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And
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Indiana State Climate Office

Monthly Weather Report

Apr 8, 2014



<http://www.inclimate.org>

March 2014 Climate Summary

Month Summary

Winter had officially ended by the calendar but snow and cold persisted in Indiana to the end of the month. March became the fifth consecutive month with below normal temperature, a testimony to how intense and extended the recent winter season has been. The month was drier than normal with just 5 statewide snow days. The bit of good news from this is the number of traffic accidents due to slippery highways fell this month.

The March state average temperature was 34.1°F, or 6.6°F below normal. This ranks the month as the 10th coldest March on record. It had been a long time, 30 years ago, since March has been this cold in Indiana. This occurred in 1984 when the March state average temperature was 32.4°F, pegged at 4th place. Before then March 1978 with its 33.6°F average temperature wasn't quite as cold, placing 8th in the record book. The coldest March on record since 1895 was in 1960 with its state temperature of 26.3°F. The day split in March 2014 was heavily one sided. There were 24 days of below normal temperature, 5 days above normal, and 2 days at normal. The state average temperature was 10°F or more below normal on 11 days and 20°F or more below normal on 2 days. There was just 1 day when the daily temperature was 10°F or more above normal. The highest cooperative network temperature of the month was 77°F recorded on March 12th at French Lick. The coldest temperature was -7°F observed on two dates: on March 1st at Angola, and again on March 3rd at Wanatah and Lagrange.

March state precipitation averaged 2.01 inches which is 1.39 inch below normal. This ties March 1900 as the 19th driest March on record since 1895. Some recent drier Marches include a 0.98 inch amount in 2001 in 3rd place, and a 1.35 inch value in 1994, coming in at 6th place. The driest March on record goes way back to 1910, with 0.23 inch posted. Regionally March 2014 precipitation was about 55% of normal in the northern and southern thirds of Indiana, and 65% of normal in the central third of the state. Normal March precipitation ranges between 2.7 inches in northeast Indiana to 4.2 inches in the southwest. The highest single day precipitation in the cooperative network this month was 1.80 inches on March 3rd at the Evansville Museum and on March 12th at a location near Kokomo. In the CoCoRaHS network the highest daily value was 1.59 inches on March 12th in New Ross. Widespread precipitation fell on about 13 days this month.

Snowfall in March totaled between 14 and 22 inches in the Lake Michigan effect region. Elsewhere in northern Indiana snow totals ranged from about 8 to 14 inches. Central areas received 2 to 8 inches with 2 to 3 inches common in southern Indiana. The highest March snowfall in the cooperative network was 22.5 inches measured at Indiana Dunes. Among CoCoRaHS volunteers the greatest total was 20.8 inches in Porter. The largest single day snowfall in that network was

11.0 inches recorded on March 13th just outside Valparaiso. Widespread snow fell on about 5 days this month. Precipitation and snowfall maps are found in the weekly narratives which follow.

Drivers were perhaps too eager to put away their winter driving skills. After a few days of pleasant weather, motorists seemed surprised by snow events on March 12th and 25th. There were dozens of vehicle slide offs and accidents in several counties especially on these two dates. Some cars overturned on slick roads, pinning in drivers, even in areas with only a dusting of snowfall.

March 1st – 8th

The big chill continued through a second week. The state average temperature has remained below normal for 14 consecutive days. Precipitation was also less than normal for a second straight week, although totals were actually higher. Snow fell across most of the state to start the month. Winter should wind down soon as March transitions into spring.

Another cold front was passing through Indiana on March 1st, holding the state average temperature cold at 9°F below normal. The front pushed south of the Ohio River the next day as cold arctic air arrived, dropping temperatures still further to 16°F below normal. Strong high pressure muscled in behind the front, clearing Indiana skies in time for even colder temperatures of 23°F below normal on March 3rd, the coldest day of the 8 day interval.

This high pressure ridge was big and strong, sprawling ever wider from Arkansas to Pennsylvania on March 4th. As the ridge crept east, Indiana temperatures climbed higher each of the next 4 days under clear skies. By March 7th the state temperature had reached 4°F below normal, the warmest of the 8 day interval. A new cold front crossed Indiana on March 8th, only the second cold front of the month. The state temperature fell slightly to 5°F below normal. Overall the first 8 days of March averaged 13°F below normal. Typical daily maximum temperatures this time of year should range between 42°F near the Michigan border to 52°F in far southwest Indiana. Normal daily minimums should vary from 25°F to 32°F north to south across the state.

