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Indiana State Climate Office

Monthly Weather Report

Apr 5, 2011



<http://www.iclimete.org>

March 2011 Climate Summary

Summary

The fast paced weather action of February slowed some in March. The major March weather features were flooding and hail. The harsh winter is finally ending but left its pothole mark on Indiana roads. Six cars were quickly disabled by massive craters on an interstate highway.

The temperature roller coaster continued throughout the month. Yet the large temperature variations between periods of warm and cold are masked in the March 2011 state average temperature of 41.4° which is just 0.7° above normal. This ranks the month near midrange as the 49th warmest on record in Indiana since 1895. Last year March ranked 23rd warmest at 43.9°. The even split this month in the day count on each side of normal is also bland: 15 days of below normal temperature, 15 days of above, and one day at normal. The daily state mean temperature was at least 10° below normal on the last 6 days of the month. On 5 days state mean temperatures were at least 10° above normal. The highest recorded temperature of the month was 80° on March 20th at Boonville, and again two days later at Greensburg, Lexington, Terre Haute, and Vincennes. The coldest observed temperature was 14° at Angola on March 1st.

The state average precipitation total in March was 3.50 inches which is just 3% or 0.10 inch above normal. Again this places the month near the historical middle as the 52nd wettest March on record. The most recent wetter March was three years ago when 6.88 inches of precipitation was reported, locking in 7th place. In far southwestern Indiana the CoCoRaHS observer in Newburgh observed the highest single day precipitation for the month on March 15th with 3.35 inches. Second highest honors go to the Gosport volunteer who measured 3.13 inches on March 5th. Regionally March precipitation averaged about 2.5 inches in northern Indiana, 3.7 inches in central, and near 4.4 inches in the south. These totals are about 90% of normal in the north and 110% of normal in central and southern Indiana.

The snow season usually concludes in Indiana by the end of March. Snow fell some place in the state on only about 6 days this month. Generally 3 to 5 inches of snow fell in the northwest lake effect region and 0.5 inch to 2.5 inches elsewhere across northern Indiana. Central Indiana averaged about 0.5 inch to 1.5 inch while a trace to 2.5 inches of the white stuff was seen across the southern counties. The highest monthly total of 5.0 inches was measured in Chesterton.

The past winter has seen many disasters in Indiana and this trend continued in March. East central Indiana was devastated by two rounds of flooding which occurred over a week from February 28th through March 6th. The Portland downtown area was especially hard hit with some of its worst flooding in over 40 years. Flooding also afflicted the Indianapolis metro area where 7 people had to

be rescued in Zionsville. In southwest Indiana, a levee breach in Daviess county flooded 11,000 acres. The small town of Maysville had to be evacuated. Later in the month severe storms on March 23rd caused wind and hail damage in 16 counties. Details on these specific weather incidents can be found in the weekly narratives which follow.

There was continued improvement in the Indiana drought status during March. According to the National Drought Monitor there are no longer any areas of moderate drought (D1 class) or worse in the state. The acreage classified as abnormally dry (D0 class) has shrunk from 40% to 33% over the month while the drought free region has increased from 56% to 67%. Weekly Indiana drought maps are included at the end of this monthly report.

March 1st – 7th

The transition to spring is noticeably underway. Daily temperatures this week skittered on both sides of normal while rain events are becoming as common as snow storms. The rain has come more often and heavily, setting the stage for an impact well known in Indiana: flooding. Yet birds are returning and the sun is rising earlier each morning, that is, until Daylight Savings Time begins next week.

March began with daily average temperatures 2° below normal. Each day grew a bit warmer until March 4th when state average temperatures peaked at 6° above normal. A strong cold front on March 6th sunk temperatures about 12° to settle at 6° below normal. The first week of March finished with daily temperatures at 4° below normal. Overall for the week temperatures averaged about 1° above normal in Indiana. Typically at the start of March daily maximum temperatures range from 44° to 55° north to south across the state. Normal daily minimums vary between 27° in far northern Indiana to 34° in the extreme southwest.

The upper atmospheric jet stream continued in a mostly west to east zonal pattern this week. Only two storm systems passed through Indiana, the first on March 2nd and an intense triple-low system on March 5th and 6th. It was this second system that produced nearly all the precipitation, averaging about 1.1 inch in northern Indiana, 2.2 inches in central, and 1.8 inches across southern Indiana. These regional averages are about 180% of normal in the north, 310% of normal in central Indiana, and 200% of normal in the south. The heaviest single day precipitation reported was 3.13 inches by the CoCoRaHS reporter at Gosport on the morning of March 5th. Other heavy totals that day were 2.96 and 2.84 inches at two locations in New Castle, and 2.95 inches at Greenfield. Among the heaviest precipitation totals for the week were 3.69 inches at Gosport, 3.39 inches in Spencer, and 3.33 inches in New Castle.

