



# DROUGHT UPDATE

**September 7, 2012**

## Precipitation and Temperature

Two significant weather events happened since the August 20 drought update. The first event was that August finished with near-normal temperatures and precipitation, our first “normal” month of 2012. The second event was the arrival of the remains of Hurricane Isaac over Labor Day weekend.

**August:** The statewide average temperature for August was 73.6 degrees, which is exactly normal for the month. The statewide average precipitation for August was 3.4 inches, which is 95 percent of normal. Many areas in central and southern Illinois received 3 to 5 inches, while some areas west of Effingham and east of Champaign had more than 6 inches (Figure 1). Areas north of Interstate 80 and in a band from Quincy to Decatur received less than 2.5 inches. The largest precipitation total in the state was at Grayville in southeast Illinois with 10.69 inches. In second place was Hoopeston with 8.33 inches.

**January-August:** The statewide average precipitation for January-August was 17.5 inches, 7.3 inches below normal. *It was the fourth driest January-August on record in Illinois.* The driest was 1936 with 14.9 inches, followed by 1988 with 17.1 inches, and 1934 with 17.4 inches. The statewide average temperature for January-August was 59.0 degrees, 4.2 degrees above normal. Despite the mild August, *it was the warmest January-August on record in Illinois.*

**Hurricane Isaac:** After striking the Gulf Coast, the remains of Hurricane Isaac reached Illinois over the Labor Day weekend. While much weaker and classified as a tropical depression (i.e., low pressure system), it brought widespread and heavy precipitation across central and southern Illinois (Figure 2). Amounts of 2 to 4 inches were common with some areas seeing 4-6 inches. Meanwhile areas north of Interstate 80 received little if any precipitation from this event.

While Illinois has received a considerable amount of precipitation since August 1, long-term precipitation deficits still remain across the state. The statewide average precipitation for January 1 to September 6 was 20.8 inches, still 6.3 inches below normal. Figure 3 shows the distribution of precipitation deficits across the state since January. A few areas in far northern, far southern, and western Illinois are still 12 to 16 inches below normal. Meanwhile, areas east of St. Louis and north of Champaign are approaching near-normal precipitation due to large precipitation amounts in August and from Isaac.

## Soil Moisture

The ISWS maintains a soil moisture network of 19 sites in Illinois. We measure the soil moisture as the fraction of water in the soil by volume. For example, a value of 0.4 means four-tenths of the soil is water by volume. Another way to put it is that 40 percent of the soil is water by volume. In general:

- values in the range of 0.4 to 0.5 means the soil is close to or at saturation;
- values in the range of 0.3 to 0.4 are typical of a moist soil;
- values less than 0.3 are getting dry;
- values between 0.1 and 0.15 are at the lower limit of what plants can use.

Figure 4 shows the observed soil moisture level at 4 inches. For most of Illinois, the fraction of water by volume is in the range of 0.3 to 0.4 – that’s good, especially for this time of year. There are a few places over 0.4, which means they are getting close to saturation at that level of the soil. A month ago most of these stations were in the 0.10 to 0.15 range, which is at the lower limit of what plants can use. Similar results were found at the 8 and 20 inch levels. The one site near Havana in west-central Illinois with a report of 0.04 is in very sandy soils and therefore has little water holding capacity.

These soil moisture values suggest that soil conditions in much of Illinois have improved dramatically after Isaac. However, they still have room for improvement in northern Illinois. And the revived soil moisture came too late for the corn crop and much of the soybean crop. Even so, it is reassuring that we have gone a long ways towards recharging the soil moisture as we move into fall.

## Agricultural Conditions

As of September 2, the USDA reported that 75 percent of the corn crop, 40 percent of the soybean crop, and 71 percent of pasture was rated poor to very poor. Topsoil was rated at 47 percent poor to very poor and subsoil was rated 86 percent poor to very poor. It should be noted that these may reflect conditions before all the rain from Hurricane Isaac had fallen. More details can be found in the weekly Illinois Weather and Crops report published by the USDA.