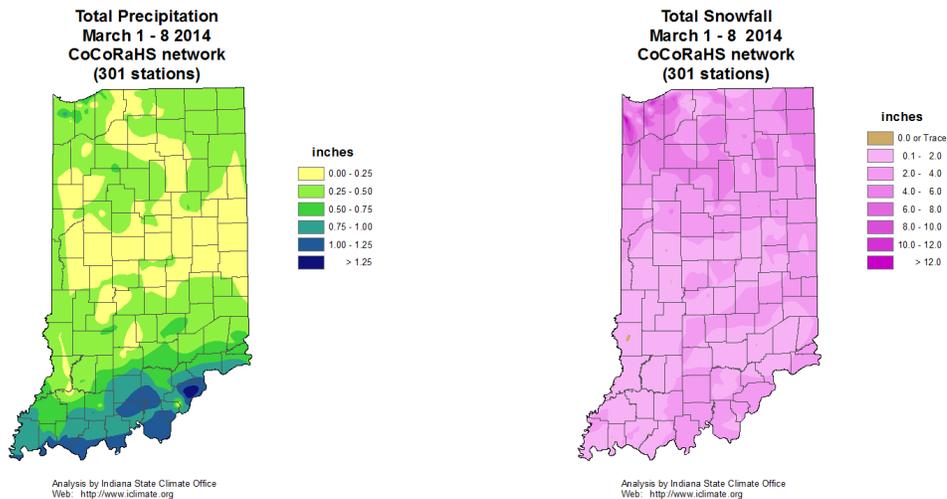
Snow continued to fall almost daily in the northern half of the state. The major storm that brought arctic cold back to Indiana on March 2nd deposited 1 to 2 inches along the Michigan border and in central Indiana but thrashed Lake and Porter counties with up to 9 inches. Precipitation in far southern Indiana counties began as rain, then changed to freezing rain which coated the ground with ice 0.10 inch to 0.25 inch thick. About a half inch of sleet followed the freezing rain that afternoon before it all changed to snow. The cold front marched south the next day, adding an extra inch of snow in the northern half of Indiana with 1 to 2 inches across the southern half. Some spots in southeast Indiana received another 3 inches of snow before the storm moved east. No new snow was reported on March 4th.

As high pressure drifted east of Indiana on March 5th and 6th, moisture from a storm southwest of the state lifted and cooled over Lake Michigan. Another inch of snow fell in this northwest corner of the state with a half inch in northeast Indiana on March 5th. The next day up to 2 inches was added in the northern third of the state. Yet up to another 2 inches was noted the morning of March 8th in the lake effect region.

By the end of the 8 days snow had piled up in Lake and Porter counties. Some of the larger snow totals in the CoCoRaHS network included 15.1 inches at St John, 13.5 inches in Porter, 11.0 inches

at the Lakes of the Four Seasons, 8.8 inches in Trail Creek, and 8.5 inches at Chesterton. Most of this total had arrived by the morning of March 2nd when Porter received 8.7 inches in 24 hours. Some of the other high single day snowfall amounts included 8.5 inches in St John, with reports of 8.4 inches and 8.0 inches in Portage. Hobart noted 7.0 inches that morning.

Most new moisture in the southern half of the state counted as rain and freezing rain. On March 3rd the largest single day precipitation reports ranged from 1.18 inch at Newburgh to 1.24 inch in Elizabeth. Fredericksburg recorded 1.22 inch that morning while Evansville noted 1.19 inch. Over the 8 days Plymouth topped the precipitation totals list with 1.73 inch while Fredericksburg had 1.26 inch, Elizabeth 1.24 inch, and two Evansville volunteers measured 1.19 and 1.18 inch totals. Regional averages came in at about one-third inch in northern and central Indiana with 0.6 inch across the south. These precipitation totals equate to about 50% of normal in northern Indiana, a third of normal in central areas, and 60% of normal in the southern region.



March 9th – 15th

The long cold spell ended on March 9th at 15 consecutive days of below normal state temperatures. Then came this week as temperatures varied widely on both sides of normal, more typical of March. The snow season wasn't over yet as a surprise snow storm arrived in Indiana in mid-week.

High pressure settled over Indiana as the week began March 9th. The state average temperature was near 5°F below normal. Finally two weeks of cold relented. High pressure drifted southeast of Indiana the next day and the state average temperature responded to reach 5°F above normal. A storm system in Kansas on March 11th stretched a long stationary front from there eastward across Indiana to Pennsylvania. Warmer air flowed into Indiana and temperatures continued to rise to 13°F above normal, the warmest day of the week.

