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## Indiana State Climate Office

### Monthly Weather Report

**Sep 6, 2011**



<http://www.iclimate.org>

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## August 2011 Climate Summary

### Month Summary

The blistering heat of July continued the first week of August but then a cool trend the next week spelled relief for Indiana. The middle of August marked an end to the extended periods of warm and cool for now as the pace of above and below normal temperature swings quickened. Deadly severe storms attended the warm and cool temperature shifts. Severe weather on August 9<sup>th</sup> and 13<sup>th</sup> contributed to an eventual 8 deaths in the state. All but one of these deaths were related to the collapse of an outdoor concert stage at the Indiana State Fair during a severe thunderstorm. Four days earlier a delivery driver was killed when a tree fell on his vehicle in Auburn.

A string of 25 days with above normal temperatures ended on August 9<sup>th</sup>. Eight days of below normal temperatures followed before a mix of above and below normal temperature days ran to the end of the month. This sequence of hot weather, a cool week, then a mixture of warm and cool weather guided the monthly temperature remarkably toward neutral. The August state average temperature of 72.4° was just 0.8° above normal. This statistic ties August 1987, 1954, 1932, and 1905 as the unexceptional 46<sup>th</sup> warmest August on record in Indiana since 1895. A year ago August was much warmer at 75.8°, good for 13<sup>th</sup> warmest among all Augusts. The day split in August 2011 was a dead heat with 16 days of above normal temperatures, 15 days of below, and one day near normal. There were no days in August 2011 when daily state mean temperatures were at least 10° warmer or colder than normal. The hottest reported temperature of the month was 98° on August 2<sup>nd</sup> at Bedford and Poseyville while the coldest was 45° at Wanatah on August 26<sup>th</sup>.

Precipitation in August was about two-thirds of normal, like July before it. The state mean August precipitation of 2.59 inches ranks as the 27<sup>th</sup> driest August on record in Indiana. Yet recall last year when August state precipitation was 1.87 inches, the 3<sup>rd</sup> driest in the record books? Other recent dry Augusts include 2.08 inches in 2008, holding on to 9<sup>th</sup> place among dust leaders. The driest August on record in Indiana was a meager 1.59 inches in 1897. On a regional basis August 2011 precipitation averaged about 3.3 inches across northern Indiana, 2.8 inches in central areas, and about 1.9 inches in the south. These totals are near 90% of normal in the north, 75% of normal in central Indiana, and 50% of normal across the south. Despite the low monthly totals there were some wet days in August 2011. On August 7<sup>th</sup> the CoCoRaHS observer in Bedford found 3.77 inches in the rain gauge that day while 3.10 inches fell in Blocher.

Severe weather occurred on 8 days this August. Storm damage on August 2<sup>nd</sup>, 7<sup>th</sup> and 8<sup>th</sup> were typical of summer with the usual downed trees, power lines, and damaged vehicles. On August 9<sup>th</sup> hail battered west central and northeastern counties. High winds toppled a tree onto a moving delivery truck and killed the driver. The most widespread and deadliest storm day came August

13<sup>th</sup> when 5 people were killed instantly when an outdoor stage collapsed during a concert at the Indiana State Fair. Eventually 3 others died from their injuries. Two inch diameter hail was reported across northern Indiana that day. The severe weather damage of August 18<sup>th</sup> and 21<sup>st</sup> was more typical once again, with reports of hail, high winds, and downed trees. Finally on August 24<sup>th</sup> winds overturned a barn and farm equipment. Lightning started a home on fire while elsewhere high winds snapped trees onto power poles, lines, and blocked roadways. Week by week descriptions and details of these severe events and their impacts are found in the narratives which follow below.

Drought expanded and intensified in Indiana during August. Early in August abnormally dry conditions covered all but northwest and southwest Indiana while moderate drought covered east central Indiana. By the end of the month only northwest Indiana was drought free. Areas of moderate drought had migrated to cover much of the southern half of the state except southwestern counties. Conditions had deteriorated the most in Morgan and Johnson counties, the only part of Indiana classified in severe drought conditions.

### **August 1<sup>st</sup> – 7<sup>th</sup>**

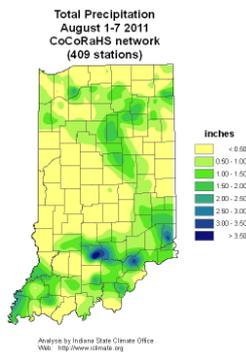
The heat of July continues into August as the warm spell with above normal daily temperatures has now extended through 23 consecutive days. The opening days of the new month featured temperatures 6° to 8° above normal. Slightly cooler air behind a cold frontal passage on August 3<sup>rd</sup> and 4<sup>th</sup> briefly lowered temperatures into the 2° to 5° above normal range. As a warm front reached Indianapolis on August 7<sup>th</sup> state average temperatures rebounded to 8° above normal to end the week. Overall for the week state temperatures averaged 6° above normal. Typically for this first week in August daily maximum temperatures should range from 86° in far northern counties to 92° in extreme southwest Indiana. Daily minimums normally vary between 65° and 70° north to south across the state.

