

# Recent Increase in Vermont's Natural Disasters: A Sign of Things to Come?!

2015 VT Emergency Preparedness Conference

Jay Peak Resort

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National Weather Service – Burlington, VT



# Outline

- **Brief Review of Presidential Disaster Assistance program**
- **VT Declared Disasters over the years**
  - Type, Location, Magnitude
- **Look back at 2011: “Year of the Floods”**
- **Root cause? Where are we headed?**

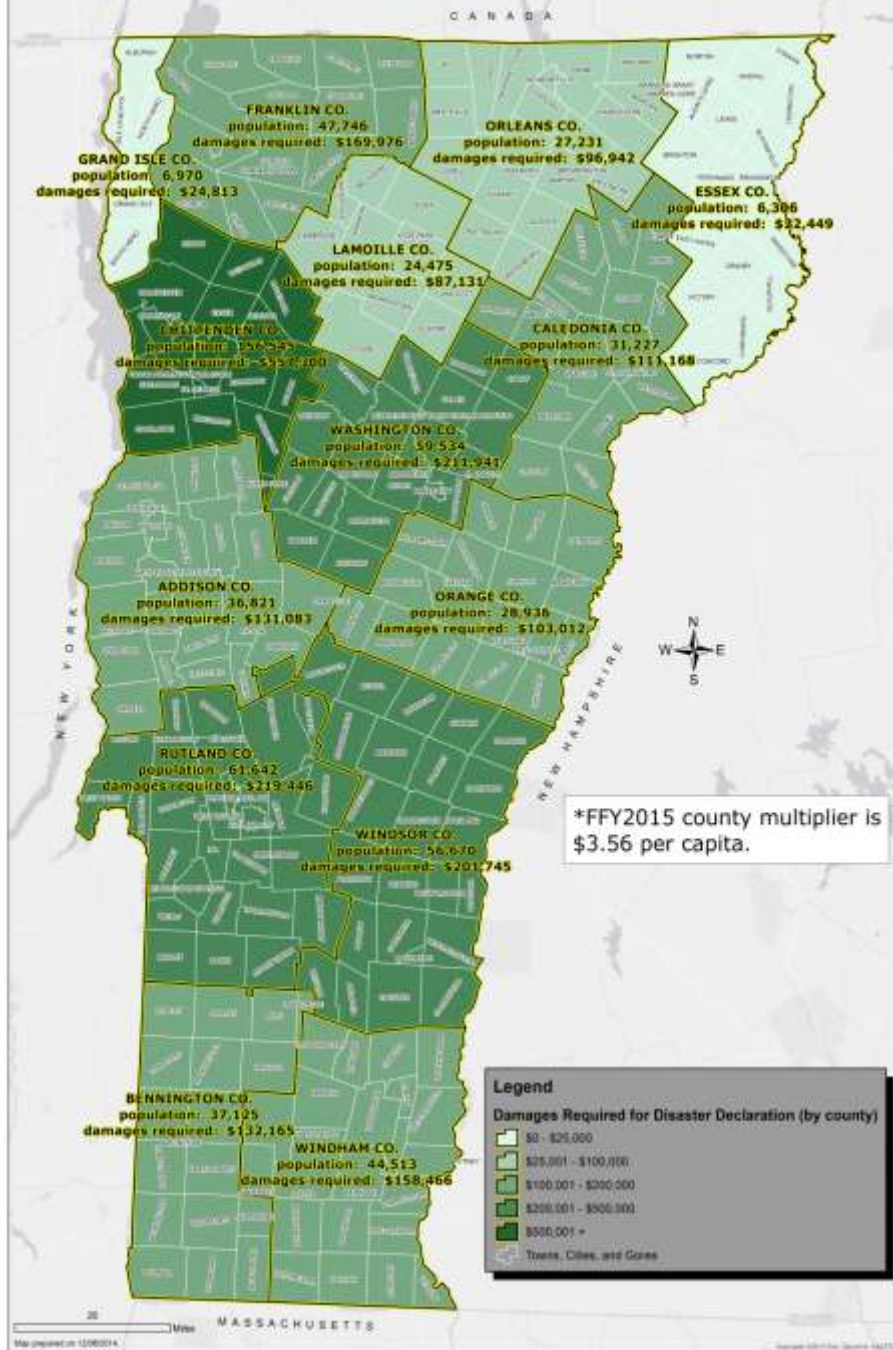


# Presidential Disaster Program History

- **1950: Federal Disaster Assistance Program**
  - For the first time, the Federal Government was authorized to respond to major disasters, determined by the President of the United States
- **1970: Disaster Relief Act of 1970**
  - expanded upon the 1950 Federal Disaster Assistance Program.
  - authorized Federal loans and tax assistance to individuals affected by disasters, as well as Federal funding for the repair and replacement of public facilities.
  - The Disaster Relief Act also introduced hazard mitigation as a Federal priority, authorizing the use of Federal funds to reduce the potential impact of future disasters
- **1974: Disaster Relief Act of 1974**
  - established the Presidential disaster declaration process.
- **1979: President Carter's executive order**
  - consolidated many separate Federal disaster-related responsibilities within FEMA.



# VT Damages Required for Disaster Declaration by County - FFY2015\*



## Public Assistance or Individual Assistance

- **Statewide Requirement**
  - >\$1. Million
  - \$1.41 per capita
- **County Requirement**
  - \$3.56 per capita



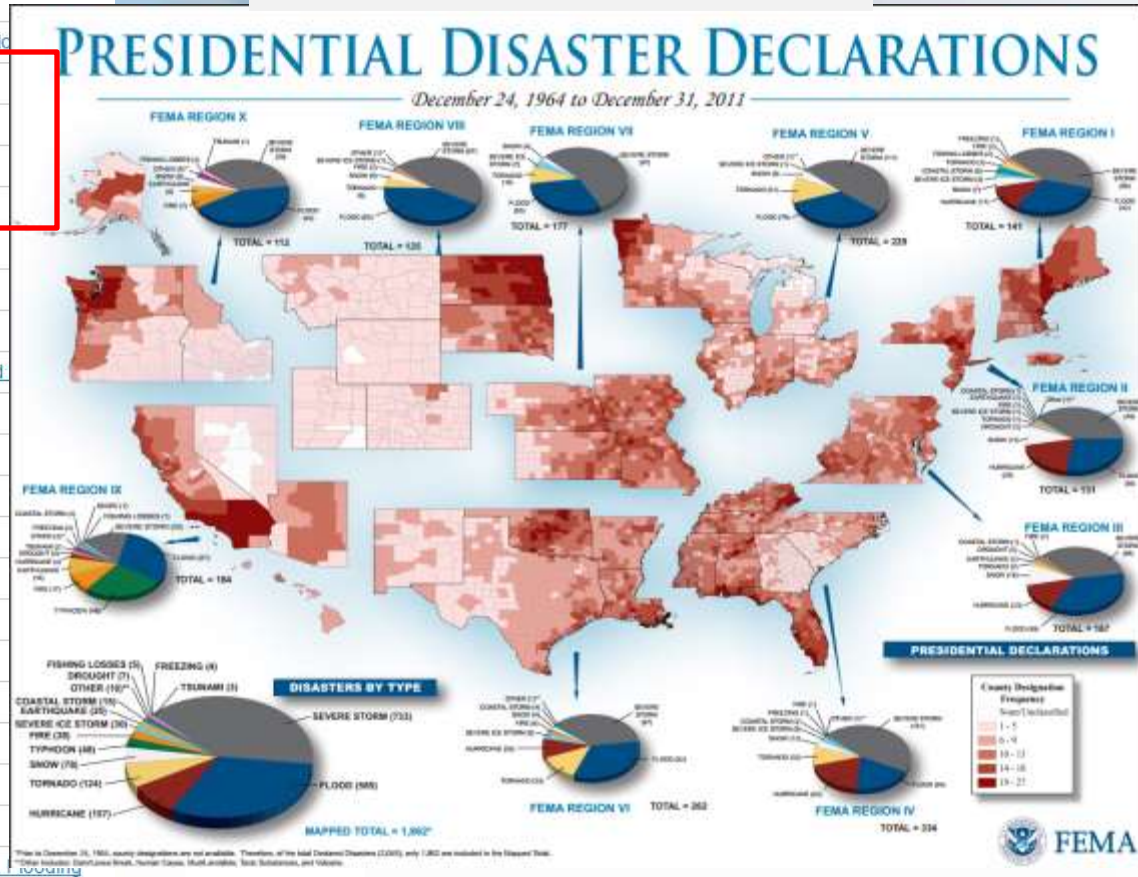


# Vermont Presidential Disaster Declarations

(37 Overall - since 1973)

