The Four Seasons

National Weather Service Burlington, VT

VOLUME IV, ISSUE I SPRING 2017

Table of Contents

Letter from the Editors

Welcome to the Spring 2017 edition of The Four Seasons, a quarterly newsletter issued by the National Weather Service in Burlington, VT. We have lots to cover in this edition with a variety of topics. We start off with a look at the GEOS-16 Satellite. It's an exciting look at the "future" of weather technology and we think you'll find it exciting too! Next, it wouldn't be Spring without a look at flooding, so we take a look back both at the historic '92 Montpellier Ice Jam Flood and this year's late February Flood. Then, we take a look back at the record warmth of this past winter. From there, we take a peak at the NWS management course and then the relationship with NWS and the Fire Community. We end with aviation weather data now available online. Thanks for reading and we hope you enjoy the newsletter.

GOES-16: The Latest in Geostationary Weather Satellite Technology

-Peter Banacos

NOAA's GOES-R weather satellite launched from Space Launch Complex 41 in Cape Canaveral, Florida on November 19, 2016 (Fig. 1), and promises valuable technological improvements for weather forecasters and other users of satellite data. GOES-R reached geostationary orbit 22,300 miles above the Earth about a week after launch, at which point the satellite took its operational name of GOES-16 (Fig. 2). The vehicle and its hardware are currently undergoing an approximate one year checkout, calibration, and validation period before becoming fully operational. However, initial (and exciting!) test images have begun to reach forecasters as of early March 2017.

GOES satellites are placed into a circular geosynchronous orbit over the equator, which keeps the satellite over a specific location on the earth. That is, the orbital period of the satellite is equal to the Earth's rotational period of one day.

Figure 1. Liftoff of NOAA's GOES-R weather satellite atop a Atlas V rocket at 6:42pm EST, November 19, 2016

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Figure 2. Artist's conception of the GOES-R environmental satellite in orbit.

By maintaining a fixed position, GOES satellites are able to constantly monitor atmospheric conditions and allows for easily creation of satellite image loops of their field of view once data is transmitted and processed on the ground. As such, intensive data analysis is done by National Weather Service forecasters using GOES satellite information on a continuous basis, 24 hours a day, 365 days a year. In fact, GOES satellites have been part of the backbone of weather analysis and forecasting in the United States since the launch of GOES-1 on October 16, 1975 (Fig. 3). The satellites have undergone dramatic improvements over the past 40+ years as technological advances in satellite stabilization methods and instrumentation have allowed. GOES-16 is the first of four planned satellites in the GOES-R series, which is expected to extend the GOES satellite system through 2036. Other types of satellites, such as polar orbiters, compliment the GOES satellites by flying at much lower orbits (~530 mi above the Earth's surface) providing greater spatial detail, but generally only make a one pass per day over a particular region as they see a constantly changing view as the Earth rotates beneath them. The polar orbiters are particularly important at the high latitudes, as the curvature of the Earth results in a much less favorable view from the GOES over the equator.

New Data

Aboard GOES-16 is a wealth of new and improved instrumentation that will greatly aid the weather community and society at large. We'll briefly outline a few of the advances, including (1) more advanced imaging, (2) real-time mapping of lightning activity, and (3) improved monitoring of solar activity.

1. Greater image quality and quantity

A multi-channel imaging radiometer known as the Advanced Baseline Imager (ABI) is the primary instrument on GOES-16 for imaging Earth's weather, oceans, and environment. It is the first geostationary weather imager that can collect multiple scenes of different sizes and locations at different repetition intervals. The ABI can collect images of the full hemispheric disk every 15 minutes (see example in Fig. 4), the Continental United States every 5 minutes, and a major storm event over a mesoscale area (the size of several states) every 30 seconds.

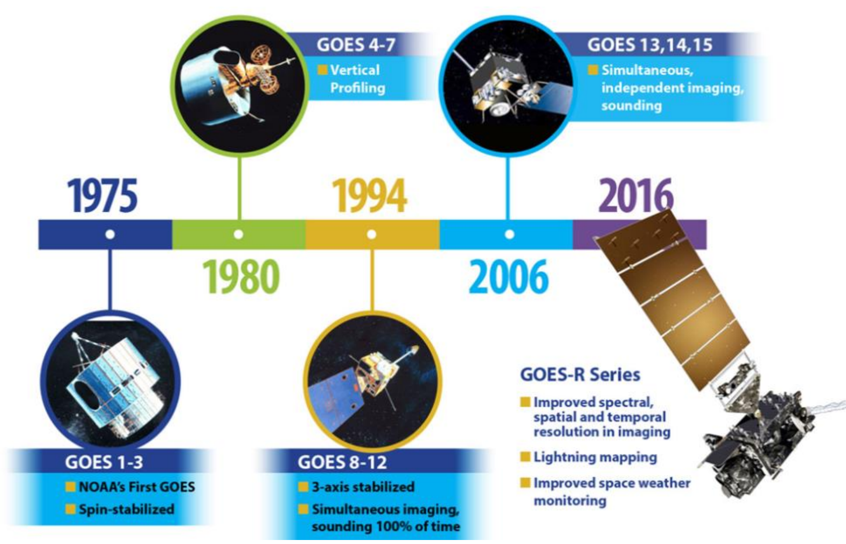

Figure 3. NOAA GOES satellites have been in operation since the launch of GOES-1 on October 16th, 1975.

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By comparison, the current GOES satellites take a full disk image every 3 hours, and generally scan the continental U.S. once every 15 minutes in a normal operating mode. Thus, we'll benefit from a dramatic increase in temporal frequency of imagery, which allows for better monitoring of quickly changing weather conditions (e.g., thunderstorm development).

The ABI has a total of 16 spectral bands, including two visible channels, four near-infrared channels, and ten infrared channels. This is compared to just 5 spectral bands on the current operational GOES-13 and GOES-15 satellites. The three-fold increase in spectral information will allow for better monitoring of clouds and water vapor at different levels, aerosols, fog, ozone, and other estimates such as cloud particle size and sea surface and atmospheric temperatures. These data will offer a much improved diagnostic view of the atmosphere and ocean surface. An accurate accounting of initial conditions is of paramount importance for the suite of computer models which project conditions out into the future, and is expected to help in overall accuracy of forecasts.

