

2023-2024 Winter Outlook for Southeast Michigan

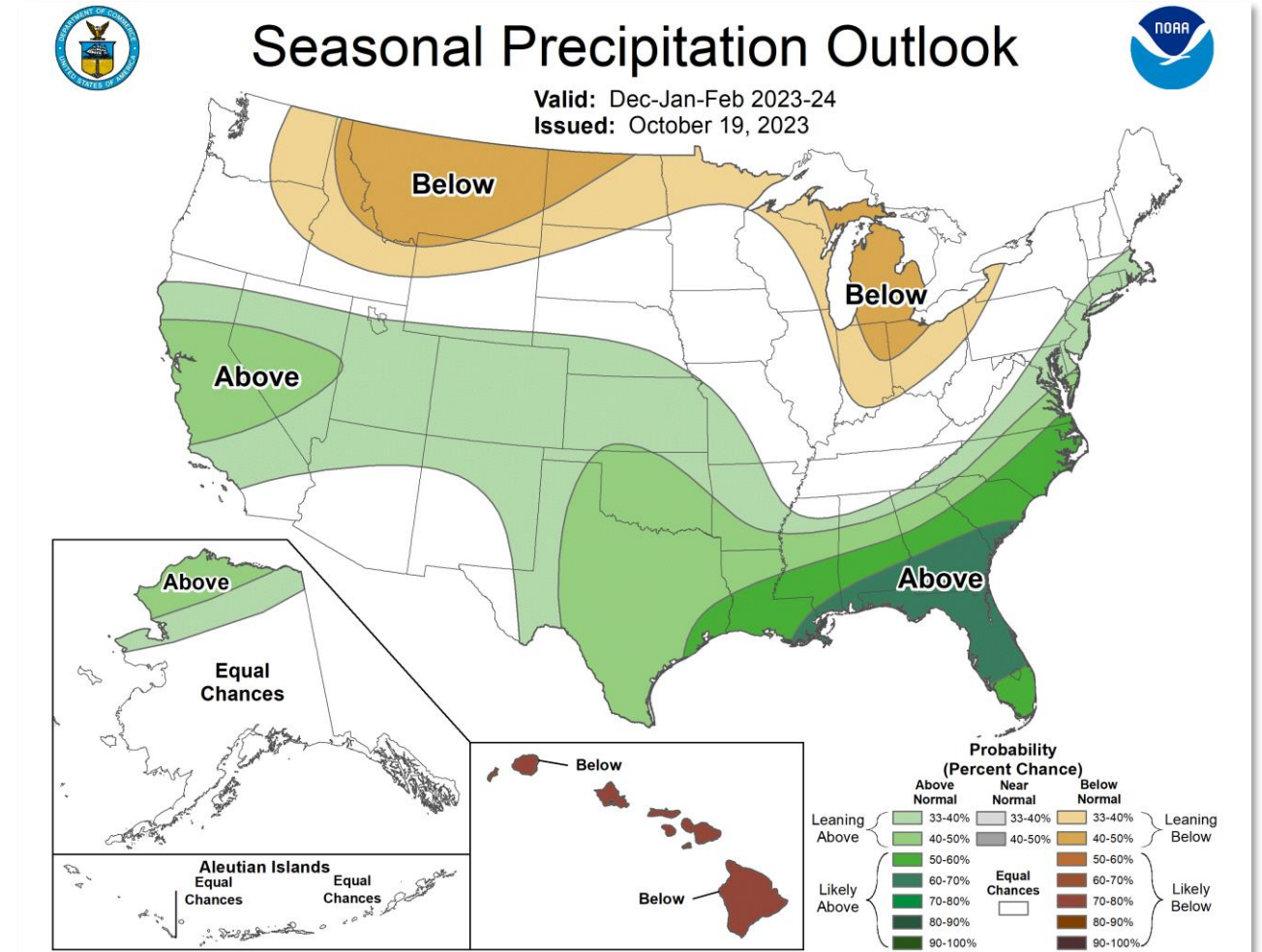
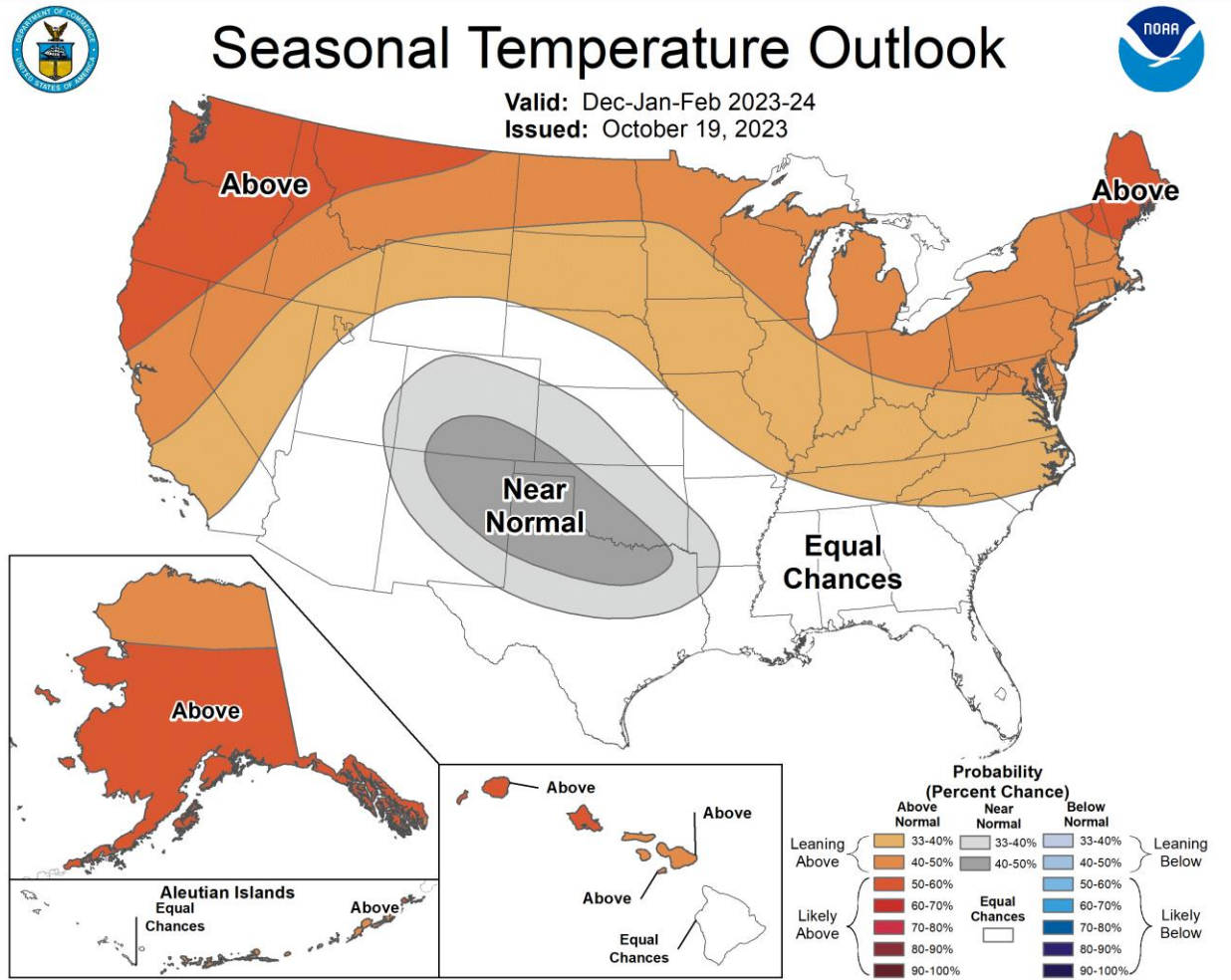
90 Day Outlook Valid December 1, 2023 to February 28, 2024





Official CPC Winter Outlook

2023-2024 Winter Outlook for SE MI



In the official winter outlook from the Climate Prediction Center, probabilities lean toward **above normal temperatures** and **below normal precipitation** for Southeast Michigan. This outlook factors in ENSO, trends in recent winters, dynamical model guidance such as the NMME, and statistical tools.

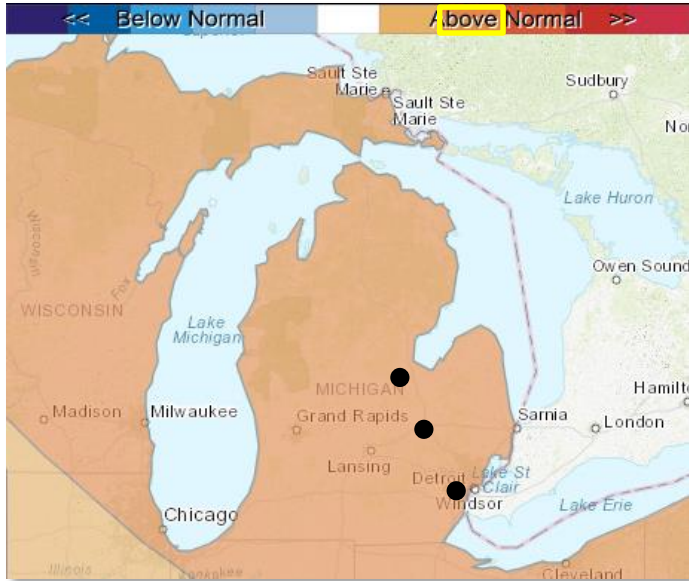




Official CPC Winter Outlook Probabilities

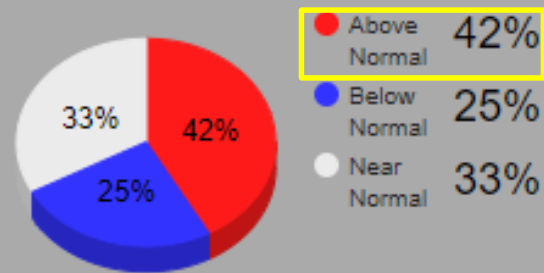
2023-2024 Winter Outlook for SE MI

Temperature



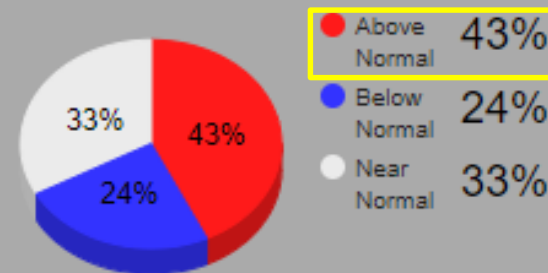
Detroit

Three Category Temperature Outlook
Normal Maximum Temperature: **34**
Normal Minimum Temperature: **20**