As colder air moved in the rain changed to snow in northern Indiana. The heaviest one day snow amounts on March 6th included 3.7 inches at Lakes of the Four Seasons and at Chesterton, with 3.5 inches in Portage, and 3.3 inches at Hudson. These amounts were also the highest weekly snowfall totals around the state. Regionally about 2 to 4 inches of snow was noted in the lake effect region and 2 inches or less elsewhere in northern Indiana. In central Indiana some locations reported just a trace of snow, but many areas received none. No snow was recorded across southern Indiana.

Heavy rain which fell at the end of February and in the second storm this week combined with melting of left over snow cover on saturated soils has pushed rivers over their banks. Flooding was particularly a problem in the eastern counties of Indiana and in the Indianapolis area.

In Decatur and southern Allen counties, emergency officials are using three different methods to mitigate the rising rivers: stacking sandbags at strategic points, building clay dikes to create a barrier, and installing up to 16 water pumps in locations known for flooding.

The situation in Jay county was more desperate. Water from strong storms surged quickly and swamped downtown Portland. A foot of water stood in Portland city hall which local residents say hasn't happened in at least 40 years. Police officers stood in the water answering city phones while trying to salvage computers and file cabinets but eventually phone lines went dead and computers stopped working. City hall and the courthouse closed and downtown businesses spent the next few days cleaning up.

Highway US 27 was closed due to high water. Sand bags were not enough to stop the flood, leaving cars stranded in the streets and making travel impossible. The fire department was called out on several flood rescues. Fortunately there were no serious injuries. Many homes in Jay county were surrounded by flood water especially in the nearby town of New Corydon.

Local officials contacted Indiana Homeland Security and state representatives. An assessment team was assigned to visit Portland and Jay county and determine if the area may qualify for state and federal disaster assistance. Meanwhile the Jay county emergency management director figured the damage will come to several million dollars.

In Delaware county Muncie authorities issued a flood disaster declaration. The Red Cross arrived with disaster assistance teams and were conducting disaster assessments, distributing cleanup kits, and providing emergency assistance to residents of Jay and Delaware counties.

To the south Henry and Randolph counties were also slammed by flooding and were placed under a flood warning. Several roads in these counties were closed due to heavy flooding along the Mississinewa River, including parts of state highways 109 and 103 in Henry county and state highway 1 in Randolph county.

Central Indiana was another area of the state with flooding issues. On the northwest side of metropolitan Indianapolis, the Zionsville fire department rescued 7 people in 5 high water incidents. One woman was trapped in her submerged car for 20 minutes until rescuers arrived. The department also saved a woman and two dogs from a flooded home in that city. On the northeast side firefighters had to rescue people from flooded vehicles in Fishers and Noblesville. Several roads were closed for a few days in Indianapolis, Fishers and Noblesville.

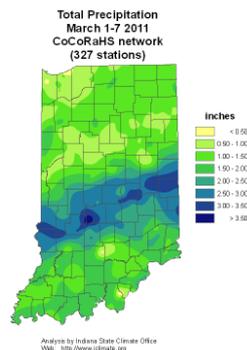
Along the White River in Indianapolis, many homes were surrounded by water. Some residents were using paddle boats to escape their neighborhoods to stay elsewhere for a few days. The White River, as well as many rivers in this area, will reach their highest level since March 2007. The heavy 4-inch rainfall upstream in Muncie is a cause of the flooding problems in the Indianapolis area. The city offered free sandbags to residents to use to protect their homes from rising water. On the southwest side of the city several cars stalled in high water at the Bloomington exit of I-465.

On the northeast side of the city a vehicle ended up in a canal in the Broad Ripple area. Neither incident resulted in injuries to the drivers.

Elsewhere there were reminders that winter is not quite over yet. In Lake county high winds combined with icy road conditions late in the week added to the enormous winter count of slide offs and vehicle crashes in Indiana this season. No serious injuries were reported in these latest incidents but interstate traffic was slowed as drivers struggled against the high winds.

The cumulative impacts of the rough winter shocked drivers in Putnam county. Potholes on I-70 west of Indianapolis became so massive they evolved into craters in the highway. Six cars had to be towed away after hitting the monster holes in the pavement. State highway workers were called to the scene to do emergency road repairs.

Perhaps the only positive news this week was an improvement in the state drought status. According to the National Drought Monitor the last remnants of drought in the southern half of Indiana were washed away this week. The updated map shows abnormally dry conditions are now limited to the area generally north of a line from Terre Haute to Decatur. Exceptions in this region are parts of St Joseph, Laporte, Newton, and Benton counties which are rated drought free. Kosciusko county and parts of its surrounding counties is the only region of Indiana remaining in moderate drought (D1 class), about 4% of the total state area. About 41% of the state area is declared as abnormally dry (D0 class).



March 8th – 14th

Daily temperature shifts above and below normal are happening quickly now that spring is approaching but without the extremes of winter. State average temperatures peaked at 7° above normal briefly on March 9th but fell back to normal the next day. For the remainder of the week temperatures remained within 4° above and below normal. Overall for Indiana this week temperatures averaged just 1° above normal. Usually in this second week of March daily maximum temperatures should range between 46° to 56° north to south across the state. Normal daily minimums vary between 28° in far northern counties to 35° in the southwest.

