

February 3 - 4, 2022  
Complex Ice, Sleet & Snow Event  
NWS Albany - Part 2

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***Christina Speciale***  
***Wintre-MIX - May 22, 2023***  
***NWS Albany, NY***

# Outline

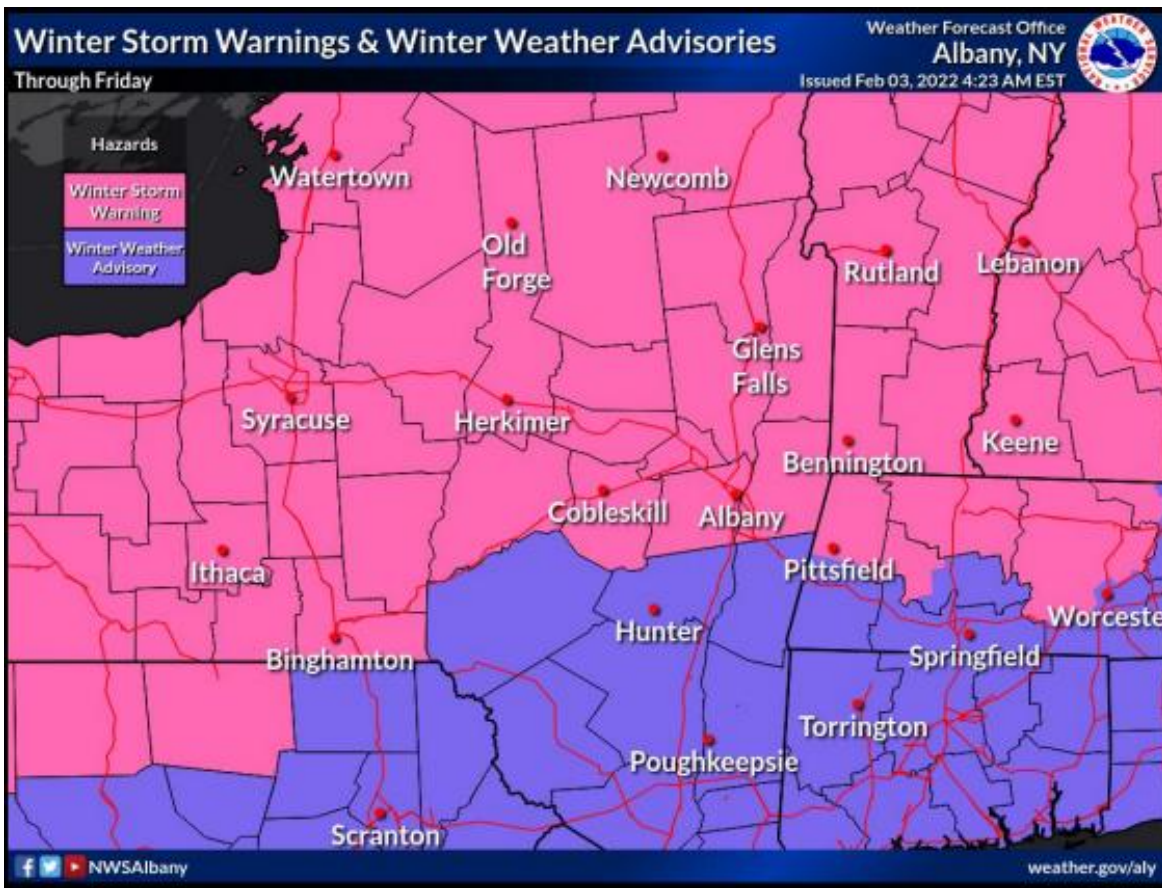
## Part I:

- Synoptic Overview including Large-Scale Anomalies
- Mesoscale/Sounding Analysis and Precipitation Type Challenges
- Observations

## Part II:

- Watch/Warning/Advisories Decision Challenges
- Discussion on the FRAM and forecasting ice accretion
- Impacts, Messaging & IDSS
- Partner Survey Results

# 3 Feb 2022 4 AM Forecast Headlines



**Winter Storm Warning:** Severe winter weather that could result in dangerous travel is expected or occurring.

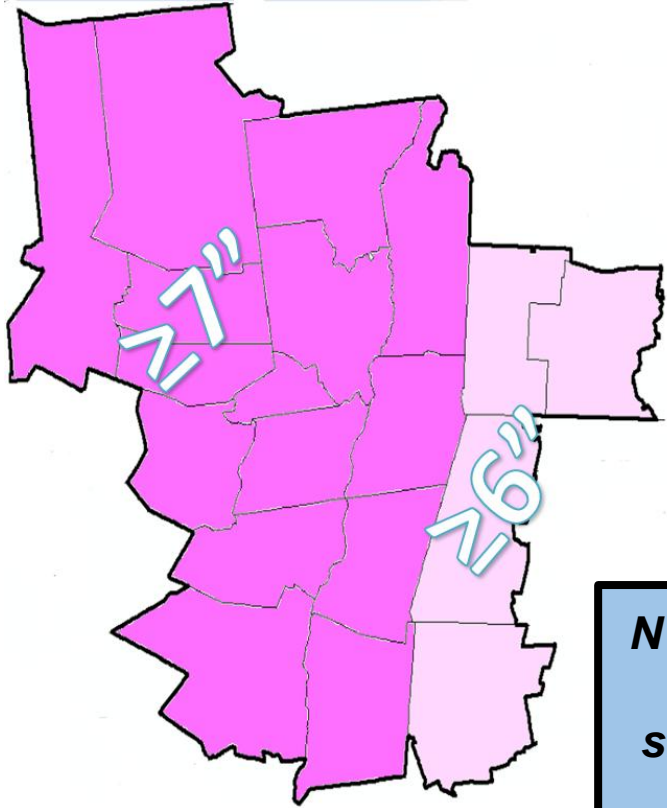
**Local criteria for snow (NY):**  
> 7" in 12h or > 9" in 24h or a combination of winter elements (sleet, snow and ice quantified)

**Winter Weather Advisory:** Snow, sleet, and/or freezing rain are expected to cause significant inconvenience. Walking and driving could be difficult.

**Local criteria for snow (NY):**  
4-7" in 12h

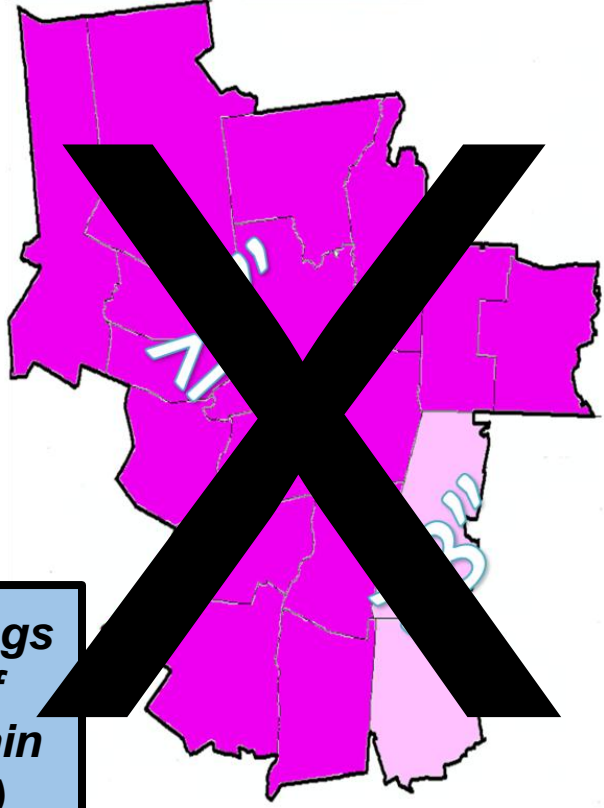
**Local criteria for ice:**  
trace to < 0.50" flat ice

# NWS Albany Winter Storm Warning Snowfall Criteria



12 Hour

*NWS can issue warnings for a combination of snow/sleet/freezing rain ("Maglaras Method")*