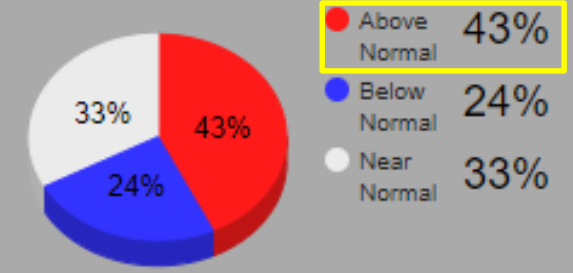
Flint

Three Category Temperature Outlook
Normal Maximum Temperature: **33**
Normal Minimum Temperature: **18**



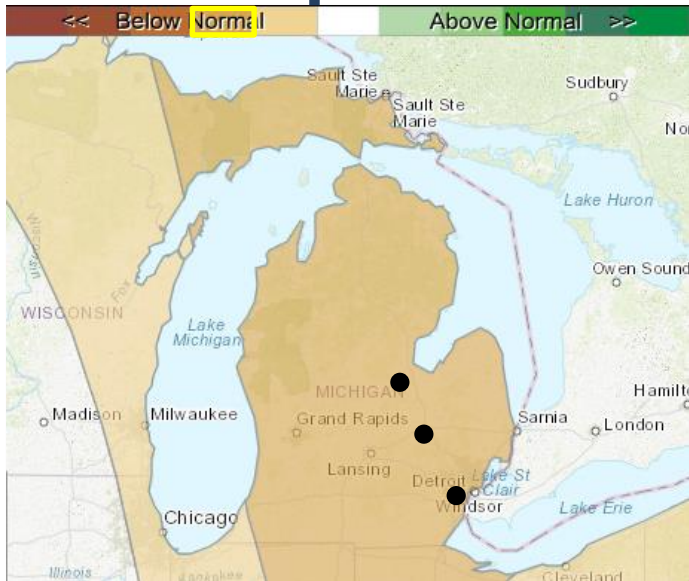
Saginaw

Three Category Temperature Outlook
Normal Maximum Temperature: **32**
Normal Minimum Temperature: **18**



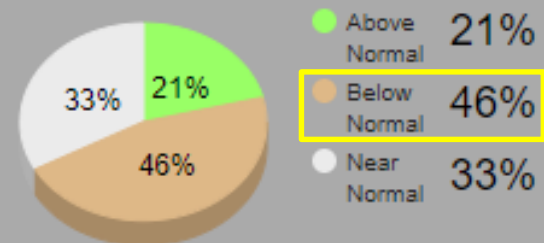
Leaning Toward Above Normal Temperatures

Precipitation



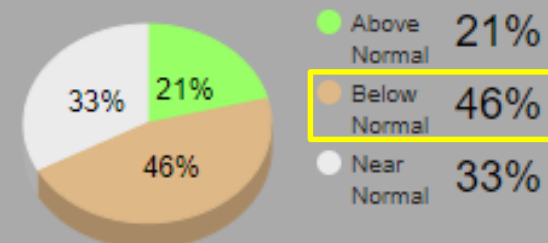
Detroit

Three Category Precipitation Outlook
Normal Precipitation: **6.52**



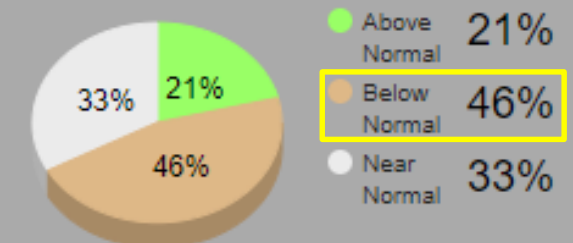
Flint

Three Category Precipitation Outlook
Normal Precipitation: **5.21**



Saginaw

Three Category Precipitation Outlook
Normal Precipitation: **5.07**



Leaning Toward Below Normal Precipitation

https://www.cpc.ncep.noaa.gov/products/predictions/long_range/interactive/index.php





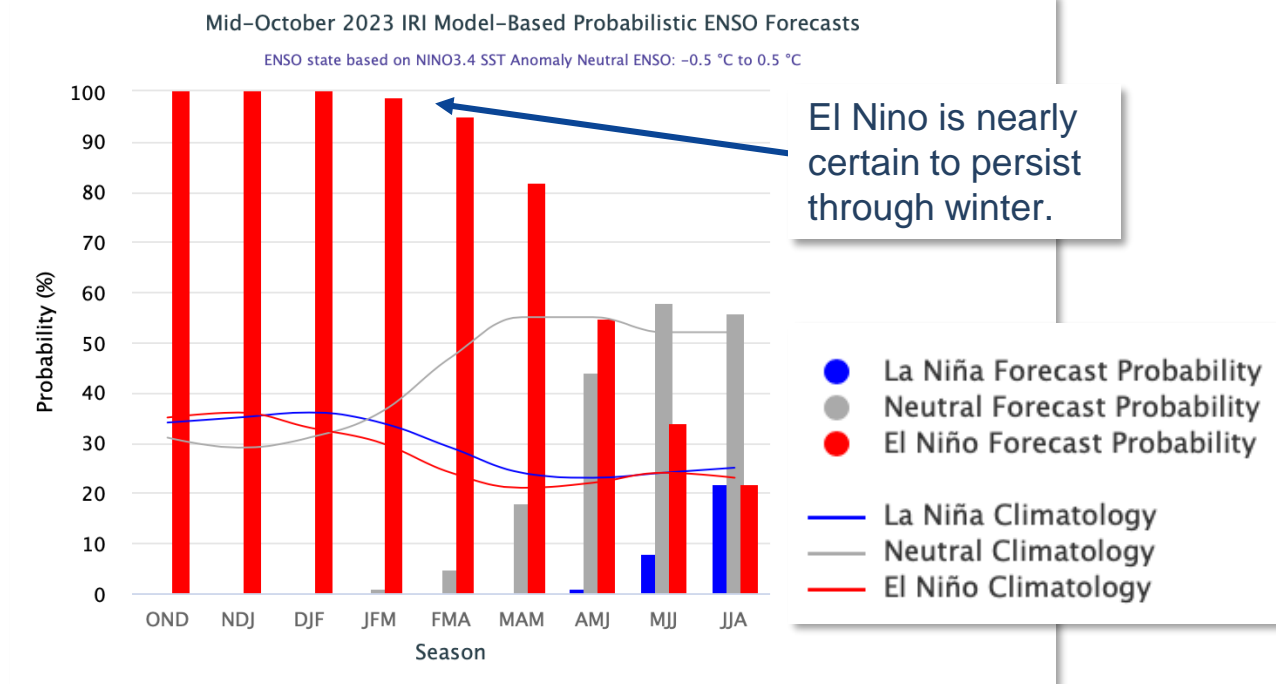
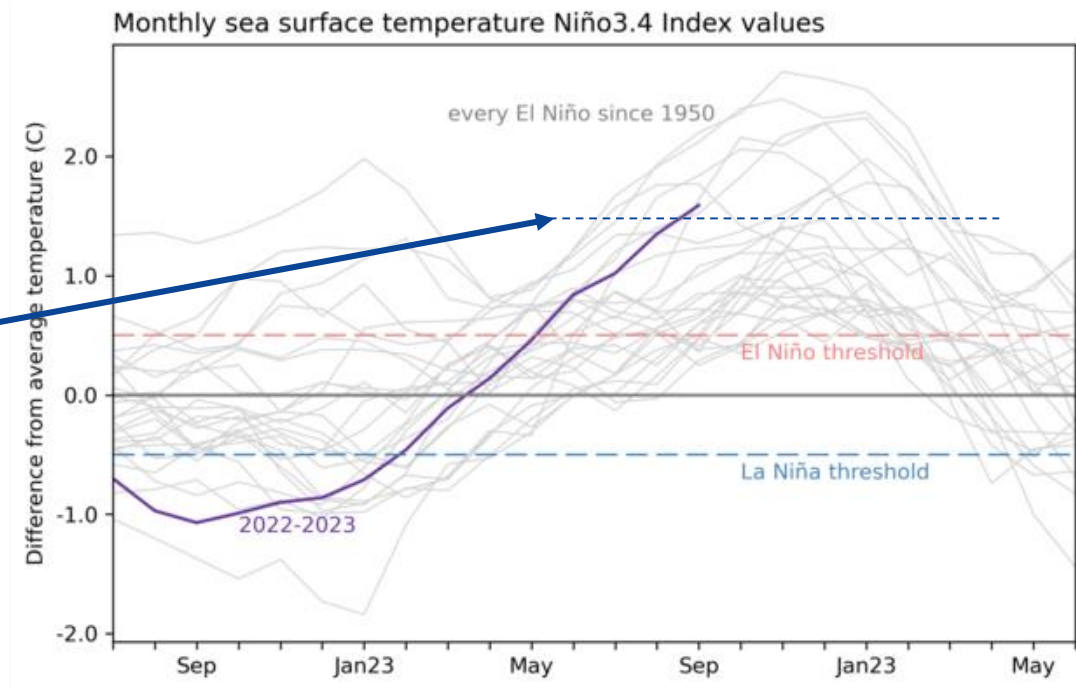
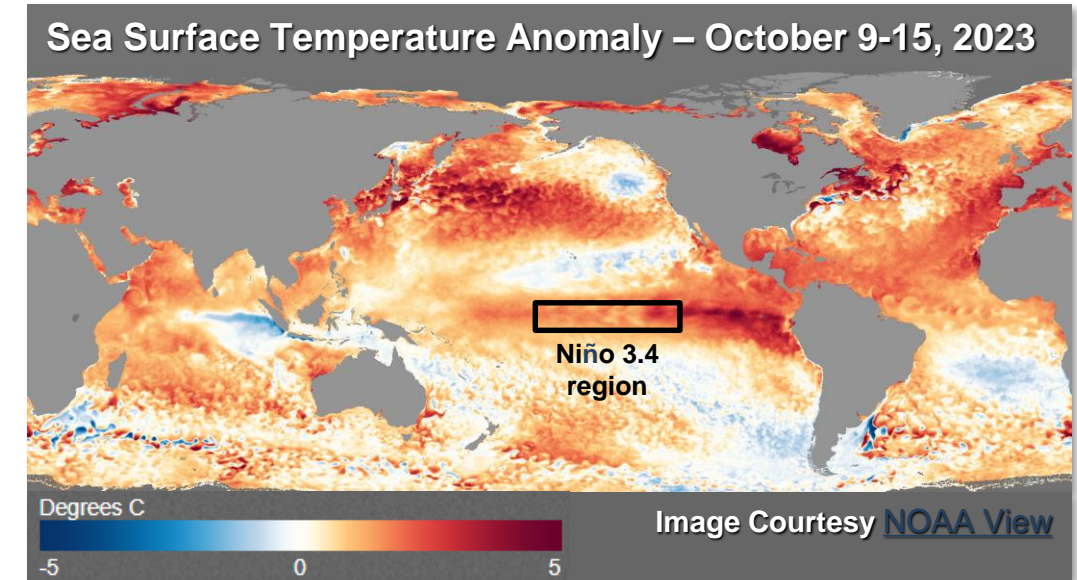
State of ENSO

