COUNTY-LEVEL FORECASTS OF WATER USE IN ILLINOIS: 2005 - 2025

PROJECT COMPLETION REPORT

SOUTHERN ILLINOIS UNIVERSITY
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EXECUTIVE SUMMARY

INTRODUCTION

The purpose of this research project was to prepare estimates of future water use in Illinois counties based upon the best available data and forecasting methods. The principal outcome of this research is a set of water demand forecasts for seven water use sectors in Illinois: thermoelectric, public supply, self-supplied commercial and industrial (C&I), irrigation, self-supplied domestic, mining, and livestock.

The study has also served to demonstrate some of the challenges to the development of effective water use forecasting in Illinois. This summary provides a discussion of the water use forecasting methods and projection results presented in this report.

FORECASTING APPROACHES AND ASSUMPTIONS

Projections of the future water use are most often based upon knowledge gained from the examination of past water use and the demonstrated relationship of water use to factors that have been shown to correlate to that water use. The record of past water use therefore has a considerable impact on projections of future use.

The principal source of water use information used in this study was the U.S. Geological Survey's National Water Use Information Program (NWUIP), which has prepared estimates of county level water use in Illinois for 1985, 1990, 1995 and 2000. The availability of county-level water use estimates from NWUIP provided an excellent opportunity to explore water use relationships to those county-level data that are routinely reported by government agencies. (Note: This research project began prior to the finalization and publication of the USGS national water use estimates for the year 2000. Therefore, preliminary estimates of Illinois water use for 2000 were provided by the NWUIP for use in this analysis. The 2000 county estimates used in this report differ from the final published estimates only in the fact that some additional data presented here were not contained in the final report.)

State coordinators for the NWUIP use a variety of different methodologies to collect water use data for each water use sector. The methodology used by USGS in each water use sector generally determined the type of forecasting approach that was adopted in this study to develop water use projections.

Water use projections were prepared for seven water use sectors based upon the water use categories used by NWUIP. Different approaches were used to prepare the sector-specific forecasts presented in this report. For those sectors where water use was directly measured and reported, multivariate regression models were estimated. For sectors where water withdrawals estimations were based upon observations of explanatory factors, the projection approaches were similar to the NWUIP estimation methods, using projected values of explanatory factors.

The capability of forecasting techniques to accurately portray and predict water use is also determined by the selection of those factors, or explanatory variables, which can be used to explain past and future changes water use. While previous research has identified many of the factors that are most likely to influence, or *drive*, water use, the data that are required to translate or *specify* these factors into variable that can be employed in water use models are often not available or do not match the geographical scale or the time periods of the corresponding water use records. Various assumption and data computations were performed in order to transform the available county-level data into variables that could be used in the forecasting process. These are described in general in Chapter 1, and more specifically in individual chapters.

Also, regardless of the forecasting approach that is used, all projections must rely upon a set of assumptions about future conditions, especially as regards those factors that have been chosen as *drivers* of future water use. Considerable effort was made to obtain authoritative projections of the water use drivers, at the most appropriate spatial scale. However, where such projections were not found, they were estimated from State, regional, or national level projections, or estimated using linear trends. In those cases where projections were not available, and trends were either unclear or unsupportable from available data, water use projections were made with driver variables fixed at their 2000 levels.

Table ES.1 provides an overview of information that was used in the development of water use projections presented in Chapters 2 through 8 of this report. Specifically, it describes the methods used by USGS water withdrawals estimation procedure, forecasting approaches, principal factors driving water use in each sector, and some of the assumptions and sources of projection data used to prepare the water use projections.

Table ES.1 Overview of Forecasting Methods, Assumptions and Data

Water Use Sector	USGS Estimation	Forecasting Approach	Principal Driver	Other Factors	Forecasting Assumptions	Forecasting Linkages	Notes
Thermoelectric	Survey of withdrawals	Modified unit-use coefficient"	Plant level electric generation	Generator water use per unit of generation	Unit-use coefficient fixed for all projection years	DOE generation projections	Estimates do not include analysis of turbine combustion generators
					No substantial increases in the generating capacity during the 2005 to 2025 forecast period		
					Projected capacity additions assigned to combined cycle & gas turbine, using natural gas		Water use calculated at generator level, aggregated to plant and county level
					Natural gas power plants will run at the 12% capacity utilization for projection period		
Public Supply	Survey of withdrawals	Multivariate regression analysis	Population	Average summer temperature	"Normal" weather assigned to counties	IL population /employment projections	Disconnect between withdrawals and explanatory factors caused by cross-county water deliveries
				Percent of multi-family housing units	Percent of population served held constant at 2000 levels	DOE national housing type estimates	
				Percent of population employed	Percent of multifamily housing in all counties projected by prorating national housing model	NOAA "normal weather" estimate	
				Time trend	"Baseline" estimate uses 2000 trend value; "conservation" estimate uses annual increasing trend		

Table ES.1 *(cont'd)* Overview of Forecasting Methods, Assumptions and Data

Water Use Sector	USGS Estimation	Forecasting Approach	Principal Driver	Other Factors	Forecasting Assumptions	Forecasting Linkages	Notes
Self-supplied Domestic	Unit use	Per capita unit-use coefficient	Population	None	Percent of self-supplied population held constant at 2000 levels Per capita water use held constant @ 90gpcd	Illinois population projections	
Self-supplied C&I	Survey of withdrawals	Multivariate regression analysis	Employment in targeted sectors	Percent of self-supplied withdrawals Time trend	Percent of self-supplied withdrawals held constant at 2000 level Rate of projected employment from 2000 to 2010 remains constant for all projection years	Illinois employment projections	
Mining	Survey of withdrawals	Modified unit-use per-employee coefficient	Employment in SIC 10, 12, 13, 14	None	Use coefficient estimated for each sub-sector in each county is assumed to remain constant throughout the projection period Rate of projected employment from 2000 to 2008 remains constant for projection years	Illinois employment projections	

Table ES.1 *(cont'd)* Overview of Forecasting Methods, Assumptions and Data

Water Use Sector	USGS Estimation	Forecasting Approach	Principal Driver	Other Factors	Forecasting Assumptions	Forecasting Linkages	Notes
Irrigation	Calculated from irrigated acres and rainfall deficit	Per acre unit-use coefficient	Irrigated acres	Rainfall deficit may to August	Irrigated acreage projections are linear extrapolations using growth rate calculated from 1987 to 1997 change in acres "Normal" weather	NOAA "normal weather" estimate	
Livestock	Unit use for selected livestock categories	Per animal unit-use coefficient	Number of animals	None	Unit water use per livestock type remains constant Growth rates from national level forecast of livestock applied to Illinois counties Number of horses, mules, and sheep held constant at 2000 levels Various extrapolations of projection rates based on long term trends	USDA ERS national projections of beef cattle, dairy cows, and hogs 2001 - 2011	

PROJECTION RESULTS

Table ES.2 compares the 2025 projections that were developed in this study to the estimates of the water use in each sector in the year 2000. However, in order to be able to make “apples-to-apples” comparisons between baseline conditions and projections, the value of the 2000 water withdrawal estimates from USGS for several sectors were adjusted to match the procedures used in the preparation of the water use projections.

The 2000 estimate of thermoelectric water use that appears in Table ES.2 is based upon assumptions and is slightly higher than the estimate reported by USGS (11,265 mgd), because water use was assigned to several generating unit in several counties that appeared not to be included in the USGS estimates (see Chapter 2). These differences are also evident in the county-level projections that appear in Table ES.4.

The 2000 estimate for the public supply sector in Table ES.2 was prepared using the forecasting model developed for this sector (see Chapter 3) and data on population served and explanatory variables from the year 2000 (Table 3A.9). This estimate is slightly smaller than the USGS estimate of *water withdrawals* for this sector (1,677.6 mgd vs. 1,761.6 mgd) and represents the sum of estimated *water use* in each county. This *water use* estimate was prepared so that the 2000 county-level estimates presented in Table ES.4 would be consistent with the 2025 *water use* projections (see Chapter 3 for details).

For two of the water use sectors examined in this report (public supply and C&I) water use projections were made using both “baseline” and “conservation” scenarios. The 2025 projections used for the comparisons presented in Table ES.2 (and Table ES.3) are based upon the “baseline” analysis (see Chapters 3 and 4 for details).

Table ES.2 Comparison of 2025 Projections and 2000 Estimates of Water Withdrawals and Water Use

Water Use Sector	Estimated 2000	Predictions 2025	Change 2000 to 2025	
			Mgd	%
Thermoelectric generation	13,272.2	16,888.5	3,616.3	27.2
Public Supply	1,677.6	2,205.6	528.0	31.5
Self-supplied C&I	493.1	547.5	54.4	11.0
Irrigation	153.9	288.6	134.7	87.5
Self-supplied domestic	135.3	157.5	22.2	16.4
Livestock	37.6	42.4	4.8	12.8
Mining	22.9	68.4	45.5	199.1
Total withdrawals and use	**15,792.6**	**20,198.6**	**4,406.0**	**27.9**

Total water use in the State is estimated to increase between 2000 and 2025 by nearly 28 percent, or more than 4.4 billion gallons per day. Nearly 82 percent of the projected 4.4 billion gallon increase in withdrawals is attributed to the thermoelectric generation sector, which is predicted to remain the overwhelming water use in the state, and will continue to account for 84 percent of total withdrawals.

Water withdrawals for all sectors are projected to increase, with the largest increases estimated for the thermoelectric, public supply, and irrigation sectors. The largest percentage increase is attributed to the mining sector. This projected percentage of increase is likely to be the result of possible under-reporting in the year 2000, which was far below withdrawal estimates from previous reporting periods (the average of mining withdrawals for 1985, 1990, and 1995 were 91 mgd; see Table 7A.1). The projected value for 2025, however, is in line with consistently declining withdrawals in this sector reported in the three previous water use inventories

Total withdrawals are projected to grow at a greater rate than projected State population (28 percent versus 12 percent). Per capita total withdrawals are projected to peak in 2015. Per capita public supply withdrawals increase steadily throughout the projection period (Table ES3).

Table ES.3 Change in Population and Population Served and
Per Capita Total and Public Supply Water Use in Illinois: 2000 to 20025

	2000	**2005**	**2010**	**2015**	**2020**	**2025**
Total Population	12,419,293	12,678,976	12,998,740	13,334,404	13,628,351	13,933,698
Per Capita Total Water Use	1,271.6	1,369.7	1,499.4	1,504.3	1,482.0	1,449.6
Population Served	10,915,910	11,128,110	11,399,105	11,679,221	11,927,025	12,183,566
Per Capita Public Supply Water Use	153.7	159.5	164.0	168.9	174.7	181.0

Notes: 2025 population projection calculated using 2015 to 2020 growth rate. Per capita public supply estimate for the year 2000 is based upon model estimates of water use (Chapter 3) reported in Table ES.2; the per capita calculated from the USGS withdrawal estimate is 161.4 gpcd (see Table 3.4).

Table ES.4 displays the 2025 county projections for total water use and water use for the three largest (major) water use sectors, as well as the change in water use from 2000 (based on USGS and study estimates as described above). Total water use is projected to increase by more than 100 mgd in 12 Illinois counties (Christian, Cook, DuPage, Grundy, Jasper, Lake Madison, Montgomery, Peoria, Putnam, Sangamon, Tazewell, and Will), primarily due to the influence of thermoelectric generation facilities in these counties.

Public supply water use is projected to increase in 70 counties. The five counties are projected to have increases greater than 25 mgd are all located in Northeastern Illinois: Cook (250 mgd), DuPage (123 mgd), Will (28 mgd), Lake (28 mgd), and Kane (27 mgd). Only four counties are projected to have declines in public supply water use, and these are all less than 1.0 mgd.

Self-supplied commercial and industrial water use is projected to increase in 47 counties and have no change or decrease in 25 other counties (the remaining counties did not have reported water use in this sector). Nine counties were estimated to have increases of 3.0 mgd or more: Knox (16 mgd), Tazwell (15 mgd), Grundy (6 mgd), Will (5 mgd), DuPage (4 mgd), Cook (4 mgd), Williamson (4 mgd), Jersey (3 mgd) and Bureau (3 mgd).

Table ES.5 displays the same information for the four smaller (minor) water use sectors (irrigation, self-supplied domestic, mining, and livestock). Irrigation withdrawals are projected to increase in 73 counties and decrease in 25. Increases in irrigation larger than 10 mgd are projected for Mason (29 mgd), Gallatin (18 mgd), Whiteside (15 mgd), and Tazewell (13mgd) counties. Projections for self-supplied domestic withdrawals are largely driven by changes in population, and so those counties projected to have increases greater than 1.0 mgd are also among those projected to have the largest increases in population (Will, Cook, DuPage, McHenry, and Lake). The spread of public water supply systems in these urban and rapidly urbanizing areas would shift some of this projected self-supplied water use to the public supply sector. Mining withdrawals are projected to have the largest percent of increase in withdrawals of any sector. More than half of this increase can be attributed to three counties: Crawford (11 mgd), Champaign (9 mgd) and Lawrence (+7 mgd). The projected change in total livestock withdrawals is the smallest of any sectors, and results in a small projected increase in every county reporting livestock water use (94 counties).

The total water use in these for minor sectors is projected to be 557.09 mgd or less than 3 percent of total water use in 2025. The total 2000-2025 increase of 207.2 mgd represents less the 5 percent of the projected increase in total use.

Table ES.4 Projections for Major Water Use Sectors

County	Total Water Use		Thermoelectric Generation		Public Supply Water Use		Self Supplied Commercial and Industrial	
	2025 Value	Mgd Change 2000-2025	2025 Value	Mgd Change 2000-2025	2025 Value	Mgd Change 2000-2025	2025 Value	Mgd Change 2000-2025
Adams	25.6	3.3			12.5	3.0	10.289	-0.164
Alexander	4.5	1.6			1.1	0.1	0.039	-0.020
Bond	2.1	0.1			1.1	0.0		
Boone	8.1	2.2			3.8	0.1	0.364	-0.109
Brown	1.1	0.1			0.7	0.1		
Bureau	17.5	4.7			2.8	0.3	8.152	2.913
Calhoun	12.3	1.5			0.1	0.0	11.711	1.541
Carroll	14.3	7.4			1.2	0.0	2.120	0.047
Cass	10.4	1.5			1.2	0.0	1.914	-0.083
Champaign	44.4	11.2			28.3	4.6	1.463	0.532
Christian	2,020.9	444.8	2,016.0	444.6	3.3	0.2	0.007	0.004
Clark	12.6	9.5			1.6	0.1		
Clay	3.6	1.6			1.0	0.0		
Clinton	6.6	0.9			3.0	0.3		
Coles	9.2	1.8			8.1	1.5	0.003	0.001
Cook	2,451.7	535.6	1,282.0	282.7	1,068.1	249.5	99.472	3.945
Crawford	123.2	38.0	98.3	21.6	2.3	0.1	4.088	-0.076
Cumberland	1.4	0.2			0.5	0.1		
De Kalb	17.6	4.2			11.0	2.5	0.458	0.274
De Witt	655.3	24.3	652.9	24.4	1.4	0.0	0.071	0.031
Douglas	2.9	-0.6			2.0	0.2	0.040	0.035
Du Page	322.9	127.3			310.5	122.8	9.761	4.285
Edgar	3.1	0.0			1.7	0.0	0.000	0.000
Edwards	2.0	0.8			0.9	0.1		
Effingham	6.8	0.8			4.1	0.2		
Fayette	8.1	1.6			1.1	0.0	2.880	-0.956
Ford	2.6	-2.6			1.6	0.1	0.022	0.014
Franklin	5.5	0.1			5.1	0.0		
Fulton	308.2	67.8	299.1	66.0	2.9	-0.2	4.492	1.884
Gallatin	30.2	20.2			0.5	0.0		
Greene	3.5	0.8			1.4	0.1		
Grundy	1,336.3	359.0	1,318.0	352.1	3.1	0.4	13.125	6.060
Hamilton	1.2	0.2			0.3	0.0		
Hancock	4.3	0.4			1.2	0.0		
Hardin	1.3	0.7			0.3	0.0		
Henderson	6.9	-0.1			0.7	0.1	0.001	0.000
Henry	10.2	0.6			3.9	0.0	0.040	-0.010
Iroquois	9.1	3.7			2.2	0.5	0.069	-0.001

Table ES.4 *(cont'd)* Projections for Major Water Use Sectors

County	Total Water Use		Thermoelectric Generation		Public Supply Water Use		Self Supplied Commercial and Industrial	
	2025 Value	Mgd Change 2000-2025	2025 Value	Mgd Change 2000-2025	2025 Value	Mgd Change 2000-2025	2025 Value	Mgd Change 2000-2025
Jackson	153.2	33.0	141.2	31.2	8.5	1.0	2.577	0.216
Jasper	684.0	138.7	680.1	153.5	0.9	0.1		
Jefferson	12.7	6.6			4.5	-0.1	5.797	-11.294
Jersey	11.1	3.8			1.9	0.3	7.898	3.143
Jo Daviess	7.0	0.1			2.1	0.0	2.769	0.049
Johnson	1.5	0.0			0.4	0.0	0.101	0.101
Kane	95.3	30.2			89.1	26.9	2.363	0.798
Kankakee	27.2	-1.1			19.1	2.9	0.224	0.062
Kendall	8.8	2.4			3.5	0.7	0.414	0.123
Knox	45.8	37.3			6.6	0.1	37.056	16.448
Lake	897.3	136.2	786.5	128.4	98.9	27.5		
La Salle	89.8	3.8	62.9	1.1	12.0	0.3	6.161	2.506
Lawrence	14.0	10.4			1.5	0.2	0.055	0.003
Lee	15.4	4.9			5.4	0.3	0.997	-0.133
Livingston	6.1	0.3			4.3	0.1	0.151	0.027
Logan	4.8	-0.2			2.9	0.1		
McDonough	4.8	-0.1			3.5	0.4	0.026	0.004
McHenry	53.2	14.8			27.4	5.7	7.402	2.481
McLean	20.9	3.0			17.4	2.8	0.205	0.049
Macon	37.9	3.4			35.8	3.7	1.270	-0.355
Macoupin	8.2	2.4			3.4	0.5	0.002	0.000
Madison	1,249.5	634.1	1,168.1	626.3	26.1	5.2	42.595	-0.173
Marion	6.9	0.2			5.6	-0.7		
Marshall	10.3	5.0			1.3	0.1	0.777	-0.212
Mason	188.1	52.2	109.6	26.6	0.9	0.0	10.386	-3.372
Massac	578.6	12.5	567.2	12.8	0.3	0.1	7.808	0.252
Menard	2.5	0.5			1.3	0.3		
Mercer	4.1	0.4			0.7	0.1		
Monroe	5.4	2.1			1.2	0.3		
Montgomery	568.8	125.5	564.2	124.4	2.6	0.3	0.022	0.022
Morgan	265.1	59.4	250.3	56.6	4.0	0.3	7.911	2.309
Moultrie	2.0	0.2			1.4	0.1	0.059	0.038
Ogle	95.5	2.1	85.4	2.0	5.3	-0.5	0.843	0.033
Peoria	798.7	142.6	654.8	136.3	31.5	5.6	107.716	0.568
Perry	3.6	0.3			2.8	0.3	0.001	0.001
Piatt	3.8	0.4			2.1	0.4	0.838	-0.075
Pike	3.5	0.4			1.4	0.0	0.003	0.000
Pope	0.6	0.1			0.4	0.1		
Pulaski	1.1	-0.2			0.4	0.0	0.027	-0.020
Putnam	224.5	42.9	221.9	42.9	0.6	0.0	1.612	0.022
Randolph	42.3	6.4	36.6	5.4	3.3	0.2		
Richland	3.2	0.9			1.7	0.1	0.010	0.010
Rock Island	1,178.8	48.1	1,149.4	42.9	20.8	3.6	4.838	1.181

Table ES.4 *(cont'd)* Projections for Major Water Use Sectors

County	Total Water Use		Thermoelectric Generation		Public Supply Water Use		Self Supplied Commercial and Industrial	
	2025 Value	Mgd Change 2000-2025	2025 Value	Mgd Change 2000-2025	2025 Value	Mgd Change 2000-2025	2025 Value	Mgd Change 2000-2025
St Clair	53.2	5.7			32.9	5.1	13.007	-1.426
Saline	6.5	2.2			3.9	0.9		
Sangamon	502.0	109.5	463.1	102.2	33.3	7.1		
Schuyler	1.1	0.0			0.4	0.0		
Scott	3.5	1.7			0.2	0.0	0.042	-0.001
Shelby	4.3	0.3			2.5	0.1	0.219	0.001
Stark	0.9	-0.4			0.3	0.0		
Stephenson	10.0	0.5			5.1	0.3	1.511	0.060
Tazewell	1,108.2	252.1	1,003.3	221.3	17.8	1.8	52.595	15.395
Union	7.6	-2.0			0.4	0.0	4.449	-2.891
Vermilion	15.5	-0.2	2.5	0.6	9.8	0.4	1.186	-1.060
Wabash	2.9	1.0			1.4	0.2	0.012	0.012
Warren	2.9	0.2			1.7	0.0		
Washington	5.2	2.6			0.6	0.1	0.024	0.024
Wayne	5.8	3.0			1.5	0.0		
White	8.7	4.5			1.1	0.0		
Whiteside	37.9	15.4			2.5	0.0	4.087	-0.068
Will	3,236.8	725.9	3,120.5	681.3	74.9	28.4	17.034	5.079
Williamson	183.4	34.0	154.6	29.4	6.9	0.6	19.349	3.572
Winnebago	48.9	7.7			40.7	6.3	2.510	0.785
Woodford	9.9	1.6			6.5	0.9	0.013	0.009
Total	**20,198.7**	**4,406.4**	**16,888.5**	**3,616.6**	**2,205.6**	**528.0**	**547.5**	**54.4**

Note: Water use estimates are show to three decimal places in the self-supplied C&I sector in order to display the small, non-zero water use in a few counties for this sector.

Table ES.5 Projections for Minor Water Use Sectors

County	Irrigation		Self Supplied Domestic		Mining		Livestock	
	2025 Value	Mgd Change 2000-2025	2025 Value	Mgd Change 2000-2025	2025 Value	Mgd Change 2000-2025	2025 Value	Mgd Change 2000-2025
Adams	1.35	0.38	0.58	0.01			0.88	0.08
Alexander	3.23	1.46	0.09	0.00			0.03	0.00
Bond	0.04	0.04	0.77	0.00			0.21	0.02
Boone	2.36	2.11	1.39	0.06			0.21	0.02
Brown	0.02	0.01	0.14	0.00			0.24	0.03
Bureau	4.27	1.46	1.57	-0.08			0.71	0.11
Calhoun	0.00	0.00	0.34	0.00			0.11	0.01
Carroll	9.53	7.38	0.56	-0.04			0.95	0.07
Cass	6.01	1.45	0.47	-0.04			0.81	0.14
Champaign	1.72	-2.78	1.46	0.23	11.19	8.58	0.23	0.03
Christian	0.06	-0.07	1.30	0.02			0.30	0.05
Clark	9.88	9.02	0.49	0.00	0.31	0.31	0.24	0.04
Clay	0.16	0.15	0.61	-0.10	1.51	1.51	0.34	0.04
Clinton	0.28	0.28	1.51	0.15	0.10	0.10	1.73	0.05
Coles	0.11	0.09	0.72	0.12	0.11	0.11	0.15	0.02
Cook	1.44	-0.38	0.51	0.03	0.20	-0.15	0.01	0.00
Crawford	6.72	5.62	0.77	-0.12	10.89	10.89	0.17	0.03
Cumberland	0.01	0.00	0.73	0.14			0.22	0.03
De Kalb	0.41	0.11	2.09	0.40	2.27	0.76	1.35	0.19
De Witt	0.39	-0.13	0.49	-0.03	0.00	0.00	0.06	0.00
Douglas	0.08	0.01	0.63	0.00	0.01	-0.81	0.11	0.01
Du Page	0.41	-0.05	2.22	0.27	0.01	0.01	0.00	0.00
Edgar	0.03	-0.01	0.66	-0.05			0.74	0.13
Edwards	0.00	0.00	0.21	-0.02	0.70	0.70	0.15	0.02
Effingham	0.09	0.09	1.46	0.00	0.44	0.44	0.79	0.06
Fayette	0.07	0.06	1.07	-0.12	2.60	2.60	0.33	0.01
Ford	0.40	-0.08	0.33	-0.01	0.00	-2.66	0.23	0.04
Franklin	0.03	-0.01	0.13	0.00	0.06	0.03	0.20	0.03
Fulton	0.07	-0.02	1.04	-0.09	0.18	0.18	0.50	0.05
Gallatin	27.36	18.14	0.24	0.01	2.04	2.04	0.07	0.00
Greene	1.14	0.58	0.17	0.01			0.80	0.13
Grundy	0.05	0.03	1.93	0.40			0.10	0.01
Hamilton	0.13	0.06	0.41	-0.05	0.22	0.22	0.11	0.01
Hancock	1.14	0.32	0.91	-0.01			1.00	0.13
Hardin	0.01	-0.02	0.12	-0.02	0.79	0.79	0.09	0.00
Henderson	5.63	-0.23	0.16	0.02			0.40	0.04
Henry	3.91	0.63	0.96	-0.17			1.42	0.20
Iroquois	5.69	3.24	0.63	-0.04			0.44	0.04

Table ES.5 *(cont'd)* Projections for Minor Water Use Sectors

County	Irrigation		Self Supplied Domestic		Mining		Livestock	
	2025 Value	Mgd Change 2000-2025	2025 Value	Mgd Change 2000-2025	2025 Value	Mgd Change 2000-2025	2025 Value	Mgd Change 2000-2025
Jackson	0.31	0.31	0.19	0.02	0.24	0.24	0.26	0.02
Jasper	0.13	0.10	0.31	0.04	2.03	2.03	0.52	0.08
Jefferson	0.18	0.08	1.09	-0.10	0.81	0.81	0.31	0.04
Jersey	0.05	0.04	1.02	0.25			0.24	0.02
Jo Daviess	0.09	-0.04	0.95	0.04			1.16	0.04
Johnson	0.02	-0.02	0.77	-0.06			0.21	0.02
Kane	1.69	0.83	0.21	0.06	1.53	1.53	0.46	0.06
Kankakee	3.27	-2.92	2.49	0.30	1.87	-1.47	0.21	0.03
Kendall	0.26	0.11	4.40	1.42			0.16	0.02
Knox	0.10	0.02	1.13	-0.03			0.93	0.14
Lake	0.82	0.29	9.03	1.74	2.02	-1.17	0.04	0.00
La Salle	2.08	1.28	2.45	0.02	3.82	-1.41	0.44	0.04
Lawrence	5.05	3.45	0.45	-0.04	6.70	6.70	0.23	0.04
Lee	8.12	4.63	0.55	0.01			0.41	0.05
Livingston	0.15	0.01	0.70	-0.02			0.81	0.14
Logan	0.26	-0.39	0.94	0.05	0.09	-0.04	0.57	0.10
McDonough	0.24	0.09	0.46	0.03	0.19	-0.69	0.40	0.05
McHenry	3.33	1.15	12.98	4.05	1.40	1.40	0.62	0.03
McLean	0.45	-0.30	2.19	0.32			0.67	0.10
Macon	0.20	0.02	0.46	0.00			0.16	0.02
Macoupin	1.32	1.15	2.38	0.26	0.46	0.46	0.65	0.08
Madison	1.41	1.41	10.76	1.22	0.08	0.08	0.42	0.05
Marion	0.27	0.25	0.19	-0.02	0.68	0.68	0.21	0.02
Marshall	7.63	5.07	0.37	0.03	0.00	0.00	0.17	0.02
Mason	66.28	29.04	0.64	-0.08			0.29	0.04
Massac	1.70	-0.73	1.31	0.14			0.21	0.02
Menard	0.49	-0.03	0.48	0.16			0.29	0.04
Mercer	1.93	0.32	0.91	-0.05			0.52	0.07
Monroe	1.18	0.92	2.55	0.75			0.43	0.07
Montgomery	0.69	0.69	0.78	-0.03	0.05	0.05	0.49	0.07
Morgan	0.80	-0.12	1.61	0.23			0.48	0.06
Moultrie	0.05	0.02	0.43	0.02			0.10	0.01
Ogle	0.89	0.40	1.95	-0.03	0.09	0.08	1.03	0.12
Peoria	3.17	0.11	1.25	0.01			0.25	0.02
Perry	0.23	0.01	0.35	-0.01			0.21	0.02
Piatt	0.18	0.06	0.56	0.05			0.12	0.02
Pike	0.70	0.26	0.59	0.01			0.81	0.11
Pope	0.00	-0.01	0.05	0.00			0.12	0.01
Pulaski	0.18	-0.23	0.38	0.02			0.10	0.00
Putnam	0.13	-0.05	0.14	0.01			0.06	0.01
Randolph	0.14	0.08	1.24	-0.01	0.67	0.67	0.39	0.03
Richland	0.04	0.04	0.25	-0.06	0.79	0.79	0.41	0.07
Rock Island	2.07	0.26	1.34	-0.01	0.10	0.10	0.34	0.05

Table ES.5 *(cont'd)* Projections for Minor Water Use Sectors

County	Irrigation		Self Supplied Domestic		Mining		Livestock	
	2025 Value	Mgd Change 2000-2025	2025 Value	Mgd Change 2000-2025	2025 Value	Mgd Change 2000-2025	2025 Value	Mgd Change 2000-2025
St Clair	0.57	0.53	5.73	0.78	0.72	0.70	0.22	0.03
Saline	0.03	0.00	0.22	0.00	2.14	1.29	0.26	0.04
Sangamon	0.58	0.19	3.85	0.33	0.66	-0.36	0.50	0.07
Schuyler	0.10	0.01	0.28	-0.04			0.27	0.04
Scott	2.68	1.55	0.41	0.08			0.11	0.01
Shelby	0.11	0.04	0.89	0.11			0.66	0.06
Stark	0.14	-0.41	0.36	0.00			0.12	0.01
Stephenson	0.12	0.01	1.67	0.05			1.55	0.06
Tazewell	32.49	13.47	1.59	0.06			0.49	0.08
Union	1.15	0.78	1.45	0.05			0.20	0.01
Vermilion	0.06	-0.12	1.79	0.05			0.23	0.03
Wabash	0.64	0.56	0.34	0.01	0.42	0.28	0.08	0.01
Warren	0.10	0.07	0.64	0.04			0.52	0.06
Washington	1.72	1.59	1.31	0.25	0.55	0.55	0.96	0.07
Wayne	0.54	0.32	0.69	-0.02	2.62	2.62	0.43	0.06
White	4.80	2.59	0.55	-0.07	2.01	1.92	0.19	0.02
Whiteside	26.85	15.52	3.65	-0.15			0.84	0.10
Will	2.55	1.25	20.00	8.20	1.66	1.66	0.15	0.02
Williamson	0.18	0.12	1.85	0.05	0.19	0.19	0.26	0.03
Winnebago	0.50	0.08	4.59	0.34	0.20	0.20	0.43	0.04
Woodford	0.22	-0.02	2.55	0.56	0.00	0.00	0.62	0.10
Total	**288.65**	**134.73**	**157.56**	**22.22**	**68.44**	**45.56**	**42.44**	**4.82**

KEY FINDINGS AND RECOMMENDATIONS

Key Findings

One important finding of this study is that, based upon the assumptions and methodologies used in this study, total water use in Illinois is expected to continue to increase despite the recent declining trends in the national estimates of water withdrawals (Hutson, et al., 2004). Water use is projected to grow faster than the State population, increasing from 1,302 gallons per capita per day (gpcd) in 2000 to 1,487 gpcd in 2025. This projected growth is primarily due to projected increases in the thermoelectric sector.

Total water use is projected to increase in 89 out of 102 Illinois counties. Small decreases are projected for 10 counties and no change in three counties. Public water supply use is often the sector that is of most concern to planning agencies and it is projected to increase by more than 1.0 mgd in 21 counties, and between 0.1 and 1.0 mgd in 49 other counties. Some of these projected increases in water use can be reduced through the implementation of water conservation programs and efficiency-in-use improvements. Reductions in the year 2025 of 384 mgd in the public supply sector (31.5 gpcd) and 234 mgd in the self-supplied commercial-industrial sector were estimated based on past water use trends in these two sectors.

Recommendations

Perhaps the issue of greatest concern in the development of water demand projections is the quality and availability of data. The only publicly available time series water use data are those available from the USGS water use inventories. However, these data were somewhat difficult to use in the development of projections because actual withdrawal data are obtained only for some water use sectors, and because of a lack of correspondence between the location of water *withdrawals* and *use*, especially in the public supply sector. Furthermore, reporting on some of the data most important to forecasting has recently become voluntary, and there is little guarantee for the continuation of any national data collection program in an era of federal budget cut-backs.

Since improved data are the most likely path to improved forecasting, State resource agencies may wish to consider actions that would improve the frequency and quality of water usage data collection (including water price), perhaps through the coordination of Illinois State Water Survey's water use data collection, and the Safe Drinking Water Act data recording and reporting responsibilities of the Illinois Environmental Protection Agency. Likewise, many types of data that would be beneficial to forecasting efforts (population, housing, income, employment, irrigated acreages, etc.) are routinely collected by State agencies. The coordinated identification and collection of such data could greatly improve the accuracy of water use projections in the State.

The usefulness of analyzing withdrawals and water use at county level also bears some consideration. This spatial level was used in this analysis primarily because it provided an opportunity to align USGS county water use estimates with socioeconomic data from other publicly available sources. However, most regional water resources problems are likely to be addressed at watershed level and therefore projections at watershed level would be most beneficial to evaluating and addressing these problems. However, the difficulties of collecting the explanatory variable data at watershed level would need to be addressed, perhaps through Geographic Information Systems (GIS) applications that would permit the allocation of Census data to watershed level.

Nevertheless, these county level forecasts should provide a useful benchmark and could be used in regional water supply studies. Also, the regional or local level planners can allocate county-level projections into smaller geographical areas (such as townships or cities) by prorating the county totals by population, employment or other demand drivers that were used in each sector. Furthermore, the forecasting methods used here can be applied to prepare water use projections based on locally available data sources.

CHAPTER 1

INTRODUCTION

"The most important requirements in water supply planning and management are to know how much water is required over a period of time, the quality of water needed, and the water supply options available. Decisions then can be made on how to meet or reduce demand. Projections of water supply and demand inevitably include significant uncertainties, and the expression of uncertainties in future projections provides a basis for water resources planners and managers to conduct risk assessments and to plan for the future."(ISWS, 2001, p. 7)

BACKGROUND

Nationwide, water resource planning is undergoing a significant paradigm shift. Gleick (1998) states that this new paradigm stresses increasing water-use efficiency and a reassessment of the allocation of water among different users, over the historical preoccupation with the expansion of water supply. The implementation of cost-effective water-use efficiency programs and reallocation schemes require a thorough understanding of the economic, technological, and social determinants of water use, as well as precise and reliable methods of estimating future water demand.

Illinois is endowed with some of the most abundant water resources in the nation. Nonetheless, in some regions of the State water demand is beginning to approach the limits of currently available supply. According to United States Geological Survey (USGS) estimates, water withdrawals in Illinois have more than doubled in the last half-century, from 9.9 billion gallons per day (bgd) in 1950, to 19.98 bgd and 1995 (USGS, 1998). At the same time, water availability is limited by local hydrological conditions, and subject to changes in local weather, global climate changes, water allocation treaties, and minimum flow requirements on the States few remaining free-flowing streams. Potential water shortages have already been projected for some high-growth areas of the State (NIPC 2001).

In an effort to avert potential future water resources problems, State agencies and advocacy groups have prepared numerous exploratory studies and planning documents spanning a wide range of water resources topics and water use sectors. In particular, the *Illinois State Water Plan* prepared by the Illinois State Water Survey, identified the need for long-term water supply and demand projections for the state. The research presented in this report is intended as a first-step effort in identifying useful data sources and forecasting techniques for estimating the quantities of water likely to be needed to support future water uses in the 102 counties of the State of Illinois.

PURPOSE AND SCOPE

The general purpose of this study is to develop county-level water use projections for the State of Illinois. More specifically, the purpose and scope of this study is to:

1. Collect and review available county-level water withdrawal data in Illinois. Explain the changes in withdrawals through the analysis of factors that have been demonstrated to explain water use. For those water use sectors for which adequate data are available, explain historical changes in sectoral withdrawals using statistical models.

2. Prepare projections of water demand for the 102 Illinois counties for the period from 2005 to 2025 in five-year increments for seven water use sectors: thermoelectric, public supply, self-supplied commercial and industrial, irrigation, self-supplied domestic, mining, and livestock.

The water use projections and applications of forecasting methodologies presented in this report should be considered to be “preliminary” because of some of the characteristics of the data used in the modeling and forecasting process. Several observations about the data are worth noting.

First, there is no precise, consistent, set of time series water-use data available for the development of water demand models for the State. This study used the county-level water withdrawal estimates prepared by the USGS water use program as the basis for water use models and projections. State-level estimates have been prepared every five years since 1950, and county level estimates have been prepared since 1985. While these estimates provide an invaluable overall assessment of water use and the changes in water use, there are few examples of their application as dependent variables in water use modeling (Dziegielewski, et al., 2002). A preliminary review of the data revealed that for some counties/sectors water use estimates were poorly correlated with potential explanatory variables or were inconsistent over time. Nonetheless, the data were judged to be of sufficient quality to establish many of the underlying relationships between water use and explanatory factors. Specific characteristics of the USGS data are described where appropriate in various sections of this report.

Second, USGS estimates of water use in some sectors were not based upon actual observed or reported water use, but instead were the result of various indirect estimation procedures. While projections can be developed by mimicking these indirect estimation procedures, preferred multivariate modeling approaches were not possible.

Third, only the annual water withdrawal data available from USGS are used in this report. Therefore, estimates of some types of water use that are most important to specific planning needs, such as consumptive use, maximum day demands, or seasonal water use, were not estimated as part of the analysis presented in this study.

Finally, where data did permit multivariate modeling, regression models were developed at the State level, and then applied to counties and groups of counties. This State-level scale of analysis was necessary because the data needed to develop models for individual counties (or groups of counties), or to trace the cross-county flows of water from public water suppliers, was not currently available. Sectors with significant cross-county flows could only be modeled by grouping counties together. Improved models could potentially be developed by clustering counties by specific attributes (such as metro/non-metro), but these forecasting improvement will remain on the horizon pending the availability of more detailed water use data.

STUDY APPROACH

In this study, the aggregate total water withdrawals are estimated as the sum of disaggregate sectoral water withdrawals. The techniques used to examine historical withdrawals and develop projections of future use were dictated by the type of water use and corresponding data that were available for each water use sector. The two principal techniques that are used in this report are the unit-use coefficient approach and multiple regression models. These techniques are used to derive the historical structural relationship between water demand and its determinants. The derived relationships are then used to project future water demand through the application of forecast values of water demand determinants.

Water Demand Modeling

The Illinois county-level water use data used in this study were obtained from the USGS National Water Use Inventory Program (NWUIP). The USGS has been collecting state-level water withdrawal data since 1950, and county-level water withdrawal data since 1985, at a five-year increments.

USGS estimates are reported for eight water use sectors: thermoelectric, public-supply, self-supplied commercial, self-supplied industrial, self-supplied irrigation, self-supplied domestic, mining, and livestock. These were grouped into seven categories (self-supplied commercial and self-supplied industrial were combined) of non-overlapping water use (although public supply withdrawals also include water delivered by public water supply systems to some commercial, industrial and thermoelectric users), and sum to total water withdrawals and can be expressed as:

$$TW_t = \sum_i (PS_{it} + DM_{it} + C\,\&\,I_{it} + IR_{it} + LS_{it} + MN_{it} + TE_{it}) \qquad \text{(Equation 1.1)}$$

where TW_t is the total (fresh and saline) water withdrawals in the state (mgd) during calendar year t; PS_{it} is the public supply withdrawals (in county i during year t); DM_{it} is the domestic (self-supplied) withdrawals; $C\&I_{it}$ is the commercial and industrial (self-supplied) withdrawals; IR_{it} is the irrigation withdrawals; LS_{it} is the livestock withdrawals; MN_{it} is the mining withdrawals; and TE_{it} is the thermoelectric withdrawals.

The description of water uses included in each of these categories can be found on the USGS website and in many USGS publications (for example, Avery, 1999). The composition of the water use categories has changed slightly over time, and care was taken to use consistent categories in this analysis. Although the USGS reports on water "withdrawals" rather than actual water "use", these terms are used somewhat interchangeably in this report. Also, because of data constraints the self-supplied commercial and industrial sectors are combined for the purposes of this study, even though their water withdrawals are reported separately by USGS.

