THE WATER CYCLE:
A FRAMEWORK FOR DROUGHT AND WATER SUPPLY PLANNING

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ILLINOIS DEPARTMENT OF NATURAL RESOURCES

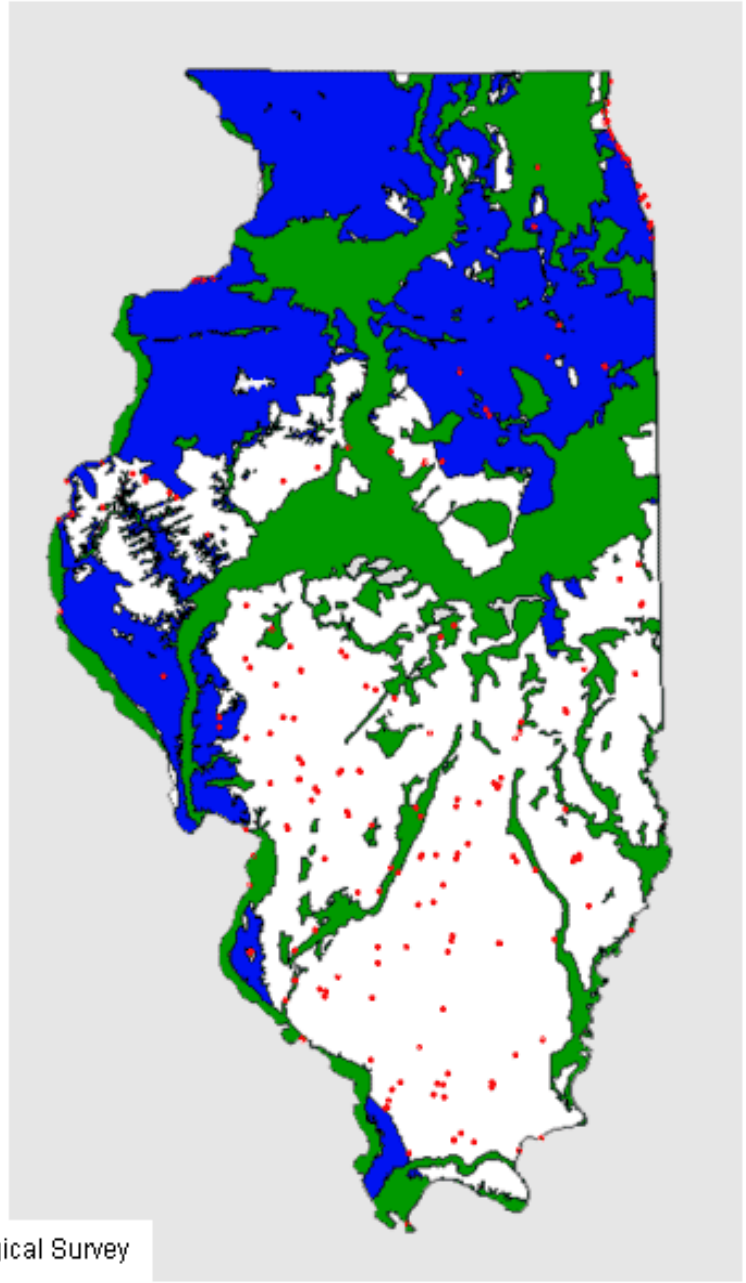
ILLINOIS

Water Resources

Surface Water Intakes
(public water supply)