24 Hour

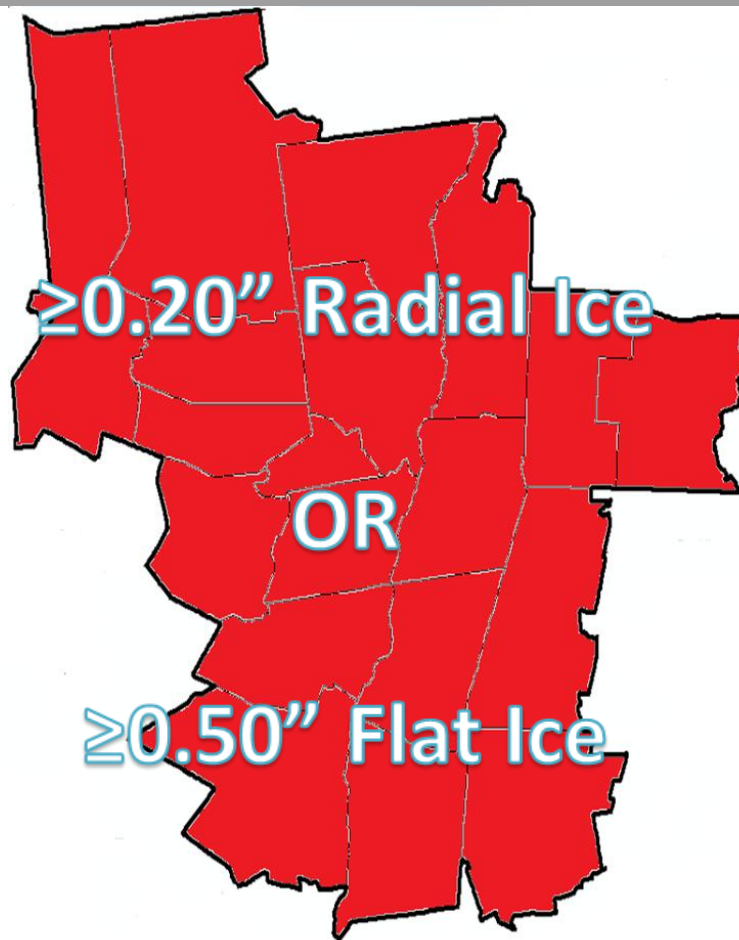
# NWS Albany Ice Storm Warning Criteria

To convert from  
“Flat Ice” to “Radial Ice”:  
***Flat Ice \* 0.4 = Radial Ice***

ASOS stations display  
ice accretion in METARs  
as flat ice so all NWS  
forecasts are shown as  
FLAT ice accretion

(NWS Directive 10-513)

KPOU 041151Z 01012G18KT 2 1/2SM BR  
SCT012 OVC022 M01/M03 A2994 RMK AO2  
FZRAE48 P0001 ***I1004***

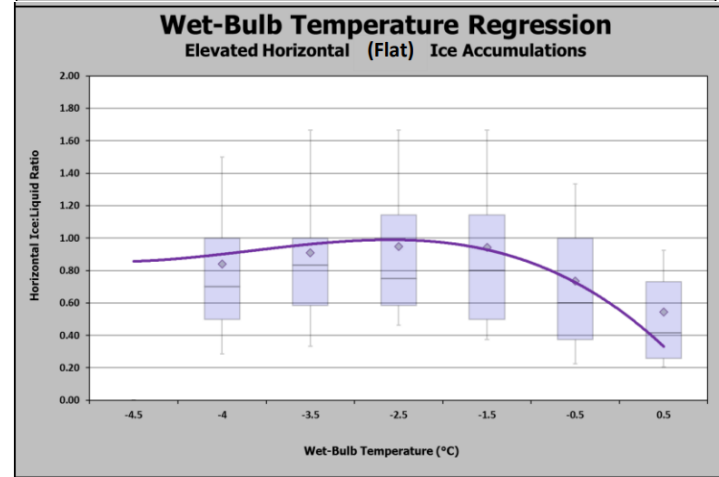
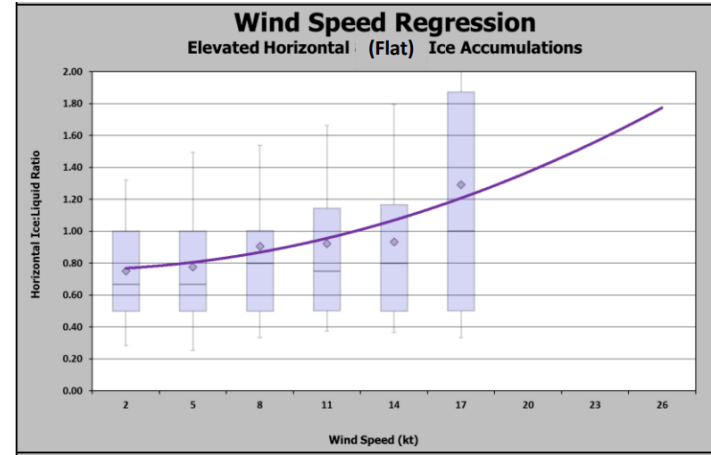
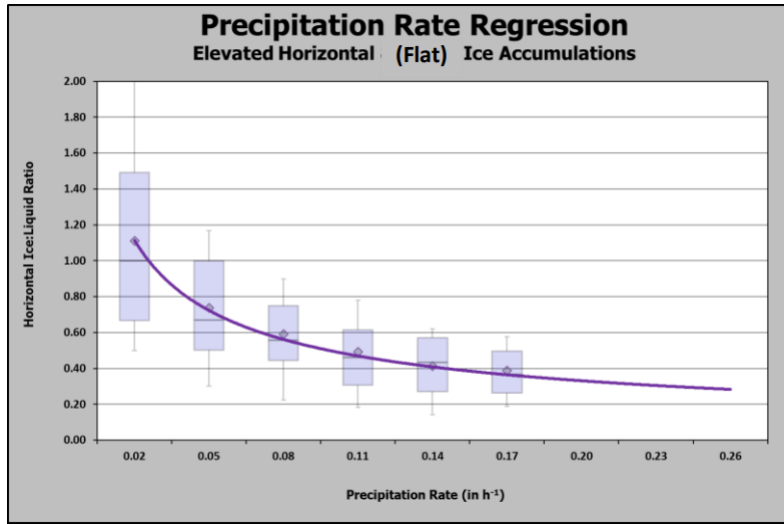


# P-Type Uncertainties

- *How far north would the warm nose get?*
- *How quickly would shallow subfreezing near-surface air drain southward down the Hudson Valley to result in a change from rain to freezing rain?*
- *How quickly would that subfreezing layer deepen, resulting in a change from freezing rain to sleet?*

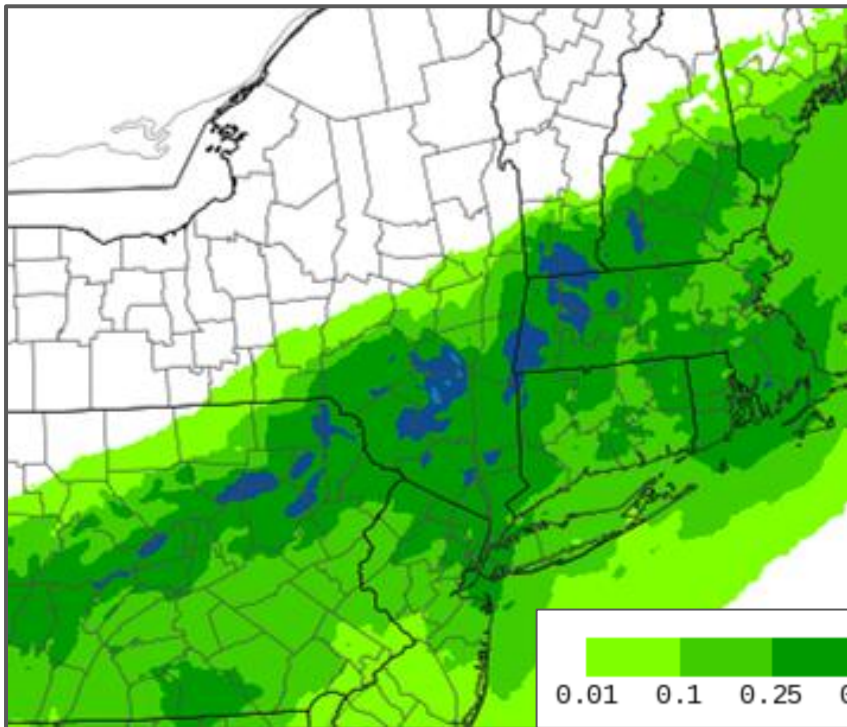
# Background - Freezing Rain Accumulation Model (FRAM)

- Developed by Sanders and Barjenbruch (2016)
- Predicts ice accretion using regression equations relating precip rate, wet bulb temp, and wind speed to ice to liquid ratio