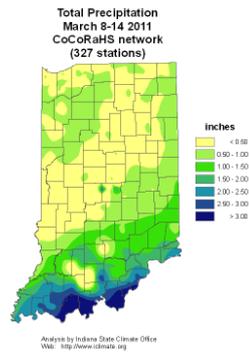
A rainy warm front passed through Indiana on March 9th. This was followed by 3 quick dry cold fronts that brought little rainfall and did not change temperatures very much across the state. Total precipitation this week averaged around a half inch in northern and central Indiana but much more in the south averaging about 1.60 inch. The warm front of March 9th dumped 2.58 and 2.45 inches of rain in Jeffersonville according to two CoCoRaHS observers in Clark county. The volunteer in Elizabeth measured 2.41 inches that morning while Lanesville noted 2.35 inches. These were the heaviest single day rainfall totals in Indiana this week. Along with showers in southern Indiana on other days this week, these storms raised the weekly rainfall total to 3.42 inches in Elizabeth and to 3.31 and 3.26 inches in the Jeffersonville gauges. Regionally northern and central Indiana noted about 80% of the normal weekly precipitation total while southern Indiana received significantly more at 190% of normal. The wind flow pattern in the upper atmosphere favored storms and rainfall the first half of this week but then zonal flow returned later which tends to quiet storm activity.

The snow season is coming to an end in Indiana but northwest counties did receive light amounts. On March 10th CoCoRaHS observers in Chesterton and Valparaiso measured 1.1 inch of snow, the most recorded for the day and week in Indiana. Other volunteers in Valparaiso, Portage, and Laporte noted 1.0 inch. In summary the snowfall pattern this week is described as up to 1 inch in the lake effect region, and a trace in the rest of northern Indiana. There was no snow observed in central or southern sections of the state.

The early week rain extended flood warnings through March 13th along the Kankakee River in northwest Indiana. Meanwhile in southwest Indiana, water from the west fork of the White River covered 11,000 acres of farm ground in Daviess County due to a levee breach on March 6th. An intentional break in another local levee was then created by county officials to siphon water back into the White River and save 49 homes west of the city of Washington from flooding. But this new breach threatened the tiny town of Maysville which faced evacuation.

Indiana Governor Mitch Daniels asked President Obama this week for federal public assistance to 39 counties which suffered in the early February snow and ice storms. If approved, Indiana state and local governments could apply for federal funding to pay 75% of the approved cost of debris removal, emergency services and the repair or replacement of public roads and buildings.

According to the US Drought Monitor there was no change in drought status throughout Indiana this week. Southern Indiana had already been removed as a drought area a week ago and the additional rainfall this week would not change that status. Rainfall was below normal this week in northern and central Indiana but was sufficient to keep the drought in those areas from worsening.



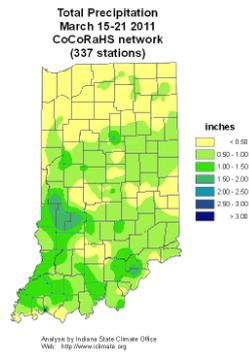
March 15th – 21st

After a cool day to start this week temperatures ramped up quickly and remained above normal to the end. A wet cool day on March 15th held temperatures to 2° below normal but a sudden warm up thanks to a high pressure center in our southern states lifted temperatures to 15° above normal just two days later. A cold frontal passage on March 18th dropped the thermometer 10° over the next two days, but left state average temperatures still 5° above normal. In advance of the next storm system Indiana temperatures rebounded to 15° above normal for the second time this week. Another cold front entered the state on March 21st. Overall this week state temperatures averaged 9° above normal. Typically at this time of year daily maximum temperatures would range between 48° in far northern Indiana to 59° in the far southwest. Daily minimums should vary between 30° and 38° north to south across the state.

Rain fell nearly every day this week but amounts were light. The upper atmosphere has settled into a mostly zonal wind field over Indiana in recent days and this pattern doesn't provide much support for widespread heavy showers. Yet each frontal passage with its surface temperature roller coaster did manage to squeeze out a little moisture most every day. For the week on average about 0.4 inch of rain fell across northern Indiana and 0.7 inch in central and southern Indiana. These totals are about 65% of normal in the north and south and around 90% of normal in central Indiana. The heaviest showers came at the start of the week in southern Indiana. The CoCoRaHS observer in Newburgh measured 3.35 inches in the rain gauge on March 15th. That same day the Hazleton volunteer recorded 1.20 inch while 1.18 inch was noted in Holland, 1.15 inch at Patoka, and 1.12 inch in Charlestown.

The calendar says spring began on March 20th and nature cooperated. No snowfall was observed in Indiana this week.

