

# The SPIA Index:

*Website Overview—with emphasis on  
Ice Index, NWS ‘Fire Spread’ Index,  
and ‘Superhydrophobics’  
Technology.*

A presentation for the  
**AIEC 2013 I.T. & Engineering Conference**  
October 16, 2013 – Springfield, IL

Presented by Sid Sperry, Director of PR, Communications & Research and  
Co-Founder of the “Sperry-Piltz Ice Accumulation Index” or “SPIA Index”  
Oklahoma Association of Electric Cooperatives, Oklahoma City, OK

# What is the 'SPIA Index?'

## And, where can I find it on the Web?



[www.spia-index.com](http://www.spia-index.com)

The Sperry-Piltz Ice Accumulation Index, or "SPIA Index" – Copyright, February, 2009

ICE DAMAGE INDEX	* AVERAGE NWS ICE AMOUNT (in inches) <small>*Revised-October, 2011</small>	WIND (mph)	DAMAGE AND IMPACT DESCRIPTIONS
<b>0</b>	< 0.25	< 15	Minimal risk of damage to exposed utility systems; no alerts or advisories needed for crews, few outages.
<b>1</b>	0.10 – 0.25	15 - 25	Some isolated or localized utility interruptions are possible, typically lasting only a few hours. Roads and bridges may become slick and hazardous.
	0.25 – 0.50	> 15	
<b>2</b>	0.10 – 0.25	25 - 35	Scattered utility interruptions expected, typically lasting 12 to 24 hours. Roads and travel conditions may be extremely hazardous due to ice accumulation.
	0.25 – 0.50	15 - 25	
	0.50 – 0.75	< 15	
<b>3</b>	0.10 – 0.25	> = 35	Numerous utility interruptions with some damage to main feeder lines and equipment expected. Tree limb damage is excessive. Outages lasting 1 – 5 days.
	0.25 – 0.50	25 - 35	
	0.50 – 0.75	15 - 25	
	0.75 – 1.00	< 15	
<b>4</b>	0.25 – 0.50	> = 35	Prolonged & widespread utility interruptions with extensive damage to main distribution feeder lines & some high voltage transmission lines/structures. Outages lasting 5 – 10 days.
	0.50 – 0.75	25 - 35	
	0.75 – 1.00	15 - 25	
	1.00 – 1.50	< 15	
<b>5</b>	0.50 – 0.75	> = 35	Catastrophic damage to entire exposed utility systems, including both distribution and transmission networks. Outages could last several weeks in some areas. Shelters needed.
	0.75 – 1.00	> = 25	
	1.00 – 1.50	> = 15	
	> 1.50	Any	

(Categories of damage are based up on combinations of precipitation totals, temperatures and wind speeds/directions.)

## Weather Conditions and SPIA Index Levels at a Glance:

Ice and Wind: <small>* Average NWS Ice in Inches; Wind in MPH.</small>	< 15 mph	15-25 mph	25-35 mph	> = 35 mph
<b>0.10 – 0.25</b> inches	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>
<b>0.25 – 0.50</b> inches	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
<b>0.50 – 0.75</b> inches	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>0.75 – 1.00</b> inches	<b>3</b>	<b>4</b>	<b>5</b>	<b>5</b>
<b>1.00 – 1.50</b> inches	<b>4</b>	<b>5</b>	<b>5</b>	<b>5</b>
<b>&gt; 1.50</b> inches	<b>5</b>	<b>5</b>	<b>5</b>	<b>5</b>

SPIA Index, Copyright February 10, 2009. Registration #TX 7-027-591. \*Graphics revised – October, 2011.

# SPIA-Index.com website overview

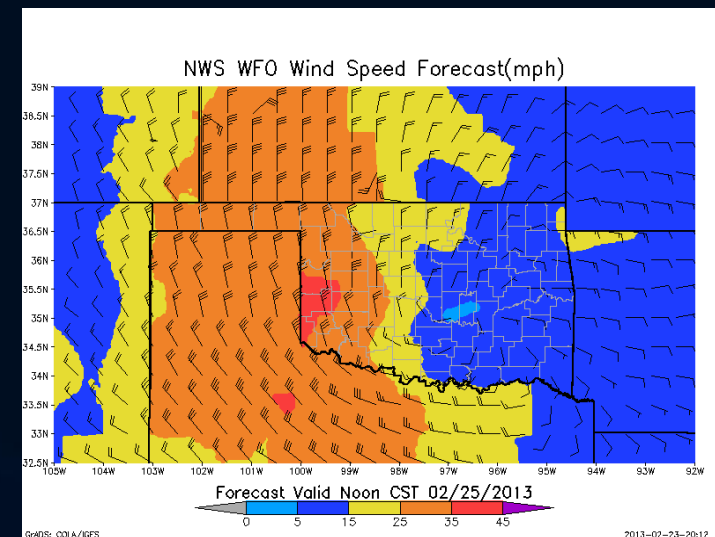
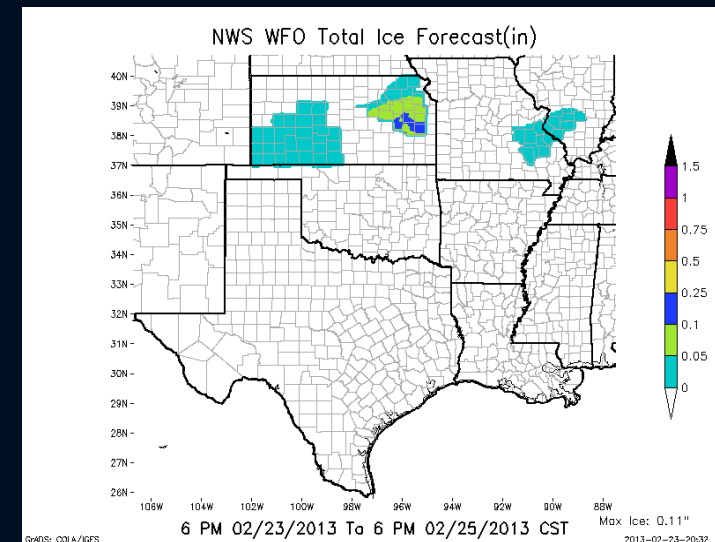
- Regional NWS Forecasts Featuring Multi-State Views, Plus 'Oklahoma Only' View.
- Five Displays Available in Each Region:
  - **SPIA Index** (Ice Accumulation & Wind Forecast)
  - **QPF** (Quantitative Precipitation Forecast)
  - **Snow & Ice Forecast**
  - **Temperature Forecast**
  - **Apparent Temperature Forecast.**
- 'Oklahoma Only' View Displays Additional Content:

## Storm Forecast Probabilities

- Thunderstorms
- Sleet
- Snow
- Ice

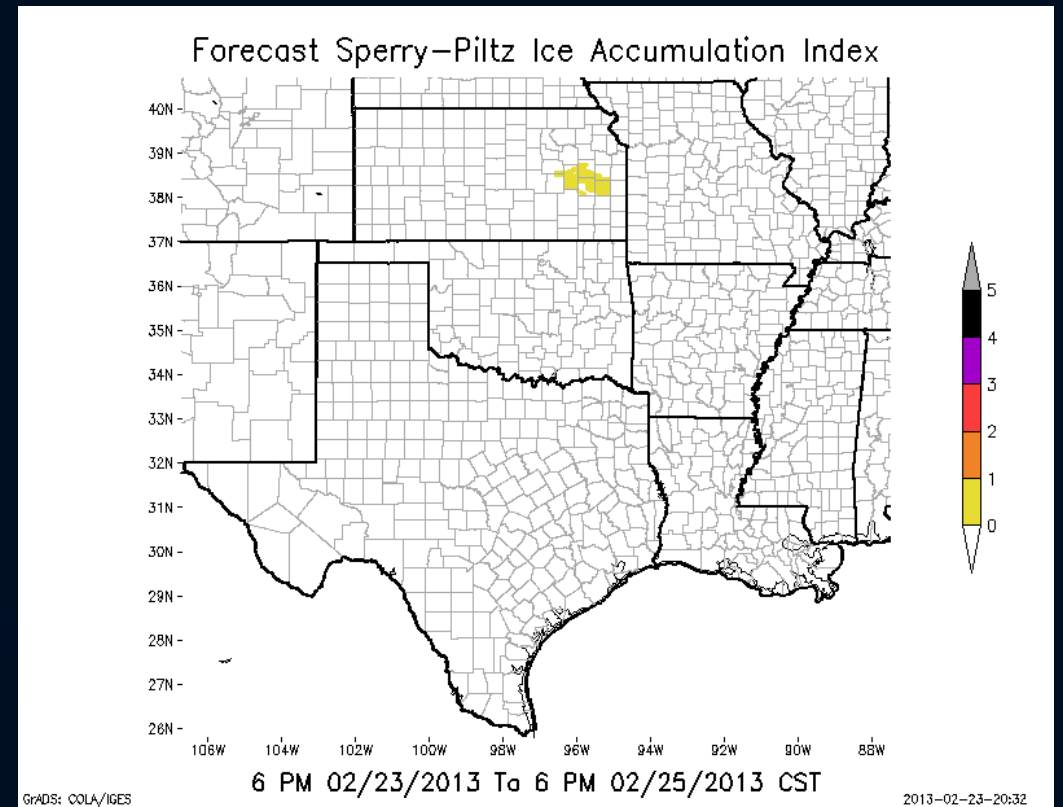
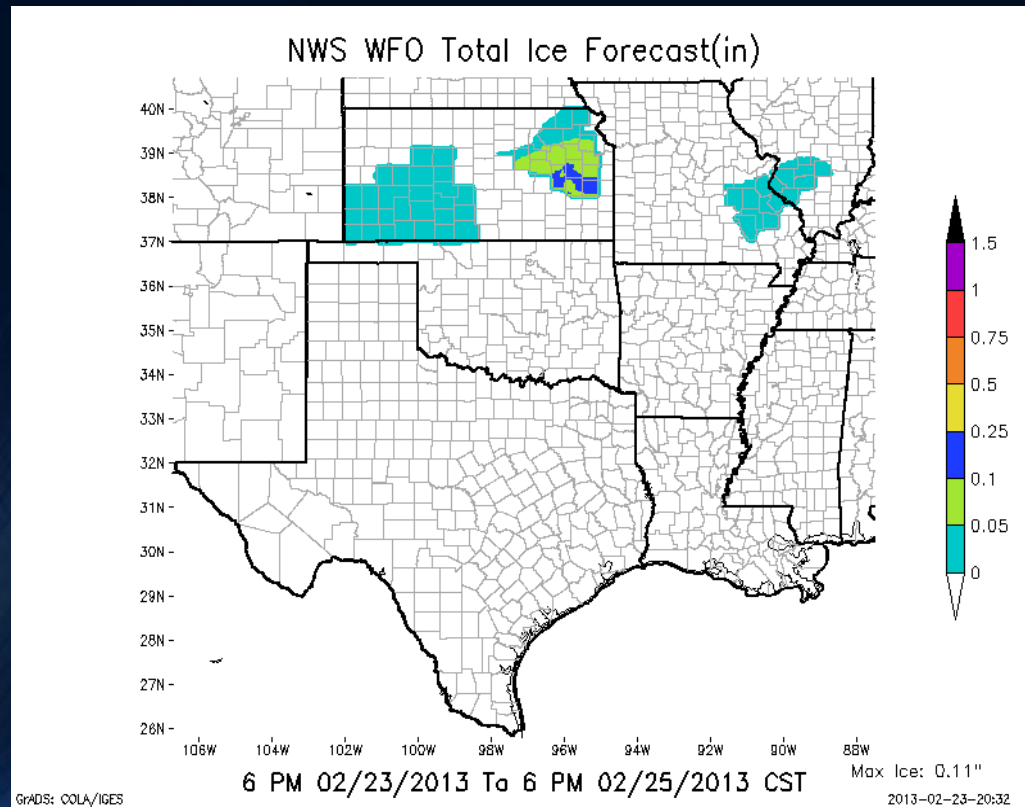
## NWS Fire Weather Products

- Fire Weather Relative Humidity
- Fire Spread Index



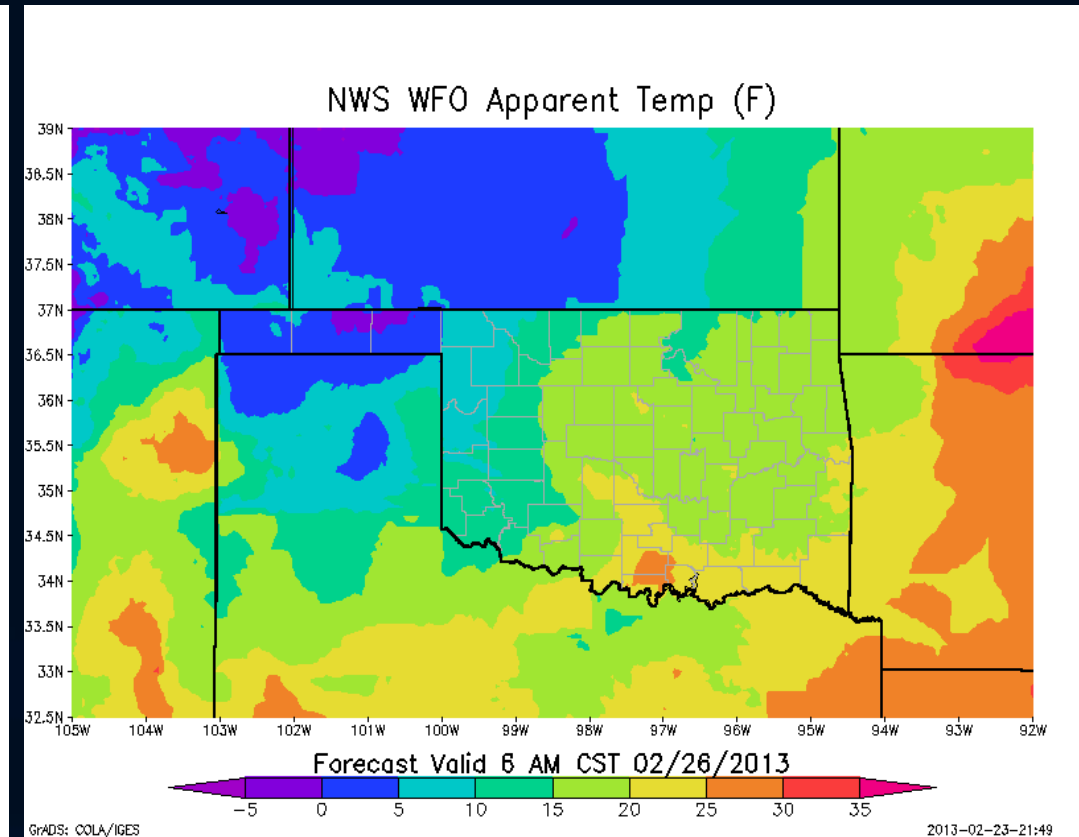
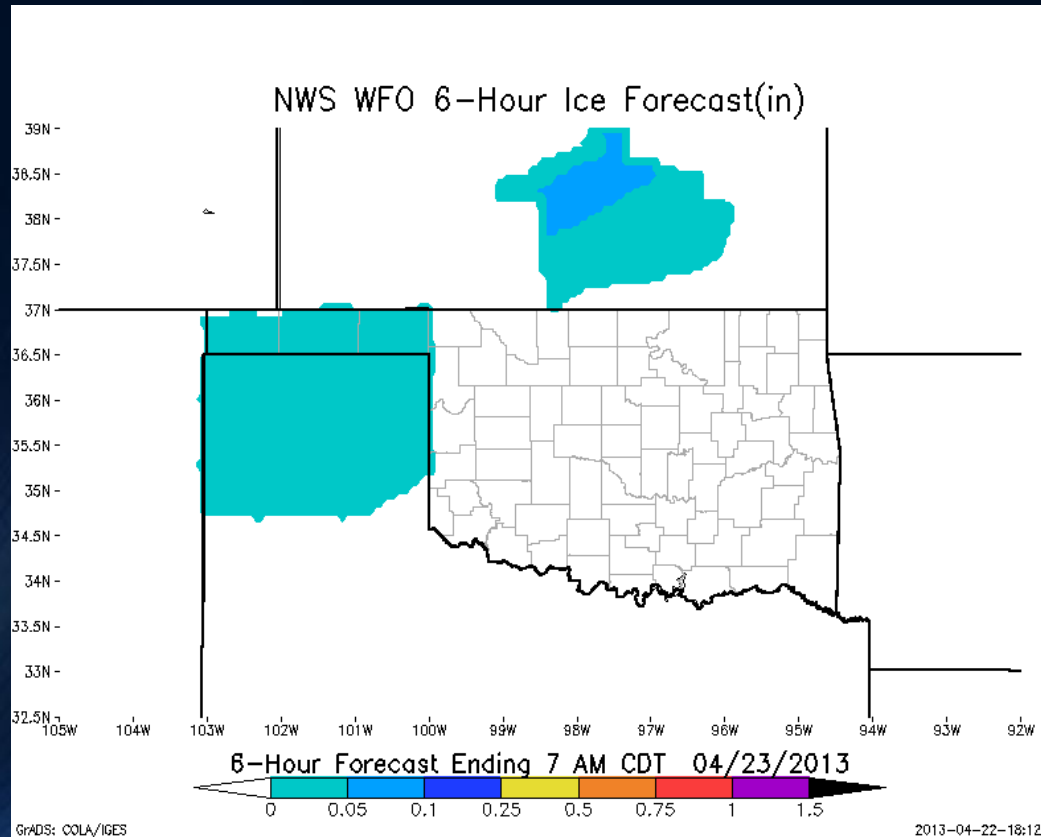


# SPIA Index Graphics Include: Total Ice Accumulation Forecast for Period; and Cumulative SPIA Index Levels for same Period.



