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and
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Indiana State Climate Office

Monthly Weather Report

Apr 5, 2013



<http://www.iclimat.org>

March 2013 Climate Summary

Month Summary

A year ago Indiana experienced its warmest March on record. This year March averaged 20°F colder than last and ranks among the coldest since 1895. The official start date of spring was ignored as the heaviest snow storm of the season slammed Indiana on Palm Sunday. One person died as a result of injuries sustained in an 8-vehicle pileup on I-65 that evening in Tippecanoe county.

March was very cold with a state average temperature of 34.8°F, the 14th coldest March on record in Indiana. The most recent March that was colder than this was the 11th place 34.3°F statistic in 1996. Some other recent colder Marches include a 32.4°F average in 1984, ranking at 4th coldest. The March 1978 average was 33.6°F, good for 8th place. The coldest March on record was long ago in 1960 with 26.3°F. The day split in March 2013 was hardly a split at all, leaning heavily to the cold side. There were 27 days of below normal temperature, 1 day at normal, and just 3 days with above normal temperature! The daily state average temperature was 10°F or more above normal on a single day while on 9 days the temperatures was at least 10°F below normal. The warmest temperature in the state this month was 70°F on March 15th at Myers Bridge near Hovey Lake. Elwood and Wanatah shared honors as the state's cold spot with 5°F on March 3rd and 8th, respectively. There were two extended cold spells during the month. An 18 day stretch of subnormal cold ended on March 8th. A second cold spell 19 days long ended on March 30th.

March was drier than usual. The state average of 2.41 inches is 1.00 inch below normal. This ranks the month as the 27th driest March since 1895. The most recent drier March had 2.21 inches in 2005 in 24th place. Two years earlier 2.17 inches was recorded in 2003, good for 21st place. Go back another two years to 2001 to find one of the driest Marches on record, a 0.98 inch state average perched in 3rd place. The driest March on record was 0.23 inch in 1910. Regionally this month precipitation was close to half of normal in northern Indiana, right at two-thirds normal in the central section, and 90% of normal in the south. The highest daily cooperative station precipitation this month was 3.01 inches at Bedford, measured on March 18th. That same day the heaviest CoCoRaHS single day precipitation amount was 3.75 inches at Princeton. Precipitation generally fell on about 13 days this month.

Snow totals in March ranged widely across the state. Between 10 and 18 inches fell in the northern third of Indiana. The observer in Mount Etna measured 25.1 inches, the highest March total in the state. Central Indiana snowfall ranged from 5 to 20 inches while in southern Indiana totals varied from trace amounts in the extreme south to 11 inches. Significant snows fell on about 7 days this month. Snowfall maps of March totals are found later in this report.

Soil moisture had been largely recharged in Indiana earlier in winter. There is little area that remains drier than normal as evidenced by the small change in Indiana status shown in the US Drought Monitor over March. At the start of March only 7% of the state was classified as abnormally dry (D0 category), but not in drought. Near the end of the month this dry region had been reduced slightly to cover just 3% of total Indiana area. Only parts of Lagrange, Steuben, Noble, and DeKalb counties are still rated as abnormally dry. The weekly set of March Indiana Drought Monitor maps are found at the end of this monthly summary.

A woman was critically injured and later died when her car was struck by a semi-truck on I-65 in Tippecanoe county during the Palm Sunday snowstorm. Earlier in the month many vehicles had slid off highways and semi-trucks jackknifed during a snow storm on March 5th and 6th. There were no deaths reported in that incident. Heavy rain fell in southwest Indiana on March 18th but no flood impacts were noted. Details on weather impacts this month can be found in the weekly narratives which follow.

March 1st – 9th

The longest cold spell of the winter was broken at the end of this week. Indiana daily state average temperatures had remained below normal for 18 consecutive days since February 19th. The longest warm streak of this meteorological winter, starting December 1st, had dominated the first 21 days of that month. The recent flip in Indiana's winter temperature experience is largely due to a persistent high pressure block in the Arctic, shuttling cold air in our direction over several weeks. This is reflected in the recent strongly negative Arctic Oscillation (AO) index, unusual for this late in the season. Only one significant storm impacted Indiana this first interval of March. Fronts passed nearby but not through the state this week. Several weaker troughs did move through, which reinforced the cold air already in place over Indiana.