Water-use relationships can be expressed in the form of equations, where water use is a function of one or more independent (explanatory) variables. A multivariate context best relates to actual water use behaviors, and multiple regression analysis can be used to determine the relationship between water use and each explanatory variable. The functional form (e.g., linear, multiplicative, exponential) and the selection of the independent variables depend on the category and aggregation of water demand that is represented by the dependent variable.

Unit-use approaches are based upon the assumption that a single factor can explain the majority of variability of water used for a specific purpose. For example, per capita water projections were previously the standard for estimating future domestic water use. A unit-use coefficient, per capita water use, was estimated by dividing total domestic water withdrawals by total population. Future domestic withdrawals were calculated by multiplying estimates of future population by this unit-use coefficient. While more precise multivariate approaches have now been demonstrated to improve forecasting accuracy (Davis, et al, 1987; Dziegielewski, et al., 1996b), for those categories of water use where no metering or other methods of recording volumetric uses were available, USGS has employed unit-use coefficient approaches to estimate water withdrawals.

Data Collection, Estimation and Validation Procedures

Data Collection Procedures

The water use data for this study were obtained from the USGS water use program. The 1985, 1990 and 1995 county data are available from the USGS water website in a downloadable format (*http://water.usgs.gov/watuse/wudownload.html*). Estimates of 2000 county-level withdrawals had not yet been published at the time this study was being conducted, but preliminary estimates of State withdrawals were made available through special arrangement with the USGS Water Use Program.

Data used to specify explanatory variables came from a variety of state and federal agencies, most often from routinely collected data available from libraries or in electronic format on agency websites. Projections of future values of explanatory variables were also required in order to calculate water use projections, and sources of projected values were also pursued from both governmental and non-governmental sources. Numerous state and federal agencies were contacted by phone an email in order to ensure that the best available data possible would be included in the analysis.

Some data were not publicly available and were obtained through cooperative arrangement with state agencies. The Illinois Environmental Protection Agency (IEPA) provided information on community water systems in Illinois. The Illinois Department of Employment Security (IDES) provided detailed employment estimates for each county.

Data Estimation Procedures

The specification for some of the variables used in this study required normalization, interpolation, or extrapolation of the data before they could be used in modeling procedures. These procedures are described briefly below. More specific details are provided in the chapters and chapter annexes of this report.

1) Data collected for years that do not coincide with water withdrawal data.

   Some of the data used in this study were obtained from US Census sources, most of which is available on a 10 year basis. Some method of interpolation was required in order to align Census data to water use data. Although several different interpolation methods were tried to estimate values of the independent values for the intervening years, a simple midpoint was eventually used to represent these values. Also, the Census of Agriculture is prepared for 'off-years" (most recently, those ending in "2" and "7"). The data from these off-years were not interpolated. Instead the data from the immediately preceding year were used.

2) Real value adjustment for economic variables

   Economic data are generally reported in "current" dollars. In order to account for the time value of money, these values were adjusted to "constant" or "real" dollars of the reference year 1995 using the Bureau of Labor Statistics, Consumer Price Index.

3) Projection of explanatory variables

   Authoritative projections prepared by government agencies or industry groups were sought for all explanatory variables. Projections that were only available at State level and were prorated down to county level based upon the last available percent distribution at county level. When projections were not available for all projection years, they were interpolated or extrapolated based upon past trends. For a few variables, projections based upon past trends or conservative assumptions resulted in unreasonable results (such as negative values). In those cases where projections no reasonable assumptions could be used to develop projections, values were held constant at 2000 for all projection years.

Data Validation Procedures

The following standard procedures were used to identify, correct and/or discard data with apparent errors caused by mistakes in collection or data input:

1. Data were arranged in spreadsheets and visually inspected for apparent anomalies
2. Standard ratios (i.e., per capita use) were calculated and compared to established benchmarks
3. Time-series data were graphed to identify outliers and trends over time; trends in water withdrawals and potential explanatory variables were compared
4. Data were verified against other available data sources.

Also, a thorough review of the USGS time series water use data was conducted and potential outlier values were identified. A report was submitted to USGS representatives in order to obtain their feedback and correction of potential errors in the water use data.

Modeling Diagnostic and Validation Procedures

Several procedures were used to specify and estimate the water demand models:

1. Models included variables that had been identified by previous research, and their corresponding coefficients, where significant, were within a reasonable range of *a priori* values with expected signs
2. The explanatory power of the models was reasonable, as measured by the coefficient of multiple determination (R^2).
3. The absolute percent error of model residuals was not excessive.

ORGANIZATION OF THE REPORT

The report is organized by the water use sectors. Each chapter begins with a brief review of the definition of the water use category, and historical changes in water use in each sector in Illinois, as reported by the USGS. This is followed by a description of the procedure used to develop projections for that water use sector, and a summary of the projection results. Each chapter also includes a Chapter Annex that includes tables containing primary data and/or interim worksheets and other information used in the forecasting process. References for all chapters appear at the end of the report. The Executive Summary chapter at the beginning of the report combines the results of the other study chapters and briefly discusses some of the implications of this study for the further development of forecasting methodologies for estimating water use in Illinois.

CHAPTER 2

THERMOELECTRIC WATER USE

INTRODUCTION

USGS defines *thermoelectric* water use as the amount of water used in the production of heat-generated electric power. The heat source may be from fossil fuels, nuclear-fission, or geothermal activity. Fossil fuels include coal, petroleum, and natural gas. The USGS prepares water use estimates for each type of heat source. The water used in thermoelectric generation may be self-supplied or provided by public water systems. (Linsey, 1995)

USGS THERMOELECTRIC WITHDRAWAL ESTIMATION PROCEDURE

Thermoelectric water withdrawal data in Illinois are obtained from questionnaires sent to power plant managers by the Illinois State Water Survey (ISWS). If the power plants do not respond to the questionnaire, a second questionnaire is sent, and a follow-up phone call is also made as a final recourse. If power plants do not provide water withdrawal data, the quantity of water use is estimated either by extrapolating data from previous years, or estimating water use from available information on the capacity of pumps and duration of operation. If no estimate for a power plant can be made, then no water withdrawal data for the plant is entered into the USGS water use database. County total thermoelectric withdrawals are estimated by aggregation of the water use data of all of the individual power plants located in that county (Avery, 1999).

THERMOELECTRIC WATER USE IN ILLINOIS

Illinois has ranked as one of the top two states in the amount of thermoelectric water withdrawals in the United States since 1980, and has accounted for between five and eleven percent of national thermoelectric withdrawals since 1960. The volume of thermoelectric withdrawals in the state have ranged between 9.1 and 17.1 bgd, and the thermoelectric share of total State water withdrawals has steadily increased from 69.5 percent (1960) to 85.9 percent (2000).

The quantity of thermoelectric power generated in Illinois is substantial, accounting for between five and seven percent of national total thermoelectric generation since 1960, with generation increasing nearly four fold from 44.5 billion kilowatt-hours (kWhs) in 1960, to 168.8 billion kWhs in 2000. This steady increase in generation, combined with a generally flat trend in reported thermoelectric withdrawals, has resulted in a decrease in the unit withdrawals for power generation from 79.9 gallons/kWh in 1960 to 24.4 gallons/KWh in 2000. The majority of water withdrawals for power generation in the state are from self-supplied, surface, fresh-water sources.

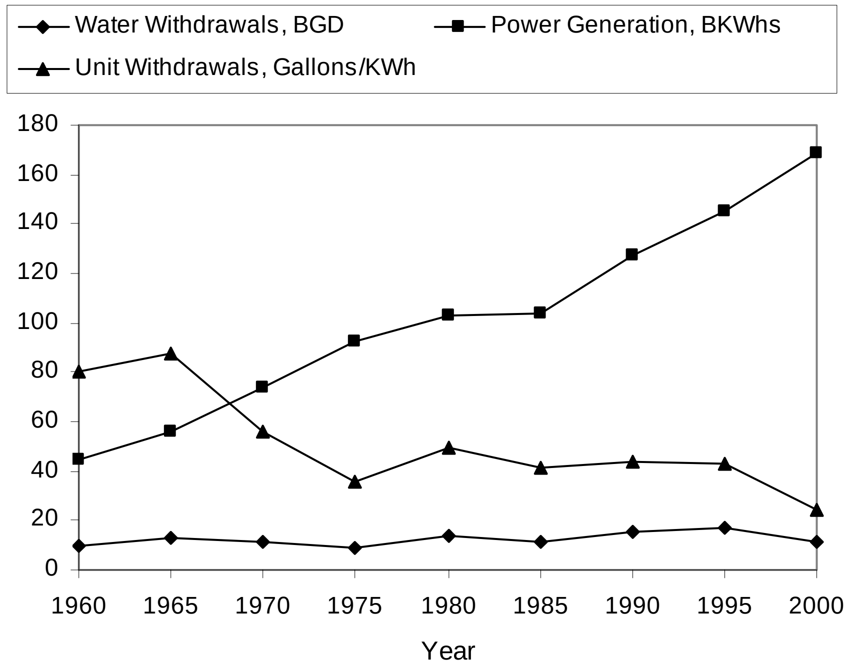


Figure 2.1. Thermoelectric Withdrawals, Thermoelectric Generation, and Unit Thermoelectric Withdrawals in Illinois: 1960-2000 (USGS, 2004)

County Estimates of Thermoelectric Withdrawals

Since the USGS began to prepare county-level estimates of water withdrawals in 1985, thermoelectric water use has been reported in 27 of Illinois' 102 counties (USGS, 2004). In every reporting period between 1985 and 2000, 7 or 8 of these counties were estimated to have thermoelectric withdrawals of less than 100 mgd, accounting for less than 3 percent of state totals. A similar number of counties (7 to 11) were estimated to have had withdrawals above 500 mgd in every reporting year. These counties consistently accounted for more than 70 percent of state total thermoelectric withdrawals (Table 2.1).

Table 2.1. Distribution of County-Level Thermoelectric Withdrawals by Size Category and Percent of Total Thermoelectric Withdrawals: 1985-2000

Size Category	Number of Counties				Percent of Total Withdrawals			
	1985	1990	1995	2000	1985	1990	1995	2000
0.01-100 mgd	7	7	8	8	1.5	1.4	0.9	2.7
100-500 mgd	12	13	8	8	24.2	25.3	11.4	16.2
500-1000 mgd	5	3	7	9	31.6	14.4	29.7	53.3
>1000 mgd	3	4	4	2	42.7	58.9	58.0	27.8

Only a few counties have ever reported large volumes of thermoelectric withdrawals (Christian, Cook, DeWitt, Grundy, Jasper, LaSalle, Lake, Massac, Randolph, Rock Island, Tazewell, and Will). Of these counties, only Rock Island has reported a consistent and significant increase in the amount of thermoelectric withdrawals, increasing from 1.1 mgd in 1985 to 1,107.6 mgd in 2000. Reported withdrawals have been stable since 1990 in five counties (Christian, Cook, Jasper, Massac, and Tazewell). Estimated withdrawals have fluctuated greatly in six counties (DeWitt, Grundy, Lake, LaSalle, Randolph, and Will). In Randolph, for example, thermoelectric withdrawals increased from about 30 mgd in 1985 to more than 1,000 mgd in 1990 and 1995, before returning to about 30 mgd in 2000. A complete list of the USGS county estimates appears in the Annex to this chapter (Table 2A-2) and demonstrates the considerable variation that is found in USGS estimates for this water use sector.

THERMOELECTRIC WITHDRAWALS PROJECTIONS PROCEDURES

There are many factors that influence thermoelectric water withdrawals, including: cooling systems type, generation technologies, fuel types, climate, and plant operation practices. Because the historical county-level data for many of these explanatory factors are not available from secondary sources, it was not possible to develop multivariate water demand models pairing USGS thermoelectric water use estimates with explanatory factors. Considering the large amount of water withdrawals in this sector, the considerable variation in reported values over time, and the potential for significant errors in estimating the water balance in the state, a simple extrapolation of historical withdrawals to project future water use was also judged to be inappropriate. Therefore, a “modified unit coefficient” method was developed in order to prepare the projections for county-level thermoelectric withdrawals.

In this approach, county-level thermoelectric withdrawal projections are calculated using projections of thermoelectric generation, and estimates of water use per unit of thermoelectric generation. Forecasts were made at the plant level, and then aggregated up to the county level. Projections for thermoelectric generation and unit water use are based on an analysis of the record of thermoelectric power generation at the generating units in each plant and county, reference to external regional projections of future energy generation, and several analytical assumptions.

The following section reviews the method used to allocate regional projections of thermoelectric generation to generation facilities and counties in Illinois. The next section describes the methodology to estimate the unit water use coefficients of each generating unit. The final section of this chapter describes how the projections of generation and water use coefficients were combined to develop county-level water use projections.

Projections of Thermoelectric Generation

Long-term projections of thermoelectric generation are complicated by several factors:

(1) The on-going deregulation of electric utilities and the integration of power plants onto a common grid have decoupled the spatial relationship between electric generation and consumption. This makes it difficult to link power generation by a particular electric utility or within a geographical area to economic activities (or other potential explanatory factors) within that area.

(2) Electric power generation is a spatially concentrated activity, with significant impacts on water use. The construction of even a single new power plant during the long-term projection period would result in a distinctly different power generation and water use scenario.

Because of these difficulties, it was not considered feasible (within the scope of this study) to model electric power generation at the State or country level. Instead, forecasts of thermoelectric generation were derived from national and regional level forecast developed by Department of Energy (DOE). These forecasts were then prorated down to the county level based on the current status of thermoelectric power plants located in each county using the methodology described in the following sections.

The National Energy Modeling System

The National Energy Modeling System (NEMS) is a computer-based, energy-economy modeling system used to prepare forecasts of energy markets in the U.S. It projects production, imports, conversions, consumption, and prices of energy, subject to a variety of assumptions (DOE, 2001). In its electricity supply module, the country is divided into 13 electricity supply regions. Illinois is assigned to Region 4, the Mid-America Interconnected Network, which includes the entire state of Illinois, Northeastern Missouri, Eastern Iowa, Eastern Wisconsin, and small parts of Minnesota and Michigan.

The NEMS model projects significant increases in both thermoelectric generation and generation capacity between 2000 and 2025 in the Mid-America Interconnected Network Region. The majority of all planned or unplanned additions for thermoelectric generation capacity additions within the region are projected for the combined cycle and turbine combustion categories (Table 2.2).

Although there have been highly contentious hearings over the siting of turbine combustion generators in Illinois (IPCB, 2000), these units generally use only a small percentage of the water of thermoelectric units and have not traditionally been included in USGS estimates of water used in the generation of electricity. Consequently, water use by turbine combustion generators is excluded from the scope of this research and is not considered in the county water use projections presented in this study. It should be noted however, that these generators can have significant localized impacts on water resources.

The omission of turbine combustion generators from consideration in this study, and the NEMS prediction of the low likelihood of capacity additions in other generation types led to the adoption of the assumption that there will be no construction of new generation facilities or substantial increases in the steam thermoelectric generation capacity in the state during the 2005 to 2025 forecast period. The projections presented here are therefore based exclusively on the current available capacity at thermoelectric generating facilities in the state.

Table 2.2. Projected Capacity Additions in Mid-America Interconnected Network Region from 2000: 2005-2025 (Gigawatts)

Capacity Additions	**2005**	**2010**	**2015**	**2020**	**2025**
Cumulative Planned Additions					
Coal Steam	0.00	0.00	0.00	0.00	0.00
Other Fossil Steam	0.00	0.00	0.00	0.00	0.00
Combined Cycle	1.21	1.21	1.21	1.21	1.21
Combustion Turbine/Diesel	2.96	2.96	2.96	2.96	2.96
Nuclear Power	0.00	0.00	0.00	0.00	0.00
Renewable Sources	0.09	0.14	0.16	0.16	0.16
Distributed Generation	0.00	0.00	0.00	0.00	0.00
Total Planned Additions	*4.26*	*4.30*	*4.32*	*4.32*	*4.32*
Cumulative Unplanned Additions					
Coal Steam	0.00	0.00	0.00	0.27	0.49
Other Fossil Steam	0.00	0.00	0.00	0.00	0.00
Combined Cycle	0.00	0.00	0.02	2.35	5.07
Combustion Turbine/Diesel	0.43	1.20	1.50	2.28	4.03
Nuclear Power	0.00	0.00	0.00	0.00	0.00
Renewable Sources	0.06	0.06	0.06	0.06	0.06
Distributed Generation	0.05	0.20	0.66	1.20	1.89
Total Unplanned Additions	*0.53*	*1.46*	*2.24*	*6.15*	*11.54*
Cumulative Total Additions	4.79	5.77	6.56	10.47	15.86

Source: DOE, 2003

Deriving Projections of Illinois Energy Generation from NEMS

Four major fuel types are used for thermoelectric generation in the region (coal, nuclear, natural gas, and petroleum) and projections were prepared for each individual fuel type. Figure 2.2 and Table 2.3 display NEMS's projections of the amount of electric generation in the Mid-America Interconnected Network Region to 2025 by fuel type (DOE, 2003). According to the NEMS projections, electric generation using coal will increase from about 147 billion KWhs (2002) to 191 billion KWhs (2014) and levels off after that. Thermoelectric generation from both nuclear and petroleum are expected to remain almost unchanged throughout the projection period. Generation from natural gas is projected to first decrease from about 12 billion KWhs in 2002 to 9.7 billion KWhs in 2011, then increase to 11.6 billion KWhs in 2016, and then rapidly increases to 32.06 billions KWhs by the end of the projection period (2025).

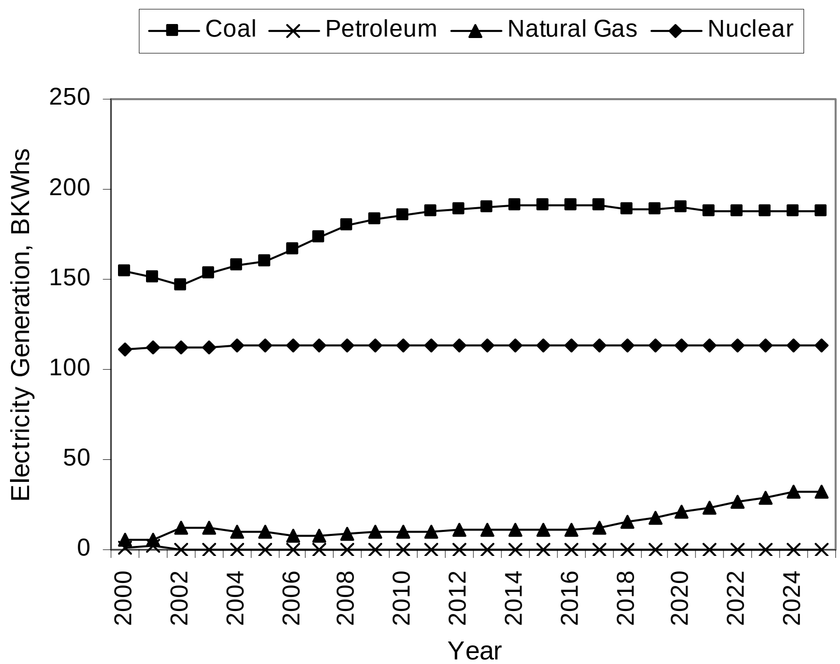


Figure 2.2 Projections of Electricity Generation in the Mid-America Interconnected Network Region: 2000-2025, by Fuel Type
Source: DOE, 2003

A major portion of electric generation in the Mid-America Interconnected Network Region takes place in Illinois (Table 2.4). In 2000, the total amount of Illinois thermoelectric generation accounted for about 65 percent of total for the region, including more than 50 percent of the generation in each major fuel type. Because of the State's large share of the region's thermoelectric generation, the projections presented here assume that the forecasts for the region can be used to represent the general trend of thermoelectric generation in Illinois. The forecast rates of change in generation by each of the four major fuel types in the Mid-America Interconnected Network Region were used to derive forecasts of electric generation in the state (base-year 2000). Because of the excess generating capacity in the State, the projected energy demand was assumed to be provided by load shifting and greater utilization of currently installed generation capacity at thermoelectric generating facilities. The projections of future generation by each of the four major fuel types are presented in Table 2.5.

Table 2.3. Projections of Electricity Generation (billion kWhs) in the Mid-America Interconnected Network Region: 2000-2025, by Fuel Type

Year	Coal	Petroleum	Natural Gas	Nuclear
2000	154.02	0.85	5.71	110.94
2001	150.75	2.18	5.33	112.25
2002	147.21	0.13	12.06	111.67
2003	153.16	0.2	12.03	112.46
2004	157.94	0.19	10.03	113.02
2005	160.13	0.16	9.65	113.06
2006	166.51	0.16	8.16	113.8
2007	173.27	0.16	8.22	113.83
2008	180.51	0.18	9.22	113.86
2009	183.02	0.18	9.93	113.88
2010	185.73	0.19	9.93	113.88
2011	187.46	0.18	9.71	113.88
2012	189.24	0.19	10.7	113.88
2013	190.29	0.2	10.75	113.88
2014	190.95	0.2	10.84	113.88
2015	190.66	0.2	10.59	113.88
2016	191.04	0.21	11.55	113.88
2017	191.28	0.21	12.6	113.88
2018	188.53	0.21	15.76	113.88
2019	189.37	0.22	18.16	113.88
2020	190.25	0.25	20.62	113.88
2021	187.6	0.26	23.63	113.88
2022	187.43	0.26	27.21	113.88
2023	187.74	0.26	29.21	113.88
2024	188.08	0.26	32.06	113.88
2025	188.05	0.26	32.06	113.88

Source: DOE, 2003

Table 2.4 Comparison of Electric Generation in Illinois and in the Mid-America Interconnected Network Region (2000)

Fuel Type	Illinois (million kWhs)	Mid-America Interconnected Network Region (million kWhs)	Illinois Percent of Region (%)
Coal	81,587	154,020	53.0
Nuclear	89,438	110,940	80.6
Natural Gas	5,042	5,710	88.3
Petroleum	591	850	69.5
Total	176,658	271,520	65.1

Source: DOE, 2003.

Table 2.5 Projected of Electric Generation by Major Fuel Type in Illinois (million kWhs): 2005-2025

Year	2000	2005	2010	2015	2020	2025
Coal	81,587	84,850.5	98,393.9	101,004.7	100,759.9	99,617.7
		(4.0)	(20.6)	(23.8)	(23.5)	(22.1)
Nuclear	89,438	91,137.3	91,852.8	91,852.8	91,852.8	91,852.8
		(1.9)	(2.7)	(2.7)	(2.7)	(2.7)
Natural Gas	5,042	8,521.0	8,768.0	9,352.9	18,206.7	28,310.8
		(69.0)	(73.9)	(85.5)	(261.1)	(461.5)
Petroleum	591	111.1	132.4	138.9	173.8	180.8
		(-81.2)	(-77.6)	(-76.5)	(-70.6)	(-69.4)
Total	176,658	184,619.9	199,147.1	202,349.3	210,993.2	219,962.1

Numbers in parentheses are the estimated percent of change from 2000
Source: DOE, 2003

Deriving County-Level Projections from State-level Projections

The year 2000 generation of thermoelectric power plants in Illinois was used as the basis for allocating state-level projections of thermoelectric generation to the county and generator level. Information on the thermoelectric power plants in Illinois was extracted from the U.S. Department of Energy, Energy Information Administration's *EIA 767* database. The *EIA 767* form is used by Department of Energy to collect annual data from all organic- or nuclear-fueled steam-electric plants with a generating capacity (nameplate rating) of 10 megawatts or more. In the year 2000, there were 32 steam thermoelectric power plants in Illinois listed in *EIA 767* database with available data, with a total generation of 172,388 million kWhs. These plants accounted for 97.6 percent of state total thermoelectric generation (Table 2A-1).

In order to estimate the amount of thermoelectric generation in each county, the forecasts of State electric generation were allocated to the power plants in the EIA-767 database. Separate allocation procedures were developed for power plants by fuel type and are described in the following sections.

Projected Generation by Fuel Type

Generation by Coal Power Plants

The 2000 *EIA 767* database reports that there are 24 power plants in 20 counties in Illinois that use coal to generate electricity. Total year 2000 generation reported in the *EIA 767* database from these power plants was 80,715 MKWhs. This is very close to the total state generation from coal-powered plants reported in the DOE's *Electric Power Annual 2000* (81,587 MKWhs). In addition, the existing coal-powered generating units have enough generation capacity to accommodate all of the projected increase in coal-powered thermoelectric generation in Illinois. Thus, 100 percent of the (NEMS-derived) state projected generation from coal was assigned to the plants in the *EIA-767* database.

The capacity utilization of coal-powered plants in the state varies considerably (Table 2A-1). For example, while the power plant in Massac County has an average percentage of generation capacity utilization above 80 percent for five out of its six generators, and nearly 70 percent for the sixth generator, 27 generators at 16 other power plants in the state have a capacity utilization of below 50 percent.

The allocation of the state projection of electric generation to individual coal power plants was based on their actual amount of generation in 2000. In addition, once the percentage of generation capacity utilization for a generator reached 80 percent, it was assumed that the generator will not increase its generation any further, but will maintain that level of generation throughout the projection period. For the five generators in Massac County whose utilization rate in 2000 was already above 80 percent, generation is assumed to stay at the 2000 level for each projection year. Table 2.6 shows the generation projections, by generator, for each projection year. The numbers in bold are used to identify the generators whose capacity was fixed for all subsequent projection years after reaching a generator capacity of 80 percent.

Table 2.6 Forecast of Coal Power Generation in Illinois: 2005-2025 (million kWhs)

County	Plant Code	Generator Code	2005	2010	2015	2020	2025
Christian	876	1	2,701.7 (46.8)	3,229.5 (55.9)	3,348.3 (57.9)	3,336.6 (57.7)	3,282.0 (56.8)
Christian	876	2	3,294.4 (57.0)	3,938.0 (68.1)	4,082.9 (70.7)	4,068.6 (70.4)	4,002.0 (69.3)
Cook	867	7	1,213.0 (57.9)	1,450.0 (69.2)	1,503.4 (71.7)	1,498.1 (71.4)	1,473.6 (70.3)
Cook	867	8	1,699.1 (54.2)	2,031.0 (64.7)	2,105.8 (67.1)	2,098.4 (66.9)	2,064.1 (65.8)
Cook	886	19	1,620.7 (49.5)	1,937.3 (59.1)	2,008.6 (61.3)	2,001.6 (61.1)	1,968.8 (60.1)
Crawford	863	3	244.2 (37.2)	291.9 (44.4)	302.6 (46.1)	301.6 (45.9)	296.6 (45.2)
Crawford	863	4	310.2 (47.2)	370.8 (56.4)	384.4 (58.5)	383.1 (58.3)	376.8 (57.4)
Fulton	6016	1	2,294.3 (59.4)	2,742.4 (71.0)	2,843.4 (73.6)	2,833.4 (73.3)	2,787.1 (72.1)
Jackson	862	3	226.6 (30.2)	270.9 (36.1)	280.8 (37.4)	279.9 (37.3)	275.3 (36.7)
Jackson	862	4	347.7 (34.9)	415.6 (41.7)	430.9 (43.3)	429.4 (43.1)	422.3 (42.4)
Jasper	6017	1	3,133.8 (57.9)	3,745.9 (69.3)	3,883.8 (71.8)	3,870.2 (71.6)	3,806.9 (70.4)
Jasper	6017	2	3,515.8 (65.0)	4,202.5 (77.7)	**4,326.7** **(80.0)**	**4,326.7** **(80.0)**	**4,326.7** **(80.0)**
Lake	883	6	557.8 (52.6)	666.8 (62.9)	691.3 (65.2)	688.9 (65.0)	677.6 (63.9)
Lake	883	7	1,947.1 (68.1)	**2,287.4** **(80.0)**	**2,287.4** **(80.0)**	**2,287.4** **(80.0)**	**2,287.4** **(80.0)**

Table 2.6 *(cont'd)* Forecast of Coal Power Generation in Illinois: 2005-2025 (million kWhs)

County	Plant Code	Generator Code	2005	2010	2015	2020	2025
Lake	883	8	2,349.5 (75.5)	**2,489.9** **(80.0)**	**2,489.9** **(80.0)**	**2,489.9** **(80.0)**	**2,489.9** **(80.0)**
Madison	898	4	484.1 (49.1)	578.7 (58.7)	600.0 (60.9)	597.9 (60.7)	588.1 (59.7)
Madison	898	5	1,672.0 (49.2)	1,998.6 (58.9)	2,072.2 (61.0)	2,064.9 (60.8)	2,031.1 (59.8)
Mason	891	6	2,280.3 (53.3)	2,725.7 (63.7)	2,826.0 (66.0)	2,816.2 (65.8)	2,770.1 (64.7)
Massac	887	1	**1,440.7** **(89.7)**	**1,440.7** **(89.7)**	**1,440.7** **(89.7)**	**1,440.7** **(89.7)**	**1,440.7** **(89.7)**
Massac	887	2	**1,289.0** **(80.2)**	**1,289.0** **(80.2)**	**1,289.0** **(80.2)**	**1,289.0** **(80.2)**	**1,289.0** **(80.2)**
Massac	887	3	1,167.2 (72.7)	**1,285.1** **(80.0)**	**1,285.1** **(80.0)**	**1,285.1** **(80.0)**	**1,285.1** **(80.0)**
Massac	887	4	**1,405.5** **(87.5)**	**1,405.5** **(87.5)**	**1,405.5** **(87.5)**	**1,405.5** **(87.5)**	**1,405.5** **(87.5)**
Massac	887	5	**1,417.2** **(88.2)**	**1,417.2** **(88.2)**	**1,417.2** **(88.2)**	**1,417.2** **(88.2)**	**1,417.2** **(88.2)**
Massac	887	6	**1,406.4** **(87.6)**	**1,406.4** **(87.6)**	**1,406.4** **(87.6)**	**1,406.4** **(87.6)**	**1,406.4** **(87.6)**
Montgomery	861	1	1,714.2 (50.3)	2,049.1 (60.1)	2,124.5 (62.4)	2,117.1 (62.1)	2,082.4 (61.1)
Montgomery	861	2	2,915.6 (54.0)	3,485.1 (64.5)	3,613.4 (66.9)	3,600.7 (66.7)	3,541.8 (65.6)
Morgan	864	1	188.9 (37.5)	225.8 (44.8)	234.1 (46.5)	233.3 (46.3)	229.5 (45.6)
Morgan	864	2	186.0 (36.9)	222.4 (44.1)	230.6 (45.8)	229.8 (45.6)	226.0 (44.9)
Morgan	864	3	881.5 (42.0)	1,053.7 (50.3)	1,092.5 (52.1)	1,088.7 (51.9)	1,070.9 (51.1)
Peoria	856	1	677.5 (56.9)	809.9 (68.0)	839.7 (70.5)	836.7 (70.2)	823.0 (69.1)
Peoria	856	2	1,730.8 (70.4)	**1,965.7** **(80.0)**	**1,965.7** **(80.0)**	**1,965.7** **(80.0)**	**1,965.7** **(80.0)**
Peoria	856	3	1,875.3 (58.8)	2,241.6 (70.3)	2,324.1 (72.9)	2,316.0 (72.7)	2,278.1 (71.5)
Putnam	892	1	379.6 (57.8)	453.7 (69.1)	470.4 (71.6)	468.8 (71.4)	461.1 (70.2)
Putnam	892	2	1,394.6 (68.8)	**1,620.6** **(80.0)**	**1,620.6** **(80.0)**	**1,620.6** **(80.0)**	**1,620.6** **(80.0)**
Randolph	889	1	3,895.0 (71.4)	**4,366.3** **(80.0)**	**4,366.3** **(80.0)**	**4,366.3** **(80.0)**	**4,366.3** **(80.0)**
Randolph	889	2	2,731.5 (49.1)	3,265.1 (58.7)	3,385.2 (60.9)	3,373.4 (60.7)	3,318.2 (59.7)

Table 2.6 *(cont'd)* Forecast of Coal Power Generation in Illinois: 2005-2025 (million kWhs)

County	Plant Code	Generator Code	2005	2010	2015	2020	2025
Randolph	889	3	4,321.9	**4,446.6**	**4,446.6**	**4,446.6**	**4,446.6**
			(77.8)	**(80.0)**	**(80.0)**	**(80.0)**	**(80.0)**
Sangamon	963	1	341.6	408.3	423.3	421.8	414.9
			(43.2)	(51.6)	(53.5)	(53.4)	(52.5)
Sangamon	963	2	385.5	460.8	477.7	476.0	468.3
			(48.8)	(58.3)	(60.4)	(60.2)	(59.2)
Sangamon	963	3	1,107.2	1,323.5	1,372.2	1,367.4	1,345.0
			(61.0)	(72.9)	(75.5)	(75.3)	(74.0)
Sangamon	964	6	0.0	0.0	0.0	0.0	0.0
			(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Sangamon	964	7	0.0	0.0	0.0	0.0	0.0
			(0.0)	(0.0)	(0.0)	(0.0)	(0.0)
Tazewell	879	5	3,621.8	4,329.2	4,488.6	4,472.9	4,399.7
			(46.3)	(55.4)	(57.4)	(57.2)	(56.3)
Tazewell	879	6	4,253.9	5,084.8	5,272.0	5,253.6	5,167.6
			(54.4)	(65.0)	(67.4)	(67.2)	(66.1)
Vermilion	897	2	523.6	625.8	648.9	646.6	636.0
			(54.9)	(65.7)	(68.1)	(67.8)	(66.7)
Vermilion	897	ST1	404.3	483.3	501.0	499.3	491.1
			(62.8)	(75.1)	(77.8)	(77.5)	(76.3)
Will	384	7	2,407.0	2,877.2	2,983.1	2,972.6	2,924.0
			(41.6)	(49.8)	(51.6)	(51.4)	(50.6)
Will	384	8	3,124.6	3,734.9	3,872.4	3,858.9	3,795.7
			(54.0)	(64.6)	(67.0)	(66.7)	(65.7)
Will	874	6	1,246.4	1,489.9	1,544.7	1,539.3	1,514.1
			(39.5)	(47.2)	(48.9)	(48.8)	(48.0)
Will	884	1	647.7	774.3	802.8	800.0	786.9
			(39.4)	(47.1)	(48.9)	(48.7)	(47.9)
Will	884	2	687.7	822.1	852.3	849.4	835.5
			(42.7)	(51.1)	(53.0)	(52.8)	(51.9)
Will	884	3	1,548.1	1,850.5	1,918.6	1,911.9	1,880.6
			(59.1)	(70.6)	(73.2)	(72.9)	(71.8)
Will	884	4	2,216.8	2,649.8	2,747.3	2,737.7	2,692.9
			(42.3)	(50.5)	(52.4)	(52.2)	(51.4)
Williamson	976	1	134.9	161.2	167.1	166.5	163.8
			(46.6)	(55.8)	(57.8)	(57.6)	(56.7)
Williamson	976	2	86.9	103.9	107.7	107.3	105.5
			(30.1)	(35.9)	(37.2)	(37.1)	(36.5)
Williamson	976	3	150.6	180.0	186.6	186.0	182.9
			(52.1)	(62.3)	(64.6)	(64.3)	(63.3)
Williamson	976	4	1,051.1	**1,212.4**	**1,212.4**	**1,212.4**	**1,212.4**
			(69.4)	**(80.0)**	**(80.0)**	**(80.0)**	**(80.0)**
			84,850.5	98,393.9	101,004.7	100,759.9	99,617.7
State Totals	--	--	(56.3)	(65.3)	(67.0)	(66.9)	(66.1)

Numbers in parentheses are the percentage of generation capacity utilized for generation.
Numbers in bold face are those that do not change in the subsequent years.

Generation by Nuclear Power Plants

The 2000 *EIA 767* database identifies six nuclear power plants, located in six counties in Illinois. Total generation at these plants is equal to 89,415 million kWhs, which is consistent with the 89,438 million kWhs reported in DOE *Electric Power Annual 2000*. Thus, the total nuclear power generation in the State was completely accounted for in the *EIA 767* database.

The generation capacity in all six power plants is highly utilized, with utilization percentage ranging from 79.8 to 95.1 percent. The projected increase in State total nuclear generation was prorated to existing nuclear power plant generators based on the amount of their generation in 2000, except for three generators whose percentages of capacity utilized was over 93 percent. These three generators are located in Grundy, La Salle, and Ogle Counties, respectively. Generation is projected to increase slightly in 2005 and 2010 and then remain constant throughout the projection period. Table 2.7 shows the projected amount of nuclear generation by each nuclear generator for each forecast year in Illinois.

Table 2.7 Projected Nuclear Power Generation in Illinois: 2005-2025 (million kWhs)

County	Plant Code	Generator Code	2005	2010	2015	2020	2025
Dewitt	204	1	7,077.7 (82.0)	7,156.2 (82.9)	7,156.2 (82.9)	7,156.2 (82.9)	7,156.2 (82.9)
Grundy	869	2	6,867.4 (94.6)	6,867.4 (94.6)	6,867.4 (94.6)	6,867.4 (94.6)	6,867.4 (94.6)
Grundy	869	3	6,539.6 (90.1)	6,612.2 (91.1)	6,612.2 (91.1)	6,612.2 (91.1)	6,612.2 (91.1)
LaSalle	6026	1	9,745.4 (95.1)	9,745.4 (95.1)	9,745.4 (95.1)	9,745.4 (95.1)	9,745.4 (95.1)
LaSalle	6026	2	9,288.3 (90.6)	9,391.3 (91.6)	9,391.3 (91.6)	9,391.3 (91.6)	9,391.3 (91.6)
Ogle	6023	1	9,546.6 (89.0)	9,652.5 (90.0)	9652.5 (90.0)	9,652.5 (90.0)	9,652.5 (90.0)
Ogle	6023	2	10005.4 (93.2)	10,005.4 (93.2)	10,005.4 (93.2)	10,005.4 (93.2)	10,005.4 (93.2)
Rock Island	880	1	6,337.2 (87.3)	6,407.5 (88.3)	6,407.5 (88.3)	6,407.5 (88.3)	6,407.5 (88.3)
Rock Island	880	2	6,391.2 (88.1)	6,462.0 (89.1)	6,462.0 (89.1)	6,462.0 (89.1)	6,462.0 (89.1)
Will	6022	1	9,566.6 (89.2)	9,672.7 (90.1)	9,672.7 (90.1)	9,672.7 (90.1)	9,672.7 (90.1)
Will	6022	2	9,771.7 (91.1)	9,880.1 (92.1)	9,880.1 (92.1)	9,880.1 (92.1)	9,880.1 (92.1)
State Totals	--	--	91,137.3 (90.2)	91,852.8 (90.9)	91,852.8 (90.9)	91,852.8 (90.9)	91,852.8 (90.9)

Numbers in parentheses are the percentage of generation capacity utilized for generation.
Note: The 2000, EIA-767 database lists 36 plants but contains no generation information for four plants.

Generation Using Natural Gas

The 2000 *EIA 767* database lists three power plants in two counties that are using natural gas to generate electricity. The total amount of electric generation from these three power plants was 2,130.1 million kWhs, which is only 42 percent of what was reported in *Electric Power Annual 2000* (5,042 million kWhs). There are two likely reasons for this possible under-reporting in the EIA 767 database: (1) EIA form 767 only collects data for generators with nameplate capacity more than 10 megawatts; (2) electric generation using gas turbines is not covered by EIA form 767. Although natural gas is used as a fuel source by both turbine and steam power generators in Illinois, only the gas-steam power plants included in EIA767 are used for projecting water withdrawals in this study, even though their total generation is smaller than the actual generation using natural gas in Illinois

The NEMS has projected a total of 15,770 Megawatts of gas powered internal combustion and combined cycle capacity additions in the Mid-America Interconnected Network Region by 2025 (Table 2.8). The natural gas generation units listed in *EIA 767* database cannot generate the projected amount of electricity even running at their full load (100 percent capacity), therefore the majority of the capacity additions are assumed to be from combustion turbines or combined cycle generators that use natural gas or petroleum (Note: DOE does not predict any capacity addition for the "other Fossil steam" category, Table 2.2) Since it is projected that there will be a substantial increase in the amount of electric generation from natural gas, while the amount of electric generation using petroleum will remain unchanged, it can be assumed that the majority of these capacity additions will use natural gas.