The Indiana drought left over from last autumn is gradually disappearing. In the latest edition of the National Drought Monitor, no areas of moderate drought (D1 category) or worse remain in Indiana. With the exception of portions of northwest border counties stretching from St Joseph to Benton county, most of Indiana north of a line from the communities of Clinton to Decatur is classified as abnormally dry (D0 category), or about 33% of total state area.



March 22nd – 31st

After a tease of spring last week winter returned abruptly these last days of March perhaps to say a long goodbye. A low pressure system with a slowing warm front in southern Indiana boosted temperatures to 15° above normal on March 22nd. But then temperatures crashed to 7° below normal on March 24th as cold Canadian air took hold for the remainder of the month. Daily state average temperatures slid a little colder each day bottoming out at 13° below normal on March 27th. There wasn't much improvement the next few days as March closed out at 10° below normal. Overall for the 10 day interval state average temperatures came in at 5° below normal. Typically in this final third of the month daily maximum temperatures should range between 53° and 62° north to south across Indiana. Daily minimums normally vary from 34° in the far north to 40° in the extreme southwest.

Most of the precipitation came at the start of the 10 days. After the storm of March 23rd moved east of Indiana no surface fronts passed through our state to the end of the month, unusual for this time of year. A zonal wind flow in the upper atmosphere suppressed storm development while a high pressure system in the Hudson Bay area of Canada continuously poured a cold pool of air our way. The upper atmospheric zonal pattern is giving way to a new wind pattern as March ends. Light to moderate precipitation fell through March 24th, averaging about a half inch in northern Indiana and a quarter inch in central and southern Indiana. The 10-day totals are only about 50% of normal in northern Indiana, 25% in central, and near 15% of normal across the south. The heaviest single day amounts came right at the start of the interval. The CoCoRaHS observer at Rochester measured 1.48 inches early on March 22nd. Other reports that day included 1.15 inch in St John, 1.10 inch in Urbana, and 1.06 inch at Wanatah. Over all 10 days the Rochester volunteer totaled 1.78 inch in the rain gauge. The Urbana total was 1.30 inch while Wanatah recorded 1.20 inch. The St John observer sent word of 1.19 inch over the 10 days.

The return to much colder weather allowed that other winter event, snowfall, to revisit as well. On March 27th from 1 to 3 inches covered the ground in parts of southern Indiana. Salem measured 2.7 inches, while the Shoals observer recorded 2.5 inches. Washington noted 2.1 inches of snowfall, and the Charlestown and Bedford volunteers each reported 2.0 inches of new snow. These single day amounts also represent the highest 10 day totals in Indiana as no more snow fell at these

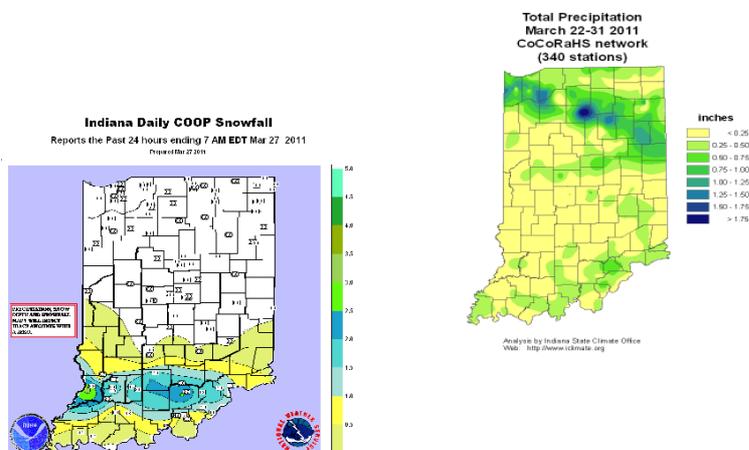
locations to the end of the month. The snow melted quickly under the now stronger March sun and was gone by that afternoon. A central Indiana snowfall on March 30th was more of a surprise to residents. This event was caused by a storm based in the upper atmosphere, not at ground level, but did drop a quick inch in bands across central Indiana. In summary over the 10 days up to 0.3 inch fell across northern Indiana, 0.5 to 1.5 inch in central, and none to about 2.5 inches in southern Indiana. In the lake effect region up to 0.4 inch was measured.

The spring warmth left over from the previous week did not go quietly. Golf ball sized hail fell during severe thunderstorms on the evening of March 23rd in Fountain, Montgomery, and Marion counties. Other hail was seen in Hancock, Boone, Hamilton, Hendricks, Shelby, Tipton, Union, Fayette, Lawrence, and Grant counties. Wind damage and power outages occurred in Hamilton, Johnson, and Rush counties. Hail damaged the roofs, siding and windows of about 30 homes in the town of New Salem in Rush county. In Rushville a garage was blown down.