Two troughs passed through Indiana on March 1st, extending the duration of the cold air push into the state. Temperatures started the month at about 5°F below normal. As high pressure moved towards and then overhead Indiana by March 4th, temperatures slipped a few more degrees each day, reaching its lowest point of the 9 days at nearly 10°F below normal. State temperatures crept upward so slowly, about 1°F per day, until returning to its starting point at 5°F below normal by March 8th. Two storm systems, one from Iowa, another from Oklahoma, had slowly transferred warmer air towards Indiana ahead of each storm. A high pressure ridge behind these storms then moved east of Indiana by March 9th. Warmer southerly winds boosted temperatures 7°F at the end of the interval to close out at 2°F above normal, the warmest day of the interval. Overall for the 9 days daily temperatures averaged 6°F below normal. Typically daily maximum temperatures range from 42°F in northern counties to 52°F in far southwest Indiana. Daily minimums normally vary from 25°F to 32°F north to south across the state.

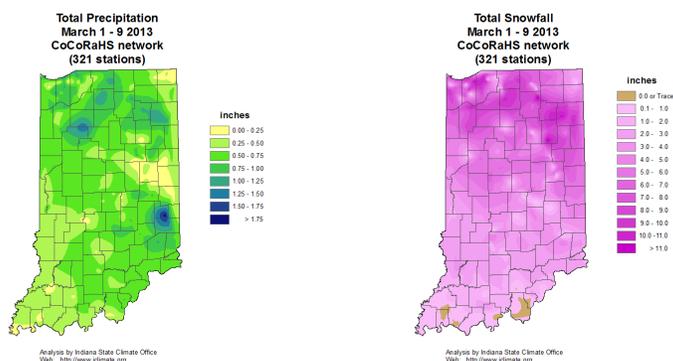
The two troughs which visited Indiana at the start of the month reinforced cold air already in place. The lack of temperature contrast limited the amount of precipitation to just a few hundredths inch each day. Then the midweek storm brought significant moisture over the top of a warm front located south of Indiana. The precipitation began as snow on March 5th in northern Indiana and rain in the south until colder air wrapped into the storm, changing precipitation to snow state wide that afternoon. By the end of the storm the next day nearly a foot of snow had fallen in northeast Indiana and along the shores of Lake Michigan. The CoCoRaHS station in North Webster reported

11.6 inches of snow, the largest amount in the state. Other heavy CoCoRaHS snowfalls that day included 11.3 inches in Leesburg, and 11.0 inches at Fort Wayne, Mount Etna, and in Chesterton. Only minor snowfall amounts fell during the other 8 days of the interval across the state. Over the 9 days about 6 to 12 inches of snow was measured across northern Indiana, about 3 to 6 inches in central areas, and none to 3 inches in southern Indiana. In northern Indiana the heaviest 9 day totals were observed mostly north of a Kentland to Rochester to Winchester line. Some of the largest weekly totals included 12.0 inches at Mount Etna, 11.9 inches in North Webster, and 11.7 inches at Fort Wayne. A snowfall map showing the total 9 day amounts around Indiana can be seen at the end of this narrative.

With temperatures near freezing during the heavy snowfall, its water content was high. This water content counts towards precipitation. In the CoCoRaHS network the largest precipitation total was 1.28 inches at the Mishawaka location. Three volunteers in Fort Wayne recorded precipitation on March 6th at 1.21 inch, 1.20 inch, and 1.16 inch. Considering all precipitation for the 9 days, the Connersville observer summed the most at 1.87 inch. Some other precipitation totals came in at 1.48 inch at Burnettsville, 1.32 inch in Gas City, 1.28 inch at Mishawaka, and 1.18 inch at Plymouth. Yet overall precipitation totals were below normal across Indiana. Regionally about 80% of normal precipitation was received in northern Indiana, 70% of normal in central counties, and 55% of normal in the south. Normal totals range between 0.8 inch and 1.1 inch.

The moderate to heavy snowfall on March 5th and 6th created hazardous road conditions. Many slide-offs and vehicle accidents were reported statewide. Some counties posted travel restrictions allowing only essential travel. Northbound I-65 was closed for a time in Jasper county after a semi-trailer accident. Jackknifed semi-trailers on other interstates interrupted traffic flow there as well. Conditions worsened after the snow ended and high wind speeds began to drift snow and ice over highways. Fortunately there were no reported fatalities with this storm. Rural schools cancelled classes for the day or declared two-hour delays.