Table 2.8 Scenario for Future Natural Gas Generation in Illinois
Based on NEMS Forecast of Natural Gas Capacity Additions: 2005-2025

Year	Capacity Additions in Mid-America Interconnected Network Region (Megawatt)	Illinois Capacity Additions* (Megawatt)	Generation at Half Load in Illinois** (MKWhs)	Illinois Forecast of Generation with Gas (MKWhs)
2005	4,700	2,350	10,293	8,521
2010	5,680	2,840	12,439	8,768
2015	6,470	3,235	14,169	9,353
2020	10,380	5,190	22,732	18,207
2025	15,770	7,885	34,536	28,311

*Assumes that half of the Region's capacity additions take place in Illinois.
**Assumes that the percent of generation capacity utilization is 50 percent.

In 2000, Illinois accounted for more than 80 percent of the electricity generated using natural gas in the Mid-America Interconnected Network Region. If only half of the projected capacity additions are located in Illinois, and these new generation units run at only half-load, they will still generate more than the projected State total electric generation from natural gas. Since it is assumed in this study that all the natural gas capacity additions will be at combined cycle and combustion turbine generators, water use projections for generation using natural gas will estimated only for existing natural gas steam power plants.

Since virtually all of the projected generation from natural gas is assumed to be supplied by these capacity additions, the natural gas-steam power plants identified in the EIA 767 database are not expected to operate at full load. The current maximum rate of capacity utilization at Illinois natural gas steam power plants was 12 percent. Therefore, these projections assume that all Illinois plants will operate at a 12 percent capacity utilization level in each projection year. The projected 12 percent capacity rate was calculated for each gas-steam powered generator and appears in Table 2.9.

Table 2.9 Projected Plant-Level Natural Gas Steam Power Generation in Illinois: 2005-2025

County	**Plant Code**	**Gen. Code**	**Generation (million kWhs)**		**County**	**Plant Code**	**Gen. Code**	**Generation (million kWhs)**	
			2000	**Projected 2005-2025**				**2000**	**Projected 2005-2025**
Grundy	6025	1	308.6	572.9	Madison	898	3	11.9	52.6
Grundy	6025	2	510.9	572.9	Madison	913	2	-2.8	42.0
Grundy	6025	3	540.6	545.5	Madison	913	3	6.8	103.0
Grundy	6025	4	314.9	547.4	Madison	913	4	13.9	103.0
Grundy	6025	5	375.4	547.4	Madison	913	5	17.0	103.0
Madison	898	1	11.9	52.6	Madison	913	6	8.3	105.1
Madison	898	2	11.9	52.6	Madison	913	ST1	0.7	42.0
					State Totals	--	--	--	3,442.0

Generation by Petroleum Power Plants

Two power plants listed in the 2000 EIA 767 database that use petroleum as the sole source for electric generation: one in Mason County, and one in Morgan County. Total generation from these plants in 2000 was 127.5 million kWhs, which is only about 22 percent of the generation reported in *Electric Power Annual 2000* (591 million kWhs). However, the NEMS projects a decrease in the amount of generation using petroleum between 2000 and 2005, and the generation capacity recorded in the form *EIA 767* database is sufficient to meet these projected quantities. Therefore, the projected generation using petroleum was assigned only to those power plants included in the year 2000 *EIA 767* database.

Table 2.10 Projected Petroleum Power Generation in Illinois: 2005-2025 (MKWhs)

County	Plant Code	Generator Code	2005	2010	2015	2020	2025
Mason	891	1	12.4	14.7	15.4	19.3	20.1
			(3.1)	(3.7)	(3.8)	(4.8)	(5.0)
Mason	891	2	9.8	11.7	12.3	15.4	16.0
			(2.4)	(2.9)	(3.0)	(3.8)	(4.0)
Mason	891	3	11.7	14.0	14.7	18.4	19.1
			(2.9)	(3.5)	(3.6)	(4.6)	(4.7)
Mason	891	4	11.4	13.6	14.3	17.9	18.6
			(2.8)	(3.4)	(3.5)	(4.4)	(4.6)
Mason	891	5	12.7	15.2	15.9	19.9	20.7
			(3.2)	(3.8)	(3.9)	(4.9)	(5.1)
Morgan	864	4	53.0	63.2	66.3	82.9	86.3
			(2.9)	(3.4)	(3.6)	(4.5)	(4.7)
State Totals	--	--	111.1	132.4	138.9	173.8	180.8
			(2.9)	(3.4)	(3.6)	(4.5)	(4.7)

Numbers in parentheses are the percentage of generation capacity utilized for generation

The generators at all of the petroleum power plants use only a fraction of their potential capacity (utilization is less than 4.0 percent). As with the projection for other fuel types, generation projections were calculated by prorating the State total generation using petroleum to each generating unit (Table 2.10).

Estimation of Thermoelectric Withdrawals

Projections of future water withdrawals for each generator in each thermoelectric plant were estimated by multiplying projected thermoelectric generation (described in the previous sections) and an estimated unit thermoelectric withdrawal coefficient for each generator unit. Total county estimates were then calculated by aggregating the projections from each generating unit. Because the USGS withdrawal estimates are disaggregated only to county level, cooling water flow rate estimates from the *EIA 767* database were used to calculate the unit thermoelectric withdrawal for each generator. This procedure is described in the following paragraphs.

The relationship between boilers, generators, and cooling systems is often complicated, and the calculation of the unit thermoelectric withdrawal for each generator required several simplifying assumptions. First, the estimation in this study assumed that a single unit thermoelectric withdrawal coefficient could be estimated, and applied to all the generators that are connected to the same cooling system. Second, the information available in the *EIA 767* data for the year 2000 were assumed to be representative of the future unit-use of each generator. In most cases, unit withdrawal for each generating unit were estimated by dividing the total annual water use (calculated from the reported cooling-water flow rate) by the total annual generation for the year 2000 as reported in the *EIA 767* database.

For those generating units where withdrawal rates were not reported in the *EIA 767*, unit use coefficients were calculated by either: (1) using historical data from the most recently available year, or (2) using the flow at 100 percent utilization of the design capacity of the cooling system and adjusting it by the percent of generator utilization of that unit in the year 2000. In several counties (Christian, Cook, Ogle, Peoria, and Will), this procedure resulted in estimation of 2000 withdrawals that were significantly higher than the USGS estimates for the year 2000. One possible explanation for this result is that the USGS estimates did not include water use estimates for some of the generating units in these counties.

Five years of available *EIA 767* data (1996-2000) were reviewed in an effort to assess whether or not there was any discernible trend in the efficiency of thermoelectric water use in Illinois. However, no trend could be determined and therefore the unit-use coefficients (in gallons/kWh) were held constant throughout the entire projection period. Therefore, the impacts of potential water conservation activities are not considered in the projections made using these coefficients. The unit thermoelectric withdrawals used in calculating the projected water withdrawals for each generator unit are presented in Table 2.11

Table 2.11 Plant Level Projection Results of Thermoelectric Water Withdrawals in Illinois: 2005-2025

County	Plant ID	Generator Code	Cool System Code	Cool Type	Unit Thermo-electric Withdrawals (gal/KWh)	Thermoelectric Withdrawals					
						2000	2005	2010	2015	2020	2025
Christian	876	1	1	RC	106.9	749.3	791.3	945.8	980.6	977.2	961.2
Christian	876	2	2	RC	96.2	822.2	868.3	1,037.9	1,076.1	1,072.3	1,054.8
Cook	867	7	7	OF	131.7	414.4	437.7	523.2	542.4	540.5	531.7
Cook	867	8	8	OF	91.0	401.1	423.6	506.4	525.0	523.2	514.6
Cook	886	19	19	OF	43.7	183.7	194.0	231.9	240.5	239.6	235.7
Crawford	863	3	2	OF	53.3	33.8	35.7	42.6	44.2	44.0	43.3
Crawford	863	4	2	OF	53.3	42.9	45.3	54.1	56.1	55.9	55.0
Dewitt	204	1	CW	OC	33.3	628.5	645.7	652.9	652.9	652.9	652.9
Fulton	6016	1	1	RC	39.2	233.1	246.2	294.3	305.1	304.1	299.1
Grundy	869	2	OC	RC, OC	4.6	86.5	86.5	86.5	86.5	86.5	86.5
Grundy	869	3	OC	RC, OC	4.6	80.2	82.4	83.3	83.3	83.3	83.3
Grundy	6025	1	1	RC	189.0	159.8	296.6	296.6	296.6	296.6	296.6
Grundy	6025	2	2	RC	114.2	159.8	179.2	179.2	179.2	179.2	179.2
Grundy	6025	3	3	RC	107.9	159.8	161.3	161.3	161.3	161.3	161.3
Grundy	6025	4	4	RC	185.3	159.9	277.9	277.9	277.9	277.9	277.9
Grundy	6025	5	5	RC	155.4	159.8	233.1	233.1	233.1	233.1	233.1
Jackson	862	3	3	OF	94.8	55.7	58.9	70.4	72.9	72.7	71.5
Jackson	862	4	4	OF	60.2	54.3	57.3	68.5	71.1	70.8	69.7
Jasper	6017	1	1	OC	31.0	252.0	266.2	318.1	329.9	328.7	323.3
Jasper	6017	2	2	OC	30.1	274.5	289.9	346.6	356.8	356.8	356.8
Lake	883	6	6	OF	96.9	140.2	148.1	177.0	183.5	182.9	179.9
Lake	883	7	7	OF	44.0	222.3	234.7	275.7	275.7	275.7	275.7
Lake	883	8	8	OF	48.5	295.6	312.2	330.9	330.9	330.9	330.9

Table 2.11 *(cont'd)* Plant Level Projection Results of Thermoelectric Water Withdrawals in Illinois: 2005-2025

County	Plant ID	Generator Code	Cool System Code	Cool Type	Unit Thermo-electric Withdrawals (gal/KWh)	Thermoelectric Withdrawals					
						2000	2005	2010	2015	2020	2025
LaSalle	6026	1	OC	RC	1.2	32.0	32.0	32.0	32.0	32.0	32.0
LaSalle	6026	2	OC	RC	1.2	29.7	30.5	30.9	30.9	30.9	30.9
Madison	898	1	1	OF	87.4	2.9	12.6	12.6	12.6	12.6	12.6
Madison	898	2	1	OF	87.4	2.9	12.6	12.6	12.6	12.6	12.6
Madison	898	3	1	OF	87.4	2.9	12.6	12.6	12.6	12.6	12.6
Madison	898	4	1	OF	87.4	109.8	115.9	138.6	143.7	143.2	140.8
Madison	898	5	1	OF	87.4	379.1	400.4	478.6	496.2	494.4	486.4
Madison	913	2	1-6	OF	368.6	-2.8	42.5	42.5	42.5	42.5	42.5
Madison	913	3	1-6	OF	368.6	6.9	104.0	104.0	104.0	104.0	104.0
Madison	913	4	1-6	OF	368.6	14.0	104.0	104.0	104.0	104.0	104.0
Madison	913	5	1-6	OF	368.6	17.2	104.0	104.0	104.0	104.0	104.0
Madison	913	6	1-6	OF	368.6	8.3	106.2	106.2	106.2	106.2	106.2
Madison	913	ST1	1-6	OF	368.6	0.7	42.5	42.5	42.5	42.5	42.5
Mason	891	1	1	OF	127.4	4.9	4.3	5.1	5.4	6.7	7.0
Mason	891	2	1	OF	127.4	3.9	3.4	4.1	4.3	5.4	5.6
Mason	891	3	1	OF	127.4	4.7	4.1	4.9	5.1	6.4	6.7
Mason	891	4	1	OF	127.4	4.6	4.0	4.8	5.0	6.2	6.5
Mason	891	5	1	OF	127.4	5.1	4.4	5.3	5.6	6.9	7.2
Mason	891	6	6	RF	10.1	59.7	63.1	75.4	78.2	77.9	76.7
Massac	887	1	1-4	OF	25.9	102.2	102.2	102.2	102.2	102.2	102.2
Massac	887	2	1-4	OF	25.9	91.5	91.5	91.5	91.5	91.5	91.5

Table 2.11 *(cont'd)* Plant Level Projection Results of Thermoelectric Water Withdrawals in Illinois: 2005-2025

County	Plant ID	Generator Code	Cool System Code	Cool Type	Unit Thermo-electric Withdrawals (gal/KWh)	Thermoelectric Withdrawals 2000	2005	2010	2015	2020	2025
Massac	887	3	1-4	OF	25.9	78.4	82.8	91.2	91.2	91.2	91.2
Massac	887	4	1-4	OF	25.9	99.7	99.7	99.7	99.7	99.7	99.7
Massac	887	5	5-6	OF	23.6	91.6	91.6	91.6	91.6	91.6	91.6
Massac	887	6	5-6	OF	23.6	90.9	90.9	90.9	90.9	90.9	90.9
Montgomery	861	1	1	OC	39.7	176.6	186.5	222.9	231.1	230.3	226.5
Montgomery	861	2	2	OC	34.8	263.2	278.0	332.3	344.5	343.3	337.7
Morgan	864	1	1	OF	95.7	46.9	49.5	59.2	61.4	61.2	60.2
Morgan	864	2	2	OF	92.0	44.4	46.9	56.0	58.1	57.9	57.0
Morgan	864	3	3	OF	39.0	89.2	94.2	112.6	116.7	116.3	114.4
Morgan	864	4	4	RI	79.5	13.3	11.5	13.8	14.4	18.1	18.8
Ogle	6023	1	RN1	RN	2.0	50.9	52.3	52.9	52.9	52.9	52.9
Ogle	6023	2	RN2	RN	1.2	32.5	32.5	32.5	32.5	32.5	32.5
Peoria	856	1	1	OF	137.5	241.7	255.2	305.1	316.3	315.2	310.0
Peoria	856	2	2	OF	27.7	124.6	131.6	149.4	149.4	149.4	149.4
Peoria	856	3	3	OF	31.3	152.3	160.8	192.2	199.3	198.6	195.3
Putnam	892	1	1	OF	38.9	38.3	40.5	48.4	50.1	50.0	49.1
Putnam	892	2	1	OF	38.9	140.7	148.6	172.7	172.7	172.7	172.7
Randolph	889	1	1	OC	1.1	11.1	11.7	13.2	13.2	13.2	13.2
Randolph	889	2	1	OC	1.1	7.8	8.2	9.8	10.2	10.2	10.0
Randolph	889	3	1	OC	1.1	12.3	13.0	13.4	13.4	13.4	13.4
Rock Island	880	1	OF	OF	32.6	550.9	566.0	572.3	572.3	572.3	572.3
Rock Island	880	2	OF	OF	32.6	555.6	570.8	577.2	577.2	577.2	577.2

Table 2.11 *(cont'd)* Plant Level Projection Results of Thermoelectric Water Withdrawals in Illinois: 2005-2025

County	Plant ID	Generator Code	Cool System Code	Cool Type	Unit Thermo-electric Withdrawals (gal/KWh)	Thermoelectric Withdrawals 2000	2005	2010	2015	2020	2025
Sangamon	963	1	31	OC	160.6	142.3	150.3	179.6	186.3	185.6	182.6
Sangamon	963	2	32	OC	46.6	46.6	49.2	58.8	61.0	60.7	59.8
Sangamon	963	3	33	OC	59.9	172.1	181.7	217.2	225.2	224.4	220.7
Sangamon	964	6			No reported	0.0	0.0	0.0	0.0	0.0	0.0
Sangamon	964	7			generation	0.0	0.0	0.0	0.0	0.0	0.0
Tazewell	879	5	5	RC	38.6	362.7	383.0	457.8	474.7	473.0	465.3
Tazewell	879	6	6	RC	38.0	419.4	442.9	529.4	548.9	546.9	538.0
Vermilion	897	2	1	RF	0.8	1.1	1.1	1.4	1.4	1.4	1.4
Vermilion	897	ST1	1	RF	0.8	0.8	0.9	1.1	1.1	1.1	1.1
Will	384	7	7	OF	75.7	472.8	499.3	596.9	618.8	616.7	606.6
Will	384	8	8	OF	56.2	455.2	480.7	574.6	595.8	593.7	584.0
Will	874	6	6	OF	87.8	283.9	299.8	358.4	371.6	370.3	364.2
Will	884	1	1	OF	86.9	146.1	154.3	184.4	191.2	190.6	187.4
Will	884	2	2	OF	84.3	150.5	158.9	189.9	196.9	196.3	193.0
Will	884	3	3	OF	85.5	343.2	362.5	433.3	449.2	447.7	440.3
Will	884	4	4	OF	95.9	551.4	582.3	696.0	721.7	719.1	707.4
Will	6022	1	OC	RC	0.7	17.9	18.3	18.6	18.6	18.6	18.6
Will	6022	2	OC	RC	0.7	18.2	18.7	18.9	18.9	18.9	18.9

Table 2.11 *(cont'd)* Plant Level Projection Results of Thermoelectric Water Withdrawals in Illinois: 2005-2025

County	Plant ID	Generator Code	Cool System Code	Cool Type	Unit Thermo-electric Withdrawals (gal/KWh)	Thermoelectric Withdrawals					
						2000	**2005**	**2010**	**2015**	**2020**	**2025**
Williamson	976	1	1-4	OC	33.9	11.9	12.5	15.0	15.5	15.5	15.2
Williamson	976	2	1-4	OC	33.9	7.6	8.1	9.6	10.0	10.0	9.8
Williamson	976	3	1-4	OC	33.9	13.2	14.0	16.7	17.3	17.3	17.0
Williamson	976	4	1-4	OC	33.9	92.4	97.6	112.6	112.6	112.6	112.6
State Totals	--	--	--	--	--	13,272	14,708	16,688	17,099	17,069	16,888

Source: EIA 767 database

Cooling System Codes:

OC- once-through with cooling ponds or canals
OF - fresh water once-through system
OS - saline once-through system
RC - re-circulating with cooling ponds or canals
RF - re-circulating with forced draft cooling towers
RI - re-circulating with induced draft cooling towers
RN - re-circulating with natural draft cooling towers

Note: Unit thermoelectric withdrawals were calculated based on 2000 water use and generation estimates from *EIA 767*, except for the following generating units:

- Christian Co., Plant 876, generating unit #2, used 1997 data.
- Cook Co., Plant 867, generating units #1 & #2, used 1999 data.
- Ogle Co. Plant 6023, generating unit #2, Peoria Co., Plant 856, generating units #2 & #3, and Sangamon Co., Plant 963, generating unit #2 all used unit withdrawal estimates calculated from the flow rate and percent of utilized generating capacity reported in *EIA 767* for 2000.
- Will Co., Plant 384, generating units #7 & #8, used 1997 data

THERMOELECTRIC WATER USE PROJECTIONS

The projected thermoelectric water use estimates from each generating unit were aggregated to county level and are presented in Table 2.12. The table also includes the USGS estimated water withdrawals for each county for the year 2000 (USGS counties estimates for 1985, 1990, and 1995 are presented in Table 2A.2), as well as an estimate of the 2000 water use calculated using the water use coefficients adopted for this study and power generation as reported in *EIA 767*. The study estimates differ from those published by the USGS by approximately 2.0 bgd. This difference is the result of the inclusion of estimates of water use for generating units in six counties (Christian, Cook, Ogle, Peoria, Sangamon, and Will) for which no water use data were available in the *EIA 767* database (as described above).

Table 2.12 Projection of County Level Thermoelectric Withdrawals (mgd): 2005-2025

County	USGS 2000	2000	2005	2010	2015	2020	2025
Christian	749.1	1,571.4	1,659.6	1,983.7	2,056.7	2,049.6	2,016.0
Cook	598.0	999.3	1,055.3	1,261.5	1,307.9	1,303.4	1,282.0
Crawford	77.3	76.7	81.0	96.8	100.3	100.0	98.3
Dewitt	628.3	628.5	645.7	652.9	652.9	652.9	652.9
Fulton	233.1	233.1	246.2	294.3	305.1	304.1	299.1
Grundy	967.3	965.9	1,317.0	1,318.0	1,318.0	1,318.0	1,318.0
Jackson	110.1	110.0	116.2	138.9	144.0	143.5	141.2
Jasper	526.7	526.6	556.1	664.7	686.7	685.5	680.1
Lake	658.2	658.1	695.0	783.6	790.1	789.5	786.5
LaSalle	59.9	61.8	62.6	62.9	62.9	62.9	62.9
Madison	542.0	541.8	1,057.2	1,158.1	1,180.8	1,178.6	1,168.1
Mason	84.2	83.0	83.4	99.6	103.5	109.6	109.6
Massac	556.1	554.4	558.8	567.2	567.2	567.2	567.2
Montgomery	439.6	439.8	464.4	555.1	575.6	573.6	564.2
Morgan	193.8	193.7	202.2	241.6	250.7	253.5	250.3
Ogle	50.1	83.4	84.8	85.4	85.4	85.4	85.4
Peoria	241.7	518.5	547.6	646.7	665.0	663.2	654.8
Putnam	179.1	179.0	189.1	221.1	222.9	222.7	221.9
Randolph	32.3	31.2	33.0	36.4	36.8	36.7	36.6
Rock Island	1,107.6	1,106.5	1,136.8	1,149.4	1,149.4	1,149.4	1,149.4
Sangamon	314.3	360.9	381.2	455.6	472.4	470.8	463.1
Tazewell	782.0	782.0	825.9	987.2	1,023.5	1,020.0	1,003.3
Vermilion	2.2	1.9	2.0	2.4	2.5	2.5	2.5
Will	2,027.9	2,439.2	2,575.0	3,071.1	3,182.8	3,171.8	3,120.5
Williamson	104.2	125.2	132.2	153.9	155.5	155.3	154.6
State Totals	11,265.3	13,272.2	14,708.3	16,688.2	17,098.6	17,069.4	16,888.5

Note: USGS also reported Thermo withdrawals for DuPage County in 1990/5 and Pike County in 1985/90/95. These counties reported zero Thermo generation for 2000 and are assumed to have no future thermo water use.

The projection results estimate that the total thermoelectric water withdrawals in Illinois will increase by more than 3 billion gallons per day between 2000 and 2025, after peaking at 17.1 bgd in 2015. This decline after 2015 occurs largely as the result of the projected decline in coal generation. The largest increases are projected for Will (681 mgd), Madison (626 mgd), and Grundy (352 mgd) Counties.

CHAPTER 2 ANNEX

Table 2A.1 Overview of Steam Thermoelectric Power Plants in Illinois: 2000

County	Plant Code	Generator Code	Rated Capacity (Megawatt)	Annual Generation (MKWhs)	Percent Capacity Utilized (%)	Fuel Type*
Christian	876	1	659.7	2,558.3	44.3	Coal
Christian	876	2	659.7	3,119.5	54.0	Coal
Cook	867	7	239.4	1,148.6	54.8	Coal
Cook	867	8	358.2	1,608.9	51.3	Coal
Cook	886	19	374.1	1,534.7	46.8	Coal
Crawford	863	3	75.0	231.2	35.2	Coal
Crawford	863	4	75.0	293.7	44.7	Coal
Dewitt	204	1	984.9	6,888.8	79.8	Nuclear
Fulton	6016	1	441.0	2,172.5	56.2	Coal
Grundy	869	2	828.3	6,867.4	94.6	Nuclear
Grundy	869	3	828.3	6,365.1	87.7	Nuclear
Grundy	6025	1	545.0	308.6	6.5	Gas, petroleum
Grundy	6025	2	545.0	510.9	10.7	Gas, petroleum
Grundy	6025	3	518.9	540.6	11.9	Gas, petroleum
Grundy	6025	4	520.7	314.9	6.9	Gas, petroleum
Grundy	6025	5	520.7	375.4	8.2	Gas, petroleum
Jackson	862	3	85.7	214.6	28.6	Coal
Jackson	862	4	113.6	329.2	33.1	Coal
Jasper	6017	1	617.4	2,967.4	54.9	Coal
Jasper	6017	2	617.4	3,329.1	61.6	Coal
Lake	883	6	121.0	528.2	49.8	Coal
Lake	883	7	326.4	1,843.7	64.5	Coal
Lake	883	8	355.3	2,224.7	71.5	Coal
LaSalle	6026	1	1,170.3	9,745.4	95.1	Nuclear
LaSalle	6026	2	1,170.3	9,040.4	88.2	Nuclear
Madison	898	1	50.0	11.9	2.7	Gas, petroleum
Madison	898	2	50.0	11.9	2.7	Gas, petroleum
Madison	898	3	50.0	11.9	2.7	Gas, petroleum
Madison	898	4	112.5	458.4	46.5	Coal, gas
Madison	898	5	387.6	1,583.2	46.6	Coal
Madison	913	2	40.0	-2.8	NA	Gas, petroleum
Madison	913	3	98.0	6.8	0.8	Gas, petroleum
Madison	913	4	98.0	13.9	1.6	Gas, petroleum
Madison	913	5	98.0	17.0	2.0	Gas, petroleum
Madison	913	6	100.0	8.3	0.9	Gas, petroleum
Madison	913	ST1	40.0	0.7	0.2	Gas, petroleum

Table 2A.1 *(cont'd)* Overview of Steam Thermoelectric Power Plants in Illinois: 2000

County	Plant Code	Generator Code	Rated Capacity (Megawatt)	Annual Generation (MKWhs)	Percent Capacity Utilized (%)	Fuel Type*
Mason	891	1	46.0	14.2	3.5	Petroleum
Mason	891	2	46.0	11.3	2.8	Petroleum
Mason	891	3	46.0	13.5	3.3	Petroleum
Mason	891	4	46.0	13.1	3.3	Petroleum
Mason	891	5	46.0	14.6	3.6	Petroleum
Mason	891	6	488.5	2,159.2	50.5	Coal
Mason	891	1	46.0	14.2	3.5	Petroleum
Mason	891	2	46.0	11.3	2.8	Petroleum
Massac	887	1	183.4	1,440.7	89.7	Coal, gas
Massac	887	2	183.4	1,289.0	80.2	Coal
Massac	887	3	183.4	1,105.2	68.8	Coal
Massac	887	4	183.4	1,405.5	87.5	Coal, gas
Massac	887	5	183.4	1,417.2	88.2	Coal
Massac	887	6	183.4	1,406.4	87.6	Coal
Montgomery	861	1	389.0	1,623.2	47.6	Coal
Montgomery	861	2	616.5	2,760.8	51.1	Coal
Morgan	864	1	57.5	178.9	35.5	Coal
Morgan	864	2	57.5	176.2	35.0	Coal
Morgan	864	3	239.4	834.7	39.8	Coal
Morgan	864	4	209.7	60.8	3.3	Petroleum
Ogle	6023	1	1,224.9	9,291.9	86.6	Nuclear
Ogle	6023	2	1,224.9	10,005.4	93.2	Nuclear
Peoria	856	1	136.0	641.5	53.8	Coal
Peoria	856	2	280.5	1,638.9	66.7	Coal
Peoria	856	3	363.8	1,775.7	55.7	Coal
Putnam	892	1	75.0	359.4	54.7	Coal, gas
Putnam	892	2	231.3	1,320.6	65.2	Coal, gas
Randolph	889	1	623.1	3,688.2	67.6	Coal
Randolph	889	2	634.5	2,586.5	46.5	Coal
Randolph	889	3	634.5	4,092.4	73.6	Coal
Rock Island	880	1	828.3	6,168.1	85.0	Nuclear
Rock Island	880	2	828.3	6,220.6	85.7	Nuclear
Sangamon	963	1	90.3	323.4	40.9	Coal
Sangamon	963	2	90.3	365.0	46.2	Coal
Sangamon	963	3	207.4	1,048.4	57.7	Coal
Sangamon	964	6	37.5	0.0	0.0	Coal, petroleum, gas
Sangamon	964	7	37.5	0.0	0.0	Coal, petroleum

Table 2A.1 *(cont'd)* Overview of Steam Thermoelectric Power Plants in Illinois: 2000

County	**Plant Code**	**Generator Code**	**Rated Capacity (Megawatt)**	**Annual Generation (MKWhs)**	**Percent Capacity Utilized (%)**	**Fuel Type***
Tazewell	879	5	892.8	3,429.5	43.8	Coal
Tazewell	879	6	892.8	4,028.0	51.5	Coal
Vermilion	897	2	108.8	495.8	52.0	Coal, gas
Vermilion	897	ST1	73.5	382.8	59.5	Coal, gas
Will	384	7	660.0	2,279.2	39.4	Coal
Will	384	8	660.0	2,958.7	51.2	Coal
Will	874	6	360.4	1,180.2	37.4	Coal
Will	884	1	187.5	613.3	37.3	Coal
Will	884	2	183.8	651.2	40.5	Coal
Will	884	3	299.2	1,465.9	55.9	Coal
Will	884	4	598.4	2,099.1	40.0	Coal
Will	6022	1	1,224.9	9,311.3	86.8	Nuclear
Will	6022	2	1,224.9	9,510.9	88.6	Nuclear
Williamson	976	1	33.0	127.7	44.2	Coal
Williamson	976	2	33.0	82.3	28.5	Coal
Williamson	976	3	33.0	142.6	49.3	Coal
Williamson	976	4	173.0	995.3	65.7	Coal
State Totals	32 plants	88 units	32,451.0	172,387.3	60.6	--

*Fuel types are listed in the order of greatest use. Source: DOE, 2000

Table 2A.2 Estimated Thermoelectric Water Withdrawals (1985 – 2000)

County	1985	1990	1995	2000
Christian	859.45	793.43	770.85	749.10
Cook	580.82	409.64	409.18	598.00
Crawford	150.22	59.42	47.69	77.32
De Witt	125.28	493.18	709.40	628.30
DuPage	0.00	0.01	0.01	0.00
Fulton	234.60	267.99	247.67	233.14
Grundy	781.18	1,537.94	2,550.76	967.34
Jackson	142.53	142.85	180.01	110.10
Jasper	387.67	419.18	529.68	526.70
Lake	2,170.33	2,789.62	2,363.99	658.20
LaSalle	923.47	630.38	860.50	59.93
Madison	368.25	257.32	162.58	542.00
Mason	63.13	102.83	61.21	84.24
Massac	541.60	467.48	583.52	556.09
Montgomery	328.77	420.00	328.49	439.60
Morgan	260.37	136.51	146.09	193.76
Ogle	52.26	57.84	19.37	50.10
Peoria	285.22	343.00	0.98	241.70
Pike	26.70	13.63	19.40	0.00
Putnam	187.78	171.58	160.71	179.08
Randolph	30.69	1,047.75	1,173.97	32.30
Rock Island	1.07	3.35	896.53	1,107.63
Sangamon	258.78	204.58	307.12	314.30
Tazewell	1,055.82	765.41	734.35	782.00
Vermilion	2.00	2.76	1.51	2.24
Will	1,757.01	3,561.14	3,837.98	2,027.92
Williamson	103.01	69.92	0.00	104.20
State Total	11,678.01	15,168.74	17,103.55	11,265.29

Source: USGS water use reports, various years.
Note: Counties not listed had no estimated thermoelectric water withdrawals.

CHAPTER 3

PUBLIC SUPPLY WATER USE

INTRODUCTION

The U.S. Environmental Protection Agency (USEPA) defines a "public" water system as a public or privately-owned system that serves at least 25 people or 15 service connections for at least 60 days per year. "Community" water systems are a sub-category of public water systems consisting of those that provide water service to their customers throughout the year (USEPA, 2004a). Information on the characteristics and regulatory compliance of community water systems is available from the USEPA and various state regulatory agencies, however reliable water use data are not (USEPA, 2004b).

The U.S. Geological Survey (USGS) has been preparing estimates of water withdrawals in the United States since 1950. Withdrawals by public water supply systems are included in the *public supply* water use category. USGS defines *public supply* withdrawals as: "Water withdrawn by public and private water suppliers and delivered to groups of users. Public suppliers provide water for a variety of uses, such as domestic, commercial, thermoelectric-power generation, industrial, and public water use" (Avery, 1999, p.25). Water used by "community" water systems, as defined by USEPA, corresponds to the USGS classification of "public supply" water use. USGS does not include water use from non-community systems in their public supply estimates, and therefore, these are not included in this analysis. (Note: An assessment of the magnitude of "non-community" public water supply water use is included in the Chapter 3 Annex.)

USGS PUBLIC SUPPLY WITHDRAWAL ESTIMATION PROCEDURE

The principal source of information used by USGS to estimate public water supply withdrawals is an annual questionnaire administered by the Illinois State Water Survey (ISWS). This questionnaire is sent to all of the nearly 1,800 community water systems in the state and includes questions about water sources, withdrawals, and water deliveries to domestic, commercial, and industrial users (ISWS, 2004). If systems do not complete a survey for the USGS target years, water use is estimated based on extrapolation from data submitted in previous years. The withdrawal and population served data from each reporting systems are aggregated to create the county-level total reported in the national water use summary (Avery, 1996).

The USGS reports public supply withdrawals in million gallons per day (mgd) for both groundwater and surface water withdrawals. USGS also uses the ISWS forms to estimate the population served by public water systems in each county and uses this estimate to calculate a per capita estimate of withdrawals. USGS reports have included state-level reporting of public supply water use since the first inventory in 1950 (although it was classified as "municipal" water use in the first inventory). In the 1985, 1990, and 1995 inventories, USGS also reported county level withdrawals, including estimates of deliveries to industrial and commercial customers. The 2000 inventory also includes county level estimates, but details of deliveries to commercial and industrial customers were no longer estimated or reported.

PUBLIC SUPPLY WATER WITHDRAWALS IN ILLINOIS

The USGS estimated that public supply withdrawals in Illinois nearly doubled between 1950 and 1970, and declined in 1975 and 1980 (Figure 3.1). Estimated public supply use since 1985 is reported to have decreased, even though population in the State increased by nearly one million and the population served by public water supplies increased by more than one million (Hutson, et al., 2004; Solley, et al., 1988).

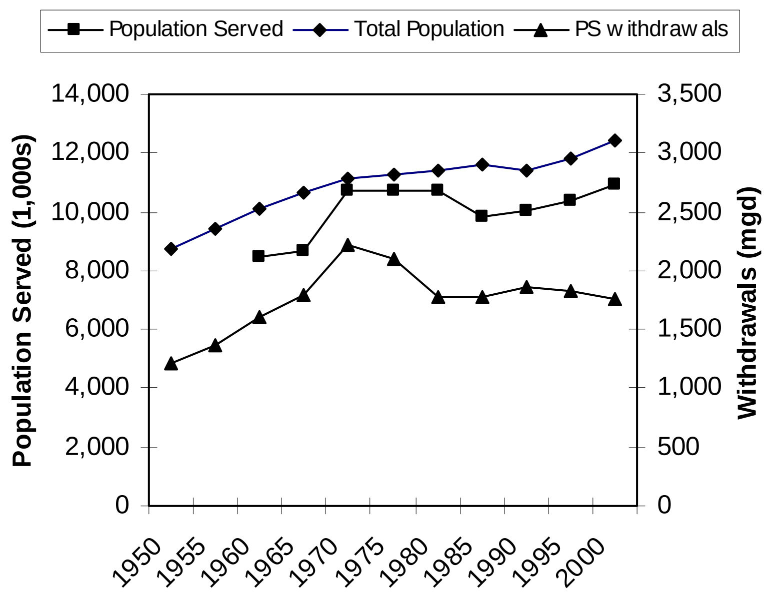


Figure 3.1 Public Supply Withdrawals, Population, and Population Served by Public Supplies: 1950 – 2000
(Source: USGS water use reports)

Slightly more than 20 percent of public supply withdrawals are from groundwater sources, with the remainder coming from surface water sources. Approximately 25 percent of the 10.4 million public water system customers in 1995 received their water from groundwater systems.

Characteristics of County-Level Public Supply Water Use

Public supply withdrawals vary greatly county-by-county. A review of data from the 1995 USGS water use inventory demonstrates some of the characteristics of the distribution of withdrawals in the state. County public water supply withdrawals range from less than 150,000 gallons per day to more than a billion gallons per day. Per capita public supply water use (based on reported population served estimates) demonstrates a similar variability. Table 3.1 displays the summary statistics of the distribution of total and per capita withdrawals for the 102 counties in Illinois.

Table 3.1 Distribution of County Total and Per Capita Public Supply Withdrawals - 1995

Characteristic	Withdrawals
State total withdrawals (mgd)	1,822.55
Mean total	17.87
Median total	2.37
Max total	1,134.35
Min total	0.00
SD total	112.22
State per capita withdrawals (gpcd)	175.3
Mean per capita	197.12
Median per capita	138.39
Max per capita	1,486.99
Min per capita	0.00
SD per capita	213.94

Source: USGS, 1995 inventory.

USGS estimates water use "*withdrawals*" that take place within a county, rather than actual water "*use*" within the county. Many public water supply systems in the State deliver water to wholesale and retail customers in other counties. These cross-county flows are most evident in the exceptionally high or low per capita estimates. For example, six counties in the state report per capita withdrawals of less than 30 gallons per capita per day (gpcd), and two counties report zero per capita withdrawals. These low (and null) per capita estimates indicate that public supply water users are obtaining the majority of water from outside of their own counties. Unfortunately, it is not possible to accurately account for these cross-county flows using only the data available from USGS. Therefore, a county grouping procedure was developed to create spatial areas that encapsulated all cross-county transfer of water. This procedure is described in detail later in this chapter.

The percent of population served by public water supplies also varies considerably from county to county. For example, in 1995, eight counties (Saline, Cook, Kane, DuPage, Champaign, Coles, Franklin, Adams) reported more than 95 percent of the population served; three counties (Effingham, Wayne, Union, Massac) reported less than 25 percent. Eighty-two counties had more than half of their residents served by public suppliers. Statewide, 88 percent of the population are served by public water systems.

Public water suppliers in Illinois deliver water to domestic, commercial, industrial, and to a very limited extent, thermoelectric generation water users. Deliveries to non-domestic water users also contribute to the variability in per capita estimates. In 1995, USGS estimated that about 38 percent of deliveries statewide were provided to non-domestic water users, ranging from more than 80 percent in two counties (Pope and

Kane) to zero in six other counties. Unfortunately, USGS data collection procedures were altered for the preparation of 2000 national water use summary, and the USGS stopped requiring the estimation of non-domestic deliveries by public water suppliers. Therefore, these data were not available for the analysis presented in this report.

At 1.1 billion gallons per day (in 1995), public supply water withdrawals in Cook County account for more than 60 percent of all public supply withdrawals in the Illinois. These withdrawals are delivered to wholesale and domestic water customers in Cook, DuPage, and Will Counties. The county with the next largest withdrawals is Lake County (60 mgd). Eighty-two of the state's 102 counties were estimated to have less than 10 mgd in public supply withdrawals, with 19 counties reporting less than one mgd. Two counties, Saline and Hamilton, were estimated to have had zero public supply withdrawals for 1995.

PUBLIC SUPPLY WITHDRAWAL PROJECTION PROCEDURES

A considerable body of literature is available describing the approaches to modeling and forecasting public supply water use. Numerous demographic, socioeconomic, climatic, and technological factors have been examined in relation to public water supply use. Multivariate models have been successfully used to both explain and forecast water use based upon the explanatory power of these factors that influence water use behavior (Dziegielewski, 1996a; Dziegielewski, et al., 1996b; Dziegielewski, et al., 2002b). A multivariate modeling approach was used to develop forecasts of future public supply water use.

Modeling public supply water use is complicated by the considerable diversity in water uses that may be served by public water systems. More than half (54%) of the 1,196 public water systems responding to the ISWS surveys in 2000 reported deliveries to non-domestic water users, and for some water systems in the state, these constitute a significant percentage of their total water withdrawals (140 systems reported more than 25 percent of total water withdrawals delivered to commercial of industrial users). Consequently, models should include variables to account for both domestic and non-domestic uses.

The development of projections for public supply consisted of four tasks:

1) Determination of cross-county flows of public supply water and aggregation of counties into groups, to facilitate a direct correlation between water withdrawal estimates for the grouped counties and county-based explanatory variables.
2) Specification of model variables.
3) Development of a statewide, public supply, per capita water use model through the application of multiple regression analysis to the data.
4) Estimation of projected values of model variables and public supply service population; calculation of projections of future water use for counties and county groupings.

Grouping Illinois Counties by Public Supply Water Transfers

Community water systems frequently provide water services beyond the borders of a single county. However, the USGS water use estimates that are used in the analysis in this study account only for withdrawals within each county and provide no information on the county where that water is ultimately used.

While no agency in Illinois currently reports the volumes of cross-county water transfers by public water suppliers, the Illinois Environmental Protection Agency (IEPA) does identify the principal county served by each water system, as well as systems that buy and sell water to each other. This information can be used to create groups of counties that are self-contained in both public supply withdrawals and use, thus allowing grouped county-level explanatory variables to be applied to the appropriate measure of water use.

