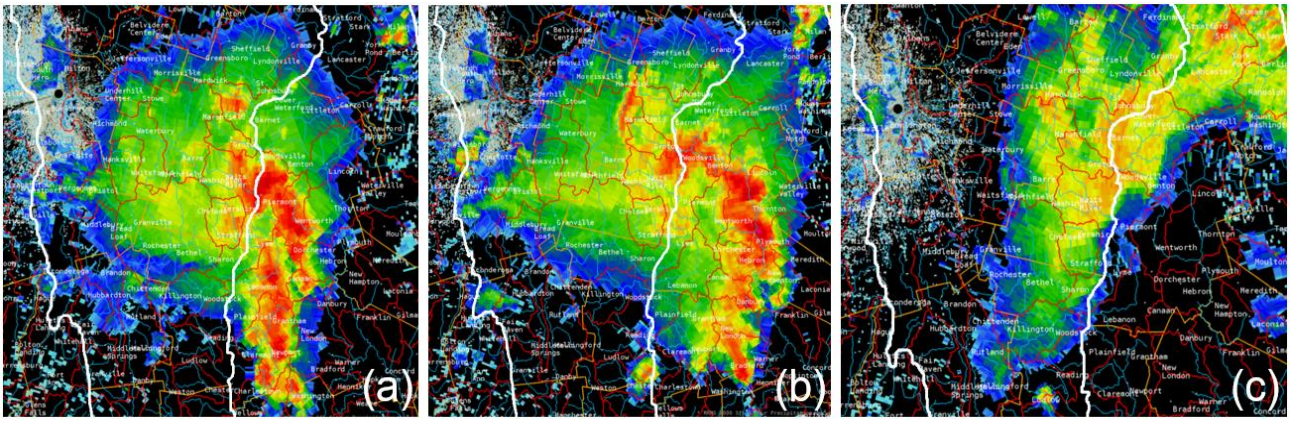

Figure 1. Evolution of radar imagery through the morning of July 14th, 2020 at (a) 5:30 AM (b) 7:30 AM (c) 10:30 AM. State of Vermont outlined in white. Notice the prolonged rainfall over portions of eastern Vermont as the system slowly pivoted over the area through the morning hours.

A look at the environment the morning of the 14th shows several parameters favorable for heavy rainfall. Most notably, an upper-level low pressure system centered directly overhead (Fig. 2) ensured weak storm motion, which is why the system pivoted so slowly overhead. Around 1000 J/kg of Most Unstable CAPE pointed to a fair amount of instability under the upper-low, which favored some embedded thunderstorms capable of torrential rainfall. The slow storm motion and the pivoting nature of the system allowed multiple storms to slowly move over the same areas in northeastern Vermont, leading to flash flooding concerns.

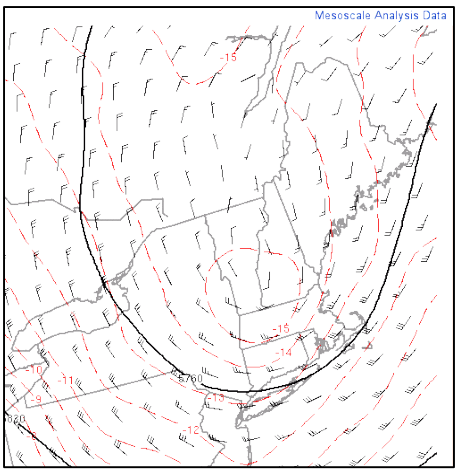

Figure 2. 500 mb analysis at 1200 UTC courtesy of the Storm Prediction Center Mesoscale Analysis.

Precipitable Water (PW) values this day were around 1.4 inches. According to the Storm Prediction Center Sounding Climatology, the PW value of around 1.4 inches is somewhere between the 75th and 90th percent of the daily average for the area. In other words, the moisture content of the air mass was higher than the daily average but still within a relatively normal range.

