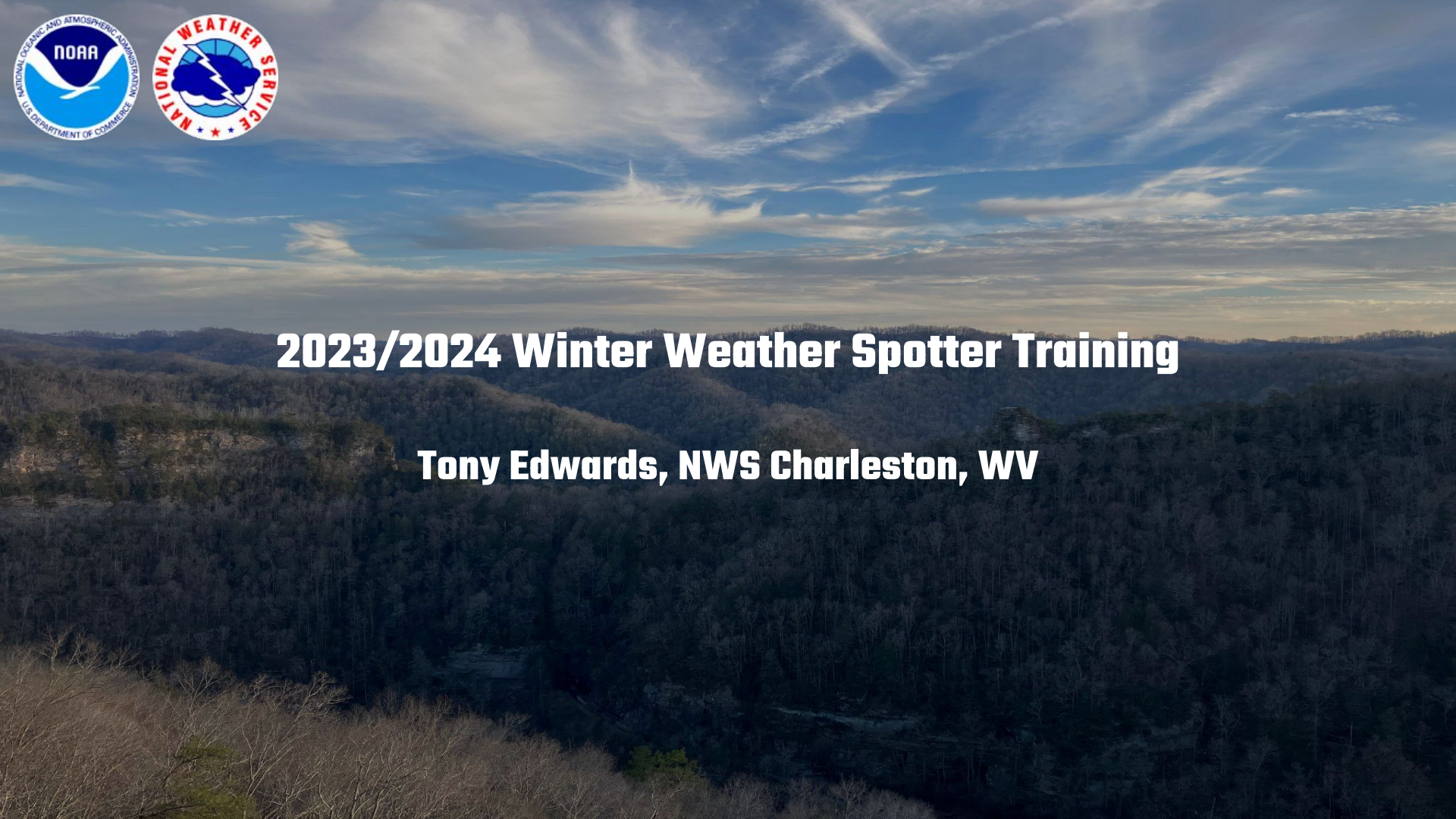


2023/2024 Winter Weather Spotter Training

Tony Edwards, NWS Charleston, WV

Bottom Line Up Front….

Your Observations of Snow and Ice are EXTREMELY Important to Us!

Here's what we do with your observations:

- Adjust our forecast as needed.
- Send the reports out to the media and the world (Local Storm Reports).
  - **Your report may help change someone's plans (and save lives!)**
- Use them for verification purposes so we know how good/bad our forecasts were.
- Include them in post event summaries which are used by state and local Emergency Management and even FEMA.

Presentation Outline

- A Look Back at Last Winter?
  - Overall trends
  - Memorable storms

- How to Properly Observe and Report Winter Weather
  - What to report
  - Properly measuring snow and ice
  - How to send us your reports

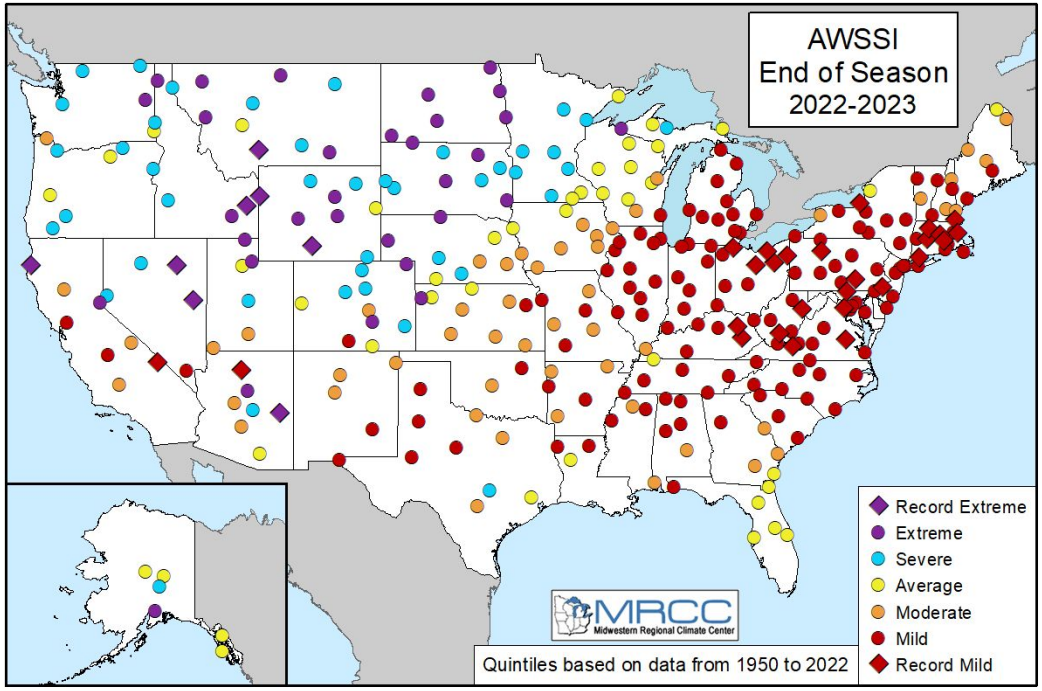
- Forecasting Winter Weather
  - Why is it so hard to forecast winter storms?
  - Finding winter weather forecasts

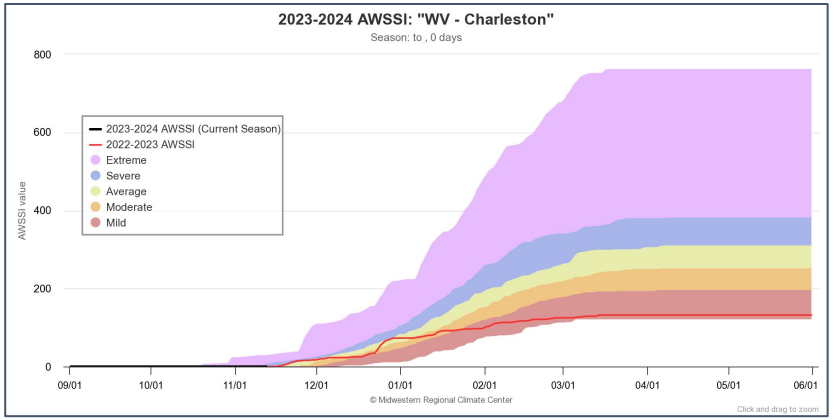
- NOAA Winter Outlook
  - What it means for our region
  - How to be prepared

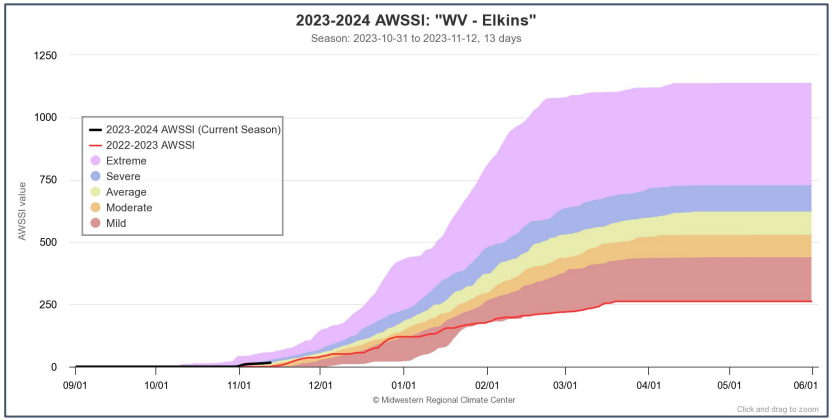
A Look Back at Last Winter

A Look Back at Last Winter

The Accumulated Winter Season Severity Index (AWSSI) attempts to quantify how severe the winter was.







https://mrcc.purdue.edu/research/awssi

Winter 2022/2023 Recap

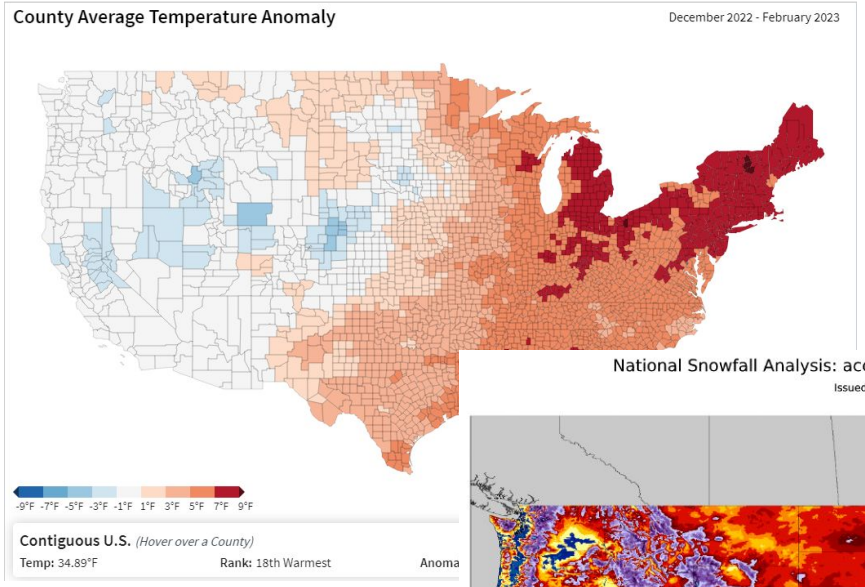
2022-2023 SEASONAL SNOWFALL AMOUNTS AND CORRESPONDING HISTORICAL RANK

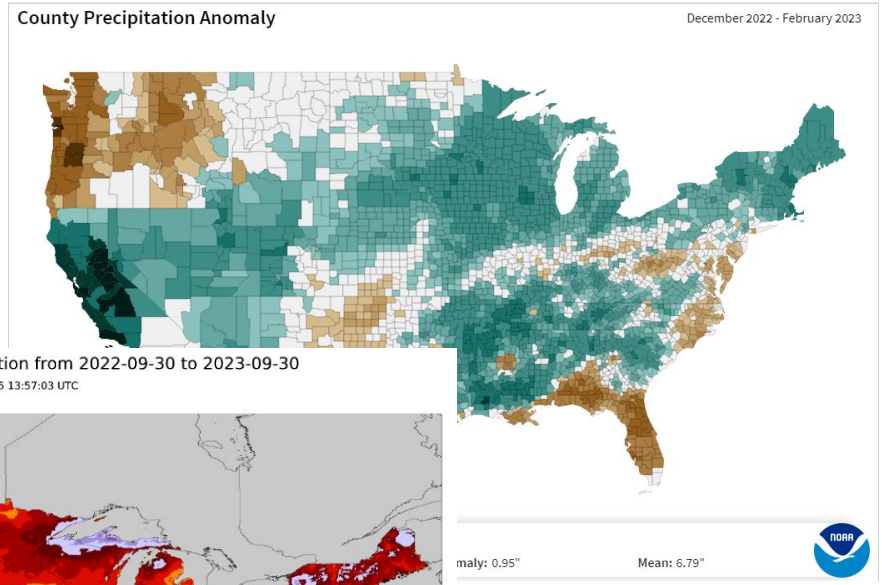
LOCATION	OBSERVED VALUE	RANK	PERIOD OF RECORD
- BECKLEY, WV	11.5 INCHES	-> LEAST SNOWIEST	1893 TO 2023
- CHARLESTON, WV	3.0 INCHES	-> 2ND LEAST SNOWIEST	1901 TO 2023
- ELKINS, WV	15.2 INCHES	-> 2ND LEAST SNOWIEST	1899 TO 2023
- HUNTINGTON, WV	2.6 INCHES	-> 3RD LEAST SNOWIEST	1897 TO 2023

