# NRV Hazard Mitigation Plan 2016 Update Working Group: High Winds (non-rotational) and Tornadoes

October 6, 2016, 10:30 am - 12:00 pm

New River Room, New River Valley Business Center
Fairlawn, VA

## Agenda

1. Welcome ..... Christy Straight
   *New River Valley Regional Commission*

2. High Winds (non-rotational) and Tornadoes ..... William Perry
   *National Weather Service*

3. 2011 Pulaski Tornado ..... Pete Huber
   *Pulaski County*

   Janet Jonas
   *Community Planning Partners*

4. Data Review ..... Christy Straight
   *New River Valley Regional Commission*

5. Regional Mitigation Strategy Review ..... Christy Straight
   *New River Valley Regional Commission*

6. Wrap Up
   a. Question and answer
   b. Next meeting- November 3, 2016
      (Please check your calendars to see if we might be able to reschedule to November 10th)

**HAZARD MITIGATION Working Group – Winds**
**Meeting Notes**
**October 6, 2016**

**Attending**: <see list>

**Notes**

1. Overview of project
    a. 5-year timeline to update, last adopted in 2012
    b. Once adopted by localities, eligible for federal mitigation funding
    c. Reviewed schedule of future working groups – please send contact information to Christy Straight for any stakeholders and subject matter experts that should be invited to participate
2. Presentation by Will Perry of National Weather Service
    a. Presented technical information on winds and their impacts in the region
    b. Presentation included in this file
3. Presentation by Pete Huber, Pulaski County and Janet Jonas, Community Planning Partners
    a. Spoke on the process for 2011 Pulaski area tornados' response and recovery
    b. Presentation included in Parts 2 and 3 for the October 6 meeting on the website
4. Reviewed summary of data for tornados and non-rotational winds
5. Goals and Strategies
    a. Reviewed 2011 goals, objectives and strategies
    b. Group discussion for any changes and additions to the list
6. Next Meeting: November 10 at 10:30 AM, topic – winter hazards
7. Comments
    a. National Weather Service is having an Open House on October 29, 10 am to 3 pm.
    b. VDEM
        i. Mentioned software for event response called Crisis Track that could be useful on a regional level. Pursuing funding to acquire.

Adjourned

Hazard Mitigation
Winds Working Group
October 6, 2016

# Sign In Sheet

| Name | Organization | Email |
|---|---|---|
| Grady DeVilbiss | Radford University | jdevilbis@radford.edu |
| A T - BRANSCOME | Radford University | atbranco@radford.edu |
| Bill Perry | National Weather Service | William.perry@noaa.gov |
| WILLIE RICHARDSON | VDEM | WILLIAM.RICHARDSON@VDEM.VIRGINIA.GOV |
| Lydeane Martin | Floyd Co | lmartin@floydcova.org |
| Robbie Kiser | Town of Pulaski | rkiser@pulaski.town.org |
| Patrick Wilson | National Weather Service | patrick.wilson@noaa.gov |
| Sara Harrington | VDEM | sara.harrington@vdem.virginia.gov |
| Pete Huber | Pulaski County | phuber@pulaskicounty.org |
| John Ross | Giles County | jross@gilescounty.org |
| Buddy Kast | Town of Narrows | jkast@townofnarrows.org |
| Melissa Skelton | City of Radford | Melissa.Skelton@radfordva.gov |
| Jay Eanes | City of Radford | Jay.Eanes@radfordva.gov |
| Jonathan T. Simmons | Vir. Dept. of Emerg. Mgmt. | jonathan.simmons@vdem.virginia.gov |
| Janet Jonas | Community Planning Partners | jjonas@cppartnersinc.com |
| Anamaria Bukvic | virginia Tech | ana.bukvic@vt.edu |
| Emily Gibson | Mont Co | gibsonej@montgomerycountyva.gov |
| DAVID LINKOUS | New River Health Dist. (VDH) | david.linkous@vdh.virginia.gov |
| KALI CASPER | TOB | kcasper@blacksburg.gov |

# Regional Hazard Mitigation Plan Update

Working Group - Winds

October 6, 2016



## Definition

- Hazard Mitigation

...is a sustainable action that will reduce or eliminate injury to citizens, damages to structures and allow continuity of critical society functions...

This is different from response and recovery.