The two fronts generated nearly all the rainfall this week. The cold front of August 4<sup>th</sup> generally produced amounts ranging from a tenth inch in southern Indiana to 0.4 inch across the north. The warm front gave southern Indiana about 0.8 inch but much less to the north. Totals for the week were about 0.8 inch in northern Indiana, 0.5 inch in central, and 1.1 inch in southern areas. These amounts are near normal in southern Indiana but subpar elsewhere with just 85% of normal in northern Indiana and 60% of normal in the central third of the state. There were spots in southern Indiana with locally heavy showers. On August 7<sup>th</sup> the CoCoRaHS observer in Bedford measured 3.77 inches. Other heavier amounts that morning included 3.10 inches at Springville, 2.89 inches in Austin, 2.63 inches in New Albany, and 2.45 inches at Aurora. For the entire week the Aurora observer collected 3.18 inches in the gage while Lawrenceburg had 2.39 inches. The Floyds Knobs and Bedford volunteers each had 2.18 inches for the week.

The rainfall created by the two fronts was welcome but the severe weather in advance of these systems was not. On August 2<sup>nd</sup> high winds brought damage to northwest Indiana and to a few counties in the east central part of the state. Trees fell on power lines, phone lines, roads, and a few vehicles in these areas. In Ripley county trees fell on busy I-74. The counties affected by high wind damage included Lake, Porter, Newton, Jasper, Kosciusko, White, Huntington, Howard, Tipton, Fayette, Ripley, and Franklin.

A second round of severe weather associated with the warm front hit central and north central Indiana on August 7<sup>th</sup> although this wind damage didn't appear as extensive as earlier in the week. Trees came down in Miami, Howard, Marion, and Kosciusko counties along with the usual power lines. Three vehicle accidents on I-65 south of Lafayette were directly related to the severe weather. High winds but with little damage was reported over a much larger area.

The intense heat of recent weeks has gradually dried up Indiana soils that were once saturated a few months ago after heavy spring rains. The area of Indiana classified by the National Drought Monitor as abnormally dry (D0 class) has more than doubled to 72% of the state in its August 2<sup>nd</sup> report. The dry area has spread westward to include all of the central third of the state. Far southeast counties are now also labeled as abnormally dry extending west as far as Harrison county. Much of the eastern third of Indiana with exception of far northeast and southeast counties has deteriorated into class D1, the moderate drought category. This new drought region includes 19% of the total state area and qualifies as the first official drought declaration in Indiana since March.



## August 8<sup>th</sup> – 14<sup>th</sup>

The warm spell which began on July 16<sup>th</sup> ended on August 9<sup>th</sup>, a string of 25 consecutive days of above normal state average temperature. In its place a cool spell may have begun as each day since then has had below normal temperature. The week started with daily average temperatures about 4° above normal but quickly cooled to 5° below normal by August 11<sup>th</sup>. Since then deviations have run between 1° and 4° below normal. Overall for this second week the state temperature has averaged 1° below normal. Typically at this point in summer daily maximum temperatures should vary between 84° and 91° north to south across Indiana. Daily minimums normally range between 64° in the far north to 68° in the southwest corner of the state.

The dome of hot air which so dominated our weather in July is losing its grip on Indiana this month. The jet stream was far displaced north of Indiana in July but its path has turned southward aligned with the storm track. One sign of this change is the increased frequency of cold fronts passing through Indiana. Many cold fronts last month stalled and became stationary over Indiana in their journey toward the Ohio River. Last week two cold fronts crossed the state and this week three cold fronts passed through, on August 9<sup>th</sup>, 11<sup>th</sup>, and 14<sup>th</sup>. The first and last fronts produced thunderstorms, hail, and high winds which resulted in 8 deaths.

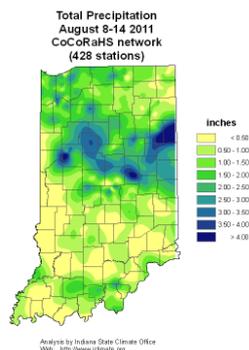
About an inch of rain fell with the first front but the second front was mostly dry. The last front of the week generated about 0.4 inch. For the week regional totals came to about 1.5 inches in northern and central Indiana and around 0.6 inch across the south. These totals are near 170% of normal across the north, about double normal in central Indiana, and about 70% of normal in the southern third of the state. The highest daily rainfall totals were recorded on the morning of August 9<sup>th</sup>. The CoCoRaHS observer at Anderson measured 2.80 inches, the Indianapolis reporter 2.56 inches, and the Bluffton volunteer noted 2.55 inches. For the week Anderson accumulated 4.35 inches, West Lafayette 3.83 inches, and Bluffton 3.35 inches. Some other heavy weekly totals were 3.23 inches in Lapel, 3.20 inches at Atlanta, and 3.18 inches in Demotte.