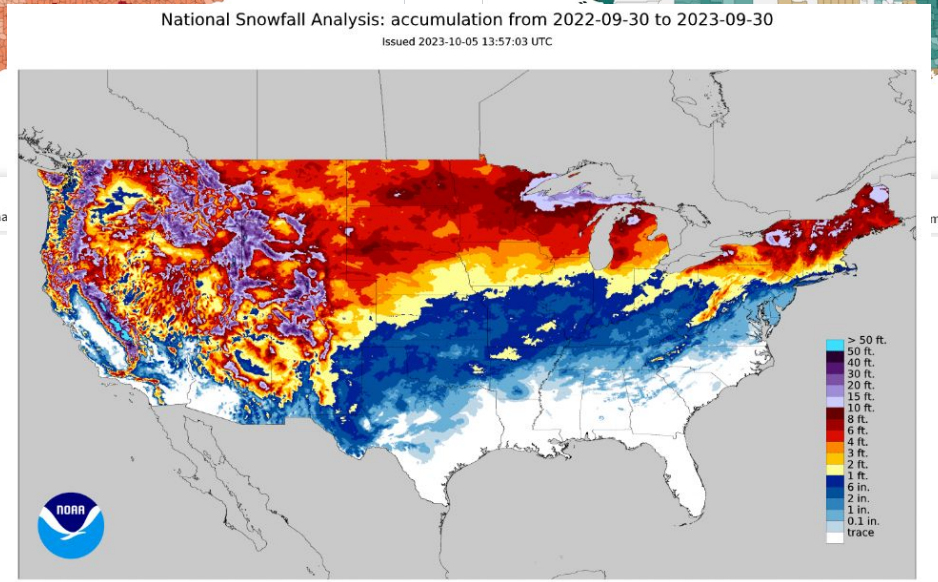
FEBRUARY TOP TENS SET (AVERAGE TEMPERATURE)

LOCATION	TOP 10 RANK	OBSERVED VALUE
- CLARKSBURG, WV	: WARMEST	-> 45.7 F
- HUNTINGTON, WV	: 2ND WARMEST	-> 46.6 F
- ELKINS, WV	: TIED 2ND WARMEST	-> 40.6 F
- BECKLEY, WV	: 3RD WARMEST	-> 43.4 F
- PARKERSBURG, WV	: 3RD WARMEST	-> 43.5 F
- CHARLESTON, WV	: TIED 7TH WARMEST	-> 45.1 F

A Look Back at Last Winter

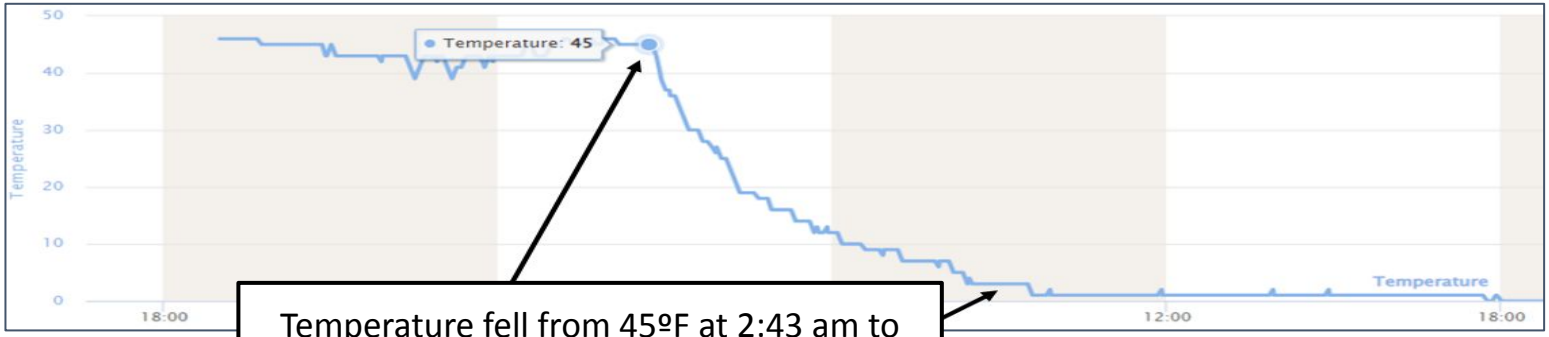






December 23-26 Arctic Blast

Arctic Frontal Passage at Charleston Yeager Airport on Friday December 23rd



Temperature fell from 45ºF at 2:43 am to 3ºF at 8:43 am - a 42ºF drop in 6 hours!

.....HIGHEST WIND GUST REPORTS.....

Location	Speed	Time/Date	Provider
Clarksburg Airport	54 MPH	0654 AM 12/23	ASOS
Conaway Lake	48 MPH	0516 AM 12/23	RAWS
REEDSVILLE	47 MPH	0517 AM 12/23	CWOP
Charleston Airport	47 MPH	0250 AM 12/23	ASOS
Buckhannon Airport	47 MPH	0455 AM 12/23	AWOS
Snowshoe	46 MPH	1040 AM 12/23	CWOP
Parkersburg Airport	45 MPH	0345 AM 12/23	ASOS
Bee Mountain	44 MPH	0517 AM 12/23	RAWS
Huntington Airport	44 MPH	0852 AM 12/23	ASOS
Burr Oak	44 MPH	0535 AM 12/23	RAWS
Logan	43 MPH	0414 AM 12/23	RAWS
Louisa 1 S	42 MPH	0135 AM 12/23	KYMN2
Waterford	41 MPH	0408 AM 12/23	CWOP
Beckley Airport	41 MPH	0453 AM 12/23	ASOS
Elkins Airport	41 MPH	0529 AM 12/23	ASOS
Athens Airport	41 MPH	0135 AM 12/23	AWOS
Lakin	41 MPH	0416 AM 12/23	RAWS
Logan Cnty Airport	40 MPH	0415 AM 12/23	AWOS
Ashland Airport	40 MPH	0557 AM 12/23	AWOS

Minimum Observed Wind Chills

Charleston
Recent Low Wind Chill: -21
Record: -38 on 1/20/1985

Huntington
Recent Low Wind Chill: -25
Record: -40 on 1/20/1985

Parkersburg
Recent Low Wind Chill: -23
Record: -44 on 1/21/1985

Clarksburg
Recent Low Wind Chill: -22
Record: -34 on 1/17/1977

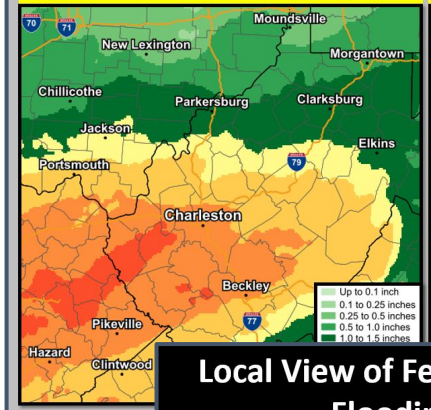
Elkins
Recent Low Wind Chill: -28
Record: -39 on 1/20/1985

Beckley
Recent Low Wind Chill: -30
Record: -49 on 1/21/1985

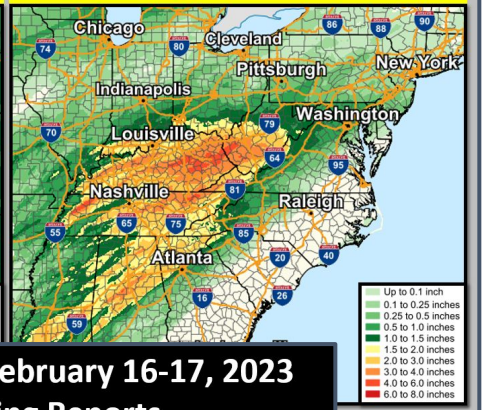
Heavy Rainfall and Flooding - February 16-17

February 16-17 Rainfall Totals

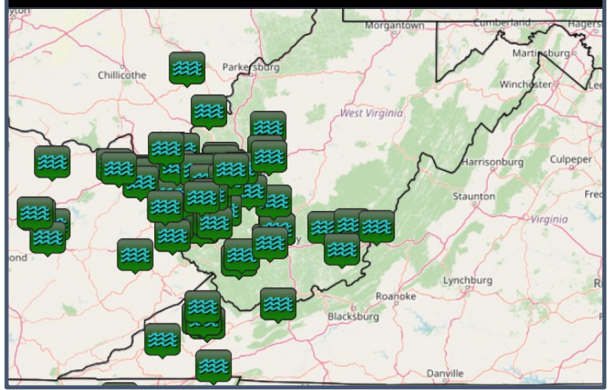
Local Perspective



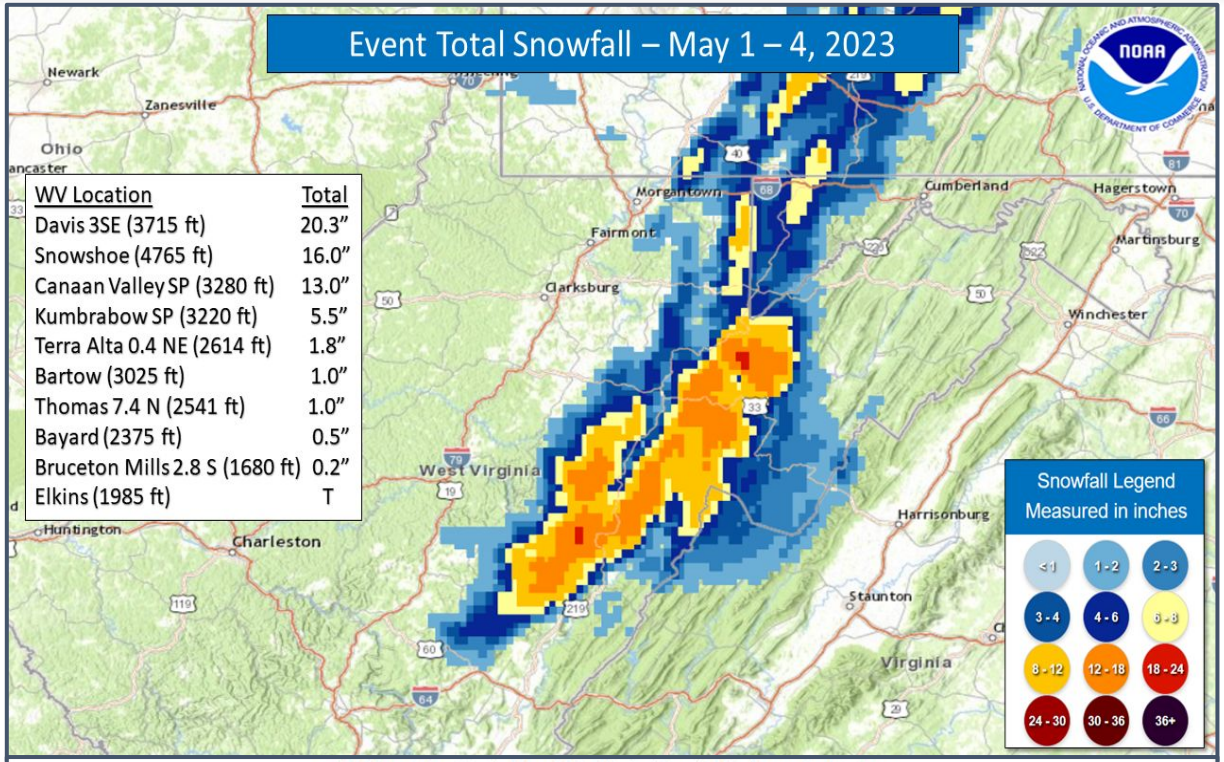
Regional Perspective



Local View of February 16-17, 2023 Flooding Reports



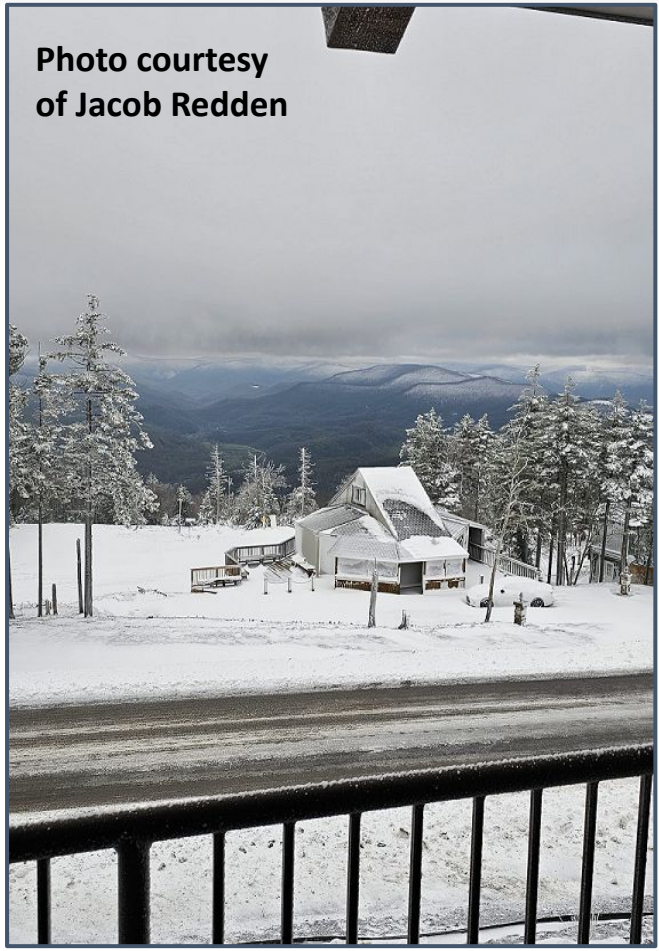
Historic Late Season (High Elevation) Snowstorm - May 1-4