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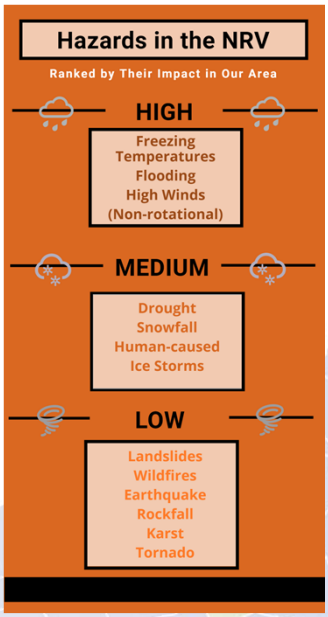
# Project overview

- Update every 5 years
- Must be FEMA-approved
  - Maintains participants' eligibility for mitigation funds
- Covers natural hazards with potential impact in NRV
  - Floods, drought, wildfire, geologic hazards, severe weather, etc.
  - And considers human-caused hazards
- Project website - http://nrvrc.org/hazardmitigation/

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# Working groups

- Steering committee and staff will
  - Invite stakeholders with technical expertise
  - Invite community representatives to participate
- Participants will
  - Provide input on hazard issues and impacts
  - Develop mitigation goals and regional strategies
  - Further identification and input on
    - Mitigation options
    - Resources

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# Working groups

- High Wind and Tornado Hazards | October 6, 2016
- Winter Hazards | November 3, 2016
- Geologic Hazards | December 1, 2016
- Human-caused, Wildfire, & Drought Hazards | January 5, 2016
- Flooding Hazards | February 2, 2016



# Today we will

- Hear presentations on
  - High Winds and Tornados
    - William Perry, National Weather Service
  - 2011 Pulaski Tornado
    - Pete Huber, Pulaski County
    - Janet Jones, Community Housing Partners
- Consider the risk assessment process
- Review latest available data
- Review and update mitigation strategies

# Presentation

- High Winds and Tornados
  - William Perry, National Weather Service



# Presentation

- 2011 Pulaski Tornado
  - Pete Huber, Pulaski County
  - Janet Jones, Community Housing Partners

# Risk Assessment

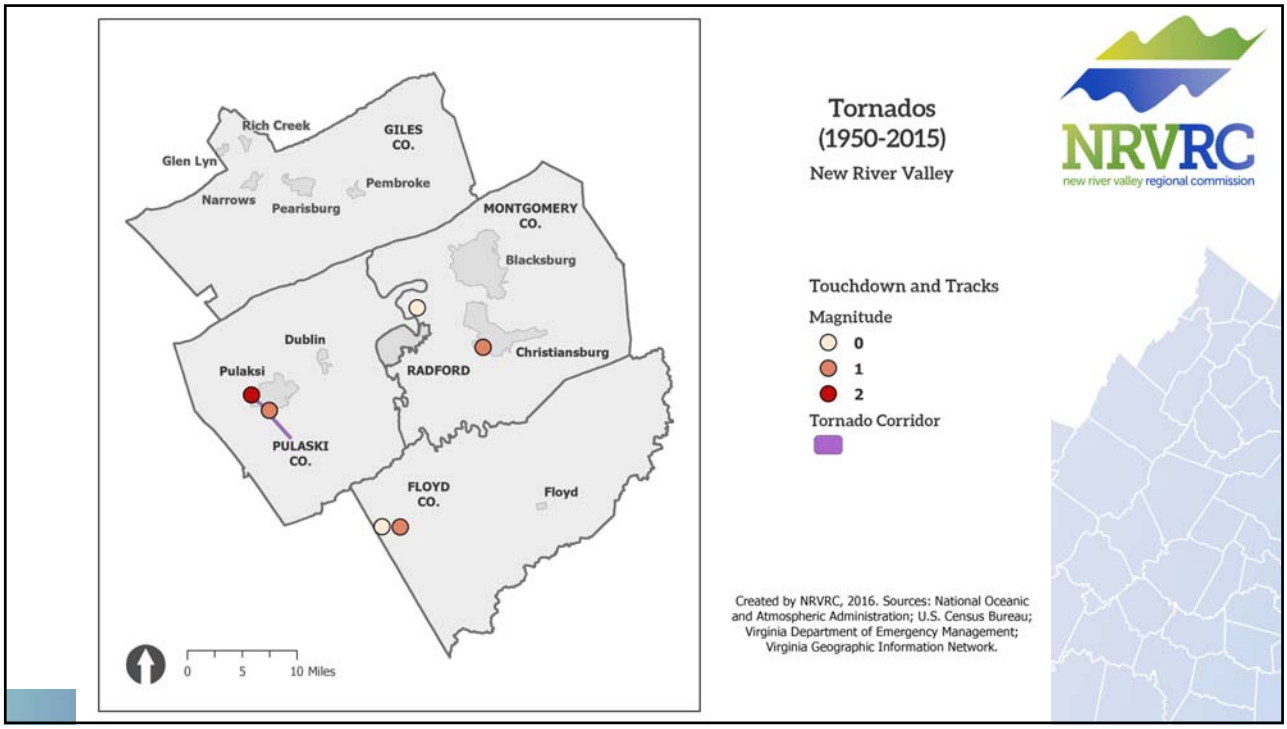
- Probability (area affected & frequency)
- Impact to & vulnerability of community assets
- Risk to population & property