Abnormally dry soils in far northern Indiana left over from the 2012 drought continue to disappear as snow keeps falling. The March 5th edition of the US Drought Monitor eliminated the abnormally dry rating in most of Lake, Porter, and DeKalb counties, and in small parts of other counties. The net result was a 5% improvement in Indiana since a week ago. The new rating revises the abnormally dry coverage in Indiana to just 7% of total state area. This portion consists primarily of Lagrange and Noble counties, and the west halves of Steuben and DeKalb counties. About 93% of Indiana land surface has returned to normal soil moisture status for this time of year.



March 10th – 16th

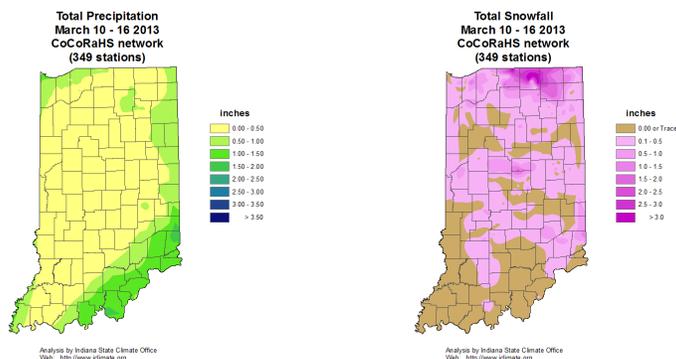
A pause in the 18-day run of below normal temperatures was brief. For the next 3 days average daily temperature finally poked into the warmer than normal category. On March 10th the daily state average temperature peaked at 12°F above normal! High pressure had passed to the east allowing its warmer southerly winds to lift our temperatures. Then the temperature fell a few degrees the next day to 9°F above normal as two storms, one from Canada, and another from Missouri, attempted to merge over Indiana.

A strong cold front now passed through the state, forcing temperatures downward again to 2°F below normal. The bottom was reached at 10°F below normal by March 13th. The weather stayed cold the next day as high pressure passed overhead. On March 15th the high center drifted east of Indiana and began another temperature bounce, ending the week at 1°F below normal. Finally an Alberta clipper moved through Indiana on March 16th, its cold front tapping more cold air from western Canada as the week closed. The warm start of the week nearly balanced the mid-week cool down. The weekly state temperature averaged to less than 1°F below normal. Daily maximum temperatures in Indiana around mid-March should vary between 45°F and 56°F north to south across the state. Daily minimums normally range between 27°F in the northernmost counties to 34°F in the far southwest.

The March 11th cold front began as a rain event, changing over to snow late in the day as colder air filtered into the state. The heaviest one-day rainfall amounts were reported that day by CoCoRaHS observers in south central Indiana. Gages which caught the most rainfall measured 1.54 inch at Mauckport and 1.41 inch at Leavenworth. The Marengo volunteer collected 1.26 inch that day while the Birdseye and Leopold gages each held 1.20 inch. This storm had moved off the Atlantic coast by March 13th but cold air and moisture was wrapped around its north side and gave Indiana another dose of precipitation, this time as all snow. North central Indiana counties received the heaviest amounts. Three Goshen observers recorded 4.9 inches, 3.2 inches, and 2.8 inches of the white stuff on the morning of March 13th. Granger noted 3.8 inches and Middlebury 3.5 inches of snow. The storm finally moved away for good.

The late week Alberta clipper storm finished off the week with rain statewide but amounts were generally light. For the full week the largest precipitation totals were measured as 1.49 inch in Batesville and 1.40 inch at Floyds Knobs. Charlestown had 1.35 inch, and two Milltown observers had 1.36 inch and 1.34 inch. The highest snowfall totals for the week were essentially the same as the single day maximums stated above. State maps of total weekly precipitation and snowfall can be found at the end of this narrative. Weekly precipitation was again less than normal, at about 70% of normal in northern and southern Indiana and 55% of normal across the middle. Weekly normals range from 0.5 inch in the north to 0.9 inch in the south.

For the second straight week soil moisture conditions improved across far northern Indiana. According to the March 12th US Drought Monitor, all of Laporte, St Joseph, and Elkhart counties have been restored to normal soil moisture status for this time of year. Small parts of Lake, Starke, and Marshall counties that were rated abnormally dry (D0 category) the week prior were also taken off the abnormally dry list. Only 3% of Indiana area continues to be rated as abnormally dry, which includes the west half of Steuben county, the north half of Noble county, and the northwest corner of DeKalb county. The remaining 97% of the state is now classified in normal soil moisture status as we move closer to the start of the April planting season. Weekly US Drought Monitor maps for Indiana can be seen at the end of this monthly summary.