Number	Date	State/Tribal Government	Incident Description
<a href="#">4178</a>	06/11/2014	Vermont	<a href="#">Severe Storms and Flooding</a>
<a href="#">4163</a>	01/29/2014	Vermont	<a href="#">Severe Winter Storms</a>
<a href="#">4140</a>	08/02/2013	Vermont	<a href="#">Severe Storms and Flooding</a>
<a href="#">4120</a>	06/13/2013	Vermont	<a href="#">Severe Storms and Flooding</a>
<a href="#">4066</a>	06/22/2012	Vermont	<a href="#">Severe Storm, Tornado, And Flooding</a>
<a href="#">4043</a>	11/08/2011	Vermont	<a href="#">Severe Storms And Flooding</a>
<a href="#">4022</a>	09/01/2011	Vermont	<a href="#">Tropical Storm Irene</a>
<a href="#">4001</a>	07/08/2011	Vermont	<a href="#">Severe Storms And Flooding</a>
<a href="#">1995</a>	06/15/2011	Vermont	<a href="#">Severe Storms And Flooding</a>
<a href="#">1951</a>	12/22/2010	Vermont	<a href="#">Severe Storm</a>
<a href="#">1816</a>	01/14/2009	Vermont	<a href="#">Severe Winter Storm</a>
<a href="#">1790</a>	09/12/2008	Vermont	<a href="#">Severe Storms and Flooding</a>
<a href="#">1784</a>	08/15/2008	Vermont	<a href="#">Severe Storms, a Tornado, and Flooding</a>
<a href="#">1778</a>	07/15/2008	Vermont	<a href="#">Severe Storms and Flooding</a>
<a href="#">1715</a>	08/03/2007	Vermont	<a href="#">Severe Storms and Flooding</a>
<a href="#">1698</a>	05/04/2007	Vermont	<a href="#">Severe Storms and Flooding</a>
<a href="#">1559</a>	09/23/2004	Vermont	<a href="#">Severe Storms and Flooding</a>
<a href="#">1488</a>	09/12/2003	Vermont	<a href="#">Severe Storms and Flooding</a>
<a href="#">1428</a>	07/12/2002	Vermont	<a href="#">Severe Storms and Flooding</a>
<a href="#">1358</a>	01/18/2001	Vermont	<a href="#">Severe Winter Storm</a>
<a href="#">1336</a>	07/27/2000	Vermont	<a href="#">Severe Storms And Flooding</a>
<a href="#">1307</a>	11/10/1999	Vermont	<a href="#">Tropical Storm Floyd</a>
<a href="#">1228</a>	06/30/1998	Vermont	<a href="#">Severe Storms and Flooding</a>
<a href="#">1201</a>	01/15/1998	Vermont	<a href="#">Ice Storms</a>
<a href="#">1184</a>	07/25/1997	Vermont	<a href="#">Excessive Rainfall, High Winds, and Flooding</a>
<a href="#">1124</a>	06/27/1996	Vermont	<a href="#">Flooding</a>
<a href="#">1101</a>	02/13/1996	Vermont	<a href="#">Storms and Flooding</a>

**Disasters since 2010: 12**  
**Disasters since 2005: 18**  
**Disasters since 2000: 23**  
**Disasters since 1995: 30**

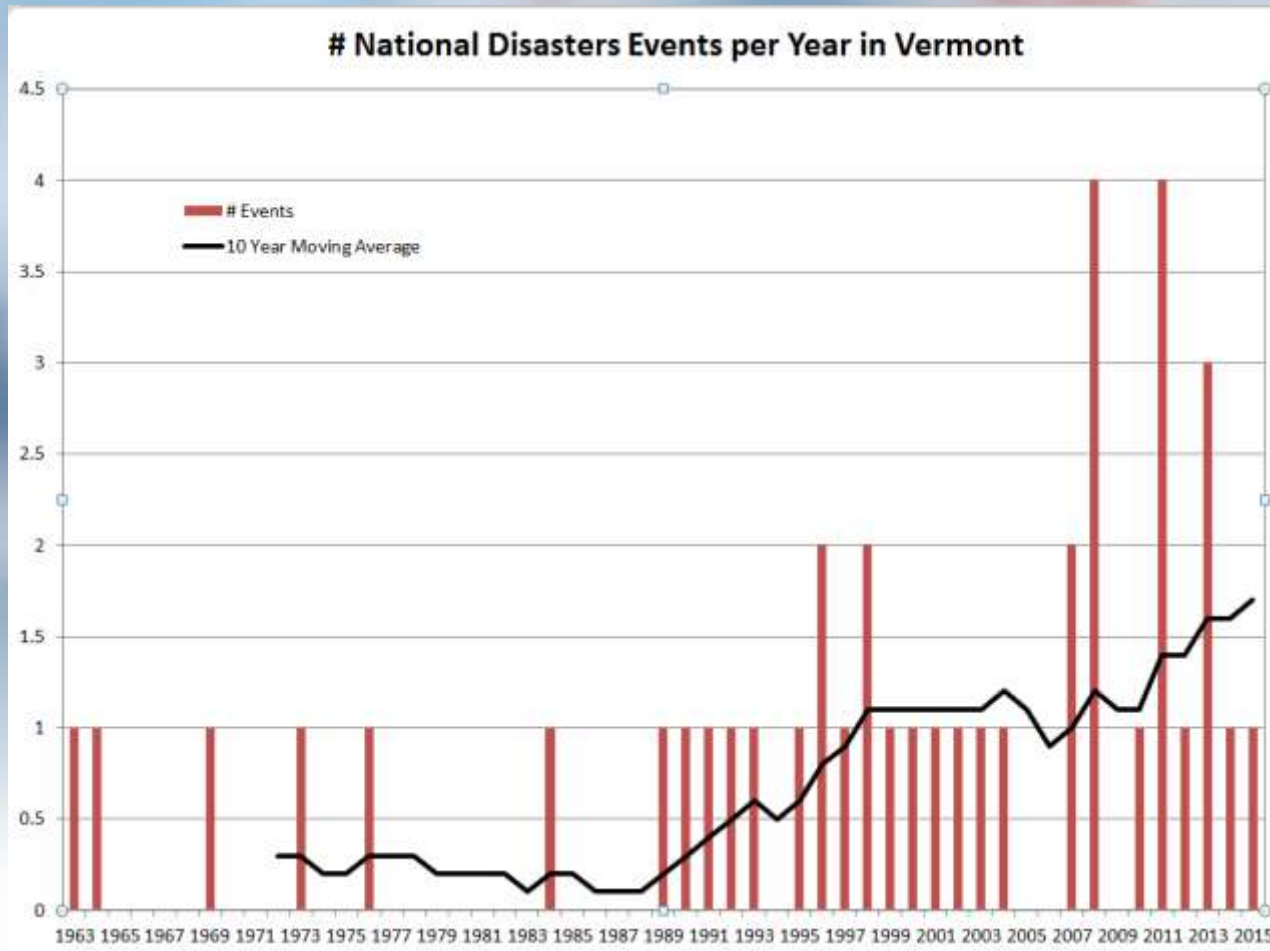


This is December 31, 2011; county designations are not available. Therefore, all the total Disaster/Declarations (2,245), only 1,862 are included in the Mapped Total.  
 \*Other includes: Earthquake, Nuclear, Chemical, Hazardous, Toxic, Substances, and Volcanic.



# # National Disasters in Vermont

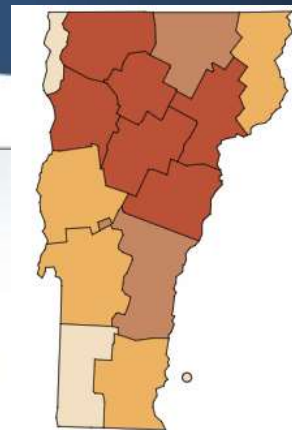
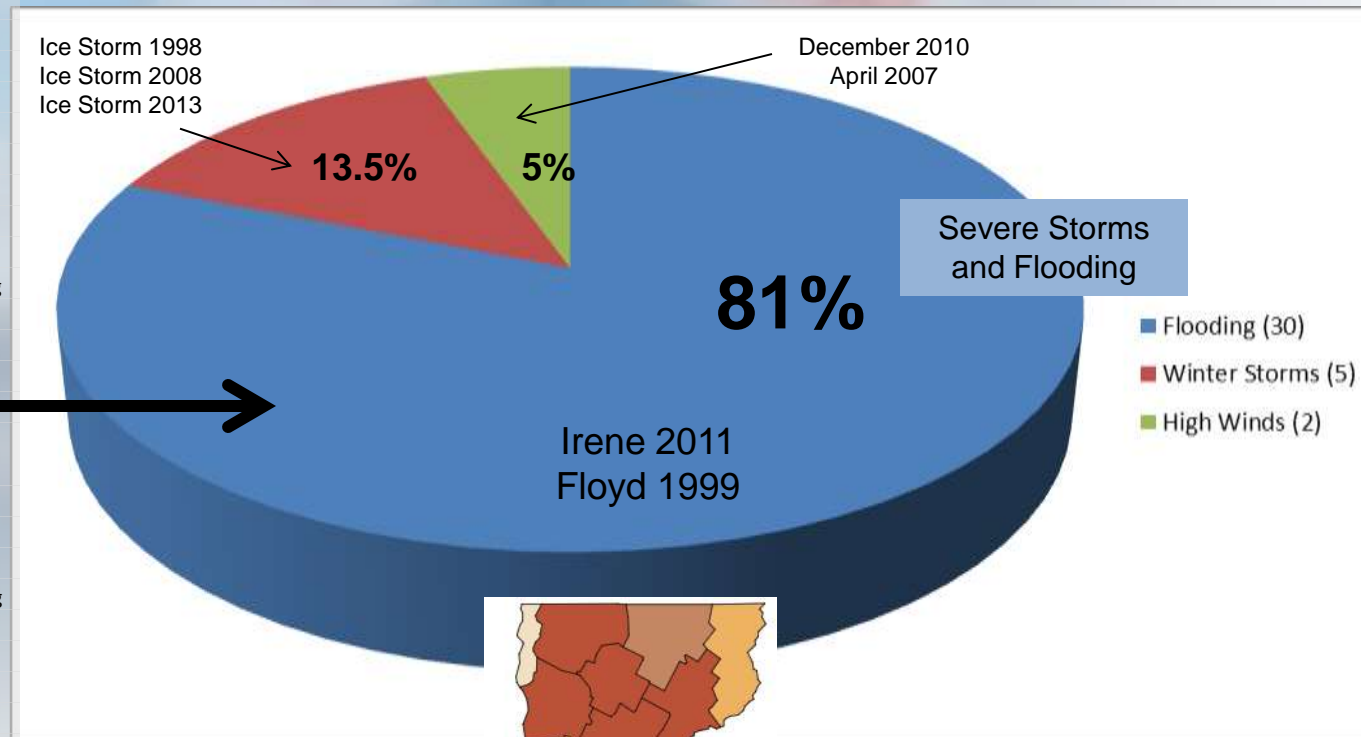
## 10 Year Moving Average