In order to develop county groupings community water system data (2003) were obtained from the IEPA. The procedure used to group counties is described in the Annex to this chapter. Also included is a map of the groups that were created. The grouping procedure resulted in forty-two counties being assigned to 10 groups. Therefore, cross-county public-supply flows for the 60 remaining counties and the 10 groups of counties are assumed to be negligible.

Specification of Model Variables

A substantial data collection and processing effort was required in order to prepare appropriate variables to have available for model development. Four general groups of variables were employed in the water use models presented in this study.

Dependent Variables

The USGS reported county-level water use estimates for 1985, 1990, 1995, and 2000. Public supply sector reports included: the population served, withdrawals by source (ground or surface), population served by source, and total and per capita withdrawals. Deliveries from public water suppliers to domestic, commercial, industrial, and thermoelectric generation water users were also available for all years except 2000. However, this lack of 2000 delivery data prohibited the development of separate dependent variables for domestic and non-domestic withdrawals. Specification of a dependent variable was therefore based on the total county, and county grouping, public supply withdrawals.

Preliminary investigations of water use and potential explanatory variables revealed that population served was highly correlated to total public supply withdrawals (R^2=0.98). In order to take advantage of the high correspondence between population served and water use, per capita withdrawals were used as the dependent variable.

Finally, because both nominal and log models were tested during the analysis, logarithmic transformation of the per capita values were also prepared.

Independent variables

A large number of explanatory variables were prepared and tested in numerous model runs. Selection of these variables was based upon a review of the literature, availability of county-level data, and past experience of the research team (Dziegielewski, et al., 2002). Principal data sources for the data used to develop the independent variables included, the USGS, the U.S. Census, and the National Climate Data Center. For some of the independent variables several alternative specifications were tested. A county-level water price variable was also developed using data from a survey of State water prices conducted in 2003 (see Chapter 3 Annex for details). Some variables required special manipulation in order to be consistent across years, and others required interpolation or extrapolation in order to have values for all data years (as described in Chapter 1). Logarithmic transformations of many of the variables were also prepared for use in the double-log models.

Although a large number of variables were prepared and tested during the modeling procedure, only a small number were found to be significant. A listing of some of the independent variables tested during modeling procedure appears in Table 3.2. More details on the specification of the variables used in the Public Supply analysis appear in the Chapter 3 Annex

Table 3.2 Categories of Explanatory Variables

Group	Potential Explanatory Variables
Socioeconomic variables	Income per capita Median family income Percentage of single family housing units Percentage of multifamily housing units Percentage of mobile homes Residential water price
Demographic variables	Resident population Population served by public water supply Population density Percentage of urban population Ratio of total employment to population
Weather variables	Total precipitation during summer months (growing season) Total annual precipitation Annual minimum monthly Palmer Drought Severity Index (PDSI) Average temperature in summer months (growing season) Cooling degree days Heating degree days
Labor force variables	Total employment Employment by 2-digit SIC Employment in the manufacturing sector Percentage of population employed (pop employed/total pop)

Binary variables

Two types of binary variables were included in the model. *County* binaries were added to the model to account for county-specific characteristics that were not accounted for by other variables in the model. *Outlier* binaries were added to the model to account for county/year observations that are far outside the expected ranges of values (these are represented in the model below by the county name and year of the outlier data point). By providing binary variables for these outlier observations, they were allowed to remain in the modeling process, without data "smoothing" or other approaches that are sometimes used to account for outliers (Dziegielewski, et al., 2002a).

Trend

A variable was included in the model to account for unspecified changes that are likely to be influencing water use over time, and that represent general trends in water using behavior. Such influences include the dramatic increase in water-use awareness programs, implementation of laws mandating adoption of conservation technologies, and a new emphasis on adoption of full-cost pricing of water. The *trend* variable was specified as zero for 1985, 5 for 1990, 10 for 1995, and 15 for the year 2000.

Modeling procedure

It was assumed in this analysis that a single model could be used to represent public supply water use throughout the entire State. A two-stage modeling procedure was used. In the first stage of the model the explanatory variables were regressed against the dependent variable, annual average per capita withdrawals. Both log and linear models were tested using a stepwise regression procedure. A double-log model was selected that explains per capita water use as a function of housing type (negatively correlated to percent of multi-family housing), weather (positively correlated to higher average summer temperature), employment (positively correlated to the percent of persons employed), residential water price (negatively correlated to marginal price), trends in water use technology, policy, and behavior (negatively correlated to trend), and county specific influences (binary variables for 12 counties and groups of counties, and outliers coefficients for 16 observations). The model variables explain approximately 85 percent of variance in county and county group per capita withdrawals (Table 3.3). One measure of the performance of regression models is the mean average percent error (MAPE) of the model's estimation of the data used to generate the model. The MAPE of the model presented here is 15.2 percent.

A second stage of the model was added in order to improve the model fit for several of the counties that demonstrated a lack of correspondence to the historical trends in water use that did not appear to be caused by corresponding changes in the explanatory variables. In the second stage procedure, the regression model residuals are regressed against the county binary variables. These coefficients for these counties (adjusted by the Stage 2 intercept) were added to the procedure calculation used to calculate projected county water use.

Table 3.3 Water Use Regression Model for Illinois

Explanatory Variable	Regression Coefficient	t Statistic
Stage 1 – Regression of explanatory variables		
Intercept	-1.966	-0.62
Ln Average Summer Temp	1.587	2.11
Trend	-0.008	-2.28
Ln Residential Marginal Price	-0.157	-4.47
Percent Multi-Family Housing	-0.006	-2.26
Percent Employed (CBP)	0.016	6.25
Crawford	0.293	2.58
Cumberland	-0.435	-3.28
Henry	-0.273	-2.4
Iroquois	-0.436	-3.82
Lake	-0.258	-2.23
McLean	-0.484	-4.08
Ogle	0.270	2.36
Peoria	-0.331	-2.71
Piatt	0.325	2.85
Richland	-0.251	-2.18
Rock Island	-0.245	-2.11
Woodford	1.214	7.66
Group1	0.409	3.64
Group9	1.214	7.43
Woodford-1985	-1.328	-4.9
Woodford-2000	0.565	2.09
Carroll-1990	-2.953	-13.19
Knox-2000	-2.874	-12.94
Knox-1990	-1.757	-7.9
Menard-2000	-2.010	-8.85
Mason-2000	-0.972	-4.34
Wayne-1995	1.311	5.86
Morgan-1990	-1.905	-8.5
Morgan-2000	-2.268	-10.17
Putnam-2000	-1.201	-5.35
Group10-1995	0.983	4.37
Whiteside-2000	0.669	2.99
Jo Daviess-1995	0.821	3.69
Cumberland-1995	0.982	3.85
Macon-1995	0.752	3.35
N=232, R^2=0.85, Mean Y=4.90 (135 gpcd), Root MSE=0.24 (1.25 gpcd)		
Stage 2- Regression of residuals		
Intercept	-0.020	-1.52
Christian	0.181	1.93
Jo Daviess	0.187	2.00
Lee	0.223	2.07
McDonough	-0.182	-1.69
McHenry	-0.178	-1.9
Macon	0.420	4.49
Montgomery	-0.186	-1.98
Shelby	0.222	2.06
Wayne	0.220	2.35
Group2	0.176	1.88
Group8	0.163	1.75
N=232, R^2=0.2, Mean Y=0.00 (1.0 gpcd), Root MSE=0.19 (1.2 gpcd)		

Development of Projection Data

Projections of future water use can be calculated by entering projected values of the explanatory variables into the public water supply model. An extensive search was performed to seek out externally generated projections of explanatory variables from government agencies, industry groups, and researchers. The sources, assumptions, and methods used to develop the projected values for each of the explanatory variables in the public water supply model are described in the following sections.

Percent of multi-family housing

The type of housing in a county will influence the quantity of water that is used, with single family housing generally expected to be correlated with higher levels of water use than either multi-family housing or mobile homes. A search for projections of future county housing for Illinois counties was unproductive. However, on a national level, the Energy Information Administration (EIA) prepares estimates of future housing is each state (*www.eia.gov/oiaf/aeo/aeotab_20.htm*). These estimates include a projected rate of change for each housing type from 2001 to 2025. These estimates predict that single family component of the housing mix in Illinois will decline, while the proportion of both multi-family and mobile homes will increase. Because county-level projections were not available, the EIA rates of change were applied uniformly to all Illinois counties.

In order to calculate projections of the housing mix in Illinois, the 2000 values of the number of each type of housing in each county were multiplied by the EIA rate of change for each projection year. The percent of housing by type were then calculated from these projected values of the number of housing units. The percent housing type for grouped counties was estimated by summing the number of projected housing units in each type for the counties in each group, and calculating the percent of housing by type. It should also be noted that because housing is often highly correlated with income, water demand models rarely include both income and housing variables, and housing type variables are often considered to be a proxy for income.

Average summer temperature

Weather has a substantial impact on the volumes of public supply water use. While there are certainly concerns about the impact of climate change on Illinois water use, this analysis does not attempt to present any specific future climate scenario in the projections of water use. Therefore, the projected values for the average summer temperature variable included in the model are based upon the assumption of *normal* weather patterns.

NOAA weather data includes published *normal* weather for all Illinois stations. This value of the *normal* average summer temperature was used for calculate the projections of all five projection years. The average of the *normal* summer temperature in each of the counties in a group was used to represent the temperature the entire county group.

Percent of population employed

Projections of the percent of employed persons involved combining projections of future changes in population with future changes in employment. The State of Illinois regularly publishes population projections for each county (available from: *www.cadus.ilstu.edu/overview.htm*). However, these projections were prepared prior to the 2000 Census and an updated version has yet to be released. In order to adjust these projections to account for the results from the 2000 Census, an adjustment factor (the ratio of projected 2000 values to the Census 2000 population estimate) was applied to the projected values for each county. Projected population for groups of counties was prepared by summing the projected population values from the individual counties included in each group.

The Illinois Department of Employment Security (IDES) prepares county level projections of future employment (*lmi.ides.state.il.us/projections/countyltproj.htm*). The growth rate from the IDES 2000-2010 projections for each county was calculated. Future values of county employment were estimated by multiplying this growth rate times the total county employment in 2000 as reported in the Census Bureau's County Business Patterns. The projected value of the percent of population employed was calculated by dividing the projected employment by the projected population in each county. The value for county groupings was calculated by summing the population and employment values for the component counties and then calculating the percent of projected employment for the grouping.

Population served

Projections of the population served by public water systems in each county were not found to be available from government agencies or other sources, and attempts to model this parameter using a linear trend of historical USGS data did not produce results that were considered to be reasonable. Consequently, the *percent* of population served in 2000 was assumed to be constant throughout the projection period. Projected values for the population served were calculated by multiplying the percent of population served in 2000 by the projected population in individual counties and groupings of counties. Because the dependent variable in the model is per capita water use, the model results were multiplied by the projected population served in order to estimate future water use. Therefore, the projected value of population served (and the assumption of constant percent served) has a significant influence on the estimated of total water use in each county and county grouping.

The percent of population served in each county, as reported by USGS inventories appears in Table 3A-5 and the projected population served for each county, county grouping, and projection year appear in Table 3A-4. The actual percent of the population served, particularly in high-growth counties, may differ greatly from USGS reported 2000 values. Other scenarios for county projections can be prepared by altering these population estimates and recalculating total water estimates using the per capita model results (Table 3.5).

Residential water price

The residential water price variable that was included in the model was developed from a survey of water prices in Illinois that was conducted in 2003 (see Chapter Annex for details). The price variable used in the model development was specified in constant 2000 dollars so that prices in different time periods would be comparable. The prices used to calculate the projected water use were based upon the latest set of prices (2003) that were available from the information provided by survey respondents during the price study.

The values of the price variable that were used in calculating water use projections were developed by first estimating the "current" (2003) population weighted price variable for each county and group or counties, and then deflating these prices to their 2000 dollar values. In five counties (Calhoun, Cass, Marshall, Pope, and Schulyer) no water systems responded to the price survey. A price estimate for these counties was developed by "averaging" the prices of all of the adjacent counties (and then converting them to 2000 dollars). The constant dollar value of these 2003 price estimates were then treated as a constant in the calculations of future water use for each of the five projection years. Freezing the county-level price variables at their constant dollar current values is in effect an assumption that water prices will not increase at a rate greater than inflation for the next 20 years. However, surveys and studies frequently report water prices increasing faster than inflation (for example, AWWA, 2005). Because price has a negative relationship to water use, counties where water prices are increased greater than the rate of inflation should expect lower levels of water use than presented in this analysis.

Trend

The value for trend was held constant at the 1995 value (of 15) for all projections years. This "no-further-decrease" scenario was used in order to present projections that represented a "no future action" assumption. A second conditional set of projections is also included using the continued incremental decrease scenario in order to demonstrate the impact of a continuation of water conservation programs and technologies into the future.

PUBLIC SUPPLY WATER USE PROJECTIONS

Table 3.4 displays the historical and projected values of public supply water use in Illinois counties. Counties that are included in groups appear in *italics* with the number in the superscript representing group membership. It is important to note that the projection model was used to prepare projection of *water use* based upon the explanatory variables for each county or the grouped explanatory variables (using the methods described above) for each group of counties. Therefore, projections of county *water use* in 2005 may not correspond well to USGS estimates of county *water withdrawals* in

2000. Also, while the historical values of *water withdrawals* from 1985 to 2000 in each county group represent the sum of withdrawals of the counties that make up the group, this is not necessarily the case for the *water use* projections. Wherever possible, the explanatory variables for county grouping that were used in the projection model were weighted to represent the influence of the counties in the group, and therefore group projections or water use may not correspond exactly to projections in individual counties that are part of a group.

Since the purpose of this study is to present county level projections, the State totals presented in Tables 3.4 and 3.5 are calculated as the sum of the projections from individual counties. State total projections calculated by summing non-grouped counties and the county groupings would result in a slightly larger State total for 2005 (about 23 mgd), but this total decreases over the projection period and disappears by 2025.

The last five columns of Table 3.4 display a second set of projections where the trend variable was increased by five (5) for each of the projections periods (i.e., 20 for 2005, 25 for 2010, 30 for 2015, etc.). This decreasing trend projection estimates of the potential impacts of conservation technologies and programs on projected water use.

Table 3.5 presents the per capita projections for each county and group of counties. As in Table 3.4, both the “no future action” and “continued conservation” scenarios are presented. The results indicate that under baseline conditions (no additional conservation in the future years) the total public supply withdrawals are expected to increase from 1,762 mgd in the year 2000, to 2,206 mgd in the year 2025, a 25 percent increase. Of the total 444 mgd increase, approximately 205 mgd can be attributed to increases in population, and 239 mgd can be attributed to increases in per capita water use.

However, if the trend of declining rates of water use due to conservation continues, the total 2000-2025 increase in water use would be only 60 mgd (a 3 percent increase).This would be a result of the declining per capita water use (from 161.4 gpcd in 2000 to 149.5 gpcd in 2025). Without conservation, the percapita use in 2025 would increase to 181.0 gpcd because of the increase in the percent of population employed and growth in counties with high per capita use of water.

Table 3.4 Total Water Use Projections for Illinois (mgd)

County	USGS Historical Estimates				Baseline Projections					Projections with Conservation (trend)				
	1985	1990	1995	2000	2005	2010	2015	2020	2025	2005	2010	2015	2020	2025
Adams[2]	7.02	8.73	9.11	9.34	11.33	11.59	11.87	12.18	12.49	10.90	10.74	10.59	10.45	10.32
Alexander[h]	1.76	1.78	1.33	1.18	1.12	1.11	1.11	1.12	1.12	1.07	1.03	0.99	0.96	0.93
Bond[1]	0.80	1.01	1.25	0.19	1.09	1.09	1.09	1.10	1.10	1.05	1.01	0.97	0.94	0.91
Boone	3.04	3.83	3.57	3.71	3.65	3.67	3.71	3.73	3.76	3.51	3.40	3.31	3.20	3.10
Brown[2]	0.06	0.09	0.08	0.08	0.66	0.67	0.68	0.69	0.70	0.64	0.62	0.61	0.59	0.57
Bureau	3.67	3.18	2.10	2.90	2.51	2.56	2.64	2.72	2.81	2.41	2.38	2.35	2.33	2.32
Calhoun	0.38	0.34	0.40	0.30	0.14	0.14	0.14	0.14	0.14	0.13	0.13	0.12	0.12	0.12
Carroll	1.52	0.06	1.47	1.34	1.15	1.15	1.15	1.16	1.16	1.11	1.06	1.03	0.99	0.96
Cass	1.54	3.01	1.43	1.61	1.17	1.17	1.17	1.18	1.19	1.12	1.08	1.05	1.02	0.99
Champaign[6]	19.94	20.57	22.59	22.65	24.42	25.49	26.42	27.35	28.32	23.51	23.61	23.56	23.47	23.39
Christian	4.30	3.41	2.90	3.17	3.05	3.10	3.15	3.20	3.26	2.94	2.87	2.81	2.75	2.69
Clark	1.26	1.23	1.54	1.06	1.57	1.57	1.58	1.61	1.64	1.51	1.45	1.41	1.38	1.35
Clay[3]	0.91	0.88	0.88	0.77	1.03	1.02	1.02	1.02	1.02	0.99	0.94	0.91	0.88	0.85
Clinton[4]	1.44	2.27	2.04	1.95	2.66	2.72	2.80	2.89	2.98	2.56	2.52	2.50	2.48	2.46
Coles	4.93	5.03	7.34	4.53	6.89	7.16	7.45	7.77	8.10	6.63	6.63	6.64	6.66	6.69
Cook[5]	1,113.29	1,122.87	1,134.35	1,043.16	857.52	902.54	952.18	1,007.32	1,068.06	825.34	836.08	848.96	864.43	882.16
Crawford	2.05	2.05	2.01	2.38	2.27	2.27	2.27	2.28	2.30	2.19	2.10	2.03	1.96	1.90
Cumberland	0.40	0.28	1.06	0.43	0.38	0.39	0.41	0.43	0.45	0.37	0.36	0.36	0.37	0.37
De Kalb	7.06	7.79	6.75	7.70	9.34	9.80	10.20	10.58	10.99	8.99	9.08	9.09	9.08	9.07
De Witt	1.42	2.21	1.48	1.30	1.41	1.41	1.40	1.41	1.41	1.36	1.30	1.25	1.21	1.16
Douglas[6]	0.79	1.24	1.26	0.47	1.97	1.98	1.99	2.02	2.04	1.90	1.83	1.78	1.73	1.69
Du Page[5]	77.20	86.35	11.96	10.03	215.09	234.45	256.47	281.64	310.47	207.02	217.18	228.67	241.69	256.43
Edgar	1.80	1.54	1.71	1.57	1.70	1.69	1.68	1.69	1.70	1.64	1.57	1.50	1.45	1.40
Edwards[10]	0.49	0.13	0.57	0.14	0.86	0.87	0.89	0.92	0.94	0.83	0.81	0.80	0.79	0.78
Effingham[3]	1.77	2.45	2.67	2.66	3.84	3.89	3.94	3.99	4.05	3.70	3.60	3.52	3.43	3.34

Table 3.4 *(cont'd)* Total Water Use Projections for Illinois (mgd)

County	USGS Historical Estimates				Baseline Projections					Projections with Conservation (trend)				
	1985	1990	1995	2000	2005	2010	2015	2020	2025	2005	2010	2015	2020	2025
Fayette	1.23	1.29	1.45	1.07	1.09	1.09	1.09	1.10	1.11	1.05	1.01	0.97	0.94	0.92
Ford	1.36	1.68	1.73	1.93	1.55	1.56	1.57	1.58	1.59	1.50	1.45	1.40	1.36	1.31
Franklin[7]	13.51	12.52	12.87	14.37	*4.94*	*4.90*	*4.92*	*4.98*	*5.05*	*4.76*	*4.54*	*4.38*	*4.27*	*4.17*
Fulton	2.49	2.72	3.14	2.26	2.88	2.85	2.84	2.85	2.86	2.77	2.64	2.53	2.45	2.36
Gallatin[7]	*0.64*	*2.72*	*3.51*	*3.25*	*0.50*	*0.50*	*0.50*	*0.51*	*0.52*	*0.48*	*0.46*	*0.45*	*0.44*	*0.43*
Greene[9]	*0.95*	*0.66*	*0.76*	*1.02*	*1.31*	*1.30*	*1.31*	*1.34*	*1.36*	*1.26*	*1.21*	*1.17*	*1.15*	*1.13*
Grundy	2.32	2.53	1.09	2.90	2.57	2.67	2.79	2.92	3.06	2.47	2.48	2.49	2.51	2.52
Hamilton[7]	*0.00*	*0.02*	*0.00*	*0.00*	*0.36*	*0.35*	*0.35*	*0.34*	*0.34*	*0.35*	*0.32*	*0.31*	*0.29*	*0.28*
Hancock[2]	*1.19*	*1.25*	*1.10*	*0.90*	*1.20*	*1.20*	*1.20*	*1.22*	*1.23*	*1.16*	*1.11*	*1.07*	*1.04*	*1.02*
Hardin[7]	*0.28*	*0.27*	*0.21*	*0.14*	*0.34*	*0.33*	*0.33*	*0.32*	*0.31*	*0.33*	*0.31*	*0.29*	*0.27*	*0.26*
Henderson[2]	*0.23*	*5.90*	*6.39*	*6.19*	*0.65*	*0.65*	*0.67*	*0.70*	*0.73*	*0.62*	*0.60*	*0.59*	*0.60*	*0.60*
Henry	3.74	4.76	3.90	3.56	3.90	3.87	3.86	3.87	3.88	3.75	3.59	3.44	3.32	3.20
Iroquois	2.13	2.17	2.34	1.63	2.23	2.21	2.22	2.22	2.23	2.15	2.05	1.97	1.91	1.84
Jackson	8.88	8.00	6.62	6.39	7.58	7.81	8.05	8.26	8.47	7.29	7.24	7.18	7.09	7.00
Jasper[3]	*0.41*	*0.40*	*0.63*	*1.28*	*0.85*	*0.86*	*0.87*	*0.90*	*0.92*	*0.82*	*0.80*	*0.78*	*0.77*	*0.76*
Jefferson[7]	*0.40*	*1.28*	*0.50*	*0.00*	*4.21*	*4.27*	*4.35*	*4.43*	*4.52*	*4.06*	*3.96*	*3.88*	*3.80*	*3.73*
Jersey[1]	*0.78*	*0.90*	*1.18*	*1.27*	*1.54*	*1.60*	*1.68*	*1.79*	*1.90*	*1.49*	*1.49*	*1.50*	*1.53*	*1.57*
Jo Daviess	1.79	2.44	2.54	2.37	1.94	1.97	1.99	2.02	2.06	1.87	1.82	1.78	1.74	1.70
Johnson[7]	*0.52*	*0.64*	*0.80*	*1.04*	*0.37*	*0.37*	*0.36*	*0.36*	*0.36*	*0.36*	*0.34*	*0.32*	*0.31*	*0.30*
Kane	33.34	37.90	47.97	52.71	66.71	72.22	78.10	83.36	89.07	64.21	66.91	69.64	71.54	73.56
Kankakee	12.19	13.52	13.88	14.37	16.84	17.37	17.92	18.50	19.10	16.21	16.09	15.98	15.88	15.77
Kendall	1.92	2.01	1.82	2.24	2.74	2.87	3.04	3.27	3.53	2.64	2.66	2.71	2.81	2.91
Knox	7.77	1.39	6.34	0.37	6.91	6.83	6.77	6.69	6.62	6.65	6.33	6.04	5.74	5.47
Lake	49.40	58.33	60.34	65.55	77.83	82.75	87.98	93.23	98.89	74.91	76.66	78.44	80.00	81.68
La Salle	13.30	14.24	15.38	11.02	11.28	11.41	11.57	11.77	11.98	10.85	10.57	10.32	10.10	9.89

Table 3.4 *(cont'd)* Total Water Use Projections for Illinois (mgd)

County	**USGS Historical Estimates**				**Baseline Projections**					**Projections with Conservation (trend)**				
	1985	**1990**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**	**2005**	**2010**	**2015**	**2020**	**2025**
Lawrence	1.21	1.68	1.35	0.00	1.41	1.42	1.45	1.49	1.54	1.35	1.32	1.30	1.28	1.27
Lee	3.62	3.94	4.28	4.28	5.05	5.10	5.16	5.26	5.36	4.86	4.72	4.60	4.51	4.43
Livingston	3.47	3.76	4.85	5.45	4.13	4.16	4.19	4.25	4.31	3.98	3.85	3.73	3.65	3.56
Logan	3.50	3.30	3.20	3.12	2.82	2.85	2.86	2.87	2.89	2.72	2.64	2.55	2.47	2.38
McDonough	3.01	3.18	3.23	2.94	3.11	3.19	3.28	3.36	3.45	2.99	2.96	2.92	2.89	2.85
McHenry	12.21	14.52	15.11	20.66	21.53	23.27	25.14	26.25	27.42	20.72	21.56	22.42	22.53	22.64
McLean	13.26	9.13	10.54	10.18	14.78	15.41	16.05	16.72	17.43	14.23	14.27	14.31	14.35	14.39
Macon	28.21	33.87	39.70	39.33	32.96	33.59	34.29	35.01	35.76	31.72	31.12	30.57	30.04	29.53
Macoupin[1]	*3.65*	*3.76*	*4.51*	*3.26*	*3.06*	*3.12*	*3.19*	*3.28*	*3.38*	*2.94*	*2.89*	*2.84*	*2.81*	*2.79*
Madison[1]	*54.35*	*56.11*	*53.46*	*54.30*	*22.98*	*23.64*	*24.34*	*25.22*	*26.14*	*22.11*	*21.90*	*21.70*	*21.65*	*21.59*
Marion[4]	*5.02*	*6.90*	*5.12*	*5.42*	*6.12*	*5.96*	*5.82*	*5.70*	*5.58*	*5.89*	*5.52*	*5.19*	*4.89*	*4.61*
Marshall	1.88	1.74	1.74	1.73	1.22	1.23	1.25	1.28	1.31	1.18	1.14	1.11	1.10	1.08
Mason	1.03	1.16	1.16	0.37	0.94	0.92	0.91	0.91	0.92	0.91	0.86	0.81	0.79	0.76
Massac[7]	*0.69*	*1.66*	*1.26*	*1.31*	*0.31*	*0.31*	*0.32*	*0.33*	*0.34*	*0.30*	*0.29*	*0.29*	*0.28*	*0.28*
Menard	0.68	0.71	0.76	0.12	0.95	1.02	1.09	1.18	1.27	0.92	0.94	0.97	1.01	1.05
Mercer	0.92	0.95	1.06	0.64	0.75	0.74	0.74	0.74	0.74	0.72	0.69	0.66	0.63	0.61
Monroe[4]	*0.55*	*0.62*	*0.66*	*0.17*	*0.96*	*1.01*	*1.07*	*1.13*	*1.21*	*0.92*	*0.94*	*0.95*	*0.97*	*1.00*
Montgomery	2.83	2.80	3.17	1.36	2.54	2.54	2.56	2.57	2.58	2.44	2.35	2.28	2.20	2.13
Morgan	4.63	0.76	5.98	0.36	3.57	3.66	3.76	3.86	3.96	3.43	3.39	3.36	3.31	3.27
Moultrie	1.12	1.08	1.16	1.02	1.28	1.30	1.31	1.33	1.35	1.23	1.20	1.17	1.14	1.11
Ogle	5.39	5.62	5.28	5.03	5.06	5.09	5.13	5.19	5.25	4.87	4.71	4.57	4.45	4.34
Peoria	21.76	26.69	24.89	25.69	26.08	27.26	28.53	29.94	31.50	25.11	25.25	25.44	25.69	26.02
Perry[7]	*0.61*	*0.55*	*0.53*	*0.73*	*2.56*	*2.61*	*2.67*	*2.74*	*2.82*	*2.46*	*2.41*	*2.38*	*2.35*	*2.33*
Piatt	1.25	1.93	1.35	1.90	1.96	1.98	2.01	2.05	2.10	1.88	1.83	1.79	1.76	1.73
Pike	1.23	1.46	1.71	1.90	1.38	1.38	1.39	1.40	1.41	1.33	1.28	1.24	1.20	1.16

Table 3.4 *(cont'd)* Total Water Use Projections for Illinois (mgd)

County	USGS Historical Estimates				Baseline Projections					Projections with Conservation (trend)				
	1985	1990	1995	2000	2005	2010	2015	2020	2025	2005	2010	2015	2020	2025
Pope[7]	*0.90*	*0.08*	*0.07*	*0.00*	*0.41*	*0.41*	*0.41*	*0.42*	*0.43*	*0.39*	*0.38*	*0.37*	*0.36*	*0.36*
Pulaski[8]	*0.72*	*0.50*	*0.57*	*0.11*	*0.40*	*0.40*	*0.40*	*0.41*	*0.41*	*0.38*	*0.37*	*0.36*	*0.35*	*0.34*
Putnam	0.45	0.49	0.40	0.19	0.67	0.66	0.65	0.64	0.63	0.64	0.61	0.58	0.55	0.52
Randolph	3.76	3.37	3.56	3.40	3.17	3.20	3.23	3.27	3.30	3.06	2.97	2.88	2.80	2.73
Richland	1.26	1.57	1.67	1.46	1.64	1.65	1.67	1.70	1.74	1.58	1.53	1.49	1.46	1.43
Rock Island	20.03	17.45	17.42	15.79	18.82	19.26	19.72	20.22	20.75	18.12	17.84	17.58	17.35	17.14
St Clair[4]	*22.02*	*19.96*	*18.68*	*53.90*	*28.19*	*29.38*	*30.50*	*31.69*	*32.94*	*27.14*	*27.21*	*27.19*	*27.20*	*27.21*
Saline[7]	*2.21*	*0.34*	*0.00*	*0.00*	*3.63*	*3.67*	*3.72*	*3.79*	*3.87*	*3.49*	*3.40*	*3.32*	*3.25*	*3.20*
Sangamon[1]	*20.18*	*33.97*	*23.79*	*35.99*	*28.16*	*29.34*	*30.58*	*31.87*	*33.26*	*27.10*	*27.18*	*27.27*	*27.35*	*27.47*
Schuyler	0.73	0.64	1.45	1.03	0.43	0.42	0.42	0.42	0.42	0.41	0.39	0.37	0.36	0.35
Scott[9]	*0.25*	*0.98*	*4.00*	*4.74*	*0.21*	*0.22*	*0.23*	*0.24*	*0.24*	*0.21*	*0.20*	*0.20*	*0.20*	*0.20*
Shelby	1.19	2.53	2.39	2.17	2.22	2.26	2.31	2.38	2.46	2.14	2.09	2.06	2.04	2.03
Stark	0.43	0.70	0.49	0.29	0.28	0.28	0.29	0.29	0.29	0.27	0.26	0.26	0.25	0.24
Stephenson	5.84	4.80	5.04	4.00	4.75	4.84	4.93	5.02	5.12	4.57	4.48	4.39	4.31	4.23
Tazewell	13.02	16.27	14.77	15.11	16.47	16.74	17.04	17.40	17.77	15.85	15.51	15.19	14.93	14.68
Union[8]	*1.50*	*1.40*	*1.19*	*0.21*	*0.36*	*0.37*	*0.37*	*0.38*	*0.39*	*0.35*	*0.34*	*0.33*	*0.32*	*0.32*
Vermilion	10.08	11.46	10.55	9.93	9.24	9.35	9.48	9.62	9.77	8.90	8.67	8.45	8.26	8.07
Wabash[10]	*1.29*	*1.82*	*5.66*	*1.68*	*1.34*	*1.35*	*1.38*	*1.41*	*1.44*	*1.29*	*1.25*	*1.23*	*1.21*	*1.19*
Warren[2]	*2.86*	*2.36*	*2.49*	*2.81*	*1.57*	*1.59*	*1.61*	*1.64*	*1.67*	*1.51*	*1.47*	*1.43*	*1.41*	*1.38*
Washington[4]	*0.59*	*0.81*	*0.86*	*0.60*	*0.51*	*0.53*	*0.55*	*0.57*	*0.59*	*0.50*	*0.49*	*0.49*	*0.49*	*0.49*
Wayne	1.36	1.25	1.25	1.68	1.45	1.45	1.45	1.47	1.48	1.39	1.34	1.30	1.26	1.22
White[7]	*1.69*	*1.39*	*1.04*	*1.24*	*1.12*	*1.11*	*1.11*	*1.11*	*1.11*	*1.08*	*1.03*	*0.99*	*0.95*	*0.92*
Whiteside	4.55	5.03	5.78	4.95	2.50	2.50	2.51	2.51	2.52	2.41	2.32	2.23	2.16	2.08
Will[5]	*30.25*	*33.83*	*37.49*	*41.57*	*54.07*	*59.69*	*65.64*	*70.12*	*74.92*	*52.04*	*55.30*	*58.52*	*60.17*	*61.88*
Williamson[7]	*2.57*	*2.36*	*2.88*	*2.46*	*6.23*	*6.37*	*6.54*	*6.73*	*6.93*	*6.00*	*5.90*	*5.83*	*5.78*	*5.72*
Winnebago	35.24	36.76	35.99	32.80	35.27	36.50	37.81	39.21	40.69	33.94	33.81	33.71	33.65	33.61
Woodford	2.08	7.32	8.67	9.80	5.49	5.68	5.93	6.23	6.54	5.28	5.26	5.29	5.34	5.40

Table 3.4 *(cont'd)* Total Water Use Projections for Illinois (mgd)

County	USGS Historical Estimates				Baseline Projections					Projections with Conservation (trend)				
	1985	**1990**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**	**2005**	**2010**	**2015**	**2020**	**2025**
Group 1	79.76	95.75	84.19	95.02	83.61	86.30	89.13	92.35	95.72	80.47	79.95	79.46	79.25	79.06
Group 2	11.36	18.33	19.17	19.31	17.35	17.62	17.93	18.31	18.69	16.70	16.32	15.99	15.71	15.44
Group 3	3.09	3.73	4.18	4.71	5.72	5.76	5.81	5.87	5.93	5.51	5.33	5.18	5.04	4.90
Group 4	29.62	30.56	27.36	62.05	37.65	38.90	40.11	41.46	42.87	36.24	36.03	35.77	35.58	35.41
Group 5	1,220.74	1,243.05	1,183.80	1,094.75	1,117.10	1,181.52	1,251.64	1,328.12	1,411.91	1,075.18	1,094.52	1,115.96	1,139.72	1,166.16
Group 6	20.73	21.81	23.85	23.11	26.88	27.95	28.90	29.85	30.85	25.87	25.89	25.76	25.62	25.48
Group 7	24.02	23.83	23.67	24.54	24.87	25.08	25.43	25.90	26.39	23.93	23.23	22.67	22.22	21.80
Group 8	3.98	3.68	3.09	1.49	2.16	2.18	2.20	2.23	2.26	2.08	2.02	1.96	1.92	1.87
Group 9	1.20	1.64	4.76	5.76	5.24	5.27	5.35	5.48	5.62	5.04	4.89	4.77	4.70	4.64
Group 10	1.78	1.95	6.23	1.81	2.22	2.25	2.29	2.34	2.39	2.14	2.08	2.04	2.01	1.98
All Counties	**1,782.74**	**1,859.19**	**1,822.55**	**1,761.62**	**1,775.25**	**1,869.30**	**1,972.71**	**2,083.48**	**2,205.56**	**1,708.64**	**1,731.65**	**1,758.87**	**1,787.93**	**1,821.67**

Note: Counties in *italics* are members of grouped county. The number in the superscript indicates group membership. Projections for the 10 county groupings were calculated by applying the forecasting model to a set of projected model variables that represent the entire group of counties. Projections for the county grouping are not necessarily equal to the sum of the projections of the counties that are included in the grouping.

