# December 2010 Climate Summary for Southwest Lower Michigan

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## *Overview*

December 2010 was a little cooler, drier and had less snow than normal across the area.

The first two thirds of December were generally cooler than normal and the last third was around to a bit above normal. This resulted in average temperatures for the month ranging from around normal to 4 degrees below normal.

Precipitation in December 2010 fell frequently through the first two thirds of the month with at least a trace amount recorded on most days. Most of this fell as snow. The end of the month was fairly dry, with the exception of the 30$^{th}$ and 31$^{st}$, when rainfall amounts of over a half inch were recorded. Overall, precipitation totals for December 2010 ranged from under an inch to 3 inches, which was a half inch to an inch and a half below normal.

Total snowfall for December ranged from around 5 inches in the southeast to over 20 inches near Lake Michigan. This was near normal in a few locations and ranged up to over 15 inches below normal for some locations such as at the Muskegon County Airport.

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**TABLE 1.** Average temperature and precipitation / snowfall totals for December 2010 at the primary climate stations. Normals are computed from the 1971-2000 30-year average.

| Location | | Average Temperature (degrees F) | Precipitation (inches) | Snowfall (inches) |
|---|---|---|---|---|
| | | | | |
| Grand Rapids | *Reported* | 27.4 | 1.78 | 11.4 |
| | *Normal* | 27.6 | 2.70 | 18.8 |
| | *Departure* | -0.2 | -0.92 | -7.4 |
| | *Record Max Avg (year)* | 42.8 (1982) | | |
| | *Record Min Avg (year)* | 9.8 (1989) | | |
| | *Record Max (year)* | 69 (2001) | 6.95 (1893) | 59.2 (2000) |
| | *Record Min (year)* | -18 (1983) | 0.31 (1913) | 0.0 |
| | | | | |
| Lansing | *Reported* | 24.4 | 1.65 | 8.1 |
| | *Normal* | 26.9 | 2.17 | 13.2 |
| | *Departure* | + 2.5 | -0.52 | -5.1 |
| | *Record Max Avg (year)* | 45.1 (1889) | | |
| | *Record Min Avg (year)* | 3.1 (1876) | | |
| | *Record Max (year)* | 70 (1875) | 6.91 (1895) | 31.9 (2000) |
| | *Record Min (year)* | -25 (1884) | 0.37 (1967) | 0.0 |
| | | | | |
| Muskegon | *Reported* | 28.6 | 1.87 | 13.8 |
| | *Normal* | 28.6 | 2.64 | 29.3 |
| | *Departure* | +/- 0.0 | -0.77 | -15.5 |
| | *Record Max Avg (year)* | 42.8 (1931) | | |
| | *Record Min Avg (year)* | 14.0 (1913) | | |
| | *Record Max (year)* | 64 (1982) | 6.99 (2008) | 82.6 (1963) |
| | *Record Min (year)* | -15 (1976) | 0.47 (1930) | 0.0 |

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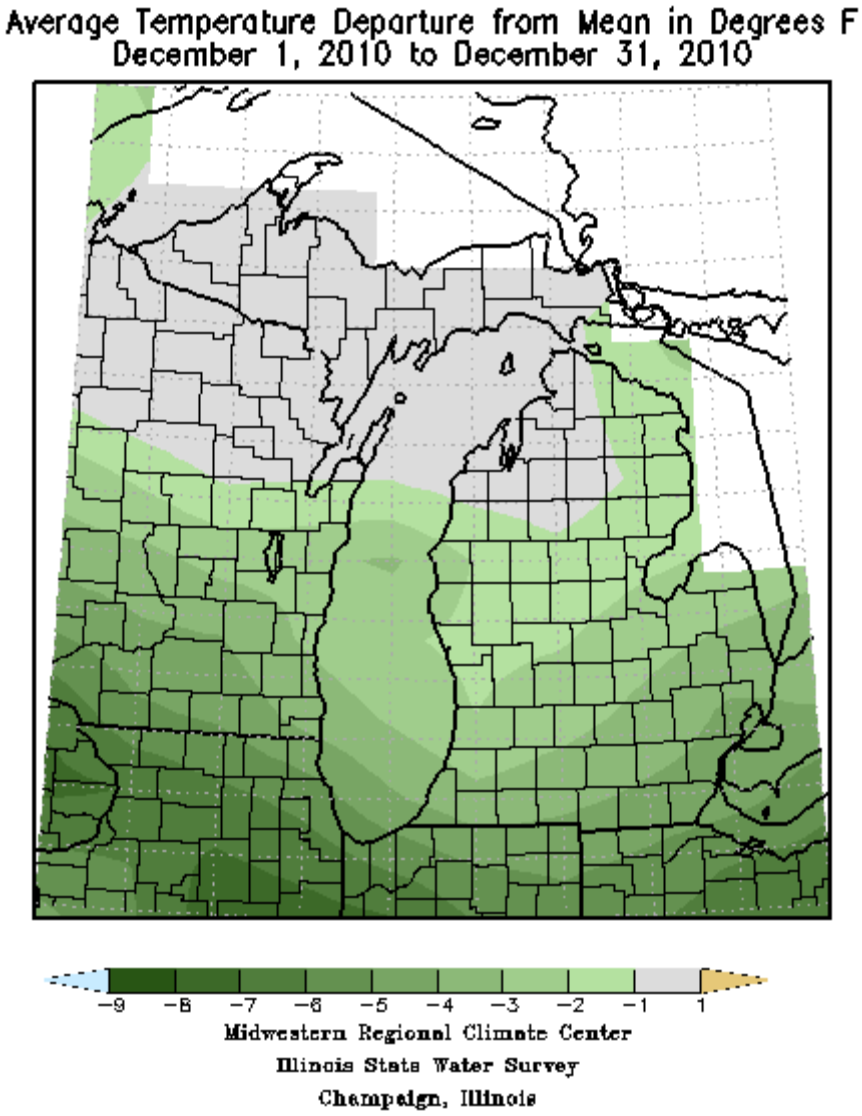


