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Indiana State Climate Office

Monthly Weather Report

Aug 8, 2011



<http://www.iclimate.org>

July 2011 Climate Summary

Month Summary

The upper atmospheric high pressure dome which baked the Texas area in heat and drought the past few months expanded to include much of the nation in July. The heat wave became the major weather event and news story in Indiana this month, reaching its peak during the week of July 18th through 24th. Heat related impacts included a jump in heat illness visits to hospitals, increased air conditioning sales and service calls, problems with underground utility electrical cables, and a developing drought leading to urban water restrictions. The intense heat fueled severe storms that week including an unconfirmed tornado near Kentland on July 23rd.

The early part of the month was a mix of above and below normal temperatures. The first real signs of a pending heat wave came on July 11th when a brief surge of heat and humidity engulfed the state. The full intensity of the intolerable conditions arrived on July 18th and continued over the next 8 days. Comparisons to past heat waves in 1995, 1988, 1941, and even 1936 were in the news. The heat wave lost some of its edge the final week of July although temperatures in Indiana remained well above normal. Taking the month as a whole the state average temperature calculates to 78.9°, an impressive 4.5° above normal to place as the 5th warmest July on record in Indiana since 1895. The warmest July in the record books was in 1936 with a monthly temperature a full 2.0° warmer than the current month! The day split in July 2011 was 2 days with below normal temperatures, 26 days above normal, and 3 days with near normal temperatures. The daily mean temperature was 10° or more above normal on two days this month. The hottest reported temperature of the month was 102° at Terre Haute on July 22nd and the coolest at 49° in Lexington on July 14th.

On average state precipitation was about two-thirds of the July normal at 2.78 inches, a deviation of 1.40 inches below normal. This ranks July 2011 as the 24th driest July on record in Indiana. The most recent drier July was in 2002 when the mean state precipitation was 2.76 inches, good for 22nd driest in a tie with 1999. The driest July on record was a meager 1.29 inches which fell in 1974. Among CoCoRaHS volunteers the wettest single day occurred in Demotte with reports of 6.71 inches and 5.82 inches on July 23rd. Regionally July precipitation averaged about 3.1 inches in northern Indiana, 1.9 inches in central, and 3.2 inches in southern Indiana. These totals are about 80% of normal in the north, 45% in central, and 75% of normal in southern sections.

There were 8 days of severe weather in July including a string of 5 days between July 19th and 23rd during the week of intense heat. In the first two days of the month lightning jolted a police dispatcher talking on the phone and started a home fire. Two people had to be rescued from a flooded storm drain. On July 11th heavy storms in northern Indiana flipped semi trucks in addition

to the usual tree damage to power lines and home roofs. But the longest stretch of severe weather came during the week of intense heat resulting in an interstate grass fire and an unconfirmed tornado, and of course, the usual wind and hail damage. One person was injured when a tree fell on a house. Week by week descriptions and details of these severe events and their impacts are found in the narratives which follow below.

July 1st – 10th

Weather systems usually slow in summer months increasing the tendency for weather fronts to stall and become stationary. This trend was very evident this week as two cold fronts tried but each failed to pass through Indiana. A first cold front washed out on July 5th, allowing warm and humid air to reclaim the state the next day. A second cold front on July 7th also failed to reach the Ohio River, again surrendering to surging warm air from our south. It wasn't until July 9th that a stronger cold front managed to push its way to the southern states and quiet our weather.

The inability for cooler air to take control of Indiana was reflected in the state average temperatures. All 10 days of this interval had temperatures at or above normal. Warm air near the start of the interval raised temperatures on July 2nd to 5° above normal. Stormy skies let temperatures slip a few degrees each day, falling back to normal by July 5th. There was little temperature change the rest of the 10 days, settling into a pattern 1° to 2° above normal each day. Overall for the 10 day interval temperatures averaged 2° above normal around the state. Normally this time of year daytime high temperatures would average between 87° and 92° from north to south across Indiana. Daily minimums typically vary between 65° and 70° from far north to extreme southwest counties.