Table 3.5 Per Capita Water Use Projections for Illinois (gpcd)

County	USGS Historical Estimates				Baseline Projections					Projections with Conservation (trend)				
	1985	**1990**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**	**2005**	**2010**	**2015**	**2020**	**2025**
Adams[2]	*109.4*	*143.2*	*139.7*	*150.8*	*179.9*	*184.0*	*188.0*	*192.1*	*196.5*	*173.1*	*170.4*	*167.6*	*164.9*	*162.3*
Alexander[h]	*161.2*	*183.3*	*138.8*	*136.8*	*132.7*	*134.2*	*135.1*	*136.1*	*137.0*	*127.7*	*124.3*	*120.5*	*116.8*	*113.2*
Bond[1]	*81.2*	*142.9*	*174.6*	*21.3*	*121.0*	*121.8*	*122.4*	*122.8*	*123.1*	*116.5*	*112.8*	*109.2*	*105.4*	*101.7*
Boone	163.8	217.2	154.1	137.7	134.2	134.1	133.6	133.5	133.3	129.1	124.2	119.2	114.5	110.1
Brown[2]	*19.4*	*32.0*	*16.2*	*14.3*	*120.0*	*120.4*	*120.9*	*121.4*	*122.0*	*115.5*	*111.5*	*107.8*	*104.2*	*100.7*
Bureau	120.2	129.1	100.6	168.4	147.5	153.0	158.7	165.1	172.1	142.0	141.7	141.5	141.6	142.1
Calhoun	182.7	261.5	197.0	226.7	106.9	107.6	107.8	107.7	107.7	102.9	99.6	96.1	92.5	88.9
Carroll	128.9	5.8	145.4	132.9	118.5	120.0	121.4	122.7	124.0	114.0	111.2	108.2	105.3	102.4
Cass	140.5	288.9	148.7	198.8	147.9	152.2	155.1	157.4	159.9	142.4	141.0	138.3	135.1	132.0
Champaign[6]	*146.7*	*144.9*	*135.4*	*136.4*	*141.9*	*140.9*	*141.7*	*142.8*	*143.9*	*136.6*	*130.5*	*126.3*	*122.5*	*118.9*
Christian	148.3	135.6	152.3	149.6	143.4	145.2	147.0	149.1	151.1	138.0	134.5	131.1	127.9	124.8
Clark	117.3	125.3	139.9	91.9	137.8	140.5	142.4	142.9	143.4	132.6	130.2	126.9	122.6	118.5
Clay[3]	*107.1*	*108.9*	*104.0*	*114.3*	*158.3*	*164.8*	*169.1*	*172.7*	*176.6*	*152.4*	*152.6*	*150.8*	*148.2*	*145.8*
Clinton[4]	*64.2*	*85.5*	*107.3*	*95.8*	*128.6*	*129.7*	*130.4*	*130.9*	*131.4*	*123.8*	*120.1*	*116.3*	*112.3*	*108.6*
Coles	119.5	111.1	144.2	97.3	143.6	144.7	145.4	145.5	145.6	138.3	134.0	129.7	124.9	120.3
Cook[5]	*232.2*	*220.2*	*221.0*	*194.2*	*159.0*	*165.6*	*172.8*	*180.1*	*188.2*	*153.1*	*153.4*	*154.1*	*154.6*	*155.4*
Crawford	134.6	155.0	295.6	225.5	222.3	229.2	236.1	243.1	250.7	213.9	212.4	210.5	208.6	207.1
Cumberland	80.3	62.9	209.9	92.5	80.1	79.8	79.3	78.5	77.7	77.1	73.9	70.7	67.3	64.2
De Kalb	99.5	143.3	99.4	109.7	126.0	125.3	125.6	126.2	126.8	121.2	116.1	112.0	108.3	104.7
De Witt	114.2	223.7	119.6	117.9	129.8	131.7	133.5	135.0	136.6	124.9	122.0	119.0	115.8	112.8
Douglas[6]	*56.0*	*110.3*	*96.5*	*36.1*	*152.8*	*155.5*	*157.4*	*158.1*	*158.8*	*147.1*	*144.1*	*140.3*	*135.6*	*131.2*
Du Page[5]	*124.6*	*127.0*	*14.1*	*11.4*	*238.8*	*252.9*	*269.4*	*288.2*	*309.6*	*229.8*	*234.3*	*240.2*	*247.4*	*255.7*
Edgar	129.2	123.6	137.5	133.6	148.4	151.0	153.4	154.7	156.0	142.8	139.9	136.8	132.7	128.9
Edwards[10]	*111.1*	*40.1*	*127.0*	*31.1*	*202.6*	*212.6*	*221.4*	*230.0*	*239.4*	*195.0*	*197.0*	*197.4*	*197.4*	*197.8*
Effingham[3]	*80.3*	*144.5*	*459.6*	*147.7*	*210.5*	*213.6*	*215.8*	*219.9*	*224.2*	*202.6*	*197.9*	*192.4*	*188.7*	*185.1*

Table 3.5 *(cont'd)* Per Capita Water Use Projections for Illinois (gpcd)

County	USGS Historical Estimates				Baseline Projections					Projections with Conservation (trend)				
	1985	**1990**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**	**2005**	**2010**	**2015**	**2020**	**2025**
Fayette	107.9	123.7	137.2	126.1	131.7	135.4	138.8	142.1	145.8	126.8	125.4	123.7	122.0	120.4
Ford	117.1	145.6	187.4	185.2	149.8	151.8	154.1	156.5	159.1	144.2	140.6	137.4	134.3	131.4
Franklin[7]	420.9	380.9	328.3	383.1	135.5	138.6	141.0	142.4	143.8	130.4	128.4	125.7	122.2	118.8
Fulton	83.1	86.9	109.9	88.0	114.9	116.6	118.1	119.2	120.4	110.6	108.0	105.3	102.3	99.4
Gallatin[7]	99.8	488.3	690.9	842.5	129.9	131.1	131.6	132.0	132.4	125.0	121.5	117.3	113.3	109.3
Greene[9]	77.4	57.7	67.4	78.7	101.2	101.5	101.5	101.1	100.8	97.4	94.0	90.5	86.8	83.2
Grundy	75.3	112.0	54.6	141.2	119.9	119.8	119.3	118.7	118.1	115.4	111.0	106.3	101.8	97.5
Hamilton[7]	0.0	5.3	0.0	0.0	107.6	108.7	109.7	110.5	111.3	103.6	100.7	97.8	94.8	91.9
Hancock[2]	80.2	123.9	82.8	90.2	122.2	123.8	124.8	124.8	124.9	117.6	114.6	111.2	107.1	103.2
Hardin[7]	98.3	61.6	58.3	43.1	112.3	114.6	116.7	118.6	120.7	108.1	106.1	104.0	101.8	99.7
Henderson[2]	73.7	3554.2	1045.8	933.2	96.1	96.1	95.9	95.4	95.0	92.4	89.0	85.5	81.9	78.4
Henry	83.8	129.9	99.9	92.6	105.4	108.7	111.8	115.1	118.6	101.5	100.7	99.7	98.7	97.9
Iroquois	96.7	109.4	98.5	68.4	95.3	96.8	97.8	98.7	99.6	91.7	89.6	87.2	84.7	82.3
Jackson	151.3	141.3	116.6	110.7	128.2	129.4	130.9	133.3	135.8	123.4	119.9	116.7	114.4	112.2
Jasper[3]	92.1	132.5	82.9	179.8	117.9	117.6	116.5	114.7	113.1	113.5	108.9	103.8	98.5	93.4
Jefferson[7]	14.4	45.5	16.7	0.0	158.1	163.9	169.7	176.3	183.5	152.2	151.8	151.3	151.3	151.5
Jersey[1]	44.3	48.9	122.4	96.9	113.4	113.3	112.8	111.3	110.0	109.1	105.0	100.5	95.5	90.8
Jo Daviess	124.5	216.3	329.9	194.7	158.5	159.3	160.3	160.8	161.4	152.5	147.6	142.9	138.0	133.3
Johnson[7]	82.2	121.9	203.1	280.8	102.2	102.8	103.3	103.7	104.2	98.4	95.2	92.1	89.0	86.0
Kane	147.9	135.7	133.8	131.0	152.0	150.3	149.0	152.6	156.4	146.3	139.2	132.8	130.9	129.2
Kankakee	153.3	204.2	195.4	180.7	206.6	209.4	211.5	211.3	211.0	198.9	194.0	188.6	181.3	174.3
Kendall	132.8	192.7	122.1	104.5	117.9	117.1	115.6	113.2	111.0	113.5	108.4	103.1	97.2	91.7
Knox	145.1	28.2	138.2	8.6	161.8	161.5	160.1	159.4	158.7	155.7	149.6	142.8	136.8	131.1
Lake	121.4	146.6	112.7	116.3	131.9	133.0	134.2	137.9	141.7	126.9	123.2	119.7	118.3	117.1
La Salle	138.5	154.7	183.8	130.4	133.4	135.6	137.6	139.1	140.7	128.4	125.7	122.7	119.4	116.2

Table 3.5 *(cont'd)* Per Capita Water Use Projections for Illinois (gpcd)

County	USGS Historical Estimates				Baseline Projections					Projections with Conservation (trend)				
	1985	1990	1995	2000	2005	2010	2015	2020	2025	2005	2010	2015	2020	2025
Lawrence	106.7	153.7	120.6	0.0	144.1	150.2	156.1	162.2	169.1	138.7	139.2	139.1	139.2	139.6
Lee	125.6	168.8	214.5	142.4	169.9	172.1	174.3	174.8	175.4	163.6	159.5	155.4	150.0	144.8
Livingston	112.3	148.6	170.5	171.8	131.6	133.8	136.1	137.2	138.4	126.7	124.0	121.3	117.7	114.3
Logan	133.7	138.0	123.2	146.5	130.3	129.7	129.3	129.0	128.8	125.4	120.1	115.2	110.7	106.4
McDonough	101.7	107.6	106.3	104.2	108.4	109.7	111.1	112.8	114.7	104.4	101.6	99.0	96.8	94.8
McHenry	126.2	131.2	114.1	128.5	120.9	117.6	114.8	116.0	117.3	116.4	109.0	102.3	99.6	96.9
McLean	131.9	80.1	133.1	78.6	109.4	110.1	111.3	113.1	114.9	105.3	102.0	99.2	97.0	94.9
Macon	237.4	313.1	395.8	358.8	301.2	307.7	313.1	319.0	325.1	289.9	285.1	279.2	273.7	268.5
Macoupin[1]	*86.6*	*115.3*	*184.2*	*128.3*	*118.8*	*119.0*	*119.1*	*118.7*	*118.4*	*114.3*	*110.2*	*106.2*	*101.9*	*97.8*
Madison[1]	*229.6*	*240.4*	*353.3*	*355.1*	*147.2*	*148.9*	*150.6*	*151.0*	*151.5*	*141.7*	*137.9*	*134.3*	*129.6*	*125.1*
Marion[4]	*113.5*	*211.5*	*129.0*	*137.5*	*158.5*	*158.0*	*157.0*	*155.3*	*153.6*	*152.6*	*146.3*	*140.0*	*133.2*	*126.9*
Marshall	184.3	198.6	166.8	184.3	129.3	129.7	129.5	128.5	127.5	124.4	120.2	115.5	110.3	105.3
Mason	103.6	141.5	129.5	45.9	121.6	123.6	125.2	126.1	127.1	117.1	114.5	111.6	108.2	105.0
Massac[7]	*56.7*	*147.0*	*976.7*	*595.0*	*138.2*	*139.2*	*139.6*	*138.7*	*137.9*	*133.0*	*129.0*	*124.4*	*119.1*	*113.9*
Menard	82.3	121.2	87.1	13.8	96.0	95.1	94.3	93.3	92.5	92.4	88.1	84.0	80.1	76.4
Mercer	83.4	124.2	104.7	102.5	122.0	123.0	123.7	124.1	124.5	117.5	113.9	110.3	106.5	102.8
Monroe[4]	*63.1*	*47.3*	*89.0*	*22.8*	*116.1*	*115.0*	*114.1*	*112.9*	*111.7*	*111.8*	*106.5*	*101.7*	*96.9*	*92.3*
Montgomery	118.5	146.4	138.6	62.8	117.3	119.3	120.8	122.5	124.4	112.9	110.5	107.7	105.2	102.7
Morgan	148.9	25.9	205.6	16.9	161.3	160.5	159.9	159.5	159.2	155.3	148.7	142.5	136.9	131.5
Moultrie	99.4	111.7	119.0	105.4	132.4	133.3	134.1	134.6	135.1	127.4	123.5	119.6	115.5	111.5
Ogle	192.6	221.3	188.4	173.3	175.6	178.4	180.7	182.3	184.0	169.0	165.2	161.1	156.5	152.0
Peoria	108.5	155.8	148.5	151.4	153.0	159.3	165.8	174.2	183.4	147.3	147.5	147.9	149.5	151.5
Perry[7]	*44.1*	*50.2*	*29.6*	*38.3*	*135.2*	*139.0*	*142.7*	*146.3*	*150.3*	*130.2*	*128.8*	*127.2*	*125.6*	*124.1*
Piatt	108.0	188.7	205.2	177.8	181.0	181.4	181.6	181.3	181.0	174.2	168.1	161.9	155.6	149.5
Pike	95.1	126.7	161.0	173.9	126.9	127.5	127.9	128.2	128.5	122.1	118.1	114.0	110.0	106.1

Table 3.5 *(cont'd)* Per Capita Water Use Projections for Illinois (mgd)

County	**USGS Historical Estimates**				**Baseline Projections**					**Projections with Conservation (trend)**				
	1985	**1990**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**	**2005**	**2010**	**2015**	**2020**	**2025**
Pope[7]	*236.8*	*20.5*	*58.8*	*0.0*	*104.2*	*104.3*	*104.3*	*104.0*	*103.7*	*100.3*	*96.6*	*93.0*	*89.2*	*85.7*
Pulaski[8]	*134.6*	*109.7*	*148.4*	*32.2*	*118.1*	*118.3*	*118.3*	*118.1*	*117.9*	*113.7*	*109.6*	*105.5*	*101.3*	*97.4*
Putnam	87.2	125.3	97.3	42.3	144.3	141.6	138.8	136.2	133.7	138.9	131.2	123.8	116.9	110.4
Randolph	127.2	127.9	140.1	170.4	159.2	161.2	163.2	165.3	167.4	153.2	149.3	145.5	141.8	138.3
Richland	106.0	133.1	125.9	115.1	136.0	143.8	152.1	160.2	169.3	130.9	133.2	135.7	137.5	139.9
Rock Island	135.3	125.3	128.0	117.5	139.3	142.9	147.2	151.4	155.9	134.1	132.4	131.2	129.9	128.7
St Clair[4]	*109.2*	*89.8*	*88.6*	*268.1*	*135.5*	*136.6*	*138.2*	*139.8*	*141.5*	*130.4*	*126.5*	*123.2*	*120.0*	*116.9*
Saline[7]	*89.3*	*14.7*	*0.0*	*0.0*	*151.4*	*154.5*	*157.2*	*159.1*	*161.0*	*145.7*	*143.1*	*140.1*	*136.5*	*133.0*
Sangamon[1]	*149.5*	*213.0*	*166.2*	*240.2*	*182.1*	*186.2*	*190.9*	*196.9*	*203.2*	*175.3*	*172.5*	*170.2*	*168.9*	*167.8*
Schuyler	154.3	162.0	381.6	280.2	119.9	121.8	123.4	124.6	125.9	115.4	112.9	110.0	106.9	103.9
Scott[9]	*73.1*	*381.3*	*1487.0*	*2587.4*	*111.9*	*111.3*	*110.7*	*109.9*	*109.2*	*107.7*	*103.1*	*98.7*	*94.3*	*90.2*
Shelby	83.9	270.6	170.8	152.7	154.6	154.7	154.0	152.6	151.1	148.8	143.3	137.3	130.9	124.8
Stark	101.7	177.2	130.3	123.6	120.5	120.9	121.2	121.4	121.7	115.9	112.0	108.1	104.2	100.5
Stephenson	151.9	128.9	154.9	129.1	151.9	153.9	156.2	158.4	160.7	146.2	142.6	139.2	135.9	132.8
Tazewell	107.7	143.2	130.2	135.5	146.0	148.1	150.0	151.3	152.7	140.6	137.2	133.7	129.8	126.1
Union[8]	*129.3*	*123.4*	*687.9*	*77.8*	*133.2*	*134.6*	*135.7*	*136.7*	*137.7*	*128.2*	*124.7*	*121.0*	*117.3*	*113.8*
Vermilion	126.6	163.3	141.1	153.6	142.4	143.8	145.0	145.9	146.8	137.0	133.2	129.3	125.2	121.3
Wabash[10]	*124.5*	*190.8*	*592.1*	*180.0*	*143.8*	*146.1*	*147.3*	*148.1*	*148.8*	*138.4*	*135.3*	*131.4*	*127.1*	*122.9*
Warren[2]	*236.4*	*174.8*	*192.4*	*232.5*	*128.8*	*129.5*	*129.9*	*129.8*	*129.7*	*124.0*	*120.0*	*115.8*	*111.4*	*107.1*
Washington[4]	*40.3*	*67.1*	*160.8*	*181.3*	*149.9*	*149.5*	*148.6*	*146.6*	*144.8*	*144.3*	*138.5*	*132.5*	*125.8*	*119.6*
Wayne	210.2	143.5	518.7	180.6	157.1	158.9	160.3	161.4	162.5	151.2	147.2	143.0	138.5	134.3
White[7]	*157.1*	*119.8*	*91.2*	*146.1*	*136.0*	*139.0*	*141.9*	*144.8*	*148.0*	*130.9*	*128.8*	*126.5*	*124.3*	*122.2*
Whiteside	104.0	134.3	248.7	268.6	137.2	138.7	140.2	141.2	142.3	132.1	128.5	125.0	121.2	117.6
Will[5]	*119.0*	*140.5*	*133.3*	*112.0*	*127.6*	*123.7*	*120.7*	*119.9*	*119.1*	*122.8*	*114.6*	*107.6*	*102.9*	*98.3*
Williamson[7]	*46.3*	*42.2*	*69.7*	*59.5*	*150.5*	*154.3*	*157.5*	*160.4*	*163.5*	*144.9*	*142.9*	*140.4*	*137.7*	*135.0*
Winnebago	188.5	193.9	167.7	141.9	150.6	153.9	157.2	160.0	162.9	144.9	142.6	140.2	137.3	134.5
Woodford	96.1	393.6	403.3	733.3	395.0	394.1	390.9	386.4	382.0	380.2	365.1	348.5	331.6	315.5

Table 3.5 *(cont'd)* Per Capita Water Use Projections for Illinois (gpcd)

County	USGS Historical Estimates				Baseline Projections					Projections with Conservation (trend)				
	1985	**1990**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**	**2005**	**2010**	**2015**	**2020**	**2025**
Group 1	180.8	212.3	250.8	271.2	233.1	236.3	239.6	242.0	244.3	224.4	218.9	213.7	207.6	201.8
Group 2	116.8	205.9	187.0	201.1	178.8	181.6	184.0	185.8	187.6	172.1	168.2	164.1	159.4	155.0
Group 3	88.3	132.9	191.1	147.8	179.2	182.4	184.1	185.9	187.6	172.5	169.0	164.1	159.5	155.0
Group 4	101.5	99.6	96.9	228.3	134.5	135.0	135.9	136.5	137.3	129.5	125.1	121.1	117.2	113.4
Group 5	215.3	206.5	189.0	165.2	165.9	171.4	177.3	184.0	191.2	159.7	158.8	158.1	157.9	157.9
Group 6	138.2	142.3	132.5	129.2	145.5	144.8	145.6	146.7	147.8	140.0	134.1	129.8	125.9	122.1
Group 7	119.7	121.1	126.4	138.0	141.4	144.7	147.6	150.0	152.6	136.1	134.0	131.6	128.8	126.1
Group 8	142.8	143.6	204.0	102.0	148.3	149.6	150.6	151.4	152.2	142.7	138.6	134.2	129.9	125.7
Group 9	76.5	117.1	340.7	388.9	350.9	351.3	350.9	349.3	347.7	337.7	325.4	312.9	299.8	287.2
Group 10	120.5	152.6	443.4	132.5	164.5	168.7	171.7	174.1	176.5	158.3	156.3	153.1	149.4	145.8
All Counties	**181.3**	**184.8**	**175.3**	**161.4**	**159.5**	**164.0**	**168.9**	**174.7**	**181.0**	**153.5**	**151.9**	**150.6**	**149.9**	**149.5**

Note: Counties in *italics* are members of grouped county. The number in the superscript indicates group membership. Projections for the 10 county groupings were calculated by applying the forecasting model to a set of projected model variables that represent the entire group of counties. Projections for the county grouping are not necessarily equal to the sum of the projections of the counties that are included in the grouping.

CHAPTER 3 ANNEX

A3.1 COUNTY GROUPING PROCEDURES AND RESULTS

Multivariate models used to describe (and predict) water use generally depend upon Census-based data as the source for many of the determinants, or explanatory variables, that are used to account for water use. The lowest level of spatial disaggregation of water use available from USGS is the county, and conveniently, many county-level data are reported in Census (and other) sources. However, USGS water use inventories report the amount of public supply water *withdrawals* in each county. The actual amount of public supply water *use* may be quite different from the amount of public supply water withdrawals because of significant cross-county transfers. In order to ensure that water withdrawal data and explanatory variable data are spatially consistent, a county grouping procedure was designed to group the counties that are connected by direct or indirect water purchases.

The information that was used to group counties with cross-county transfers was obtained from the Illinois Environmental Protection Agency's drinking water database, which includes the selling water system ID, the purchase water system ID, and the principal county served by each water system. Cross-county flows were identified by comparing the "principal county served" information of the buying and selling systems. All counties with significant cross-county flows are grouped together. The final groupings of Illinois counties are shown in Table 3A.1 and Figure 3A.1.

Not all of the counties are included in the final groupings. Counties that are displayed in bold text were excluded from grouping, because their cross-county flows were considered to be insignificant (Table 3A.2). Two factors were used to decide whether cross-county flows are significant. One factor is the ratio of population served by the water systems that are engaged in cross county water purchase to total population in the county that buys water. The other factor is the ratio of population served by the water systems that are engaged in cross county water purchase to total population served in the county that sells water (column 6 and column 9). If both ratios are less than 6 percent, then the cross county flow are considered to be insignificant.

Table3A.1 County Grouping for Illinois: 2003

Group	Counties in the Group
Group 1	Bond, Jersey, Macoupin, Madison, Sangamon
Group 2	Adams, Brown, Hancock, Henderson, Warren
Group 3	Clay, Effingham, Jasper
Group 4	Clinton, St. Clair, Monroe, Washington, Marion
Group 5	Cook, DuPage, Will
Group 6	Douglas, Champaign
Group 7	Franklin, Gallatin, Hamilton, Hardin, Jefferson, Johnson, Perry, Pope, Massac, Saline, White, Williamson,
Group 8	Alexander, Pulaski, Union
Group 9	Scott, Greene
Group 10	Wabash, Edwards

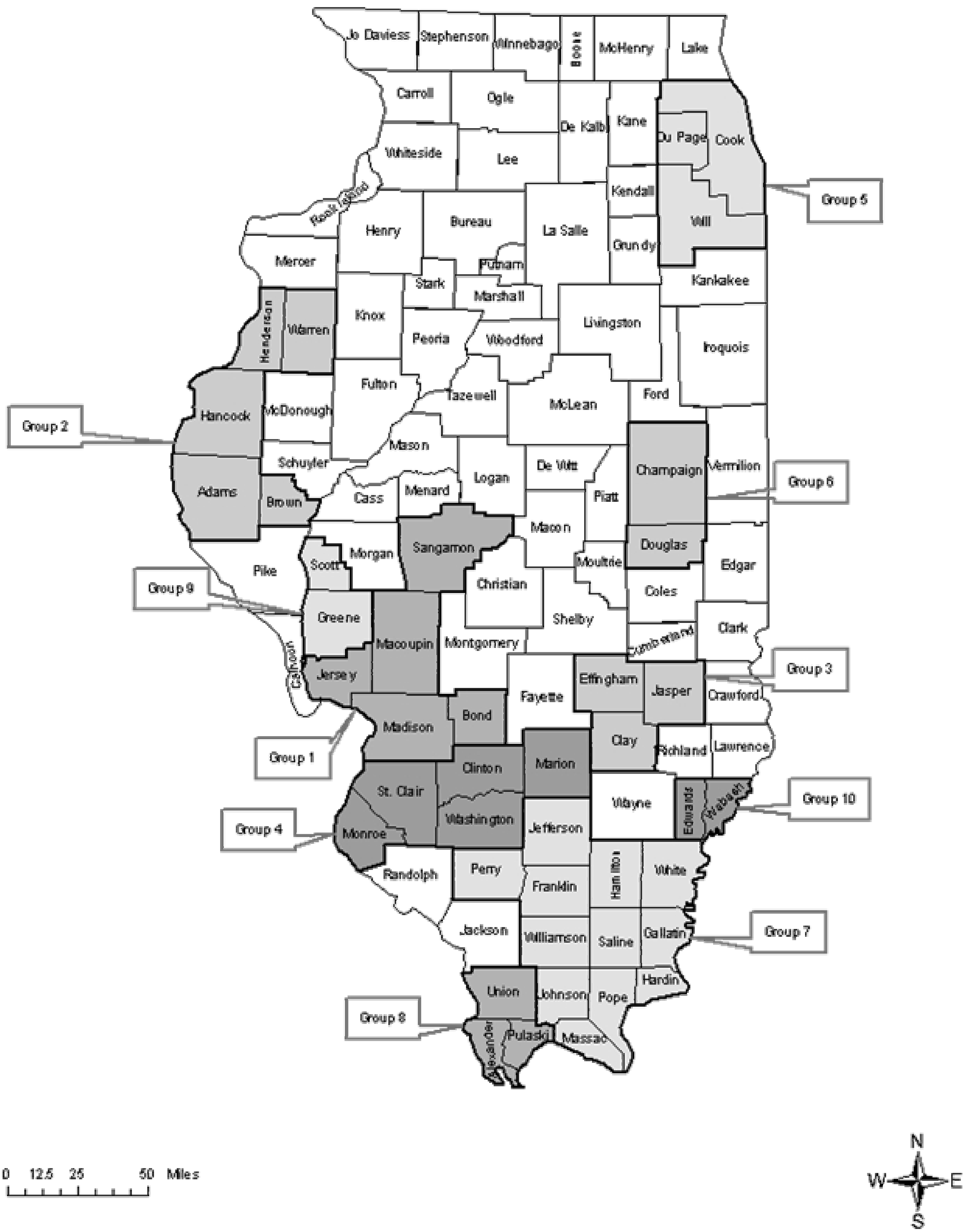
Table 3A.2 Population Served in Counties with Cross-County Transfers in Illinois

Group	Buying County	Retail Pop. By Purchase System	Total Retail Pop. In Buying County	% Pop. in Buying County	Selling County	Total Retail Pop. In Selling County	% Pop. in Selling County
Group 1	Bond	3,346	11,360	29.5	Madison	266,611	1.3
	Jersey	14,118	24,370	57.9	Madison	266,611	5.3
	Macoupin	10,002	44,024	22.7	Madison	266,611	3.8
	Madison	1,050	266,611	0.4	Bond	11,360	9.2
	Madison	**340**	**266,611**	**0.1**	**Macoupin**	**44,024**	0.8
	Madison	**1,755**	**266,611**	**0.7**	**Montgomery**	**21,512**	8.2
	Madison	**3,265**	**266,611**	**1.2**	**St Clair**	**250,204**	1.3
	Sangamon	8,947	193,315	4.6	Macoupin	44,024	20.3
Group 2	Brown	2,172	2,792	77.8	Adams	61,320	3.5
	Hancock	1,442	13,659	10.6	Adams	61,320	2.4
	Hancock	1,200	13,659	8.8	Henderson	5,680	21.1
	Schuyler	**500**	**6,135**	**8.1**	**Adams**	**61,320**	0.8
	Warren	1,100	12,942	8.5	Henderson	5,680	19.4
Group 3	Clay	1,242	9,169	13.5	Jasper	13,950	8.9
	Effingham	1,641	22,864	7.2	Jasper	13,950	11.8
Group 4	Clinton	1,575	27,419	5.7	Marion	43,675	3.6
	Clinton	7,315	27,419	26.7	St Clair	250,204	2.9
	Washington	2,653	18,364	14.4	Marion	43,675	6.1
	Washington	11,498	18,364	62.6	St Clair	250,204	4.6
	Monroe	16,514	18,325	90.1	St Clair	250,204	6.6
	Randolph	**1,169**	**23,170**	**5.0**	**St Clair**	**250,204**	0.5
	St Clair	2,940	250,204	1.2	Monroe	18,325	16.0
Group 5	**Cook**	**855**	**5,274,969**	**0.0**	**Lake**	**528,861**	0.2
	Du Page	703,239	763,599	92.1	Cook	5,274,969	13.3
	Will	107,037	382,070	28.0	Cook	5,274,969	2.0
Group 6	Douglas	7,853	14,042	55.9	Champaign	163,318	4.8

Table 3A.2 *(cont'd)* Population Served in Counties with Cross-County Transfers in Illinois

Group	Buying County	Retail Pop. By Purchase System	Total Retail Pop. In Buying County	% Pop. in Buying County	Selling County	Total Retail Pop. In Selling County	% Pop. in Selling County
No Group	**Fulton**	**250**	**28,466**	**0.9**	**McDonough**	**27,883**	0.9
	McDonough	**333**	**27,883**	**1.2**	**Fulton**	**28,466**	1.2
No Group	**Greene**	**238**	**11,235**	**2.1**	**Madison**	**266,611**	0.1
Group 7	Hamilton	5,587	6,281	89.0	Franklin	40,581	13.8
	Hamilton	694	6,281	11.0	White	13,608	5.1
	Jackson	**1,240**	**62,827**	**2.0**	**Franklin**	**40,581**	3.1
	Jefferson	12,916	31,581	40.9	Franklin	40,581	31.8
	Perry	9,482	15,926	59.5	Franklin	40,581	23.4
	Perry	**795**	**15,926**	**5.0**	**Jackson**	**62,827**	1.3
	Saline	2,187	26,315	8.3	Franklin	40,581	5.4
	Saline	1,492	26,315	5.7	Pope	4,697	31.8
	White	1,255	13,608	9.2	Franklin	40,581	3.1
	Hardin	1,401	3,466	40.4	Saline	26,315	5.3
	Johnson	1,755	8,385	20.9	Saline	26,315	6.7
	Johnson	872	8,385	10.4	Williamson	66,532	1.3
	Williamson	37,047	66,532	55.7	Franklin	40,581	91.3
	Gallatin	1,112	5,827	19.1	Saline	26,315	4.2
	Massac	4,397	13,112	33.5	Pope	4,697	93.6
Group 8	Pulaski	2,776	4,516	61.5	Alexander	10,208	27.2
	Union	841	12,056	7.0	Alexander	10,208	8.2
Group 9	Scott	900	3,746	24.0	Greene	11,235	8.0
Group 10	Wabash	1,066	10,561	10.1	Edwards	4,547	23.4

Illinois



Jo Daviess
Stephenson
Winnebago
Boone
McHenry
Lake
Carroll
Ogle
De Kalb
Kane
Du Page
Cook
Whiteside
Lee
Kendall
Group 5
Rock Island
Henry
Bureau
La Salle
Will
Grundy
Mercer
Putnam
Kankakee
Stark
Marshall
Henderson
Warren
Knox
Livingston
Peoria
Woodford
Iroquois
Fulton
Tazewell
Ford
Group 2
Hancock
McDonough
McLean
Mason
Schuyler
De Witt
Champaign
Vermilion
Group 6
Adams
Brown
Cass
Menard
Logan
Piatt
Macon
Sangamon
Douglas
Scott
Morgan
Pike
Moultrie
Edgar
Group 9
Christian
Coles
Greene
Shelby
Clark
Calhoun
Macoupin
Montgomery
Cumberland
Jersey
Effingham
Jasper
Group 3
Fayette
Crawford
Madison
Bond
Clay
Richland
Lawrence
Group 1
Clinton
Marion
St. Clair
Wayne
Edwards
Wabash
Group 10
Group 4
Washington
Jefferson
Monroe
Randolph
Perry
Franklin
Hamilton
White
Jackson
Williamson
Saline
Gallatin
Group 7
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Johnson
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Hardin
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Pulaski
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0 12.5 25 50 Miles
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S

A3.2 ESTIMATES AND PROJECTIONS OF TOTAL POPULATION, POPULATION SERVED

This section of the Chapter 3 Annex contains the historical estimates of total population and population served by community water supply systems in Illinois. Historical estimates of per capita water use and population served were prepared by the USGS National Water Use Information Program and downloaded from their website (*http://water.usgs.gov/watuse/wudownload.html*).

This appendix also contains projections of population and population served in each county and county grouping for the five water demand forecast projections years used in this study (2005, 2010, 2015, 2020, 2025).

County population projection estimates were developed from projections provided by the Illinois State University's Census and Data Users Services. County population projections can be downloaded from: *http://www.cadus.ilstu.edu/database/population.xls* .

The Census and Data User's Services had not prepared population projections for the 2025 at the time this study was conducted. Therefore, the projected rate of growth in each county from 2015 to 2020 was applied to the projected 2020 value to prepare the population projections for 2025 (Table 3A.3).

Projections of the population served in each county were first developed using the historical trends in population served as reported in the USGS water use inventories from 1985 to 2000. However, the wide disparity in reported values across this time period for many counties resulted in values for projections years that did not seem reasonable. Consequently, the population served projections for each county were calculated by multiplying projected population values for each county by the percent of population served in each county in the year 2000 (Table 3A.4). The population and population served in county groupings were prepared by summing the estimates from the individual counties in each grouping.

A review of the Census data on household water sources from 1970 to 1990 (this information was not collected in the 2000 Census) revealed a slight trend toward increasing population served nationally. The static values of percent of population served used in the projections presented in this study could potentially result in a slight underestimation of public supply water use, and readers of this report may wish to adjust this percentage to better represent public water supply participation in their counties or regions.

Table 3A.3. Historical Estimates and Projections of Population in Illinois

County	USGS Historical Estimates				Study Projections				
	1985	1990	1995	2000	2005	2010	2015	2020	2025
Adams[2]	71,700	66,090	68,040	68,277	69,410	69,428	69,609	69,833	70,058
Alexander[8]	12,370	10,630	10,180	9,590	9,395	9,216	9,199	9,173	9,148
Bond[1]	16,420	14,990	15,740	17,633	17,575	17,469	17,417	17,469	17,522
Boone	28,670	30,810	36,180	41,786	42,151	42,440	42,977	43,332	43,688
Brown[2]	5,440	5,840	6,250	6,950	7,065	7,130	7,185	7,229	7,273
Bureau	39,290	35,690	36,050	35,503	35,074	34,617	34,297	34,012	33,728
Calhoun	6,010	5,320	4,950	5,084	4,987	4,903	4,903	4,962	5,021
Carroll	18,920	16,800	16,870	16,674	16,100	15,885	15,746	15,648	15,552
Cass	15,500	13,440	13,330	13,695	13,374	12,967	12,793	12,718	12,644
Champaign[6]	169,800	173,020	169,100	179,669	186,234	195,752	201,810	207,331	213,002
Christian	37,460	34,420	34,920	35,372	35,593	35,689	35,815	35,902	35,988
Clark	17,140	15,920	16,280	17,008	16,839	16,491	16,396	16,620	16,846
Clay[3]	16,140	14,460	14,440	14,560	14,064	13,392	13,052	12,816	12,585
Clinton[4]	32,640	33,940	35,280	35,535	36,016	36,580	37,430	38,436	39,469
Coles	54,450	51,640	52,360	53,196	54,841	56,587	58,556	61,005	63,556
Cook[5]	5,212,220	5,105,070	5,136,880	5,376,741	5,396,919	5,456,149	5,514,377	5,597,469	5,681,813
Crawford	20,990	19,460	19,910	20,452	19,770	19,142	18,631	18,174	17,728
Cumberland	11,640	10,670	11,110	11,253	11,513	11,820	12,286	13,074	13,912
De Kalb	76,250	77,930	83,440	88,969	93,942	99,148	102,951	106,345	109,851
De Witt	18,920	16,520	16,820	16,798	16,546	16,253	16,033	15,874	15,717
Douglas[6]	20,700	19,460	19,800	19,922	19,899	19,628	19,548	19,688	19,828
Du Page[5]	743,200	781,670	853,460	904,161	922,970	949,679	975,494	1,001,074	1,027,324
Edgar	21,880	19,600	19,980	19,704	19,233	18,733	18,368	18,289	18,210
Edwards[10]	7,810	7,440	7,260	6,971	6,759	6,554	6,441	6,362	6,284
Effingham[3]	32,790	31,700	33,010	34,264	34,713	34,644	34,743	34,530	34,319
Fayette	22,740	20,890	21,240	21,802	21,182	20,547	20,120	19,812	19,508
Ford	15,550	14,280	14,130	14,241	14,177	14,075	13,940	13,804	13,671
Franklin[7]	45,650	40,320	40,810	39,018	37,936	36,786	36,267	36,377	36,487
Fulton	45,580	38,080	38,790	38,250	37,295	36,389	35,780	35,578	35,378
Gallatin[7]	7,590	6,910	6,780	6,445	6,369	6,316	6,376	6,454	6,532
Greene[9]	16,800	15,320	15,640	14,761	14,690	14,591	14,679	15,031	15,391
Grundy	37,170	32,340	35,160	37,535	39,123	40,798	42,814	44,993	47,283
Hamilton[7]	10,080	8,500	8,520	8,621	8,293	8,012	7,820	7,692	7,566
Hancock[2]	23,890	21,370	21,290	20,121	19,895	19,581	19,485	19,748	20,014
Hardin[7]	5,910	5,190	5,180	4,800	4,592	4,360	4,184	4,046	3,913
Henderson[2]	9,940	8,100	8,430	8,213	8,332	8,399	8,609	9,045	9,504
Henry	60,170	51,160	51,720	51,020	49,121	47,308	45,869	44,626	43,416
Iroquois	33,340	30,790	31,410	31,334	30,757	30,075	29,795	29,611	29,428
Jackson	61,630	61,070	61,500	59,612	61,041	62,383	63,559	64,011	64,467
Jasper[3]	11,460	10,610	10,590	10,117	10,287	10,378	10,660	11,110	11,580
Jefferson[7]	37,490	37,020	39,000	40,045	39,710	38,862	38,155	37,430	36,718
Jersey[1]	20,590	20,540	21,190	21,668	22,533	23,409	24,635	26,536	28,584
Jo Daviess	23,680	21,820	21,930	22,289	22,420	22,623	22,790	23,066	23,345
Johnson[7]	11,330	11,350	12,430	12,878	12,692	12,402	12,252	12,152	12,053
Kane	279,160	317,470	359,950	404,119	440,560	482,589	526,441	548,614	571,721
Kankakee	103,200	96,260	102,050	103,833	106,371	108,261	110,595	114,295	118,119
Kendall	43,760	39,410	45,400	54,544	58,944	62,256	66,679	73,338	80,663
Knox	61,720	56,390	56,070	55,836	55,575	54,991	54,978	54,603	54,231
Lake	455,490	516,420	572,430	644,356	675,002	711,773	749,755	773,501	797,999
La Salle	111,870	106,910	109,960	111,509	111,545	110,996	110,996	111,657	112,322
Lawrence	18,490	15,970	15,920	15,452	15,100	14,666	14,431	14,265	14,100
Lee	35,710	34,390	35,800	36,062	35,694	35,589	35,547	36,129	36,721
Livingston	41,710	39,300	40,400	39,678	39,268	38,853	38,496	38,723	38,952
Logan	32,280	30,800	31,270	31,183	31,763	32,166	32,473	32,669	32,866
McDonough	38,160	35,240	35,520	32,913	33,478	34,022	34,496	34,815	35,138
McHenry	164,510	183,240	224,680	260,077	288,007	319,910	354,281	365,939	377,980
McLean	120,180	129,180	139,270	150,433	156,861	162,357	167,370	171,641	176,021
Macon	135,620	117,210	116,410	114,706	114,516	114,242	114,597	114,845	115,093
Macoupin[1]	50,020	47,680	48,730	49,019	49,625	50,536	51,558	53,226	54,947
Madison[1]	240,500	249,240	256,460	258,941	264,230	268,794	273,635	282,720	292,107
Marion[4]	44,830	41,560	42,000	41,691	40,831	39,936	39,232	38,857	38,486
Marshall	16,610	12,850	12,790	13,180	13,290	13,305	13,505	13,967	14,445

Table 3A.3. Historical Estimates and Projections of Population in Illinois

County	USGS Historical Estimates				Study Projections				
	1985	1990	1995	2000	2005	2010	2015	2020	2025
Mason	19,680	16,270	16,690	16,038	15,443	14,911	14,568	14,469	14,370
Massac[7]	*16,120*	*14,750*	*15,370*	*15,161*	*15,376*	*15,520*	*15,827*	*16,414*	*17,022*
Menard	12,360	11,160	12,280	12,486	13,772	14,879	16,082	17,522	19,091
Mercer	20,010	17,290	17,440	16,957	16,590	16,264	16,089	16,088	16,087
Monroe[4]	*20,210*	*22,420*	*24,720*	*27,619*	*29,841*	*31,927*	*33,943*	*36,444*	*39,128*
Montgomery	32,230	30,730	30,990	30,652	30,611	30,160	29,971	29,687	29,406
Morgan	38,110	36,400	36,170	36,616	38,012	39,241	40,467	41,605	42,775
Moultrie	16,140	13,930	14,170	14,287	14,302	14,340	14,413	14,578	14,745
Ogle	46,380	45,960	49,410	51,032	50,683	50,119	49,863	50,005	50,147
Peoria	200,600	182,830	183,380	183,433	184,292	185,005	185,976	185,818	185,661
Perry[7]	*23,020*	*21,410*	*21,300*	*23,094*	*22,888*	*22,685*	*22,614*	*22,672*	*22,730*
Piatt	16,760	15,550	16,160	16,365	16,555	16,699	16,946	17,347	17,757
Pike	19,800	17,580	17,340	17,384	17,354	17,278	17,331	17,392	17,454
Pope[7]	*4,830*	*4,370*	*4,690*	*4,413*	*4,440*	*4,468*	*4,504*	*4,607*	*4,713*
Pulaski[8]	*8,870*	*7,520*	*7,460*	*7,348*	*7,396*	*7,416*	*7,461*	*7,573*	*7,686*
Putnam	6,060	5,730	5,720	6,086	6,145	6,151	6,185	6,231	6,278
Randolph	35,770	34,580	34,300	33,893	33,844	33,732	33,634	33,558	33,482
Richland	17,340	16,540	16,790	16,149	15,369	14,620	13,975	13,506	13,052
Rock Island	159,980	148,720	149,830	149,374	150,245	149,833	148,907	148,460	148,015
St Clair[4]	*267,890*	*262,850*	*265,420*	*256,082*	*265,016*	*273,978*	*281,126*	*288,685*	*296,447*
Saline[7]	*28,530*	*26,550*	*26,520*	*26,733*	*26,453*	*26,184*	*26,098*	*26,305*	*26,514*
Sangamon[1]	*176,600*	*178,390*	*184,730*	*188,951*	*194,971*	*198,763*	*201,954*	*204,173*	*206,415*
Schuyler	8,750	7,500	7,800	7,189	6,947	6,737	6,609	6,544	6,480
Scott[9]	*6,510*	*5,640*	*5,630*	*5,537*	*5,791*	*6,000*	*6,221*	*6,485*	*6,761*
Shelby	24,710	22,260	22,560	22,893	23,127	23,457	24,082	25,107	26,175
Stark	7,880	6,530	6,400	6,332	6,317	6,295	6,321	6,346	6,371
Stephenson	49,430	48,050	48,840	48,979	49,417	49,661	49,873	50,111	50,351
Tazewell	134,510	123,690	127,600	128,485	129,922	130,233	130,857	132,465	134,093
Union[8]	*17,850*	*17,620*	*18,110*	*18,293*	*18,351*	*18,395*	*18,558*	*18,748*	*18,940*
Vermilion	92,530	88,260	86,540	83,919	84,324	84,471	84,872	85,640	86,414
Wabash[10]	*14,030*	*13,110*	*12,930*	*12,937*	*12,891*	*12,834*	*12,960*	*13,187*	*13,417*
Warren[2]	*23,360*	*19,180*	*18,820*	*18,735*	*18,865*	*18,985*	*19,194*	*19,579*	*19,973*
Washington[4]	*16,550*	*14,960*	*15,240*	*15,148*	*15,664*	*16,164*	*16,797*	*17,678*	*18,606*
Wayne	18,540	17,240	17,210	17,151	17,008	16,803	16,743	16,778	16,814
White[7]	*18,870*	*16,520*	*15,900*	*15,371*	*14,899*	*14,459*	*14,131*	*13,844*	*13,562*
Whiteside	67,770	60,190	60,350	60,653	60,001	59,360	58,805	58,560	58,316
Will[5]	*351,120*	*357,310*	*413,380*	*502,266*	*573,500*	*652,809*	*736,050*	*791,645*	*851,438*
Williamson[7]	*57,360*	*57,730*	*59,750*	*61,296*	*61,413*	*61,310*	*61,648*	*62,270*	*62,899*
Winnebago	250,050	252,910	264,950	278,418	281,991	285,537	289,598	295,180	300,869
Woodford	35,030	32,650	34,580	35,469	36,869	38,226	40,238	42,756	45,431
Group 1	504,130	510,840	526,850	536,212	548,934	558,970	569,199	584,124	599,576
Group 2	134,330	120,580	122,830	122,296	123,566	123,523	124,081	125,434	126,821
Group 3	60,390	56,770	58,040	58,941	59,063	58,414	58,455	58,457	58,483
Group 4	382,120	375,730	382,660	376,075	387,367	398,584	408,528	420,100	432,137
Group 5	6,306,540	6,244,050	6,403,720	6,783,168	6,893,389	7,058,636	7,225,921	7,390,187	7,560,575
Group 6	190,500	192,480	188,900	199,591	206,133	215,380	221,359	227,019	232,831
Group 7	266,780	250,620	256,250	257,875	255,061	251,364	249,879	250,263	250,709
Group 8	39,090	35,770	35,750	35,231	35,141	35,026	35,218	35,494	35,773
Group 9	23,310	20,960	21,270	20,298	20,481	20,591	20,900	21,516	22,151
Group 10	21,840	20,550	20,190	19,908	19,650	19,389	19,402	19,549	19,700
All Counties	**11,584,900**	**11,430,590**	**11,829,960**	**12,419,293**	**12,678,976**	**12,998,740**	**13,334,404**	**13,628,351**	**13,933,698**

Note: Counties in *italics* are members of a county grouping. The number in the superscript indicates group membership.