# Forecast Periods:

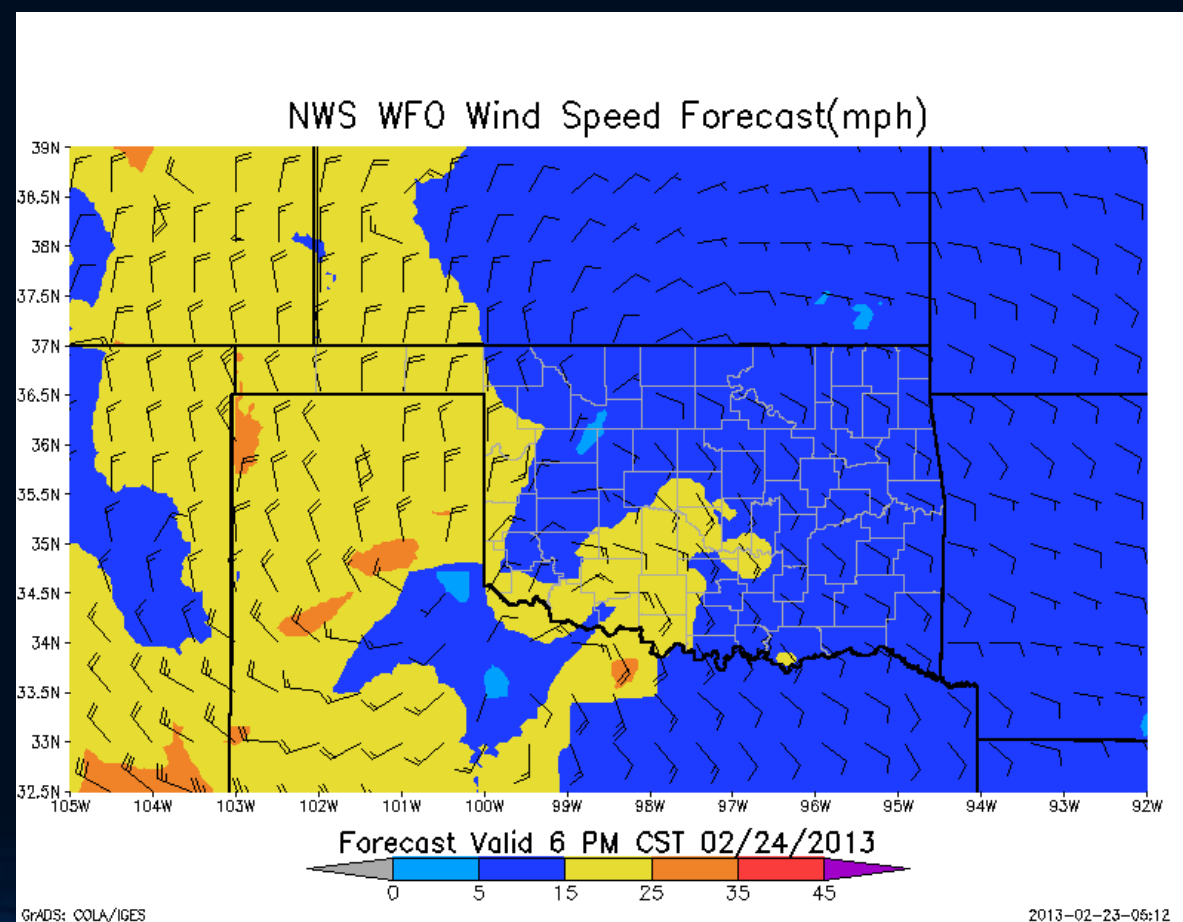
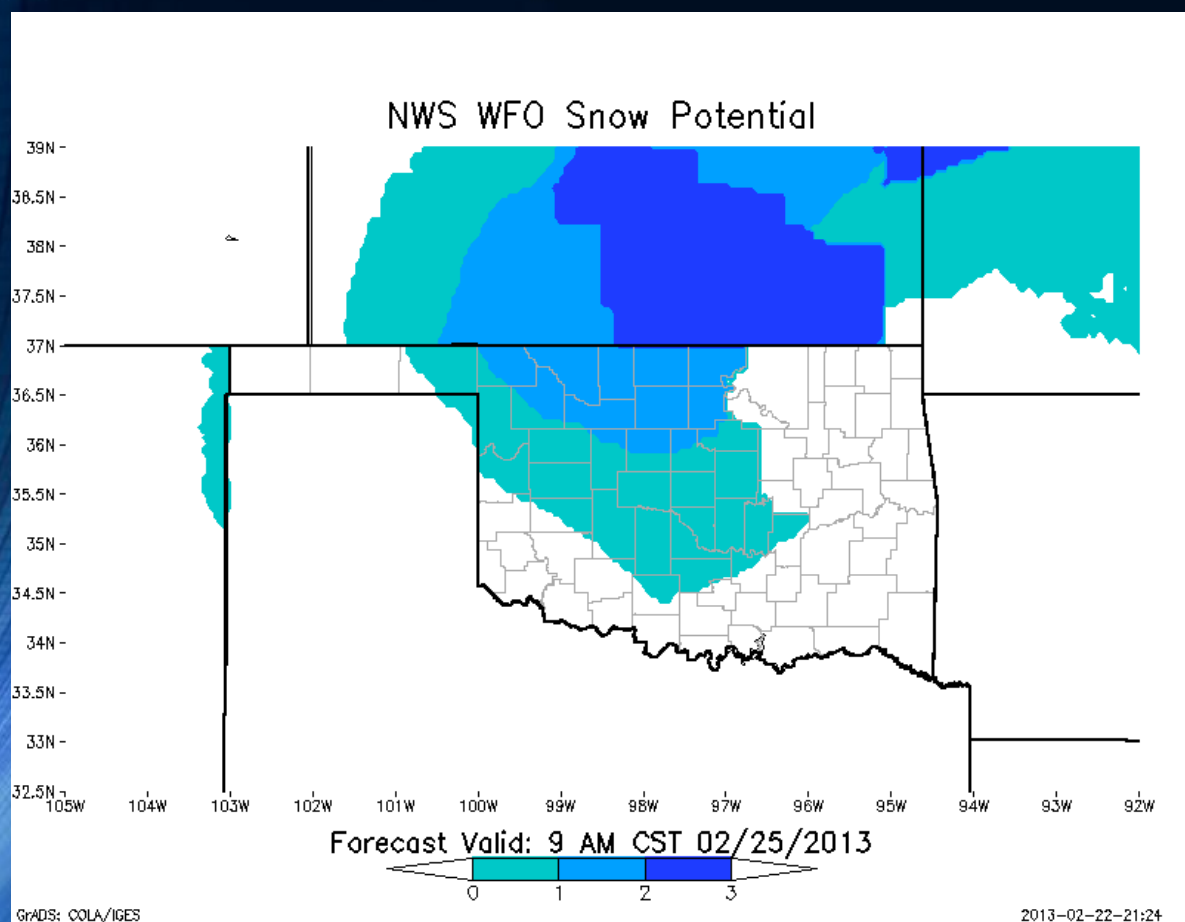
6-hours for Ice, QPF & Snow/Sleet;  
3-hours for Temperature & Apparent Temperature.



# The SPIA Index: **Uses & Relies on NWS Forecasts!**

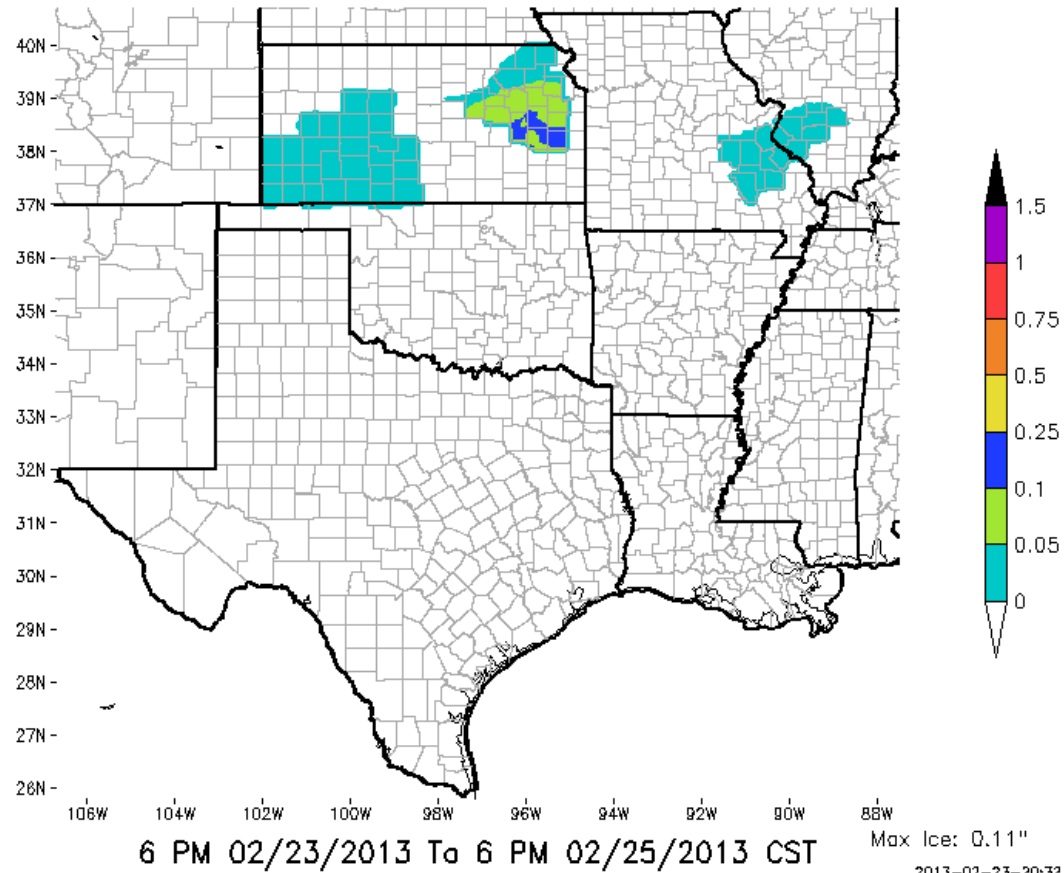
## A Tale of Two Winter Storms in 2013

February 25-26, 2013: Snow/Ice storm impacts large areas of KS, MO and OK.

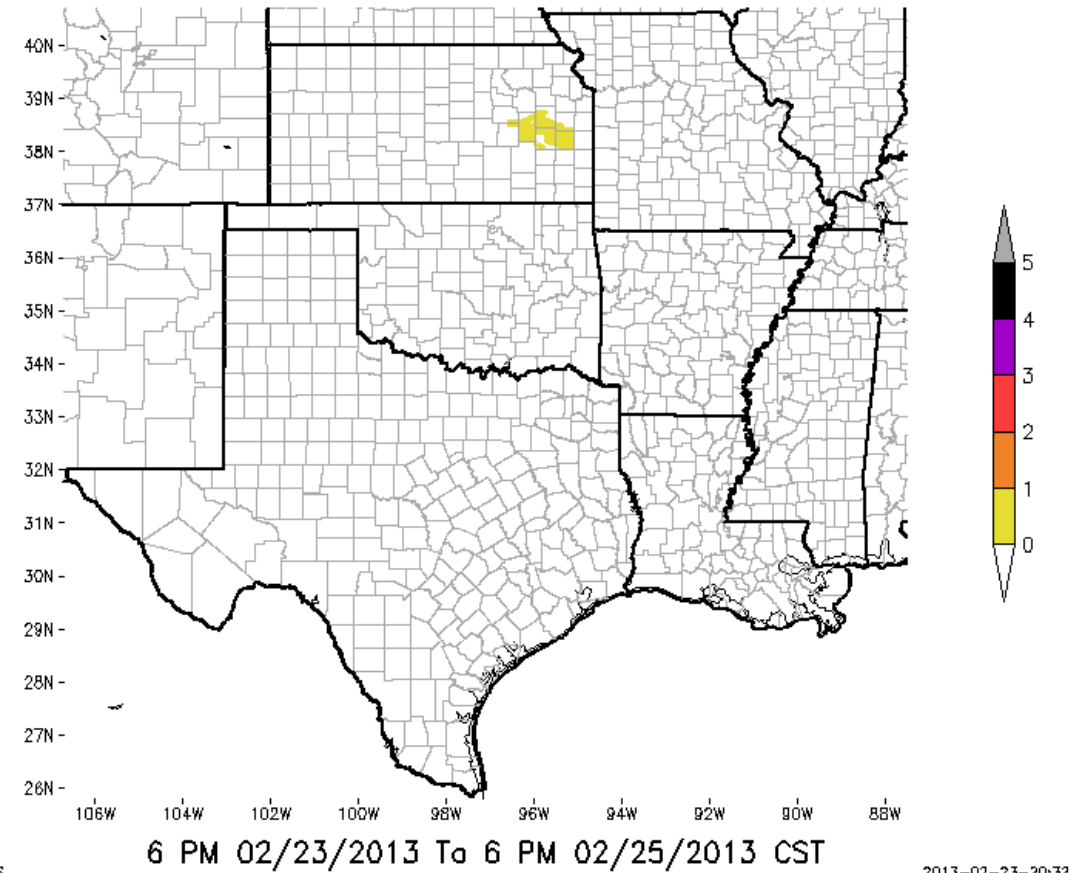


February 25-26, 2013: Very light icing in the forecast. Max ice in grid = 0.11 inches.

NWS WFO Total Ice Forecast(in)

