



# The Four Seasons



National Weather Service Burlington, VT

VOLUME III, ISSUE I

Spring 2016

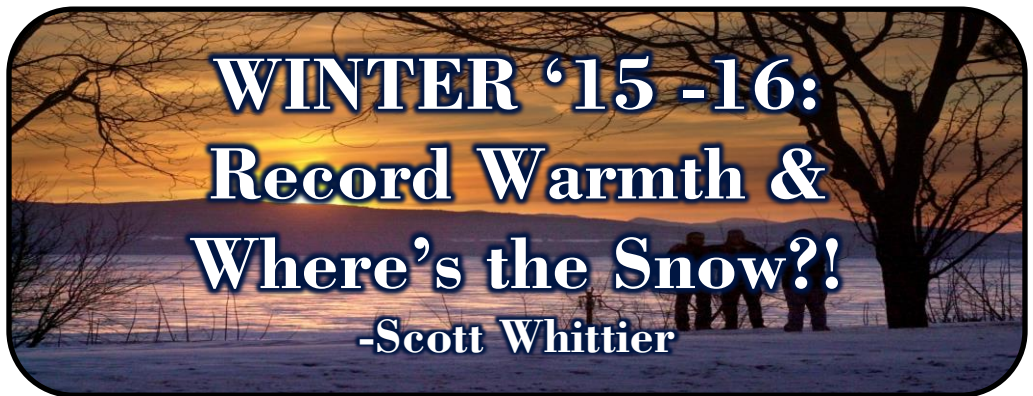
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## Letter from the Editors

Welcome to the Spring 2016 edition of *The Four Seasons*, a quarterly newsletter issued by the National Weather Service in Burlington, VT. In this edition we'll take a look back at this mild and record breaking warm winter. We'll also take a look into Cold Water Boating and the associated hazards being out on the water in the early spring season. We have some highlights from our latest science webinar of Downslope windstorms. Spring wouldn't be Spring without Spring Weather Awareness and safety. Finally, we'll take a look at Advanced Hydrologic Prediction Service (AHPs) and how you can use this great site to help you keep up on the rivers near your home. Thanks for reading and we hope you enjoy the newsletter.



Meteorological winter (December-February) 2015-16 was the warmest winter on record in the North Country and elsewhere. The average mean temperature for Meteorological winter 2015-16 at Burlington, VT was 30.1 degrees, breaking the old record of 28.7 degrees set in the winter of 2001-02, and leap-frogging past the normal mean temperature of 22.0 degrees, a departure of +8.1 degrees.

As impressive the warmth of the Winter 2015-16 was by itself, a comparison to the Winter of 2014-15 makes it even more remarkable. Winter 2015-16 in Burlington averaged more than 12 degrees warmer than last winter (A relief to heating bills across the North Country). Both December's averaged above normal, yet December 2015 experienced record warmth and averaged more than 9 degrees warmer than December 2014. January 2016 was only the 15th warmest on record with a departure from normal of +6.2 degrees, yet was 9 degrees warmer than January 2015. Lastly, February 2016 was the lowest departure from normal (+4.8 degrees) this winter, yet it was an incredible +18.7 degrees warmer than February 2015!

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Utility companies and others use a measurement called Heating Degree Days (HDD) to reflect the demand for energy to heat a building, the standard base

temperature is 65 degrees. The number of Heating Degree Days is determined by taking the average temperature of the day  $[(High + Low)/2]$  and subtracting from 65 degrees. The number of heating degree days across the North Country this 2015-16 winter season averaged 75-80% of 2014-15 levels and 80-85% from normal levels. Less cold...less fuel...more \$\$\$ in your pocket.

Mean Temperature Departures from Average  
December 2015 – February 2016  
Base Period: 20<sup>th</sup> Century

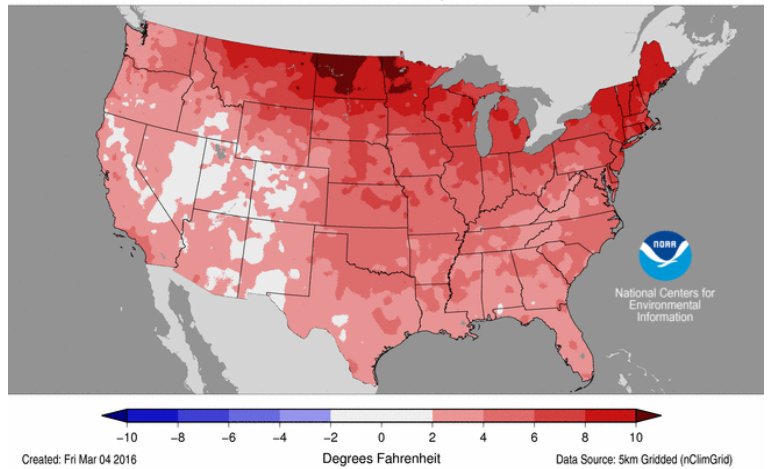


Figure 1. Mean December 2015 – February 2016 Temperature Departures from 20<sup>th</sup> Century Normals