# Presidential Disasters by Type

## Flooding

Number	Date	Incident Description
4232	7/29/2015	Severe Storm and Flooding
4178	6/11/2014	Severe Storms and Flooding
4140	8/2/2013	Severe Storms and Flooding
4120	6/13/2013	Severe Storms and Flooding
4066	6/22/2012	Severe Storm, Tornado, and Flooding
4043	11/8/2011	Severe Storms And Flooding
4022	9/1/2011	Tropical Storm Irene
4001	7/8/2011	Severe Storms And Flooding
1995	6/15/2011	Severe Storms and Flooding
1790	9/12/2008	Severe Storms and Flooding
1784	8/15/2008	Severe Storms, a Tornado, and Flooding
1778	7/15/2008	Severe Storms and Flooding
1715	8/3/2007	Severe Storms and Flooding
1698	5/4/2007	Severe Storms and Flooding
1559	9/23/2004	Severe Storms and Flooding
1488	9/12/2003	Severe Storms and Flooding
1428	7/12/2002	Severe Storms and Flooding
1336	7/27/2000	Severe Storms And Flooding
1307	11/10/1999	Tropical Storm Floyd
1228	6/30/1998	Severe Storms and Flooding
1184	7/25/1997	Excessive Rainfall, High Winds, Flooding
1124	6/27/1996	Flooding
1101	2/13/1996	Storms and Flooding
1063	8/16/1995	Heavy Rain, Flooding
990	5/12/1993	Flooding, Heavy Rain, Snowmelt
938	3/18/1992	Flooding, Heavy Rain, Ice Jams
875	7/25/1990	Flooding, Severe Storm
840	9/11/1989	SEVERE STORMS, FLOODING
712	6/18/1984	SEVERE STORMS, FLOODING
518	8/5/1976	Severe Storms, High Winds, Flooding
397	7/6/1973	SEVERE STORMS, FLOODING, LANDSLIDES

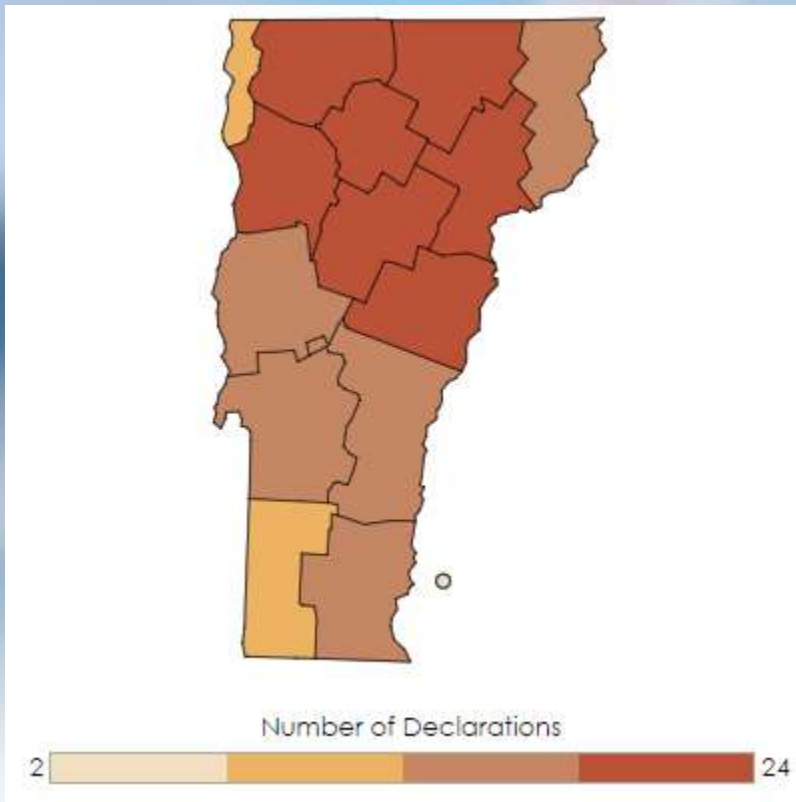


Number of Declarations



# # of Declarations by County

- Lamoille: 24
- Caledonia: 22
- Washington: 21
- Franklin: 20
- Orange: 20
- Chittenden: 19
- Orleans: 19
- Addison: 18
- Windsor: 18
- Essex: 16
- Windham: 15
- Rutland: 13
- Bennington: 12
- Grand Isle: 9