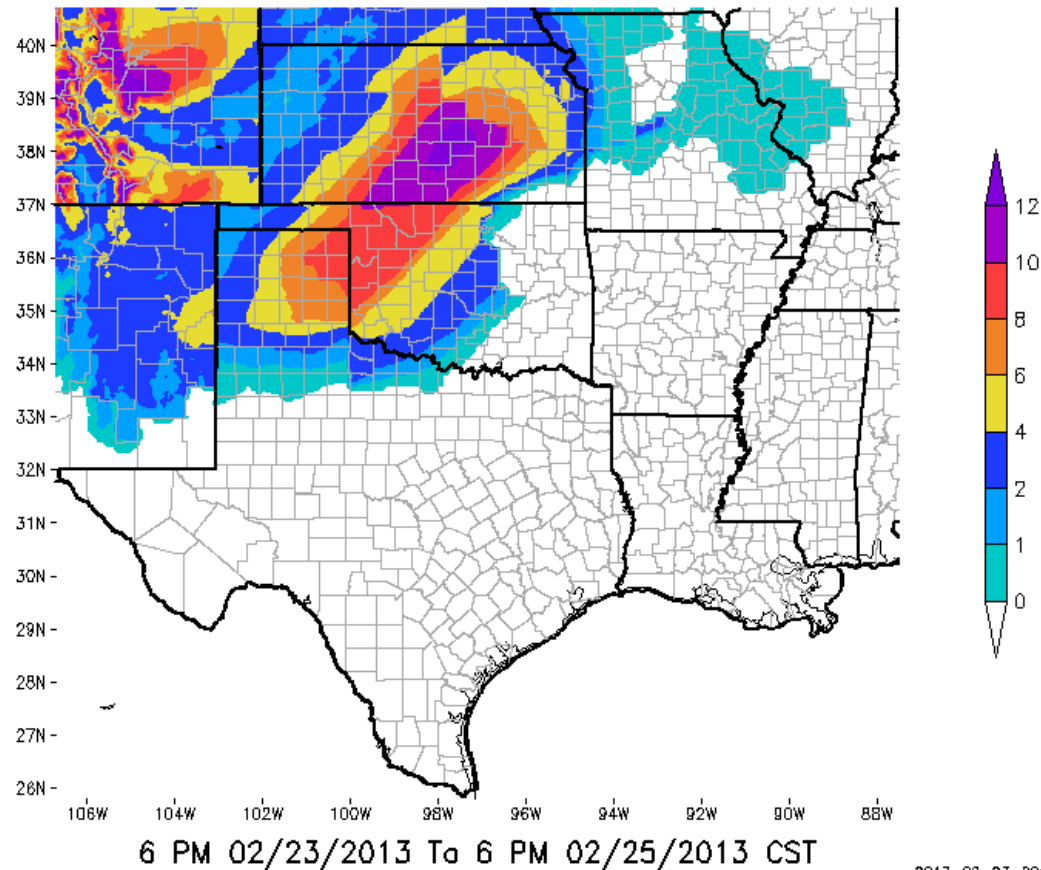


Forecast Sperry-Piltz Ice Accumulation Index

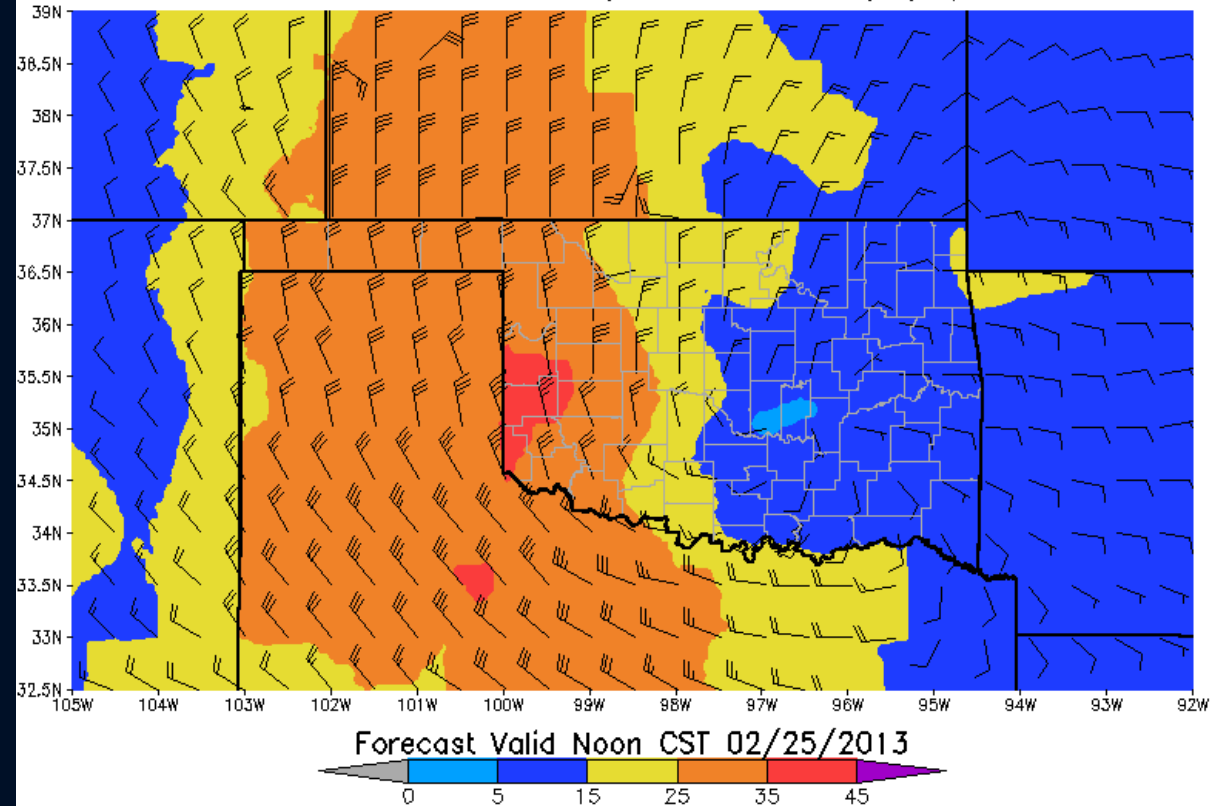


# February 25-26, 2013: Forecaster concerns – heavy snow, strong northerly winds.

NWS WFO Total Snow and Sleet Forecast (in)



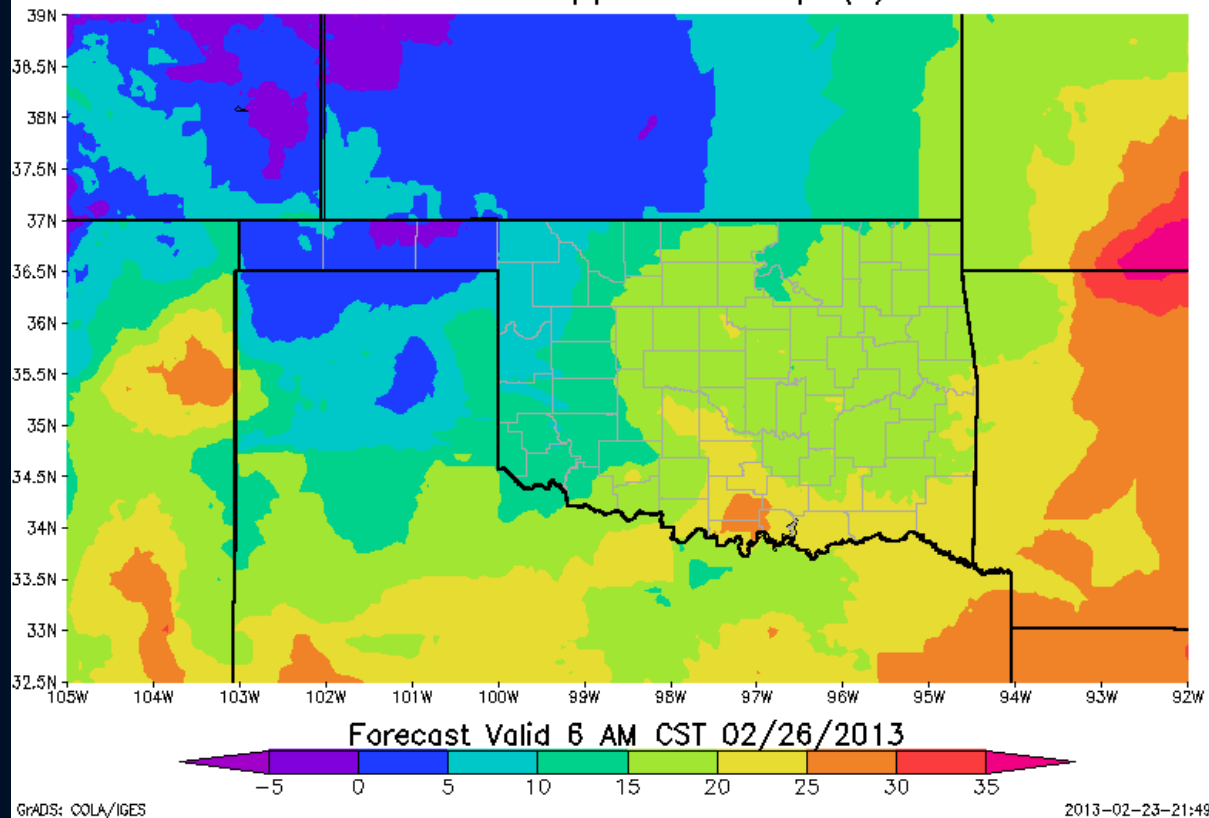
NWS WFO Wind Speed Forecast(mph)



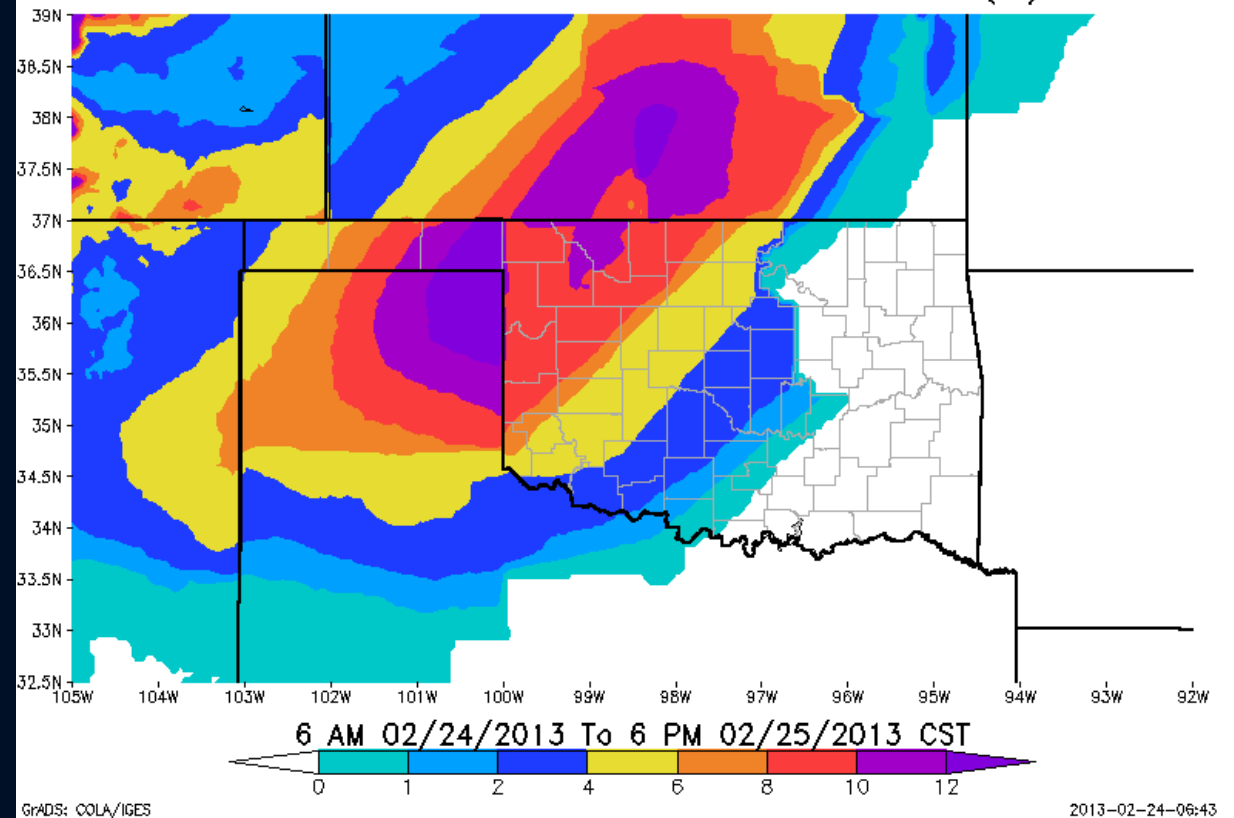


## February 25-26, 2013: Very cold air coming with front; also, varying snow forecasts.

NWS WFO Apparent Temp (F)

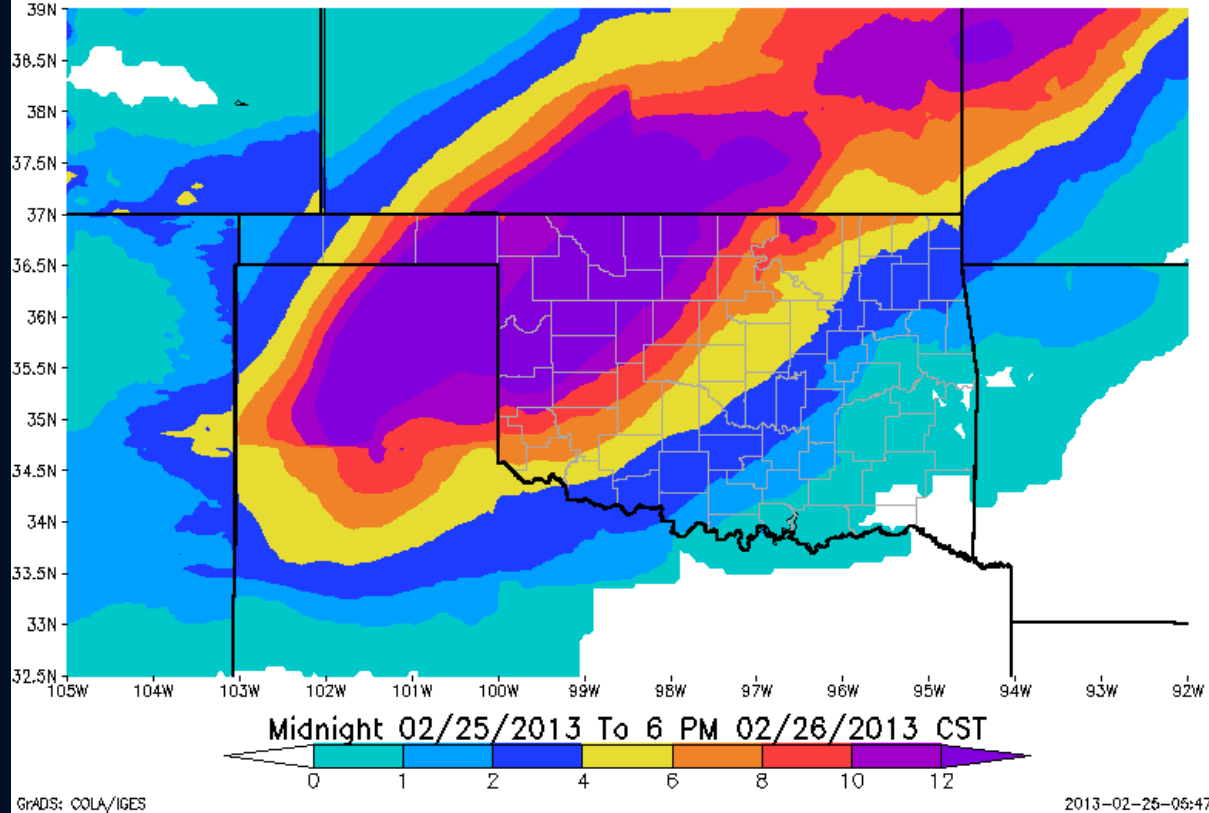


NWS WFO Total Snow and Sleet Forecast (in)

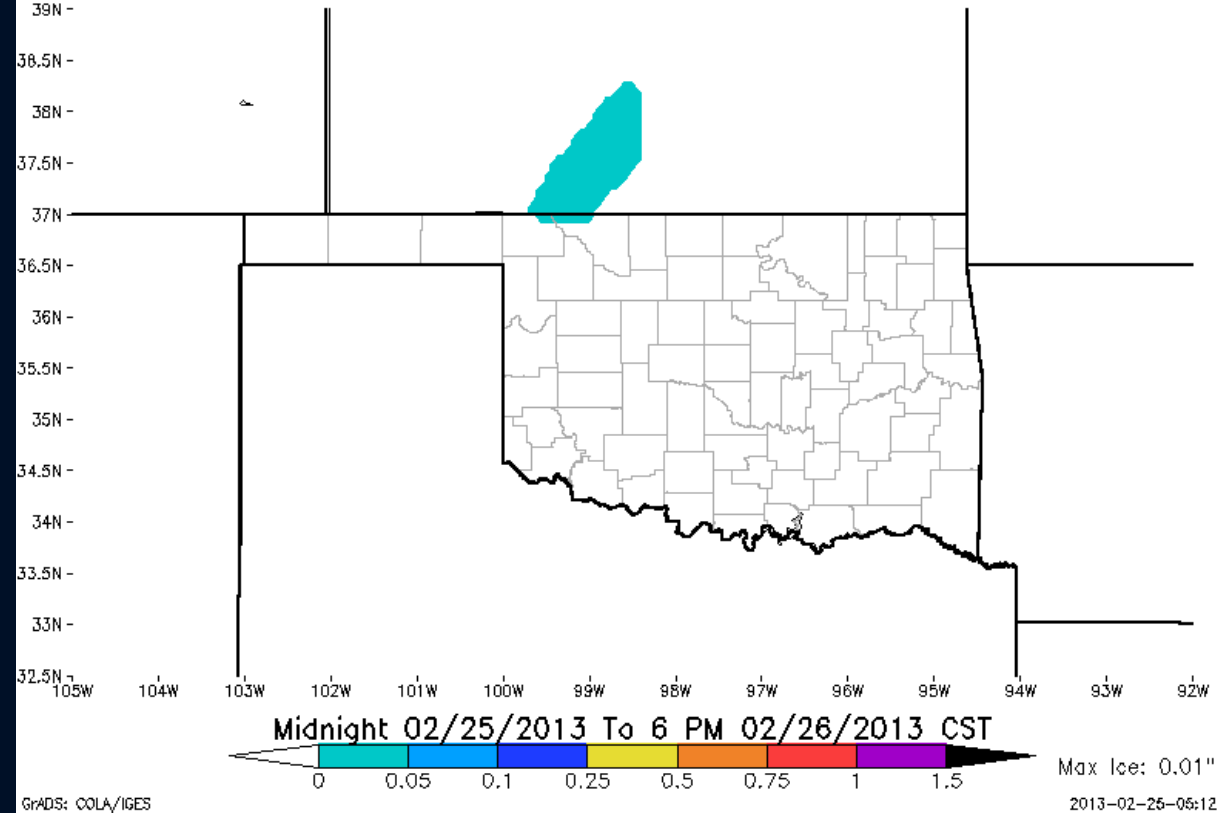


# February 25-26, 2013: Snow forecasts come together; ice forecast still in doubt. Why?

NWS WFO Total Snow and Sleet Forecast (in)