Meanwhile in Noblesville, a downburst in which cold air aloft is suddenly shot downwards and spread out when it hits the ground, tore down fences and stripped shingles and siding from about a dozen homes. Trees were uprooted and fell in an outward fan pattern when the downburst with its high winds arrived at the leading edge of the storm. Some of the trees fell on homes elsewhere in Hamilton county and caused damage there. Power was lost to several hundred residents just north of Indianapolis as more trees came down in those neighborhoods. In Montgomery county some of the hail was estimated at 1.75 inches in diameter.

Damage was not limited to central Indiana. Hail was also noted in the Columbia City area during severe storms. Thunderstorm and tornado warnings were issued as the hail and high winds ravaged this area. In far southwest Indiana, trees fell on power lines in Evansville causing 2,500 customers to loose power. Hail was reported in Orange county and high winds took down some trees there. Hail dented many vehicles and covered the ground in Jefferson county while hail was also noted in Ripley county.

The overall light precipitation totals of these final 10 days of March did not improve the soil moisture status of northern Indiana according to the National Drought Monitor. As reported last week about 33% of the total land area in Indiana remains abnormally dry (D0 drought category).



March

Region	Temperature	Temperature	
		Normal	Deviation
Northwest	38.4	38.6	-0.2
North Central	37.5	37.9	-0.4
Northeast	36.7	37.3	-0.6
West Central	41.7	40.6	1.1
Central	41.3	40.1	1.3
East Central	40.4	39.1	1.3
Southwest	45.8	44.8	1.0
South Central	45.4	44.2	1.2
Southeast	44.2	43.1	1.0
State	41.4	40.7	0.7

Region	Precipitation	Precipitation		
		Normal	Deviation	Percent of Normal
Northwest	2.38	2.92	-0.54	81
North Central	2.59	2.78	-0.20	93
Northeast	2.56	2.71	-0.15	94
West Central	2.95	3.36	-0.41	88
Central	3.89	3.28	0.60	118
East Central	4.16	3.08	1.08	135
Southwest	4.34	4.23	0.12	103
South Central	4.23	4.17	0.06	102
Southeast	4.47	3.95	0.52	113
State	3.50	3.40	0.10	103

Spring 2011 to date (same as March)

Region	Temperature	Temperature	
		Normal	Deviation
Northwest	38.4	38.6	-0.2
North Central	37.5	37.9	-0.4
Northeast	36.7	37.3	-0.6
West Central	41.7	40.6	1.1
Central	41.3	40.1	1.3
East Central	40.4	39.1	1.3
Southwest	45.8	44.8	1.0
South Central	45.4	44.2	1.2
Southeast	44.2	43.1	1.0
State	41.4	40.7	0.7

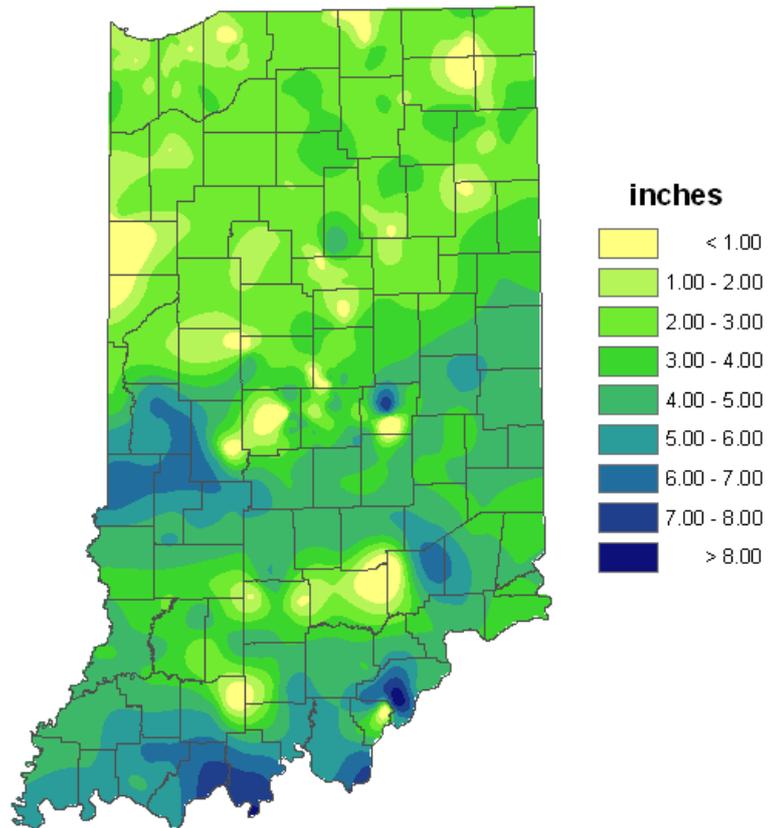
Region	Precipitation	Precipitation		Percent of Normal
		Normal	Deviation	
Northwest	2.38	2.92	-0.54	81
North Central	2.59	2.78	-0.20	93
Northeast	2.56	2.71	-0.15	94
West Central	2.95	3.36	-0.41	88
Central	3.89	3.28	0.60	118
East Central	4.16	3.08	1.08	135
Southwest	4.34	4.23	0.12	103
South Central	4.23	4.17	0.06	102
Southeast	4.47	3.95	0.52	113
State	3.50	3.40	0.10	103