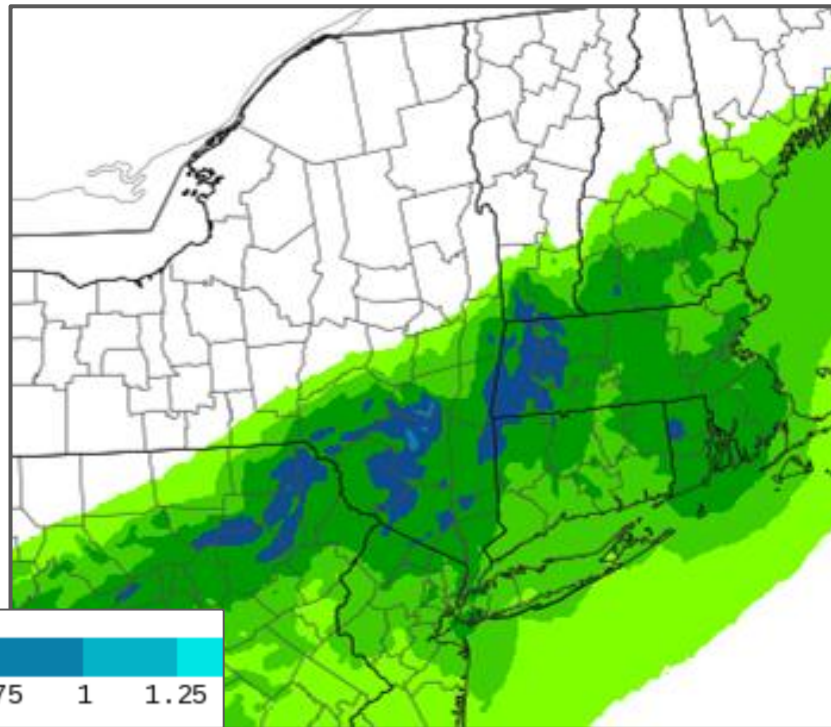


# HREF Mean Event Total FRAM Flat Ice Accretion

00Z 3 Feb Run



12Z 3 Feb Run

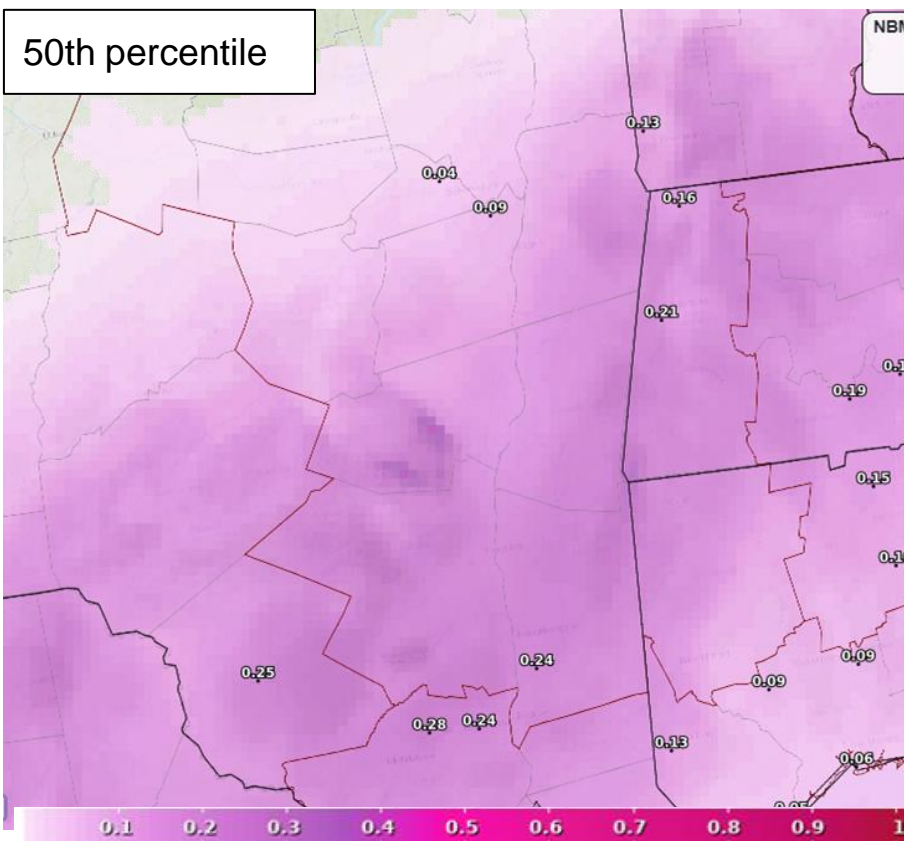


0.01 0.1 0.25 0.5 0.75 1 1.25

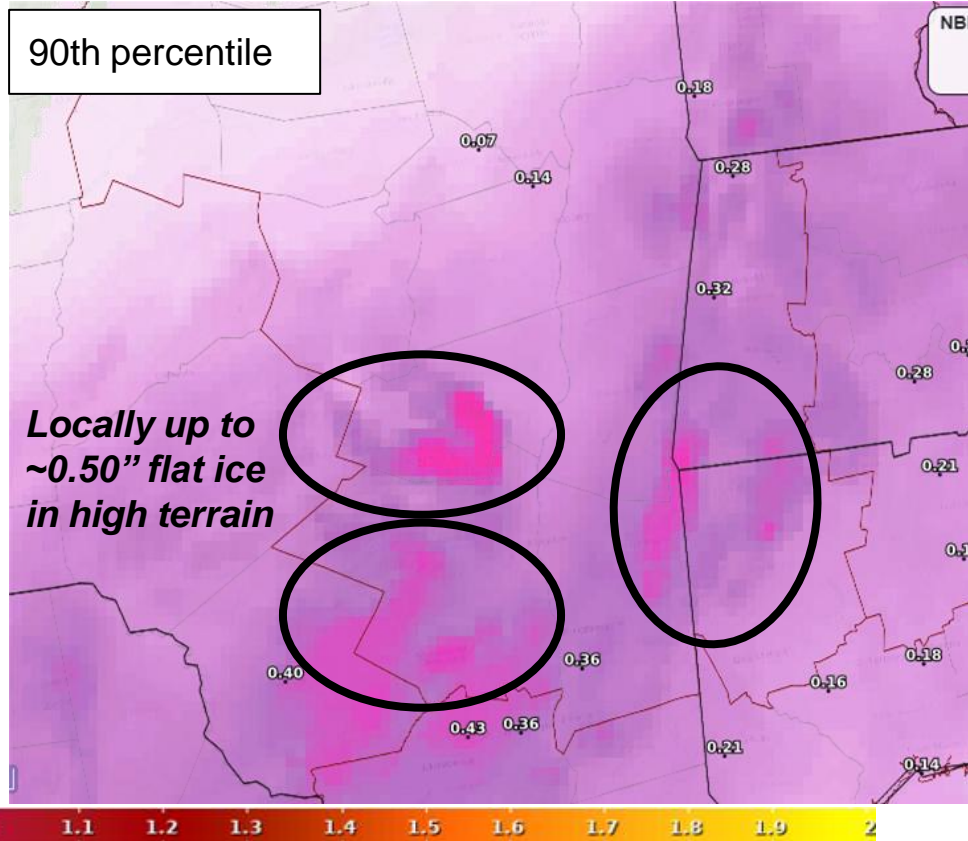


# NBM v4.0 Event Total FRAM Flat Ice Accretion

50th percentile



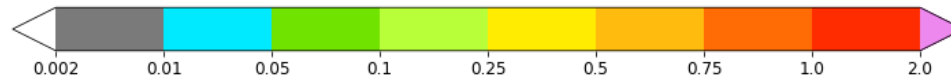
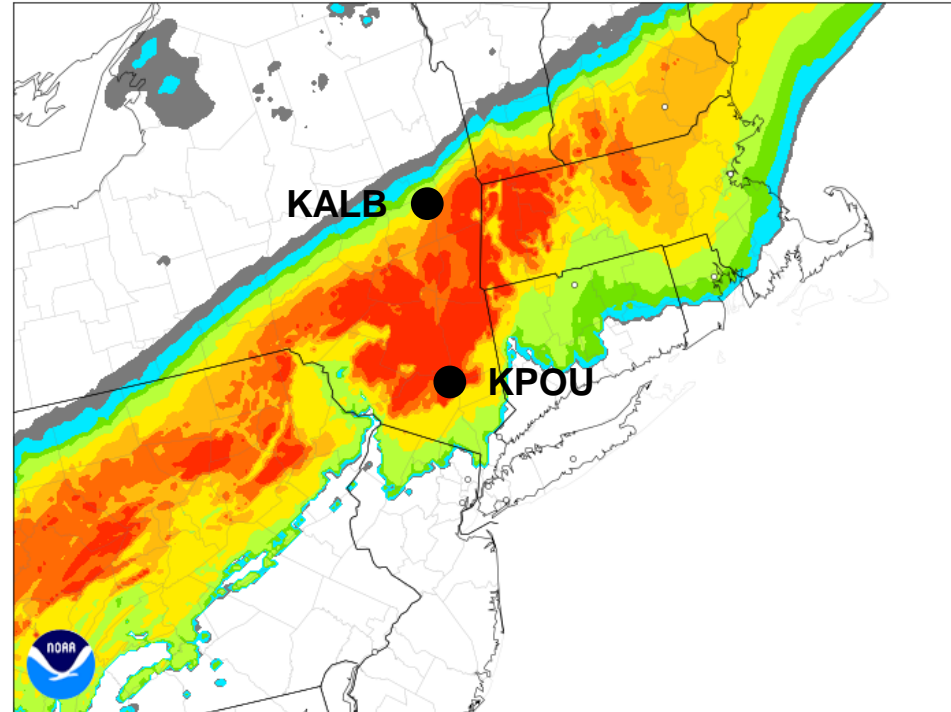
90th percentile



# 12Z 3 Feb HRRR Accumulated Freezing Rain

Run Total Freezing Rain (in, shaded)

HRRR-NCEP: 20220203 12 UTC  
Fcst Hr: 30, Valid Time 20220204 18 UTC



# Warning Decision

**Ice Storm Warning:** Issued when damaging accumulations of ice are expected. Downed trees and wires resulting in widespread power outages. Walking and driving extremely dangerous.