March 17th – 23rd

Spring officially began this week on March 20th but apparently nature didn't get the memo. Another stretch of subnormal cold is underway. Since March 12th the daily state average temperature has persisted below normal. Recall a year ago this week when daily maximum temperatures were hitting the 80s in Indiana, about 50°F warmer than this week!

Indiana temperatures actually rose slightly to start the week at about 4°F below normal. A stationary front was located in Tennessee, its moisture being transported into southern Indiana over the top of cold air near the ground. Low pressure moved into Kentucky on March 18th, bringing heavy rain to southwest Indiana, a little bit of snow to the east, and light freezing rain to central counties. A strengthening storm system in Minnesota moved east to upper Michigan on

March 19th. Its cold front rushed through Indiana and wrapped around and far ahead of the storm center. State temperatures slid to 8°F below normal.

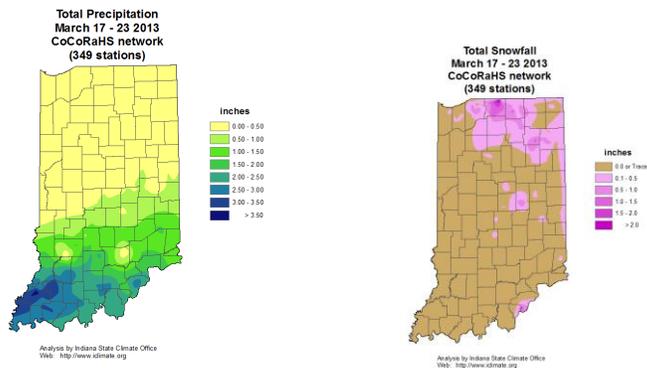
High pressure dived south from central Canada behind the storm, delivering more arctic air to Indiana over the next 3 days. State temperatures hit bottom by March 21st at 16°F below normal. The ridge pushed southeast of Indiana and weakened. Two days of warming lifted state temperatures to 8°F below normal to close out the week. Clouds now thickened over the state. A heavy snow producing weather system was moving this way out of Colorado as the week ended. Overall for the week the daily state temperature averaged to about 9°F below normal. Typically in mid-March daily maximum temperatures should range from 48°F in far northern Indiana to 58°F in the far southwest. Daily minimums normally would vary between 30°F and 36°F north to south across the state.

The southern storm produced about a third of an inch of rain in southwest Indiana on March 17th but the heaviest rainfall of the week came the next day. Two to 3 inches of rain drenched southwest and parts of south central Indiana while 1 to 2 inches covered the rest of the south. Among the heaviest CoCoRaHS rainfall reports on the morning of March 18th were 3.75 inches at Princeton and 3.63 inches in Patoka. The CoCoRaHS observer in Francisco had 3.02 inches while the rain gage at Melody Hill collected 2.91 inches. Evansville noted 2.85 inches that morning. Rainfall in the second storm this week wasn't nearly as heavy. Less than 0.2 inch fell in east central Indiana with less than 0.1 inch elsewhere. Some of the larger precipitation totals for the full week include 3.45 inches in Petersburg and 3.37 inches at Francisco. The Poseyville observer tallied 3.35 inches while Evansville had 3.27 inches and Boonville 3.03 inches.

Colder air poured into Indiana the second half of the week with all precipitation in the form of snow. There were no storm systems in the area but cold north winds picking up moisture from Lake Michigan generated lake effect snows in northern Indiana. A half to one inch of snowfall was common. Some of the heavier amounts reported on the morning of March 21st included 3.5 inches at South Bend and 2.6 inches in Granger. As the cold air flow off the lake continued, northeast Indiana received a dusting of new snow on March 22nd. Weekly totals were close to these amounts as only minor events of new snowfall bumped these readings up a tad.

As shown in the weekly precipitation map which follows this narrative the distribution of water contributed by snowfall and rainfall was not uniform across the state. Regionally only about a tenth inch of precipitation fell across the north, a half inch in central, and 1.9 inch in southern Indiana. These totals equate to about 10% of normal precipitation in northern Indiana, 60% across central areas, but nearly double the normal amount across the south.

Though little precipitation fell across northern Indiana this week, the unusual cold has suppressed natural water loss through evaporation. This also is reflected in the March 19th edition of the US Drought Monitor. The Indiana drought map is unchanged from the previous week. The abnormally dry (D0 category) rating continues to be limited to Lagrange county and parts of Noble, DeKalb, and Steuben counties. Together these areas represent less than 3 percent of total Indiana acreage. Weekly Indiana drought maps are shown at the end of this monthly report.