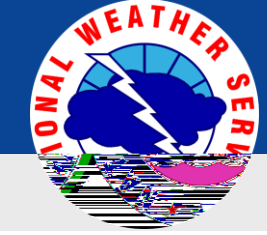
After three consecutive La Niña winters, its counterpart El Niño is back this winter. Warm sea surface temperature anomalies are noted in the central and eastern equatorial Pacific (see black box in image to right). The typical atmospheric processes have been observed as well. El Niño is expected to persist into spring 2024.

This El Niño has a 75-85% chance to be a strong event which means we are more likely to see the typical El Niño influence on winter temperature and precipitation patterns. Read more about the El Niño Advisory and the latest forecast from CPC [here](#) (updated weekly).

Of note this winter is the record warm global oceans (in addition to the warm tropical Pacific). This is unique from other El Niño events and may affect how the typical El Niño impacts play out.

2023-2024 Winter Outlook for SE MI





Typical El Niño Impacts

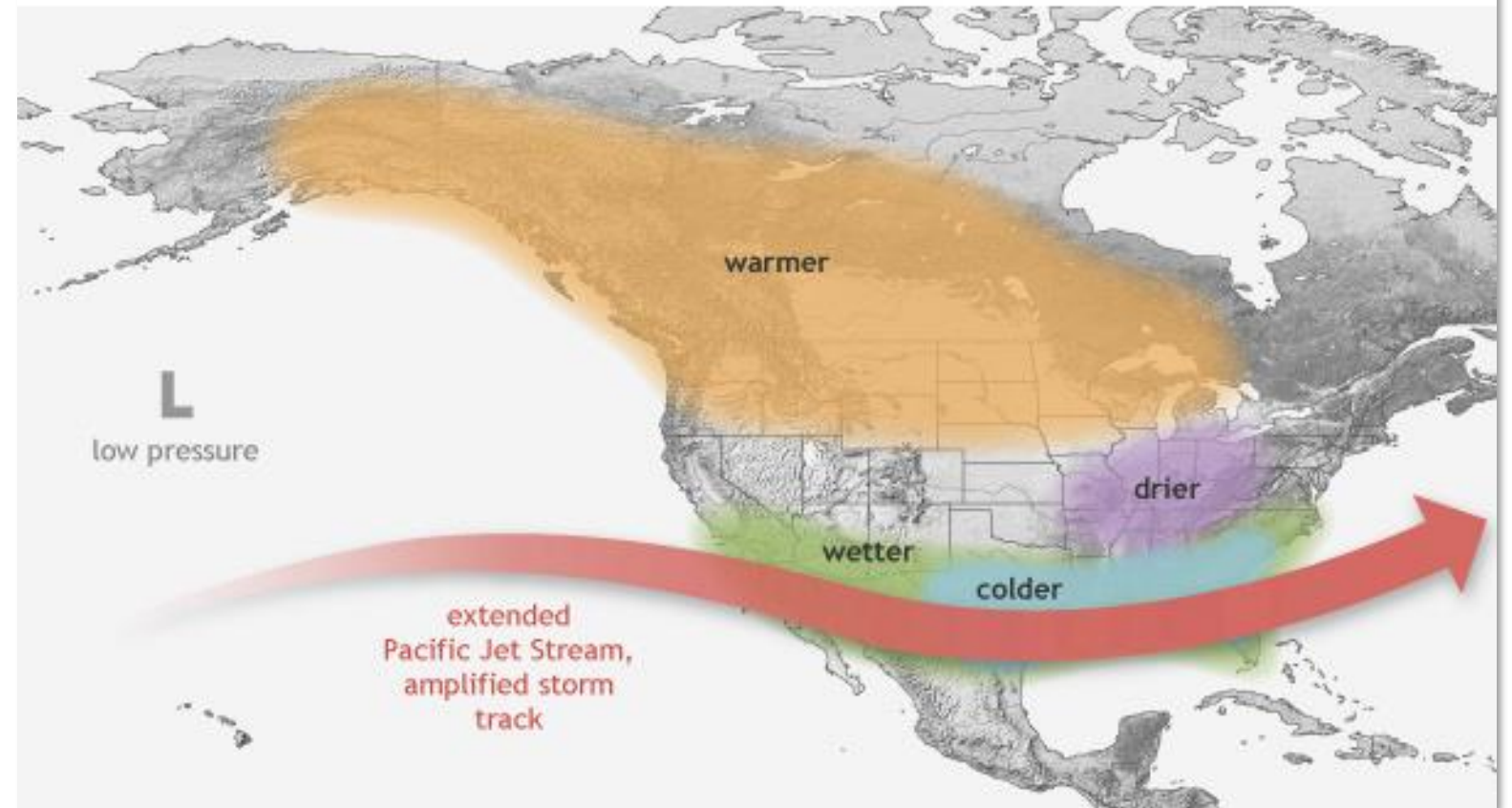
2023-2024 Winter Outlook for SE MI

El Niño will be the main driver for the atmospheric circulation pattern this winter, with implications on the local conditions for the Great Lakes.

What this can mean:

- An active jet stream pattern across the southern tier of the US that directs storm systems away from the local area. More often than not, El Niño winters are drier and warmer than normal across for Southeast MI.

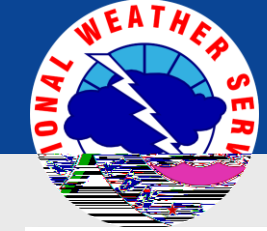
WINTER EL NIÑO PATTERN



What we don't know:

- How sub-seasonal variability will influence the season as a whole. El Niño provides a strong background forcing, but other climate signals such as the Arctic Oscillation, North Atlantic Oscillation, and stratospheric warming events can still emerge and influence local conditions on shorter (weekly-to-monthly) time scales. These influences are not predictable at the seasonal time scale.
- How the record warm sea surface temperatures may affect the influence of El Niño.

