Illinois Drought Update, March 22, 2006
DROUGHT RESPONSE TASK FORCE
Illinois State Water Survey, Department of Natural Resources

SUMMARY Statewide, the period March 2005 through February 2006 has been the driest March-February period in the last 75 years. Despite normal to above normal March precipitation, much of northern and western Illinois remains in a severe drought. Streamflows increased temporarily, but have declined. Water levels in reservoirs in western and central Illinois have increased, but are still below full pool. Soil moisture below 20 inches and shallow groundwater levels remain below normal and are causing low baseflows in rivers and streams. If drought conditions continue, and indicators do point to the possibility of a dry summer after a wet spring, then we can expect a more rapid deterioration in water resources than occurred in 2005. We recommend that the Task Force takes steps to encourage renewed drought preparedness planning in northern, western, and central Illinois. Southern and east-central Illinois are drought free.

1. DROUGHT STATUS. According to the U.S. Drought Monitor (Figure 1), much of northern and western Illinois remain in a severe drought (category 2 in their 4-category drought classification). Some parts of western and central Illinois remain in the categories of moderate drought or abnormally dry. At this time, the drought impacts in Illinois are classified as hydrological rather than agricultural. Only southern Illinois is considered to be clear of drought. Moderate to severe drought extends throughout the southern two-thirds of Iowa and much of Missouri with more serious drought concerns in the southern High Plains and the southwestern U.S. The broad band of drought from Texas to the Great Lakes has been in place to some degree since last May. The Drought Monitor is updated each Thursday morning at 8am EDT and can be accessed via the Internet at http://www.drought.unl.edu/dm/monitor.html.

2. PRECIPITATION. Statewide precipitation in 2006 has been 7.46 inches, which is 1.62 inches (or 28 percent) above normal. In general, extreme northern and southern Illinois were wetter than central Illinois during this time. March has been particularly wet with 3.70 inches of precipitation already in the first 20 days, compared to a normal of 3.22 inches for the entire month (Figure 2). Going back to the beginning of the drought, statewide precipitation since March 1, 2005 (Figure 3) has been 31.98 inches (8.79 inches below normal and 78 percent of normal). Precipitation deficits are still severe in northern and western Illinois. Since March 1, 2005, Rockford received only 25.73 inches (12.25 inches below normal); Chicago, 24.79 inches (13.10 inches below normal); Moline, 21.14 inches (18.76 inches below normal); Peoria, 24.75 inches (13.23 inches below normal); Quincy, 24.24 inches (15.65 inches below normal); Springfield, 30.60 inches (7.06 inches below normal); and Champaign-Urbana, 33.32 inches (9.82 inches below normal). While the recent rains are welcome, it will likely take considerable time to recover from these precipitation deficits.

3. LAST 110 YEARS. The accumulated precipitation deficits that began in March 2005 continued through February 2006, especially in northern Illinois. Statewide precipitation totals during those 12 months were the 3rd driest March – February period in Illinois since 1895 (Figure 3). This represented drier conditions from the 6th place position one month ago. The 27.78-inch statewide total for the last 12 months is approximately 1.5 inches less than during the

1988-89 drought. In perspective, precipitation in 2005-06 is the driest March-February period in the last 75 years statewide. The driest March – February drought was in 1930-31 when the state observed nearly 5 fewer inches of precipitation than during the current drought.

Regionally, precipitation totals were between the 2nd and 4th lowest ever recorded in the northwest, northeast, west, central, and west-southwest climate divisions (Figure 4). Rainfall amounts in the east-southeast division ranked as the 6th driest. Below normal precipitation returned to southern Illinois in February as rankings fell by 8 and 5 positions, respectively, in the southwest and southeast divisions. Totals in the east and west-southwest divisions fell by 3 positions each. Clearly, both 2005-06 and 1988-89 reported significantly dry conditions with 5 and 4 climate divisions, respectively, being in the top four driest periods on record. Nevertheless, as dry as these two recent droughts have been, 1930-31 and 1901-1902 were drier throughout most of the state.

4. SOIL MOISTURE. Substantial precipitation fell across southern Illinois and moderate precipitation was observed in the north during the second week of March that added much needed soil moisture. The current 0- to 72-inch profile (Figure 6) continues to show a band of dry soils in north-central Illinois, more than 25 percent below normal. This represents an improvement of approximately 25 percent from one month ago. Nevertheless, in the soil layer below 40 inches of depth, moisture totals at DeKalb and Peoria continue as very dry, and are 45 and 75 percent below normal for this time of year, respectively.

5. GROUNDWATER CONDITIONS. The ISWS maintains a long-term, statewide shallow observation well network to observe groundwater level response to climatological conditions remote from the influence of pumping wells. Based on hand-measurements made at the end of February in 15 of these observation wells, shallow groundwater levels were below normal by an average of 2.7 feet and ranged from 9.3 feet below to 0.5 feet above (Figure 7). Water levels tended to be slightly above average in some wells in southern Illinois, but far below average in western Illinois.

Most importantly, although levels averaged 0.2 feet higher than January levels, they were approximately 4.3 feet below February levels one year, exhibiting a response to the previous 11 months of dry conditions. Water levels in wells in extreme western Illinois, at Greenfield (Greene County) and Coffman (Pike County), were 12.4 and 13.9 feet below February 2005 levels, respectively. The well at Greenfield reported the lowest water level for February for its period of record (Figure 8).

Other indications of low groundwater conditions are reflected in public requests for information. The ISWS received reports in January from two homeowners that are experiencing well problems related to low water levels. These reports centered in Iroquois County and were from individuals using large-diameter bored wells which are particularly prone to problems during dry periods because of their shallow construction depths (typically 25 to 50 feet deep). Another report was received in early March from a homeowner in northwest LaSalle County whose drilled well also has not recovered from last summer, as would be typical by this time.

Beginning in 1997, the ISWS also began collecting groundwater level measurements from another set of observation wells using pressure transducers operated by data-loggers that transmit measurements back to the ISWS on a daily basis (most of these wells began daily operation after 2000). Because their period of record is not long enough to compute useful averages for historical comparison, they are not included in the table presented in Figure 7. However, the data-reporting frequency allows an almost real-time examination of current conditions. Water levels in an observation well at Monmouth (Figure 9), for example, and other wells in northwestern Illinois show a temporary upward response to recent precipitation events that occurred after the February month-end hand measurements.

February month-end shallow groundwater level measurements show extremely low water level conditions in western Illinois, matching the most recent available soil moisture and stream discharge data. While near real-time groundwater level data suggest an encouraging response to early-March precipitation, water levels are falling back on a downward trend.

