Preparing For The Winter Season

National Weather Service
2019 OP3 Fall Conference
December 16, 2019

Brandon Peloquin
Warning Coordination Meteorologist
NWS Wilmington OH

NWS Wilmington OH
November 2018 Ice Storm
Topics

- National Weather Service Background
  - How we are organized
  - What we do and how we do it
- Last Winter (2018-2019)
- This Winter (2019-2020)
- Preparing for Snow Squalls
- Weather-Ready Nation
NWS Mission

• **Federal organization:**

  Department of Commerce
  
  National Oceanic and Atmospheric Administration
  
  National Weather Service

• **To provide weather, hydrologic, and climate forecasts and warnings for the protection of life and property and the enhancement of the national economy**
Partner Agencies & Groups
NWS Organization

- 122 Weather Forecast Offices
- 5 NWS offices serve Ohio
  - Provide forecasts, warnings, and other local services
  - Operate 24/7/365
NWS Wilmington OH

- NWS Wilmington Ohio serves 52 counties across OH, IN, and KY
- The office is staffed by 26 full-time employees
NWS Operations

Long-Term

Public Service

Severe & Hydro

Severe Coord.

Aviation & Short-Term
AWIPS
Advanced Weather Interactive Processing System
Upper Air Observations

- Used by computer models to help forecast the weather.
- Launched twice daily from 73 sites in the US and 92 in North America.
- Can reach heights over 100,000 feet
Satellite
Radar (WSR-88D)

Inside of the Radar “Dome”

Velocity

Reflectivity
Computer models project a hypothetical state of the atmosphere hours and days into the future.

The computer models ingest radar, satellite and observational data and process this information through a complex series of mathematical equations to produce data/maps as shown to the right.
Receiving Weather Info

NATIONAL WEATHER SERVICE

All Hazards
NOAA Weather Radio
NOAA's National Weather Service™

Wireless
Emergency Alerts
Temperatures across much of the region ended above normal for many spots in the region – including much of Ohio. Although January featured a significant cold outbreak at the very end of the month, the warmer-than-normal temperatures of December and February were too warm to overcome.

A very wet winter evolved across the entire region, with some spots receiving nearly double the normal total precipitation that would be expected between December and February. Cincinnati, with 7.23” of precipitation, had its 7th wettest February on record with Columbus (5.49”) having its 6th wettest February on record.
## Winter Review 2018 - 2019

### Temperatures: Slightly Above Normal

<table>
<thead>
<tr>
<th>SEASON</th>
<th>Location</th>
<th>Cincinnati</th>
<th>Cleveland</th>
<th>Columbus</th>
<th>Dayton</th>
<th>Toledo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dec. Avg. Temp</td>
<td>38.5°F (+4.4°F)</td>
<td>37.0°F (+4.6°F)</td>
<td>37.3°F (+3.8°F)</td>
<td>36.8°F (+5.6°F)</td>
<td>35.0°F (+5.3°F)</td>
<td></td>
</tr>
<tr>
<td>Jan. Avg. Temp</td>
<td>30.4°F (-0.4°F)</td>
<td>27.9°F (-0.2°F)</td>
<td>29.4°F (-0.2°F)</td>
<td>28.5°F (+1.0°F)</td>
<td>24.8°F (-0.7°F)</td>
<td></td>
</tr>
<tr>
<td>Feb. Avg. Temp</td>
<td>38.2°F (+3.7°F)</td>
<td>32.8°F (+2.3°F)</td>
<td>34.8°F (+3.8°F)</td>
<td>34.8°F (+3.8°F)</td>
<td>30.4°F (+2.1°F)</td>
<td></td>
</tr>
<tr>
<td>Seasonal Dep.</td>
<td>+2.5°F</td>
<td>+2.2°F</td>
<td>+2.5°F</td>
<td>+3.5°F</td>
<td>+2.2°F</td>
<td></td>
</tr>
</tbody>
</table>

*Stats for December 2018, January 2018, and February 2019 only*

### Snowfall: Near Normal South/Below Normal North

<table>
<thead>
<tr>
<th>SEASON</th>
<th>Location</th>
<th>Cincinnati</th>
<th>Cleveland</th>
<th>Columbus</th>
<th>Dayton</th>
<th>Toledo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dec. Snowfall</td>
<td>0.5”</td>
<td>2.8”</td>
<td>0.4”</td>
<td>1.4”</td>
<td>0.1”</td>
<td></td>
</tr>
<tr>
<td>Jan. Snowfall</td>
<td>14.6”</td>
<td>16.0”</td>
<td>11.3”</td>
<td>14.4”</td>
<td>13.1”</td>
<td></td>
</tr>
<tr>
<td>Feb. Snowfall</td>
<td>1.6”</td>
<td>5.4”</td>
<td>11.6”</td>
<td>9.4”</td>
<td>4.9”</td>
<td></td>
</tr>
<tr>
<td>Seasonal Total</td>
<td>16.5” (+0.9”)</td>
<td>24.2” (-23.5&quot;)</td>
<td>23.3” (+2.0&quot;)</td>
<td>25.2” (+6.9&quot;)</td>
<td>18.1” (-10.3&quot;)</td>
<td></td>
</tr>
</tbody>
</table>