March 24th – 31st

The heaviest widespread snowfall this winter in Indiana arrived on Palm Sunday, well after the official start of spring! It is rare in Indiana weather history that a significant snowfall occurs so late in March. Yet the persistent cold this month would support the chance of this late season event. State average temperatures this week were again cold, running at 8°F to 11°F below normal over the first 6 days. Then a late week warm up booted the thermometer to 4°F below normal by March 30th. The next day the state temperature recovered to normal to close out the month. For the 8 day interval state temperatures averaged about 7°F below normal. Typical daily maximum temperatures near the end of March range from 52°F in far northern counties to 61°F in the extreme southwest. Daily minimums normally vary between 32°F and 39°F north to south across the state.

The Palm Sunday storm center slid just south and along the Ohio River on March 24th and 25th. The snow generally began in late afternoon on March 24th and produced waves of heavy snow in Indiana until about noon the next day. At times the snowfall was so intense thunder was heard. By the end of this storm 7 to 12 inches of snow had fallen across most of central Indiana, the heaviest totals centered along a line from Attica to Hartford City. Amounts tapered off into northern and southern Indiana where 1 to 3 inch amounts were common. Some locally heavy snow amounts reported by the CoCoRaHS network on the morning of March 25th included 12.4 inches at Attica, and 11.0 inches in Indian Heights. Both Covington and Hartford City had collected 10.5 inches by that morning.

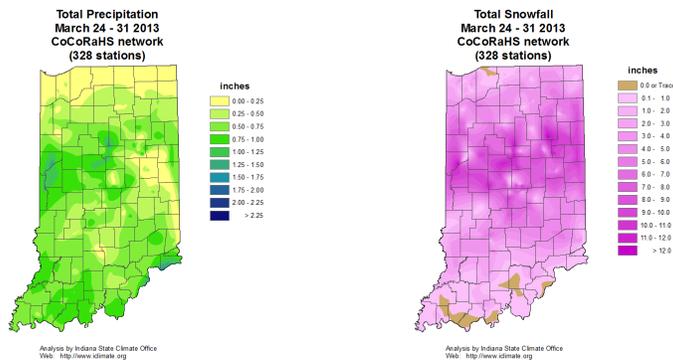
On March 26th the storm left the Midwest and quickly reached the Atlantic Ocean. A ridge of high pressure stretching from Canada to Texas brought dry but cold conditions to Indiana over the next 5 days. About an inch of lake effect snow fell in north central Indiana as the ridge moved in. On the last day of the month two new storm systems approached Indiana, one from the north and the other from the south, with Indiana squeezed between. A little more precipitation fell, lifting the total snow and precipitation totals a bit more. For the entire 8 day interval, the largest snowfall totals in Indiana were 13.0 inches at Hartford City, 12.8 inches in Attica, and 12.5 inches at Galveston. Both New Ross and Indian Heights reported in with 12.0 inches.

It was warm enough at the end of the month for light rain to fall in southern Indiana. This rainfall and the water equivalent of the early week snowfall counts toward precipitation. Regional

precipitation for the 8 days averaged about 0.3 inch across northern Indiana, and 0.7 inch in central and southern areas. These totals represent about 40% of normal precipitation in the north, 75% of normal in central Indiana, and near 60% of normal across the south. The highest local precipitation totals over the 8 days came to 1.46 inch at Galveston and Attica. Two Hartford City volunteers measured 1.30 inch and 1.11 inch at their locations. Meanwhile the Indian Heights reading came to 1.23 inch of liquid.

Indiana highways became hazardous during the Palm Sunday snowstorm. A few western counties declared snow emergencies. Many vehicle slide-offs and jackknifed trucks were reported late on March 24th. An 8-vehicle pileup on I-65 in northern Tippecanoe county caused several serious injuries. A woman in this accident died the next day. Nearby in West Lafayette a pedestrian was injured in another accident late in the storm.

There were no changes in Indiana soil moisture status this week according to the March 26th edition of the US Drought Monitor. Less than 3 percent of total Indiana land area remains classified as abnormally dry (D0 category). The remainder of the state is rated in normal soil moisture status for this time of year.



