

ILLINOIS WATER AND CLIMATE SUMMARY
December 2004

2004 Overview (Bob Scott)

Temperatures in Illinois during December were slightly above average, and precipitation was below average. Soil moisture within the top 40 inches of soil was near the long-term statewide average. Mean streamflows were well above median heights. Shallow groundwater levels were above long-term average depths.

Temperatures across Illinois (Figure 1) for December were slightly above average (a +1.1-degree departure). Crop Reporting District (CRD) temperatures ranged from 0.9 degrees below average (southeast) to 2.4 degrees above average (west).

Precipitation amounts for the state were below average (Figure 1). The statewide average of 1.94 inches represents a -0.74-inch departure or 72 percent of average. Rainfall totals were lowest in the northwest CRD (1.29 inches, 63 percent of average) and highest in the southeast CRD (2.41 inches, 67 percent of average). The 2.31-inch total in east-central Illinois was 90 percent of that area's average December precipitation.

Soil moisture in the 0- to 40-inch (0- to 100-centimeter) layer at the end of December was near normal overall. In general, conditions were near normal to below normal in northern Illinois and near normal to above normal in southern Illinois.

Mean provisional streamflow statewide was well above the median flow in December, 424 percent of median (Figure 1). In general, rivers in Illinois recorded monthly mean discharges in the above normal to much above normal range this month. Peak stages were above flood stage at several Illinois River stations and on the Ohio River at Cairo.

Water surface levels at the end of December were below the normal pool/target operating level at 4 of 30 reporting reservoirs. Levels at Rend Lake, Lake Shelbyville, and Carlyle Lake were well above their seasonal target levels. Lake Michigan's mean level remains below the long-term average.

Statewide, **shallow groundwater levels** were above normal for December. Deviations averaged 1.7 feet above normal for the month. Levels averaged 0.5 feet higher than November levels and 1.6 feet above December levels one year ago.

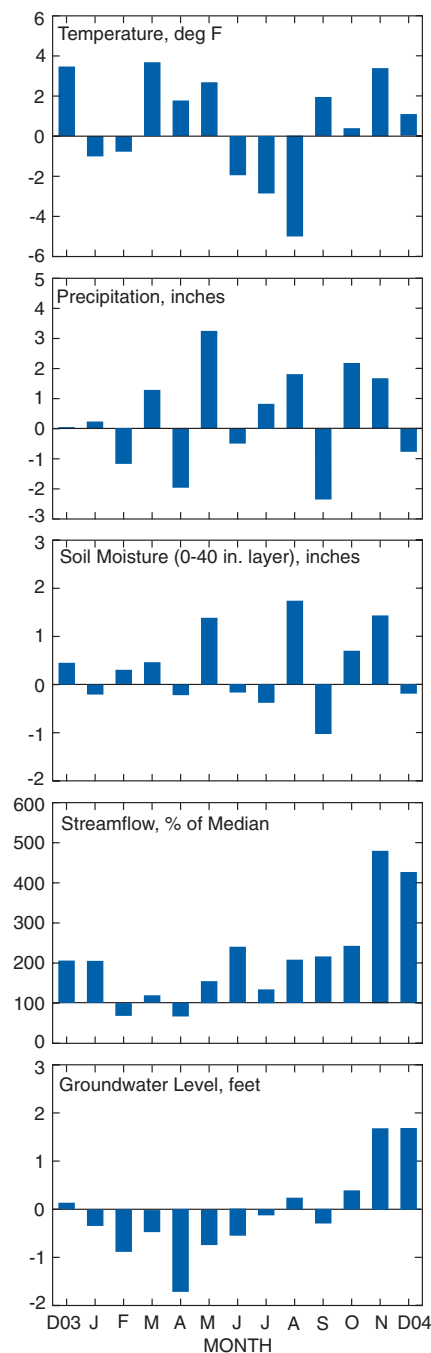


Figure 1. Statewide departures from normal

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

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Weather/Climate Information (Jim Angel and Bob Scott)

Temperatures across Illinois for December were slightly above normal (Figure 2 and Table 1). Extremes ranged from -14°F at Grand Tower on December 24 to 70°F at Belleville on December 31.

Precipitation for December was below normal statewide (Figure 2 and Table 1). Edwardsville reported the highest one-day precipitation, 2.20 inches on December 7. Grand Chain Dam reported the highest monthly total for December, 4.29 inches. The statewide October–December precipitation total of 11.82 inches is the 9th wettest such period since 1895.

