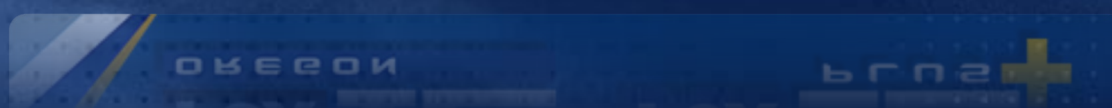


YEARLY WEATHER RECAP

Mark Nelsen

A (MOSTLY) MILD & WET EL NIÑO WINTER



Winter 2023-24

- Warmer & wetter than average, not unusual for strong El Niño winter
- One brief period of lowland snow/ice/cold (mid-January in northern OR+WA)
- Most intense cold/wind episode in Portland metro since Feb. 1989 (?)
- Two episodes of heavy Cascade snowfall, otherwise terrible ski season start through early January



**OFFICIAL
SNOW TOTAL:**

1.6"

at PQR (NWS Office)

2.0" Downtown (KGW-TV)
(+ **0.2"** & **0.3"** in record but incorrect)

FIRST ALERT PORTLAND SNOWFALL

WINTER 2023-24



1.6
inches
WINTER
SNOWFALL
+ SLEET

1 measurable snow event

SNOW	FRZ RAIN/ICE
Trace Jan 9th	.20" Jan 16th
Trace Jan 12th	.40" Jan 18th
1.6" Jan 13th	
Trace Mar 2nd	

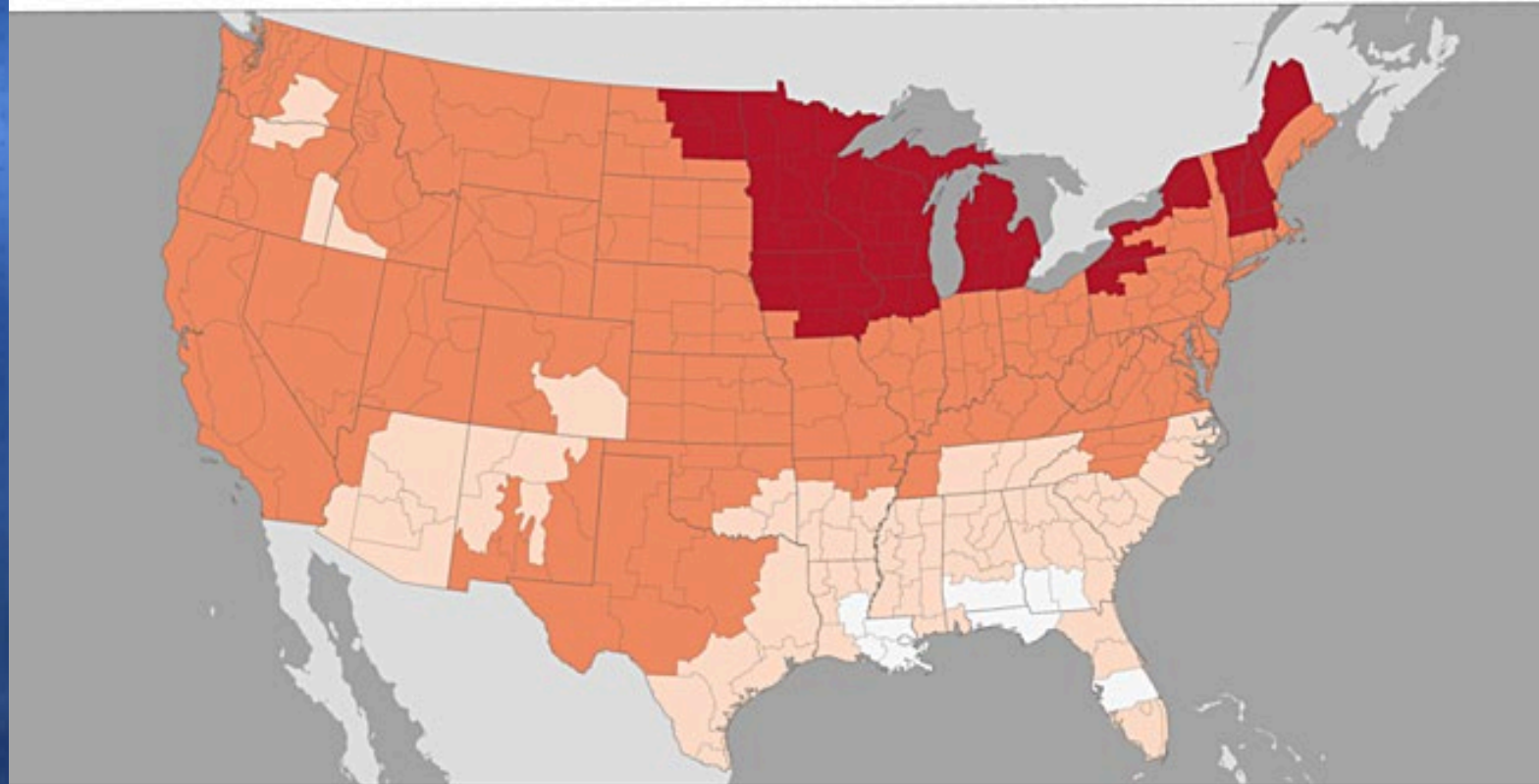
Winter Temperature Anomaly

Divisional Average Temperature Ranks

December 2023–February 2024

Ranking Period: 1895–2024

NOAA's National Centers for Environmental Information



Record
Coldest

Much
Below
Average

Below
Average

Near
Average

Above
Average

Much
Above
Average

Record
Warmest



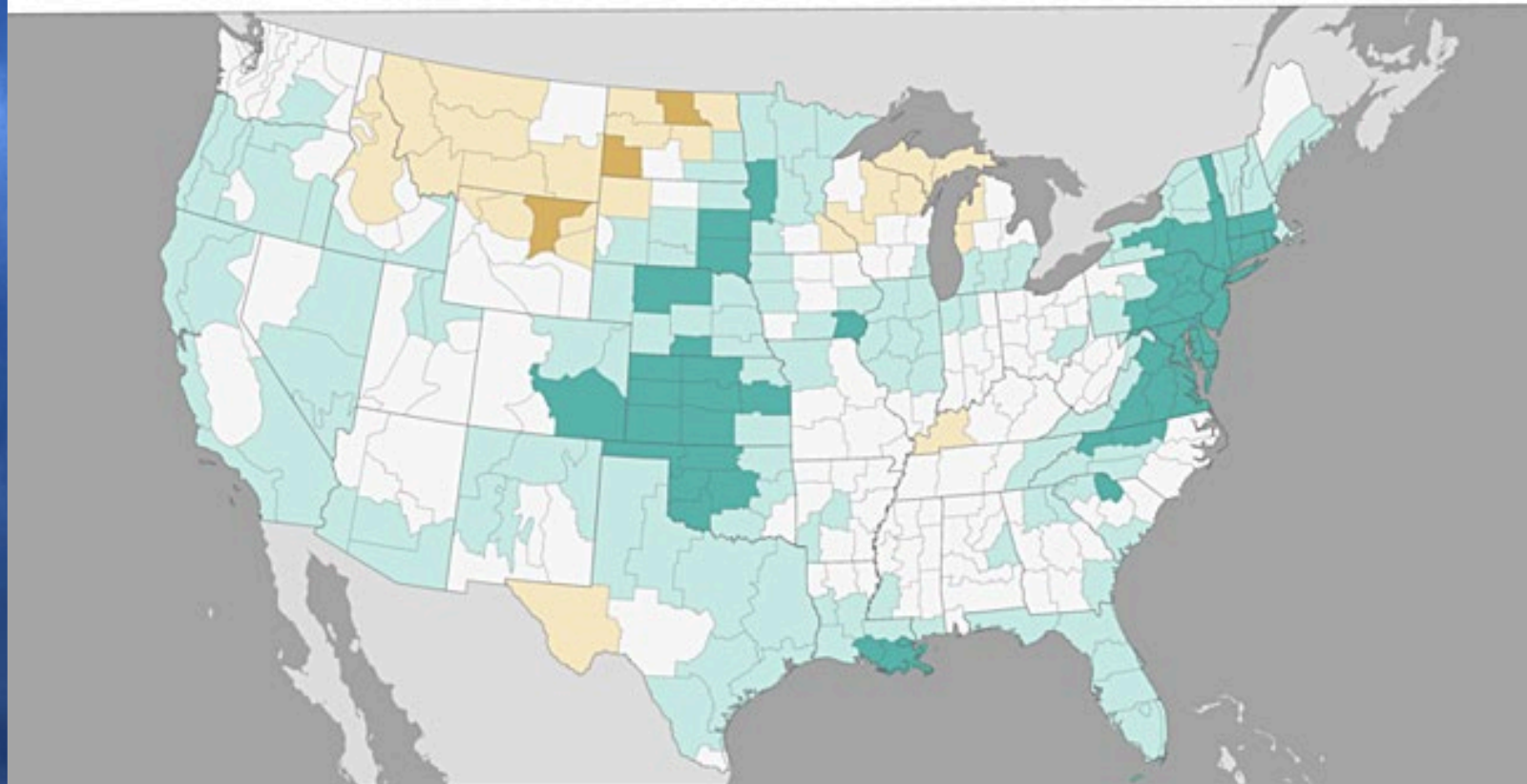
Winter Precip Anomaly

Divisional Precipitation Ranks

December 2023–February 2024

Ranking Period: 1895–2024

NOAA's National Centers for Environmental Information



Record Driest

Much Below Average

Below Average

Near Average

Above Average

Much Above Average

Record Wettest



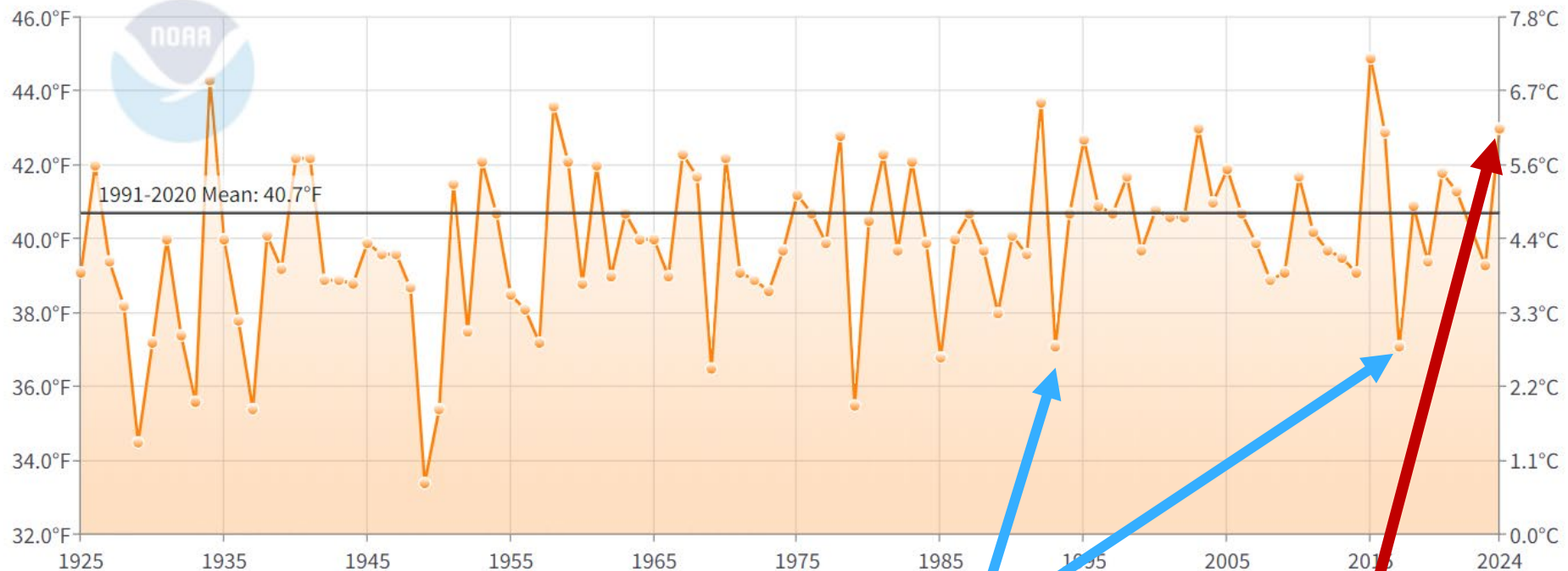
OR Western Valleys Winter Temperature

(the past 100 years)

Warmer than normal, in top 10. Last “very cold” winter was 2016-17

Oregon, Climate Division 2 Average Temperature

December-February



The last two cold winters (92-93 & 16-17)

Last Winter in Oregon Zone 2 (Willamette Valley)

NOVEMBER 2023

Nothing interesting...
near average temps/precip with cool spell end of month

FIRST ALERT NOVEMBER 2023 IN PORTLAND

SUN	MON	TUE	WED	THU	FRI	SAT
			1 55°	2 68°	3 61°	4 67°
5 64°	6 58°	7 59°	8 55°	9 54°	10 55°	11 56°
12 57°	13 58°	14 55°	15 52°	16 54°	17 57°	18 52°
19 55°	20 51°	21 56°	22 54°	23 53°	24 52°	25 52°
26 52°	27 49°	28 46°	29 40°	30 40°		

AVERAGE HIGH:

58° 1st

50° 30th

+0.6°
from normal
CHILLY DAYS
AT THE END

December starts with mountain snow-storm...exciting for 1-2 days

FIRST ALERT DECEMBER 1-2ND STORM

FIRST BIG SNOW WAS FOLLOWED BY PINEAPPLE EXPRESS

15"

SKIBOWL

33"

TIMBERLINE

24"

MT. HOOD
MEADOWS

DECEMBER 1ST

26

35

DECEMBER 2023

Very warm! Included warmest December day at PDX

FIRST ALERT DECEMBER 2023 IN PORTLAND

SUN	MON	TUE	WED	THU	FRI	SAT
					1 52°	2 53°
3 61°	4 67°	5 64°	6 59°	7 50°	8 49°	9 44°
10 54°	11 51°	12 53°	13 54°	14 52°	15 53°	16 51°
17 50°	18 49°	19 49°	20 52°	21 51°	22 48°	23 41°
24 46°	25 43°	26 48°	27 49°	28 50°	29 55°	30 50°
31 46°	AVERAGE HIGH: 49° 1st 46° 31st					

+4.5°
from normal

SECOND WARMEST
DECEMBER ON
RECORD
(1950 #1)

DECEMBER 2023

Very warm...and wet!