**Local criteria: 0.50" flat ice (0.20" radial ice)**

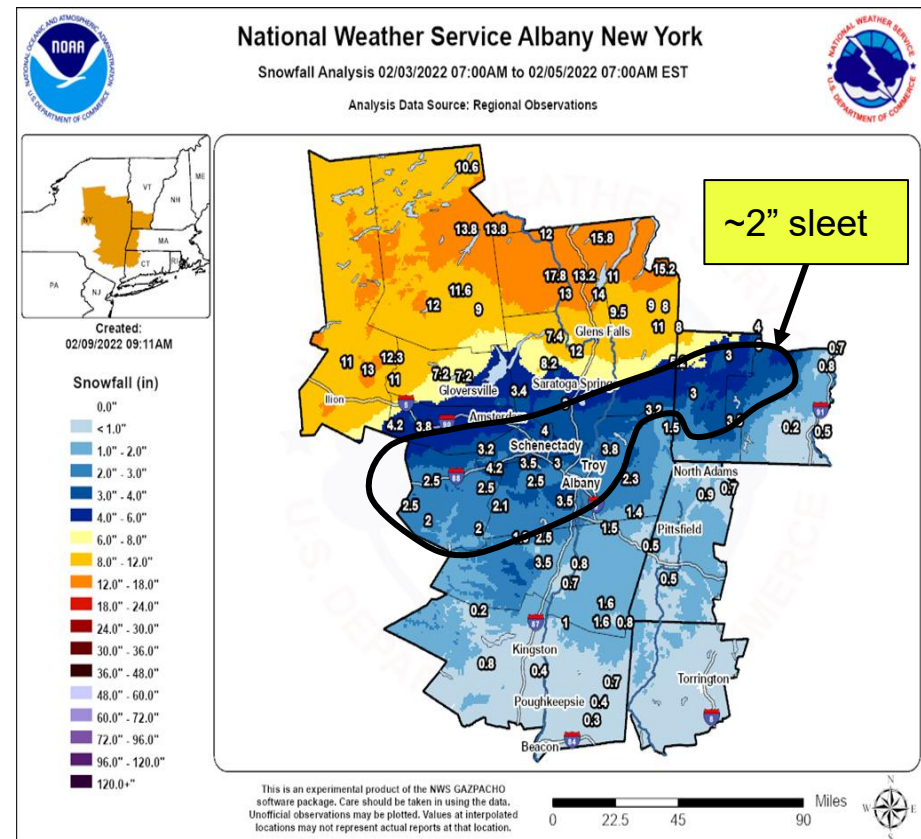
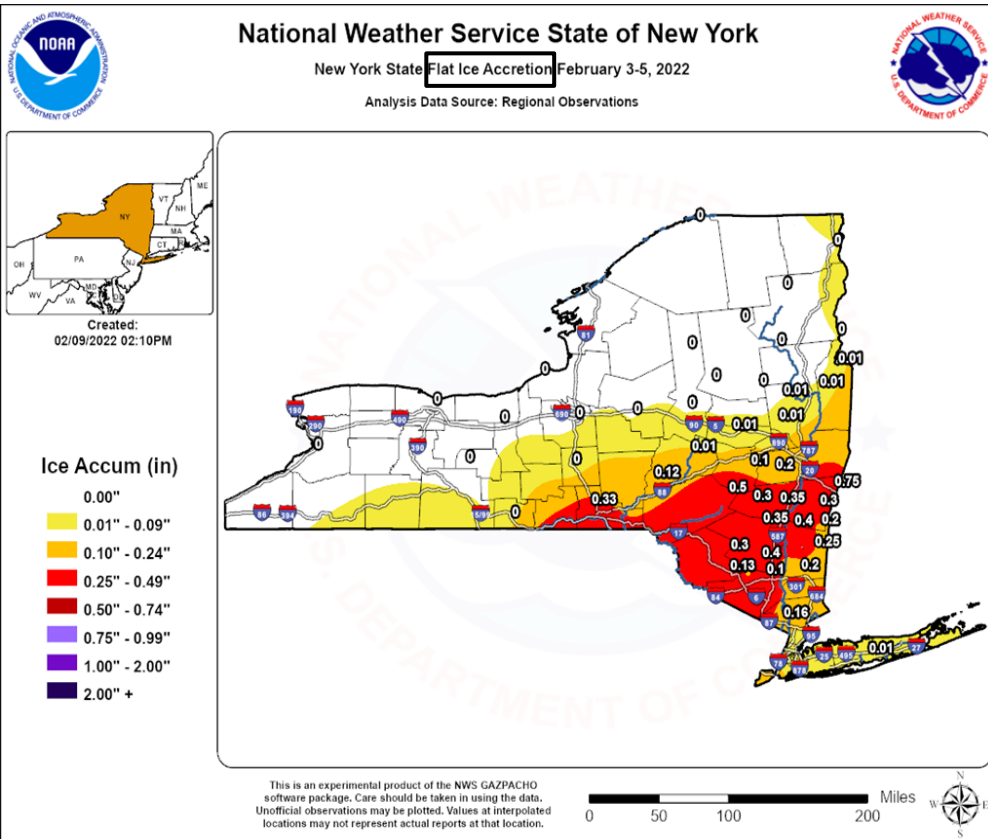
**Winter Weather Advisory:** Issued when snow, sleet, and/or freezing rain are expected to cause significant inconvenience. Downed trees and wires possible resulting in isolated to scattered power outages. Walking and driving could be difficult.

**Local criteria: trace to < 0.50" flat ice**

Icing obs and impacts supported Ice Storm Warning in eastern Ulster and eastern Columbia Counties. However, it was not a slam dunk for multiple reasons.

