

## ILLINOIS WATER AND CLIMATE SUMMARY September 2003

### September 2003 Overview (Bob Scott)

Temperatures in Illinois during September were well below average, and precipitation was above average. Soil moisture within the top 40 inches of soil was above the long-term statewide average. Mean streamflows were well above median heights. Shallow groundwater levels were below long-term average depths and below average for the 13th consecutive month. Central Illinois experienced heavy precipitation on August 30–September 3 at the end of what had been a very dry August. Due to the time schedule required to collect all data for these monthly reports, many observations last month were taken just prior to those rain events. Comparison with current observations has generated some exceptional changes in a few measurements reported here.

**Temperatures** across Illinois (Figure 1) for September were well below average (a -2.5-degree departure), the 15th coolest September since 1895. Crop Reporting District (CRD) temperatures ranged from 1.1 degrees below average (northeast) to 3.3 degrees below average (west).

**Precipitation** amounts in Illinois for September were above average (Figure 1). The statewide average of 4.60 inches represents a +1.41-inch departure or 144 percent of average. Rainfall amounts varied from 77 percent of average (2.59 inches) in the northeast CRD to 213 percent of average (6.52 inches) in the east-southeast CRD.

**Soil moisture** in the 0- to 40-inch (0- to 100-centimeter) layer at the end of September was above normal overall. Moisture near the soil surface generally was above normal. Moisture in deeper layers was below to well below normal in central Illinois, but substantially wetter soils were measured in west-central, east-central, and far southern Illinois.

**Mean provisional streamflow** statewide at the end of September was 545 percent above the median flow (Figure 1). Rivers in Illinois recorded mean discharges in the much above normal to below normal range this month. Peak stages recorded were below flood stage at stations on the Illinois River, the Mississippi River along the Illinois border, and the Ohio River at Cairo.

**Water surface levels** at the end of September were below the normal pool/target operating level at 29 of 37 reporting reservoirs. Water surface levels at Lake Shelbyville and Carlyle Lake were near target levels at the end of September; Rend Lake was slightly above target operating level. Lake Michigan's mean level remains below the long-term average. This month's mean is 0.6 feet above the record-low monthly mean for September.

Statewide, **shallow groundwater levels** were below average for September. This is the 13th consecutive month of below average levels in Illinois. Deviations from the September normal averaged 2.7 feet below average. Levels were 0.2 feet higher than August levels and approximately 1.1 feet below September levels one year ago.

*Note: Extended network descriptions appear in the January and July issues. Network maps are available upon request.*

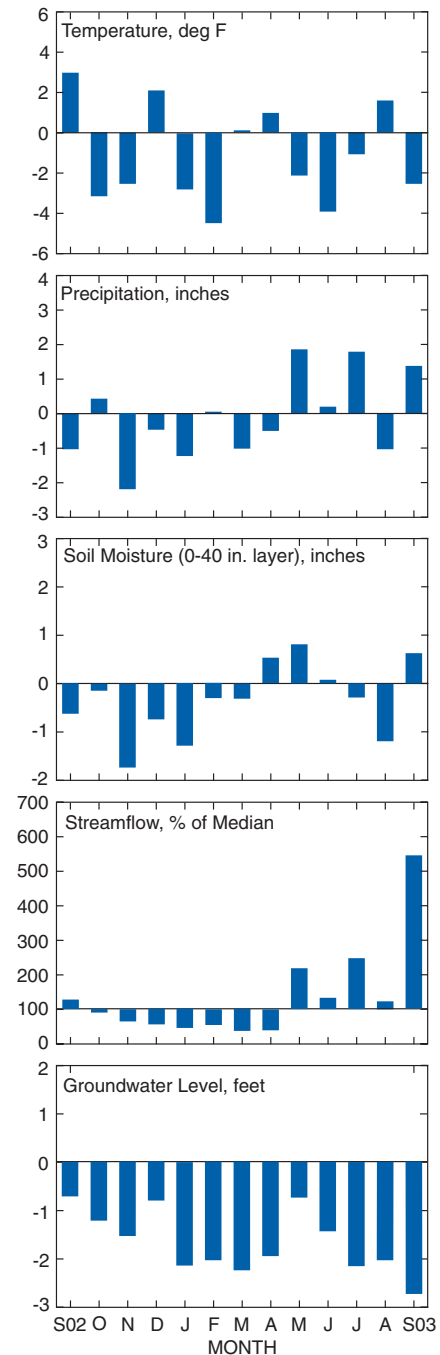


Figure 1.  
Statewide departures from normal

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## Weather/Climate Information (Jim Angel and Bob Scott)

**Temperatures** across Illinois for September were well below average across the state (Figure 2 and Table 1), the 15th coolest September since 1895. Temperature extremes ranged from 91°F at Rochelle and Streamwood on September 8 to 28°F at Mt. Carroll on September 9. When added to prior months, this was the 41st coolest July–September, 38th coolest April–September, and 25th coolest October–September since 1895.