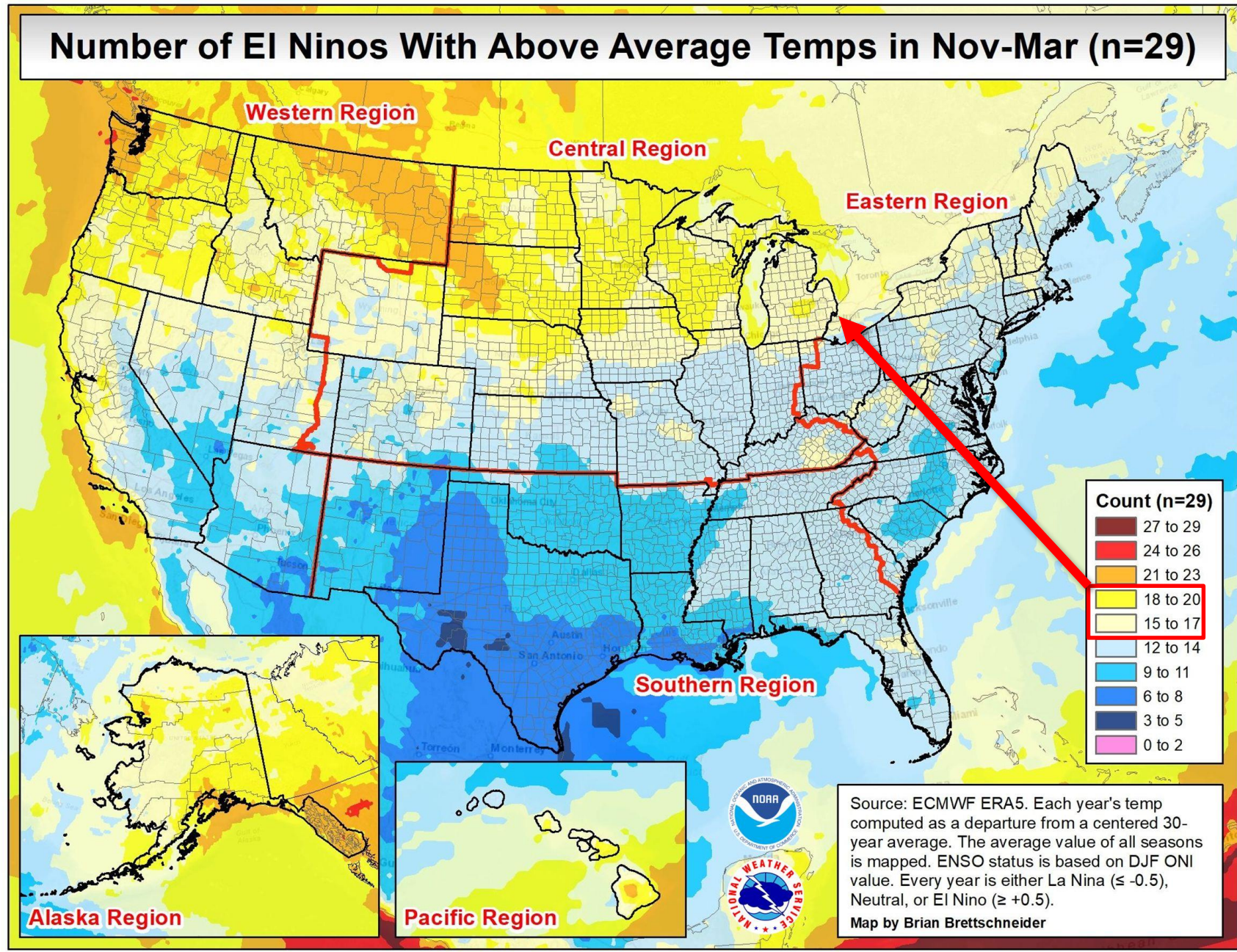




Historical El Niño Impacts – Temperature

2023-2024 Winter Outlook for SE MI

Number of El Ninos With Above Average Temps in Nov-Mar (n=29)



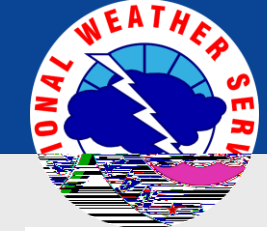
Source: ECMWF ERA5. Each year's temp computed as a departure from a centered 30-year average. The average value of all seasons is mapped. ENSO status is based on DJF ONI value. Every year is either La Nina (≤ -0.5), Neutral, or El Niño ($\geq +0.5$).

Map by Brian Brettschneider

Over half of the 29 El Niño winters since 1940 have had above average temperatures across our area.

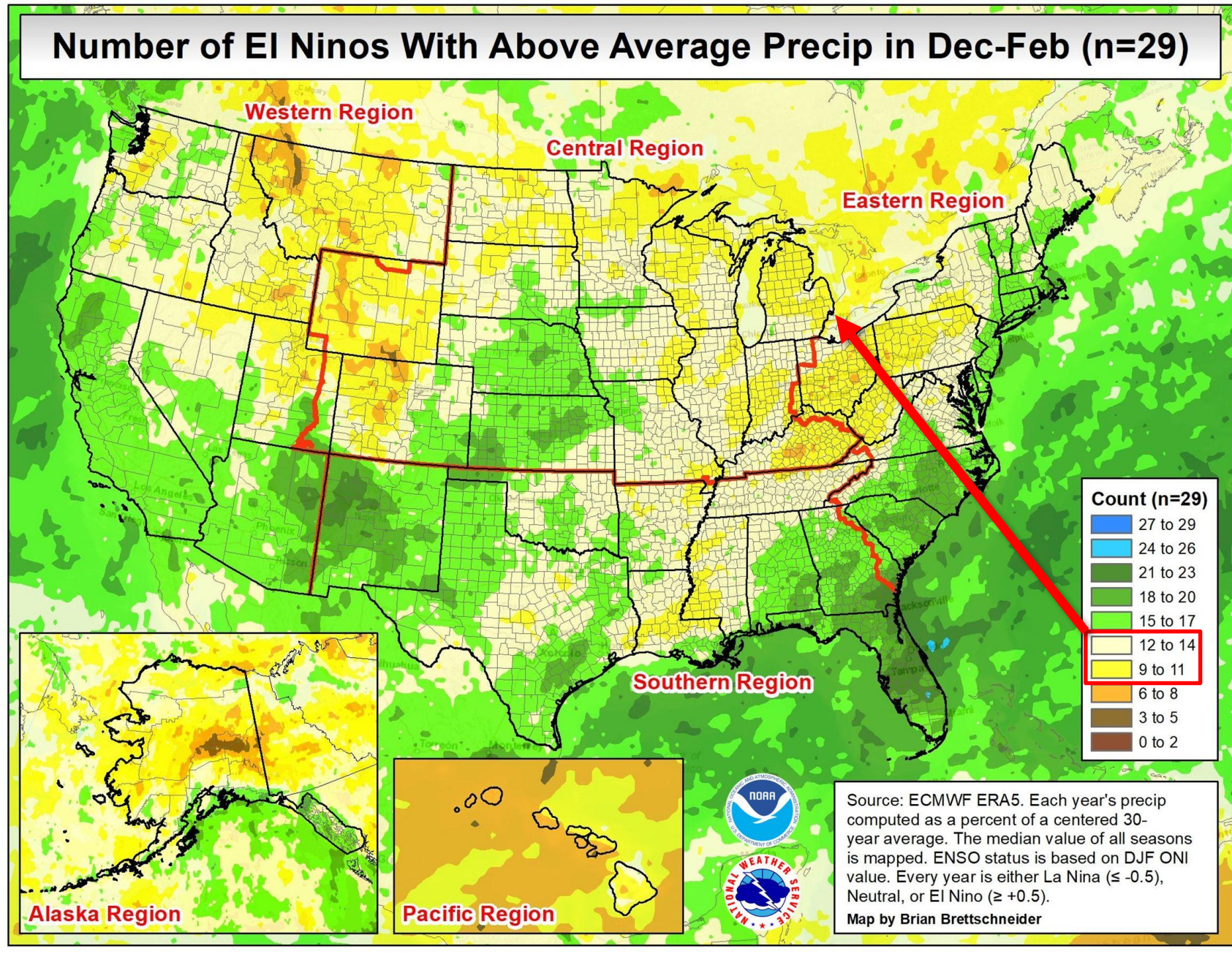
This graphic accounts for trends in average winter temperatures over the years.





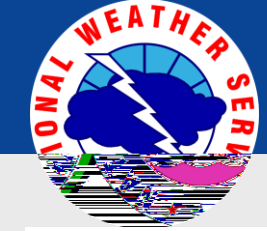
Historical El Niño Impacts – Precipitation

2023-2024 Winter Outlook for SE MI



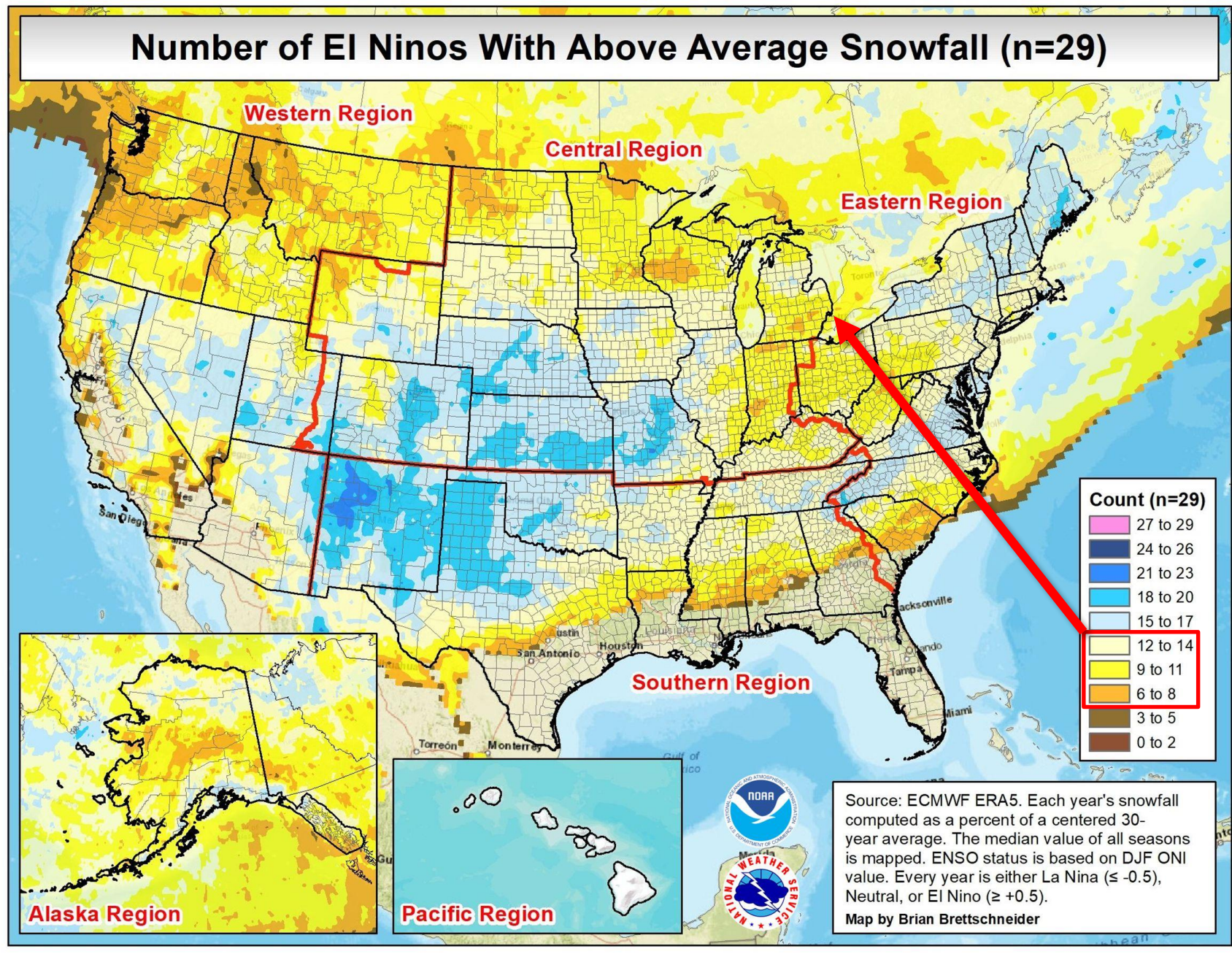
Over half of the 29 El Niño winters since 1940 have had below average precipitation across our area.