Radar estimates of 6 hour rainfall were close to 3 to 4 inches by 10 AM (Fig. 3). 6-hr flash flood guidance (Fig. 4) issued by the Northeast River Forecast Center in Norton, Massachusetts on the morning of July 14th was around 3 inches for eastern Vermont. The flash flood guidance is simply the amount of rainfall needed within a certain period of time for small streams to overflow their banks. So with 6-hr rainfall amounts exceeding flash flood guidance,

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several flash flood warnings were issued. Storm spotters in Cabot, Vermont reported close to 4 inches of rainfall, suggesting the radar estimated precipitation was fairly accurate. By the time the precipitation ended, several roads has washed out in northeastern Washington County and Caledonia County in Vermont. A mudslide also occurred in St. Johnsbury as a result of the heavy rains (Figure 5).

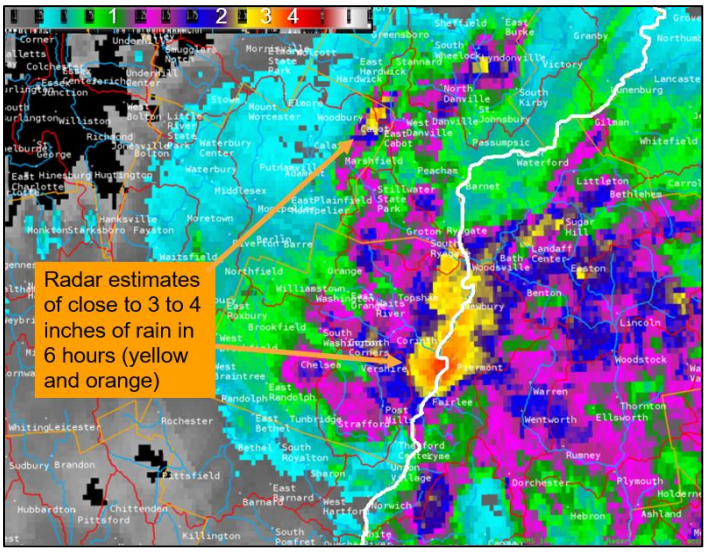


Figure 3. Radar estimated 6-hr rainfall as of 10 AM local time. Vermont/ New Hampshire border outlined in white.

Figure 5 (left). Mud Slide that occurred in St. Johnsbury. Pictures courtesy of State of Vermont, Division of Fire Safety.

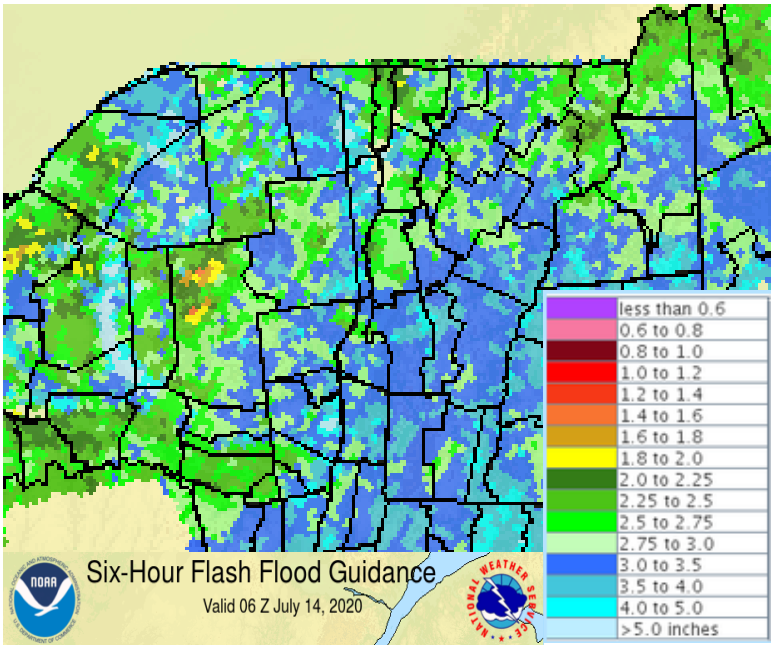
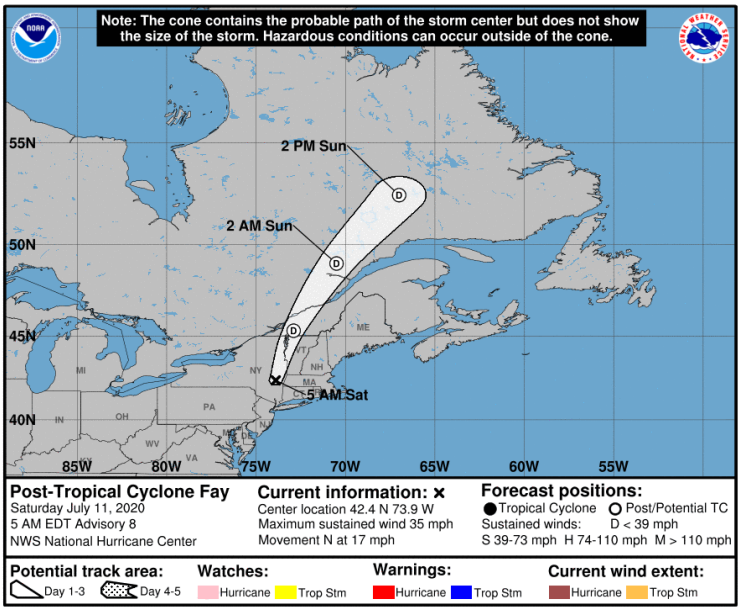