March 2013

Region	Temperature	Temperature	
		Normal	Deviation
Northwest	32.6	38.6	-5.9
North Central	32.5	37.9	-5.4
Northeast	32.3	37.3	-5.0
West Central	34.4	40.6	-6.2
Central	34.3	40.1	-5.8
East Central	33.8	39.1	-5.3
Southwest	38.0	44.8	-6.8
South Central	37.6	44.2	-6.6
Southeast	36.8	43.1	-6.4
State	34.8	40.7	-6.0

Region	Precipitation	Precipitation		
		Normal	Deviation	Percent of Normal
Northwest	1.45	2.92	-1.46	50
North Central	1.49	2.78	-1.30	53
Northeast	1.41	2.71	-1.30	52
West Central	1.71	3.36	-1.64	51
Central	2.14	3.28	-1.14	65
East Central	2.42	3.08	-0.66	79
Southwest	3.68	4.23	-0.55	87
South Central	3.84	4.17	-0.33	92
Southeast	3.66	3.95	-0.29	93
State	2.41	3.40	-1.00	71

Spring (same as March so far)

Region	Temperature	Temperature	
		Normal	Deviation
Northwest	32.6	38.6	-5.9
North Central	32.5	37.9	-5.4
Northeast	32.3	37.3	-5.0
West Central	34.4	40.6	-6.2
Central	34.3	40.1	-5.8
East Central	33.8	39.1	-5.3
Southwest	38.0	44.8	-6.8
South Central	37.6	44.2	-6.6
Southeast	36.8	43.1	-6.4
State	34.8	40.7	-6.0

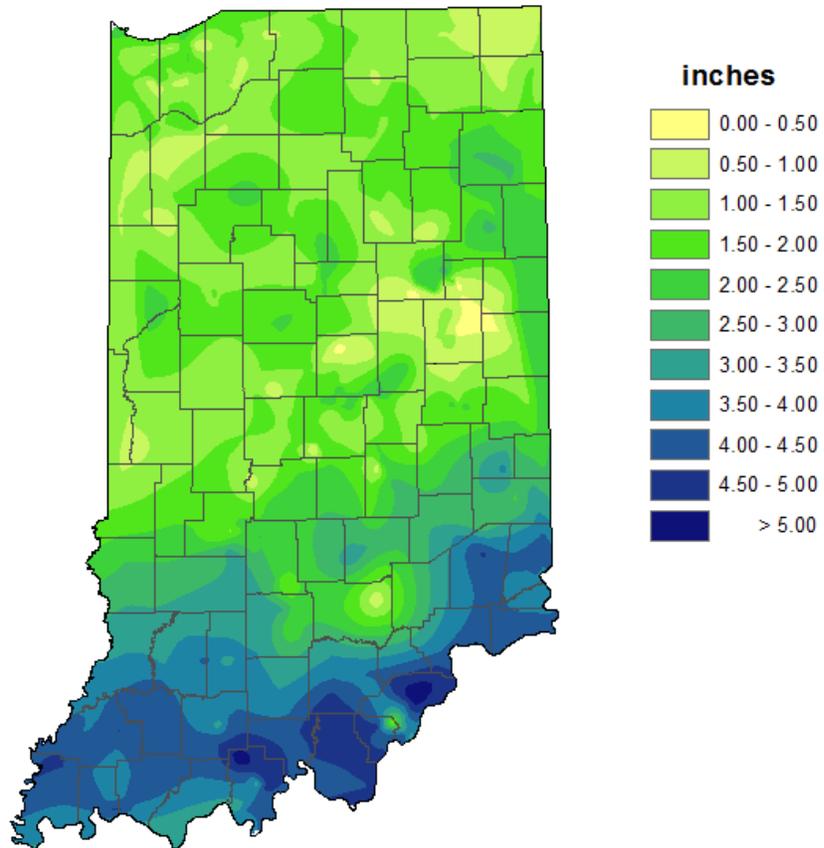
Region	Precipitation	Precipitation		
		Normal	Deviation	Percent of Normal
Northwest	1.45	2.92	-1.46	50
North Central	1.49	2.78	-1.30	53
Northeast	1.41	2.71	-1.30	52
West Central	1.71	3.36	-1.64	51
Central	2.14	3.28	-1.14	65
East Central	2.42	3.08	-0.66	79
Southwest	3.68	4.23	-0.55	87
South Central	3.84	4.17	-0.33	92
Southeast	3.66	3.95	-0.29	93
State	2.41	3.40	-1.00	71

2013 Annual (through March)

Region	Temperature	Temperature	
		Normal	Deviation
Northwest	28.7	29.8	-1.1
North Central	28.6	29.5	-0.9
Northeast	28.5	29.2	-0.7
West Central	30.9	32.0	-1.1
Central	30.8	31.8	-0.9
East Central	30.4	30.9	-0.5
Southwest	35.0	36.5	-1.5
South Central	34.8	36.3	-1.5
Southeast	33.9	35.3	-1.4
State	31.3	32.4	-1.1