This graphic accounts for trends in average winter precipitation over the years.



Historical El Niño Impacts – Snowfall

2023-2024 Winter Outlook for SE MI



Over half of the 29 El Niño winters since 1940 have had below average snowfall across our area.

This graphic accounts for trends in average winter snowfall over the years.



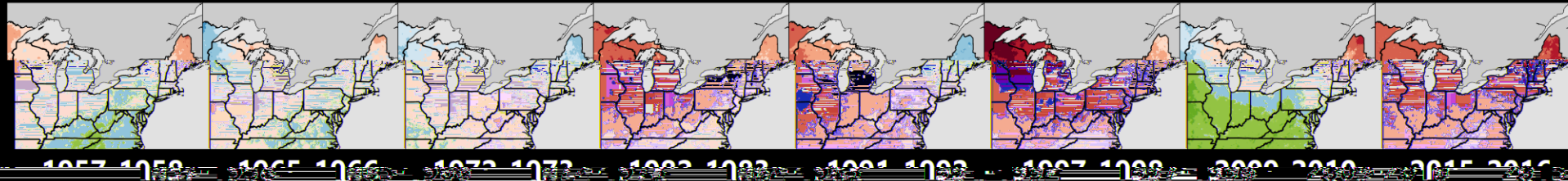


No Two El Niños Are The Same

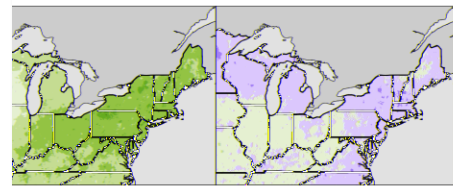
2023-2024 Winter Outlook for SE MI

EL NIÑO EVENTS (DJF): TEMPERATURE

STRONG

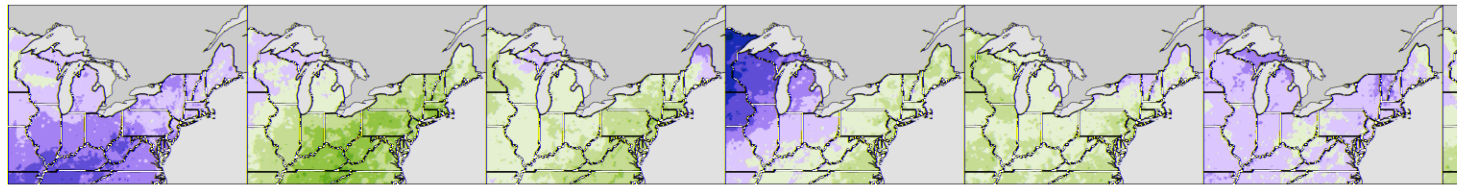


MODERATE



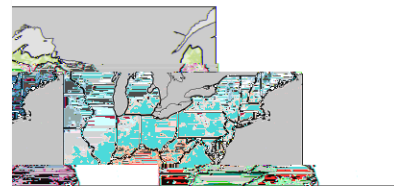
2002-2003, 2006-2007

MODERATE

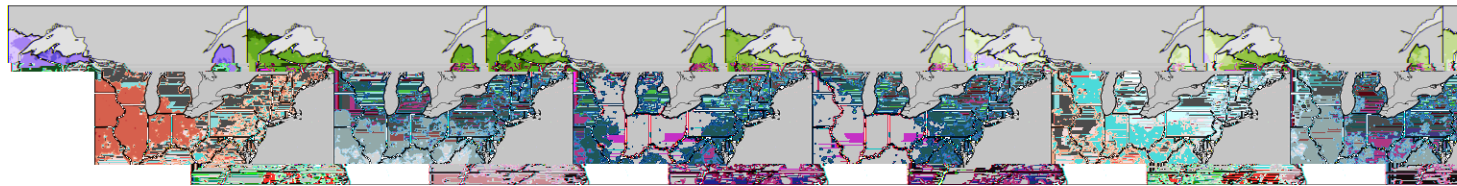


1951-1952, 1963-1964, 1968-1969, 1986-1987, 1987-1988, 1994-1995

WEAK



4-2015, 2018-2019



1953-1954, 1958-1959, 1976-1977, 1977-1978, 2004-2005, 201

Data: PRISM, Oregon State University



4, 6, 8



NATIONAL WEATHER SERVICE
NATIONAL OCEANIC & ATMOSPHERIC ADMINISTRATION

Temperature
Departure from Normal



8, 6, 4, 2, 0, 2

El Niño doesn't guarantee a warmer than normal winter, but does generally tilt the odds in that direction. These maps show the temperature anomaly associated with each El Niño winter. The take-home point is that no two events are exactly the same.

A strong El Niño is forecast this year.



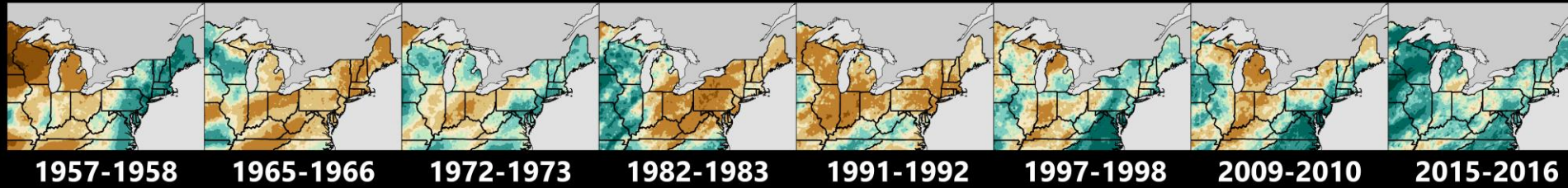


No Two El Niños Are The Same

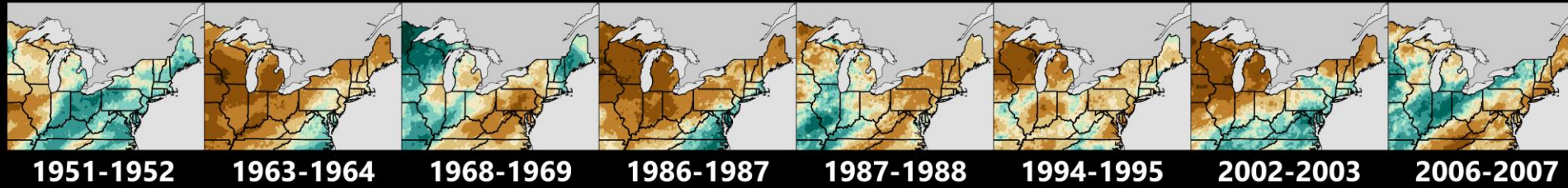
2023-2024 Winter Outlook for SE MI

EL NIÑO EVENTS (DJF): PRECIPITATION

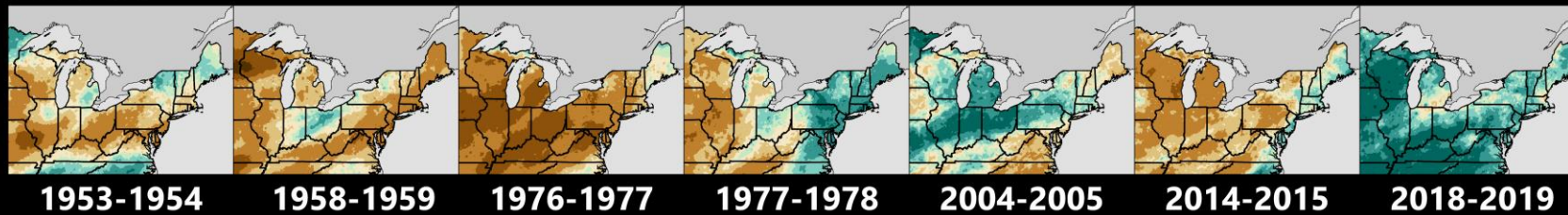
STRONG



MODERATE



WEAK



Data: PRISM, Oregon State University



El Niño doesn't guarantee a drier than normal winter, but does generally tilt the odds in that direction. These maps show the precipitation anomaly associated with each El Niño winter. The take-home point is that no two events are exactly the same.


A strong El Niño is forecast this year.