Table 3A.4. Historical Estimates and Projections of Population Served in Illinois

County	USGS Historical Estimates				Study Projections				
	1985	1990	1995	2000	2005	2010	2015	2020	2025
Adams[2]	64,150	60,970	65,200	61,960	62,988	63,005	63,169	63,372	63,576
Alexander[8]	10,920	9,710	9,580	8,590	8,416	8,255	8,239	8,217	8,194
Bond[1]	9,850	7,070	7,160	9,030	9,000	8,946	8,919	8,946	8,973
Boone	18,560	17,630	23,170	26,970	27,206	27,392	27,739	27,968	28,198
Brown[2]	3,090	2,810	4,950	5,450	5,540	5,591	5,634	5,668	5,703
Bureau	30,530	24,630	20,870	17,190	16,982	16,761	16,606	16,468	16,331
Calhoun	2,080	1,300	2,030	1,310	1,285	1,263	1,263	1,278	1,294
Carroll	11,790	10,360	10,110	10,050	9,704	9,575	9,490	9,432	9,374
Cass	10,960	10,420	9,620	8,090	7,900	7,660	7,557	7,513	7,469
Champaign[6]	135,910	141,980	166,880	166,020	172,086	180,881	186,479	191,580	196,821
Christian	29,000	25,140	19,040	21,170	21,302	21,360	21,435	21,487	21,539
Clark	10,740	9,820	11,010	11,510	11,396	11,160	11,096	11,247	11,400
Clay[3]	8,500	8,080	8,460	6,710	6,481	6,172	6,015	5,906	5,800
Clinton[4]	22,440	26,560	19,020	20,380	20,656	20,979	21,467	22,044	22,636
Coles	41,250	45,270	50,890	46,540	47,979	49,507	51,229	53,372	55,604
Cook[5]	4,795,240	5,099,990	5,132,290	5,371,360	5,391,518	5,450,688	5,508,858	5,591,867	5,676,127
Crawford	15,230	13,230	6,800	10,570	10,217	9,893	9,629	9,393	9,162
Cumberland	4,980	4,450	5,050	4,680	4,788	4,916	5,110	5,437	5,786
De Kalb	70,960	54,350	67,890	70,190	74,113	78,221	81,220	83,898	86,665
De Witt	12,430	9,880	12,380	11,030	10,864	10,672	10,527	10,423	10,320
Douglas[6]	14,110	11,240	13,060	12,920	12,905	12,729	12,678	12,768	12,859
Du Page[5]	619,660	680,130	849,190	882,500	900,858	926,927	952,124	977,091	1,002,712
Edgar	13,930	12,460	12,440	11,770	11,488	11,190	10,972	10,925	10,878
Edwards[10]	4,410	3,240	4,490	4,370	4,237	4,109	4,038	3,988	3,939
Effingham[3]	22,030	16,960	5,810	18,020	18,256	18,220	18,272	18,160	18,049
Fayette	11,400	10,430	10,570	8,520	8,278	8,029	7,863	7,742	7,624
Ford	11,610	11,540	9,230	10,420	10,373	10,298	10,199	10,101	10,003
Franklin[7]	32,100	32,870	39,200	37,520	36,479	35,374	34,875	34,980	35,086
Fulton	29,980	31,310	28,580	25,700	25,059	24,450	24,040	23,905	23,770
Gallatin[7]	6,410	5,570	5,080	3,860	3,815	3,783	3,819	3,865	3,912
Greene[9]	12,270	11,440	11,280	12,970	12,907	12,821	12,898	13,207	13,523
Grundy	30,800	22,600	19,950	20,540	21,409	22,326	23,429	24,621	25,874
Hamilton[7]	4,330	3,780	5,940	3,470	3,338	3,225	3,148	3,096	3,045
Hancock[2]	14,840	10,090	13,290	9,930	9,818	9,664	9,616	9,746	9,877
Hardin[7]	2,850	4,380	3,600	3,200	3,061	2,906	2,790	2,698	2,609
Henderson[2]	3,120	1,660	6,110	6,630	6,726	6,780	6,950	7,302	7,672
Henry	44,650	36,650	39,060	38,420	36,990	35,625	34,541	33,605	32,694
Iroquois	22,030	19,840	23,760	23,830	23,391	22,872	22,660	22,520	22,380
Jackson	58,690	56,630	56,790	57,690	59,073	60,372	61,510	61,948	62,388
Jasper[3]	4,450	3,020	7,600	7,120	7,240	7,304	7,502	7,819	8,149
Jefferson[7]	27,700	28,160	29,940	26,880	26,655	26,086	25,612	25,124	24,647
Jersey[1]	17,610	18,390	9,640	13,100	13,623	14,152	14,894	16,043	17,282
Jo Daviess	14,380	11,280	7,700	12,160	12,232	12,342	12,433	12,584	12,736
Johnson[7]	6,330	5,250	3,940	3,700	3,647	3,563	3,520	3,492	3,463
Kane	225,360	279,370	358,450	402,500	438,795	480,655	524,332	546,416	569,430
Kankakee	79,540	66,210	71,020	79,550	81,495	82,942	84,731	87,566	90,495
Kendall	14,460	10,430	14,910	21,480	23,213	24,517	26,259	28,881	31,766
Knox	53,540	49,360	45,870	42,930	42,729	42,281	42,270	41,982	41,696
Lake	406,920	397,980	535,400	563,380	590,174	622,325	655,533	676,295	697,715
La Salle	96,040	92,080	83,680	84,510	84,538	84,121	84,121	84,622	85,126
Lawrence	11,340	10,930	11,190	9,980	9,753	9,473	9,321	9,213	9,107
Lee	28,820	23,340	19,950	30,020	29,713	29,626	29,591	30,076	30,568
Livingston	30,890	25,300	28,450	31,730	31,402	31,070	30,785	30,966	31,149
Logan	26,180	23,920	25,970	21,270	21,666	21,941	22,150	22,283	22,418
McDonough	29,590	29,560	30,400	28,170	28,654	29,119	29,525	29,798	30,074
McHenry	96,740	110,680	132,400	160,810	178,079	197,806	219,058	226,266	233,711
McLean	100,500	114,060	79,170	129,620	135,158	139,894	144,214	147,894	151,667
Macon	118,850	108,190	100,300	109,610	109,428	109,166	109,506	109,743	109,980
Macoupin[1]	42,160	32,610	24,480	25,440	25,755	26,227	26,758	27,623	28,516
Madison[1]	236,670	233,410	151,330	152,940	156,064	158,759	161,619	166,985	172,529
Marion[4]	44,230	32,620	39,680	39,390	38,577	37,731	37,067	36,713	36,362
Marshall	10,200	8,760	10,430	9,380	9,458	9,469	9,612	9,940	10,280
Mason	9,940	8,200	8,960	8,040	7,742	7,475	7,303	7,253	7,204

Table 3A.4. Historical Estimates and Projections of Population Served in Illinois

County	USGS Historical Estimates				Study Projections				
	1985	**1990**	**1995**	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**
Massac[7]	*12,180*	*11,290*	*1,290*	*2,200*	*2,231*	*2,252*	*2,297*	*2,382*	*2,470*
Menard	8,260	5,860	8,730	8,990	9,916	10,713	11,579	12,616	13,745
Mercer	11,030	7,650	10,120	6,280	6,144	6,023	5,958	5,958	5,958
Monroe[4]	*8,720*	*13,110*	*7,420*	*7,620*	*8,233*	*8,809*	*9,365*	*10,055*	*10,795*
Montgomery	23,880	19,120	22,880	21,650	21,621	21,303	21,169	20,968	20,770
Morgan	31,090	29,300	29,080	21,300	22,112	22,827	23,540	24,202	24,883
Moultrie	11,270	9,670	9,750	9,680	9,690	9,716	9,765	9,877	9,990
Ogle	27,980	25,400	28,020	29,030	28,831	28,511	28,365	28,446	28,527
Peoria	200,600	171,350	167,650	169,700	170,495	171,155	172,052	171,907	171,761
Perry[7]	*13,840*	*10,960*	*17,910*	*19,090*	*18,920*	*18,752*	*18,693*	*18,741*	*18,789*
Piatt	11,570	10,230	6,580	10,680	10,804	10,898	11,059	11,321	11,588
Pike	12,940	11,520	10,620	10,900	10,881	10,834	10,866	10,905	10,944
Pope[7]	*3,800*	*3,900*	*1,190*	*3,900*	*3,924*	*3,949*	*3,980*	*4,072*	*4,165*
Pulaski[8]	*5,350*	*4,560*	*3,840*	*3,350*	*3,372*	*3,381*	*3,402*	*3,452*	*3,504*
Putnam	5,160	3,910	4,110	4,590	4,635	4,639	4,664	4,700	4,735
Randolph	29,560	26,350	25,410	19,970	19,941	19,875	19,818	19,773	19,728
Richland	11,890	11,800	13,270	12,680	12,067	11,479	10,973	10,605	10,248
Rock Island	148,090	139,240	136,110	134,370	135,153	134,783	133,950	133,548	133,147
St Clair[4]	*201,710*	*222,340*	*210,870*	*201,080*	*208,095*	*215,132*	*220,745*	*226,680*	*232,775*
Saline[7]	*24,740*	*23,160*	*26,520*	*24,230*	*23,976*	*23,732*	*23,655*	*23,842*	*24,032*
Sangamon[1]	*134,970*	*159,510*	*143,120*	*149,840*	*154,614*	*157,621*	*160,152*	*161,911*	*163,689*
Schuyler	4,730	3,950	3,800	3,690	3,566	3,458	3,392	3,359	3,326
Scott[9]	*3,420*	*2,570*	*2,690*	*1,830*	*1,914*	*1,983*	*2,056*	*2,143*	*2,235*
Shelby	14,190	9,350	13,990	14,240	14,385	14,591	14,980	15,617	16,281
Stark	4,230	3,950	3,760	2,370	2,364	2,356	2,366	2,375	2,385
Stephenson	38,460	37,250	32,530	30,980	31,257	31,411	31,545	31,696	31,848
Tazewell	120,940	113,630	113,460	111,540	112,787	113,058	113,599	114,995	116,408
Union[8]	*11,600*	*11,350*	*1,730*	*2,700*	*2,708*	*2,715*	*2,739*	*2,767*	*2,795*
Vermilion	79,620	70,170	74,750	64,620	64,932	65,045	65,354	65,945	66,541
Wabash[10]	*10,360*	*9,540*	*9,560*	*9,320*	*9,287*	*9,246*	*9,337*	*9,500*	*9,666*
Warren[2]	*12,100*	*13,500*	*12,940*	*12,090*	*12,174*	*12,251*	*12,386*	*12,635*	*12,889*
Washington[4]	*14,640*	*12,070*	*5,350*	*3,320*	*3,433*	*3,543*	*3,682*	*3,875*	*4,078*
Wayne	6,470	8,710	2,410	9,290	9,213	9,101	9,069	9,088	9,108
White[7]	*10,760*	*11,600*	*11,410*	*8,500*	*8,239*	*7,996*	*7,814*	*7,655*	*7,499*
Whiteside	43,760	37,450	23,240	18,430	18,232	18,037	17,869	17,794	17,720
Will[5]	*254,190*	*240,740*	*281,210*	*371,200*	*423,846*	*482,459*	*543,978*	*585,066*	*629,256*
Williamson[7]	*55,570*	*55,870*	*41,310*	*41,300*	*41,379*	*41,310*	*41,537*	*41,957*	*42,380*
Winnebago	186,970	189,560	214,590	231,200	234,167	237,111	240,484	245,119	249,844
Woodford	21,640	18,600	21,500	13,370	13,898	14,409	15,168	16,117	17,125
Group 1	441,260	450,990	335,730	350,350	358,662	365,220	371,903	381,655	391,750
Group 2	97,300	89,030	102,490	96,060	97,058	97,024	97,462	98,525	99,614
Group 3	34,980	28,060	21,870	31,850	31,916	31,565	31,587	31,588	31,602
Group 4	291,740	306,700	282,340	271,790	279,950	288,057	295,244	303,607	312,306
Group 5	5,669,090	6,020,860	6,262,690	6,625,060	6,732,712	6,894,108	7,057,493	7,217,930	7,384,347
Group 6	150,020	153,220	179,940	178,940	184,805	193,095	198,455	203,530	208,740
Group 7	200,610	196,790	187,330	177,850	175,909	173,359	172,335	172,600	172,908
Group 8	27,870	25,620	15,150	14,640	14,603	14,555	14,635	14,749	14,865
Group 9	15,690	14,010	13,970	14,800	14,933	15,013	15,239	15,688	16,151
Group 10	14,770	12,780	14,050	13,690	13,513	13,333	13,342	13,443	13,547
All Counties	**9,832,550**	**10,059,670**	**10,395,410**	**10,915,910**	**11,128,110**	**11,399,105**	**11,679,221**	**11,927,025**	**12,183,566**

Note: Counties in *italics* are members of a county grouping. The number in the superscript indicates group membership.

Table 3A.5 Estimated Percent of Population Served by Public Supply: 1985-2000

County	1985	1990	1995	2000	County	1985	1990	1995	2000
Adams	89.5	92.3	95.8	90.7	McLean	83.6	88.3	56.8	86.2
Alexander	88.3	91.3	94.1	89.6	Macon	87.6	92.3	86.2	95.6
Bond	60.0	47.2	45.5	51.2	Macoupin	84.3	68.4	50.2	51.9
Boone	64.7	57.2	64.0	64.5	Madison	98.4	93.6	59.0	59.1
Brown	56.8	48.1	79.2	78.4	Marion	98.7	78.5	94.5	94.5
Bureau	77.7	69.0	57.9	48.4	Marshall	61.4	68.2	81.5	71.2
Calhoun	34.6	24.4	41.0	25.8	Mason	50.5	50.4	53.7	50.1
Carroll	62.3	61.7	59.9	60.3	Massac	75.6	76.5	8.4	14.5
Cass	70.7	77.5	72.2	59.1	Menard	66.8	52.5	71.1	72.0
Champaign	80.0	82.1	98.7	92.4	Mercer	55.1	44.2	58.0	37.0
Christian	77.4	73.0	54.5	59.8	Monroe	43.1	58.5	30.0	27.6
Clark	62.7	61.7	67.6	67.7	Montgomery	74.1	62.2	73.8	70.6
Clay	52.7	55.9	58.6	46.1	Morgan	81.6	80.5	80.4	58.2
Clinton	68.8	78.3	53.9	57.4	Moultrie	69.8	69.4	68.8	67.8
Coles	75.8	87.7	97.2	87.5	Ogle	60.3	55.3	56.7	56.9
Cook	92.0	99.9	99.9	99.9	Peoria	100.0	93.7	91.4	92.5
Crawford	72.6	68.0	34.2	51.7	Perry	60.1	51.2	84.1	82.7
Cumberland	42.8	41.7	45.5	41.6	Piatt	69.0	65.8	40.7	65.3
De Kalb	93.1	69.7	81.4	78.9	Pike	65.4	65.5	61.2	62.7
De Witt	65.7	59.8	73.6	65.7	Pope	78.7	89.2	25.4	88.4
Douglas	68.2	57.8	66.0	64.9	Pulaski	60.3	60.6	51.5	45.6
Du Page	83.4	87.0	99.5	97.6	Putnam	85.1	68.2	71.9	75.4
Edgar	63.7	63.6	62.3	59.7	Randolph	82.6	76.2	74.1	58.9
Edwards	56.5	43.5	61.8	62.7	Richland	68.6	71.3	79.0	78.5
Effingham	67.2	53.5	17.6	52.6	Rock Island	92.6	93.6	90.8	90.0
Fayette	50.1	49.9	49.8	39.1	St Clair	75.3	84.6	79.4	78.5
Ford	74.7	80.8	65.3	73.2	Saline	86.7	87.2	100.0	90.6
Franklin	70.3	81.5	96.1	96.2	Sangamon	76.4	89.4	77.5	79.3
Fulton	65.8	82.2	73.7	67.2	Schuyler	54.1	52.7	48.7	51.3
Gallatin	84.5	80.6	74.9	59.9	Scott	52.5	45.6	47.8	33.1
Greene	73.0	74.7	72.1	87.9	Shelby	57.4	42.0	62.0	62.2
Grundy	82.9	69.9	56.7	54.7	Stark	53.7	60.5	58.8	37.4
Hamilton	43.0	44.5	69.7	40.3	Stephenson	77.8	77.5	66.6	63.3
Hancock	62.1	47.2	62.4	49.4	Tazewell	89.9	91.9	88.9	86.8
Hardin	48.2	84.4	69.5	66.7	Union	65.0	64.4	9.6	14.8
Henderson	31.4	20.5	72.5	80.7	Vermilion	86.0	79.5	86.4	77.0
Henry	74.2	71.6	75.5	75.3	Wabash	73.8	72.8	73.9	72.0
Iroquois	66.1	64.4	75.6	76.1	Warren	51.8	70.4	68.8	64.5
Jackson	95.2	92.7	92.3	96.8	Washington	88.5	80.7	35.1	21.9
Jasper	38.8	28.5	71.8	70.4	Wayne	34.9	50.5	14.0	54.2
Jefferson	73.9	76.1	76.8	67.1	White	57.0	70.2	71.8	55.3
Jersey	85.5	89.5	45.5	60.5	Whiteside	64.6	62.2	38.5	30.4
Jo Daviess	60.7	51.7	35.1	54.6	Will	72.4	67.4	68.0	73.9
Johnson	55.9	46.3	31.7	28.7	Williamson	96.9	96.8	69.1	67.4
Kane	80.7	88.0	99.6	99.6	Winnebago	74.8	75.0	81.0	83.0

Table 3A.5 *(cont'd)* Estimated Percent of Population Served by Public Supply: 1985-2000

County	**1985**	**1990**	**1995**	**2000**	**County**	**1985**	**1990**	**1995**	**2000**
Kankakee	77.1	68.8	69.6	76.6	Woodford	61.8	57.0	62.2	37.7
Kendall	33.0	26.5	32.8	39.4	Group1	87.5	88.3	63.7	65.3
Knox	86.7	87.5	81.8	76.9	Group2	72.4	73.8	83.4	78.5
Lake	89.3	77.1	93.5	87.4	Group3	57.9	49.4	37.7	54.0
La Salle	85.8	86.1	76.1	75.8	Group4	76.3	81.6	73.8	72.3
Lawrence	61.3	68.4	70.3	64.6	Group5	89.9	96.4	97.8	97.7
Lee	80.7	67.9	55.7	83.2	Group6	78.8	79.6	95.3	89.7
Livingston	74.1	64.4	70.4	80.0	Group7	75.2	78.5	73.1	69.0
Logan	81.1	77.7	83.1	68.2	Group8	71.3	71.6	42.4	41.6
McDonough	77.5	83.9	85.6	85.6	Group9	67.3	66.8	65.7	72.9
McHenry	58.8	60.4	58.9	61.8	Group10	67.6	62.2	69.6	68.8

A3.3 PROCEDURE USED TO DEVELOP THE COUNTY-LEVEL MARGINAL PRICE VARIABLE

Introduction

The relationship between price and consumption are well established in the economic literature and the influence of price on water consumption has been well-documented (Foster and Beattie, 1979; Hanemann, 1997; Howe and Linaweaver, 1967) and water price is frequently used as an explanatory variable in water use modeling.

While price can be expected to influence water use in all sectors, information on water system pricing practices is not widely available and the costs of obtaining water for most self-supplied uses (such as thermoelectric) may be unknown even to the users themselves. However, a recent study of water prices in Illinois sponsored by the Illinois Water Resources Center (Dziegielewski, et al., 2004) provided an opportunity to develop a water price variable that could be included in the public supply water forecasting model.

Because the USGS water use data employed in the analysis was estimated at the county level, the price variable also needs to be specified to represent county-level water prices. The procedure used to develop this price variable is described below.

Data

Several data sources were used in the preparation of the county-level price variable. Water rate schedules from individual community water systems were obtained from a mail survey in the Summer of 2003 that was sent to all of the Illinois water systems that serve 100 or more customers. This sample of systems represents nearly 80 percent of the community water systems in the State. The survey requested that respondents provide all of their water and (where relevant) sewer rate schedules that were in effect from 1985 to the present.

Nearly 500 water systems responded to the survey. Of these, 420 provided information that would permit the calculation of customer water bills for various levels of water consumption. However, many systems failed to provide the historical data for all of the years requested. Therefore, the number of systems available to use in the calculation of water prices decreased for each of the years of historical data used in the forecasting model.

Because several counties did not have any reporting systems, an effort was made to supplement the survey data with information available from municipal and water systems websites and from published reports on private water systems from the Illinois Commerce Commission. Price data from only one system (Consumers Illinois in Kankakee County) was added to the survey data. Counties that had no prices available were dropped from the modeling analysis. However, average values for these counties were used in the preparation of water use projections (see page 3-10).

Annual withdrawal and population served data was also available from the Illinois State Water Survey for 1990, 1995, 2000-2003 for a large number of systems that responded to the ISWS annual water use survey. A considerable quantity of data on water system characteristics for each of the active community water systems in the State from the Illinois Environmental Protection Agency for 2003 was also obtained and reviewed. (Note: The IEPA database does contain information on water prices. However, since this in not a mandatory reporting item, there was no assurance that the reported data represented current pricing practices.)

Price variable specification/procedures

Numerous price variable specifications appear in the literature (Billings and Agthe, 1980; Chicoine and Ramamurthy, 1986; Gibbs, 1978). "Marginal" price is perhaps the specification that is most consistent with economic theory. Marginal price can be thought of as the price that a consumer will pay for the next unit of a product consumed. In the case of water, price is often calculated in 1,000-gallon increments, and that is the unit of consumption used in this procedure. However, in order to calculate marginal price, a baseline volume of consumption had to first be determined either empirically, or by observing the practices used in other studies.

Also, public supply water systems provide water to domestic (residential), commercial, and industrial water users and often charge different prices for each type of use. However, because reliable information on the volumes of deliveries to non-domestic users was not available, the rate schedule for "residential" or "all customers" was used in the calculation of prices for each system and each data-year.

Selection of volume of water use

Several surveys of water prices were reviewed, and 5,000 gallons per month was found to be a volume commonly used to estimate and compare residential water prices. A review of the residential water use from community water systems in Illinois State Water Survey files (for 1990, 1995, and 2000) found that monthly water use per connection was closer to 6,000 gallons per month. These two observations were used as the basis for calculating the marginal water price variable at increment charge to go from five (5) to six (6) thousand gallons per month.

Spatial coverage

Where data was available, price variables were estimated for the 60 counties that did not have significant cross-county transfers, and the 10 groups of counties created to ensure the correspondence between water withdrawal estimates and explanatory factors.

Weighting methodology

Because larger systems in a county have a greater influence on the amount of water use in each county, the county-level price variable needed to be “weighted” in order to consider the influence of these larger systems. This weighting process also lessens the influence of smaller un-metered systems that charge flat rates and thus have a “zero” marginal price.

Ideally, the weighting procedure would be based upon annual sales volumes, because price is expected to influence the quantity used. While public supply withdrawal data was available from the ISWS water use surveys for some of the largest systems in the State, this water use data was a poor match to the price data available from the Illinois Water Resources Center study (less than 70 percent of systems reporting 2003 prices reported 2003 water use). Therefore a weighting system based upon population served was developed.

The marginal price for each system was first calculated. This price was next multiplied by the ratio of the population served by that system to the population served of all of the systems in that county that reported prices. The “partial weighted prices” for each system in the county were then summed to create the population weighted prices for the county or group of counties. In only one system reported prices in a county, then that price represented the marginal price for the county, regardless of the size of the system. If no prices were reported, then the data field was left blank in the database and the analysis treated that price as a missing value, and the record was dropped from the analysis.

Adjustment to Constant (2000) dollars

The prices included in the model were converted to constant dollars (2000) using the Consumer Price Index from the U.S. Department of Labor, Bureau of Labor Statistics Data (*http://stats.bls.gov/cpi/*), Series Id: CUURA207SA0 (Not Seasonally Adjusted) for the Chicago-Gary-Kenosha, IL-IN-WI Area, All items, Base Period: 1982-84=100. The 2003 county-level prices used to estimate the water use projections were also adjusted using the same CPI. The conversion factors used adjust the price variable to 2000 constant dollars appear in Table 3A.6 below.

Table 3A.6 Constant Dollar Conversion Factors

Data year	**Conversion Factor**
1985	1.61
1990	1.32
1995	1.13
2000	1.00
2003	0.94

Description of Marginal Prices and Price Coverage

The statewide mean and median values for inflation adjusted marginal price variable appears in Table 3A.7. The table also includes that number of counties or groups of counties for which a price variable was reported for each time period. Based on the data that was available for this analysis, water prices appear to have changed little between 1985 and 2003.

Table 3A.7 Mean and Median Values for the Price Variable

Data year	Mean	Median	Number of Counties and Groups of Counties Included
1985	2.64	2.54	50
1990	2.49	2.38	59
1995	2.50	2.46	62
2000	2.59	2.54	63
2003	2.58	2.55	70

In order to evaluate how well the price variable represented the prices in each county, the percent of the population in each county whose prices were included in the analysis was calculated. The mean percent of coverage in each county and group of counties ranged from almost 20 percent for the 1985 estimation to more than 40 percent for the 2003 estimation (Table 3A.8).

Table 3A.8 System Participation in Price Variable Calculations: Mean Percent of Coverage and Number of Participating Systems

Data year	Mean Percent of Coverage	Number of Participating Systems
1985	0.19	155
1990	0.27	218
1995	0.29	264
2000	0.35	313
2003	0.41	420

Table 3A.9 shows the county-level marginal prices that were used to develop the water-forecasting model, along with the percent of population coverage in each county and year. The number of systems in the State used to develop the prices for each year are also included in the table.

Table 3A.9 County-Level Marginal Prices: 1985-2003

	1985		1990		1995		2000		2003	
County	**MP**	**% Cov.**	**MP**	**% Cov.**	**MP**	**% Cov.**	**MP**	**% Cov.**	**MP**	**% Cov.**
Adams	1.50	0.03	1.60	0.03	2.00	0.03	5.36	0.10	2.27	0.81
Alexander	-----	0.00	1.25	0.05	1.25	0.05	2.92	0.11	1.86	0.11
Bond	-----	0.00	-----	0.00	-----	0.00	5.00	0.22	5.62	0.25
Boone	-----	0.00	0.80	0.70	1.11	0.70	1.39	0.70	1.52	0.74
Brown	-----	0.00	5.52	0.22	5.91	0.22	5.91	0.22	5.91	0.22
Bureau	1.53	0.22	1.40	0.32	1.34	0.27	1.18	0.32	1.77	0.37
Calhoun	-----	0.00	-----	0.00	-----	0.00	-----	0.00	*3.82*	*averaged*
Carroll	2.50	0.05	2.50	0.05	2.54	0.22	2.54	0.22	2.79	0.27
Cass	-----	0.00	-----	0.00	-----	0.00	-----	0.00	*3.37*	*averaged*
Champaign	1.65	0.08	1.50	0.77	1.69	0.77	1.96	0.78	2.56	0.80
Christian	3.25	0.02	4.50	0.02	3.25	0.03	4.63	0.03	5.30	0.04
Clark	2.00	0.05	2.00	0.05	2.00	0.05	3.11	0.36	3.11	0.36
Clay	-----	0.00	-----	0.00	2.26	0.11	4.44	0.11	4.62	0.17
Clinton	2.17	0.30	2.50	0.32	2.52	0.32	2.64	0.45	2.99	0.54
Coles	3.39	0.82	3.45	0.82	3.48	0.82	4.67	0.82	5.19	0.84
Cook	0.83	0.58	0.98	0.59	1.13	0.60	1.26	0.61	1.45	0.63
Crawford	1.70	0.03	2.95	0.17	2.95	0.17	2.17	0.62	2.52	0.85
Cumberland	1.50	0.32	1.50	0.32	1.50	0.32	1.50	0.32	1.50	0.32
DeKalb	1.00	0.54	0.95	0.71	0.97	0.71	1.74	0.74	1.96	0.75
DeWitt	3.20	0.03	3.20	0.03	3.20	0.03	4.00	0.03	3.07	0.07
Douglas	5.00	0.20	2.50	0.48	4.93	0.80	4.88	0.84	4.89	0.84
DuPage	1.01	0.16	0.79	0.13	3.47	0.35	3.40	0.40	3.43	0.45
Edgar	1.50	0.02	1.50	0.02	1.50	0.02	1.50	0.02	1.50	0.02
Edwards	-----	0.00	-----	0.00	2.30	0.56	2.30	0.56	2.30	0.56
Effingham	-----	0.00	-----	0.00	-----	0.00	2.32	0.54	2.70	0.55
Fayette	-----	0.00	2.34	0.51	2.34	0.51	3.05	0.51	3.18	0.51
Ford	1.20	0.32	1.20	0.32	1.32	0.32	1.45	0.32	1.42	0.43
Franklin	-----	0.00	1.10	0.24	2.10	0.30	2.44	0.31	3.05	0.37
Fulton	-----	0.00	-----	0.00	-----	0.00	-----	0.00	3.20	0.12
Gallatin	1.00	0.06	1.23	0.27	1.31	0.27	2.54	0.27	2.35	0.46
Greene	-----	0.00	-----	0.00	-----	0.00	6.60	0.06	4.53	0.30
Grundy	-----	0.00	-----	0.00	-----	0.00	-----	0.00	4.32	0.03
Hamilton	5.20	0.32	4.34	0.39	4.34	0.39	4.34	0.39	4.54	0.39
Hancock	-----	0.00	-----	0.00	3.32	0.22	3.16	0.33	3.78	0.61
Hardin	-----	0.00	-----	0.00	-----	0.00	-----	0.00	4.20	0.23
Henderson	-----	0.00	-----	0.00	2.50	0.40	3.00	0.40	3.48	0.54
Henry	1.07	0.41	1.37	0.41	1.95	0.41	2.11	0.41	2.59	0.61
Iroquois	1.80	0.01	1.80	0.01	4.98	0.04	3.89	0.04	0.85	0.04
Jackson	1.77	0.26	2.13	0.27	2.97	0.29	3.35	0.43	3.44	0.31
Jasper	-----	0.00	-----	0.00	4.33	0.22	4.98	0.22	4.98	0.22
Jefferson	1.75	0.01	2.41	0.08	2.47	0.08	2.52	0.07	4.41	0.15
Jersey	3.00	0.57	3.00	0.57	3.00	0.57	3.00	0.57	5.00	0.57

Table 3A.9 *(cont'd)* County-Level Marginal Prices: 1985-2003

	1985		1990		1995		2000		2003	
County	**MP**	**% Cov.**	**MP**	**% Cov.**	**MP**	**% Cov.**	**MP**	**% Cov.**	**MP**	**% Cov.**
Jo Daviess	0.00	0.27	1.06	0.27	1.83	0.54	2.20	0.54	0.00	0.54
Johnson	4.50	0.21	4.50	0.21	4.50	0.21	4.06	0.41	4.17	0.41
Kane	0.93	0.01	1.59	0.20	2.19	0.20	2.82	0.21	2.78	0.23
Kankakee	-----	0.00	-----	0.00	-----	0.00	2.33	0.74	2.33	0.74
Kendall	1.25	0.03	1.25	0.03	1.32	0.03	1.32	0.03	2.68	0.56
Knox	1.15	0.07	1.15	0.07	3.75	0.07	2.55	0.14	1.59	0.87
Lake	1.21	0.33	1.60	0.42	2.49	0.51	2.79	0.52	3.00	0.52
La Salle	0.59	0.04	1.41	0.37	1.84	0.37	2.44	0.37	2.95	0.37
Lawrence	1.58	0.32	1.81	0.32	2.42	0.32	2.64	0.32	2.68	0.36
Lee	0.00	0.01	1.33	0.04	1.33	0.04	1.66	0.04	1.55	0.09
Livingston	1.54	0.48	1.13	0.48	2.66	0.61	3.03	0.61	2.39	0.63
Logan	-----	0.00	2.36	0.05	2.36	0.05	2.72	0.05	2.71	0.12
McDonough	-----	0.00	1.83	0.42	2.22	0.42	2.59	0.42	2.69	0.44
McHenry	1.00	0.21	0.96	0.20	1.41	0.45	1.55	0.49	1.73	0.50
McLean	1.80	0.27	3.27	0.76	3.10	0.76	3.45	0.77	3.84	0.77
Macon	1.34	0.79	1.47	0.80	1.66	0.84	1.95	0.89	2.03	0.89
Macoupin	1.62	0.09	2.11	0.20	3.11	0.31	3.74	0.32	4.29	0.39
Madison	1.96	0.12	2.33	0.16	2.48	0.21	2.95	0.21	3.09	0.23
Marion	2.46	0.33	2.64	0.51	3.27	0.56	3.67	0.64	3.88	0.70
Marshall	-----	0.00	-----	0.00	-----	0.00	-----	0.00	*2.33*	*averaged*
Mason	-----	0.00	-----	0.00	2.00	0.26	1.95	0.33	2.50	0.33
Massac	4.80	0.34	4.80	0.34	5.00	0.34	5.00	0.34	5.50	0.34
Menard	1.77	0.72	2.23	0.72	2.23	0.72	2.62	0.72	4.27	0.72
Mercer	5.98	0.14	4.36	0.14	2.26	0.21	2.26	0.21	1.09	0.21
Monroe	2.31	0.42	2.31	0.42	3.90	0.46	4.62	0.46	5.23	0.46
Montgomery	1.75	0.03	1.84	0.03	1.84	0.03	4.09	0.23	4.13	0.23
Morgan	1.66	0.71	1.74	0.71	2.00	0.71	2.06	0.71	2.35	0.73
Moultrie	2.12	0.37	2.17	0.55	2.81	0.55	2.92	0.74	2.91	0.84
Ogle	1.40	0.01	0.87	0.09	0.87	0.09	0.87	0.09	1.71	0.40
Peoria	1.46	0.04	1.64	0.04	2.03	0.04	2.14	0.04	2.35	0.05
Perry	1.44	0.29	1.73	0.73	2.24	0.73	2.96	0.73	3.59	0.73
Piatt	1.57	0.45	1.57	0.45	1.77	0.45	1.92	0.45	1.34	0.45
Pike	1.30	0.19	1.43	0.19	1.61	0.29	1.74	0.29	1.93	0.29
Pope	-----	0.00	-----	0.00	-----	0.00	-----	-----	*4.21*	*averaged*
Pulaski	-----	0.00	-----	0.00	2.50	0.09	2.50	0.09	3.37	0.22
Putnam	-----	0.00	1.30	0.33	1.30	0.33	1.32	0.51	1.38	0.62
Randolph	1.85	0.15	2.14	0.15	2.16	0.19	2.68	0.19	2.54	0.23
Richland	1.58	0.86	1.58	0.86	4.56	0.08	2.05	0.86	2.75	0.86
Rock Island	1.39	0.04	1.21	0.04	1.96	0.32	2.20	0.37	2.22	0.37
St Clair	1.81	0.09	1.92	0.10	2.46	0.11	2.64	0.13	3.50	0.17
Saline	4.96	0.03	6.87	0.03	6.87	0.03	6.87	0.03	2.96	0.50
Sangamon	1.09	0.79	1.46	0.84	1.55	0.86	1.83	0.86	1.85	0.87
Schuyler	-----	0.00	-----	0.00	-----	0.00	-----	-----	*2.78*	*averaged*

Table 3A.9 *(cont'd)* County-Level Marginal Prices: 1985-2003

County	1985 MP	1985 % Cov.	1990 MP	1990 % Cov.	1995 MP	1995 % Cov.	2000 MP	2000 % Cov.	2003 MP	2003 % Cov.
Scott	-----	0.00	-----	0.00	2.70	0.50	3.00	0.50	3.30	0.50
Shelby	-----	0.00	0.40	0.06	0.40	0.06	2.15	0.19	3.07	0.19
Stark	-----	0.00	-----	0.00	-----	0.00	-----	0.00	1.50	0.37
Stephenson	2.50	0.01	2.13	0.04	2.13	0.04	1.95	0.11	2.02	0.11
Tazewell	2.05	0.16	1.95	0.29	1.85	0.29	2.48	0.31	2.31	0.38
Union	1.80	0.10	2.49	0.16	3.16	0.31	3.56	0.31	3.75	0.31
Vermilion	-----	0.00	2.15	0.01	2.15	0.01	2.15	0.01	3.42	0.07
Wabash	-----	0.00	4.00	0.10	4.00	0.10	4.00	0.10	3.31	0.15
Warren	-----	0.00	-----	0.00	1.81	0.07	1.81	0.07	2.86	0.07
Washington	4.21	0.62	4.21	0.62	4.45	0.62	4.48	0.62	4.71	0.87
Wayne	1.57	0.05	1.86	0.23	2.08	0.27	3.37	0.32	3.12	0.87
White	1.60	0.08	1.77	0.24	2.57	0.24	2.94	0.24	2.96	0.91
Whiteside	-----	0.00	0.17	0.12	0.17	0.12	2.76	0.14	3.14	0.61
Will	0.87	0.02	1.46	0.07	1.83	0.07	2.57	0.02	2.15	0.08
Williamson	2.48	0.20	2.64	0.20	3.18	0.22	3.77	0.22	3.92	0.46
Winnebago	0.00	0.00	3.18	0.67	3.91	0.69	4.56	0.69	4.98	0.69
Woodford	2.38	0.27	2.38	0.27	2.75	0.27	3.02	0.27	4.02	0.37
Group1	1.43	0.48	1.79	0.48	1.95	0.48	2.31	0.49	2.50	0.49
Group2	1.48	0.52	1.65	0.52	2.07	0.56	5.16	0.56	2.39	0.56
Group3	-----	0.00	-----	0.00	3.64	0.10	2.98	0.38	3.28	0.38
Group4	2.41	0.32	2.54	0.32	3.07	0.32	3.32	0.32	3.84	0.32
Group5	0.85	0.58	0.97	0.58	1.35	0.58	1.47	0.58	1.64	0.58
Group6	1.93	0.80	1.58	0.80	1.96	0.80	2.20	0.80	2.75	0.80
Group7	2.36	0.42	2.90	0.42	3.38	0.42	3.57	0.45	3.61	0.45
Group8	1.80	0.14	1.04	0.22	2.69	0.22	0.97	0.22	3.33	0.22
Group9	-----	0.00	-----	0.00	2.70	0.13	5.32	0.35	4.09	0.35
Group10	-----	0.00	4.00	0.10	2.94	0.27	2.94	0.27	2.68	0.27
Number of systems	155		218		264		313		420	

Notes:
Groups without any representation have zero (0.00) % coverage
Counties without representation in "current" year are assigned the average of marginal prices from all adjacent counties.