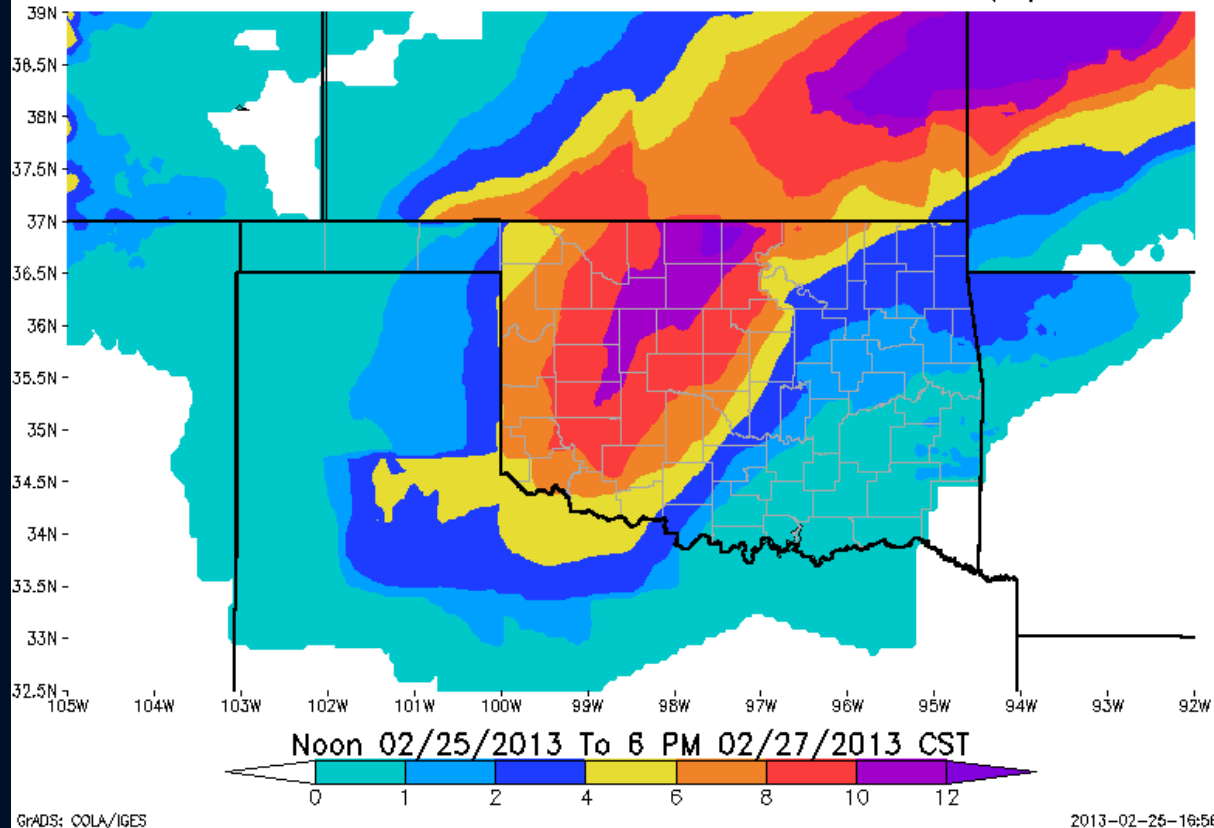


NWS WFO Total Ice Forecast(in)

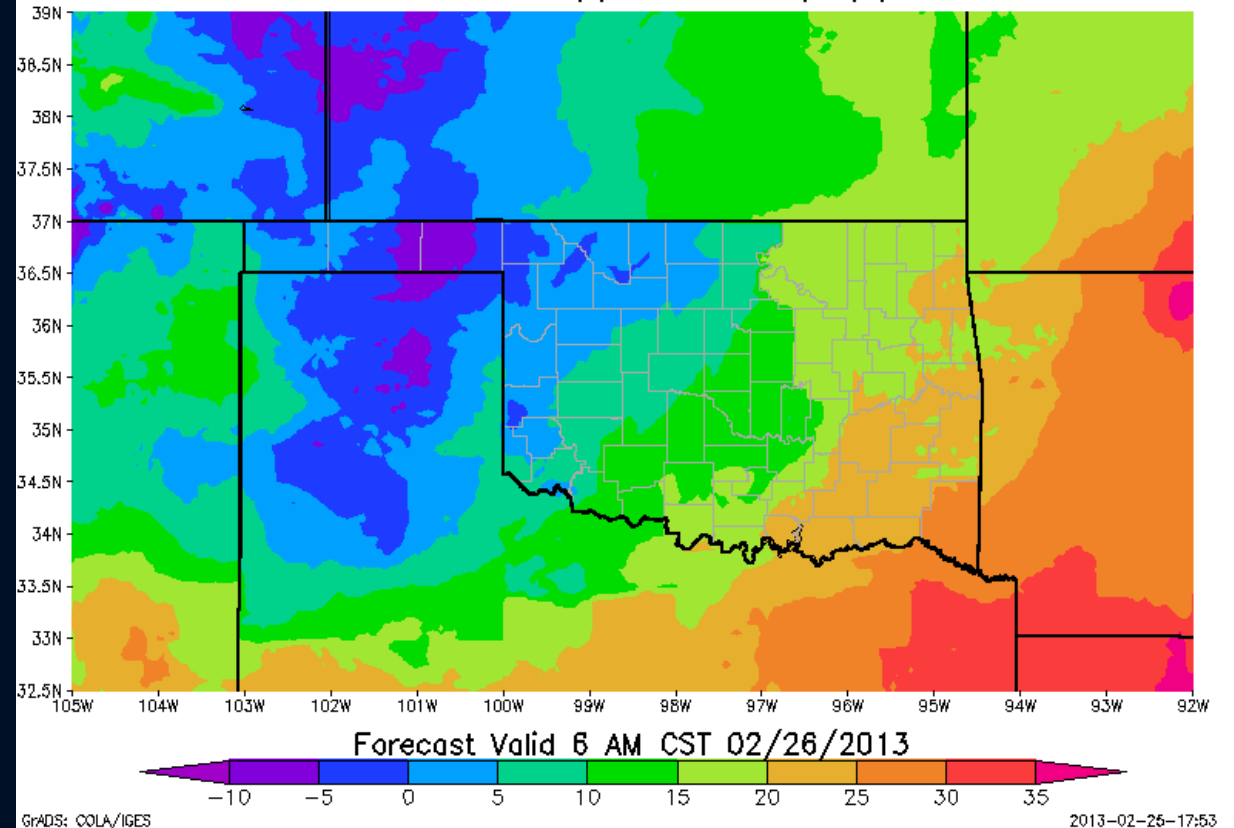


# February 25-26, 2013: Day of the event – heavy snow, cold but *very moist* air w/storm.

NWS WFO Total Snow and Sleet Forecast (in)



NWS WFO Apparent Temp (F)



February 25-26, 2013: Up to 18" of snow fell across northwest, north & n-central OK.

Woodward, OK



Fairview, OK



Okeene, OK





# February 25-26, 2013: Wet snow, high winds & light icing caused 'accretion' on lines.

Okeene, OK



Okeene, OK





February 25-26, 2013: 'Accretion' damage to Kay Electric Co-op system, Blackwell, OK



**February 25-26, 2013:**

**12" to 18" of snow; 1/10" to 1/8" ice;  
Max Wind Gusts Avg. 40 mph (4 Mesonet Stations)**

**38,532 customer outages; longest for 9 days (Level 4 SPIA)  
2,083 broken poles; 1 high voltage transmission structure;  
799 broken X-arms; 1 transmission structure X-arm;  
6 oil circuit reclosers & 8 transformers destroyed.**



**Hardest Hit Counties:** Alfalfa, Beckham, Blaine, Custer, Dewey,  
Garfield, Grant, Kay, Kingfisher, Major, Noble, Washita & Woods

**Estimated Damages:**  
**\$6.6 Million to 10 Co-ops**



# Different kinds of 'extreme' weather events are now becoming much more common. *Preparedness* is key.

January, 2002 Ice Storm:  
Cimarron Electric Co-op, Kingfisher, OK



February, 2013 Snow/Ice Storm:  
Cimarron Electric Co-op, Kingfisher, OK

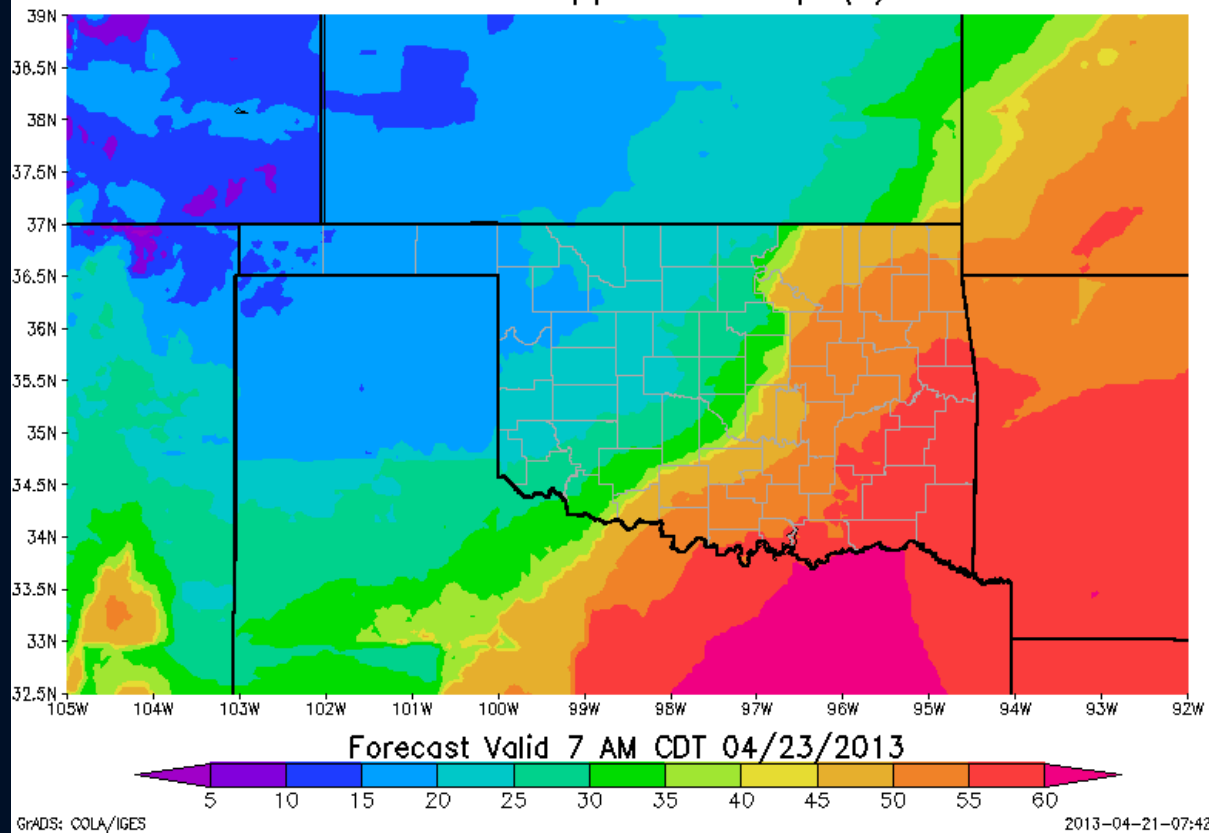




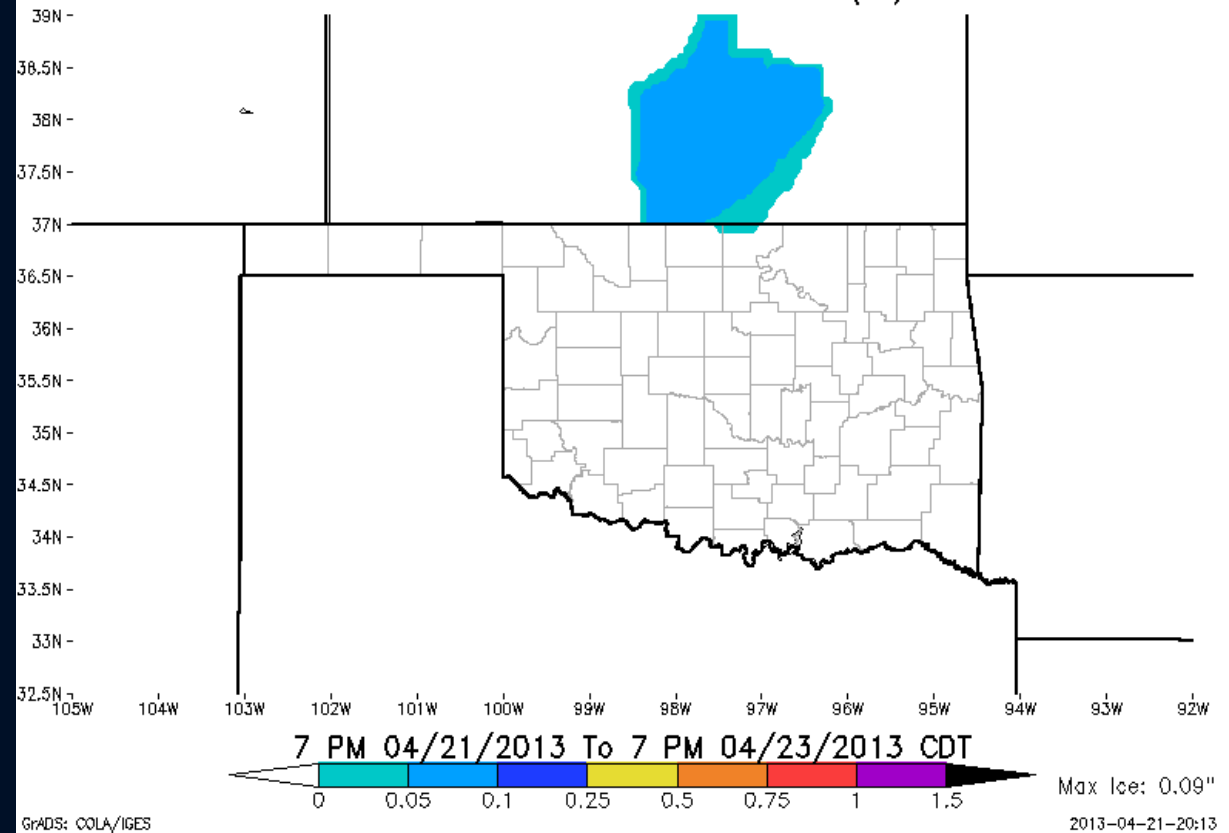
# Winter Storm #2

April 22-23, 2013: Light icing event to impact parts of OK & TX panhandles, NW-OK

NWS WFO Apparent Temp (F)

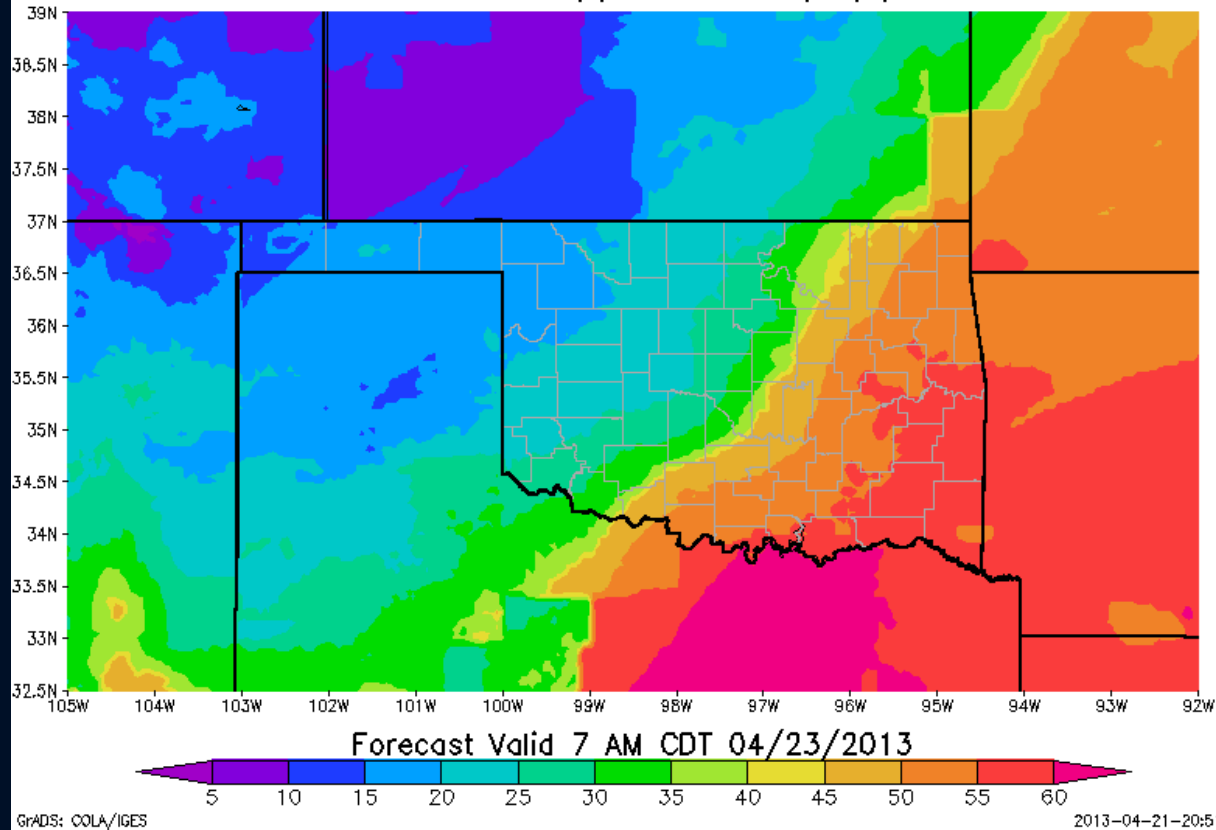


NWS WFO Total Ice Forecast(in)