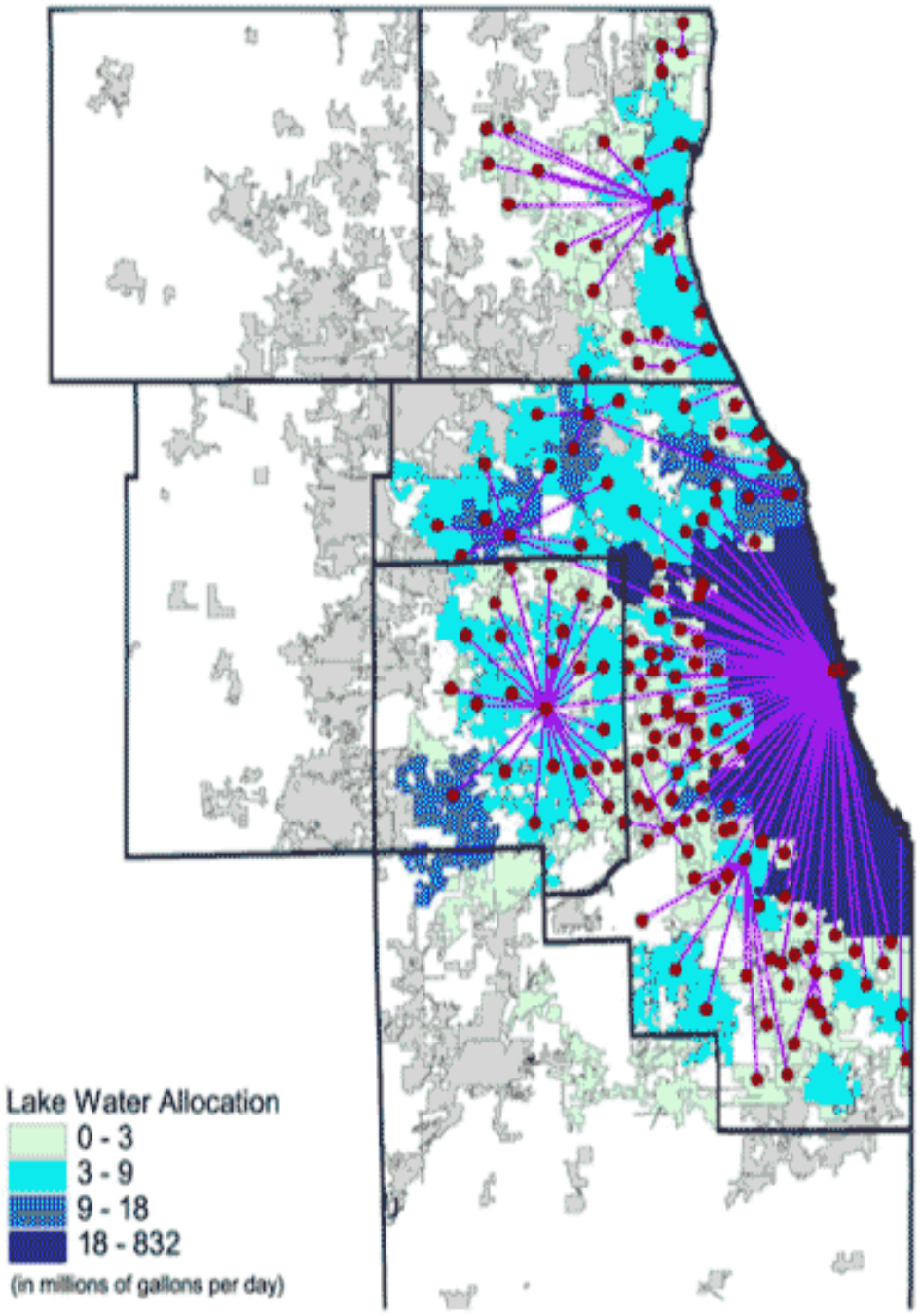
Sand/gravel aquifers

Bedrock aquifers within
300 feet of land surface



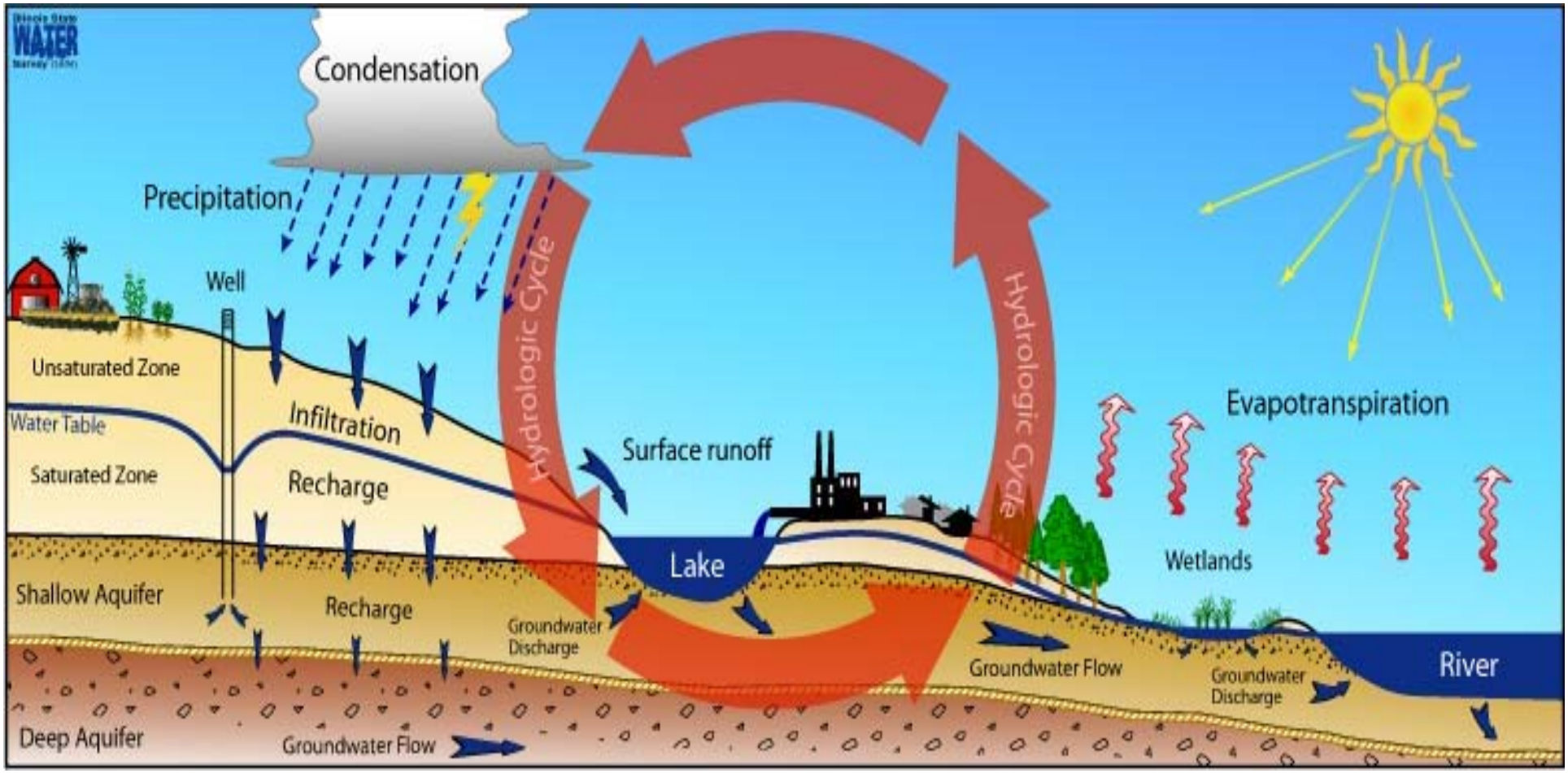
Source for aquifer boundaries, Illinois State Geological Survey

