

# RUTGERS

THE STATE UNIVERSITY  
OF NEW JERSEY

## Northeast Snow Season Recap

NOAA Northeast Regional  
Climate Center Webinar

Dr. David A. Robinson  
Distinguished Professor & NJ State  
Climatologist  
Rutgers University

April 30, 2020



February 12, 2010: MODIS

Rutgers Climate Lab

# Office of the NJ State Climatologist

Helping decision  
makers

Locals trusting  
locals

[njclimate.org](http://njclimate.org)

**ONJSC**  
at Rutgers University

**RUTGERS**  
New Jersey Agricultural  
Experiment Station

Office of the New Jersey State Climatologist · Rutgers University · 54 Joyce Kilmer Avenue · Lucy Stone Hall B224 · Piscataway, NJ 08854

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A cirrus cloud deck partially fills the sky looking southeast from Jenny Jump State Park in Hope Township (Warren County) around 10:30 AM on March 21. Inset in the

# Rutgers Global Snow Lab

Monitoring snow  
cover

Research on  
snow-climate  
interactions

The screenshot displays the Rutgers Global Snow Lab website interface. At the top, the logo features 'gsl' in a stylized font with a snowflake, followed by 'RUTGERS UNIVERSITY' and 'GLOBAL SNOW LAB'. A navigation bar includes links for 'home', 'publications', 'available data', 'resources', and 'NASA MEaSUREs'. Below this, three main sections are visible: 'PRODUCTS', 'LATEST SNOW', and 'MONTHLY CHART'. The 'PRODUCTS' section lists 'Northern Hemisphere Visible Satellite Charts' with options for Daily, Weekly, Monthly, Monthly Departure, Monthly Climatology, and Documentation. It also includes 'Graphs' for Snow Anomalies, Monthly Anomalies, and Seasonal Extent, and 'Tabular' data for Area of Snow Extent (Weekly). The 'LATEST SNOW' section shows a map of the Northern Hemisphere for April 18, 2020, with snow cover extent in orange. The 'MONTHLY CHART' section shows a map for March 2020, with average snow cover extent in blue. Both maps include the Rutgers Global Snow Lab logo in the bottom right corner.

home publications available data resources NASA MEaSUREs

PRODUCTS LATEST SNOW MONTHLY CHART

**Northern Hemisphere**  
Visible Satellite Charts

- \* Daily
- \* Weekly
- \* Monthly
- \* Monthly Departure
- \* Monthly Climatology
- \* Documentation

**Graphs**

- \* Snow Anomalies
- \* Monthly Anomalies
- \* Seasonal Extent

**Tabular**

Area of Snow Extent

- \* Weekly

**April 18, 2020**

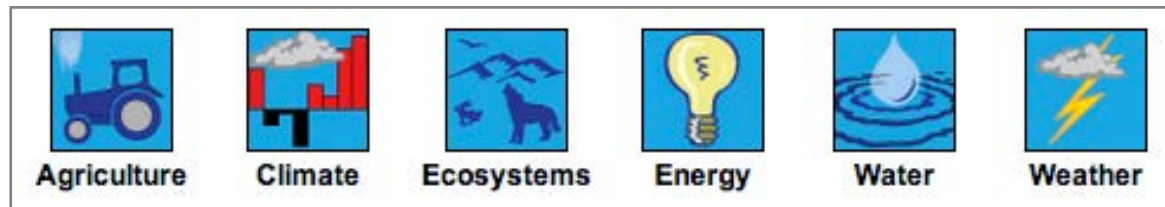
Yesterday's snow cover extent across Northern Hemisphere lands. For more daily

**March 2020**

Average snow cover extent for the latest month. Based on Rutgers GSL analysis of

# Putting Snow Cover Climate Data Records to Work

- Snow cover and hydroclimate studies
- Snow-atmosphere studies
- Snow-sea ice studies
- Seasonal cycle analysis
- Forced model simulations
- Model intercomparison/validation
- Studying long-term climate changes
- Initializing weather prediction models
- Estimating snow melt runoff
- Analyzing surface albedo



## Key sector beneficiaries include

Media  
National Geographic

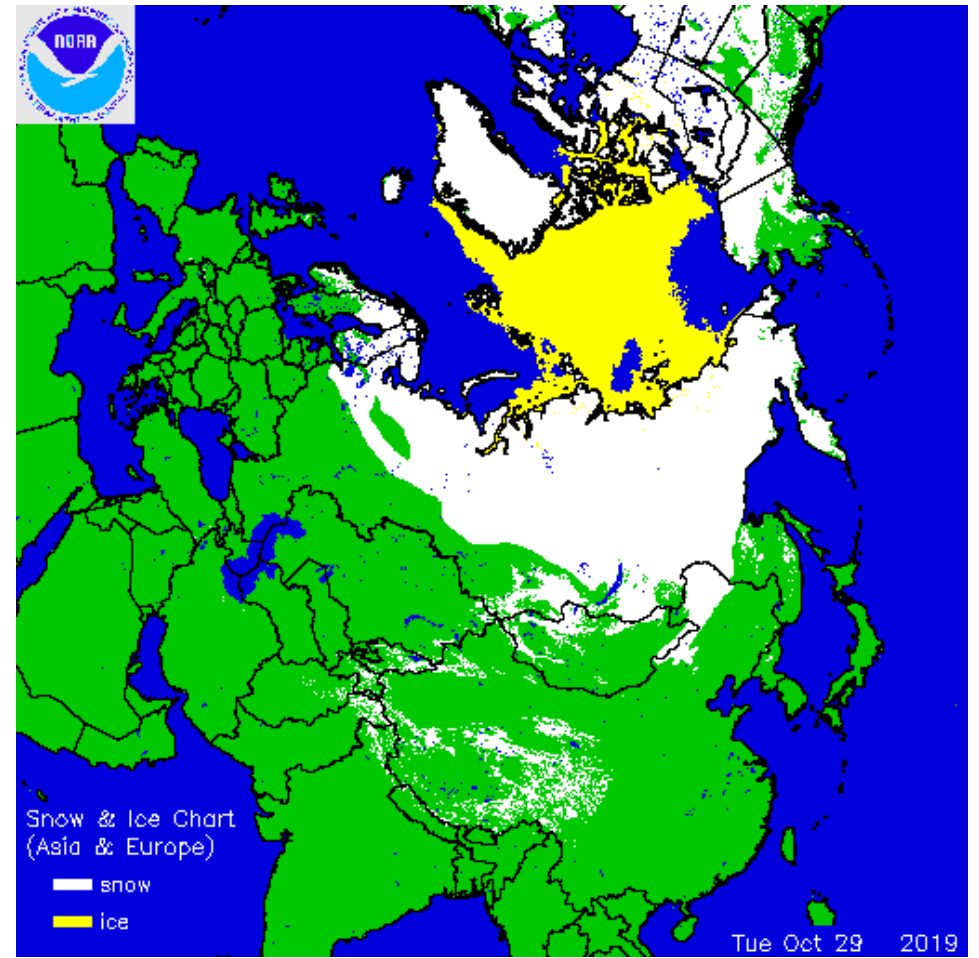
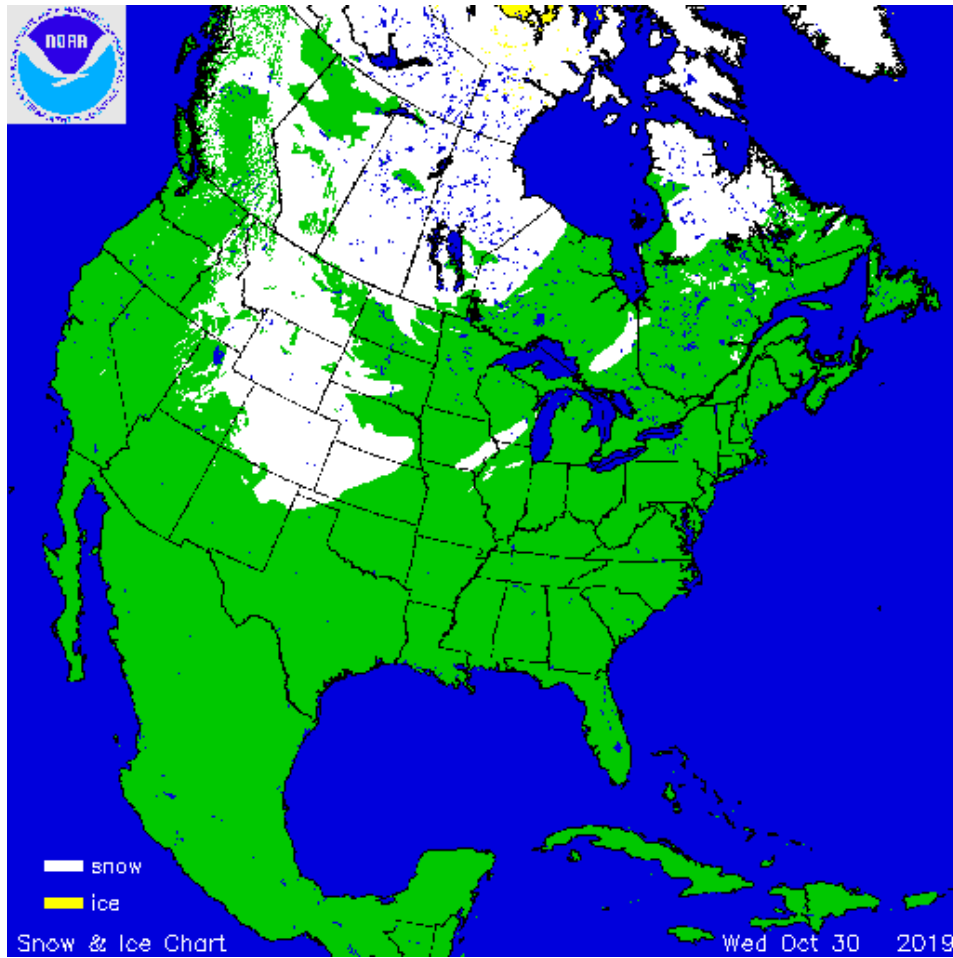
Energy Companies  
Finance & Economists  
Private Forecasting

NOAA, NASA, NCAR,  
USDA, USDOE, USGS

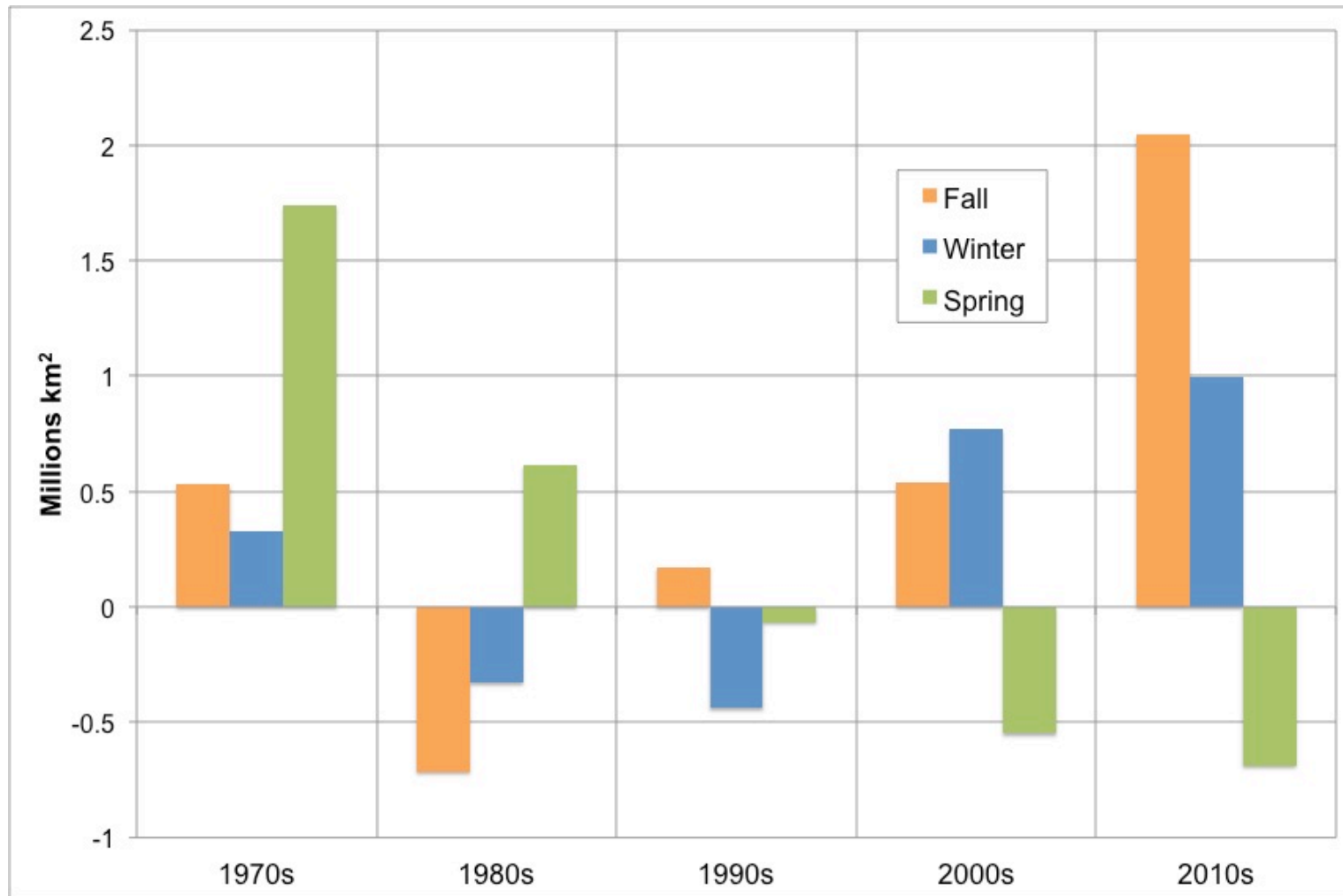
Research Groups  
Educational Institutions  
International

BAMS State of the Climate Report  
IPCC Fifth Assessment Report  
National Climate Assessment  
NOAA Global Climate Dashboard