- Pros for Ice Storm Warning:
  - CAMs depicted several hours of icing as cold near-surface temps surged down Hudson Valley while warm air aloft was maintained
  - HRRR depicted widespread ice storm with > 1" liquid equivalent freezing rain
- Cons for Ice Storm Warning:
  - NBM/HREF supported sub-warning criteria, except in higher elevations
  - Uncertainty about how quickly a deep sub-freezing layer would develop, resulting in liquid drops refreezing to sleet
  - If Warning was issued, there would have been several false alarms
  - Surrounding WFOs were not issuing

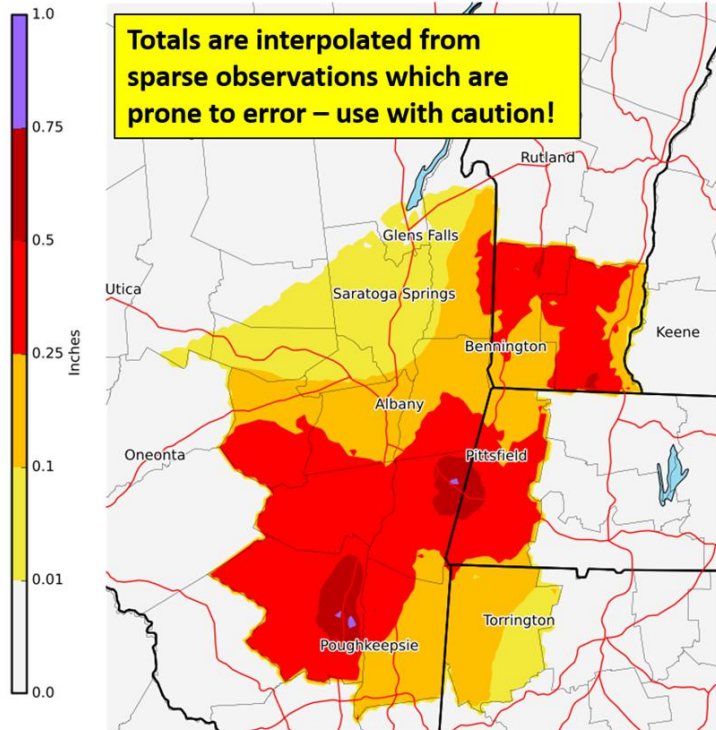
# GAZPACHO Snow, Sleet and Ice Verification Maps



# Ice Accretion Map Produced from Spotter Observations

## Estimated Flat Ice Accretion

Valid: Feb. 3-4, 2022



National Weather Service  
Albany, New York  
02/06/2022 11:47 AM EST

Follow Us:   
weather.gov/Albany/winter

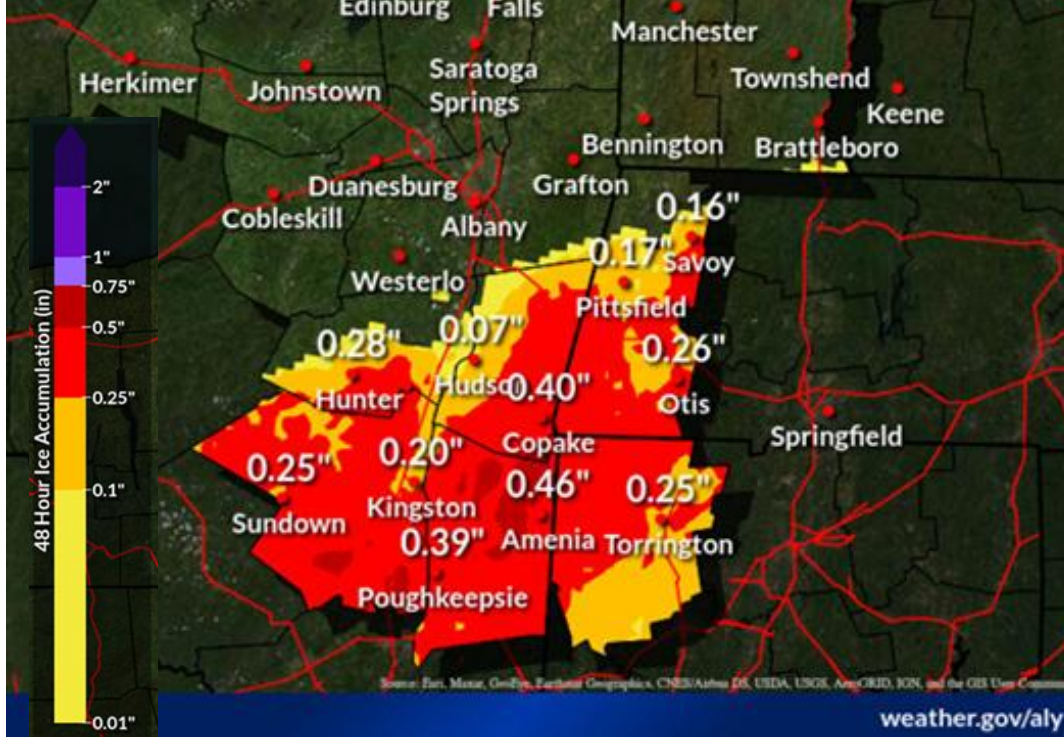
# NWS Forecast Issued 4 pm 3 Feb 2022

## Expected Ice Accumulation - Official NWS Forecast

Weather Forecast Office  
Albany, NY

Valid 7 PM Thu Feb 03, 2022 through 7 PM Sat Feb 05, 2022 EST

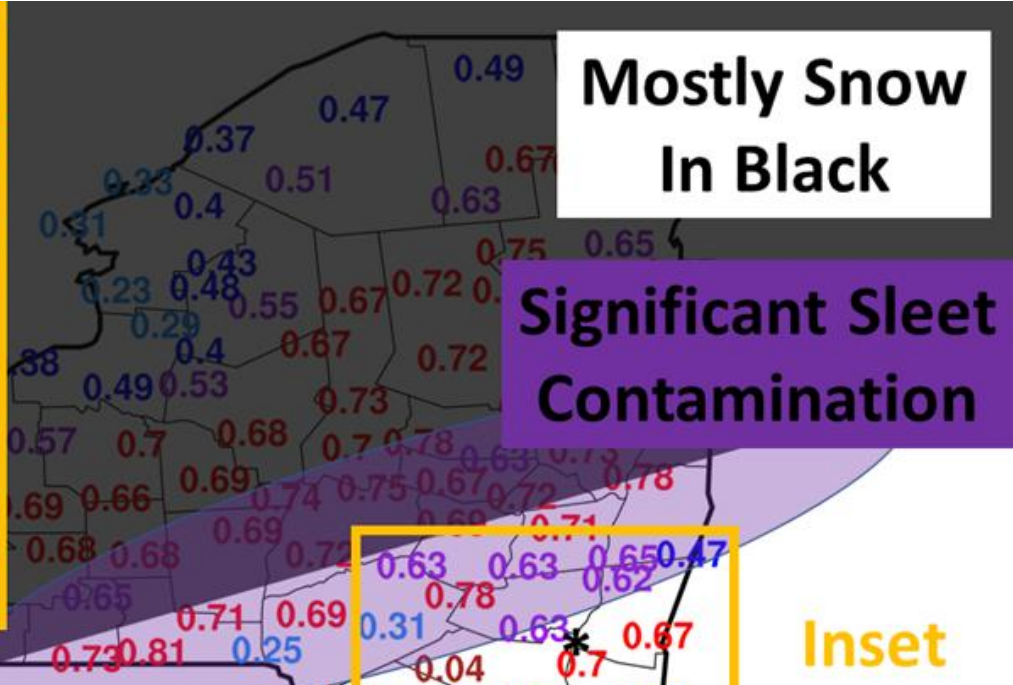
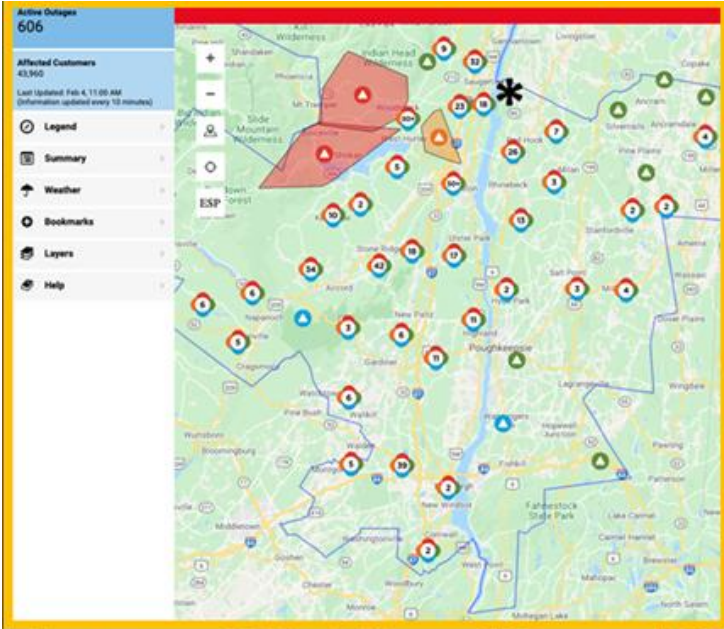
Issued Feb 03, 2022 3:42 PM EST



Source: Fort, Meteor, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

weather.gov/aly

# FRAM & NYS Mesonet (Courtesy Nick Bassill)



24 H FRAM Flat Ice Estimate (in)

Ending: Friday, 2022-02-04

At 11:44AM

# Impacts

- Central Hudson: 44 utility poles and 900 wires down
- State of Emergency in Ulster County; Governor Hochul on hand for press conference
- 27k customers remained without power the night following the storm
- Lows in the single digits during the two nights following the storm prompted several warming centers to open