# History of Tornado Events

- Five tornados since 1996
  - Pulaski 4/8/2011 EF2
  - Draper 4/8/2011 EF1
  - Indian Valley 5/3/2009 EF0
  - Indian Valley 1/23/1999 F1
  - Radford 6/11/1998 F0
- Fujita Scale and Operational EF Scale wind estimates

| F Number | 3 Second Gust (mph) | EF Number | 3 Second Gust (mph) |
|---|---|---|---|
| 0 | 45-78 | 0 | 65-85 |
| 1 | 79-117 | 1 | 86-110 |
| 2 | 118-161 | 2 | 111-135 |
| 3 | 162-209 | 3 | 136-165 |
| 4 | 210-261 | 4 | 166-200 |
| 5 | 262-317 | 5 | Over 200 |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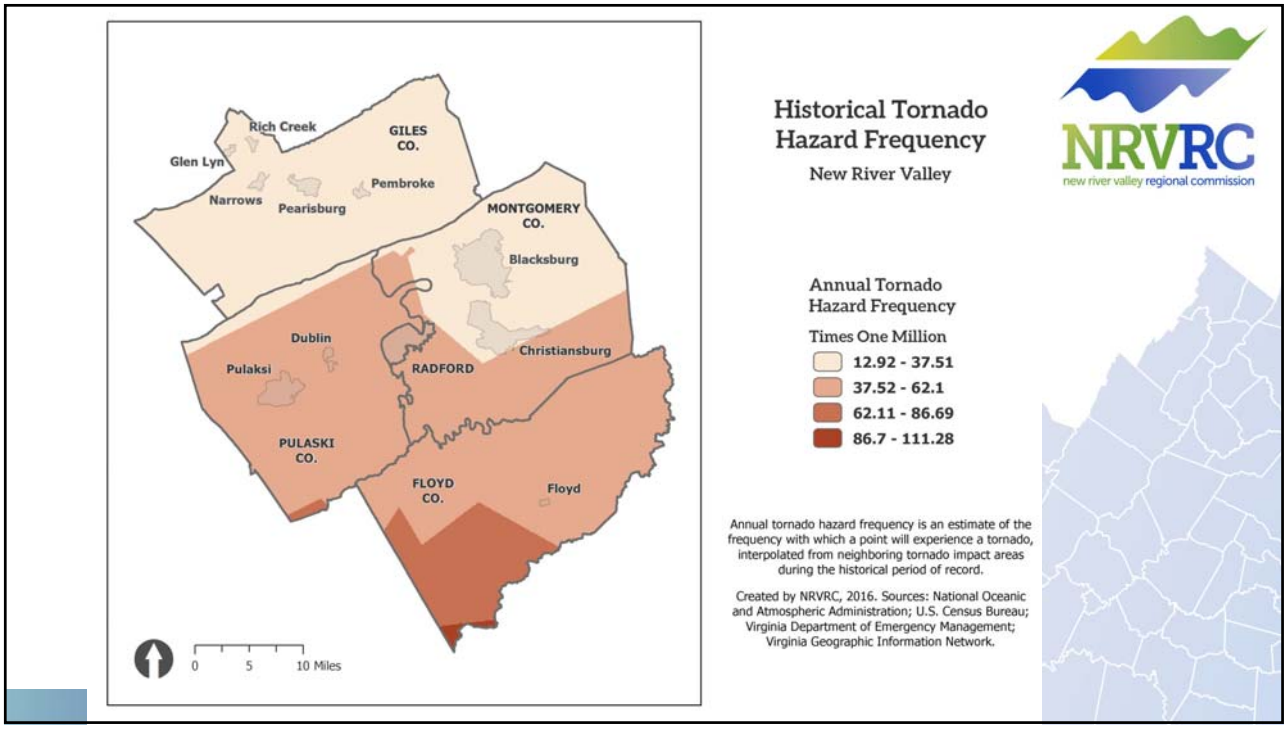
GILES CO.
Glen Lyn
Pembroke
Narrows
Pearisburg
MONTGOMERY CO.
Blacksburg
Dublin
Christiansburg
Pulaksi
RADFORD
PULASKI CO.
FLOYD CO.
Floyd
0 5 10 Miles
Tornados (1950-2015)
New River Valley
NRVRC
new river valley regional commission
Touchdown and Tracks
Magnitude
0
1
2
Tornado Corridor
Created by NRVRC, 2016. Sources: National Oceanic and Atmospheric Administration; U.S. Census Bureau; Virginia Department of Emergency Management; Virginia Geographic Information Network.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Pulaksi
RADFORD
PULASKI CO.
FLOYD CO.
Floyd
0 5 10 Miles
Historical Tornado Hazard Frequency
New River Valley
NRVRC
new river valley regional commission
Annual Tornado Hazard Frequency
Times One Million
12.92 - 37.51
37.52 - 62.1
62.11 - 86.69
86.7 - 111.28
Annual tornado hazard frequency is an estimate of the frequency with which a point will experience a tornado, interpolated from neighboring tornado impact areas during the historical period of record.
Created by NRVRC, 2016. Sources: National Oceanic and Atmospheric Administration; U.S. Census Bureau; Virginia Department of Emergency Management; Virginia Geographic Information Network.

