RUTGERS
THE STATE UNIVERSITY
OF NEW JERSEY

Bring it on…
an avalanche of snow musings

CoCoRaHS WxTalk Webinar Series

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New Jersey State Climatologist
Rutgers University

December 14, 2023

Truckee, CA: 5 March 2023
(S. Mcafee)

Rutgers Global Snow Lab

Monitoring snow cover

Research on snow-climate interactions

snowcover.org

Why is snow so important to understand?

- It is a water reservoir
- It can influence weather and climate
- It can can be dangerous
- It is important for wildlife
- It is fun to play in!

Skyline Bear Valley Ski Resort: March 2023

Did it snow because it is cold

or

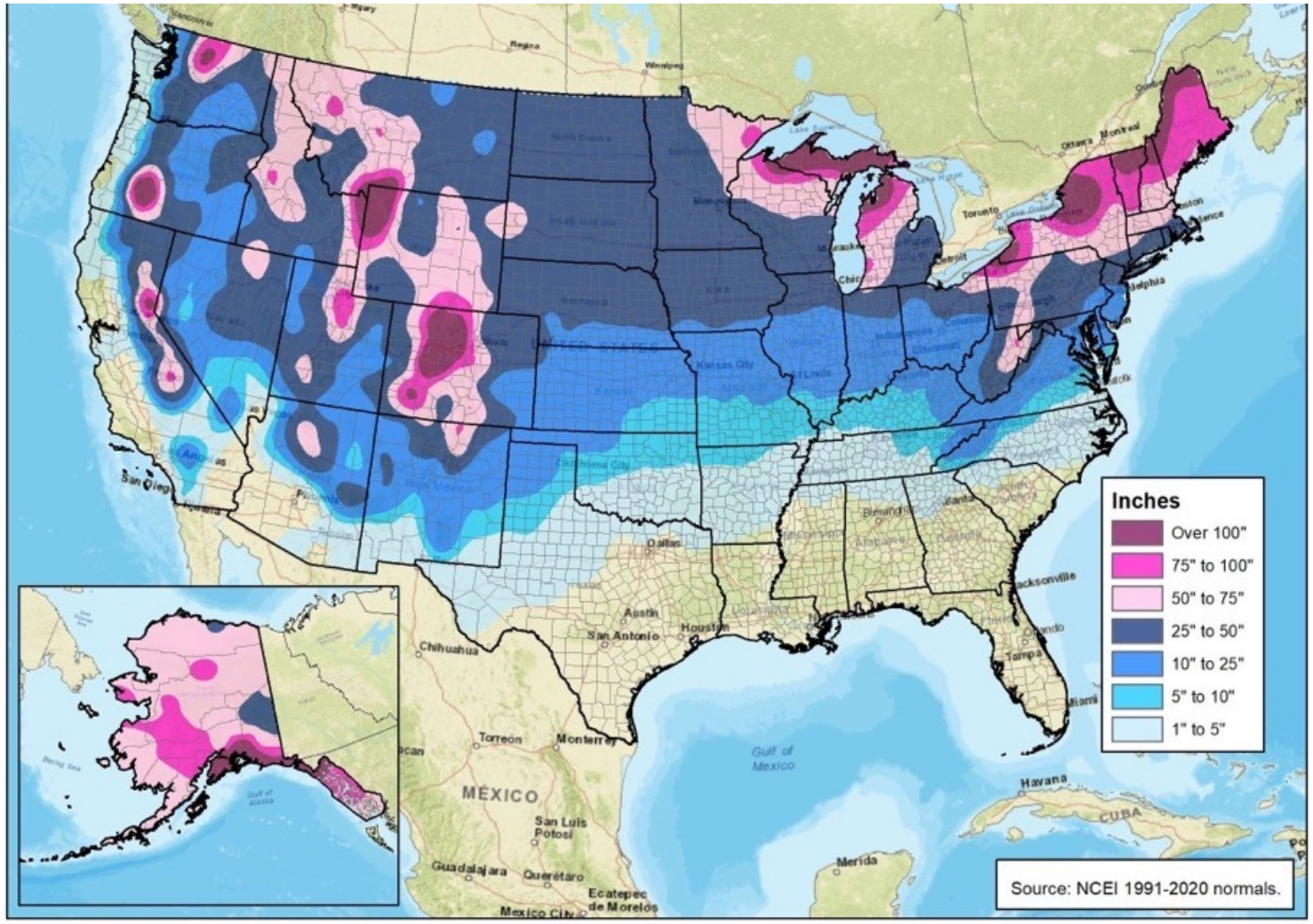
is it cold because it snowed?

Did it snow because it is cold
or
is it cold because it snowed?

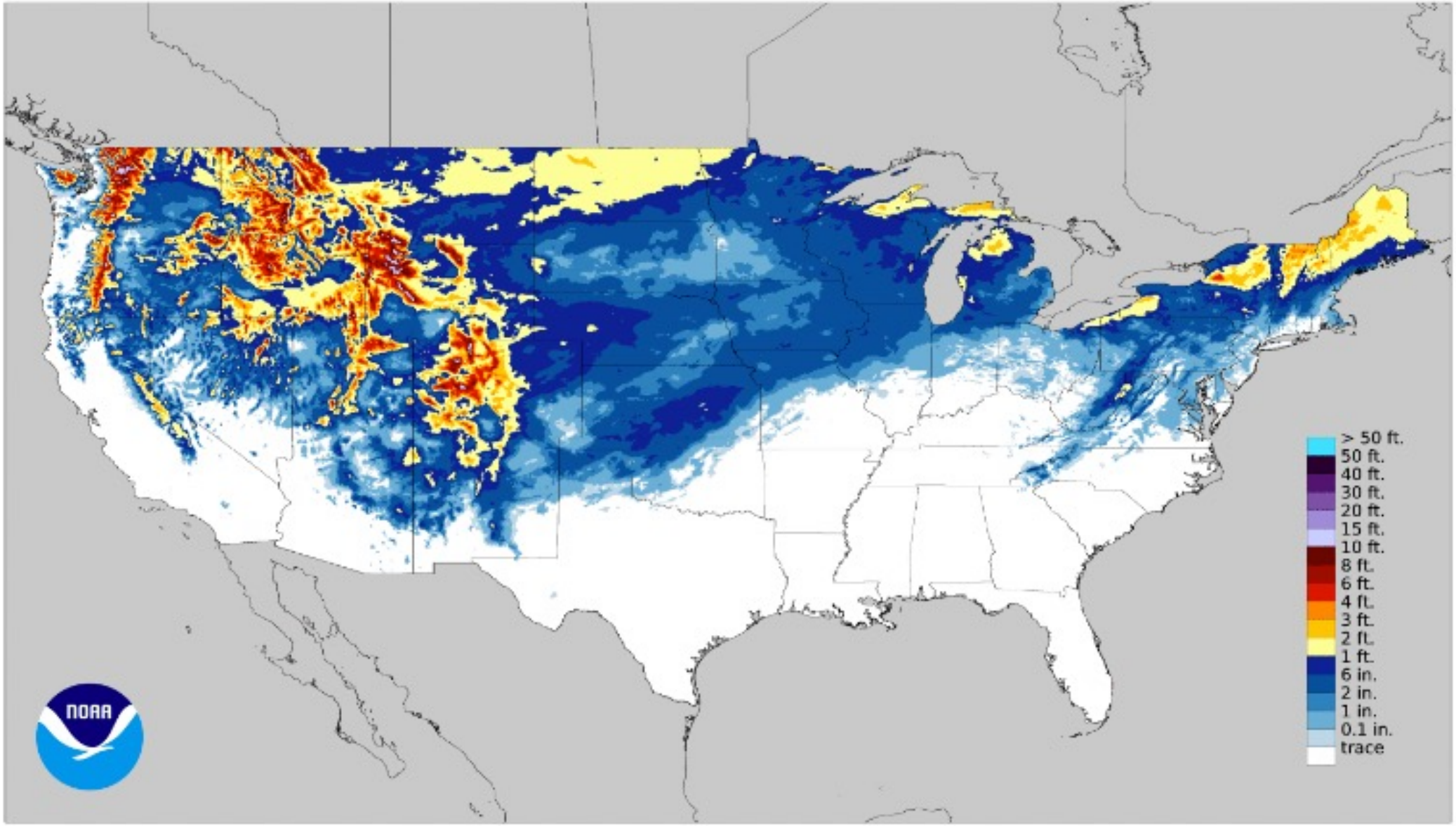
YES

Snowfall

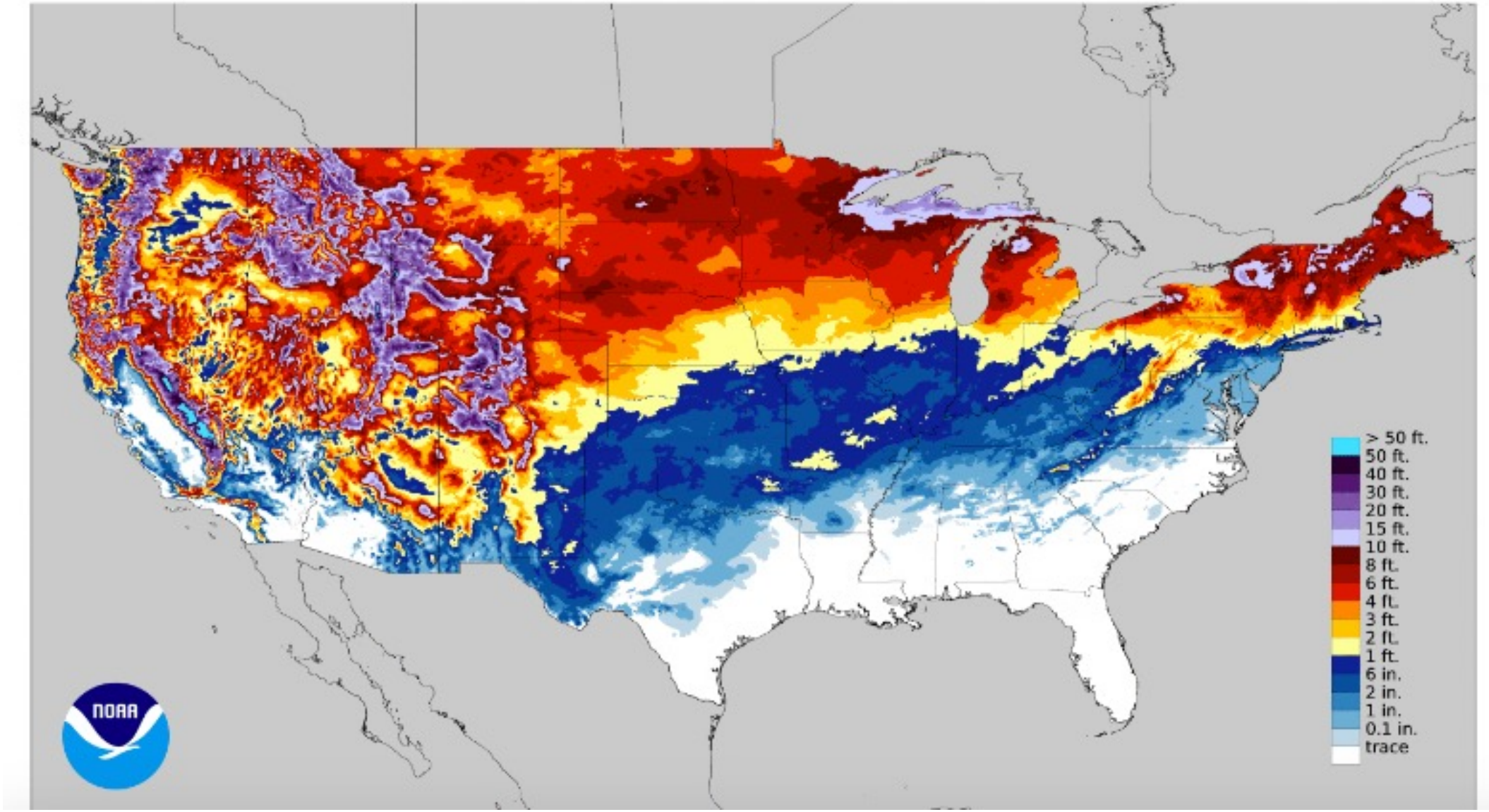
1991-2020 Normal Annual Snowfall (NCEI)



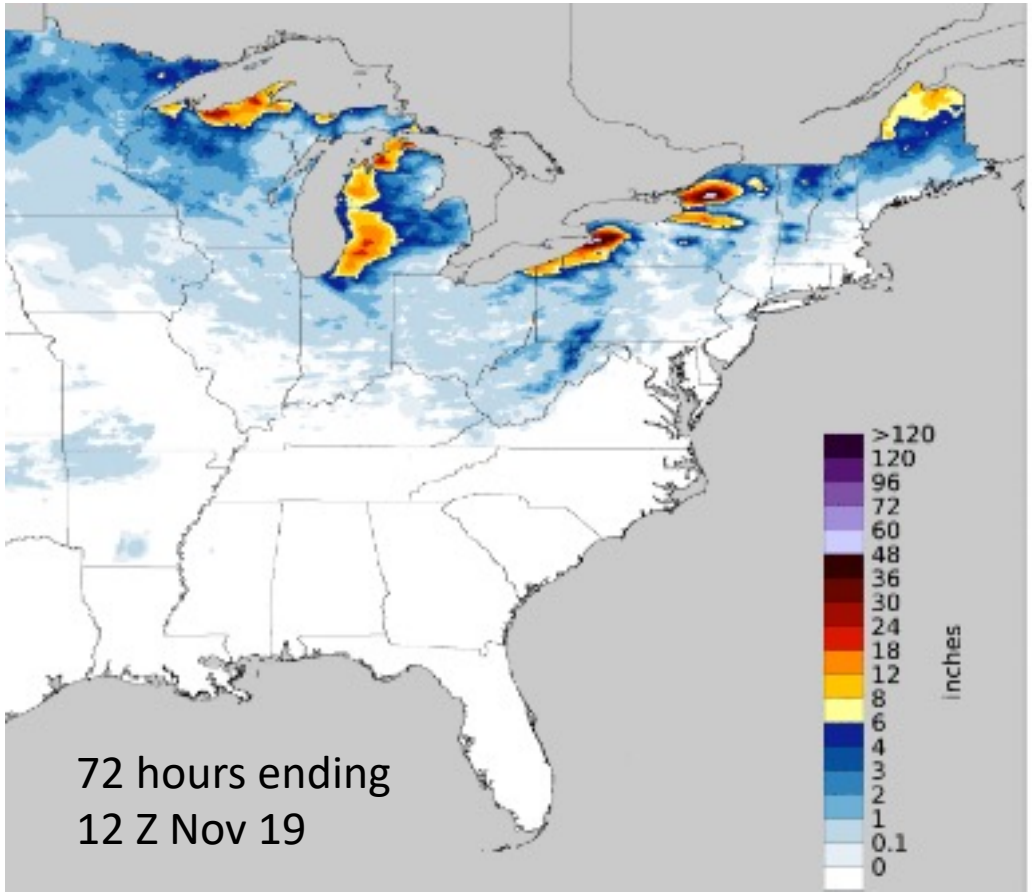
Seasonal Snowfall Accumulation: Sep 30, 2023 – Dec 12, 2023