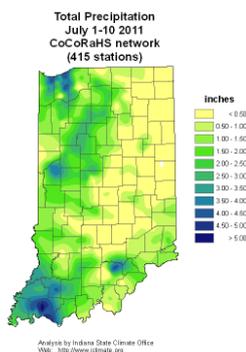
Rain fell somewhere in Indiana nearly all 10 days. Severe weather was limited to the first 3 days of the month, drifting southward across the state over that time. Total rainfall averaged about 0.9 inch in northern Indiana, 0.6 inch in central, and 1.5 inch across southern Indiana over the 10 days. These amounts are near 80% of normal in northern, 50% of normal in central Indiana, and right about normal across southern Indiana. As expected rainfall was much heavier in local summer thunderstorms. Heavier amounts measured on July 8th included 4.09 inches in Chandler, 3.65 inches at Darmstadt, and 3.37 inches in Melody Hill. Earlier in the week the CoCoRaHS observer at Michigan City recorded 4.10 inches on July 1st while in nearby Chesterton the observer there noted 3.27 inches on July 2nd. Over the entire 10 days the Chandler location received a total of 5.47 inches, while Newburgh recorded 4.71 inches and two reports from Boonville were 4.37 inches and 4.32 inches. Darmstadt had 4.19 inches for the 10 day interval.

Severe weather action didn't wait long in July to begin. On July 1st two Porter county residents were shaken up when they were hit by lightning while talking on the phone. In one situation officers at a police dispatch center watched sparks climb down the walls of their room just before lightning jolted the person on the phone. Hail up to 1.75 inch in diameter was noted. There were other reports of injuries and damages as the storm passed through. A small number of homes lost power during the storm. Some roads in the county were flooded but caused few traffic problems.

The areal coverage and impact of severe storms the next day was much greater. A Tippecanoe county home caught fire due to a lightning strike, destroying the roof. Nearby two people were trapped inside a storm drain and had to be rescued by police and fire fighters. In other places power was lost, trees came down, and hail fell. Some witnesses saw weak storm rotation. In neighboring

Carroll county 3 to 4 inches of rain quickly flooded local roads. Roads were closed due to flooding in Clinton and White counties while trees and power lines came down in Boone county. To the north 2.0 inch hail fell in Lagrange while 1.0 to 2.2 inch hail was common in Laporte county. Residents of Starke county also saw 1.0 inch hail as did folks in Hendricks county in central Indiana. These storms packed plenty of high wind as well. Numerous trees fell on roads and power lines in Starke, Kosciusko, Wabash, Whitley, Fulton, Cass, Tippecanoe, Clinton, and Boone counties in northern and central Indiana. In Kosciusko county a large field irrigation system overturned. In Knox county of southern Indiana a trampoline was wrapped around a tree by high winds.

The storm system continued moving south for a third day but weakened. On July 3rd hail was reported in Dubois county but no other damage was noted.



July 11th – 17th

Severe storms battered far northern and eastern counties of Indiana to start the week. But it was the oppressive combination of heat and humidity on July 11th that spread summer misery to all Hoosiers statewide. This surge of warm humid air was quickly replaced the next day by cooler air behind a cold front. The surface high pressure center behind this front moved east of Indiana after a few days but this allowed the uncomfortable warm and sticky air mass to return to Indiana to end the week. Meanwhile in the upper atmosphere a huge high pressure dome of hot air from the Texas drought region was spreading northward, poised to take over and dominate Midwest weather in the days ahead.

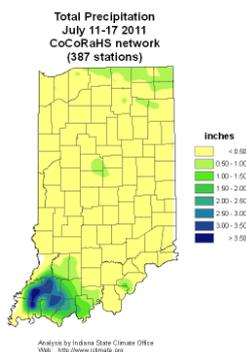
Indiana temperatures began the week 7° above normal then cooled to as low as 3° below normal in midweek in the cooler air mass. This cooling trend was reversed on July 15th as the surface high pressure moved east and warmer air returned on the backside southerly flow of the high center. Temperatures rebounded and the statewide average temperature climbed to 5° above normal to close out the week. Overall for the week the temperature averaged 3° above normal. Normally in mid July the daily maximum temperature would range between 87° to 91° north to south across the state. Daily minimum temperatures should vary from 66° in far northern counties to 70° in the far southwest region.

Rain fell the first few days of the week but amounts overall were quite light. The second half of the week was mostly dry. Totals for the week ranged from about 0.3 inch in northern Indiana, to 0.1 inch in central sections, and nearly a half inch in the south. These totals represent less than 40% of normal in northern counties, under 20% in central, and 50% of normal in southern Indiana. As is typical of summer there were localized heavy amounts in thunderstorms. On July 13th heavy showers occurred in southwest Indiana. Some of the larger amounts measured by CoCoRaHS observers included 3.93 inches at Stendal, 3.54 inches in Princeton, 3.45 inches at Evansville, 3.41 inches in Francisco, and 2.95 inches in Petersburg. There was no additional rainfall this week at Francisco and Petersburg but Darmstadt observed 5.45 inches and Boonville 2.90 inches for the full week. Huntingburg noted 2.83 inches and Holland 2.54 inches during the week.