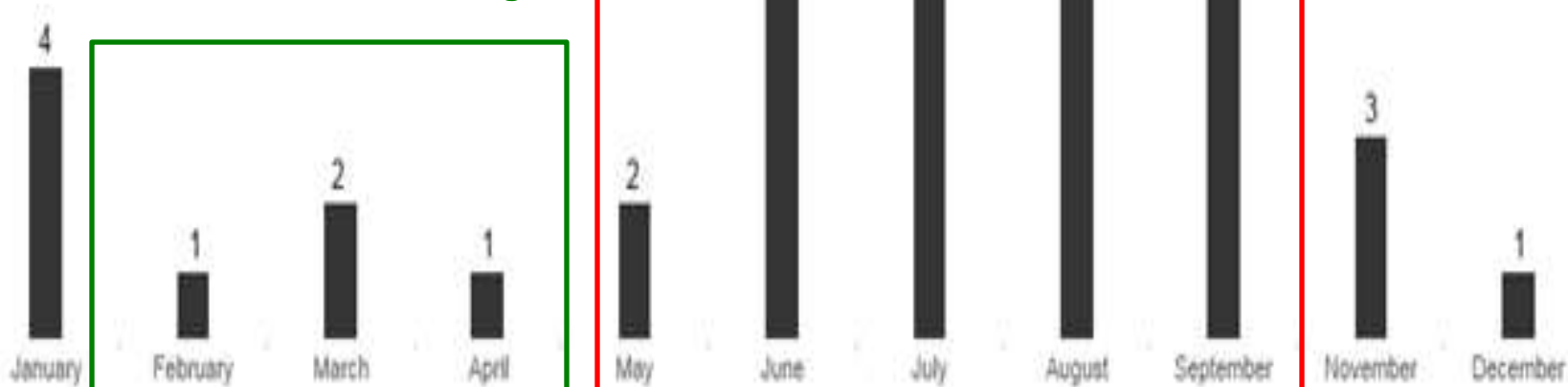




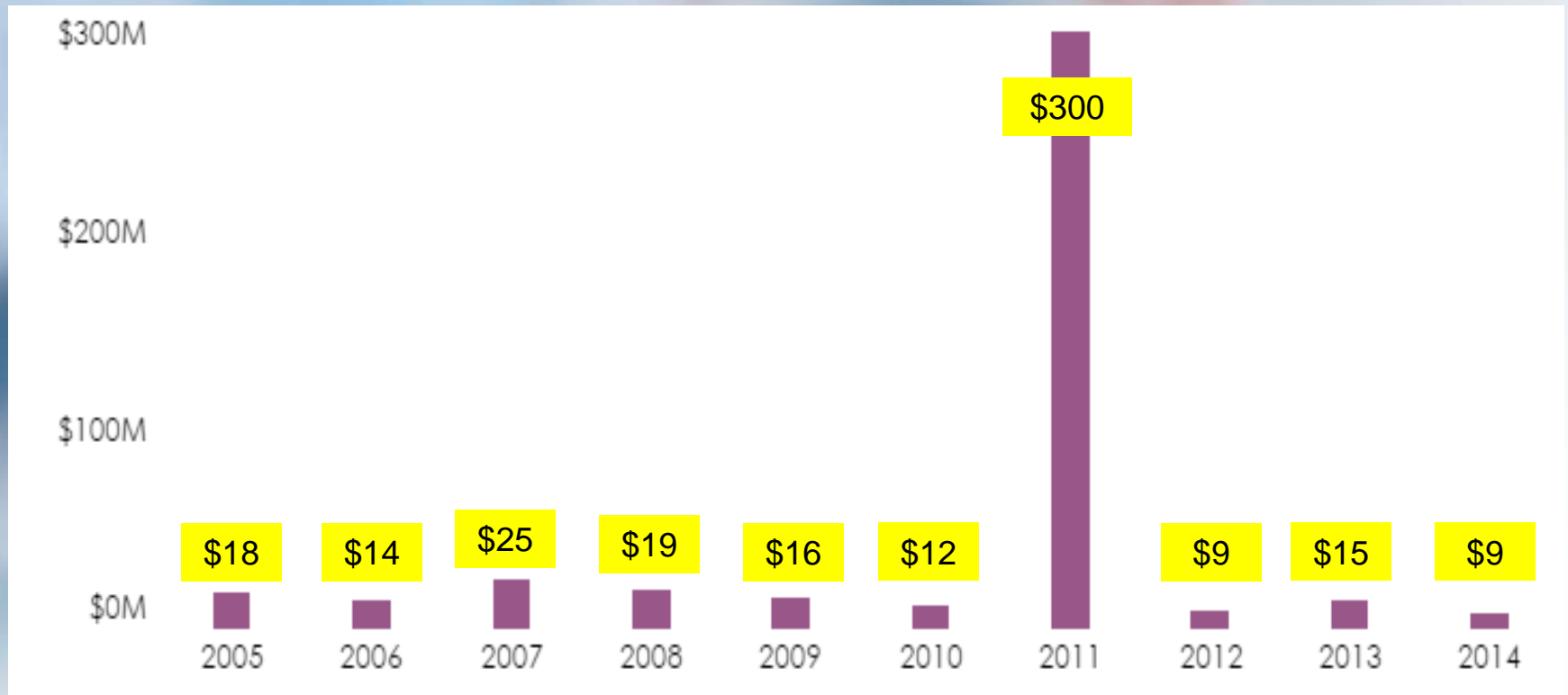
# Time of Year

## Flash Flooding and Severe Thunderstorms

### Snowmelt and Flooding



# FEMA Disaster Assistance and Preparedness Grants



# 2011 – Vermont's Year of the Floods

*Nearly \$1 Billion in Damages*

- **Spring**

- **April 13<sup>th</sup> – June 19<sup>th</sup>**

- Lake Champlain Record Level

- **April 26-27<sup>th</sup>**

- Lamoille and Missisquoi Basins
    - Mostly River Flooding

- **May 26-27<sup>th</sup>**

- Winooski and Passumpsic Basins
    - Mostly Flash Flooding

- **Irene (August 28<sup>th</sup>)**

- Greatest impact was southern 2/3 of VT



# Vermont's Landscape in 2011



Lake Champlain – April thru June



Lamoille Basin - April



Winooski Basin - May



Preview

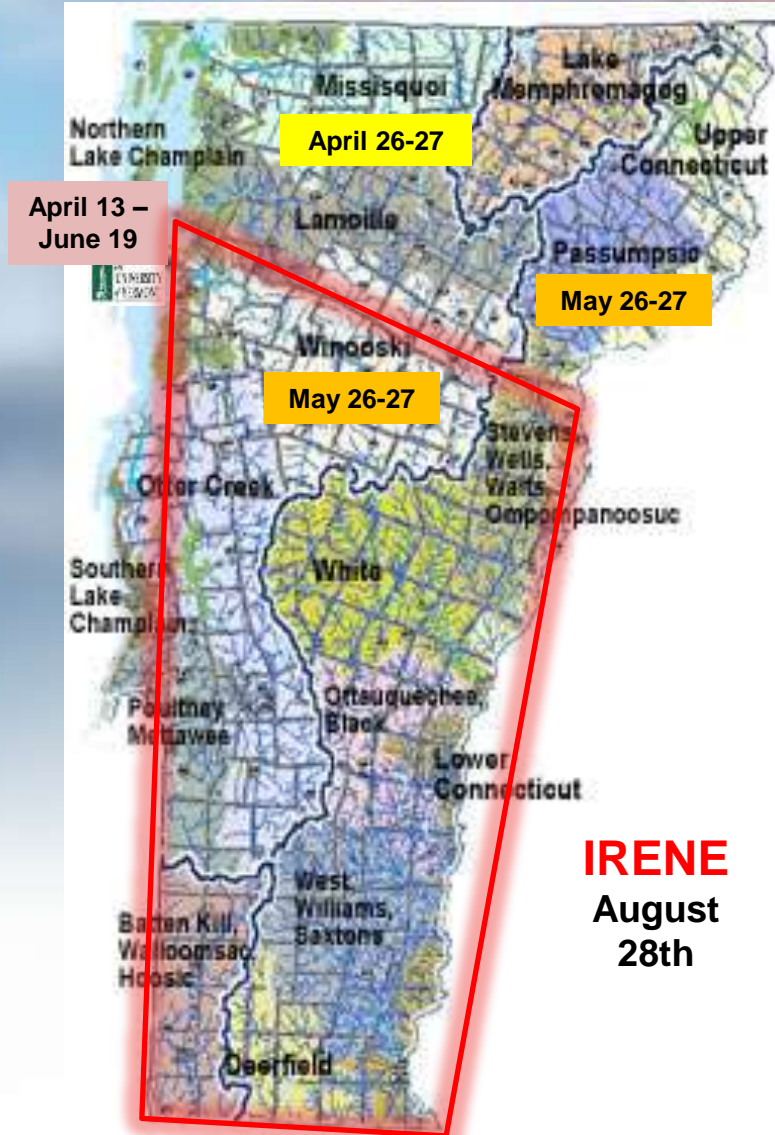


IRENE - August





# Vermont Flooding 2011



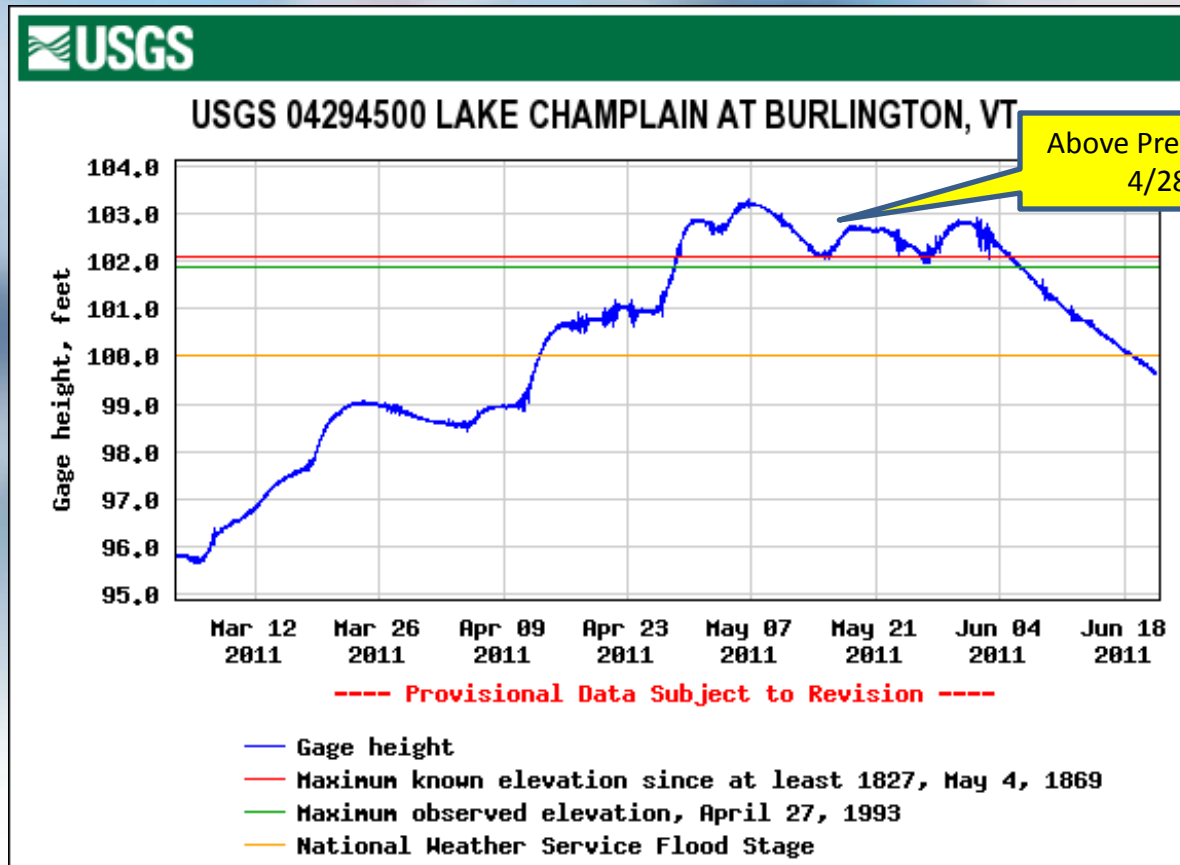
# Lake Champlain Flooding

April 13<sup>th</sup> – June 19<sup>th</sup>

Burlington, VT (ECHO Center) – Flood Stage is 100.0 feet

Old Record Stage – 101.86 ft (4/27/1993)

**2011 Peak Level - 103.27 feet (May 6<sup>th</sup>)**



Above Previous Record  
4/28 – 6/5

- Above Previous Record (101.9') – 4/28 to 6/5
- Above MAJOR Flood (101.5') – 4/28 to 6/8



