ILLINOIS STATE WATER SURVEY
PRAIRIE RESEARCH INSTITUTE

DROUGHT UPDATE

www.isws.illinois.edu/hilites/drought

December 17, 2012

Summary

After widespread and plentiful precipitation from late August through October, below-normal precipitation returned in November and early December. As a result, the recovery from the 2012 drought has slowed. Soil moisture, streamflows, and lake levels in much of the state have greatly improved from this summer. However, more precipitation is needed for improvement in the deeper soil levels, some lake levels, and shallow groundwater.

Precipitation and Temperature

Since the Drought Update of October 25, the statewide average precipitation was 2.77 inches, 51 percent of normal for the period October 25 to December 17. Precipitation totals ranged from 1.5 to 2.5 inches in northern Illinois to 2.5 to 3.5 in central Illinois to 3.5 to 4.5 inches in southern Illinois. The statewide average for this period was 2.77 inches, 51 percent of normal. Figure 1 shows the accumulated precipitation for this period across the state.

Figure 2 shows the statewide average monthly precipitation departure for 2012. Generally dry conditions prevailed from January to April with slowly growing deficits by the end of April. However, the core months of the 2012 drought were May, June, and July, when deficits grew substantially. August was close to normal while September and October were above normal due to rains from the remains of Hurricane Isaac over Labor Day weekend and other systems. However, dry conditions returned in November, slowing the rate of recovery from summer conditions.

The statewide average precipitation for January 1 to December 17 was 28.1 inches, 8.0 inches below normal. In fact, the lack of precipitation in November and early December has caused precipitation deficits to increase across the state. Figure 3 shows the distribution of precipitation deficits across the state since January. Significant portions of the state are still 12 to 20 inches below normal on precipitation. Meanwhile, areas east of St. Louis and north of Champaign are at or near normal precipitation, erasing the significant deficits accumulated earlier in the year.

According to the December 11, 2012, U.S. Drought Monitor, Illinois still has 38 percent of the state rated abnormally dry and another 40 percent in either moderate (D1) to severe drought (D2) – the two lowest categories of drought.

The statewide average temperature from October 25 to December 16 was 42.0 degrees, 1.8 degrees above normal. With cooler temperatures comes lower evaporation from soils and transpiration from plants. Estimated amounts in November and December are about one-tenth of those seen in early July and were on the order of 0.01 to 0.02 inches per day. As a result, soil moisture was not harmed nearly as much by the below-normal precipitation in November and early December.

Soil Moisture

The ISWS maintains a soil moisture network of 19 sites in Illinois. In the November 2012 Water and Climate Summary, soil moisture levels remained largely unchanged in November and early December. Most sites are reporting soil moisture in the range of 30 to 40 percent, which is within the expected range for this time of year, at the 2, 4, 8, and 20 inch levels. All ISWS soil moisture probes are measured under sod.

Agricultural Conditions

As of November 26, the USDA reported that the fall harvest in Illinois has been completed. Statewide topsoil was rated at 5 percent "very short" and 23 percent "short". Subsoil was rated as 19 percent "very short" and 42 percent "short". More details can be found in the weekly Illinois Weather and Crops report published by the USDA.

Water Supply Reservoirs

At this stage in the 2012 drought, there are relatively few surface water supply systems that are threatened with potential storages. The water levels for two systems at opposite sides of the State, La Harpe in Hancock County and the Vienna/Shawnee Correctional Center in Johnson County, are very low and are currently being watched. Since June, each system has lost over 50% of its usable capacity and potentially could face the threat of shortage in another 4-5 months if there is no inflow into the lakes before that time. However, in both cases, available hydrologic data from the worst drought on record (1953-1954) indicates the likelihood that some recharge of the reservoirs will occur during the winter and early spring. Furthermore, the current water levels at each lake are not as low for December as what would be expected if a drought similar to 1953-1954 were to recur in present-day conditions; thus they are not facing a worst-case drought condition. Rather than experiencing shortages this coming spring, the more likely scenario is that these lakes will rebound but not completely refill in the spring, leaving them vulnerable to extended drought if such dry conditions persist into the summer of 2013.