July 11th was an eventful weather day featuring both severe storms and extreme heat and humidity. A heat advisory was issued for many Indiana counties as temperatures moved into the 90s and dew points beyond 80 degrees, common in the tropics but rare for Indiana. The heat index soared to more than 120 in parts of southern Indiana, forcing some universities to rotate air conditioning blackouts among its buildings and curtail student athletics. The high heat indices created a very unstable air mass, ripe for the development of thunderstorms and damaging winds.

Counties along the Michigan and Ohio borders experienced the worst of the severe weather that day. There were several reports of downed trees and power lines in Laporte, St Joseph, Elkhart, Lagrange, Steuben, Noble, and Whitley counties due to winds up to 70 mph. In Kosciusko county high winds brought down telephone poles. Wind gusts caused two semi trucks to roll over on I-69 at two locations in DeKalb county. Trees fell on homes and power lines in Allen and Huntington counties. To the south in Wayne county high winds in a thunderstorm tore the roof off a legacy baseball stadium. Trees fell on homes and roads causing roof damage and interfering with traffic. In central Indiana there was isolated wind damage in Hamilton county as trees fell on top of power lines and roads, and telephone poles were snapped. One inch diameter hail was reported in Randolph county while hail 1.75 inch in diameter fell in Clinton county.

There was only one report of wind damage the next day in Gibson county as trees fell on top of power lines in that area.



July 18th – 24th

An intense heat wave dominated Indiana this entire week, reminiscent of previous episodes in 1995, 1988, and even 1941. The heat combined with unusually humid conditions to push heat indices to 115 and higher, a dangerous situation that prompted a week long excessive heat warning for those working outdoors. The most intense heat of the summer so far arrived on July 20th and 21st. For some cities the daily maximums above 100° were their hottest days since July and August 1988 and would become part of the warmest 8 day stretch since July 1941. Despite the mostly sunny skies there were 4 days with local severe weather events around the state.

The huge high pressure dome of hot air in the upper atmosphere which originates in Texas expanded northeast into the Great Lakes region this week. A cold front entered northern Indiana on July 19th and traveled as far south as Lafayette the next day. Here it stalled unable to advance against the strong high pressure dome and it retreated northward into Michigan by July 22nd. The hot humid air mass resumed control of Indiana weather the final days of the week.

The cold front in mid week was hardly noticeable. State average temperatures which started the week at 7° above normal actually warmed a bit each day, peaking at 10° above normal on July 21st. Temperatures slid a bit from there to end the week at 7° above normal, the same level as a week ago. For the week overall state temperatures averaged 9° above normal. Normal daily maximum temperatures range from 86° in far northern Indiana to 92° in the southwest. Daily minimums typically vary between 67° and 71° north to south across the state.

Light rain fell every day somewhere in the state despite the hot sinking air mass. The daily light showers each yielded a few hundredths inch before increasing to average near a quarter inch on the final day of the week. Total rainfall for the week averaged near 0.8 inch in northern Indiana, about 0.5 inch in central sections, and 0.7 inch across the south. These totals are about 75% of normal in northern and southern areas and barely half of normal in central Indiana. In the vicinity of the retreating cold front in northern Indiana, however, thunderstorms were heavy in isolated spots. On July 23rd four CoCoRaHS observers near Demotte recorded highly variable amounts, ranging from 6.71 inches to 5.82 inches, 2.94 inches, and 2.80 inches. Other heavy amounts that day were 2.24 inches and 2.29 inches in Bourbon, and 2.03 inches at Hebron. Some grand totals for the week were 6.90 inches at Demotte, 2.89 inches in Angola, and 2.81 inches at Bourbon and Hebron.

The intense heat is certainly impacting daily life. Indiana hospitals are reporting increased emergency room visits due to heat illnesses. Air conditioner sales around Indiana are brisk in home supply stores. Some cities are opening cooling centers for residents without home air conditioning. Businesses with outdoor sales have noticed a sharp drop off in customers due to the extremely uncomfortable conditions. Even our infrastructure struggles with the heat. Utility companies have had to reduce the voltage of its underground supply lines to avoid overheating caused by high electrical demand. Some utilities have implemented rolling power blackouts. Indianapolis has ordered residents to stop watering lawns to curtail water demand.