**Precipitation** was above average statewide for September (Figure 2 and Table 1), the 26th wettest September since 1895. Findlay reported the highest one-day rainfall (7.01 inches) on September 1, and Sullivan reported the highest monthly total (9.10 inches). Heavy rains near the first of the month accounted for a substantial portion of September’s precipitation across the state. Rainfall was below normal in most CRDs during the remainder of the month. This was the 24th wettest July–September, 34th wettest April–September, and 29th driest October–September since 1895.

**Severe weather** in September included reports of two tornadoes in Illinois. No injuries but widespread tree damage were reported in Fulton from a tornado on September 12. Another tornado blew doors and windows out of a house near Broadwell (Logan County) on September 26. Two-inch hail at Camp Point (Adams County) and several additional reports of hail and wind damage also occurred on that date. Although most wind damage was limited to trees and power lines, highway signs and billboards were blown down along I-44 (Franklin County).

**Illinois Climate Network (ICN) Data.** Average daily wind speeds across Illinois for September (Figure 3) ranged from 3 mph at Dixon Springs to 8 mph at Monmouth. The highest wind gust for the month, 38 mph, occurred at Monmouth on September 18; Fairfield and Belleville recorded 37 mph winds on September 26 and 27, respectively. The prevailing wind direction during September showed predominately southeasterly winds in northern and central Illinois to westerly winds over southern Illinois. Wind speeds in excess of 8 mph varied from 30–35 hours at Rend Lake and Dixon Springs to nearly 335 hours at Monmouth. (September has 720 hours.) Average air temperatures in September ranged from the lower 60s in northern Illinois to the middle 60s in southern Illinois.

Solar radiation totals ranged from 562 Mega-Joules per meter squared (MJ/m<sup>2</sup>) at Dixon Springs to 480 MJ/m<sup>2</sup> at DeKalb and St. Charles. Potential evapotranspiration observations ranged from a low of 4.1 inches at DeKalb and St. Charles to 4.8 inches at Dixon Springs. Soil temperatures at the 4- and 8-inch levels ranged from the middle 60s to the lower 70s from north to south across the state.