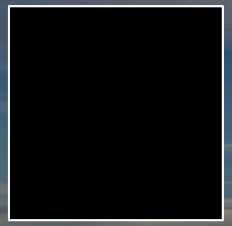
WV Location	Total
Davis 3SE (3715 ft)	20.3”
Snowshoe (4765 ft)	16.0”
Canaan Valley SP (3280 ft)	13.0”
Kumbrabow SP (3220 ft)	5.5”
Terra Alta 0.4 NE (2614 ft)	1.8”
Bartow (3025 ft)	1.0”
Thomas 7.4 N (2541 ft)	1.0”
Bayard (2375 ft)	0.5”
Bruceton Mills 2.8 S (1680 ft)	0.2”
Elkins (1985 ft)	T

All-Time May West Virginia State Snowfall Records Broken

Category	Old Record	New Record
Largest 24-Hr May Snow	10.0 In (Beckley, WV: May 8/9, 1923)	10.1 In (3 SE Davis, WV: May 2/3, 2023)
Largest May Snowstorm	12.0 In (Kumbrabow State Forest (WV): May 4-6, 1945)	20.3 In (3 SE Davis, WV: May 1-4, 2023)
Greatest May Snow Depth	6 In (Cheat Bridge, WV: May 12, 1924)	15 In (Snowshoe, WV: May 4, 2023)
Snowiest May	12.0 In (Kumbrabow State Forest (WV): May 1945)	20.3 In (3 SE Davis, WV: May 2023)



Presentation Outline



- A Look Back at Last Winter?
  - Overall trends
  - Memorable storms

- How to Properly Observe and Report Winter Weather
  - What to report
  - Properly measuring snow and ice
  - How to send us your reports

- Forecasting Winter Weather
  - Why is it so hard to forecast winter storms?
  - Finding winter weather forecasts

- NOAA Winter Outlook
  - What it means for our region
  - How to be prepared

What to Report

*** Snow, Sleet and Freezing Rain Amounts ***

✔ Intermediate reports during the storm and one final total at the end

- **Any Occurrence of Freezing Rain**
- **Changing Precipitation Types**
  - Rain – Freezing Rain – Snow – Etc

Report Precip Type Easily Using mPing App!

How to Properly Measure Snow & Ice

Supplies

- **Snow measuring board, or a flat surface like a picnic table or porch railing**
  - Place the snow board on a flat surface away from trees or other obstructions.
  - Mark it with a flag so you know where it is under the snow.
  - Do not measure on grass as it will artificially inflate the total.
  - Two snow boards are great – one for new snow and one left undisturbed for snow depth measurements

- **Ruler or yard stick**
  - We typically prefer measurement in 1/10ths of an inch, but if you don't have a ruler that measures in those increments, just give us the fractional measurement and we'll convert it for you.

https://www.weather.gov/media/coop/Snow_Measurement_Guidelines-2014.pdf

How to Properly Measure Snow & Ice

What About Ice?

For spotter reports, we'll take either FLAT ICE or RADIAL ICE ACCUMULATION but just let us know how you took the measurement.

Flat Ice = Radial Ice / 0.4

Taking a Radial Ice Accumulation Measurement

- Use a ruler to measure the thickness of ice on a branch.
- Often ice varies in thickness on the top and bottom of the branch. Measure both thicknesses and get the average thickness for your report.
- Top 3/10 inch | Bottom 1/10 inch
  Average 2/10 inch

Taking a Flat Ice Accumulation Measurement

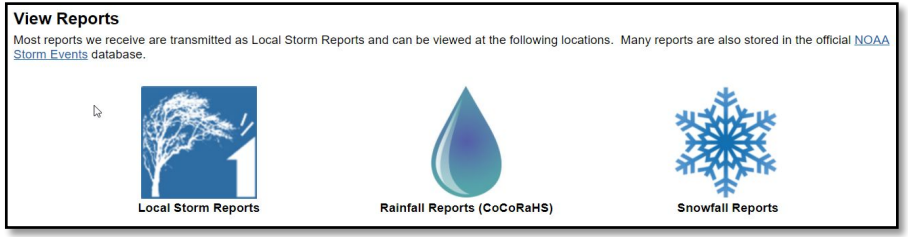
- Measure from top of flat surface such as a metal post or porch railing.
- Chip into the ice down to the surface and measure the accumulation of ice from the top of the surface.
- Example from pic: **1/2 inch**

https://media.cocorahs.org/training/Training_IceAccreation.html

Sending Us Your Reports

- Please send us reports by looking for the icon on you local NWS office website.

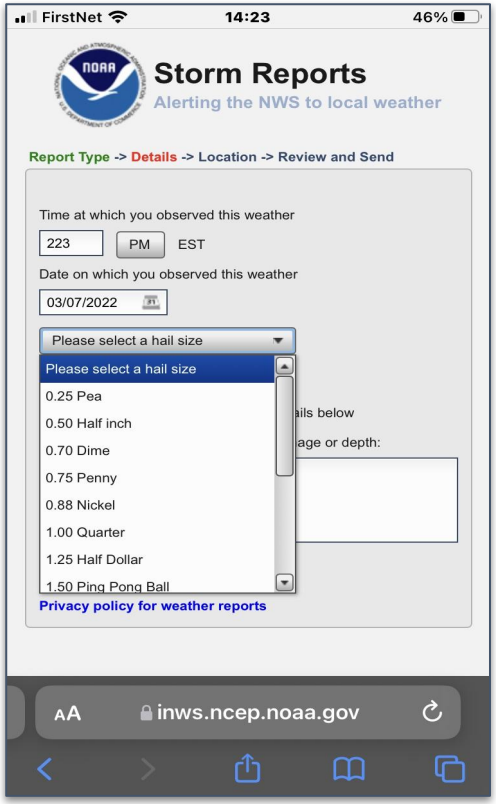
- You can report using the following platforms:
  - Web Based Form
  - Spotter Hotline given out to trained spotters
  - Facebook (NWSCharlestonWV)
  - Twitter (@NWSCharlestonWV)
  - Email us at rlx.ops@noaa.gov
  - Mping mobile app



https://www.weather.gov/rlx/reports

How to Report

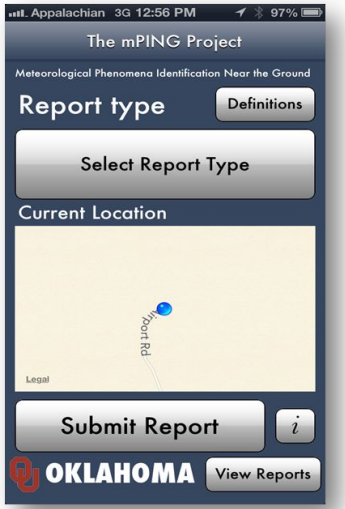
Storm Report Form

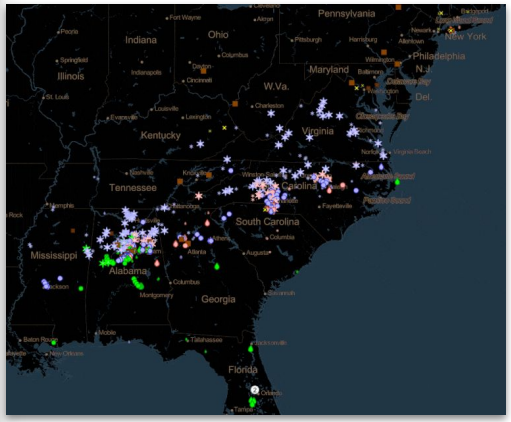


- ➔ Available on PC and Mobile.
- ➔ Automatically routes your report to the appropriate NWS office
  - ◆ Great when traveling!
- ➔ Select “Trained Spotter” under Custom Groups

https://inws.ncep.noaa.gov/report/

MPing App





- ➔ Search “mping” in your phones app store
- ➔ Your reports help are sent to us in real-time and help weather research!

https://mping.nssl.noaa.gov/

How to Report

Social Media

- ➔ Follow/Like us at **NWSCharlestonWV**
- ➔ We monitor Facebook and Twitter for reports
- ➔ Pictures of your snow/ice measurements are great!
- ➔ Be sure to post location of report!

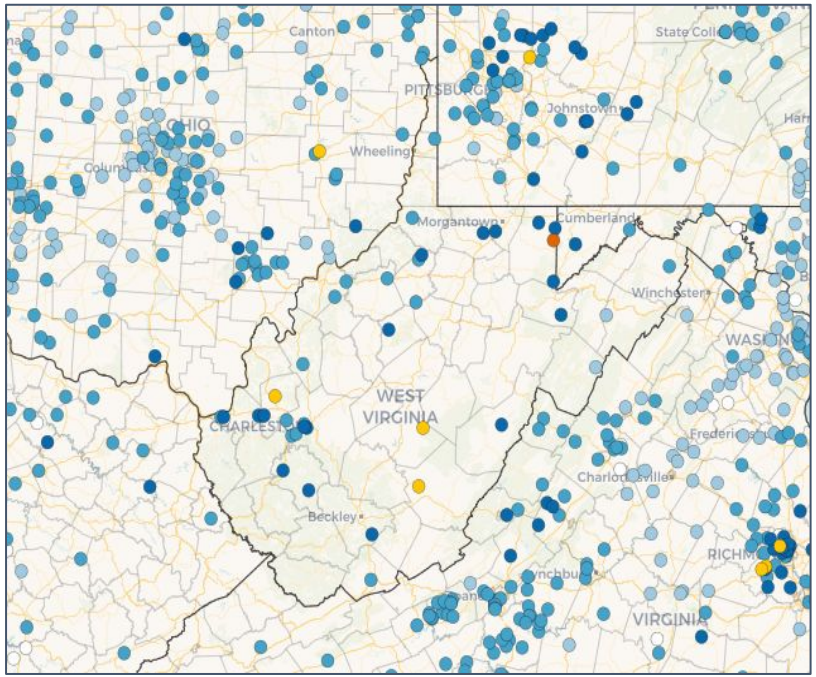
Amateur Radio

- ➔ New equipment (2m/440 and HF) was installed in 2022 at NWS Charleston!
- ➔ We are working on building out relationships with Amateur Radio groups in our service area for relay of reports from SKYWARN Nets.
- ➔ NWS Talk Groups on SIRN Radio

CoCoRaHS – Rainfall and Snowfall Reporting

https://www.weather.gov/rlx/cocorahs_observers

- The Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) is a volunteer network of weather observers working together to measure and map precipitation in their local communities.
- Can be individuals but also fire departments, water plants, DOH garages, etc. There's also a program tailored to schools with lesson plans and teaching aids.
- It is very important to have "trained" observers in your county for FEMA Disaster Declarations for winter storms!
- Help us fill in the gaps on the map at the right by signing up today!



Presentation Outline

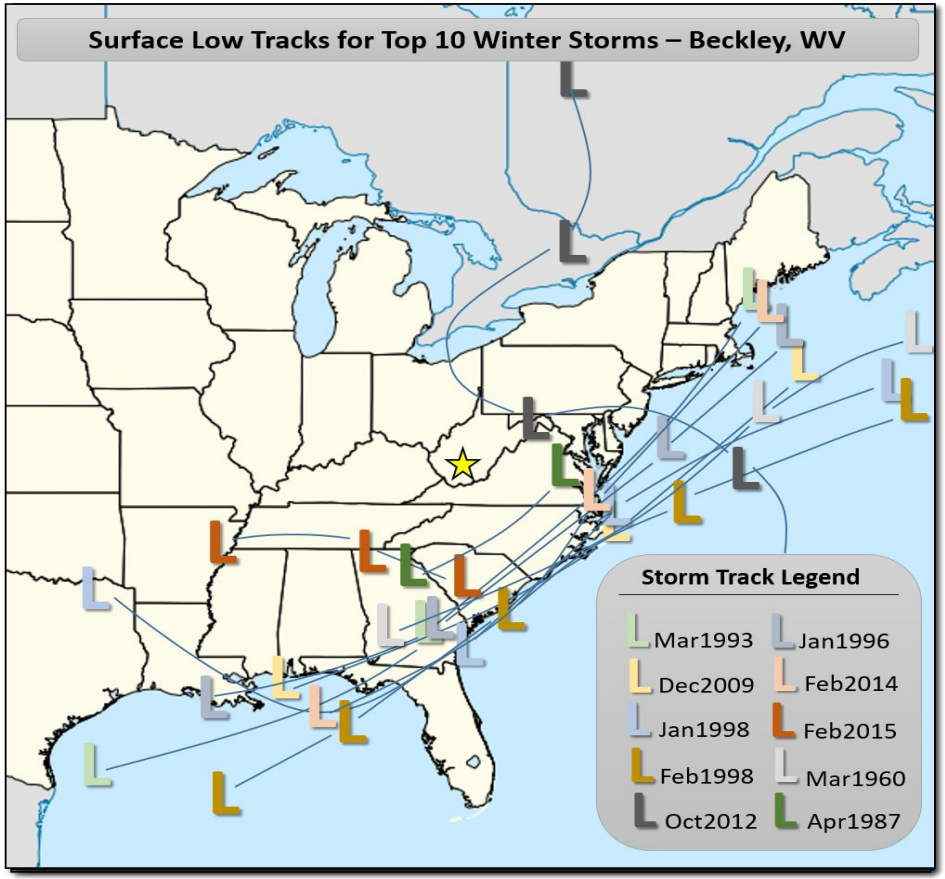
- A Look Back at Last Winter?
  - Overall trends
  - Memorable storms