Statewide Average Temperature Ranks  
December 2015  
Period: 1895–2015

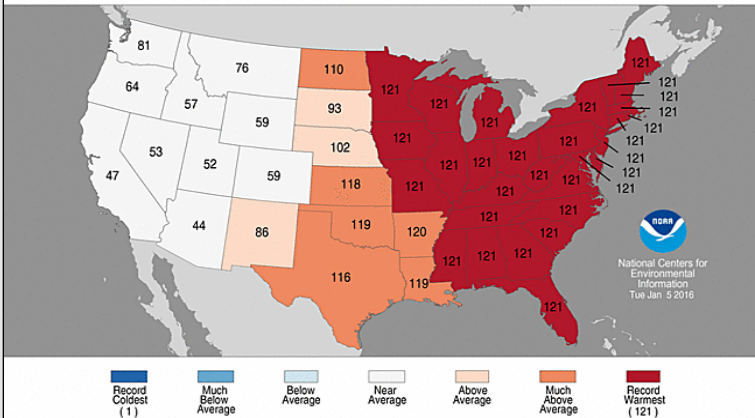


Figure 2. December 2015 Average Temperature Ranks Against Historical Records

**A December to Remember**

December 2015 was the warmest December on record for much of the Northeast. At Burlington, VT, the mean average temperature was 39.2 degrees, an astounding departure of +13.4 degrees and shattered the old December record of 32.6 degrees set in 2006 and 2001. December 1st was the only day to average below normal for December, and it wasn't until January 4th (33 days) that the average temperature was colder than normal. During this incredible stretch, daily high temperatures reached or exceeded 50 degrees for a nearly record 10 days (11 days in 1982), reaching its climax just near the Christmas holiday with an all-time December and Meteorological Winter record high of 68 degrees on December 24th.

**The Snowy Winter...That Wasn't**

Record warmth led to below-normal snowfall for much of the region with Burlington witnessing the latest occurrence (December 19th) of the first accumulated inch of snowfall. We normally refer snowfall to the "snow" season (July 1st through June 30th). However at times we do make comparisons to Meteorological winter. Vermont and Northern New York witnessed one of the least snowiest winters in modern times. Much of the region witnessed 3 to 4+ feet below normal snowfall with the mountains (Continued on Page 3)



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experiencing deficits of at least 5 to 8 feet or approximately 35-50% of normal snowfall. As of March 15th, Burlington, VT had only experienced 29.9 inches of snowfall (43% of normal), some 40 inches below normal (69.9 inches) for the season and this ranked as the 3rd least snowiest on record (29.7 inches in 1929/1913). Mount Mansfield only witnessed 66.3 inches (34% of normal), more than 130 inches below normal (197.2 inches) for the season. What's even more remarkable for Mount Mansfield is that the accumulated snowfall for the season (through March 15th) of 66.3 inches is below the normal snow depth (75 inches) for March 15th by nearly 10 inches.

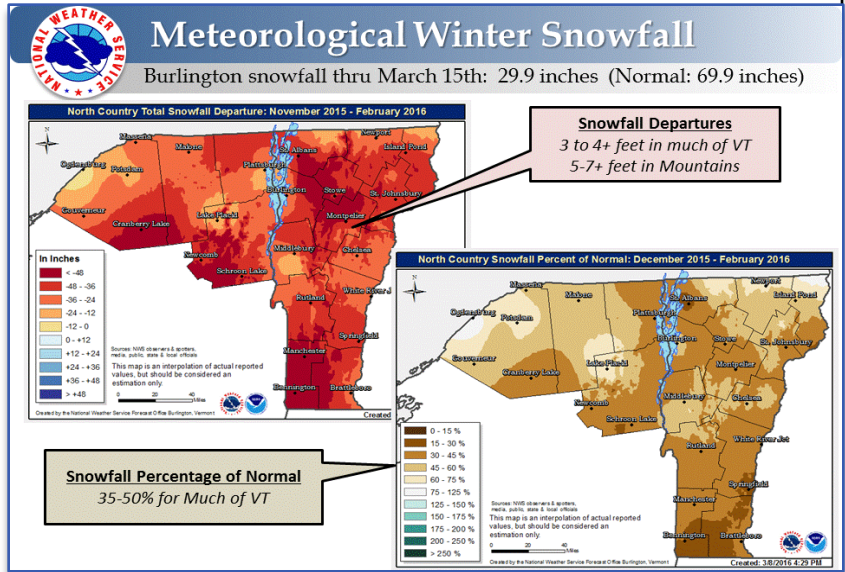
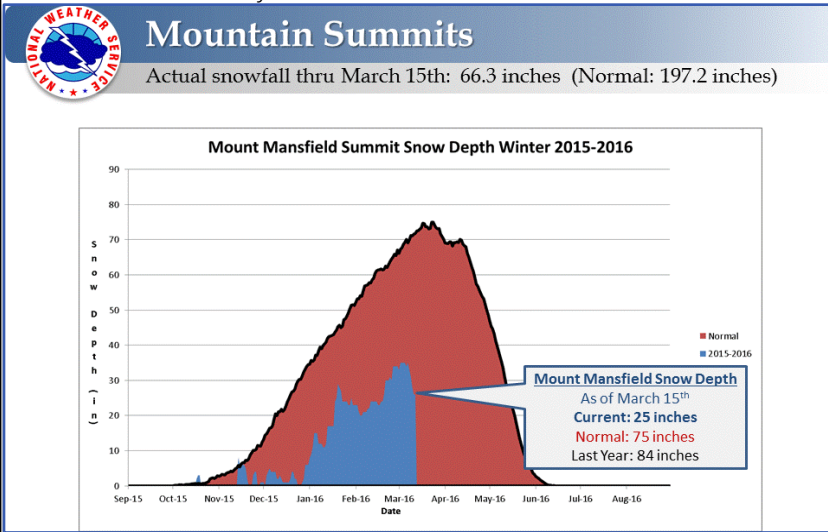