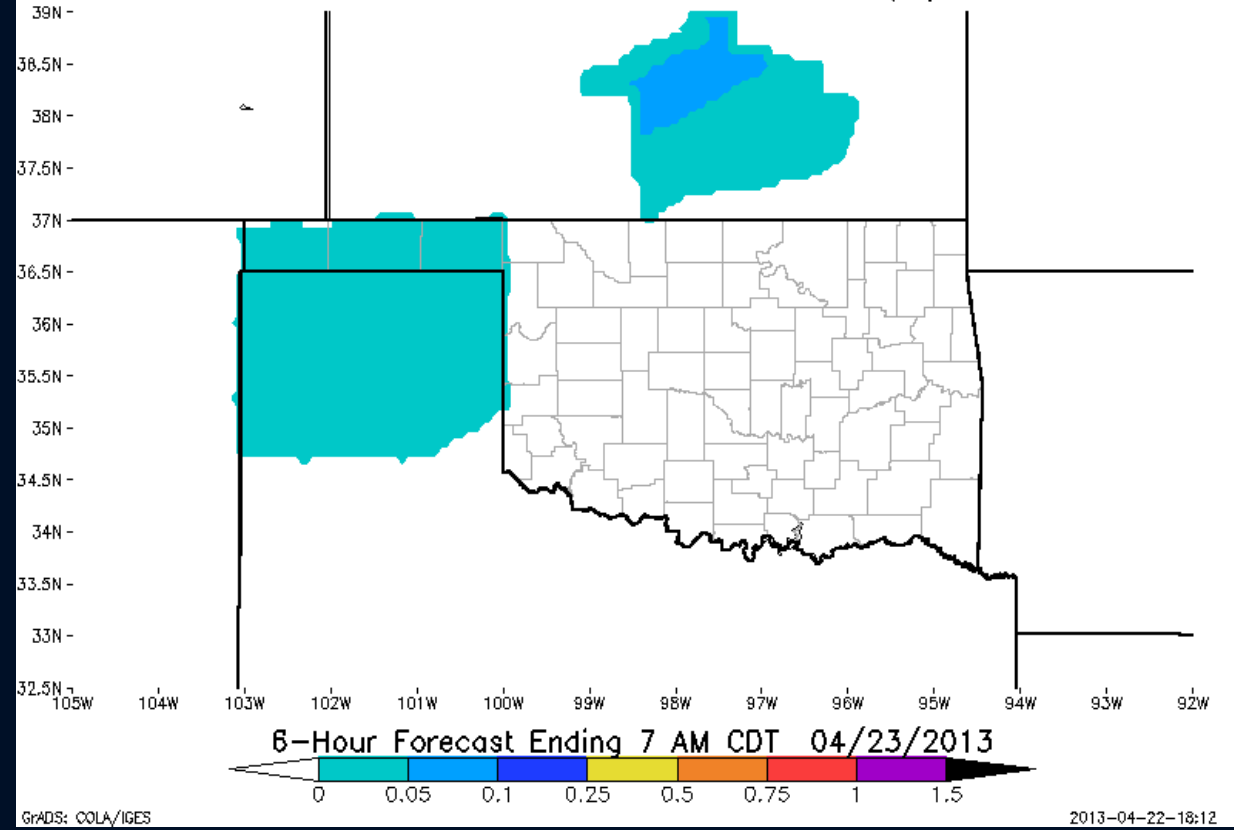


# April 22-23, 2013: Very cold air behind front; light ice forecast by Amarillo, Wichita NWS.

NWS WFO Apparent Temp (F)

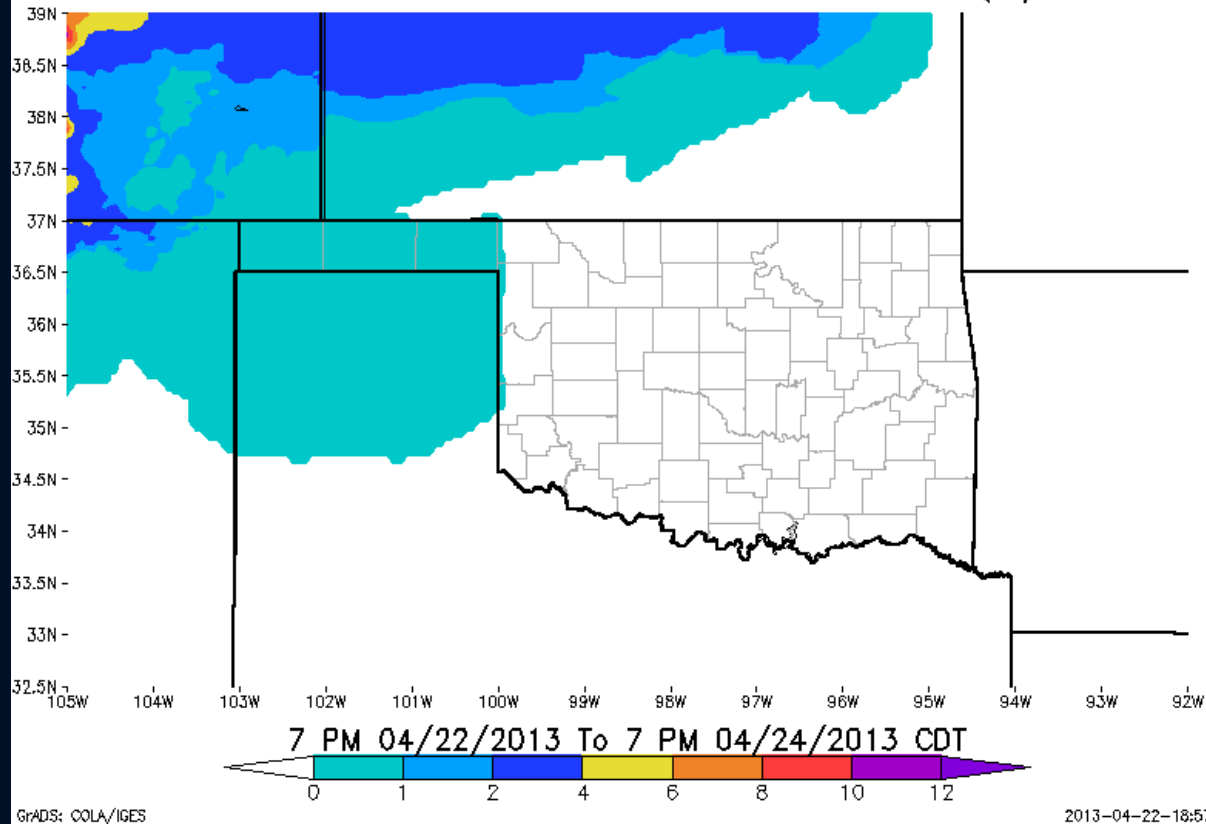


NWS WFO 6-Hour Ice Forecast(in)

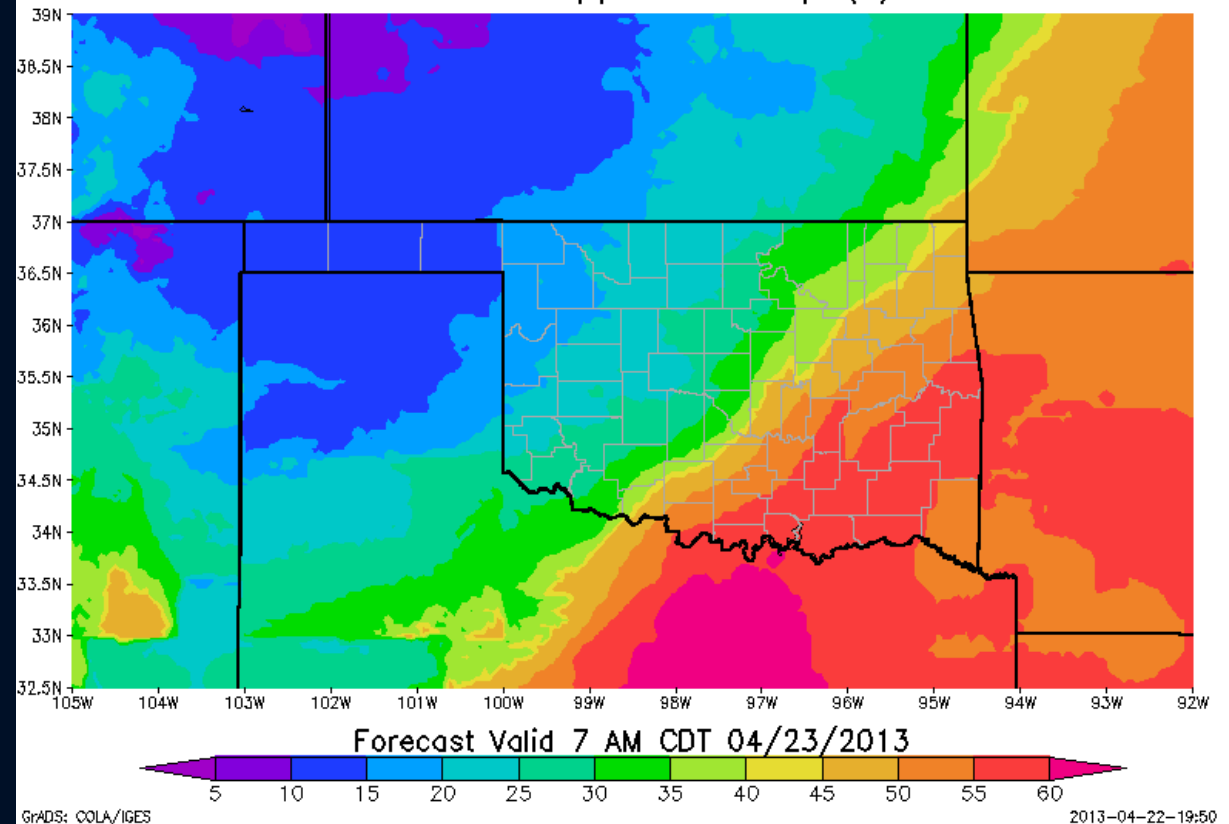


# April 22-23, 2013: Forecasts indicate snow and/or sleet more likely than ice. Maybe...

NWS WFO Total Snow and Sleet Forecast (in)



NWS WFO Apparent Temp (F)



April 22-23, 2013: Northwestern Electric Cooperative, Woodward, OK, service area.



*Latest “ice storm” or freezing rain event in recorded OK weather observation history.*



April 22-23, 2013:  
Why the damage?

<http://youtu.be/GXWWIMhwAmw>



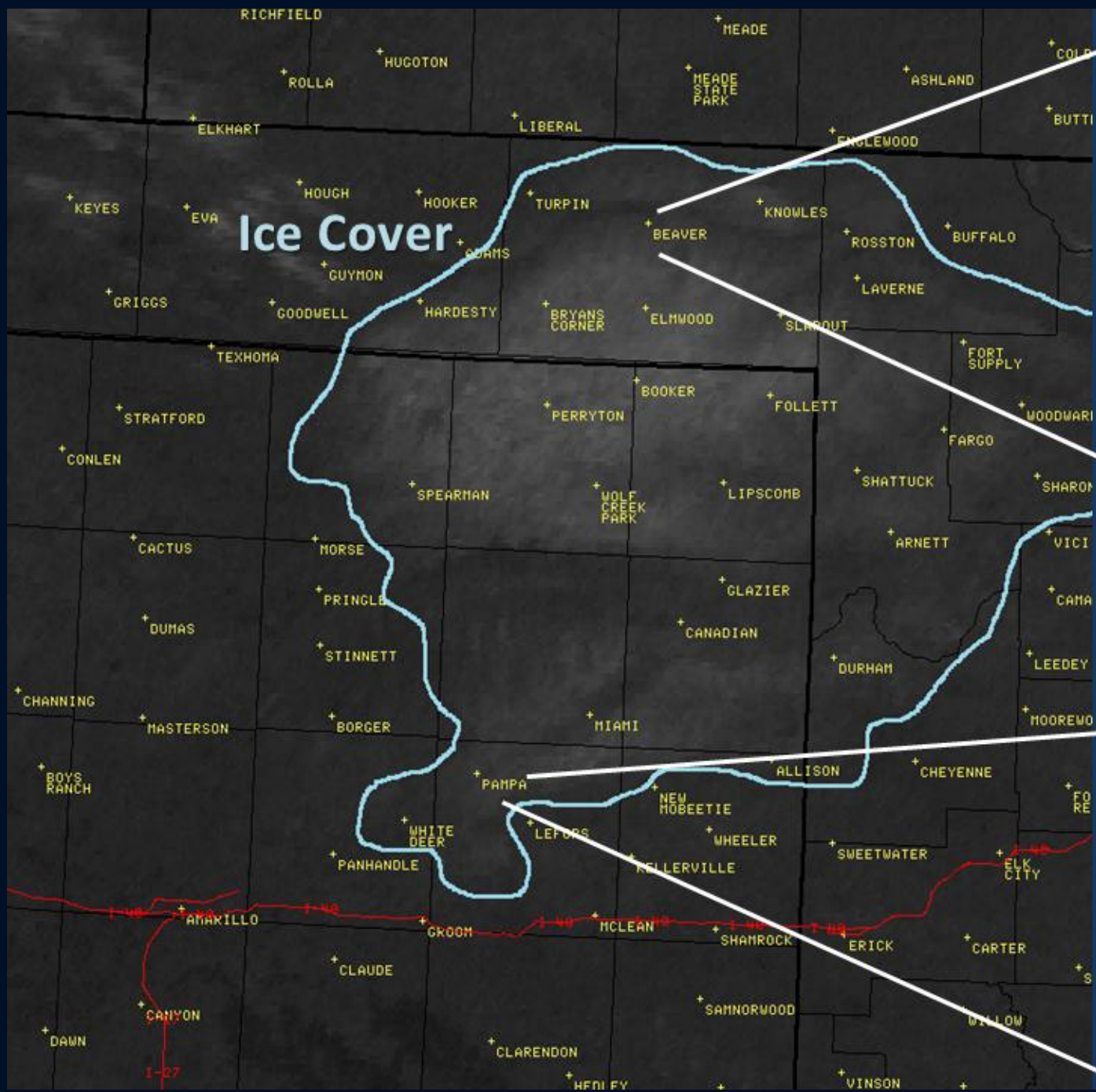


April  
22-23  
2013:

1/8"  
to 3/8"  
ice

Max  
wind  
gusts  
avg.\*  
47 mph

\* From 6  
Mesonet  
Stations



Hardest Hit  
Counties:

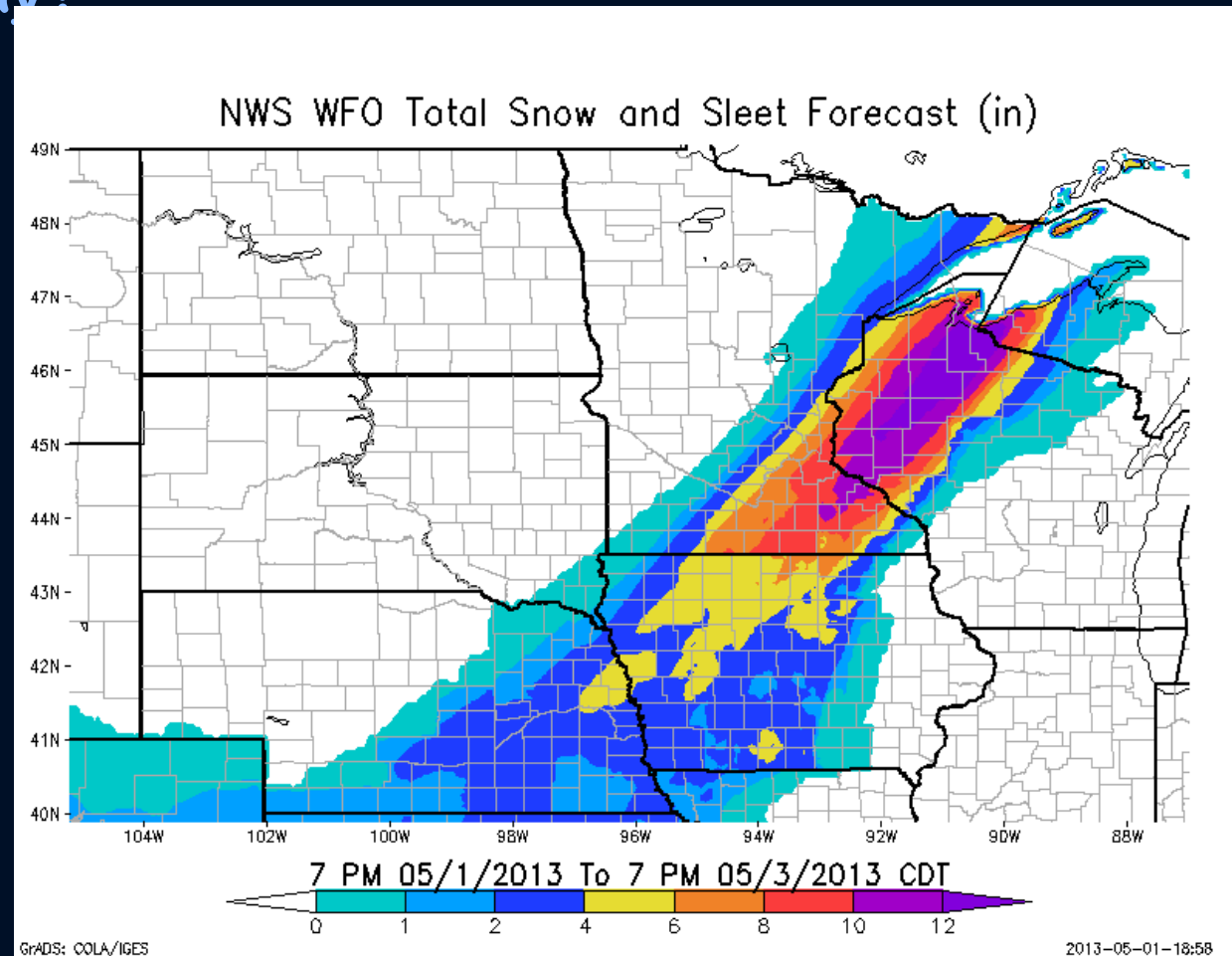
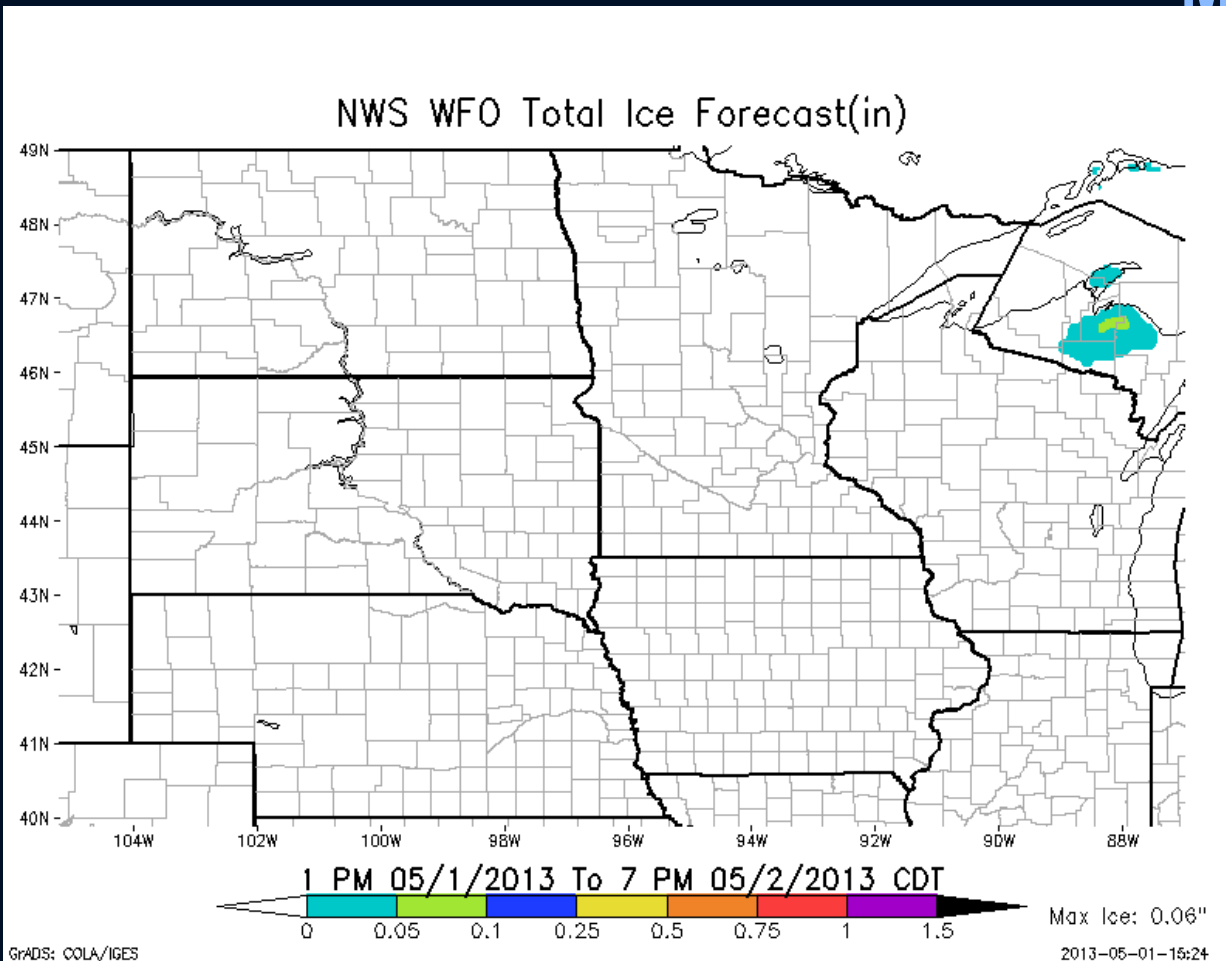
Beaver  
Ellis  
Harper  
Texas  
Woodward

Estimated  
Damages:  
\$250,000

6,000  
customer  
outages for  
24-36 hours;  
(Level 3 SPIA)

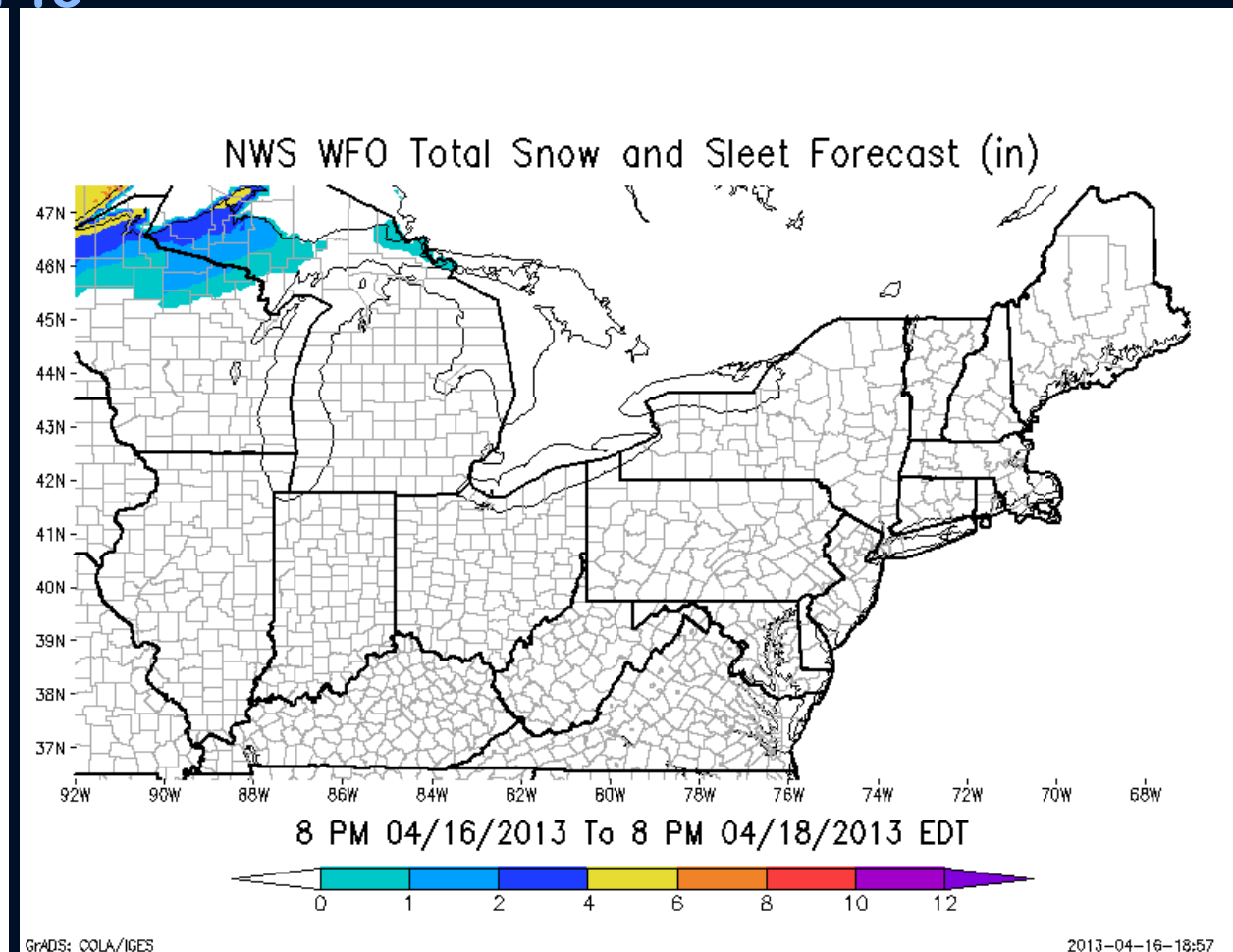
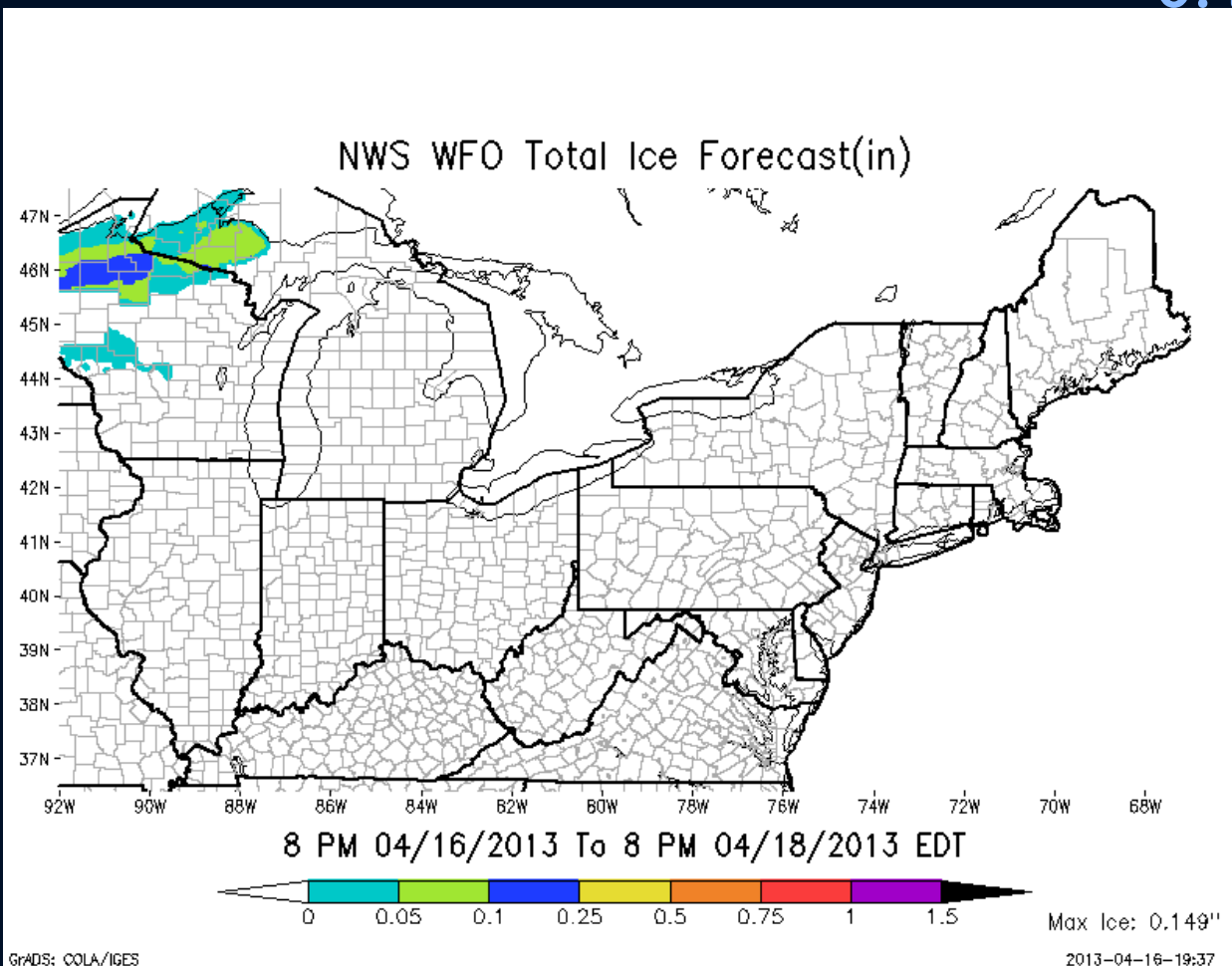
62 broken poles,  
30 broken X-arms,  
150 X-arm bolts,  
600 conductor ties,  
4 oil circuit reclosers

With late April ice in OK, what was going on in other states in late April, early May?



***There was also ice in the forecast for the Texas panhandle on May 3, 2013. Climate trends ARE changing; growing season now 22 days longer in west, 10 in east.***

# NWS Total Ice Forecast, Northeast Region, through April 18, 2013. Max ice = 0.149"

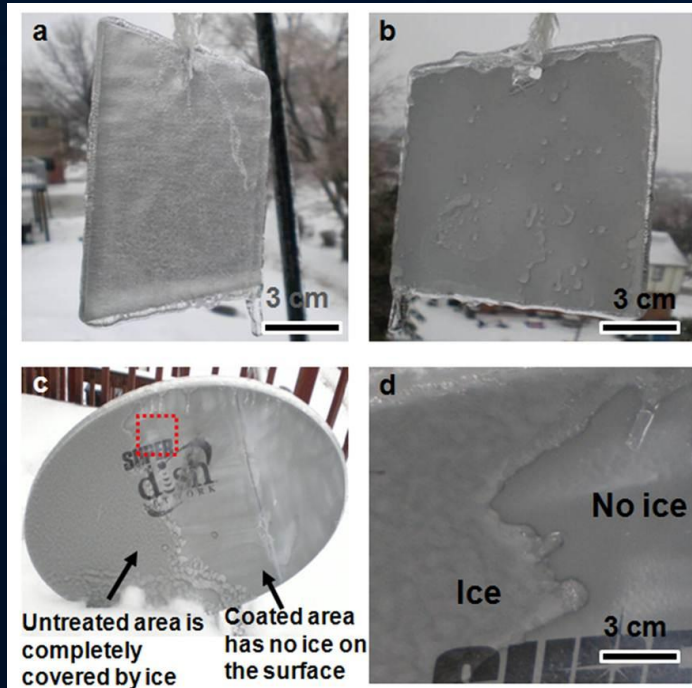


**NWS Total Snow & Sleet Forecast, Northeast Region, through April 18, 2013. 6" to 8"**



# What is “Superhydrophobics” Technology?

AND, MORE  
IMPORTANTLY,  
WHAT COULD “SH”  
TECHNOLOGY  
MEAN FOR MY  
COOPERATIVE?



# Anti-Icing Superhydrophobic Coatings

- Superhydrophobics technology involves the development of a liquid that includes microscopic bits of silica mixed in an acrylic polymer resin, which, when applied to conductors, allows for the formation of tiny air pockets. When freezing rain tries to ‘stick’ to this ‘agitated surface,’ the air pockets do not allow the freezing rain to adhere to the conductor surface, **thus ‘shedding’ the ice from power lines automatically.**

**What Inspired  
This Technology?**



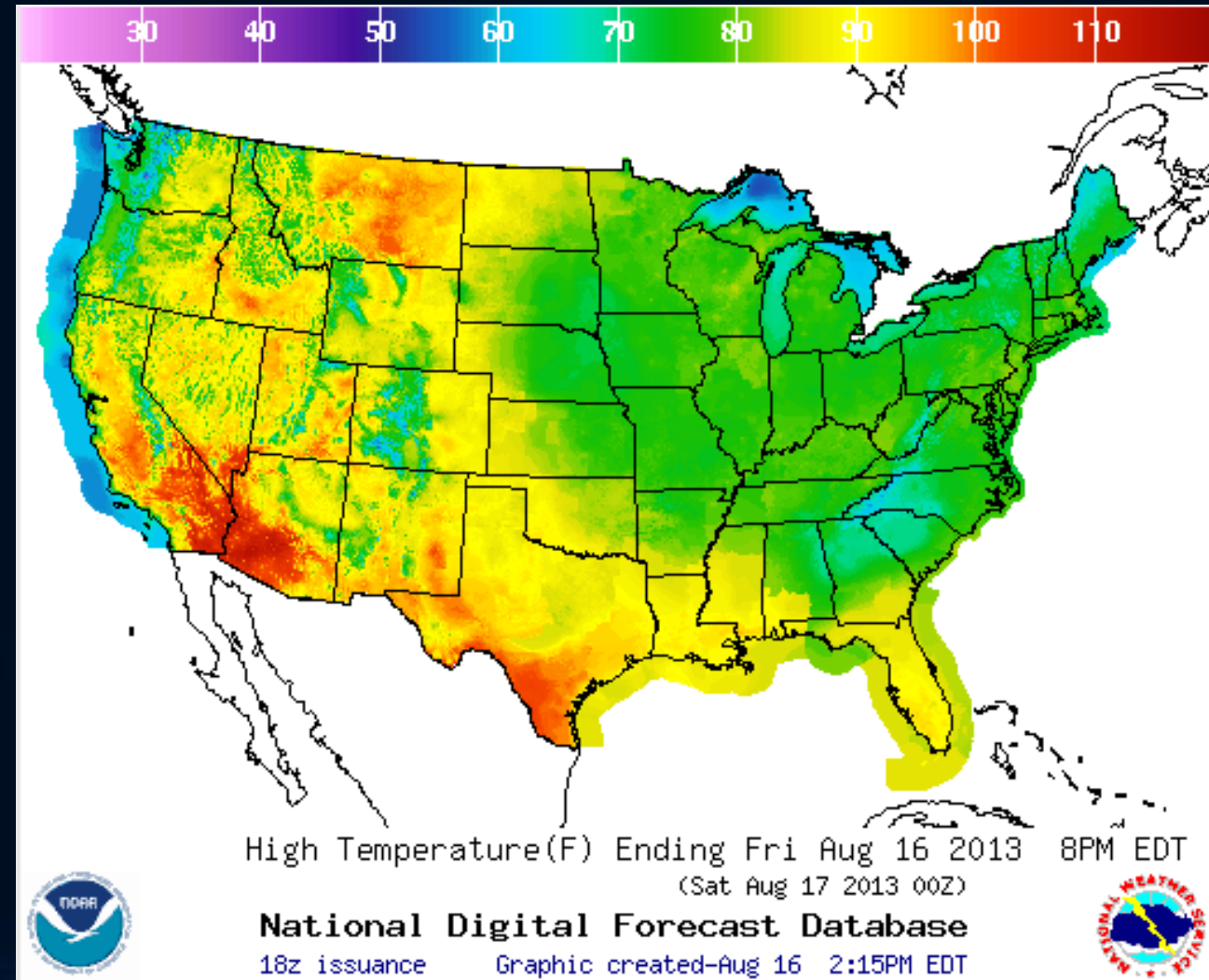
**LOTUS LEAVES!**  
No kidding... Lotus leaves!