# IMS: 30 October 2019



# NH mean decadal SCE anomalies (millions km<sup>2</sup>)

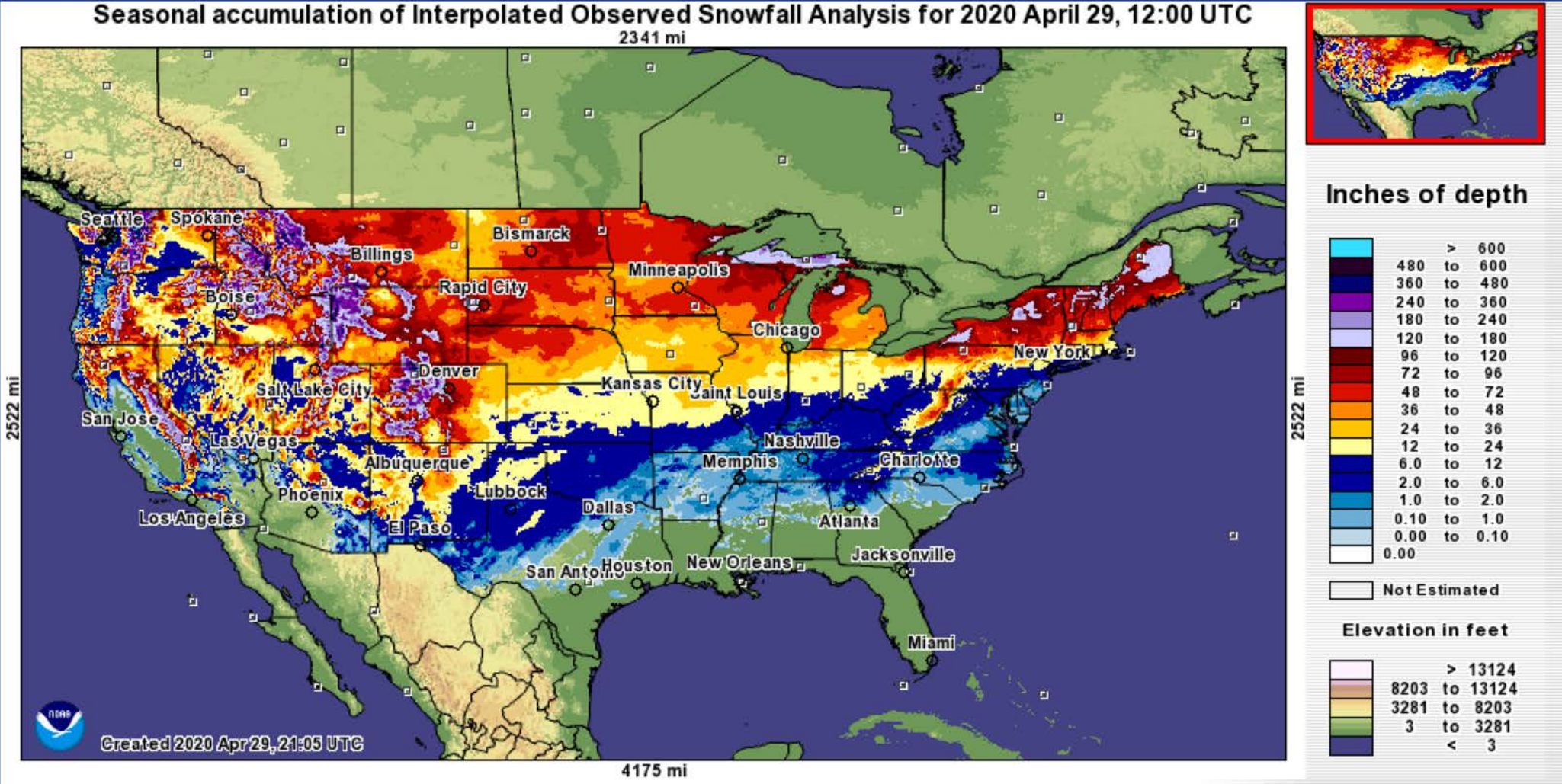


Calculated over 49 snow seasons (years) using seasonal SCE means from Sep 1970–May 2019. Normal period is 30 years for each season spanning from Sep 1980–May 2010 (1981–2010). Fall 1971 missing. “2010s” calculated using Sep 2010–May 2019 (9 snow seasons, 2011–2019).

# 2019-2020 Northeast Snowfall



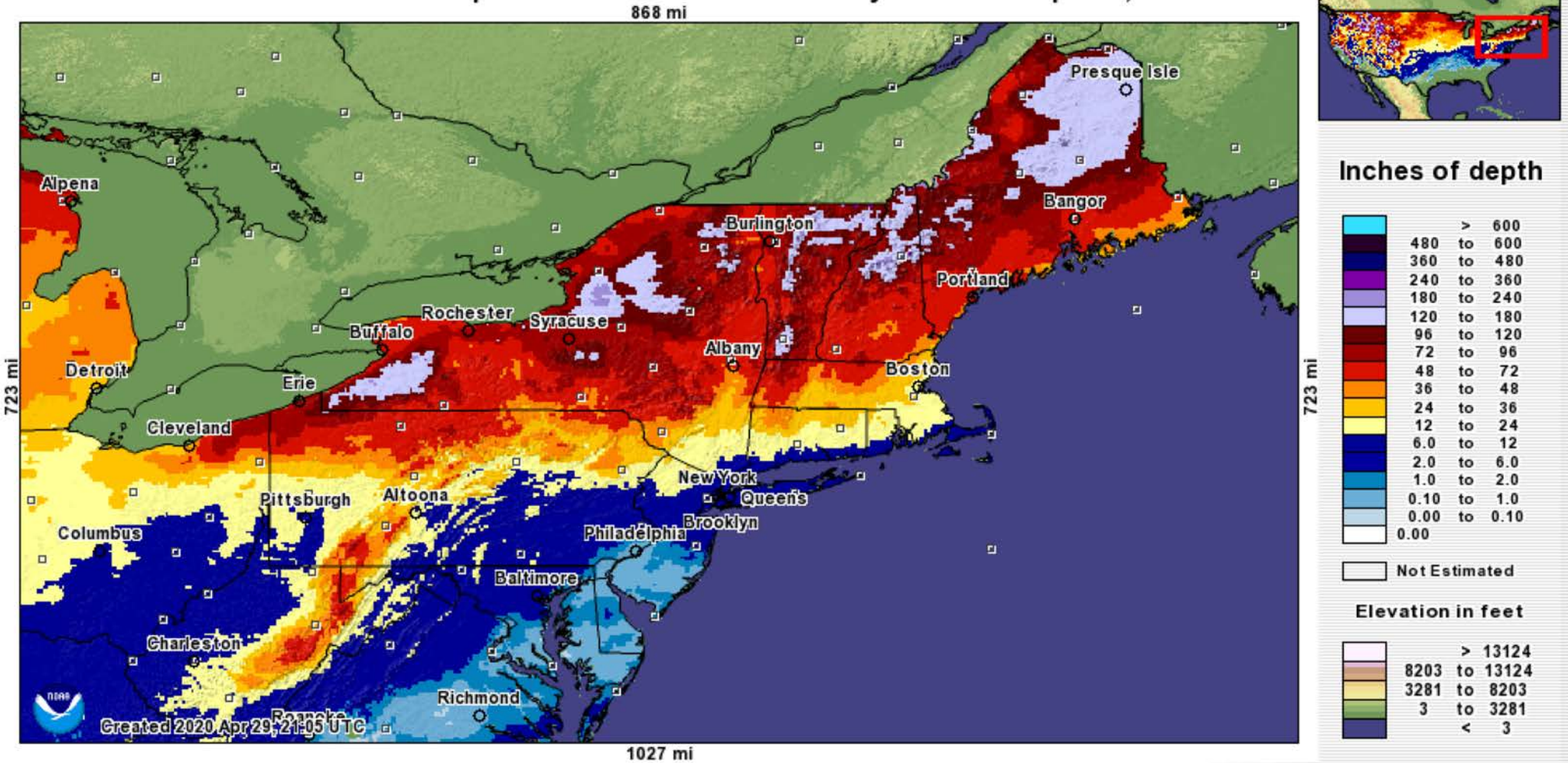
# US Snowfall: 2019-2020 season



National Operational Hydrology Remote Sensing Center

# Northeast Snowfall: 2019-2020 season

Seasonal accumulation of Interpolated Observed Snowfall Analysis for 2020 April 29, 12:00 UTC



NOHRSC

# Seasonal Snowfall at Northeast Airports

Station	Oct. 1, 2019 - Apr. 27 2020 Snowfall (in.)	Normal (in.)	Departure (in.)	Rank (least snowy)
Caribou, ME	146.0	107.9	38.1	9 snowiest
Rochester, NY	91.6	99.0	-7.4	
Syracuse, NY	87.3	123.6	-36.3	
Binghamton, NY	77.9	83.1	-5.2	
Burlington, VT	69.6	81.0	-11.4	
Buffalo, NY	68.9	94.3	-25.4	
Erie, PA	67.6	100.9	-33.3	
Portland, ME	59.6	61.8	-2.2	
Albany, NY	49.7	60.1	-10.4	
Concord, NH	46.1	61.3	-15.2	
Worcester, MA	44.2	64.0	-19.8	
Elkins, WV	34.1	83.4	-49.3	15
Hartford, CT	32.5	40.6	-8.1	
Beckley, WV	27.7	61.9	-34.2	14
Pittsburgh, PA	21.7	41.4	-19.7	11
Scranton, PA	21.7	46.0	-24.3	8
Boston, MA	15.8	43.8	-28.0	8
Williamsport, PA	13.4	36.0	-22.6	5
Providence, RI	13.2	33.9	-20.7	7
Charleston, WV	10.9	36.4	-25.5	13
Bridgeport, CT	10.1	27.6	-17.5	8
Newark, NJ	6.9	28.5	-21.6	3
Islip, NY	6.8	24.8	-18.0	5
Huntington, WV	5.5	23.6	-18.1	10
Allentown, PA	5.3	32.9	-27.6	2
Harrisburg, PA	5.1	30.6	-25.5	1
Central Park, NY	4.8	25.8	-21.0	4
LaGuardia Airport, NY	4.6	26.9	-22.3	4
Kennedy Airport, NY	3.8	23.8	-20.0	4
Dulles Airport, VA	2.9	22.0	-19.1	3
Baltimore, MD	1.8	20.1	-18.3	3
Wilmington, DE	0.9	20.2	-19.3	2
Washington National, DC	0.6	15.5	-14.9	3
Atlantic City, NJ	0.5	16.5	-16.0	2
Philadelphia, PA	0.3	22.4	-22.1	2

# Top 2019-2020 snow season totals at CoCoRaHS (and a few other) stations

## Maine

Caribou NWS	146.0"
New Sweden	135.9"
Presque Island	131.3"

## New Hampshire

Mt. Washington	227.0"
Randolph	199.5"
Berlin	97.3"

## Vermont

Greensboro	161.0"
Morgan	159.4"

## Massachusetts

Fitchburg	71.2"
Plainfield	69.6"

## Rhode Island

Harrisville	26.7"
Greenville	25.7"

## Connecticut

New Hartford Center	38.4"
Colebrook	38.3"

## New York

Colden	166.7"
Wyoming	151.8"

## New Jersey

High Point	39.2"
Highland Lakes	26.5"

## Pennsylvania

Hidden Valley	95.6"
Springboro	90.4"

## Delaware

Newark	2.8"
Milton	2.8"

## Maryland

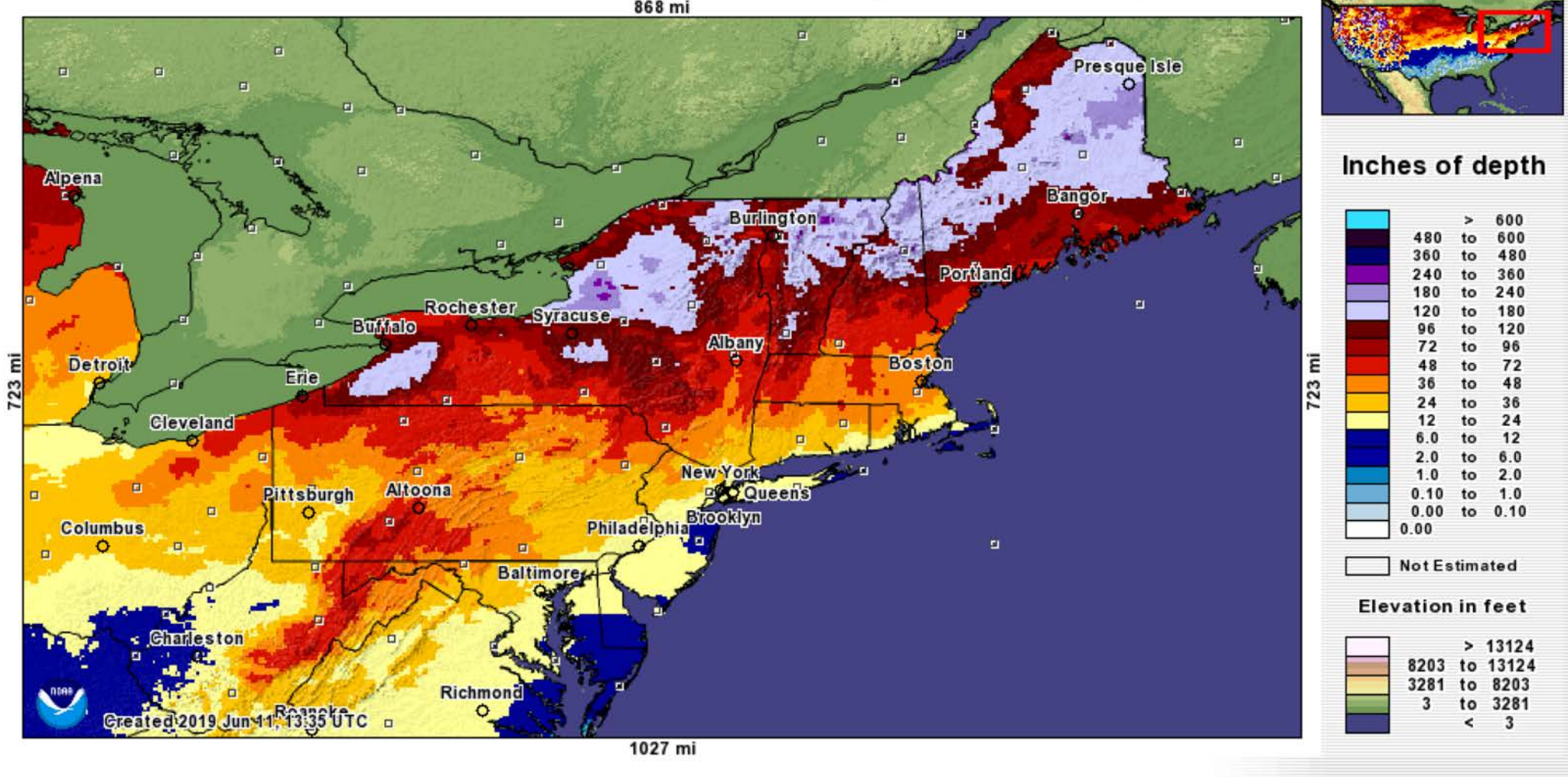
Mountain Lake Park	60.2"
McHenry	53.0"