Figure 3. Winter 2015 - 2016 Snowfall Departures from 1981-2010 Normals

Figure 4. Winter 2015 - 2016 Mt Mansfield Snow Depth Vs. from 1981-2010 Normals



Why was it so Warm?

What was the main cause for this winter's record warmth? Although there are other meteorological variables that can impact the daily weather across the North Country, the main variable for the 2015-16 winter season was the strong El-Nino conditions that were occurring on the equatorial regions of the central and eastern Pacific ocean that influenced the jet stream and steering patterns across North America.

*Daily Records Set Winter 2015-2016*

Dec 11	Dec 24	Jan 10	Feb 1	Feb 3	Feb 4	Feb 16	Feb 25
Massena 60°F(tie)	Burlington 68°F Montpelier 66°F Massena 68°F Mt. Mansfield 51°F	Burlington 52°F Montpelier 45°F	Burlington 52°F St. Johnsbury 53°F	Burlington 54 °F Massena 53°F	Burlington 54 °F	Burlington 55°F St. Johnsbury 53°F	St. Johnsbury 59°F

# The Hazard of Cold Water Boating

*-Peter Banacos*

The National Weather Service (NWS) in Burlington, Vermont urges extreme caution when boating, canoeing, or kayaking during the spring, when water temperatures typically remain dangerously cold in the event of a capsized.

After a long North Country winter, thoughts naturally turn toward warm weather recreational activities. The first warm days of spring often attract boaters and other recreational enthusiasts to the many beautiful lakes, rivers, and streams across Vermont and northern New York. Those venturing out on area lakes and rivers need to be aware of the dangers posed by cold water temperatures and high water flows.

On pleasantly warm and dry days in April and May, it is easy to overlook the fact that the temperature of the water is much slower to respond to the change of season and warms more slowly than the air temperature. Rivers are often still affected by runoff from melting snow from mountain summits. Lakes continue to up-well cold water from below until a temperature of 39°F, and then increase in temperature slowly based on amount and days of sunshine, near surface air temperature, and the size of the body of water. On Lake Champlain, climate records indicate that surface water temperatures are typically in the upper 30s in late April, and only rise into the 40s during May (Figure 1).