**FIG. 1.** December 2010 average temperature departure from normal.

**Temperatures:**

Temperatures for December 2010 ranged from near normal values across northern Lower Michigan to over 4 degrees cooler than normal across the south (Fig. 1).

Temperature trends at the primary climate stations can be seen in Figs. 2-4. As December began, cold air was flowing into the region behind a cold front. Temperatures remained below average through the 9$^{th}$, thanks to another system passing to the south of the area, which reinforced the cold north-northwest flow. A strong storm system pulled warmer air into the region for the 10$^{th}$ and 11$^{th}$. Colder air

then moved back into Michigan beginning on the 12th. The air slowly warmed through the 19th to around normal values. Warming continued through the 23rd, when a wave of low pressure passed through. This wave brought stronger northwest winds and temperatures fell back down to around normal. A storm developed in the plains on the 29th and brought warm air into the region for the end of December. The 30th and 31st were both over 15 degrees above normal. Overall, the entire state of Michigan had the 38th coldest winter out the past 116 years (Fig. 5).

**TABLE 2.** December 2010 temperature frequencies at the primary climate stations.

| Number of days | Grand Rapids | Lansing | Muskegon |
|---|---|---|---|
| *highs ≥ 60 (2010)* | 0 | 0 | 0 |
| *highs ≥ 60 (2009)* | 0 | 0 | 0 |
| *highs ≥ 60 (normal)* | 0.5 | 0.6 | 0.2 |
| *highs ≥ 60 (record)* | 5 | 6 | 5 |
| *year(s) of record* | 1982 | 1982 | 1982 |
| | | | |
| *highs ≤ 32 (2010)* | 20 | 25 | 20 |
| *highs ≤ 32 (2009)* | 16 | 17 | 14 |
| *highs ≤ 32 (normal)* | 13.1 | 12.8 | 12.0 |
| *highs ≤ 32 (record)* | 25 | 26 | 24 |
| *year(s) of record* | 1989 | 1876, 1989 | 1989 |
| | | | |
| *lows ≤ 32 (2010)* | 29 | 30 | 29 |
| *lows ≤ 32 (2009)* | 27 | 28 | 27 |
| *lows ≤ 32 (normal)* | 27.8 | 27.4 | 26.3 |
| *lows ≤ 32 (record)* | 31 | 31 | 31 |
| *year(s) of record* | Many | Many | Many |
| | | | |
| *lows ≤ 0 (2010)* | 0 | 0 | 0 |
| *lows ≤ 0 (2009)* | 0 | 0 | 0 |
| *lows ≤ 0 (normal)* | 1.2 | 2.3 | 0.5 |
| *lows ≤ 0 (record)* | 8 | 13 | 4 |
| *year(s) of record* | 1983 | 1876 | 1976 |