2011 Annual so far

Region	Temperature	Temperature	
		Normal	Deviation
Northwest	28.6	29.8	-1.3
North Central	28.1	29.5	-1.4
Northeast	27.6	29.2	-1.6
West Central	31.3	32.0	-0.7
Central	31.4	31.8	-0.4
East Central	30.7	30.9	-0.2
Southwest	36.3	36.5	-0.2
South Central	36.1	36.3	-0.2
Southeast	35.1	35.3	-0.2
State	31.8	32.4	-0.7

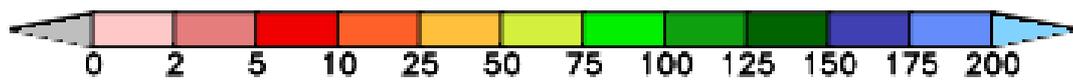
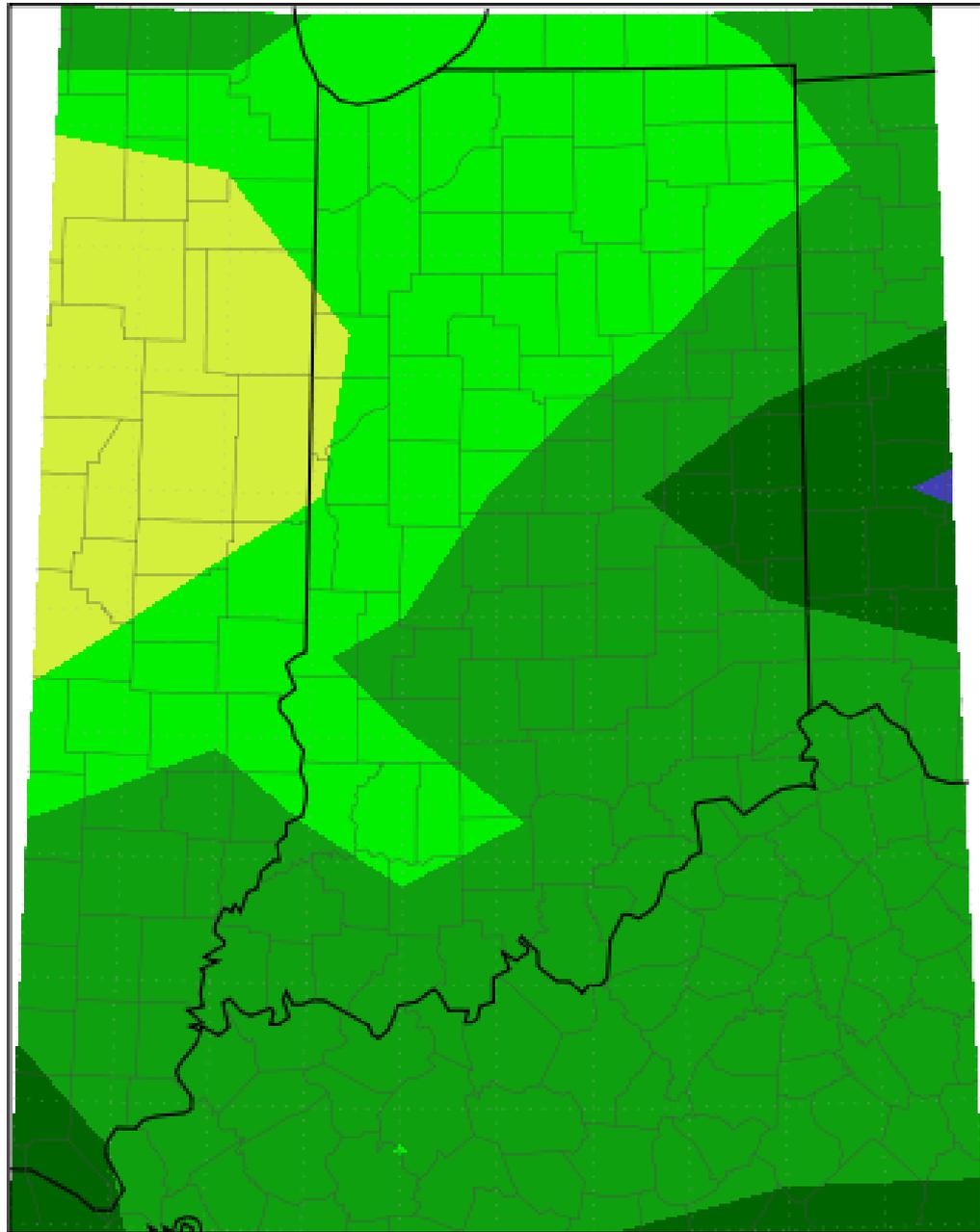
Region	Precipitation	Precipitation		Percent of Normal
		Normal	Deviation	
Northwest	6.58	6.47	0.11	102
North Central	7.16	6.63	0.54	108
Northeast	7.55	6.47	1.08	117
West Central	8.94	7.80	1.14	115
Central	10.87	7.89	2.97	138
East Central	11.29	7.52	3.77	150
Southwest	9.96	10.10	-0.14	99
South Central	9.74	10.19	-0.45	96
Southeast	10.77	9.75	1.02	110
State	9.20	8.12	1.09	113