**[http://www.youtube.com/watch?feature  
=player\\_embedded&v=PUPYFpfqeyo](http://www.youtube.com/watch?feature=player_embedded&v=PUPYFpfqeyo)**



# Where does the Data Come From?

- ❑ Over the past 10 years the NWS has placed an emphasis on producing gridded forecasts.
- ❑ Forecast numbers every 2.5 kilometers, make it possible to make **many different calculations** .



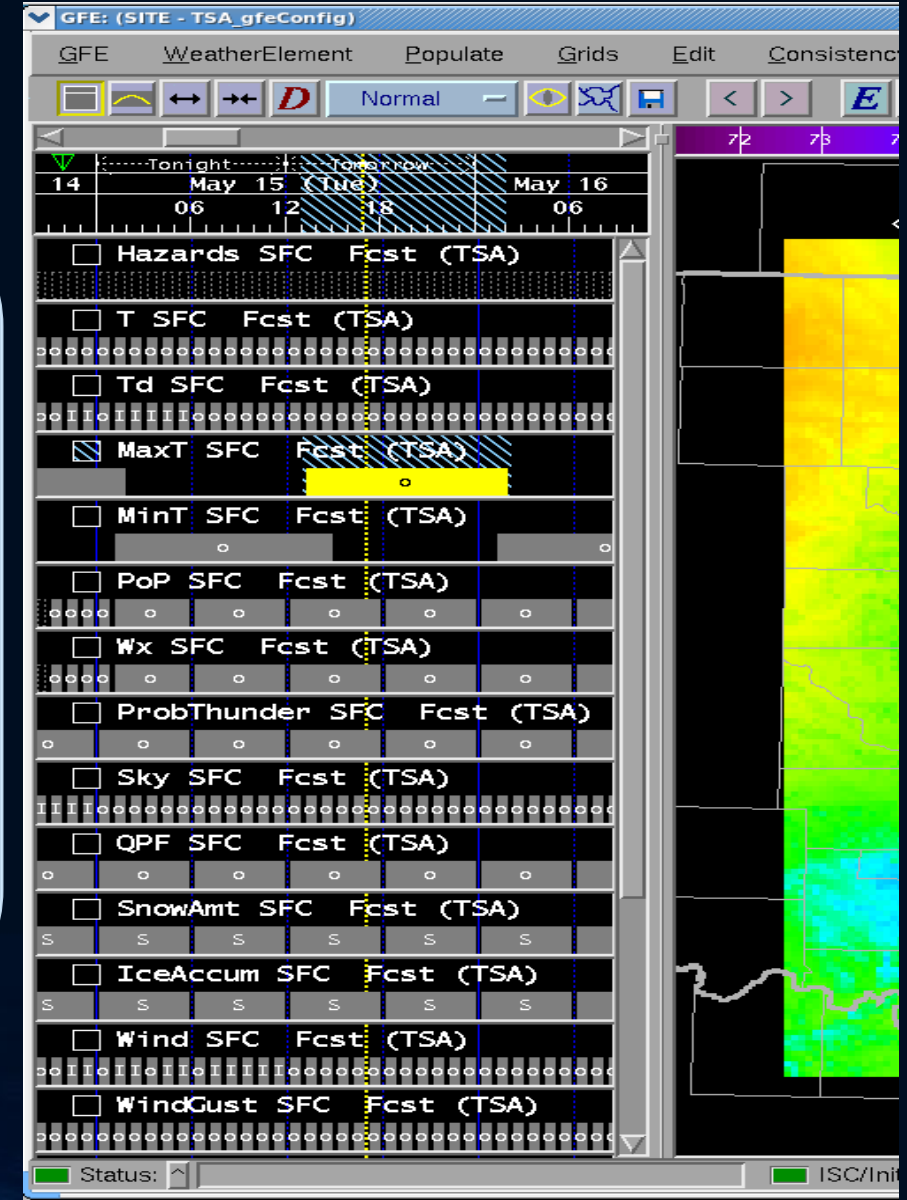




# NWS Gridded Forecasts

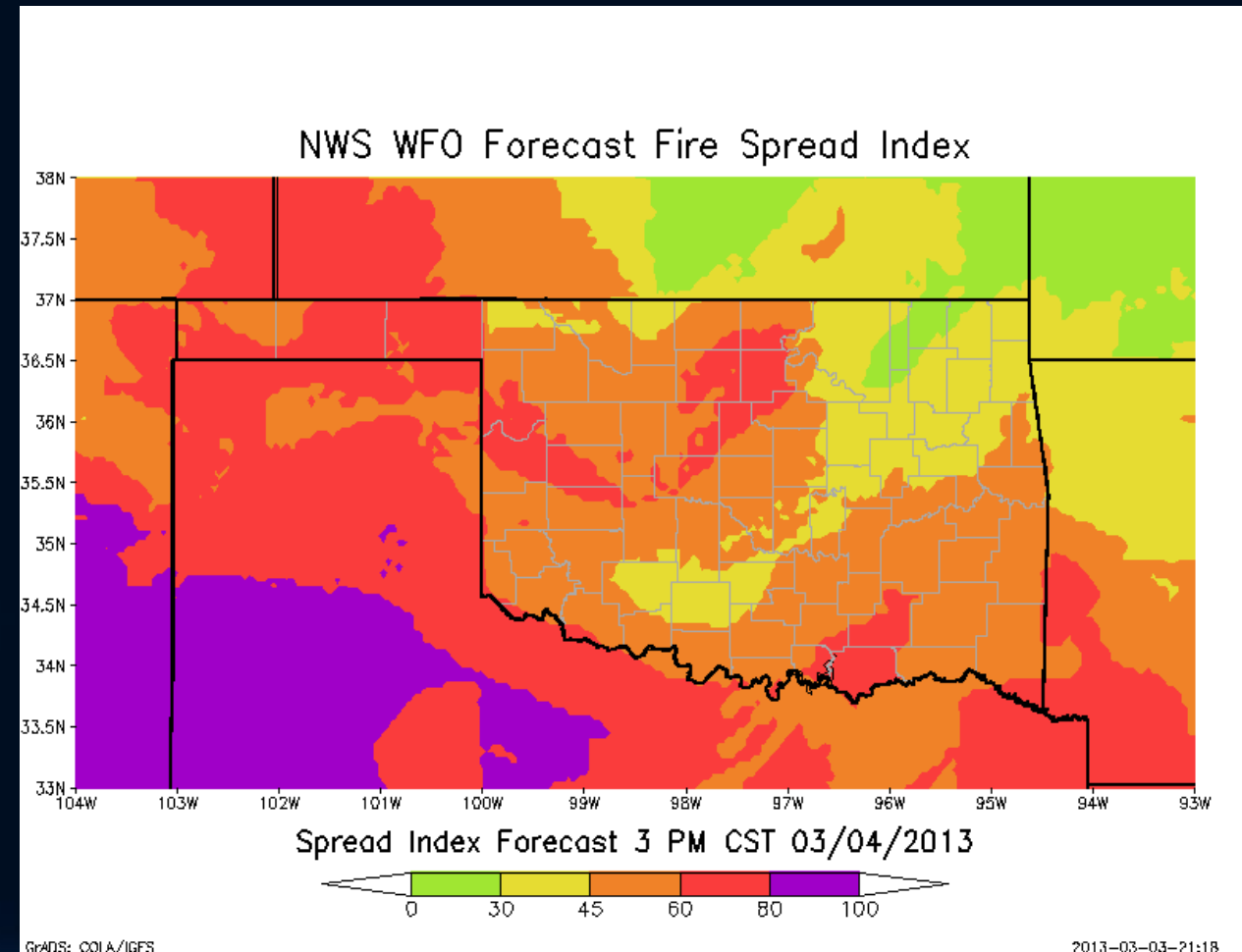
For the  
7-Day  
Forecast  
The  
NWS  
Makes  
Grids of:

- Temperature
- Dew Point
- Probability of Precipitation
- Weather Type
- Sky Cover
- QPF – Precipitation Amounts
- Snow Amount
- Ice Amount
- Wind
- Wind Gust



# Not Just Ice Decision Support

- If wind, temperature, and precipitation can be combined into an Ice Index...
- Then wind, temperature, and humidity can be combined into a Fire Spread Index...





# Fire Spread Index

*In the 1990s - Oklahoma Forestry asks the NWS to use these tables to calculate fire danger.*  
*In the 2000s – these table were converted into something that can be used with the gridded data.*

Table 1.--FINE FUEL MOISTURE - CURED HERBACEOUS STAGE

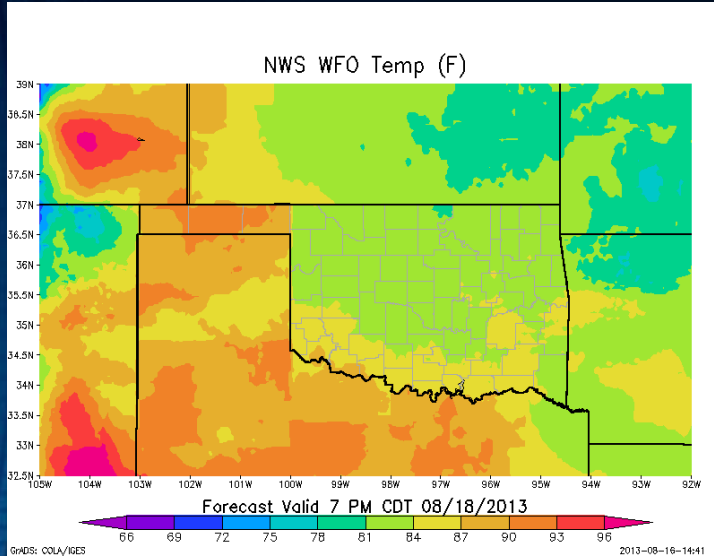
RELATIVE HUMIDITY (Percent)	DRY BULB TEMPERATURE (Degrees F)									
	100 to 109	90 to 99	80 to 89	70 to 79	60 to 69	50 to 59	40 to 49	30 to 39	20 to 29	10 to 19
100 to 90-94	PERCENT									
	30+ to 20	30+ to 23	30+ to 25	30+ to 25	30+ to 25	30+ to 25	30+ to 25	30+ to 25	30+ to 25	30+ to 25
100 to 90-94	14	16	18	19	20	22	25	25	25	30+
85-89 to 80-84	10	13	15	16	18	19	21	21	21	21
75-79 to 70-74	8	9.5	11	12	14	15	17	17	17	17
65-69 to 60-64	6	7.5	8.5	9.5	11	13	14	14	14	14
55-59 to 50-54	5	6	7	8	9	10	12	12	12	12
45-49 to 40-44	4	5	6	7	8	9	9	9	9	9
35-39 to 30-34	3.5	4	5	5.5	6.5	7.5	8	8	8	8
25-29 to 20-24	3	3	4	4.5	5.5	6.5	7.5	7.5	7.5	7.5
15-19 to 10-14	2	2.5	3	3.5	4	5	6	6	6	6
5-9 to 0-4	1.5	1.5	2	2.5	3	3.5	4	4	4	4

FUEL MOISTURE (Percent)	WIND SPEED (MPH 20-foot Standard)																	
	0-1	2	3	4	5	6	7	8	9	10	11-12	13-15	16-19	20-24	25-29	30+		
NUMBER																		
30+	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
29-30	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
27-28	1	1	1	1	1	1	1	1	1	2	3	4	5	6	8	9	9	9
25-26	1	1	1	1	2	2	2	3	3	4	6	7	8	9	11	13	13	13
23-24	1	2	3	3	4	4	5	6	7	7	8	10	11	13	15	17	17	17
21-22	2	3	4	5	6	7	8	8	9	10	11	13	15	17	20	22	22	22
19-20	4	5	6	7	8	9	10	11	12	13	15	17	19	22	25	29	29	29
17-18	6	8	9	10	11	12	13	14	15	16	18	21	24	28	32	36	36	36
15-16	8	10	11	12	14	15	17	18	19	20	22	26	30	34	39	44	44	44
14	9	11	12	14	16	18	20	21	22	23	26	30	34	39	44	51	51	51
13	10	12	14	16	18	20	21	23	25	26	28	33	37	43	48	56	56	56
12	11	13	15	17	19	21	23	25	27	28	31	36	41	47	53	61	61	61
11	12	15	17	19	21	23	25	27	29	31	34	39	44	51	58	67	67	67
10	13	16	18	20	22	25	27	29	31	33	37	42	48	56	63	73	73	73
9.5	14	17	19	21	23	26	28	30	33	35	38	44	50	58	66	76	76	76
9	14	17	20	22	24	27	29	32	34	36	40	46	52	60	68	79	79	79
8.5	15	18	21	23	25	28	30	33	36	38	42	48	54	63	71	81	81	81
8	15	19	22	24	26	29	31	34	37	39	43	49	56	65	73	83	83	83
7.5	16	19	22	25	28	30	33	35	38	40	45	51	58	67	75	85	85	85
7	17	20	23	25	28	31	34	37	39	42	47	53	60	69	77	87	87	87
6.5	17	21	24	26	29	32	35	38	40	43	48	54	61	70	78	88	88	88
6	18	22	25	27	30	34	37	39	42	45	50	56	63	72	80	90	90	90
5.5	18	22	25	28	31	35	38	41	44	47	52	58	65	74	82	92	92	92
5	19	23	26	29	32	36	39	42	45	48	53	59	66	75	83	93	93	93
4.5	20	24	27	30	33	37	40	43	46	49	54	60	67	76	84	94	94	94
4	21	24	28	31	34	38	41	44	47	50	55	61	68	77	85	95	95	95
3.5	21	25	29	32	35	39	42	45	48	51	56	62	69	78	86	96	96	96
3	22	26	30	33	36	40	43	46	49	52	57	63	70	79	87	97	97	97
2.5	23	27	31	34	38	42	45	48	51	54	59	65	72	81	89	99	99	99
2	24	28	32	35	39	43	46	50	54	58	63	69	76	85	93	100	100	100
1.5	24	28	32	36	40	44	48	52	56	60	65	71	78	87	95	100	100	100
1	25	29	33	37	41	45	49	53	57	61	66	72	79	88	96	100	100	100

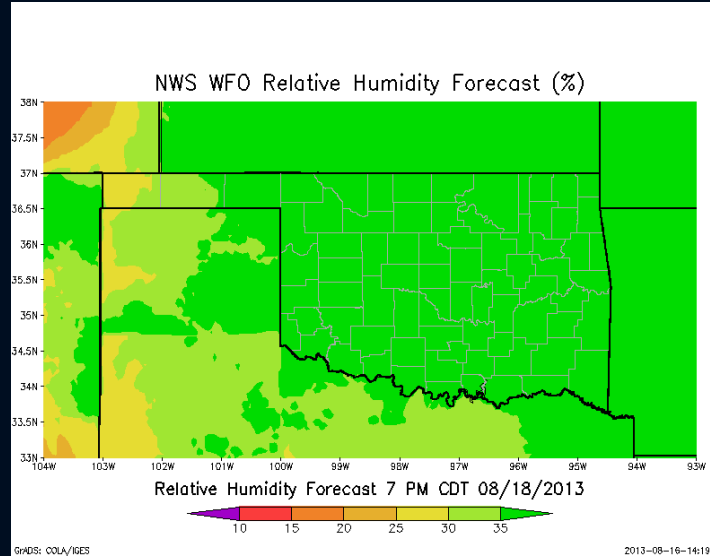
Spread Index =  
 Temp  
 Humidity  
 Wind  
 Vegetation State