## West Virginia

Terra Alta	49.2"
Craigsville	42.5"

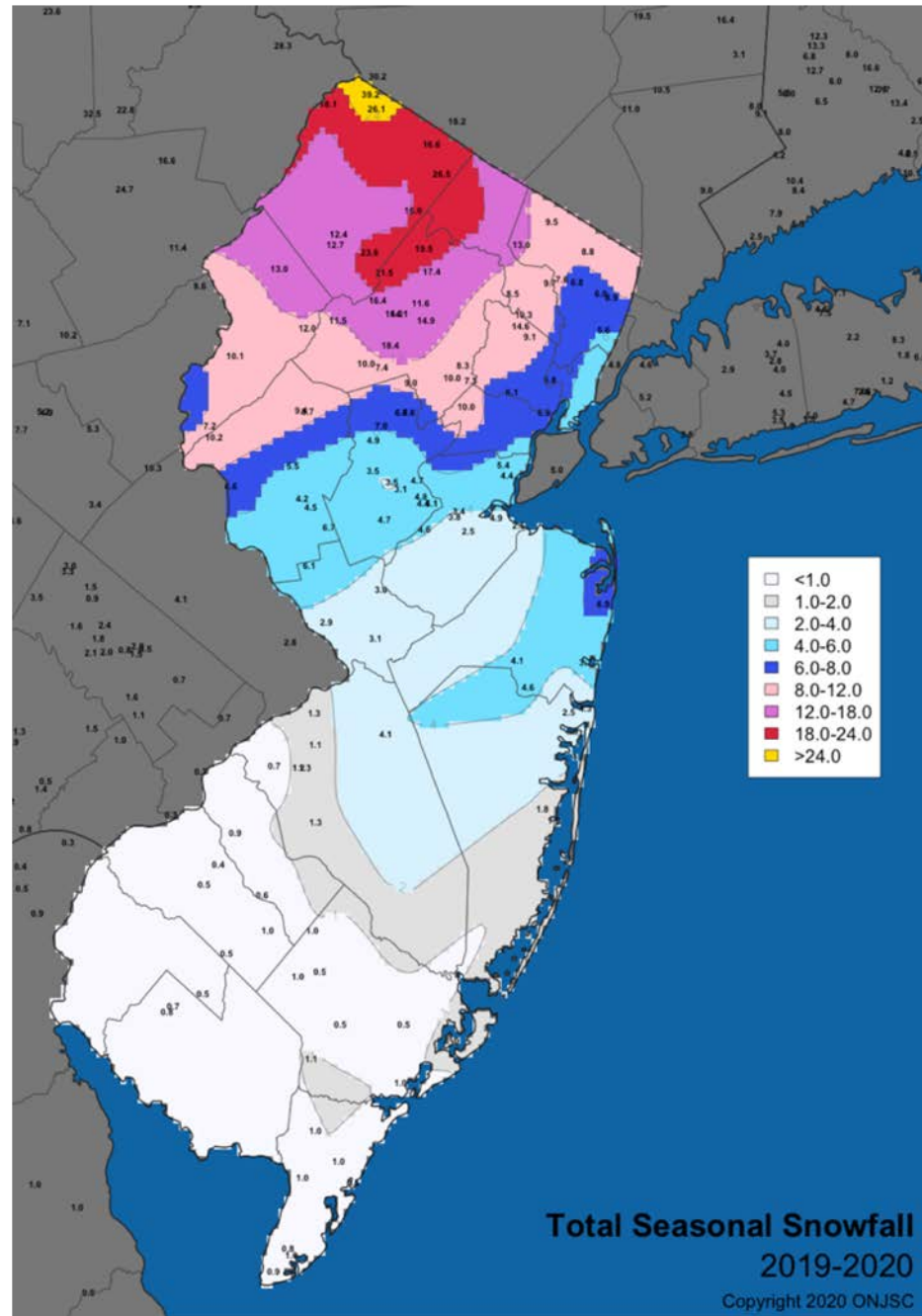
# US Snowfall: 2018-2019 season

Seasonal accumulation of Interpolated Observed Snowfall Analysis for 2019 April 29, 12:00 UTC

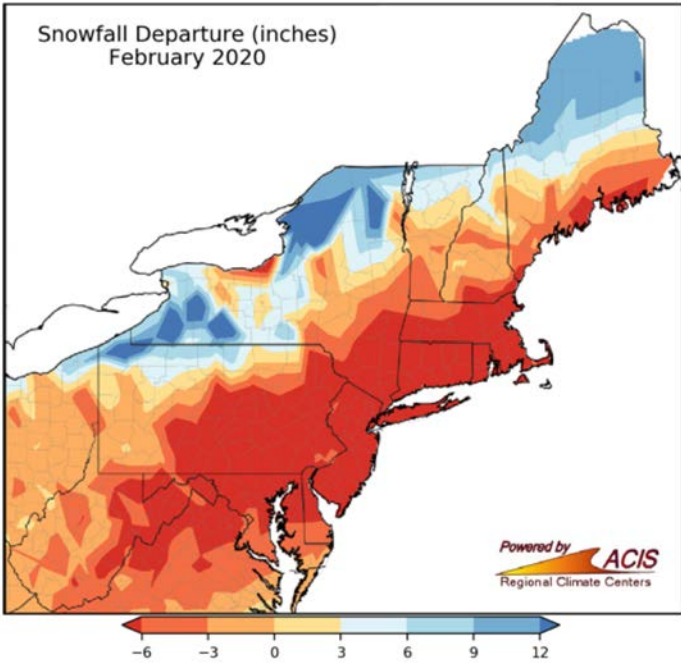
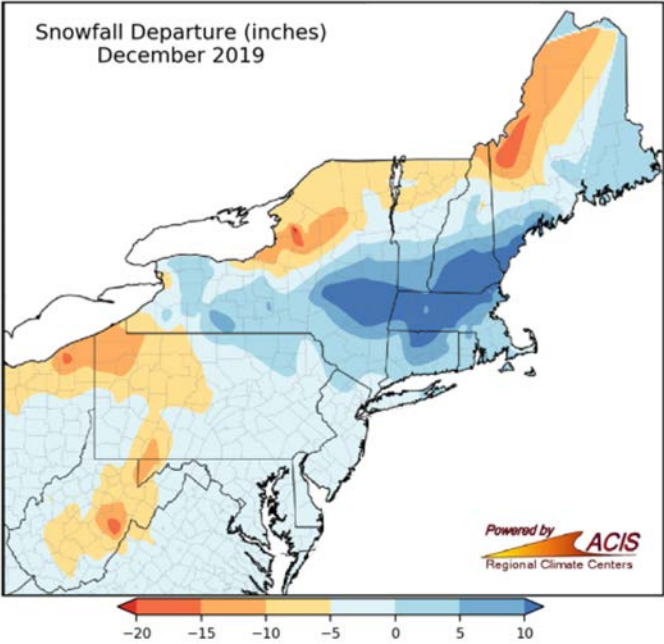
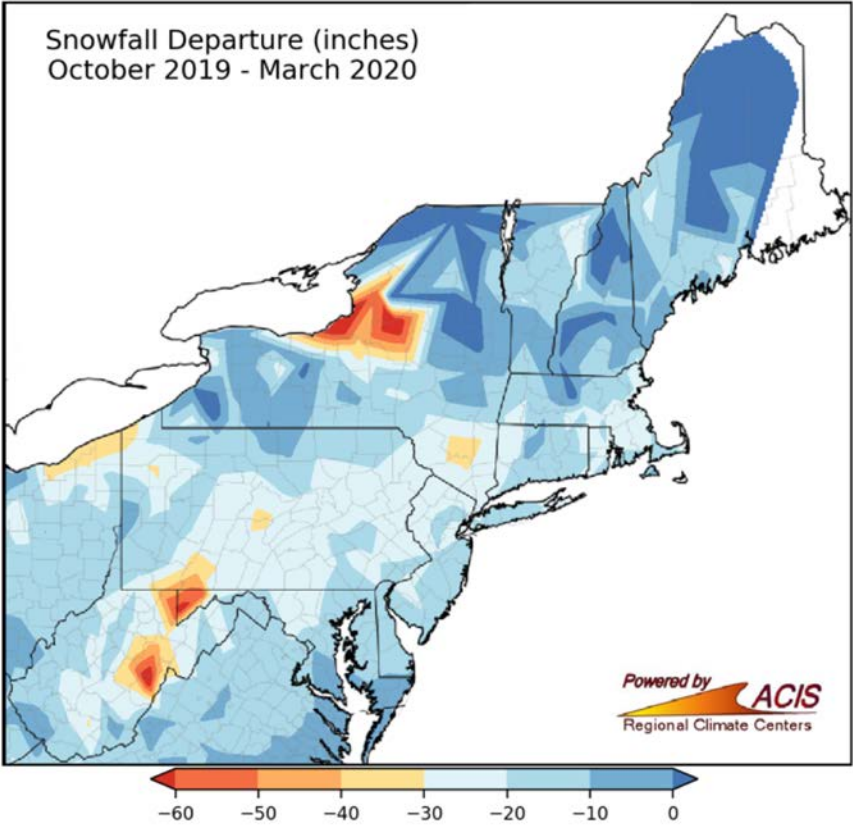


NOHRSC

New Jersey  
2019-2020  
Snowfall  
(or lack thereof)



# 2019-2020 Snowfall departures

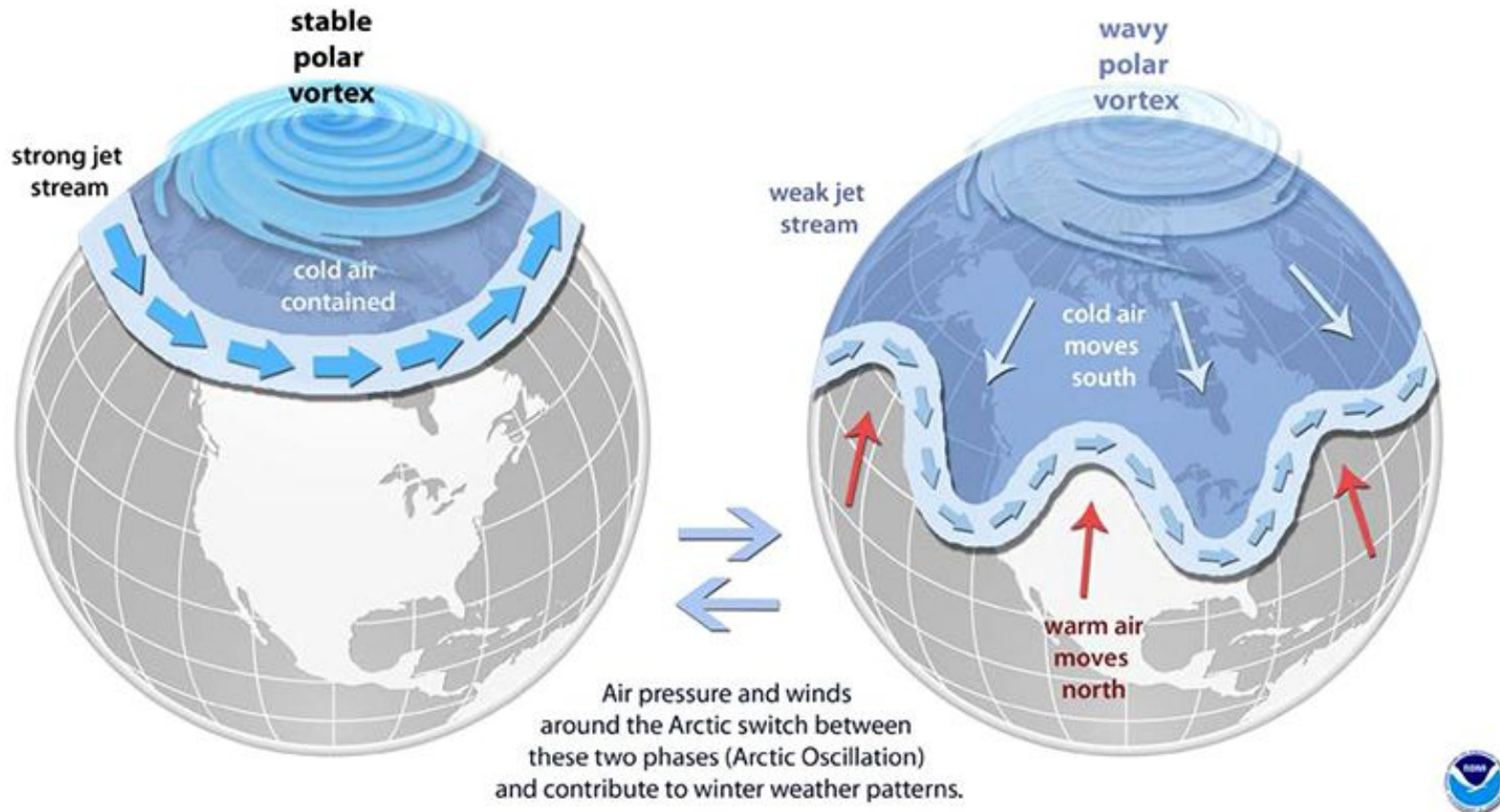


Why the Seasonal Snow Pattern?