FIRST ALERT DECEMBER 2023 IN PORTLAND

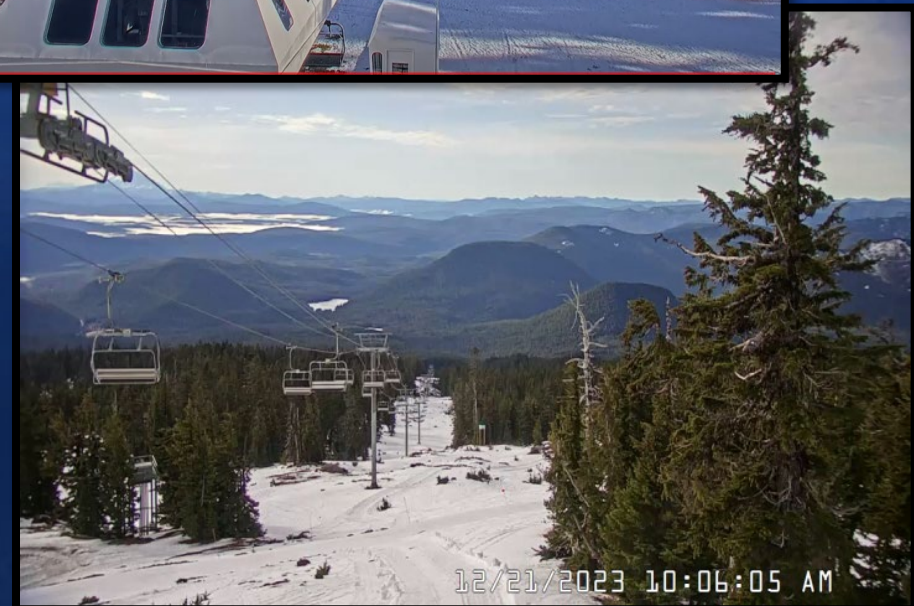
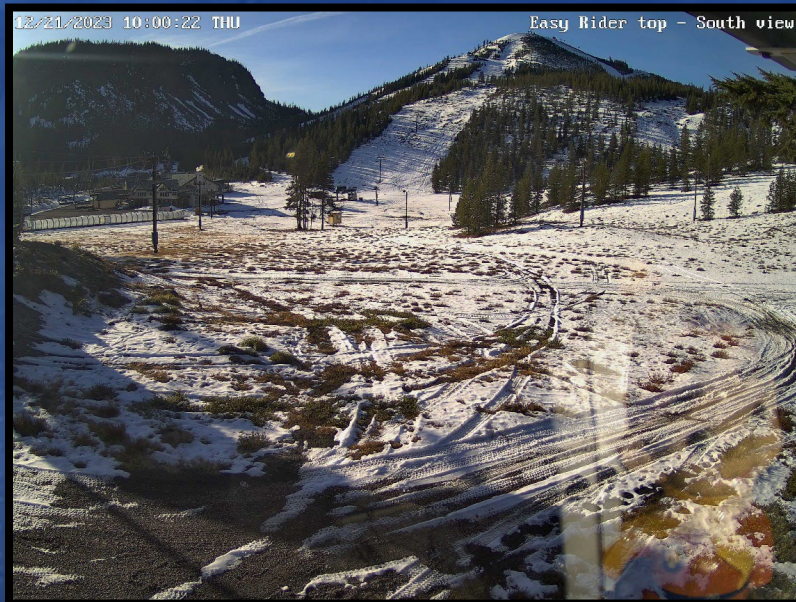
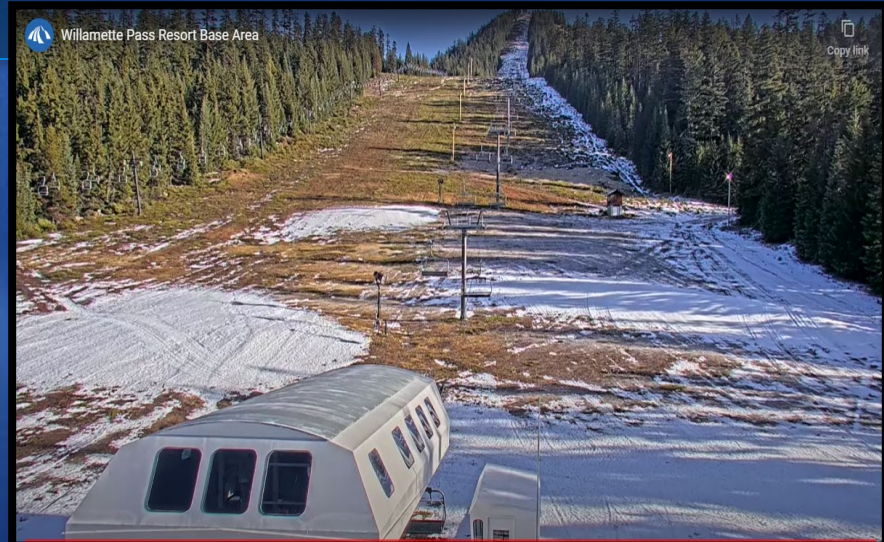
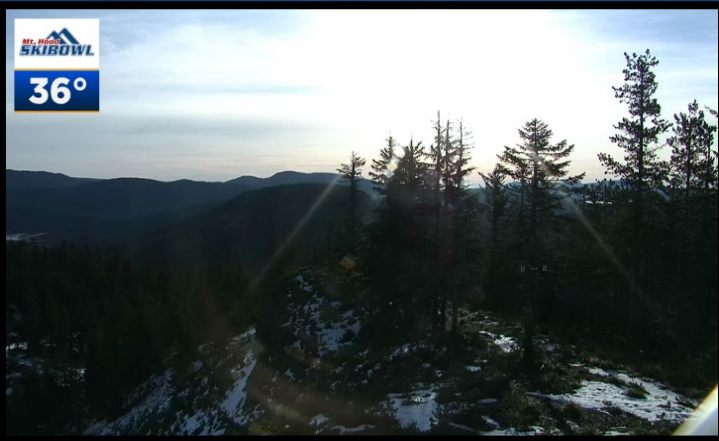
SUN	MON	TUE	WED	THU	FRI	SAT
					¹ .56"	² .96"
³ .81"	⁴ .06"	⁵ 1.48"	⁶ 1.68"	⁷ .08"	⁸	⁹ .44"
¹⁰ .77"	¹¹ .08"	¹²	¹³	¹⁴ .01"	¹⁵	¹⁶
¹⁷	¹⁸	¹⁹ .51"	²⁰	²¹	²² .36"	²³
²⁴ .02"	²⁵ .49"	²⁶ .03"	²⁷ .12"	²⁸ .02"	²⁹ .10"	³⁰ .15"
³¹						

RAIN
8.73"

A TYPICAL
DECEMBER
5.77"

DECEMBER 2023

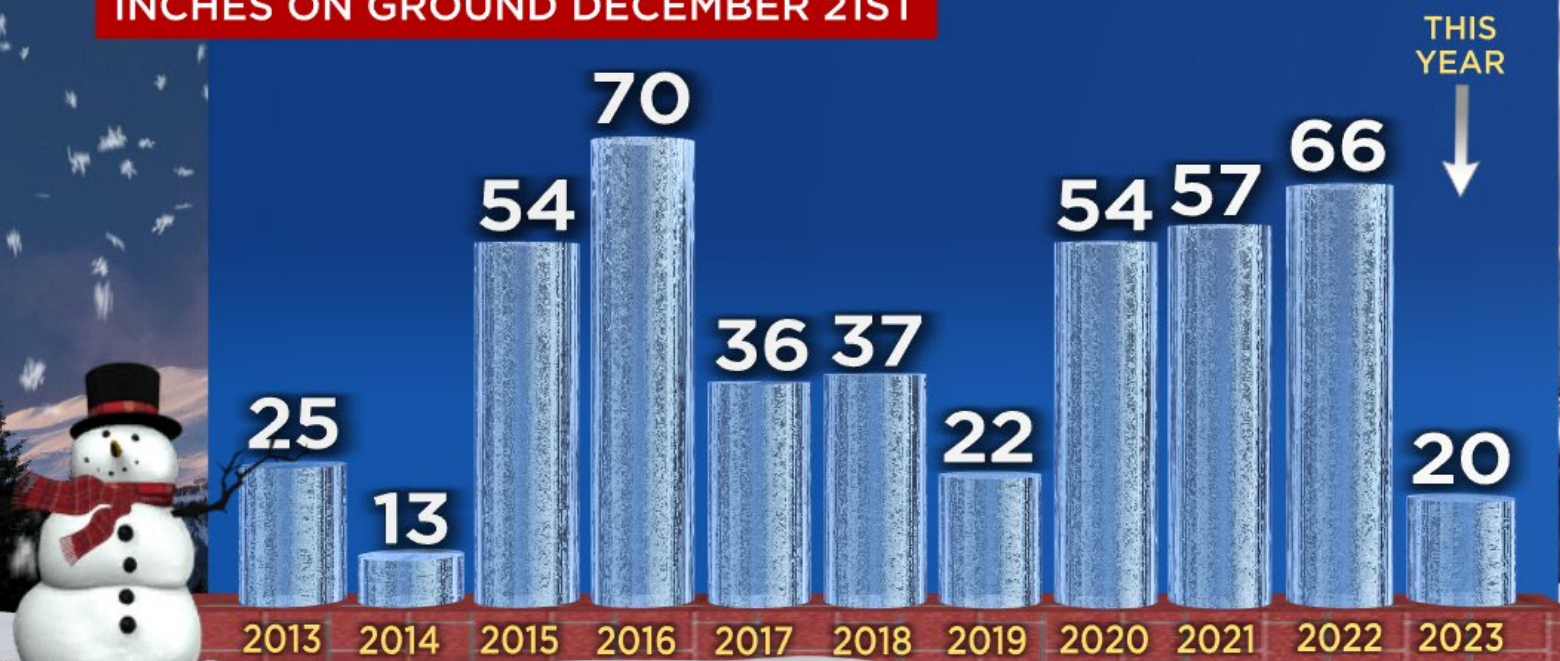
Winter break arrives with no skiing for some resorts (pic on 21st)



TERRIBLE SNOWPACK FOR CHRISTMAS BREAK

FIRST ALERT MT. HOOD SNOW DEPTH @ 5,400'

INCHES ON GROUND DECEMBER 21ST

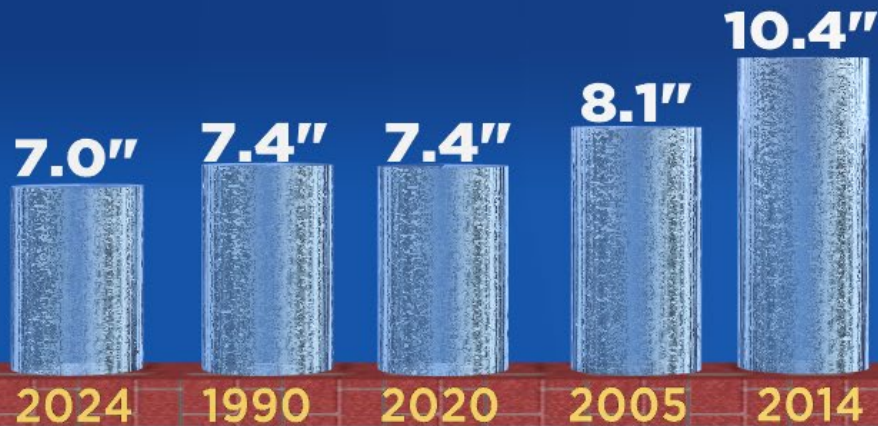


TERRIBLE SNOWPACK CONTINUES THROUGH FIRST FEW DAYS OF JANUARY

FIRST ALERT LOWEST SNOWPACK IN 40+ YEARS

JANUARY 1ST @ 5,400' ON MT. HOOD (Bottom of Pucci lift)

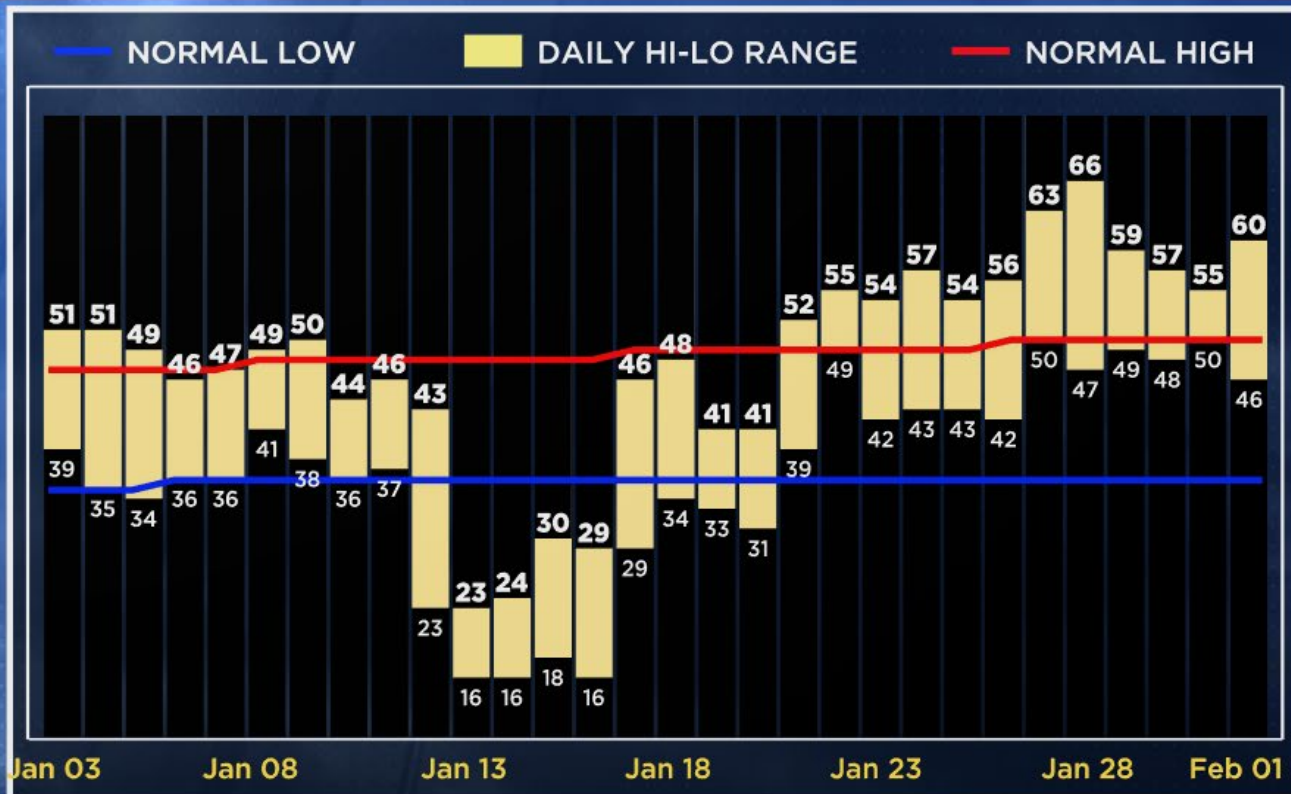
THE 5 LOWEST SNOWPACKS SINCE 1983
(SWE = Snow Water Equivalent)