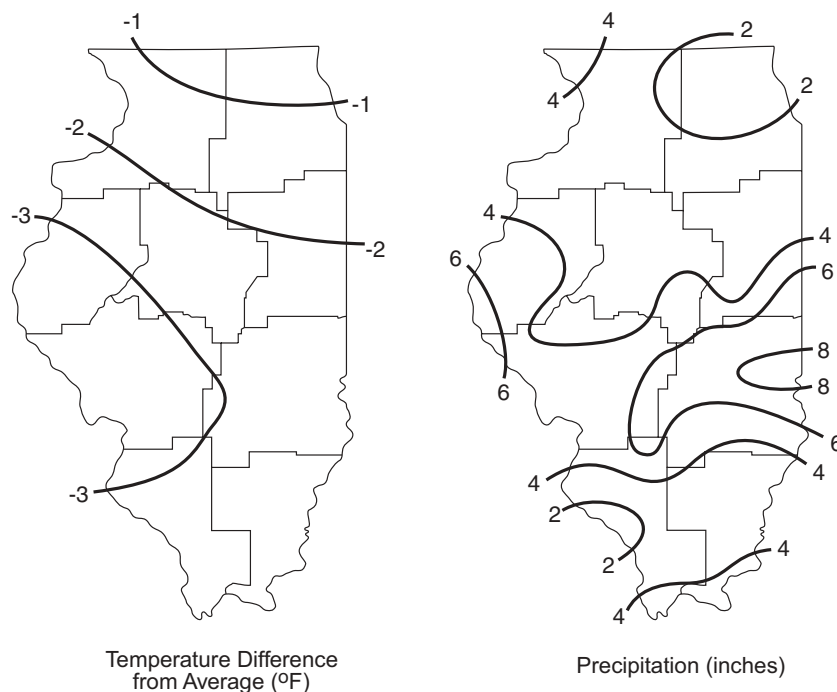


Figure 2. Illinois temperature and precipitation during September 2003

**Table 1. Illinois Precipitation (inches) and Temperature (°F) by Crop Reporting District**

<i>Crop Reporting District</i>	<i>Last Month</i>			<i>Last 3 Months</i>			<i>Last 6 Months</i>			<i>Last 12 months</i>		
	<i>Sep 03 Amount</i>	<i>% Avg</i>	<i>Temp Dev</i>	<i>Jul 03- Sep 03</i>	<i>% Avg</i>	<i>Temp Dev</i>	<i>Apr 03- Sep 03</i>	<i>% Avg</i>	<i>Temp Dev</i>	<i>Oct 02- Sep 03</i>	<i>% Avg</i>	<i>Temp Dev</i>
Northwest	3.51	106	-1.6	9.80	86	0.0	20.02	85	-0.6	26.98	74	-0.8
Northeast	2.59	77	-1.1	11.03	98	-0.1	22.09	96	-0.9	29.05	79	-1.1
West	6.17	174	-3.3	14.06	125	-0.8	25.79	110	-1.1	34.50	92	-1.3
Central	4.19	132	-2.6	13.04	122	-0.6	24.00	107	-1.0	32.05	86	-1.3
East	5.20	175	-2.0	17.01	158	-0.6	28.29	125	-0.9	36.51	97	-1.5
West-southwest	5.68	188	-3.2	13.01	132	-1.2	26.51	122	-1.4	37.88	100	-1.6
East-southeast	6.52	213	-3.0	13.87	132	-0.7	26.43	116	-1.0	39.61	96	-1.5
Southwest	3.28	103	-2.9	8.54	83	-0.5	25.54	112	-0.9	41.89	98	-1.4
Southeast	3.72	123	-2.7	8.59	86	-0.4	24.07	103	-0.7	43.88	99	-1.2
<b>State Average</b>	<b>4.60</b>	<b>144</b>	<b>-2.5</b>	<b>12.20</b>	<b>114</b>	<b>-0.6</b>	<b>24.69</b>	<b>108</b>	<b>-1.0</b>	<b>35.45</b>	<b>91</b>	<b>-1.3</b>

**Note:** Data are provisional. Complete, quality controlled data are available about six months after a given month.

**Extended climate outlooks** issued by the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Climate Prediction Center for October and for October–December call for equal chances of above, below, and normal temperatures and precipitation across Illinois.

### Soil Moisture Information (Bob Scott)

Precipitation across most of Illinois was heavy during the first few days of September, but the balance of the month was relatively dry. Nevertheless, with evapotranspiration and root extraction of moisture waning during the month, most of the state measured above normal moisture near the soil surface at the end of September (Figure 4). Only sites in northern Illinois reported below normal conditions. Moisture values ranged from 70 percent of normal at Freeport to more than 200 percent of normal at Topeka. Similar patterns were observed in the 6- to 20-inch layer where near to above normal soil moisture conditions were found everywhere, except DeKalb (24 percent of normal). Moisture levels near 200 percent of normal were measured at Perry in this layer. Soil moisture 20 to 40 inches deep was complex and displayed high regional variability. DeKalb, Peoria, Belleville, and Olney reported values less than 50 percent of normal, while sites in west-central, east-central, and far southern Illinois observed above normal conditions. Long-term soil moisture patterns were observed in the 40- to 72-inch layer: above normal conditions in west-central and east-central Illinois, but dry soils across much of central Illinois. Values in this layer ranged from less than 15 percent of normal at Brownstown and less than 50 percent of normal at Peoria and DeKalb to 150 percent of normal at Kilbourne. Overall, soil moisture conditions across Illinois at the end of September were above normal (Figure 1).

Compared to last month, soil moisture increased substantially at nearly every site in the two uppermost layers (Table 2), primarily because soil moisture observations in late August just preceded the heavy rains that bridged August and September. Only DeKalb and Perry showed little moisture change in the 6- to 20-layer. Extreme increases at Belleville were due to exceptionally dry conditions there last month. Most sites measured relatively small moisture changes in the 20- to 40-inch layer, although Dixon Springs and Topeka reported notable increases.