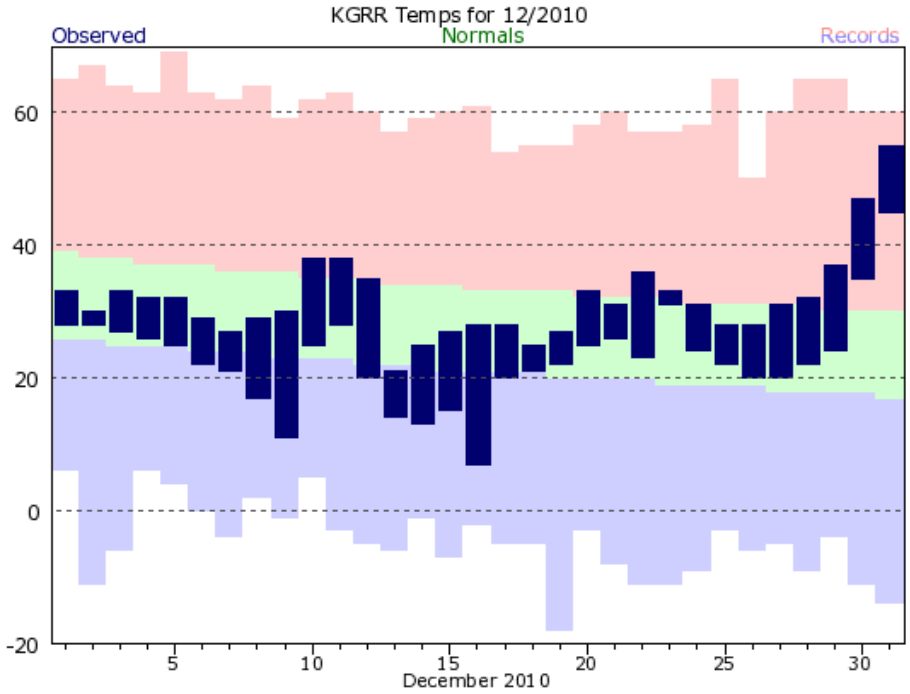


**FIG. 2.** Observed temperatures at the Grand Rapids International Airport. Dark blue bars are the temperature range for each day. The yellow strip indicates the normal range of temperatures. Record high and low temperatures are indicated at the top of the pink area and the bottom of the blue area, respectively.