Many reservoirs have already completely refilled and, for them, the drought is effectively over. The Lake Decatur reservoir, once the poster child of the 2012 drought, has recovered to its normal winter pool level (see Figure 4). At the time of this update, the inflow rate into Lake Decatur is roughly equivalent to what is being drawn for water supply, maintain a steady pool.

To our knowledge, no other water supply reservoirs in Illinois are experiencing significant continued declines in water level. Some reservoirs in the vicinity of Springfield, including Lake Springfield (Figure 2) and Gillespie Lake, are maintaining water levels that are roughly 4 feet below full pool. At Springfield, the water level has not changed substantially in the last three months, which for Springfield means that the inflow into the lake is offset by the 20-plus million gallons that are daily withdrawn from the lake for water supply. When compared to the expected water level declines associated with many of the worst historical droughts (Figure 5), it can be seen that the current drought condition no longer has the "legs" of a most severe drought, and we believe the water level may only drop slightly over the upcoming winter months. For water supply reservoirs such as Springfield and Gillespie, there is the expectation that water levels will greatly, if not fully, recover by the spring of 2013. Only an extraordinarily dry upcoming winter and spring (close to the driest on record) would prevent substantial replenishment from happening by May or June. But it is prudent to plan for the possibility of such a dry spring.

In hindsight, it might appear that, in many cases, the concerns about the drought's potential impact to water supplies were overstated. However, it is worth noting that in mid-August – prior to the drought relief brought by the remnants of Hurricane Isaac – the water levels of most Illinois reservoirs were declining rapidly similar to that experienced by some of the worst historical droughts (as illustrated in Figures 1 and 2). But, as stated in previous updates, drought conditions would have needed to continue unabated into 2013 before most of Illinois' water supply reservoirs would have had serious concerns about depleted water storage, which normally occur during the second year of an extended drought episode. Drought conditions are still persisting to the west. But we are now tempering concerns about continuing water supply problems for Illinois specifically because the state has experienced noticeable recovery and specifically has not followed the same persistent dry patterns exhibited by the most severe multi-year historical droughts. The possibility still exists, however, for lingering problems at a few water supply systems.

Shallow Groundwater Supplies

During the summer of 2012, there were a number of reports of private wells going dry or having reduced capacity during periods of high water use. Interference between wells was noticeably prevalent in regions having high amounts of irrigation use, where there was considerable increase in water use compared to previous droughts. There were few reports of problems with community water supply wells; although we understand that some systems did come very close to experiencing limitations in their supply. Despite these problems, we believe that the potential exists for even greater problems in 2013 in regions where groundwater recharge is limited this spring.

As stated in previous updates, shallow groundwater is usually the last hydrologic component to see recovery following drought conditions. Even if soil moisture, reservoirs, and stream levels fully recover in upcoming months, and the drought is declared to be no more, there may still be lingering effects from groundwater levels that have not fully returned to pre-drought levels. This

may not be much of a concern unless 2013 is also a dry year; in which case the number of wells having problems could be greater than in 2012. Lingering problems with low groundwater levels could also affect streams and a handful of surface water supplies. Many streams in northwestern Illinois and other locations scattered throughout the State receive a good share of their flow from groundwater. A study of historical flow records indicates that many such streams experience their lowest flows during the year following a drought – when groundwater levels also often reach their minimum.

Streamflow levels

The levels of most Illinois streams have rebounded over the past 3 months. But as noted in the paragraph above, in certain regions, such as western and northern Illinois, there is a concern that stream levels may decline to even lower levels in 2013 if the upcoming spring and summer are also dry and the corresponding recharge of shallow groundwater is limited. According to the US Drought Monitor, northern Illinois is currently considered to be only part of Illinois in "severe drought;" however, to date, we have given relatively little attention to streamflow conditions in that part of the state. One reason is that northern Illinois, particularly in the northwest, has abundant flows compared to the remainder of Illinois. For example, although the Pecatonica River this year experienced their lowest flows since 2005, its flow rate was at least 5 times greater than the low flows at any similarly-sized river in central or southern Illinois. Also, the flow rates in much of the region were typically not in the lowest 10^{th} percentile compared to other years in the historical gaging records – a condition that we usually expect most streams and rivers to reach during a moderate to severe hydrologic drought. This is also not to suggest that there are no impacts related such low flows in the region; the Rock River, for example, provides water to power plants that depend on a high rate of flow from the river. However, as we have indicated above, our biggest concern in western and northern Illinois is the potential for additional declines in baseflow amounts through 2013. In contrast, low flows in central and southern Illinois streams have lower groundwater contributions and less persistence, such that low flow conditions in 2013 will be associated much more closely to the possibility of dry weather conditions as they occur in 2013.