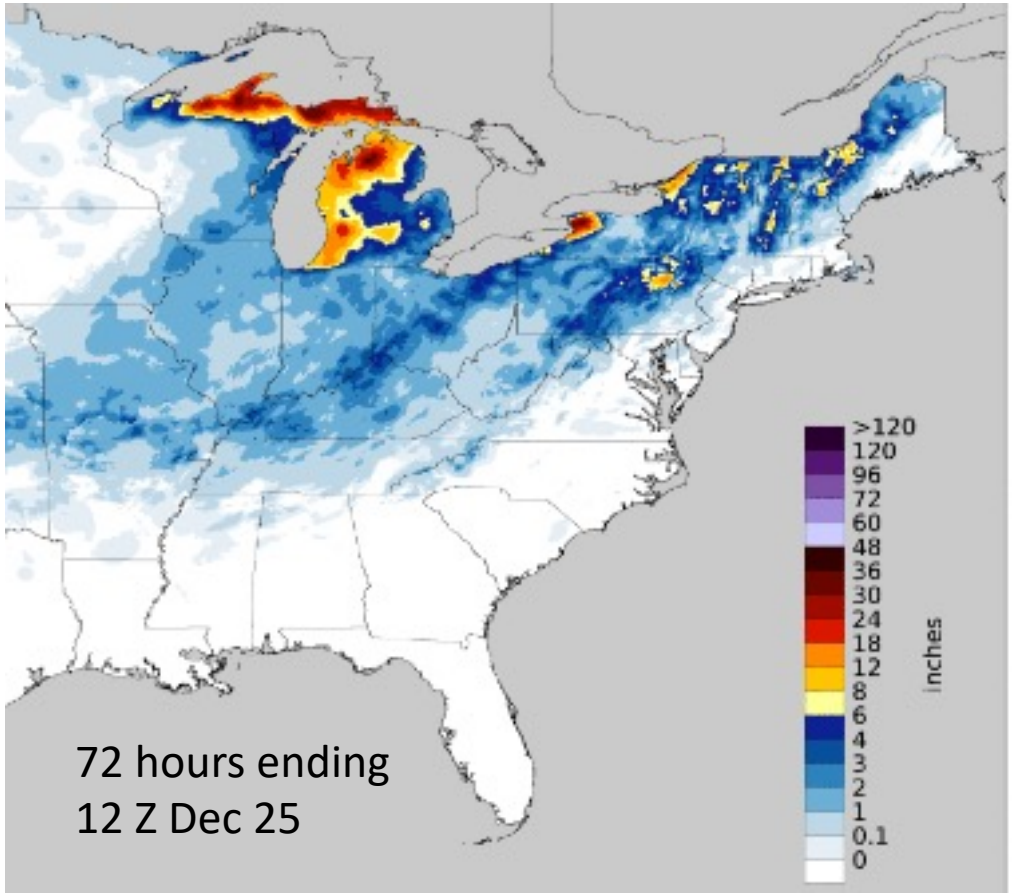


Seasonal Snowfall Accumulation: October 1, 2022 – June 30, 2023



November & December 2022 lake-effect snow blitzes





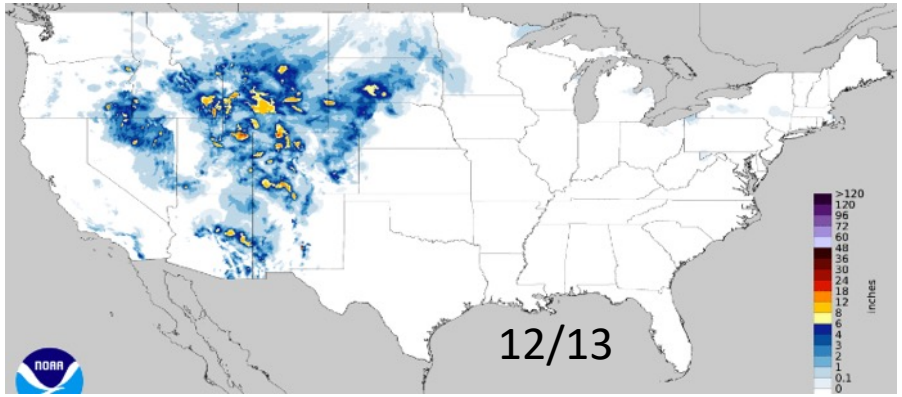
Buffalo region double punch

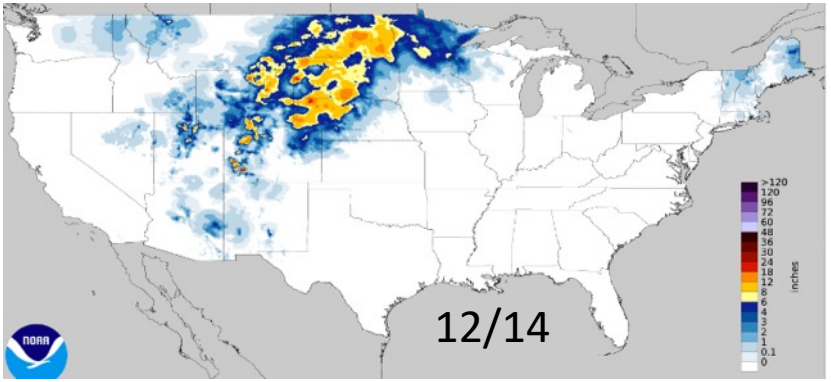
Lake View, NY
19 November 2022

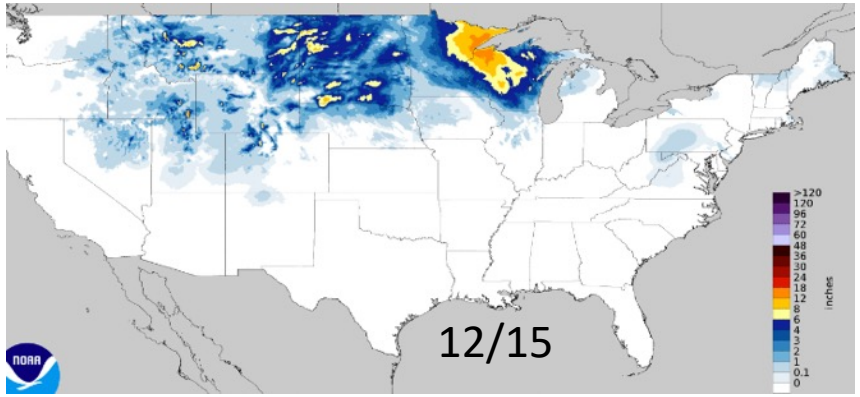
NWS Office, Buffalo, NY
24 December 2022

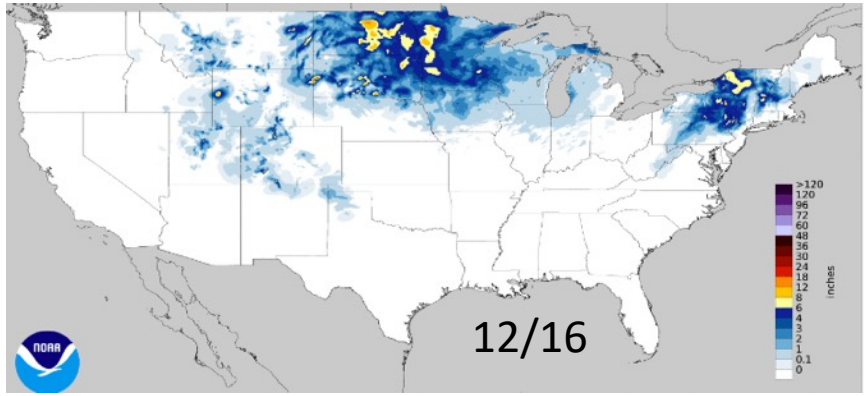
"Must be a lake-effect snowstorm."

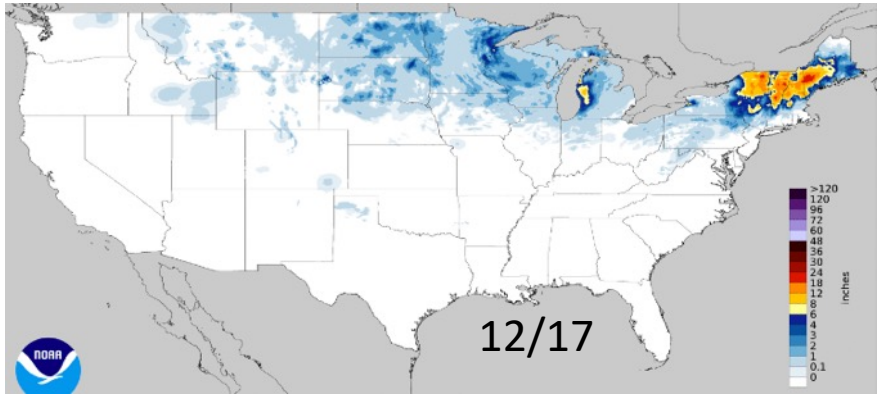
Typical 2022/23 Storm “Trek”: 11 December (12Z) to 19 December (12Z) 2022