- How to Properly Observe and Report Winter Weather
  - What to report
  - Properly measuring snow and ice
  - How to send us your reports

- Forecasting Winter Weather
  - Why is it so hard to forecast winter storms?
  - Finding winter weather forecasts

- NOAA Winter Outlook
  - What it means for our region
  - How to be prepared

Forecasting Winter Storms



The Key Ingredients for a Winter Storm

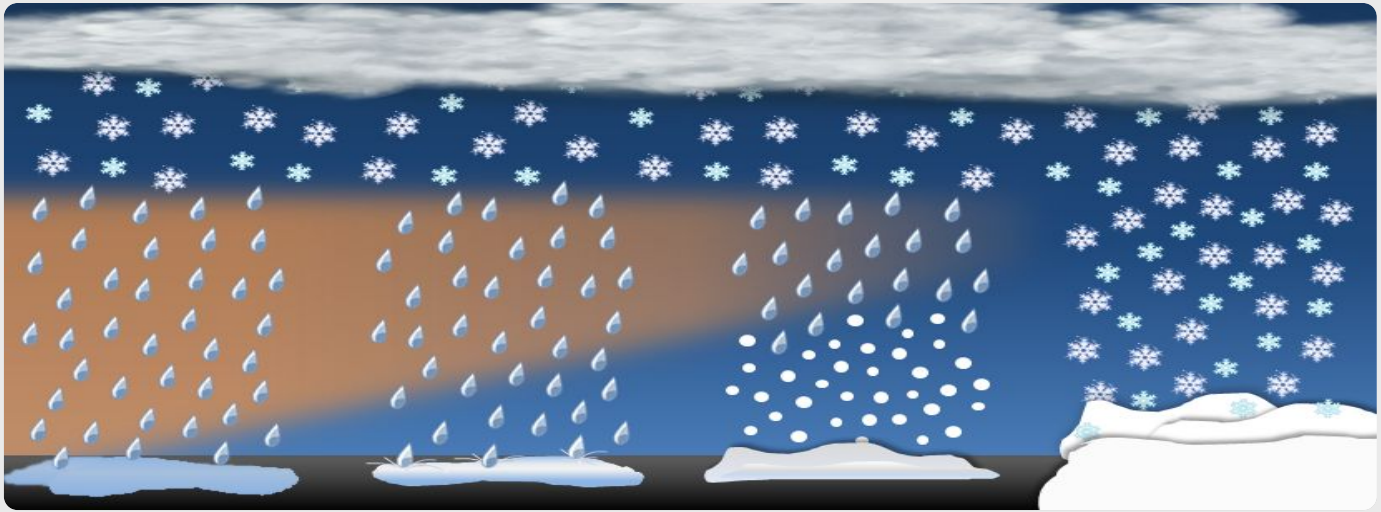
Cold Air: For snow and ice to form, the air must be below freezing in the clouds and near the ground.

Moisture: Sources are large bodies of water, such as the Atlantic Ocean and Gulf of Mexico.

Lift: Causes moisture to rise and form clouds and precipitation.

The surface low track is very important and often determines "who gets what" as far as precipitation type and amount!

Forecasting Winter Storms



Snow falls out of clouds into cold air aloft and…

…melts to rain in a deep layer of warm air that extends down to the surface.

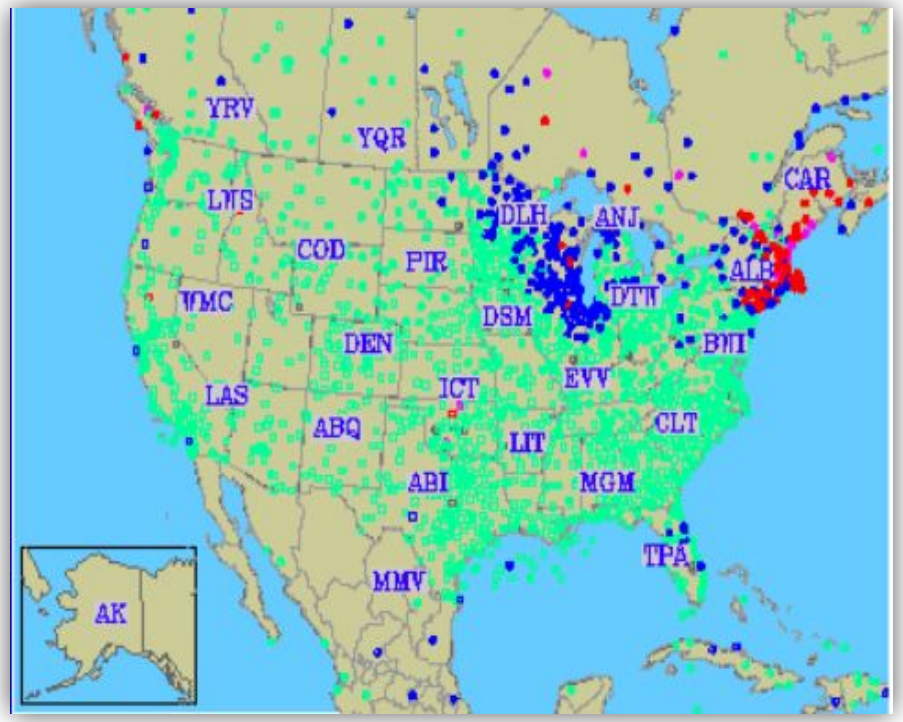
…melts to rain in a warm layer aloft, then freezes into glaze ice upon contact with cold surfaces.

…melts in a warm layer aloft, then refreezes into ice pellets in a layer of cold air above the surface.

…remains snow in the absence of any warm layer of air aloft.

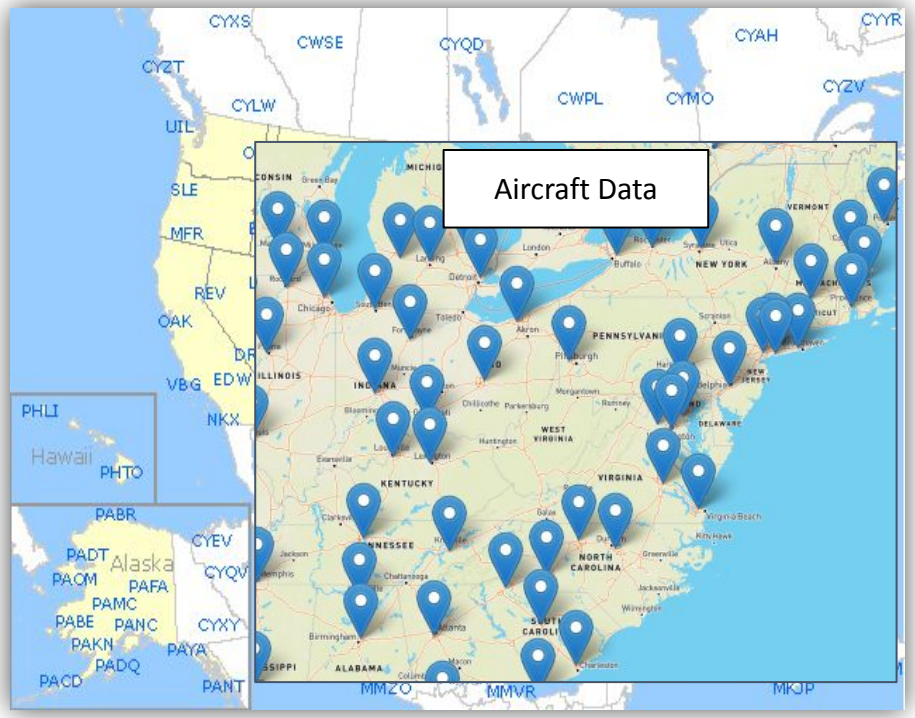
Forecasting Winter Storms

Surface Observation Locations



We have a pretty good handle on what's going on at the surface.

Upper Air Balloon Launch Locations



Above the surface, however, observations are rather sparse.

Forecasting Winter Storms

Forecasting Snow Amount is THE Hardest Thing We Do!

We have to get the temperature correct - at the surface and above the surface!

We have to get the amount of liquid that is going to fall right. Rainfall amount (liquid equivalent) is the second hardest thing we do!

wet
vs
dry

Finally, we have to get the snow to liquid ratio correct.

If we get any of this wrong - and we will - then the snowfall forecast will be different then our forecast. That's why we like to use ranges!

Forecasting Winter Storms

Know the Terminology

WINTER STORM WATCH

Significant winter weather is possible

Monitor the latest forecast and be prepared!

WINTER STORM WARNING

Severe winter weather is occurring/imminent

Take necessary precautions and avoid travel!

WINTER WEATHER ADVISORY

Expect some travel difficulties

Exercise caution, especially if you must travel!

Snow Squall Warnings

Snow Squall Warning Criteria

- Snow squalls reducing the visibility to 1/4 statute miles or less,
- AND sub-freezing ambient road temperatures or plunging temperatures sufficient to produce flash freezes,
- AND gusty winds and blowing snow.

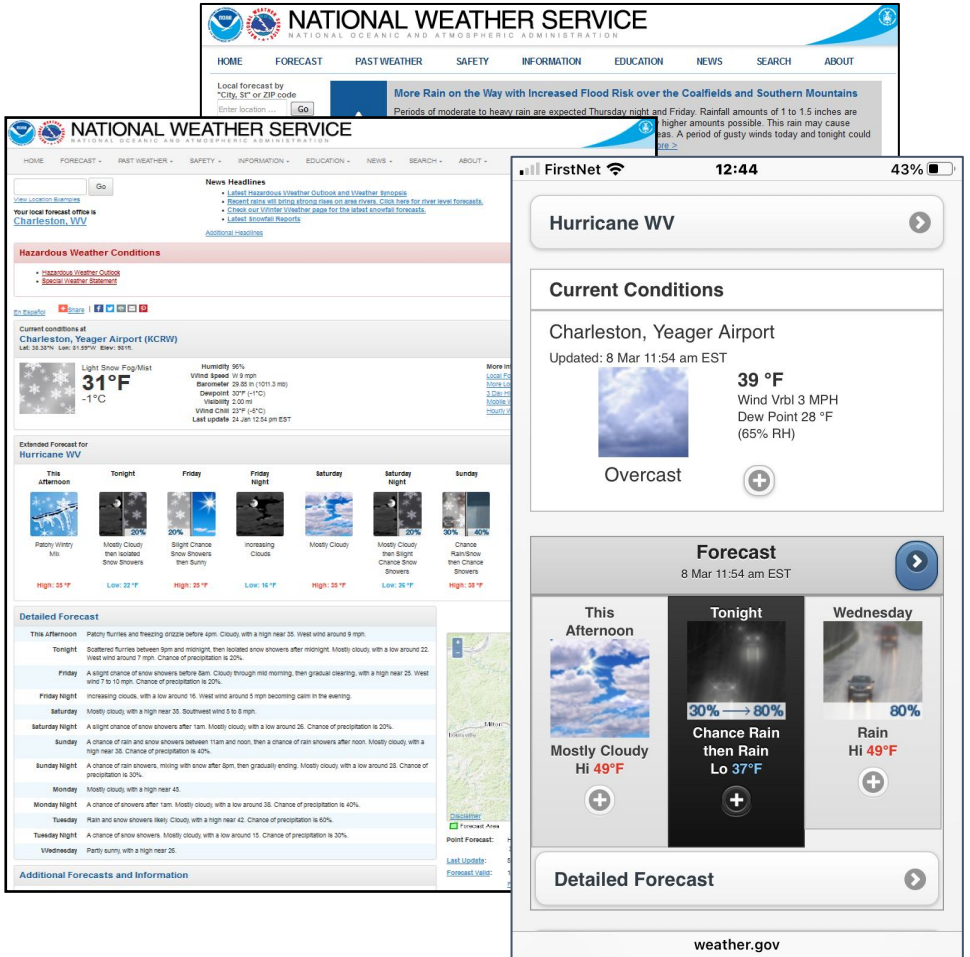
SNOW SQUALL WARNINGS WILL ALERT ON CELL PHONES (WEA) THIS WINTER!

- WEA alerting will be reserved to when squalls target interstates and main highways.