**Total Precipitation
March 2011
CoCoRaHS network
(347 stations)**



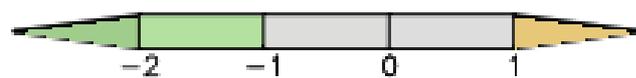
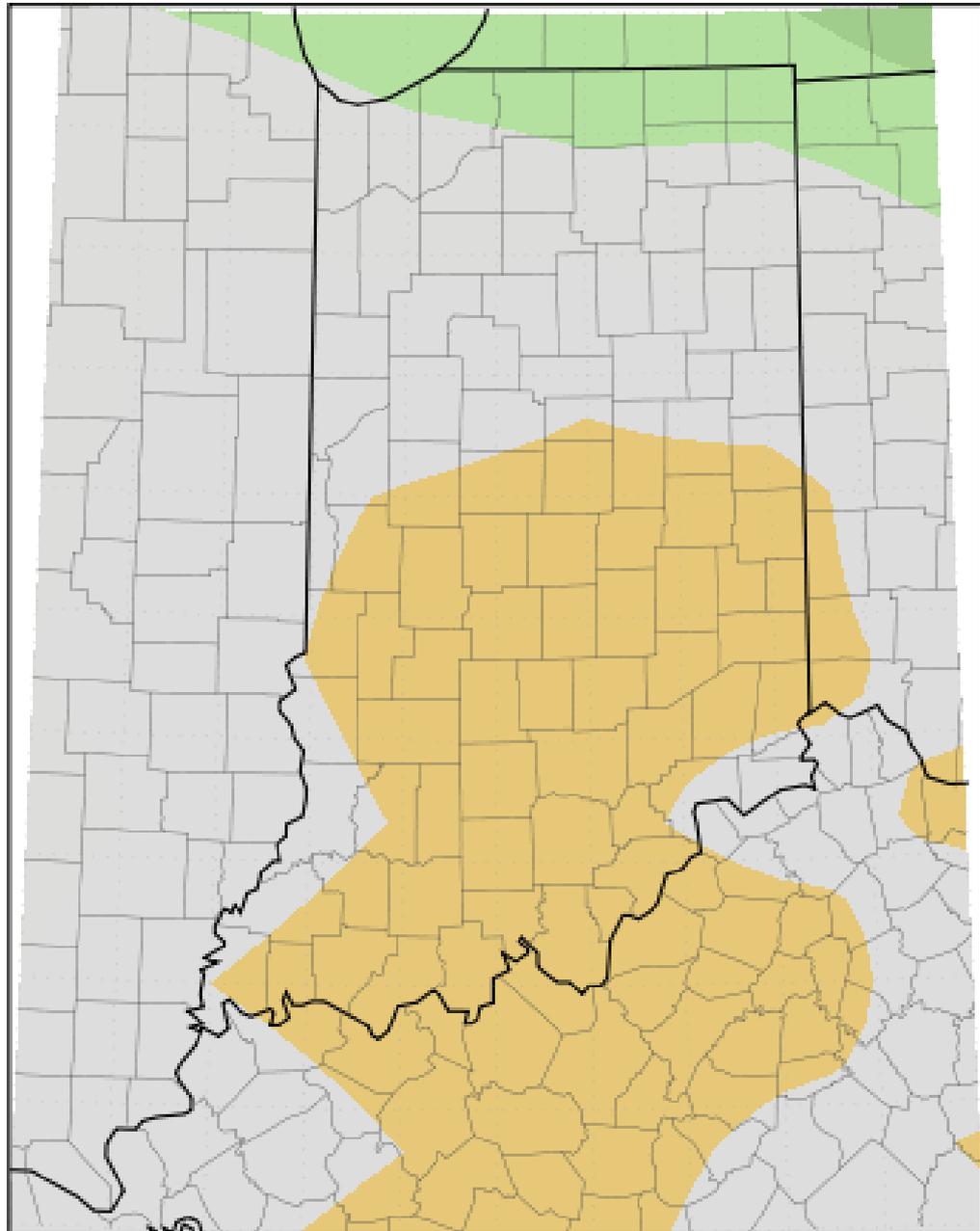
Analysis by Indiana State Climate Office
Web: <http://www.iclimat.org>

Total Precipitation: Percent of Mean
March 1, 2011 to March 31, 2011



Midwestern Regional Climate Center
Illinois State Water Survey
University of Illinois at Urbana-Champaign

Average Temperature (°F): Departure from Mean
March 1, 2011 to March 31, 2011



Midwestern Regional Climate Center
Illinois State Water Survey
University of Illinois at Urbana-Champaign

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 entirely 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 29th has 66.7% of Indiana under no drought, and 33.3% of Indiana under at *least* D0 through D4 drought status. Please note, however, that these areas are not exact, and much of this drought map has been created from reports throughout the state and estimation, so use this information as a general view rather than for specifics.