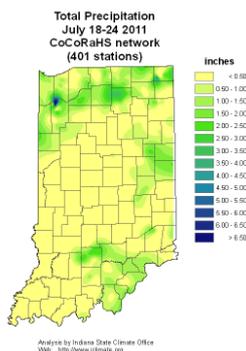
Field crops are suffering right along with people. Most corn was planted later in the wet spring and pollination was delayed until a later and hotter part of summer. Pollen is susceptible to heat and its reduced effectiveness may lead to smaller ears, missing kernels, and in turn lower yields. The quick loss of topsoil moisture due to high evaporative demand is also a concern depending on soil type.

The intense heat is quickly drying topsoil vegetation but is also firing up thunderstorms. On July 18th a semi truck blew a tire on I-65 near Lafayette, setting the grass shoulder on fire. The next day a local wind storm brought down trees and power lines in Harrison county in far southern Indiana. The action moved to central Indiana on July 20th. Trees fell on roads and hail 1.00 inch to 1.75 inch in diameter was observed in Henry county. High winds in Lawrence county pulled down utility poles and uprooted trees that fell on roads and houses.

Severe weather on July 22nd and 23rd occurred mainly in northern Indiana. On July 22nd over 40 trees fell in high winds in Steuben county while an old barn was leveled and about 1000 acres of corn lodged. Corn was lodged over a 4 square mile area in Randolph county due to high winds there. In Allen county a gas station canopy was ripped down. Trees falling on power lines or roads were a common theme in Allen, Dekalb, Huntington, Whitley, Kosciusko, Marshall, and Pulaski counties. One person was injured in Starke county when a tree fell on a house. Winds were estimated around 70 mph throughout northern Indiana during these storms.

The weather became more violent the next day. On July 23rd an unconfirmed tornado touched down briefly near Kentland in Newton county tearing down tree branches. In northeast Indiana a barn roof was torn off in Whitley county and trees were uprooted or snapped off there and in Kosciusko county. To the south in Randolph county high winds caused small structural damage and toppled trees and utility poles.

The dry down of soils in the intense heat has prompted an alert to closely monitor soil moisture conditions. The National Drought Monitor introduced a D0 classification (abnormally dry) for northeast Indiana in its July 19th edition. The affected area includes counties bounded on the north and east by the Michigan and Ohio state lines, and on the west by a line roughly from Goshen to Elwood, then on to Winchester. The D0 area represents about 18% of the total state area.



July 25th – 31st

The summer heat wave relented briefly this week as maximum temperatures in some cities dipped below 90°. The dominant high pressure ridge in the upper atmosphere that has controlled our weather this month is still in place, expanding and shrinking in area in a slow long cycle. At ground level a cold front passed half way through the state on July 27th before it stalled, then retreated as a warm front the next day into Michigan. A second try a few days later was more successful. The cold front pushed its way across the Ohio River, allowing less humid air into the state at the close of the week and month.

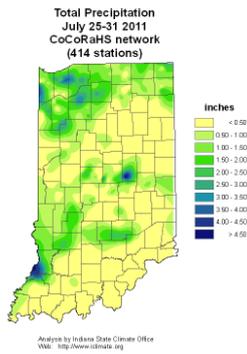
State average temperatures early in the week ranged 4° to 6° above normal, then warmed up a few degrees to 7° to 9° above normal after July 27th. For the week overall temperatures averaged 7° above normal. Typically in the last week of July daily maximum temperatures should range from 86° to 91° north to south across Indiana. Daily minimums normally vary from 66° in the far north to 70° in the southwest corner of the state.

The week began with about 0.8 inch of rain in southern Indiana and a quarter inch in northern and central sections. Dry weather followed the next 3 days. Light showers fell the next two days with the passage of the second cold front. Total rainfall for the week averaged near 1.1 inch in northern Indiana and about 0.6 elsewhere across the state. These amounts are about 130% of normal across the north and 60% to 70% of normal in central and southern Indiana. As expected the summer heat aided the development of locally heavy thunderstorms. On July 29th the CoCoRaHS observer in Fowler recorded 5.00 inches. Three Valparaiso gauges collected 3.14 inches, 3.10 inches, and 3.05 inches that day. Earlier in the week the Pendleton volunteer measured 3.10 inches on July 25th. Among the higher grand totals for the week were 3.63 inches in Kentland and 3.45 inches at Brook. The Valparaiso trio totaled 3.61 inches, 3.35 inches, and 3.34 inches.