A3.4 ASSESSMENT OF "NON-COMMUNITY" PUBLIC SUPPLY WATER USE

Introduction

The USEPA distinguishes between three different types of "public" water systems: Community, Non-community non-transient, and Non-community transient systems. The USEPA definitions for these three types of public water systems are:

Public water systems provide water for human consumption through pipes or other constructed conveyances to at least 15 service connections or serves an average of at least 25 people for at least 60 days a year. The USEPA (2004) has defined three types of public water systems:

- *Community Water System* (CWS): A public water system that supplies water to the same population year-round.
- *Non-Transient Non-Community Water System* (NTNCWS): A public water system that regularly supplies water to at least 25 of the same people at least six months per year, but not year-round. Some examples are schools, factories, office buildings, and hospitals which have their own water systems.
- *Transient Non-Community Water System* (TNCWS): A public water system that provides water in a place such as a gas station or campground where people do not remain for long periods of time.

Non-Community Public Water Supply Estimation Procedure (2003)

The USGS water use coordinating office in Illinois was contacted as part of this investigation and confirmed that only "community" public water systems are included in the water use estimates that served as the basis of this study. In order to provide some assessment of the potential quantity of non-community water use in Illinois counties, the USEPA 2003 "Pivot-Table" database was used to collect information on the number of transient and non-transient community water systems and the population served by each for every county in Illinois. The sum of the populations served by both types of non-community systems was then multiplied by 90 gallons per capita per day (gpcd).

The results of this estimation are displayed in Table 3A.10. Total non-community water use in Illinois in 2003 using this method is estimated to be approximately 47 mgd. Non-community public supply water use in small in the most counties, but twelve counties are estimated to have water use in excess of one million gallons per day. Five counties in northeastern Illinois are estimated to have water use greater than three million gallons per day, with Will County (5.3 mgd) and Lake County (8.6 mgd) estimated to have the greatest quantity of water use. Water use projections were not prepared for the non-community public water use sector and the estimates below are not included in either the county or State summaries reported in this study.

Table 3A.10 Estimated Non-Community Public Water Supply Use: 2003

County	Non-Transient Non-Community # of Systems	Non-Transient Non-Community Population Served	Transient Non-Community # of Systems	Transient Non-Community Population Served	Non-Community Water Use @ 90 gpcd
Adams	0	0	10	727	65,430
Alexander	1	833	0	0	74,970
Bond	0	0	8	1,325	119,250
Boone	6	1,547	25	2,325	348,480
Brown	0	0	0	0	0
Bureau	3	825	39	2,674	314,910
Calhoun	0	0	4	295	26,550
Carroll	1	110	32	2,557	240,030
Cass	2	2,150	5	590	246,600
Champaign	4	546	39	6,164	603,900
Christian	2	390	9	411	72,090
Clark	0	0	5	485	43,650
Clay	0	0	1	30	2,700
Clinton	0	0	2	52	4,680
Coles	0	0	13	590	53,100
Cook	24	11,445	339	27,652	3,518,730
Crawford	1	100	1	32	11,880
Cumberland	0	0	2	85	7,650
DeKalb	2	610	20	1,152	158,580
De Witt	1	1,000	20	1,575	231,750
Douglas	1	135	10	813	85,320
DuPage	19	6,649	132	15,242	1,970,190
Edgar	0	0	5	200	18,000
Edwards	0	0	0	0	0
Effingham	0	0	0	0	0
Fayette	0	0	9	410	36,900
Ford	0	0	2	70	6,300
Franklin	0	0	0	0	0
Fulton	1	560	32	1,895	220,950
Gallatin	0	0	3	145	13,050
Greene	0	0	2	50	4,500
Grundy	9	3,150	34	9,970	1,180,800
Hamilton	0	0	0	0	0
Hancock	0	0	5	200	18,000
Hardin	1	35	2	55	8,100
Henderson	1	800	25	1,377	195,930

Table 3A.10 *(cont'd)* Estimated Non-Community Public Water Supply Use: 2003

	Non-Transient Non-Community		Transient Non-Community		Non-Community Water Use
County	# of Systems	Population Served	# of Systems	Population Served	@ 90 gpcd
Henry	3	250	40	5,189	489,510
Iroquois	5	1,388	25	1,857	292,050
Jackson	2	350	2	800	103,500
Jasper	0	0	1	25	2,250
Jefferson	0	0	0	0	0
Jersey	0	0	1	25	2,250
Jo Daviess	0	0	35	2,590	233,100
Johnson	0	0	3	150	13,500
Kane	31	15,955	170	21,704	3,389,310
Kankakee	7	975	60	7,108	727,470
Kendall	7	4,286	24	3,036	658,980
Knox	0	0	38	4,371	393,390
Lake	51	25,302	437	69,930	8,570,880
La Salle	15	4,156	108	9,876	1,262,880
Lawrence	3	545	13	785	119,700
Lee	4	990	35	4,887	528,930
Livingston	3	268	14	2,210	223,020
Logan	1	208	15	676	79,560
McDonough	4	452	21	1,445	170,730
McHenry	39	13,491	293	20,790	3,085,290
McLean	3	1,287	35	5,113	576,000
Macon	1	65	30	3,520	322,650
Macoupin	3	725	2	225	85,500
Madison	1	3,250	11	330	322,200
Marion	0	0	0	0	0
Marshall	2	510	13	570	97,200
Mason	2	181	32	2,333	226,260
Massac	1	470	3	744	109,260
Menard	0	0	3	650	58,500
Mercer	0	0	16	930	83,700
Monroe	0	0	2	70	6,300
Montgomery	0	0	2	335	30,150
Morgan	1	140	13	514	58,860
Moultrie	1	55	3	155	18,900

Table 3A.10 *(cont'd)* Estimated Non-Community Public Water Supply Use: 2003

	Non-Transient Non-Community		Transient Non-Community		Non-Community Water Use
County	**# of Systems**	**Population Served**	**# of Systems**	**Population Served**	**@ 90 gpcd**
Ogle	12	1,840	68	9,842	1,051,380
Peoria	6	6,565	63	6,645	1,188,900
Perry	0	0	2	100	9,000
Piatt	1	290	5	685	87,750
Pike	0	0	1	85	7,650
Pope	0	0	2	50	4,500
Pulaski	2	495	2	85	52,200
Putnam	2	300	12	1,130	128,700
Randolph	2	115	2	550	59,850
Richland	0	0	5	220	19,800
Rock Island	14	7,146	75	8,384	1,397,700
St. Clair	0	0	19	1,850	166,500
Saline	0	0	2	50	4,500
Sangamon	0	0	25	2,811	252,990
Schuyler	0	0	2	100	9,000
Scott	0	0	1	30	2,700
Shelby	0	0	10	480	43,200
Stark	0	0	4	195	17,550
Stephenson	2	375	36	4,310	421,650
Tazewell	7	1,110	61	8,715	884,250
Union	0	0	3	150	13,500
Vermilion	5	943	18	2,266	288,810
Wabash	1	165	3	187	31,680
Warren	1	480	12	580	95,400
Washington	0	0	0	0	0
Wayne	0	0	2	200	18,000
White	1	240	1	25	23,850
Whiteside	9	1,305	50	5,001	567,540
Will	53	15,821	331	43,372	5,327,370
Williamson	0	0	0	0	0
Winnebago	25	6,268	179	17,334	2,124,180
Woodford	4	660	39	6,834	674,460
State Total	416	150,302	3,370	374,357	47,219,310

3A.5 COMPARISON OF FORECASTING MODEL RESULTS AND USGS ESTIMATED WITHDRAWALS: 2000 PUBLIC SUPPLY WATER USE

In order to be able to compare the projected change in Public Supply water use from 2000 to 2025, an estimate of the 2000 water use was prepared using the forecasting model developed in this Chapter. The was loaded with population, housing, weather, and water price data for each county from the year 2000, and the water use in each county was estimated.

Table 3A.11 compares the *water use* estimates of the 2000 model to the USGS estimates of *water withdrawals* for each county. USGS estimated withdrawals for counties that did have significant cross-county flows (were not members of grouped counties during model development) appear in bold face.

Table 3A.11 Comparison of 2000 Public Water Supply Use Estimates and USGS Withdrawal Estimates

County	Forecasting Model	USGS Estimate	County	Forecasting Model	USGS Estimate
Adams	9.47	9.34	Lee	5.06	**4.28**
Alexander	1.00	1.17	Livingston	4.20	**5.46**
Bond	1.06	0.20	Logan	2.78	**3.12**
Boone	3.68	**3.71**	McDonough	3.02	**2.93**
Brown	0.65	0.08	McHenry	21.75	**20.66**
Bureau	2.50	**2.90**	McLean	14.60	**10.18**
Calhoun	0.14	**0.30**	Macon	32.09	**39.32**
Carroll	1.20	**1.34**	Macoupin	2.93	3.26
Cass	1.20	**1.61**	Madison	20.90	54.30
Champaign	23.69	22.65	Marion	6.28	5.41
Christian	3.05	**3.16**	Marshall	1.21	**1.73**
Clark	1.54	**1.06**	Mason	0.92	**0.37**
Clay	1.01	0.77	Massac	0.28	1.31
Clinton	2.68	1.95	Menard	0.93	**0.12**
Coles	6.65	**4.53**	Mercer	0.67	**0.64**
Cook	818.57	1,043.16	Monroe	0.90	0.17
Crawford	2.22	**2.38**	Montgomery	2.32	**1.36**
Cumberland	0.37	**0.43**	Morgan	3.61	**0.36**

Table 3A.11 *(cont'd)* Comparison of 2000 Public Water Supply Use Estimates and USGS Withdrawal Estimates

County	Forecasting Model	USGS Estimate	County	Forecasting Model	USGS Estimate
DeKalb	8.53	**7.70**	Moultrie	1.25	**1.02**
De Witt	1.42	**2.93**	Ogle	5.71	**5.03**
Douglas	1.89	0.47	Peoria	25.92	**25.69**
DuPage	187.71	10.03	Perry	2.53	0.73
Edgar	1.73	**1.58**	Piatt	1.74	**1.90**
Edwards	0.82	0.14	Pike	1.40	**1.90**
Effingham	3.86	2.67	Pope	0.38	0.00
Fayette	1.08	**1.07**	Pulaski	0.40	0.11
Ford	1.53	**1.93**	Putnam	0.65	**0.19**
Franklin	5.04	14.37	Randolph	3.06	**3.40**
Fulton	3.08	**2.26**	Richland	1.69	**1.46**
Gallatin	0.49	3.25	Rock Island	17.14	**15.79**
Greene	1.23	1.02	St. Clair	27.84	53.90
Grundy	2.61	**2.90**	Saline	2.97	0.00
Hamilton	0.37	0.00	Sangamon	26.19	36.00
Hancock	1.23	0.89	Schuyler	0.42	**1.03**
Hardin	0.36	0.14	Scott	0.21	4.74
Henderson	0.66	6.19	Shelby	2.38	**2.17**
Henry	3.90	**3.56**	Stark	0.27	**0.29**
Iroquois	1.76	**1.63**	Stephenson	4.80	**4.00**
Jackson	7.48	**6.38**	Tazewell	15.96	**15.11**
Jasper	0.85	1.28	Union	0.35	0.21
Jefferson	4.59	0.00	Vermilion	9.42	**9.92**
Jersey	1.59	1.27	Wabash	1.27	1.68
Jo Daviess	2.06	**2.37**	Warren	1.68	2.81
Johnson	0.37	1.04	Washington	0.50	0.60
Kane	62.14	**52.71**	Wayne	1.45	**1.68**
Kankakee	16.17	**14.37**	White	1.12	1.24
Kendall	2.81	**2.24**	Whiteside	2.53	**4.95**
Knox	6.54	**0.37**	Will	46.56	41.57
Lake	71.38	**65.55**	Williamson	6.30	2.46
La Salle	11.72	**11.02**	Winnebago	34.39	**32.80**
Lawrence	1.34	**0.00**	Woodford	5.62	**9.80**
			State Total	1,677.60	1,761.60

3A.6 VARIABLE DEFINITIONS AND DATA SOURCES: PUBLIC SUPPLY WATER USE MODEL

INTRODUCTION

This section of the Chapter 3 Annex documents the data sources and specification of the dependent and independent variables used in the analysis of public-supply water use, regardless of whether or not the variables actually appeared in the final model. The description of each variable includes the variable name, units (in parenthesis), the source of raw data, the method used to specify the variable, and any modifications or adjustments made to the original data. It should be noted that the units in a few variables were altered in several models so that regression coefficients might be more easily interpreted. Variables that are estimated as ratios of other variables are also described in this section.

Values of each variable for county groupings were estimated using several different techniques. When possible, values for county groupings were calculated by summing the values from each county in the group. For weather variables, county averages were used. For variables specified as ratios (percentages), projected values of the components of the ratios were estimated, and the ratios were recalculated for the group.

Projected values for variables were developed only for those that were included in the final model in each state. These are described in detail in the main body of the Chapter.

DEPENDENT VARIABLES

Total public-supply water withdrawals (mgd)

Source: USGS water use inventories.

http://water.usgs.gov/watuse/

Estimation/Modification:

Zero values for Lawrence County (2000) were replace with average from the three previous inventories (1.27 mgd)

Public water supply per capita withdrawals (gallons per capita per day)

Source: USGS water use inventories.

http://water.usgs.gov/watuse/

Estimation/Modification:

Per capita values were adjusted for Lawrence County using adjusted withdrawal data (see above).

INDEPENDENT VARIABLES

Total population (thousands)

Source: USGS water use inventories.

http://water.usgs.gov/watuse/

Population served by public water supply (thousands)

Source: USGS water use inventories.

http://water.usgs.gov/watuse/

Personal income per capita ($ 1995)

Source: Bureau of Economic Analysis.

Estimation/Modification:

Data are downloaded from the website:

http://www.bea.doc.gov/bea/regional/reis/

Nominal values were converted to 1995 dollars using the consumer price index-all urban consumers (*http://www.bls.gov/cpi/*).

Median family income (1995 $ in thousands)

Source: Bureau of Census.

Estimation/Modification:

1979 and 1989 data are downloaded from the website

http://www.census.gov/hhes/income/histinc/county/county2.

1999 data are downloaded from the website

http://factfinder.census.gov/servlet/BasicFactsServlet Table STF3

The 1985 and 1995 values are estimated by midpoints.

Nominal values were converted to 1995 dollars using the consumer price index-all urban consumers (*http://www.bls.gov/cpi*).

GSP per capita (1995 $ in thousands)

Source: Bureau of Economic Analysis

http://www.bea.doc.gov/bea/regional/gsp/action.cfm

Estimation/Modification:

Nominal values were converted to 1995 dollars using the consumer price index-all urban consumers

http://data.bls.gov/servlet/SurveyOutputServlet

Percentage of urban population (%)

Source: Bureau of Economic Analysis.

Estimation/Modification:

The percentage is calculated by dividing urban population by total population.

1980 urban population data are downloaded from the website:

http://www.nationalatlas.gov/census1980m.html

1990 urban population data are downloaded from the website

http://venus.census.gov/cdrom/lookup STF3A Table P6

2000 urban population data are downloaded from the website

http://factfinder.census.gov/servlet/BasicFactsServlet Table P5

Percentage values for 1985 and 1995 are estimated by mid points.

Land area (square miles)

Source: Bureau of Census

Estimation/Modification:

Data are downloaded from the website:

http://www.census.gov/population/censusdata/90den_stco.txt

Gross population density (persons/square mile)

Estimation/Modification:

Calculated as: (total county population/land area)

Total employment (BEA) (thousands)

Source: Bureau of Economic Analysis.

Data are downloaded from the website:

http://www.bea.gov/bea/regional/reis/ Table CA25

Total employment (CBP) (thousands)

Source: County Business Pattern.

Data are downloaded from the website:

http://fisher.lib.virginia.edu/cbp/county.html

Percentage of total manufacturing employment in SIC 20 (%)

Source: County Business Patterns

http://fisher.lib.virginia.edu/cbp/state.html

Estimation/Modification:

The two-digit SIC employment data available from CBP contains many "missing" data points due to Census Bureau non-disclosure policies. Therefore, two-digit SIC employment data was obtained through a special arrangement with the Illinois Department of Employment Security, and tested in the public supply model.

Percentage of total manufacturing employment in SIC 24 (%)

Source: County Business Patterns

http://fisher.lib.virginia.edu/cbp/state.html

Estimation/Modification:

See SIC 20 above.

Percentage of total manufacturing employment in SIC 26 (%)

Source: County Business Patterns

http://fisher.lib.virginia.edu/cbp/state.html

Estimation/Modification:

See SIC 20 above.

Percentage of total manufacturing employment in SIC 28 (%)

Source: County Business Patterns

http://fisher.lib.virginia.edu/cbp/state.html

Estimation/Modification:

See SIC 20 above.

Percentage of total manufacturing employment in SIC 29 (%)

Source: County Business Patterns

http://fisher.lib.virginia.edu/cbp/state.html

Estimation/Modification:

See SIC 20 above.

Percentage of total manufacturing employment in SIC 33 (%)

Source: County Business Patterns

http://fisher.lib.virginia.edu/cbp/state.html

Estimation/Modification:

See SIC 20 above.

Percentage of population employed (BEA) & (CBP) (%)

Estimation/Modification:

Calculated as: (total employment*100/total population) using total both CBP and BEA total employment estimates

Total employees in manufacturing

Source: Country Business Pattern

http://fisher.lib.virginia.edu/cbp/state.html

Percentage of total manufacturing employment

Source: Country Business Pattern

http://fisher.lib.virginia.edu/cbp/state.html

Total employment (CBP) divided by CBP manufacturing employment

Percentage of single family housing units (%); *Source:* Bureau of Census.

Estimation/Modification:

1980 data on housing units are obtained from 1980 census Table 93.

1990 data on housing units are downloaded from the website:

http://venus.census.gov/cdrom/lookup/, STF3A Table H20

2000 data on housing units are downloaded from the website:

http://factfinder.census.gov/servlet/BasicFactsServlet, Table H30

Single family units were calculated as the sum of "1 detached" and "1 attached" housing units

The percentage value is calculated as:

(total number of single housing units)/(total number of housing units)*100

Percentage values of 1985 and 1995 are estimated by midpoints.

Percentage of multi-family housing units (%)

Source: Bureau of Census.

Estimation/Modification:

Calculated using the same sources and methods as single family housing units.

Multi-family housing were calculated as the sum of "2 units, " 3 or 4 units", "5 to 9 units", 10 to 49 units", and "50 or more units".

Percentage of mobile homes (%)

Source: Bureau of Census

Estimation/Modification:

Calculated using the same sources and methods as single family housing units. Mobile homes were calculated and the sum of "Mobile homes or trailers" and "Other".

Monthly precipitation (Inches)

Source: National Oceanic and Atmospheric Administration

Estimation/Modification:

Precipitation data for 344 climatic divisions are downloaded from the website:

ftp.ncdc.noaa.gov/pub/data/cirs/hold/0105.pcp

Using GIS software, each county was assigned to the climate division where the centroid of that county is located. The weather data for that climate division is used to represent the weather in the county. This same method was used for all weather variables (below).

Total precipitation of summer months (Inches)

Source: National Oceanic and Atmospheric Administration

Estimation/Modification:

It is calculated as the sum of monthly precipitation from May to September.

Monthly temperature (°F)

Source: National Oceanic and Atmospheric Administration

Estimation/Modification:

Temperature data for 344 climatic divisions are downloaded from the website:

ftp.ncdc.noaa.gov/pub/data/cirs/hold/0105.tmp

Average summer temperature (°F)

Source: National Oceanic and Atmospheric Administration

Estimation/Modification:

It is calculated as the average of monthly temperature from May to September.

Monthly Palmer drought severity index

Source: National Oceanic and Atmospheric Administration

Estimation/Modification:

Drought index data for 344 climatic divisions are downloaded from the website:

ftp.ncdc.noaa.gov/pub/data/cirs/hold/0105.pdsi

Minimum monthly Palmer drought severity index

Source: National Oceanic and Atmospheric Administration

Estimation/Modification:

The minimum monthly value of the Palmer drought severity index is used.

CHAPTER 4

SELF-SUPPLIED DOMESTIC WATER USE

INTRODUCTION

Domestic water use includes water for normal household purposes such as drinking, food preparation, bathing, washing clothes and dishes, flushing toilets, car washing, and watering lawns and gardens (Solley et al., 1998). Domestic water can be provided by a public water supply system or be self-supplied by individual users. Nearly all of the self-supplied domestic withdrawals are reported to be from groundwater sources. Domestic water use provided by public or private water systems was accounted for in Chapter 3. The focus of Chapter 4 is domestic water use by individuals who operate their own household water supply systems.

USGS PROCEDURE FOR ESTIMATION OF DOMESTIC WITHDRAWALS

USGS estimates self-supplied domestic water use by multiplying the estimated self-supplied population in each county by a per capita water use coefficient. The self-supplied population is calculated as the difference between total county population and the estimated number of persons served by public-supply facilities that is obtained from Illinois EPA and other sources. The self-supplied domestic water-use coefficient in Illinois has been increased several times since the USGS first began reporting self-supplied domestic water use in 1960. The coefficient used in the 2000 report was 90 gallons per person per day.

SELF-SUPPLIED DOMESTIC WITHDRAWALS IN ILLINOIS

The self-supplied domestic sector is a relatively small water using sector in Illinois. In 1992, about 13 percent of total domestic water use in Illinois was self-supplied (Avery, 1999). Since 1965, reported self-supplied domestic withdrawals have ranged between 110 mgd and 140 mgd, accounting for less than 2 percent of the state total water use in every reporting period.

Figure 4.1 shows the historical changes in estimated self-supplied population and domestic water use in Illinois from 1960 to 2000. Self-supplied domestic water withdrawals were estimated to have increased from 1960 to 1965, then declined sharply between in 1970, followed by a consistent increase until 1985. A second decline was estimated in 1985, followed by slight increases in the last two inventories.

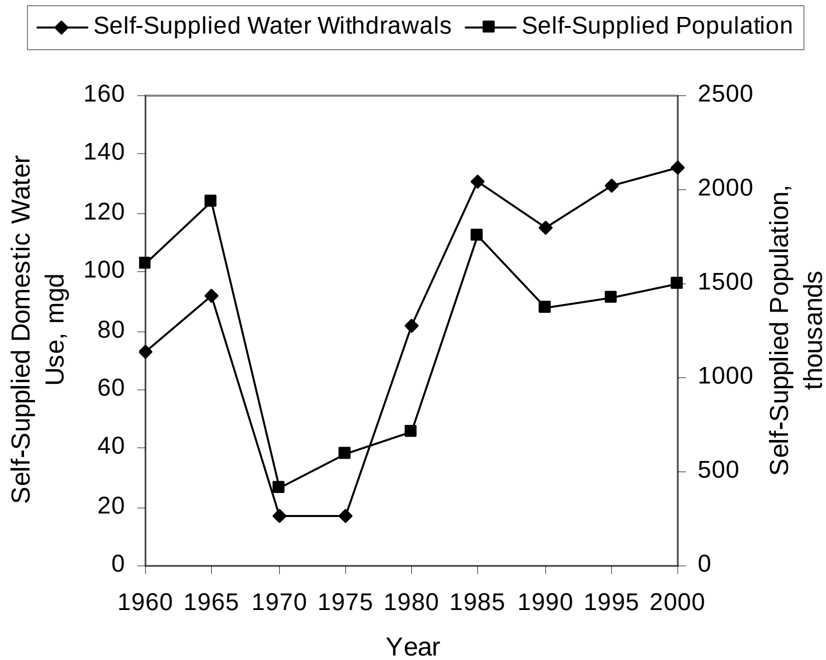

Figure 4.1. Estimated Self-Supplied Population and Domestic Water Use: 1960-2000
Source: USGS inventory reports, various years

Characteristics of County-Level Self-Supplied Water Use

Self-supplied domestic withdrawals have been reported for every county, for every year that USGS has reported county estimates (see Table 4A.1). In general, reported self-supplied domestic withdrawals have been less than 1.0 mgd in most counties in all the USGS reporting periods (Table 4.1). The amount of self-supplied domestic water use has been larger than 4 mgd in at least three out of the four reporting periods in the following five counties: Lake, McHenry, St. Clair, Will, and Winnebago. In several counties the amount of self-supplied domestic water use has changed significantly. For example, in Du Page County, the county with the largest quantity of self-supplied domestic water use ever reported for an Illinois county, the estimated amount of water use changed from 17.3 mgd in 1985 to 1.9 mgd in 2000. In Madison County, the amount of self-supplied domestic water use increased from 2.3 mgd in 1985 to 9.5 mgd in 2000.

In the year 2000, nearly a third (33) of Illinois counties were estimated to have had less that 0.5 mgd of self-supplied domestic withdrawals, and most counties (90) were estimated to have 2.0 mgd or less. Only 4 counties were estimated to have self-supplied domestic withdrawals of 5.0 mgd or more (Will, Madison, McHenry, and Lake, and St. Clair at 4.95).

Table 4.1. Distribution of County Level Self-Supplied Domestic Water Use: 1985-2000

	Number of Counties				Percent of State Total Self-Supplied Domestic Water Use			
Range	1985	1990	1995	2000	1985	1990	1995	2000
0-1 mgd	70	74	63	61	27.7	29.4	21.7	21.5
1-2 mgd	20	15	25	29	20.0	15.2	26.1	31.4
2-3 mgd	6	6	5	4	10.6	11.7	9.7	7.2
3-4 mgd	0	2	3	2	0.0	5.7	8.1	5.4
4-5 mgd	0	0	2	2	0.0	0.0	7.3	6.8
>5 mgd	6	5	4	4	41.7	38.0	27.2	27.8

Source: USGS water use inventories, various years.

DOMESTIC WATER USE PROJECTION PROCEDURES

Because the USGS estimation procedure for the self-supplied domestinc water use sector does not employ the actual measurement of water use, it is not practical to use the USGS data to develop a water use model for this sector. Instead, the water use forecast for this sector is based on the same “per capita” procedure used by USGS to estimate past water use. Projections of future self-supplied water use were calculated by preparing estimates of future self-supplied county populations and multiplying these by a constant per capita water use value for each projection year. Details on this process are presented below.

Projection of Self-Supplied Population

Estimates of the self-supplied domestic population are inherently imprecise. USGS estimates the self-supplied domestic population by subtracting the reported population served by public drinking water systems (reported in SDWIS and in State sources) from the Census Bureau’s estimate of total county population. However, public water system reports of their service population are themselves estimates, generally based upon the number of active residential connections. At county level, service population estimates are further complicated by the fact that water systems often serve customers in more than one county. No documentation was found on the methods used by USGS to allocate these populations to the appropriate counties.

Estimates of future self-supplied populations are equally uncertain. A search of agency and industry sources failed to locate any self-supplied population projections. However, a USGS review of the 1955 to 1995 trend in self-supplied domestic water users found a small but consistent trend of a decreasing percent of self-supplied domestic water (*http://ga.water.usgs.gov/edu/graphicshtml/dopsss.html*). Likewise, a review of the U.S. Census housing data found a steady increase in the percentage of housing units served by public water systems in the State from 1970 to 1990 (questions on the household source of water were dropped from the 2000 Census), as well as a decline in the absolute number of housing units served by individual wells or “other” sources since 1980 (Table 4.2).

Table 4.2 U.S. Census Household Data on Water Sources in Illinois: 1970-1990

Year	**Percent of Housing Units Served by Public or Private Water Systems**	**Number of Housing Units Served by Individual Wells**	**Number of Housing Units Served by "Other" Sources**
1970	88.0	418,316	23,810
1980	89.1	443,681	25,356
1990	89.8	440,172	21,132

Source: U.S. Census (1999)

For the purpose of the analysis presented here, projections of the self-supplied population in each county were estimated by subtracting the projected publicly supplied population from the projected total county population. Projections of the publicly supplied population in each county were developed in Chapter 3, based upon the percent of publicly supplied population in each county in the year 2000. County level population projections were obtained from the Illinois State University *Census and Data Users Services*, which provides population projections to 2020. The 2025 population was projected using the average annual growth rate between 2015 and 2020. However, the population projections were based on the 1990 census data, and there are some differences between the projected 2000 county population and the total county population reported by 2000 census. The ratio between the 2000 census county population and the projected 2000 county level population was calculated, and this ratio was applied to every projection year to make adjustment for the Illinois State University's population projection values. The adjusted county level population projections appear in Table 3A-3. Projections of the self-supplied population in each county appear in Table 4A.2.

Projection of Self-Supplied Per Capita Water Use

Only one research articles was found that described self-supplied domestic water use (i.e., O'Dell, 1995), and no estimates of the volume of water use in self-supplied households was found in government or industry sources. The record of USGS per capita estimates calculated from past water use inventories show a somewhat erratic pattern until 1985. USGS increased the per capita estimate in 1990, and 1995 and held it constant at 90 gallons per capita per day (gpcd) in 2000 (Table 4.3).

For the purpose of the projections presented in this analysis, the per capita estimate of self-supplied water use was kept at the 90 gpcd level used by USGS in the 1990 and 1995 water use inventories.

Table 4.3. USGS Domestic Self-Supplied Per Capita Water Use Estimates: 1960 - 2000

State	1960	1965	1970	1975	1980	1985	1990	1995	2000
Illinois	45.3	47.4	41.1	28.7	114.2	74.4	84.1	90.0	90.0

Table Notes:
1) 1960-80 self-served domestic population is not reported by USGS. Calculated by subtracting reported Public Supply population served from USGS reported total state population.
2) 1960-80 self-served domestic per capita water use is not reported by USGS. The estimates above were calculated by dividing reported annual self supplied domestic water use by estimated population not served by public supply and multiplying by 1,000.
3) The 1975 Illinois population adjusted from USGS estimate (10,692,000) to U.S. Census estimate (11,291,743) before calculating per cap.

PROJECTIONS OF SELF-SUPPLIED DOMESTIC WATER USE

The self-supplied domestic water use in each county was forecast by multiplying the self-supplied population by the per capita water use coefficient of 90 gpcd for each of the projection years. The projection results are shown in Table 4.4 along with the 2000 USGS estimates for this sector.

Water use in this sector is projected to increase by about 15 percent over the next twenty years, from 135 to 158 mgd. Thirty-four counties are projected to have small decreases in water use (less than 0.2 mgd) and 12 counties are projected to have no change in water use in this sector. Fifty-six counties are projected to have increases in water use, but only five in excess of 1.0 mgd: Madison (1.2 mgd), Kendall (1.4 mgd), Lake (1.7 mgd), McHenry (4.0 mgd) and Will (8.2 mgd).

The projected self-supplied domestic use may decrease or increase depending on the future values of per capita use which may be different than the 90 gpcd value used in this study. Also, the economic conditions which influence the rate of extending water supply lines into rural homes may change the estimates of the future self-supplied population in the State.

Table 4.4 USGS Estimated Withdrawals in 2000 and Projected County Level Self-Supplied Domestic Water Use: 2005-2025

County	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**
Adams	0.57	0.58	0.58	0.58	0.58	0.58
Alexander	0.09	0.09	0.09	0.09	0.09	0.09
Bond	0.77	0.77	0.77	0.76	0.77	0.77
Boone	1.33	1.35	1.35	1.37	1.38	1.39
Brown	0.14	0.14	0.14	0.14	0.14	0.14
Bureau	1.65	1.63	1.61	1.59	1.58	1.57
Calhoun	0.34	0.33	0.33	0.33	0.33	0.34
Carroll	0.60	0.58	0.57	0.56	0.56	0.56
Cass	0.51	0.49	0.48	0.47	0.47	0.47
Champaign	1.23	1.27	1.34	1.38	1.42	1.46
Christian	1.28	1.29	1.29	1.29	1.30	1.30
Clark	0.49	0.49	0.48	0.48	0.48	0.49
Clay	0.71	0.68	0.65	0.63	0.62	0.61
Clinton	1.36	1.38	1.40	1.44	1.48	1.51
Coles	0.60	0.62	0.64	0.66	0.69	0.72
Cook	0.48	0.49	0.49	0.50	0.50	0.51
Crawford	0.89	0.86	0.83	0.81	0.79	0.77
Cumberland	0.59	0.61	0.62	0.65	0.69	0.73
De Kalb	1.69	1.78	1.88	1.96	2.02	2.09
De Witt	0.52	0.51	0.50	0.50	0.49	0.49
Douglas	0.63	0.63	0.62	0.62	0.62	0.63
Du Page	1.95	1.99	2.05	2.10	2.16	2.22
Edgar	0.71	0.70	0.68	0.67	0.66	0.66
Edwards	0.23	0.23	0.22	0.22	0.21	0.21
Effingham	1.46	1.48	1.48	1.48	1.47	1.46
Fayette	1.19	1.16	1.13	1.10	1.09	1.07
Ford	0.34	0.34	0.34	0.34	0.33	0.33
Franklin	0.13	0.13	0.13	0.13	0.13	0.13
Fulton	1.13	1.10	1.07	1.06	1.05	1.04
Gallatin	0.23	0.23	0.23	0.23	0.23	0.24
Greene	0.16	0.16	0.16	0.16	0.16	0.17
Grundy	1.53	1.59	1.66	1.74	1.83	1.93
Hamilton	0.46	0.45	0.43	0.42	0.41	0.41
Hancock	0.92	0.91	0.89	0.89	0.90	0.91
Hardin	0.14	0.14	0.13	0.13	0.12	0.12
Henderson	0.14	0.14	0.15	0.15	0.16	0.16
Henry	1.13	1.09	1.05	1.02	0.99	0.96
Iroquois	0.67	0.66	0.65	0.64	0.64	0.63
Jackson	0.17	0.18	0.18	0.18	0.19	0.19
Jasper	0.27	0.27	0.28	0.28	0.30	0.31
Jefferson	1.19	1.17	1.15	1.13	1.11	1.09
Jersey	0.77	0.80	0.83	0.88	0.94	1.02
Jo Daviess	0.91	0.92	0.93	0.93	0.94	0.95

Table 4.4 *(cont'd)* USGS Estimated Withdrawals in 2000 and Projected County Level Self-Supplied Domestic Water Use: 2005-2025

County	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**
Johnson	0.83	0.81	0.80	0.79	0.78	0.77
Kane	0.15	0.16	0.17	0.19	0.20	0.21
Kankakee	2.19	2.24	2.28	2.33	2.41	2.49
Kendall	2.98	3.22	3.40	3.64	4.00	4.40
Knox	1.16	1.16	1.14	1.14	1.14	1.13
Lake	7.29	7.63	8.05	8.48	8.75	9.03
La Salle	2.43	2.43	2.42	2.42	2.43	2.45
Lawrence	0.49	0.48	0.47	0.46	0.45	0.45
Lee	0.54	0.54	0.54	0.54	0.54	0.55
Livingston	0.72	0.71	0.70	0.69	0.70	0.70
Logan	0.89	0.91	0.92	0.93	0.93	0.94
McDonough	0.43	0.43	0.44	0.45	0.45	0.46
McHenry	8.93	9.89	10.99	12.17	12.57	12.98
McLean	1.87	1.95	2.02	2.08	2.14	2.19
Macon	0.46	0.46	0.46	0.46	0.46	0.46
Macoupin	2.12	2.15	2.19	2.23	2.30	2.38
Madison	9.54	9.73	9.90	10.08	10.42	10.76
Marion	0.21	0.20	0.20	0.19	0.19	0.19
Marshall	0.34	0.34	0.35	0.35	0.36	0.37
Mason	0.72	0.69	0.67	0.65	0.65	0.64
Massac	1.17	1.18	1.19	1.22	1.26	1.31
Menard	0.32	0.35	0.37	0.41	0.44	0.48
Mercer	0.96	0.94	0.92	0.91	0.91	0.91
Monroe	1.80	1.94	2.08	2.21	2.38	2.55
Montgomery	0.81	0.81	0.80	0.79	0.78	0.78
Morgan	1.38	1.43	1.48	1.52	1.57	1.61
Moultrie	0.41	0.42	0.42	0.42	0.42	0.43
Ogle	1.98	1.97	1.94	1.93	1.94	1.95
Peoria	1.24	1.24	1.25	1.25	1.25	1.25
Perry	0.36	0.36	0.35	0.35	0.35	0.35
Piatt	0.51	0.52	0.52	0.53	0.54	0.56
Pike	0.58	0.58	0.58	0.58	0.58	0.59
Pope	0.05	0.05	0.05	0.05	0.05	0.05
Pulaski	0.36	0.36	0.36	0.37	0.37	0.38
Putnam	0.13	0.14	0.14	0.14	0.14	0.14
Randolph	1.25	1.25	1.25	1.24	1.24	1.24
Richland	0.31	0.30	0.28	0.27	0.26	0.25
Rock Island	1.35	1.36	1.35	1.35	1.34	1.34
St Clair	4.95	5.12	5.30	5.43	5.58	5.73
Saline	0.22	0.22	0.22	0.22	0.22	0.22
Sangamon	3.52	3.63	3.70	3.76	3.80	3.85
Schuyler	0.32	0.30	0.30	0.29	0.29	0.28

Table 4.4 *(cont'd)* USGS Estimated Withdrawals in 2000 and Projected County Level Self-Supplied Domestic Water Use: 2005-2025

County	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**
Scott	0.33	0.35	0.36	0.37	0.39	0.41
Shelby	0.78	0.79	0.80	0.82	0.85	0.89
Stark	0.36	0.36	0.35	0.36	0.36	0.36
Stephenson	1.62	1.63	1.64	1.65	1.66	1.67
Tazewell	1.53	1.54	1.55	1.55	1.57	1.59
Union	1.40	1.41	1.41	1.42	1.44	1.45
Vermilion	1.74	1.75	1.75	1.76	1.77	1.79
Wabash	0.33	0.32	0.32	0.33	0.33	0.34
Warren	0.60	0.60	0.61	0.61	0.63	0.64
Washington	1.06	1.10	1.14	1.18	1.24	1.31
Wayne	0.71	0.70	0.69	0.69	0.69	0.69
White	0.62	0.60	0.58	0.57	0.56	0.55
Whiteside	3.80	3.76	3.72	3.68	3.67	3.65
Will	11.80	13.47	15.33	17.29	18.59	20.00
Williamson	1.80	1.80	1.80	1.81	1.83	1.85
Winnebago	4.25	4.30	4.36	4.42	4.51	4.59
Woodford	1.99	2.07	2.14	2.26	2.40	2.55
State Total	135.29	139.58	143.97	148.97	153.12	157.51

CHAPTER 4 ANNEX

Table 4A.1 County Level Self-Supplied Domestic Withdrawals: 1985 – 2000

County	1985	1990	1995	2000	County	1985	1990	1995	2000
Adams	0.61	0.37	0.26	0.57	Lee	0.76	1.10	1.43	0.54
Alexander	0.12	0.07	0.05	0.09	Livingston	1.08	1.01	1.08	0.72
Bond	0.52	0.58	0.77	0.77	Logan	0.63	0.51	0.48	0.89
Boone	0.95	1.21	1.17	1.33	McDonough	0.62	0.41	0.46	0.43
Brown	0.16	0.22	0.12	0.14	McHenry	6.48	6.65	8.31	8.93
Bureau	0.83	1.10	1.37	1.65	McLean	0.59	1.12	5.41	1.87
Calhoun	0.31	0.29	0.26	0.34	Macon	1.28	0.67	1.45	0.46
Carroll	0.67	0.64	0.61	0.60	Macoupin	0.81	1.10	2.18	2.12
Cass	0.36	0.22	0.33	0.51	Madison	2.28	1.16	9.46	9.54
Champaign	2.47	2.24	0.20	1.23	Marion	0.46	0.61	0.21	0.21
Christian	2.21	0.68	1.43	1.28	Marshall	0.48	0.30	0.21	0.34
Clark	0.43	0.42	0.47	0.49	Mason	0.78	0.60	0.70	0.72
Clay	0.88	0.44	0.54	0.71	Massac	0.27	0.27	1.27	1.17
Clinton	1.34	0.56	1.46	1.36	Menard	0.33	0.39	0.32	0.32
Coles	0.22	0.44	0.13	0.60	Mercer	0.83	0.96	0.66	0.96
Cook	1.84	0.47	0.41	0.48	Monroe	1.00	0.71	1.56	1.80
Crawford	0.40	0.43	1.18	0.89	Montgomery	0.77	0.85	0.73	0.81
Cumberland	0.44	0.43	0.55	0.59	Morgan	0.53	0.52	0.64	1.38
De Kalb	0.54	2.16	1.40	1.69	Moultrie	0.31	0.29	0.40	0.41
De Witt	1.16	0.49	0.40	0.52	Ogle	1.78	2.05	1.93	1.98
Douglas	0.77	0.56	0.61	0.63	Peoria	0.05	0.85	1.42	1.24
Du Page	17.34	9.30	0.38	1.95	Perry	1.40	0.79	0.31	0.36
Edgar	0.53	0.49	0.68	0.71	Piatt	0.52	0.38	0.86	0.51
Edwards	0.25	0.33	0.25	0.23	Pike	0.53	0.44	0.60	0.58
Effingham	0.82	1.01	2.45	1.46	Pope	0.07	0.04	0.32	0.05
Fayette	0.83	0.72	0.96	1.19	Pulaski	0.31	0.22	0.33	0.36
Ford	0.29	0.20	0.44	0.34	Putnam	0.08	0.18	0.14	0.13
Franklin	2.02	0.59	0.14	0.13	Randolph	0.83	0.62	0.80	1.25
Fulton	1.07	0.49	0.92	1.13	Richland	0.37	0.32	0.32	0.31
Gallatin	0.08	0.11	0.15	0.23	Rock Island	1.52	0.95	1.23	1.35
Greene	0.36	0.28	0.39	0.16	St Clair	6.72	3.11	4.91	4.95
Grundy	0.47	0.89	1.37	1.53	Saline	0.15	0.27	0.00	0.22
Hamilton	0.62	0.37	0.23	0.46	Sangamon	0.54	1.38	3.74	3.52
Hancock	0.78	0.81	0.72	0.92	Schuyler	0.28	0.26	0.36	0.32
Hardin	0.21	0.06	0.14	0.14	Scott	0.24	0.22	0.26	0.33
Henderson	0.47	0.46	0.21	0.14	Shelby	0.70	0.88	0.77	0.78
Henry	1.44	1.45	1.14	1.13	Stark	0.29	0.19	0.24	0.36