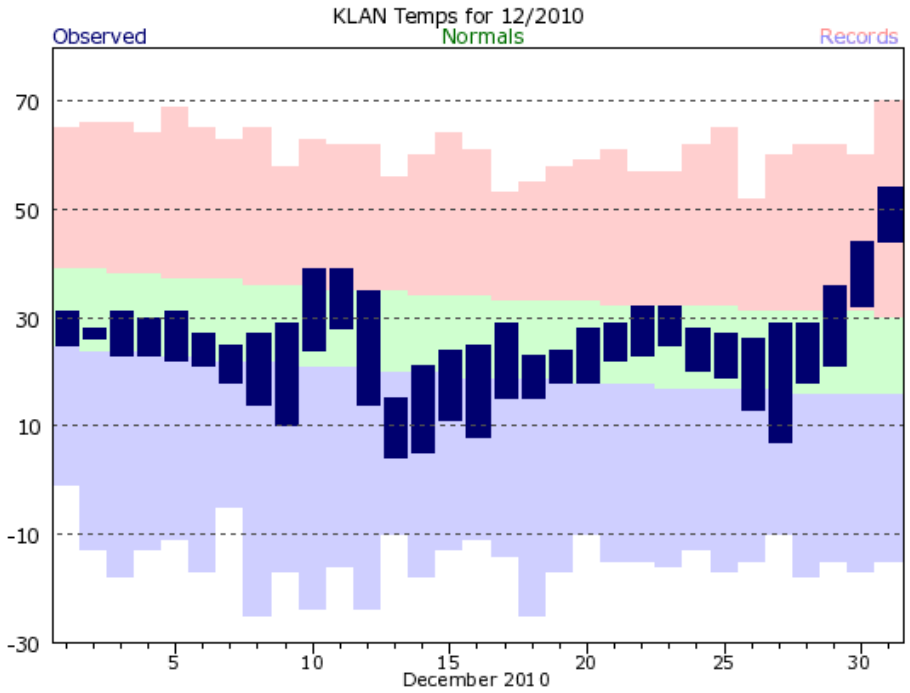


**FIG. 3.** As in Fig. 2, except for the Lansing/Capital City Airport.

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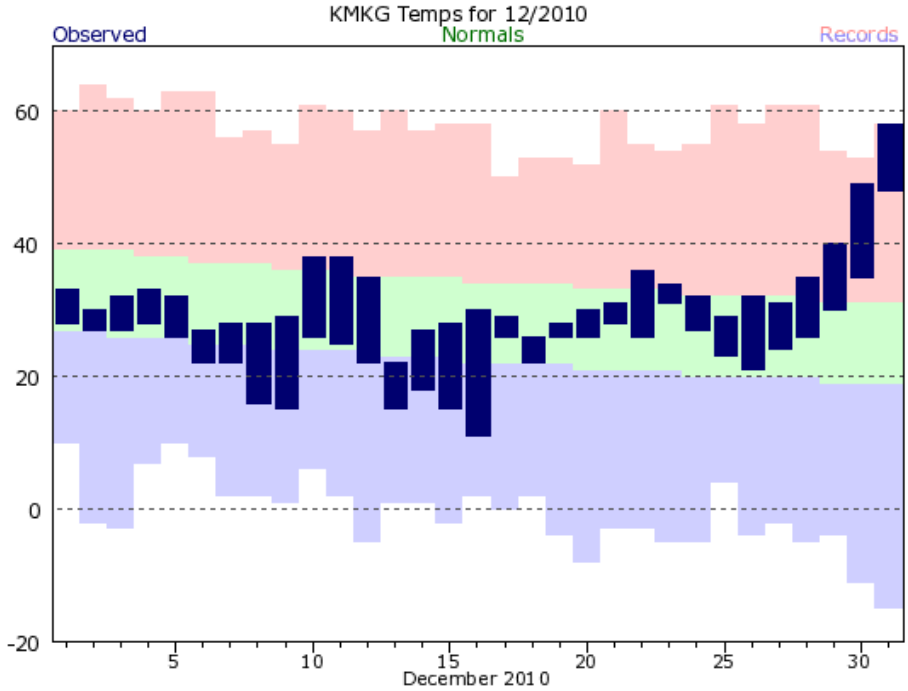


**FIG. 4.** As in Fig. 2, except for the Muskegon County Airport.

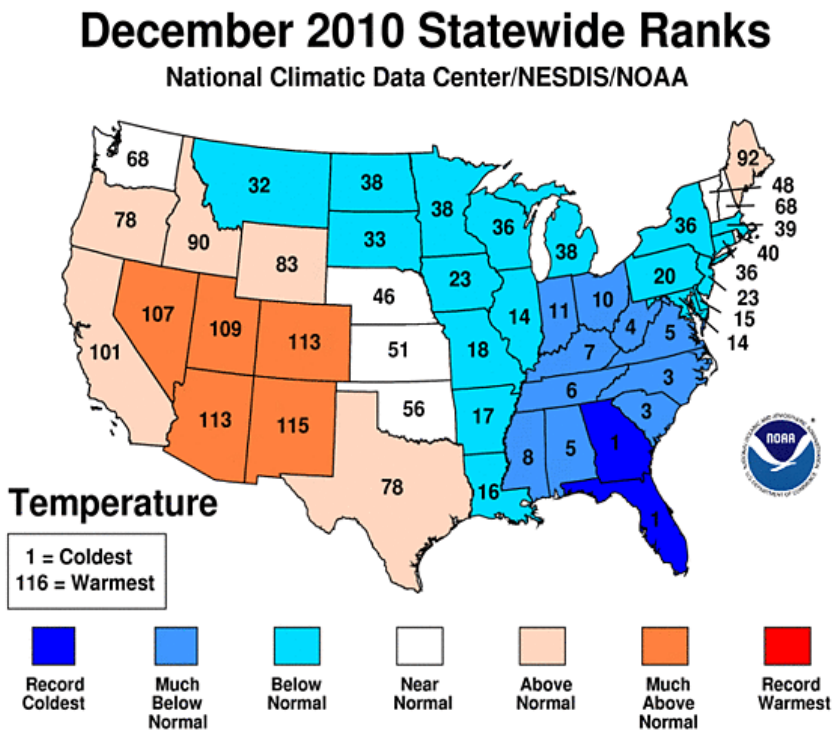


**FIG. 5.** National Climate Data Center state temperature ranking for December 2010.

# December 2010 Climate Summary for Southwest Lower Michigan

**Precipitation:**

December 2010 had precipitation values (Fig. 6) ranging from ¾ of an inch around Gratiot County to around 2 inches near Lake Michigan. This ranged from ¾ of an inch below normal in central Lower Michigan (Fig. 7) to over an inch below normal across the south of the state.

Precipitation trends for the primary climate stations can be seen in Fig. 8-10. As December began, snow was ongoing due to a low pressure system pulling out of the region. This transitioned to lake effect snow on the 2nd, which continued into the 3rd. A clipper system moved to the south of the region on the 4th to the 5th. This brought lake effect snow back to the area for the 5th through the 8th.