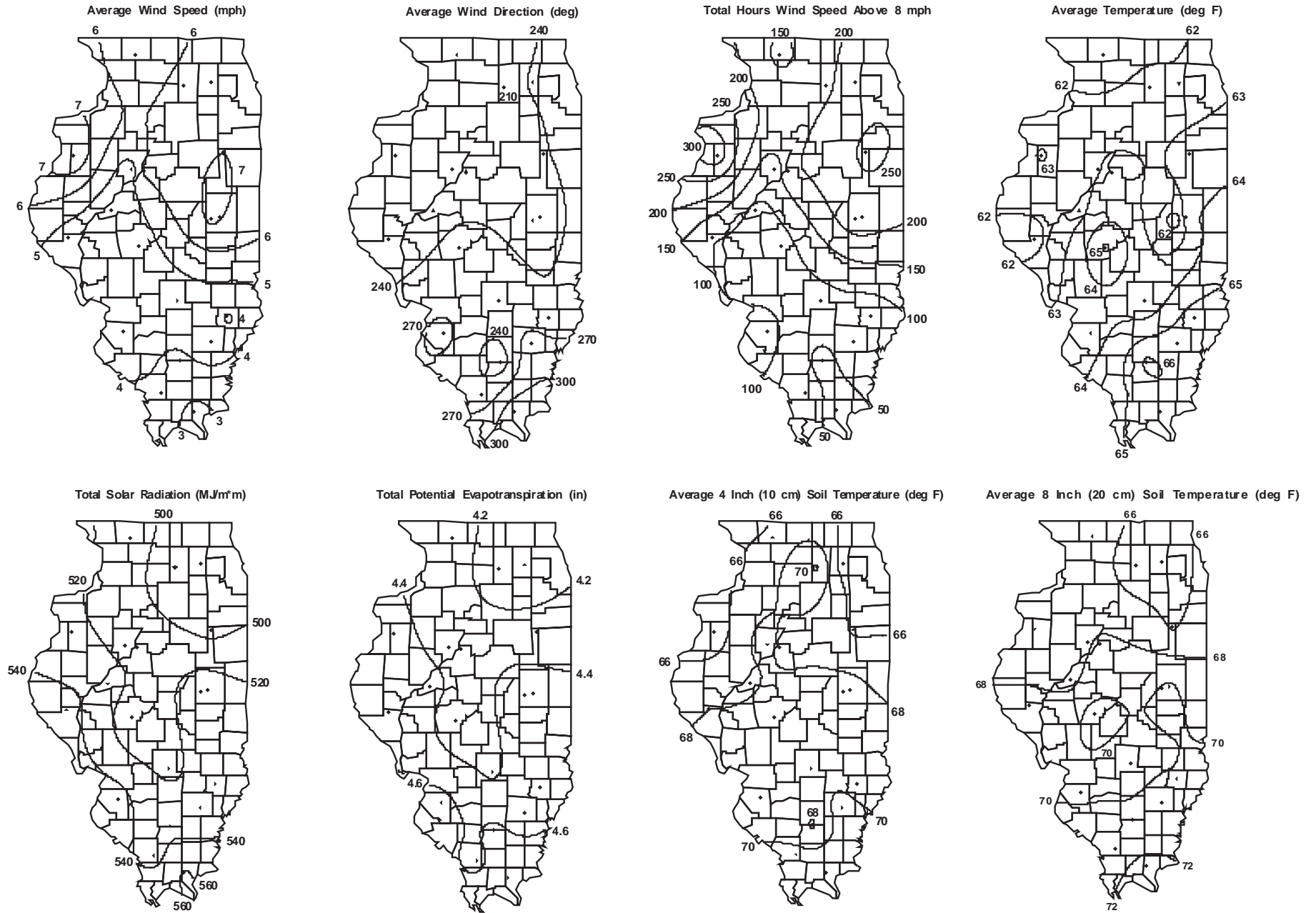


Figure 3. September monthly averages and totals as collected by the Illinois Climate Network