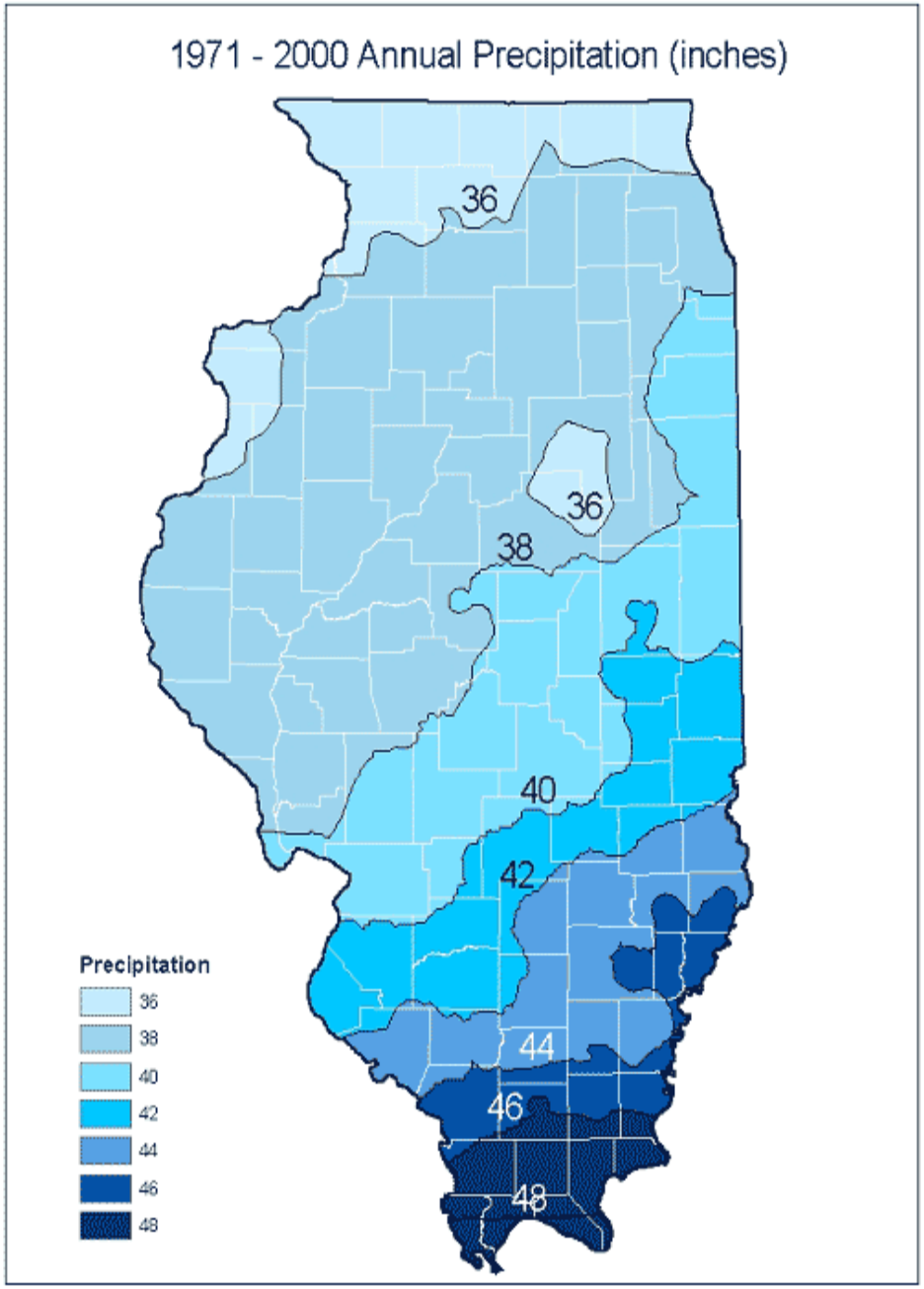
Lake Michigan Allocations In Year 2000

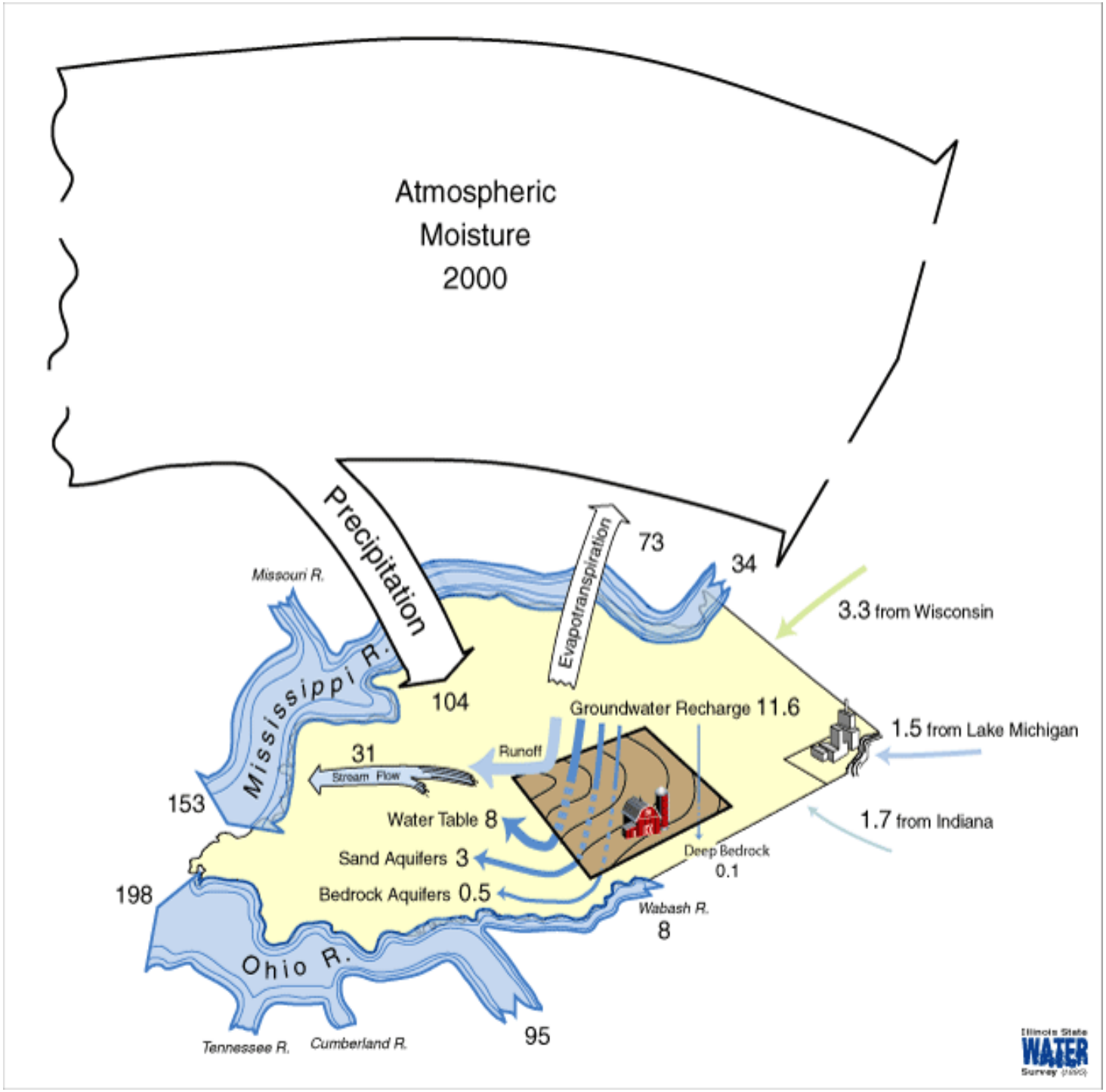


Graphic: Martin Jaffe, University of Illinois at Chicago

THE WATER CYCLE




1971 - 2000 Annual Precipitation (inches)
36
36
38
40
42
44
46
48
Precipitation
36
38
40
42
44
46
48