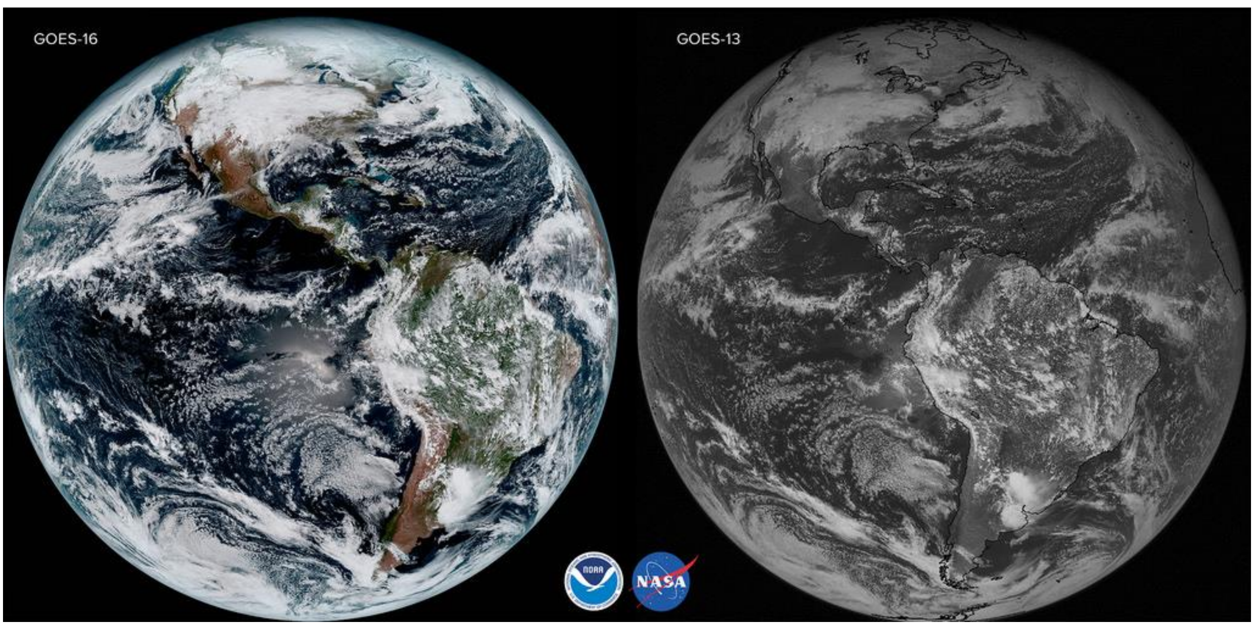

Figure 4. . Full-disk visible images of the Western Hemisphere ~1 pm EST on January 15, 2017 captured by NOAA's GOES-16 (left) and GOES-13 (right).

Spatial resolution of the available images are also greatly improved (Fig. 4). Many forecasters have described the difference akin to watching high definition versus standard television. 0.64 µm visible imagery will be up to 4x the previous resolution, with details resolved to as small as 500 m. Other visible and near-infrared bands will have spatial resolution to 1 km, allowing unprecedented temporal and spatial detail from a GOES satellite.

Improved processing speed brings about another key advantage: reduced latency between ABI capture and availability to the forecaster. Preliminary testing shows normal operating mode allows receipt 1-2 minutes after image capture, which is a reduction of ~15 minutes. The ability for forecasters to begin assessing satellite data in near real-time will enhance forecasting, especially in quickly changing weather situations.

2.**) Geostationary Lightning Mapper (GLM)**

The Geostationary Lightning Mapper (GLM) is the first ever geostationary lightning instrument of its kind. On GOES-16, the GLM will be able to detect total lightning (both in-cloud and cloud-to-ground lightning strikes) across a large field of view extending from 55°S to 55°N latitude. Lightning detection efficiency is expected to be ~70% during the daytime, and 90+% at nighttime, and will be reported to forecasters in their AWIPS

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workstations within 20 seconds of occurrence. That very low latency of product receipt will allow forecasters to monitor lightning trends in near-real time, providing better information for those with outdoor activities potentially threatened by lightning, for aviation route planning, and in mitigating other lightning related hazards.

The spatial resolution of the reported lightning will also be available on a 8-14km grid, and will be color-coded based on the density of lightning over each grid box. These data will be useful in detection of intensifying or weakening convective storms (based on lightning trends over time), and areas of quickly changing or highly electrically active storms. The GLM will also be useful in detecting lightning over the oceans, beyond the reach of ground-based lightning detection systems. This means the ability to monitor potential rapid intensity changes within tropical cyclones, which is often accompanied by bursts of eyewall lightning. For longer-term applications, the GLM will also result in refined lightning climatologies within the GOES-16 field of view.

Some of the very first images from the GLM can be seen at the following link:
https://www.nesdis.noaa.gov/content/flashy-first-images-arrive-noaa%E2%80%99s-goes-16-lightning-mapper

3.) Better solar monitoring

GOES-16 also has two sun-facing instruments: (1) the Solar Ultraviolet Imager (SUVI) and (2) the Extreme Ultraviolet and X-Ray Irradiance sensors (EXIS). The SUVI is a telescope that observes various characteristics such as coronal holes, solar flares, and coronal mass ejections (Fig. 5). Likewise, the EXIS monitors solar irradiance and solar flares. Monitoring these data will improve forecasting of space weather and early warnings of possible impacts from associated geomagnetic storms, which can disrupt power utilities, communication and navigation systems, and may cause radiation damage to orbiting satellites. NOAA's Space Weather Prediction Center (http://www.swpc.noaa.gov/) will rely on these products to issue associated alerts, watches and warnings, with human response aimed at mitigating any potential damage to radio communications and navigation systems. On a lighter note, space weather enthusiasts may also enjoy more accurate aurora forecasts based on the improved solar sensing capabilities.

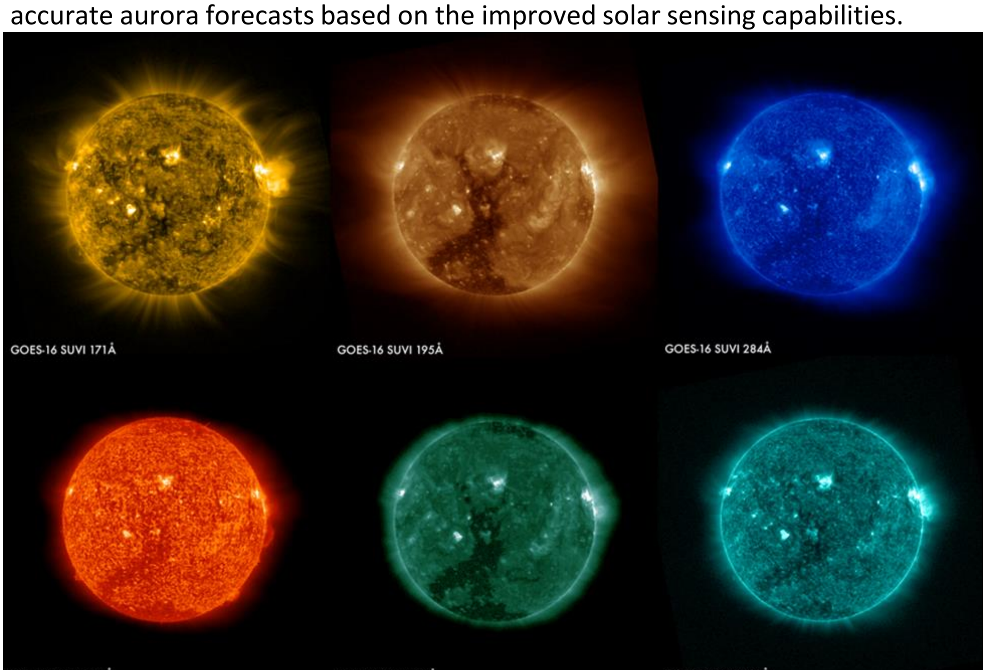

Figure 5. The Solar Ultraviolet Imager (SUVI) instrument onboard NOAA's GOES-16 satellite captured these images of the sun on January 29, 2017.