Severe weather on August 8<sup>th</sup> and 9<sup>th</sup> announced the passage of the first cold front. High winds in the northern counties of Miami, Cass, Carroll, White, and Tippecanoe on August 8<sup>th</sup> brought down trees which fell on roads and electrical lines, causing power outages to several hundred homes. A tornado warning was issued for White county. The damage area moved further south along with the cold front the next day. One inch diameter hail was reported in Montgomery, Boone, Hendricks, Marion, and Decatur counties. Winds in excess of 60 mph were observed all along this same line from Crawfordsville to Greensburg. A second region of severe weather this day was located in extreme northeast Indiana. Hail was noted in Steuben county with high winds in Dekalb, Whitley, and Allen counties. A package delivery driver was killed at Auburn in Dekalb county when a tree fell on the truck he was driving. On August 10<sup>th</sup> the storms had passed but higher than usual wind speeds persisted. A young man went missing in Lake Michigan near Gary when he was possibly caught in a rip current offshore.

Storms on August 13<sup>th</sup> were even more deadly and covered a much larger area of the state. Five people were killed and more than 45 injured when a temporary stage at the Indiana State Fair collapsed onto fans immediately before a Sugarland concert. A strong wind gust started the tragedy but a full investigation as to all contributing causes is ongoing. A sixth and seventh person died in the days following due to head injuries. The high winds were part of a large storm complex which crossed Indiana from northwest to southeast. Up to 2 inch diameter hail was reported primarily in northwest Indiana, including in Lake, Laporte, Jasper, Benton, and Tippecanoe counties. Car windshields were cracked in Lake county and traffic was stopped on I-65. Other reports of scattered hail came from Wabash, Adams, Madison, and Monroe counties and a funnel cloud was seen in Madison county. No tornado was confirmed there. Much of central Indiana noted high winds of 60 to 77 mph, generally within an area delimited by the cities of Portland, Wabash, Lafayette, Bloomington, Greenfield, and Richmond. Wind gusts were also reported in far south central Indiana, in Floyd, Harrison, Clark, and Crawford counties which brought down more trees and power lines. By Sunday the severe weather had moved southeastward into Kentucky.

Rains this week were spotty and their impact on crops is hard to evaluate as drought stress was already varied across the state. The area of Indiana classified as D0 (abnormally dry) has decreased from 54% coverage to 43% over the previous week according to the August 9<sup>th</sup> report of the National Drought Monitor. However this 11% portion has been transferred into the region classified as D1 (moderate drought), increasing its share from 19% to 30% over the past week. The new D1 area is now roughly bounded on the north by a line from Attica to Kokomo, then to North Manchester and on to Butler. On the south the new D1 area is delimited by a line from Covington to Martinsville to Brookville. No signs of dryness are seen in 27% of the total state area. In

summary the intensity of drought in Indiana has gradually increased in areas that were already showing signs of abnormal dryness.



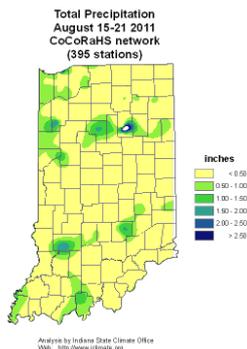
## August 15<sup>th</sup> – 21<sup>st</sup>

After an 8 day cool spell a slow warm up returned daily temperatures to slightly above normal. State average temperatures began 3° below normal but by mid week had reached normal and continued to rise to 3° above normal by the weekend. Overall weekly temperatures averaged right at normal. Normal daily maximum temperatures range from 84° in far northern Indiana to 91° in southwest counties. Daily minimums typically vary between 64° to 69° north to south across the state.

The pace of cold fronts has slowed this week as the jet stream has retreated northward. The first half of this week was rather dry until a cold front stalled near the middle of the state on August 19<sup>th</sup>. The stationary front broke free the next day and traveled quickly to the southern states. A second cold front began a slow journey across the state on August 21<sup>st</sup>. These were weak cold fronts and had little impact on temperature. Except for locally heavy showers only very light amounts of rain fell generally during the second half of the week. Regionally for this third week of August precipitation totals averaged near 0.4 inch across northern Indiana, and about 0.1 inch in central and southern sections. These amounts are near 40% of normal in the north and about 20% of normal elsewhere across the state. Near the end of the week some spots did receive heavy rainfall in local thundershowers. On the morning of August 21<sup>st</sup> two CoCoRaHS observers in Wabash recorded 2.57 and 2.56 inches, while two Logansport volunteers noted 1.55 and 1.52 inches. The Kentland observer measured 1.47 inches that day. Two days earlier the Newberry rain gauge collected 1.74 inches while in Columbus 1.47 inches fell. The heaviest weekly totals included 2.70 inches at Wabash, 1.79 inches in Newberry, with 1.56 and 1.52 inches in Logansport.