Snowfall was reported across most of Illinois in December (Figure 2), with highest totals in southern Illinois. Among the official reporting stations, Grand Chain Dam reported a monthly total of 14.5 inches. Nearby Carbondale reported 13 inches, the largest December snowfall total there since records began in 1910.

Severe weather was not reported in Illinois in December.

Illinois Climate Network (ICN) Data. Average daily wind speeds across Illinois for December (Figure 3) ranged from 5 mph at Dixon Springs to near 13 mph at Bondville and Stelle. The highest wind gusts for the month, 52 mph, occurred at Big Bend and Stelle on December 12. The prevailing wind direction was from the west to west-southwest at all sites, except for east-southeast winds at Freeport. Wind speeds in excess of 8 mph ranged from 160 hours at Dixon Springs to approximately 550 hours at Bondville, Monmouth, and Stelle. (December has 744 hours.) Average air temperatures for December ranged from the upper 20s to the middle 30s from northern to southern Illinois.

Solar radiation totals in December varied from 168 Mega-Joules per meter squared (MJ/m²) at St. Charles to approximately 246 MJ/m² at Belleville and Carbondale. Potential evapotranspiration observations varied from 0.8 inches at Freeport and St. Charles to 1.4 inches at Belleville. Soil temperatures at the 4- and 8-inch levels ranged from the middle 30s in northern Illinois to the low 40s in southern Illinois.

Extended climate outlooks issued by the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Climate Prediction Center for January call for equal chances of above, below, and normal temperatures and precipitation across the state. January–March outlooks also call for equal chances of above, below, and normal temperatures, but below normal precipitation statewide.