## Runoff from Tropical Storm Isaac

Runoff is the amount of water that reaches streams during and immediately following precipitation events; water supply lakes are also replenished by runoff coming from their watersheds. Runoff from a watershed is often expressed in inches – for example, an inch of runoff is the volume of water equivalent to a 1”-deep layer of water spread out over the entire watershed that contributes flow to a stream. As previously noted, the precipitation from Isaac caused considerable improvement in the soil moisture levels throughout portions of Illinois affected by drought. However, that precipitation did not produce very much runoff as nearly all of it was soaked into the soil. Data from lake level readings and from the USGS streamflow monitoring network consistently show that throughout central Illinois there was typically less than 0.1” of runoff in places that experienced 2.5 to 4.0 inches of rain. This small runoff rate is typical during extremely dry soil moisture conditions associated with drought. The greatest amount of runoff from Isaac occurred in the Kaskaskia River watershed, specifically that portion of the watershed south of Shelbyville and north of Carlyle, where over 4 inches of rain occurred and runoff was 0.5 inches and more. This area had also received considerable amounts of rain over the previous 30 days, and thus conditions preceding the arrival of Isaac were not as dry as other portions of the State. This runoff caused the water level in Lake Carlyle to rise 3 feet, resulting in water levels 2 feet

above normal pool. Other locations in southern Illinois typically had runoff amounts in the 0.1-0.3 inch range. In less than 5 days, many streams are receding to water levels that are not much higher than their conditions prior to the arrival of Isaac.

### Changes to Community Water Supplies

In general, reservoir levels throughout central and southern Illinois – the areas most affected by drought – rose modestly in response to the rainfall and runoff from Tropical Storm Isaac. Over the past week, most water supply reservoirs in this area rose between 4 and 8 inches; thus the direct rainfall over the lakes in many cases accounted for half or more of their increase. The 4-8 inch increase typically represented a 20-30% reduction (refill) of the storage deficit in the lake. Other lakes not used for community supplies – Lake Shelbyville and Clinton Lake –both rose 5 inches.

Some water supply reservoirs that saw significantly greater increases in water level were Lake Hillsboro, which became filled; Lake Altamont and Otter Lake, which rose 20 inches; and Lake Vermilion (Danville), which rose 13 inches. Lesser increases were reported at Carlinville, Carthage, LaHarpe (no increase), Macomb, and Vienna Correctional Center. Most of the reservoir levels reported here have been provided by the IEPA.

Since most reservoir levels would have fallen during the past week without the occurrence of Isaac, the net increase caused by Isaac is actually greater than the reported increase. For example, although the level in Lake Springfield has risen 5 inches, we estimate that it otherwise would have fallen 4 inches and thus the net increase is actually closer to 9 inches.

Lake Decatur has so far risen 6 inches, with an associated net increase of roughly 9 inches. With additional inflow expected to occur over the few days, we anticipate that Lake Decatur will rise a few more inches (without additional rain), for a net increase of nearly 1 foot in water level. While this does not remove drought concerns for Decatur, it certainly alleviates those concerns in the short term – providing roughly an additional month of water supply for the city and its industries and lessening the probability that severe water use restrictions will be required later this winter. Another water supply in Illinois that was considered most vulnerable, LaHarpe, received little benefit from the rain and remains a concern.

### Implications for Continuing Drought Concerns

Two major points are emphasized regarding the hydrologic and water supply impacts of Tropical Storm Isaac:

- Most water supply lakes saw only modest increases in their water level and are still considerably low for this time of year. Thus, Isaac lessened but did not end the hydrologic impacts of the drought. For a water supply system such as Decatur, which is more vulnerable to short drought episodes, the additional runoff provided by Isaac may be crucial in avoiding shortages or more severe restrictions in upcoming months. But most surface water supply systems in Illinois are vulnerable to longer drought periods lasting at least 18 months, and for these systems the modest water level increases caused by Isaac, by themselves, do little to change the long-term drought outlook.
- The large increases in soil moisture have, however, have somewhat tipped the scales in terms of projected drought recovery. With the soil moisture being less dry, we can expect that future rainfall events will produce higher rates of runoff and thus higher rates of lake storage

replenishment. If the upcoming weeks and months produce average rainfall amounts, the soil will continue to be replenished and lead to a normal recovery of most or all water supply lakes by winter or spring. However, if conditions over the next few months remain warmer and drier than usual, the benefits gained from Isaac will diminish and we could be looking at water supply concerns extending into next year.