Severe weather damage was quite limited this week. On August 18<sup>th</sup> hail and high winds were noted in Howard county while 1.0 inch diameter hail fell in Daviess county. Some trees came down in Perry county. A few days later high winds tore the roof off a business in Ripley county and snapped some trees as the second cold front passed on August 21<sup>st</sup>.

The lack of normal rainfall did not cause drought to spread this week in Indiana but some already dry areas got a little drier. The National Drought Monitor increased the drought intensity class in Monroe, Bartholomew, Lawrence, Owen, and Putnam counties from D0 (abnormally dry) to D1 class (moderate drought). This change increases the total Indiana area with moderate drought conditions to near 22%, an increase of 7% from a week ago. There was no change in the area considered drought free.



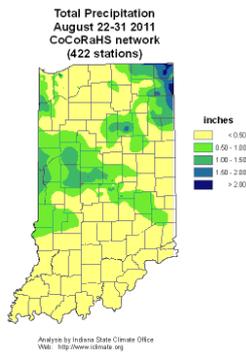
## August 22<sup>nd</sup> – 31<sup>st</sup>

The tendency for extended spells of warm and cool temperatures over the past several weeks seems to be waning. Daily mean temperatures these last 10 days were crossing to both sides of the normal line. At the start of this interval state average temperatures fell to 3° below normal as a cold front moved through the state. On August 24<sup>th</sup> a short lived warm front lifted temperatures to 5° above normal while spawning the only day of severe weather this week. A cold front followed immediately the next day, lowering temperatures to 3° and 4° below normal within a few days. A second warm and cold front pair traversed Indiana on August 27<sup>th</sup> and 28<sup>th</sup> but this system did little to change temperatures around the state and produced no severe weather. A warm front appeared in southwest Indiana on August 31<sup>st</sup> but pulled stationary just as the month ended. For the interval overall daily state temperatures averaged 1° below normal. Typically for late August we would expect daily maximum temperatures to range between 83° and 90° north to south across Indiana. Daily minimums would normally vary from 64° in far northern counties to 65° in the southwest.

The first storm system on August 24<sup>th</sup> generated a few tenths inch of rain but overall amounts were scarce these 10 days. Generally over the entire interval about 0.7 inch fell across northern Indiana, 0.6 in central counties, but less than 0.2 inch in the south. These totals are just two thirds of normal in the north, half of normal in central Indiana, and a stingy 15% of normal in southern areas. The heaviest amounts fell in northeast Indiana during the storms of August 24<sup>th</sup>, including 1.96 inches in Butler, while 3 CoCoRaHS observers in Angola measured 1.79 inches, 1.72 inches, and 1.47 inches for that day. Nearby Hamilton noted 1.52 inches. Towns in this same area reported the heaviest totals over the 10 days, including 2.07 inches, 2.03 inches, and 1.79 inches at the Angola locations. Garrett had 1.74 inches and Hamilton 1.72 inches.

Hail and wind damages were most common in west central Indiana during the August 24<sup>th</sup> event with a few reports from northeast Indiana. One inch hail was observed in Tippecanoe, Elkhart, and Allen counties while 1.75 inch hail fell in Clinton county. Winds caused a barn and farm equipment to overturn in Warren county where trees and power lines also came down. Trees and limbs fell on roadways elsewhere in Tippecanoe and Fountain counties. In Allen county lightning started a home on fire while high winds downed trees onto power poles and lines there as well.

The other story of interest is the intensifying drought in parts of Indiana. While northwest Indiana remains drought free the late summer drought is spreading to southeast and south central counties of the state. On August 30<sup>th</sup> the National Drought Monitor expanded the moderate drought (D1 class) category. This area now generally is bounded on the north by a line from Attica to Liberty and on the south by a Vincennes to Corydon line. Morgan and parts of Johnson counties have been classified into severe drought (D2 class). All other areas of the state continue in abnormally dry (D0) status.