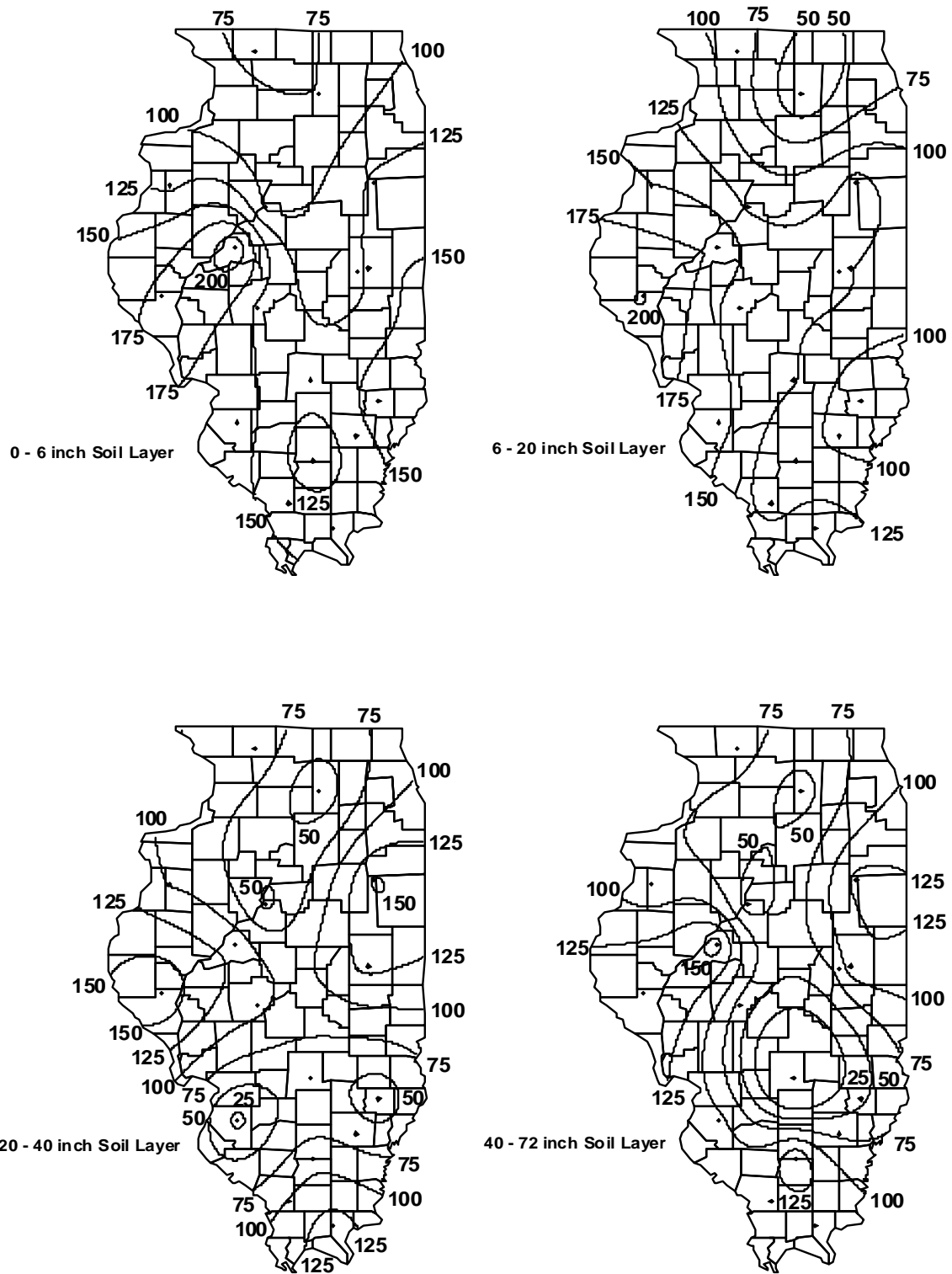


Figure 4. October 1 observed percent-of-normal soil moisture based on 1985-1995 mean

**Table 2. Soil Moisture in Various Layers on October 1, 2003**

<i>Location</i>	<i>Oct 1 0 - 6 (inches)</i>	<i>Change from Sep 1 (%)</i>	<i>Oct 1 6 - 20 (inches)</i>	<i>Change from Sep 1 (%)</i>	<i>Oct 1 20 - 40 (inches)</i>	<i>Change from Sep 1 (%)</i>
Freeport (NW)	1.4	115	3.7	139	6.0	11
DeKalb (NE)	1.5	45	2.5	-9	5.4	-4
Monmouth (W)	1.8	104	4.4	51	5.6	3
East Peoria (C)	1.4	55	4.4	31	6.6	-2
Topeka (C)	1.1	159	2.6	76	2.6	31
Stelle (E)	1.7	32	4.5	14	6.3	-2
Champaign (E)	2.0	64	4.8	32	5.8	8
Bondville (E)	1.6	41	4.5	54	7.3	17
Perry (WSW)	2.1	73	5.5	3	8.3	3
Springfield (WSW)	1.8	64	4.7	27	7.3	14
Brownstown (ESE)	1.4	146	2.7	78	6.2	0
Olney (ESE)	1.7	71	3.7	16	6.3	0
Belleville (SW)	1.7	363	3.3	1319	5.7	4
Carbondale (SW)	1.7	147	2.9	77	6.3	0
Ina (SE)	1.7	102	4.7	21	7.4	1
Fairfield (SE)	1.7	104	4.1	23	6.9	-2
Dixon Springs (SE)	2.1	53	4.8	64	7.4	22

**Surface Water Information (Sally McConkey)**

**River and stream discharge and stage data** are obtained from gaging stations operated by the U.S. Geological Survey (USGS) or the U.S. Army Corps of Engineers (USACE). The USGS gaging station network is supported, in part, by the Illinois Department of Natural Resources Office of Water Resources and the Illinois State Water Survey (ISWS), and the USACE. Provisional discharge data are obtained from direct computer access to the USGS.

Table 3 lists selected streamgaging stations located on the Illinois, Mississippi, and Ohio Rivers, flood stage, and the provisional peak stage for the current month. The peak stage is determined from the daily morning reading posted by the National Weather Service and/or the USACE. Stations on the Illinois River and the Mississippi River along the Illinois border recorded peak stages well below flood stage. The Ohio River at Cairo peaked below flood stage on September 8.

Table 4 lists 26 streamgaging stations located throughout Illinois. Provisional monthly mean flows posted by USGS are listed if available; otherwise, daily mean discharge data posted by the USGS were used to estimate the mean flow for the month. Long-term mean flows for each month are published by the USGS. The month's median flow for each station listed in Table 4 was determined by ranking the September mean flow for each year of record, and selecting the middle value, 50 percent exceedence probability.

Mean provisional flow statewide was 545 percent of the median and 156 percent of the mean. Flows in the northwestern part of the state were generally in the below normal range, as were flows in the Fox River at Dayton and the Spoon River at Seville. Central and southern Illinois experienced flows in the normal to much above normal range. The higher than normal flows reflect high flows at the beginning of September.

