

**Ken Scheeringa**  
(765) 494-8105



## Indiana State Climate Office

### Monthly Weather Report



<http://www.iclimat.e.org>

**Jul 6, 2010**



## June 2010 Climate Summary

### Summary

Summer like heat and humidity arrived in Indiana on May 22<sup>nd</sup> and dominated our weather scene nearly every day in June. An active jet stream hung close by to Indiana, steering numerous storm systems our way and building some into super cell strength. June 2010 will surely be remembered by Hoosiers for its many violent storms, heavy rainfall, and one of the warmest Junes in many years.

Daily average temperatures exceeded normal on all but four June days. The statewide average June temperature was 74.2° which is 3.2° above normal. This ranks June 2010 in a tie for 11<sup>th</sup> warmest June on record in Indiana since 1895. It has been a long time since a June month has been this warm in Indiana. The most recent June which was warmer occurred 39 years ago in 1971 with a state average temperature of 74.3°, good for 10<sup>th</sup> place in the rankings. The next most recent warmer June had been 17 years earlier in 1954 with a state average temperature of 74.4° in 9<sup>th</sup> place. The record warmest June in Indiana happened in 1934 with a steamy 76.8° average temperature.

It rained somewhere in Indiana every day last month except for one on June 30<sup>th</sup>. Some of the heaviest CoCoRaHS network precipitation totals for the month include 14.20 inches at Fowler, 13.67 inches in Fairland, and 13.65 inches at Atlanta. Overall for Indiana June 2010 total precipitation averaged 7.68 inches, the 3<sup>rd</sup> wettest June on record. The two wettest Junes were 1998 in 2<sup>nd</sup> place with 7.72 inches of precipitation and 1958 at the top of the list with 8.08 inches. By region June 2010 precipitation was about 60 percent above normal in northern and central Indiana and about 120 percent above normal in the central part of the state.

Severe weather caused extensive damage in Indiana this month and came in three major waves. The first major event produced three tornadoes in north central Indiana on June 5<sup>th</sup> and 6<sup>th</sup>. A second wave of storms began on June 11<sup>th</sup>. One man was killed near Salamonie by a fallen tree. Four consecutive days of severe weather caused widespread flash flooding and wind damage. A super cell thunderstorm in Benton county on June 14<sup>th</sup> generated softball size hail and wiped out thousands of acres of cropland. A tornado near the town of Spencer was confirmed. A third wave of storms struck on June 22<sup>nd</sup> with more heavy rain, wind, and flooding. The town of Edna Mills was evacuated for a time while parts of downtown Delphi were under water. More details on these storm events follow in the weekly summaries below.

## **June 1<sup>st</sup> – 6<sup>th</sup>**

The warmth of late May persisted into the early days of June but the drier weather did not. A zonal upper wind flow pattern, in which the jet stream travels nearly directly west to east across our country, paraded storms directly over Indiana. Warm and cold fronts tend to slow and became stationary over our state, as surface temperatures equalize and daily rains fall. The passage of warm and cold fronts at this time of year are often better recognized for their change in comfort level, ie, humidity rather than air temperature changes at ground level. The contrasts between these warm and cool air masses vertically can be dramatic, however, and the potential for severe weather can be great especially on the warm side of these frontal boundaries.

Indeed state averaged temperatures varied little this week, settling between 6° and 8° above normal until cooling somewhat to 2° above normal at the close of the six day interval. This extends the current warm spell to 16 consecutive days. Overall for the week temperatures averaged 6° above normal. Usually in the first week of June we would expect daily maximum temperatures to range from 76° to 83° north to south across the state. Daily minimums should typically vary between 55° to 61° from far north to extreme southwest.