6. **ILLINOIS STREAMFLOWS.** As shown in Figure 10 for the period from March 1-21, there continues to be a marked contrast in streamflow conditions between the northwestern and southeastern halves of Illinois. Streamflows throughout Illinois rose in mid-March following heavy precipitation, with most streams peaking during March 13-15 and receding in the past week. For some streams in far southern Illinois, the flows in March 2006 will be in the top 10th percentile on record. In contrast, most of the northwestern half of Illinois will have below normal (lowest 30th percentile) total flows for March, assuming precipitation in this part of the State stays below normal for the remainder of March, as is forecasted. Streams in the core area of the drought (Spoon River, Green River, Bureau Creek) are expected to have their 2nd lowest March flows on record (70-90 years of record).

In northern and central Illinois, it is fairly common for a precipitation drought to influence hydrologic conditions in the following year. For many streams in northwestern Illinois that are continuing to experience below-normal flows, it would not be unusual for flows in 2006 to be lower than the 2005 flows – even without much additional deficit in 2006 precipitation amounts.

7. WATER LEVELS AT PUBLIC WATER SUPPLY (PWS) RESERVOIRS. The Water Survey maintains monthly lake level records for 35 public water supply reservoirs in Illinois. Of these, 15 reservoirs have records that date back to the 1980s and have a relatively consistent level of water use from which the impacts of different drought periods can be compared. Nine of these 15 reservoirs are now at or near full pool, which is normal for this time of year. Six reservoirs, listed in Figure 11, were still below their normal condition at the time of this report (March 20). There are no PWS reservoirs in the core area of the drought in northwestern Illinois. Canton Lake, Lake Bloomington, and Evergreen Lake are the most northern impounding reservoirs used for PWS in Illinois.

> In early March, Altamont Lake (Effingham County) was at its lowest level since its construction in the early 1970s. Following a four-inch rainfall in mid-March, the lake rose 2.5 feet to its current level of 4.3 feet below normal. The capacity of Altamont Lake has never been measured, and as such the yield of the system is uncertain and may not be as great as previously estimated – such that its supply could potentially be at risk if the

lake doesn't recover to full pool this spring and low precipitation occurs again in 2006. The lake is currently at about 70% capacity.

The level of Canton Lake (Fulton County) rose approximately 18 inches in mid-March, and is now estimated to be at 73% of capacity. It is still possible that the lake level may not fully recover this spring; however, Canton has been pumping wells to supplement the storage in the lake since November, and the water supply system should be adequate as long as the wells continue to be used. The city is planning to develop a withdrawal site on the Illinois River, 10 miles to the east, which will serve as its primary water supply source beginning in 2008.

Carlinville Lake (Macoupin County) and Lake Pana (Christian County), included in previous monthly reports, both recovered to full pool in mid-March.

The levels in Lake Bloomington and Evergreen Lake (McLean County) each rose almost 3 feet in mid-March, and at this point appear likely to fully recover later this spring.

Lake Springfield (Sangamon County) has risen only 0.9 foot despite local March rainfall amounts of roughly 4 inches, and is at its 2nd lowest March level in 30 years. The low runoff ratio suggests several spring storms will be needed to raise the lake to full pool.

8. FEDERAL RESERVOIRS. Lake Shelbyville and Carlyle Lake are currently 6 feet and 3 feet, respectively, above their seasonal target level and are releasing water to bring their water levels down. Rend Lake is currently almost 6 feet above its normal pool level. In mid-month, the Big Muddy River downstream of Rend Lake experienced its second-highest March peak flow since the construction of the reservoir in the early 1970s.

9. MISSISSIPPI AND OHIO RIVERS. The water levels in the Ohio River and the Mississippi River upstream of the Missouri River confluence near St. Louis are experiencing fairly normal flow conditions for this time of year. Because the Missouri River is experiencing extremely low seasonal conditions (less than one-half of its normal flow), the flow levels on the Mississippi River downstream of the Missouri have been in the below normal range (10th to 30th percentile).

10. **ILLINOIS RIVER**. Streamflows on the Illinois River were unusually low at the beginning of March, but rose in response to mid-month rainfall to a level that is a typical high flow condition for the month. The average flow in the river over the month to date is very close to its long-term average.

11. LAKE MICHIGAN. The water level for Lake Michigan has remained relatively unchanged over the past two months, but it appears that the level is just starting to rise as part of its normal seasonal cycle. Lake Michigan is now 0.7 foot lower than it was one year ago and 1.3 feet lower than its long-term March average, but is still 1.1 foot higher than the record March low that occurred in 1964 and 0.6 foot higher than the more recent low levels that occurred during the winter of 2002-2003.

12. OUTLOOK. Precipitation is expected to be below normal through the first week of April, while temperatures will be variable but not likely to deviate far from normal conditions after some cold weather over the next several days. The Climate Forecast System (CFS) model of the federal Climate Prediction Center (CPC) calls for the continuation of a weak La Niña event. These events, marked by cooler than normal sea surface temperatures in the east equatorial

Pacific Ocean, have been noteworthy for their association with severe summer drought in the central U.S., such as during the strong La Niñas in the mid-1950s, 1988-89, and 1998-2000. The CFS model predicts below normal precipitation in the central U.S. this year, with a moist early to mid-spring giving way to dryness in late spring that persists during summer. Because of this increased likelihood of above normal spring rainfall, the official U.S. Drought Outlook (Figure 12) released on March 16 refers to some potential for improvement early in the period for the drought region encompassing Illinois. However, it does not remove the core drought by the end of the prediction window in June. The CFS model and U.S. Drought Outlook are in agreement with previous analyses by State Climatologist Jim Angel of past La Niña events similar in timing to the current one that show somewhat above normal precipitation in March and April giving way to consistently below normal precipitation from May through August (Figure 13).

In previous cases following the ten driest March through November periods in northern Illinois (climate divisions 1, 2, and 4), the years following tended to remain drier than normal if there was little winter moisture recovery. Of the six years of ten that fall in this category, five did not show significant recovery during spring from cumulative precipitation deficits (1901-02, 1910-11, 1914-15, 1930-31, and 1988-89), while three of these even had increasing deficits during summer (1910-11, 1930-31, and 1988-89). Through March 21 of this year, there has been little improvement in the northern Illinois precipitation deficit (Figure 14, red line), implying that there is a substantial chance for precipitation to remain below normal.

Additionally, the North Atlantic Ocean has been in a warmer than normal sea surface temperature phase since the mid-1990s, and it is currently above normal in temperature. This anomaly has been shown to favor higher probabilities for drought in Illinois over extended periods, such as during the 1930-60 epoch that encompassed both the 1930s Dust Bowl years and the 1950s multi-year drought.