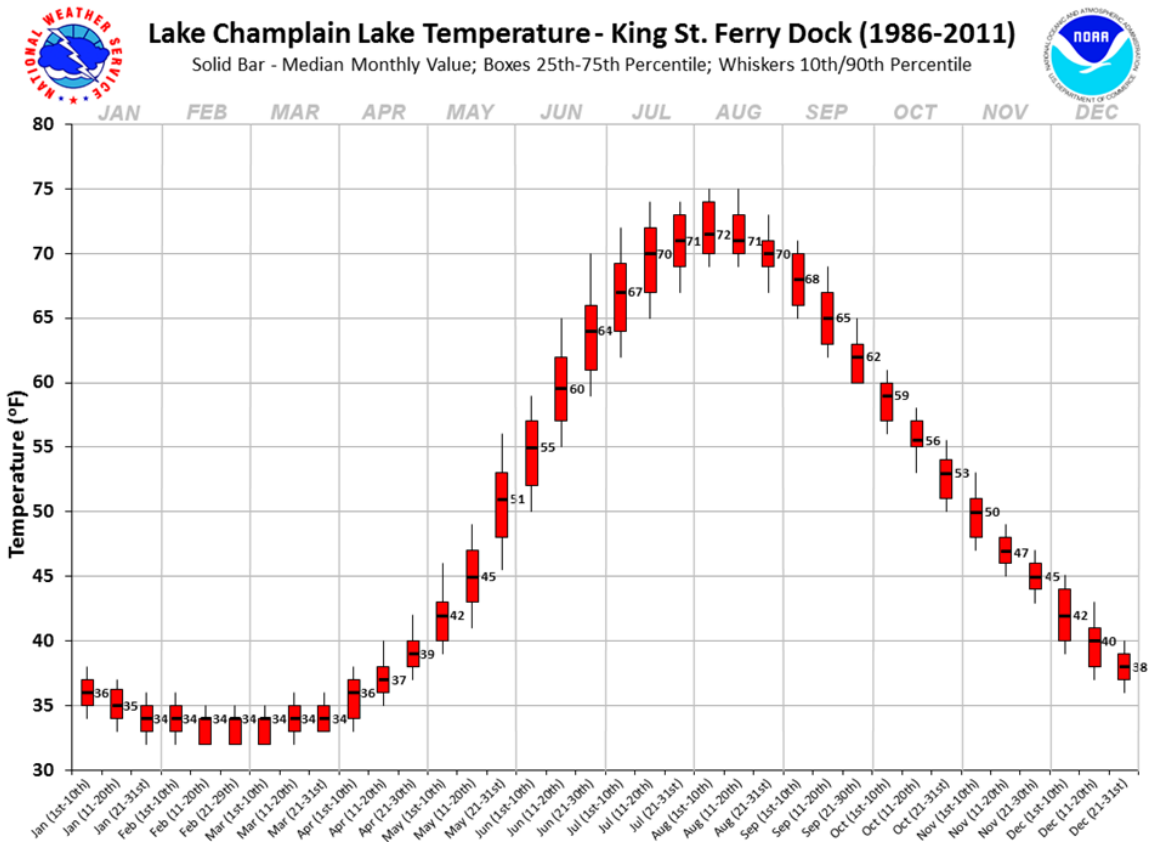


Figure 1. Box and whisker graph of Lake Champlain water temperatures (°F) in 10- to 11-day increments, as measured at the King Street Ferry Dock in Burlington, VT for the period 1986-2011. The median water temperature is shown as a solid bar and labeled with the numeric value for each 10- to 11-day increment.

The red boxes encompass the interquartile range, or 25th to 75th percentile of the water temperature data, representing the middle 50% of the temperature variability for each 10- to 11-day period. The ends of each whisker represent the 10th and 90th percentile of the water temperature data.

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Spring snowmelt and rainfall also brings high river levels and fast flows, making waterways hazardous to navigate. Woodland debris – such as logs, sticks, and branches - swept downstream in fast flowing currents can also present a hazard, particularly for those in canoes and kayaks.

Immersion in cold water can become life threatening very quickly. Should your craft capsize, hypothermia\* in waters with temperatures in the upper 30s and 40s can occur in just a matter of minutes. Since water conducts body heat away up to 26 times faster than air of the same temperature, the cold water rapidly causes extremities to become numb, weakening the ability of muscles to work effectively. Tragically, several individuals have lost their lives on North Country rivers and lakes in recent years, drowning in the very low water temperatures of April and early May.

The NWS urges the following safety measures to protect yourself and maximize your enjoyment of area waterways:

- Consider postponing small craft boating activities until water temperatures become warmer in late spring and summer.
- If you do choose to boat, canoe, or kayak in April or May, wear a dry suit appropriate for water temperatures in the upper 30s and 40s.
- Wear all recommended protective gear to guard against the cold water in the event of an accident or capsize.

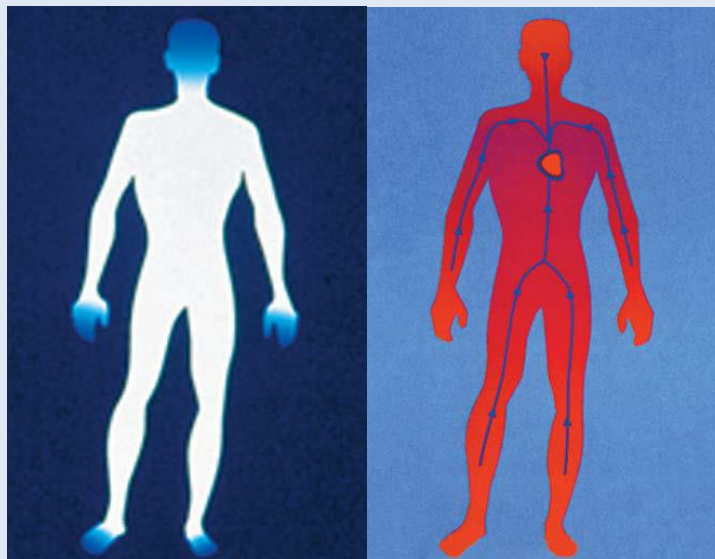
Remember, no matter the season, when you are on the water, always wear your life jacket.

**Safe boating is no accident!** Please take the time to think safety first and plan appropriately for weather and water conditions before heading out on lakes, rivers, and streams.