Conclusion

We hope that you've enjoyed this brief look at the new satellite capabilities. Future news articles are planned once GOES-16 data becomes operational. In the meantime, you can learn more about the GOES-R/GOES-16 mission online at http://www.goes-r.gov/

Disclaimer: GOES-16 data shown in this article are preliminary, non-operational data and are undergoing on-orbit testing.

25th Anniversary Montpelier Ice Jam: March 11, 1992

-Jessica Neiles

Weather Synopsis:

After a light snowfall on March 1st, there was 10" of snow on the ground in Montpelier, VT. Mild daytime temperatures beginning on the 3rd of March melted away some of the snow each day, with only 2" remaining on March 10th. There was still considerable snow cover in the higher elevations of the Green Mountains. Data from an unpublished USGS report reported 18" snow depth with 5" of snow water equivalent at 1,300' in the headwaters of the Winooski River basin on March 3rd. On the morning of March 10th, a low-pressure system was centered near Toledo, OH. Vermont was in the warm sector ahead of this system and recorded a maximum temperature of 44 degrees. Late Tuesday evening rain showers began as this low-pressure system tracked eastward. By midnight, 0.24" of rain had fallen in Montpelier.

The rain continued overnight as the aforementioned low-pressure system was centered over Eastern Pennsylvania by Wednesday morning (Figure 1). At 6 am on the 11th, there was about 0.60 inches of rainfall in Montpelier. An early daytime high temperature of 51 degrees was reached and all remaining snow on the ground melted adding to the runoff. During the daytime hours, this low-pressure system lifted Northeastward across Vermont. Another 0.22" of rainfall would fall, with rainfall totaling over 1" in Montpelier before changing to snow.

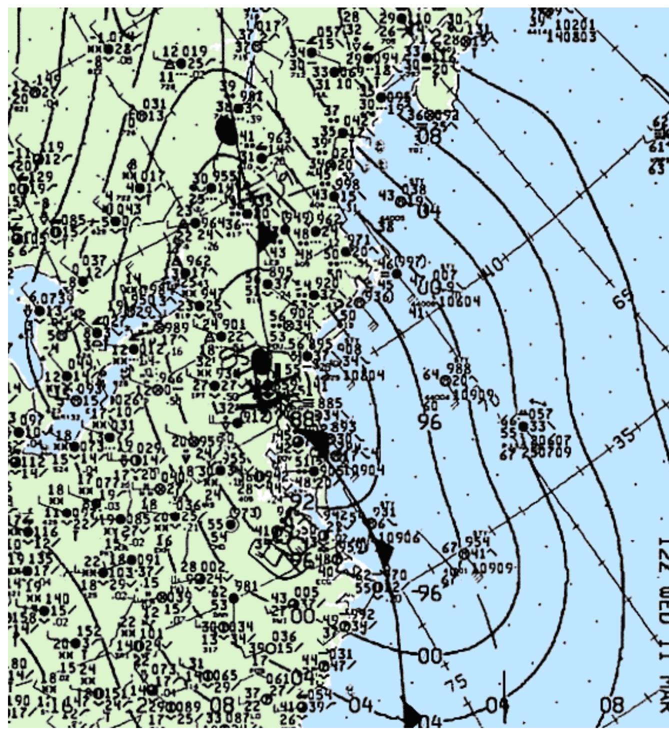

Figure 1. WPC Surface Archive Page 8AM Wed 03/11/92

Ice Jam Flooding:

Local police first reported an ice jam near the Washington Country Railroad Bridge, which is west of the Pioneer Street Bridge (Figure 2). This initial jam released, but as the ice and water surged downstream it caused another jam near the Bailey Avenue Bridge. The first flood warning was issued around 7:20am EST. Water surged into downtown Montpelier as it backed up due to the jam, within

Date	Max Temperature	Min Temperature	Avg Temperature	Avg Temperature Departure	HDD	CDD	Precipitation	Snowfall	Snow Depth
1992-03-01	21	-8	6.5	-17.0	58	0	0.08	2.4	8
1992-03-02	24	-4	10.0	-13.8	55	0	T	T	10
1992-03-03	40	10	25.0	0.9	40	0	T	T	10
1992-03-04	37	9	23.0	-1.4	42	0	0.00	0.0	7
1992-03-05	43	15	29.0	4.3	36	0	0.00	0.0	5
1992-03-06	43	23	33.0	7.9	32	0	T	T	5
1992-03-07	36	28	32.0	6.6	33	0	0.13	0.0	4
1992-03-08	40	32	36.0	10.3	29	0	T	0.0	3
1992-03-09	48	31	39.5	13.4	25	0	0.00	0.0	3
1992-03-10	44	37	40.5	14.0	24	0	0.24	0.0	2
1992-03-11	51	16	33.5	6.7	31	0	0.82	0.3	T
1992-03-12	18	6	12.0	-15.2	53	0	0.14	1.3	M

Table 1. Climatological data for March 1-12, 1992 Barre Montpelier Airport, VT

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less than an hour downtown Montpelier was inundated to a depth of 2-5 feet. The Governor of Vermont declared a state of emergency by 9 am, evacuations continued through the morning hours. Around 3 pm backhoes and a crane were staged to attempt to dislodge the jam below the Bailey Ave Bridge. The ice was dislodged and began flowing but caused a secondary ice jam, causing even further flooding in downtown Montpelier. The ice jam was once again knocked loose and as huge chunks of ice moved downstream, the railroad bridge downstream from the Bailey Ave Bridge was ruined. By 5:30 pm the last ice cleared the bridge and flood waters quickly drained from the downtown area. As the ice jam released, the peak stage was 15.71’ (Figure 3). The corresponding maximum discharge was 11,500 cubic feet per second, this has a recurrence interval of about 10 years (10-percent chance in a given year.) In comparison, the maximum gage height during the flood of 1927 was 27.1’, which has a recurrence interval of greater than 100 years. The duration of flooding downtown was about 11 hours. When the jam released the water receded very quickly. The arrival of sharply colder temperatures reduced runoff and lessened the potential for further flooding.