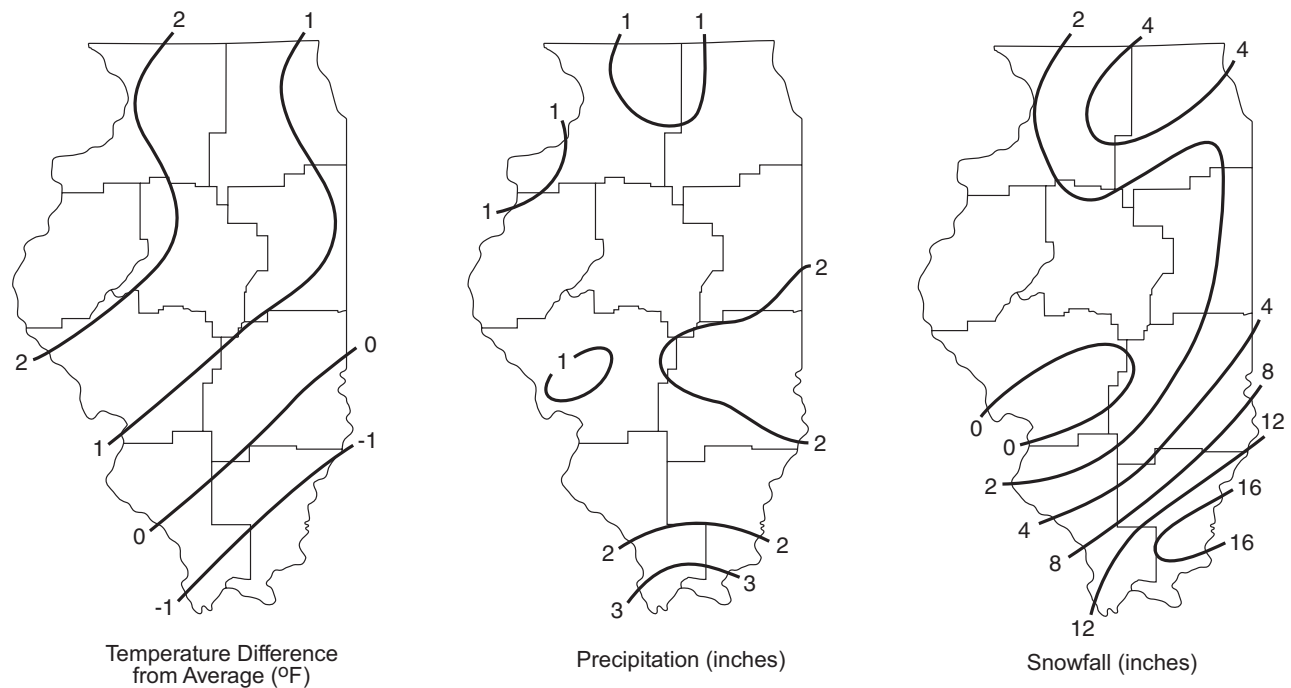


Figure 2. Illinois temperature, precipitation, and snowfall during December 2004

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>Dec 04 Amount</i>	<i>% Avg</i>	<i>Temp Dev</i>	<i>Oct 04- Dec 04</i>	<i>% Avg</i>	<i>Temp Dev</i>	<i>Jul 04- Dec 04</i>	<i>% Avg</i>	<i>Temp Dev</i>	<i>Jan 04- Dec 04</i>	<i>% Avg</i>	<i>Temp Dev</i>
Northwest	1.29	63	1.8	8.88	119	2.0	16.98	90	0.2	36.53	101	0.7
Northeast	1.67	72	0.9	8.09	101	1.7	16.86	88	0.0	36.99	101	0.4
West	1.74	78	2.4	11.85	146	1.9	23.77	123	-0.2	39.29	105	0.4
Central	1.84	74	2.0	11.27	135	1.6	21.06	111	-0.3	38.11	102	0.3
East	2.31	90	1.5	10.85	127	1.5	21.79	113	-0.3	41.87	111	0.3
West-southwest	2.08	77	1.5	13.00	145	1.6	21.73	116	-0.5	39.19	104	0.2
East-southeast	2.30	75	0.1	14.15	142	1.4	24.91	122	-0.3	45.74	111	0.4
Southwest	2.01	59	0.2	14.50	135	2.0	24.59	117	-0.2	46.32	108	0.5
Southeast	2.41	67	-0.9	14.73	135	1.7	24.78	118	0.0	46.78	105	0.7
State Average	1.94	72	1.1	11.82	132	1.7	21.63	110	-0.2	40.94	105	0.4

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

Soil Moisture Information (Bob Scott)

Precipitation in Illinois during December was below average statewide. Although heavy snow fell in southern Illinois late in the month, most of this precipitation remained frozen at the end of the month. Thus, near-surface soil moisture conditions were below normal to above normal north to south across Illinois (Figure 4). Moisture values in the 0- to 6-inch layer ranged from 71 percent of normal at Freeport to 131 percent at Carbondale. Similarly, values in the 6- to 20-inch layer ranged from 66 percent at Stelle to 115 percent at Rend Lake and Carbondale. Conditions in deeper layers showed greater variability. Values 20 to 40 inches deep ranged from 67 percent at DeKalb and Stelle to 160 percent at Belleville. Values in the 40- to 72-inch layer varied from 68 percent of normal at DeKalb to more than 200 percent at Rend Lake. Overall, soil moisture in Illinois at the end of December was near normal (Figure 1).

Compared to the end of last month, soil moisture in the 0- to 6-inch layer decreased at most northern Illinois locations and increased in the south (Table 2). Greatest decreases occurred at Topeka (28 percent); largest increases were observed at Dixon Springs (52 percent). In the 6- to 20-inch layer, increases occurred in southern Illinois (approximately 50 percent at Belleville and Carbondale), while changes were mixed in northern Illinois. Typically, soil moisture deviations in the 20- to 40-inch layer are small. However, this month several large increases occurred at many sites, including the largest increase observed at Dixon Springs (56 percent).