# History of Wind Events

- 499 high wind events
  - thunderstorm winds
  - high winds
- Speeds typically over 50 knots (60.9 mph)
  - Beaufort scale

| Force | Wind (Knots) | WMO Classification |
|---|---|---|
| 0 | Less than 1 | Calm |
| 1 | 1-3 | Light Air |
| 2 | 4-6 | Light Breeze |
| 3 | 7-10 | Gentle Breeze |
| 4 | 11-16 | Moderate Breeze |
| 5 | 17-21 | Fresh Breeze |
| 6 | 22-27 | Strong Breeze |
| 7 | 28-33 | Near Gale |
| 8 | 34-40 | Gale |
| 9 | 41-47 | Strong Gale |
| 10 | 48-55 | Storm |
| 11 | 56-63 | Violent Storm |
| 12 | 64+ | Hurricane |

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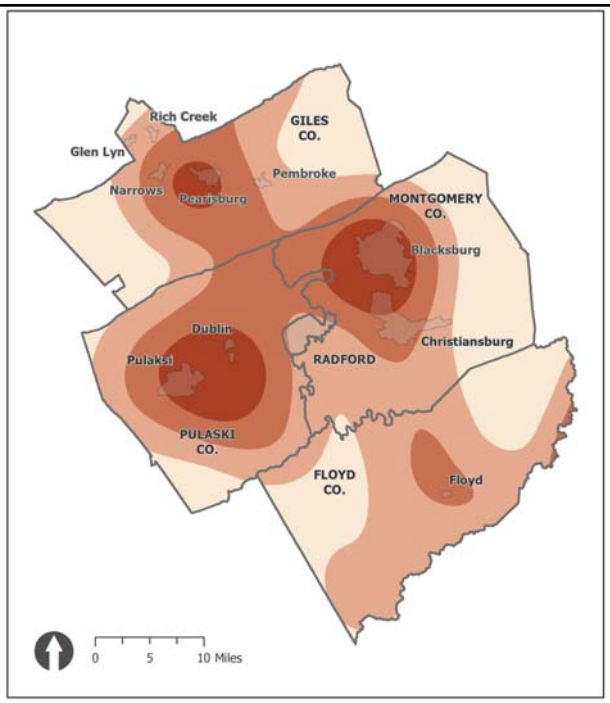


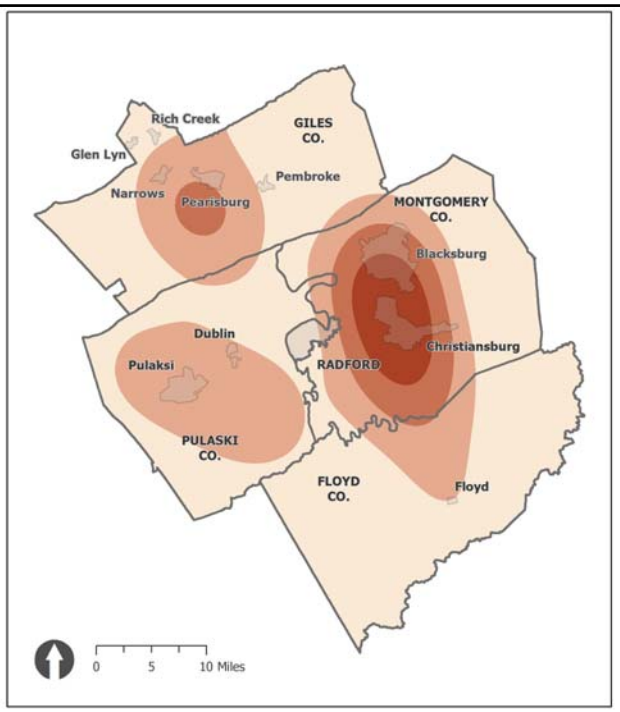

## Wind Gust Density (1996-2015)

New River Valley

Wind Gust Density
- Low
- Med-Low
- Med-High
- High

Reflects kernel density of thunderstorm wind gusts within a 10-mile radius of a point. Equal interval distribution.

Created by NRVRC, 2016. Sources: National Oceanic and Atmospheric Administration; U.S. Census Bureau; Virginia Geographic Information Network.




## Wind Gust Property Damage Density (1996-2015)

New River Valley

NRVRC
new river valley regional commission

Cumulative Property Damage

- Low
- Med-Low
- Med-High
- High

Reflects kernel density of total property damage caused by thunderstorm wind gusts within a 10-mile radius of a point. Equal interval distribution.

Created by NRVRC, 2016. Sources: National Oceanic and Atmospheric Administration; U.S. Census Bureau; Virginia Geographic Information Network.