*Stats for December 2018, January 2018, and February 2019 only*
Annual Snowfall Normals (1981 – 2010)

*Record Annual Snowfall

<table>
<thead>
<tr>
<th>City</th>
<th>MAX</th>
<th>MIN</th>
<th>Year(s)</th>
<th>Year(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cincinnati</td>
<td>53.9”</td>
<td>5.0”</td>
<td>(1977)</td>
<td>(1919)</td>
</tr>
<tr>
<td>Cleveland</td>
<td>108.4”</td>
<td>13.0”</td>
<td>(2005)</td>
<td>(1931)</td>
</tr>
<tr>
<td>Columbus</td>
<td>49.4”</td>
<td>3.9”</td>
<td>(2003)</td>
<td>(1946)</td>
</tr>
<tr>
<td>Dayton</td>
<td>52.9”</td>
<td>8.0”</td>
<td>(1978)</td>
<td>(2001)</td>
</tr>
<tr>
<td>Toledo</td>
<td>77.4”</td>
<td>6.6”</td>
<td>(2014)</td>
<td>(2006)</td>
</tr>
</tbody>
</table>

*Only Years That Had No Missing Data Per Year

Image Courtesy of MRCC (Midwest Regional Climate Center)
# Winter Temperatures

## Regional Normals (1981-2010)

### Regional Normal Temperatures

<table>
<thead>
<tr>
<th>Location</th>
<th>Cincinnati</th>
<th>Cleveland</th>
<th>Columbus</th>
<th>Dayton</th>
<th>Toledo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dec. Avg. High</td>
<td>41.6°F</td>
<td>38.3°F</td>
<td>40.1°F</td>
<td>38.1°F</td>
<td>36.4°F</td>
</tr>
<tr>
<td>Jan. Avg. High</td>
<td>38.7°F</td>
<td>34.4°F</td>
<td>36.5°F</td>
<td>34.7°F</td>
<td>32.6°F</td>
</tr>
<tr>
<td>Jan. Avg. Low</td>
<td>23.0°F</td>
<td>21.7°F</td>
<td>22.6°F</td>
<td>20.3°F</td>
<td>18.4°F</td>
</tr>
<tr>
<td>Feb. Avg. High</td>
<td>42.9°F</td>
<td>37.5°F</td>
<td>40.6°F</td>
<td>38.9°F</td>
<td>36.0°F</td>
</tr>
<tr>
<td>Feb. Avg. Low</td>
<td>26.0°F</td>
<td>23.6°F</td>
<td>25.0°F</td>
<td>23.1°F</td>
<td>20.6°F</td>
</tr>
</tbody>
</table>
### Regional Temperature Extremes

<table>
<thead>
<tr>
<th>Location</th>
<th>Cincinnati</th>
<th>Cleveland</th>
<th>Columbus</th>
<th>Dayton</th>
<th>Toledo</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2018-2019 Winter Highest Temp</strong></td>
<td><strong>66°F (02/07)</strong></td>
<td><strong>64°F (12/02)</strong></td>
<td><strong>66°F (12/02)</strong></td>
<td><strong>64°F (12/02)</strong></td>
<td><strong>63°F (12/02)</strong></td>
</tr>
<tr>
<td><strong>2018-2019 Winter Lowest Temp</strong></td>
<td><strong>-7°F (01/31)</strong></td>
<td><strong>-3°F (01/30)</strong></td>
<td><strong>-4°F (01/31)</strong></td>
<td><strong>-8°F (01/30)</strong></td>
<td><strong>-10°F (01/31)</strong></td>
</tr>
</tbody>
</table>

**Records Since:** 1873  1876  1879  1894  1875

Very cold wind chills were experienced across the region from January 30-31, with the coldest wind chill (-36°F) observed at Dayton (DAY) since 1994 and nearly the coldest wind chill (-28°F) at Columbus in over 35 years! Toledo had an observed wind chill of -38°F, and Cleveland had a wind chill of -29°F, both which were the coldest at each respective site since 2014.
# Winter Precipitation