Figure 4 (above). 6-hr Flash Flood Guidance from the Northeast River Forecast Center for the morning of July 14, 2020.

Your Tropical Questions Answered

-Nichole Hammond and Rebecca Duell

Note from the Editors: This article was written before Tropical Storm Isaias moved through the region, thus Isaias is not included in the climatology presented here. Look for more information on Isaias in the next edition of the newsletter.



On the afternoon of July 10, 2020, Tropical Storm Fay made landfall near Atlantic City, New Jersey. The storm became a post-tropical low over upstate New York, then the low continued northward through western Vermont and into Quebec. Overall the storm had little impact on our area; in fact, we received quite a bit more rain from a low pressure system that moved in from the west over the next couple of days. However, we received many questions in the days leading up to Fay, and we decided to share some of the questions and answers here.

Figure 1 (left). Track of Post-Tropical Cyclone Fay issued by the National Hurricane Center at 5 AM on Saturday, July 11th.

Question: Tropical Storm Fay was downgraded to a post-tropical low. What does this mean? Is that the same thing as a tropical depression?

Answer: A post-tropical Low is actually not the same thing as a tropical depression. In order for a system to be officially designated "tropical", it needs to meet several criteria. The system needs to be "warm-core" and non-frontal (no fronts in the system), originating over tropical or subtropical waters, and have a closed surface wind circulation about a well-defined center. When a system no longer meets these criteria, it can no longer be classified as tropical. As tropical systems move further away from the tropics, they begin to develop fronts and are no longer symmetric, and eventually are classified by the National Hurricane Center as post-tropical cyclones or extratropical cyclones. So when Tropical Storm Fay became Post-Tropical Low Fay, all that meant is that the National Hurricane Center decided the system no longer met the criteria to be classified as tropical.

Question: Does this mean I no longer have to worry about the system?

Answer: No. Post-tropical systems can still generate strong winds, heavy rain, or isolated tornadoes. In fact, Hurricane Sandy had become extratropical before it made landfall over the northeastern US in 2012. Regardless of the classification of the system, it is important to keep on top of the latest forecasts from your local NWS and from the National Hurricane Center.

Question: How common is it to get hurricanes or tropical storms in Vermont and northern New York?
Answer: According to the National Hurricane Center, it is quite unusual for the center of a hurricane or tropical storm to track through northern New York or Vermont. In fact, since 1851, only seven such storms have occurred, and only one of which was categorized as a hurricane upon its arrival in Vermont. This occurred in 1938 when a category 3 hurricane tracked through southern Rutland County in Vermont before transitioning to a post-tropical low. Of the six remaining storms to have tracked through the North Country,

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five were categorized as tropical storms (including Irene in 2011), and one categorized as a tropical depression. You can find more information on these particular storms in the table below. To view their tracks, visit NOAA's Historical Hurricane Tracks.