# Why the mild and relatively snow free 2020 winter?

## Weather or Climate?

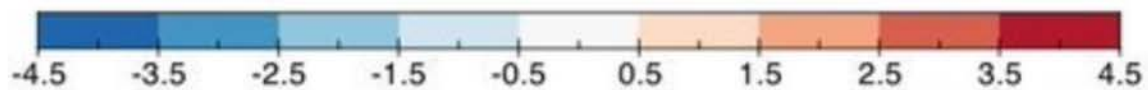
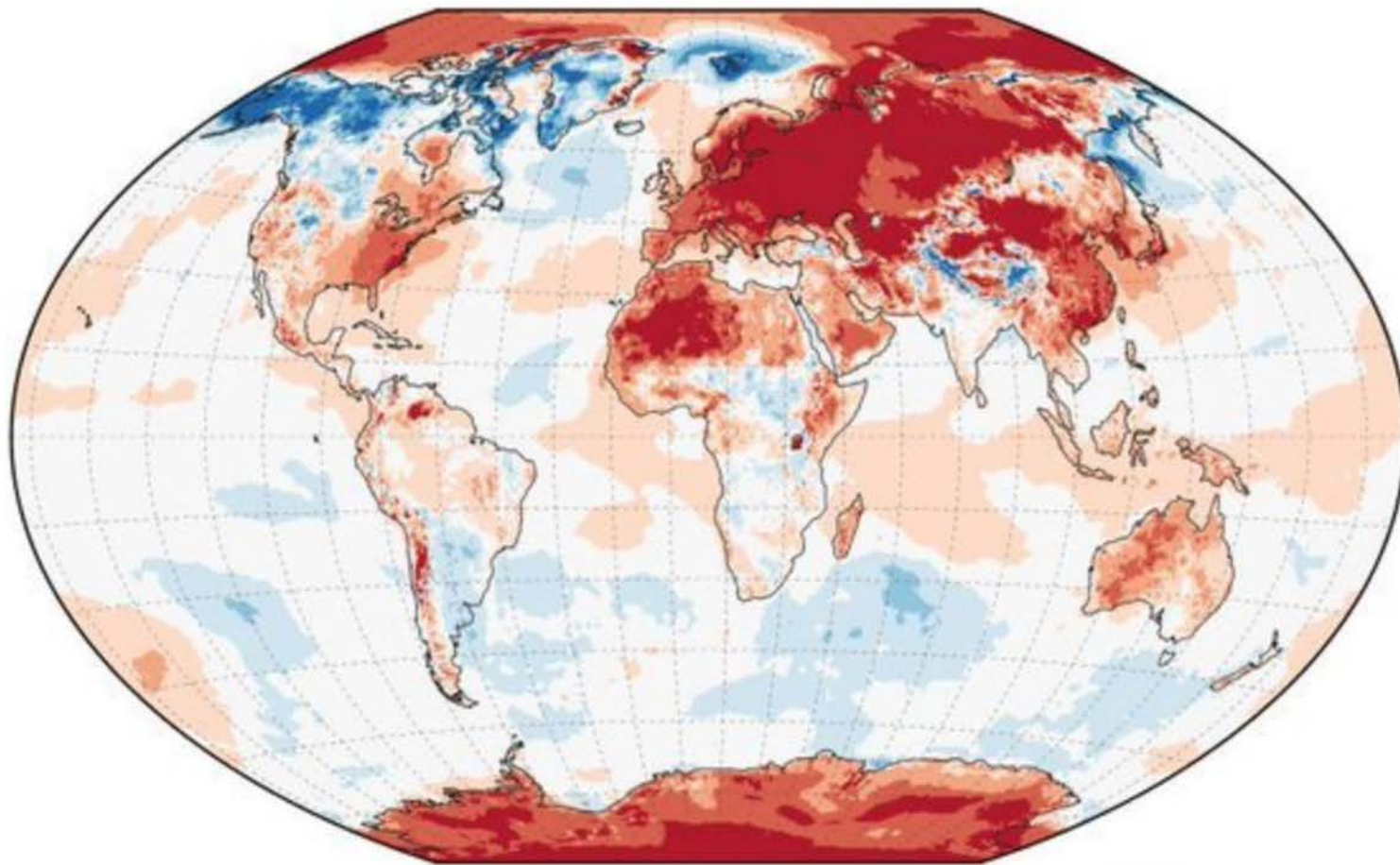


2019-2020

Snowy Northeast winters

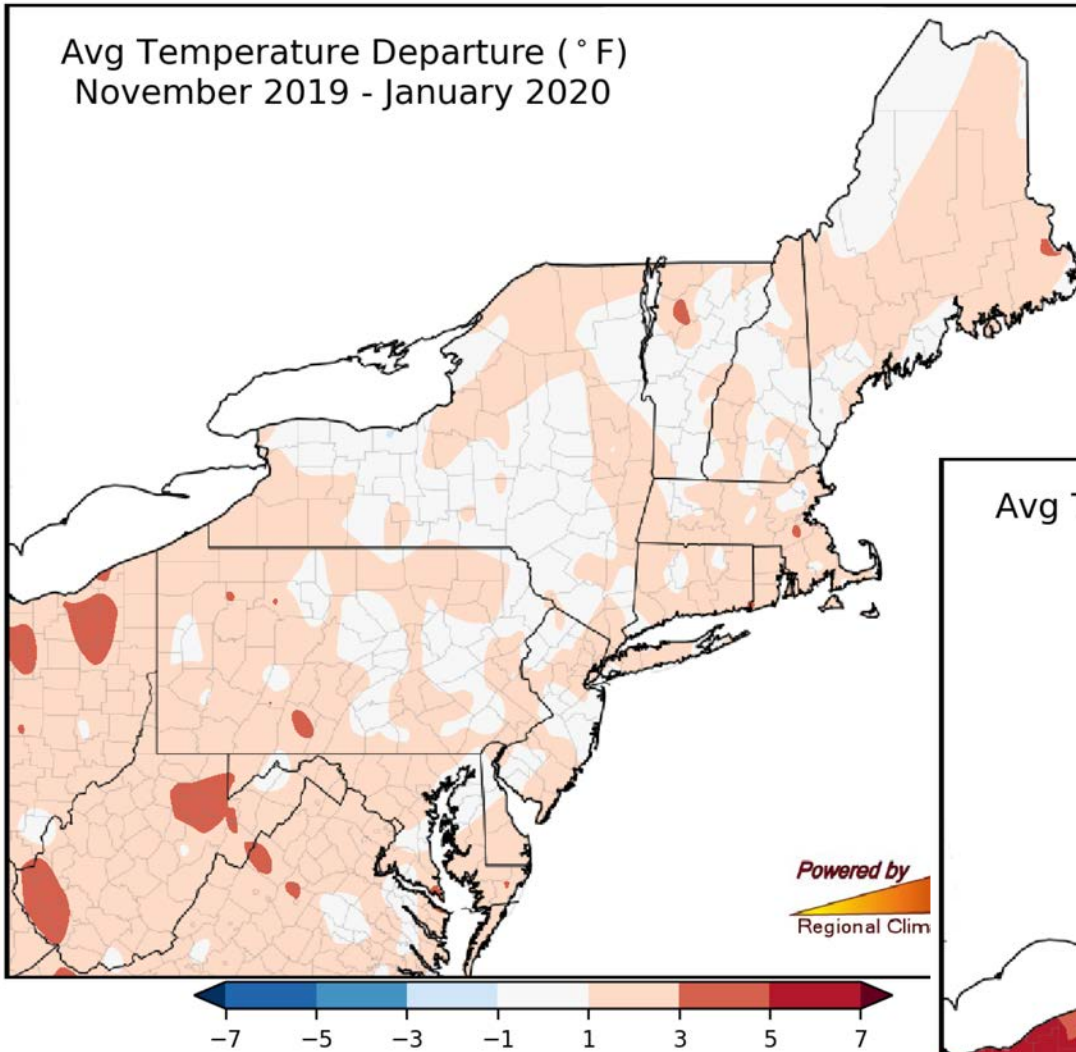
# Most of the Northern Hemisphere was mild this past winter

NCEP GFS air temperature anomaly Winter 2019/20 (relative to 1981-2010)



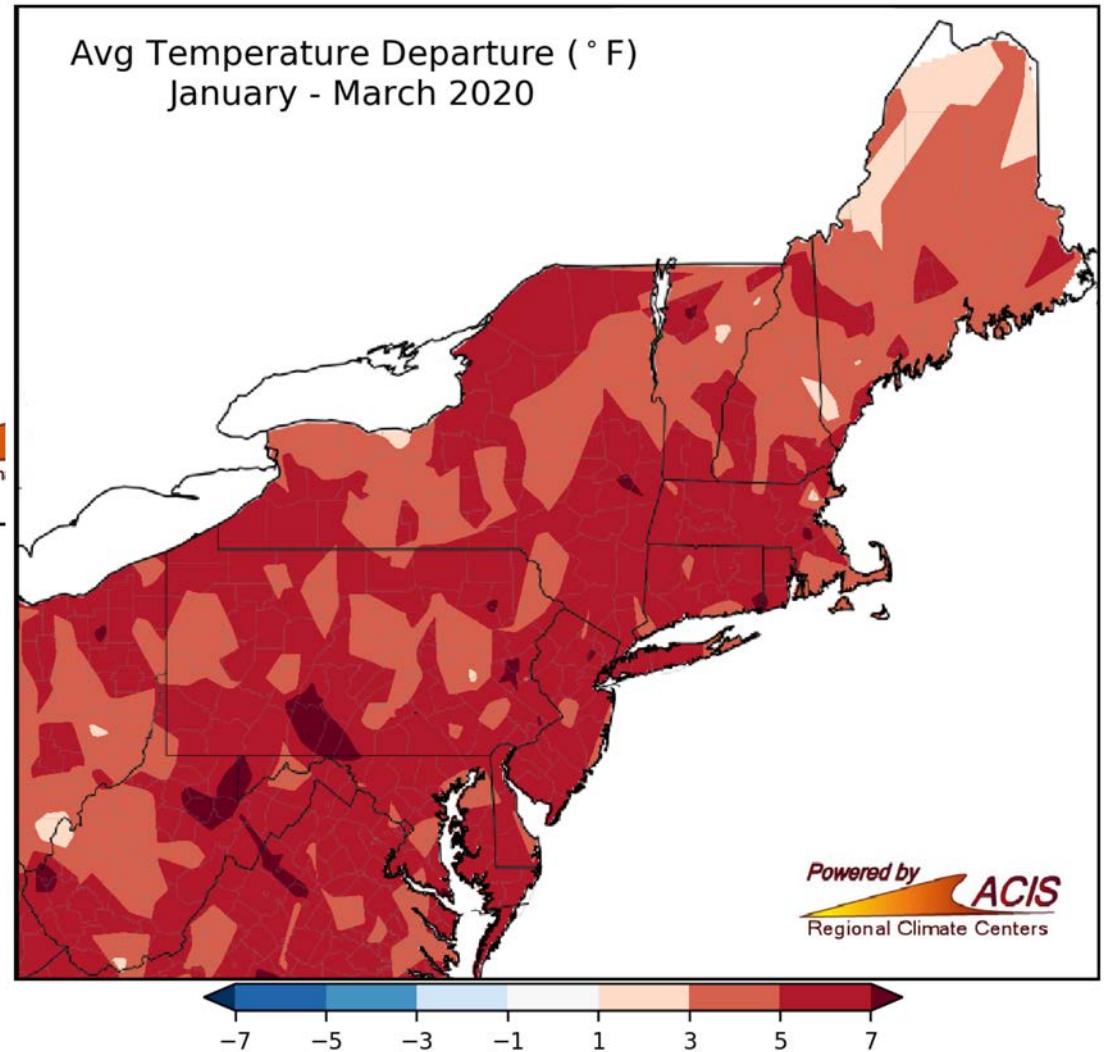
Data Min = -10.1, Max = 10.2, Mean = 0.6