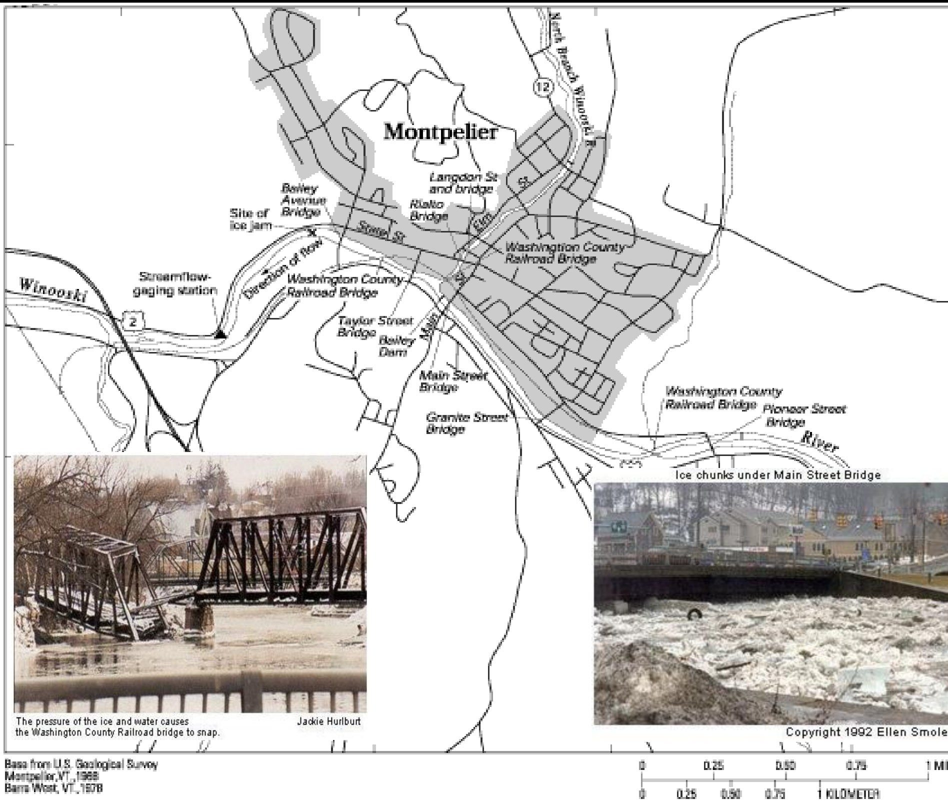

Figure 2. Location of the Winooski River, North Branch Winooski River, and Stevens Branch in Montpelier, VT (USGS)1

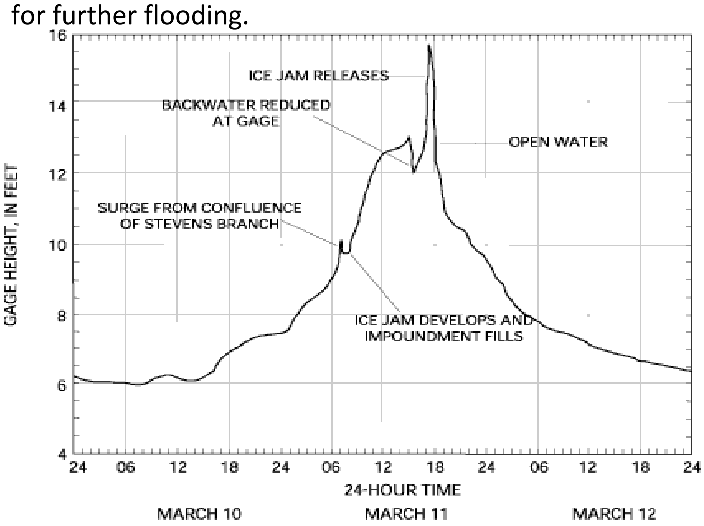

Figure 3. Gage height, Winooski River at Montpelier, VT (USGS)

Flood Damage:

The downtown commercial district of Montpelier suffered severe damage as water levels rose to 2 to 3 feet above the main-level floors in many businesses. Buildings, streets, sidewalks, and a railroad bridge were damaged. Cleanup efforts were hampered by extremely cold temperatures and light snow. It was important to pump out basements and repair heating units quickly because the subfreezing temperatures could further damage properties. More than 200 automobiles were damaged or destroyed. Petroleum spills caused pollution and safety hazards. FEMA estimated that 8,000 gallons of fuel oil were discharged

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discharged into the floodwater. In the city of Montpelier, the ice jam flood caused estimated $4 million damage. The President of the United States declared the flood affected counties a disaster area. No deaths or serious injuries were reported.

Figure 5. Timeline from City of Montpelier

Photos from City of Montpelier Website.

Wednesday, March 11, 1992

6:57 a.m.	A large ice jam on the Winooski River breaks loose about the Pioneer Street Bridge and travels through Montpelier. Ice jams just below the Bailey Avenue Bridge and dams the river.
7:05 a.m.	Filled with rain and snowmelt, the Winooski begins to overflow its banks along State Street and the North branch begins backing up onto Elm Street.
7:15 a.m.	Water surges dramatically into low-lying areas behind Main and State Streets, floating propane tanks from moorings, flooding parked cars and innundating store basements.
7:23 a.m.	Radio stations are notified of a flood emergency as first warnings are issued.
7:45 a.m.	Icy flood waters hit the steam heating boiler at MacPherson's Travel on Main Street and the boiler explodes, shattering the glass storefront and destroying the basement.
7:56 a.m.	Two to three feet of water is reported in front of Days Inn on State Street where an estimated 100 people are stranded. Flood waters pout onto Main Street, stalling cars and making the road impassable. Backed-up water from the swollen North Branch flows upstream on Elm Street.
8:09 a.m.	Evacuations begin of hundreds of stranded residents, workers and state employees on Main, State and Elm Street. Some wade to safety, while others are taken out by boat or by fire engines and dump trucks.
8:30 a.m.	Gov. Howard Dean declares a state of emergency in the capital and closes state offices. The National Guard is called in to assist, and state police, game wardens and other public safety crews begin arriving to help in the disaster.
8:46 a.m.	A Red Cross emergency shelter is set up at the gymnasium at Vermont College.
9:00 a.m. to noon	Human chains of volunteers work successfully in frigid waters to save historic documents stored in the basement of the Pavilion Building. On Main Street, similar efforts rescue about 18,000 children's books from the basement of Kellogg-Hubbard Library and thousands of videotapes in the basement of the Savoy Theater.
10:07 a.m.	Power crews shut off electricity in downtown Montpelier because of high fire and explosion hazards from leaking fuel oil and propane. Many telephone lines are out. About 200 buildings in the downtown area are flooded.
3:00 p.m.	Backhoes and a crane move into place and begin dislodging the ice jam below Bailey Avenue Bridge.
4:57 p.m.	After getting the ice flowing, a second jam occurs, sending a surge of water back up into Montpelier to cause the worst flooding of the day.
5:10 p.m.	The ice jam is knocked loose again, and begins moving downstream.
5:17 p.m.	Huge ice chunks grinding downriver lift and twist half the trestle railroad bridge near Bailey Avenue off its foundation, leaving it perpendicular to the rest of the bridge and pointing downstream.
5:31 p.m.	The last ice clears the Bailey Avenue Bridge, and flood waters rapidly drain from downtown.

A backhoe works to break up the ice jam at the Bailey Avenue Bridge.