A Canadian cold front surged south the next day and caught up with the stationary front where they merged and pushed into Kentucky. Arctic air reclaimed Indiana, dragging temperatures lower to 2°F below normal. A high pressure ridge settled over Indiana on March 13th as state temperatures continued to fall to 13°F below normal, the coldest of the week. The next day an Alberta clipper system dove south into Wisconsin. Its warm front quickly crossed Indiana. A new warming trend lifted the state temperature to 4°F below normal. The week ended on March 15th with the clipper cold front sliding through Indiana, followed by another cold front right behind it. Yet these fronts were much weaker than the mid-week system and were already slowing down.

The state average temperature closed out the week at 2°F above normal. The extreme temperature swings this week both above and below normal nearly balanced with a net weekly temperature of less than 1°F below normal. Typically for the second week of March daily maximum temperatures should vary between 45°F in far northern Indiana to 55°F in the far southwest corner. Daily minimums normally range from 27°F to 34°F north to south across the state.

Up to 2 inches of new snowfall was measured on the morning of March 9th in the northwest lake effect region. This moisture came with the cold front that passed through Indiana at the very end of last week. A few pleasant spring like days followed and some Hoosiers thought winter was finally over.

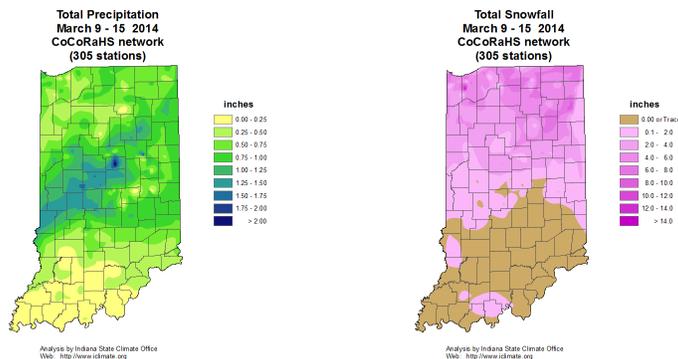
The reality of winter came roaring back in the early morning hours of March 12th. The storm began as rain, transitioned to sleet, and finally to snow before dawn. The CoCoRaHS data a few hours later revealed that 5 to 7 inches of snow had fallen along the Lake Michigan shore, with about 2 to 5 inches elsewhere across northern Indiana. Snowfall amounts in central Indiana ranged from around a half inch to 2 inches with nearly all of this snow north of Indianapolis. Rain did not turn to snow across the southern half of the state until later on March 12th.

All precipitation had turned to snow before the next CoCoRaHS daily measurement on March 13th. On that morning 3 to 7 inches of new snow had fallen in the northeast quarter of the state while up to 2 more inches had arrived in northwest Indiana. In central counties new snow amounts varied from a half to 3 inches. Just a trace was recorded generally in the southeast third of the state. Snow was streaky in southwest Indiana with narrow bands of up to 2 inches but most areas had nothing. The heaviest local snowfall noted on March 13th was 11.0 inches in Valparaiso. Nearby Portage had 8.0 inches, while in the northeast Columbia City had 7.5 inches and Hometown 6.5 inches. Grand snowfall totals for the week included 16.9 inches at Valparaiso, 8.7 and 8.4 inches at two Fort Wayne locations, 8.5 inches in Leo, and 8.3 inches at Syracuse.

The heaviest local single day precipitation numbers on March 12th had New Ross with 1.59 inch, West Terre Haute at 1.49 inch, and Clayton with 1.41 inch. Whitestown noted 1.39 inch while in Lebanon 1.37 inch was recorded. Overall for the week New Ross totaled 1.66 inch, Atlanta 1.48 inch, Zionsville and Clayton 1.45 inch, with 1.42 inch at Kokomo. Regional averages came in at near 0.7 inch across northern Indiana, 1.1 inch in central sections, and just 0.3 inch in the south. These amounts equate to about 130% of normal in the north, 150% of normal in central Indiana, and right about normal across the southern third of the state.

Some drivers were caught off guard by the mid-week snow storm. While the long winter provided many snow events with which to improve winter driving skills, some drivers had already shelved

those skills until next winter. Several county police departments had already reported dozens of slide offs and accidents on area roadways just hours after the snow had started on March 12th. Winds became gusty after the first round of snow ended that afternoon. Besides difficult travel conditions the high winds snapped trees and limbs which fell on power lines. A few thousand homes in west central Indiana lost power until evening. Some traffic signals became plastered by wind driven snow and snarled traffic with driver confusion in these areas.