## Regional Normals (1981-2010)

### Regional Winter Precipitation Statistics

<table>
<thead>
<tr>
<th>Location</th>
<th>Cincinnati</th>
<th>Cleveland</th>
<th>Columbus</th>
<th>Dayton</th>
<th>Toledo</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dec. Norm.</strong></td>
<td>3.37”</td>
<td>3.10”</td>
<td>2.97”</td>
<td>3.12”</td>
<td>2.68”</td>
</tr>
<tr>
<td><strong>Jan. Norm.</strong></td>
<td>3.00”</td>
<td>2.72”</td>
<td>2.73”</td>
<td>2.71”</td>
<td>2.05”</td>
</tr>
<tr>
<td><strong>Jan. Rec.</strong></td>
<td>13.68” (1937)</td>
<td>7.01” (1950)</td>
<td>10.71” (1937)</td>
<td>12.41” (1937)</td>
<td>6.63” (1913)</td>
</tr>
<tr>
<td><strong>Feb. Norm.</strong></td>
<td>2.81”</td>
<td>2.34”</td>
<td>2.25”</td>
<td>2.24”</td>
<td>2.07”</td>
</tr>
<tr>
<td><strong>Feb. Rec.</strong></td>
<td>8.87” (1884)</td>
<td>7.73” (1887)</td>
<td>7.65” (1893)</td>
<td>6.77” (1909)</td>
<td>6.84” (1887)</td>
</tr>
</tbody>
</table>

**Records Since:**
- Cincinnati: 1871
- Cleveland: 1871
- Columbus: 1878
- Dayton: 1894
- Toledo: 1871
### Early/Late Snowfall Regional Extremes

<table>
<thead>
<tr>
<th>City</th>
<th>Earliest</th>
<th>Latest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cincinnati</td>
<td>10/19 (1989)</td>
<td>05/05 (1992)</td>
</tr>
<tr>
<td>Cleveland</td>
<td>10/02 (2003)</td>
<td>05/10 (1907)</td>
</tr>
<tr>
<td>Columbus</td>
<td>10/19 (1989)</td>
<td>05/07 (1989)</td>
</tr>
<tr>
<td>Dayton</td>
<td>10/18 (1989)</td>
<td>05/09 (1923)</td>
</tr>
<tr>
<td>Toledo</td>
<td>10/18 (1972)</td>
<td>05/07 (1989)</td>
</tr>
</tbody>
</table>

**Image Courtesy of MRCC (Midwest Regional Climate Center)**
**Winter Pattern 2019-2020**

**Implications on the Ohio Valley**

- ENSO Neutral (El Nino Southern Oscillation)
- Confidence is high in the maintenance of an ENSO-neutral pattern through the winter months into the spring.
- Confidence on temperature trends through the wintertime is fairly low, with a favorable pattern that will support near normal temperatures due to a mix of both **warmups** and **cooldowns** through the next several months.
- Confidence is a bit higher on an expectation for wetter-than-normal conditions to develop locally with the maintenance of a fairly active storm track through the Ohio Valley.
According to the Climate Prediction Center (CPC), there is not a clear signal for either below normal or above normal temperatures for the entire Ohio Valley region for the winter months.

According to the Climate Prediction Center (CPC), there are favorable probabilities for above normal precipitation from the Upper Midwest through the Ohio Valley for the winter months.
Be Prepared...

... For Winter Hazards
Be Prepared...

... For Winter Hazards

Winter Storm Products

1. Winter Storm Warning
   Snow, sleet, or ice expected! Take Action!
   Confidence is high that a winter storm will produce heavy snow, sleet or freezing rain and cause significant impacts.

2. Winter Storm Watch
   Snow, sleet, or ice possible! Be prepared.
   Confidence is medium that a winter storm could produce heavy snow, sleet, or freezing rain and cause significant impacts.

3. Winter Weather Advisory
   Wintry weather expected. Exercise caution.
   Light amounts of wintry precipitation or patchy blowing snow will cause slick conditions and could affect travel if precautions are not taken.
Winter Weather

Have a Plan

- Have a disaster supply kit in your office where everyone knows its location!
- If on the road, have non-perishable food and blankets and coats in the vehicle with you at all times in case your vehicle becomes stranded!
- Always have means to communicate with your friends, coworkers, and family if a winter storm is on its way.
- In case of loss of electricity, never use a backup generator in an enclosed space!
Winter (Snow/Ice) Probability Graphics

Expect At Least This Much

Expected Snowfall (Official Forecast)

Potential For This Much

Low/Middle/High Graphics

www.weather.gov/iln/winter
Potential For At Least 2” of Snow
Potential For At Least 4” of Snow
Potential For At Least 6” of Snow

Amount Threshold Graphics

www.weather.gov/iln/winter
Statewide

www.weather.gov/iln/winter#tab3
Snow Squall Safety
Newspaper Articles – February 14, 2015

2 deadly pileups close Ohio Turnpike; snow grounds flights

The Columbus Dispatch
Wind, white-out conditions cause fatal crashes
Icy roads, blinding snow cause pileups across state, killing 4

Whiteout conditions, accidents in high area

Blowing snow fueled by wind gusts of more than 40 mph caused whiteout conditions across Indiana on Saturday, causing pileups including one that killed a child and forcing the closure of highways in the north and east.