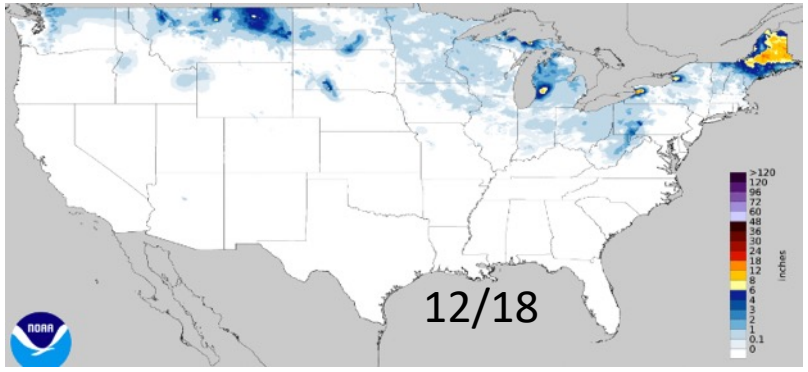


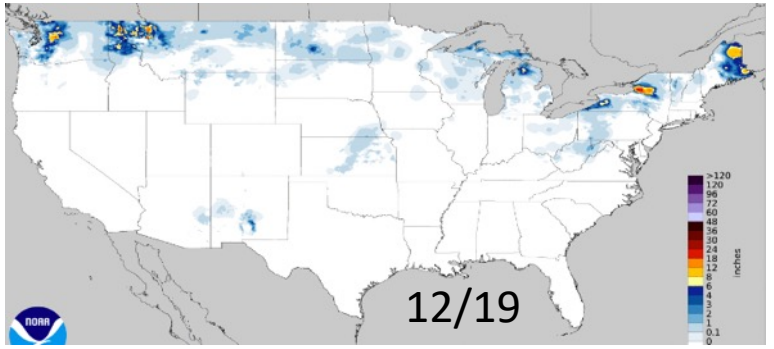




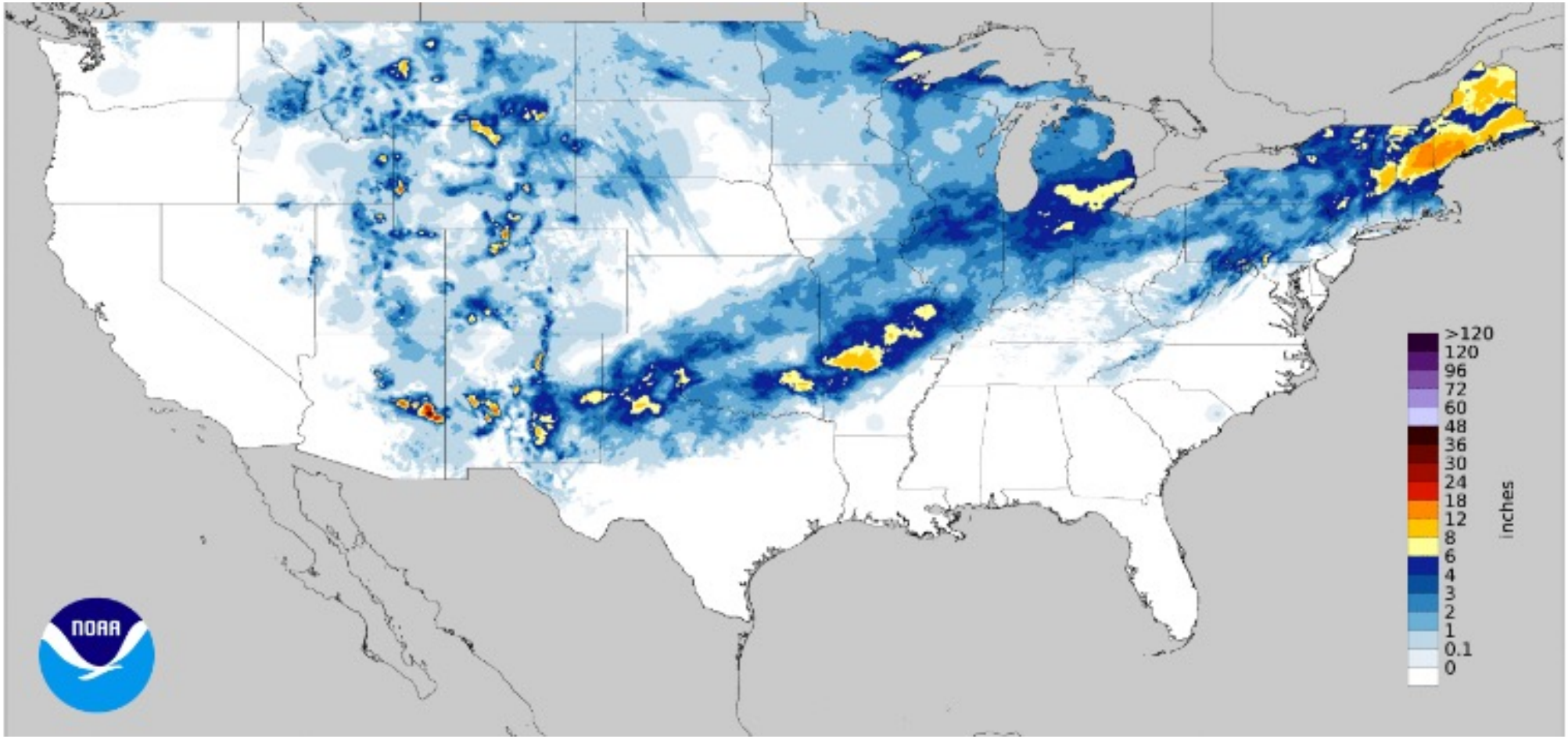




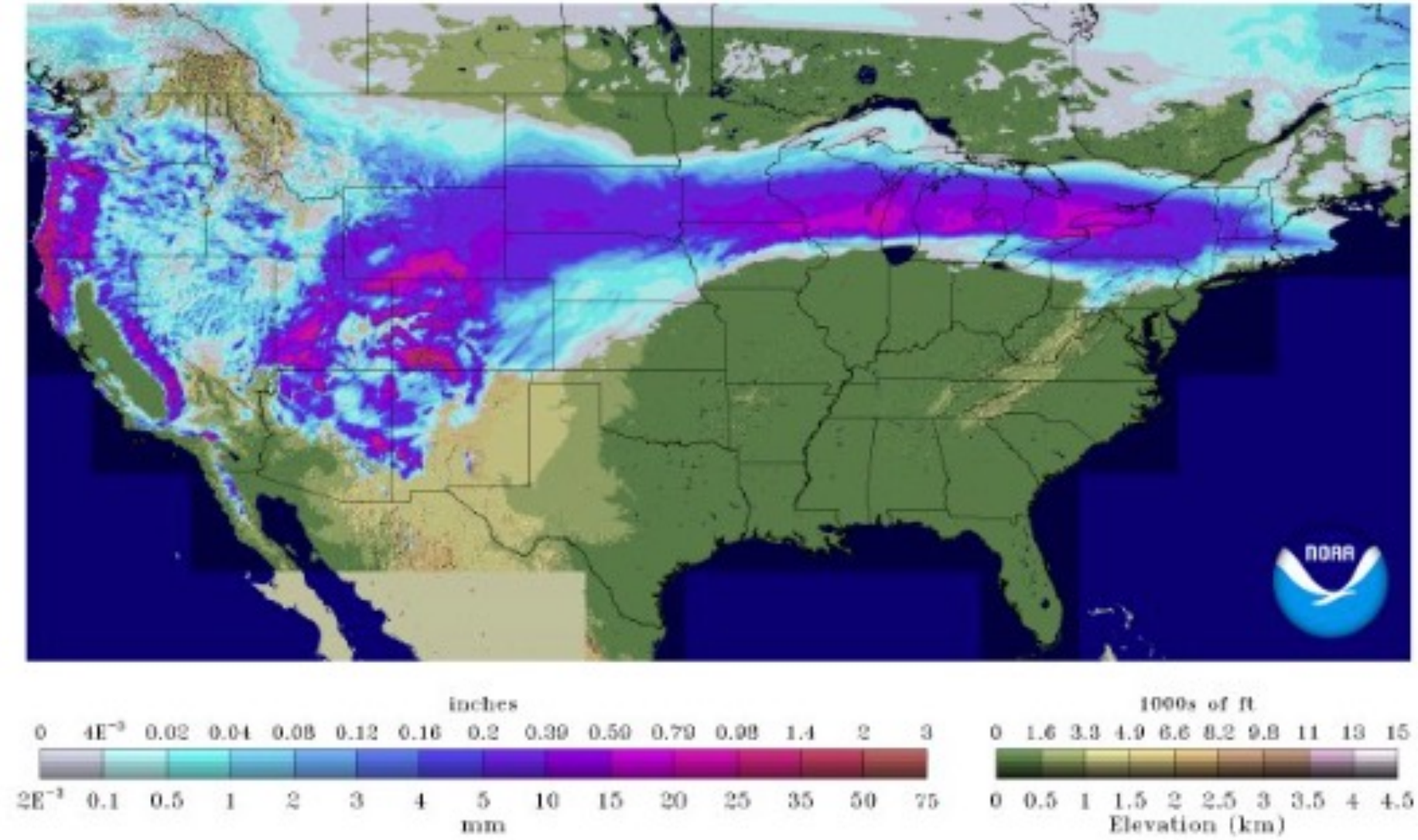




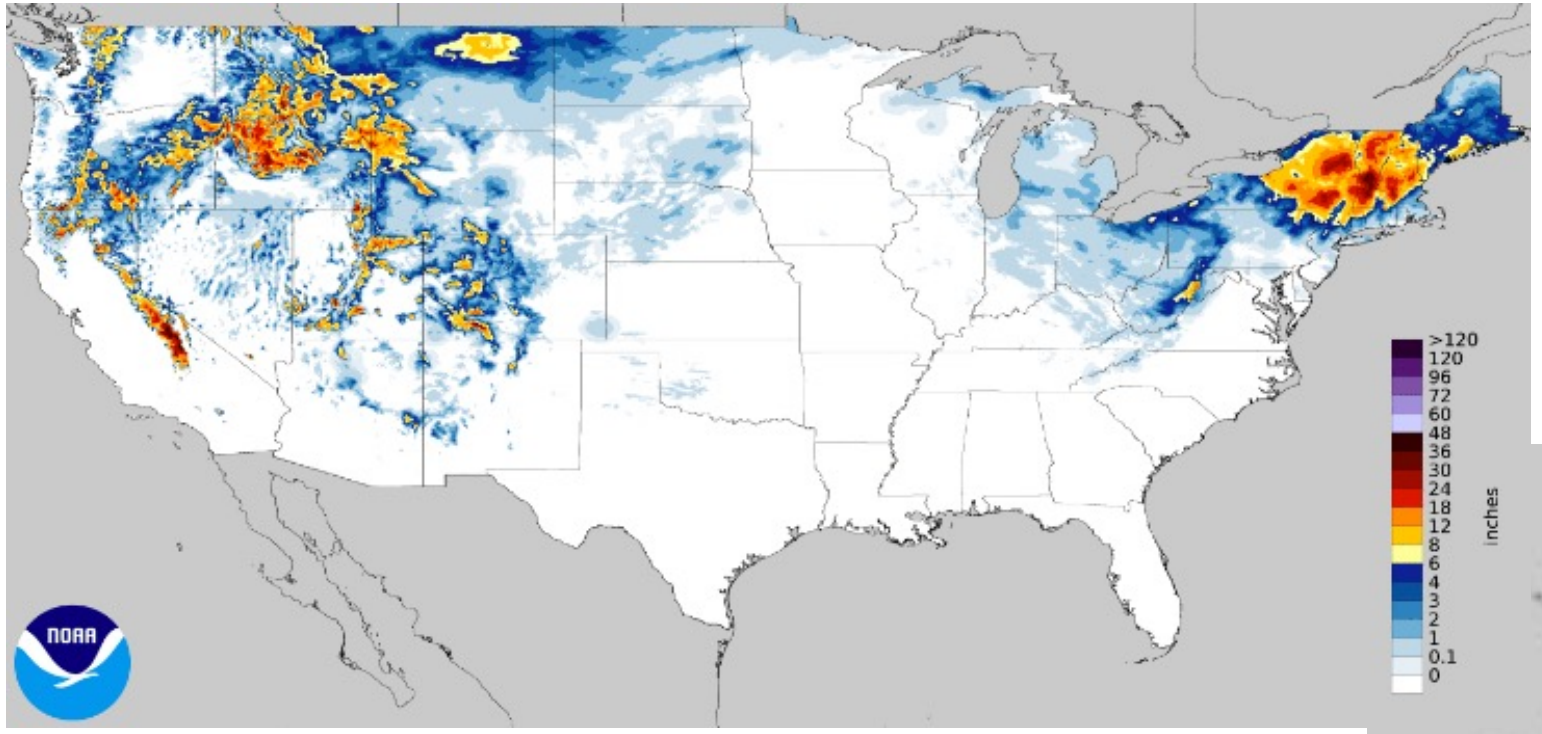
A Rare Southern(ish) 2022/23 Track:
72-hour snowfall as of 12Z on 26 January 2023



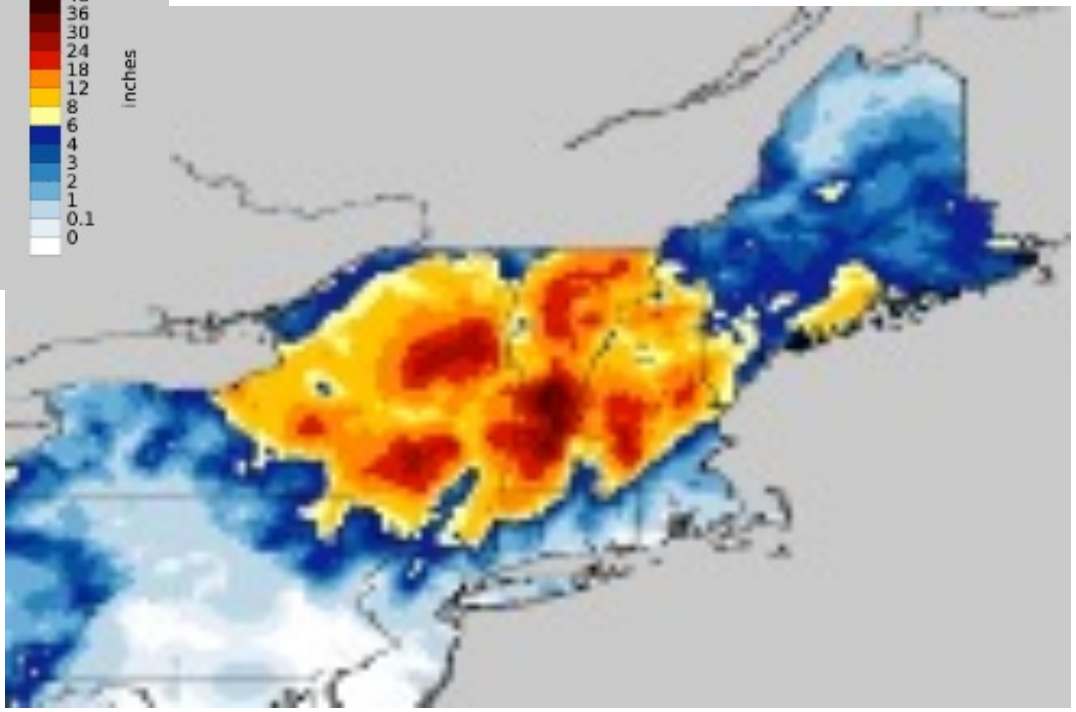
Fast Mover: 24-hour snow precipitation ending 6Z on 23 February 2023