March 16th – 22nd

Despite a cold start the state average temperature rode a warming trend through most of this week. It was rather dry with precipitation concentrated in the far northern and southern tier of counties, along the Michigan border and Ohio River. The sun crossed the equator into the northern hemisphere on March 20th so daylight hours now exceed the duration of darkness.

A high pressure ridge was building into Indiana from the southwest as the week began, keeping the state temperature cold at 10°F below normal. A weak weather system, a low pressure trough, moved through the state on March 18th in advance of warmer air. By the next day it was obvious Indiana was within the warm air sector of the next storm system as temperatures had rebounded to normal. The cold front of this storm moved through Indiana on March 20th but warming continued another day with the state temperature gaining to 5°F above normal, the warmest day of the week. The air mass behind this storm had originated from the Pacific Ocean rather than Canada. The path of the jet stream in the upper atmosphere was primarily zonal this week, steering air masses west to east while blocking new surges of arctic air from Canada.

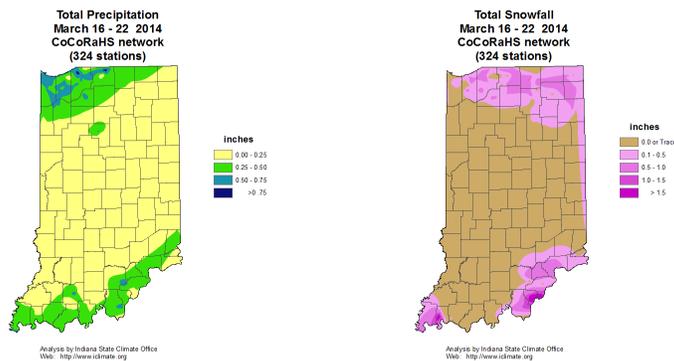
Along came another storm system on March 21st, its leading warm front stalling over central Indiana as a stationary front. Weather conditions were changing and now it was time for another cold blast from western Canada. A cold front passed through Indiana on March 22nd, opening the door to the transport of cold air into our state driven by high pressure plunging southward from the Yukon. The week ended with the state temperature at 1°F below normal.

It had taken several days this week to lift temperatures back to normal. The weekly temperature averaged to 3°F below normal. Usually by this time in March daily maximum temperatures should

vary between 48°F near the Michigan border to 58°F in the far southwest corner of the state. Daily minimums normally range from 29°F to 36°F north to south across Indiana.

The path of storms early in the week tended to be south of Indiana and north of the state later on. The lack of a direct hit was evident in the snowfall pattern: more on the northern and southern edges of the state with less across the center. On the morning of March 17th about 1 to 2 inches of snow was recorded in the vicinity of Louisville, up to an inch in counties near the Ohio River, but nothing elsewhere in the state. The north end of the state received snowfall a few days later. A trace was measured in extreme northwest Indiana the morning of March 20th. The next day up to an inch fell in the lake effect region, generally north of highway US 30. Up to 2 inches was noted in northeast Indiana but little to no snow elsewhere. Another half inch of snow was observed in northeast Indiana in readings taken the morning of March 22nd. Of interest is that the heaviest single day snowfall amounts this week all occurred in far southern Indiana. On the morning of March 17th two CoCoRaHS observers in Jeffersonville recorded 2.0 inches as did the Evansville volunteer. The Galena report was 1.8 inch. These were also the largest weekly snowfall totals around the state.

The largest precipitation totals for the week were noted in both far northern and southern counties. The South Bend observer accumulated 0.92 inch while nearby Long Beach had 0.69 inch. Laporte tallied 0.66 inch. In southern Indiana New Pekin measured 0.68 inch and Jasper summed to 0.67 inch. None of these numbers are extraordinarily high, which reflects the drier than normal status in precipitation this week. Regionally northern Indiana averaged about 0.25 inch, central near 0.05 inch, with 0.20 inch across the south. These values equate to about 40% of normal in the north, just 5% of normal in the central third, and 20% of normal in southern Indiana.



March 23rd – 31st

State average temperatures the final 9 days of March persisted below normal until the very last day of the month. Snowfall was heaviest in the center of the state with new measureable snowfall also coming to most of northern Indiana and in southwest areas. About half the state had only a trace or no snowfall. Precipitation totals trended heavier north to south but overall were below normal.