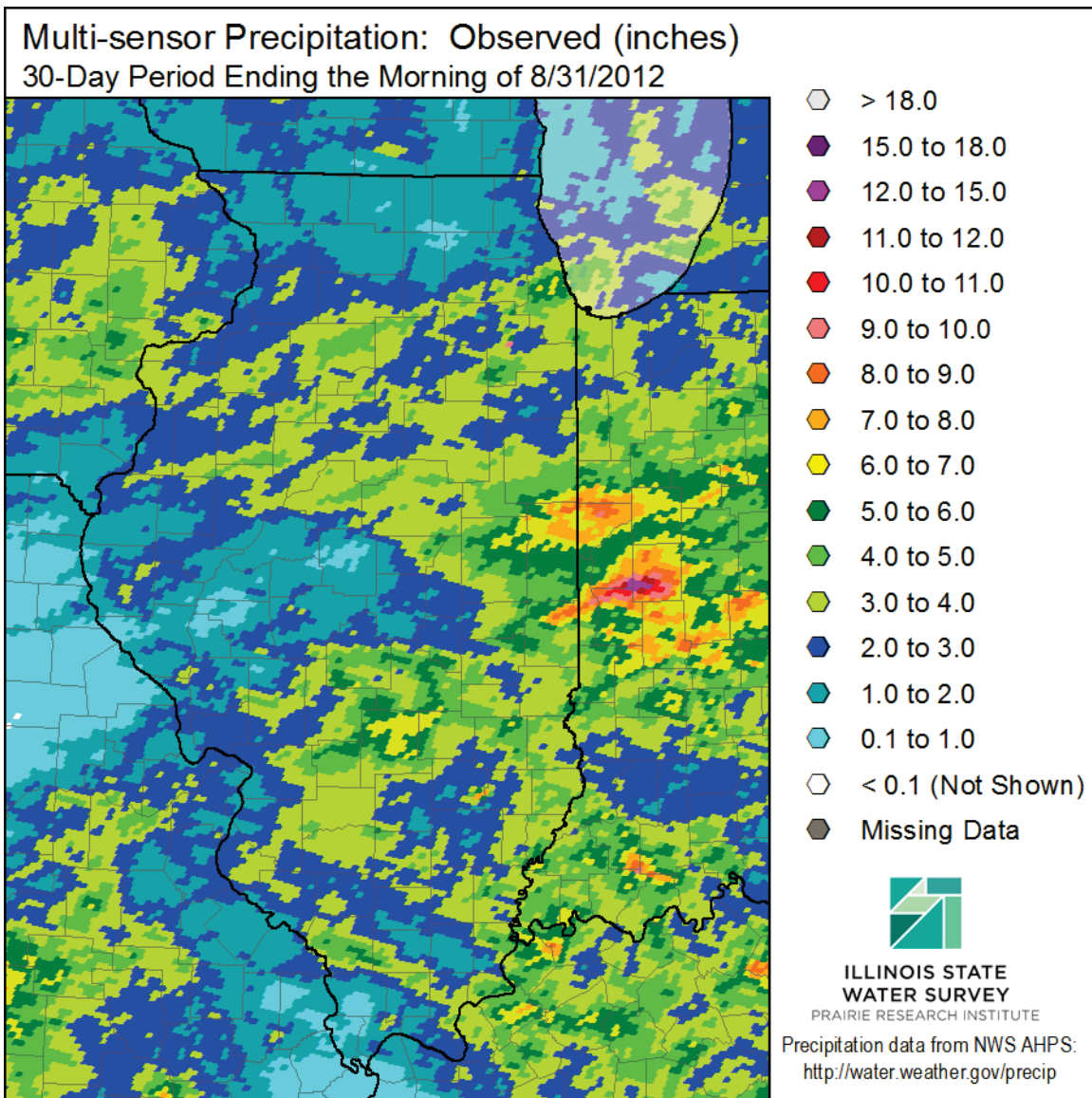


Figure 1. Precipitation for the 30-day period that covers most of August, based on the radar/raingauge data from the Advanced Hydrologic Prediction Service (AHPS) of the NWS and prepared by the ISWS.