Bookends: Snowfall for the 72 hours ending 12Z on 16 March 2023



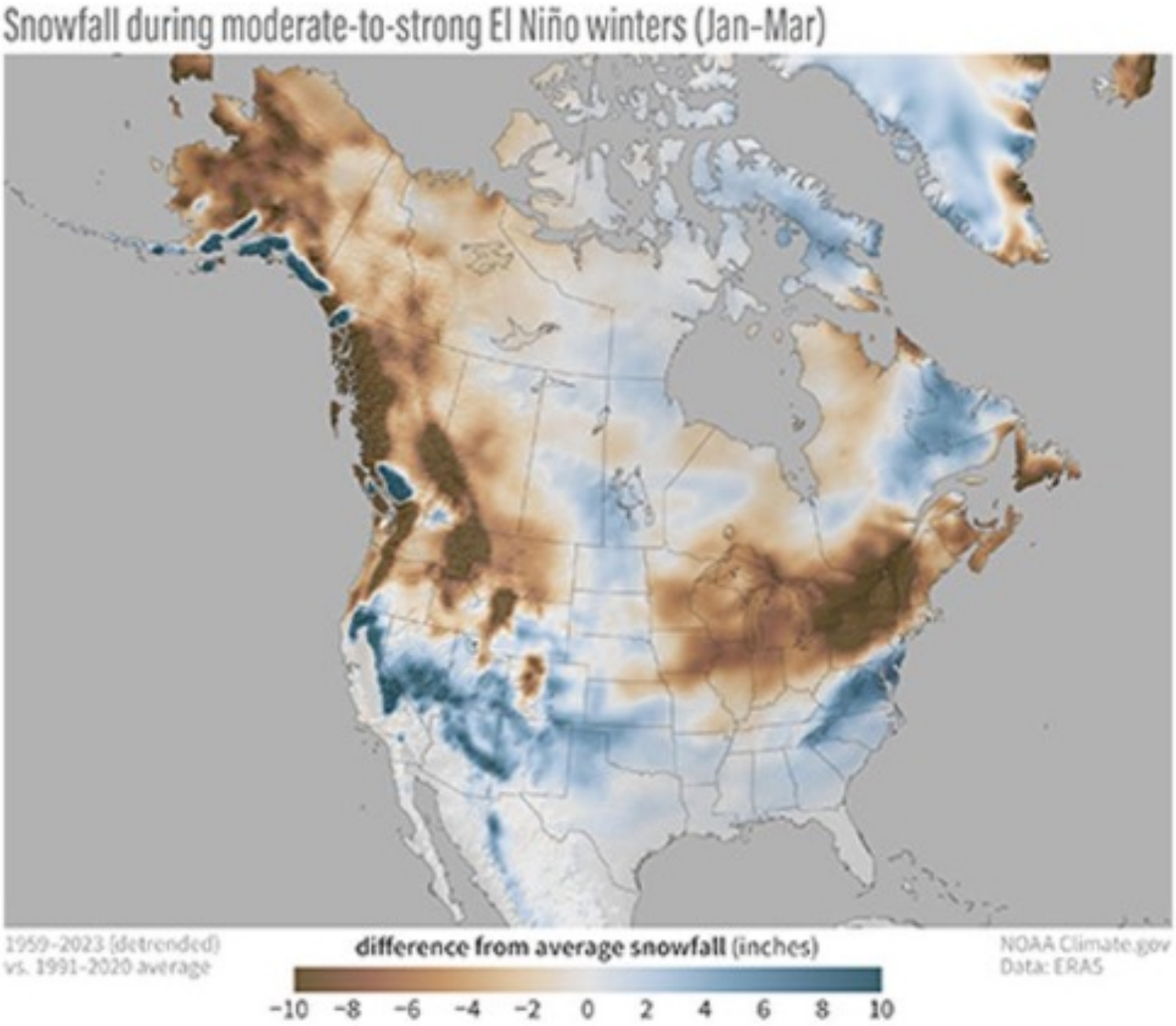
Season's biggest hit in the Northeast

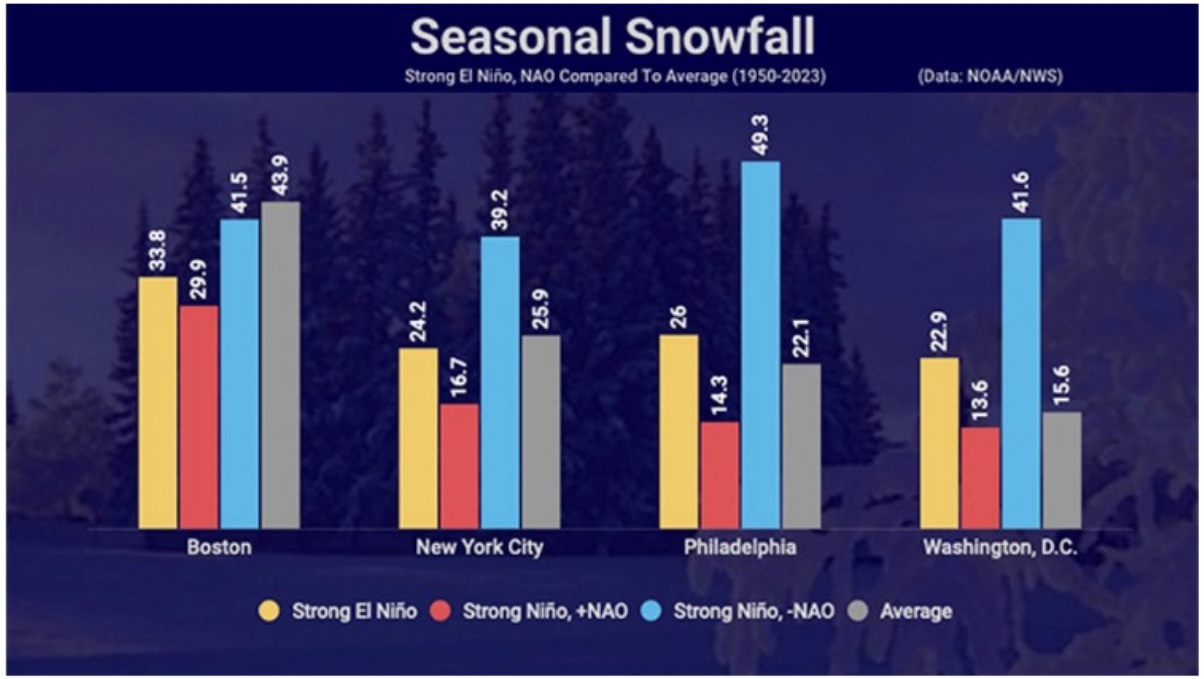


Last hurrah

Summit of Mt. Washington, NH
8 June 2023

Snowfall this El Nino winter?

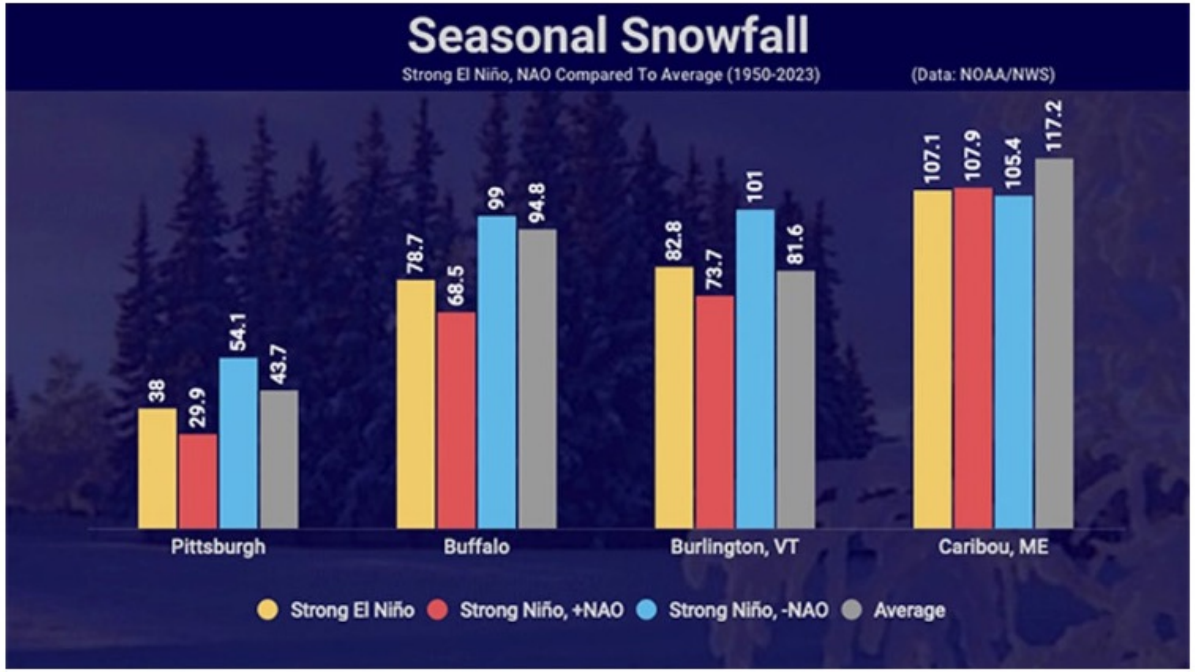




Seasonal snowfall during all strong El Niños (yellow bars), strong El Niños without Greenland blocking (red bars), strong El Niños with frequent Greenland blocking (blue bars), compared to 1950-2023 average (gray bars) in four major Northeast cities along the Interstate 95 corridor.

Interior Northeast

Coastal Mid-Atlantic/Northeast



Same as the previous graph, but for interior Northeast cities from Pennsylvania to Maine.

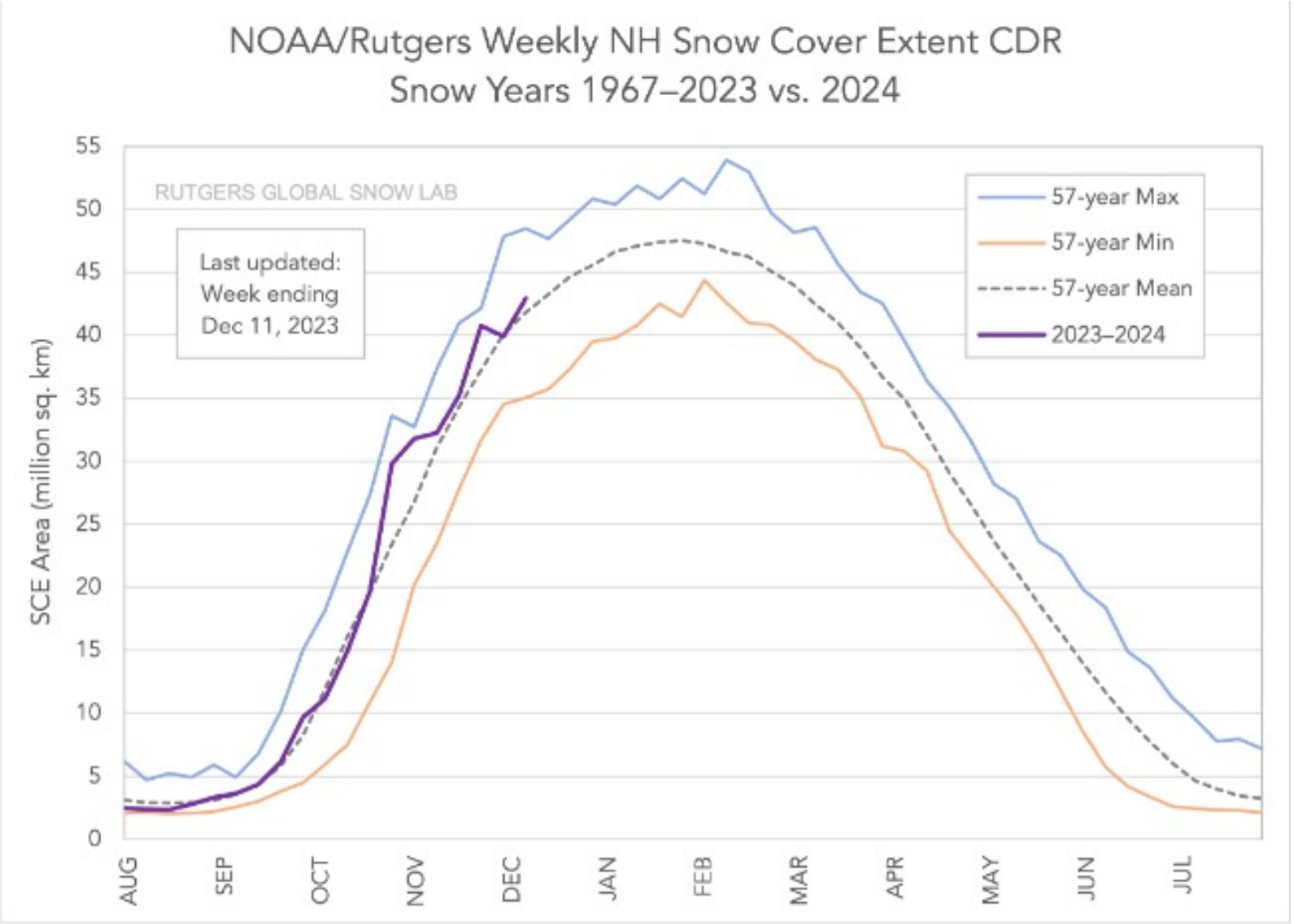
As with financial investments, past snowfall during strong El Niños doesn't guarantee this winter's results. It will be fascinating to see how winter 2023-24 measures up.

Inland Northeast

https://www.wunderground.com/article/storms/winter/news/2023-11-29-el-nino-snow-northeast-us