# Annualized Loss

NRVRC
new river valley regional commission

- Using HAZUS-MH (2013 data)
- Based on a 100-year simulation of anticipated high winds activity
- This is a number to gauge comparative risk

| Locality | Loss |
|---|---|
| Floyd County | $19,996 |
| Giles County | $13,893 |
| Montgomery County | $101,587 |
| Pulaski County | $54,601 |
| City of Radford | $18,441 |

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## Goals & Strategies

- **Mission:** Minimize the loss of life and property to natural hazards by focusing on likely events, high-risks areas, and cost-effective mitigation opportunities.
- Regional and local strategies in support of goals
- Strategies can include
  - Education
  - Regional Cooperation
  - Capital improvement projects
  - Development and planning guidelines



## Wrap up

- Questions?
- Next steps
- Next meeting – November 3, 10:30 am – request to reschedule to November 10

- Contact information for NRVRC
  Christy Straight (cstraight@nrvrc.org)
  Michael Gottfredson (michaelg@nrvrc.org)
  540.639.9313

Thank you for coming!

# Winds: 2011 Goals, Objectives, Strategies

**Minimize impacts of significant weather events, such as winter weather and severe weather events in the NRV.**

s. *Encourage activities to prevent impacts during storm events.*

i. Promote the installation and maintenance of drift fences to maintain access during snow events.

ii. Emphasize that all road maintenance be done prior to storms to prevent access issues.

t. *Develop educational materials and events to prevent loss of life and property in severe weather events.*

i. Emphasize what should be done during a storm event (i.e., lightning) to maintain safety.

ii. Educate landowners about how overhanging utility lines and trees can cause property damage during a storm.

iii. Continue educational efforts during times when events are not occurring (i.e., brochures, websites, awareness weeks-promotions coordination).

iv. Create a brochure or handout of local hazards to provide to the community.

v. Pursue and maintain Storm Ready designation for the region's communities.

u. *Encourage preparation and planning activities that ensure minimal impacts to life and property.*

i. Encourage personal planning for storm events and their impacts.

ii. Inventory public facilities to determine the need for back-up power generation.

iii. Inventory of possible roof collapses through an analysis of building permits to determine need for future mitigation efforts.

iv. Engage in regional emergency management exercises (table-top and field) to train responders.

~~iv.~~ v. Look into techonology to be applied on a regional level (damage assessement software such as Crisis Track)

# Perspectives on Damaging Winds vs Tornadoes for the New River Valley


**Will Perry**

**National Weather Service**
**Blacksburg, VA**

# Definition of Non-Tornadic Damaging Winds


- Damaging winds are often called "straight-line" winds to differentiate the damage they cause from tornado damage.
- The most common cause of straight line wind damage is from severe thunderstorm winds, which is a result of outflow generated by a thunderstorm downdraft.
- Damaging winds are classified as those exceeding 58 mph.

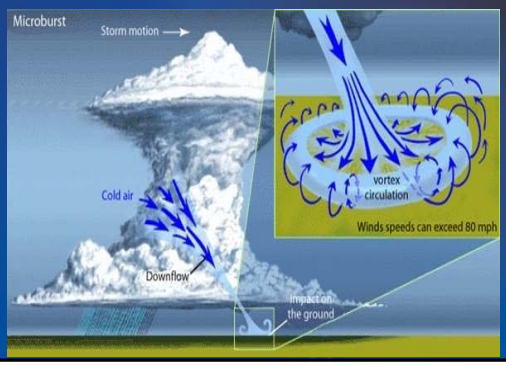
## Definition of Tornadic Winds


A tornado is a narrow, violently rotating column of air that extends from the base of a thunderstorm to the ground. Because wind is invisible, it is hard to see a tornado unless it forms a condensation funnel made up of water droplets, dust and debris. Tornadoes are the most violent of all atmospheric storms.

## Appomattox, VA Tornado
## Feb 24th, 2016

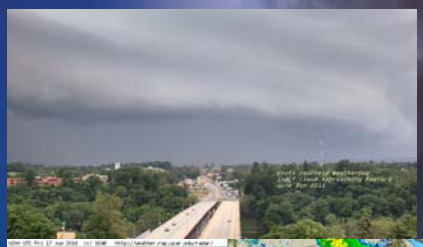
## Examples of non-tornadic winds that affect the NRV

- **Downbursts/microbursts:** Sudden, short-lived localized wind that radiates outward from a central point
- Covers less than 2.5 miles in damage
- Winds can exceed 100 mph


## Squall Lines/Gust Fronts

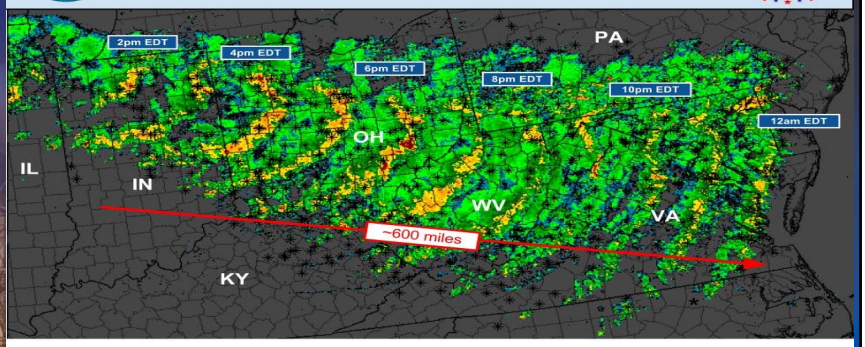
- Storms are in a linear structure and can be more than 100 miles long
- The primary threat is straight line damaging winds.