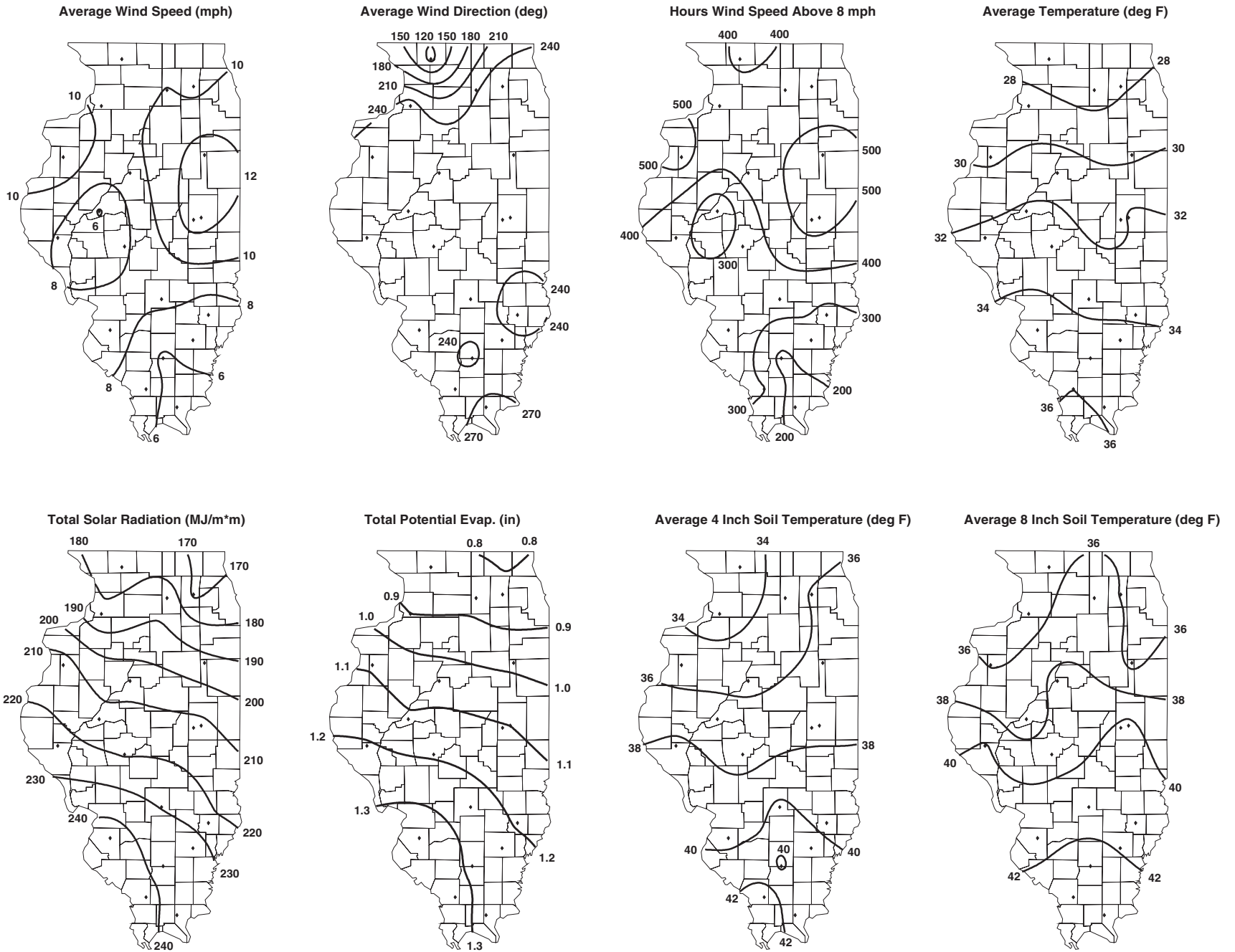


Figure 3. December monthly averages and totals as collected by the Illinois Climate Network