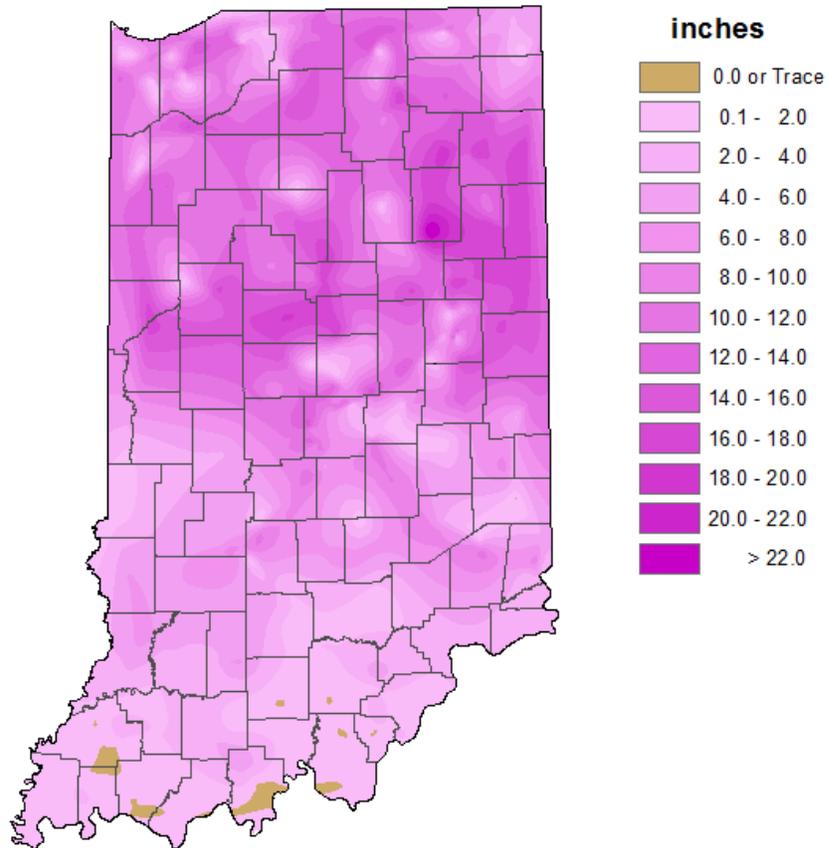
Region	Precipitation	Precipitation		
		Normal	Deviation	Percent of Normal
Northwest	7.06	6.47	0.59	109
North Central	7.42	6.63	0.80	112
Northeast	6.92	6.47	0.45	107
West Central	9.39	7.80	1.59	120
Central	9.69	7.89	1.79	123
East Central	8.43	7.52	0.92	112
Southwest	12.68	10.10	2.58	125
South Central	12.09	10.19	1.90	119
Southeast	9.90	9.75	0.15	102
State	9.44	8.12	1.32	116

**Total Precipitation
March 2013
CoCoRaHS network
(355 stations)**



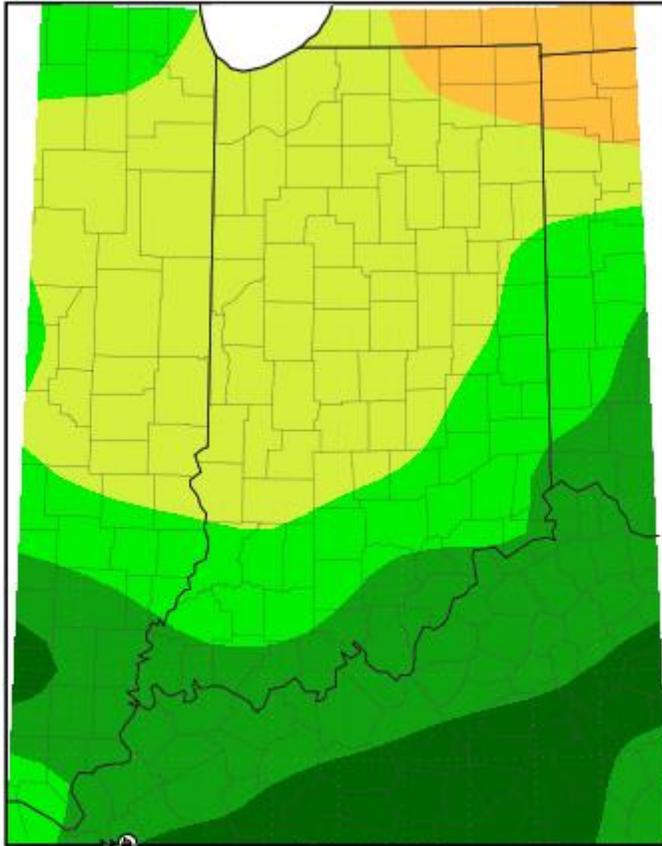
Analysis by Indiana State Climate Office
Web: <http://www.iclimat.org>