Given the current state of depleted subsoil moisture and shallow groundwater in northern and western Illinois, timely and normal to above normal rains will be required for a successful growing season in these regions. Unlike last year, when the effects of drought were ameliorated by an abundance of soil moisture recharged during a wet winter, this year we enter the growing season in a far more vulnerable condition in northern and western portions of the state. In addition, unlike last year, the spatial extent of drought development is projected by the CPC to cover a much broader area, including most of the western Corn Belt and Southwest. While the specific probability of drought intensification in Illinois is not known, there are significant signals to indicate that this probability is higher than normal.

13. SUMMARY OF STATE'S WATER RESOURCES. Currently, all observed water resources are lower than their levels one year ago (Figure 15). A continuation of drought conditions would cause more rapid departures in water resources than occurred in 2005, and quickly acerbate an already dry situation.

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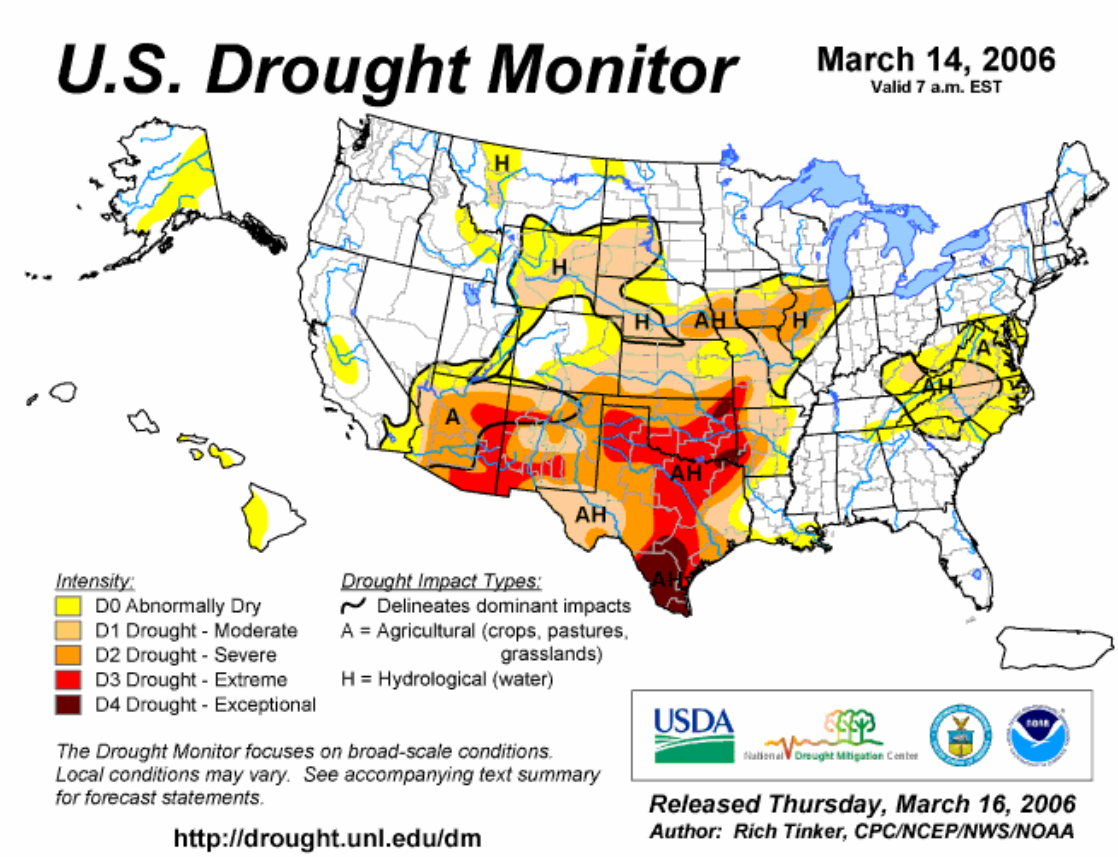


Figure 1. U.S. Drought Monitor for March 14, 2006.

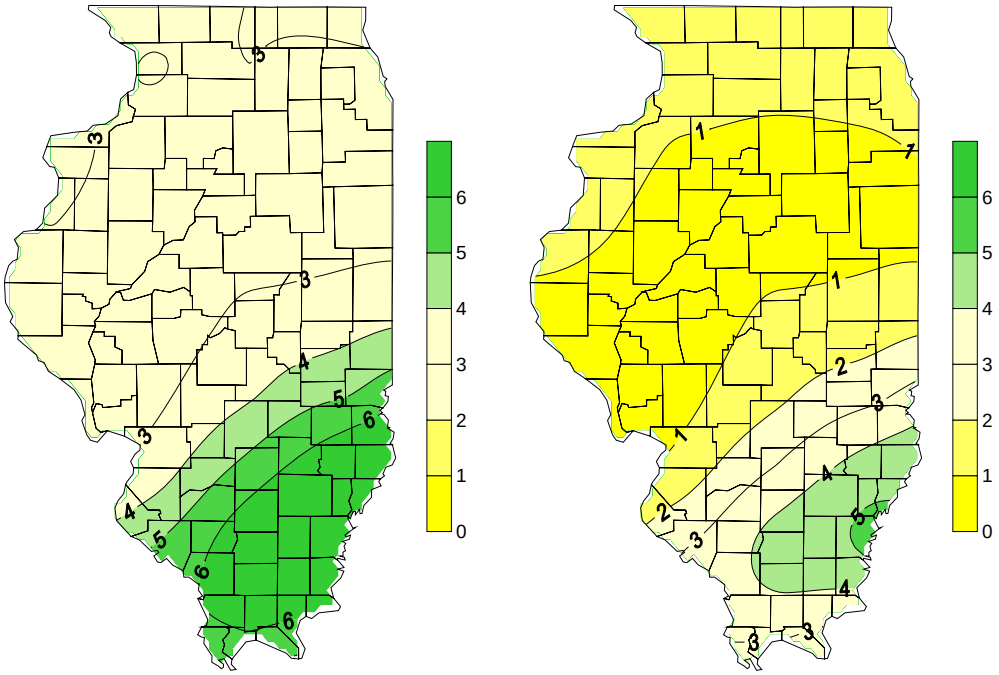
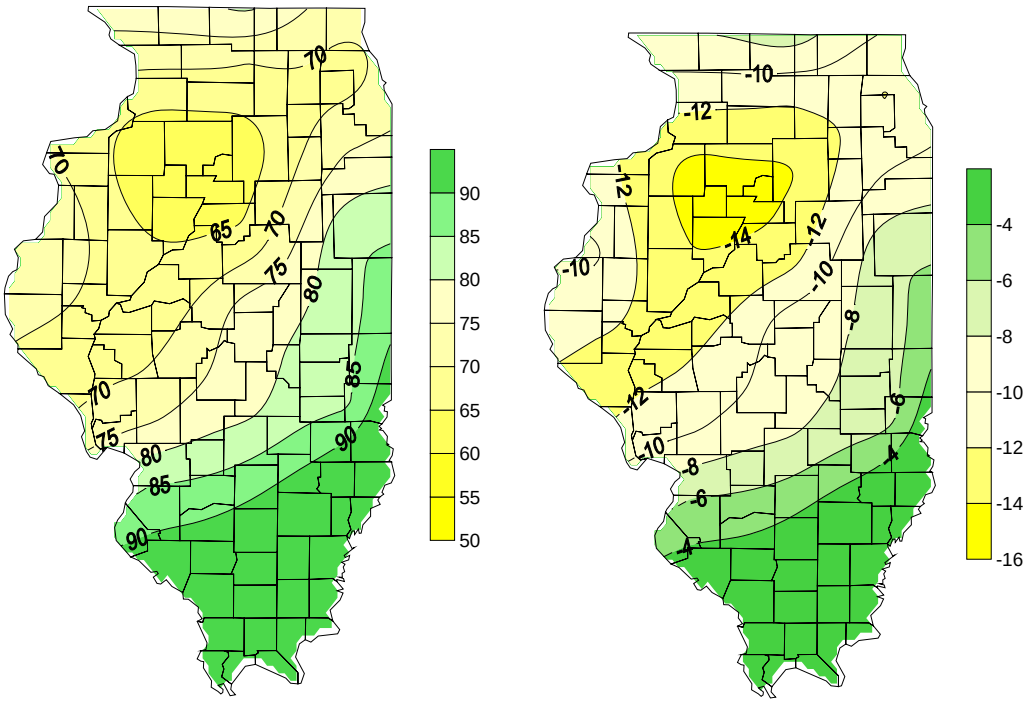