## August 2011

Region	Temperature	Temperature	
		Normal	Deviation
Northwest	71.5	71.6	-0.1
North Central	71.2	71.0	0.2
Northeast	71.5	70.6	0.8
West Central	73.1	72.8	0.4
Central	72.9	72.2	0.7
East Central	72.5	71.4	1.1
Southwest	76.6	75.2	1.3
South Central	75.9	74.5	1.4
Southeast	75.2	73.8	1.4
<b>State</b>	<b>73.4</b>	<b>72.7</b>	<b>0.8</b>

Region	Precipitation	Precipitation		Percent of Normal
		Normal	Deviation	
Northwest	3.30	3.81	-0.52	86
North Central	3.04	3.83	-0.79	79
Northeast	3.60	3.68	-0.08	98
West Central	2.36	3.96	-1.61	59
Central	2.81	3.75	-0.95	75
East Central	3.14	3.55	-0.41	89
Southwest	1.14	3.67	-2.53	31
South Central	1.84	3.91	-2.08	47
Southeast	2.64	3.90	-1.26	68
<b>State</b>	<b>2.59</b>	<b>3.79</b>	<b>-1.20</b>	<b>68</b>

### Summer 2011 (June - August)

Region	Temperature	Temperature	
		Normal	Deviation
Northwest	73.3	71.8	1.6
North Central	73.2	71.2	1.9
Northeast	73.4	70.9	2.5
West Central	74.8	73.0	1.8
Central	74.7	72.4	2.3
East Central	74.4	71.6	2.9
Southwest	78.0	75.2	2.8
South Central	77.2	74.4	2.8
Southeast	76.3	73.6	2.7
<b>State</b>	<b>75.1</b>	<b>72.8</b>	<b>2.3</b>

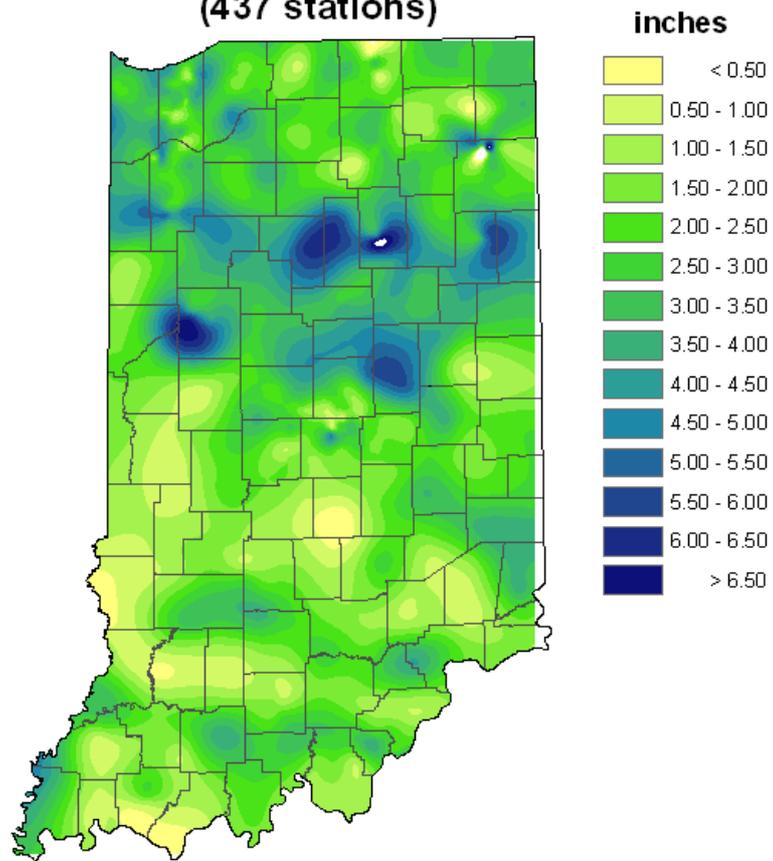
Region	Precipitation	Precipitation		Percent of Normal
		Normal	Deviation	
Northwest	12.57	12.01	0.56	105
North Central	10.19	11.93	-1.74	85
Northeast	8.30	11.42	-3.12	73
West Central	9.55	12.68	-3.13	75
Central	9.88	12.11	-2.24	82
East Central	9.03	11.88	-2.85	76
Southwest	12.68	12.04	0.64	105
South Central	12.11	12.32	-0.21	98
Southeast	11.34	12.23	-0.89	93
<b>State</b>	<b>10.71</b>	<b>12.08</b>	<b>-1.37</b>	<b>89</b>

## 2011 Annual so far

Region	Temperature	Temperature	
		Normal	Deviation
Northwest	52.2	52.1	0.1
North Central	52.0	51.6	0.4
Northeast	51.8	51.2	0.6
West Central	54.5	53.8	0.7
Central	54.4	53.3	1.1
East Central	53.9	52.5	1.5
Southwest	58.4	57.0	1.4
South Central	57.9	56.4	1.4
Southeast	57.0	55.6	1.4
<b>State</b>	<b>54.8</b>	<b>53.8</b>	<b>0.9</b>