Though still unusual, it is more common for a storm of tropical origin to track through the North Country as a post-tropical low. Including Tropical Storm Fay, nine such storms have occurred since 1851.

Name	Dates	Max Category	Max Wind Speed (kts)	Min Pressure (mb)
Irene 2011	Aug 21-30, 2011	H3	105	942
Unnamed 1949	Aug 23-Sept 1, 1949	H4	115	954
Unnamed 1938	Sept 9-23, 1938	H5	140	940
Unnamed 1933	Aug 13-28, 1933	H4	120	948
Unnamed 1923	Oct 15-19, 1923	TS	55	994
Unnamed 1893	Aug 15-26, 1893	H3	100	952
Unnamed 1861	Sept 22-29, 1861	H1	70	989

Hurricane | Tropical Depression | Tropical Storm

*Colors indicate storm category at time of arrival in NWS Burlington's County Warning Area (CWA).

*Figure 2 (above). List of the hurricanes and tropical storms that have tracked through northern NY or VT. Post-tropical lows not included. **Tropical Storm Isaias not included***

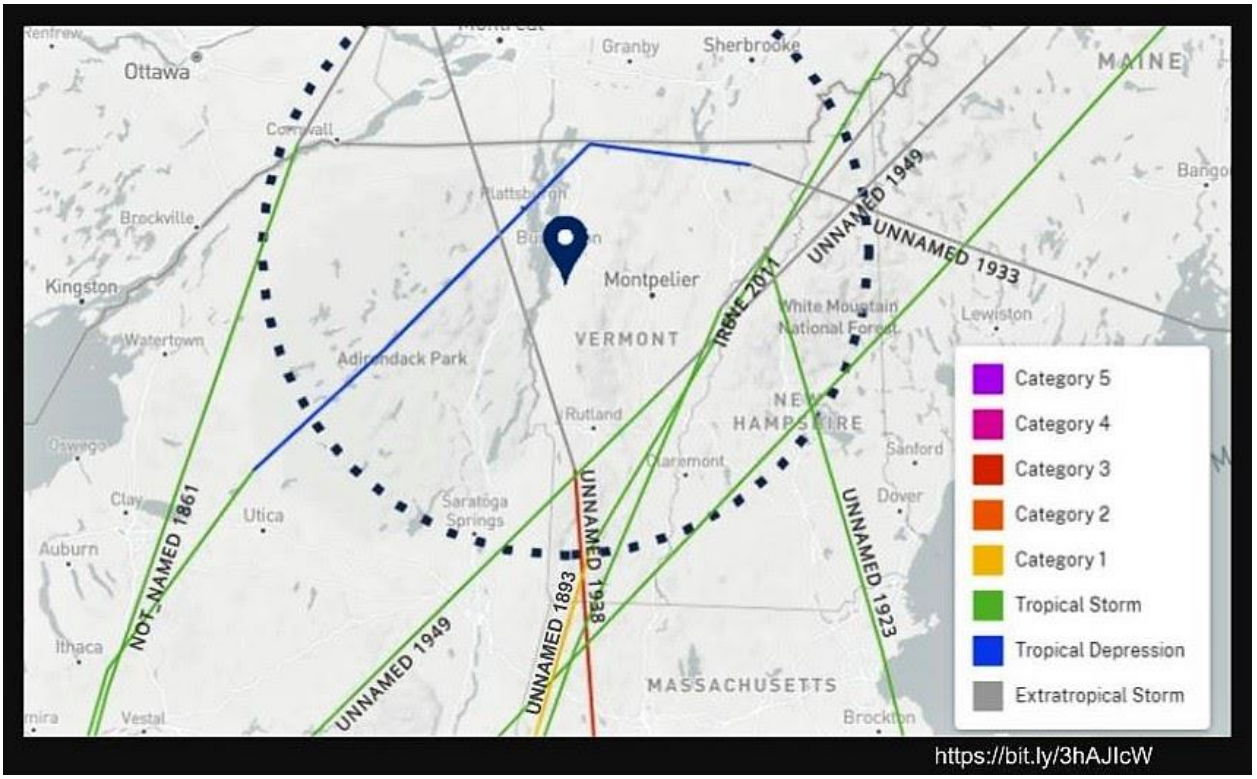

*Figure 3(above). Tracks of tropical systems that have moves through the North Country. Post-tropical lows not included. **Tropical Storm Isaias not included***