Rain fell every day with half inch amounts on average at the start and end of the week and lighter amounts sandwiched in the middle. Weekly totals averaged about 1.7 inch in northern Indiana, 1.4 inch in central, and 0.8 inch in the south. This is double the normal weekly total in northern Indiana, 50 percent above normal in central, and right about the normal amount in the south. The normal total for the six days is nearly 0.9 inch statewide. Stationary fronts clustered near the Michigan border this week generated the highest spot rainfall totals. The CoCoRaHS observer in Granger recorded 3.34 inches on the morning of June 1<sup>st</sup> while Demotte summed 5.04 inches for the largest total over the six days in Indiana.

The heavy rains in northern Indiana lifted Wabash River levels downstream. Flood warnings were issued for Fountain, Parke, Tippecanoe, Vermillion, Warren, Vigo, Knox, and Sullivan counties on July 4<sup>th</sup>. On June 5<sup>th</sup> an EF-3 tornado traveled for more than 7 miles after touching down near Grissom Air Force Base. Later that day a smaller EF-1 tornado was confirmed near the Carroll and White county line.

Severe weather continued the next day. An EF-1 tornado touched down in White county near Lake Freeman very early on the morning of June 6<sup>th</sup>. The tornado continued into Carroll county where it heavily damaged a church in Yeoman. The church had just completed a major renovation but will be rebuilt. Elsewhere in Carroll county, a commercial hog farm and 15 homes were hit by the tornado. Total damage in the county was estimated at \$4 million.

## **June 7<sup>th</sup> – 13<sup>th</sup>**

A strong Canadian high pressure center pushed a cold front all the way to the Gulf of Mexico to start this week, ending a 16 day warm spell, and sending state averaged air temperatures briefly below normal. Temperatures dipped to 4° below normal for two days before rebounding to 2° above normal. On June 10<sup>th</sup> a weaker cold front passed through Indiana but stalled near the Ohio River. This front reversed direction and returned to central Indiana as a warm front in advance of a

new storm system moving eastward from South Dakota. On June 12<sup>th</sup> this warm front entered Michigan, keeping Indiana in the warm humid air sector to its south. The stationary weather pattern of last week had now reset. State averaged temperatures had reached the 6° to 8° above normal perch once again. The final days of the week resumed the now familiar warm, stormy, and wet June weather pattern. For the week overall state average temperatures were cooler than last week at 2° above normal. Daily maximum temperatures the second week of June should range from 79° to 85° north to south across the state. Daily minimums are expected to vary between 58° in extreme northern Indiana to 63° in the far south.

June continues to be a stormy month. Rain has now fallen on every day this month somewhere in Indiana. Amounts were very light during the cold snap at the start of this week, then more than a half inch was reported on the morning of June 9<sup>th</sup>. About a half inch was also noted the final two days of the week with lighter amounts on other days. For the week northern Indiana averaged near 1.3 inch. Rain totals were heavier in central Indiana at about 2.3 inches while southern Indiana settled in the middle at about 1.7 inch. These totals are slightly above normal in northern Indiana, more than twice normal in central, and nearly double in the south, a wet week. The highest one-day amount of 4.22 inches on June 12<sup>th</sup> and greatest weekly total of 5.78 inches were both recorded at a CoCoRaHS station in Columbia City. Normally for this second week of June around 1.1 inch is expected in northern Indiana and about 0.9 inch in central and southern Indiana.

A California man died near Salamonie Reservoir on June 11<sup>th</sup> when he was trapped under a tree that had been blown over by high winds during Friday's thunderstorms. Winds up to 61 mph were reported that evening in northeast Indiana. Several trees and power lines came down in the storm. A roof was blown off an auto auction building in that area that night as well.

### **June 14<sup>th</sup> – 20<sup>th</sup>**

Four consecutive days of severe weather in Indiana finally came to an end the morning of June 15<sup>th</sup>. That final day on June 14<sup>th</sup> was perhaps the most brutal with extensive damage reported in northern and central Indiana. A series of storm waves rode the jet stream over Indiana this week, a recipe for numerous wild storm events this time of year. Temperatures varied little day to day again this week as both warm and cool air masses in the vicinity moderated temperature swings although still on the warm side of normal. State averaged temperatures varied between 3° and 5° above normal every day this week, settling on the weekly average at 4° above normal. The warm month continues as below normal temperatures have been limited to just two June days so far. Daily maximum temperatures in mid June typically vary between 81° and 87° north to south across the state. Daily minimums are expected to range from 60° to 65° from the far north end to extreme southwest Indiana.