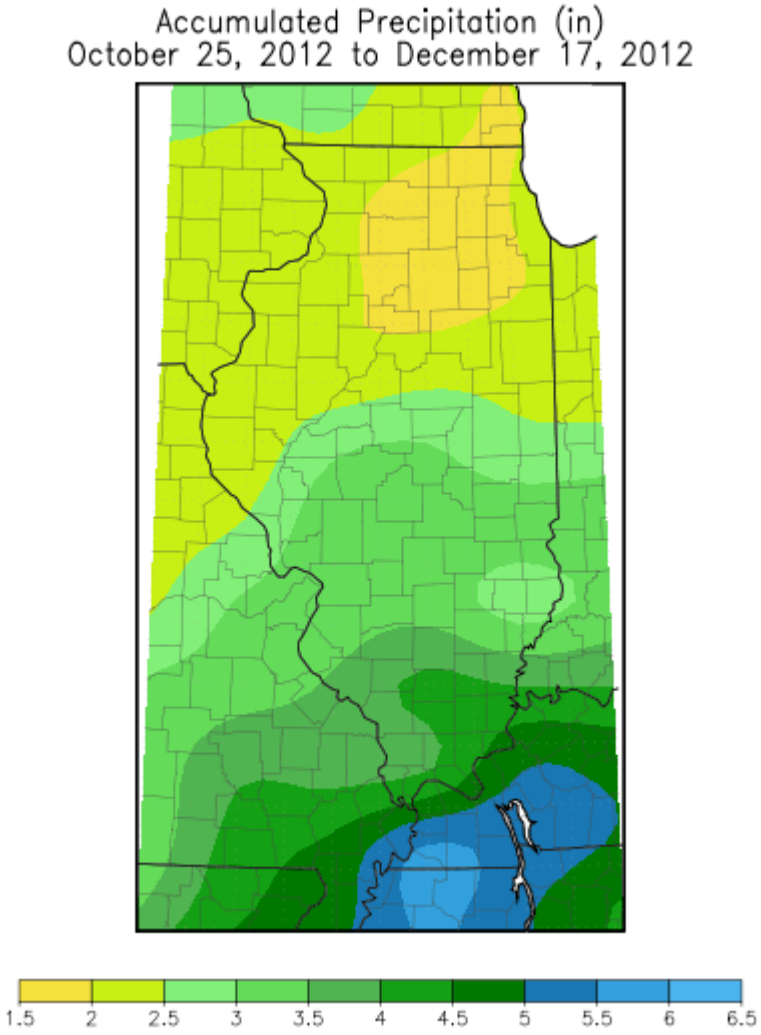

Figure 1. Shown are the accumulated precipitation amounts from October 25 to December 17, 2012.