July 8th Severe Weather Event

-Matthew Clay

On July 8, 2020, a weak upper level disturbance pushed across the Ottawa Valley and interacted with a very warm and moist environment across Vermont. As our dewpoints rose into the upper 60s to lower 70s, our temperatures also climbed into the mid to upper 80s and yielded Convective Available Potential Energy (CAPE) values exceeding 1500 J/kg. The combination of instability, decent deep layer shear and the upper level disturbance aided in the development of several strong to severe thunderstorms across Vermont. Widespread wind damage was observed across the northern Champlain Valley while a long track supercell dropped large hail and downed trees in Rutland County. You can see a map of the damage reports received in Figure 1.

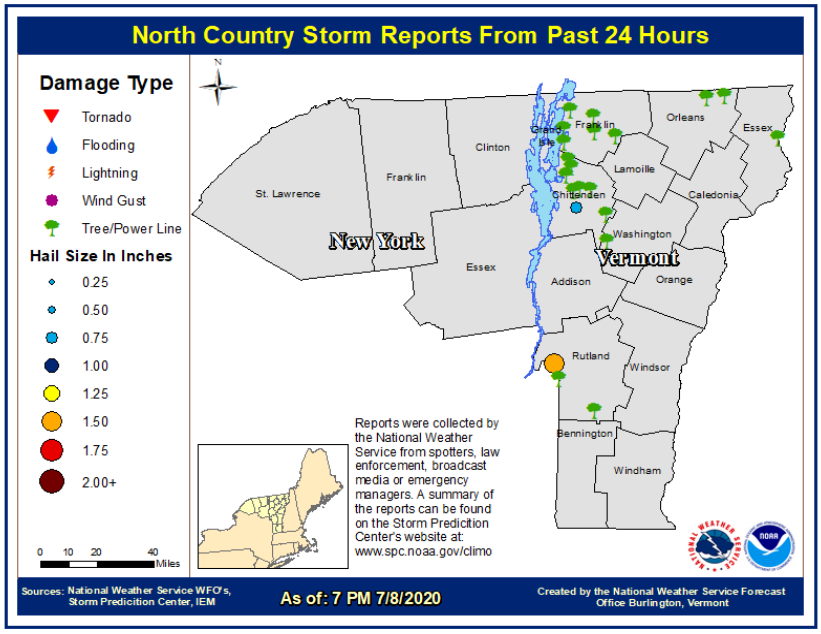

Figure 1. A map of wind damage reports (green) and large hail (blue and orange) from July 8th, 2020.

Pre-Storm Environment

When trying to analyze the pre-storm environment, it's important to not look solely at the surface but to also analyze what is going on aloft. In the instance of July 8th, the upper levels were key in trying to analyze the trigger mechanism that would be responsible for initiating the convection. For this case, the 500 mb and 300 mb levels (Figure 2) were analyzed to determine the location of the shortwave, determine the low-level and deep layer shear and finally the possibility of upper level divergence. At the 500 mb level, a weak shortwave was analyzed across the Ottawa Valley and was forecasted to push south and eastward throughout the day. The reason shortwaves are important when trying to forecast convection is that large scale lift due to divergence and positive vorticity advection tends to occur. Without this lift the chances for thunderstorms, especially severe thunderstorms will be very limited. Now that we have determined there is some support in the mid levels, let's continue to look higher. At the 300 mb level, you will notice there is not a strong jet stream over the region which would be highlighted in yellow. However, what you will notice is there is a spreading of the geopotential heights which is noted by the arrows in brown. This phenomenon is known as diffluence and can be associated with upper level divergence. The divergence at the 300 mb level, just like at the 500 mb level helps to create organized and potentially severe thunderstorms.