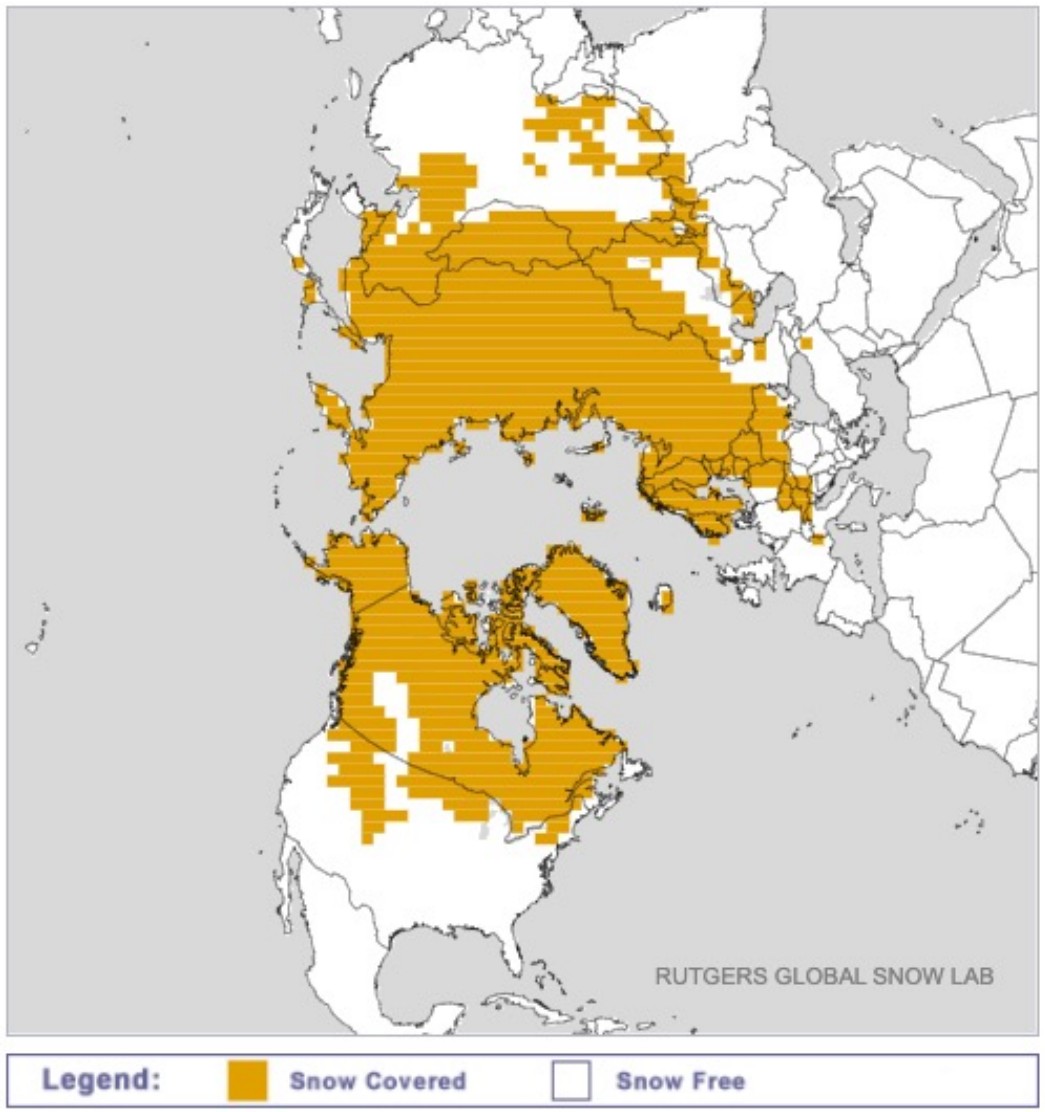
Snow Cover

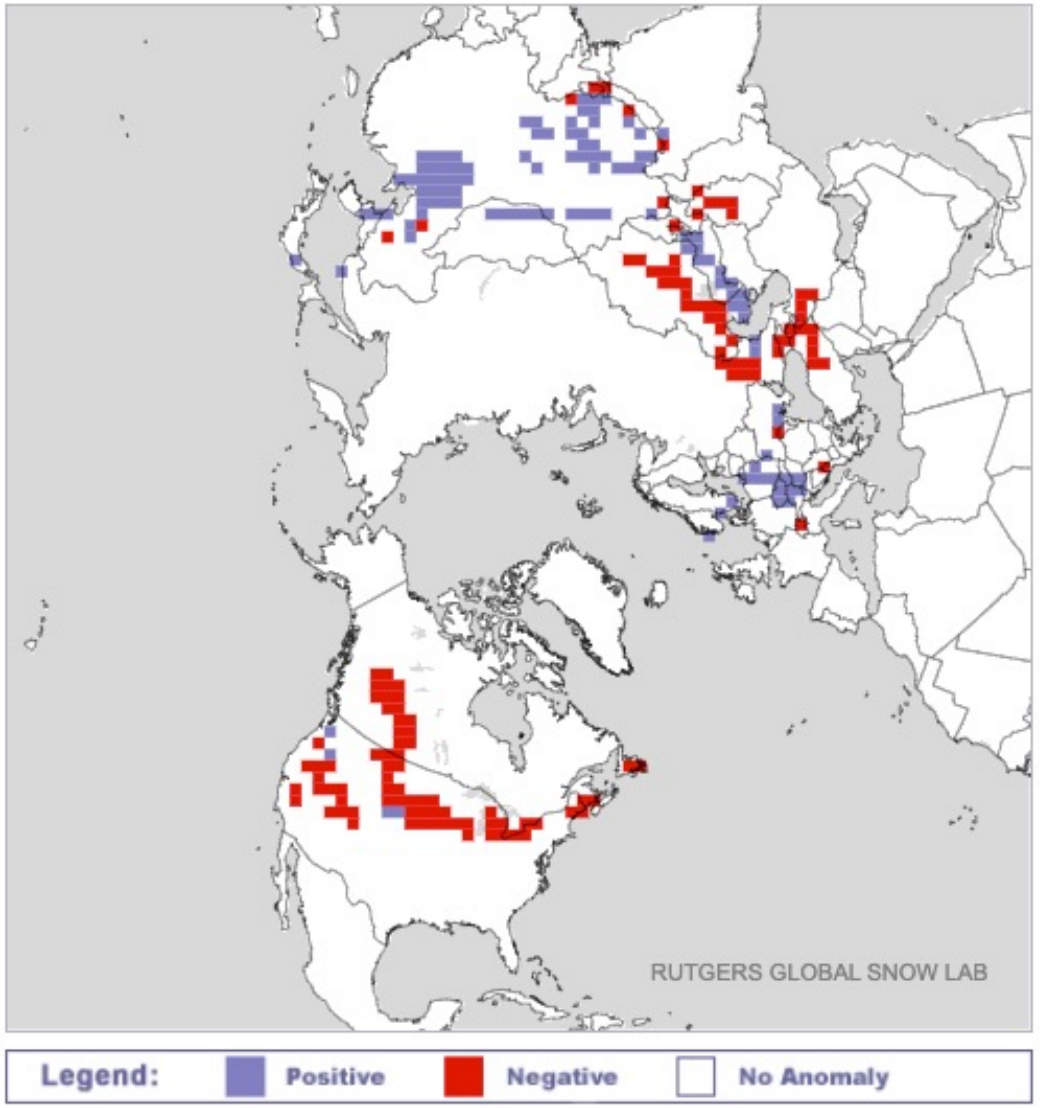
Keeping an eye on seasonal snow cover extent



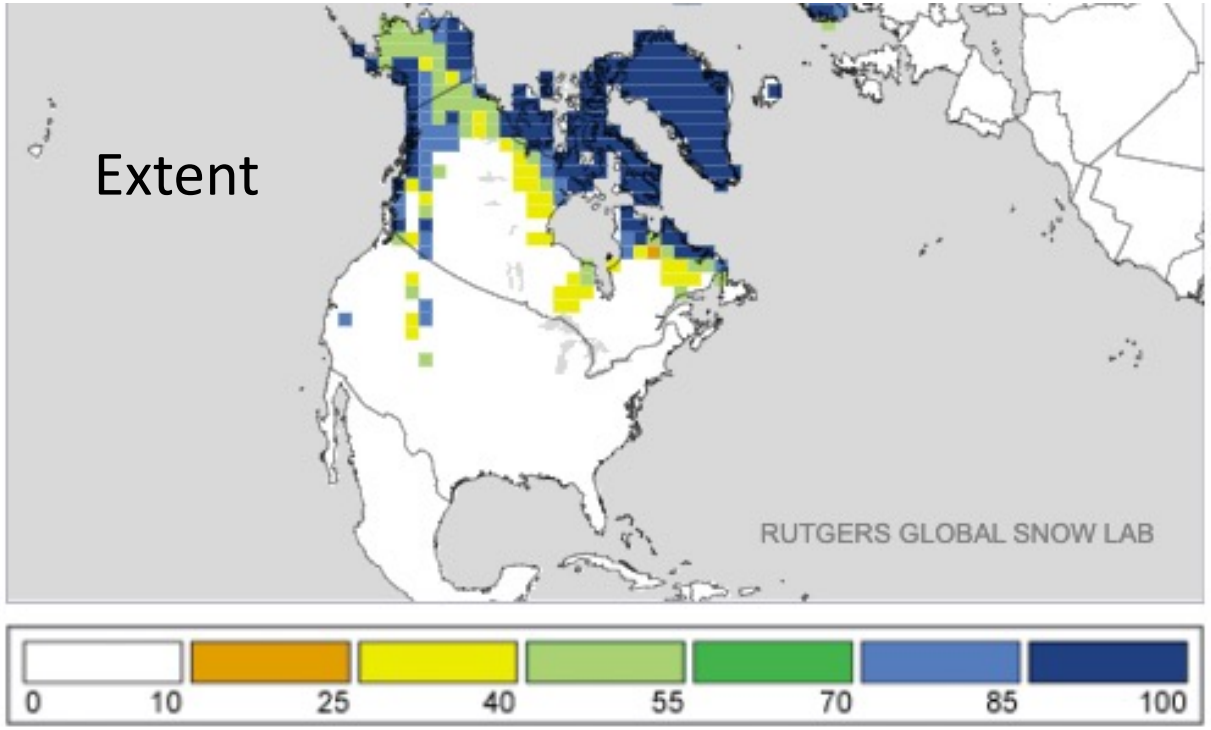
https://globalcryospherewatch.org/state_of_cryo/snow/