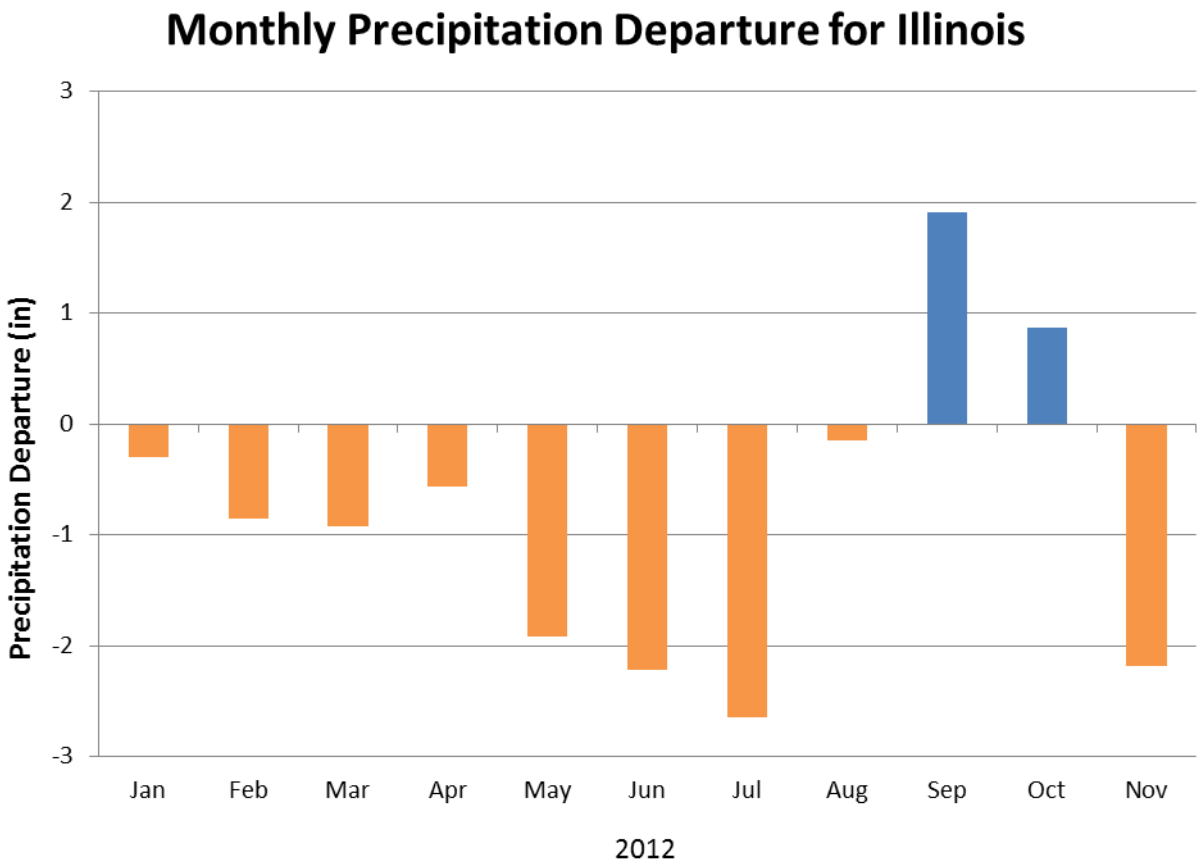

Figure 2. Statewide average precipitation for 2012 in Illinois. Orange bars indicate a deficit while blue bars indicate a surplus of precipitation for the month.