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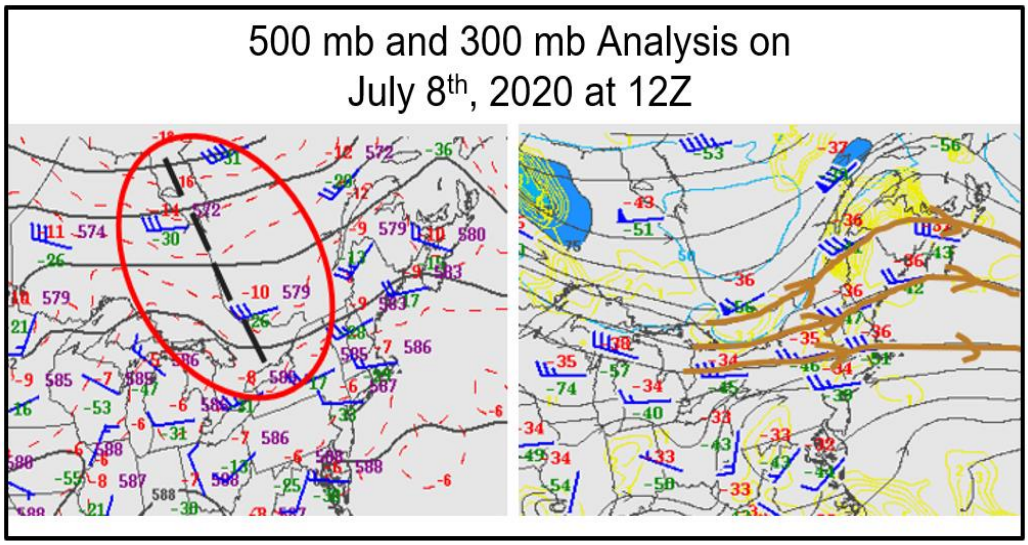

Figure 2. The 500 mb (left) and 300 mb (right) upper air analysis as of 8 AM on July 8th. The red circle with dashed black lines (left) indicates the 500 mb shortwave trough. The brown arrows (right) indicate the upper level diffluence at 300 mb.

Northern Champlain Valley Dynamic Bow Echo

One of the two main storms that developed on July 8th was a long-lasting bow echo that developed over southern Quebec and moved across the northern Champlain Valley. A very unstable air mass ahead of the storm allowed for the storm to last for over 3 hours as it moved into central Vermont. This storm moved through the populated areas of Milton, Fairfax and Essex Junction during the afternoon rush hour and impacted the commute of many as traffic lights stopped working and many roads were blocked by trees. On the KCXX radar located in Colchester, an area of 60-70 knots of wind was observed at around 400 ft off the surface as seen in Figure 3.

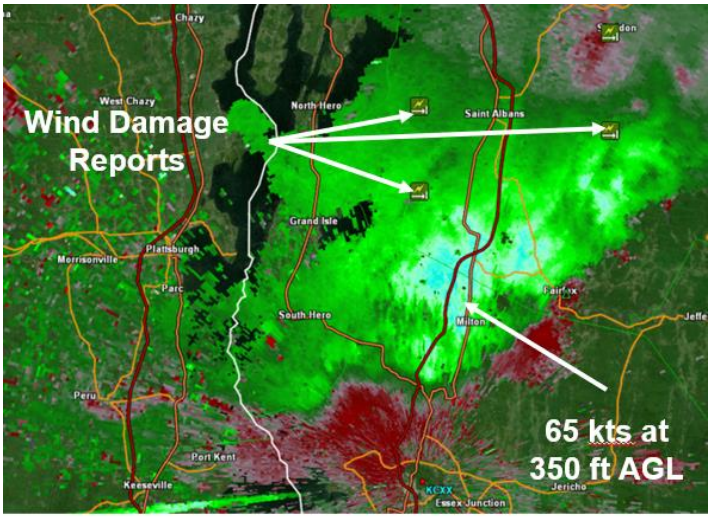

Figure 3. KCXX 0.5-degree scan velocity at 4:37 PM on July 8th. The arrow points to a location of 60-70 knots of wind at just a few hundred feet above ground level. In addition, you can see some previous storm reports near Saint Albans.