Certainly rain has not fallen uniformly across Indiana and this fact is demonstrated in the latest National Drought Monitor product. The July 26th edition of this report shows the area classified as abnormally dry (D0 category) has nearly doubled in one week from 18% of the state area to 33% in the latest report. This eastern D0 area is now generally bound within a line from Elkhart to Tipton to Martinsville, then on to Columbus and Brookville. The impacted area has expanded southward into southeast Indiana and westward into central Indiana this week. The remaining two thirds of the state remains classified as normal and not in drought.

Noticeably missing this week is severe weather. Only a single report of fallen trees and power lines was noted in a thunderstorm in Vigo county.

The persistently high maximum temperatures, unusually high dew points and heat indices, warm night time temperatures, and high evapotranspiration rates have certainly impacted people without home air conditioning. Many home improvement stores report record window air conditioner sales. By some estimates new home central air conditioning installations have increased 10% above normal for this time of year while central air service calls have increased 20% or more.



July 2011

Temperature

Region	Temperature	Normal	Deviation
Northwest	77.6	73.6	4.0
North Central	77.5	73.1	4.4
Northeast	78.1	72.8	5.2
West Central	78.9	74.8	4.0
Central	79.0	74.3	4.7
East Central	79.0	73.5	5.5
Southwest	81.5	77.1	4.4
South Central	80.9	76.3	4.6
Southeast	80.4	75.5	5.0
State	79.2	74.6	4.6

Precipitation

Region	Precipitation	Normal	Deviation	Percent of Normal
Northwest	4.06	3.86	0.20	105
North Central	3.10	3.80	-0.69	82
Northeast	2.09	3.66	-1.57	57
West Central	2.11	4.39	-2.28	48
Central	1.60	4.26	-2.65	38
East Central	2.14	4.10	-1.96	52
Southwest	4.26	4.26	-0.01	100
South Central	3.28	4.32	-1.05	76
Southeast	2.25	4.12	-1.87	55
State	2.79	4.10	-1.31	68

Summer 2011 (June - July so far)

Region	Temperature	Temperature	
		Normal	Deviation
Northwest	74.3	71.9	2.4
North Central	74.1	71.3	2.8
Northeast	74.4	71.0	3.4
West Central	75.7	73.1	2.5
Central	75.6	72.5	3.1
East Central	75.4	71.7	3.7
Southwest	78.7	75.2	3.5
South Central	77.9	74.4	3.5
Southeast	76.9	73.5	3.4
State	75.9	72.8	3.1

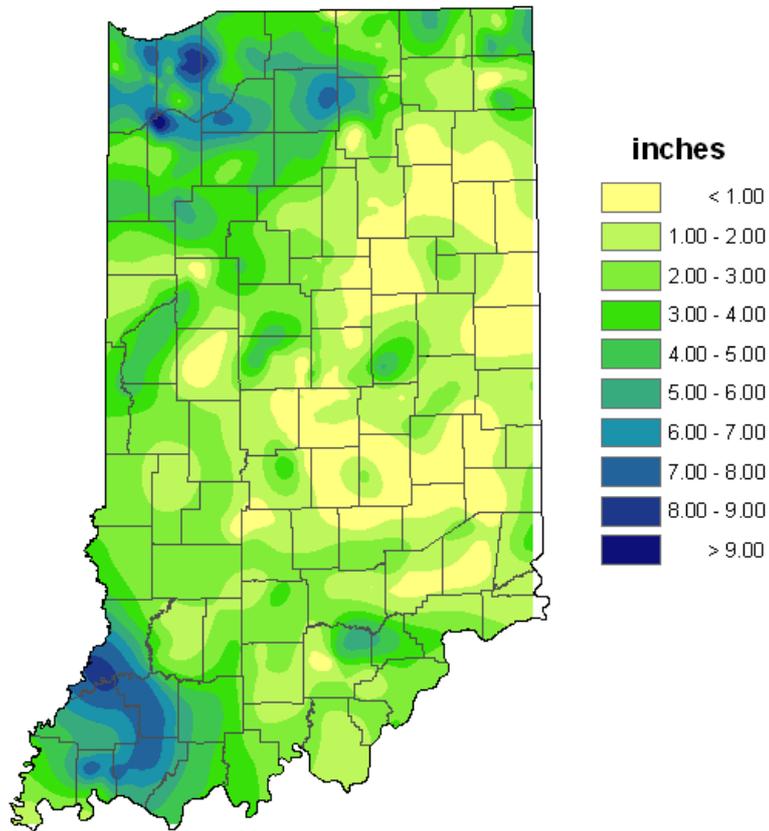
Region	Precipitation	Precipitation		
		Normal	Deviation	Percent of Normal
Northwest	9.29	8.20	1.09	113
North Central	7.13	8.10	-0.97	88
Northeast	4.67	7.74	-3.07	60
West Central	7.21	8.72	-1.51	83
Central	6.99	8.36	-1.36	84
East Central	5.85	8.33	-2.49	70
Southwest	11.47	8.37	3.10	137
South Central	10.31	8.41	1.90	123
Southeast	8.73	8.34	0.39	105
State	8.10	8.30	-0.19	98