12 December 2023 IMS snow coverage and Rutgers departures

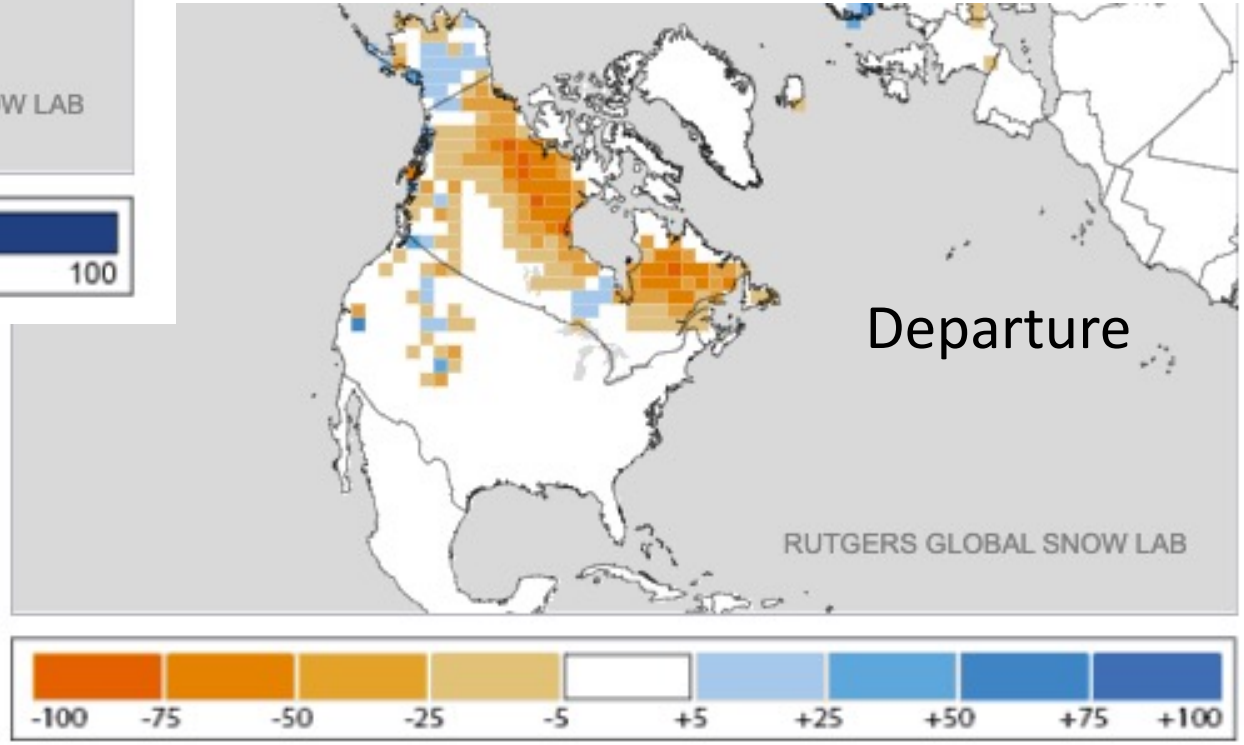




North America Snow Cover Extent and Departure: May 2023

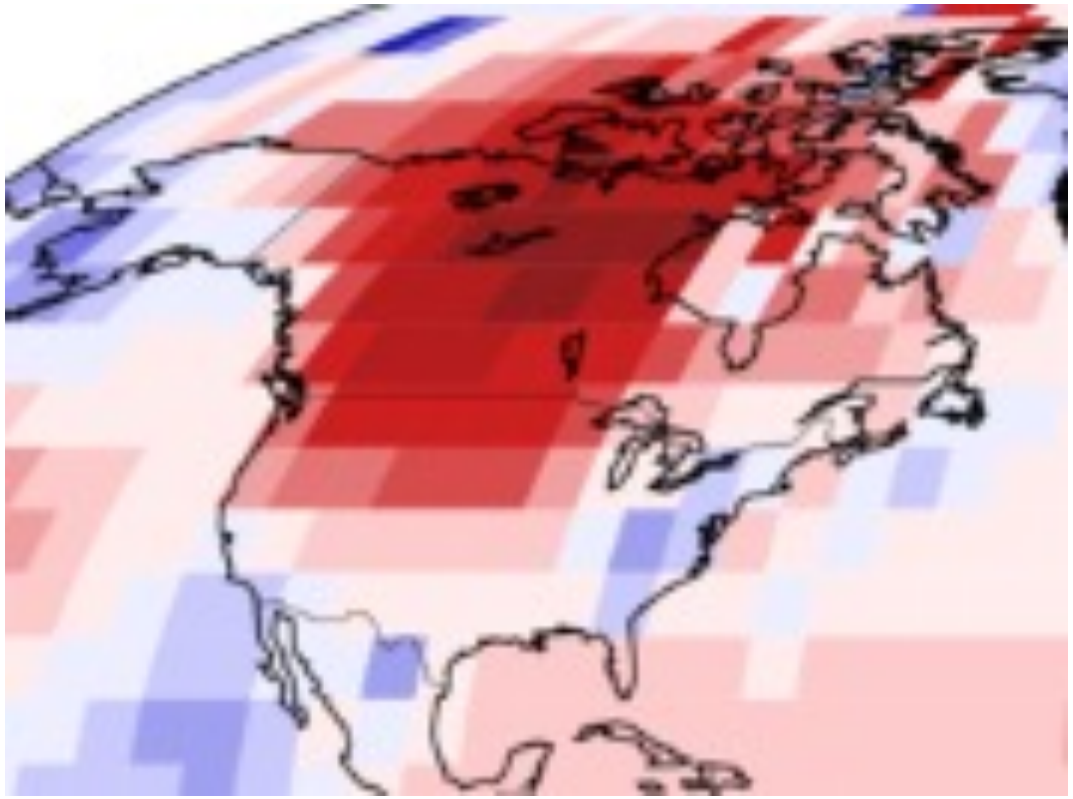


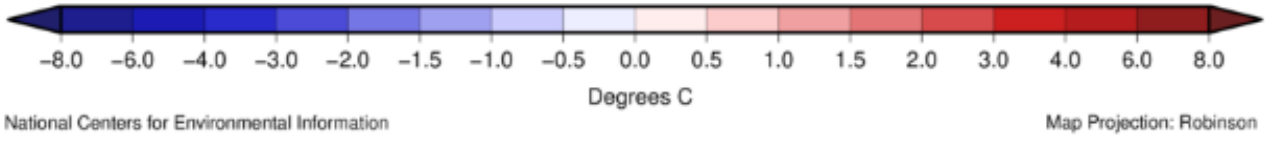
Percent cover



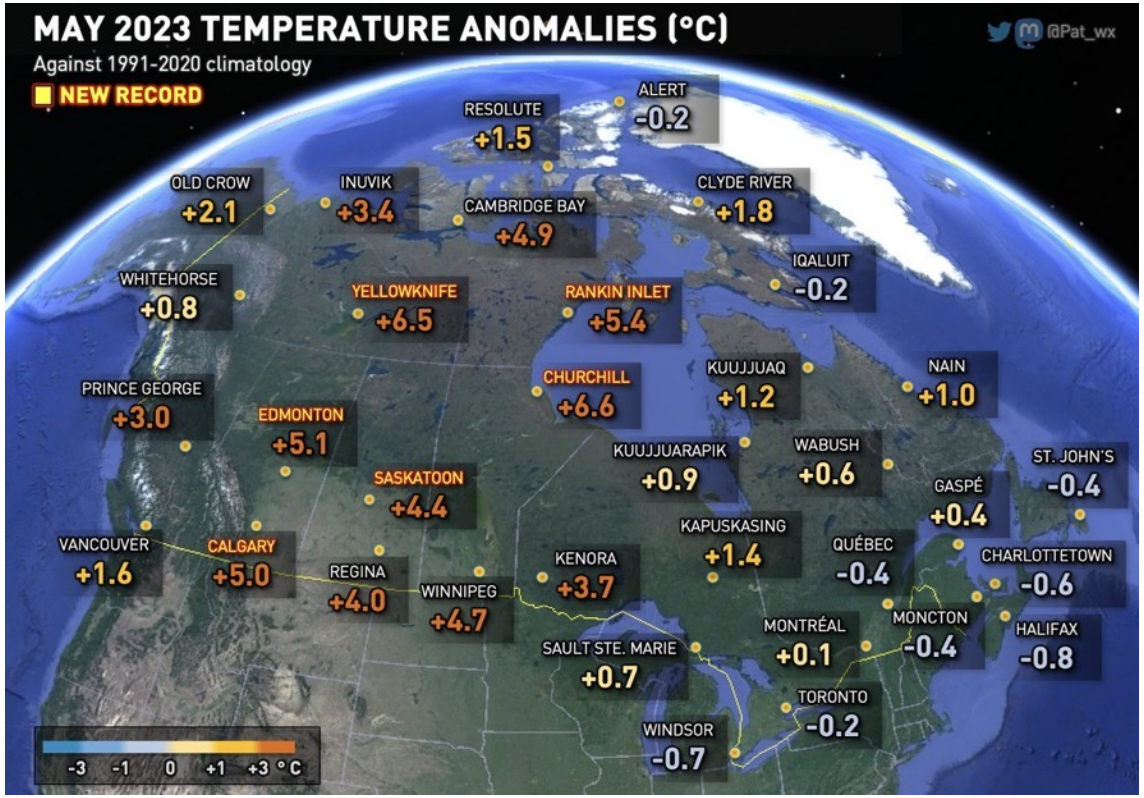
Percent of normal

Temperature Departure from Average: May 2023





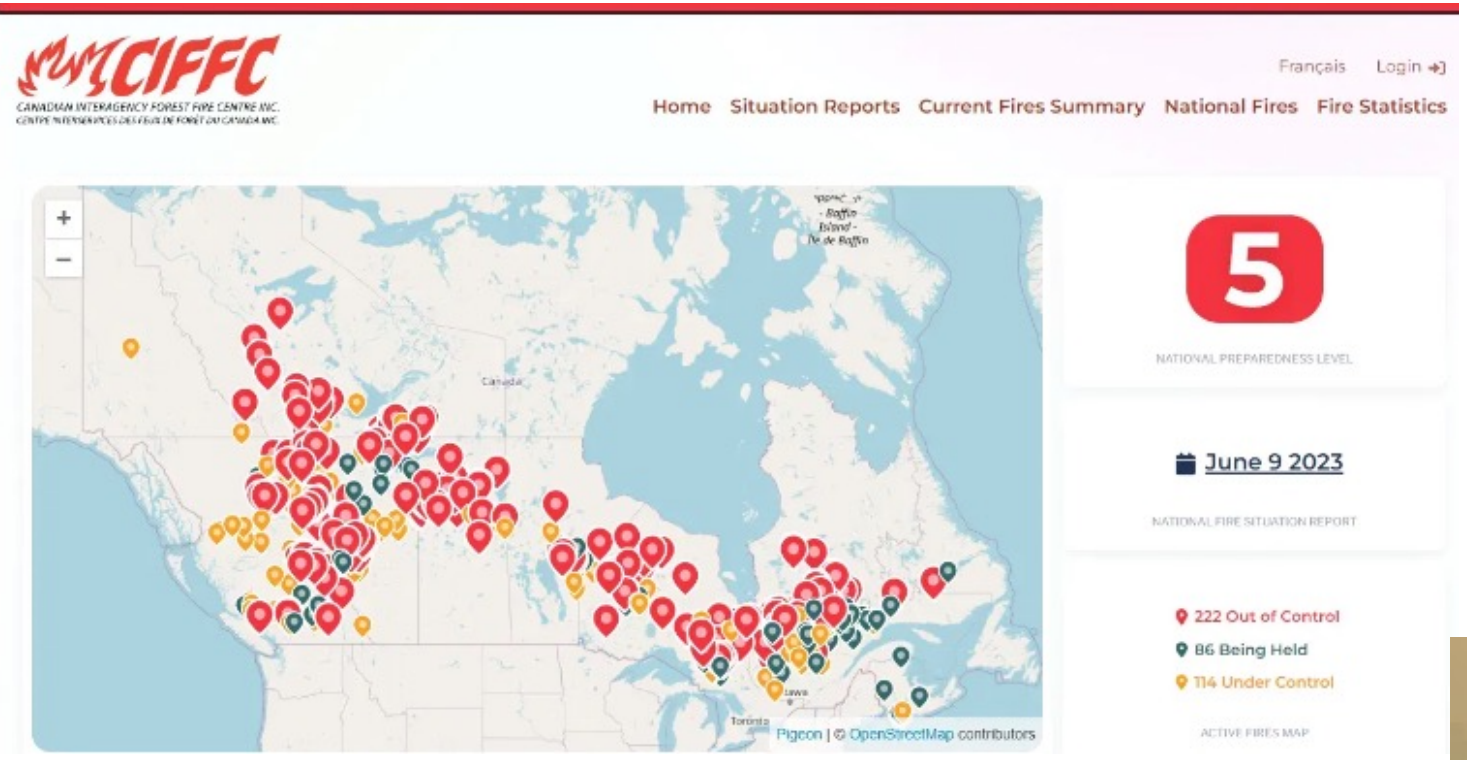
Coincidence?



Data source: NOAAGlobalTemp v5.1.0-20230608

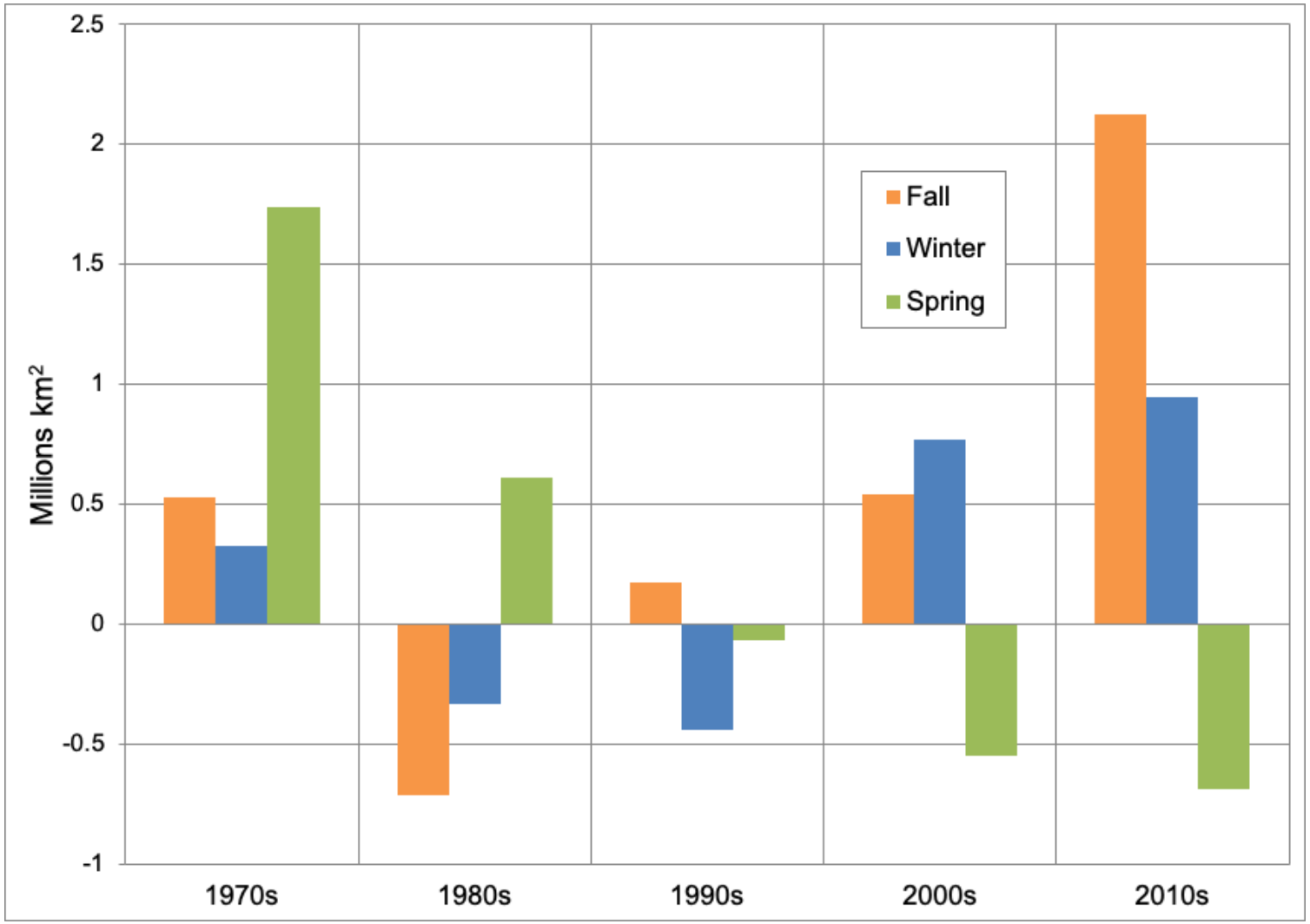
Consequences

Canadian wildfire situation:
9 June 2023



Paterson, NJ: 7 June 2023 (early afternoon)

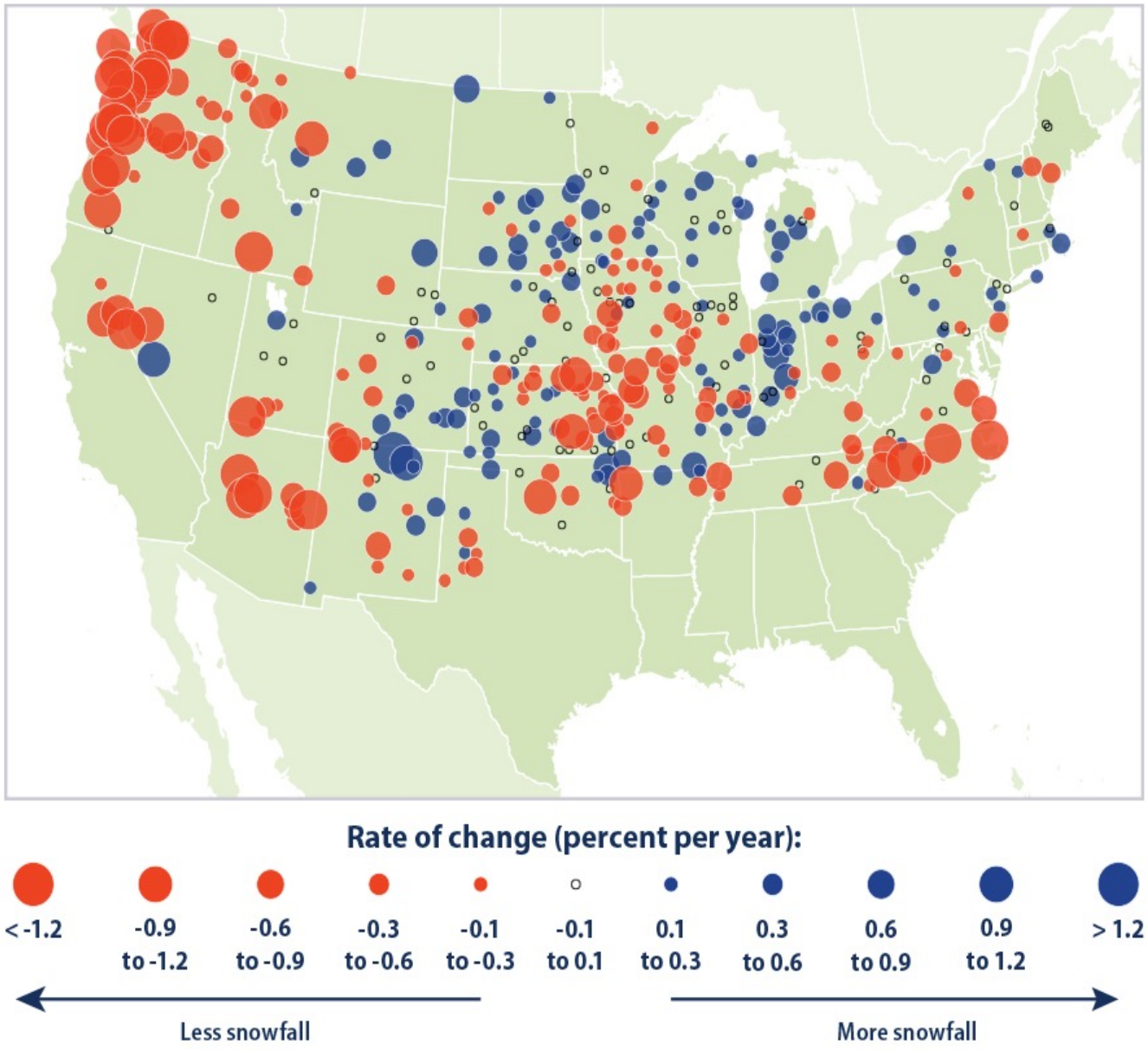
NH Mean Decadal SCE Anomalies



Calculated over 50 snow seasons (years) using seasonal SCE means from Sep 1970–Nov 2020. Fall 1971 missing. Normal period is 30 years for each season spanning from Sep 1980–May 2010 (1981–2010).