JANUARY 2024 IN SALEM. LOTS OF MILD WEATHER, BUT 4 VERY COLD DAYS

FIRST ALERT TEMPS THE PAST 30 DAYS

IN SALEM



FIRST ALERT JANUARY 2024 IN PORTLAND

SUN	MON	TUE	WED	THU	FRI	SAT
	1 49°	2 46°	3 51°	4 48°	5 51°	6 48°
7 48°	8 52°	9 52°	10 47°	11 46°	12 41°	13 21°
14 23°	15 30°	16 27°	17 34°	18 37°	19 40°	20 43°
21 41°	22 45°	23 55°	24 51°	25 55°	26 45°	27 48°
28 51°	29 58°	30 54°	31 51°			

AVERAGE HIGH: 46° 1st 49° 31st

-1.6°
from normal
4 DAYS BELOW
FREEZING
13TH-16TH

FIRST ALERT JANUARY 2024 IN PORTLAND

SUN	MON	TUE	WED	THU	FRI	SAT
	¹	²	³	⁴	⁵	⁶
		.11"	.19"	.26"	.08"	.97"
⁷	⁸	⁹	¹⁰	¹¹	¹²	¹³
.10"	.61"	1.00"	.11"	.20"	.02"	.12"
¹⁴	¹⁵	¹⁶	¹⁷	¹⁸	¹⁹	²⁰
		.20"	.39"	.83"		.11"
²¹	²²	²³	²⁴	²⁵	²⁶	²⁷
.64"	.49"	.18"	.88"	.06"	.83"	.86"
²⁸	²⁹	³⁰	³¹			
.17"		.01"	.01"			

RAIN
9.43"

A TYPICAL
JANUARY
5.03"

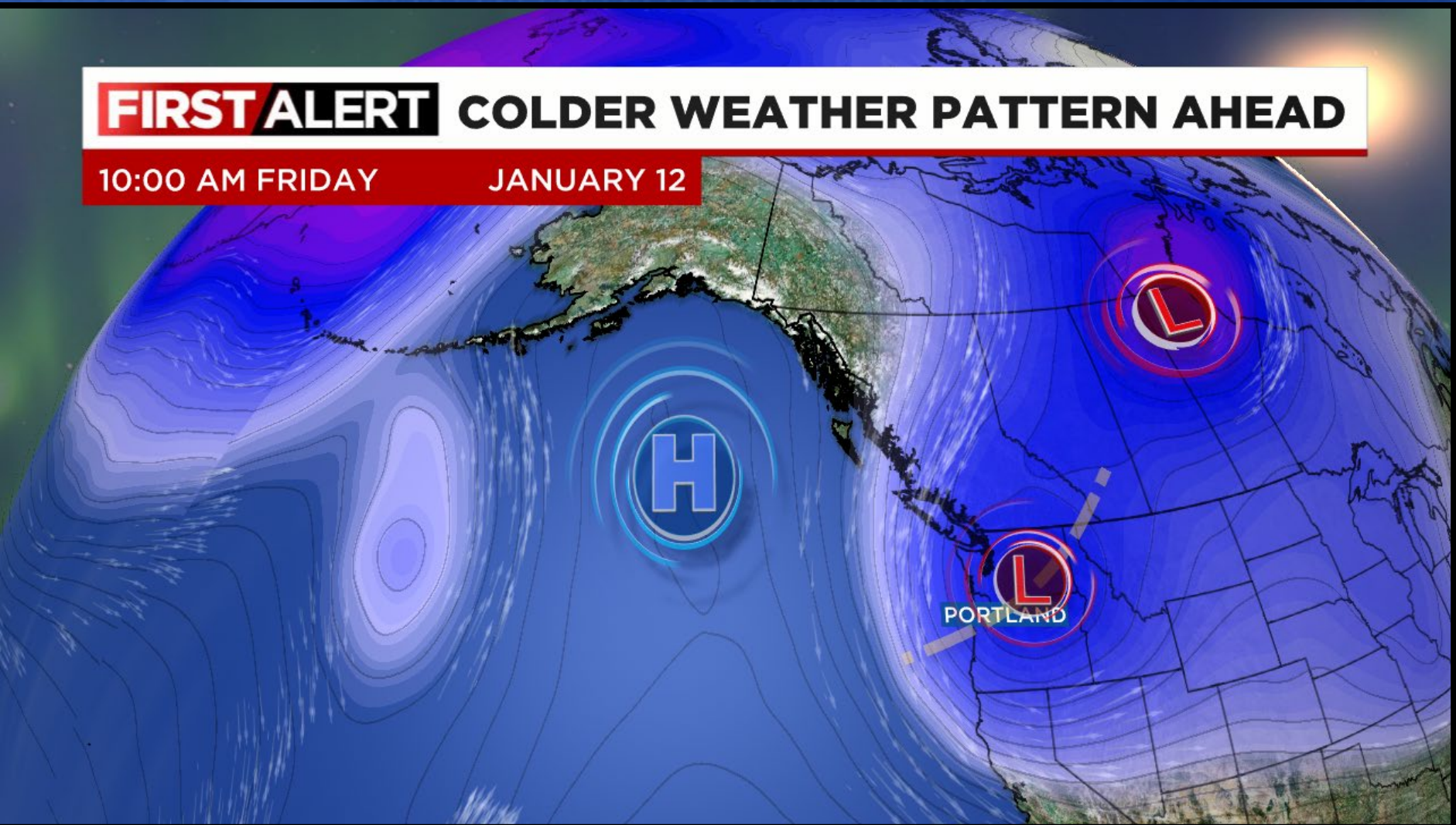
ECMWF FORECAST 10 DAYS OUT

Around January 2-4th, all models show cold pattern setting up for lowlands

FIRST ALERT COLDER WEATHER PATTERN AHEAD

10:00 AM FRIDAY

JANUARY 12



JANUARY 2024

Huge mountain snowfall during 2nd week of month,
one of two “base-building” periods this winter

FIRST ALERT 9 DAYS = 7-9 FT OF SNOW

FRIDAY JANUARY 5TH TO SATURDAY JANUARY 13TH

81"
SKIBOWL

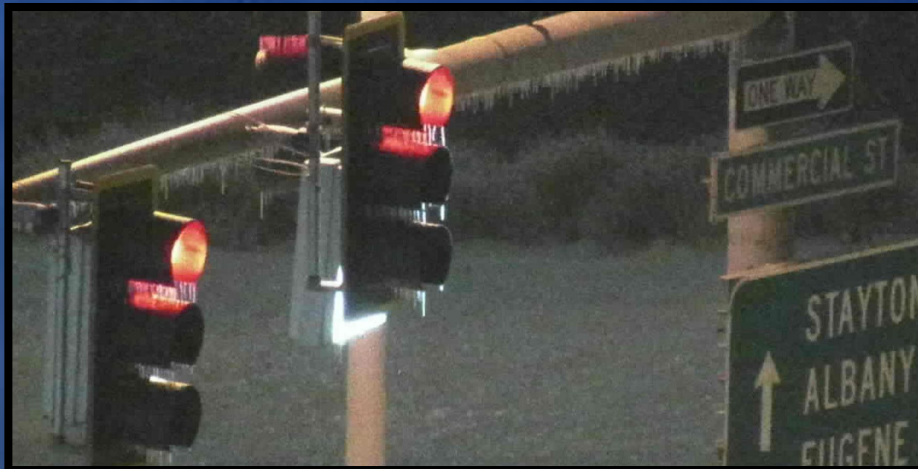
106"
TIMBERLINE

110"
MT. HOOD
MEADOWS

26

35

JANUARY COLD/ICE/WIND

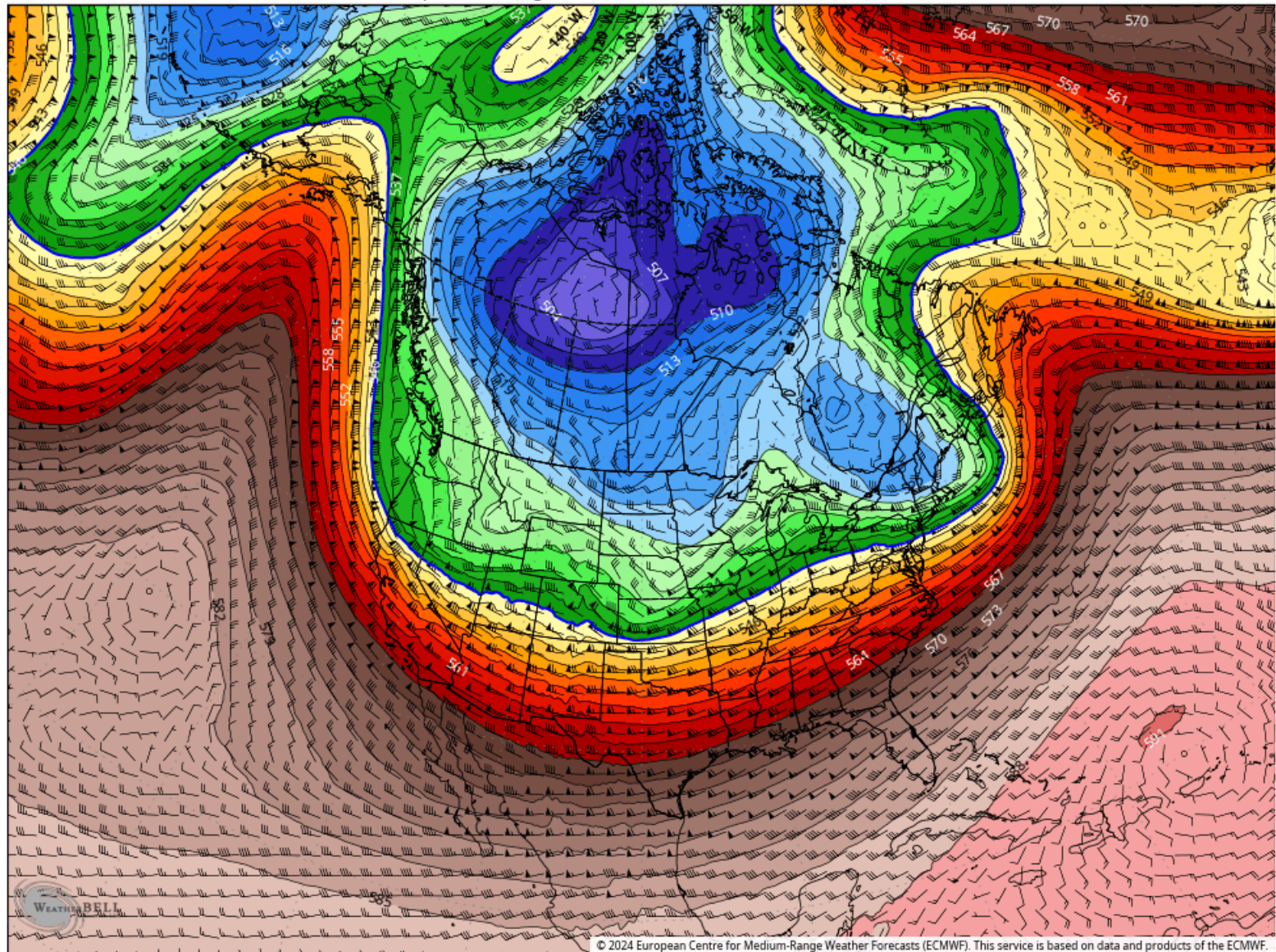


COLDEST AIR JUST BARELY MADE IT INTO OREGON 10TH-13TH

But classic setup for a snow/ice storm

ECMWF 0.2° Init 12z 8 Jan 2024 • 500mb Geopotential Height (dam) and Wind (kt)

Hour: 57 • Valid: 21z Wed 10 Jan 2024



474 480 486 492 498 504 510 516 522 528 534 540 546 552 558 564 570 576 582 588 594 600

Max: 591.1 • Min: 501.4

COLDEST AIR JUST BARELY MADE IT INTO OREGON 10TH-13TH

But classic setup for a snow/ice storm

BIG WINTER EVENT CAME IN 2-3 “WAVES”

(Only 2 outside of Portland metro)

SATURDAY 13TH

- Extreme cold northern Oregon + snow/ice pellets/frz rain
- Damaging easterly wind metro

LATE TUESDAY 16TH

- Mild freezing rain/ice storm

THURSDAY/THURS NIGHT 18th

- Damaging ice storm (central/east metro+west/southwest hills)