**Table 3. Peak Stages for Major Rivers, September 2003**

<i>River</i>	<i>Station</i>	<i>River mile*</i>	<i>Flood stage (feet)*</i>	<i>Peak stage (feet)**</i>	<i>Date</i>
Illinois	Morris	263.1	13	6.5	02
	La Salle	224.7	20	11.7	06
	Peoria	164.6	18	12.6	19
	Havana	119.6	14	6.6	02
	Beardstown	88.6	14	10.1	03
	Hardin	21.5	25	20.7	02
Mississippi	Dubuque	579.9	17	8.0	14
	Keokuk	364.2	16	4.2	14
	Quincy	327.9	17	11.8	23
	Grafton	218.0	18	15.8	01
	St. Louis	180.0	30	5.6	02
	Chester	109.9	27	8.2	03
	Thebes	43.7	33	12.8	04
	Cairo	2.0	40	31.0	08

**Notes:**

\* River mile and flood stage from *River Stages in Illinois: Flood and Damage Data*, Illinois Department of Natural Resources, Office of Water Resources, July 1998.

\*\* Peak stage based on daily a.m. readings, not instantaneous peak.

**Water-Supply Lakes and Major Reservoirs.** Table 5 lists reservoirs in Illinois, their normal pool or target water surface elevation, and other data related to observed variations in water surface elevations. Reservoir levels are reported in terms of their difference from normal pool (or target level), and are obtained from a network of cooperating reservoir operators who are contacted each month by ISWS staff for the current water levels. The average of the month-end readings for the period of record is reported in terms of the difference from normal pool or target level (column 6 of Table 5). The number of years of record for each reservoir also is given (column 7). Most of the reservoirs listed in Table 5 serve as public water supplies, with the exceptions noted in the last column.

Compared to levels at the end of August at 36 reservoirs, by the end of September the water surface elevation had risen at 6 reservoirs, was the same as last month at 4 reservoirs, and had decreased at 26 reservoirs. For the 37 reservoirs reporting at the end of September, 5 reservoirs had water surface levels above the normal pool (or target operating level), 3 reservoirs were at normal pool, and 29 reservoirs were below normal pool. Six reservoirs were more than 2 feet below normal pool.

*Major Reservoirs.* The water levels at Lake Shelbyville and Carlyle Lake were near their respective seasonal target levels; Rend Lake was above its target level.

**Great Lakes.** Current month mean and end-of-month values are provisional and are relative to International Great Lakes Datum 1985. The September mean level for Lake Michigan was 577.2 feet, compared to a mean level of 578.1 feet in September 2002. The long-term average lake level for September is 579.2 feet, based on 1918–1999 data. Historically, the lowest mean level for Lake Michigan in September occurred in 1964 at 576.6 feet, and the highest level occurred in 1986 at 582.0 feet. The month-end level of Lake Michigan was 577.1 feet.

**Table 4. Provisional Mean Flows, September 2003**

Station	Drainage area (sq mi)	Years of record	2003 mean flow (cfs)	Long-term flows		Flow condition	Percent chance of exceedence	Days of data this month
				Mean* (cfs)	Median (cfs)			
Rock River at Rockton	6363	67	1,493	2913	2706	below normal	77	29
Rock River near Joslin	9,549	59	1,907	4241	3740	below normal	79	30
Pecatonica River at Freeport	1,326	83	369	758	646	below normal	80	29
Green River near Geneseo	1,003	63	73	341	156	below normal	88	30
Edwards River near New Boston	445	64	27	127	49	normal	69	29
Kankakee River at Momence	2,294	84	914	982	746	normal	34	29
Iroquois River near Chebanse	2,091	78	654	560	123	above normal	20	29
Fox River at Dayton	2,642	82	293	983	591	below normal	84	30
Vermilion River at Pontiac	579	58	24	119	17	normal	32	29
Spoon River at Seville	1,636	85	92	610	195	below normal	78	30
LaMoine River at Ripley	1,293	78	234	438	129	normal	31	29
Bear Creek near Marceline	349	57	140	155	20	above normal	18	30
Mackinaw River near Congerville	767	53	50	222	23	normal	31	30
Salt Creek near Greenview	1,804	60	466	414	194	above normal	21	29
Sangamon River at Monticello	550	89	198	114	26	above normal	15	30
South Fork Sangamon near Rochester	867	52	508	138	23	much above normal	7	29
Illinois River at Valley City	26,743	63	7,444	11,440	8119	normal	60	26
Macoupin Creek near Kane	868	73	264	177	47	above normal	13	30
Vermilion River near Danville	1,290	58	2,524	253	108	much above normal	3	29
Kaskaskia River at Vandalia	1,940	32	N/A	565	306	N/A	N/A	N/A
Shoal Creek near Breese	735	58	366	137	36	above normal	10	29
Embarras River at Ste. Marie	1,516	88	946	378	113	above normal	12	29
Skillet Fork at Wayne City	464	82	10	76	21	normal	65	29
Little Wabash below Clay City	1,131	87	544	213	63	above normal	11	30
Big Muddy at Plumfield	794	87	97	133	74	normal	40	29
Cache River at Forman	244	78	253	55.8	14	much above normal	5	30

**Notes:**

N/A = not available.

Much below normal flow = 90-100% chance of exceedence.

Below normal flow = 70-90% chance of exceedence.