Previous Strong El Niño Winter Stats

2023-2024 Winter Outlook for SE MI

	Normal Winter Avg Temp
Detroit	28.4
Flint	25.5
Saginaw	25.5


Observed Winter Avg Temp During Strong El Niños (°F)							
1957-1958	1965-1966	1972-1973	1982-1983	1991-1992	1997-1998	2009-2010	2015-2016
27.8	28.5	27.8	32.5	30.4	33.9	27.4	33.5
23.5	26.5	27.2	32.2	28.2	31.4	24.2	33.0
23.7	25.1	23.8	29.6	27.0	31.0	24.9	31.7

Below Normal
Near Normal
Above Normal

	Normal Winter Precipitation
Detroit	6.56
Flint	5.56
Saginaw	5.54

Observed Winter Precipitation During Strong El Niños (inches)							
1957-1958	1965-1966	1972-1973	1982-1983	1991-1992	1997-1998	2009-2010	2015-2016
6.07	5.99	5.84	5.02	5.23	7.77	5.56	6.37
2.93	4.27	6.59	4.67	4.89	5.49	3.61	5.75
4.60	8.11	7.81	5.38	4.75	7.61	3.68	7.02

Below Normal
Near Normal
Above Normal

	Normal Winter Snowfall
Detroit	35.4
Flint	39.5
Saginaw	37.1

Observed Winter Snowfall During Strong El Niños (inches)							
1957-1958	1965-1966	1972-1973	1982-1983	1991-1992	1997-1998	2009-2010	2015-2016
12.6	10.8	27.7	7.2	29.4	14.3	43.7	20.4
19.1	26.0	36.3	12.2	32.1	15.3	44.4	39.8
25.1	32.4	35.6	9.7	26.8	22.3	44.6	30.0

Below Normal
Near Normal
Above Normal



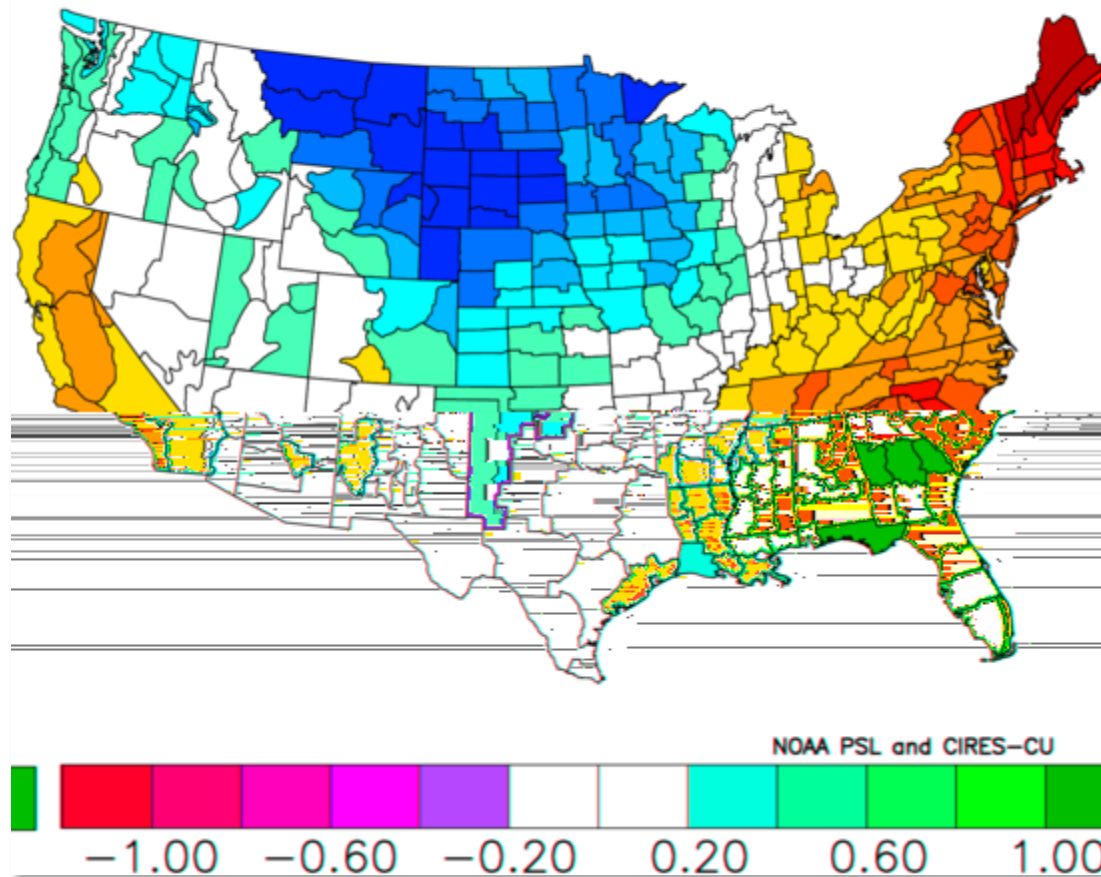
Trends in Recent Winters

2023-2024 Winter Outlook for SE MI

Beyond ENSO, a skillful predictor at the seasonal time scale is to account for how trends have evolved over the past 10 to 15 years. Composite anomalies of the past 15 years show that winters have trended warmer across much of Lower MI. Meanwhile, there is no strong signal for precipitation trends.

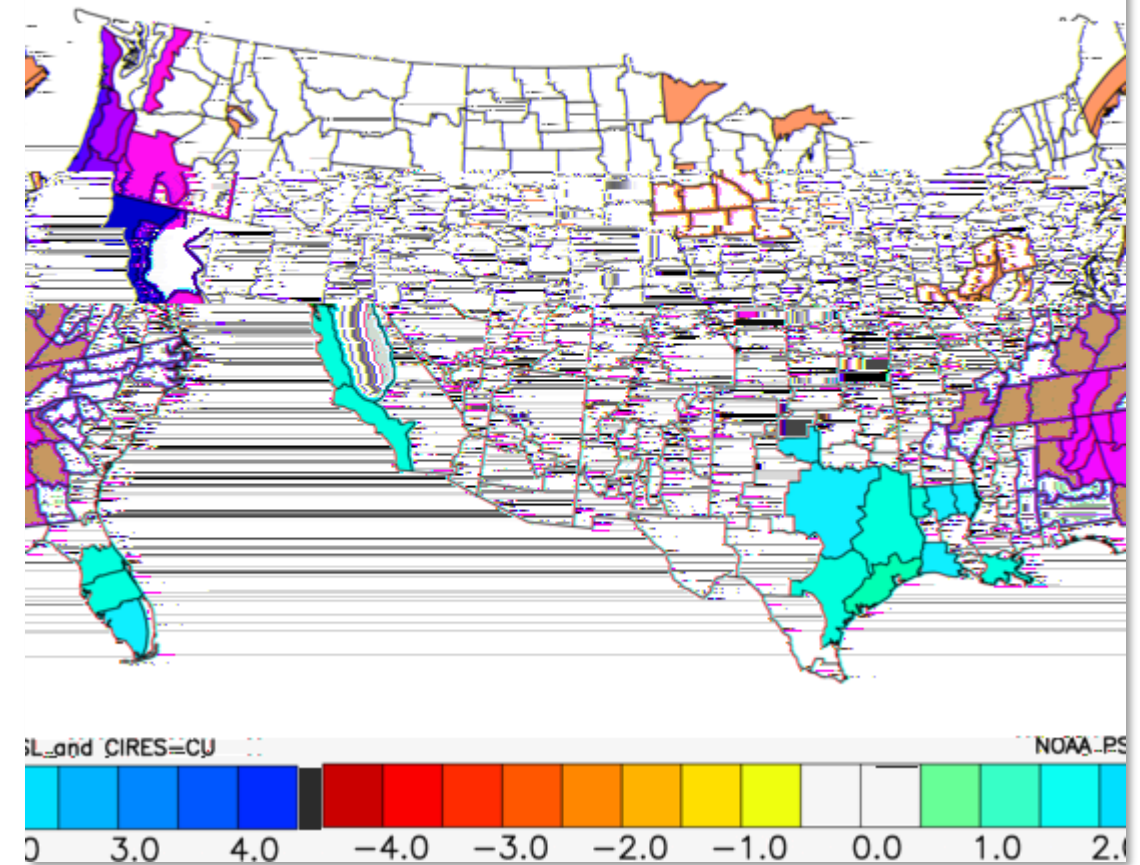
Temperature

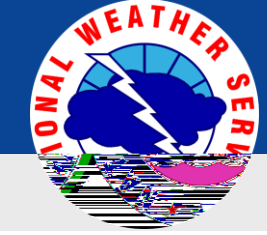
NOAA/NCEI Climate Division Composite Temperature Anomalies (F)
Dec to Feb 2008-09 to 2022-23
Versus 1991-2020 Longterm Average



Precipitation

NOAA/NCEI Climate Division Composite Precipitation Anomalies (in)
Dec to Feb 2008-09 to 2022-23
Versus 1991-2020 Longterm Average