Future Snow?

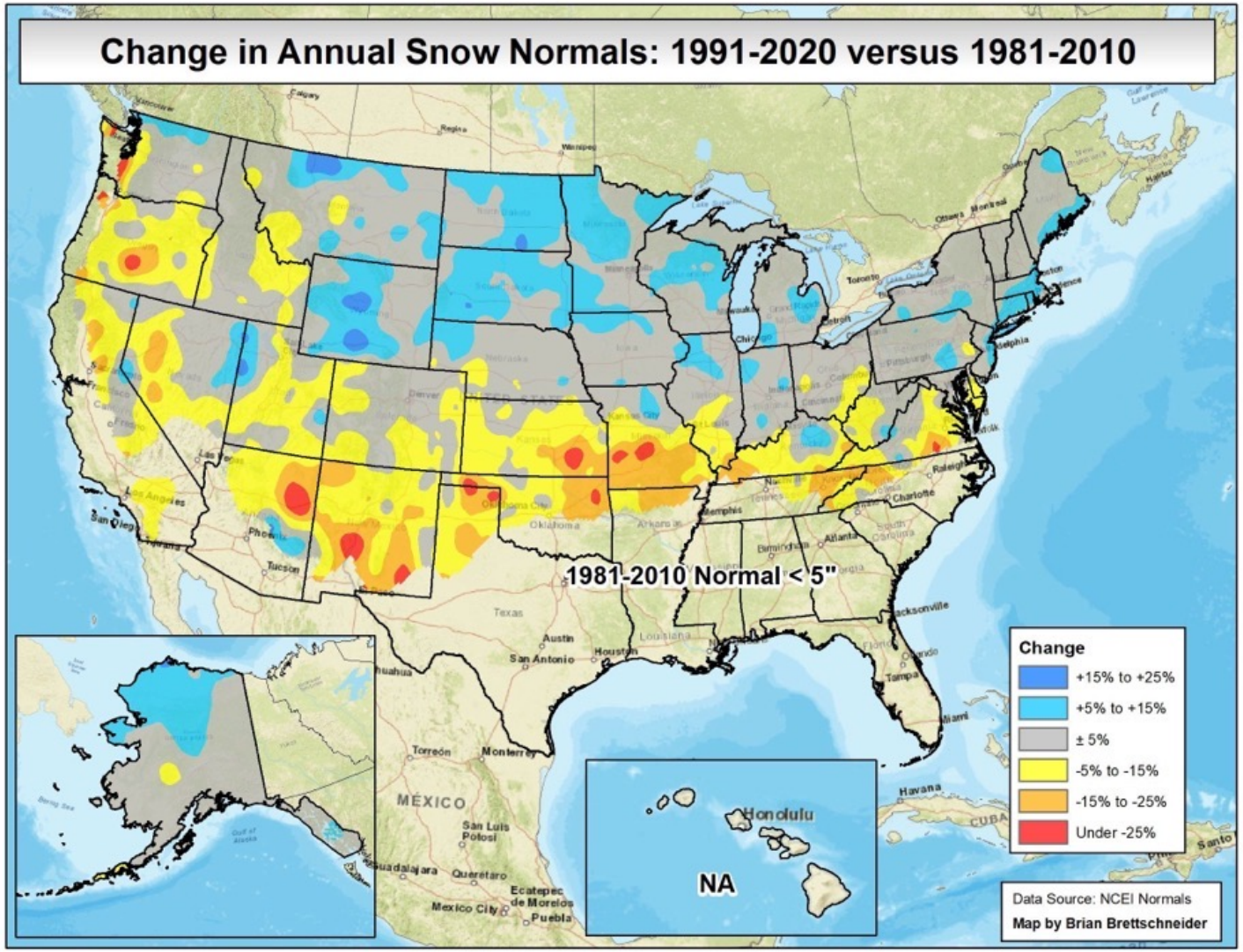
Thousands attend global warming protest

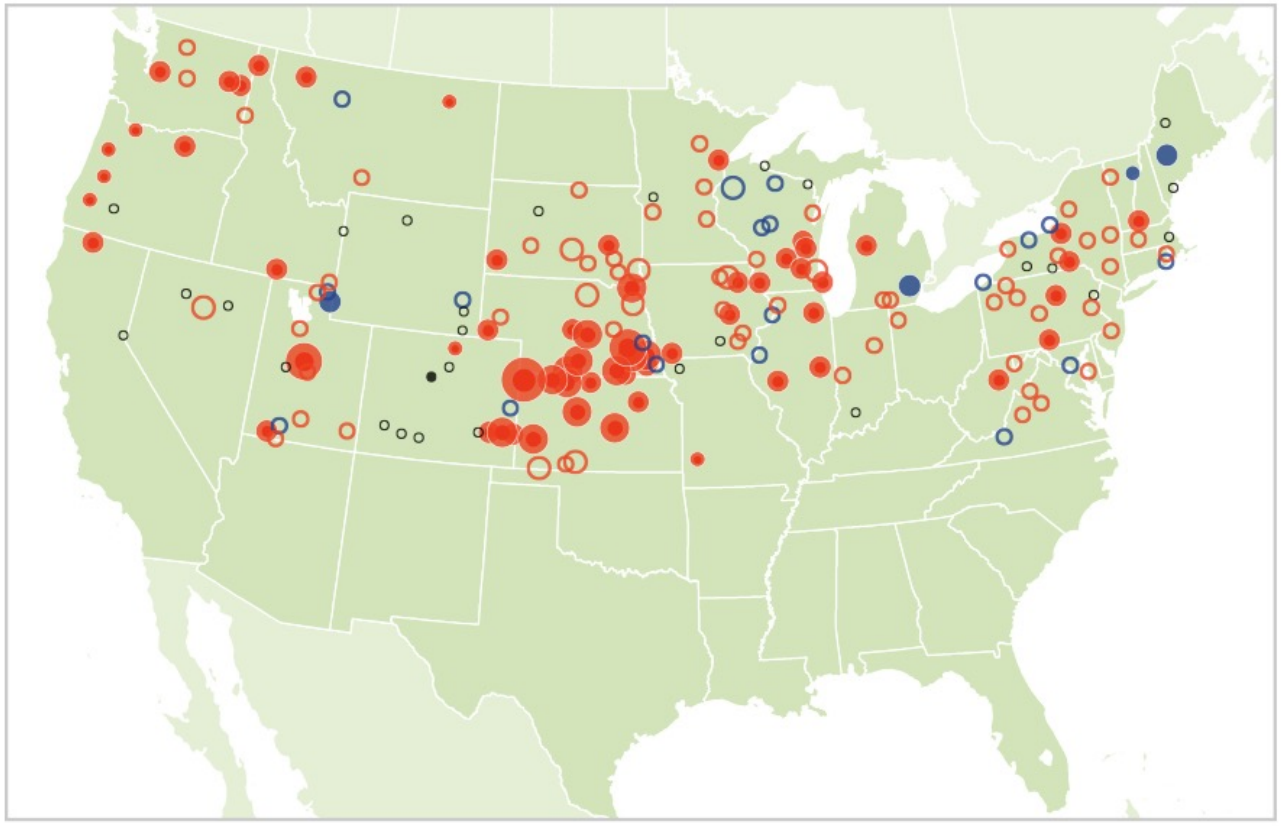


Change in snowfall in the contiguous US: 1930-2007

https://www.epa.gov/climate-indicators

Less snowy south, snowier north: a sign of climate change?





Percent change:

< -40	-30 to -40	-20 to -30	-10 to -20	-2 to -10	-2 to 2	2 to 10	10 to 20	20 to 30	30 to 40	> 40

Lower percentage of snow

Higher percentage of snow

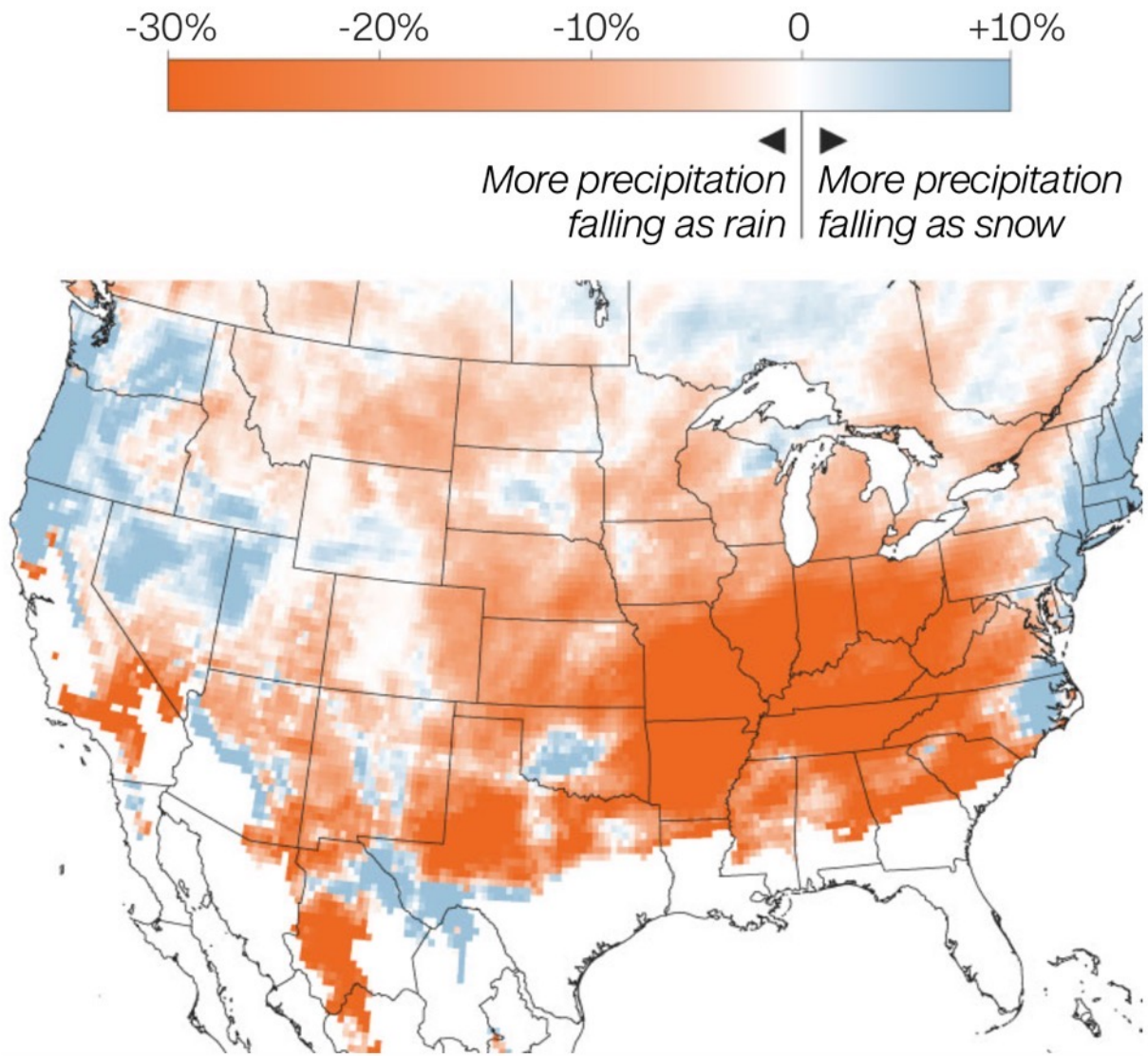
Filled circles represent statistically significant trends.
Open circles represent trends that are not statistically significant.

Data source: NOAA (National Oceanic and Atmospheric Administration). 2021. National Centers for Environmental Information. Accessed February 2021. www.ncdc.noaa.gov.