# Lake Champlain Flooding





# Winooski/Passumpsic River Basins

May 26<sup>th</sup> – May 27<sup>th</sup>



*Preview*

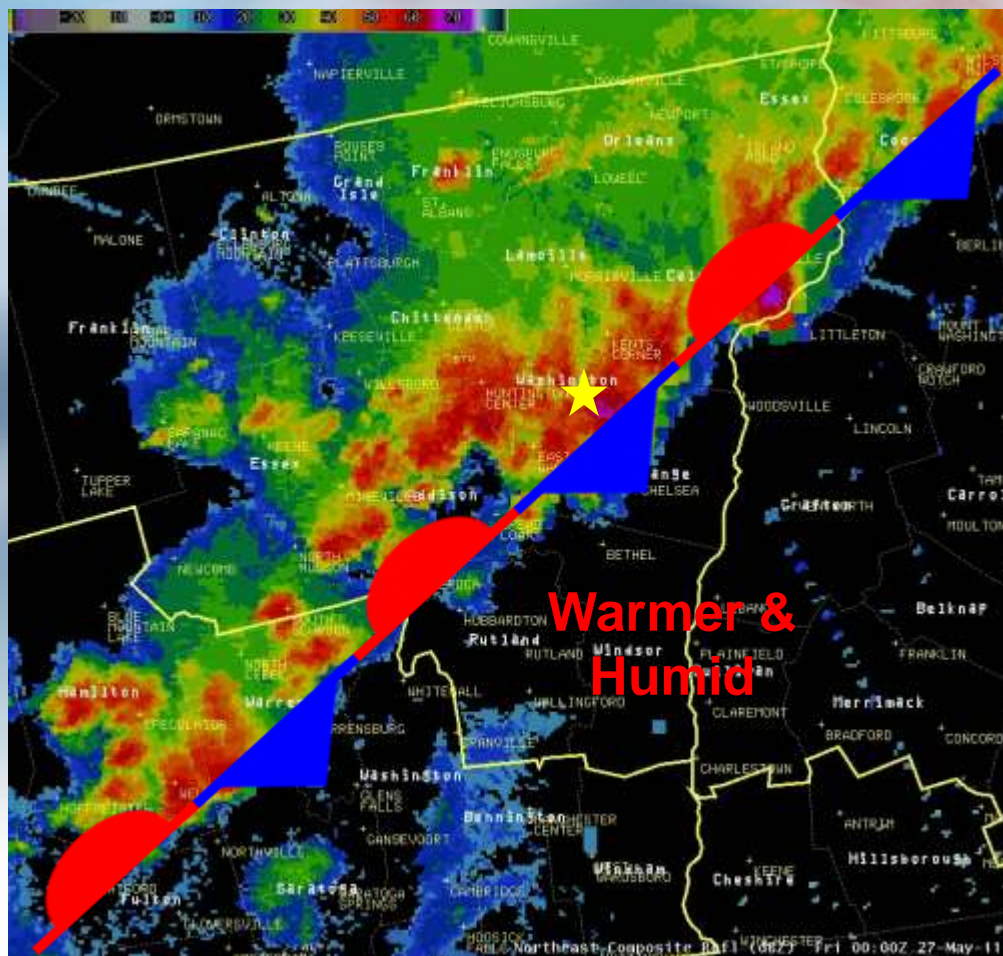


**Bailey Avenue**  
May 27, 2011 Montpelier, Vt.



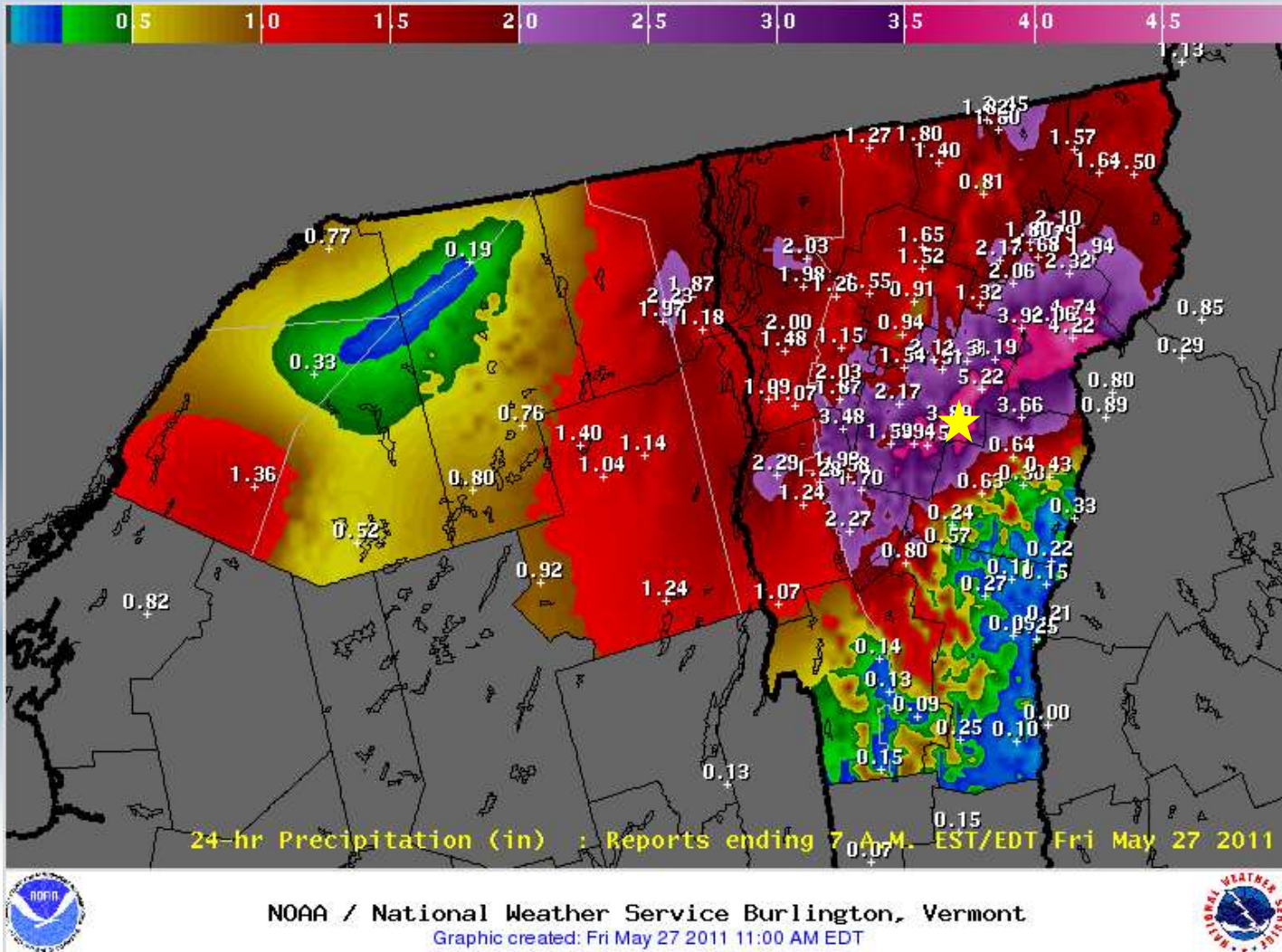
# Radar

May 26<sup>th</sup> 800 pm – May 27<sup>th</sup> 200 am



# Rainfall ending 7am, Friday 5/27

3-5+ inches along Route 2 (Middlesex-NH border)