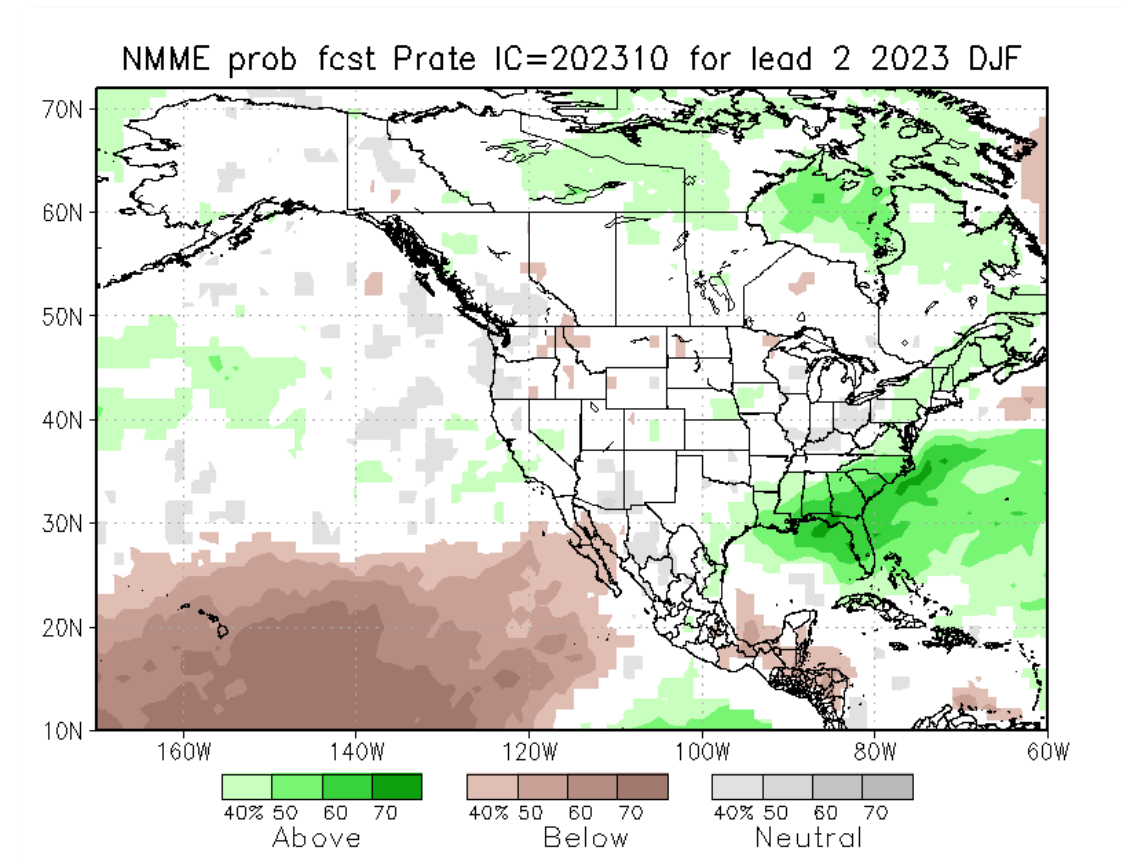
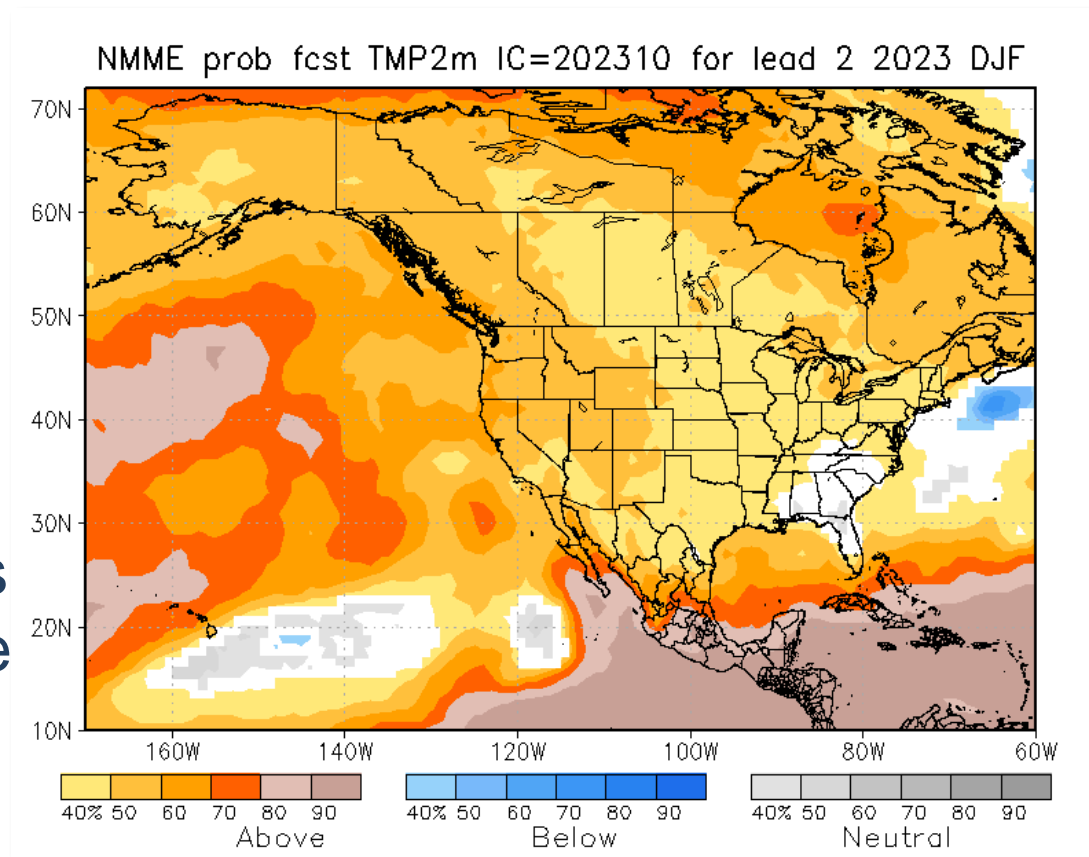
Model Ensemble Guidance

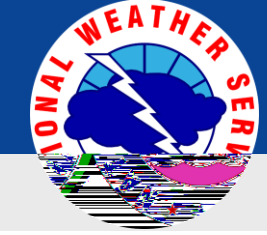
2023-2024 Winter Outlook for SE MI

Temperature

Precipitation

The North American Multi-Model Ensemble ([NMME](#)), a seasonal forecasting system featuring coupled models from US and Canadian modeling centers, is another tool that provides some additional guidance to inform seasonal forecasters. The latest output offers increased probabilities for above normal temperatures across the Great Lakes.





Current Drought Status and Seasonal Drought Outlook

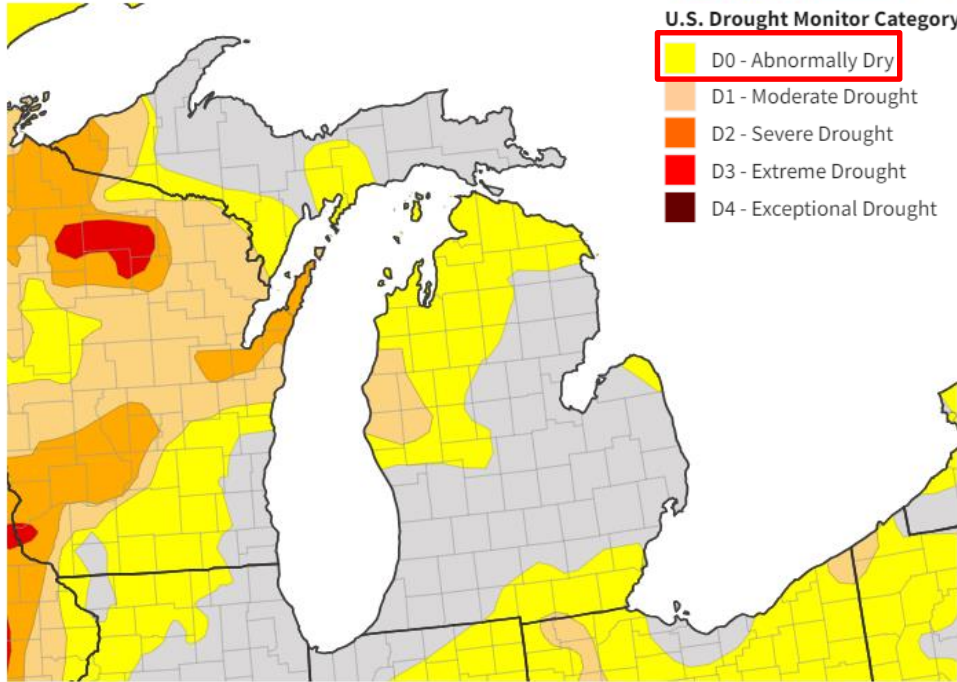
2023-2024 Winter Outlook for SE MI

U.S. Drought Monitor



U.S. Drought Monitor Category

- D0 - Abnormally Dry
- D1 - Moderate Drought
- D2 - Severe Drought
- D3 - Extreme Drought
- D4 - Exceptional Drought



Source(s): NDMC, NOAA, USDA
Updates Weekly: 10/17/23

[Drought.gov](https://drought.gov)

Far southern Southeast MI and far northern Huron County are experiencing abnormally dry conditions this fall. Rainfall amounts have been about 1 inch below normal since September 1.