Rain fell in Indiana on six of the seven days this week. The path of the jet stream directly over or very near Indiana favors the slowing and stalling of warm and cold fronts in our area, leading to frequent severe weather events with wind and hail damage amid heavy downpours. For the week total precipitation averaged about 1.7 inch in northern Indiana, 2.9 inches in central, and 2.5 inches in southern Indiana. These amounts are about 80 percent higher than normal in northern Indiana, nearly triple normal in central, and two and a half times normal in southern Indiana. As expected rainfall was very heavy in local thunderstorms. The CoCoRaHS observer near Sullivan measured

5.85 inches for the week. The highest one day CoCoRaHS total was 2.99 inches at Shelbyville on June 19<sup>th</sup>. Weekly normals for this time of year are very nearly one inch everywhere statewide.

Damage due to severe weather on June 14<sup>th</sup> was concentrated in northwest and central Indiana, but wind damage was also noted in Parke, Boone, Carroll, Clinton, Benton, Monroe, Knox, Greene, Owen, Hamilton, Jennings, Martin, and Sullivan counties. Police closed a lane of I-70 in Putnam county for about an hour due to flash flooding. About 13,000 Duke Energy customers were without power statewide near the conclusion of that stormy day.

The National Weather Service confirmed that a tornado touched down at about 7:45 pm on June 14<sup>th</sup> about 3 miles west of Spencer in Owen county. No injuries or deaths were reported with this tornado.

A supercell thunderstorm produced wind gusts up to 100 mph and softball size hail in Benton county on June 14<sup>th</sup>. An estimated 10,000 to 15,000 acres of crops in the Oxford area were destroyed. Affected farmers may recover some of these losses through crop insurance. Trees were stripped of patches of leaves, buildings and vehicles were pummeled, and 75 homes in town were damaged by hail that measured over 4 inches in diameter. A tool shed was destroyed by straight line winds in Chase west of Oxford. Chase residents also noted the very high wind gusts, rain, and hail caused significant damage to trees in that area. Power lines were downed especially in the Templeton and Oxford areas. A level two travel advisory, later revised to level one, were issued for the county by the emergency management director, banning most vehicles from the roads. The arrival of personnel from the US Department of Homeland Security to conduct a damage assessment in the county was expected soon. The Farm Service Agency of the US Department of Agriculture will file a failed acreage report by July 15.

To the east in Tippecanoe county that same day, a two to three mile wide damage path was traced from its entry near Otterbein southeast across the south side of Lafayette to an exit point north of Clarks Hill. A National Weather Service damage survey and reports from local contacts concluded all the damage was done by a thunderstorm downburst. The survey stated there were no confirmed tornadoes anywhere in the county. A large number of trees and power lines were down throughout the area, prompting several temporary road closures especially in southern Tippecanoe county. A few roads were also closed due to high water.

Damage was also widespread in central Indiana. In Shelbyville wind gusts damaged the doors on five hangers at the Shelbyville Municipal Airport. Flooding was a problem in Martinsville. More than 3 inches of rain in a few hours caused water damage to a group of homes in a rural area that had been badly damaged in the record flooding just two years ago in June 2008. The Red Cross provided clean up kits to residents where the receding water left mud and debris inside some homes. Six roads in Morgan county were closed temporarily and marked with high water signs.

In Indianapolis 65 mph winds were reported downtown with street flooding on the north side of the city. Quarter inch diameter hail was reported in Greenfield in Hancock county.