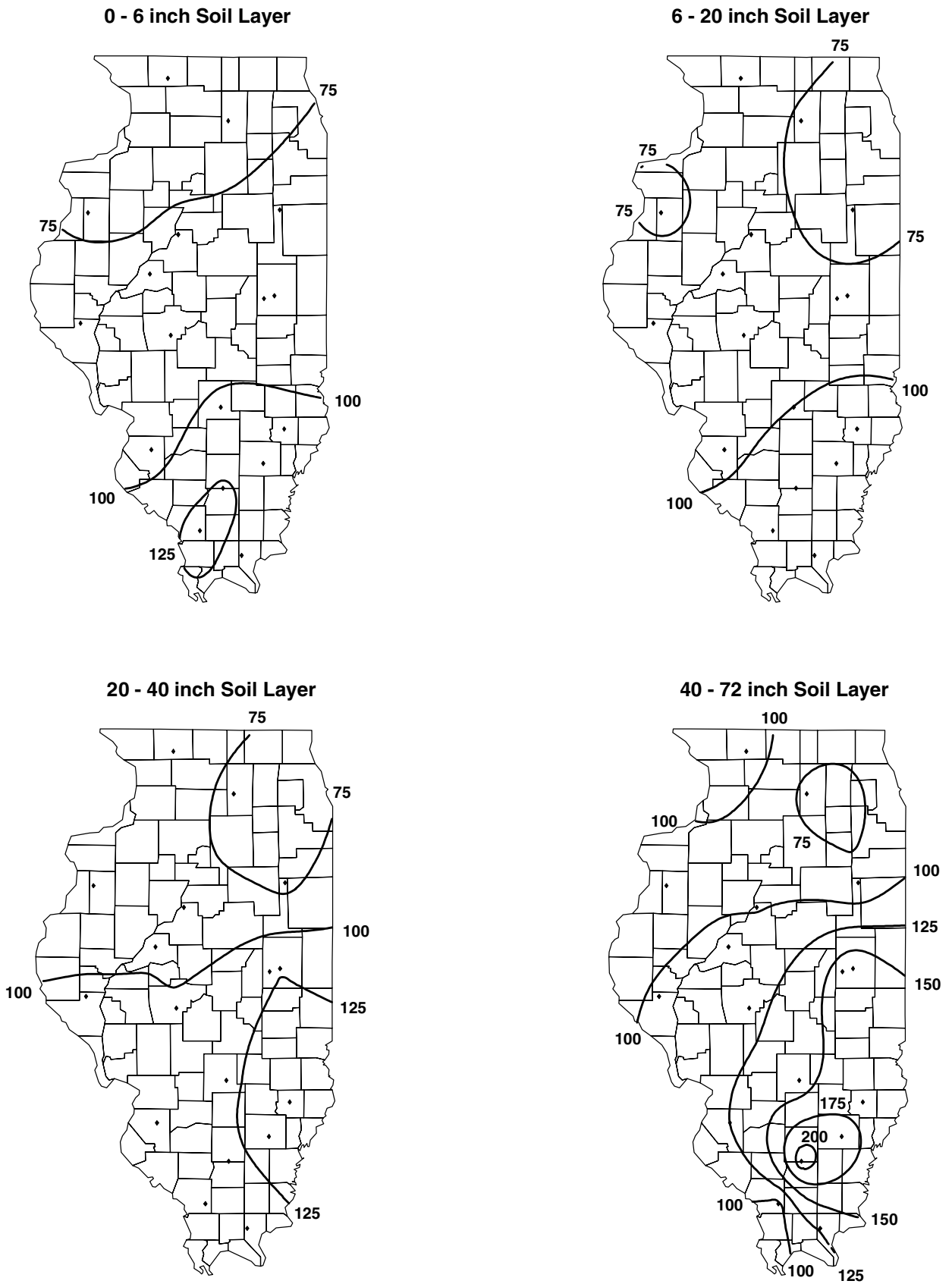


Figure 4. January 1 observed percent-of-normal soil moisture based on 1985-1995 mean

Table 2. Soil Moisture in Various Layers on January 1, 2005

<i>Location</i>	<i>Jan. 1 0 - 6 (inches)</i>	<i>Change from Dec.1 (%)</i>	<i>Jan. 1 6 - 20 (inches)</i>	<i>Change from Dec.1 (%)</i>	<i>Jan. 1 20 - 40 (inches)</i>	<i>Change from Dec.1 (%)</i>
Freeport (NW)	1.8	-5	4.2	34	6.9	18
DeKalb (NE)	1.6	-5	3.8	22	6.2	18
Monmouth (W)	1.8	-23	4.2	-12	6.3	-9
East Peoria (C)	1.9	-13	4.7	14	7.8	24
Topeka (C)	1.0	-28	2.5	-13	3.2	19
Stelle (E)	1.7	-17	3.8	-12	5.9	-4
Champaign (E)	1.9	-23	4.7	-12	6.5	16
Bondville (E)	N/A	N/A	N/A	N/A	N/A	N/A
Perry (WSW)	2.1	-8	5.1	-3	7.4	1
Springfield (WSW)	1.8	-16	4.9	-2	7.9	25
Brownstown (ESE)	2.5	37	4.7	36	8.3	25
Olney (ESE)	2.5	8	4.8	5	7.4	5
Belleville (SW)	2.0	-7	5.0	49	8.5	24
Carbondale (SW)	3.2	42	5.5	48	8.0	31
Ina (SE)	2.8	-6	5.5	1	7.8	-1
Fairfield (SE)	3.3	23	5.6	2	7.5	2
Dixon Springs (SE)	2.8	52	5.6	25	8.3	56

Note:

N/A = Data not available.

Surface Water Information (Bill Saylor and Vern Knapp)

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 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 readings posted by the National Weather Service and/or the USACE. December peak stages were above flood stage at most Illinois River streamgages listed in Table 3 and on the Ohio River at Cairo. Peak stages on the Mississippi River were below flood stage.

Provisional monthly mean flows for 26 streamgaging stations located throughout Illinois are shown (Table 4). Data posted by the 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 December mean flow for each year of record, and selecting the middle value, 50 percent exceedence probability.