A strong storm system then moved toward the region. It brought snow showers on the 9th and 10th which changed to rain by the 11th as warmer air was pulled into the region. The precipitation changed back to snow by late on the 11th and transitioned to lake effect by late on the 12th. A weak wave of low pressure enhanced the lake effect snow and kept it going into the 15th.

A series of short waves moved through the region from the 17th to the 19th bringing light lake enhanced snow to Lower Michigan. A stronger short wave moved through on the 21st and 22nd with more snow. Northwest flow developed around Christmas and light lake effect snow fell across much of the area.

A storm developed in the plains on the 29th and brought warm air and over a half inch of rain to Southwest Lower Michigan through the end of December. Overall, the state of Michigan experienced the 17th driest December in the past 116 years (Fig. 11).

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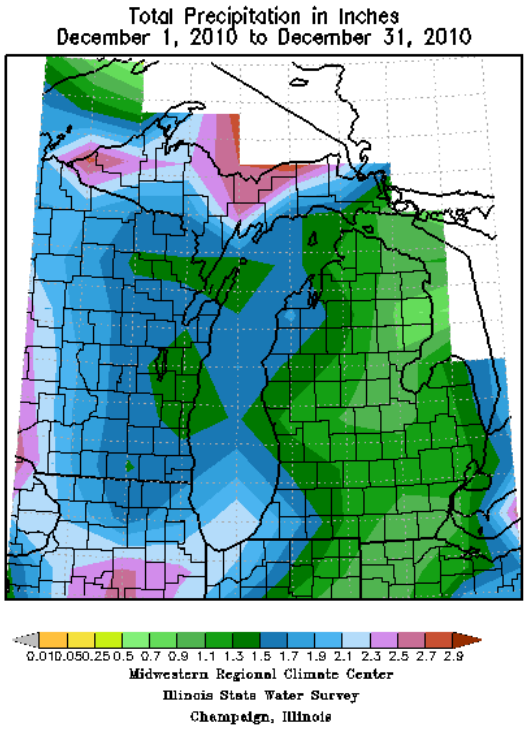