Cold air was pouring into Indiana on March 23rd with state temperatures running about 9°F below normal. High pressure moved overhead the state from Nebraska the next day, forcing temperatures downward to 14°F below normal. The high pressure center quickly moved eastward but no warm up followed. Two cold fronts pushed through Indiana on March 25th to reinforce the cold already in place. State temperatures held steady at 14°F below normal through the next day. Another high pressure ridge had moved southeast from Alberta into Indiana on March 26th and locked the cold air in place.

The cold air influx was finally halted on March 27th as the warm front of a new Great Plains storm complex crossed Indiana. The state temperature rebounded to 9°F below normal. A second warm front moved through the next day and temperatures continued upward to 3°F below normal. The warming trend was slowed temporarily as a cold front followed closely behind the second warm front. The state average temperature gave up its gains and fell back to 9°F below normal by March 29th. The high pressure ridge behind this last cold front was very narrow east to west, so the cool down was very brief. Warm southerly winds quickly returned to Indiana. By March 31st the state average temperature had reached 1°F above normal, only the fifth date this month that temperatures exceeded normal. The overall intense cold of these final 9 days was evident with an average state temperature at near 9°F below normal. Typically in late March daily maximum temperatures should range between 51°F and 61°F north to south. Normal daily minimums vary between 32°F in far northern counties to 38°F in the southwest corner of the state.

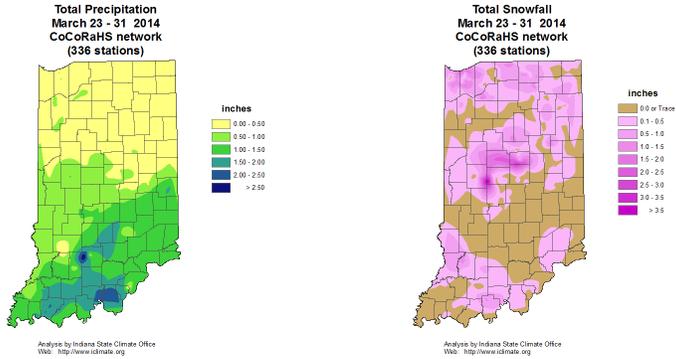
The snowfall season is ending in Indiana as snow events are becoming more localized and less organized statewide. Up to a half inch of snow was observed in extreme northwest Indiana on March 23rd with about an inch more in Lake county the next day. On March 25th up to a half inch fell in the northwest quarter of the state and in a part of southwest Indiana. Up to 1.5 inch was noted in Lake and Porter counties. The snow moved east on March 26th with variable amounts up to an inch except in northwest and west central Indiana.

The next snow came on March 29th when an inch was recorded only in the Indianapolis area. Up to another inch fell there and in northeast Indiana which was tallied on March 30th. Over the 9 day interval the largest snow total in the CoCoRaHS network was 4.3 inches in New Ross. In central Indiana two observers in Atlanta recorded 3.2 and 2.5 inches. The Frankfort volunteer had 2.3 inches while 1.8 inch was measured in Thorntown.

While snow fell throughout the 9 day interval rainfall was limited mostly to the southern half of the state during the last few days when temperatures were warmer. The highest single day precipitation, the water equivalent of melted snowfall and rainfall, was observed on the morning of March 29th. Two CoCoRaHS volunteers in Newburgh measured 1.32 and 1.30 inch. The Taylorsville observer had 1.24 inch while at Williams 1.22 inch was collected. Over the entire 9 days the New Salisbury gage accumulated 2.25 inches. Two Milltown volunteers had 2.13 and 2.06 inches. The Boonville total was 2.11 inches and Newburgh summed to 2.09 inches.

Regional average precipitation trended heavier moving south across Indiana. About 0.3 inch of precipitation fell in northern Indiana, 0.8 inch in central, and 1.3 inch in the south. These amounts equate to about 30% of normal in the northern third of the state, about 80% in central, and to right about normal in southern Indiana.

Now that spring has arrived Indiana drivers cannot wait for that last snowfall of the season to have come and gone. Slide offs and accidents continued through March later than usual. On March 25th some counties reported a few cars overturned and their drivers pinned inside, surprised yet again by slick pavement where only a dusting of snow had fallen.