**Total Snowfall
March 2013
CoCoRaHS network
(355 stations)**



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

Accumulated Precipitation: Percent of Mean
March 1, 2013 to March 31, 2013

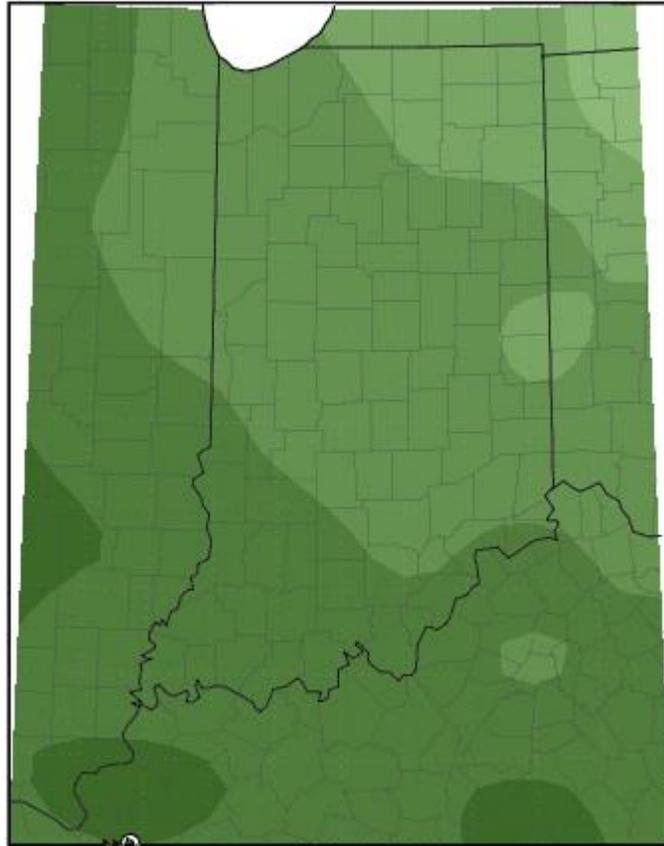


Mean period is 1981-2010.

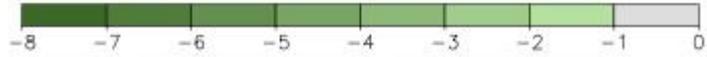


Midwestern Regional Climate Center
MRCC Applied Climate System
Generated at: 4/5/2013 10:30:12 AM CDT

Average Temperature (°F): Departure from Mean
March 1, 2013 to March 31, 2013



Mean period is 1981-2010.



Midwestern Regional Climate Center
MRCC Applied Climate System
Generated at: 4/5/2013 10:30:47 AM CDT

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 how much of the state is not under drought conditions, and also how much of the state is under drought conditions from its respective column upwards.

For example, March 26th has 2.8% of Indiana under at *least* D0- D4 status. There were no other drought categories active at this time so there are no calculations to be made. The D0 category (abnormally dry) is not a drought category in and of itself. Therefore there was no drought anywhere in Indiana on this date.

Indiana		Drought Severity				
		D0 - Abnormally Dry	D1 Drought - Moderate	D2 Drought - Severe	D3 Drought - Extreme	D4 Drought - Exceptional
Week	Nothing	D0-D4	D1-D4	D2-D4	D3-D4	D4
April 2, 2013	97.34	2.66	0.00	0.00	0.00	0.00
March 26, 2013	97.22	2.78	0.00	0.00	0.00	0.00
March 19, 2013	97.22	2.78	0.00	0.00	0.00	0.00
March 12, 2013	97.22	2.78	0.00	0.00	0.00	0.00
March 5, 2013	93.10	6.90	0.00	0.00	0.00	0.00

March 5th Drought Summary



March 12th Drought Summary



March 19th Drought Summary



March 26th Drought Summary



April 2nd Drought Summary