**\*What is Hypothermia?**

Hypothermia is abnormally low body temperature (below 95 degrees Fahrenheit). Warning signs include uncontrollable shivering, memory loss, disorientation, incoherence, slurred speech, drowsiness, and apparent exhaustion. Medical attention is needed immediately.

**Hypothermia occurs when the extremities are excessively cold (blue)**



**Improperly warming the body will drive cold blood from the extremities to the heart, leading to heart failure**



# Downslope Windstorm Webinar

-Kimberly McMahon



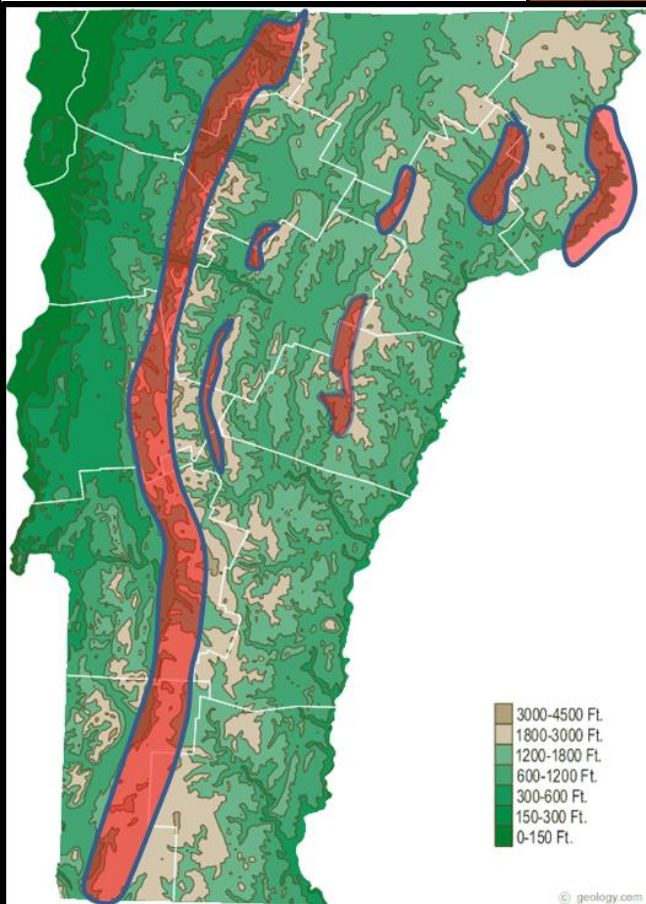
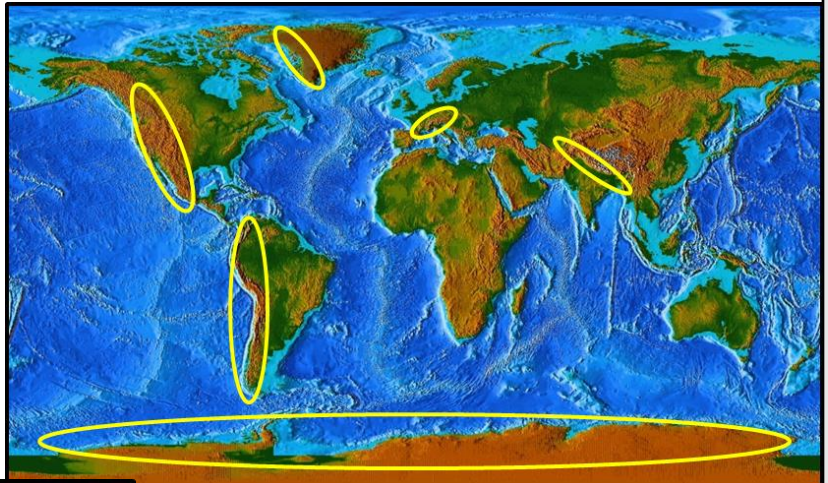
On the evening of Monday, March 14, 2016, Lead Forecaster John Goff led members of the public in the latest of our science webinars discussing how downslope winds develop, what areas of the North Country are regularly affected by these events and some of the effects this microscale phenomena. He had 116 people register for the 30 minute webinar.

Downslope windstorms are not exclusive to the North Country. It is actually a common feature in mountainous regions of the world, producing wind gusts in excess of 100 mph at times.

The complex terrain of the North Country has seen its share of recent windstorm events including:

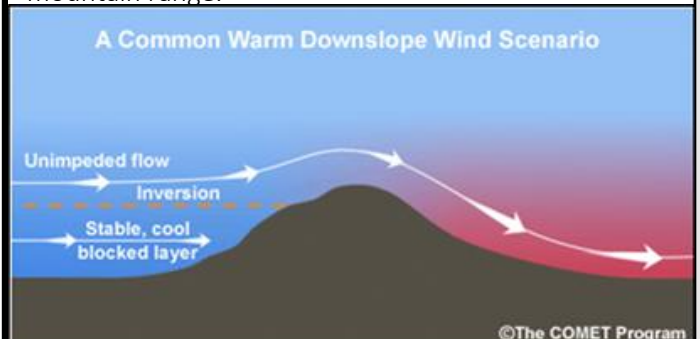
- December 1, 2010
- April 16, 2007, and
- January 27, 1996.