A “textbook” setup for cold/wind/snow/ice in our area

FIRST ALERT FORECAST

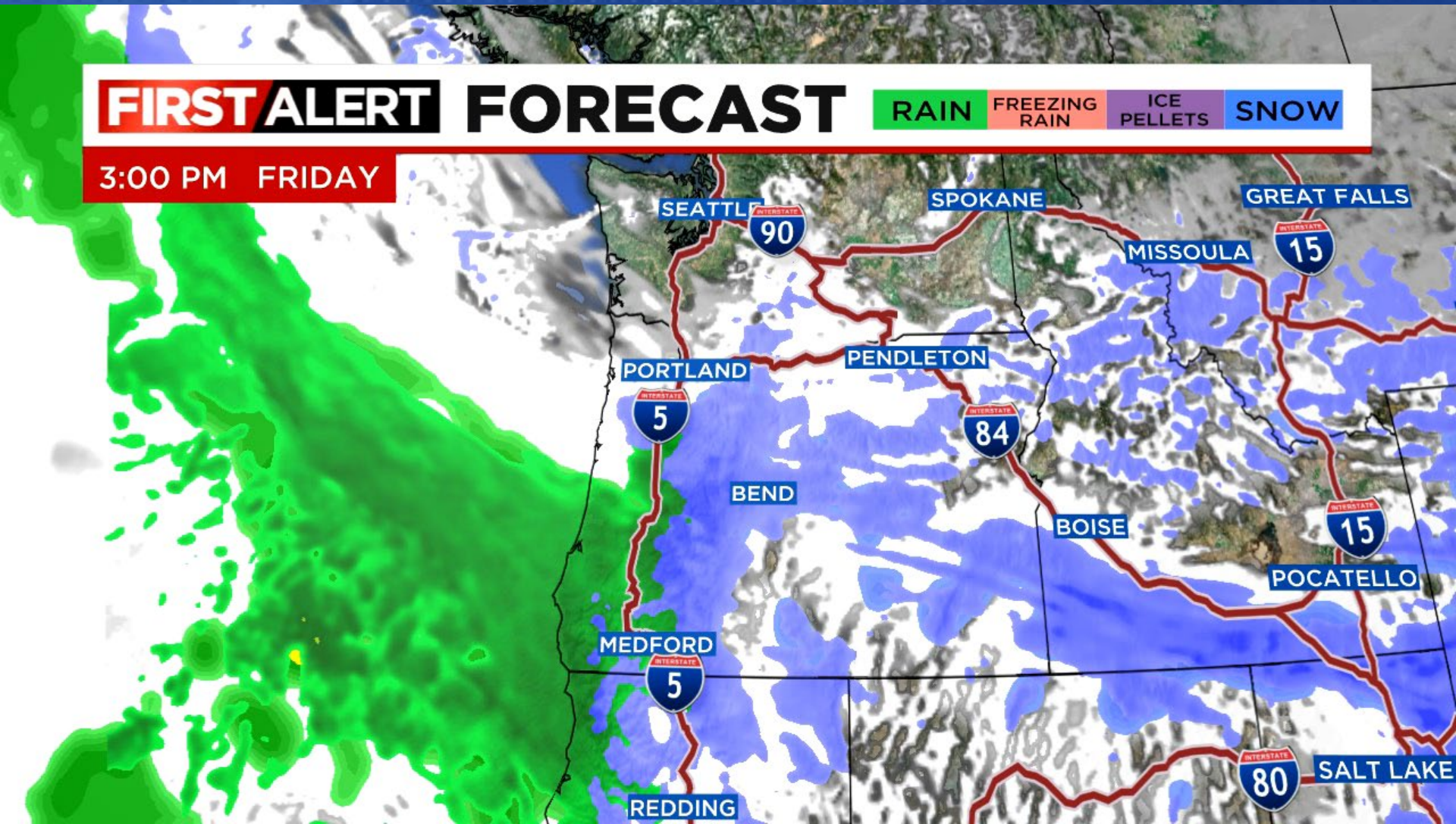
RAIN

FREEZING
RAIN

ICE
PELLETS

SNOW

3:00 PM FRIDAY



Unbelievable cross-Cascade pressure gradient forecast

But this actually occurred on Saturday the 13th!

UW WRF-GFS 4km Domain

Fest: 57 h

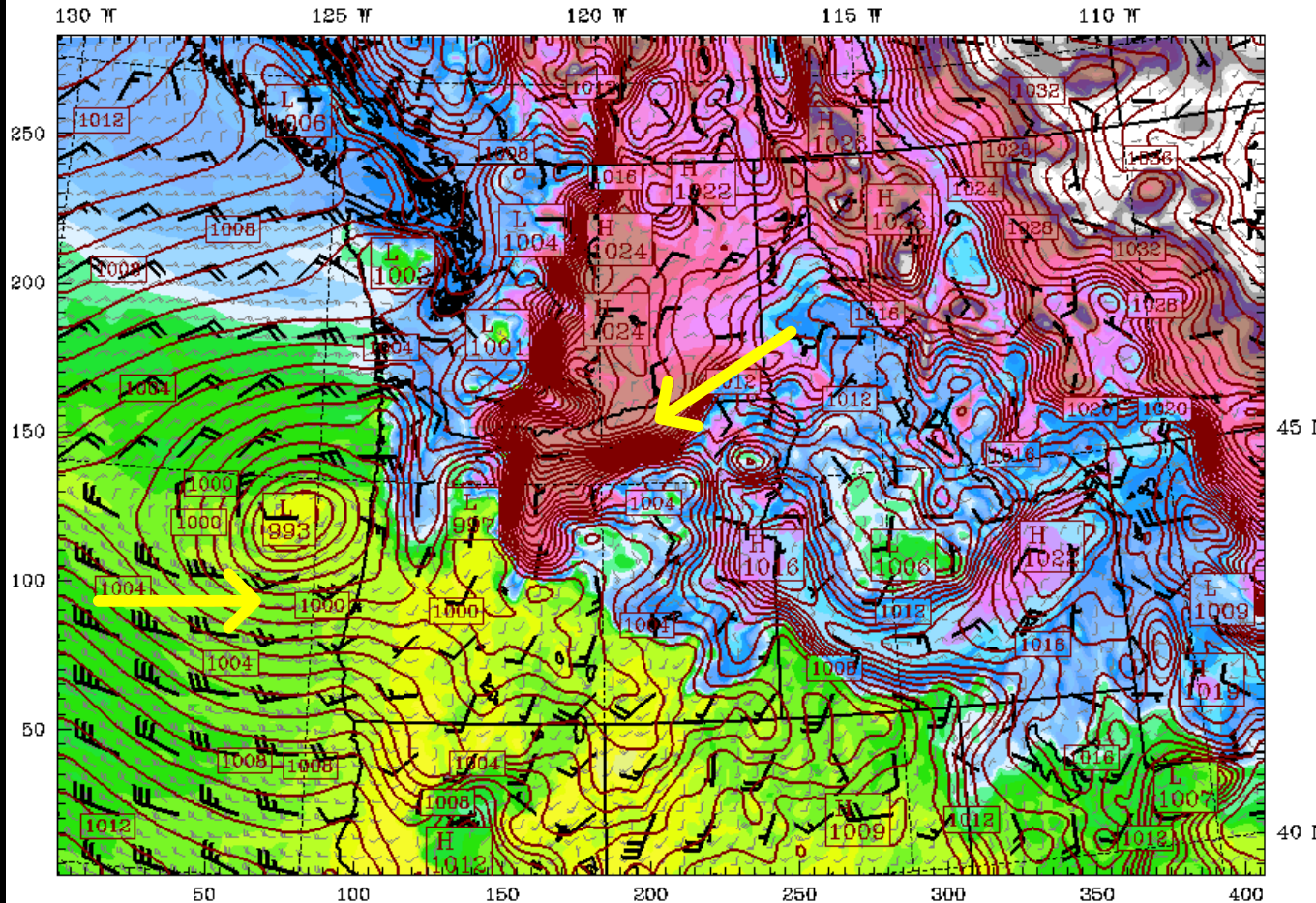
Temperature at 925 mb (°C)

Sea Level Pressure (hPa)

Init: 12 UTC Thu 11 Jan 24

Valid: 21 UTC Sat 13 Jan 24 (13 PST Sat 13 Jan 24)

Winds at 10m (full barb = 10kts)



CONTOURS: UNITS=hPa LOW= 994.00 HIGH= 1040.0 INTERVAL= 1.0000

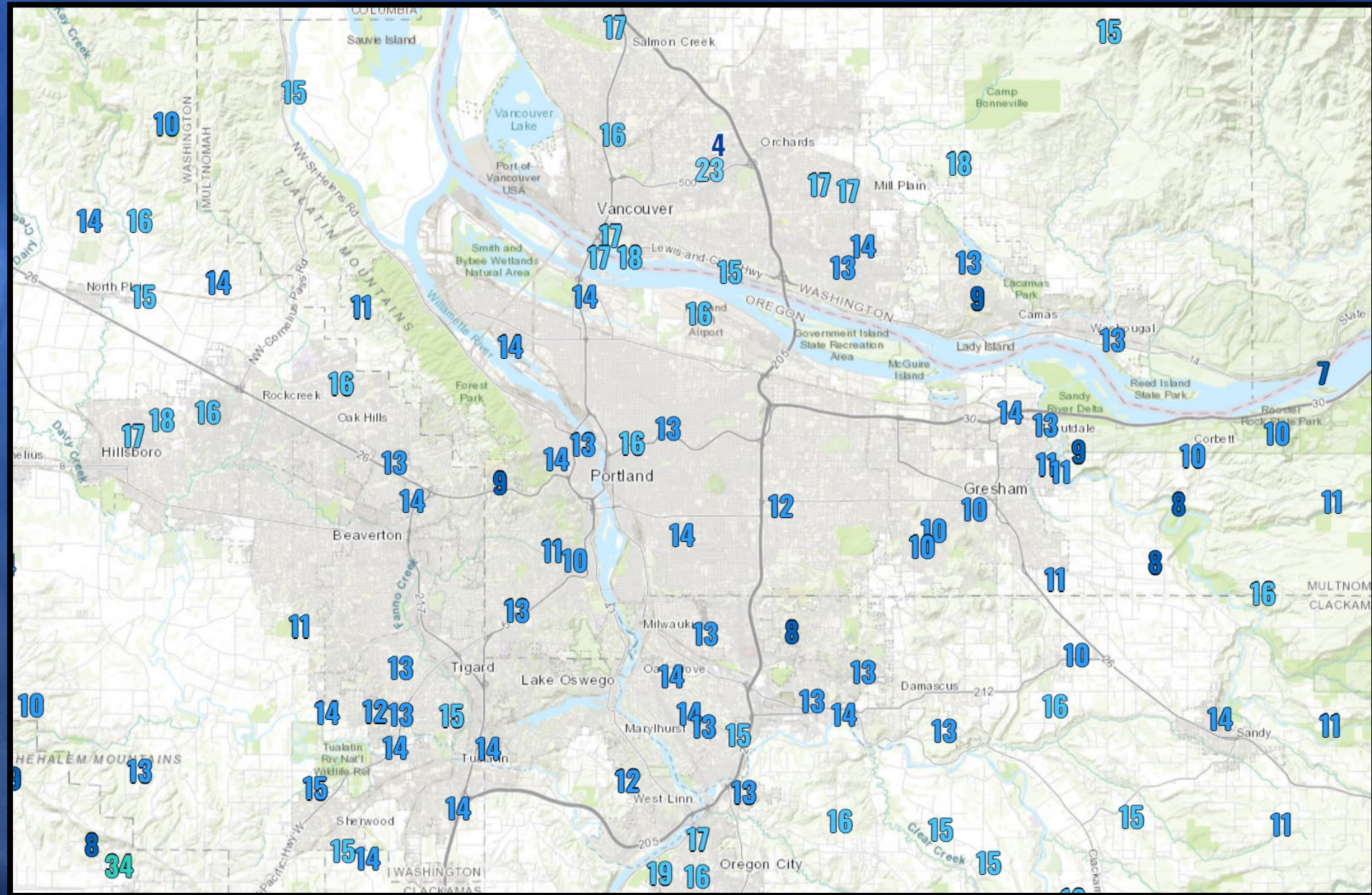


STRONGEST ARCTIC FRONT WE'VE SEEN IN MANY YEARS

Arrived midday Friday the 12th, just a few flurries

DD/HH	EUG- PDX	PDX- SEA	OTH- GEG	EUG- RDM	HQM- OLM	AST- PDT	AST- PDX	PDX- PDT	AST- DLS	PDX- DLS	PDX- TTD	TTD- DLS
14/02	-4.6	-2.2	-20.4	-12.1	-1.5	-16.5	-4.4	-12.1	-19.2	-14.8	-1.2	-13.6
14/00	-4.1	-1.7	-22.3	-11.4	-2.2	-17.7	-5.2	-12.5	-20.6	-15.4	-1.1	-14.3
13/22	-3.9	-3.0	-24.1	-13.0	-3.3	-20.6	-5.6	-15.0	-23.3	-17.7	-1.8	-15.9
13/20	-4.9	-2.5	-26.2	-13.7	-3.7	-21.4	-5.9	-15.5	-23.6	-17.7	-1.6	-16.1
13/18	-5.2	-1.9	-27.5	-13.0	-3.8	-20.3	-6.4	-13.9	-22.7	-16.3	-2.1	-14.2
13/16	-4.7	-2.1	-26.0	-11.3	-3.5	-18.6	-6.0	-12.6	-21.4	-15.4	-1.9	-13.5
13/14	-4.6	-2.6	-24.6	-10.4	-3.5	-18.1	-5.7	-12.4	-20.1	-14.4	-1.1	-13.3
13/12	-4.8	-1.6	-22.2	-8.6	-3.0	-16.1	-5.4	-10.7	-18.1	-12.7	-0.9	-11.8
13/10	-4.1	-2.3	-20.2	-6.9	-2.9	-15.0	-4.8	-10.2	-17.0	-12.2	-1.1	-11.1
13/08	-4.1	-2.6	-18.1	-6.1	-2.4	-14.0	-4.5	-9.5	-16.0	-11.5	-0.8	-10.7
13/06	-3.9	-3.1	-15.5	-5.2	-2.8	-12.3	-3.6	-8.7	-14.6	-11.0	-0.4	-10.6
13/04	-3.8	-3.5	-13.0	-4.0	-1.8	-11.0	-2.7	-8.3	-13.3	-10.6	-0.6	-10.0
13/02	-3.3	-4.2	-10.0	-1.3	-1.6	-8.5	-1.5	-7.0	-10.6	-9.1	-0.3	-8.8

Strong east wind and very cold!



