Tornadoes: Understanding How They Develop and Providing Early Warning; Part III NWS

Steven Zubrick

Science and Operations Officer
NOAA National Weather Service
Weather Forecast Office, Sterling, VA

Washington, DC
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Tornadoes Nationally

Frequency of Tornado Occurrence by County, 1950-2007

Source: NOAA/NWS Storm Prediction Center
## Enhanced Fujita (EF) Tornado Scale

<table>
<thead>
<tr>
<th>F Number</th>
<th>FUJITA SCALE</th>
<th>DERIVED EF SCALE</th>
<th>OPERATIONAL EF SCALE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>3 Second Gust (mph)</td>
<td>3 Second Gust (mph)</td>
</tr>
<tr>
<td>0</td>
<td>40-72</td>
<td>45-78</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>73-112</td>
<td>79-117</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>113-157</td>
<td>118-161</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>158-207</td>
<td>162-209</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>208-260</td>
<td>210-261</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>261-318</td>
<td>262-317</td>
<td>5</td>
</tr>
</tbody>
</table>

The Operational EF Scale is over 200 for F5 tornadoes.
Radar Network

National WSR-88D Doppler Radars

National WSR-88D Doppler Radar Sites

Alaska
Guam
Hawaii
Puerto Rico
Radar Network

National FAA TDWR Radars

TDWR = Terminal Doppler Weather Radar
January 10, 2008
Caledonia, MS

- EF-3 Tornado
- 41 min. lead time
- 2,000 people inside
  only 3 minor injuries
Tornado Examples

February 5-6, 2008
Super Tuesday Outbreak
- 63 tornadoes
- 17 minute lead time
- 57 fatalities
May 10, 2010 Tornado Outbreak

EF-4 Tornado

33 min. lead time
Preparing the Public for Tornadoes

- Outlooks
- Watches
- Tornado
- Warnings
National Weather Service - Storm Prediction Center
Day 1 Convective Outlook
Issued 4:00 PM May 8, 2008
Watch Phase

Storm Prediction Center Tornado Watch #238
Warning Phase

VAC047-177-179-630-090315-
/O.NEW.KLWX.TO.W.0006.080509T0232Z-080509T0315Z/

BULLETIN - EAS ACTIVATION REQUESTED
TORNADO WARNING
NATIONAL WEATHER SERVICE BALTIMORE MD/WASHINGTON DC
1032 PM EDT THU MAY 8 2008

THE NATIONAL WEATHER SERVICE IN STERLING VIRGINIA HAS ISSUED A

* TORNADO WARNING FOR...
   CITY OF FREDERICKSBURG IN CENTRAL VIRGINIA
   SPOTSYLVANIA COUNTY IN CENTRAL VIRGINIA
   CULPEPER COUNTY IN NORTHERN VIRGINIA
   STAFFORD COUNTY IN NORTHERN VIRGINIA

* UNTIL 1115 PM EDT

* AT 1027 PM EDT...NATIONAL WEATHER SERVICE DOPPLER RADAR INDICATED A
   DEVELOPING TORNADO 17 MILES SOUTHWEST OF STAFFORD...MOVING
   NORTHEAST AT 22 MPH.
NOAA All Hazards Warning System

Civil Emergency Message: Local, State, Federal

- National Weather Service Office
- NOAA Weather Radio All Hazards
- Other NWS Dissemination Systems
- Local Radio/TV/Media (Emergency Alert System) Voluntary broadcast
- Internet
- Mobile Devices

Public

Rt. 2, Severna Park, MD
Sept 28, 2006
How Public Receives Warnings

- NOAA All Hazards Weather Radio
- NOAA Weather Wire Service (NWWS) (satellite-based)
- Emergency Managers Weather Information Network (EMWIN) (satellite-based)
- Internet (http://weather.gov)
  - Common Alerting Protocol Format
  - Emergency Alert System (broadcast media - TV & Radio)
- Sirens (for persons outdoors; not indoors!)
- Mobile Devices (cell phone, Blackberry, etc.)
- Satellite (e.g., XM radio)
NOAA All Hazards Weather Radio

- Government-operated network provides direct warnings to the public
- 1,013 transmitters nationwide cover over 98% of the population
- Entry point into Emergency Alert System
- Alert operates 24 x 7
- Able to reach you when you most need it
- Low cost receiver units
- System tested weekly
Recent Accomplishments

- Improved Warning Delivery
  - NOAA Weather Radio (NWR)
  - 97,000 NWRs distributed to public schools
  - 182,000+ NWRs distributed in FY 09
  - All schools – K-12 + Univ.
Where We’re Headed

Severe Weather Services

- **Improved Science & Tech:**
  - Radar enhancements
  - Model enhancements
  - National mesonet

- **Improved Services:**
  - Longer lead times for tornadoes and severe thunderstorms
  - Decreased warned areas and false alarms
Communicating Forecast Confidence

- Explicit information on the certainty of a forecast to aid in decision making
  - Confidence levels and probabilities
  - Educate users on how to interpret information for decision making
Working Together to Achieve Success

- U.S. severe weather among world’s worst
- U.S. needs the world’s best Weather Service
- Partnerships with emergency managers essential