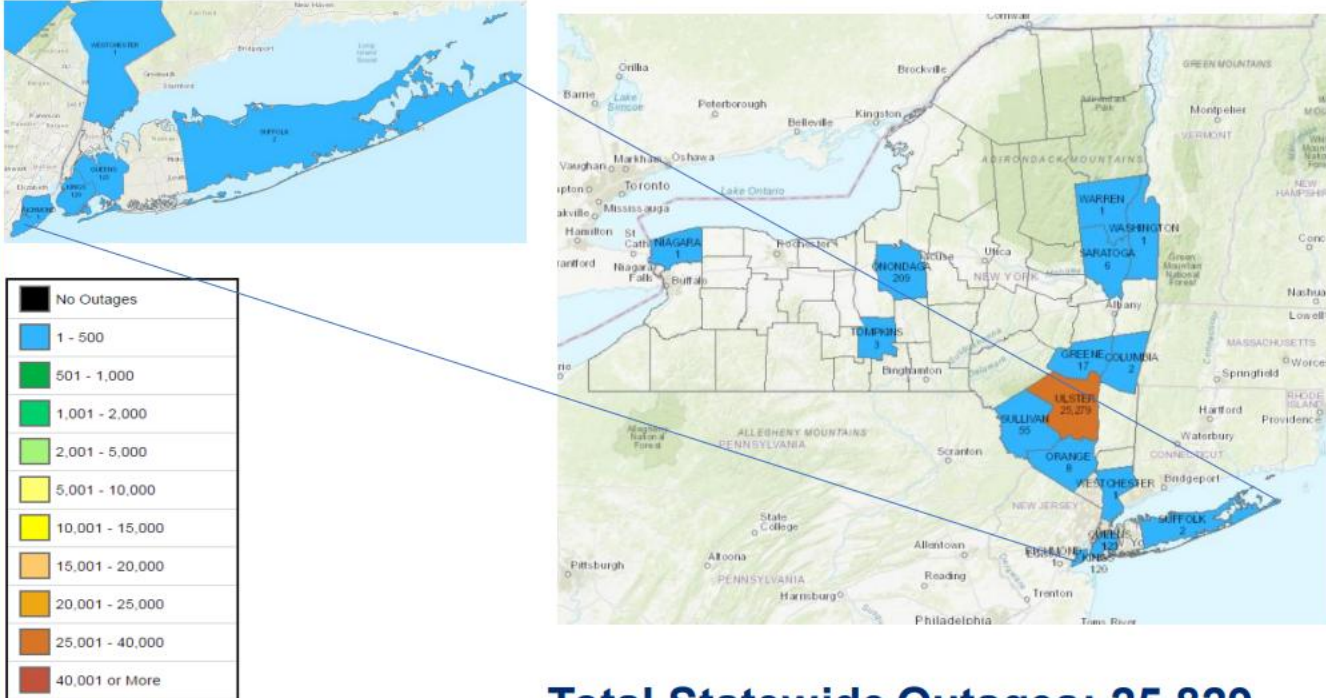
**Ruby, NY**  
**Source: Kingston Daily Freeman**



**Kingston, NY**  
**Source: Kingston Daily Freeman**

# Power Outages

## Current Electrical Utility Outages (as of 8:45 a.m.)

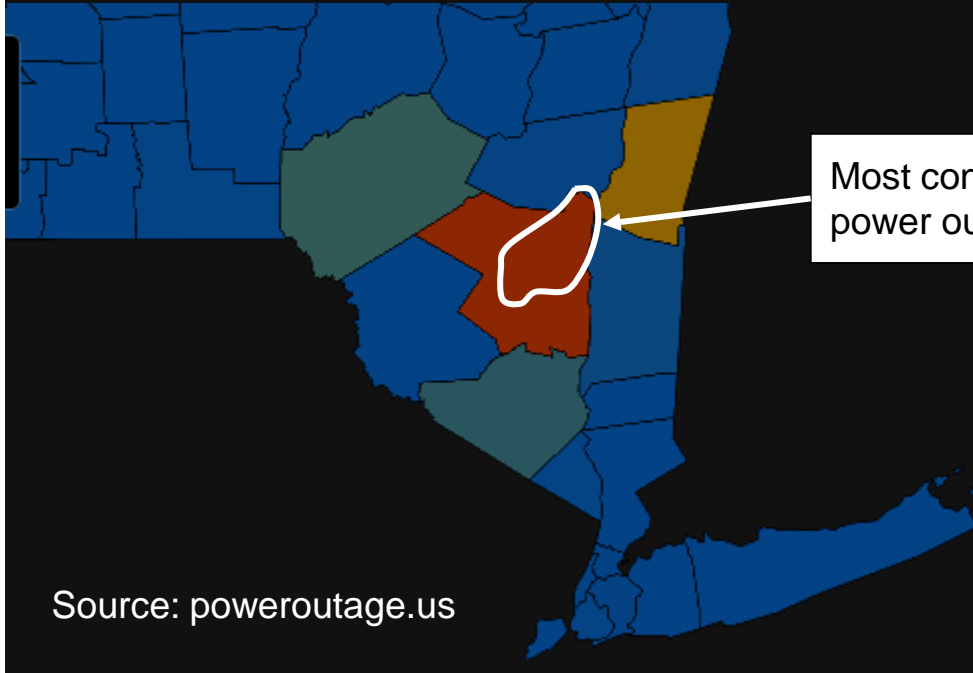


**Total Statewide Outages: 25,829**

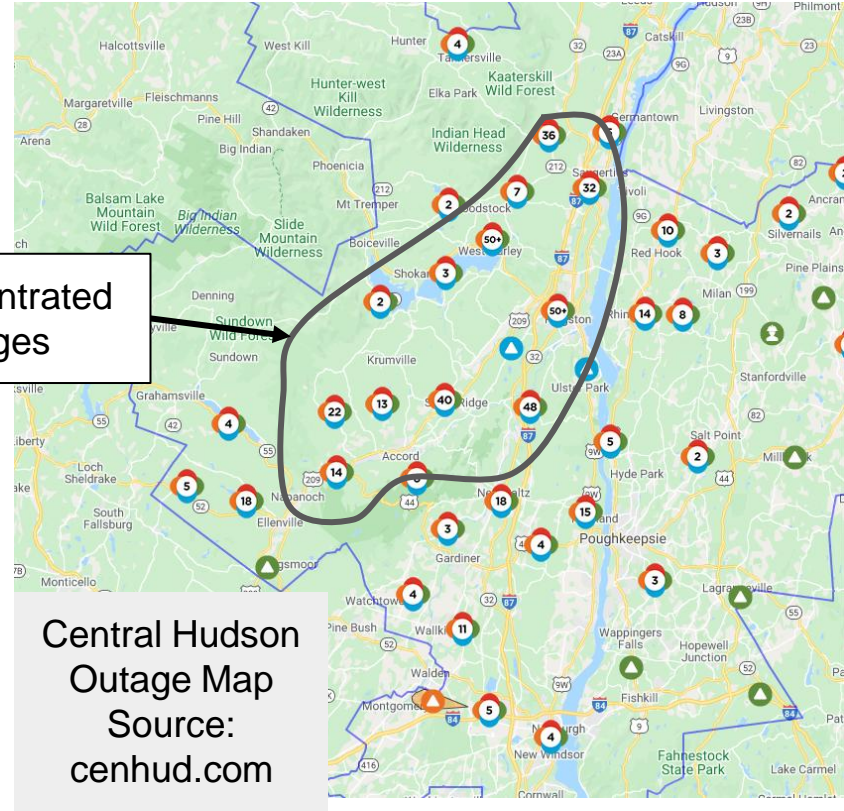


# Impacts - Power Outages

Outage Scale: 0% 10% 30% 60%



Most concentrated power outages



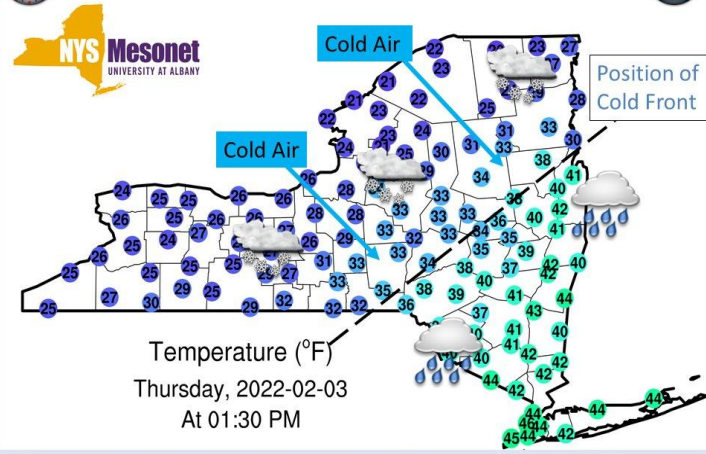
# NWS Messaging Methods & Challenges

## How does the NWS Message Hazardous Weather?

- Social Media (at least once per shift)
- Weather Stories on NWS Albany webpage (updated at least once per day)
- Partner Briefings (At least twice daily, typically 5AM & 5PM. Displayed on NWS Albany webpage)
- Statewide written and verbal briefings
- Partner Conference Calls (Webex, Microsoft Teams, etc)