FIRST ALERT PORTLAND'S COLDEST

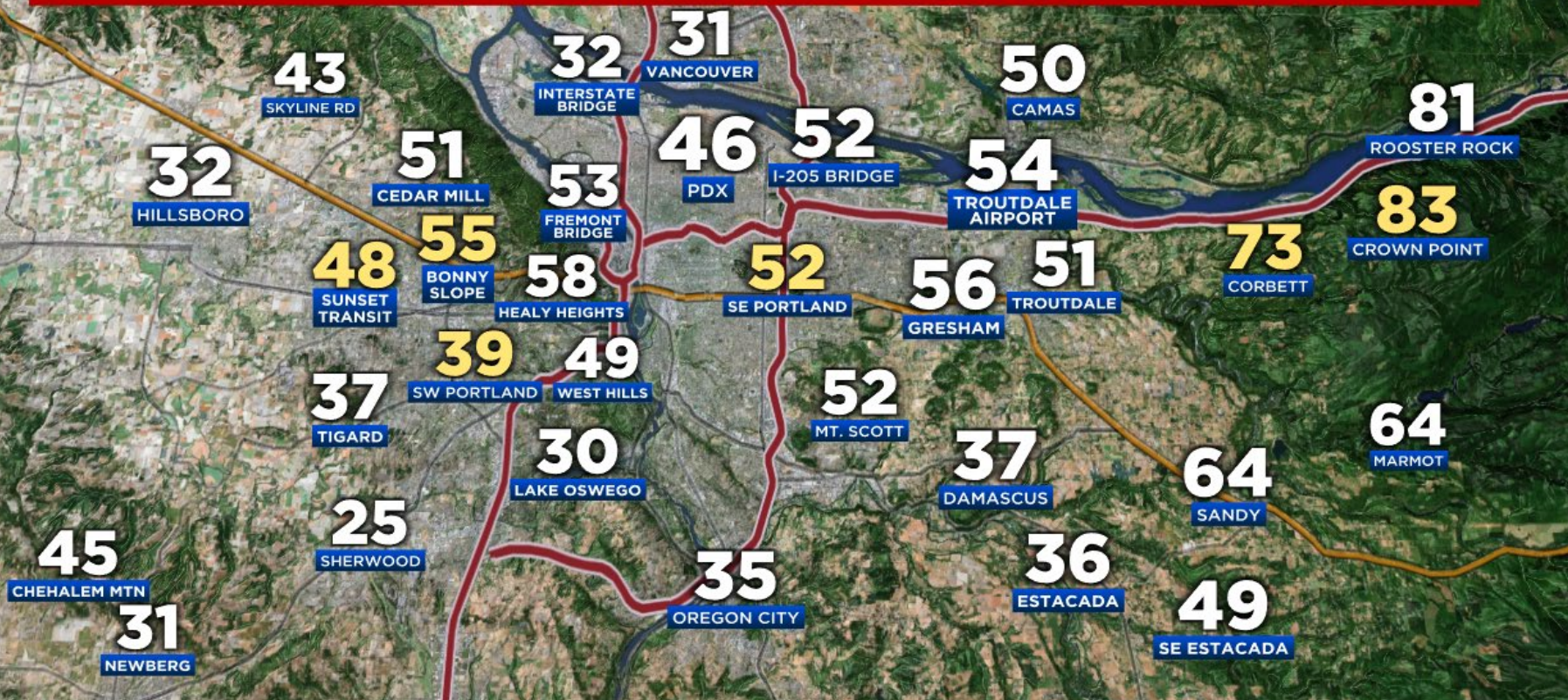
COLDEST DAYTIME HIGHS SINCE 1940



160,000 PGE CUSTOMERS LOSE POWER...WITH TEMP IN TEENS

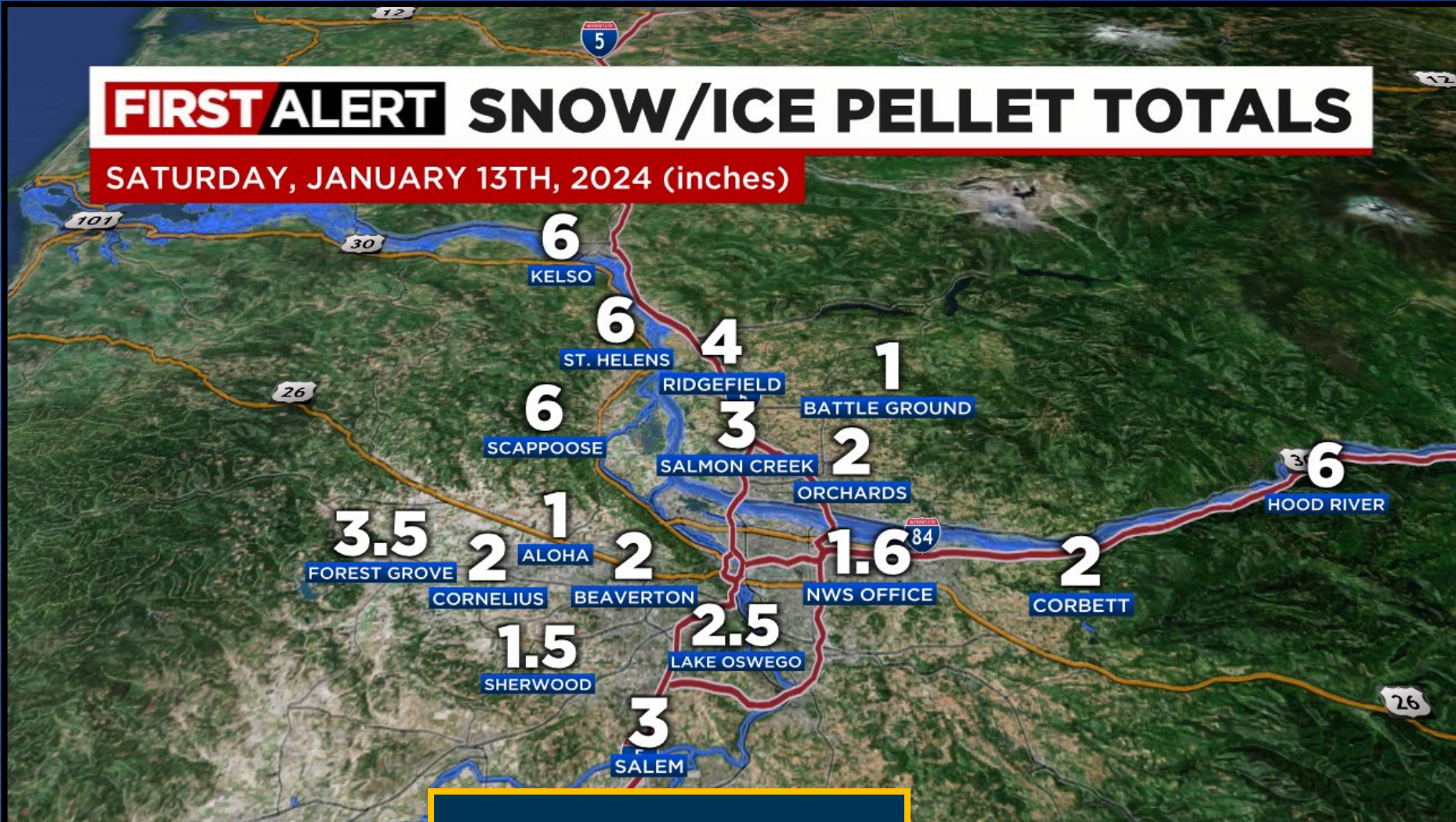
FIRST ALERT METRO AREA PEAK GUSTS

SATURDAY JAN. 13TH, 2024 (mph) **YELLOW = LOST POWER, LIKELY HIGHER**



FIRST ALERT SNOW/ICE PELLET TOTALS

SATURDAY, JANUARY 13TH, 2024 (inches)



Salem was mainly ice pellets

MINOR ICE STORM LATER TUESDAY 16TH

Was final winter event most areas west of Cascades

FIRST ALERT FREEZING RAIN AHEAD

ICE STORM WARNING

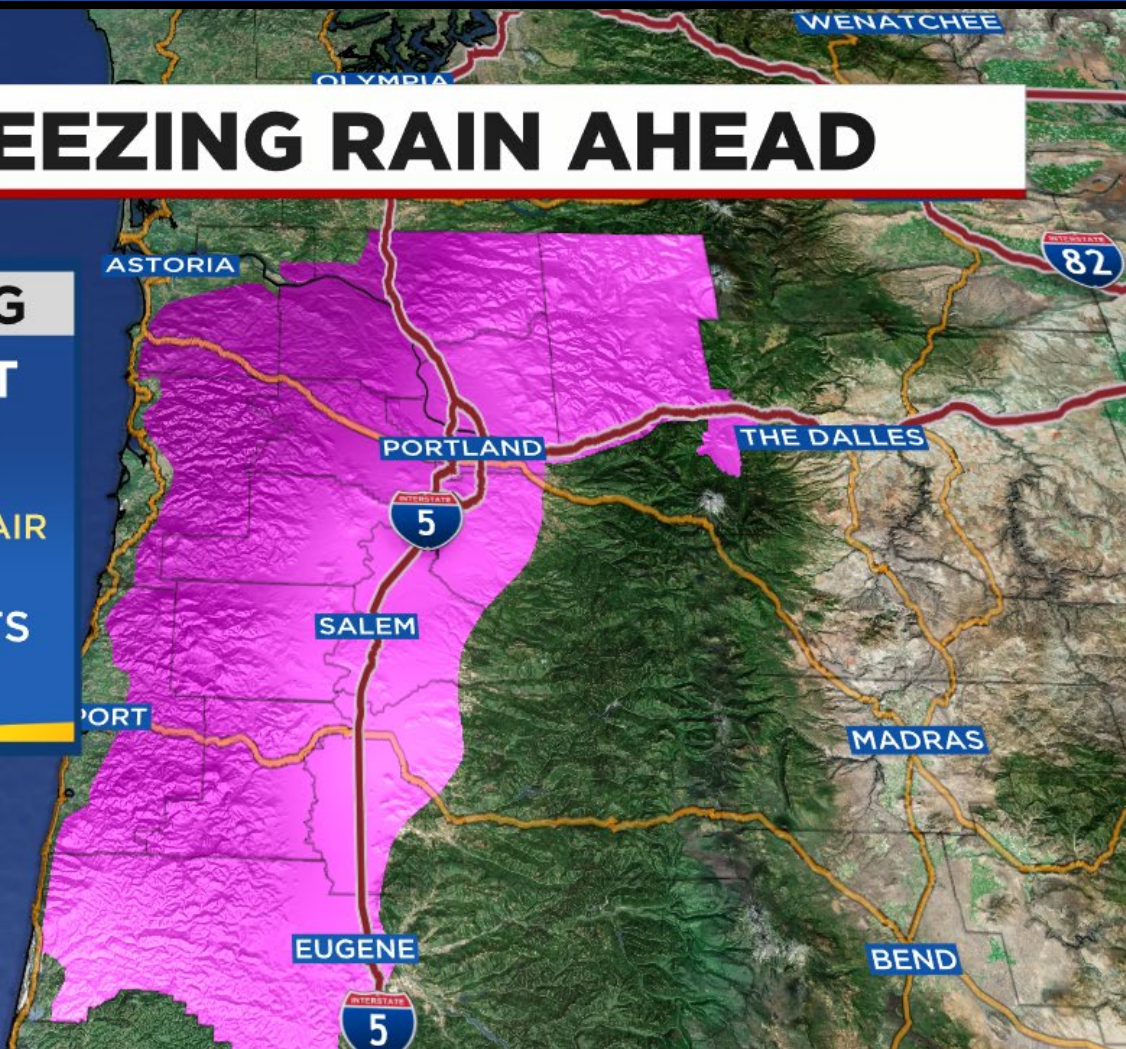
TUESDAY PM & NIGHT

**FREEZING
RAIN**

LIQUID RAIN
FALLS INTO
SUB-FREEZING AIR

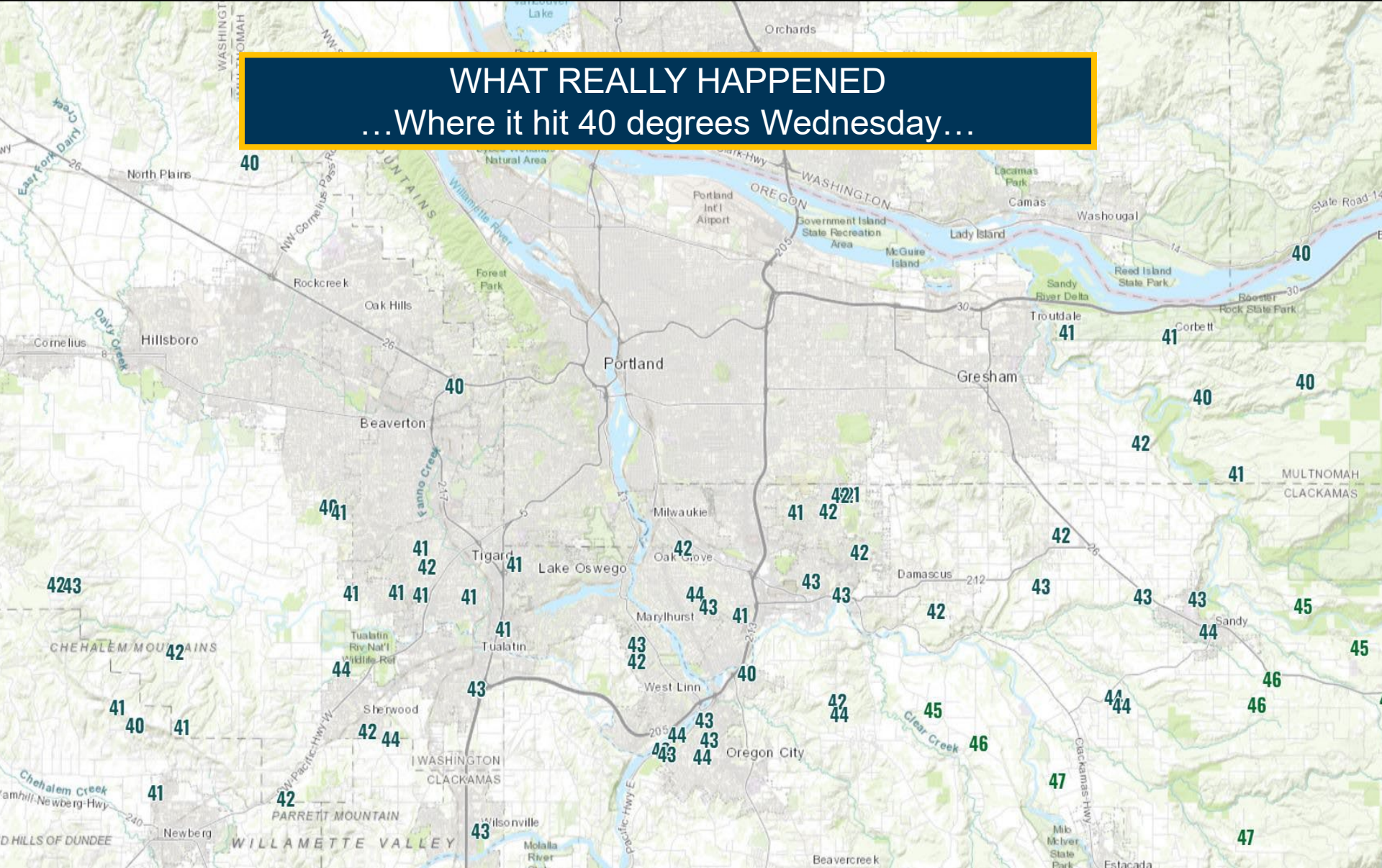


**ICY GLAZE COATS
ALL OBJECTS**



SOUTHERLY WIND WARMS UP **MOST** AREAS WEST OF CASCADIES TUES. NIGHT & WED.

WHAT REALLY HAPPENED
...Where it hit 40 degrees Wednesday...