Recent Rainfall

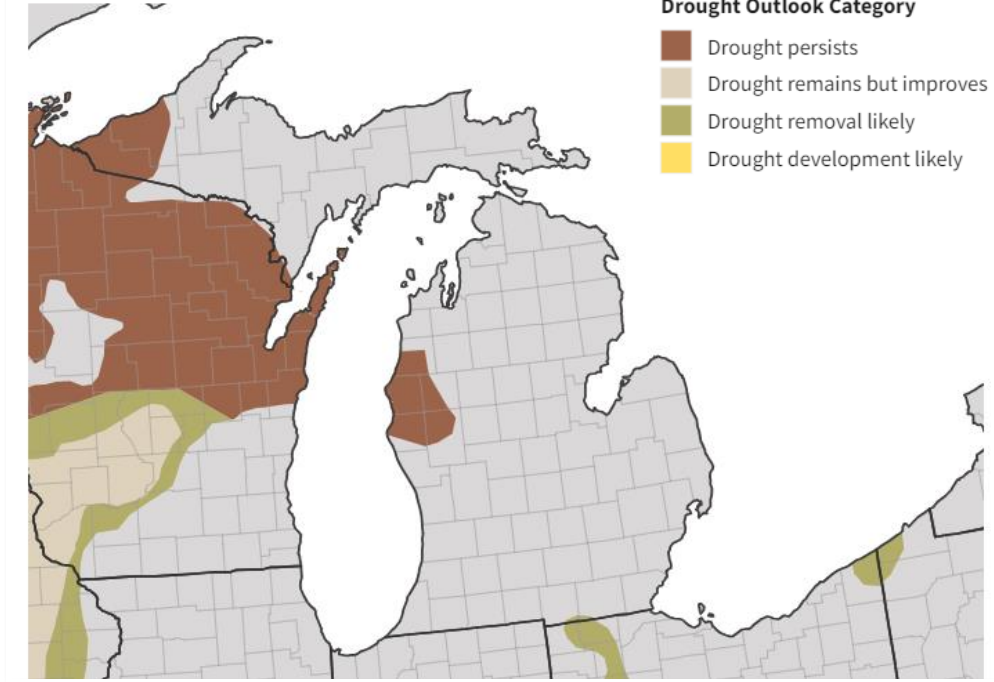
Rainfall (Departure)	Detroit	Flint	Saginaw
1 Month Sep 20 to Oct 20	2.29" (-0.46")	3.14" (+0.20")	2.81" (-0.14")
3 Months Jul 20 to Oct 20	12.51" (+2.96")	11.17" (+1.84")	11.99" (+2.30")
6 Months Apr 20 to Oct 20	21.01" (+1.11")	18.74" (-0.60")	20.36" (+1.07")
9 Months Jan 20 to Oct 20	30.60" (+3.42")	28.71" (+3.11")	29.23" (+3.50")
1 Year Oct 20, 2022 to Oct 20, 2023	37.38" (+2.98")	31.78" (-0.28")	33.49" (+1.28")

U.S. Seasonal (3-Month) Drought Outlook



Drought Outlook Category

- Drought persists
- Drought remains but improves
- Drought removal likely
- Drought development likely



Source(s): Climate Prediction Center
Updates Monthly: 10/19/23

[Drought.gov](https://drought.gov)

Drought conditions are not expected to expand across the region through January.

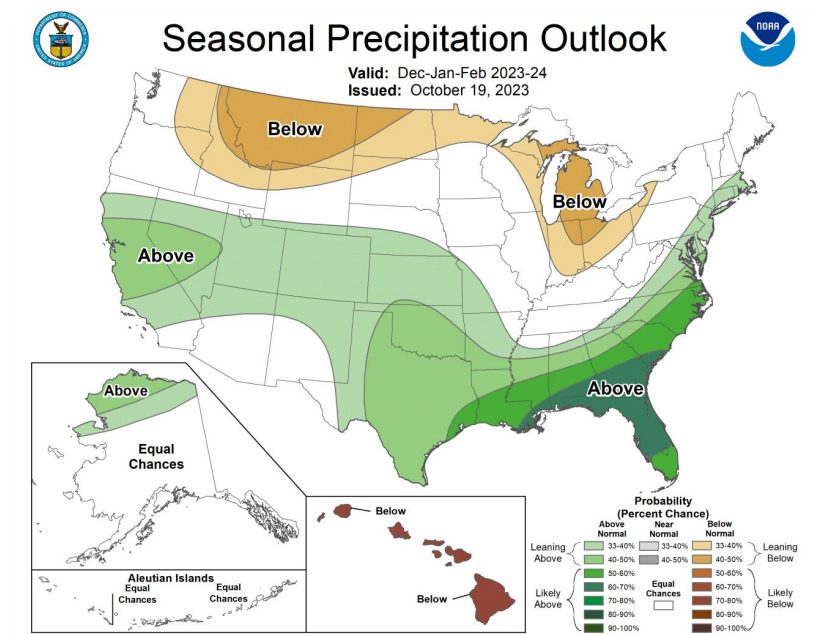
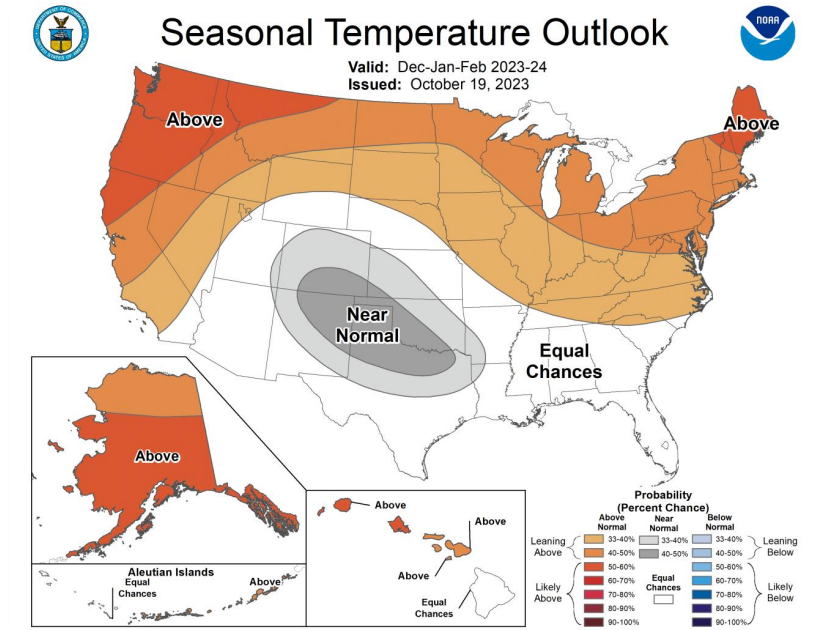


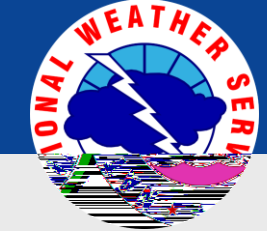


Outlook Summary

2023-2024 Winter Outlook for SE MI

- El Niño is expected to be a primary driver of the upper air pattern this winter and the outlook is based heavily upon typical impacts.
- El Niño often (but not always) results in drier and warmer than normal winters for Southeast Michigan. Thus, probabilities lean towards **above normal temperatures** and **below normal precipitation**. Note: this is not a snowfall outlook, but generally milder temps and below normal precip would favor below normal snowfall as well.
- Trends over recent years are also accounted for in these outlooks, which show Southeast Michigan winters generally becoming warmer.
- Ensemble model guidance advertising increased probability for above normal temperatures provides additional confidence.
- Despite odds favoring a milder and drier winter overall, that does not rule out cold outbreaks and/or periods of heavy snow which remain a possibility like in any other winter.
- Drought conditions are currently not expected to expand across the region.





Winter Records and Trivia – Temperature

2023-2024 Winter Outlook for SE MI

Normal High Temp	December	January	February	Winter (DJF)
Detroit	37.2	32.3	35.2	34.9
Flint	34.9	29.9	32.8	32.6
Saginaw	34.7	29.5	31.8	32.0

Normal Low Temp	December	January	February	Winter (DJF)
Detroit	25.3	19.2	20.8	21.8
Flint	22.5	16.0	16.7	18.4
Saginaw	23.1	16.4	17.3	18.9

Warmest...	Temperature	Month	Winter (DJF)
Detroit	70 (2/24/2017 & 2/11/1999)	41.1 (Dec. 2015)	37.0 (1881 – 1882)
Flint	70 (12/5/2001)	41.0 (Dec. 2015)	33.6 (1931 – 1932)
Saginaw	67 (12/5/2001 & 2/22/1930)	39.1 (Dec. 2015)	33.2 (1931 – 1932)

Coollest...	Temperature	Month	Winter (DJF)
Detroit	-21 (1/21/1984)	12.2 (Feb. 1875)	18.7 (1903 – 1904)
Flint	-25 (2/20/2015 & 1/18/1976)	10.9 (Jan. 1977)	16.9 (1976 – 1977)
Saginaw	-23 (2/5/1918)	9.4 (Jan. 1912)	13.3 (1911 – 1912)

Normal number of days per winter with a min temp at or below 0 degrees: Detroit: 3.4; Flint: 8.7; Saginaw: 6.5

All temps in °F; normals reflect 1991-2020 period



Winter Records and Trivia – Precipitation & Snowfall

2023-2024 Winter Outlook for SE MI

Normal Precipitation	December	January	February	Winter (DJF)
Detroit	2.25"	2.23"	2.08"	6.56"
Flint	1.89"	1.99"	1.68"	5.56"
Saginaw	1.85"	1.92"	1.77"	5.54"

Normal Snowfall	December	January	February	Winter (DJF)
Detroit	8.9"	14.0"	12.5"	35.4"
Flint	11.4"	15.1"	13.0"	39.5"
Saginaw	11.8"	13.9"	11.4"	37.1"

Wettest...	Month	Winter (DJF)
Detroit	6.41" (Feb. 1881)	12.74" (1949 – 1950)
Flint	5.28" (Feb. 1954)	10.48" (1949 – 1950)
Saginaw	6.10" (Feb. 1997)	11.95" (1996 – 1997)

Snowiest...	Month	Winter (DJF)
Detroit	39.1" (Jan. 2014)	78.0" (2013 – 2014)
Flint	35.3" (Dec. 2000)	71.6" (2013 – 2014)
Saginaw	40.2" (Dec. 2000)	75.7" (2007 – 2008)

Driest...	Month	Winter (DJF)
Detroit	0.04" (Feb. 1877)	2.24" (2002 – 2003)
Flint	0.07" (Jan. 1945)	1.51" (1962 – 1963)
Saginaw	0.21" (Feb. 1969)	1.86" (1941 – 1942)

Least Snowy...	Month	Winter (DJF)
Detroit	0.0" (Dec. 1889)	5.6" (1889 – 1890)
Flint	T (Jan. 1934)	5.8" (1936 – 1937)
Saginaw	T (Dec. 1943 & Feb. 1987)	5.6" (1941 – 1942)