# Derechos

- A widespread, long-lived wind storm that is associated with a band of rapidly moving showers or thunderstorms. A typical derecho consists of numerous microbursts, downbursts, and downburst clusters. By definition, if the wind damage swath extends more than 240 and includes wind gusts of at least 58 or greater along most of its length, then the event may be classified as a derecho.

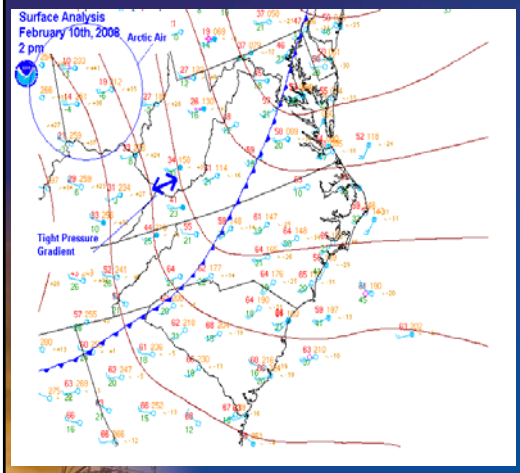
June 29, 2012 Midwest to East Coast Derecho
Radar Imagery Composite Summary 18-04 UTC
~600 miles in 10 hours / Average Speed ~60 mph




Over 800 preliminary thunderstorm wind reports indicated by *
Peak wind gusts 80-100mph. Millions w/o power.

Summary Map by G. Carbin
NWS/Storm Prediction Center

# Damaging winds from strong cold frontal passages

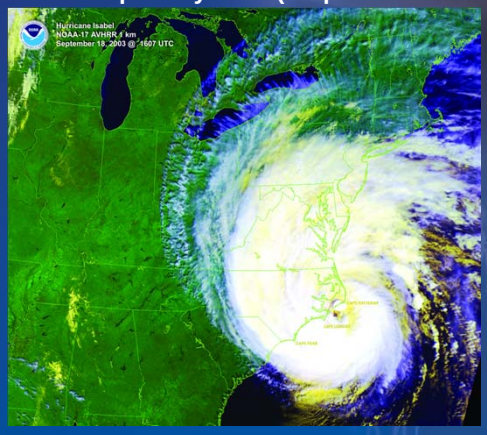



- In addition the New River Valley can receiving damaging winds due to the passage of strong cold front.
- This is more common during the cool weather months. (Oct-Apr).

## Peak Wind Gusts from that event


## Tropical Cyclones

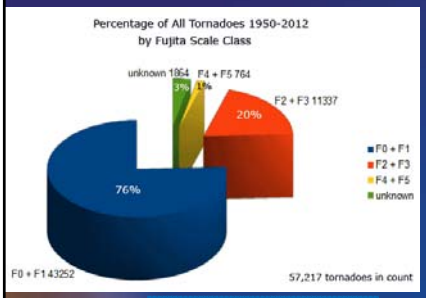
- We can also get damaging winds from tropical systems, though not as often.
- 2003 was the last time we had strong wind gusts with damage in the New River Valley from a tropical system. (Tropical Storm Isabel, Sept 2003).



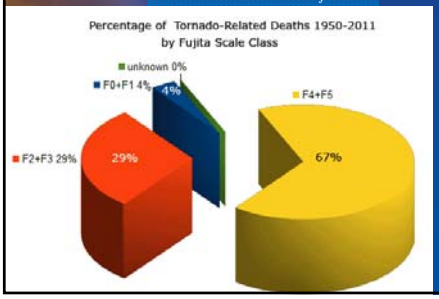
# Tornadic Winds

- The damage from tornadoes comes from the strong winds they contain. It is generally believed that tornadic wind speeds can be as high as 300 mph in the most violent tornadoes.
- Wind speeds that high can cause automobiles to become airborne, rip ordinary homes to shreds, and turn broken glass and other debris into lethal missiles.
- The biggest threat to living creatures (including humans) from tornadoes is from flying debris and from being tossed about in the wind.
- Tornadoes can occur anytime of the year. Most tornadoes are weak, and this is especially true in the New River Valley. Weak meaning EF-0-EF-1.