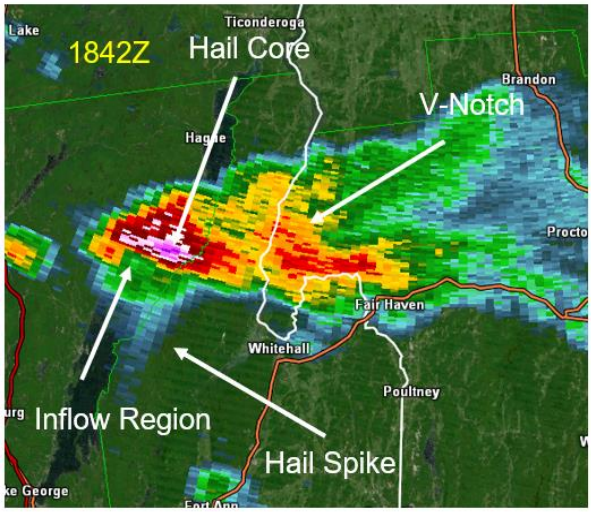

Figure 4. KCXX 0.5-degree scan velocity at 2:42 PM on July 8th. This shows the classic storm structure of a supercell that created widespread wind damage and a few reports of large hail.

Congratulations to Steve Maleski for winning the Holm Award

- Marlon Verasamy

On July 11, 2020, WFO Burlington was proud to present the John Campanius Holm Award to COOP observer Stephen Maleski of Sutton, VT. Of the nearly 10,000 volunteer COOP observers across the nation, only 25 individuals earn this prestigious award each year. John Campanius Holm, a Lutheran minister, was the first person known to have taken systematic weather observations in the American Colonies. He did so in 1644 and 1645, without the benefit of instruments. Benjamin Franklin, George Washington and Thomas Jefferson all maintained early weather records. Jefferson kept an almost unbroken record of weather observations from 1776 through 1816.

Steve with some of his COOP equipment

Steve, a resident of the Northeast Kingdom for more than 40 years, received his B.A. in Philosophy from the University of Connecticut in 1978, and a B.S. in Meteorology from Lyndon State College 1981. As an inaugurating member of the Eye On The Sky weather broadcast on Vermont Public Radio originating out of the Fairbanks Museum and Planetarium in St. Johnsbury, VT, Steve is well known to many across Vermont and New Hampshire for his daily forecasts broadcasted on Vermont Public Radio. Steve was also on the original team at the launch of the Weather Channel from 1982 -1984, eventually becoming a lead forecaster, before returning to Eye in the Sky and the Museum at the end of 1984, helping out even today despite his recent retirement.

Steve Maleski (left) being presented the Holm Award by BTV Observing Program Leader (OPL) Marlon Verasamy (right).

Steve missed only 10 observations over 25 years in the lead up to his award. Even in the last 2 years, as Steve battled leukemia, his son faithfully stepped in and assumed observing responsibilities until Steve was back home to take the mantle once again. Since then, he's once again been the example of consistency. "It's one of the things I look forward to every morning" he said about the last year of taking observations. Steve remains a dedicated observer and pillar of the local weather community. A special thanks to Steve and to all the dedicated COOP Observers across the country!

The Four Seasons

VOLUME VI, ISSUE II

Contributors:
Matthew Clay, Meteorologist
John Goff, Meteorologist
Nichole Hammond, Meteorologist
Maureen Hastings, Meteorologist

Editors:
Rebecca Duell, Meteorologist
Marlon Verasamy, Observing Program Leader
Andrea LaRocca, Meteorologist

We Need Your Storm Reports!

Please report snowfall, flooding, damaging winds, hail, and tornadoes. When doing so, please try, to the best of your ability, to measure snowfall, estimate hail size, and be specific as to what damage occurred and when. We also love pictures!

For reports, please call:
(802) 863-4279
Or visit:
http://www.weather.gov/btv/stormreport

National Weather Service Burlington, VT
Burlington International Airport
1200 Airport Drive
South Burlington, VT 05403
Phone: (802) 862 2475
www.weather.gov/btv
Email: btv.webmaster@noaa.gov

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