Figure 2. Precipitation for the period of March 1, 2006 to March 20, 2006, in terms of actual precipitation (left) and departure from normal (right).

Source: Illinois State Water Survey



March 1, 2005, to March 20, 2006
Precipitation Percent of Normal

March 1, 2005, to March 20, 2006
Precipitation Departures (inches)

Figure 3. Precipitation for the period of March 1, 2005 to March 20, 2006, in terms of percent of normal (left) and departure from normal (right).

Source: Illinois State Water Survey

Figure 4. Ten driest March through February periods in Illinois (since 1895)

Rank	*Year*	*Precip (in)*
1	1930-31	22.97
2	1901-02	25.53
3	**2005-06**	**27.78**
4	1976-77	28.17
5	1953-54	28.19
6	1914-15	29.03
7	1988-89	29.31
8	1963-64	29.32
9	1940-41	29.56
10	1962-63	29.61

Figure 5. Rankings of driest March through February periods within Illinois climate divisions (since 1895)

Climate divisions	*2005-06 rank*	*top 4 driest years (year drought started)*
Northwest	2	1988, **2005**, 1930, 1976
Northeast	3	1962, 1930, **2005**, 1956
West	2	1988, **2005**, 1901, 1953
Central	4	1901, 1930, 1988, **2005**
East	12	1930, 1963, 1901, 1988
West-Southwest	4	1930, 1901, 1953, **2005**
East-Southeast	6	1930, 1901, 1914, 1976
Southwest	17	1930, 1901, 1953, 1976
Southeast	23	1930, 1901, 1940, 1953

Source: Illinois State Water Survey

0 - 72 inch Soil Layer

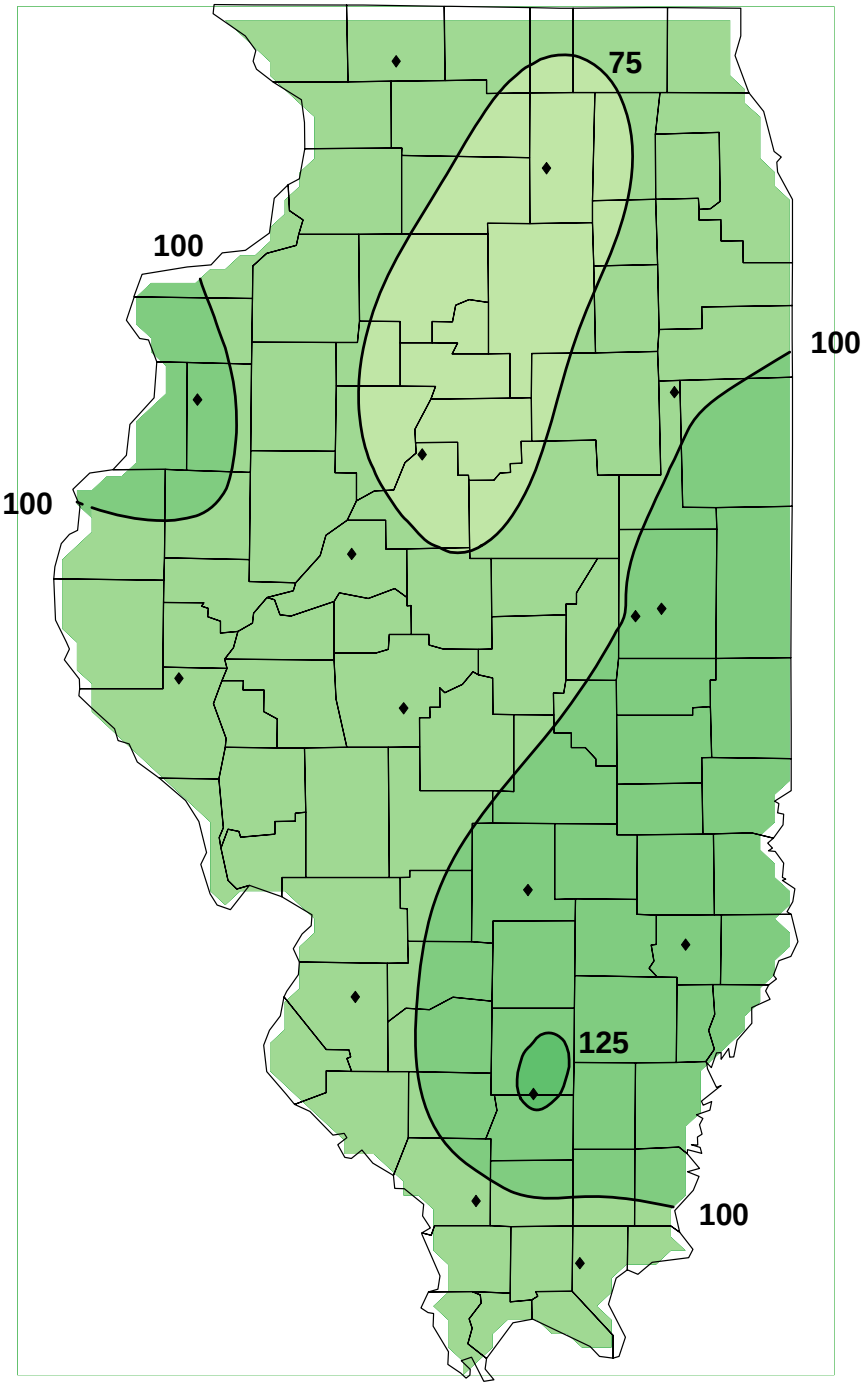


Figure 6. March 15, 2006 observed percent of normal soil moisture based on 1985-1995 mean.