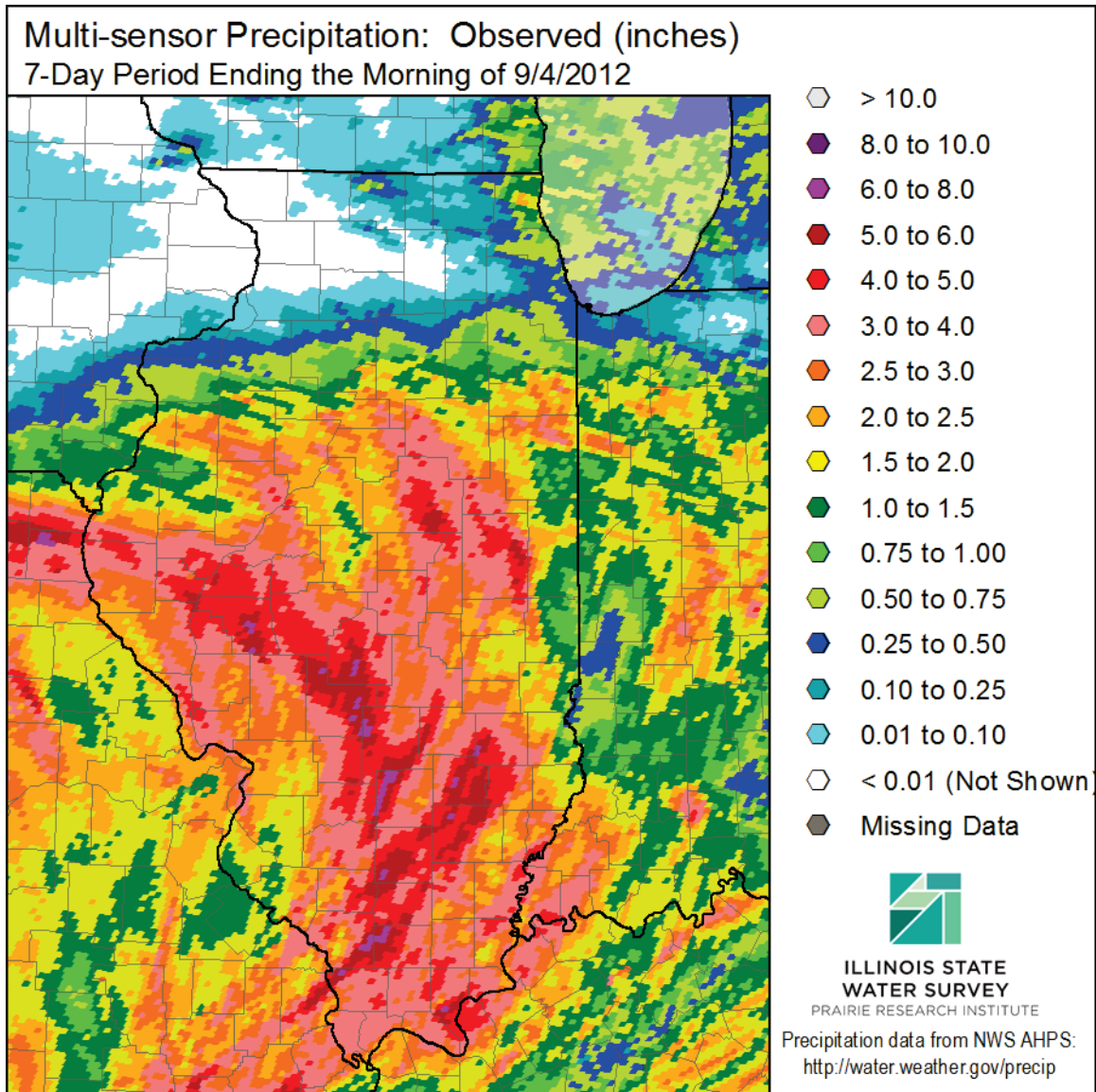


Figure 2. Rainfall from the remains of Hurricane Isaac over the Labor Day weekend, based on the radar/raingauge data from the Advanced Hydrologic Prediction Service (AHPS) of the NWS and prepared by the ISWS.