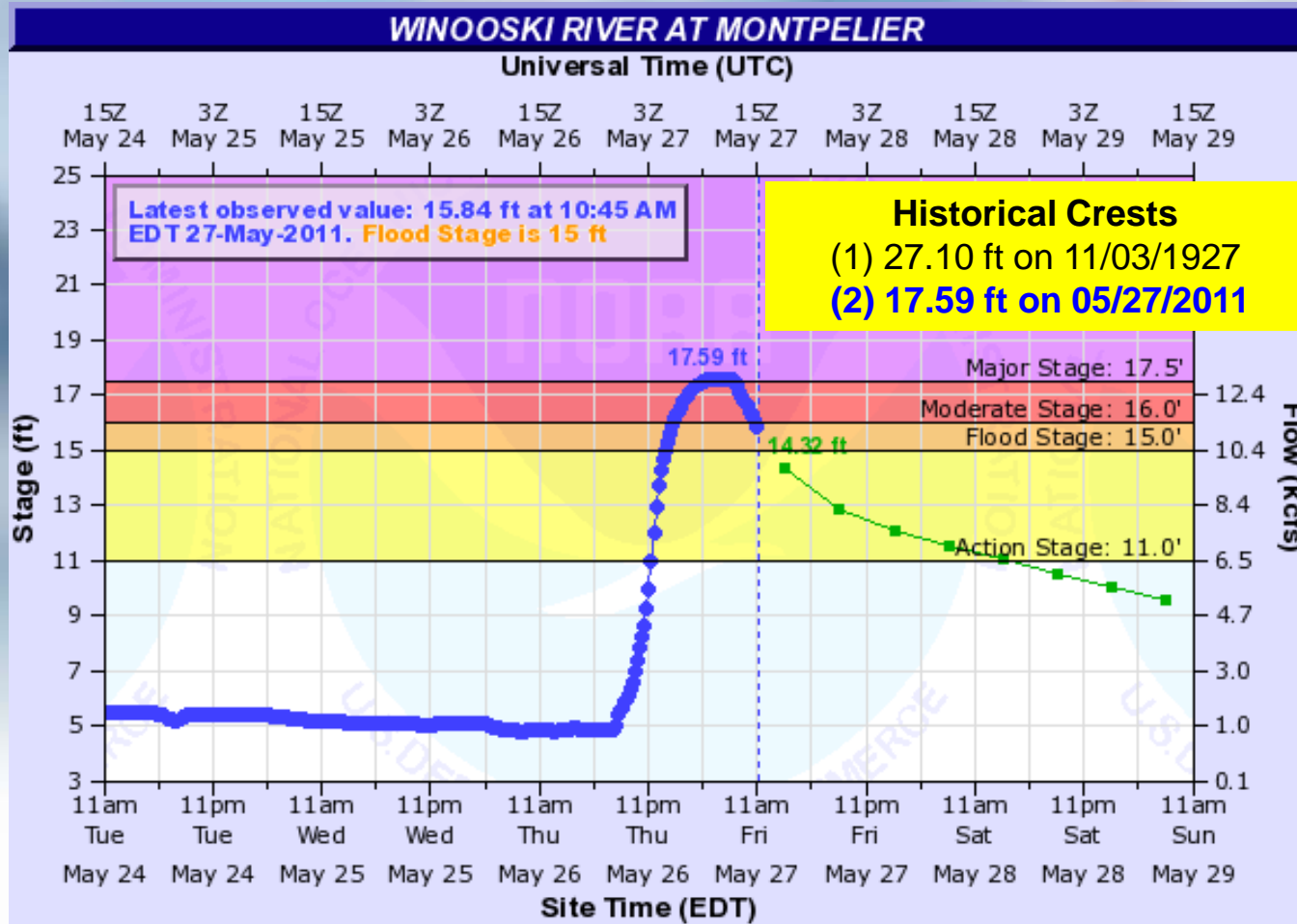
# Winooski River at Montpelier, VT

Flood Stage is 15.0 feet

1<sup>st</sup> Flood since March 1992 Ice Jam

1<sup>st</sup> Flood from Rainfall since June 1973

Rate of Rise ~ 4 feet per hour for a few hours 930-1130 pm!!!





A satellite image of Hurricane Irene, showing a well-defined eye and spiral cloud bands, positioned over the Eastern United States. The hurricane is centered over the Atlantic coast, with its eye clearly visible. The surrounding cloud cover is dense and extends across the region.

# IRENE – 28 August 2011

[www.weather.gov/btv](http://www.weather.gov/btv)

*National Weather Service  
Burlington, VT*



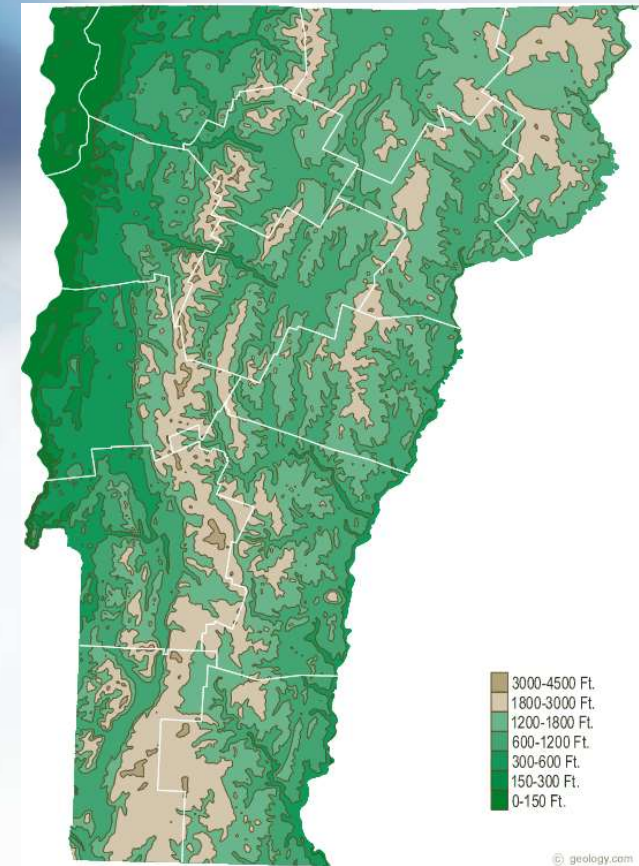
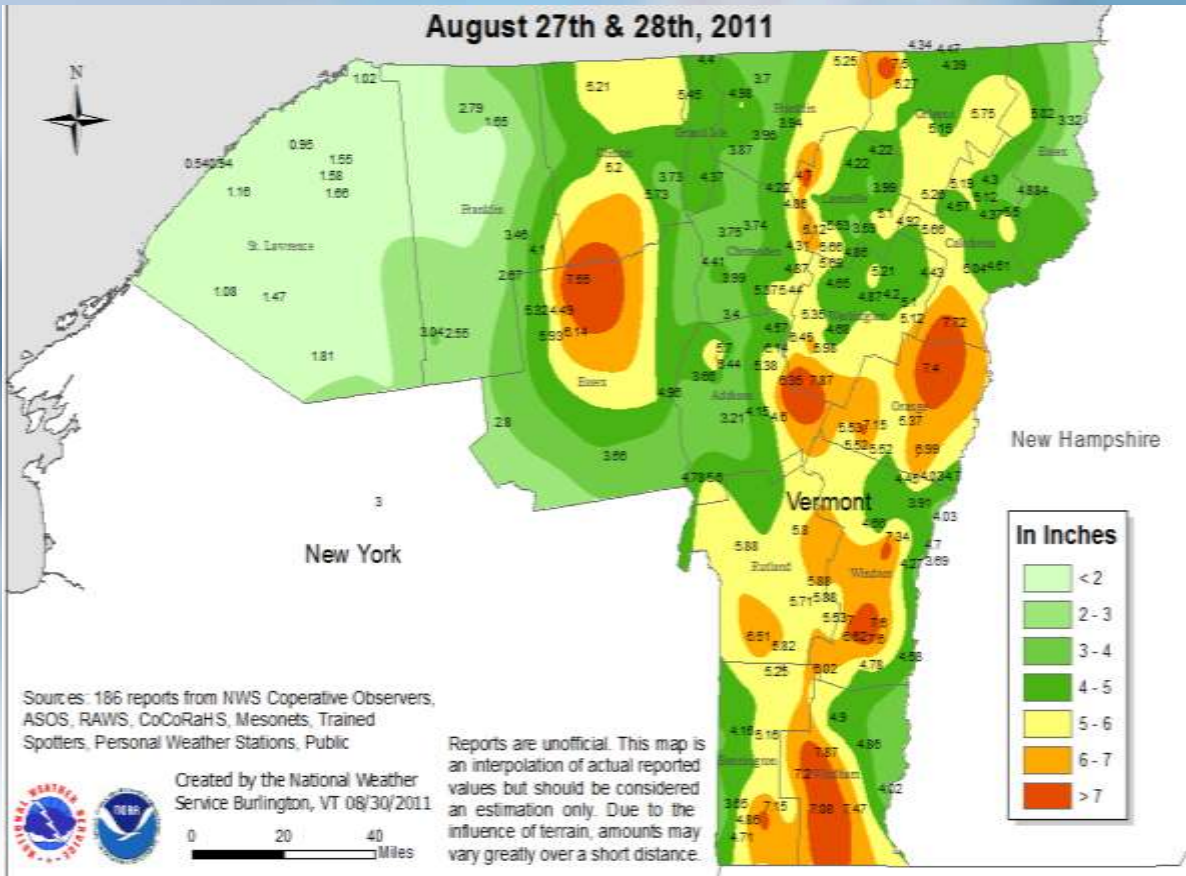


# Irene – 28 August 2011



# Irene Rainfall

Widespread 4-5 inches, Scattered 7+ inches  
Heaviest along Higher Terrain, especially eastern slopes