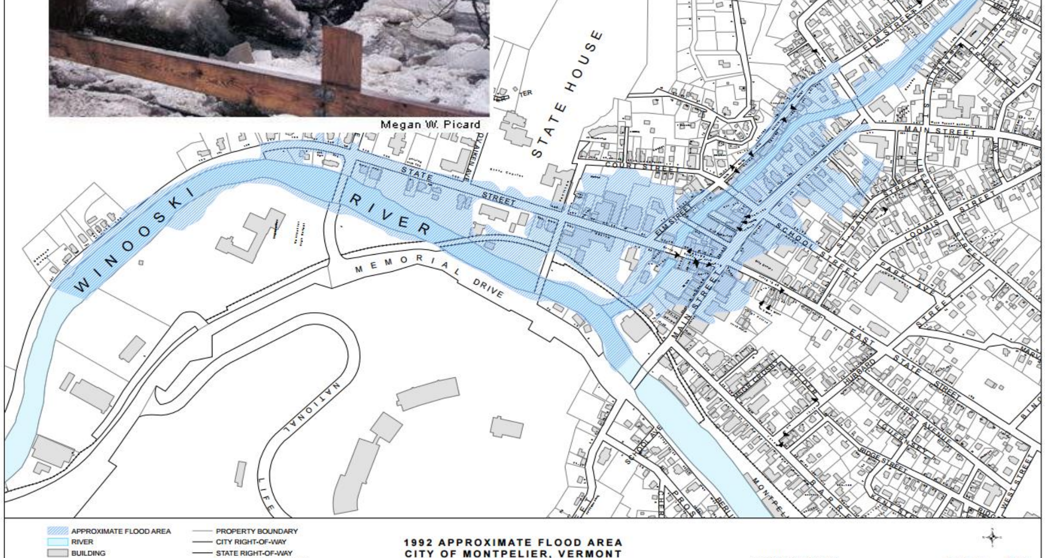
Ethel Grandfield

Copyright 1992 Ellen Smolen

Some of the formidable ice chunks that clogged the Winooski.

Megan W. Picard

Figure 4. Approximate Flood Inundation Area, City of Montpelier, VT (USGS)



References:

City of Montpelier website: http://www.montpelier-vt.org/604/Flood-of-1992

Denner, Jon C. and Robert O. Brown USGS Summary of Floods of 1992: https://ks.water.usgs.gov/pubs/reports/wsp.2499.sumvt0392.html

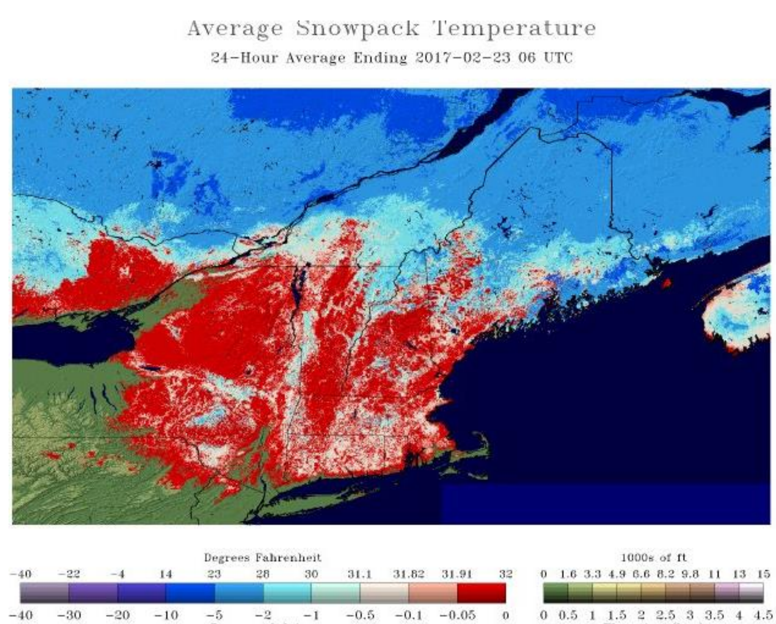
A Review of the February 24-26, 2017 Flood Event

-Robert Deal

The combination of snow melt, ice in the rivers, prolonged warmth, and excessive rainfall lead to widespread flooding across Northern New York and Vermont. In total, 11 Flood Warnings were issued by the National Weather Service (NWS) across several river basins with water overtopping the banks and causing inundation over many local roadways.

In order to understand the scope of the ingredients that lead to the flooding, we need to go back to mid-February. From Feb 9th- Feb 13th, the North Country saw below normal temperatures to the tune of 5 consecutive days below freezing. This caused ice to form across many of our river basins and thicken across the northern basins include the Chazy and Ausable rivers in Northern New York and the Missisquoi, Passumpic, and Lamoille rivers in Vermont. Then, came the snow. A long-fused snow storm brought widespread 10-18 inches of snow to the North Country on Feb. 13th. And again on Feb 16th, another storm brought 4-8 inches of snow for the Champlain Valley, with 5-12 inches of snow across eastern Vermont. So to recap, approximately a week before the flood, we had significant ice in the rivers and the deepest snowpack of the season.

In the days leading up to the flood, the weather pattern completely changed as record-setting warmth surged into the North Country. Temperatures warmed into the 50s and even into the 60's twice ahead of the flood. With 3 days of temperatures well above freezing, the snowpack became ripe and started melting into local river basins. To give you a sense of how much snow melt was occurring, the snow depth on Mount Mansfield on Feb 17th was 102 inches, and the day before the flood the same snow depth was down to 76 inches. We generally mention that a snowpack is considered "ripe" with the temperature of the snow pack is warmer than 31.1 degrees. On Feb 23rd, the only locations in the North Country with a temperature less than 31.9 were in the Northeast Kingdom.



National Snow Analysis, Office of Water Prediction

By themselves, the frozen rivers, snow, and warm up would not have likely caused flooding. To get flooding we need a heavy rainfall component. That came in the form of a strong cold front that tracked through the North Country. The cold front brought widespread rainfall totals of between 0.5 to 1.0 inches. That rain melted, even more, snow and caused significant rises on area rivers along with ice movement. Typically the rule of thumb is that to breakup ice, the water level needs to rise 2 to 3 times the thickness of the ice. That easily occurred during the event as river levels increased by 3-5 feet. This lead to numerous ice jams forming most notably along the Ausable and Chazy rivers in northern New York, the Mississiqoui (example shown in figure), Passumpsic, Lamoille, and White Rivers in Vermont. Free flow flooding occurred along the Winooski, Barton, Otter Creek, and Ausable (the second time with both examples shown in figure) basins as well. Free flow simply means that ice is not affecting the gauge height, so there could still have ice in the water, just not impacted the gauge. On the next page is a chart with selected crests from the flooding event.