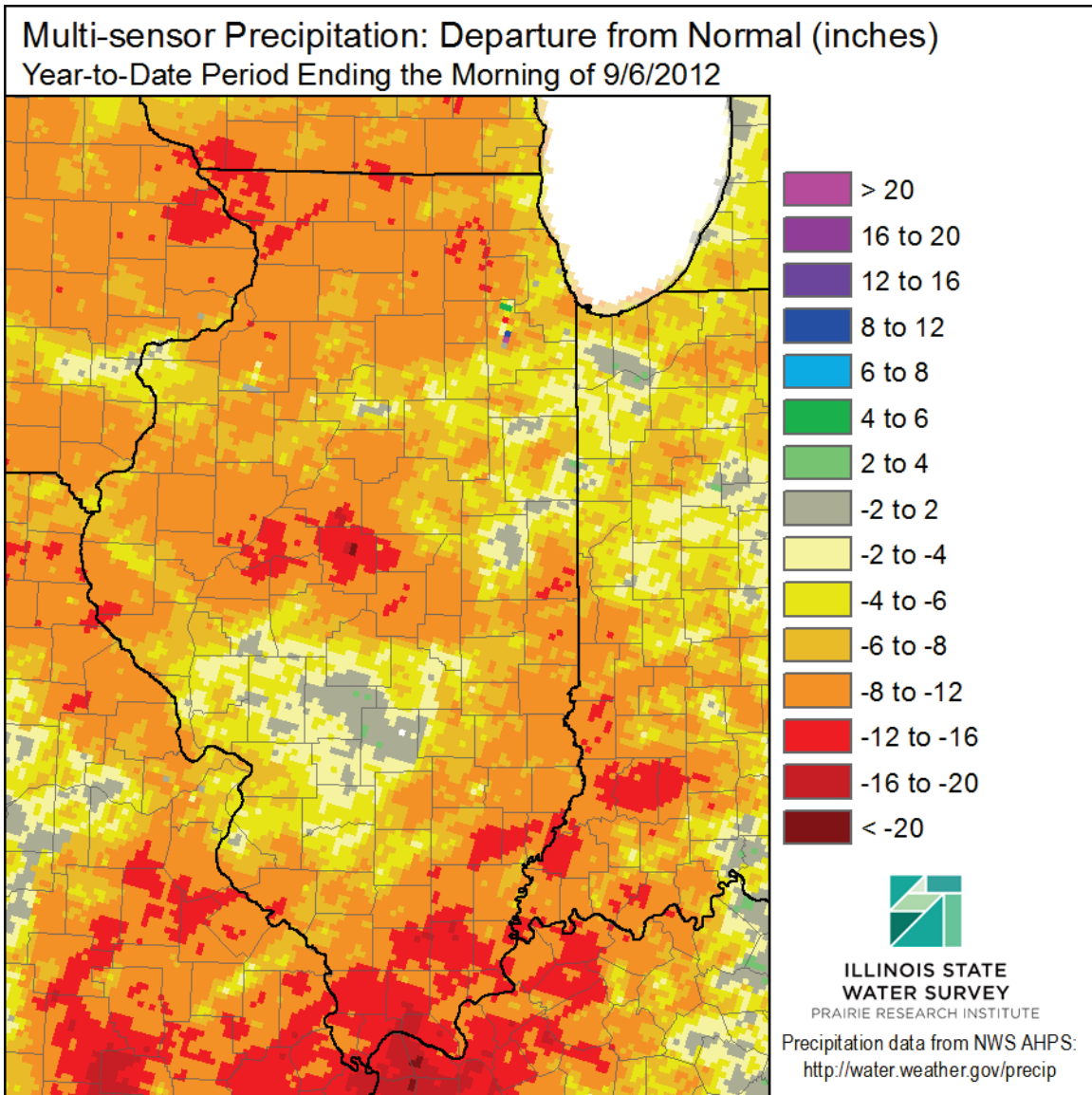


Figure 3. The January 1 to September 6, 2012, rainfall departures from normal, based on the radar/raingauge data from the Advanced Hydrologic Prediction Service (AHPS) of the NWS and prepared by the ISWS.