The April 16, 2007 event resulted from a strong low pressure system moving across the New York City Metro area, and produced 60-80 mph gusts in Rutland with nearly \$5million in damages throughout the windstorm.



The winds that produced such damage were out of the east and accelerated as they moved west in the lee of the Green mountains. These winds caused widespread damage in the city of Rutland. The figure to the left shows which areas are commonly affected in strong easterly flow, which would be the western slopes of the Green Mountains to approximately 10 miles west.

In order for winds to accelerate on the downwind side of mountain ranges, the wind flow must be perpendicular to the orientation of the mountain range. This is not to say windstorms cannot occur if the flow is not perpendicular, these winds will be of a lesser magnitude. The figure below shows how the flow increases and warms as it descends over a mountain range.





# SPRING WEATHER AWARENESS!

-Kimberly McMahon

As we head into another season, we need to be vigilant of the changing weather hazards. We've already experienced thunderstorms this March as a sign of the changing seasons. But no matter what the weather or which season we are in, preparedness and awareness are the best tools to stay safe from various weather hazards. Living in the North Country of Vermont and Northern New

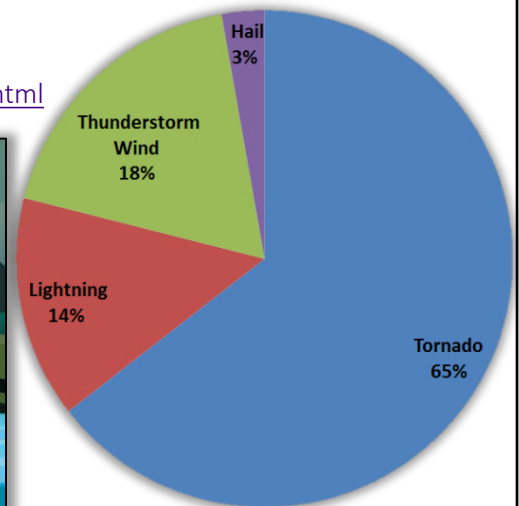
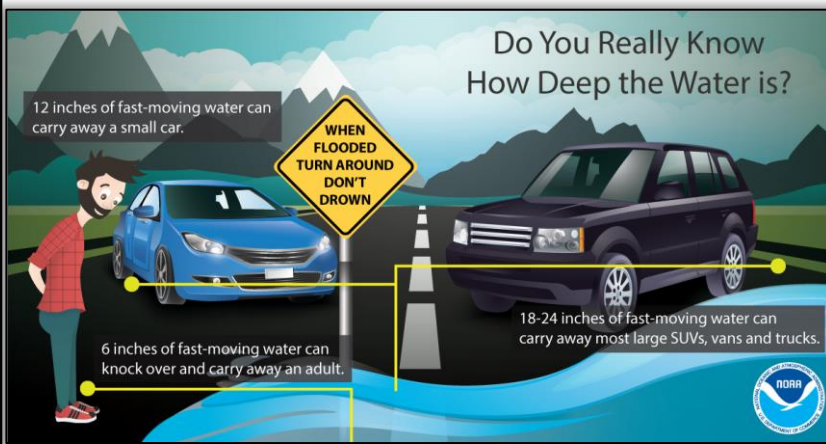
York, you need to be prepared for a variety of hazards that could happen this spring:

- **Flooding & Flash Flooding**
  - Rapid rises on rivers as well as poor drainage and clogged culverts can lead to dangerous flooding.
- **Severe Weather: Tornadoes, Thunderstorms & Lightning**
  - Thunderstorms can produce deadly lightning, damaging winds and hail, heavy downpours that can lead to flash flooding, and tornadoes.
- **Fire Weather**
  - Recent dry weather can be exacerbated by breezy winds and low relative humidities, allowing fire to spread quickly out of control.
- **Cold Water**
  - Hypothermia can quick set in if you are immersed in cold water.
- **Safe Boating**
  - Cold water, thunderstorms, and driving under the influence can prove dangerous especially when boating.

Make sure you have the following in place so you can act fast should you be affected by adverse weather: an emergency kit packed and ready to go, know your evacuation routes, have an emergency point of contact in place so loved ones know where you are, know where to obtain the latest weather data.

**ONLINE RESOURCES:**

- **NWS Burlington, VT Awareness Campaigns:**  
[http://www-md.weather.gov/btv/hazard\\_awareness](http://www-md.weather.gov/btv/hazard_awareness)
- **NWS Burlington, VT YouTube Channel:**  
<https://www.youtube.com/user/NWSBurlington>
- **National Weather Service Weather-Ready Nation Spring Safety:**  
[http://www.nws.noaa.gov/com/weatherreadynation/spring\\_safety.html](http://www.nws.noaa.gov/com/weatherreadynation/spring_safety.html)



Severe Weather Injuries by type across the USA 1995-2013



# Inside Our Website:

# Advanced Hydrologic Prediction Service

*Marlon Verasamy*

Spring time has arrived and the thaw has begun around the North Country. But with that thaw comes ice breaking up on frozen rivers and sometimes causing ice jams which could lead to flooding. How can you keep an eye on the local rivers without having to keep an actual eye on the local rivers?