2011 Annual so far

Region	Temperature	Temperature	
		Normal	Deviation
Northwest	49.4	49.2	0.2
North Central	49.2	48.8	0.4
Northeast	49.0	48.4	0.6
West Central	51.7	51.0	0.7
Central	51.7	50.6	1.2
East Central	51.2	49.7	1.5
Southwest	55.8	54.4	1.4
South Central	55.3	53.8	1.5
Southeast	54.3	52.9	1.4
State	52.0	51.1	1.0

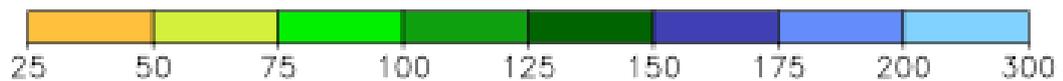
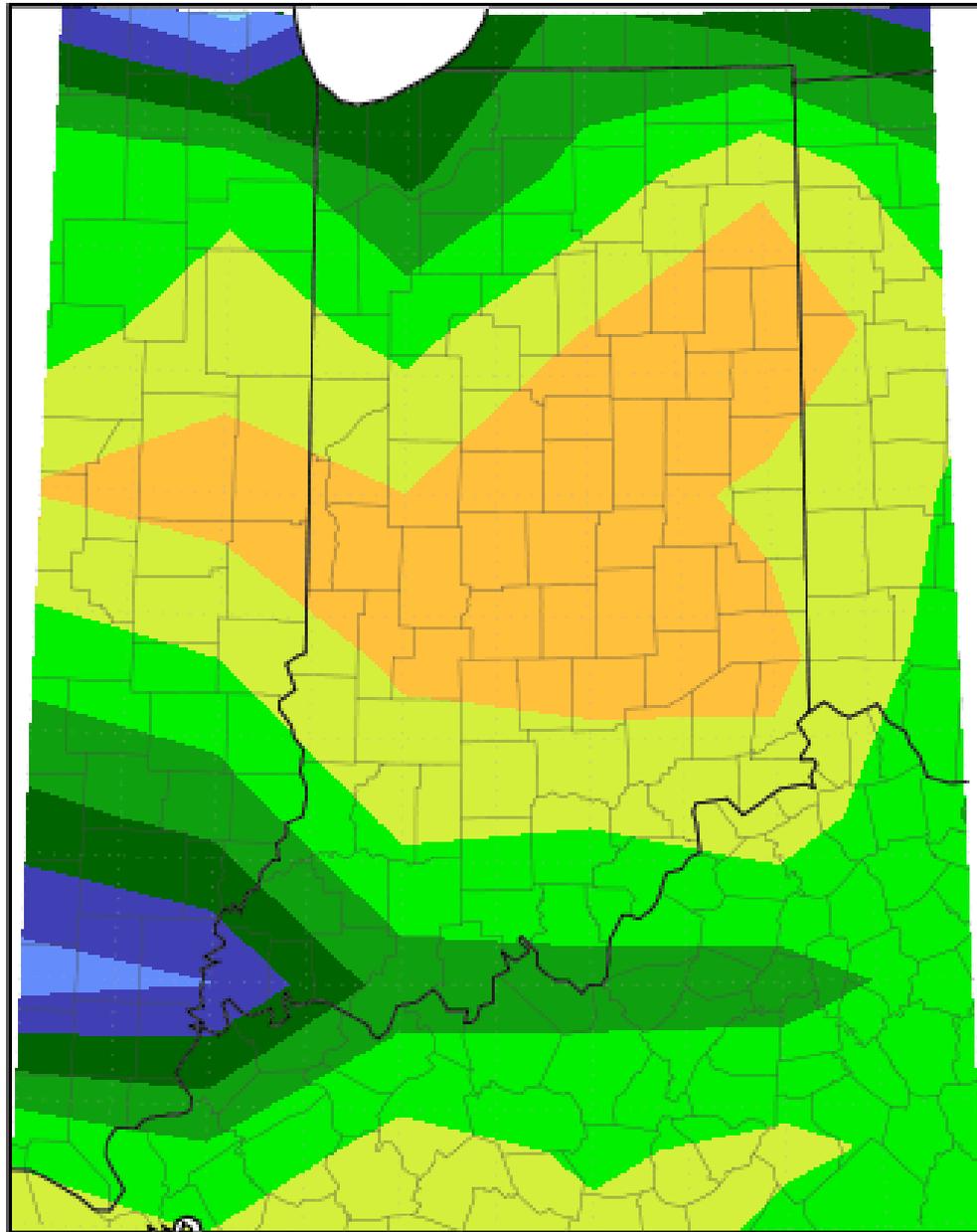
Region	Precipitation	Precipitation		Percent of Normal
		Normal	Deviation	
Northwest	29.19	22.25	6.93	131
North Central	27.83	22.17	5.66	126
Northeast	26.02	21.46	4.56	121
West Central	30.46	24.78	5.68	123
Central	33.23	24.56	8.67	135
East Central	32.37	23.93	8.44	135
Southwest	40.82	27.91	12.91	146
South Central	40.51	28.02	12.49	145
Southeast	39.96	27.15	12.81	147
State	33.46	24.75	8.71	135