# Enhanced Fujita Scale



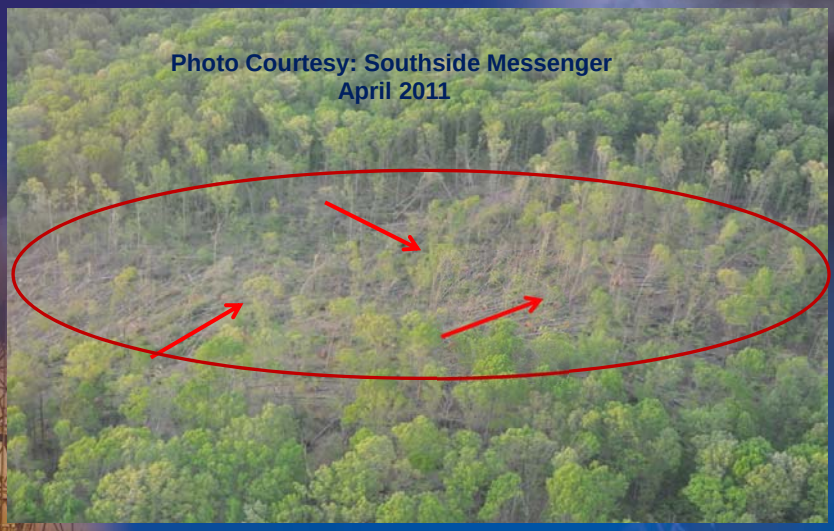

From: Tornado Project




| ENHANCED FUJITA SCALE | |
|---|---|
| EF5 | +200 mph |
| EF4 | 166-200 mph |
| EF3 | 136-165 mph |
| EF2 | 111-135 mph |
| EF1 | 86-110 mph |
| EF0 | 65-85 mph |

# Microburst vs. Tornado

Tornadic




NOAA's National Weather Service

# Damage Comparison of Non-Tornadic vs Tornadic Wind

Microburst

## Impacts by County of Damaging Winds vs Tornadoes

**All Non-Tornadic Wind Damage Jan 2005-Jun 2016**

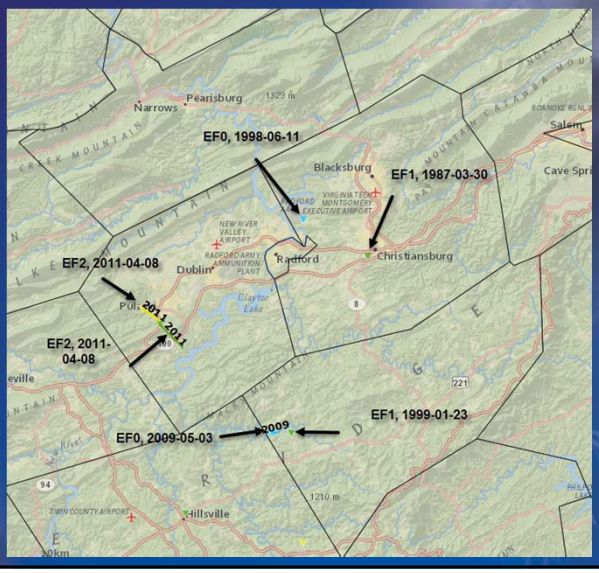
| County | # of Events | $ Damage | Deaths |
|---|---|---|---|
| Giles | 89 | $697,100 | 0 |
| Montgomery | 95 | $1,308,000 | 0 |
| Pulaski | 90 | $845,850 | 0 |
| Floyd | 63 | $410,500 | 0 |
| City of Radford | 28 | $139,300 | 0 |
| Totals | 365 | $3,400,750 | 0 |

## Impacts by County of Damaging Winds vs Tornadoes

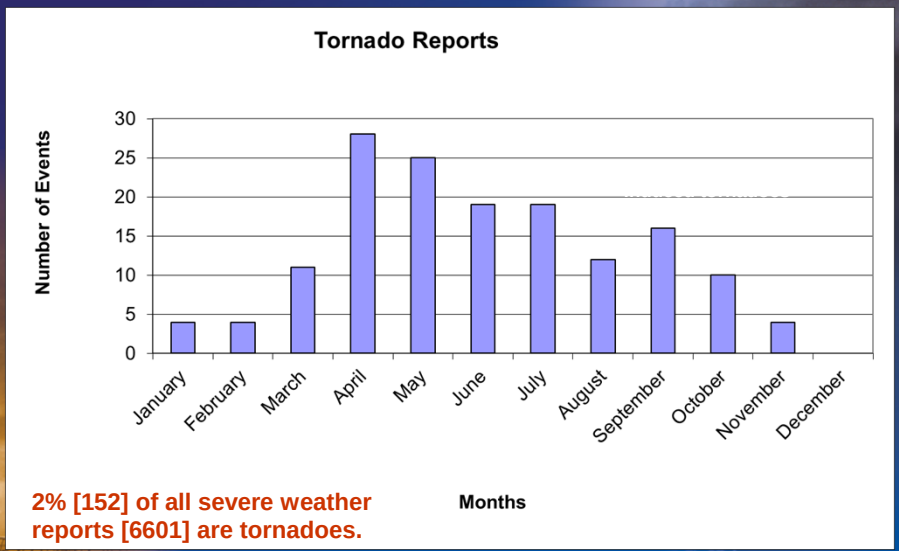
**All Tornadic Wind Damage Jan 2005-Jun 2016**

| County | # of Events | $ Damage | Deaths |
|---|---|---|---|
| Giles | 0 | $0 | 0 |
| Montgomery | 0 | $0 | 0 |
| Pulaski | 2 | $5,300,000 | 0 |
| Floyd | 1 | $10,000 | 0 |
| City of Radford | 0 | $0 | 0 |
| Totals | 3 | $5,310,000 | 0 |