Tools for Winter Storm Situational Awareness

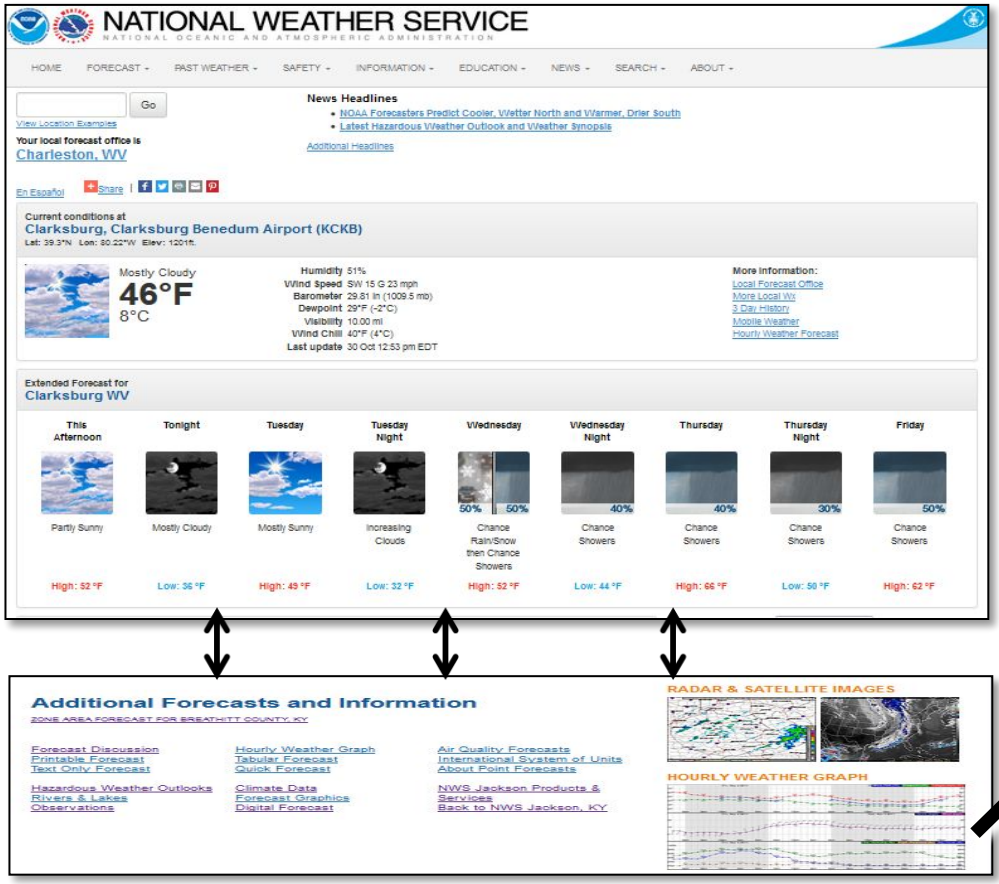
Getting Day-to-Day Weather Info

- ➔ weather.gov/charlestonwv
  - ◆ OR Weather.gov/[zipcode]
  - ◆ Graphics
  - ◆ “Point-and-Click” Forecast
- ➔ Mobile.weather.gov
- ➔ Facebook/Twitter
  - ◆ @NWSCharlestonWV
- ➔ NOAA Weather Radio
- ➔ Local TV/Radio
- ➔ Reliable Apps and Websites

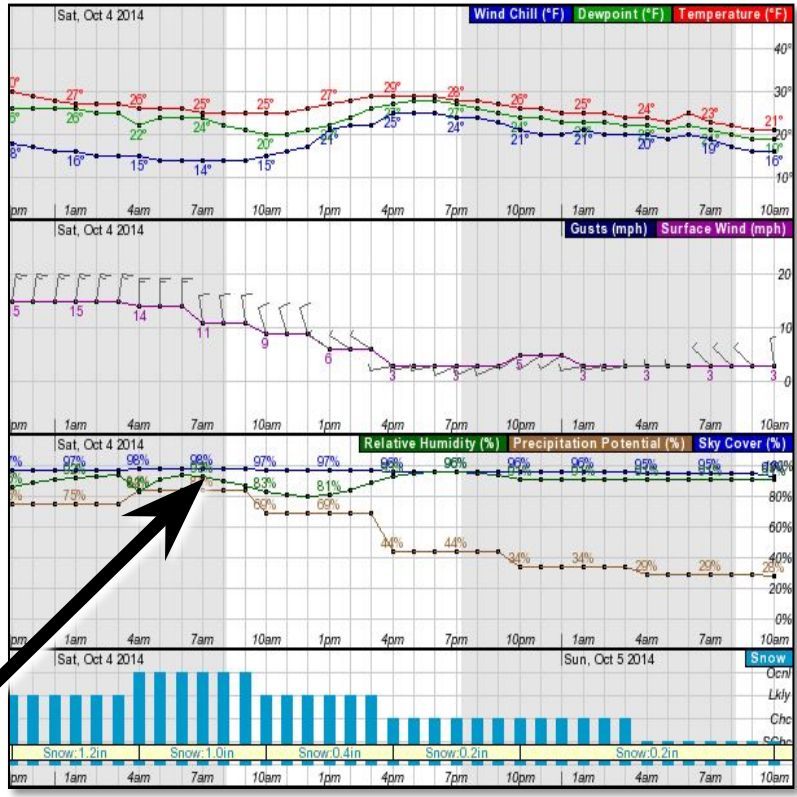


Tools for Winter Storm Situational Awareness

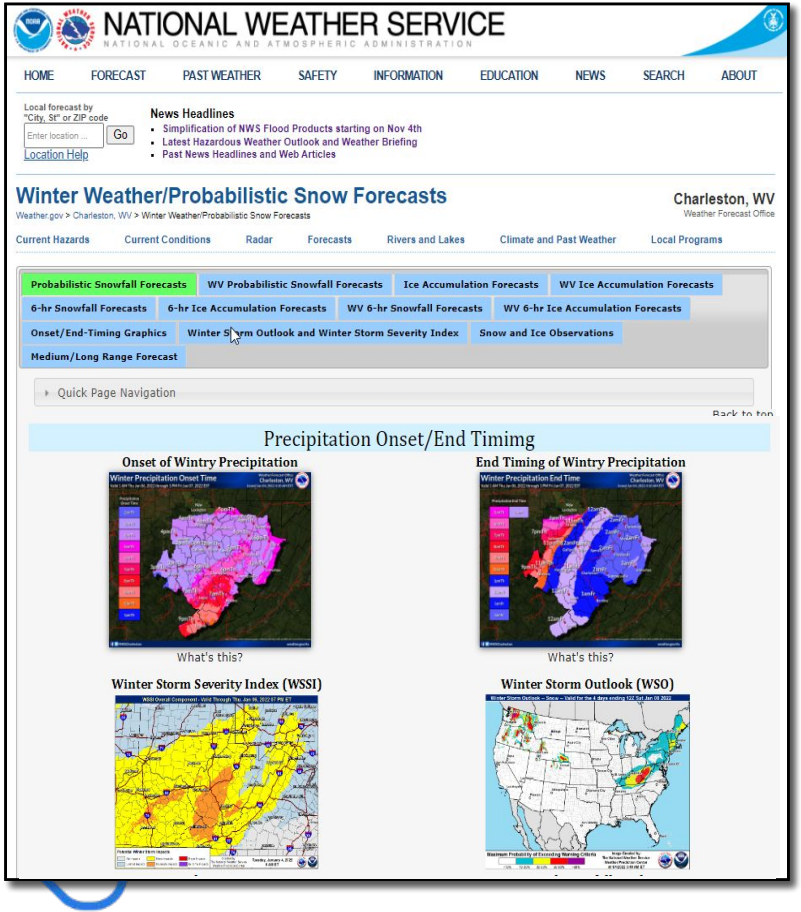
weather.gov/{your zip code}



Location Specific Hourly Weather



Winter Weather Page



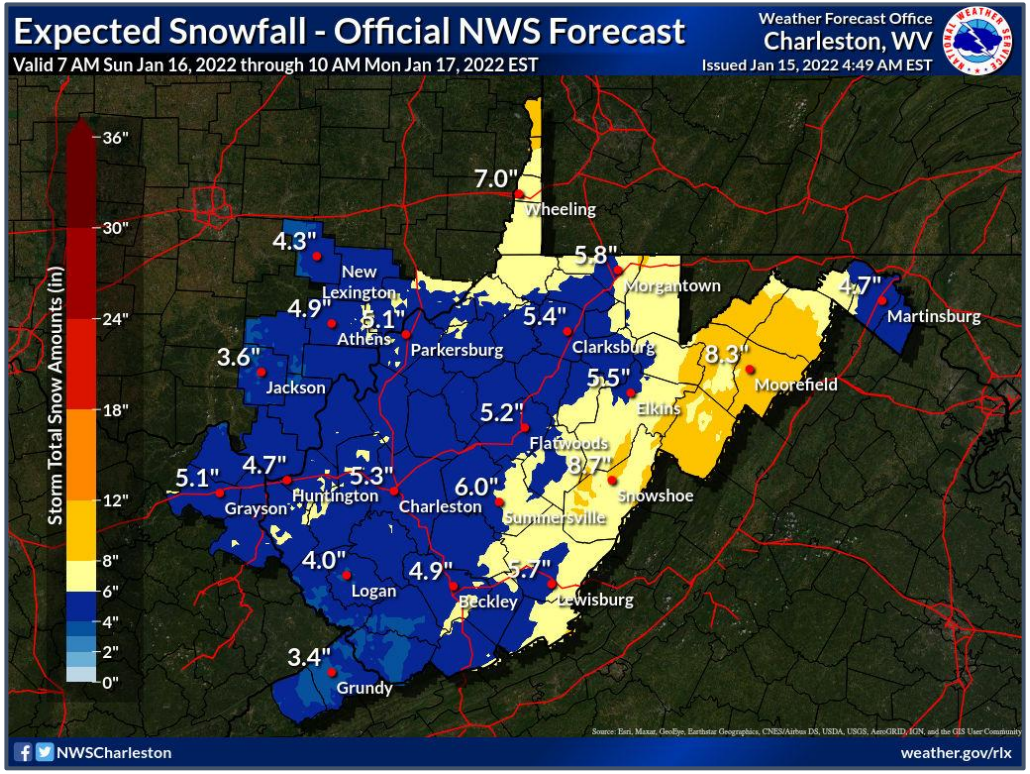
- Comprehensive winter weather forecast information can be found by looking for the icon on you local NWS office's webpage.

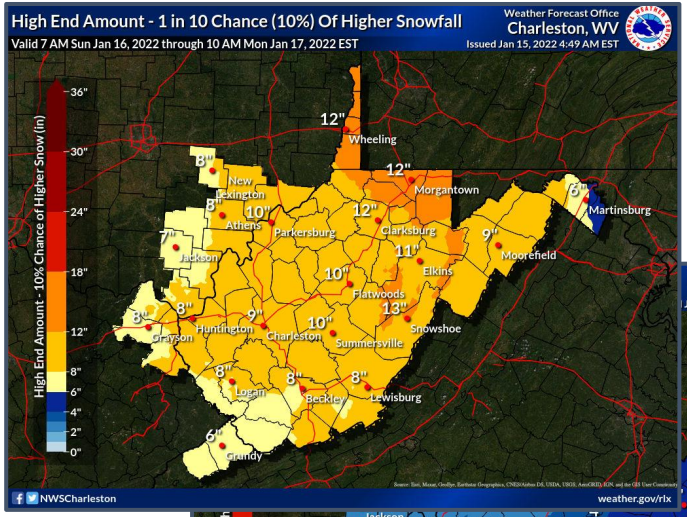
- Winter weather information for the NWS Charleston, WV forecast area and statewide graphics for West Virginia can be found at www.weather.gov/rlx/winter

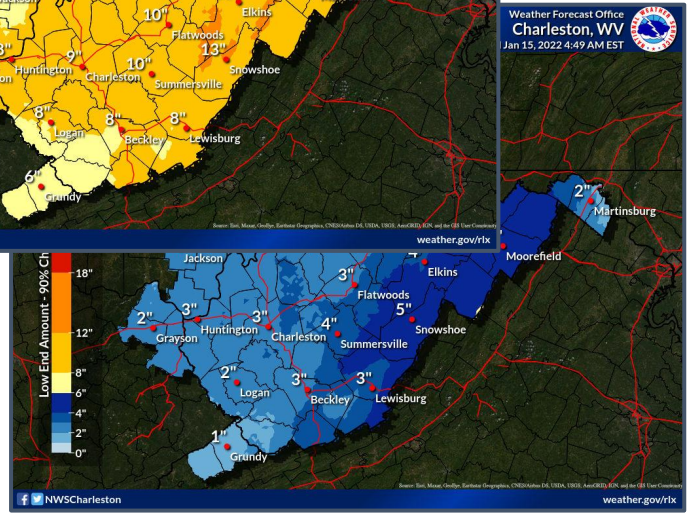
Probabilistic Snowfall Forecasts

www.weather.gov/rlx/winter

Given the difficulty in forecasting snowfall amounts, potential “worst case” and “best case” scenarios are given to assist with planning and response activities. When the gap between “best case” and “worst case” is large, confidence is low.