Atmospheric
Moisture
2000
Precipitation
104
Evapotranspiration
73
34
3.3 from Wisconsin
Missouri R.
Mississippi R.
153
Groundwater Recharge 11.6
1.5 from Lake Michigan
31
Stream Flow
Runoff
Water Table 8
1.7 from Indiana
Sand Aquifers 3
Deep Bedrock
0.1
198
Bedrock Aquifers 0.5
Wabash R.
8
Ohio R.
95
Tennessee R.
Cumberland R.
Illinois State
WATER
Survey

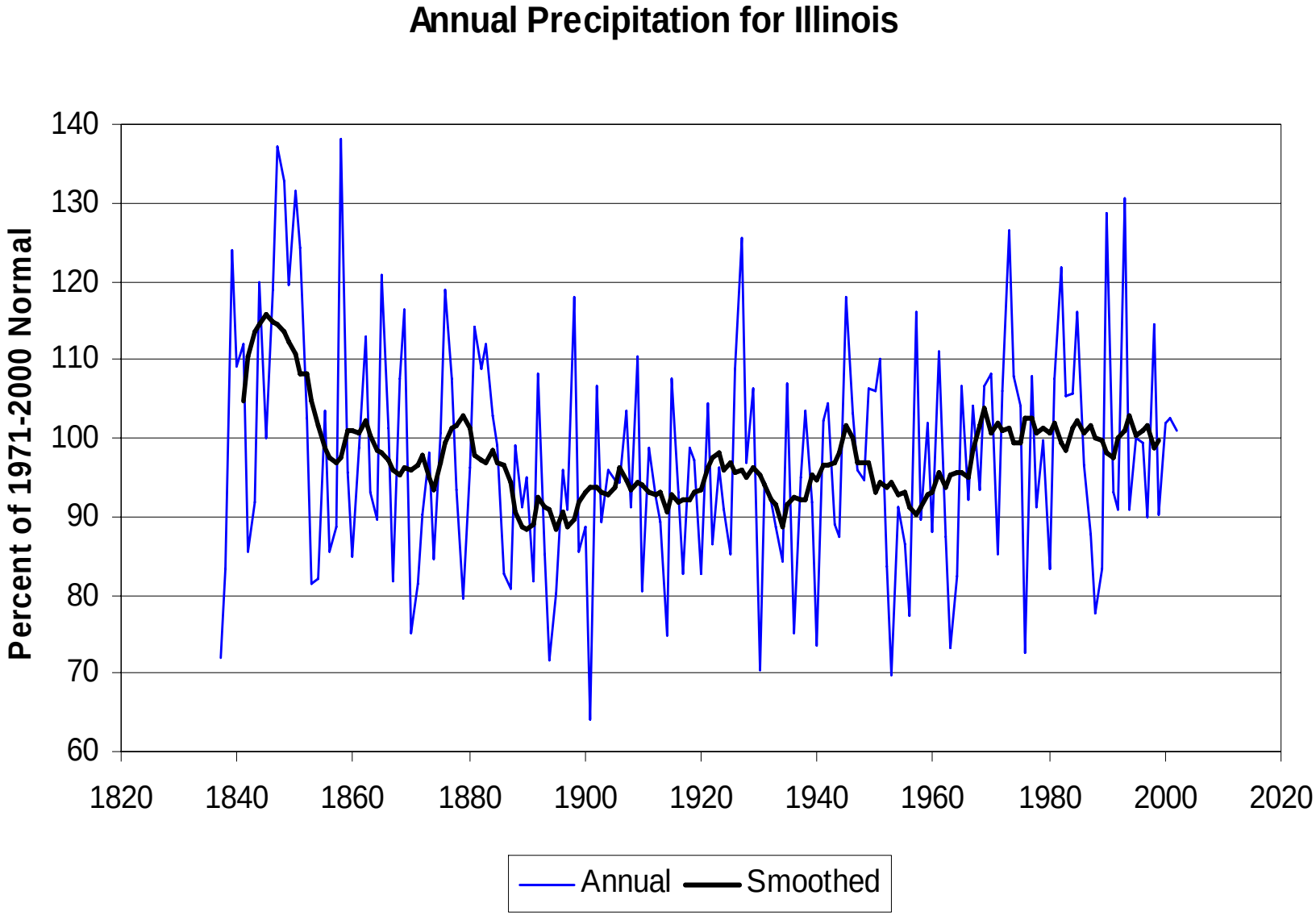
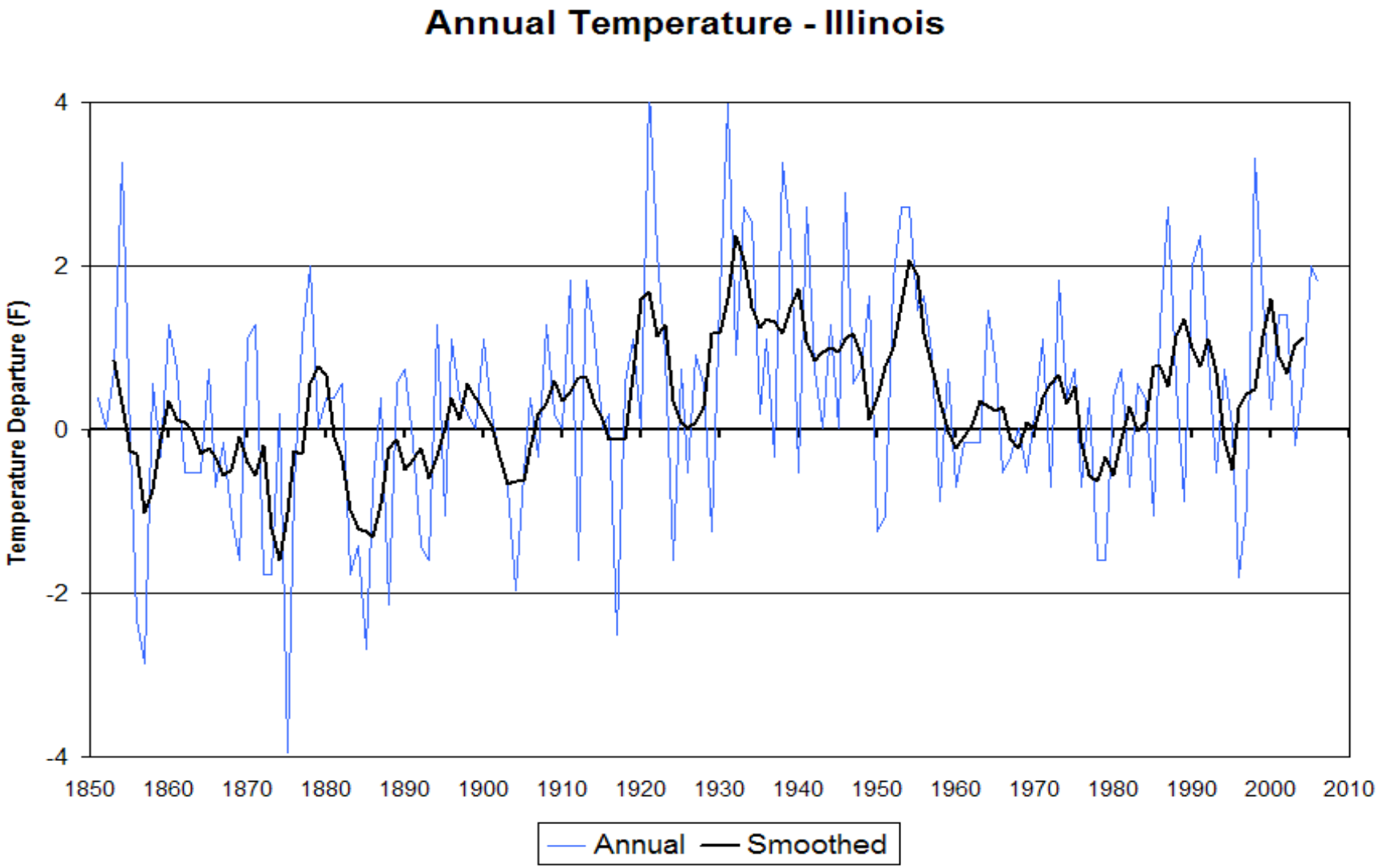