# New River Valley Tornadoes 1950-2015

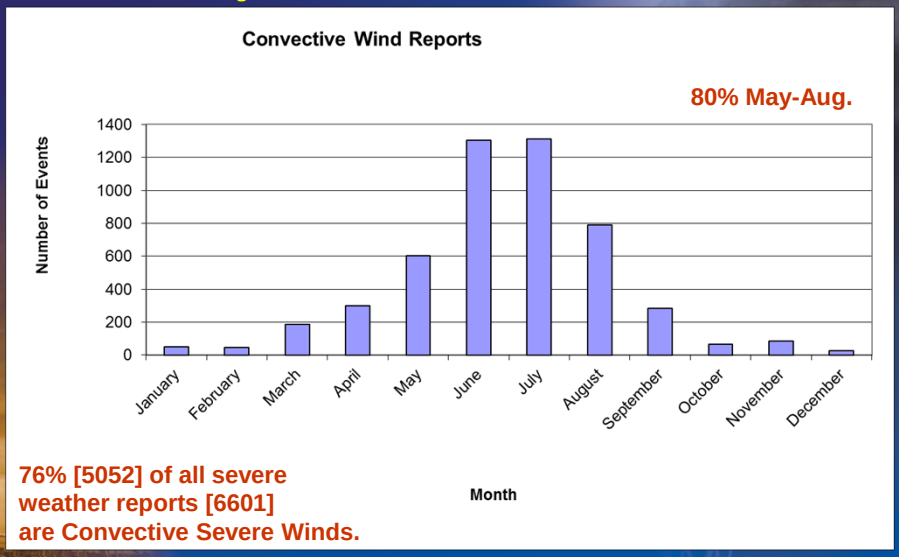



# Tornado Reports by Month 1950-2013



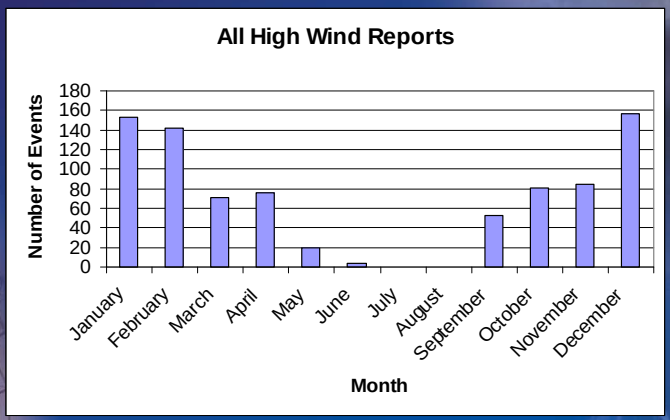

**2% [152] of all severe weather reports [6601] are tornadoes.**

# Thunderstorm Wind Reports by Month 1950-2013




76% [5052] of all severe weather reports [6601] are Convective Severe Winds.

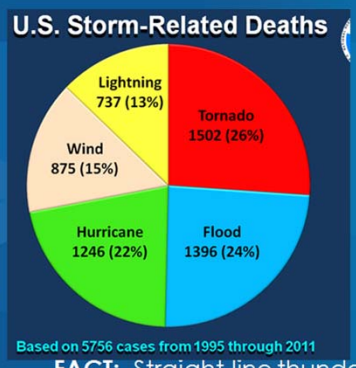
# Non-Thunderstorm High Wind Reports by Month (1994-2008)



# Know Your Risk

**Straight-line thunderstorm winds** cause more damage, and are more frequent than tornadoes.

**FACT:** Downed trees are the number one cause of the fatalities associated with straight-line thunderstorm winds.




**FACT:** Straight-line thunderstorm wind speeds can exceed 100 mph and produce a damage path extending for hundreds of miles.

# Tornado and Damaging Wind Safety

- **Get underground.**
- **If an underground shelter is not available, get on the lowest floor putting as many walls between you and the outside as possible.**
- **Avoid windows, doors and outside walls.**
- **Mobile homes and vehicles should be abandoned for more substantial shelter.**

Pulaski Tornado Damage, April 8th, 2011

# References

- http://www.weather.gov/media/rnk/research/svr_climo_update.pdf
- http://www.weather.gov/media/rnk/winter_high_wind_climo.pdf
- http://mrcc.isws.illinois.edu/gismaps/cntytorn.htm#
- http://www.nssl.noaa.gov/education/svrwx101/
- http://www.ncdc.noaa.gov/stormevents/