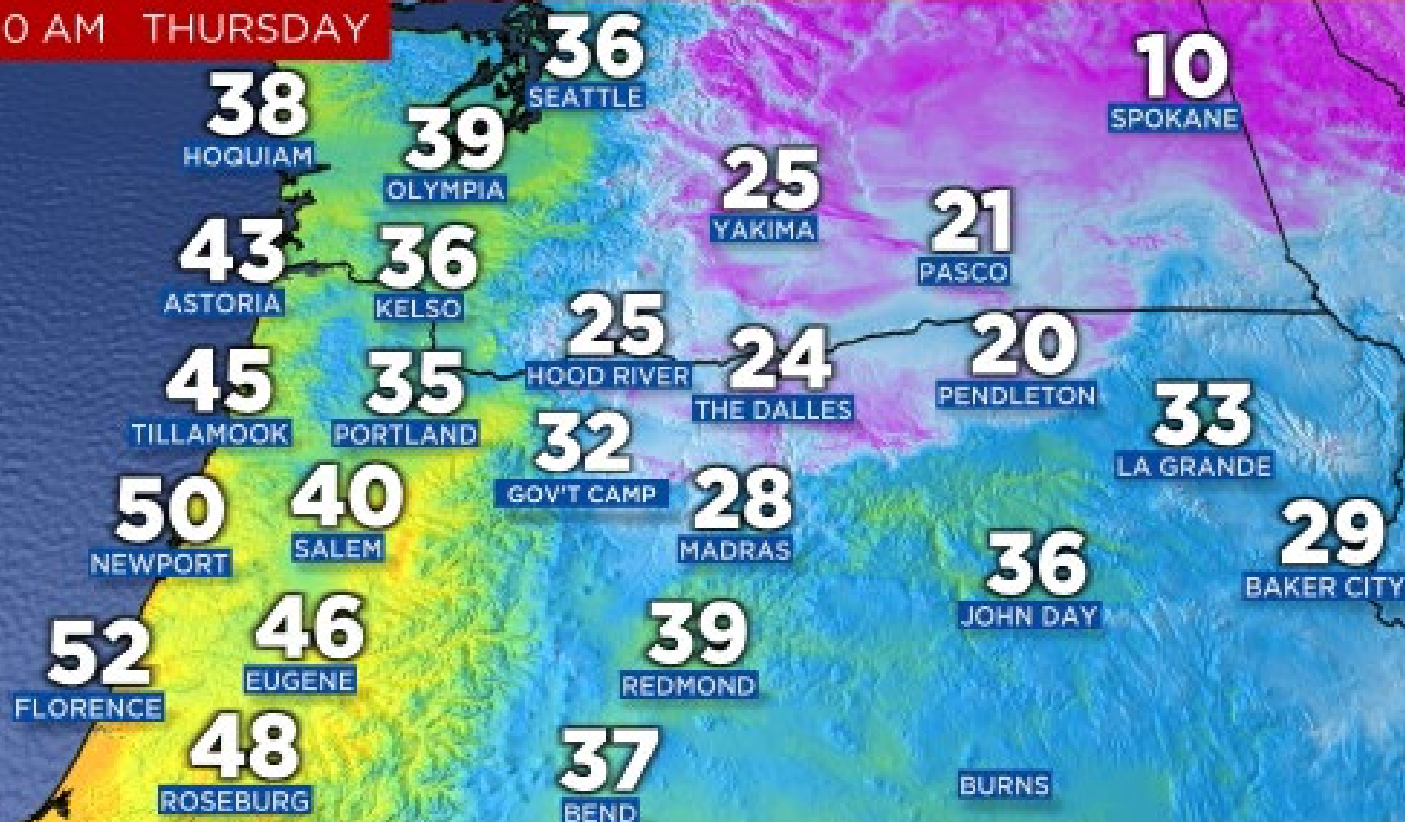


THURSDAY 18TH

Below freezing only in Gorge outflow areas west of Cascades
Frigid air sloshes back in central/eastern Gorge...uh-oh...

FIRST ALERT TEMPERATURES

9:00 AM THURSDAY



THURSDAY 18TH

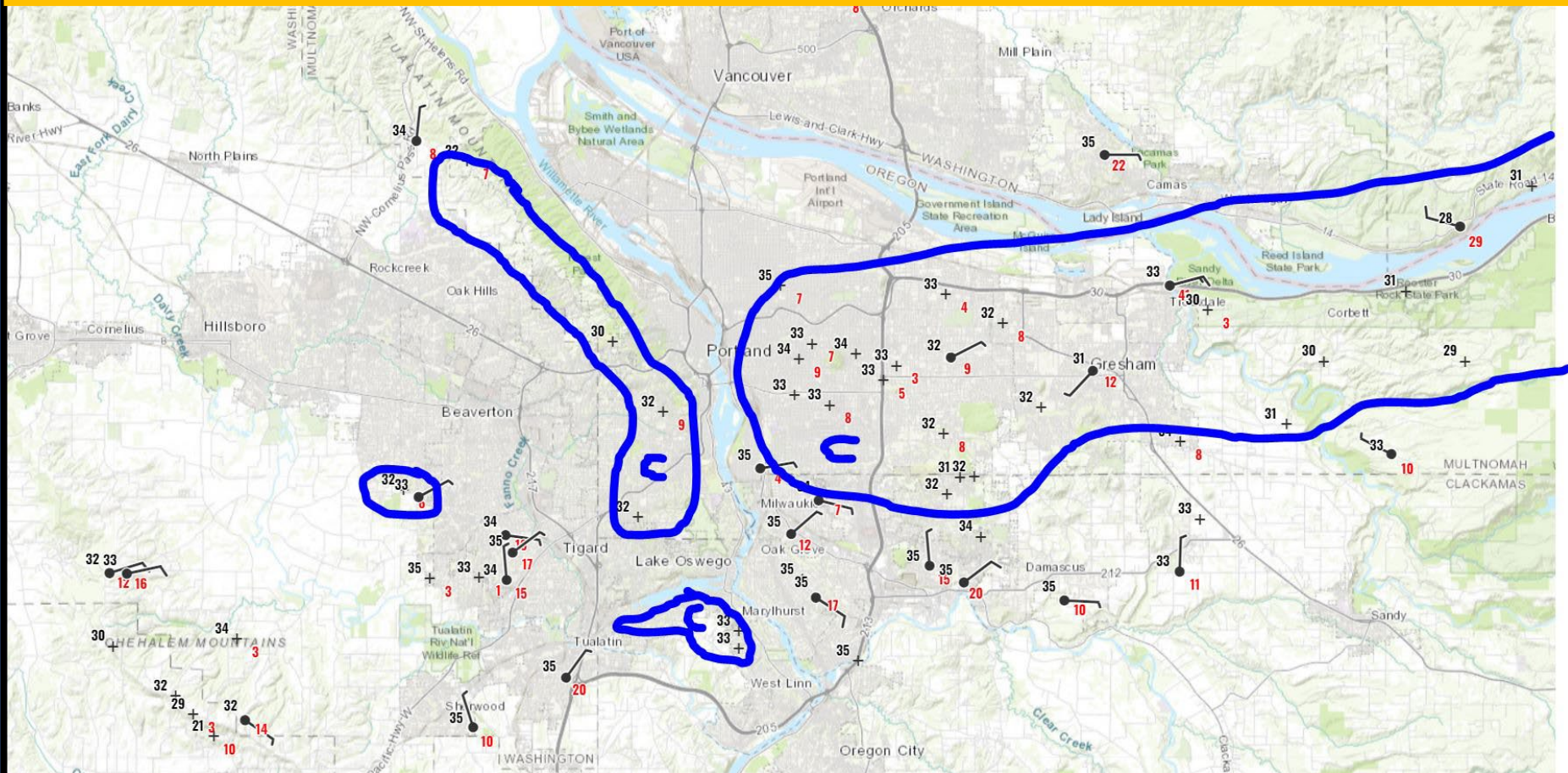
STRONG WIND + ICE GLAZING RENEWS OUTAGES...
PGE PEAKS AROUND 120,000 AGAIN!



MARK'S ROUGHEST DRIVE HOME WAS THIS NIGHT

FRIDAY AFTERNOON – 19TH

- Most areas thawing, but temps lingered near freezing all day east metro & west hills = still icy there.
- Temperatures rose that night as more rain moved in
- THE END



WHAT WE NEED TO REMEMBER FOR “NEXT TIME”

- Don't forget when forecasting...ice pellets are included as “snow” in some models (GRAF).
- Snow/ice melts VERY slowly if highs remain in the 30s; we all know that, but we are usually eager to “move on” with our lives.
Melting takes time unless temps soar well into the 40s.
- Extreme cold means ground very slow to warm/thaw even if temperatures rise to 40 and above. I noticed this in my neighborhood and I wonder how deeply the ground froze. It just took so long for pavement to give up the layers of glaze ice and pellets.
- Be wary of just a 2-3 millibar southerly gradient in the valley. If it's just 1-2 millibars too weak in the end...not much warmup!

JANUARY CLOSES OUT WITH RECORD HIGHS

Plus, a Pineapple Express...again

FIRST ALERT JANUARY 28TH HIGHS

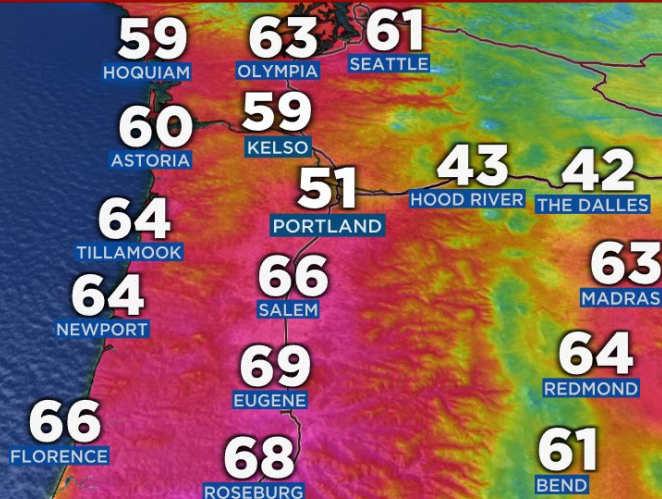
PORTLAND

49°

AVERAGE HIGH

59° / 1992

RECORD HIGH



FIRST ALERT UNUSUAL WINTER WARMTH

**70° IN
JANUARY**
Highs Today

YACHATS	71°
LINCOLN CITY	70°
TILLAMOOK	70°
CANNON BEACH	72°
HORSE CREEK (3,500' In Clackamas Co.)	71°
REDMOND	69°



FIRST ALERT JANUARY 29TH HIGHS

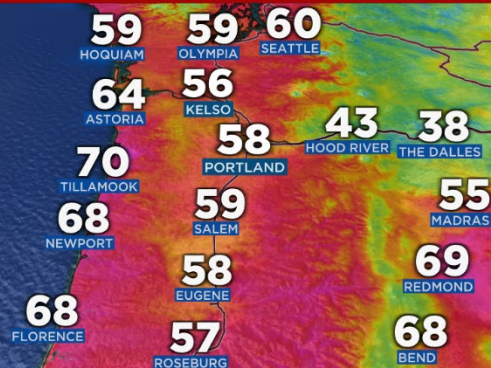
PORTLAND

49°

AVERAGE HIGH

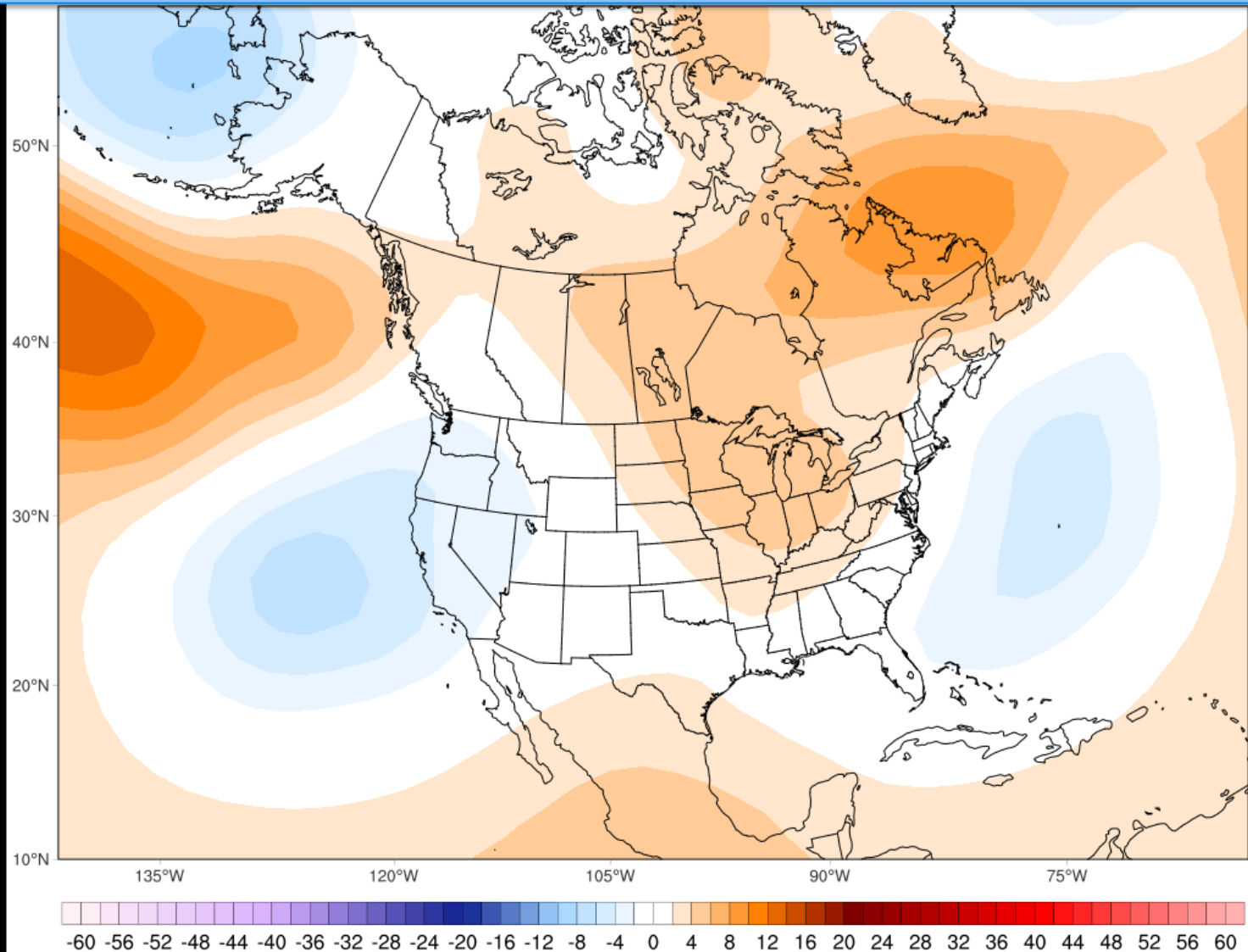
62° / 1984

RECORD HIGH



FEBRUARY

Split-flow and/or weak jet stream over Eastern Pacific
AN UNEVENTFUL MONTH



FEBRUARY

...but ends with cold westerly flow: A week of foothill and mountain snow

FIRST ALERT 8 SNOWY DAYS!