Avg Temperature Departure (° F)  
November 2019 - January 2020

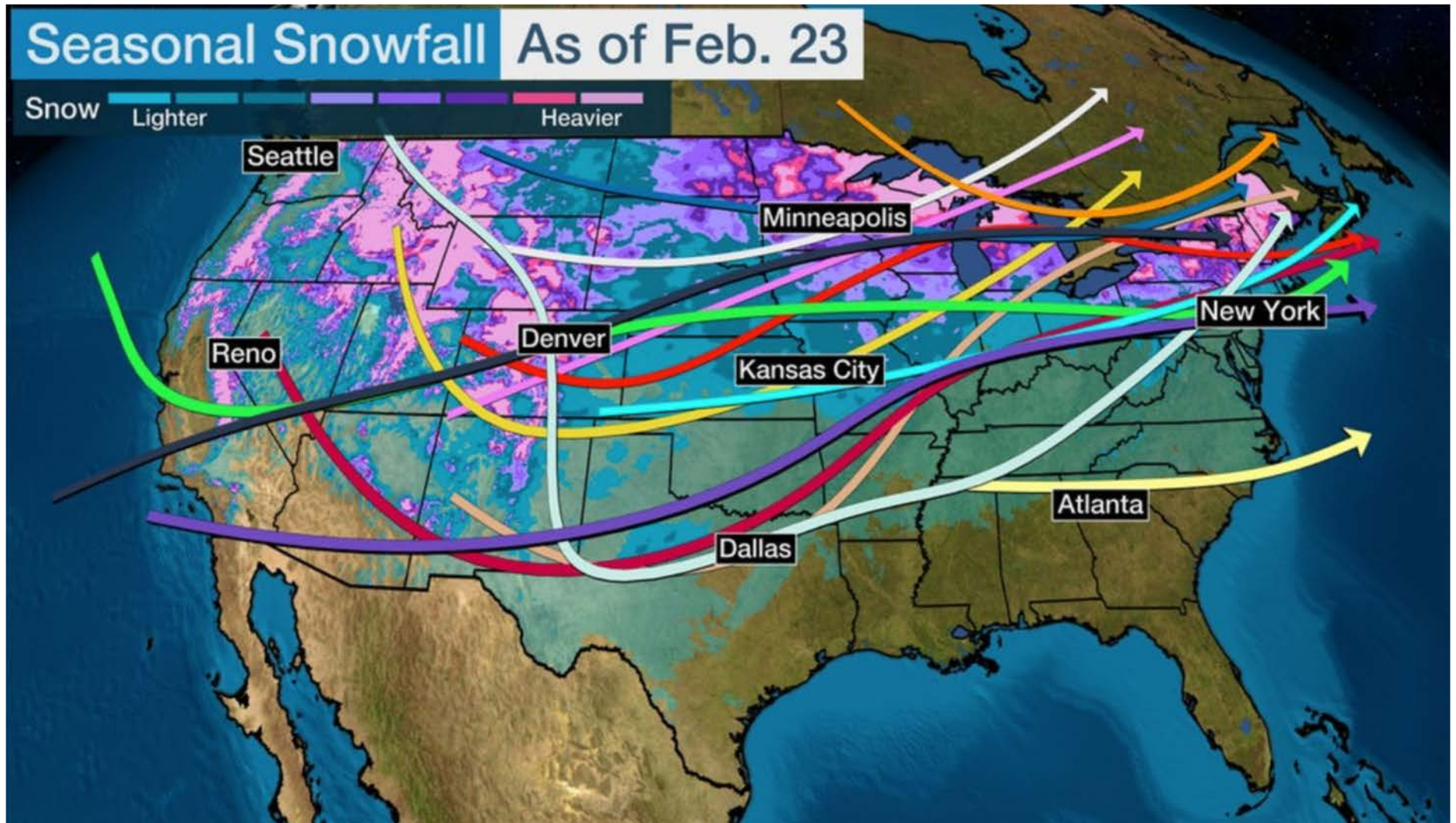


## 2019-2020 Cold season temperature departures

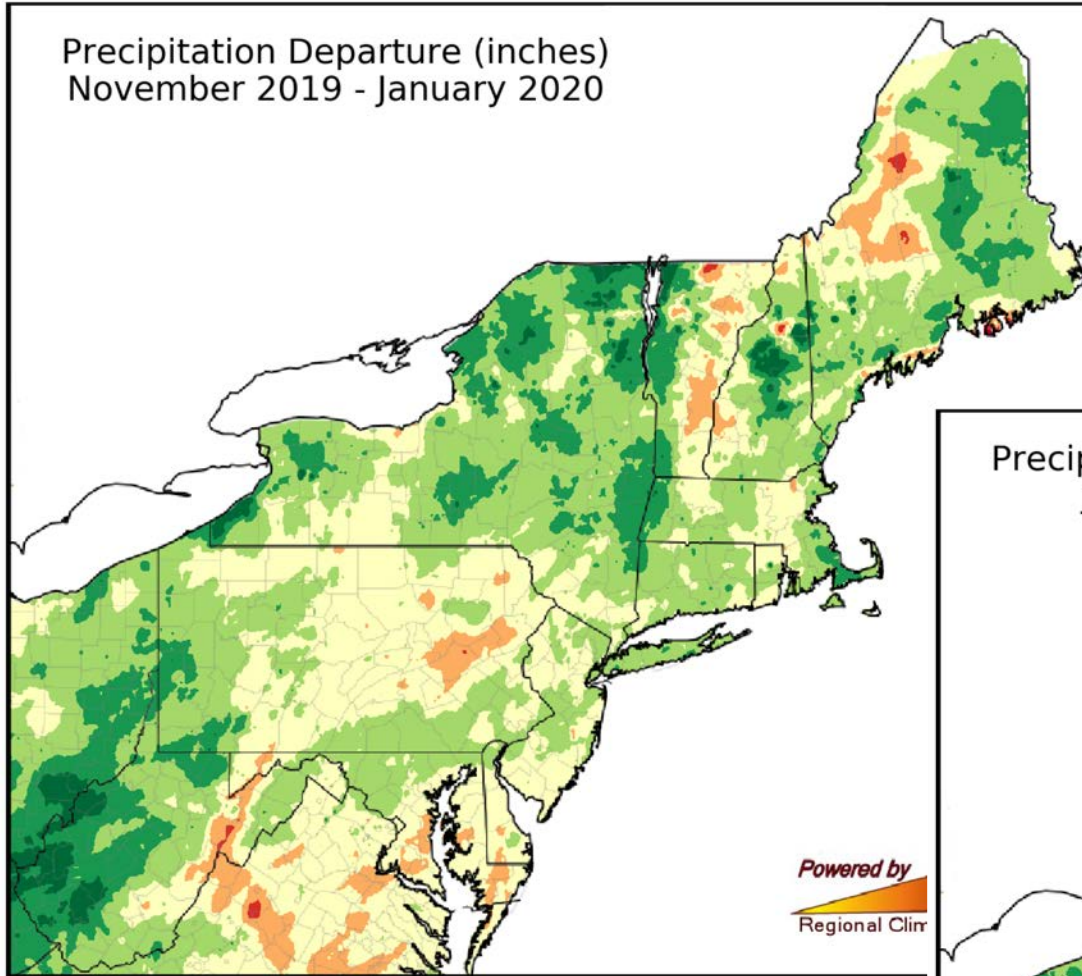
Avg Temperature Departure (° F)  
January - March 2020



# Why the Mid-Atlantic had so little snow this season



Precipitation Departure (inches)  
November 2019 - January 2020

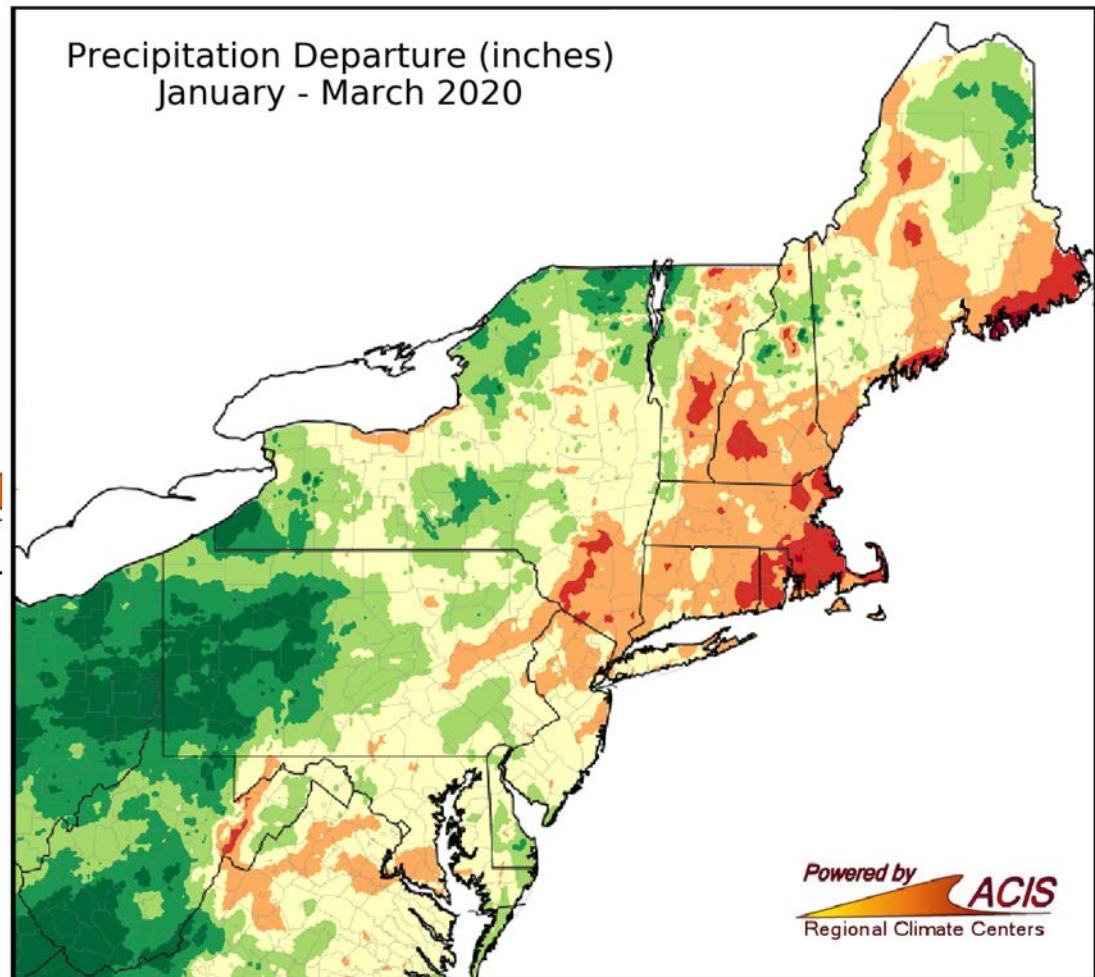


Powered by  
Regional Clir

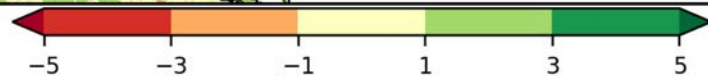


## 2019-2020 Cold season precipitation departures

Precipitation Departure (inches)  
January - March 2020



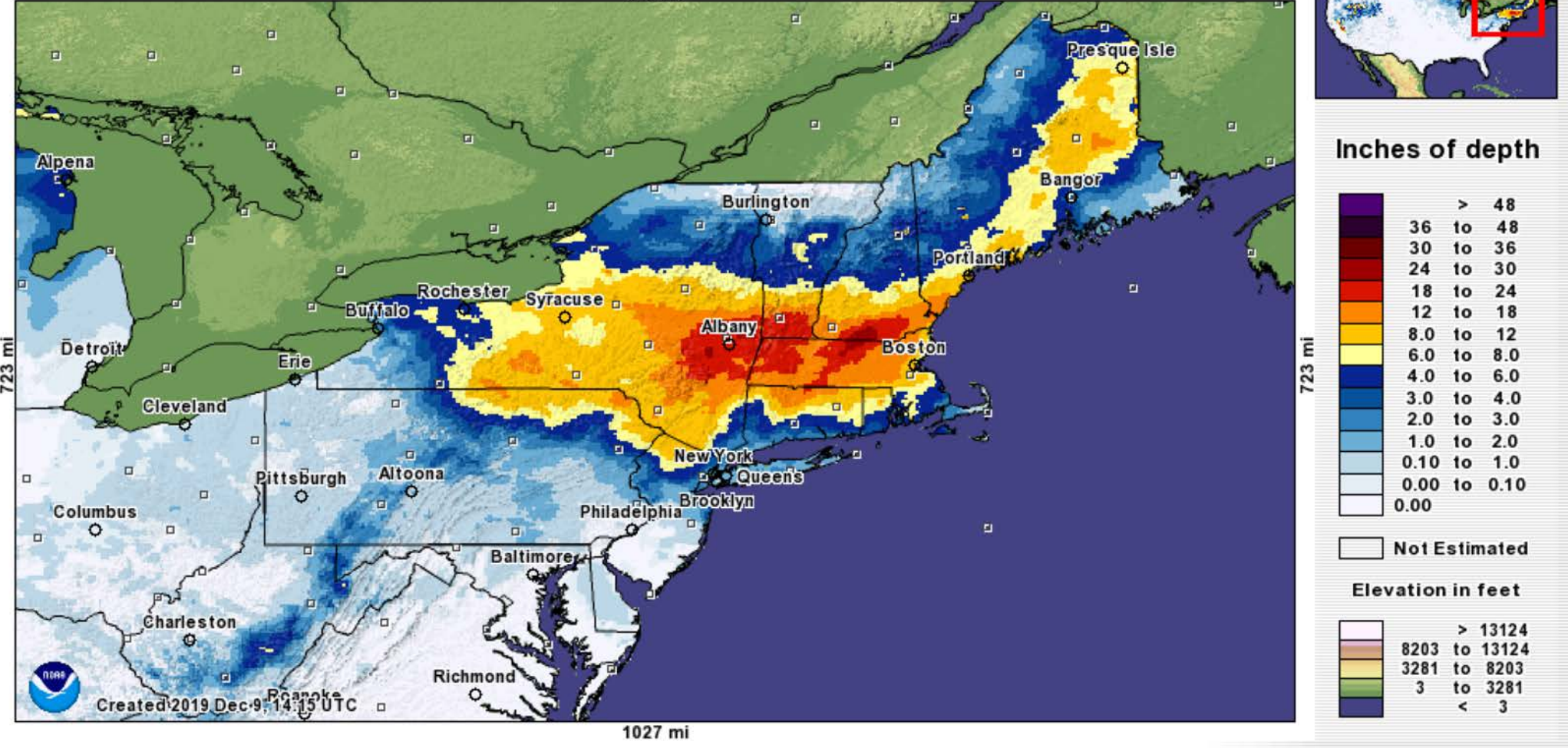
Powered by  
ACIS  
Regional Climate Centers



# Journey through the Season

# Early December 2019 Storm

Interpolated Observed Snowfall Analysis during 72h preceding 2019 December 4, 12:00 UTC