**FIG. 6.** Total precipitation for Michigan during December 2010.

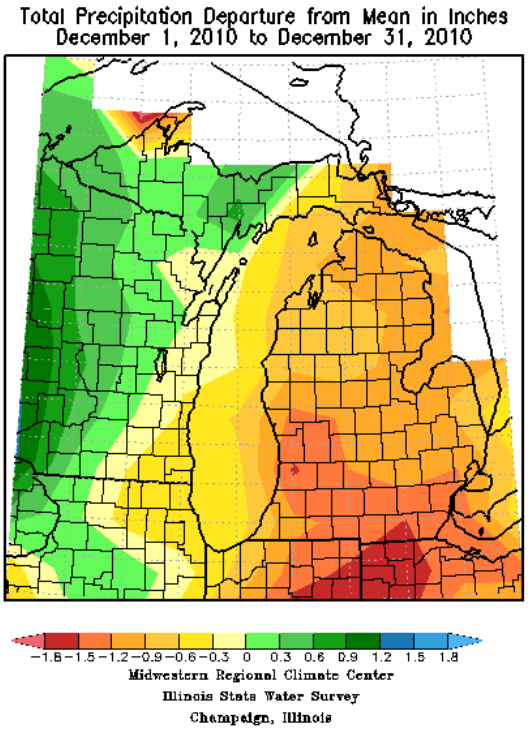


**FIG. 7.** Precipitation departure from normal for Michigan during December 2010.

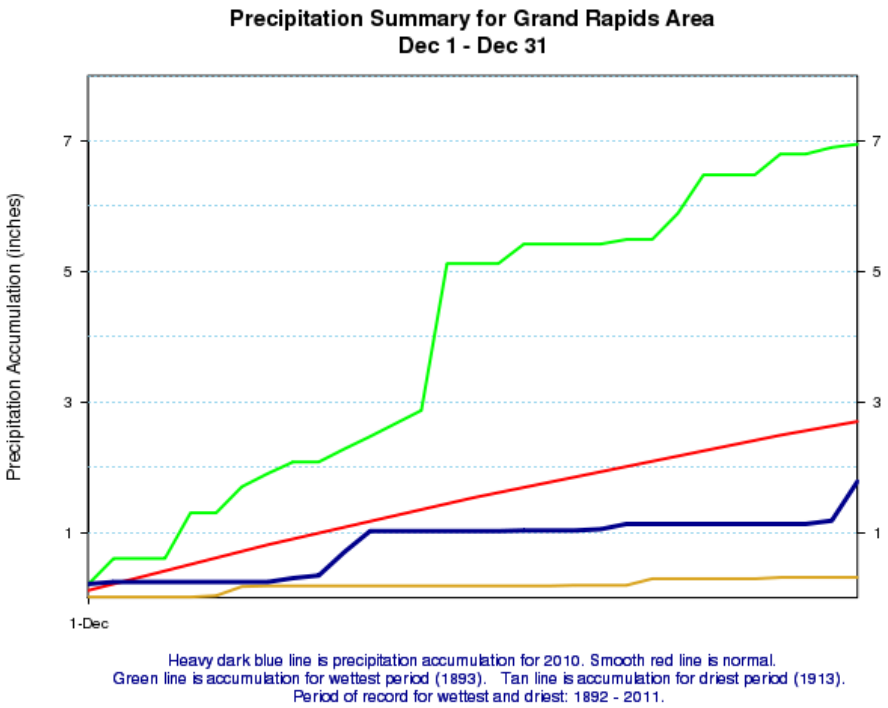


**FIG. 8.** Precipitation accumulation in inches for December 2010 at the G.R. Ford International Airport.

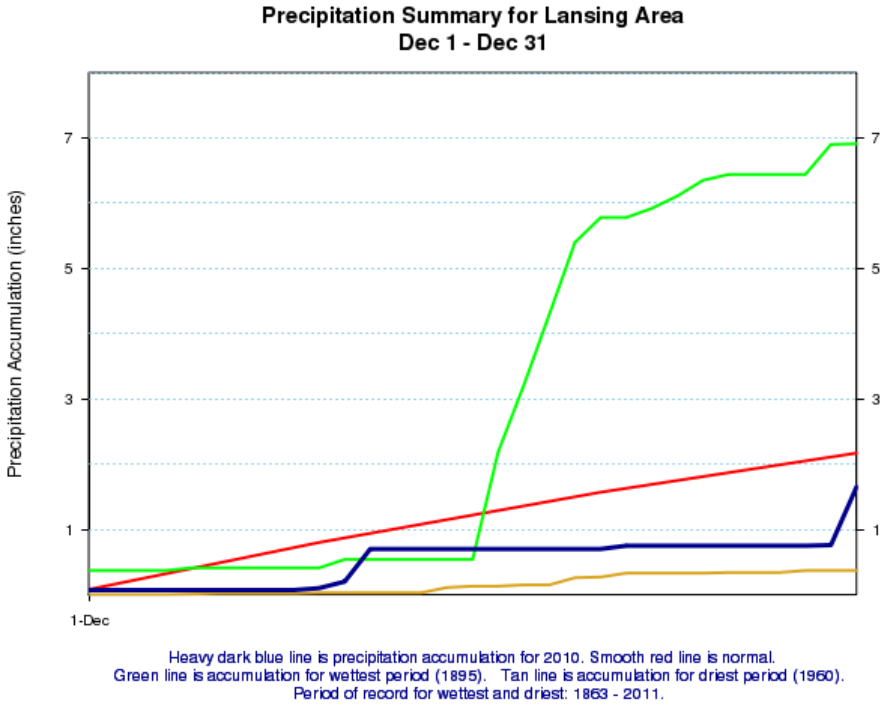


**FIG. 9.** As in Fig. 9, except for the Lansing Capital City Airport.

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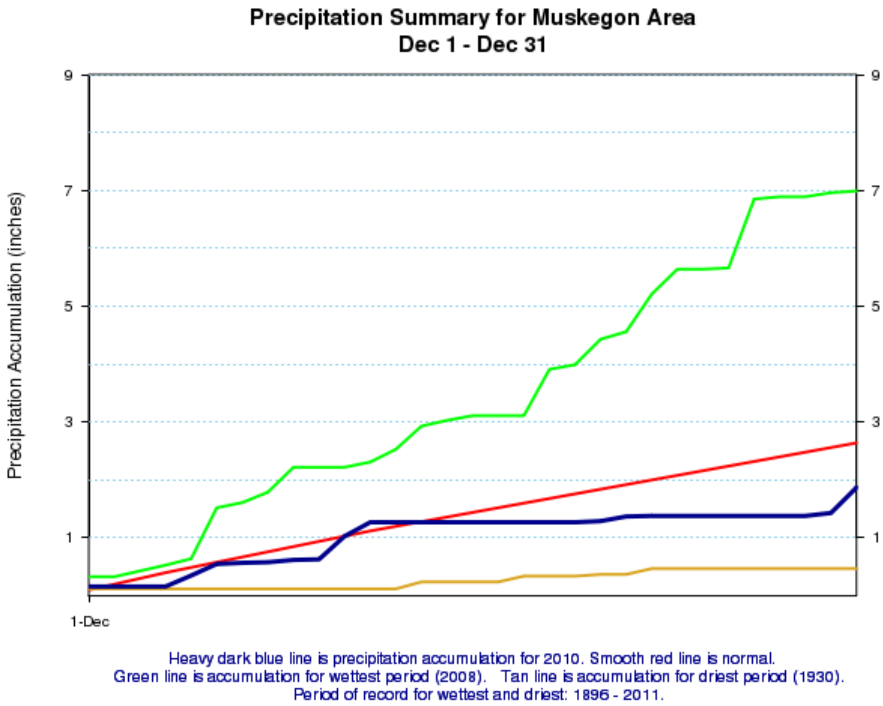