# IRENE 2011 Flooding



Photos courtesy of BTV Free Press and AP

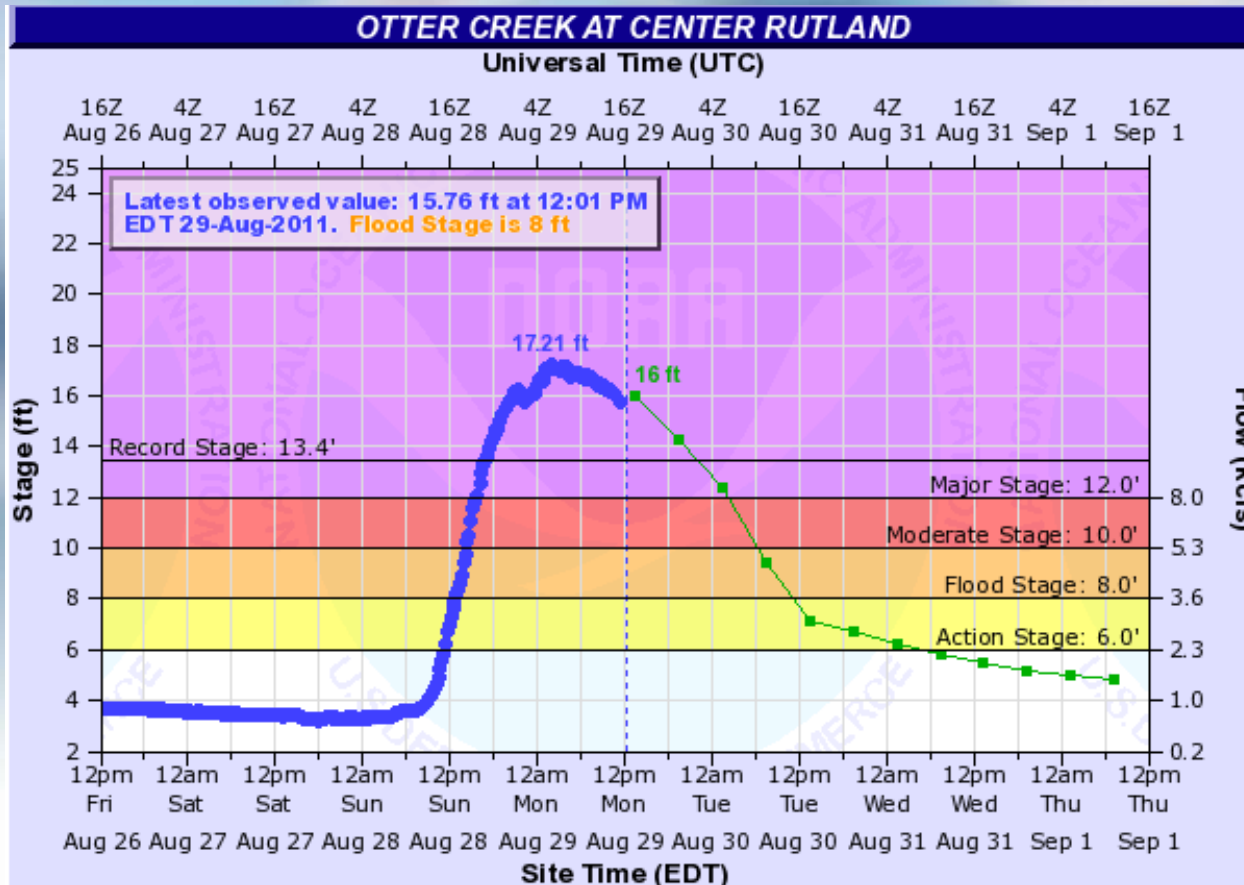


# Otter Creek at Center Rutland

Flood Stage is 8.0 feet

## Historical Crests

- (1) 17.21 ft on 08/29/2011
- (2) 13.45 ft on 09/22/1938
- (3) 13.25 ft on 06/30/1973





# Winooski River at Montpelier

Flood Stage is 15.0 feet

## Historical Crests

- (1) 27.10 ft on 11/03/1927
- (2) 19.05 ft on 08/28/2011
- (3) 17.59 ft on 05/27/2011



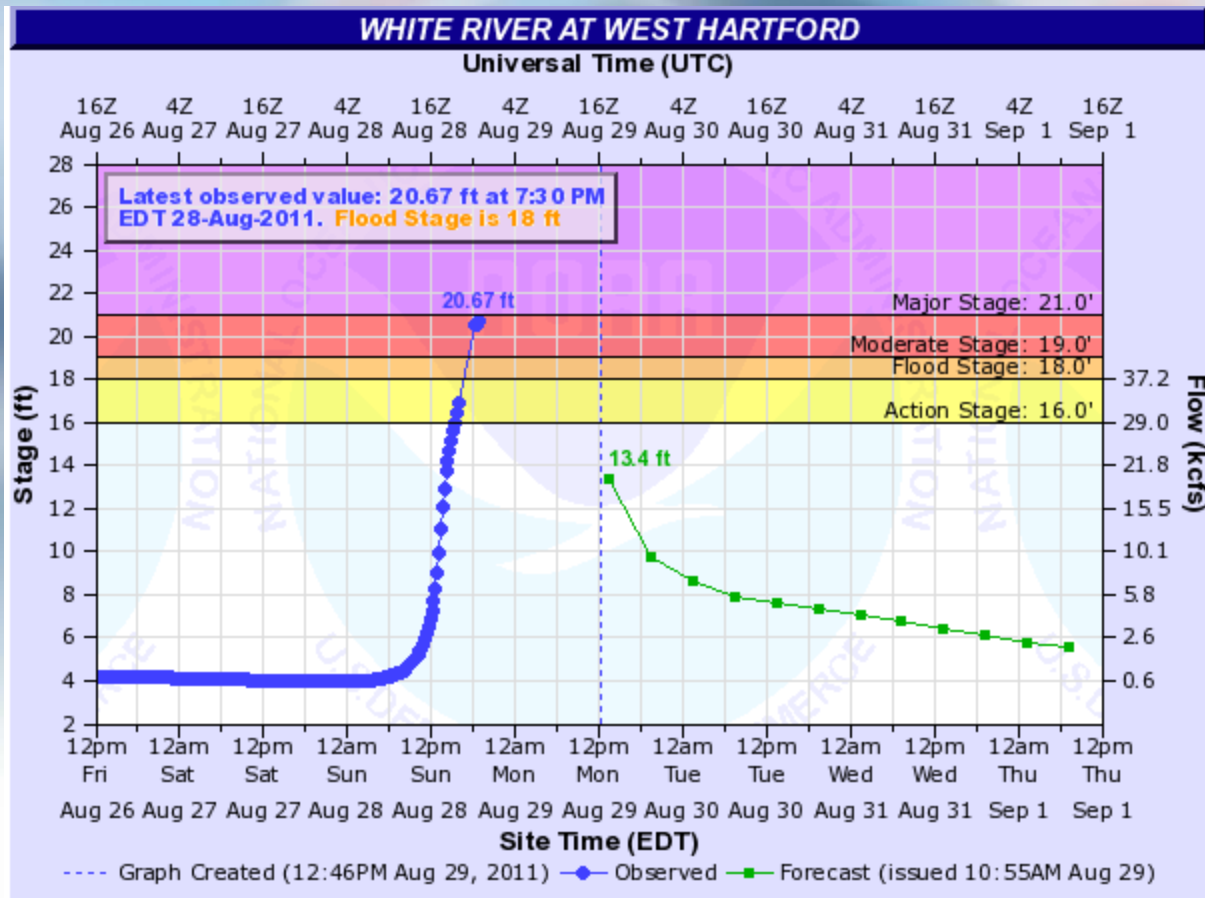


# White River at West Hartford

Flood Stage is 18.0 feet

## Historical Crests

- (1) 29.30 ft on 11/04/1927
- (2) 28.40 ft on 08/29/2011
- (3) 19.26 ft on 09/22/1938