Source: Illinois State Water Survey

Figure 7. Month-End Shallow Groundwater Level Data, February 2006

Number	*Well name*	*County*	*Well depth (feet)*	*This month's reading (depth to water, feet)*	*15-year avg. level (feet)*	*Deviation from Period of record avg. (feet)*	*Previous month (feet)*	*Previous year (feet)*
1	Galena	JoDaviess	25.00	22.65	-1.30	-0.85	-0.25	-1.37
2	Mt. Morris	Ogle	55.00	29.59	-9.97	-8.99	-0.18	-7.71
3	Crystal Lake	McHenry	18.00	7.37	-2.50	-2.06	+0.31	-3.57
4	Cambridge	Henry	42.00	*40.86	N/A	N/A	N/A	N/A
5	Fermi Lab	DuPage	17.00	8.34	-3.02	-2.89	+1.28	-5.21
6	Good Hope	McDonough	30.00	10.95	-4.81	-3.68	-1.25	-7.56
7	Snicarte	Mason	40.30	39.88	-2.80	-2.64	+0.21	-5.36
8	Coffman	Pike	28.00	16.64	-7.92	-5.74	0.00	-12.35
9	Greenfield	Greene	20.70	**18.64	-9.99	-9.25	-0.16	-13.90
10	Janesville	Cumberland	11.00	5.47	-0.89	-0.84	-1.10	-0.64
11	St. Peter	Fayette	15.00	1.56	-0.12	+0.12	-0.56	-0.45
12	SWS #2	St. Clair	80.00	N/A	N/A	N/A	N/A	N/A
13	Boyleston	Wayne	23.00	1.86	-0.04	+0.22	-0.59	+0.03
14	Sparta	Randolph	27.00	5.56	-0.43	+0.46	-0.19	-1.96
15	SE College	Saline	10.19	2.33	-0.78	-0.85	+0.26	-0.91
16	Dixon Springs	Pope	8.63	3.31	-1.35	-1.88	+1.85	-1.28
17	Bondville	Champaign	21.00	4.20	-1.28	-1.36	+2.61	-1.92
				Averages	-3.15	-2.68	+0.15	-4.28

* Well not used for analyses.
** Lowest level of record for month.
N/A - Data not available.

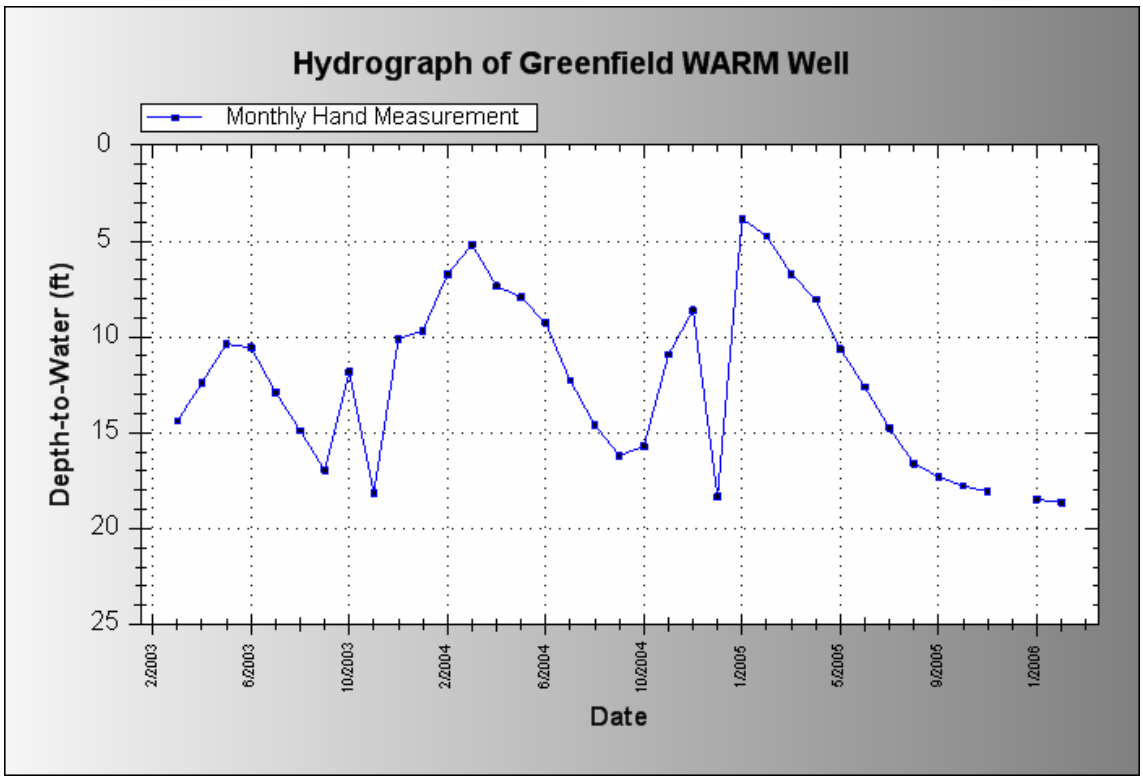


Figure 8. Monthly water levels in ISWS observation well at Greenfield (Greene County).