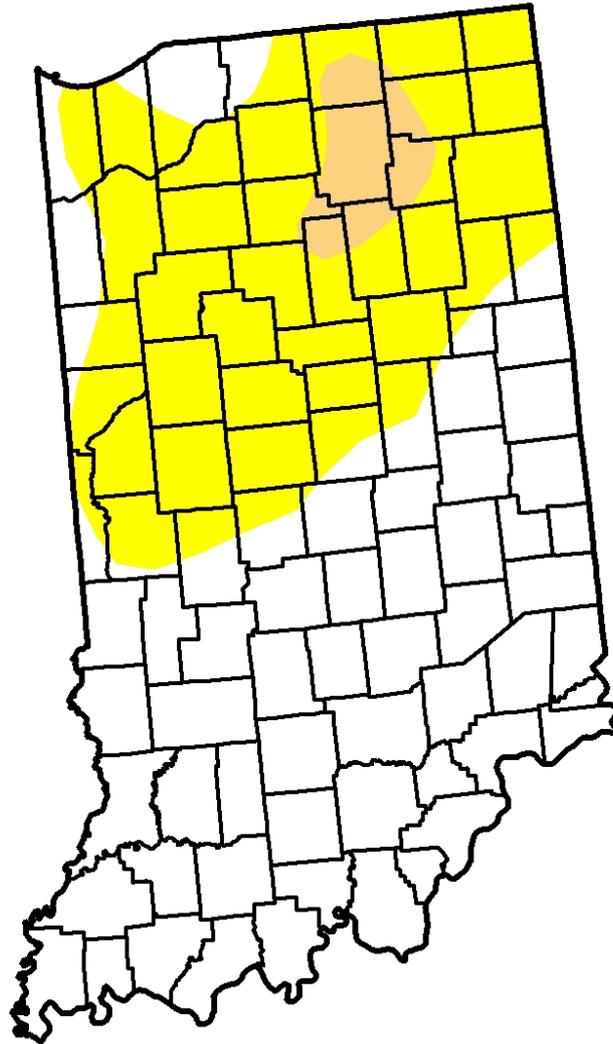
Intensity:



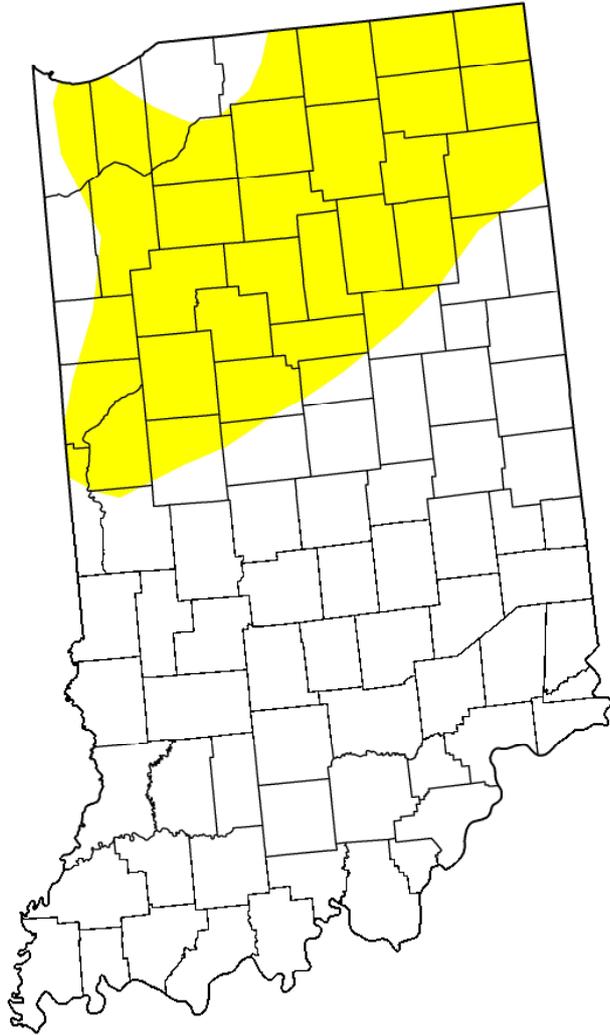
Drought Condition (Percent Area): Indiana

Date	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
03/29/11	66.72	33.28	0.00	0.00	0.00	0.00
03/22/11	66.72	33.28	0.00	0.00	0.00	0.00
03/15/11	58.99	41.01	3.91	0.00	0.00	0.00
03/08/11	58.99	41.01	3.91	0.00	0.00	0.00

March 8th Drought Summary



March 22nd Drought Summary



March 29th Drought Summary