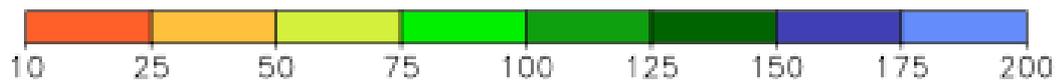
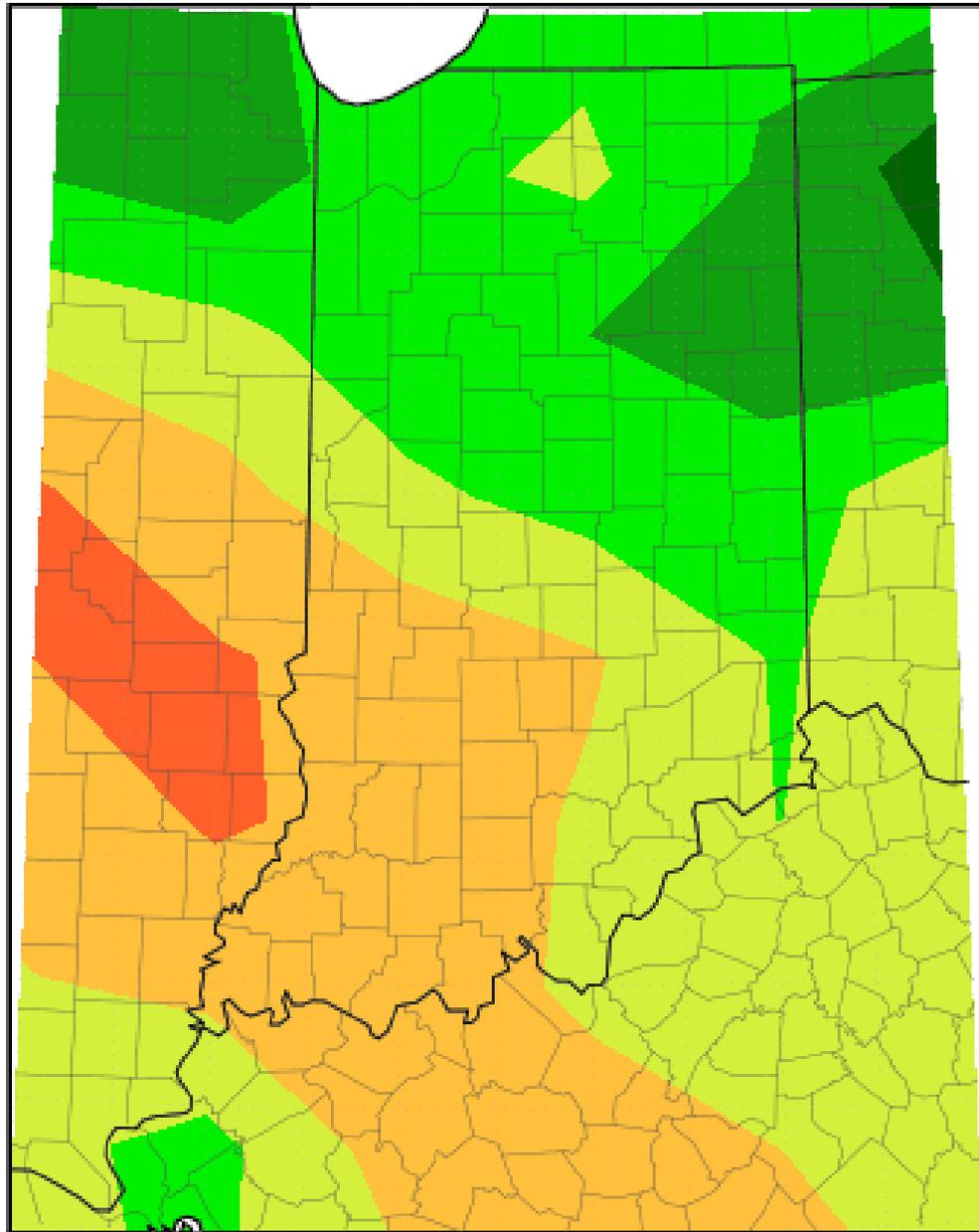
Region	Precipitation	Precipitation		
		Normal	Deviation	Percent of Normal
Northwest	32.47	26.06	6.41	125
North Central	30.89	26.00	4.89	119
Northeast	29.65	25.15	4.50	118
West Central	32.81	28.74	4.07	114
Central	36.11	28.31	7.80	128
East Central	35.56	27.48	8.08	129
Southwest	42.03	31.58	10.45	133
South Central	42.30	31.93	10.37	132
Southeast	42.57	31.05	11.52	137
<b>State</b>	<b>36.07</b>	<b>28.54</b>	<b>7.53</b>	<b>126</b>