Annual Precipitation for Illinois
Percent of 1971-2000 Normal
140
130
120
110
100
90
80
70
60
1820
1840
1860
1880
1900
1920
1940
1960
1980
2000
2020
Annual
Smoothed

Table 1. Wettest and driest years in Illinois, 1895-2002. Precipitation amounts are averaged for entire state				
	Wettest		*Driest*	
Rank	*Year*	*Amount*	*Year*	*Amount*
1	1993	51.15”	1901	26.32”
2	1990	50.34”	1930	27.85”
3	1927	49.52”	1963	27.94”
4	1973	48.23”	1953	28.08”
5	1898	47.31”	1914	28.63”


Annual Temperature - Illinois
Temperature Departure (F)
4
2
0
-2
-4
1850
1860
1870
1880
1890
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000
2010
Annual
Smoothed

ISWS I/EM 2006-02

The Water Cycle and Water Budgets in Illinois:
A Framework for Drought and Water-Supply Planning

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Kenneth E. Kunkel, Michael A. Palecki, Robert W. Scott, and H. Allen Wehrmann

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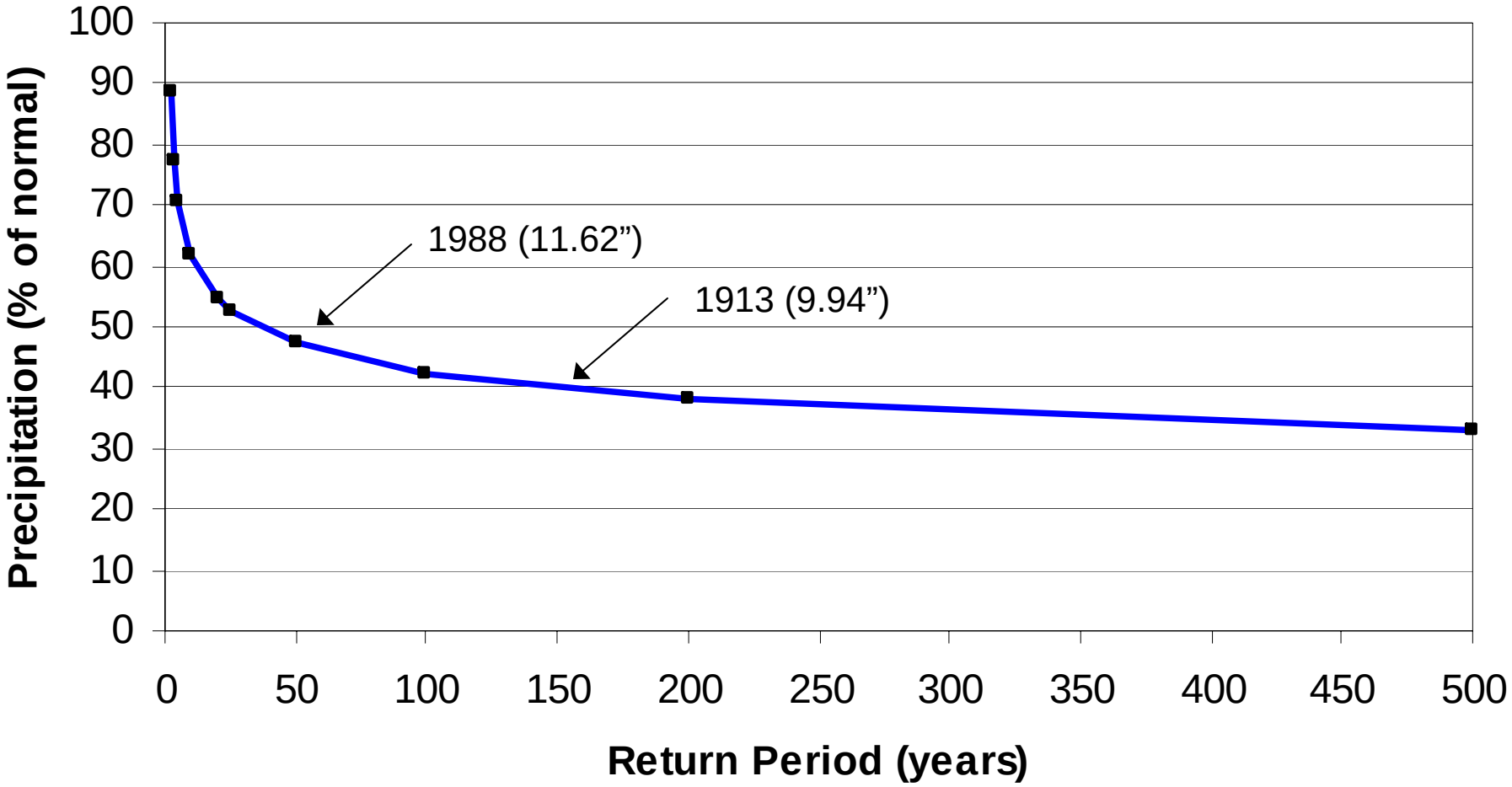
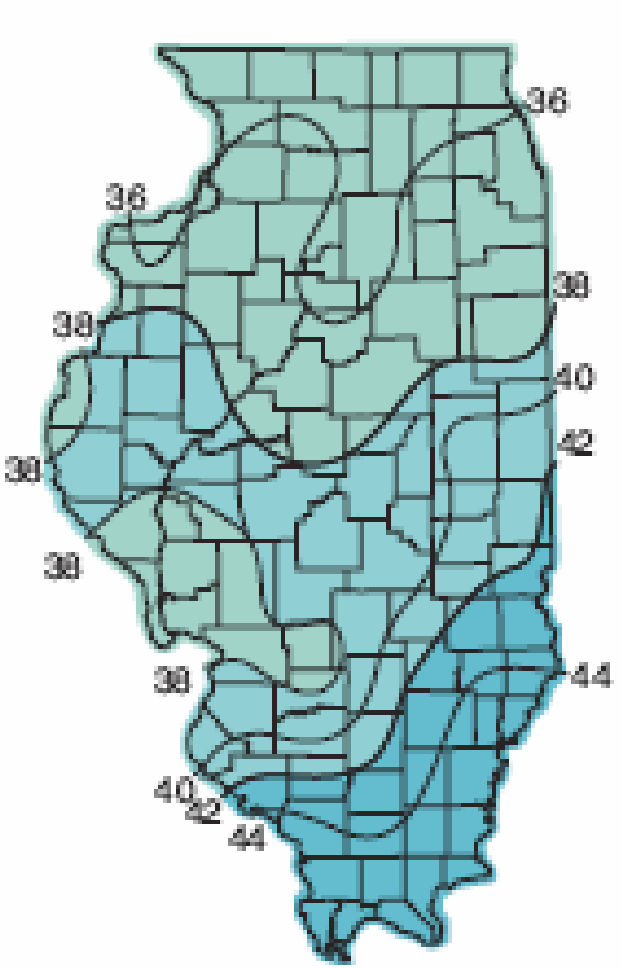
Table 2. Expected Average Precipitation for All Sites, Expressed as Percent of Normal (1971-2000), for Selected Drought Durations and Return Periods

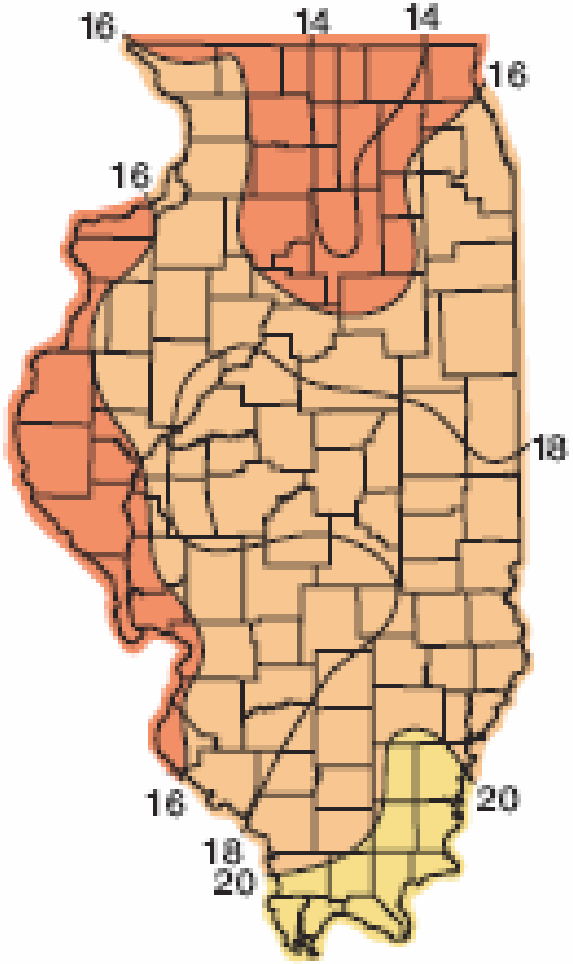
Drought Duration	*25-year return period*	*50-year return period*	*100-year return period*	*200-year return period*
12 months	59.1	52.5	47.8	44.0
18 months	66.8	60.1	55.2	51.3
24 months	71.9	64.8	59.7	55.5
36 months	77.8	71.1	66.2	62.2
48 months	81.8	75.0	70.1	66.1
60 months	85.3	78.3	73.2	69.0

Champaign-Urbana April-September Drought Frequency



ARE WE PREPARED...





...FOR SEVERE DROUGHT?