## What are the Challenges?

- Partners have different background knowledge and thresholds
- NWS Forecasters have to “know their audience”
- Explaining a complex forecast in as few words/images as possible
- Impacts vary depending on precip type, duration, terrain, etc



**Expected Snowfall - Official NWS Forecast**  
Albany, NY  
Valid 7 PM Thu Feb 03, 2022 through 7 PM Sat Feb 05, 2022 EST  
Issued Feb 03, 2022 3:40 PM EST



**Examples of NWS Messaging Efforts**

**Event Summary**

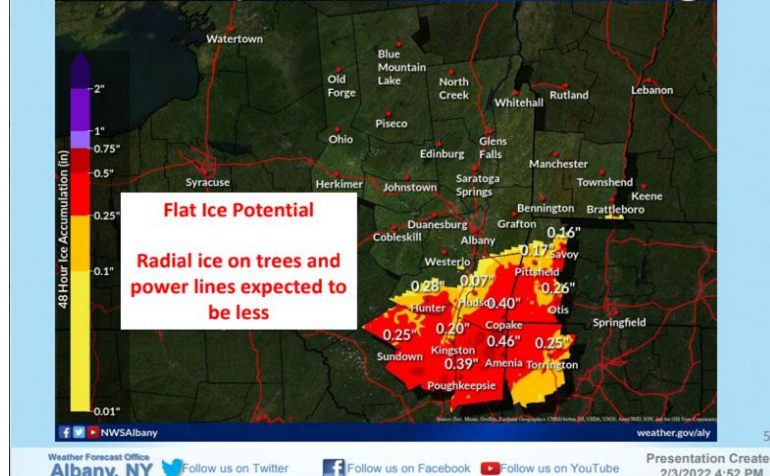
**Winter Precipitation**

SNOW SLEET FREEZING RAIN RAIN

At or Below 32°F Above 32°F weather.gov

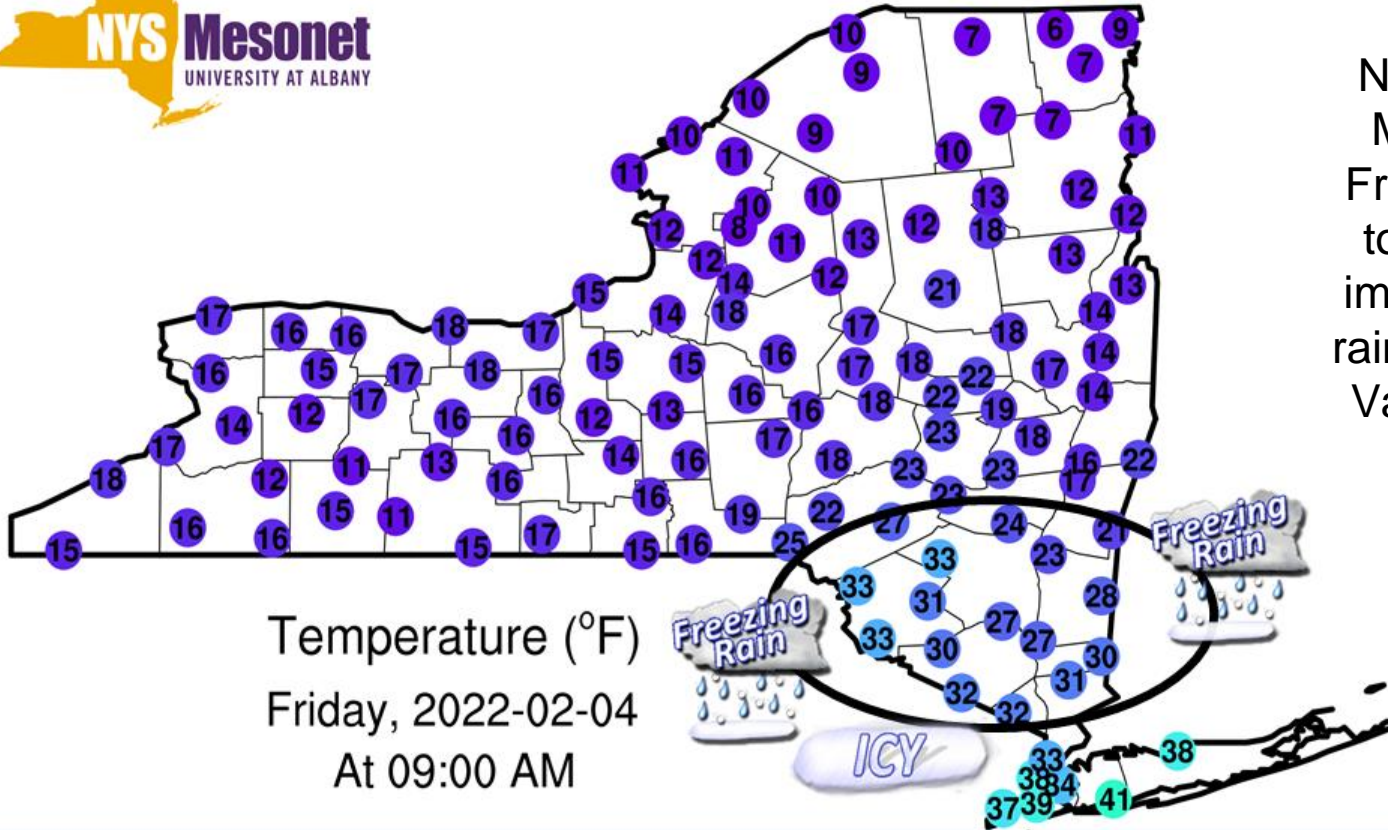
- ✓ Ice accretion of a tenth up to four-tenths are possible mainly from the Schoharie Valley, Capital District and southern Vermont southward
- ✓ The ice amounts will be dependent on how long it takes the freezing rain to transition to sleet and snow
- ✓ Ice forecasts are for flat ice on untreated flat surfaces, radial ice accumulation on trees and power lines is usually less than flat ice

**Expected Ice Accumulation - Official NWS Forecast**  
Albany, NY  
Valid 7 PM Thu Feb 03, 2022 through 7 PM Sat Feb 05, 2022 EST  
Issued Feb 03, 2022 3:42 PM EST



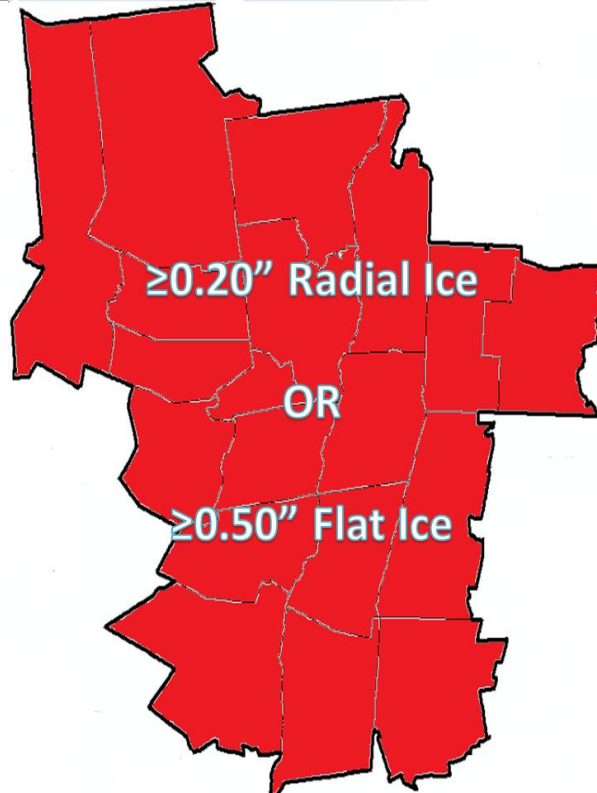


# Freezing Rain Thru Early Aft'n Resulting in Downed Tree Limbs & Power Outages Mid-Hudson Valley, Litchfield Hills & Berkshires



NWS Albany Twitter Mesoanalysis Post Friday morning Feb 4 to highlight the high impacts from freezing rain in the mid-Hudson Valley and Taconics.