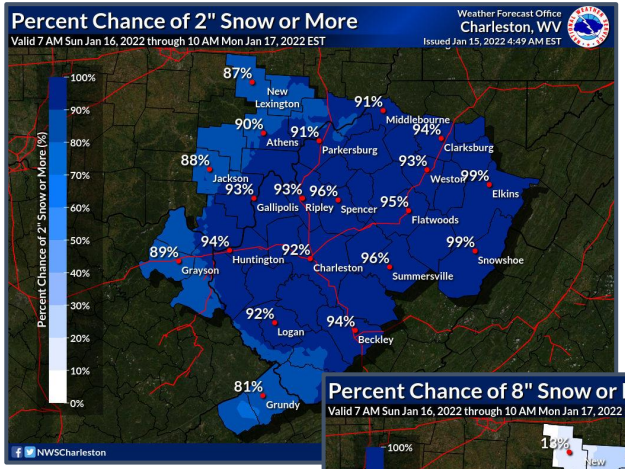


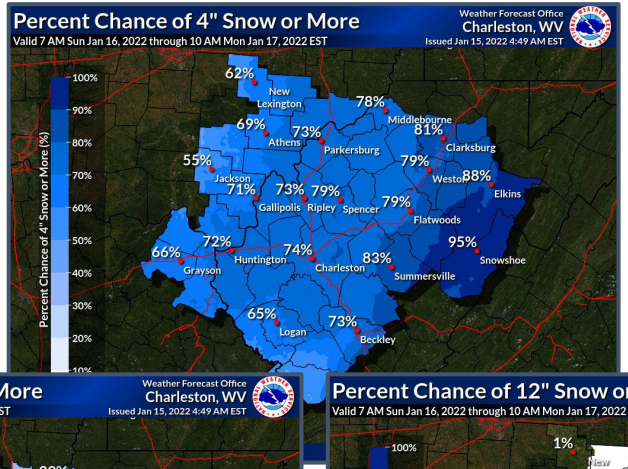


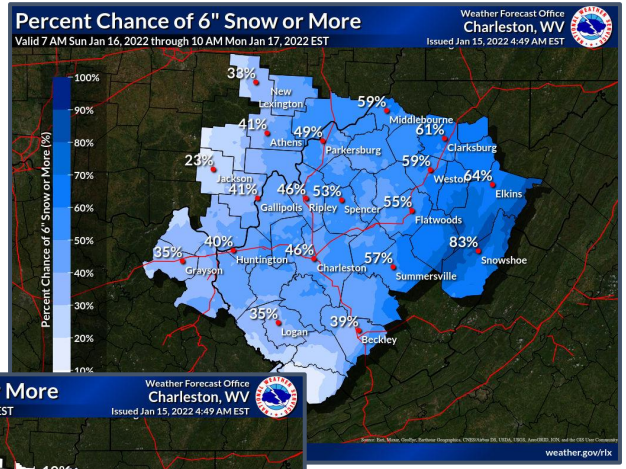
Probabilistic Snowfall Forecasts

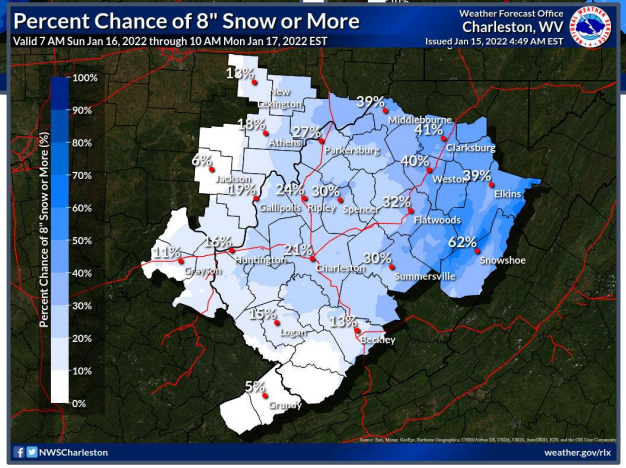
www.weather.gov/rlx/winter

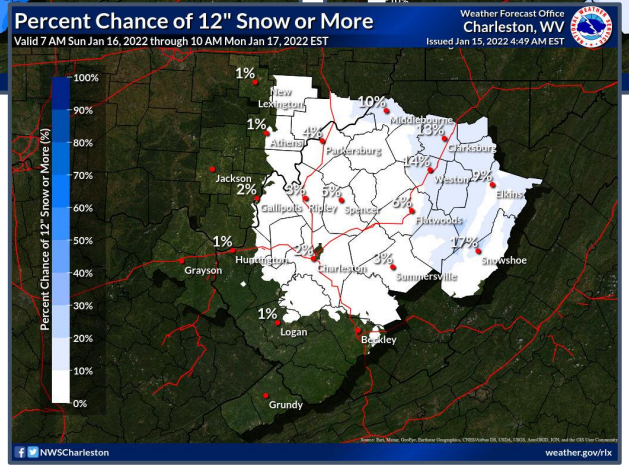
The probability of reaching/exceeding certain thresholds can also be found on our winter weather page.





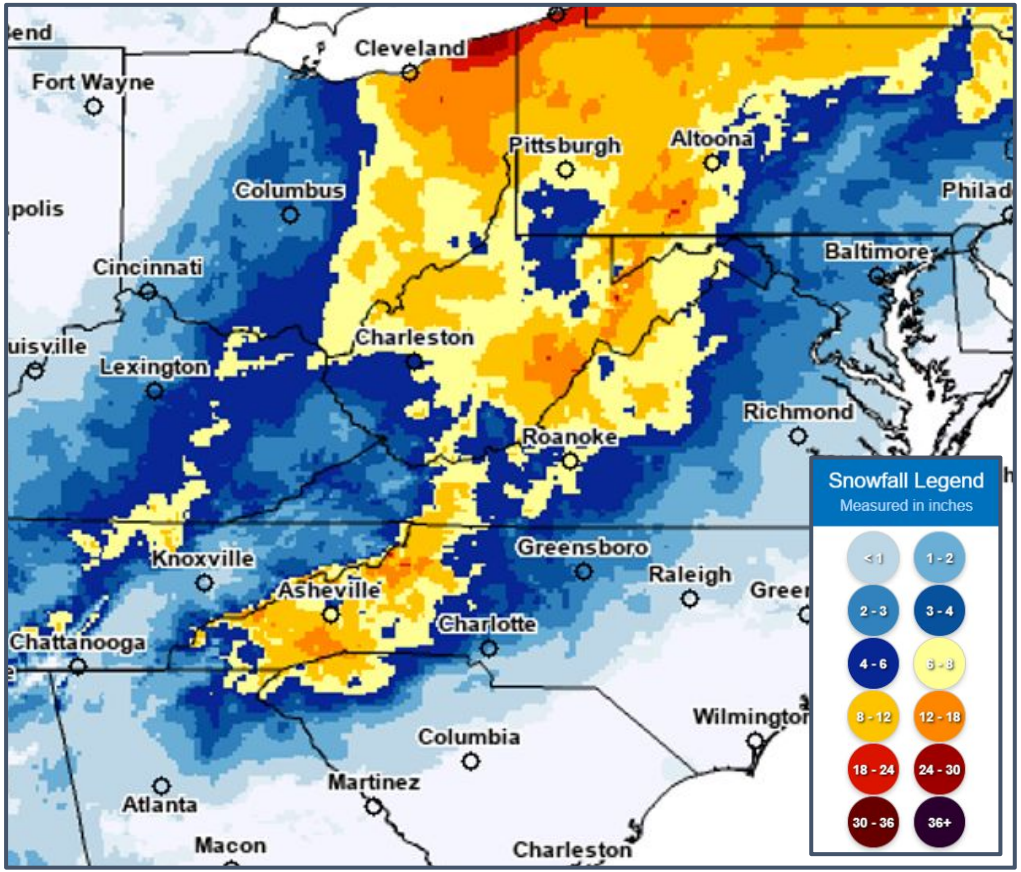






Probabilistic Snowfall Forecasts

Here's the final snowfall totals - January 16-17, 2022



Parkersburg

- Forecast- 5.1"
- Worst Case- 10"
- Final Total- 10.3"

Charleston

- Forecast- 5.3"
- Worst Case- 9"
- Final Total- 6.0"

Morgantown

- Forecast- 5.8"
- Worst Case- 12"
- Best Case- 3"
- Final Total- 3.0"

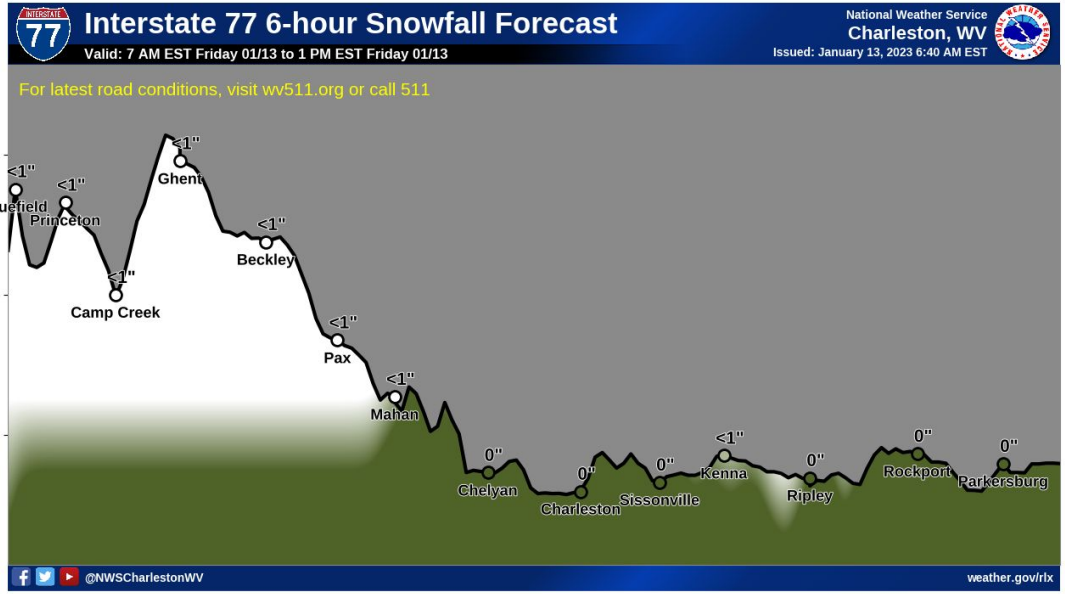
West Virginia Highway Forecast Profiles

Probabilistic Snowfall Forecasts | WV Probabilistic Snowfall Forecasts | Ice Accumulation Forecasts | WV Ice Accumulation Forecasts

6-hr Snowfall Forecasts | 6-hr Ice Accumulation Forecasts | WV 6-hr Snowfall Forecasts | WV 6-hr Ice Accumulation Forecasts

Onset/End-Timing Graphics | Winter Storm Outlook and Winter Storm Severity Index | Snow and Ice Observations | **WV Highway Snow**

WV Highway Ice | Medium/Long Range Forecast



Newly added is highway snow/ice forecast profiles for several Interstates and US Highways

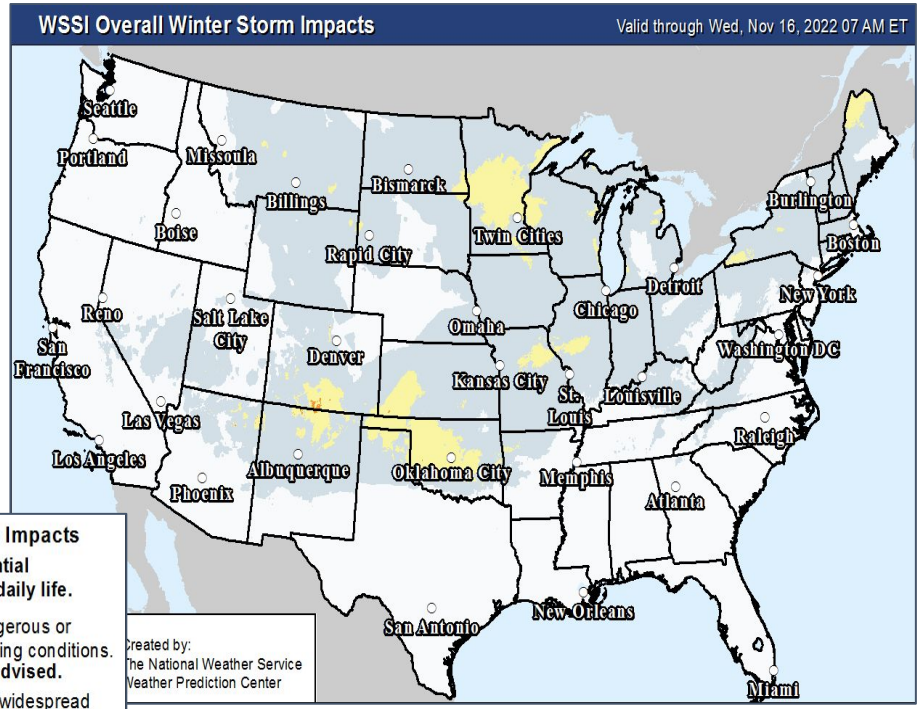
- Interstate 64 — Huntington to White Sulphur Springs
- Interstate 68 — Morgantown to Hazelton
- Interstate 77 — Bluefield to Parkersburg
- Interstate 79 — Charleston to Morgantown
- Interstate 81 — Ridgeway to Marlowe

- US Route 33 — Ravenswood to High Knob
- US Route 50 — Parkersburg to Capon Bridge
- US Route 219 — Rich Creek to Silver Lake