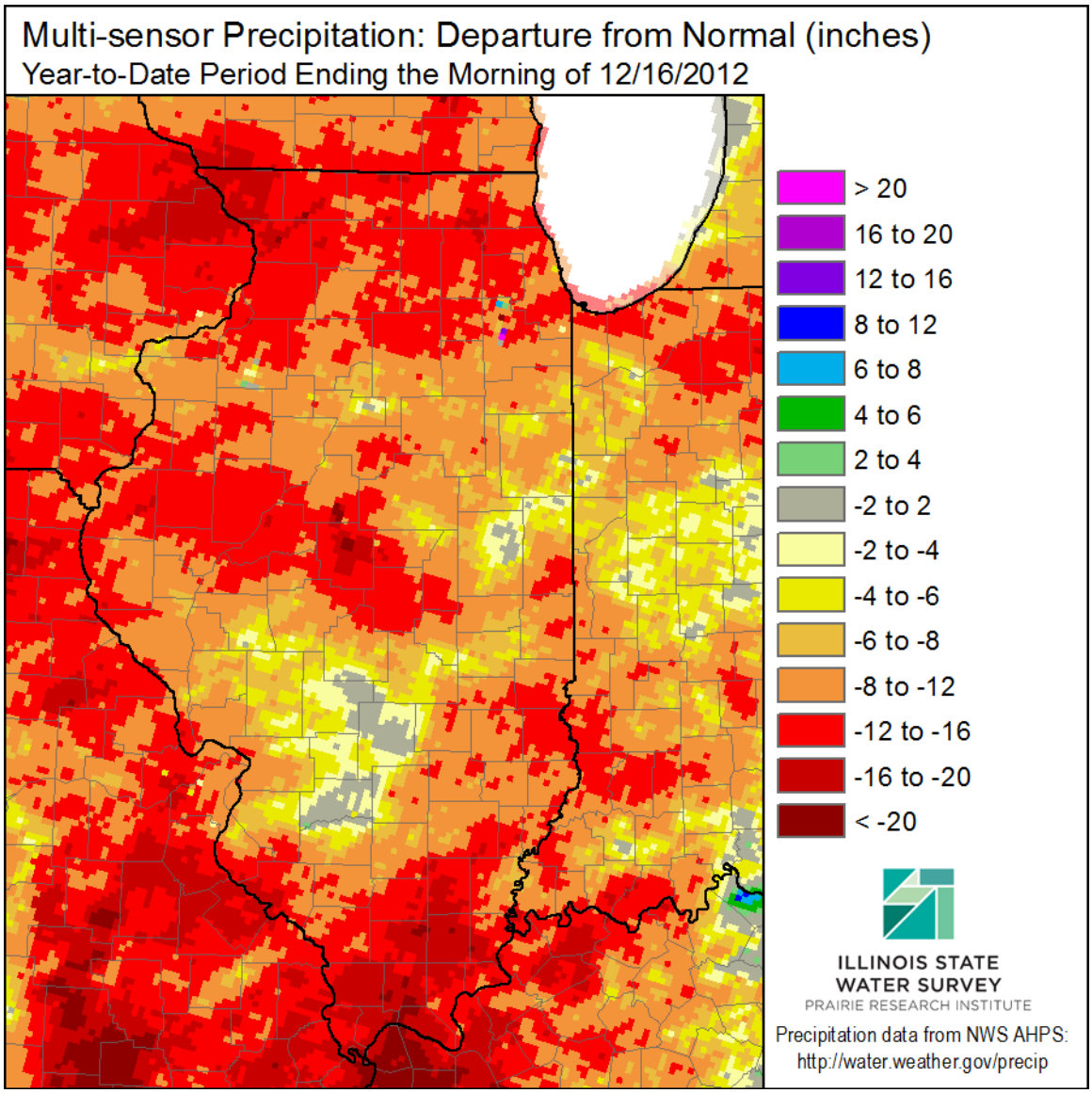

Figure 3. Shown are the January 1 to December 16, 2012, rainfall departures from normal, based on the radar/raingauge data from the Advanced Hydrologic Prediction Service (AHPS) of the NWS and prepared by the ISWS.