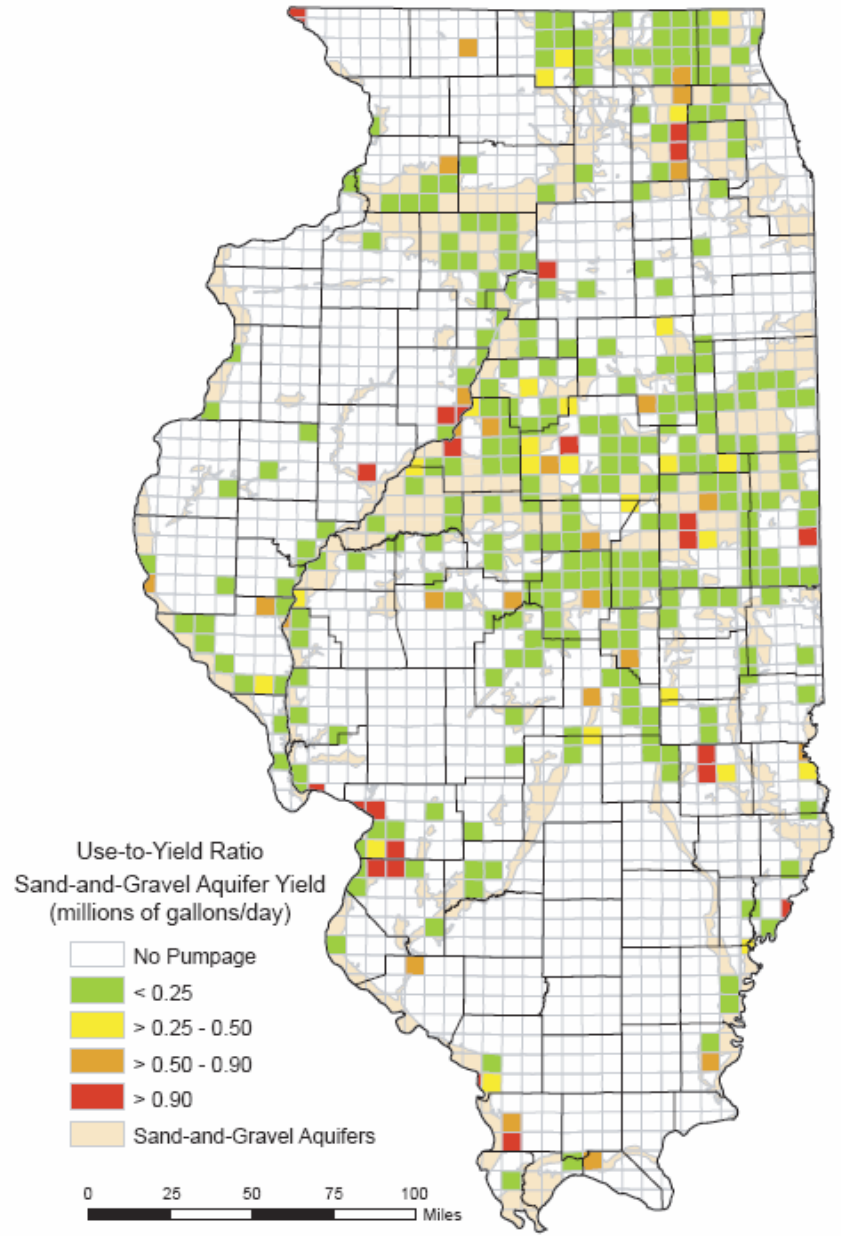


Figure 19. Ratio of Groundwater Use (Withdrawals) to Groundwater Yield (Potential Aquifer Yield) for Sand-and-Gravel Aquifers on a Township Basis.

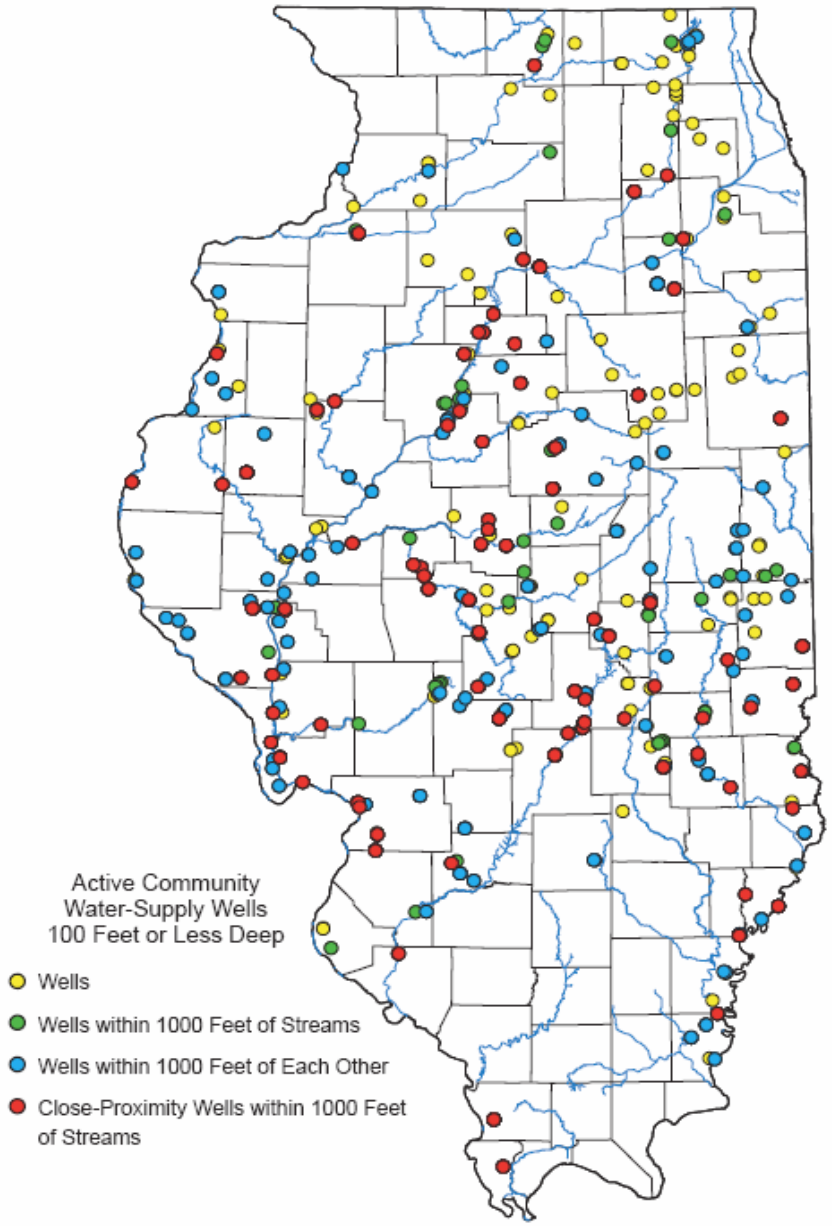


Figure 16. Community Water-Supply Wells Less than 100 Feet Deep, Within 1000 Feet of Another Community Well, and Within 1000 Feet of a Recognized Stream.