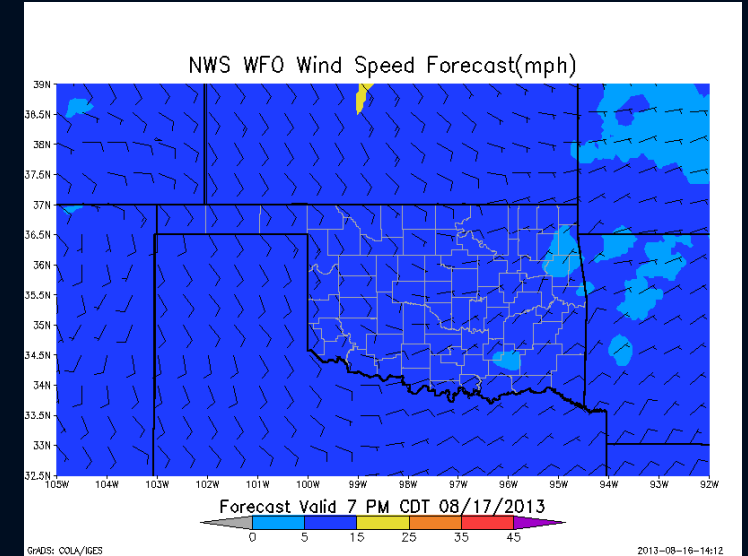
# Fire Spread Index



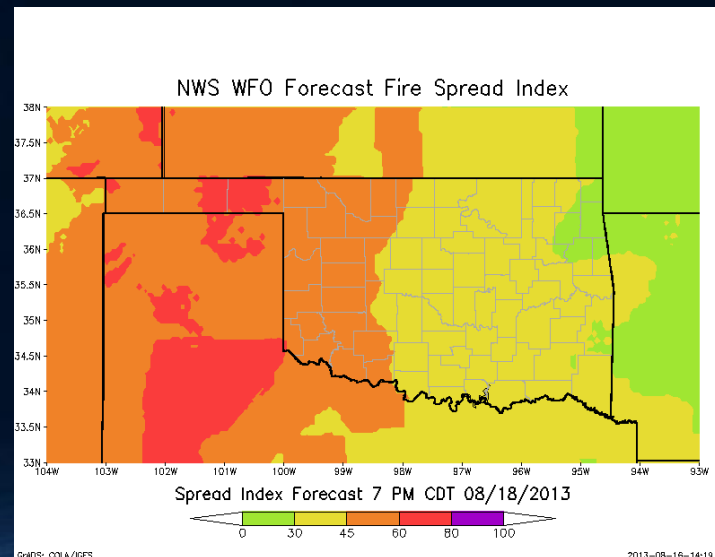
+



+



=

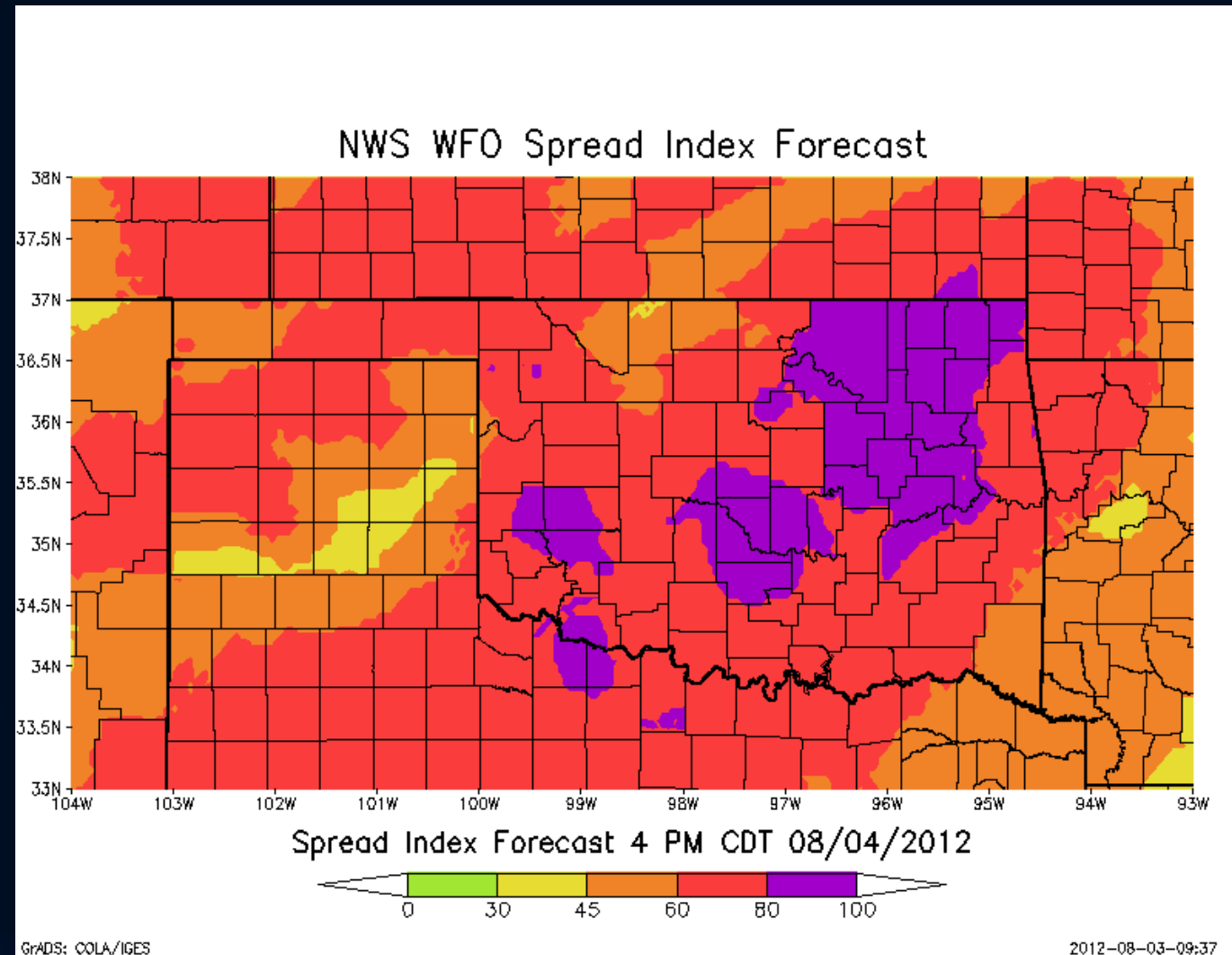


These images are created in the State EOC each hour using NWS data from each office in the region.

*\* Images made in the State EOC are created with the vegetation state set to cured... so the spread potential will be less where the grass is green.*

# Fire Spread Index

- Forecast Spread Index created on 3 August for Saturday August 4<sup>th</sup>, 2012
- This image was used in OEM and NWS briefings on August 3<sup>rd</sup>.
- Heard on the briefing: “If this is right, tomorrow will be very bad”.





# 4 August 2012 – Thermal Satellite Image – Black Areas = Large Fires



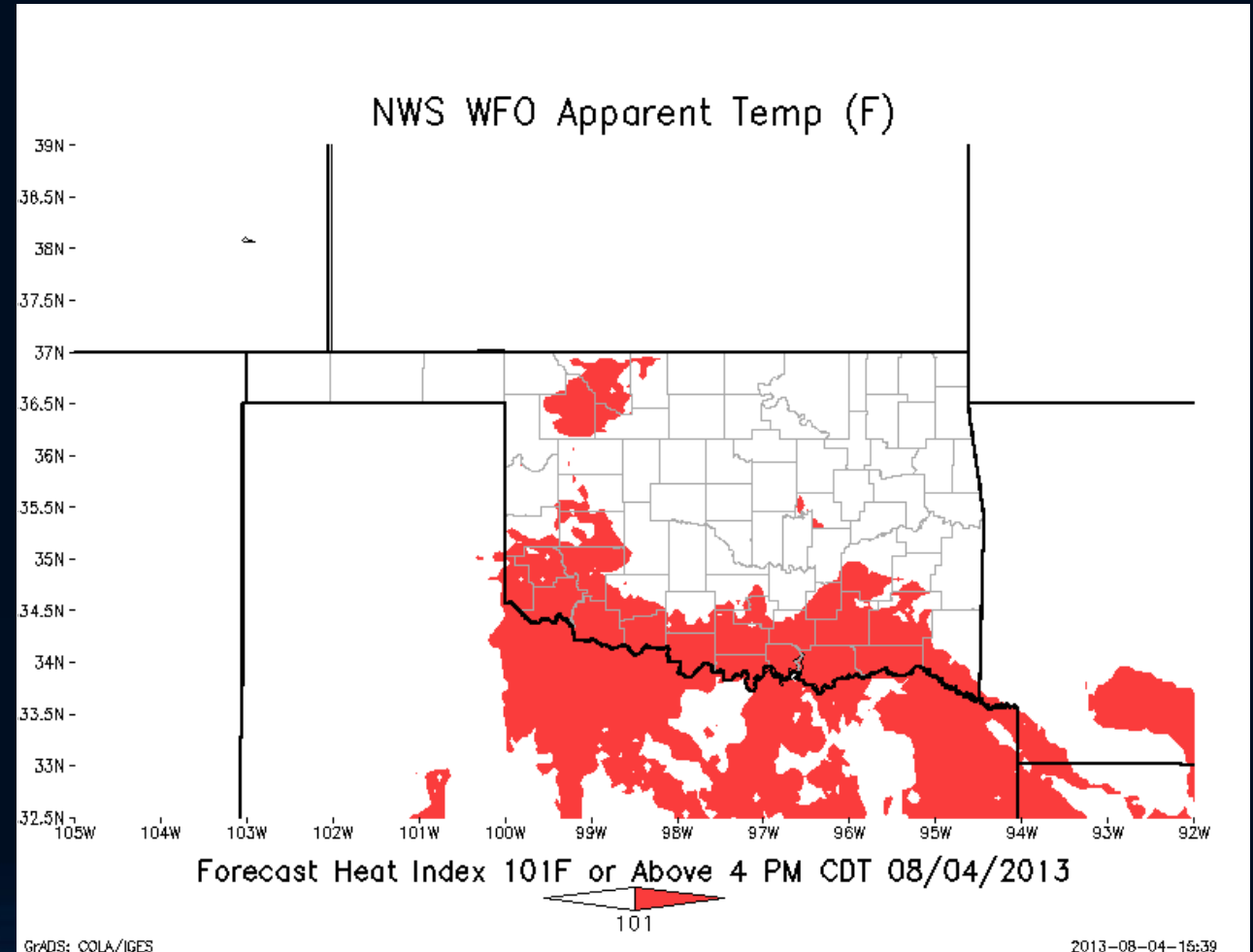
*Dozens of homes & structures were destroyed by large wildfires in OK on 4 Aug*



# Customized Decision Support

- Oklahoma Corporation Commission Rules require that electric companies not cut-off delinquent customers when the heat index is forecast to reach or exceed 101F.
- Customized graphics based on digital forecast data can help decision makers.
- The full temperature map can be changed to just a criteria-based map.

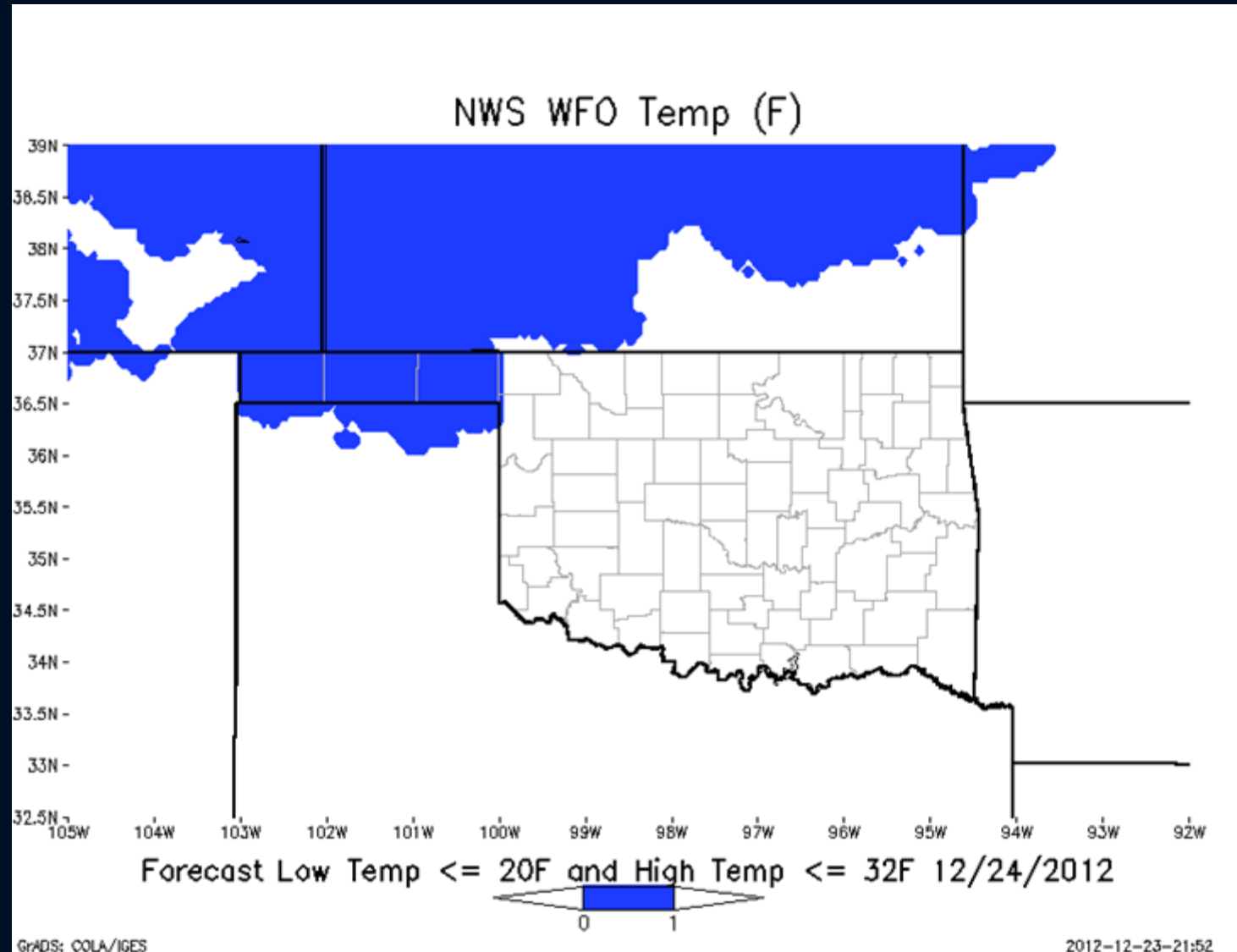
*OCC Rules: OAC 165:35-21-10 (c)*



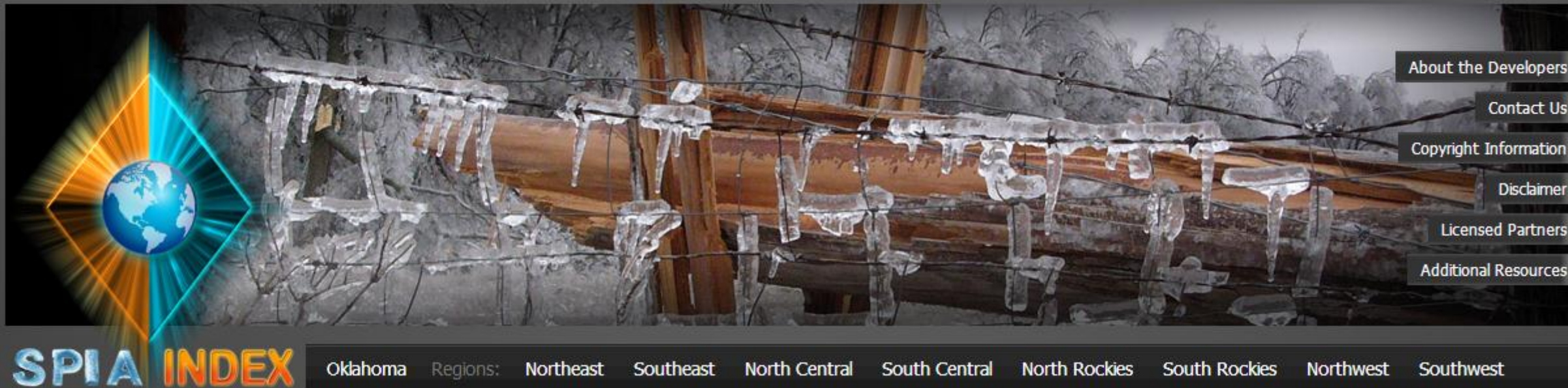
# Customized Decision Support

- OCC Rules also require that electric companies not cut-off delinquent customers in winter when the temperature is forecast to be 32F or below or nighttime low is forecast to be 20F or less.
- Customized graphics based on digital forecast data can help decision makers.
- The full temperature map can be changed to just a criteria-based map.

*OCC Rules: OAC 165:35-21-10 (c)*







QUESTIONS?



*Thank  
You!*