## June 21<sup>st</sup> – 30<sup>th</sup>

The final days of June arrived with more of the same warm and unsettled weather. State average temperatures on June 21<sup>st</sup> registered 4° above normal, rising to 7° above normal two days later. A stationary front over Indianapolis was headed northbound as a warm front. Temperatures slid a few degrees by June 25<sup>th</sup> as a weak cool front crossed Indiana but stalled and dissolved over Tennessee. An upper atmospheric high pressure system had sprawled over nearly the whole country early this week, limiting the development of new storms.

A major weather pattern change was underway on June 26<sup>th</sup>. Low pressure centers in Canada had greatly intensified and teamed up to create a double low system with two parallel fronts, the first positioned along the Indiana-Michigan border. Indiana temperatures returned to 5° above normal on June 27<sup>th</sup> in the warm sector of this first system. The next day the double low raced to New England and cool Canadian air spilled into Indiana. On June 30<sup>th</sup> the second cold front passed through Indiana, reinforcing the cool air mass. The 20 day warm spell had come to an end on June 29<sup>th</sup>, dropping state average temperatures to 7° below normal to close out the month. Typically daily maximum temperatures range from 84° in northern Indiana to 91° south in late June. Daily minimums usually vary from 63° in the far north to 68° in extreme southwest Indiana.

Throughout these ten days most of the precipitation fell while Indiana was on the warm side of these storm systems. Severe thunderstorms produced rain on the first four days of the interval. The heaviest amounts were noted on the morning of June 22<sup>nd</sup>, when 4 to 5 inches was reported in spots in west central and central Indiana. Some CoCoRaHS reports that day included 4.69 inches at Avon, 4.77 inches in Brookston, and 5.50 inches in Fowler. Another round of rain occurred in advance of the cold air mass. Amounts averaged about an inch in central and southern Indiana as reported on the morning of June 28<sup>th</sup>. Overall for the ten days precipitation totals were near 2.3 inches in northern Indiana, 3.0 inches in central, and 1.5 inches in the south. These totals are about 70 percent above normal in northern Indiana, more than double normal in central Indiana, and just about normal in the southern part of the state. Usually for this time period about 1.4 inch is expected throughout Indiana. Isolated totals were quite large. For example, 6.89 inches was noted in Atlanta over the ten days.

Severe weather has plagued Indiana all month long and continued to the end. Waves of thunderstorms overnight into the predawn hours of June 22<sup>nd</sup> with strong winds, intense lightning, and heavy rainfall caused road closures and widespread damage in west central and central Indiana.

Flooding of Wildcat Creek in Clinton county forced the evacuation of the town of Edna Mills as water was entering houses and flowing over State Road 26. There were many other reports of eroded road shoulders, small landslides, power outages and flooding across the county as well.

Fountain county residents saw fire and rain. Some houses caught fire overnight due to lightning strikes and downed power lines. Numerous trees and limbs were down and high water was a problem throughout the county.

There were many tree limbs down, power outages, and high water problems in Tippecanoe county but no apparent wind damage. Quarter size hail fell in the southwest corner of the county overnight.

The Wabash River was flooding at 4 feet above flood stage and still rising. Significant flooding begins on the Wabash at 7 feet above flood stage. High water was a concern at other creeks and rivers in the county as well as potential damage to other roadways.

What seemed like tornado damage in Montgomery county was actually due to strong straight line winds. Like surrounding areas high water and downed trees and limbs were the most common problems throughout the county.

Heavy rainfall especially caused problems in counties to the north. Large areas of standing water following torrential rains flooded the Brookston area of southern White county. A little further east in Carroll county some parts of downtown Delphi were underwater the morning of June 22<sup>nd</sup> while downed trees and washed out roads were noted throughout the rural areas. At the peak of the crisis Benton county enforced a Level 1 travel advisory with travel restricted to emergency vehicles only.