**FIG. 10.** As in Fig. 9, except for the Muskegon County Airport

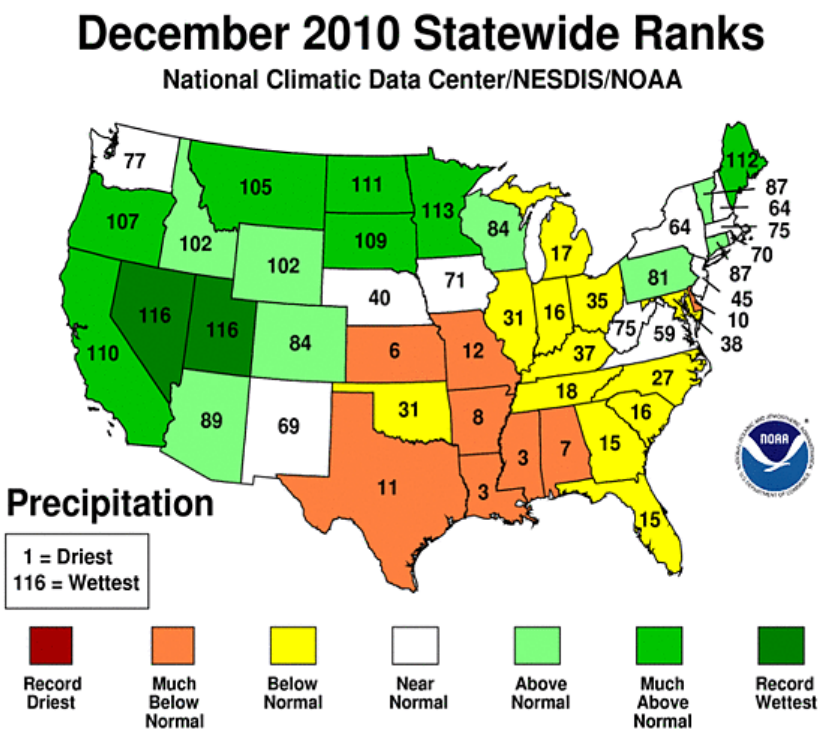


**FIG. 11.** National Climate Data Center state precipitation ranking for December 2010.

# December 2010 Climate Summary for Southwest Lower Michigan

## Highlights of the month of December 2010

**1st – 2nd**

Synoptic snow (Fig. 12) falls as a strong system passes through the area.

**5th – 8th**

A clipper system moved to the south of the region on the 4th to the 5th. This brought lake effect snow (Fig. 13) to the area for the 5th through the 8th.

**9th – 15th**

A strong storm system moved through the region and brought snow with lake enhancement (Fig. 14) on the 11th and 12th.mainly to central Lower Michigan. The precipitation transitioned to lake effect snow by late on the 12th. A weak wave of low pressure enhanced the lake effect snow and kept it going into the 15th.

**16th - 23rd**

A series of short waves moved through the region from the 17th to the 19th bringing light lake enhanced snow to Lower Michigan. A stronger short wave moved through on the 21st and 22nd with more snow. Temperatures slowly warmed to above normal through the period.

**24th - 26th**

Northwest flow developed around Christmas and light lake effect snow fell on the 26th across much of the area. This brought stronger northwest winds, and temperatures fell back down to around normal.

**28th – 31st**

A storm developed in the plains on the 29th and brought warm air and over a half inch of rain to Southwest Lower Michigan through the end of December. The 30th and 31st were both over 15 degrees above normal.