**Total Precipitation
July 2011
CoCoRaHS network
(424 stations)**



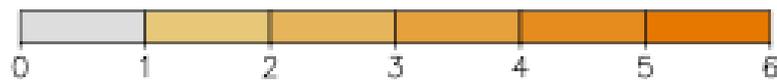
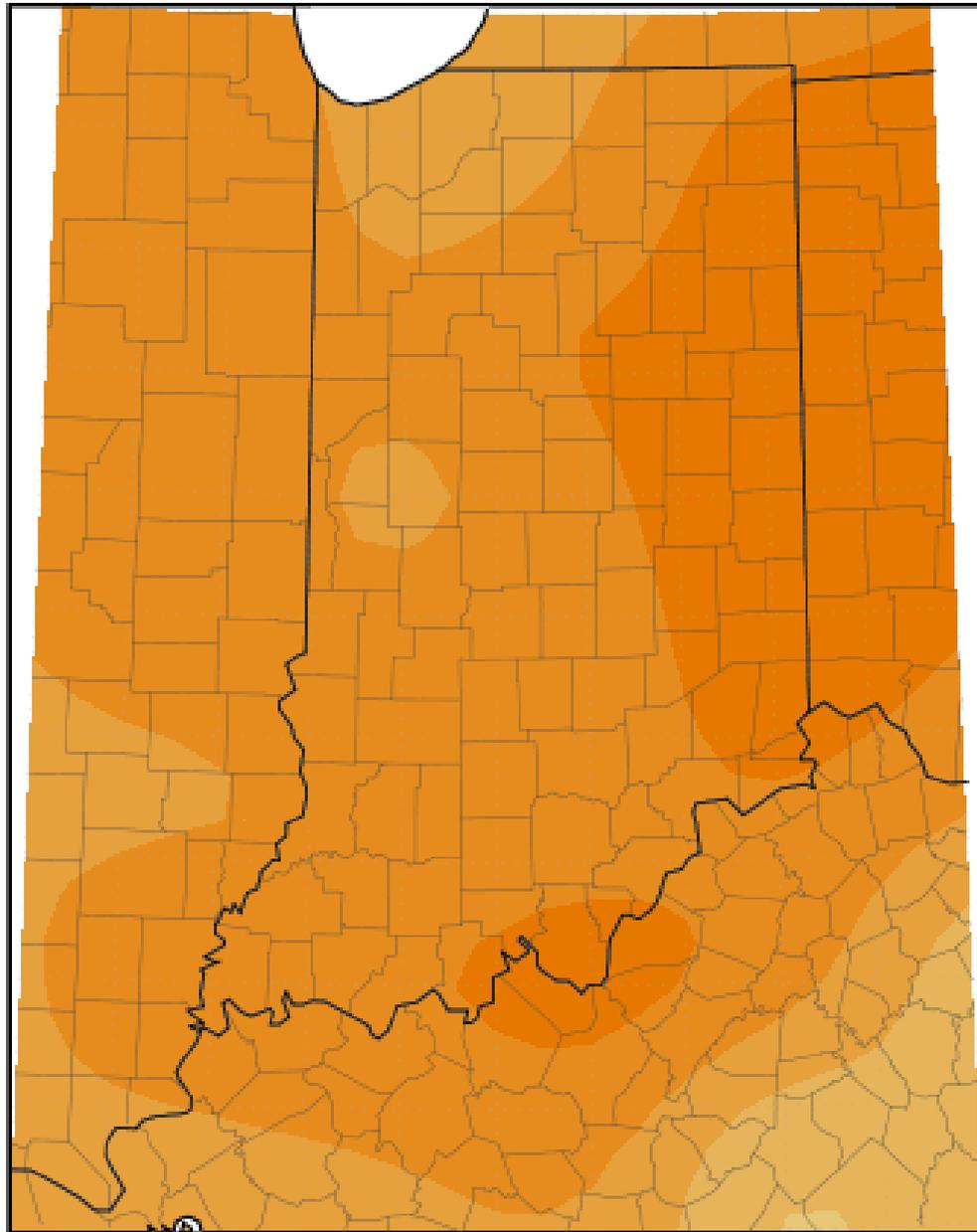
Analysis by Indiana State Climate Office
Web: <http://www.iclimat.org>