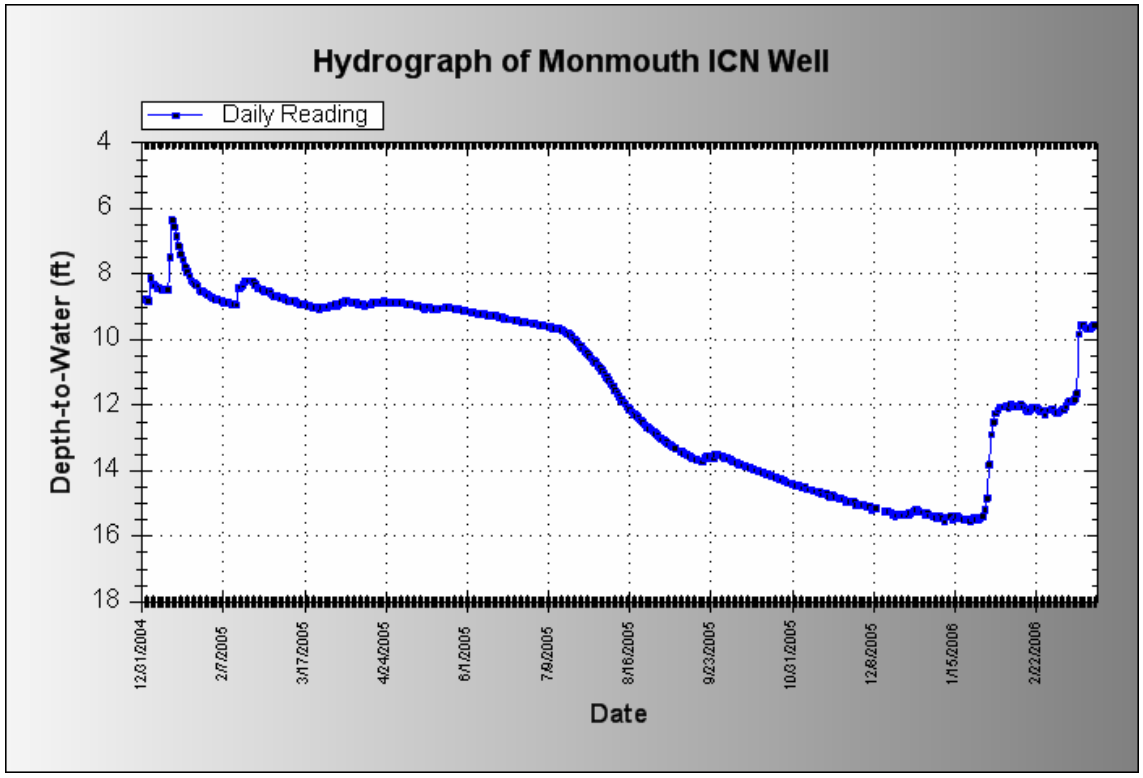


Figure 9. Daily water levels in ISWS observation well at Monmouth (Warren County).