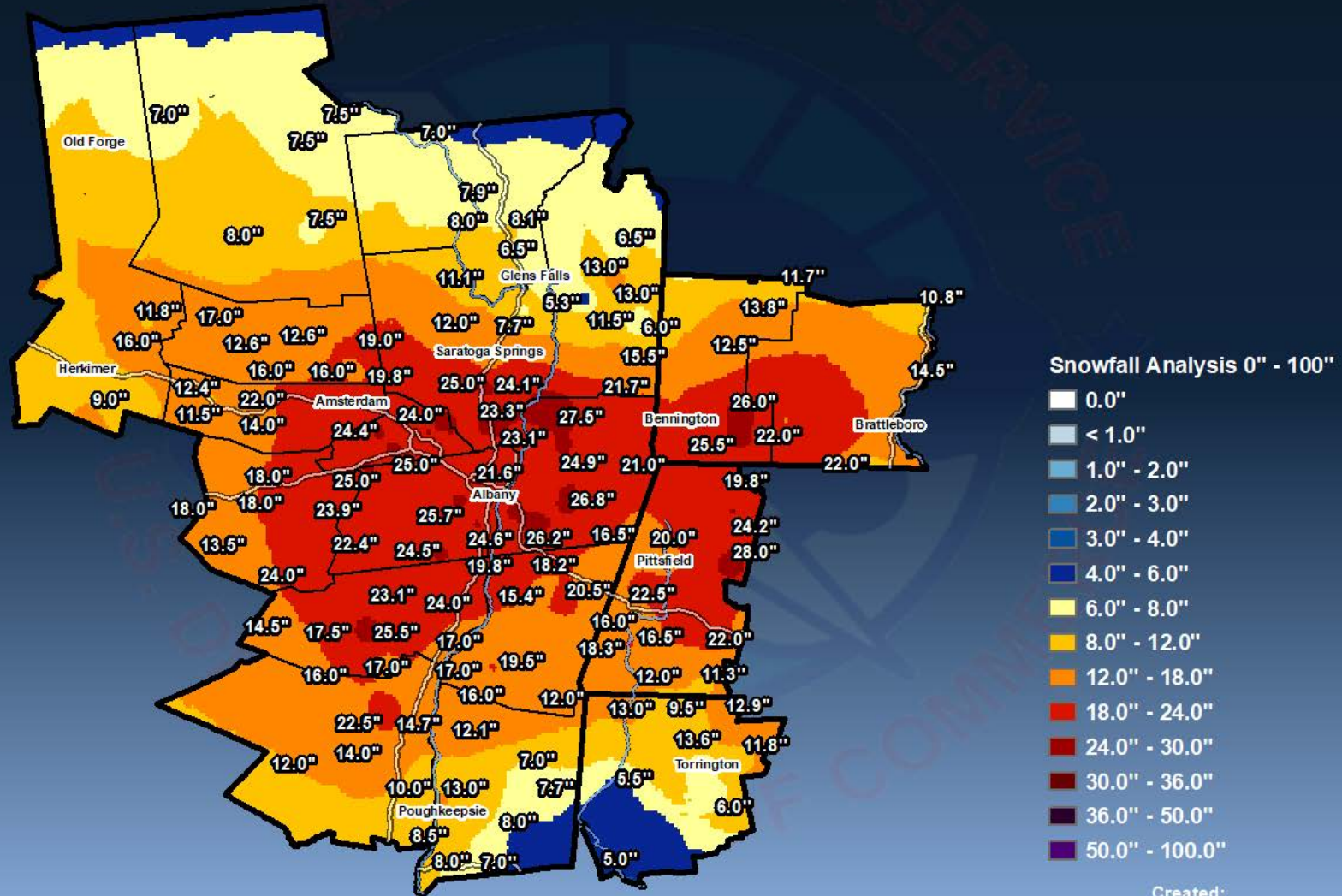


NOHRSC

# National Weather Service Albany New York

## NDFD Snowfall Verification 1-3 December 2019

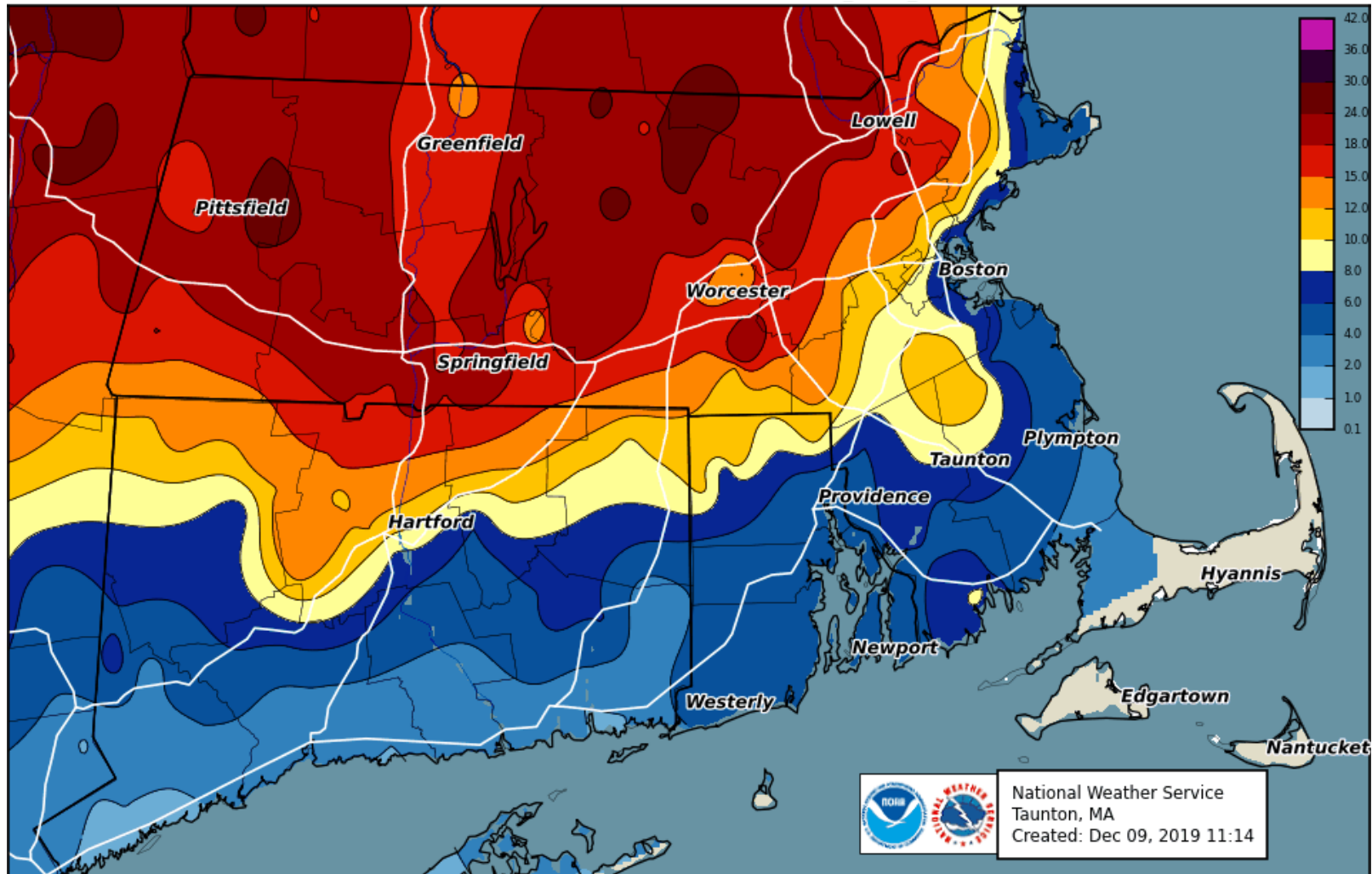
Analysis Data Source: Regional Observations



This is an experimental product. Care should be taken in using the data. Unofficial observations are plotted. Values at interpolated locations may not represent actual precipitation totals at that location.



# Snowfall December 1-3, 2019

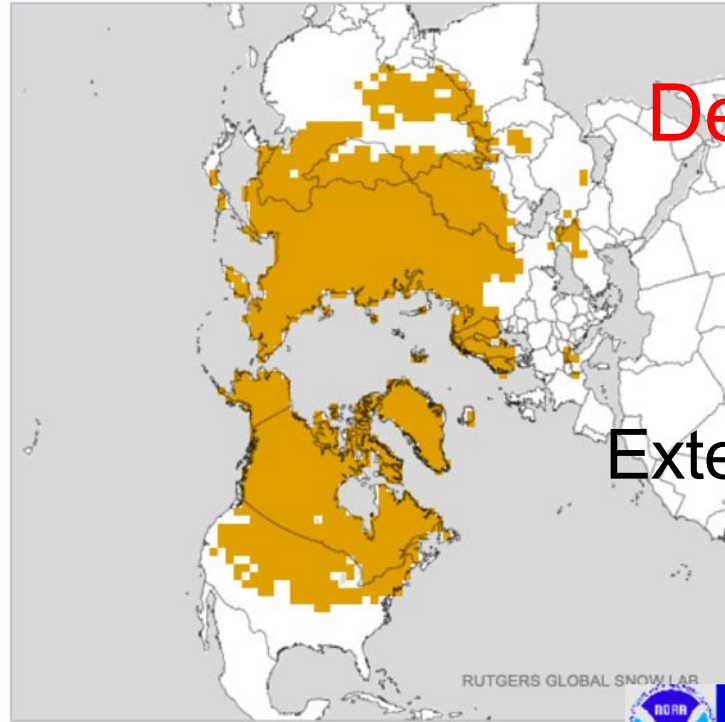


Highland Lakes, NJ  
December 4, 2019



Source unknown

Daily Snow - December 17, 2019 (Day 351)

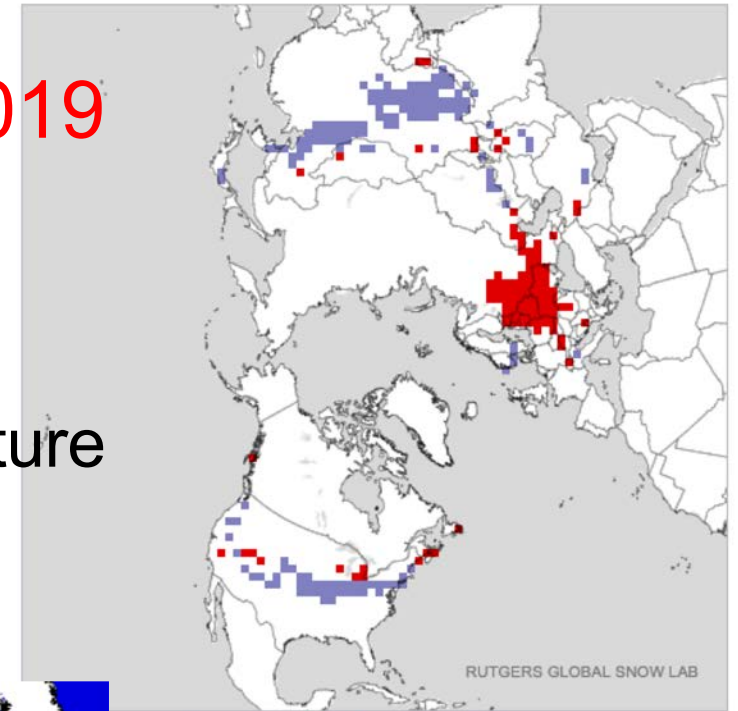


# December 17, 2019 Snow Cover

Extent

Departure

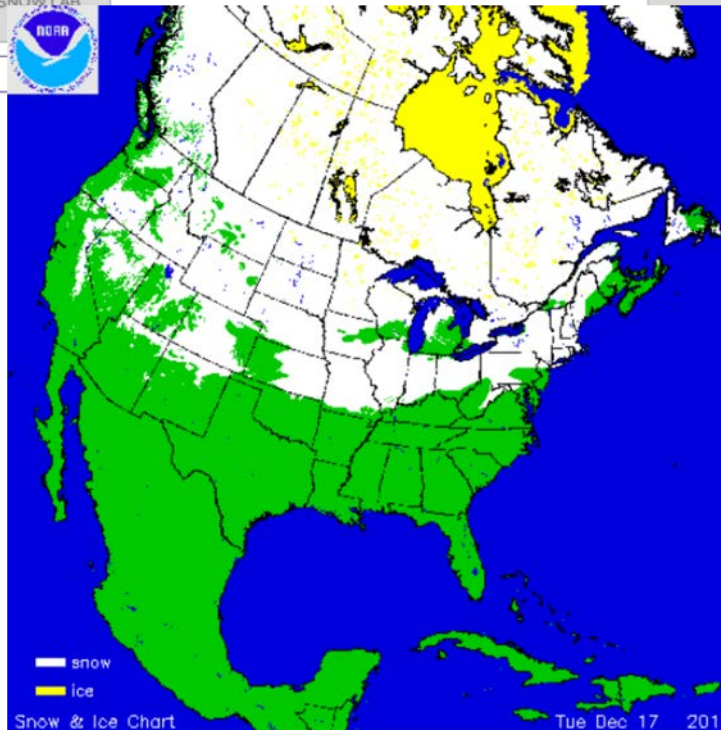
Daily Departure - December 17, 2019 (Day 351)



Legend:  Snow Covered  Snow Free



Legend:  Positive  Negative  No Anomaly



48.4% US snow coverage  
(season max)

## NJ Snow Cover December 19, 2019



*Figure 5. Snow cover across northern and central NJ and surrounding areas on the morning of December 19. Skies over the land are cloud-free, thus the streaks of white of various shades are snow that was laid down in squalls the previous afternoon and evening. Some snow cover toward the north also remains from snowfalls earlier in the month. (NASA MODIS image)*

January 20, 2020



MODIS

February 21, 2020



MODIS

# Adams Center, NY: February 28, 2020

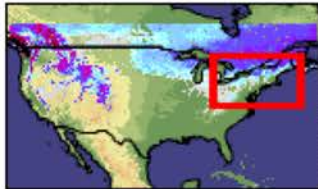
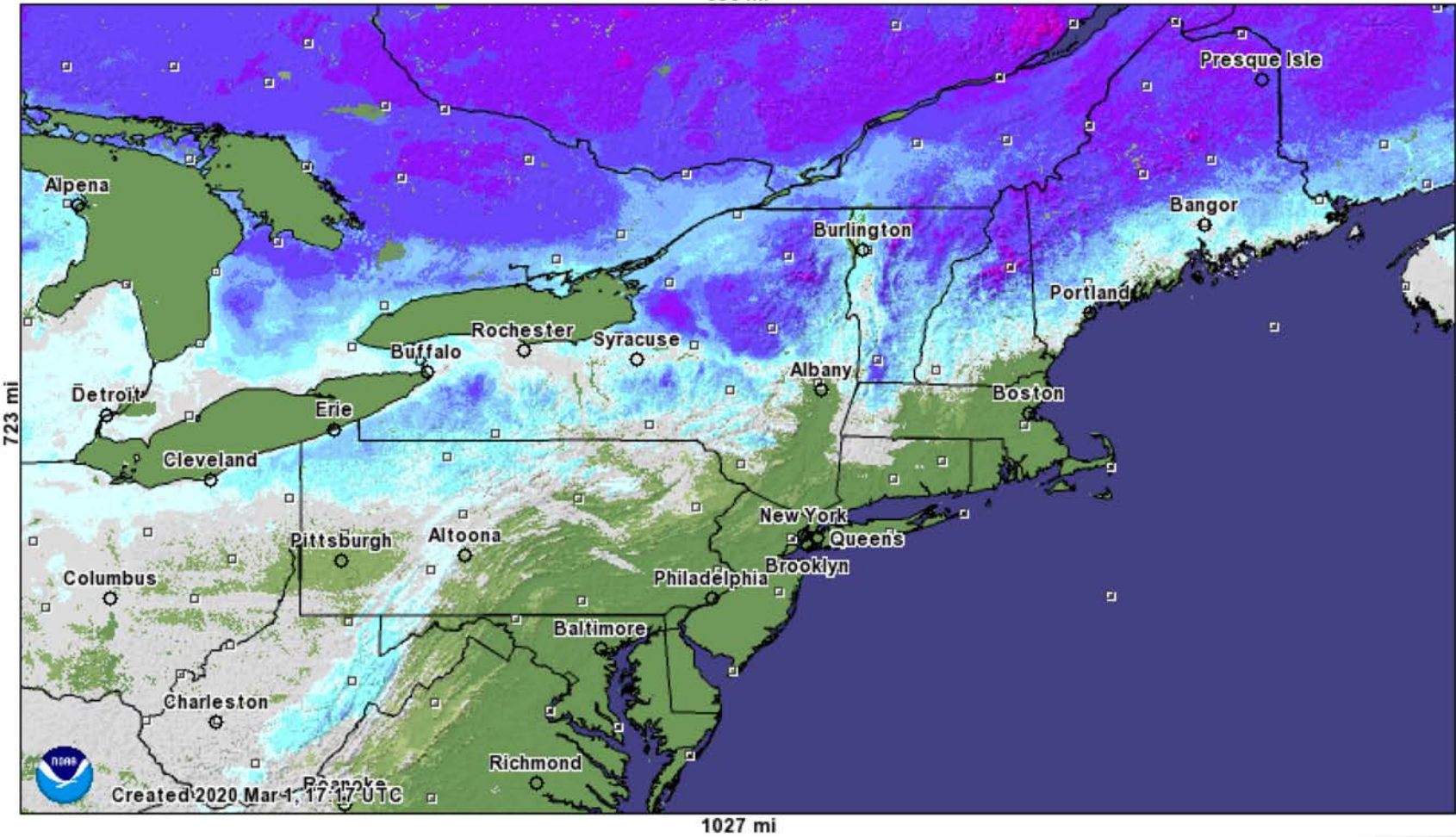