Normal flow = 30-70% chance of exceedence.

Above normal flow = 10-30% chance of exceedence.

Much above normal flow = 0-10% chance of exceedence.

\*As reported in U.S. Geological Survey (USGS) Water Resources Data, Illinois, Water Year 2001.

**Table 5. Reservoir Levels in Illinois, September 2003**

**For security considerations, statewide tabular reservoir data are not available on the Internet. Specific data requests may be made to Sally McConkey at: [sally@sws.uiuc.edu](mailto:sally@sws.uiuc.edu).**

## Groundwater Information (Ken Hlinka)

**Comparison to Average Levels.** Shallow groundwater levels in 16 observation wells, which are remote from pumping centers, were below average levels for September by 2.7 feet and ranged from 28.7 feet below average to 5.2 feet above average (Table 6). Once again, northern Illinois reported the largest deviations at Cambridge (Henry County) and Mt. Morris (Ogle County). This is the fourth and seventh consecutive month for a record monthly low at Cambridge and Mt. Morris, respectively. Over the last year, the Cambridge well has experienced extremely low water levels (up to 32 feet below normal in February) and was not included in the *Illinois Water and Climate Summary*. After discussions with observer Dan DeSmith, Natural Resources Conservation Service, and review of groundwater-related documents for this area, it appears that the extremely low record water levels were a result of extremely dry conditions and not caused by local activities. Conditions in this area will continue to be monitored closely.

**Comparison to Previous Month.** Shallow groundwater levels were slightly above those of August. Levels averaged 0.2 feet above those of last month and ranged from 2.6 feet below to 4.9 feet above August levels.

**Comparison to Same Month, Previous Year.** Shallow groundwater levels in September were below levels of last year. Levels averaged 1.1 feet lower and ranged from 20.2 feet lower to 5.1 feet above levels of last year.

**Table 6. Month-End Shallow Groundwater Level Data Sites, September 2003**

Number	Well name	County	Well depth (feet)	This month's reading (depth to water, feet)	Deviation from			
					15-year avg. level (feet)	Period of record avg. (feet)	Previous month (feet)	Previous year (feet)
1	Galena	JoDaviess	25.00	22.25	-1.08	-0.98	+0.51	-2.52
2	Mt. Morris	Ogle	55.00	31.16*	-12.17	-11.87	-0.96	N/A
3	Crystal Lake	McHenry	18.00	6.89	-1.23	-1.20	+3.53	N/A
4	Cambridge	Henry	42.00	40.88*	-27.56	-28.65	-2.60	-20.21
5	Fermi Lab	DuPage	17.00	9.74	-1.92	-1.92	-1.27	-1.38
6	Good Hope	McDonough	30.00	10.45	-0.40	-0.83	-1.51	N/A
7	Snicarte	Mason	42.00	38.98	-2.18	-2.02	-0.12	-1.92
8	Coffman	Pike	28.00	9.17	+4.43	+5.22	+4.86	+5.14
9	Greenfield	Greene	20.70	16.95	-1.52	-1.67	-2.07	-1.09
10	Janesville	Cumberland	11.00	5.14	+0.90	+1.31	+1.57	+2.05
11	St. Peter	Fayette	15.00	3.96	+0.65	+0.77	+0.65	+2.33
12	SWS #2	St. Clair	80.00	N/A	N/A	N/A	N/A	N/A
13	Boyleston	Wayne	23.00	6.95	+0.49	+0.76	-0.83	+0.79
14	Sparta	Randolph	27.00	9.54	-0.59	+0.19	-1.53	+0.15
15	SE College	Saline	10.19	7.41	+0.56	+0.25	+0.53	+1.90
16	Dixon Springs	Pope	8.63	6.44	+0.39	-1.11	+1.84	+2.19
17	Bondville	Champaign	21.00	6.56	-1.22	-0.99	-0.25	-1.24
Averages					-2.65	-2.67	+0.15	-1.06

**Notes:**

N/A = Data not available.