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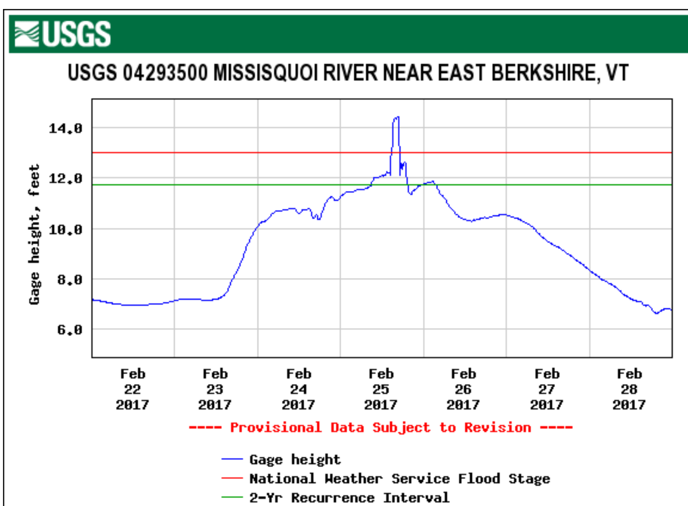
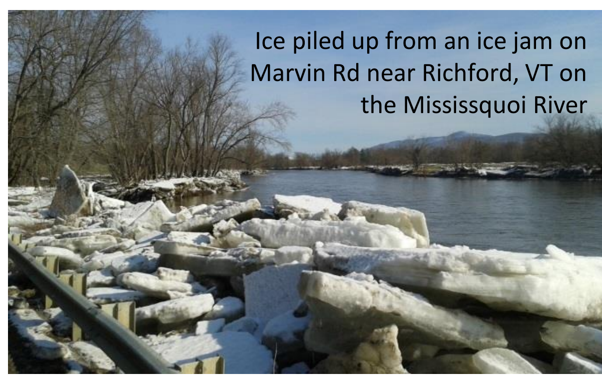
River	Flood Stage	Crest Height	Crest Date	Flood Reason
Ausable at Ausable Forks,NY	7.0	8.96	Feb 25 01:00 am	Ice Jam
Ausable at Ausable Forks, NY	7.0	7.96	Feb 26 01:01 am	Rain/Snow Melt
Lamoille at Jeffersonville, VT	450.0	450.89	Feb 26 07:15 am	Rain/Snow possible ice
Mississqoui at North Troy, VT	9.0	9.80	Feb 26 08:30 am	Ice Jam
Mississqoui at East Berkshire, VT	13.0	14.42	Feb 25 04:45 pm	Ice Jam
Otter Creek at Center Rutland, VT	8.0	9.38	Feb 26 01:30 pm	Rain/Snow Melt
Winooski at Waterbury, VT	419.0	419.34	Feb 26 01:30 am	Rain/Snow Melt
Winooski at Essex Junction, VT	12.0	12.83	Feb 26 11:45 am	Rain/Snow Melt
Passumpsic at Passumpsic, VT	14.0	15.67	Feb 26 05:15 am	Ice Jam
Barton at Coventry, VT	8.0	9.4	Feb 26 10:00 am	Rain/Snow Melt

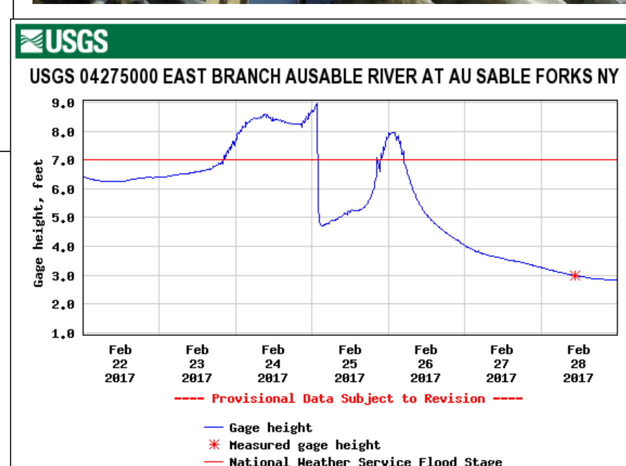
This was a well forecast event for the NWS in Burlington, as we began mentioning the threat in a Hydrology section of our Area Forecast Discussion on Tuesday afternoon on Feb 21st. By Thursday morning, confidence in the potential for flooding had increased, and so a Flood Watch was issued by the midnight crew with two full days of advanced notice of the potential for flooding. In total there were 11 flood warnings issued with an average lead time of 6 hours and 20 minutes before the rivers went above flood stage and an average of 12 hours and 57 minutes of lead time before the rivers crested.




Ice piled up from an ice jam on Marvin Rd near Richford, VT on the Mississquoi River

(Above) Hydrograph of the Mississquoi River at East Berkshire. Note the sharp rise and subsequent drop in the gauge height. This is indicative of an ice jam forming and backing water upstream.

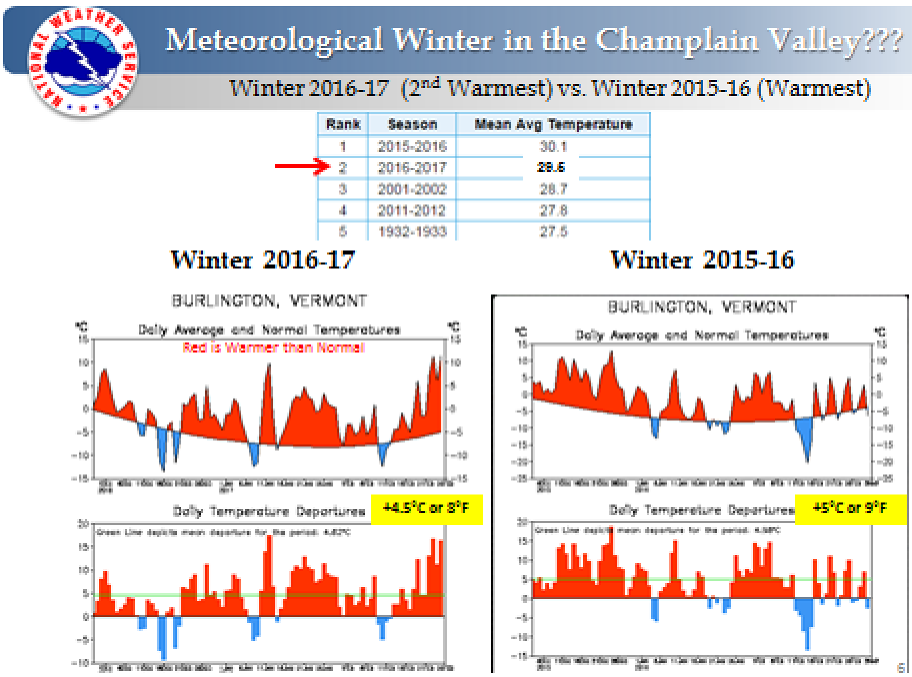
(Right) Hydrograph of the East Ausable Branch of the Ausable River at Au Sable Forks, NY. Note that the river shows a crest due to an ice jam, then a sudden drop as the ice released, and then flooding due to the rain and snow melt in free flow.



Recap of Winter 2016-17: Record Warmth

-Scott Whittier

Meteorological winter (Dec-Feb) has just finished and after the record breaking warmth of the Winter of 2015-16, what were the odds of another record breaking warm winter?! Apparently, not as much of a long shot than anyone expected. Here at the NWS office in Burlington, VT, we witnessed the 2nd Warmest Meteorological winter on record, just a half degree cooler than the record set in 2015-16.



Rank	Season	Mean Avg Temperature
1	2015-2016	30.1
2	2016-2017	29.6
3	2001-2002	28.7
4	2011-2012	27.8
5	1932-1933	27.5

The charts (left) show lots of warmer than normal conditions (red) all winter long during both winters with the difference between 2016-17 and 2015-16 was some cooler temperatures (Blue) in December 2016 vs. December 2015 and then milder in February 2017 vs. February 2016.