Appendix C

Community Wells Less Than 100 feet Deep, Within 1000 feet of Another Community Well, and Within 1000 feet of a Recognized Stream

Community Name	County	Well No.	Depth (feet)	Population Served
Community wells < 50 feet deep				
DALZELL	BUREAU	4	19	717
DALZELL	BUREAU	5	18	717
EDINBURG	CHRISTIAN	9	43	1135
EDINBURG	CHRISTIAN	10	44	1135
EDINBURG	CHRISTIAN	11	44	1135
EDINBURG	CHRISTIAN	12	43	1135
EDINBURG	CHRISTIAN	13	40	1135
MORRISONVILLE	CHRISTIAN	4	39	1068
MORRISONVILLE	CHRISTIAN	5	41	1068
ASHMORE	COLES	1	42	806
ASHMORE	COLES	2	44	806
CLEAR WATER SERVICE CORP	COLES	6	36	5400
CLEAR WATER SERVICE CORP	COLES	7	32	5400
GREENUP	CUMBERLAND	5	40	1532
GREENUP	CUMBERLAND	8	40	1532
BONE GAP	EDWARDS	1	47	287
BEECHER CITY	EFFINGHAM	7	33	493
BEECHER CITY	EFFINGHAM	12	38	493
DIETERICH	EFFINGHAM	5	24	600
DIETERICH	EFFINGHAM	10	25	600

Historical and possible future precipitation in Illinois

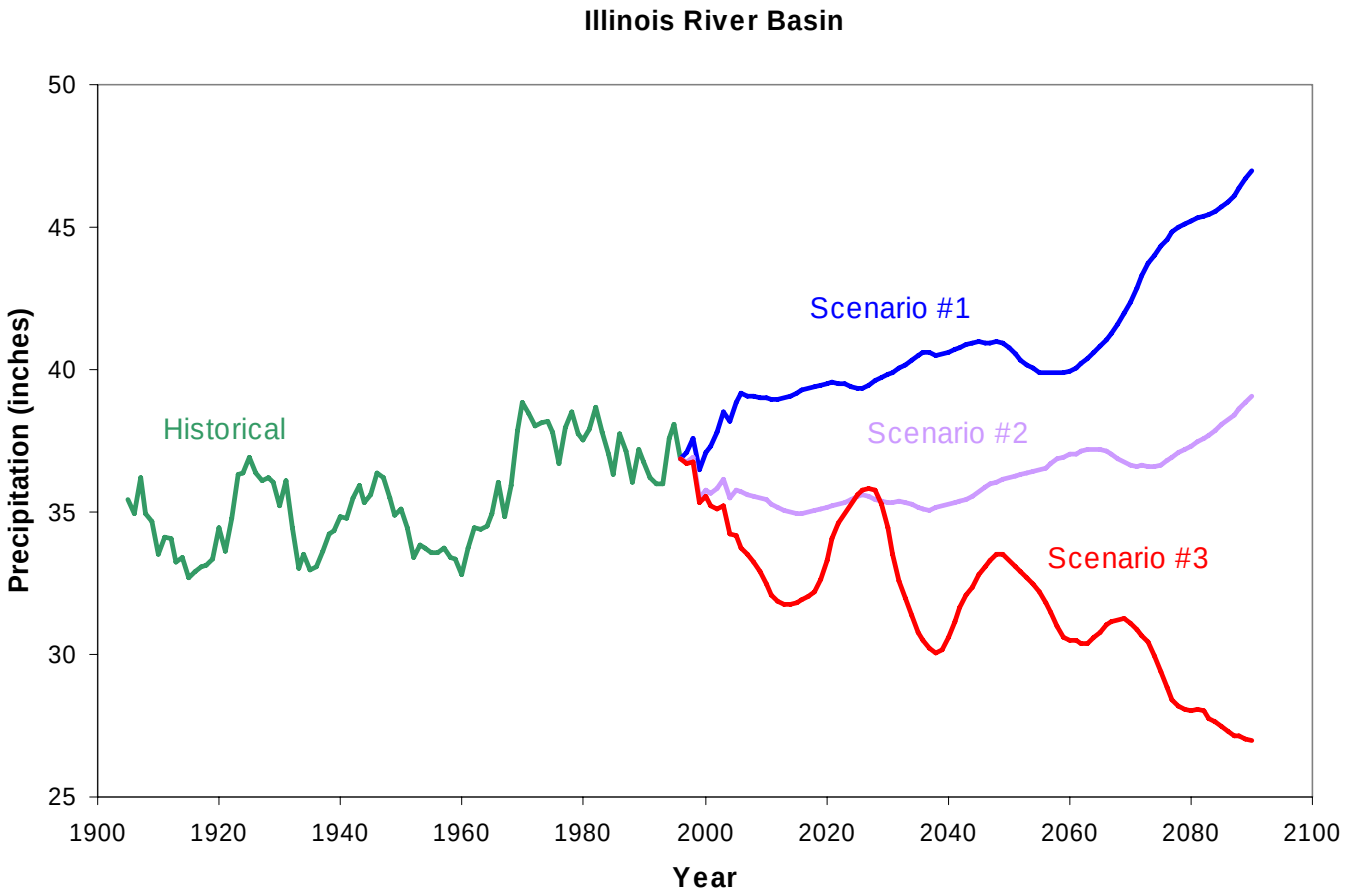


Table 6. Comparison of Parameters for Simulated Water Budget and Streamflow, Fox River Watershed

Parameters	*Present*	*Wet2050*	*Wet2100*	*Dry2050*	*Dry2100*
Average annual precipitation (inches)	33.0	34.5	36.6	32.0	29.7
Average annual evapotranspiration (inches)	24.7	26.0	27.5	26.6	28.0
Average annual flow (inches)	8.3	8.5	9.1	5.4	1.7
Average flow (cfs)	531	547	582	343	107
Maximum daily flow (cfs)	6825	6307	6551	4498	3051
Minimum daily flow (cfs)	10	9	10	0	0
7-day, 10-year low flow (cfs)	71	89	92	11	0
3-month, 25-year low flow (cfs)	61	57	61	7	0
18-month, 25-year low flow (cfs)	303	260	284	126	16

Considerations in Evaluating Local and Regional Water Supplies

- **Changes in Water Use**
- **Changes to the Water Supply System**
- **Uncertainties and Potential Decreases in the Capacity of the Current System**
- **Problems Experienced in Past Drought Periods**

Illinois State WATER Survey (1895)

ILLINOIS STATE WATER SURVEY

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