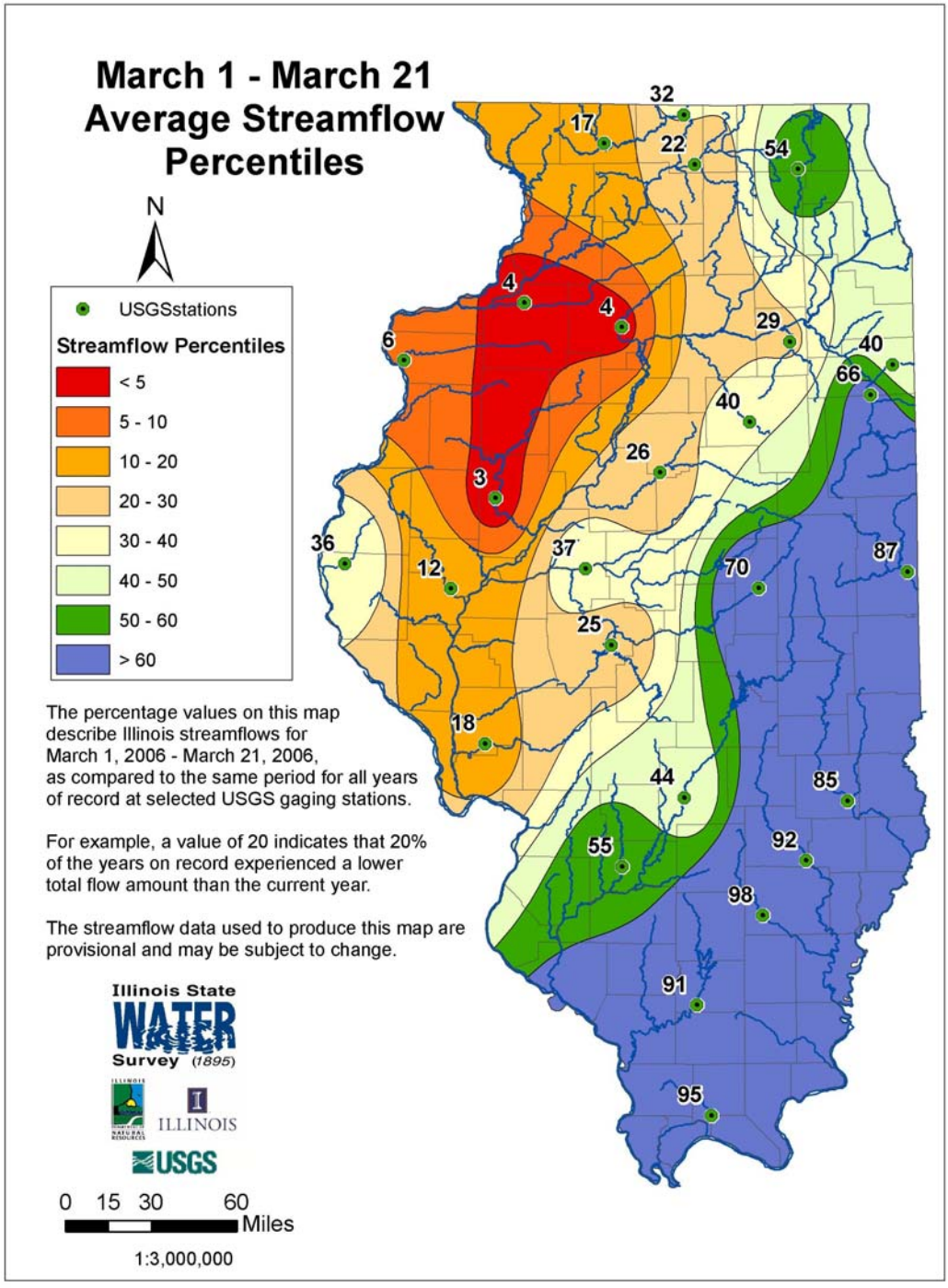


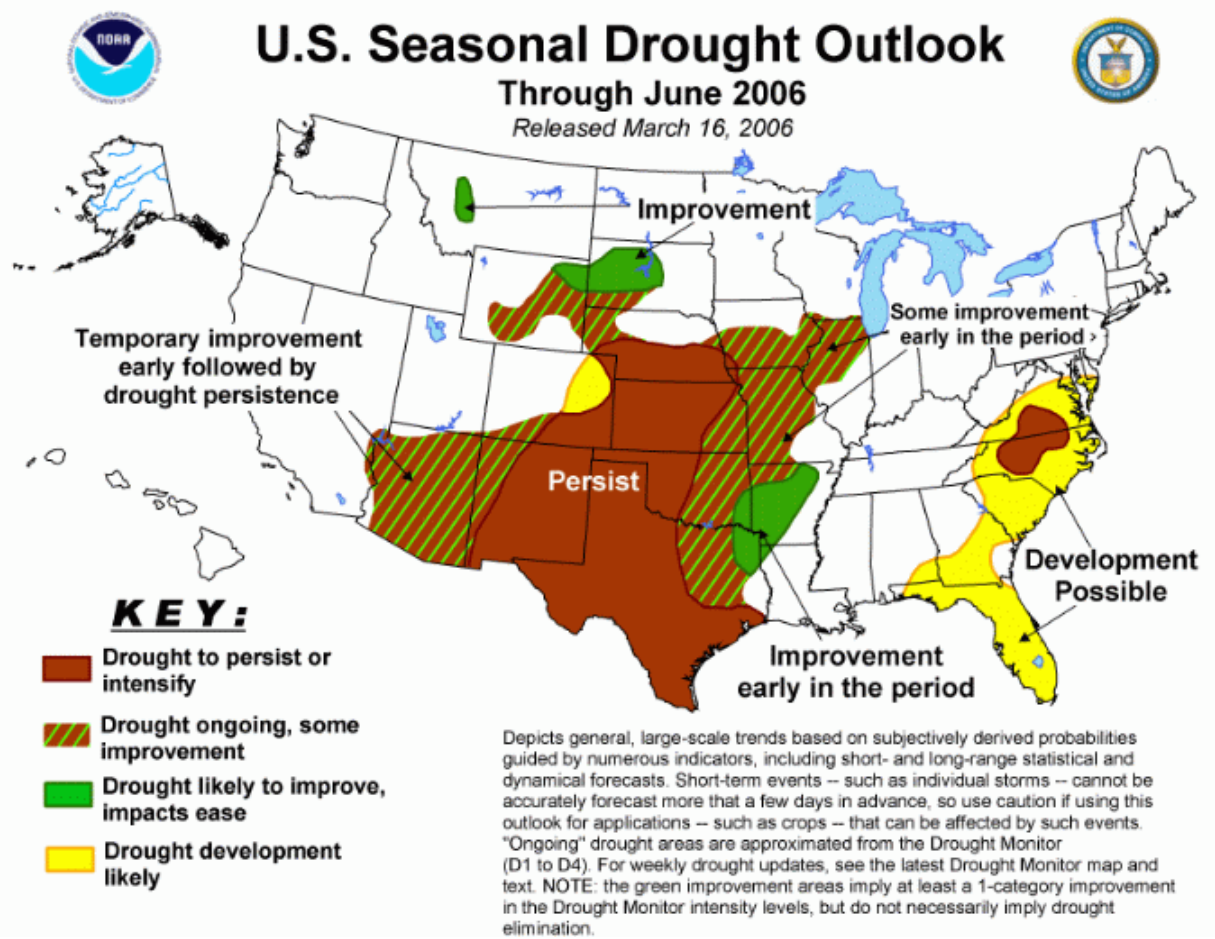
Figure 10. Streamflow percentiles for March 1–21, 2006

Figure 11. March 20, 2006 Water Levels at Selected PWS Reservoirs

Reservoir	Current reservoir drawdown	Beginning of ISWS lake record (year)	This month's rank	Lowest March level on record (year)**	Median March level**
Altamont Lake	-4.3 ft	1983	1	-4.3 ft (2006)	full pool
Canton Lake	-4.2 ft	1989	2	- 9.6 ft (1990)	full pool
Lake Springfield	-2.4 ft	1983	2	-5.5 ft (2000)	-0.2 ft
Lake Pittsfield	-0.5 ft	1988	3	-2.0 ft (2000)	full pool
Evergreen Lake	-2.9 ft	1988	4	-13.9 ft (1989)	full pool
Lake Bloomington	-2.3 ft	1983	4	-10.4 ft (1989)	full pool

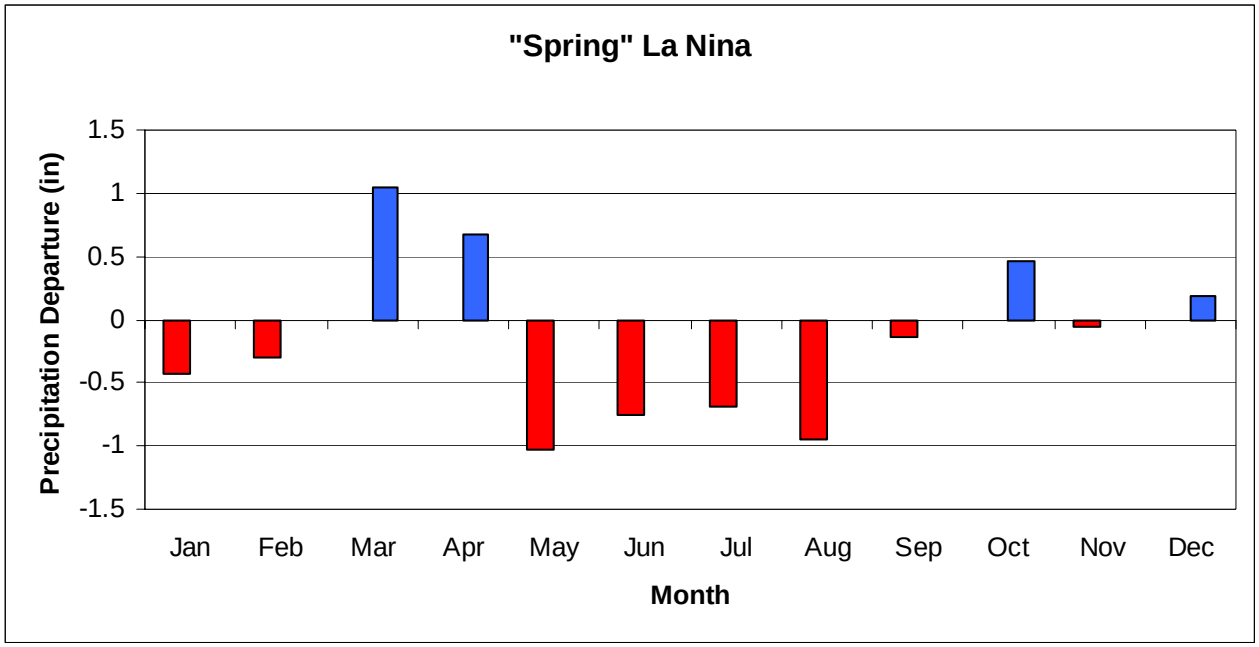
**Median and lowest March values are estimated using end-of-month historical values. This month's rank is based on an assumption that there will not be much precipitation during the remainder of the month and that lake levels will not change over that time.