### June Summary

Region	Temperature		
	Temperature	Normal	Deviation
Northwest	72.2	70.0	2.2
North Central	71.5	69.4	2.1
Northeast	71.6	69.1	2.5
West Central	74.4	71.3	3.0
Central	74.0	70.7	3.3
East Central	73.2	69.8	3.4
Southwest	77.8	73.3	4.5
South Central	76.7	72.4	4.3
Southeast	75.5	71.5	4.0
<b>State</b>	<b>74.2</b>	<b>70.9</b>	<b>3.3</b>

Region	Precipitation			
	Precipitation	Normal	Deviation	Percent of Normal
Northwest	7.88	4.34	3.54	182
North Central	6.95	4.31	2.64	161
Northeast	6.31	4.08	2.23	155
West Central	8.69	4.33	4.36	201
Central	10.41	4.10	6.31	254
East Central	8.85	4.23	4.62	209
Southwest	5.02	4.10	0.92	122
South Central	6.53	4.09	2.44	160
Southeast	8.01	4.22	3.79	190
<b>State</b>	<b>7.68</b>	<b>4.19</b>	<b>3.49</b>	<b>183</b>

## Summer (same as June)

Region	Temperature		
	Temperature	Normal	Deviation
Northwest	72.2	70.0	2.2
North Central	71.5	69.4	2.1
Northeast	71.6	69.1	2.5
West Central	74.4	71.3	3.0
Central	74.0	70.7	3.3
East Central	73.2	69.8	3.4
Southwest	77.8	73.3	4.5
South Central	76.7	72.4	4.3
Southeast	75.5	71.5	4.0
<b>State</b>	<b>74.2</b>	<b>70.9</b>	<b>3.3</b>

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## 2010 Annual to date

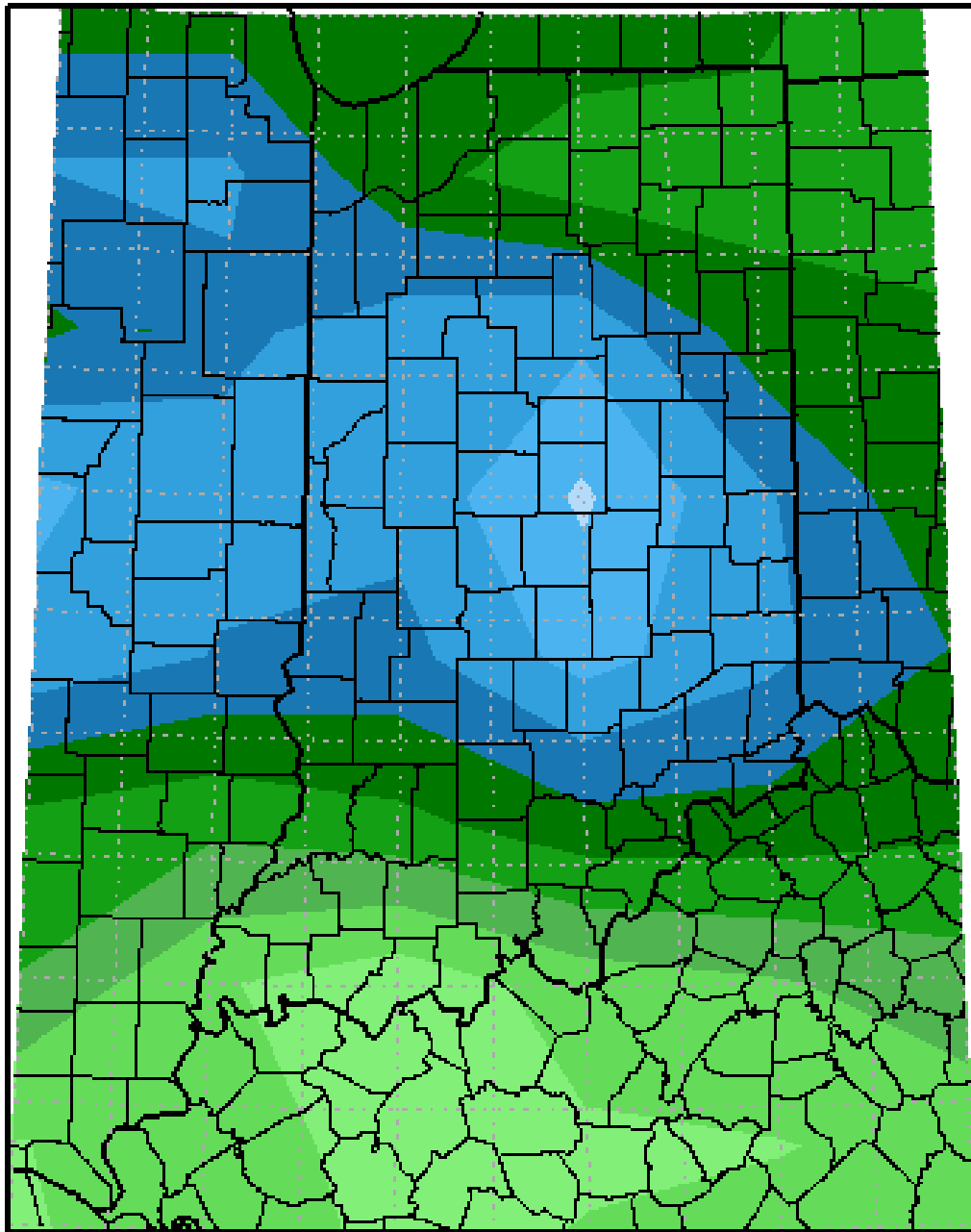
Region	Temperature		
	Temperature	Normal	Deviation
Northwest	46.5	45.0	1.5
North Central	46.5	44.6	1.8
Northeast	46.3	44.2	2.1
West Central	47.9	46.9	1.0
Central	47.8	46.5	1.4
East Central	47.2	45.6	1.6
Southwest	51.4	50.5	0.9
South Central	50.5	50.0	0.5
Southeast	49.7	49.0	0.7
<b>State</b>	<b>48.3</b>	<b>47.0</b>	<b>1.3</b>