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



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

Average Temperature (°F): Departure from Mean
July 1, 2011 to July 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, July 26th has 66.5% of Indiana under no drought, and 33.5% 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
08/02/11	27.95	72.05	18.74	0.00	0.00	0.00
07/26/11	66.52	33.48	0.00	0.00	0.00	0.00
07/19/11	81.91	18.09	0.00	0.00	0.00	0.00
07/12/11	100.00	0.00	0.00	0.00	0.00	0.00
07/05/11	100.00	0.00	0.00	0.00	0.00	0.00

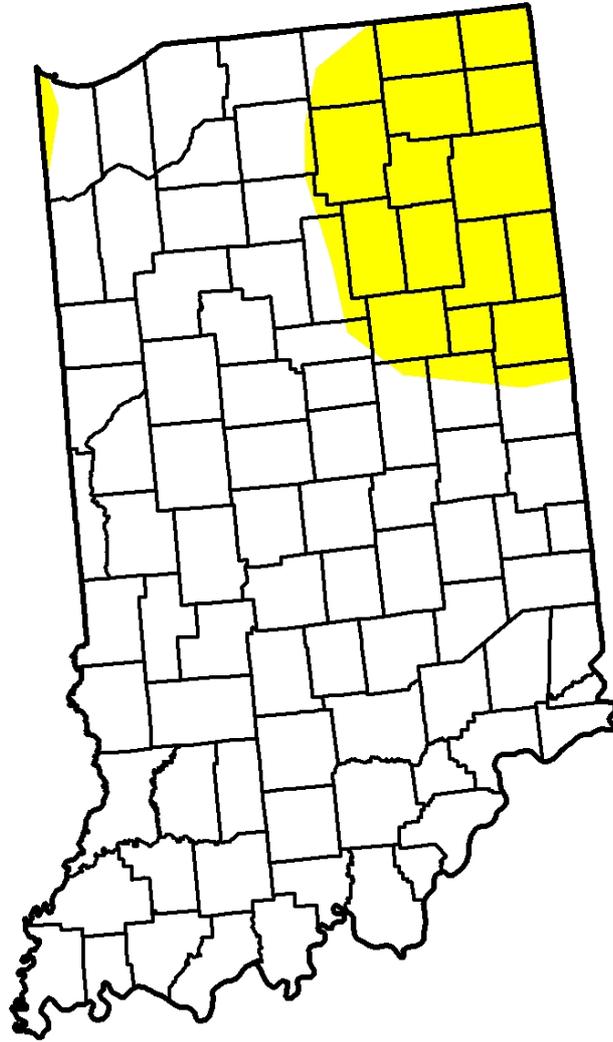
July 5th Drought Summary



July 12th Drought Summary



July 19th Drought Summary



July 26th Drought Summary