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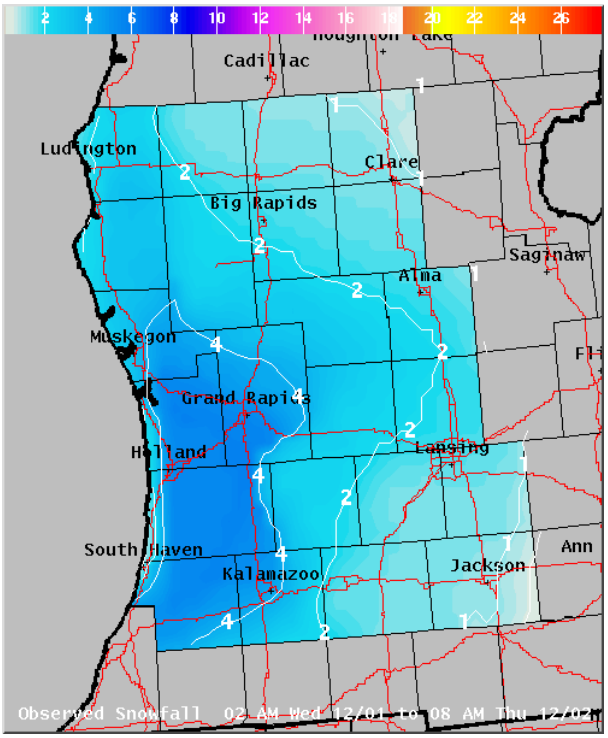


**FIG. 12.** Observed snowfall for December 1st and 2nd, 2010

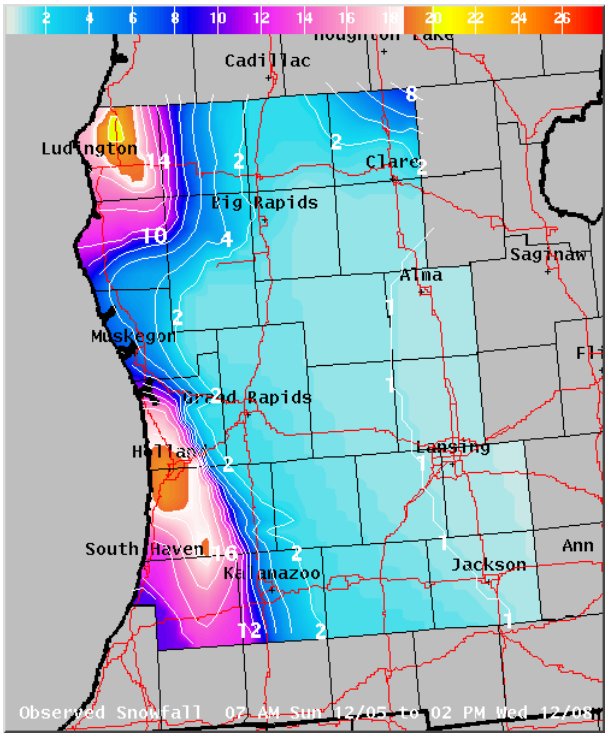


**FIG. 13.** Observed snowfall for December 5th to the 8th, 2010

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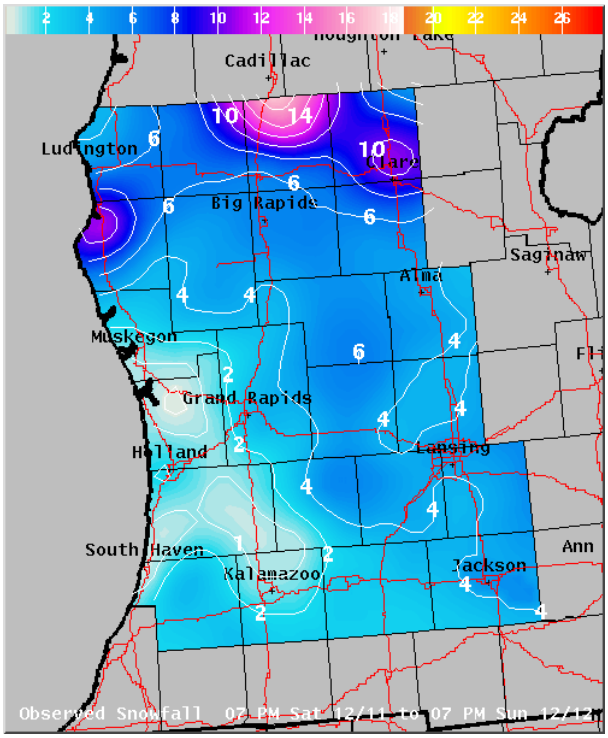


**FIG. 14.** Observed snowfall for December 11th and 12th, 2010