The statewide percent of historical mean flow and percent of historical median flow are calculated by dividing the sum of the average flows this month at stations in Table 4 by the sum of the historical mean and median flows calculated for the month, respectively, at the same stations. This method is intended to weight individual observations proportionately in the aggregate comparison. (The Illinois River and Rock River stations are excluded from the statewide calculation because other rivers listed in Table 4 contribute to their flow.)

Mean provisional flow statewide was well above the median this month (424 percent of the median) and above the long-term mean (258 percent of the mean). Mean streamflows were in the above normal to much above normal range this month throughout Illinois (except on the Pecatonica River at Freeport).

Table 3. Peak Stages for Major Rivers, December 2004

<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	14.2	09
	La Salle	224.7	20	22.6	09
	Peoria	164.6	18	18.8	13
	Havana	119.6	14	17.7	13
	Beardstown	88.6	14	18.9	14
	Hardin	21.5	25	24.8	08
Mississippi	Dubuque	579.9	17	8.6	13
	Keokuk	364.2	16	5.3	09
	Quincy	327.9	17	11.9	18
	Grafton	218.0	18	16.8	08
	St. Louis	180.0	30	18.0	09
	Chester	109.9	27	20.7	09
	Thebes	43.7	33	27.9	10
Ohio	Cairo	2.0	40	47.0	11

Notes:

*River mile and flood stage from *River Stages in Illinois: Flood and Damage Data*, Illinois Department of Natural Resources, Office of Water Resources, August 2004.

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

Note: October 2004 was the first month for use of a new method of calculating the statewide percentages of historical mean and median flows. Accordingly, the percentage of median flows shown for the past months in Figure 1 have been recalculated.

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). Reservoir levels 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), and the number of years of record for each reservoir also is given (column 7). Most reservoirs serve as public water supplies, with the exceptions noted in the last column.

Compared to end-of-November levels at 30 reservoirs, by the end of December the water surface elevation had decreased at 12 reservoirs, had risen at 10 reservoirs, and was the same as last month at 8 reservoirs. For the 30 reservoirs with observations reported at the end of December, the water surface level at 21 reservoirs was above normal pool (or target operating level), 5 reservoirs were at normal pool, and 4 reservoirs were below normal pool.

Major Reservoirs. Water levels at the three major reservoirs decreased at Carlyle Lake and Rend Lake during December, but increased at Lake Shelbyville. At the end of the month, Carlyle Lake was 2 feet above its seasonal target level, and Rend Lake was 3 feet above its seasonal target level. Lake Shelbyville was 12 feet above its seasonal target level; note that this difference is relative to the target operating level for January 1, which is 6.2 feet lower than the December target operating level.

Great Lakes. Current month mean and end-of-month values are provisional and are relative to International Great Lakes Datum 1985. The December mean level for Lake Michigan was 577.7 feet, compared to a mean level of 577.1 feet in December 2003. The long-term average lake level for December is 578.7 feet, based on 1918–2003 data. Historically, the lowest mean level for Lake Michigan in December occurred in 1964 at 576.2 feet, and the highest level occurred in 1986 at 581.6 feet. The month-end level of Lake Michigan was 577.6 feet.

Table 4. Provisional Mean Flows, December 2004

<i>Station</i>	<i>Drainage area (sq mi)</i>	<i>Years of record</i>	<i>2004 mean flow (cfs)</i>	<i>Long-term flows</i>		<i>Flow condition</i>	<i>Percent chance of exceedence</i>	<i>Days of data this month</i>
				<i>Mean* (cfs)</i>	<i>Median (cfs)</i>			
Rock River at Rockton	6363	69	4222	3286	3046	above normal	23	31
Rock River near Joslin	9549	61	6098	5000	4812	above normal	30	31
Pecatonica River at Freeport	1326	85	782	685	577	normal	33	31
Green River near Geneseo	1003	65	752	457	351	above normal	21	31
Edwards River near New Boston	445	66	460	173	97	much above normal	6	31
Kankakee River at Momence	2294	86	4342	1976	1706	much above normal	6	31
Iroquois River near Chebanse	2091	80	5533	1505	945	much above normal	4	31
Fox River at Dayton	2642	84	1972	1476	1231	above normal	21	31
Vermilion River at Pontiac	579	60	1247	327	133	much above normal	6	31
Spoon River at Seville	1636	87	2105	657	395	much above normal	4	31
LaMoine River at Ripley	1293	80	1997	485	251	much above normal	5	31
Bear Creek near Marceline	349	59	477	137	35	much above normal	8	31
Mackinaw River near Congerville	767	55	1526	384	157	much above normal	5	31
Salt Creek near Greenview	1804	62	3773	1006	533	much above normal	5	31
Sangamon River at Monticello	550	91	1250	338	180	much above normal	6	30
South Fork Sangamon near Rochester	867	54	2333	526	124	much above normal	7	31
Illinois River at Valley City	26,743	65	47,394	17,570	14,858	much above normal	4	31
Macoupin Creek near Kane	868	75	1032	455	124	above normal	16	28
Vermilion River near Danville	1290	82	3199	855	454	much above normal	5	31
Kaskaskia River at Vandalia	1940	34	3698	1971	1339	above normal	19	31
Shoal Creek near Breese	735	60	1719	553	171	above normal	11	31
Embarras River at Ste. Marie	1516	90	3090	1244	755	above normal	14	31
Skillet Fork at Wayne City	464	84	573	419	227	above normal	24	31
Little Wabash below Clay City	1131	89	1801	1015	452	above normal	20	31
Big Muddy at Plumfield	794	33	1150	668	278	above normal	23	31
Cache River at Forman	244	80	622	336	200	above normal	20	31