Winter Storm Severity Index

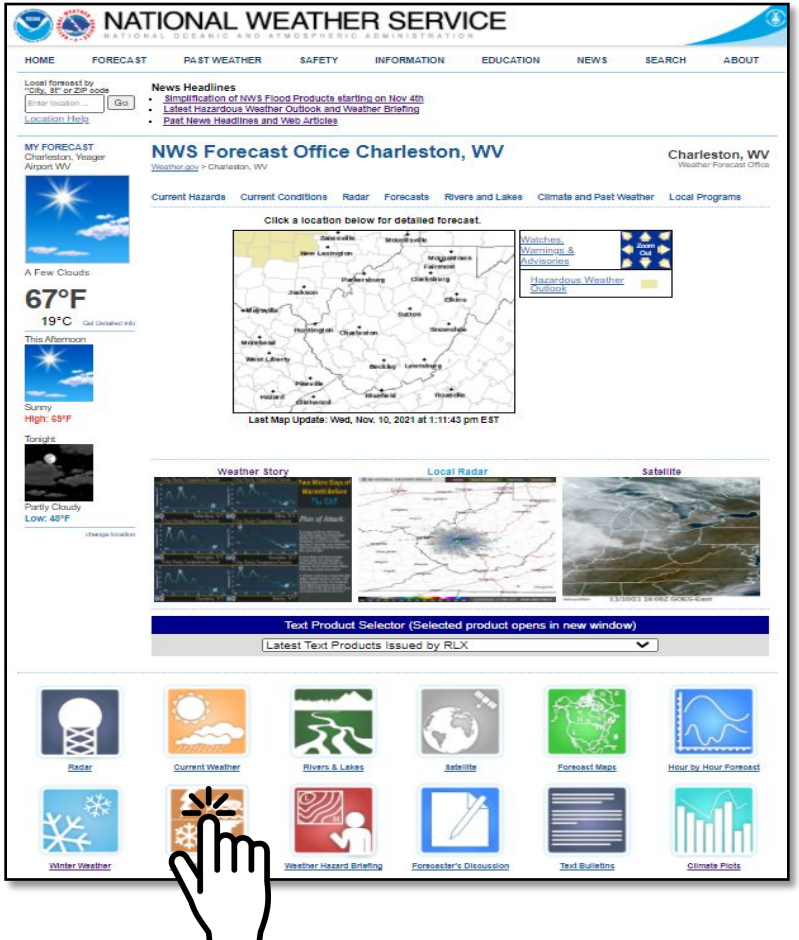
www.wpc.ncep.noaa.gov/wwd/wssi/wssi.php?id=RLX

- Provides winter storm impact information out to 72 hours.
- Includes meteorological and non-meteorological factors and factors in differences in regional susceptibility.
  - Snow Load (weight of snow)
  - Snow Amount
  - Ice Accumulation
  - Ground Blizzard
  - Flash Freeze (during and after precipitation)
  - Blowing Snow
- Experimental Probabilistic and rolling 24 hour period options are also available.



Winter Weather Area	Minor Impacts	Moderate Impacts	Major Impacts	Extreme Impacts
Expect winter weather. • Winter driving conditions. **Drive carefully.**	Expect a few inconveniences to daily life. • Winter driving conditions. **Use Caution while driving.**	Expect disruptions to daily life. • Hazardous driving conditions. **Use extra caution while driving.** • Closures and disruptions to infrastructure may occur.	Expect considerable disruptions to daily life. • Dangerous or impossible driving conditions. **Avoid travel if possible.** • Widespread closures and disruptions to infrastructure may occur.	Expect substantial disruptions to daily life. • Extremely dangerous or impossible driving conditions. **Travel is not advised.** • Extensive and widespread closures and disruptions to infrastructure may occur. • Life-saving actions may be needed.

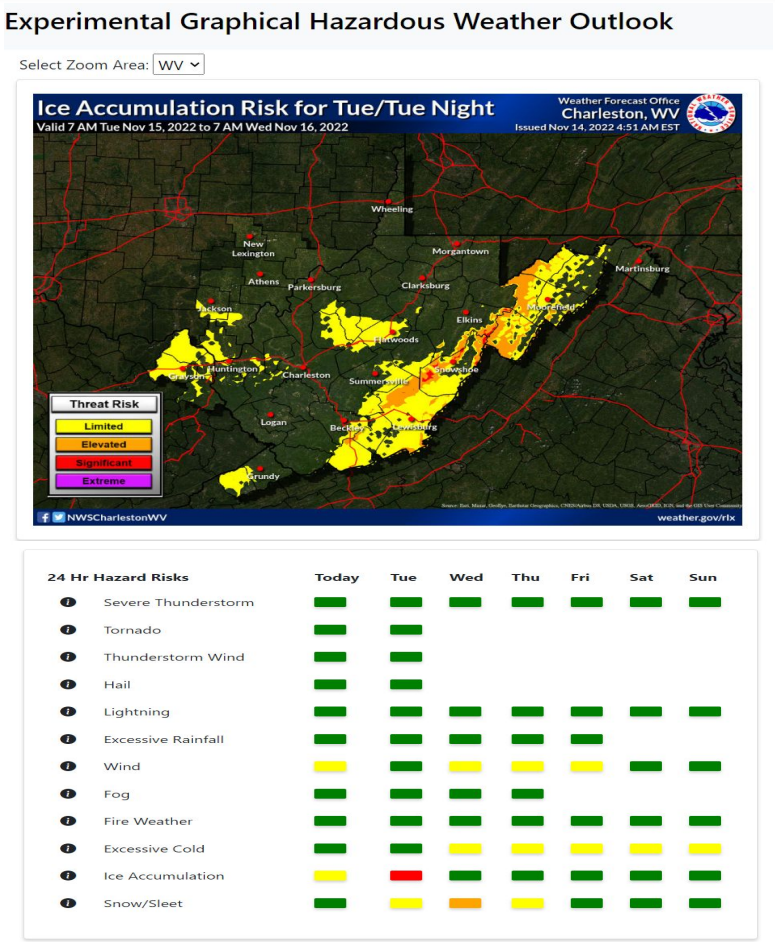
Graphical Hazardous Weather Outlook



- Graphical Hazardous Weather Outlook can be found by looking for the  icon on your local NWS office's webpage.

- Or go to www.weather.gov/erh/ghwo?wfo=rlx

Graphical Hazardous Weather Outlook



- Quick way to get briefed on what weather hazards are in the forecast over the next week
- Change the hazard graphic map by clicking on the “chicklet” icon in the hazard matrix.
- Includes statewide graphics by changing the “Select Zoom Area” dropdown
  - WV- www.weather.gov/erh/ghwo?wfo=rlx
  - OH- www.weather.gov/erh/ghwo?wfo=iln
  - KY- www.weather.gov/erh/ghwo?wfo=lmk

Presentation Outline

- A Look Back at Last Winter?
  - Overall trends
  - Memorable storms

- How to Properly Observe and Report Winter Weather
  - What to report
  - Properly measuring snow and ice
  - How to send us your reports

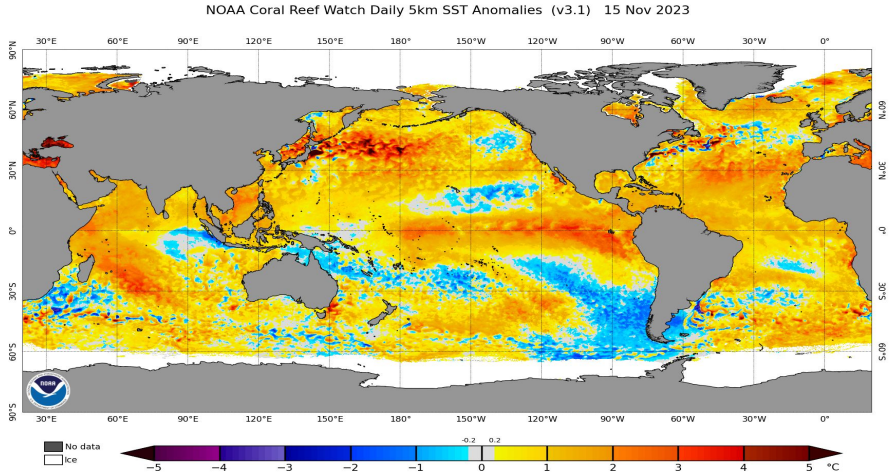
- Forecasting Winter Weather
  - Why is it so hard to forecast winter storms?
  - Finding winter weather forecasts

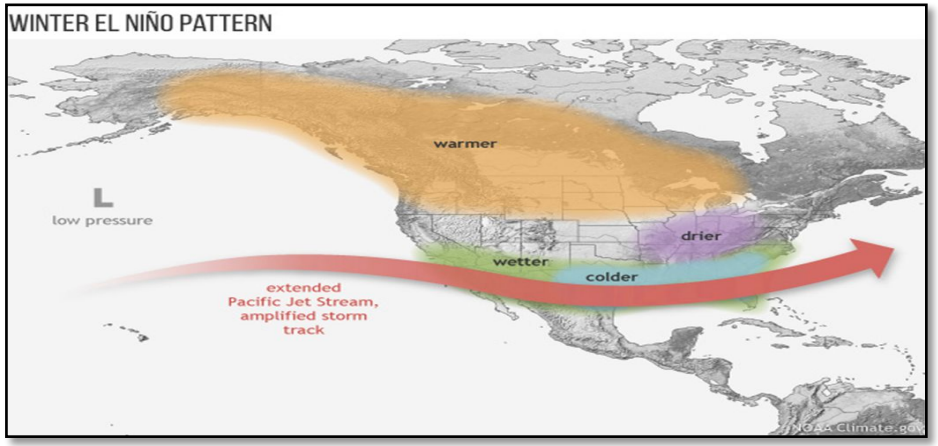
- NOAA Winter Outlook
  - What it means for our region
  - How to be prepared

Winter 2023/24 Outlook

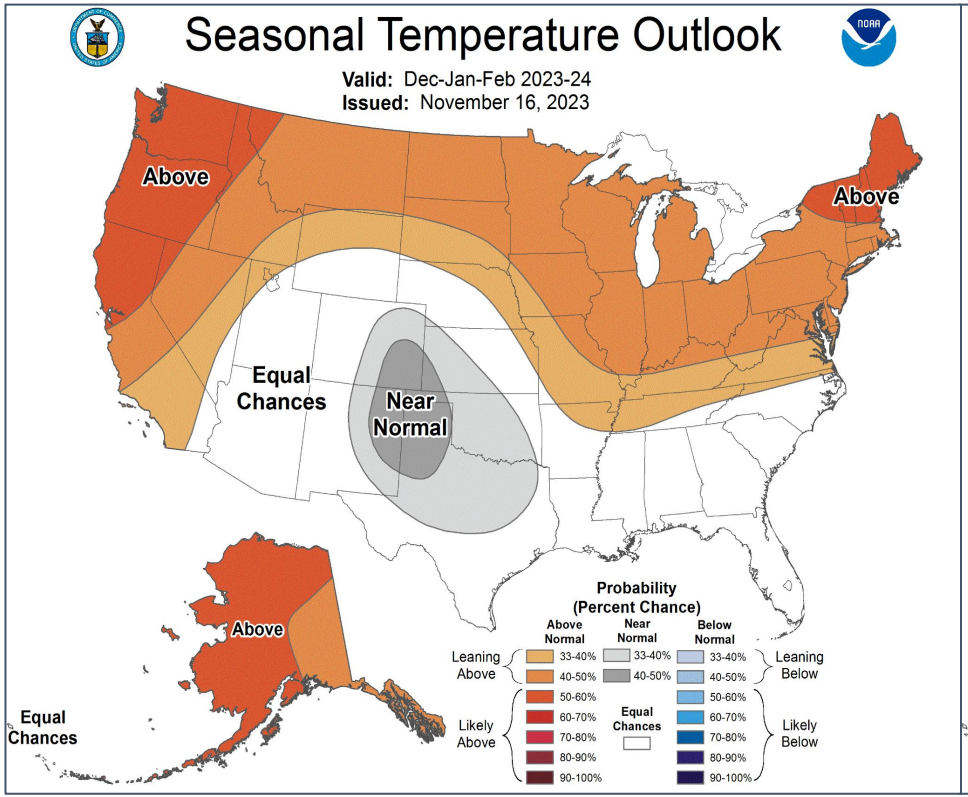
What is it REALLY?