Change in snow-to-precipitation ratio in the contiguous US: 1949-2020

https://www.epa.gov/climate-indicators

Change in the November to March precipitation falling as snow (1973-74 to 2022-23)



Sources: European Centre for Medium-Range Weather Forecasts and climate scientist Brian Brettschneider

Graphic: Renée Rigdon, CNN

IT'S NOT WORTH IT, ROY! LET'S JUST GIVE HIM OUR NOSES & LET HIM GO!
PIPARO.
UFSPECS.COM

Measuring Snow

Measuring Snow

- Snowfall measurement is typically more difficult than rainfall
- Snowfall measurement takes more time

Accurate and timely snowfall measurements can be extremely important to the local National Weather Service office, public works departments, media outlets, climatologists, and other scientists

Four Snow Measurements

1. The depth of new snow
2. Liquid water equivalent of new snow
3. The total depth of new snow and old snow and ice at observation time
4. Snow Water Equivalent (SWE) of total snow on the ground

Tools of the Trade

- Rain Gauge
- Snow board
  - A 24”x16”piece of ½ or ¾”plywood painted white
- Yardstick or snow stick

Where to measure new **snowfall**

1. Find a nice, level place to measure where drifting or melting has not occurred (like a snowboard) and there are no trees overhead

2. Slide snow stick or ruler into snow until it reaches the ground/board surface

3. Read value on snow stick (value is always to nearest tenth of an inch, like 3.4 inches)

Measuring the Depth of New Snowfall

CoCoRaHS
Community Collaborative Rain, Hail & Snow Network

When to Measure New Snow

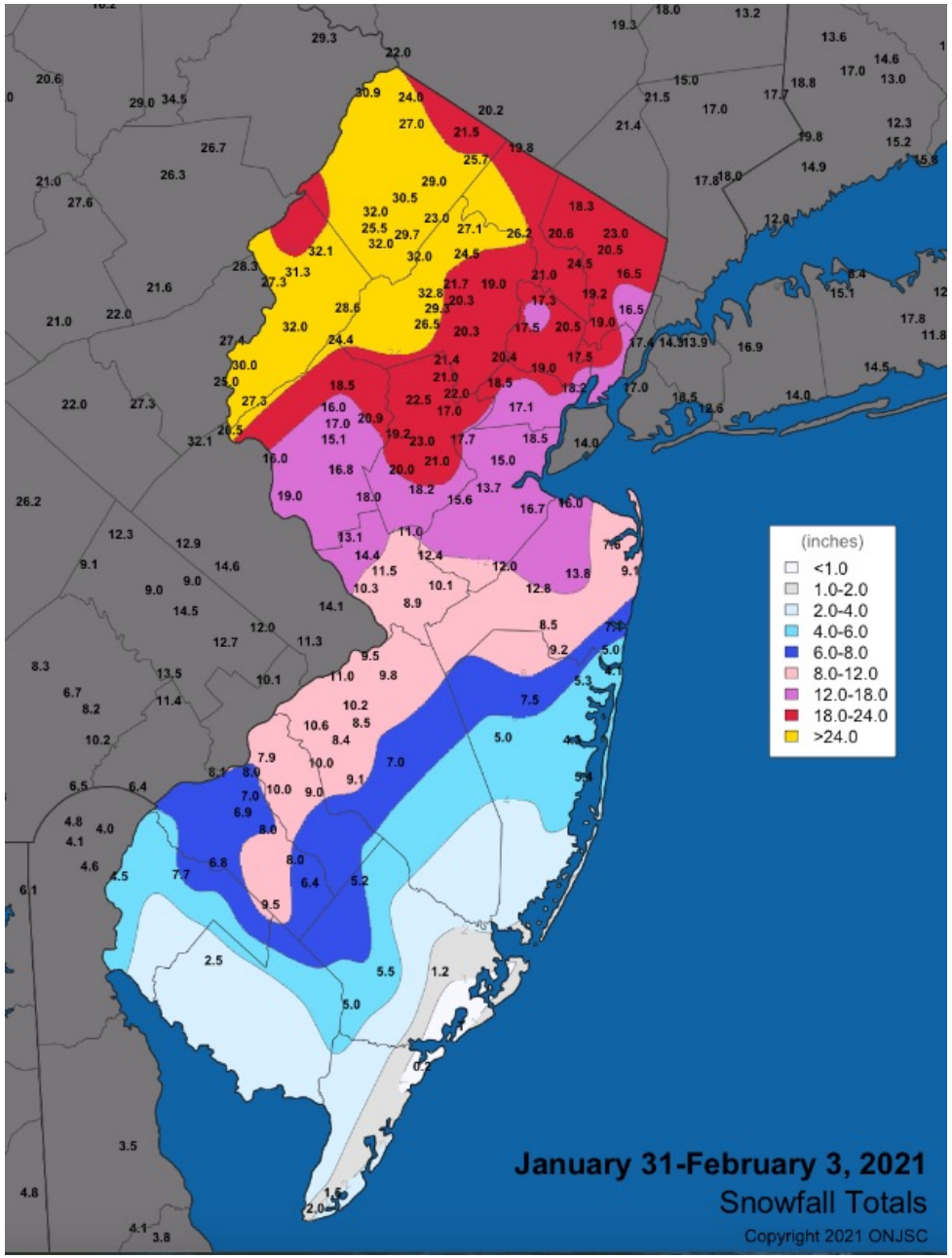
- **Measure new snowfall as soon as possible after it ends, before settling and melting occur.**

- This often will not be at your regular observation time.

Snowfall
31 Jan-3 Feb 2021

Couldn't map it so closely without CoCoRaHS!

Contributed to successful NJOEM grant from FEMA to fund snow removal



Reports from 4 of NJ's 21 counties

Essex County	
Bloomfield	20.5
Livingston Twp(CoCo)	17.5
Maplewood Twp(CoCo)	18.1
Montclair(CoCo)	17.7
Newark Airport(Coop)	18.2
North Caldwell	17.3
West Caldwell Twp(CoCo)	17.4
Gloucester County	
Franklin Twp(CoCo)	9.5
Monroe Twp(CoCo)	6.4
Pitman(CoCo)	8.8
South Harrison Twp(CoCo)	6.8
Washington Twp(CoCo)	6.0-8.0 (two reports)
Wenonah(CoCo)	6.9
Westville	8.0
Williamstown	8.0
Woodbury(CoCo)	7.0
Hudson County	
Harrison(CoCo,Coop)	17.5
Kearny(CoCo)	20.1
North Arlington	17.5
Hunterdon County	
Clinton(CoCo)	16.0
Clinton Twp(CoCo)	18.5
Flemington(CoCo,Coop)	15.0-18.8 (five reports)
Franklin Twp(CoCo)	14.3
Frenchtown(CoCo)	16.0
Holland Twp(CoCo)	24.2
Kingwood Twp(CoCo)	19.0
Lebanon(CoCo)	15.0-17.0 (two reports)
Readington Twp	16.2
Wertsville(Coop)	18.0
White House Station	20.9

Liquid Water Equivalent of New Snow

- Two methods: Melt what falls in the gauge (as pictures show, not always best), or take a core sample

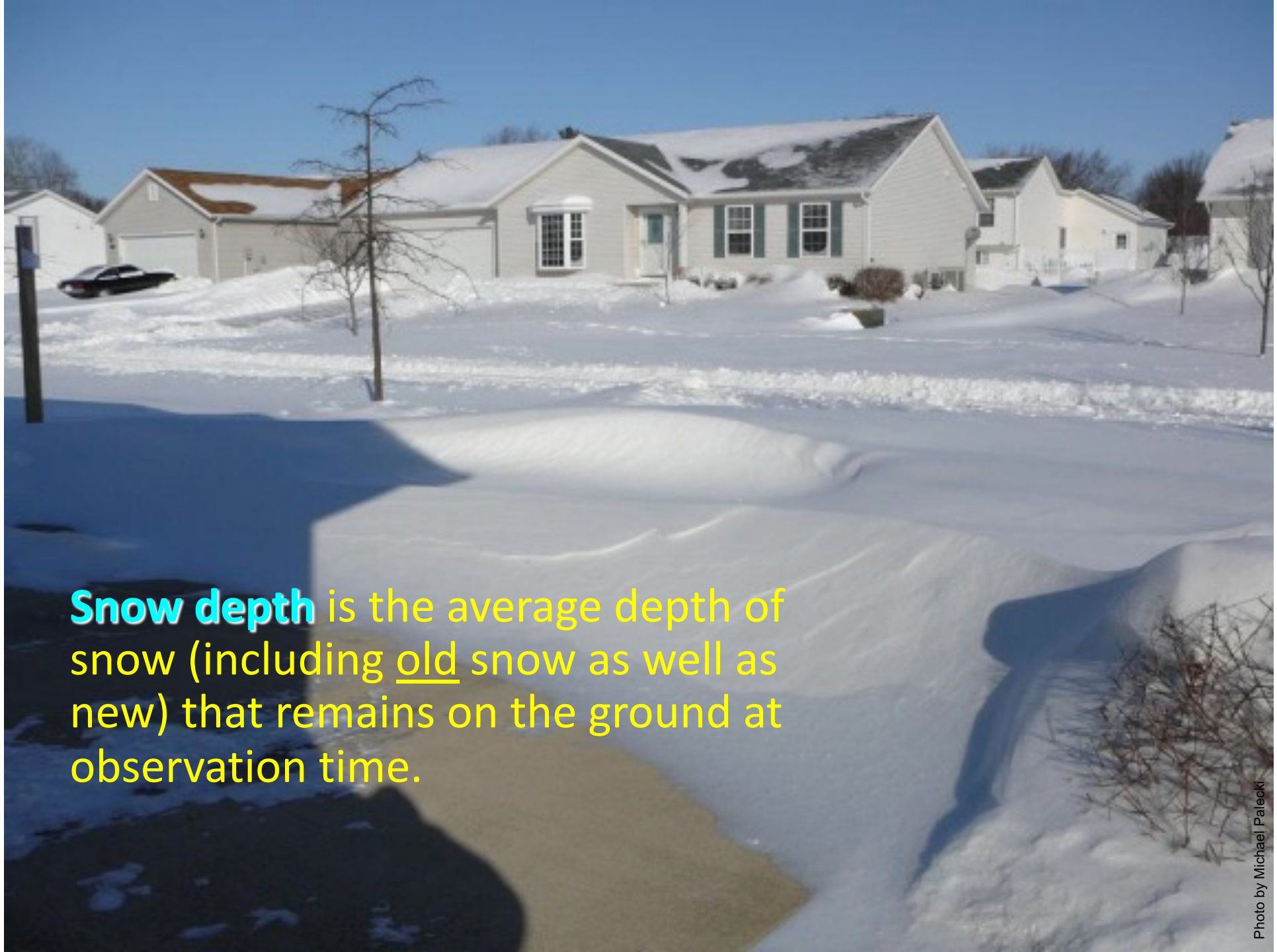
Taking a Snow Core of New Snow

- Capture a core by inverting the outer cylinder and pushing straight down into the snow

- Use something thin and sturdy to slide under the cylinder (aluminum flashing, spatula, snow swatter)

Measuring Total Snow on the Ground

- Snow is rarely uniform in coverage, so take several measurements and average them to obtain your total depth of snow.
- Slide snow stick through all layers of snow (new and old).
- Read value on snow stick and record (values are to the nearest ½” like 4.5 or 5.0).
- Don’t measure “artificial accumulations”, such as plowed piles, large drifts, or shoveled snow.

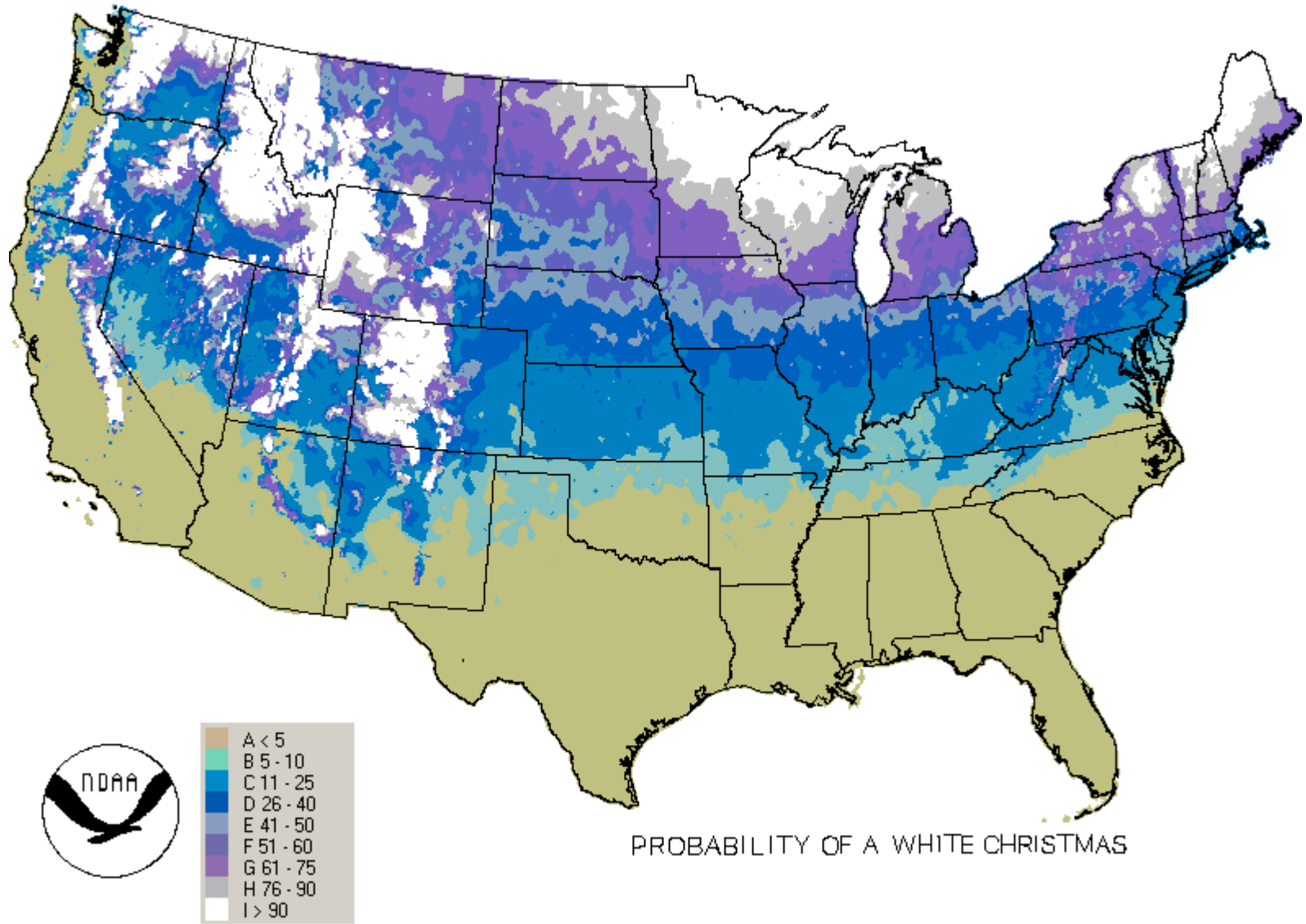

Snow depth is the average depth of snow (including old snow as well as new) that remains on the ground at observation time.
Photo by Michael Palecki

Snow on the ground

If half the ground has 2.0” and half the ground is bare, take an average and report 1.0” as your total depth

What is the snow depth?

A White Christmas this year?



Happy holidays,
and may all your
winters be white!
SNOWMAN WORLD
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