Source: Illinois State Water Survey



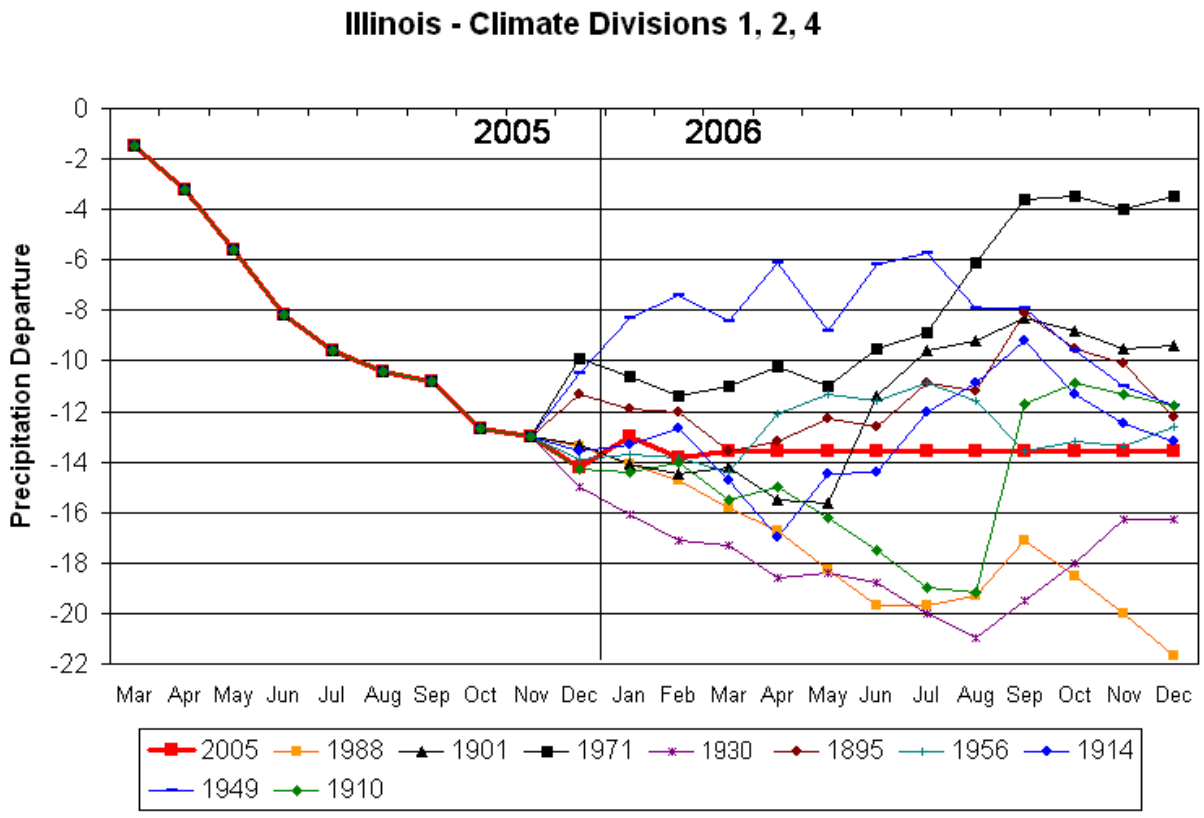
Source: U.S. Climate Prediction Center:
http://www.cpc.ncep.noaa.gov/products/expert_assessment/seasonal_drought.html.

Figure 12. U.S. Drought Outlook for April, May, and June 2006. Northern Illinois is expected to have some improvement early in the period, but not full drought recovery.



Source: Illinois State Water Survey

Figure 13. Illinois statewide precipitation averages for five La Niña events similar to the current event, sharing a late winter / early spring starting time (1954, 1964, 1973, 1984, 1988). These similar events resulted in drier than normal conditions in the late spring and summer in Illinois.



Source: Illinois State Water Survey

Figure 14. The Northern Illinois cumulative precipitation departure from normal (inches) for March 2005 through March 2006 is compared to the actual months that followed during the other 9 driest March through November periods. March 2006 data are current only through the 21st. The red line for 2005-2006 is extended to December 2006 using normal monthly precipitation. The Northern Illinois average combines precipitation from the Northwest (Div 1), Northeast (Div 2), and Central (Div 4) climate divisions of Illinois. A map of Illinois climate divisions is located at:
http://www.ncdc.noaa.gov/img/onlineprod/drought/il.gif.

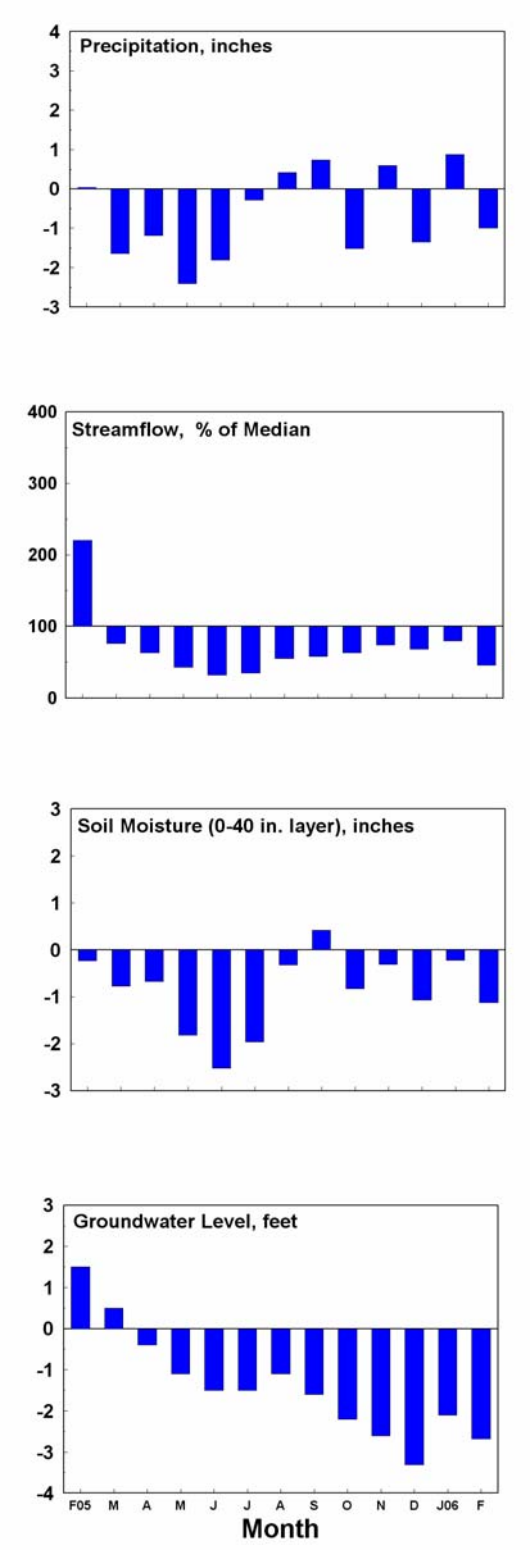


Figure 15. Statewide departures from normal.

Source: Illinois State Water Survey