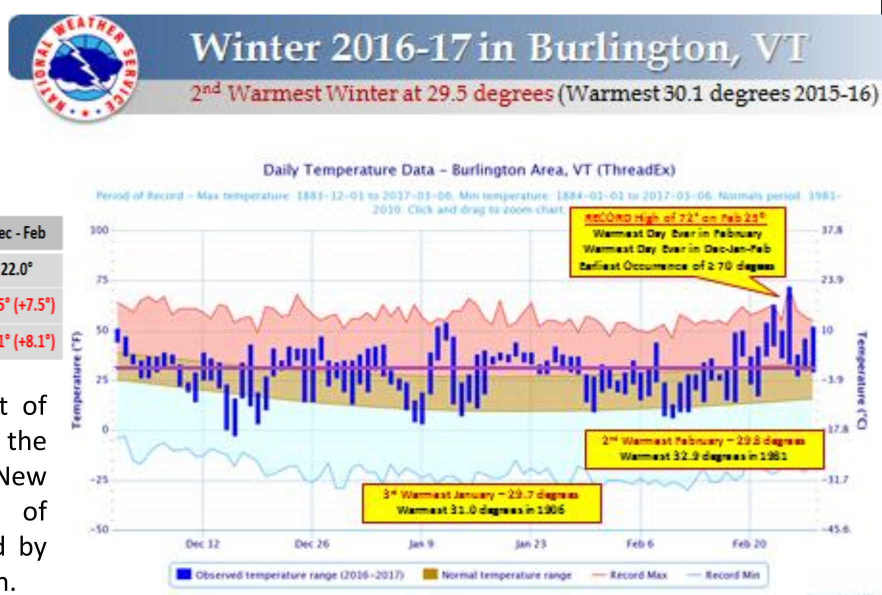
The chart (below) is a look at the daily maximum and minimum temperatures with respect to normals and daily records with the purple horizontal line representing the 32 degree mark. There were 64 out of a possible 90 days that recorded a temperature greater than 32 degrees, the 3rd greatest (67 in 2011-12, 64 in 2015-16). The most striking is the unprecedented record heat toward the end of February that caused a tremendous snow melt across the North Country. On February 23rd, Burlington's high temperature for February was broken with 63 degrees.

However, on February 25th, that record was shattered by 9 degrees with a high temperature of 72 degrees.

This reading of 72 degrees was the Warmest February and Warmest Meteorological Winter daily temperature ever recorded.

Burlington, VT

Year	December	January	February	Dec - Feb
Normal	25.8°	18.7°	21.5°	22.0°
2016-17	29.0° (+3.2°)	29.7° (+11.0°)	29.8° (+7.3°)	29.5° (+7.5°)
2015-16	39.2° (+13.4°)	24.9° (+6.2°)	26.3° (+4.8°)	30.1° (+8.1°)



It was the same story across most of Vermont, northern New York and the Connecticut River Valley of New Hampshire. Whereas the Winter of 2016-17 was mostly only surpassed by last winters (2015-16) record warmth.

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Meteorological winter 2016-17 did start cooler than Winter 2015-16, as December 2016 was 10 degrees cooler than December 2015, yet still above normal. However, January 2017 was the 3rd warmest January on record and February 2017 was the 2nd warmest February on record, registering months respectively 11 and 7 degrees above normal respectively.

Meteorological Winter 2016-17 in the North Country

Last Winter (2015-16) was the Warmest for Most in the North Country

Massena, NY

Rank	Season	Mean Avg Temperature
1	2001-02	25.8
2	2016-17	25.6
3	2015-16	25.4
4	1952-53	23.9
5	2011-12	23.7

Since 1948

Saranac Lake, NY

Rank	Season	Mean Avg Temperature
1	2015-16	23.5
2	2016-17	22.0
3	2001-02	21.8
4	2011-12	20.9
5	1998-99	19.2

Since 1998

Burlington, VT

Rank	Season	Mean Avg Temperature
1	2015-16	30.1
2	2016-17	29.5
3	2001-02	28.7
4	2011-12	27.8
5	1932-33	27.5

Since 1892

Montpelier, VT

Rank	Season	Mean Avg Temperature
1	2015-16	26.0
2	2001-02	25.7
3	2016-17	24.5
4	1974-75	24.4
5	2011-12	24.1

Since 1948

St. Johnsbury, VT

Rank	Season	Mean Avg Temperature
1	2015-16	27.3
2	2001-02	27.2
3	1932-33	26.4
4	1948-49	25.5
5	2016-17	24.9

Since 1894

West Lebanon, NH

Rank	Season	Mean Avg Temperature
1	2015-16	28.6
2	2016-17	27.5
3	2011-12	27.3
4	2001-02	27.2
5	2009-10	25.9

Since 1948

As we head into Spring, don't forget the weather hazards that can still affect the region:

- Flooding
  - Ice Jam
  - Significant Snowmelt & rain
- Strong Winds
- Late Winter/early Spring snowstorms
- Wintry Mixed Precipitation
- Thunderstorms/Lightning

My Field Operations & Management Course Experience

-Brooke Taber

The Field Operations and Management Course was held in Kansas City on January 9th through the 12th and was designed to provide new lead forecasters in the National Weather Service (NWS) the necessary leadership tools and skills to be successful at their position. We had 28 students in our class from all over the United States, representing not only the NWS, but River Forecast Centers and the Tsunami Warning Center, along with several folks from regional and national headquarters.

The first day of class we discussed the roles and responsibilities of NOAA leadership in building trust with their employees through effective relationships. We learned defining our sense of purpose and communicating our intent is critical in building positive relationships and inspiring team action toward future organizational success. The second day of class was dedicated to media communication and developing our understanding of the fundamentals of effective communications. This included having the opportunity to participate in live interviews with Keli Pirtle, a NOAA Public Affairs Officer from the Storm Prediction Center at the training centers TV studio. Figure 1 shows Keli Pirtle providing a mock interview as part of media training.

...Continued from page 11

Figure 1: Brooke Taber participating in a mock interview with Keli Pirtle as part of media training at the Field Operations and Management Course.

The next several days of the course concentrated on building effective teams and the associated principles and values needed, such as effective listening skills, strong communication practices, the benefits of empowering your team members through delegation, and making sure your actions are aligning with your team's sense of purpose. We participated in numerous group exercises designed to enhance our effective team leadership skills and practices. For example, to improve our effective listening skills we divided up into teams of two, and one person had to describe a picture, while the other team member drew what they heard on a sheet of paper. At the end we compared pictures to see how well we listened and followed detailed instructions described by our team member. Other activities included learning about our top 5 strengths through reading and completing the Strengths-Based Leadership Book and associated survey. During another group session we had the opportunity to apply and practice our leadership strengths toward solving difficult situations. Figure 2 shows our group interaction in utilizing our leadership strengths in solving difficult issues.

Figure 2: Group interaction associated with the Field Operations and Management Course at the training center in Kansas City.

In addition to our classroom exercises and lectures our group had the opportunity to visit the Regional Operations Center (ROC) at the training center and witness a live briefing associated with an upcoming ice storm impacting the Central Plains. The purpose of the NWS ROC's is to facilitate the communication of decision support services to regional and national agencies during high impact events by emergency response specialists, while providing support to local Weather Forecast Offices. Figure3 shows real-time briefing inside the ROC located at the NWS training center in Kansas City.

Figure 3: Regional Operation Center (ROC) briefing for ice storm impacting much of the Central Plains.