TOTAL SNOWFALL (INCHES) FEB 26TH-MAR 4TH

68"
SKIBOWL

88"
TIMBERLINE

86"
MT. HOOD
MEADOWS

FIRST ALERT FEBRUARY 2024 IN PORTLAND

SUN	MON	TUE	WED	THU	FRI	SAT
				1 62°	2 57°	3 56°
4 58°	5 50°	6 52°	7 52°	8 51°	9 47°	10 54°
11 58°	12 56°	13 53°	14 47°	15 42°	16 46°	17 47°
18 48°	19 54°	20 53°	21 55°	22 60°	23 63°	24 57°
25 54°	26 46°	27 49°	28 54°	29 53°		
AVERAGE HIGH:				49° 1st	54° 29th	

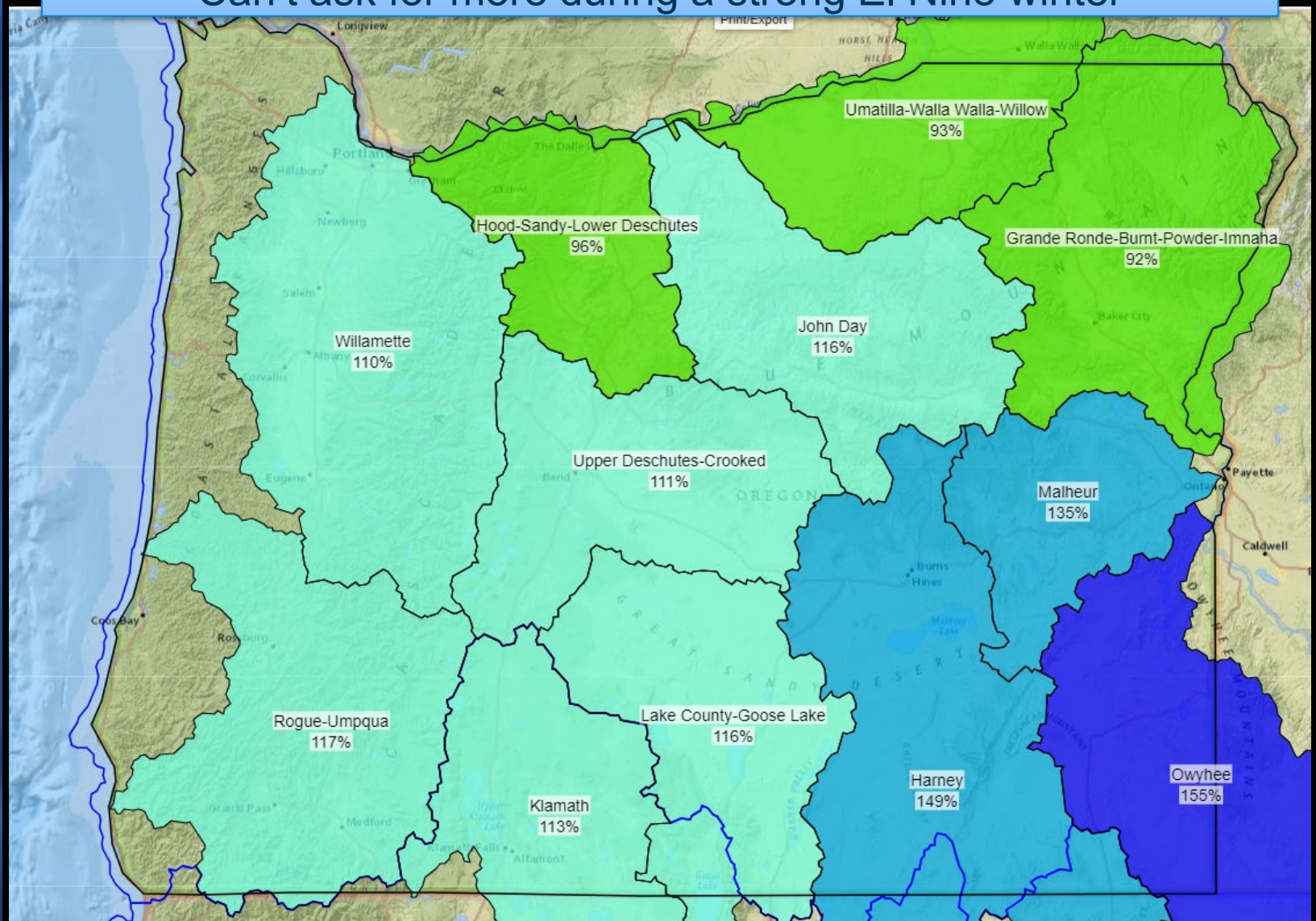
+2.1°
from normal

**FAIRLY WARM
FEBRUARY**

Good snowpack

Sunday, March 10th

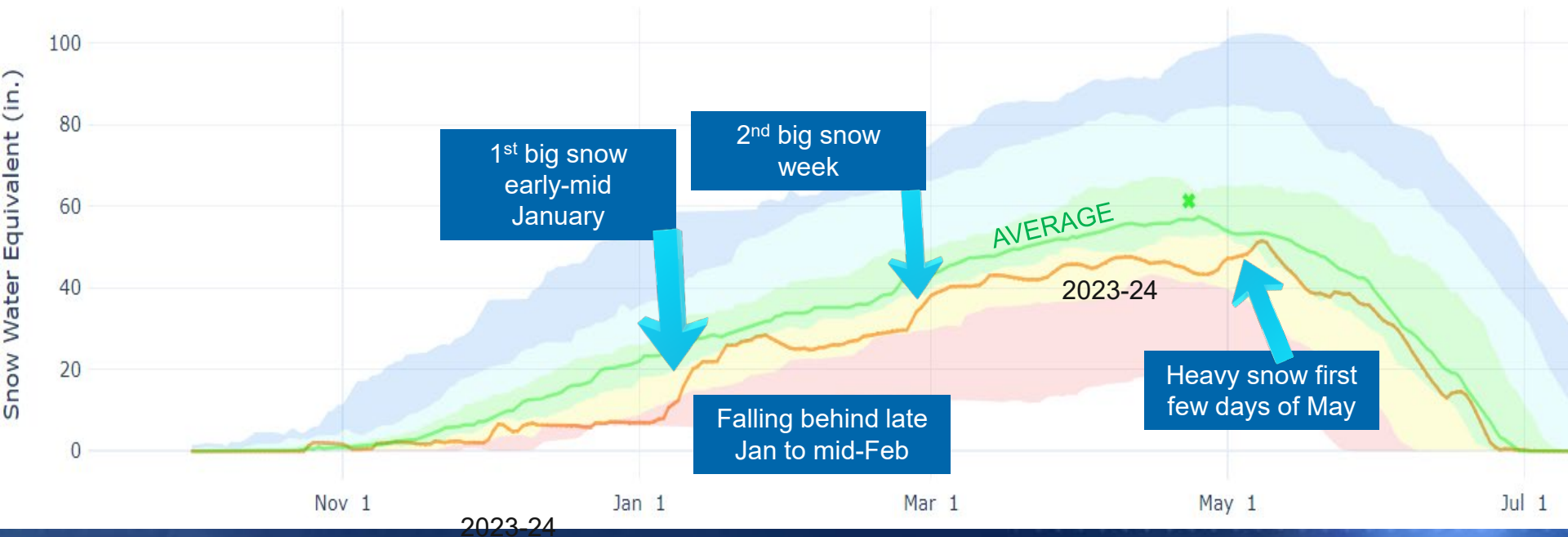
Can't ask for more during a strong El Niño winter



Mountain Snowpack @ 5,400'

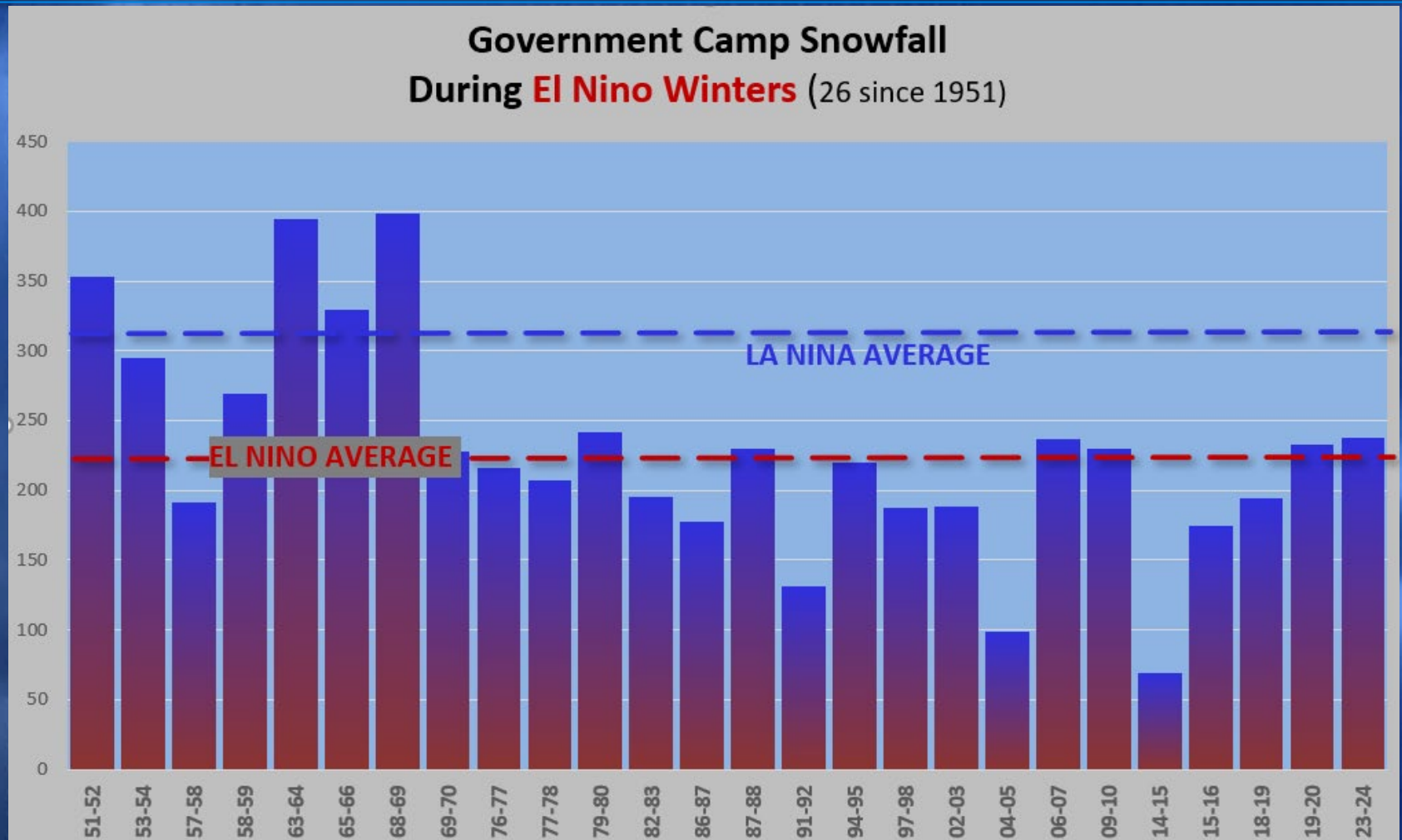
Bottom of Pucci Lift @Timberline

MT HOOD TEST SITE, OR (651) SNOW WATER EQUIVALENT



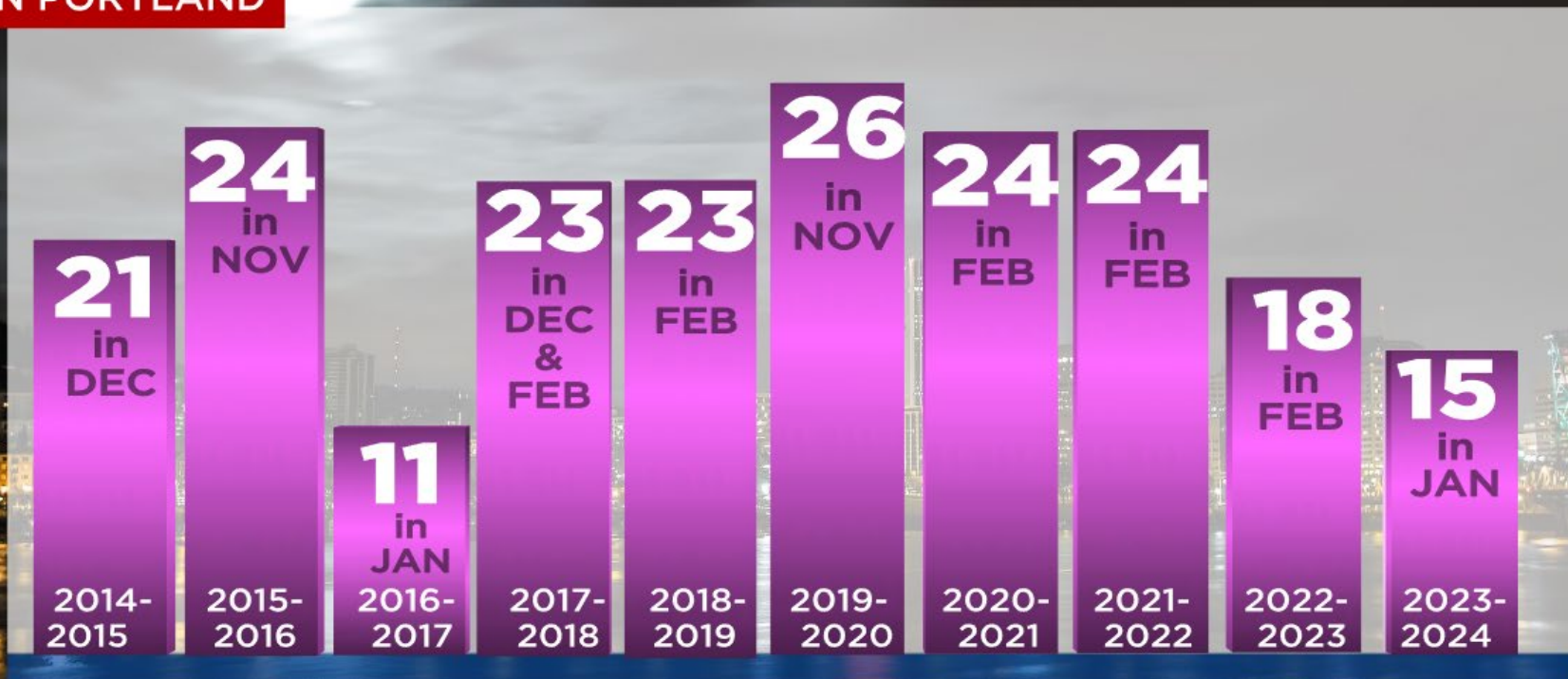
Cascade Snowfall

1. Terrible through Christmas Break, no skiing at lower resorts
2. Too much snow+wind = power outages during big January snow
3. Best of winter was in late February and early March snowy week
4. ODOT records detailed snow totals! Whew...