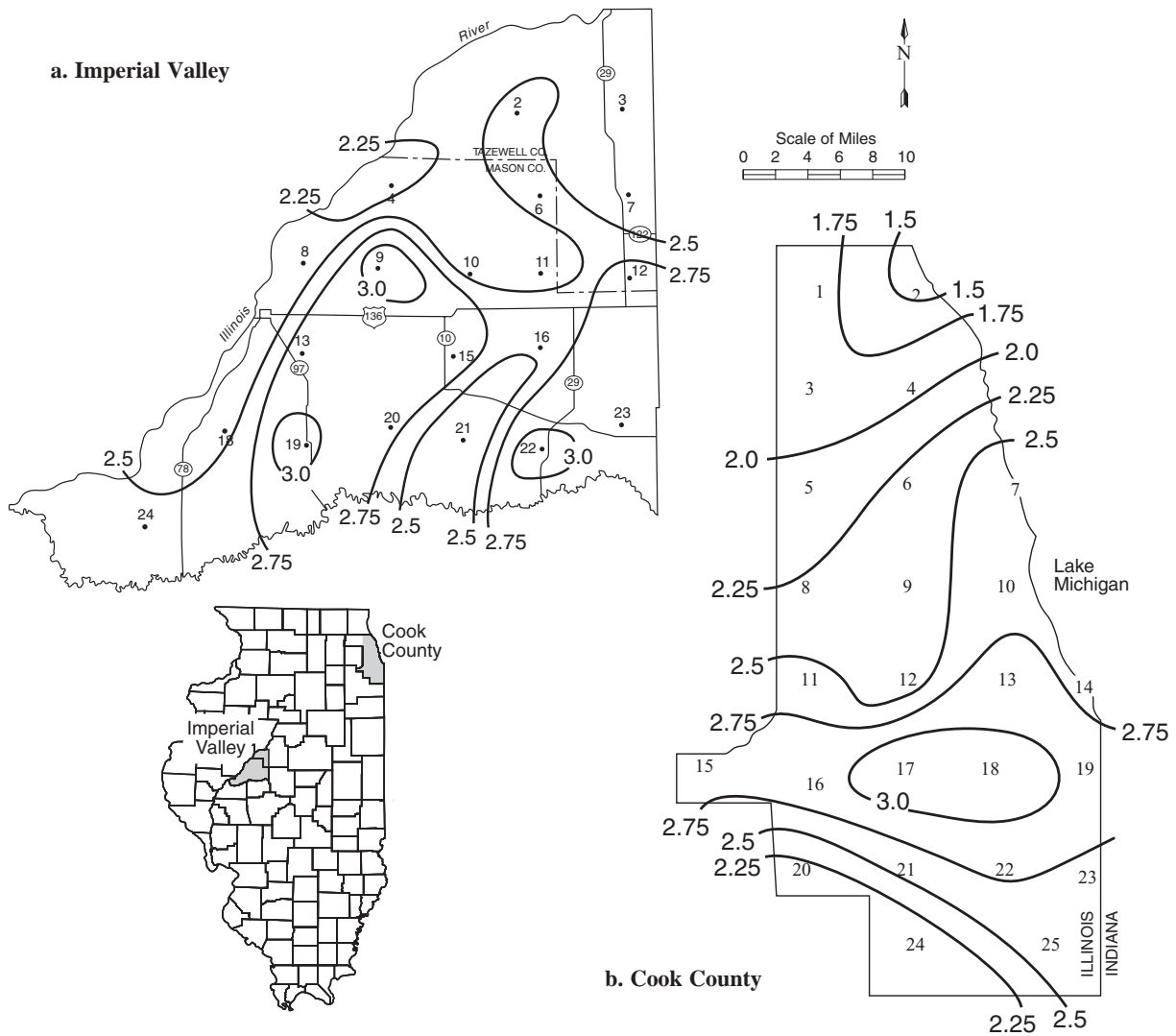
\*Lowest level of record for September.

## Addendum

### Long-Term Precipitation Networks (Nancy Westcott)

**Imperial Valley Precipitation.** September 2003 precipitation amounts (Figure 5a) were variable. Gage amounts were greatest in the central and southeastern portion of the network, and precipitation was lightest in the northern region of the network. Individual gage totals ranged from 3.08 inches at site #22 to 2.13 inches at site #4. The 30-year, 1971–2000, average precipitation amounts for September at Havana and Mason City, are 3.21 and 3.00 inches, respectively. The September 2003 network average of 2.63 inches is about 95 percent of the 11-year (1992–2002) September network average of 2.78 inches.

**Cook County Precipitation.** September 2003 precipitation amounts (Figure 5b) were relatively light. Precipitation was greatest in the south-central region of the network, and lightest in the northern portion of the network. Precipitation values ranged from 3.32 inches at site #18 (near 120th Street), to 1.49 inches at site #2 (Winnetka). The September 2003 network average of 2.48 inches is about 82 percent of the 13-year (1990–2002) September network average of 3.01 inches.



**Figure 5. Long-term raingage network precipitation totals (inches) for September 2003**

- Data sources for information in this publication include the following:
- CPC - Climate Prediction Center, <http://www.cpc.ncep.noaa.gov/products/predictions/>
  - ISWS - Illinois State Water Survey, <http://www.sws.uiuc.edu/>
  - MRCC - Midwestern Regional Climate Center, <http://mrcc.sws.uiuc.edu/>
  - NCDC - National Climate Data Center, <http://www.ncdc.noaa.gov/>
  - NWS - National Weather Service, <http://www.nws.noaa.gov/>
  - USACE - U.S. Army Corp of Engineers, <http://water.mvr.usace.army.mil/>
  - USGS - U.S. Geological Survey, <http://water.usgs.gov/>
  - WARM - Water and Atmospheric Resources Monitoring Program, <http://www.sws.uiuc.edu/warm/>

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