UPSTATE NEW YORK SNOW	
RECENT REPORTS	
Carthage	48.0"
Watertown	33.8"
Copenhagen	28.5"
Springville	25.0"
West Carthage	24.0"

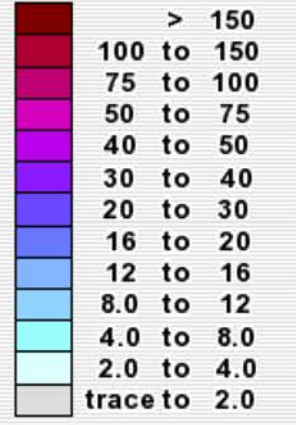
Source unknown

# Snow Depth: March 1, 2020

Modeled Snow Depth for 2020 March 1, 12:00 UTC  
868 mi

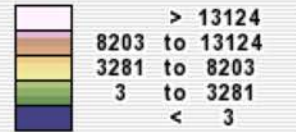


Inches of depth



Not Estimated

Elevation in feet

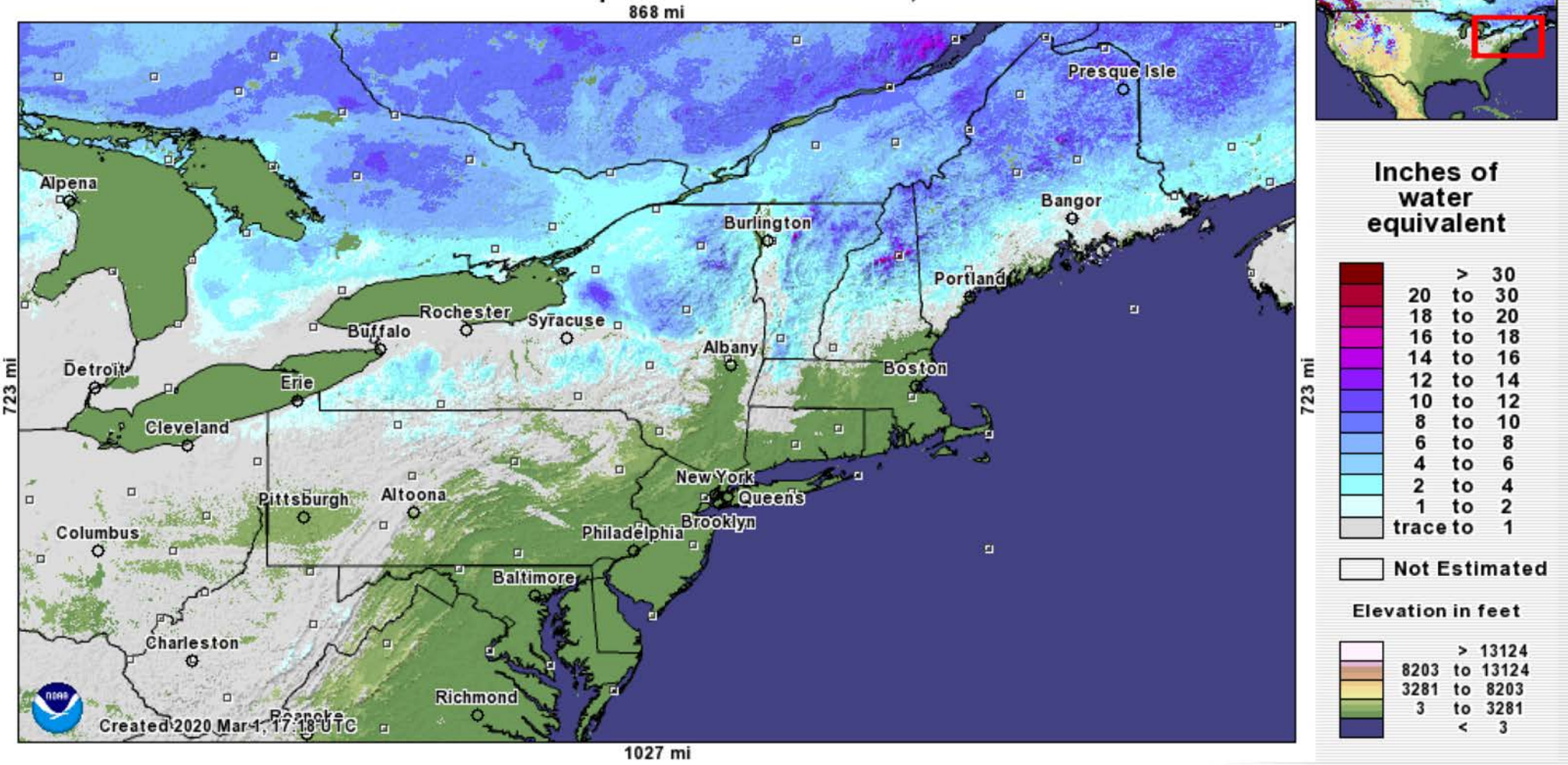


NOHRSC



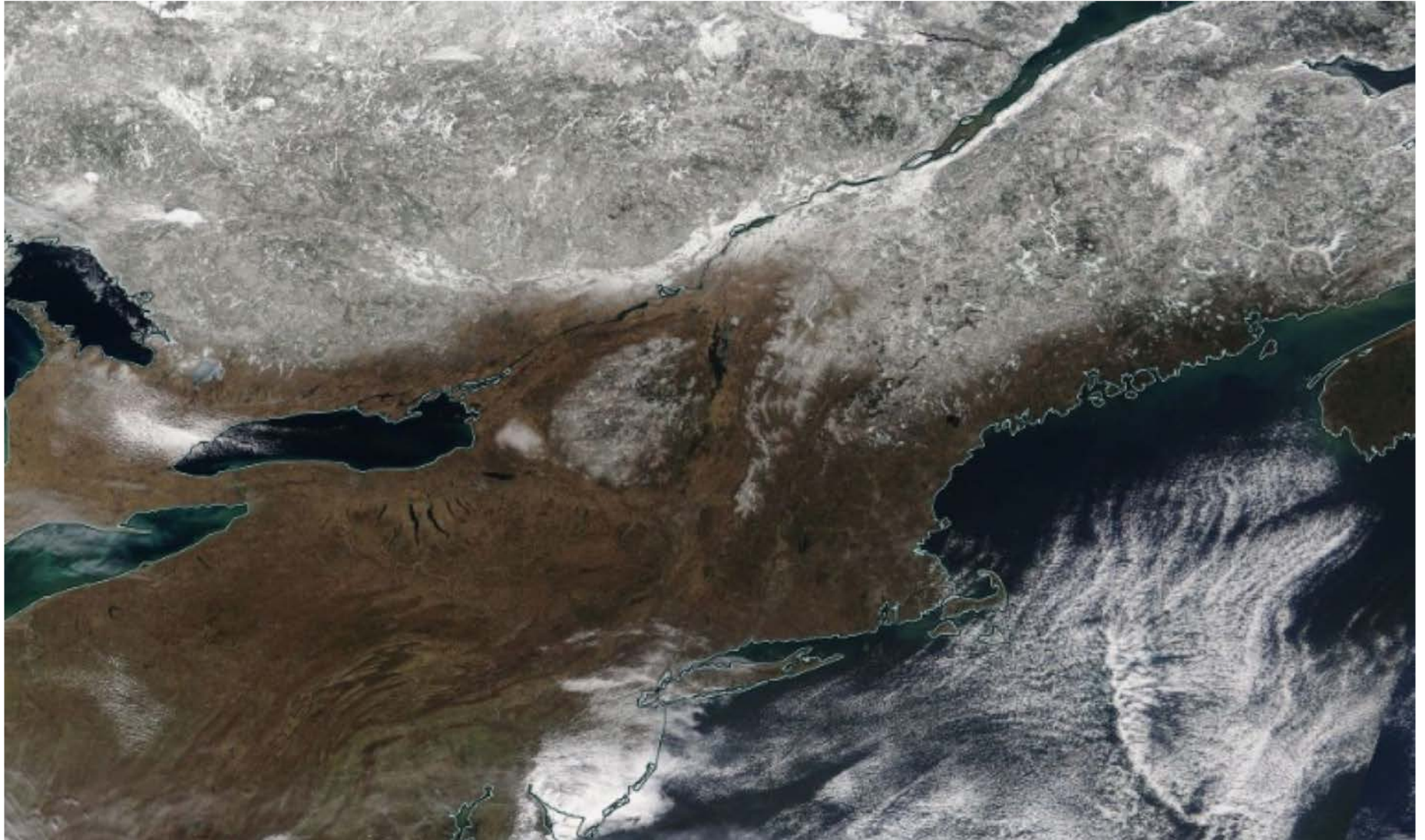
# Snow Water Equivalent: March 1, 2020

Modeled Snow Water Equivalent for 2020 March 1, 12:00 UTC



NOHRSC

March 22, 2020



MODIS

# Caribou Rules

## Number of Consecutive Days Snow Depth $\geq$ 1 for CARIBOU WFO, ME

Click column heading to sort ascending, click again to sort descending.

Rank	Run Length	Ending Date
1	163	2019-04-21
2	159	2020-04-18
3	155	2003-04-20
4	152	2008-04-19
-	152	1984-04-16
-	152	1972-04-25
7	151	1941-04-14
8	150	1973-04-19
-	150	1966-04-15
10	149	1975-04-18
Period of record: 1939-02-01 to 2020-04-28		