March 2014

Region	Temperature	Temperature	
		Normal	Deviation
Northwest	30.1	38.6	-8.5
North Central	29.2	37.9	-8.7
Northeast	28.2	37.3	-9.1
West Central	34.3	40.6	-6.3
Central	34.3	40.1	-5.8
East Central	33.3	39.1	-5.7
Southwest	39.3	44.8	-5.5
South Central	39.1	44.2	-5.1
Southeast	37.9	43.1	-5.2
State	34.1	40.7	-6.6

Region	Precipitation	Precipitation		
		Normal	Deviation	Percent of Normal
Northwest	1.58	2.92	-1.34	54
North Central	1.58	2.78	-1.21	57
Northeast	1.45	2.71	-1.26	54
West Central	2.02	3.36	-1.34	60
Central	2.21	3.28	-1.08	67
East Central	2.04	3.08	-1.03	66
Southwest	2.28	4.23	-1.95	54
South Central	2.56	4.17	-1.61	61
Southeast	2.24	3.95	-1.70	57
State	2.01	3.40	-1.39	59

Spring so far (same as March)

Region	Temperature	Temperature	
		Normal	Deviation
Northwest	30.1	38.6	-8.5
North Central	29.2	37.9	-8.7
Northeast	28.2	37.3	-9.1
West Central	34.3	40.6	-6.3
Central	34.3	40.1	-5.8
East Central	33.3	39.1	-5.7
Southwest	39.3	44.8	-5.5
South Central	39.1	44.2	-5.1
Southeast	37.9	43.1	-5.2
State	34.1	40.7	-6.6

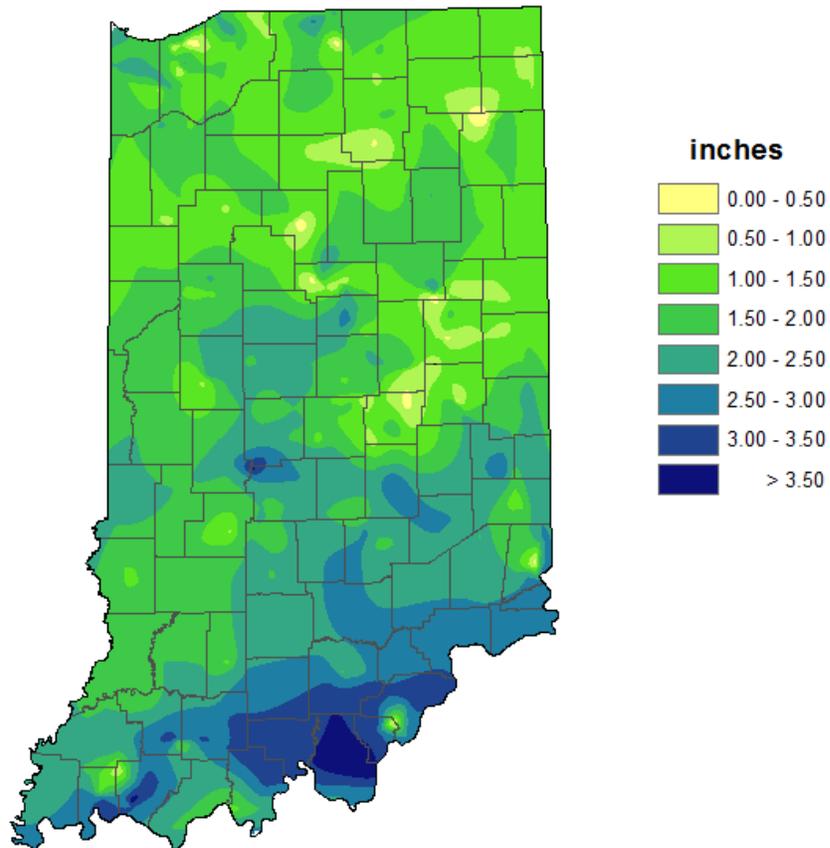
Region	Precipitation	Precipitation		
		Normal	Deviation	Percent of Normal
Northwest	1.58	2.92	-1.34	54
North Central	1.58	2.78	-1.21	57
Northeast	1.45	2.71	-1.26	54
West Central	2.02	3.36	-1.34	60
Central	2.21	3.28	-1.08	67
East Central	2.04	3.08	-1.03	66
Southwest	2.28	4.23	-1.95	54
South Central	2.56	4.17	-1.61	61
Southeast	2.24	3.95	-1.70	57
State	2.01	3.40	-1.39	59

2014 Annual so far

Region	Temperature	Temperature	
		Normal	Deviation
Northwest	20.7	29.8	-9.2
North Central	20.4	29.5	-9.1
Northeast	20.1	29.2	-9.0
West Central	24.5	32.0	-7.5
Central	25.0	31.8	-6.7
East Central	24.1	30.9	-6.8
Southwest	30.5	36.5	-6.0
South Central	30.4	36.3	-5.9
Southeast	29.0	35.3	-6.3
State	25.1	32.4	-7.4