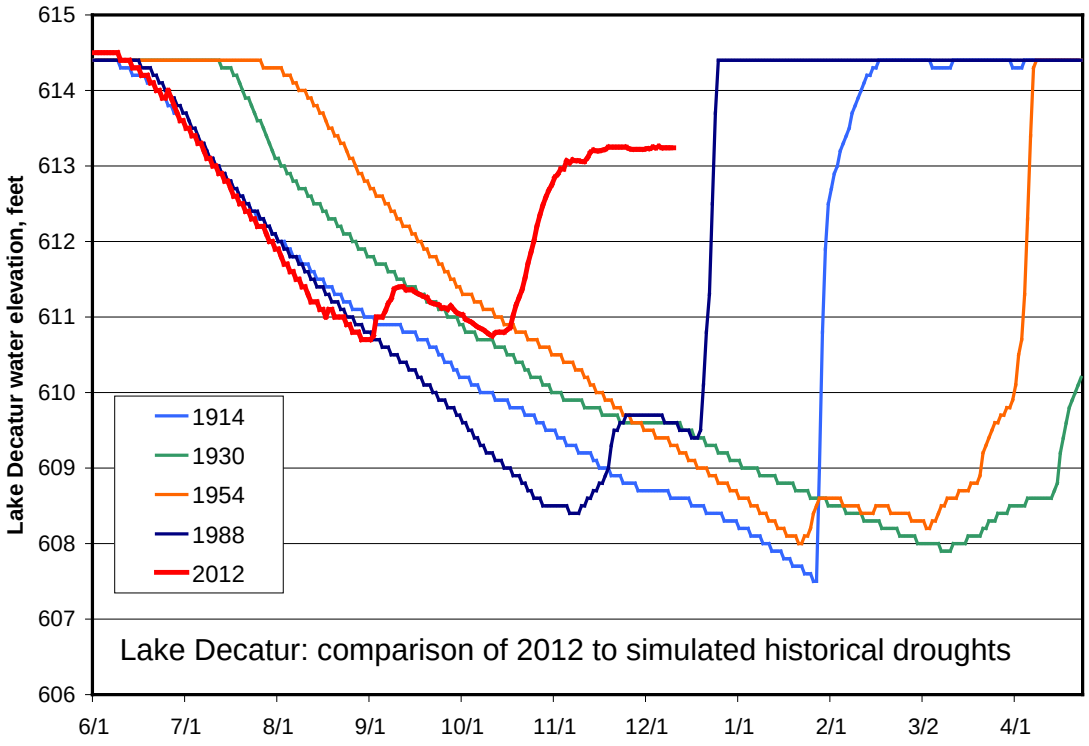

Figure 4. Water level in Lake Decatur in 2012 compared to simulated levels illustrating how Decatur's current water system would react if faced with conditions similar to major historical droughts.

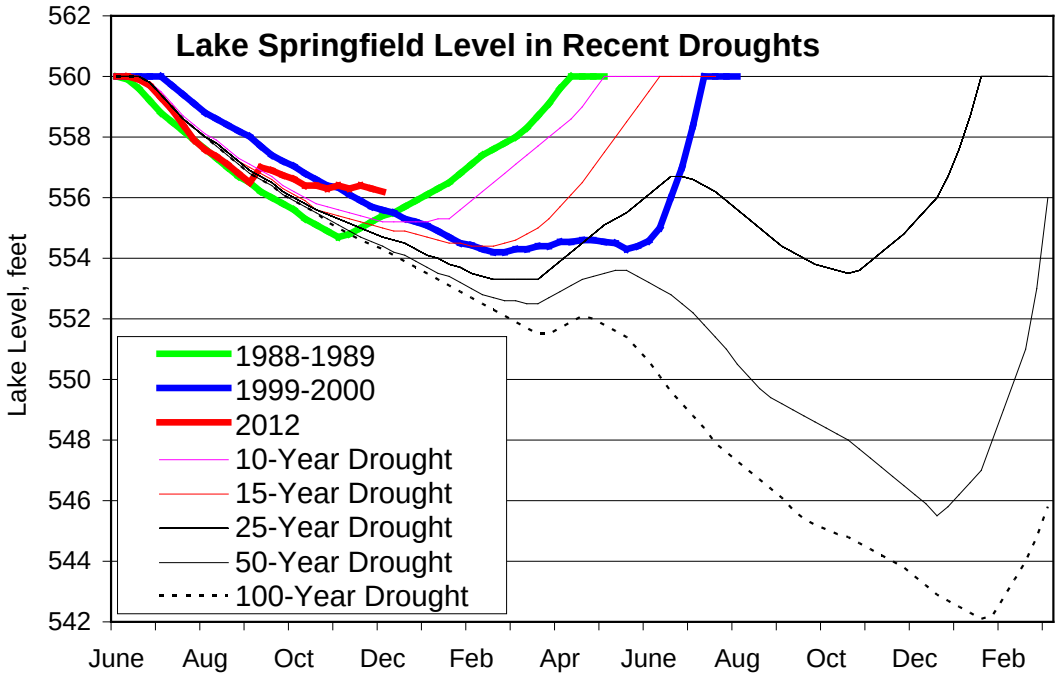

Figure 5. Water level in Lake Springfield in 2012 compared to: a) that from recent drought episodes, and b) levels expected with major droughts of varying severity or frequency.