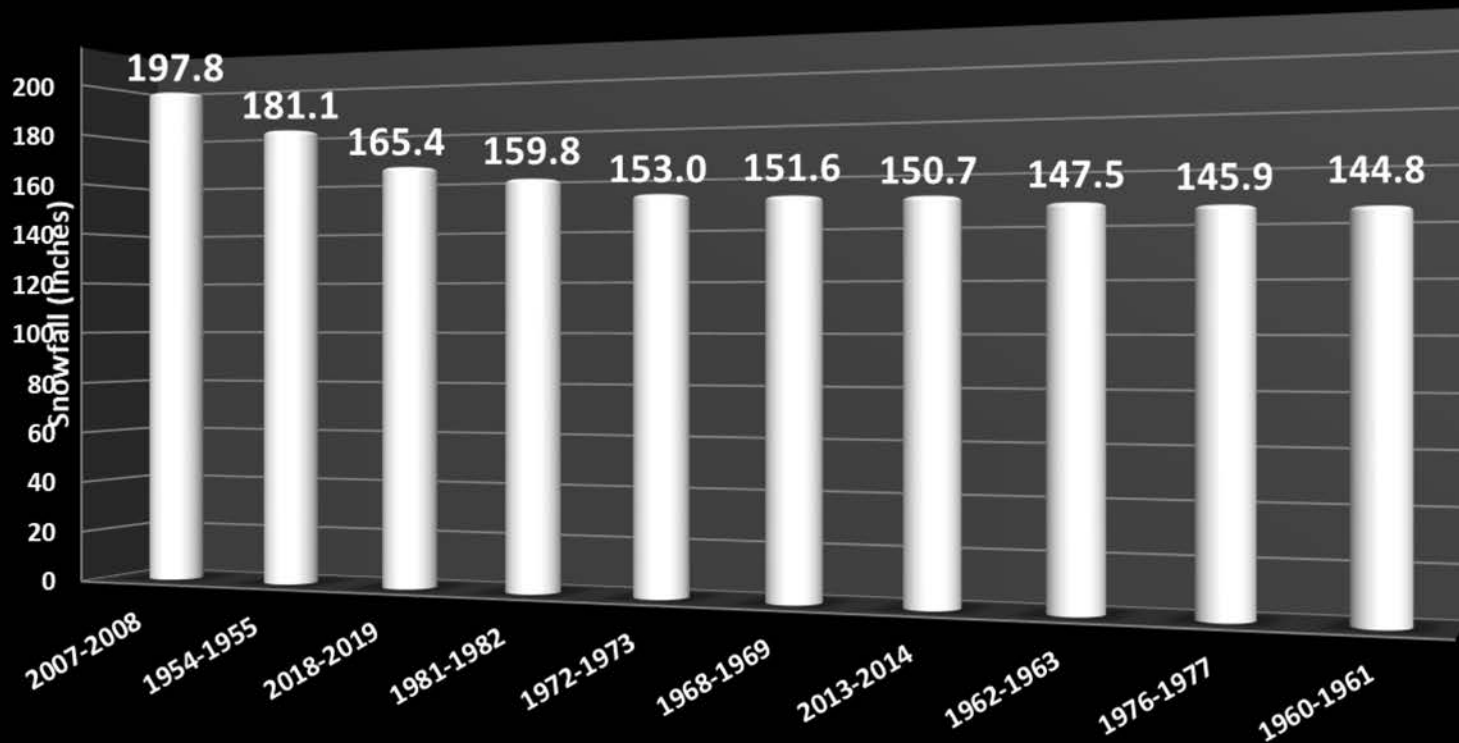
SCACIS

# Caribou 2019-2020 Snowfall: 146.0" (#9)



## Top 10 Annual Snowfall Accumulation WFO Caribou (1939 - Present)

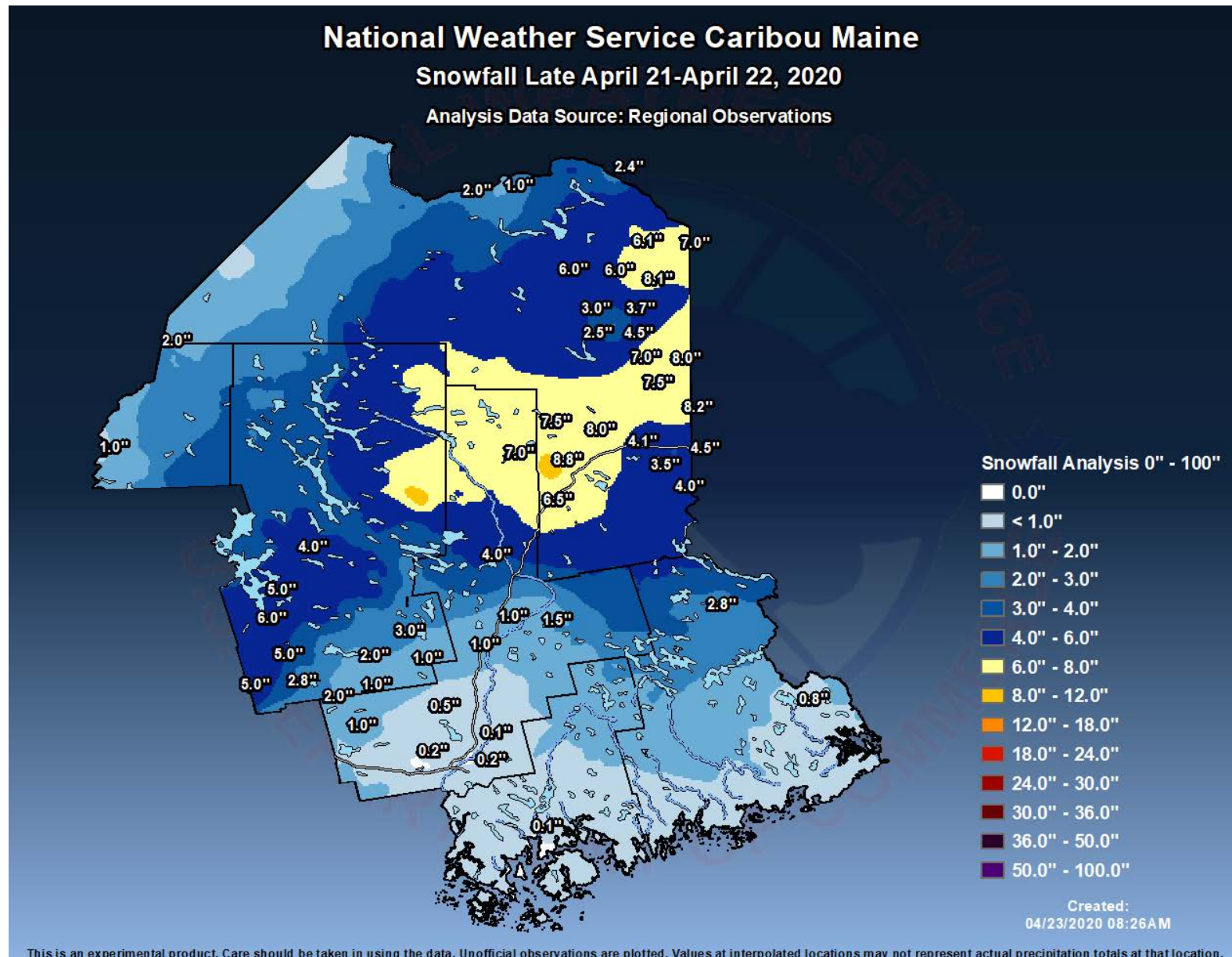
Updated: July 25, 2019



	2007-2008	1954-1955	2018-2019	1981-1982	1972-1973	1968-1969	2013-2014	1962-1963	1976-1977	1960-1961
■ Inches	197.8	181.1	165.4	159.8	153.0	151.6	150.7	147.5	145.9	144.8

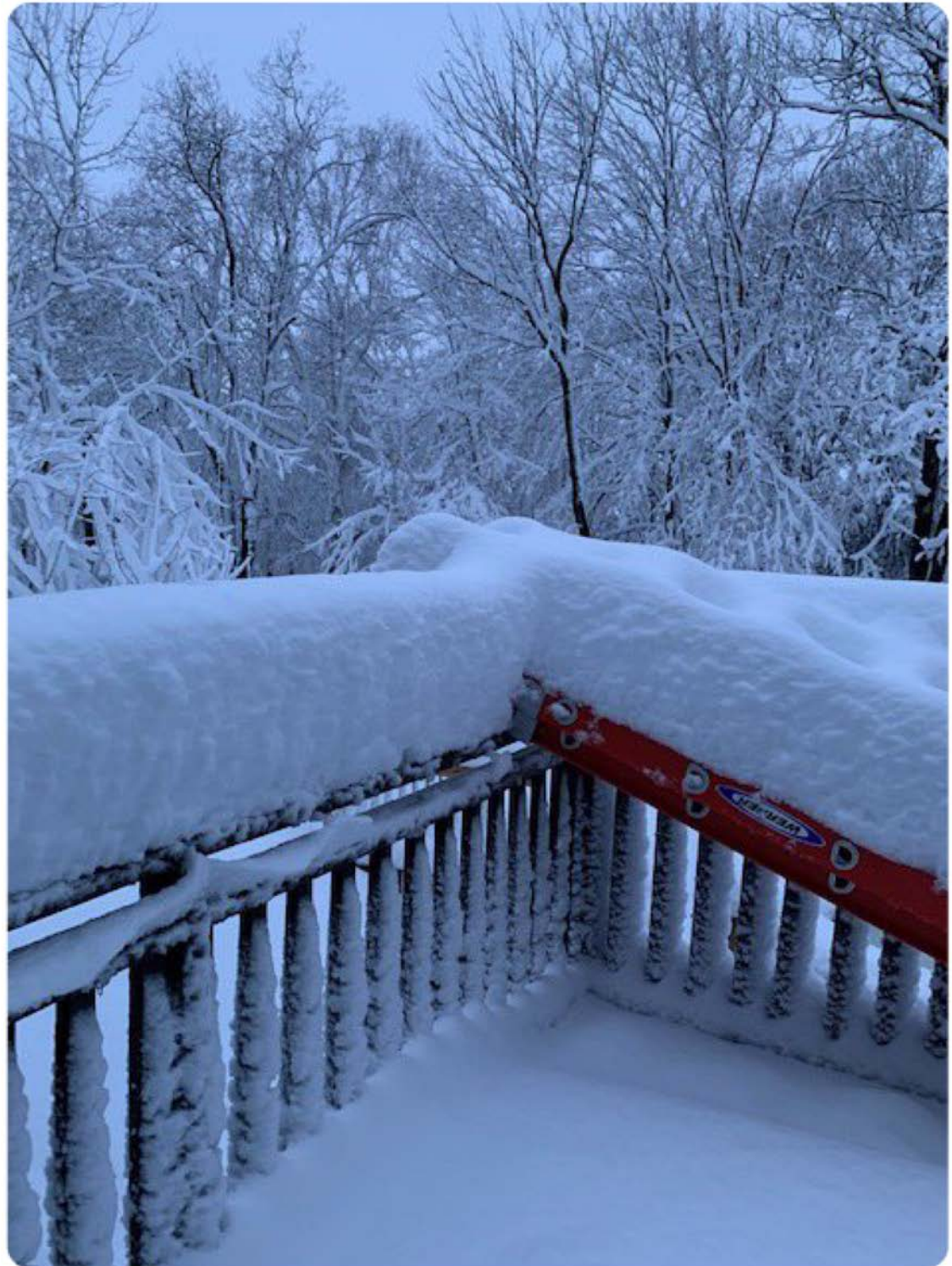
Snow Hangs On

# Northern Maine Snowfall: April 21-22, 2020



Cherry Valley, NY

April 27, 2020



Source: unknown



April 29, 2020



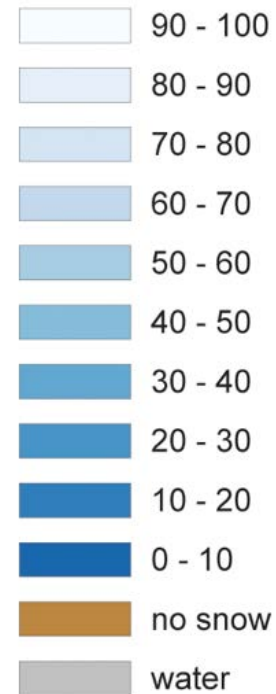
MODIS

# An Upcoming Closer Look: Ongoing Monitoring Improvements

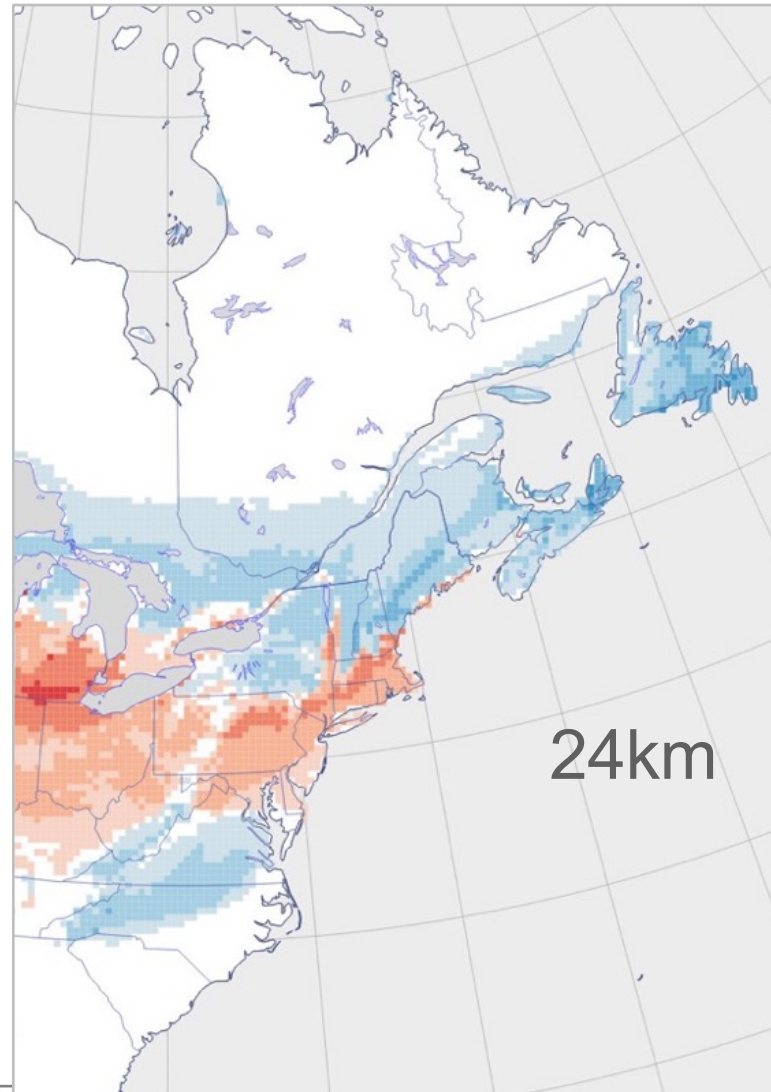
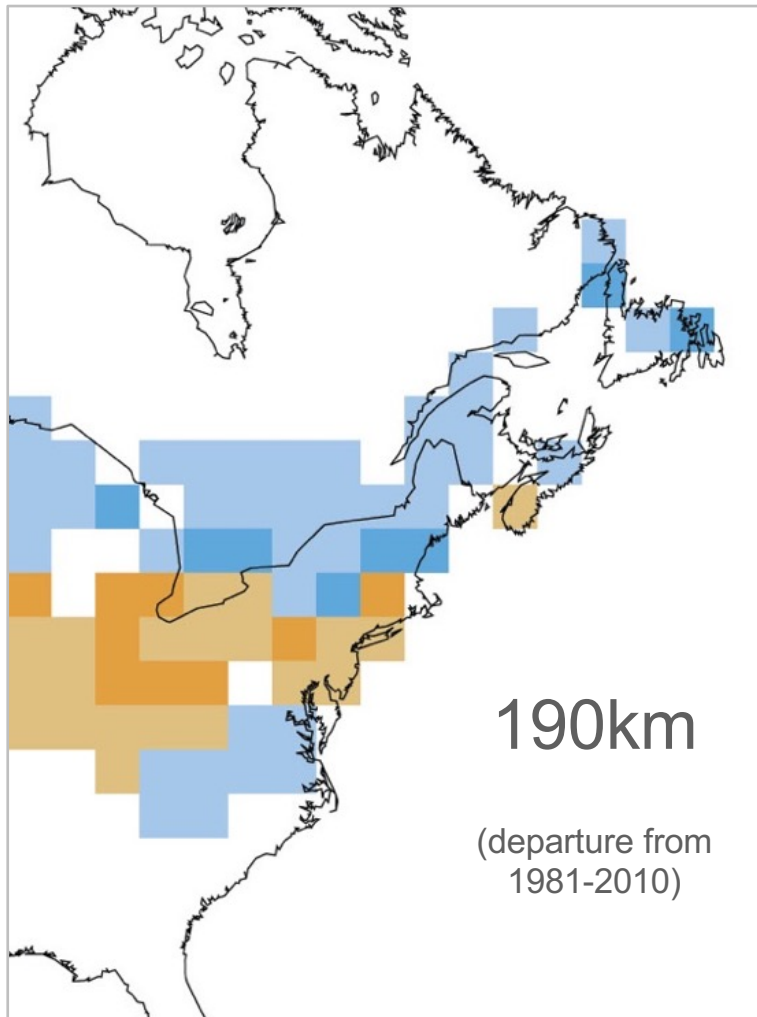
# Mean NOAA IMS Snow Cover Extent January (24 km)



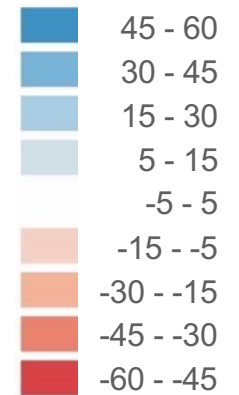
Percent of days  
snow covered



# Example of enhanced product: 24km snow cover extent departure – Dec. 2018



% departure  
from 1999–  
2018 monthly  
mean



## Summing up:

Seasonal snow isn't going away soon.

Try of late to convince anyone in the Mid-Atlantic of that!

2019-2020 polar vortex disappoints most Northeast snow lovers.

Yet on occasion the flakes did fly.

Greedy Caribou.

April snows....if only it was January.....

Ongoing monitoring improvements.

Thanks

Dave Robinson

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