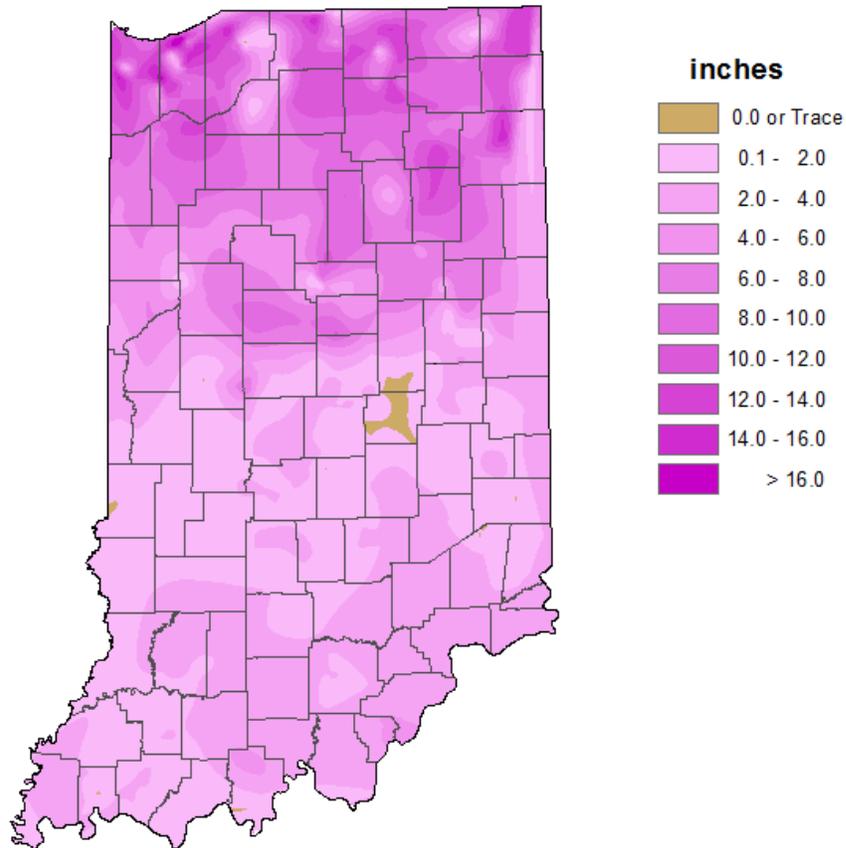
Region	Precipitation	Precipitation		
		Normal	Deviation	Percent of Normal
Northwest	6.64	6.47	0.16	103
North Central	7.08	6.63	0.45	107
Northeast	7.02	6.47	0.55	108
West Central	7.17	7.80	-0.63	92
Central	7.30	7.89	-0.60	92
East Central	6.76	7.52	-0.75	90
Southwest	6.67	10.10	-3.43	66
South Central	7.60	10.19	-2.59	75
Southeast	6.96	9.75	-2.79	71
State	7.04	8.12	-1.08	87

**Total Precipitation
March 2014
CoCoRaHS network
(333 stations)**



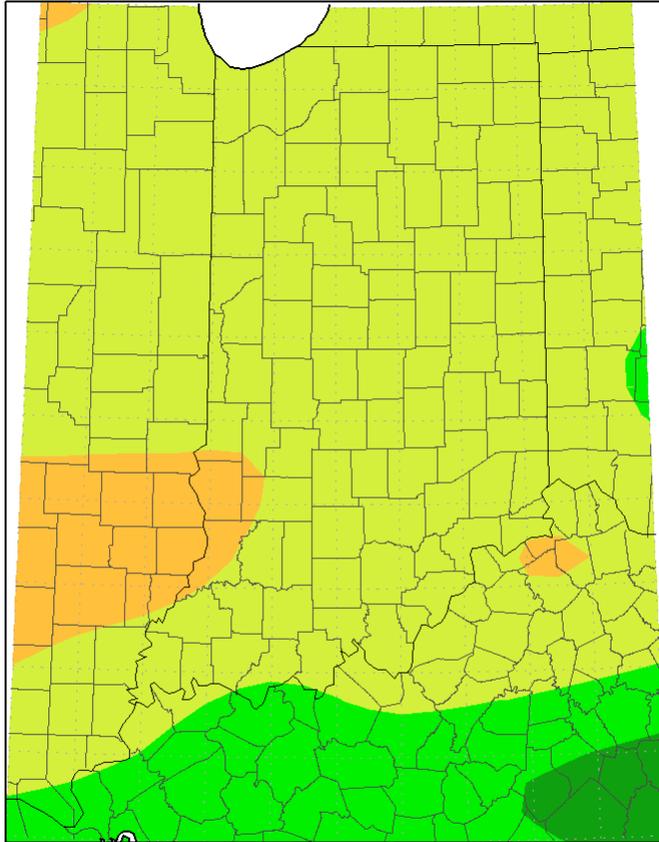
Analysis by Indiana State Climate Office
Web: <http://www.iclimate.org>