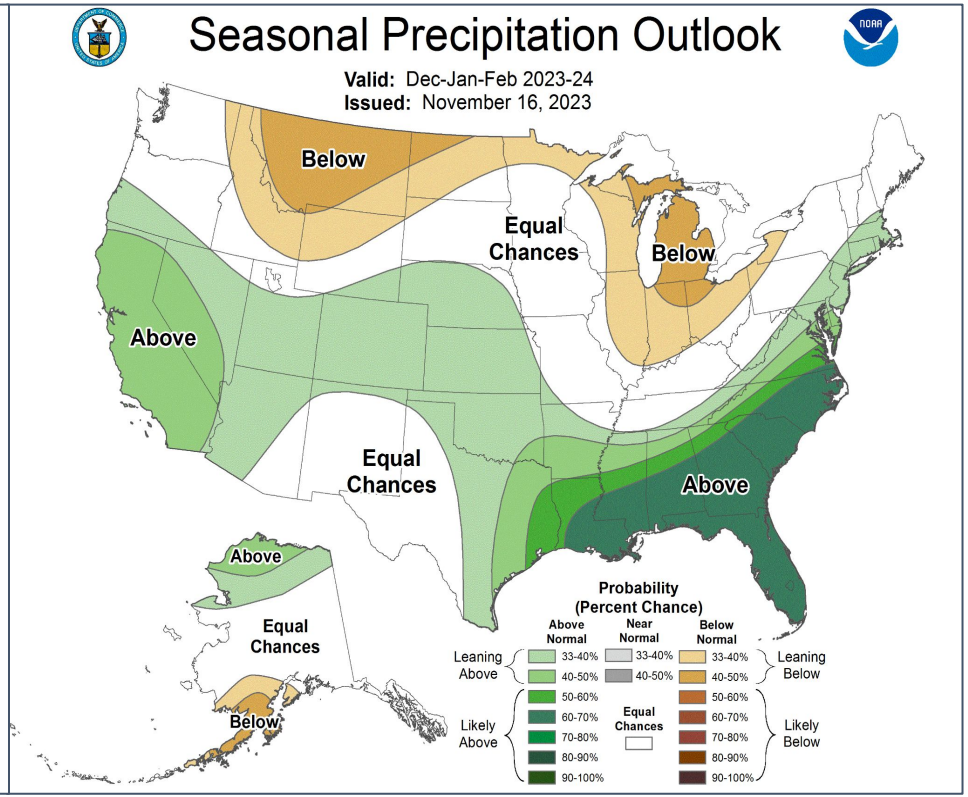
- **El Nino** is a pattern of abnormally warm water in the central Pacific Ocean which has long reaching impacts on the weather across the Northern Hemisphere.
- A **moderate to strong El Nino** is anticipated throughout the winter of 2023/24.
- A typical El Nino winter features a storm track that favors a drier than normal winter across the Ohio Valley with a wetter and colder than normal winter across the Deep South, Carolinas into Virginia.





Winter 2023/24 Outlook





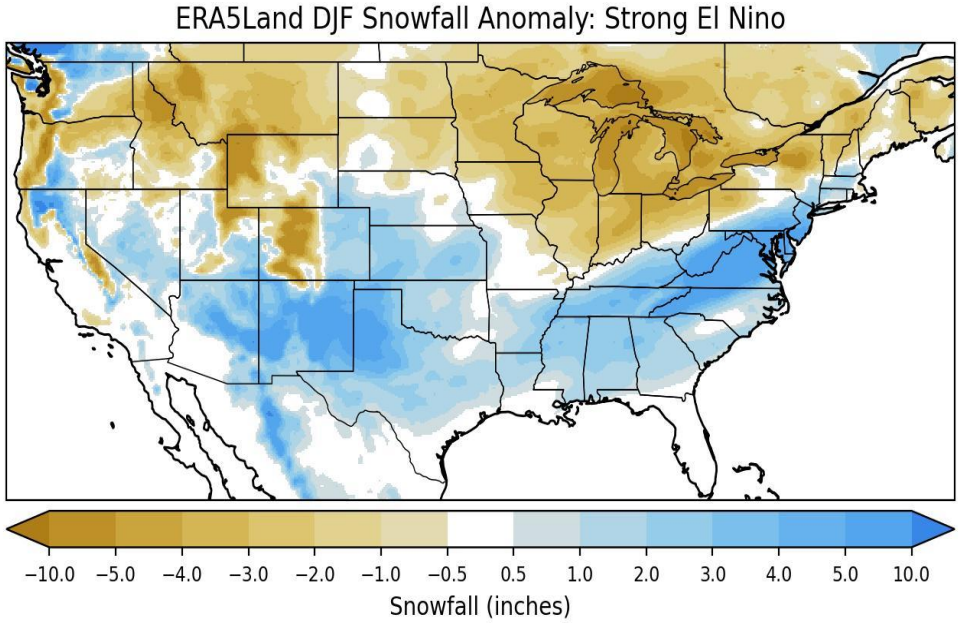
Winter 2023/24 Outlook

What About Snowfall?

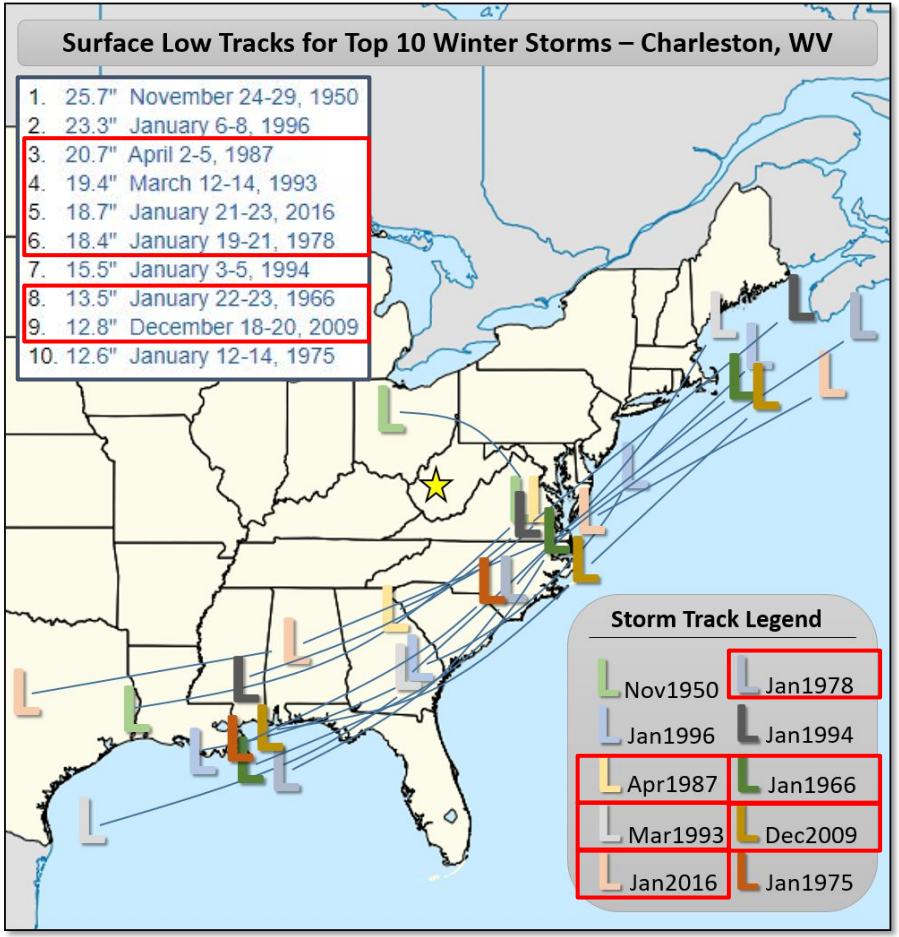
- Arctic outbreaks, ice storms and snowstorms are difficult to predict more than 1 to 2 weeks in advance. The frequency, number and intensity of these events cannot be predicted on a seasonal timescale.

- Taking all El Nino events and averaging them out, snowfall tends to be around average.

- For **strong El Ninos**, snowfall tends to run above average for most of the state.



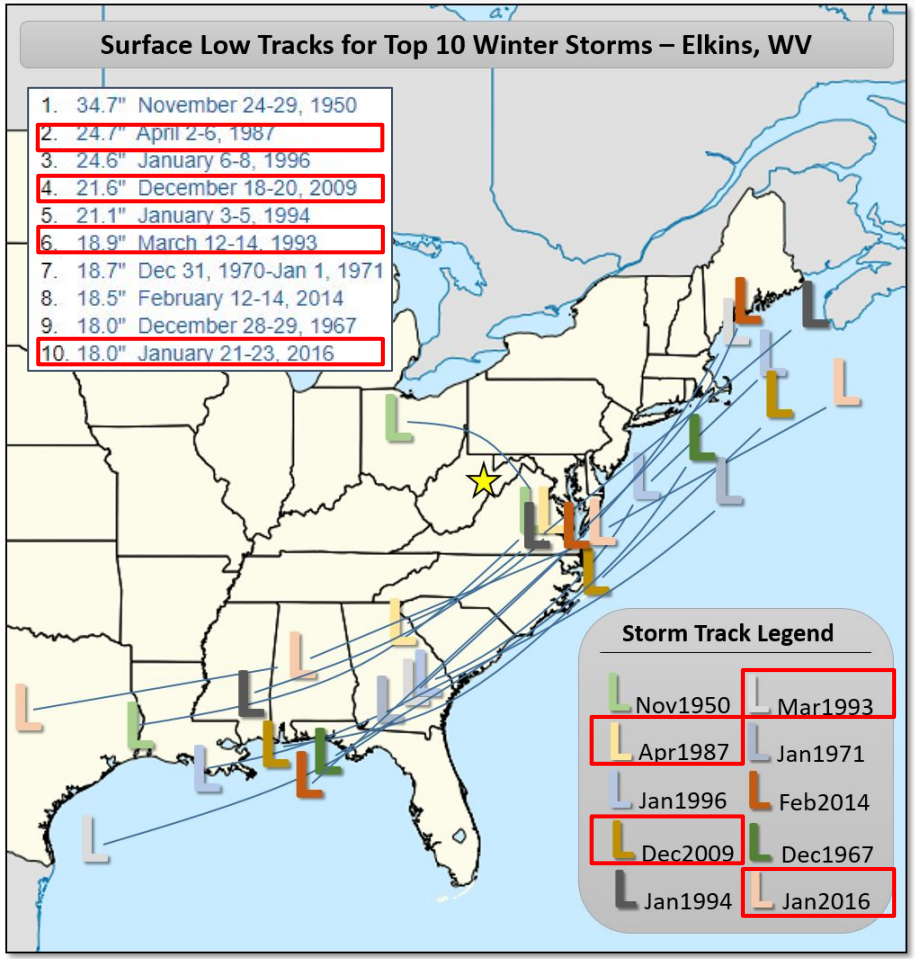
Winter 2023/24 Outlook



What About Snowfall?

- For the top 10 Snowstorms for Charleston,
  - **6 occurred during El Nino winters**
  - 1 occurred during ENSO Neutral winters
  - 3 occurred during a La Nina winter

Winter 2023/24 Outlook



What About Snowfall?

- For the top 10 Snowstorms for Elkins,
  - **4 occurred during El Nino winters**
  - 3 occurred during ENSO Neutral winters
  - 3 occurred during a La Nina winter

Winter Weather Safety

The #1 Best Thing You Can Do To Be Prepared – Build a Kit!

- **Water**, one gallon of water per person per day for at least three days
- **Food & medicine/prescriptions**, at least a three-day supply
- **Radio**, battery-powered or hand crank radio and a NOAA Weather Radio with tone alert and extra batteries for both
- **Flashlight and extra batteries**
- **First aid kit**
- **Whistle** to signal for help
- **Face mask** to help filter contaminated air and plastic sheeting and duct tape to shelter-in-place
- **Moist towelettes**, garbage bags and plastic ties for personal sanitation
- **Wrench or pliers** to turn off utilities
- **Manual can opener** for food
- **Local maps**
- **Cell phone** with chargers, inverter or solar charger

https://www.ready.gov/kit

Winter Weather Safety

Don't Forget Your Car!

https://www.ready.gov/car

Winter Weather Safety

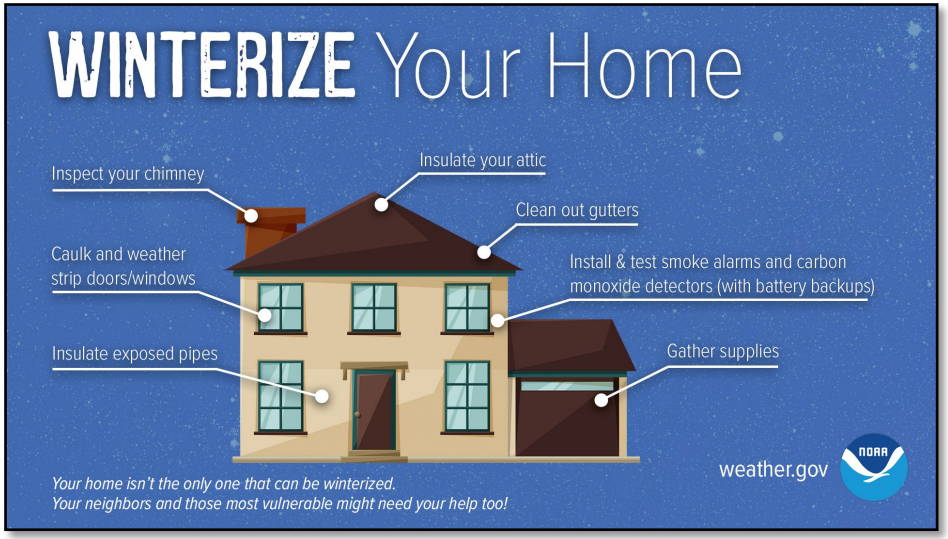
Winter Road Trip Safety

- Each year, more than 5,000 people are killed and more than 418,000 injured due to weather-related vehicle crashes.
- TAKE IT SLOW IN THE SNOW!
- If temperatures are near freezing, drive like you're on ice – you may be!
- Check the forecast and road conditions on the route between your home and your destination.

https://www.weather.gov/safety/winter-before

Winter Weather Safety

Other Considerations!



- Hypothermia occurs when your body temperature drops below 96ºF.
- If you or someone you know shows the above signs of hypothermia, get medical attention immediately.

- Inspect/clean your chimney
- Test out your backup generators, make sure they will start.
- Keep generators away from homes and garages

https://www.weather.gov/safety/cold