Overall I had a positive experience and enjoyed networking with other NWS members, while learning new leadership practices and fundamentals to integrate into my workplace environment at WFO Burlington, Vermont. My goal is to share some of these group leadership concepts and activities during upcoming staff meetings and workshops to enhance our local office team working environment.

Assisting The Fire Community Locally, Regionally, and Internationally

-Eric Evenson

The National Weather Service in Burlington, Vermont provides fire weather forecasts and information for state and forestry personnel across northern New York and much of Vermont. But did you know we also assist regional and international fire agencies as well? Every January the Northeast Forest Fire Protection Commission (NFFPC), or Northeast Compact for short, meets in Portland, Maine to prepare and train for the upcoming fire season. The NFFPC is comprised of all the New England states, New York State, and the eastern provinces of Canada.

map shows all the states and provinces in the Compact

The purpose of NFFPC is to provide mutual aid among members and establish procedures to facilitate this aid, support the development of integrated forest fire plans and maintain appropriate forest fire fighting services by its members, and establish a central agency to coordinate the services needed by member states and provinces. Of course, the weather is a vital element with respect to firefighting efforts and our office is the National Weather Service liaison to the Fire Sciences Working Group of the Northeast Compact. As the liaison of the working group we provide relevant information related to new weather technology and training material to the entire Northeast Compact, ensure all National Weather Service offices in the Northeast are providing similar and necessary weather data to the Compact, and listening to the needs of the Northeast Compact to see where we may best serve them in the upcoming season and in the future. In 2016 we experienced a drought across the Northeast and parts of eastern Canada. At the most recent Compact meeting in January and a special meeting of the Fire Prevention Working Group of the Northeast Compact last Fall, we provided information related to the drought and its impact on fire weather and fire behavior. Some of the highlights from those presentations included:

Photo taken from this past Compact meeting

- Much of the Northeast saw above normal fire activity this past summer (June/July/August of 2016) when typically the peak fire season is in April and May.
- Fire Danger, which describes the ability for fires to start and spread as well as their difficulty in containing, was in the High and Very High categories on more days than normal.
- Fires that started burned longer than usual and were more difficult to contain as they burned deeper into the ground due to dry conditions and burned in more difficult terrain.
- Dry conditions continued into the Fall and many areas were in moderate to severe drought with some parts of New England in extreme drought.
- No significant fires occurred, but conditions this past Summer and Fall were so dry that the potential for significant fire development was much higher than normal.

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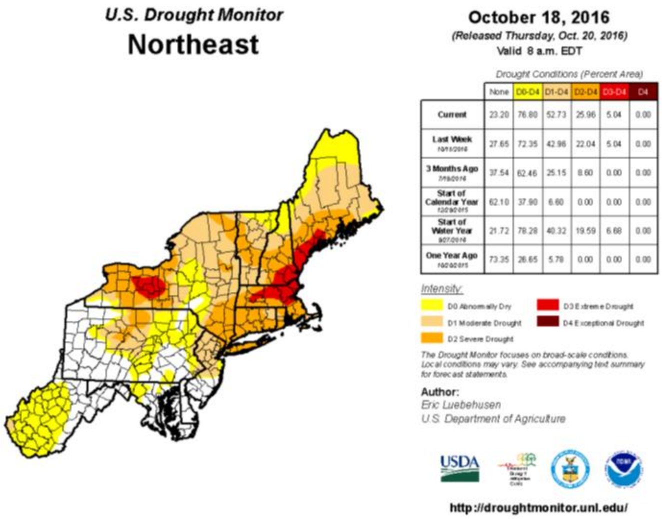


	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	23.20	76.80	52.73	25.96	5.04	0.00
Last Week	27.65	72.35	42.96	22.04	5.04	0.00
3 Months Ago	37.54	62.46	25.15	8.60	0.00	0.00
Start of Calendar Year	62.10	37.90	6.60	0.00	0.00	0.00
Start of Water Year	21.72	78.28	40.32	19.59	6.68	0.00
One Year Ago	73.35	26.65	5.78	0.00	0.00	0.00

Left: Worst Drought conditions in 2016 for the Northeast

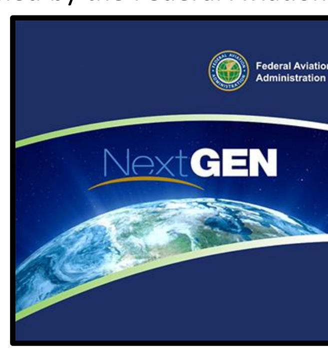
Right: Maine Fire Wardens posted a good example of how much more intense the fires were in the Northeast last year. Looks like something you would see from a fire out West

We are fast approaching the start of our local fire weather season and we will once again be meeting with forestry personnel from northern New York and Vermont, this time at our office here in Burlington. We will be discussing potential impacts last year's drought might have on the upcoming fire season, offer up an outlook to expected weather conditions for the peak time of our fire season, April and May, and see how we might better serve our local fire community through new technological advances, forecasts, and information that assists the wildland firefighting efforts expected this year across Vermont and northern New York.

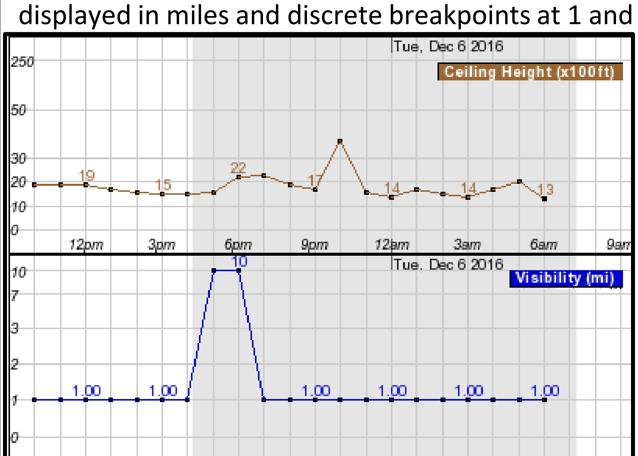
Ceiling & Visibility Data for Aviation Interests Now on the Web

-John Goff

In a continuing effort to expand data availability, the National Weather Service in Burlington began offering discrete ceiling and visibility information to aviation interests on its website in October 2016. The data is created locally from digital datasets and is a forerunner to full requirements outlined by the Federal Aviation Administration's NextGen system (https://www.faa.gov/nextgen/).



The displays are depicted in graphical form and in hourly increments through 24 hours concurrent with valid Terminal Aerodrome Forecasts (TAFs). Ceiling, or cloud base height is displayed in thousands of feet with distinct breakpoints of 1000 and 3000 feet in conjunction with instrument and marginal visual flight rules (IFR, MVFR) used by pilots. Visibility data follows a similar logic, with units displayed in miles and discrete breakpoints at 1 and 3 miles in conjunction with IFR and MVFR thresholds. Displaying aviation information in graphical Format provides pilots a unique opportunity to view the data visually over time, something that's unavailable in standard TAFs. To access the data, proceed to our homepage at www.weather.gov/btv, then to the point and click map choosing a point of interest. On the point and click forecast page that follows proceed to the Hourly Weather Forecast graphs at bottom right and select the Ceiling Height and Visibility options under the Aviation Weather tab.



The Four Seasons
Volume IV, Issue I

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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

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