**Total Snowfall
March 2014
CoCoRaHS network
(333 stations)**

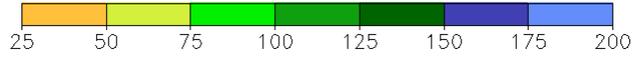


Analysis by Indiana State Climate Office
Web: <http://www.iclimat.org>

Accumulated Precipitation: Percent of Mean
March 1, 2014 to March 31, 2014

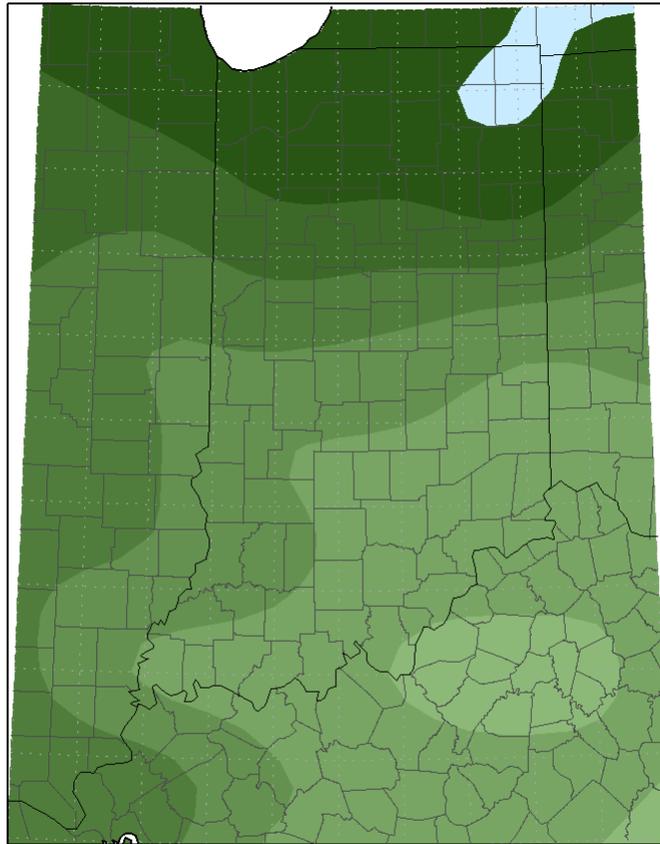


Mean period is 1981-2010.



Midwestern Regional Climate Center
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Average Temperature (°F): Departure from Mean
March 1, 2014 to March 31, 2014



Mean period is 1981-2010.



Midwestern Regional Climate Center
cli-MATE: MRCC Application Tools Environment
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Drought Summary from the U.S. Drought Monitor

Below is a drought summary for the state of Indiana from the U.S. Drought Monitor. Areas in white are not experiencing any drought. Yellow areas are abnormally dry, but not considered a drought. Drought begins when the moisture levels become more severe, with beige, orange, red, and brown indicating increasing levels of drought (moderate, severe, extreme, and exceptional, respectively). The table below indicates what percentage of the state is drought free, and how much of the state is in drought by degree of severity (D1 - D4 category).

Indiana

Drought Severity

D0 - Abnormally Dry
 D1 Drought - Moderate

D2 Drought - Severe
 D3 Drought - Extreme

D4 Drought - Exceptional

Statistics type: Traditional (D0-D4, D1-D4, etc.) Categorical (D0, D1, etc.)

Percent Area in U.S. Drought Monitor Categories

Week	Nothing	D0-D4	D1-D4	D2-D4	D3-D4	D4
4/1/2014	100.00	0.00	0.00	0.00	0.00	0.00
3/25/2014	100.00	0.00	0.00	0.00	0.00	0.00
3/18/2014	100.00	0.00	0.00	0.00	0.00	0.00
3/11/2014	100.00	0.00	0.00	0.00	0.00	0.00
3/4/2014	100.00	0.00	0.00	0.00	0.00	0.00

March 4th Drought Summary



March 11th Drought Summary



March 18th Drought Summary



March 25th Drought Summary



April 1st Drought Summary