# IRENE 2011

## Flood Aftermath

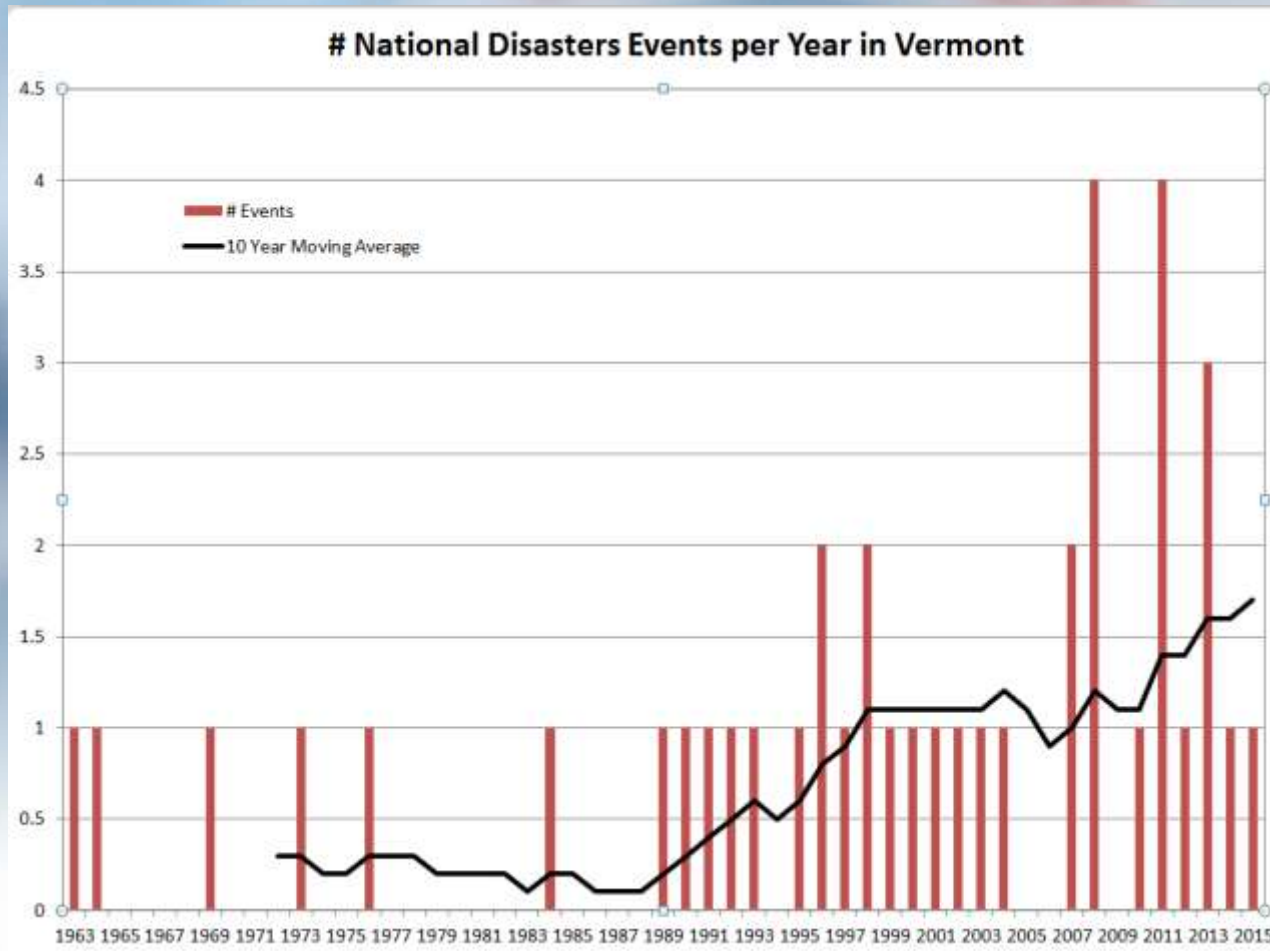


Photos courtesy of BTV Free Press and Mansfield Helicopters



# # National Disasters in Vermont

## 10 Year Moving Average



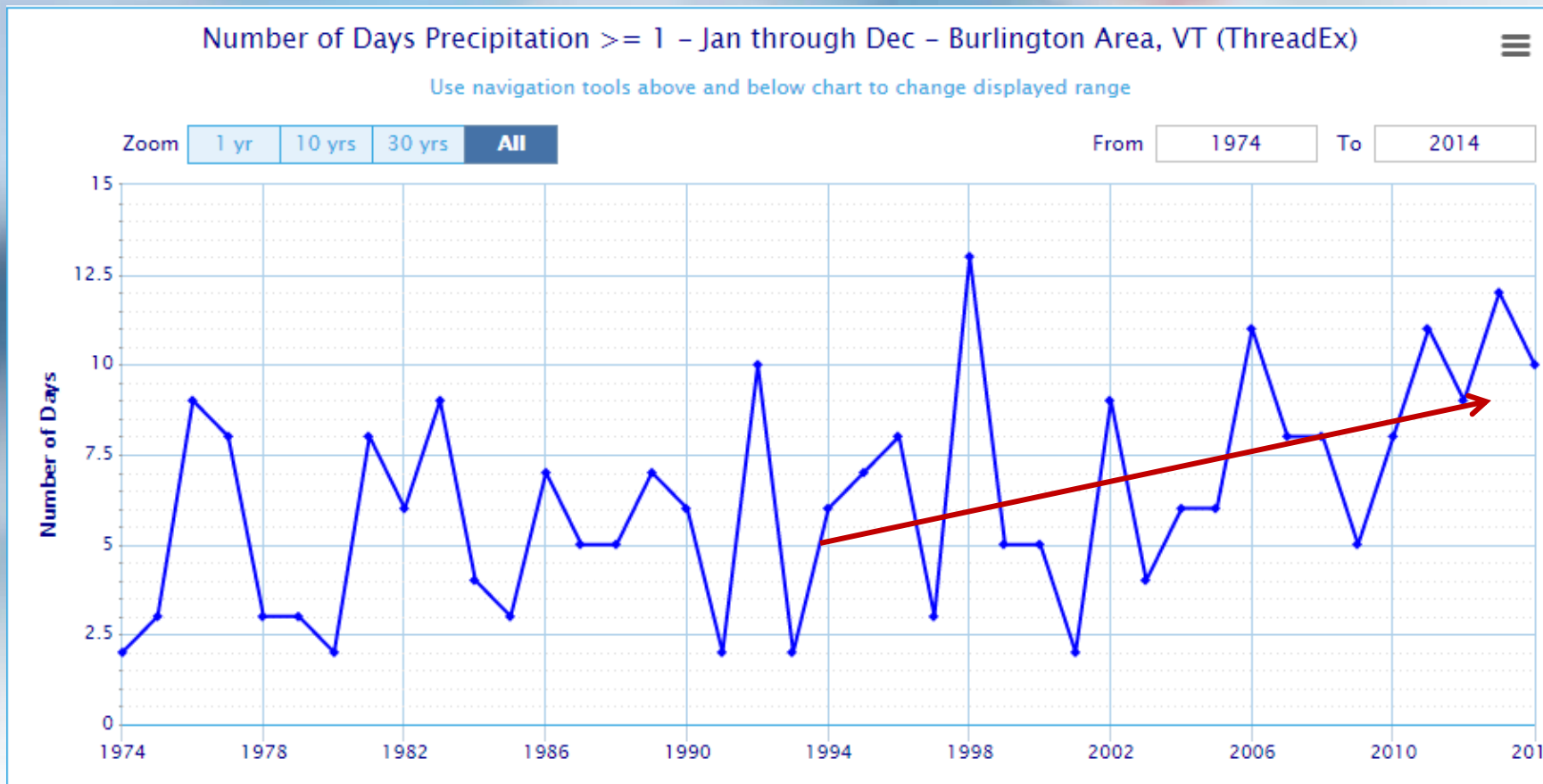


# Recap

- **75% of PDA have occurred since 1995**
  - 50% since 2005
- **80% are related to Flooding**
  - May thru September: Flash Floods and Severe
  - January thru April: Snowmelt and Spring Floods
- ***2011 was an Historic, EPIC Year!!!***
- **Root Cause of Increased Frequency of PDA?**
  - Urbanization?
  - Infrastructure?
  - Inflation?
  - Frequency of Intense Rainfall?



# Frequency (Days) of 1" or greater Burlington (1974-2014)



# Recap

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***YES!!!***





Any Questions???

Next:

Climate Change in VT:  
What does our future hold?





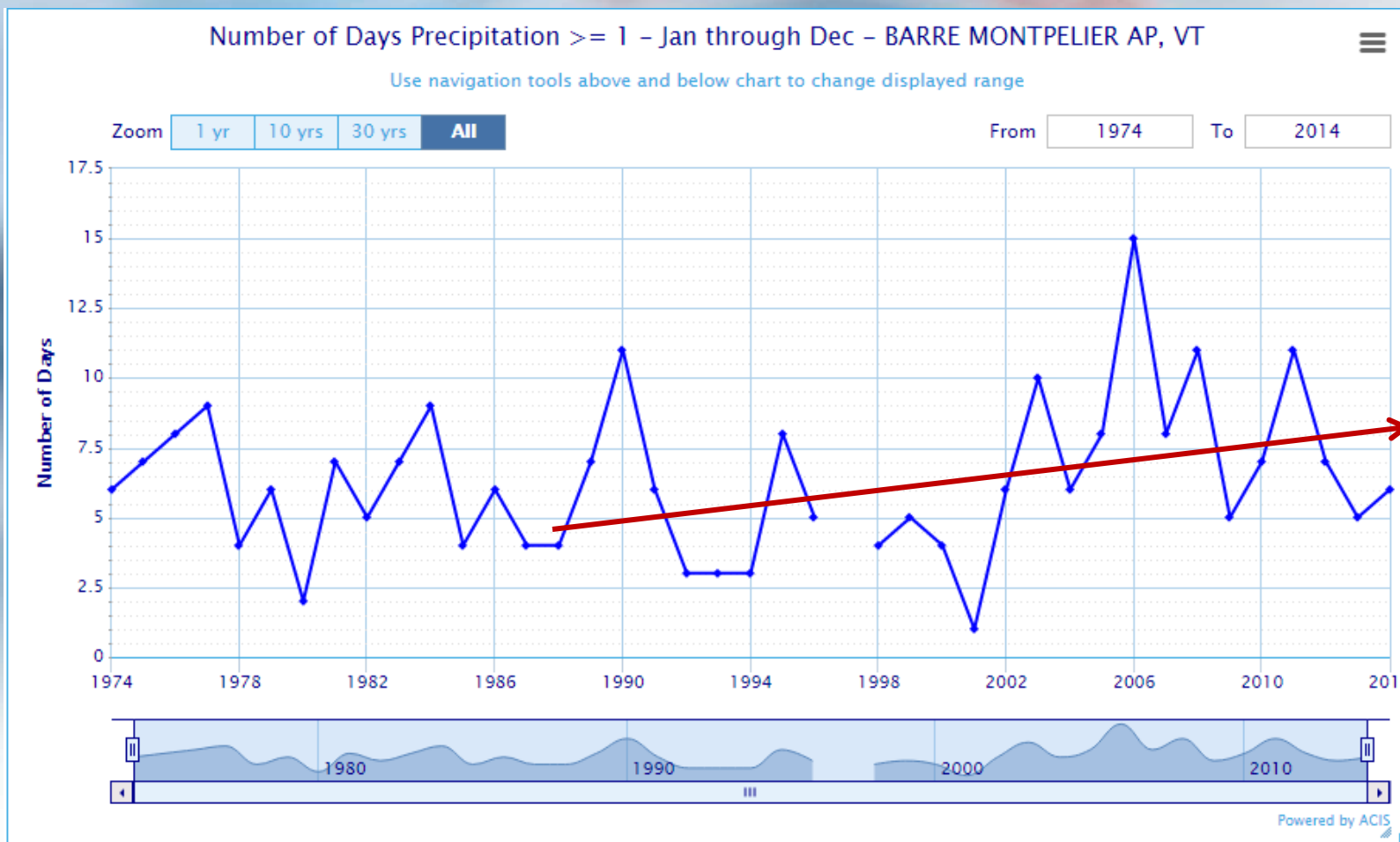
NOAA



[www.weather.gov/btv](http://www.weather.gov/btv)

*National Weather Service  
Burlington, VT*

# Frequency (Days) of 1" or greater Montpelier (1974-2014)





# Frequency (Days) of 1" or greater St. Johnsbury (1974-2014)