(Courtesy: Banacos, Lahiff)
Snow Squall Warning: short-fused polygon warning similar to a severe/tornado warning. May activate WEAs early 2020.

Snow Squall: an intense short-lived burst of heavy snowfall that leads to a quick reduction in visibilities and is often accompanied by gusty winds. They may be characterized by one main squall or multiple squalls.

Impact: The combination of quick reductions in visibilities and sudden slick conditions on roadways can often lead to high speed wrecks, pileups, and subsequently injuries and fatalities.
Working Together to Mitigate Impacts

The Ohio Department of Transportation is a valued proactive partner that works closely with the NWS to motivate action, mitigate weather impacts, and explore different avenues to ensure a Weather Ready Nation.
The Ohio Department of Transportation reaches motorists where they are impacted based off of NWS products. What started with snow squalls has expanded to other weather messaging with the Pathfinder Initiative.
Building A Weather-Ready Nation

Becoming a Weather-Ready Nation is about building community resilience in the face of increasing vulnerability to extreme weather, water, and climate events.

NOAA is developing new decision support services, improving technology to track and forecast storms, and expanding its dissemination efforts to achieve far-reaching national preparedness for weather events.

Decreasing Vulnerability by Increasing Resilience
WRN Ambassador

NWS Initiative

Promoting value of NOAA/NWS “Environmental Intelligence”
• Community events
• Press releases and media interviews
• Social media outreach
• Data access/formatting inquiries
• Corporate identity
• Expansion of stakeholder engagement to non-traditional sectors, including:
  • Insurance, health, real estate
  • Museums/Science Centers
  • Vulnerable populations

http://www.nws.noaa.gov/com/weatherreadynation/ambassadors.html
WRN Ambassador
NWS Initiative
Promoting value of NOAA/NWS
"Environmental Intelligence"
• Community events
• Press releases and media interviews
• Social media outreach
• Data access/formatting inquiries
• Corporate identity
• Expansion of stakeholder engagement
to non-traditional sectors, including:
• Insurance, health, real estate
• Museums/Science Centers
• Vulnerable populations

http://www.nws.noaa.gov/com/weatherreadynation/ambassadors.html
Severe Weather
Memorial Day Tornadoes

On the evening of May 27, 2019, the state of Ohio was hit by a major tornado outbreak. It was the largest outbreak in the history of the NWS forecast office in Wilmington, Ohio, with 19 tornadoes in the span of just a few hours. Overall, 23 tornadoes were confirmed in Ohio, with the greatest impacts in the Dayton metropolitan area.

In spite of the severity of the tornadoes, and the densely populated areas which were hit, only one direct fatality resulted from the storms.

NWS Wilmington Ohio Performance Statistics:
- Tornado Warnings Issued: 37
- Tornado Probability of Detection: 100%
- Tornado Touchdown Lead Time: 6 to 34 minutes
- Lead Time for Dayton EF4 Damage: 34 minutes
- Damage Surveys Conducted: 12

The strongest tornadoes caused significant damage to well-built homes and buildings. Remarkably, for the size of the outbreak, very few mobile homes and poorly-built structures were directly impacted.

The Trotwood-Dayton tornado was rated EF4 (170 MPH) on the Enhanced Fujita Scale, based on significant damage to multi-story apartments (Damage Indicator 5) and debarking to nearby trees.

An EF3 tornado destroyed this home near West Milton, Ohio. The homeowner sheltered inside the interior bathroom and was unjured.

https://www.weather.gov/iln/research
The National Weather Service (NWS) is an organization that relies heavily on science, partnerships, and ties to local communities to successfully provide weather, water, and climate data, forecasts and warnings for the protection of life and property and the enhancement of the national economy.

The NWS works with many partners, including those from national and local government, members of the weather enterprise, Weather-Ready Nation Ambassadors, and Academia to help educate people in all communities on how to stay safe and ensure important weather information, such as warnings, reach the broadest possible audience.
Questions???

Thank You!

@NWSILN
NWSWilmingtonOH
www.weather.gov/iln