# September 5, 2012

Daily 4-inch (10cm) Soil Moisture (water fraction by volume)

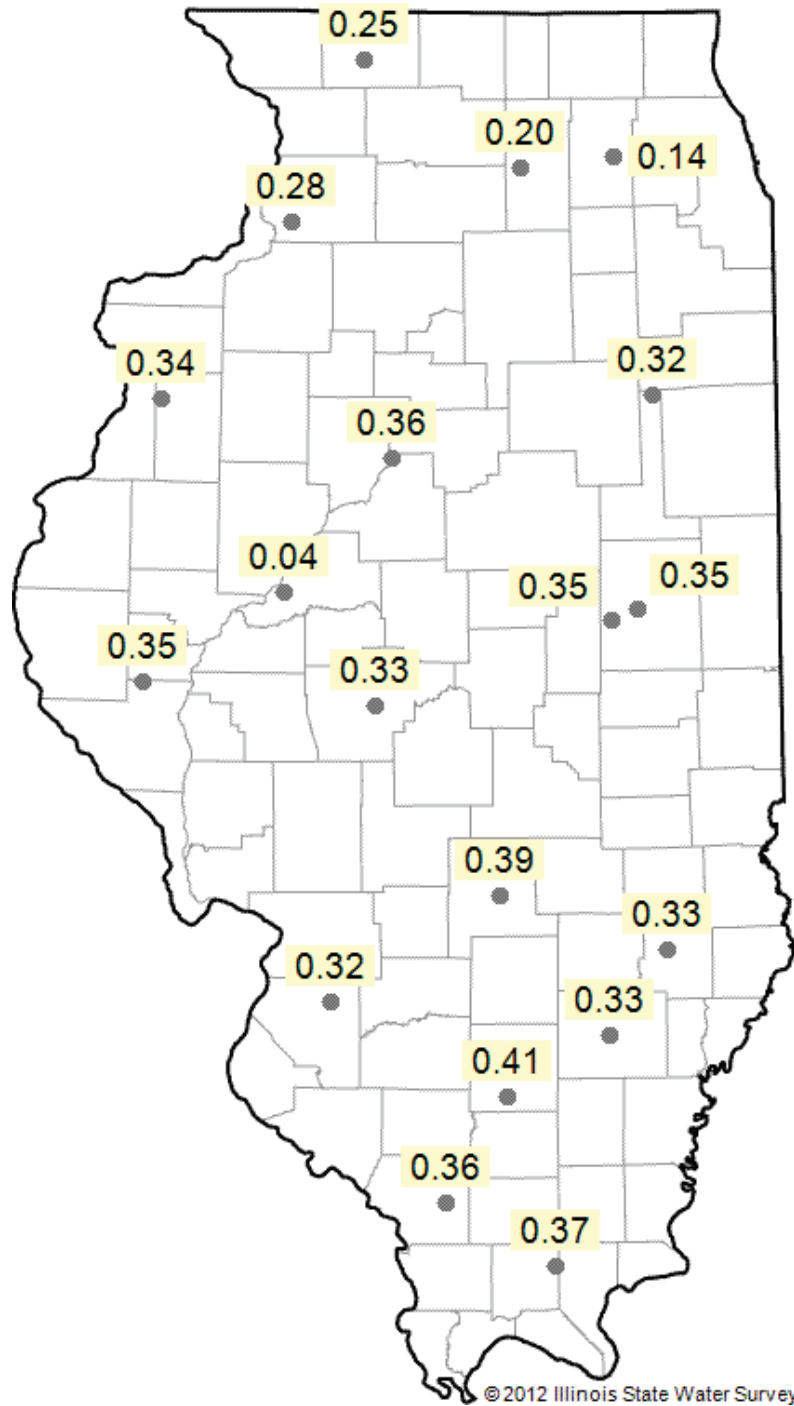


Figure 4. Shown is soil moisture at the 4-inch level from 19 ISWS sites across Illinois, expressed as a fraction of the entire volume of soil. A value in the 0.3 to 0.4 range is good for this time of year. Values in northern Illinois are lower. The 0.04 value near Havana is from a sandy soil with little water holding capacity.