**Total Precipitation  
August 2011  
CoCoRaHS network  
(437 stations)**



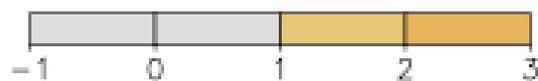
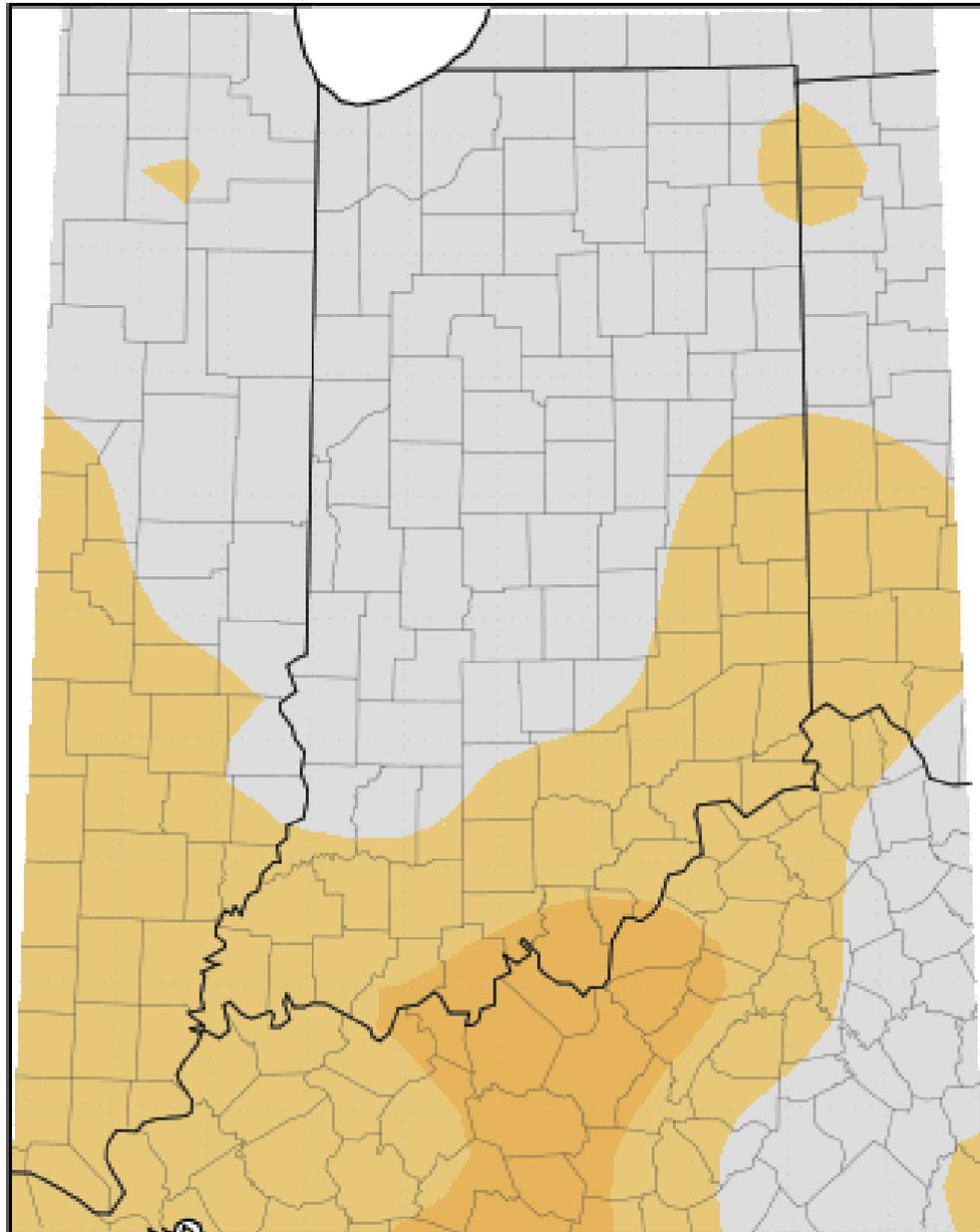
Analysis by Indiana State Climate Office  
Web: <http://www.iclimat.org>

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



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

Average Temperature (°F): Departure from Mean  
August 1, 2011 to August 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, August 9<sup>th</sup> has 30.4% of Indiana under at *least* D1-D4 drought status, 73.1% under at *least* D0 through D4 drought status, and 26.9% drought free. Subtracting the D1-D4 category (30.4%) from the D0-D4 category (73.1%), tells us that 42.7% of Indiana is in D0 category alone (abnormally dry). Please note, however, that these areas are not exact, and much of this drought map has been created from reports throughout the state and in estimation, so use this information as a general view rather than for specifics.