The National Weather Service has just the site you are looking for to help you out. The Advanced Hydrologic Prediction Service (AHPS) is a national site that helps improve flood warnings and forecasts across the nation.

AHPS provides the public with more river forecast information such as:

- how high the river will rise
- when the river will reach its peak
- where property will be flooded
- how long flooding will continue
- how long a drought will last

Figure 2. AHPS has links to the gauges on rivers across the US with the North Country as shown here (Below).

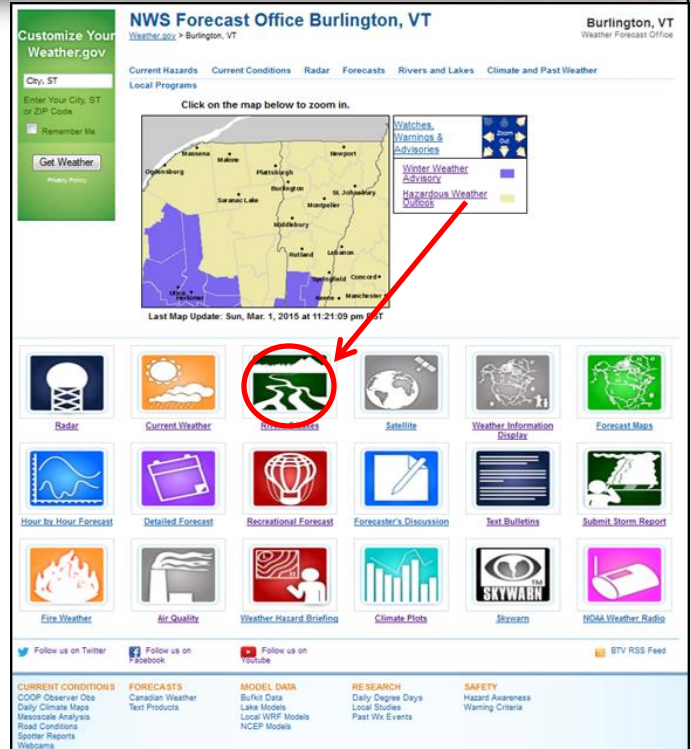
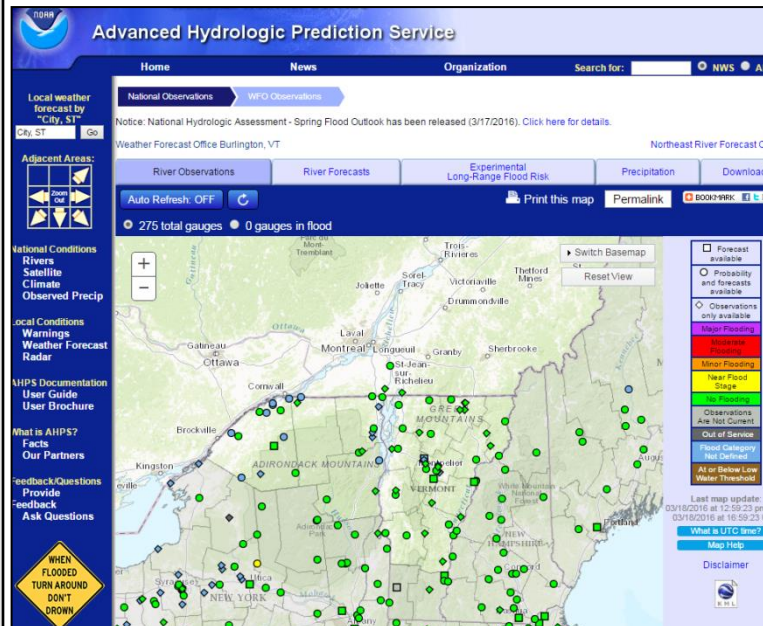