# Freezing Rain Verification Challenges: Flat v Radial Ice



Dutchess County  
CoCoRaHS Ice  
Report...Flat or radial?

.3 ice accretion. So far rain, freezing rain and sleet from the storm.  
Low spot in yard flooding typical of heavy rain on frozen ground. Up to 4th raised bed about 24 linear feet in shallow depression.

## Verification Sources:

- Trained Spotters
- Social Media
- NYS mesonet (cameras!)
- Broadcast Media
- CoCoRaHS
- ASOS (I Group)
- 911 Centers

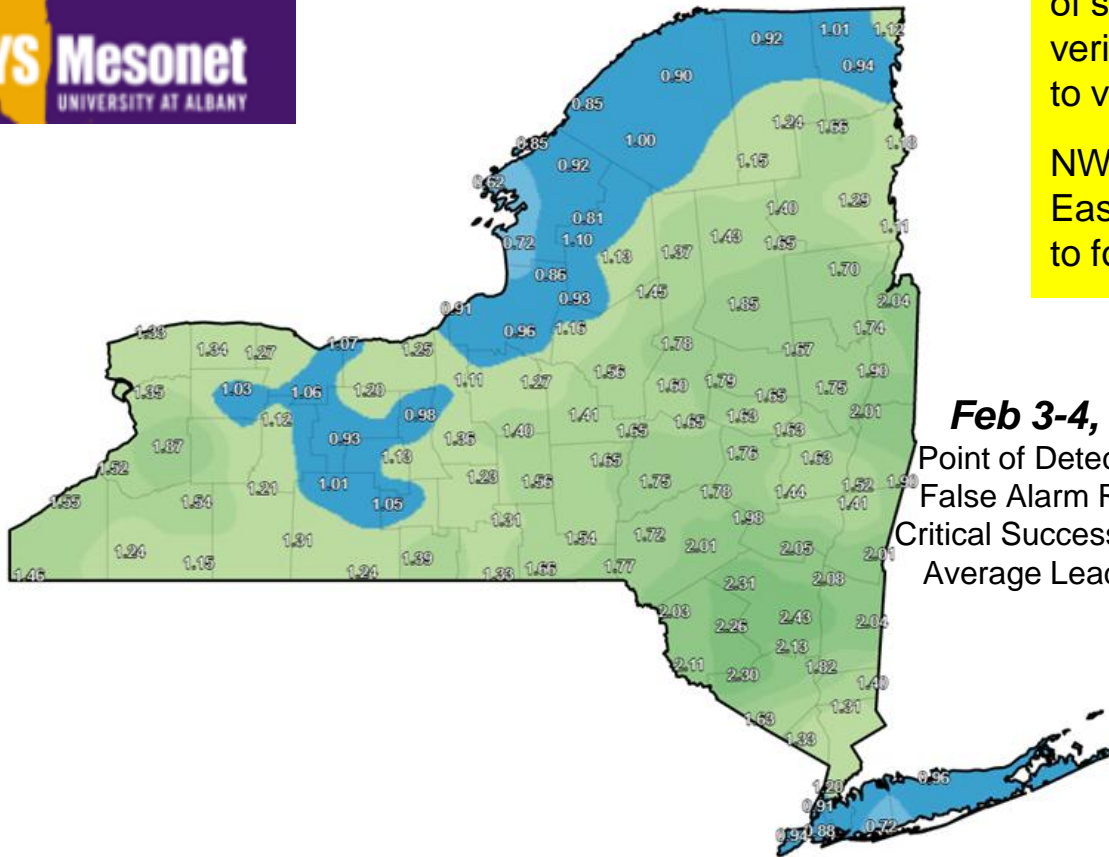
**Ice Storm Warning Criteria - 0.50" Flat Ice!**



# Radial Ice vs. Flat Ice



Radial Ice Measurement		Flat Ice Measurement	
Measure the ice thickness on both sides of the branch then add that up and divide by 2	0.04"	0.10"	Measure the ice thickness on a flat surface
	0.10"	0.25"	
	0.20"	0.50"	
	0.30"	0.75"	
	0.40"	1.00"	
	0.50"	1.25"	
	1.00"	2.50"	
Note: radial ice measurements are roughly 40% less than that of a flat ice measurement			



5-day Precipitation

Feb 6, 2022 9:45 AM EST

Maglaras Method - Verify a Winter Storm Warning due to combination of snow, sleet, and ice. 2" of sleet verifies a winter storm warning due to very low ratio (~3:1 or 2:1).

NWS Albany uses this method and Eastern Region allows other WFOs to follow it.

**Verification Scores:**

**Feb 3-4, 2022 Event**

Point of Detection (POD): 0.91  
 False Alarm Ratio (FAR): 0.09  
 Critical Success Index (CSI): 0.84  
 Average Lead Time: 54 hours

**2021-22 ER Goal**

POD: 0.90  
 FAR: 0.39  
 Average Lead Time  
 20 hours

**Based on flat ice accretion & associated liquid precipitation from POU ASOS, 40% of liquid accreted to ice**

## Partner Survey Results

*Were there any slides from this weather briefing that you DID NOT find useful or that you found confusing? Please explain.*

I understood the slides, but they did not indicate the level of concern that the actual event warranted.

Changing the ice accretion forecasts to predict based on flat ice has significantly increased our difficulty in understanding the full potential impacts of a forecasted freezing rain event. The NWS is the only outlet currently forecasting flat ice accretion increasing our uncertainty of the forecast and our ability to discern the potential impacts to Central Hudson's electric grid when compared against the forecasts of various weather based internet sites and the local and national TV media. As such, we would like to request that the NWS consider returning to a forecast based on radial ice.



# Partner Survey Results

*Did the weather briefings from the February 3-4, 2022 event provide you most of the information you needed to make life saving decisions? Or, are there products or information that you wish were included?*

There is confusion about measuring in radial ice verse flat ice. Different NWS offices answer questions differently. How should we compare 2022 ice accretion forecasts with 2012 ice accretion forecasts? Other NWS office have told us there is no change.

The briefings provided by the three local NWS offices has been invaluable in supporting our decision making process leading up to forecasted weather events. However, the extreme variability in predicting and estimating ice accretion is an area with much room for improvement. With the 4:57 PM briefing on 2/3 the ice accretion potential was still forecasted to be well less than 0.50 inches of radial ice, and yet much higher amounts occurred. Certainly this is an area where increased accuracy would assist local power providers in deciding the level of preparedness required of an event. Or even perhaps the 40% conversion factor requires further study.

# Partner Survey Results

*Any other comments you would like to share with the National Weather Service?*

Most modern forecasts are "generally" accurate, but the details are critical when determining how much preparation is required (ie. .2" of ice means there will be no outages; but .5" of ice means there will be significant outages). To help inform our future preparation for a similar forecast, it would be helpful to know if the NWS considered their forecast to be accurate and if so, how many hours in advance of the storm was the forecast considered accurate?

We thank you for your efforts, and we place a high value on the briefings provided to us as an important part of our event preparedness activities.

# Conclusions & Lessons Learned

- Delineating between sleet & freezing rain and predicting exact amounts were challenging due to uncertainty in the depth/extent of sub-freezing cold wedge, longevity of each p-type and estimating ice to liquid ratios (ILR)
- NWS Albany correctly increased ice accretion amounts in the mid-Hudson Valley in the 3 Feb P.M. forecast update. ***Predicted flat ice amounts did not meet ice storm warning criteria and therefore advisory was maintained.*** *However, the localized high impacts that occurred for some of the mid-Hudson Valley (specifically for the Kingston area) met Ice Storm Warning criteria.*
- Learned of extreme yet localized ice impacts in eastern Ulster & in Columbia County early Fri A.M. This led to two missed events. **Improved communication between NWS & locals EMs needed when extreme impacts are underway. Sleet infographics requested. Will continue to solicit partner feedback via short Google Form surveys following major events**
- NWS Albany created a detailed quality assurance (QA) report following this event to improve training & future messaging efforts in complex wintry mix events