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 2003.

Table 5. Reservoir Levels in Illinois, December 2004

For security considerations, statewide tabular reservoir data are not available on the Internet. Specific data requests may be made to Bill Saylor at: wsaylor@sws.uiuc.edu.

Groundwater Information (Ken Hlinka)

Comparison to Average Levels. Shallow groundwater levels in 15 observation wells, which are remote from pumping centers, were above average levels for December by 1.7 feet. Site values ranged from 3.2 feet below to 5.0 feet above average (see Table 6).

Comparison to Previous Month. Shallow groundwater levels were above those of November. Levels averaged 0.5 feet higher and ranged from 4.0 feet below to 3.5 feet above levels last month.

Comparison to Same Month, Previous Year. Shallow groundwater levels in December were above levels of a year ago. Levels averaged 1.6 feet higher and ranged from 1.4 feet lower to 9.2 feet above levels last December.

Table 6. Month-End Shallow Groundwater-Level Data Sites, December 2004

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	21.56	-0.08	+0.09	-0.11	+0.41
2	Mt. Morris	Ogle	55.00	23.36	-3.72	-3.21	+0.31	+9.20
3	Crystal Lake	McHenry	18.00	5.68	-0.27	-0.15	+0.15	+0.79
4	Cambridge	Henry	42.00	28.43*	N/A	N/A	N/A	N/A
5	Fermi Lab	DuPage	17.00	6.62	+0.51	+0.73	+3.48	-1.44
6	Good Hope	McDonough	30.00	3.78	+4.80	+4.95	-0.70	+0.69
7	Snicarte	Mason	42.00	36.20	+0.73	+1.00	+1.07	+2.58
8	Coffman	Pike	28.00	7.58	+3.70	+4.53	-4.02	+2.95
9	Greenfield	Greene	20.70	8.61	+3.63	+3.71	+2.31	+1.48
10	Janesville	Cumberland	11.00	2.32	+2.43	+2.55	+1.04	-0.75
11	St. Peter	Fayette	15.00	1.91	+0.23	+0.38	-0.92	-0.93
12	SWS #2	St. Clair	80.00	N/A	N/A	N/A	N/A	N/A
13	Boyleston	Wayne	23.00	2.37	+1.58	+2.41	-1.64	-1.29
14	Sparta	Randolph	27.00	4.83	+2.96	+3.58	+0.65	+4.06
15	SE College	Saline	10.19	1.12	+2.79	+2.76	+1.24	+2.90
16	Dixon Springs	Pope	8.63	2.69	+1.51	+0.25	+2.00	+3.01
17	Bondville	Champaign	21.00	2.84	+1.83	+1.42	+3.27	+0.71
Averages					+1.51	+1.67	+0.54	+1.62

Notes:

N/A = Data not available.

* Well not used for analyses.

Addendum

Long-Term Precipitation Networks (Nancy Westcott)

Imperial Valley Precipitation. December 2004 precipitation amounts (Figure 5a) were light. Gage amounts were greatest in the southwestern portion of the network, and precipitation was lightest in the eastern half of the network. Individual gage totals ranged from 1.50 inches at site #24 to 0.93 inches at site #16. The 30-year, 1971–2000, average precipitation amounts for December at Havana and Mason City are 2.63 and 2.41 inches, respectively. The December 2004 network average of 1.23 inches was about 84 percent of the 12-year (1992–2003) December network average of 1.46 inches.