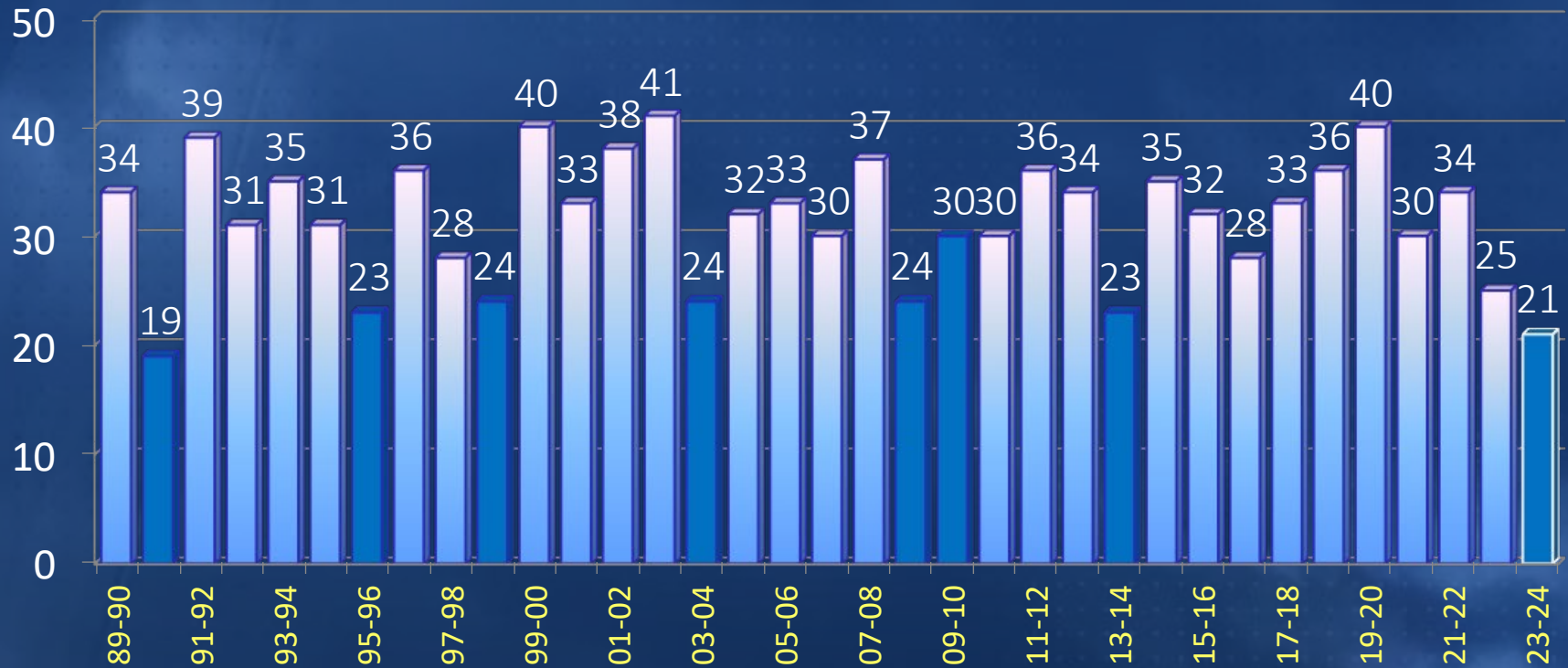
FIRST ALERT COLDEST WINTER TEMPERATURE

IN PORTLAND



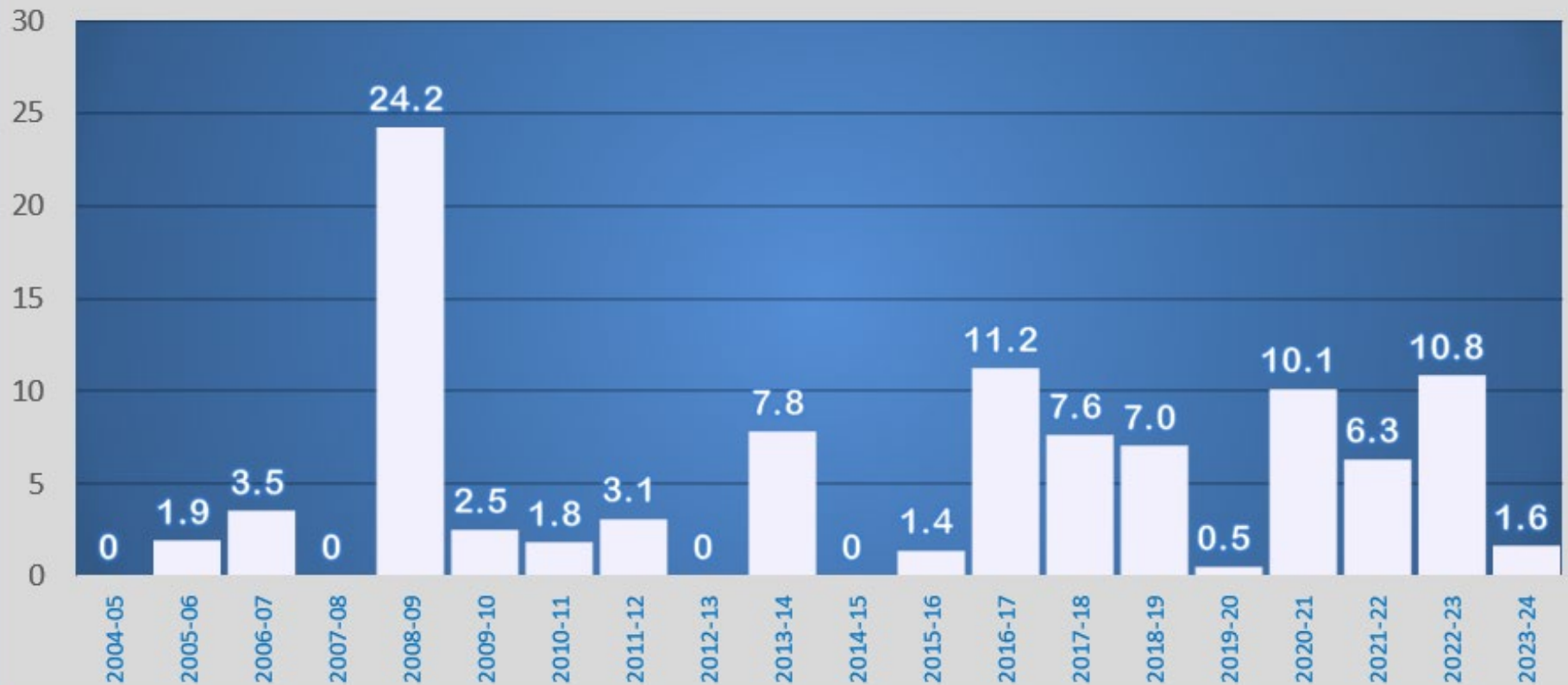
A Better Measure of an Arctic Blast

Coldest Daytime High at PDX



Blue = Widespread PACNW Arctic Air Outbreak

PORTLAND (NWS-PARKROSE)
SNOWFALL THE LAST 20 WINTERS (inches)

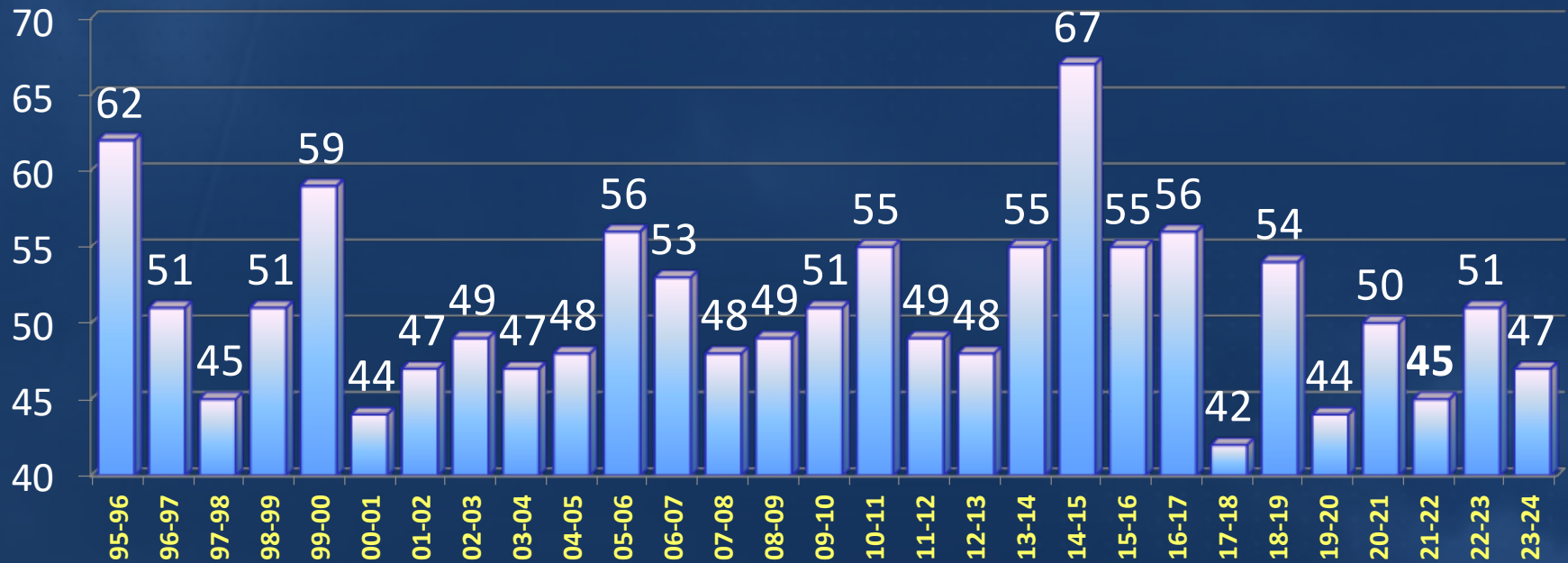


NO INLAND WIND STORMS

28 winters without a major REGIONAL storm

Yearly Peak Wind Gust at PDX in MPH

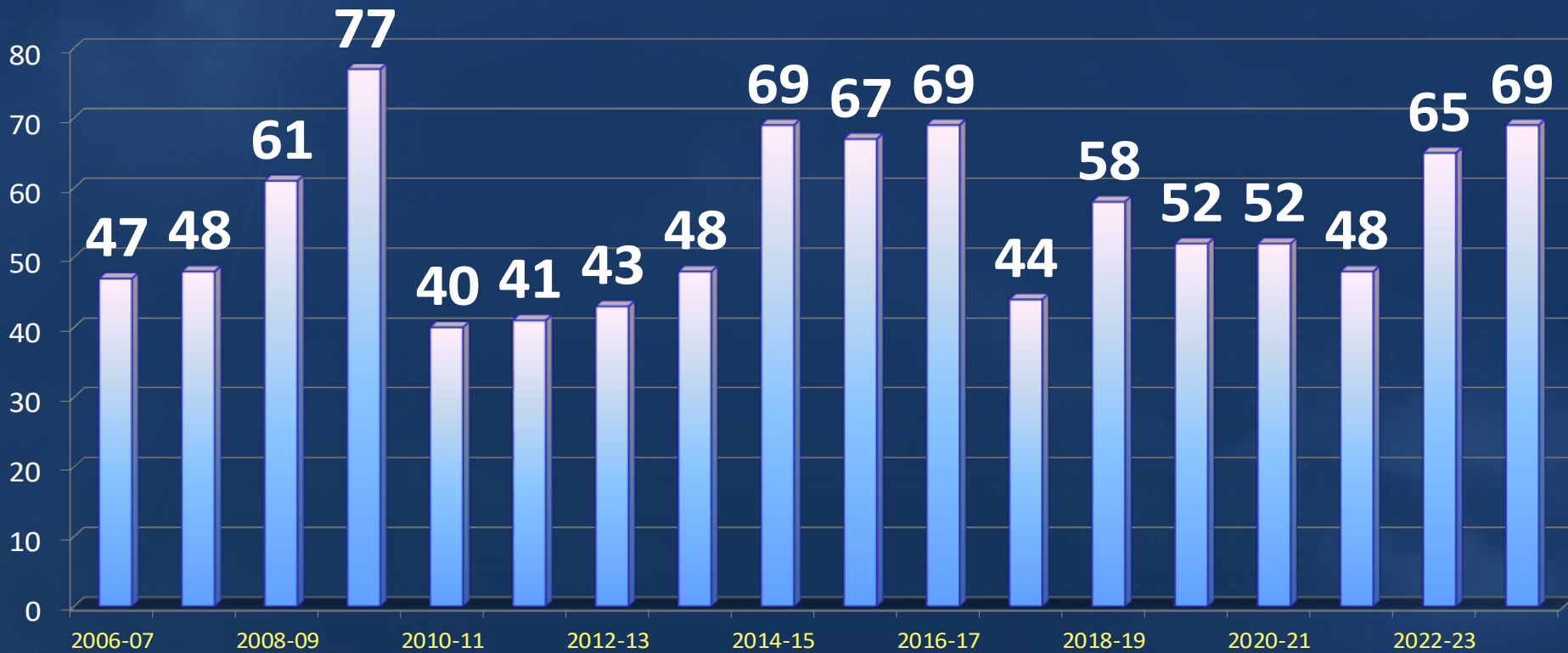
(Generally southerly)



ROUGH EAST WIND SEASON

Nov '23 – Jan '24 = most “east wind days” since at least 2006!

Days with peak easterly gusts 25+ mph at Troutdale (Nov-Feb)



FINAL WINTER THOUGHTS

1) What is an “arctic blast”?

Normal people would say we just had one in northern half of Oregon and Washington
...but...lowest 850mb temp at Salem was just ~ -5.5 degC,
It was a shallow, but intensely cold arctic airmass

2) Portland would have seen a snowless El Niño winter without January 13th

3) We are “due” for a snowless winter, major windstorm, and widespread flood



**ENJOY
YOUR
WINTER!**