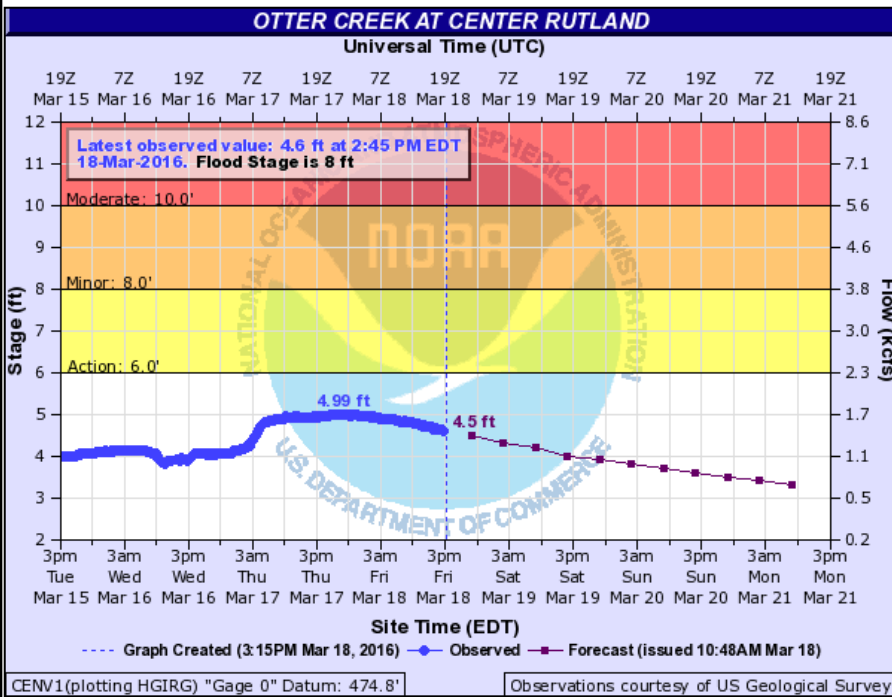
Figure 1. To find the AHPS, visit our site & click on the Rivers and Lakes button towards the center of the page (Above).

AHPS also provides better information to water managers and city officials, helping them make decisions about water allocation and economics such as:

- When and where to evacuate people, goods and industrial property from potential flood areas, thus saving more lives and contributing to economic savings
- How to use reservoir storage capacity and release to reduce flood impacts on people and businesses, including agricultural demands
- When to reinforce levees and at what level, to help reduce damage to areas nearby



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Navigation is easy to get to the river nearest you. Start at our webpage at [weather.gov/btv](http://weather.gov/btv) and from there click on the "Rivers & Lakes" button in the middle of the page below the local map (figure 1). From there you'll be taken directly to the AHPS page and centered on the North Country region (figure 2). Clicking the National Observations tab on top will take you back to the US view. When looking at a particular gauge, hover over the colored symbol for that gauge and a quick look hydrograph box will appear on the upper right of the screen (figure 3).

Figure 3. Otter Creek at Center Rutland current observation and forecast

You may also click on the on the box to see detailed information for the station to include flood impacts, historic and recent crests and location information. Other options include to customize information at a glance for a particular river or individual gauges on a river. You may also download current hydrographs as well as available photos of gauge locations along with other information.

A weekly probability graph for exceeding different river stages going out 3 months based on current conditions is also available for a quick view as well. This provides a great quick view timeframes that bear closer watching for possible flood conditions. As always, be sure to keep tuned to your local sources when conditions become more favorable for flooding conditions in your area and if you come across a flooded roadway, don't take the risk: Turn Around, Don't Drown!

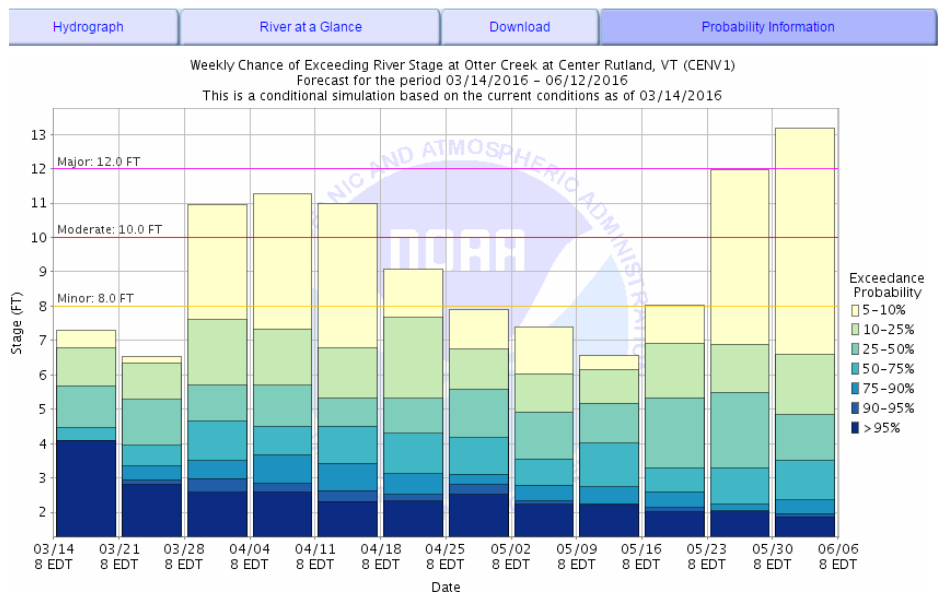


Figure 4. Otter Creek at Center Rutland 3 month "Weekly Chance of Exceeding River Stage" forecast



# The Four Seasons

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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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