Cook County Precipitation. December 2004 precipitation amounts (Figure 5b) were near average. Precipitation was heaviest in the southeastern region of the network and lightest in the northern portion of the network. Precipitation values ranged from 2.38 inches at site #25 (Chicago Heights), to 1.10 inches at site #4 (Skokie). The December 2004 network average of 1.62 inches is about 95 percent of the 15-year (1989–2003) December network average of 1.70 inches.

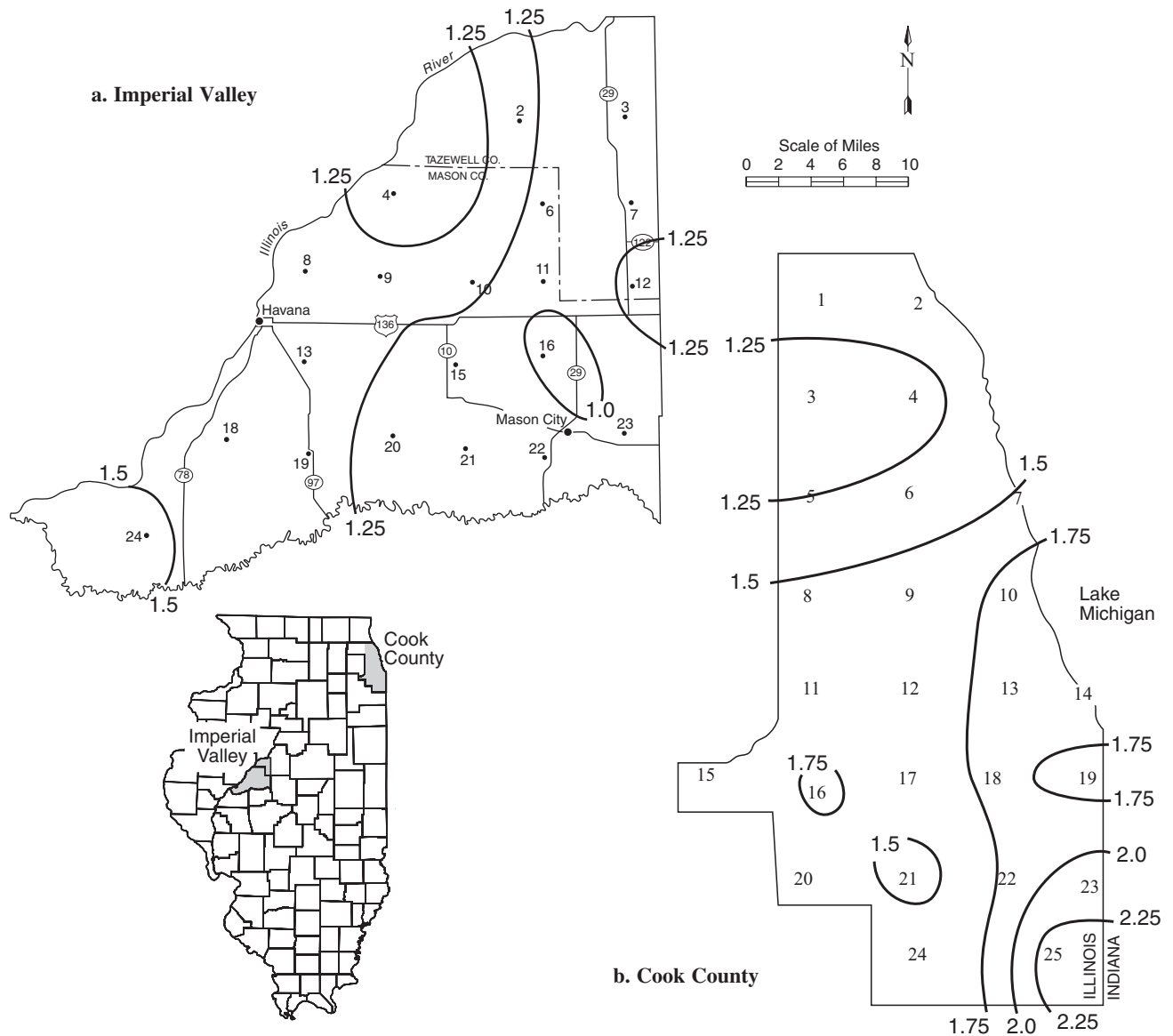


Figure 5. Long-term raingage network precipitation totals (inches) for December 2004

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 Corps of Engineers, <http://www.rivergages.com>
 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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