### Precipitation

<b>Region</b>	<b>Precipitation</b>	<b>Normal</b>	<b>Deviation</b>	<b>Percent of Normal</b>
Northwest	21.34	18.39	2.95	116
North Central	20.53	18.37	2.16	112
Northeast	20.69	17.80	2.89	116
West Central	22.28	20.39	1.89	109
Central	24.44	20.30	4.14	120
East Central	22.94	19.83	3.10	116
Southwest	22.15	23.64	-1.49	94
South Central	23.75	23.70	0.05	100
Southeast	24.19	23.03	1.15	105
<b>State</b>	22.53	20.65	1.88	109



**Total Precipitation in Inches  
June 1, 2010 to June 30, 2010**

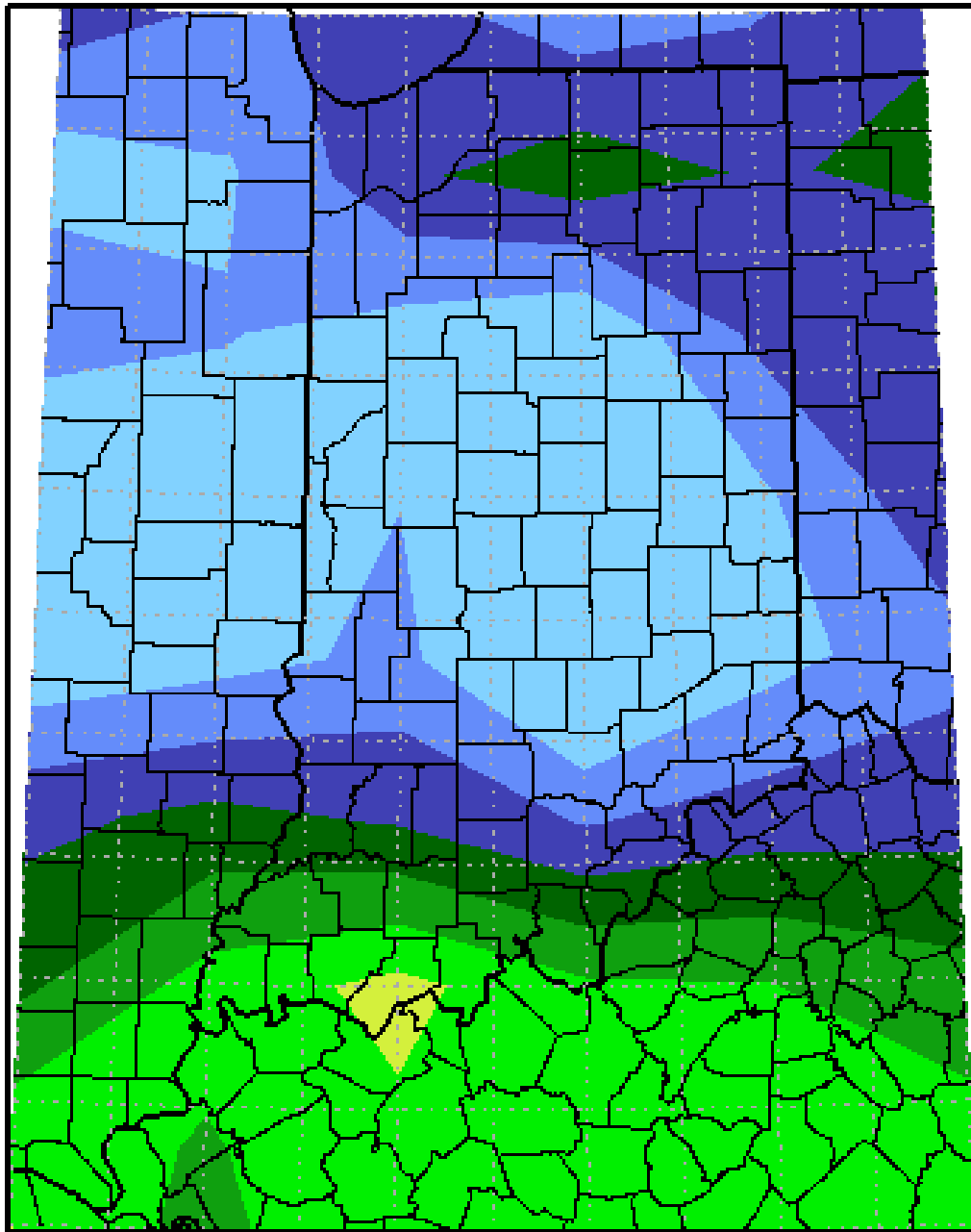


**NOAA Midwestern Regional Climate Center**

**Illinois State Water Survey**

**Champaign, Illinois**

**Total Precipitation Percent of Mean  
June 1, 2010 to June 30, 2010**

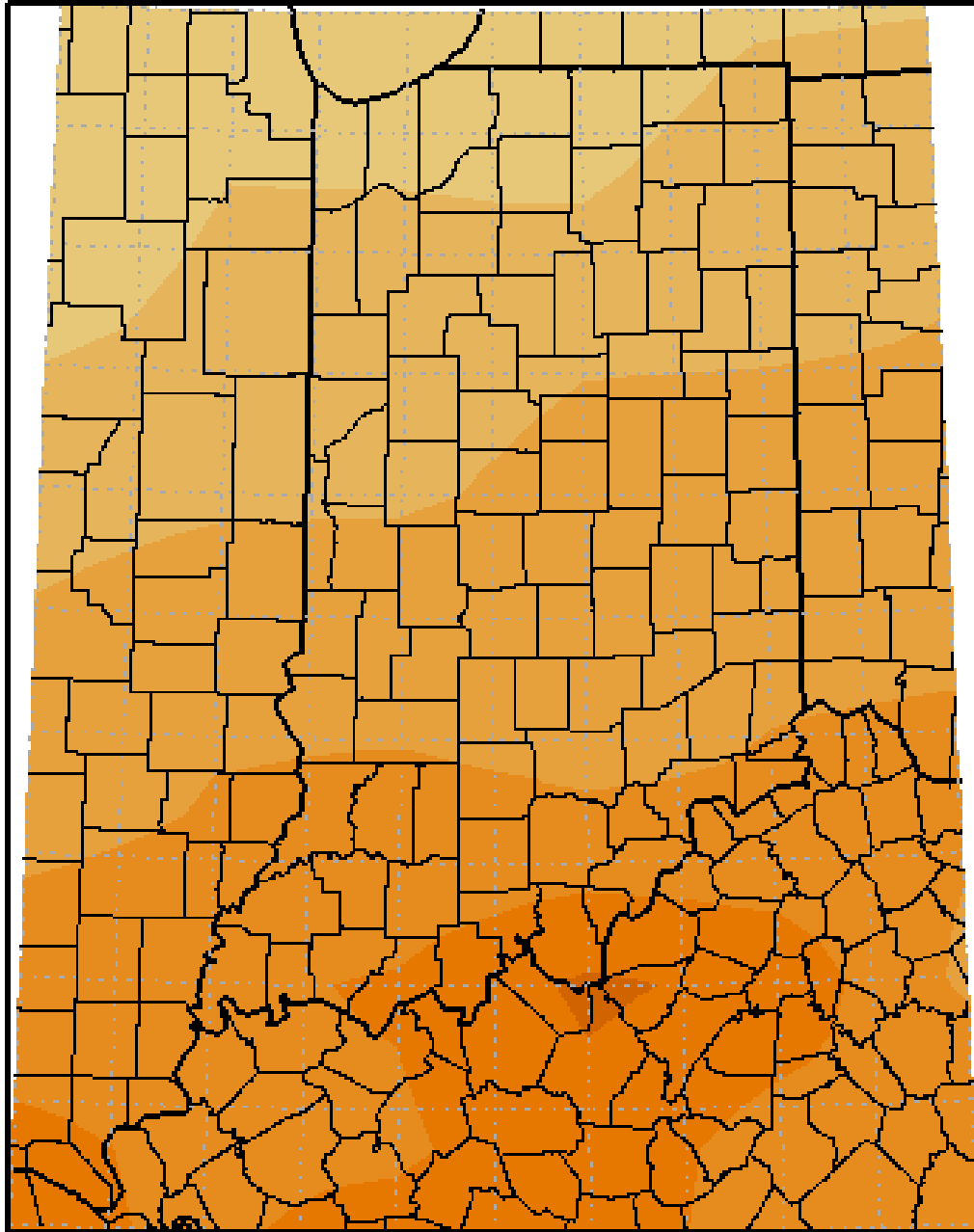


**NOAA Midwestern Regional Climate Center**

**Illinois State Water Survey**

**Champaign, Illinois**

**Average Temperature Departure from Mean in Degrees F  
June 1, 2010 to June 30, 2010**



**NOAA Midwestern Regional Climate Center**

**Illinois State Water Survey**

**Champaign, Illinois**

## *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, June 1<sup>st</sup> has 100.00% of Indiana under no drought, and 0.00% of Indiana under at least D0 through D4 drought status. This is followed by 0.0% as D1 through D4 status. To obtain the amount that is D0 status, simply subtract the D1-D4 column from the D0-D4 column, thus giving you the percentage of area with abnormally dry conditions (0.00%). 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:



Week	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
06/29/10	100.00	0.00	0.00	0.00	0.00	0.00
06/22/10	100.00	0.00	0.00	0.00	0.00	0.00
06/15/10	100.00	0.00	0.00	0.00	0.00	0.00
06/08/10	100.00	0.00	0.00	0.00	0.00	0.00
06/01/10	100.00	0.00	0.00	0.00	0.00	0.00

*June 1<sup>st</sup> Drought Summary*



*June 8<sup>th</sup> Drought Summary*



*June 15<sup>th</sup> Drought Summary*



*June 22<sup>nd</sup> Drought Summary*





*June 29<sup>th</sup> Drought Summary*