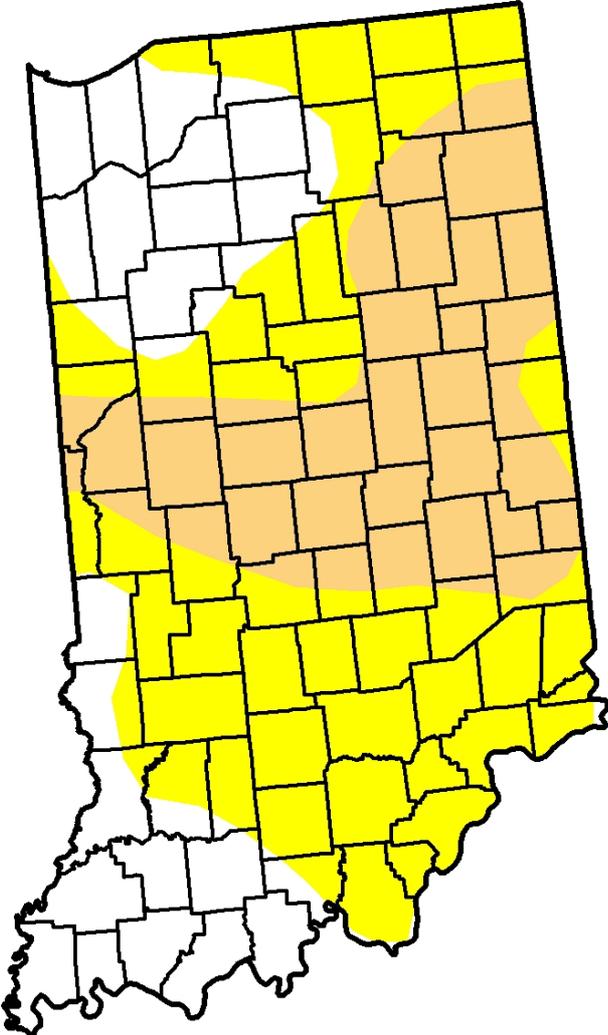
Intensity:



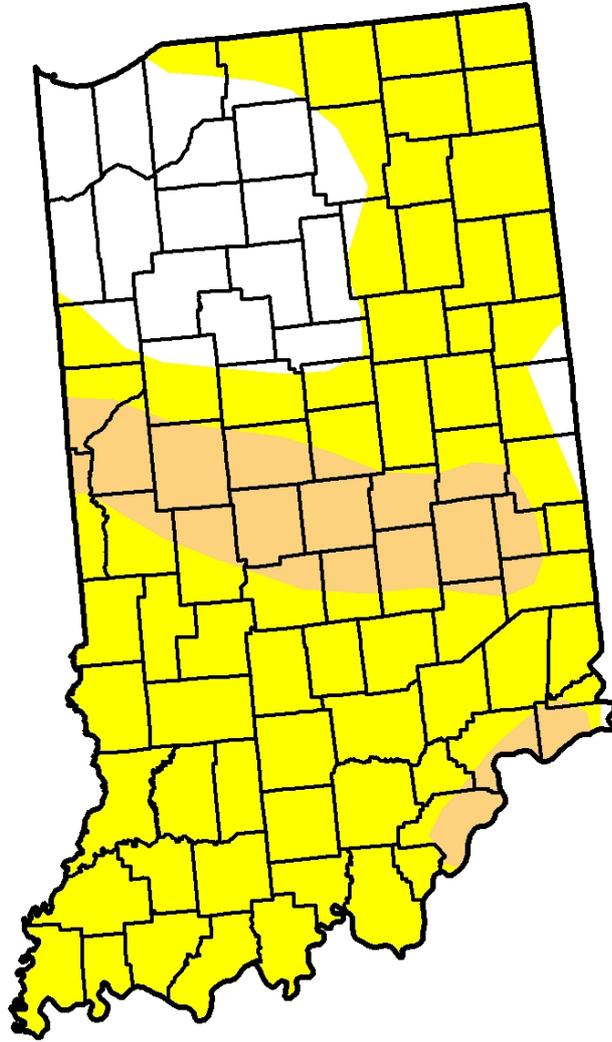
**Drought Condition (Percent Area): Indiana**

Date	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
08/30/11	16.91	83.09	44.15	2.75	0.00	0.00
08/23/11	19.33	80.67	21.69	0.00	0.00	0.00
08/16/11	19.35	80.65	14.57	0.00	0.00	0.00
08/09/11	26.94	73.06	30.35	0.00	0.00	0.00

*August 9<sup>th</sup> Drought Summary*



*August 16<sup>th</sup> Drought Summary*





*August 30<sup>th</sup> Drought Summary*