Table 4A.1 (cont'd). County Level Self-Supplied Domestic Withdrawals: 1985 – 2000

County	1985	1990	1995	2000	County	1985	1990	1995	2000
Iroquois	1.06	0.79	0.69	0.67	Stephenson	1.03	1.08	1.47	1.62
Jackson	1.08	0.26	0.42	0.17	Tazewell	1.06	0.75	1.27	1.53
Jasper	0.47	0.52	0.27	0.27	Union	0.67	0.48	1.47	1.40
Jefferson	0.85	0.70	0.82	1.19	Vermilion	1.04	1.30	1.06	1.74
Jersey	0.24	0.16	1.04	0.77	Wabash	0.92	0.28	0.30	0.33
Jo Daviess	0.91	1.05	1.28	0.91	Warren	1.34	0.41	0.53	0.60
Johnson	0.63	0.46	0.76	0.83	Washington	0.21	0.22	0.89	1.06
Kane	0.85	3.49	0.14	0.15	Wayne	0.90	0.68	1.33	0.71
Kankakee	1.90	2.17	2.79	2.19	White	0.57	0.39	0.40	0.62
Kendall	2.58	2.65	2.74	2.98	Whiteside	2.23	2.27	3.34	3.80
Knox	0.75	0.51	0.92	1.16	Will	8.84	10.68	11.90	11.80
Lake	8.70	10.85	3.33	7.29	Williamson	0.63	0.14	1.66	1.80
La Salle	1.62	1.36	2.37	2.43	Winnebago	6.31	6.32	4.53	4.25
Lawrence	0.47	0.34	0.43	0.49	Woodford	1.05	1.04	1.18	1.99
					State Totals	130.39	115.31	129.12	135.29

Table 4A.2 USGS Estimated Self-Supplied County Population in 2000 and Self-Supplied Population Projections: 2005-2025

County	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**
Adams	6,320	6,422	6,424	6,440	6,461	6,482
Alexander	1,000	980	961	959	957	954
Bond	8,600	8,575	8,523	8,497	8,523	8,549
Boone	14,820	14,946	15,048	15,238	15,364	15,491
Brown	1,500	1,525	1,539	1,551	1,560	1,570
Bureau	18,310	18,092	17,856	17,691	17,544	17,398
Calhoun	3,770	3,702	3,639	3,639	3,683	3,728
Carroll	6,620	6,396	6,311	6,255	6,217	6,178
Cass	5,610	5,473	5,307	5,236	5,205	5,175
Champaign	13,650	14,148	14,871	15,331	15,750	16,181
Christian	14,200	14,291	14,329	14,380	14,415	14,450
Clark	5,500	5,443	5,331	5,300	5,372	5,446
Clay	7,850	7,582	7,220	7,037	6,910	6,785
Clinton	15,160	15,360	15,601	15,963	16,392	16,833
Coles	6,660	6,862	7,080	7,327	7,633	7,952
Cook	5,380	5,401	5,460	5,519	5,602	5,686
Crawford	9,880	9,552	9,249	9,002	8,781	8,566
Cumberland	6,570	6,725	6,904	7,177	7,637	8,126
DeKalb	18,780	19,829	20,928	21,730	22,447	23,187
De Witt	5,770	5,681	5,581	5,505	5,451	5,397
Douglas	7,000	6,994	6,899	6,871	6,920	6,969
DuPage	21,660	22,112	22,751	23,370	23,983	24,612
Edgar	7,930	7,744	7,543	7,396	7,364	7,332
Edwards	2,600	2,522	2,446	2,403	2,374	2,345
Effingham	16,240	16,457	16,424	16,471	16,370	16,270
Fayette	13,280	12,904	12,517	12,258	12,070	11,885
Ford	3,820	3,804	3,776	3,740	3,704	3,668
Franklin	1,500	1,456	1,412	1,392	1,397	1,401
Fulton	12,550	12,237	11,939	11,740	11,673	11,608
Gallatin	2,590	2,555	2,533	2,557	2,588	2,620
Greene	1,790	1,782	1,770	1,781	1,824	1,867
Grundy	17,000	17,714	18,473	19,385	20,372	21,409
Hamilton	5,150	4,955	4,787	4,673	4,596	4,520
Hancock	10,190	10,076	9,918	9,869	10,002	10,137
Hardin	1,600	1,531	1,453	1,395	1,349	1,304
Henderson	1,580	1,606	1,619	1,659	1,743	1,832
Henry	12,600	12,131	11,683	11,328	11,021	10,722

Table 4A-2 *(cont'd)* USGS Estimated Self-Supplied County Population in 2000 and Self-Supplied Population Projections: 2005-2025

County	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**
Iroquois	7,500	7,366	7,202	7,136	7,091	7,047
Jackson	1,920	1,968	2,011	2,049	2,064	2,079
Jasper	3,000	3,047	3,074	3,158	3,291	3,430
Jefferson	13,170	13,055	12,776	12,544	12,305	12,071
Jersey	8,570	8,910	9,256	9,741	10,493	11,303
Jo Daviess	10,130	10,189	10,281	10,357	10,482	10,609
Johnson	9,180	9,045	8,839	8,732	8,661	8,590
Kane	1,620	1,765	1,933	2,109	2,198	2,290
Kankakee	24,280	24,877	25,318	25,864	26,730	27,624
Kendall	33,060	35,731	37,739	40,420	44,457	48,897
Knox	12,910	12,846	12,711	12,708	12,621	12,535
Lake	80,980	84,827	89,448	94,221	97,206	100,284
La Salle	27,000	27,008	26,875	26,875	27,035	27,196
Lawrence	5,470	5,347	5,194	5,111	5,052	4,993
Lee	6,040	5,980	5,963	5,956	6,053	6,152
Livingston	7,950	7,866	7,783	7,711	7,757	7,803
Logan	9,910	10,098	10,226	10,323	10,385	10,448
McDonough	4,740	4,824	4,903	4,971	5,017	5,064
McHenry	99,270	109,927	122,104	135,223	139,673	144,269
McLean	20,810	21,702	22,463	23,156	23,747	24,353
Macon	5,100	5,088	5,075	5,091	5,102	5,113
Macoupin	23,580	23,871	24,309	24,801	25,602	26,430
Madison	106,000	108,166	110,034	112,016	115,735	119,578
Marion	2,300	2,254	2,204	2,165	2,145	2,124
Marshall	3,800	3,832	3,836	3,894	4,027	4,165
Mason	8,000	7,701	7,436	7,265	7,215	7,166
Massac	12,960	13,145	13,268	13,530	14,032	14,552
Menard	3,500	3,856	4,166	4,503	4,906	5,345
Mercer	10,680	10,446	10,241	10,130	10,130	10,129
Monroe	20,000	21,608	23,119	24,578	26,389	28,333
Montgomery	9,000	8,990	8,858	8,802	8,719	8,636
Morgan	15,320	15,900	16,414	16,927	17,403	17,892
Moultrie	4,610	4,612	4,624	4,648	4,701	4,755
Ogle	22,000	21,851	21,608	21,498	21,559	21,621
Peoria	13,730	13,797	13,851	13,923	13,912	13,900
Perry	4,000	3,968	3,933	3,921	3,931	3,941
Piatt	5,690	5,751	5,801	5,887	6,026	6,168

Table 4A-2 *(cont'd)* USGS Estimated Self-Supplied County Population in 2000 and Self-Supplied Population Projections: 2005-2025

County	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**
Pike	6,480	6,473	6,444	6,464	6,487	6,510
Pope	510	516	519	524	536	548
Pulaski	4,000	4,024	4,035	4,060	4,120	4,182
Putnam	1,500	1,511	1,512	1,520	1,532	1,543
Randolph	13,920	13,903	13,857	13,817	13,785	13,754
Richland	3,470	3,301	3,141	3,002	2,901	2,804
Rock Island	15,000	15,091	15,050	14,957	14,912	14,867
St. Clair	55,000	56,921	58,846	60,381	62,005	63,672
Saline	2,500	2,477	2,452	2,444	2,463	2,483
Sangamon	39,110	40,357	41,142	41,803	42,262	42,726
Schuyler	3,500	3,381	3,279	3,217	3,185	3,154
Scott	3,710	3,877	4,017	4,165	4,342	4,526
Shelby	8,650	8,741	8,866	9,102	9,490	9,893
Stark	3,960	3,953	3,939	3,955	3,971	3,986
Stephenson	18,000	18,160	18,250	18,327	18,415	18,503
Tazewell	16,950	17,134	17,176	17,258	17,470	17,685
Union	15,590	15,642	15,680	15,819	15,981	16,144
Vermilion	19,300	19,392	19,426	19,518	19,695	19,873
Wabash	3,620	3,604	3,588	3,624	3,687	3,751
Warren	6,650	6,691	6,734	6,808	6,944	7,084
Washington	11,830	12,231	12,621	13,116	13,804	14,528
Wayne	7,860	7,796	7,701	7,674	7,690	7,707
White	6,870	6,660	6,463	6,317	6,188	6,062
Whiteside	42,220	41,769	41,323	40,937	40,766	40,596
Will	131,070	149,655	170,350	192,072	206,579	222,182
Williamson	20,000	20,034	20,001	20,111	20,314	20,519
Winnebago	47,220	47,824	48,425	49,114	50,061	51,026
Woodford	22,100	22,972	23,817	25,071	26,639	28,306
State Total	1,503,400	1,550,866	1,599,635	1,655,183	1,701,326	1,750,132

CHAPTER 5

SELF-SUPPLIED COMMERCIAL AND INDUSTRIAL WATER USE

INTRODUCTION

USGS describes commercial water use as water used for "motels, hotels, restaurants, office buildings, other commercial facilities, and institutions", and industrial water use as: "water used for industrial purposes such as fabrication, processing, washing, and cooling, and includes such industries as steel, chemical and allied products, paper and allied products, mining, and petroleum refining". Water for commercial and industrial uses may be obtained from public suppliers or be self-supplied by users (Avery, 1999). This chapter focuses exclusively on withdrawals for self-supplied commercial and industrial water users. Although USGS has reported commercial and industrial withdrawals separately since 1985, these two sectors were combined for the water use projections presented in this chapter.

USGS WATER WITHDRAWAL ESTIMATION PROCEDURE

The USGS has reported self-supplied industrial withdrawals since 1950. However, water used for thermoelectric generation was also included in this category in the first two inventories, and therefore the estimates from these years are not comparable to those from later inventories. Self-supplied commercial withdrawals began to be reported as a separate category in the 1985 inventory. Reporting of county-level estimates for both self-supplied commercial and self-supplied industrial withdrawals also began in 1985. These county-level estimates also included estimates of the *deliveries* from public water providers to C&I establishments, which made it possible to calculate the total C&I withdrawals from all sources. However, beginning with the 2000 report, estimates of public supply deliveries to C&I users, and self-supplied withdrawals by commercial water users have become an optional reporting component for NWUIP staff in each state, and these deliveries were no longer officially reported for Illinois.

Estimation of the quantity of water withdrawn by self-supplied commercial and industrial water users in Illinois is based on the results of an annual survey of self-supplied water users conducted by the Illinois State Water Survey (ISWS). Each year the ISWS sends this form to more than 4,000 business establishments and public water systems in the state. The form requests information on the location and quantity of water withdrawn, as well as information about the establishment, including the Standard Industrial Classification (SIC) of its primary function. If establishments do not respond to the survey, the amount is estimated by extrapolation from previous years of data. If no previous data is available, no estimate is included. The data from individual establishments are aggregated by county to prepare county-level estimates (Avery, 1999).

SELF-SUPPLIED COMMERCIAL AND INDUSTRIAL (C&I) WITHDRAWALS IN ILLINOIS

About half of all C&I withdrawals in Illinois were estimated to be “self-supplied” (1995), even though 35 counties reported no self-supplied C&I withdrawals (1995). More than 65 percent of self-supplied C&I withdrawals (1995) came from surface water sources. Commercial self-supplied withdrawals were approximately one-fourth the quantity of industrial self-supplied *withdrawals* (104 vs. 452 mgd, in 1995); commercial and industrial *deliveries* obtained from public suppliers were the reverse of self-supplied (440 vs. 118 mgd, in 1995).

Figure 5.1 displays historical estimates of the combined self-supplied C&I withdrawals and the total and manufacturing employment (full and part-time) in Illinois. Estimated C&I water withdrawals have declined almost continuously throughout the period (1960-2000), with a significant drop reported between 1980 and 1985. Commercial and industrial withdrawals are often linked to employment, especially in the high-water using manufacturing sector. Figure 5.1 also shows that total employment in Illinois has increased continuously from 1970 to 2000, while manufacturing employment has declined by nearly 30 percent (about 400,000 jobs).

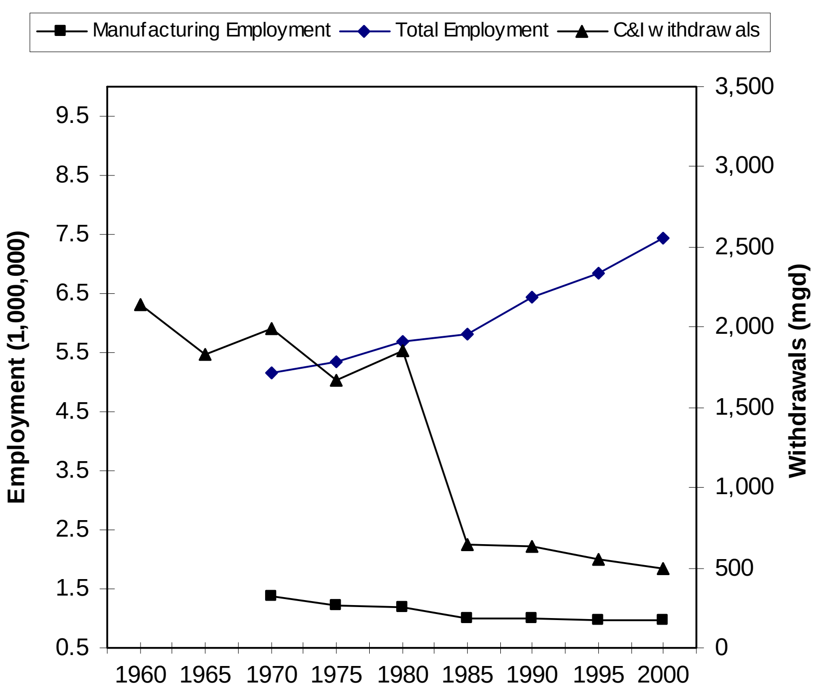

Figure 5. Self-Supplied C&I Withdrawals and Total and Manufacturing Employment: 1960 – 2000
Source: USGS reports (various years) and BEA (2004)

Characteristics of County-Level Self-Supplied C&I Water Use

Self-supplied C&I withdrawals are not reported in every county in Illinois for every reporting period. From 1985 to 2000 there were 56 counties that reported at least some self-supplied C&I in one of the last four USGS inventories. Six counties have reported more than 10 mgd in each reporting period since 1985 (Adams, Cook, Madison, Peoria, Tazewell, Will).

Cook, Madison, and Tazewell counties have been the counties with the most self-supplied C&I withdrawals in every period except 1990 (when Rock Island ranked number 3 over Peoria). Cook County is estimated to have had more than 100 mgd from 1985 to 1995, and reported 95 mgd in 2000. Peoria is the only other county to have reported more than 100 mgd in any period (2000). More than 75 percent of counties reporting self-supplied C&I withdrawals report less than 10 mgd; and half of those report less than 1.0 mgd.

SELF-SUPPLIED COMMERCIAL AND INDUSTRIAL WITHDRAWALS PROJECTION PROCEDURES

Water use for commercial and industrial purposes is most often described in economic terms, where water is treated as a factor of production. Ideally, econometric models of C&I water use could be developed based on outputs and the price of water and other inputs. Unfortunately, such data are rarely collected at the county level, or are not publicly available because of the proprietary nature of such data to C&I firms.

An alternative approach that has been commonly used is to estimate water use based upon the size and type of products produced by the firm. The type of firms can be determined by its Standard Industrial Classification (SIC), and several SICs, especially those in the manufacturing sector, are commonly associated with high-levels of water use. The size of the firm is frequently represented by its number of employees. The ready availability of data on the number of employees by SICs at the county (and often municipal) level, has led to the widespread use of sectoral employment as the primary explanatory variables in C&I water use studies (Davis, et al., 1987). Water use estimates for this sector are frequently calculated in terms of the quantity of water per employee for a specified type of business enterprise or SIC.

The availability of the USGS estimates of county level withdrawals made it possible to develop a multivariate model of self-supplied C&I withdrawals. Preparation of projections of self-supplied C&I water use consisted of the following tasks:

1) Collection and review of data on water withdrawals, employment and other potential explanatory variables; specification of model variables
2) Development of a single statewide model of self-supplied withdrawals
3) Collection and/or estimation of projected values of independent variables; calculation of water use projections based upon these values

Data Collection and Variable Specification

Dependent Variables

County-level estimates of self-supplied commercial and industrial water withdrawals from both surface and groundwater sources are available from the USGS for 1985, 1990, and 1995. In the year 2000, the USGS did not publish estimates of self-supplied commercial withdrawals, or deliveries from public suppliers to commercial or industrial water users. However, these estimates were obtained from the USGS through a special arrangement for this analysis.

Commercial and industrial water use models frequently use a water use per employee specification of the dependent variable. However, information on the composition of employment of self-supplied firms in the States was not readily available, and efforts to estimate self-supplied employment appeared to be dubious (see below). Therefore, a total water use (in mgd) specification was selected for this water use sector. County C&I withdrawals were calculated from USGS data as the sum of self-supplied commercial (ground and surface water) and self-supplied industrial (ground and surface water) withdrawals. A logarithmic specification was chosen for the C&I water use model and the final specification of the dependent variable is in logs.

While county water use data were available for 1985, 1990, 1995 and 2000, the lack of corresponding employment data for 1985 (see below) restricted the modeling data set to the last three USGS reporting years. Also, not all counties were estimated to have self-supplied commercial and industrial water use for all three years. Only "non-zero" observations were considered for the analysis, and the final data set used in modeling consisted of 193 water use observations.

Independent variables

Several types of independent variables were tested during the modeling process (a description of all variables appears in the Chapter Annex). Weather and various socioeconomic variables (i.e., population, income, etc.) were included in the preliminary statistical analysis but were not found to have a significant relationship to the dependent variable. County employment proved to be the best predictor of water use in this sector and several different specifications of employment variables were tested.

County-level employment data were obtained from several sources and were used during modeling. The most detailed county-level employment data (at the 2-digit SIC level) were those obtained with the assistance of the Illinois Department of Employment Security (IDES). This dataset was available in an electronic format for 1990, 1995, and 2000, and in paper (hard copy) format for 1985. However, collecting and processing the 1985 data was beyond the scope of this project, so employment data were prepared only for those counties and data years having non-zero water use observations for 1990, 1995 and 2000 (N=193).

Three specifications of employment were tested in the model: total county employment (in logs), county employment by 2-digit SIC (in logs); and the percent of 2-digit SIC employment in each county. The IDES 1990-2000 employment data were used to create these variables. “Total county employment” was calculated as the sum of the employment by all of the SICs for which IDES reported employment in each county. This number differs slightly from the IDES reported “total employment” because data for some SICs, particularly in smaller counties, were not available from IDES.

The IDES data were also used to prepare variables that accounted for the *total number of employees* in 85 different 2-digit SIC groups (SIC 1 to 99). The same data were also used to prepare an alternative specification, the *percent of employment* per 2-digit SIC group. The percent specification was calculated using the total county employment created above, not the county totals reported by IDES.

The use of employment data as a predictor of self-supplied water use is complicated by the fact that, with the exception of a few counties that obtain 100 percent (or zero percent) of their commercial and industrial water withdrawals from self-supplied sources, there was no readily available way to identify which firms (and employees) are served by self-supplied water sources. Therefore a variable was included in the model to provide some measure of the allocation of publicly supplied and self-supplied commercial and industrial water use in each county. This “percent of self-supplied C&I’ withdrawal variable was calculated as the quantity *of self-supplied* C&I withdrawals divided by sum of *self-supplied* and *delivered* C&I withdrawals. (Note: the C&I public supply *delivery* data for the year 2000 were obtained from preliminary data provided by the USGS for the purpose of this study. This delivery data do not appear in the final 2000 water use report released by USGS.)

Binary variables

Two types of binary variables were tested during model development. *County* binaries were added to the model to account for county specific characteristics that were not accounted for by other variables in the model. *Outlier* binaries were added to the model to account for county/year observations that are far outside the expected range of values. Both county binary and outlier variables were included in the final model for C&I water use.

Trend

A variable was included in the model to account for unspecified influences that are assumed to be affecting water use over time, and that represent general trends in water use. Water use per employee can be expected to change over time and the trend variable is intended to capture some of the rate of change in water use due to gains in efficiency in production process. The values of the *trend* variable were specified as zero for 1990, 5 for 1995, and 10 for the year 2000.

Modeling Procedure

The modeling process initially included employment variables for all two digit SICs, a great many of which were found to be correlated to self-supplied C&I withdrawals. However, this large number of variables and their apparent lack of relevance to the self-supplied C&I sector made the models difficult to estimate and interpret. In an effort to produce a more succinct C&I water use model, supplemental information on self-supplied C&I withdrawals was obtained from the 2000 ISWS water use survey (the original source of USGS estimates). A sample of self-supplied withdrawals from nearly 400 firms was summarized and reviewed. Two of the top three self-supplied water using employment classifications, nonmetallic minerals (SIC 14) and electric, gas, and sanitary services (49) are accounted for in other USGS water use sector classifications (thermoelectric and mining). These SICs were removed from the modeling process. Fourteen manufacturing SIC codes were found to be among the top self—supplied water using SICs, as were several other high-water using commercial businesses.

A stepwise regression model was run with preference given to including employment variables (using the *percent of employment by SIC* specification) in those SICs that had been identified from the review of ISWS self-supplied C&I data. Also included in the model was the trend variable, total county employment, the percent of self-supplied withdrawals in each county, and county and outlier binary variables. The variables included in the final model appear in Table 5.1. All of the variables included in the final model had the expected signs and are significant at the 0.1 level, or better. The model explains more than 95 percent of the variance in self-supplied C&I withdrawals (R^2=0.97) and the mean absolute percent error of "in-sample" predictions is 36 percent.

Two variables, total county employment (in logs) and the percent of county self-supplied withdrawals provide most of the explanatory power in the model, with self-supplied C&I withdrawals increasing with increases in both variables. Three SIC classifications also had positive and statistically significant coefficients. This indicates that the quantity of self supplied withdrawals can be expected to increase with increases in the percents of county employment in the food and kindred products (SIC 20), primary metals (SIC 33), and laundry services (SIC 72). Thirty-four counties have significant county binaries included in the model, and five data points were identified as outliers.

Table 5.1 Self-Supplied Commercial and Industrial Model for Illinois

Explanatory Variable	***Regression Coefficient***	***t Statistic***
Intercept	-13.508	-32.71
Log Total County Employment	1.126	25.89
Percent of Self-Supplied C&I Withdrawals	0.051	30.87
Trend	-0.022	-2.34
%County Employment SIC 20 (food and kindred products)	0.034	1.94
%County Employment SIC 33 (primary metal industries)	0.037	4.04
%County Employment SIC 72 (personal services; commercial laundries)	0.342	2.11
Alexander	0.903	2.76
Calhoun	3.166	9.69
Cass	-1.443	-2.29
Christian	-2.247	-7.02
Coles	-4.453	-8.49
DuPage	-1.124	-3.48
Henderson	-1.638	-2.92
Henry	-1.246	-3.95
Iroquois	-0.767	-2.47
Jefferson	-1.040	-3.40
Jersey	0.677	2.16
Johnson	2.111	3.90
Kendall	-0.625	-2.54
Kankakee	-0.778	-2.00
Lake	-1.126	-3.56
Macoupin	-3.368	-6.41
Mason	1.330	4.17
Massac	0.657	2.09
McDonough	-1.365	-4.29
McHenry	-1.079	-3.54
McLean	-1.571	-5.02
Montgomery	-1.012	-2.74
Moultrie	-1.354	-4.37
Ogle	0.857	2.71
Perry	-4.016	-10.79
Piatt	-0.709	-2.29
Pike	-1.644	-3.06
Richland	-1.324	-2.50
Shelby	-1.704	-5.51
Stephenson	-1.116	-3.70
Wabash	-0.658	-1.71
Whiteside	-0.576	-1.85
Will	-0.808	-2.61
Woodford	-1.703	-5.34
DeKalb 1995	-2.248	-4.35
DeWitt 1990	-3.949	-7.50
Douglas 2000	-1.970	-3.70
Jackson 1995	-1.818	-3.48
Union 1995	-1.701	-3.24

N = 193, R^2 = 0.97, Mean Y = 0.041 (1.04 mgd), Root MSE= 0.51 (1.67 mgd); MAPE 36%

Development of Projections for Model Independent Variables

Employment projections for 2010 are available from IDES at the total employment, and employment division and major employment group (2-digit) level (*http://lmi.ides.state.il.us/projections/employproj.htm*). Using the IDES estimates of 2000 employment and 2010 projections, the rate of change between 2000 and 2010 was calculated. This rate of change was then applied to the 2000 employment values used in the model (see above) in order to calculate total employment for the five projection years. The same process was used to calculate estimates of employment in the three SICs included in the model for each projection year, and then these were divided by the projected total county employment to estimate the projected percent of employment in each sector, in each forecast year.

Using this method, total county employment was projected to increase in every county having self-supplied withdrawals. The percent of employment for SIC 33 was projected to decline in all non-zero counties in the State. In SIC 20 the percent of employment was also projected to decline in all non-zero counties except the two counties with the largest percentage of employment in this sector (Cass and Marshall). The percent of employment in SIC 72 was project to increases in all but six counties. (Note: The projections prepared in this report are based on the Standard Industrial Classification (SIC) system because of the historical nature of water use and employment projection data. The Standard Industrial Classification is in the process of being replaced by the North American Industry Classification System (NAICS). Projections in the future will need to be based upon NAICS. A “bridge” that links these two systems these systems is available at: *http://www.census.gov/epcd/ec97brdg/* .)

The percent of self-supplied C&I withdrawals was fixed at the 2000 level in the preparation of the projections presented here (and is presented in Table 5.2 below). Local conditions in individual counties may justify altering this assumption for specific counties but no general trends that could be used to justify adjustments to this variable were found during the investigation of C&I withdrawals in this analysis.

County binary variables were held constant throughout the projection period. Outlier binaries, however, were assumed to be an artifact of data collection and were not included in the preparation of water use projections.

Projections were prepared using two separate sets of values for the trend variable. Under the *baseline* scenario, the trend variable was fixed at the value it was assigned during the modeling process for the year 2000 (10). Projections for a water *conservation* scenario were also prepared. Under this scenario, the value of the trend variable increased with each projection year (i.e., 10 for 2000, 15 for 2005, 20 for 2010, etc.)

SELF-SUPPLIED COMMERCIAL AND INDUSTRIAL WATER USE PROJECTION RESULTS

Table 5.2 displays the estimated C&I county withdrawals as reported by USGS, the estimated percent of self-supplied C&I water use in each county in 2000, and the projections of self-supplied commercial and industrial water withdrawals for the five projection years. As was done in Chapter 3, both baseline (trend variable held constant at 2000 values for projection years) and conservation (trend variable increasing by five with progressive projection years) projections are provided.

Under both the baseline and conservation scenarios, the model predicts that the State will experience a decline in withdrawals between 2000 and 2005. Under the baseline scenario these withdrawals return to their 2000 levels by 2015 and then continue to increase. Under the conservation scenario C&I withdrawals are projected to continuously decrease throughout the projection period.

Among individual counties, C&I withdrawals are projected to increase (baseline) from 2005 to 2025 in every county except Putnam. Sixteen counties are projected to have increases greater than 1.0 mgd, with the largest increases projected for Cook (24 mgd), Peoria (18 mgd), Lake (9 mgd), Tazewell (8 mgd) and Madison (5 mgd).

Table 5.2 Estimated Self-Supplied C&I Withdrawals (1990-2000), Percent of Self-Supplied C&I Withdrawals (2000) and Projected (2005-2025) C&I Water Use (mgd)

County	Historical Estimates			% SS-C&I	Baseline Projections					Projections with Conservation (trend)				
	1990	1995	2000	2000	2005	2010	2015	2020	2025	2005	2010	2015	2020	2025
Adams	10.28	12.62	10.453	74.2	8.937	9.251	9.581	9.926	10.289	7.996	7.406	6.862	6.361	5.899
Alexander	0.08	0.01	0.059	8.7	0.036	0.037	0.038	0.039	0.039	0.032	0.029	0.027	0.025	0.023
Boone	0.07	0.41	0.473	25.4	0.322	0.331	0.342	0.352	0.364	0.288	0.265	0.245	0.226	0.209
Bureau	0.74	1.19	5.239	88.0	6.870	7.167	7.479	7.807	8.152	6.146	5.737	5.357	5.003	4.674
Calhoun	9.63	7.32	10.17	99.7	11.109	11.256	11.405	11.557	11.711	9.940	9.011	8.169	7.406	6.715
Carroll	9.83	2.43	2.073	87.7	1.874	1.932	1.992	2.055	2.120	1.677	1.547	1.427	1.317	1.215
Cass	1.73	1.6	1.997	92.0	1.703	1.753	1.804	1.858	1.914	1.524	1.403	1.292	1.191	1.098
Champaign	5.25	2.4	0.931	13.2	1.199	1.260	1.324	1.391	1.463	1.073	1.009	0.948	0.892	0.839
Christian	0.01	0.01	0.003	0.4	0.006	0.006	0.007	0.007	0.007	0.006	0.005	0.005	0.004	0.004
Coles	0	0	0.002	0.1	0.002	0.002	0.002	0.002	0.003	0.002	0.002	0.002	0.002	0.001
Cook	253.55	143.1	95.527	17.4	75.865	81.109	86.771	92.880	99.472	67.877	64.930	62.149	59.521	57.034
Crawford	4.26	5.03	4.164	85.8	3.621	3.731	3.846	3.965	4.088	3.240	2.987	2.755	2.541	2.344
De Kalb	0.67	0.78	0.184	12.2	0.368	0.388	0.410	0.433	0.458	0.329	0.311	0.294	0.278	0.263
De Witt	0.04	0.04	0.04	17.1	0.063	0.065	0.067	0.069	0.071	0.056	0.052	0.048	0.044	0.041
Douglas	5.49	3.35	0.005	3.0	0.037	0.037	0.038	0.039	0.040	0.033	0.030	0.027	0.025	0.023
Du Page	6.43	4.95	5.476	27.7	7.293	7.840	8.432	9.071	9.761	6.525	6.276	6.039	5.813	5.597
Fayette	4.05	2.56	3.836	88.0	2.662	2.713	2.767	2.822	2.880	2.382	2.172	1.982	1.808	1.651
Ford	0	0.19	0.008	2.8	0.020	0.020	0.021	0.021	0.022	0.017	0.016	0.015	0.014	0.012
Fulton	2.52	19.62	2.608	88.9	3.944	4.073	4.207	4.347	4.492	3.529	3.260	3.013	2.786	2.576
Grundy	6.31	6.8	7.065	97.0	10.263	10.913	11.604	12.341	13.125	9.183	8.736	8.312	7.909	7.526
Henderson	0	0	0.001	2.1	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Henry	0.04	0.05	0.05	9.4	0.035	0.036	0.037	0.039	0.040	0.031	0.029	0.027	0.025	0.023
Iroquois	0.07	0.09	0.07	24.4	0.062	0.064	0.065	0.067	0.069	0.056	0.051	0.047	0.043	0.040
Jackson	24.53	2.39	2.361	51.5	2.136	2.238	2.345	2.458	2.577	1.912	1.792	1.680	1.575	1.477

Table 5.2 *(cont'd)* Estimated Self-Supplied C&I Withdrawals (1990-2000), Percent of Self-Supplied C&I Withdrawals (2000) and Projected (2005-2025) C&I Water Use (mgd)

County	Historical Estimates			% SS-C&I	Baseline Projections					Projections with Conservation (trend)				
	1990	1995	2000	2000	2005	2010	2015	2020	2025	2005	2010	2015	2020	2025
Jefferson	1.89	0.02	17.091	99.1	4.871	5.087	5.314	5.550	5.797	4.358	4.073	3.806	3.557	3.324
Jersey	7.39	4.81	4.755	98.8	6.344	6.698	7.074	7.474	7.898	5.676	5.362	5.067	4.789	4.528
Jo Daviess	2.03	2.95	2.72	83.5	2.535	2.590	2.648	2.707	2.769	2.268	2.073	1.896	1.735	1.588
Johnson	0	0.11	0	0.0	0.089	0.092	0.095	0.098	0.101	0.079	0.073	0.068	0.063	0.058
Kane	2.5	2.05	1.565	2.9	1.783	1.912	2.050	2.200	2.363	1.596	1.530	1.468	1.410	1.355
Kankakee	0.17	0.18	0.162	2.2	0.191	0.198	0.206	0.215	0.224	0.170	0.159	0.148	0.138	0.129
Kendall	0.33	0.31	0.291	38.8	0.337	0.355	0.373	0.393	0.414	0.302	0.284	0.267	0.252	0.237
Lake	13.12	16.95	20.608	69.3	28.119	30.114	32.261	34.571	37.056	25.158	24.107	23.107	22.155	21.247
La Salle	7.23	3.54	3.655	55.3	5.264	5.472	5.691	5.920	6.161	4.710	4.381	4.076	3.794	3.532
Lawrence	0	0.09	0.052	18.9	0.048	0.050	0.051	0.053	0.055	0.043	0.040	0.037	0.034	0.032
Lee	0.21	2.48	1.13	50.4	0.900	0.922	0.946	0.971	0.997	0.805	0.738	0.678	0.622	0.572
Livingston	0.09	0.29	0.124	12.7	0.139	0.142	0.145	0.148	0.151	0.124	0.113	0.104	0.095	0.087
McDonough	0.02	0.02	0.022	2.1	0.022	0.023	0.024	0.025	0.026	0.020	0.019	0.017	0.016	0.015
McHenry	4.02	3.92	4.921	64.0	5.943	6.273	6.625	7.001	7.402	5.318	5.021	4.745	4.486	4.244
McLean	0.14	0.12	0.156	4.8	0.164	0.173	0.183	0.194	0.205	0.147	0.139	0.131	0.124	0.118
Macon	8.58	4.97	1.625	14.6	1.115	1.150	1.188	1.228	1.270	0.997	0.921	0.851	0.787	0.728
Macoupin	0	0	0.002	0.4	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.001
Madison	58.58	81.45	42.768	72.1	37.988	38.837	39.890	41.144	42.595	33.989	31.090	28.571	26.367	24.423
Marshall	1.24	1.12	0.989	73.9	0.723	0.736	0.750	0.763	0.777	0.647	0.589	0.537	0.489	0.446
Mason	6.75	13.52	13.758	99.0	9.323	9.576	9.837	10.106	10.386	8.342	7.666	7.045	6.477	5.955
Massac	6.26	4.22	7.556	99.9	6.749	6.998	7.257	7.527	7.808	6.038	5.602	5.198	4.823	4.477
Montgomery	0.44	0.43	0	0.0	0.019	0.019	0.020	0.021	0.022	0.017	0.016	0.014	0.013	0.012
Morgan	3.91	5.03	5.602	84.1	6.928	7.157	7.397	7.648	7.911	6.199	5.730	5.298	4.901	4.536
Moultrie	0.99	0.8	0.021	51.2	0.052	0.054	0.056	0.057	0.059	0.047	0.043	0.040	0.037	0.034

Table 5.2 *(cont'd)* Estimated Self-Supplied C&I Withdrawals (1990-2000), Percent of Self-Supplied C&I Withdrawals (2000) and Projected (2005-2025) C&I Water Use (mgd)

County	**Historical Estimates**			**% SS-C&I**	**Baseline Projections**					**Projections with Conservation (trend)**				
	1990	**1995**	**2000**	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**	**2005**	**2010**	**2015**	**2020**	**2025**
Ogle	0.69	0.7	0.81	22.6	0.756	0.777	0.798	0.820	0.843	0.677	0.622	0.572	0.525	0.483
Peoria	27.2	81.16	107.148	92.9	89.372	93.489	97.911	102.649	107.716	79.963	74.840	70.128	65.781	61.761
Perry	0.61	0.02	0	0.0	0.001	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000
Piatt	0.76	0.81	0.913	89.3	0.758	0.777	0.797	0.817	0.838	0.679	0.622	0.571	0.523	0.480
Pike	0	0	0.003	1.7	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002
Pulaski	0.16	0.04	0.047	22.7	0.025	0.025	0.026	0.027	0.027	0.022	0.020	0.019	0.017	0.016
Putnam	5.19	5.11	1.59	92.1	1.948	1.847	1.758	1.680	1.612	1.743	1.479	1.260	1.077	0.924
Richland	0	0.01	0	0.0	0.008	0.009	0.009	0.009	0.010	0.007	0.007	0.006	0.006	0.005
Rock Island	49.02	6.49	3.657	39.0	4.206	4.349	4.501	4.664	4.838	3.763	3.481	3.224	2.989	2.774
St Clair	10.91	22.28	14.433	50.9	10.209	10.829	11.500	12.225	13.007	9.135	8.669	8.237	7.834	7.458
Scott	0	0.04	0.043	43.1	0.039	0.040	0.041	0.041	0.042	0.035	0.032	0.029	0.027	0.024
Shelby	0.29	0.29	0.218	76.6	0.202	0.206	0.210	0.214	0.219	0.181	0.165	0.150	0.137	0.125
Stephenson	1.83	1.78	1.451	69.4	1.327	1.370	1.415	1.462	1.511	1.188	1.097	1.013	0.937	0.866
Tazewell	23.95	35.85	37.2	92.4	44.346	46.248	48.253	50.367	52.595	39.677	37.023	34.561	32.277	30.156
Union	0.85	0.75	7.34	99.0	3.825	3.972	4.124	4.283	4.449	3.423	3.179	2.954	2.745	2.551
Vermilion	2.97	2.68	2.246	32.4	1.042	1.076	1.111	1.148	1.186	0.932	0.861	0.796	0.735	0.680
Wabash	0.02	0.02	0	0.0	0.010	0.010	0.011	0.011	0.012	0.009	0.008	0.008	0.007	0.007
Washington	0	0.11	0	0.0	0.022	0.022	0.023	0.023	0.024	0.019	0.018	0.016	0.015	0.014
Whiteside	7.83	4.98	4.155	74.6	3.698	3.788	3.883	3.982	4.087	3.309	3.032	2.781	2.552	2.343
Will	22.04	15.71	11.955	65.4	13.093	13.978	14.927	15.944	17.034	11.714	11.190	10.691	10.217	9.767
Williamson	8.14	7.12	15.777	95.0	16.407	17.091	17.809	18.560	19.349	14.680	13.682	12.755	11.894	11.094
Winnebago	3.67	3.76	1.725	10.0	2.076	2.175	2.281	2.392	2.510	1.857	1.741	1.633	1.533	1.439
Woodford	0.01	0.02	0.004	1.6	0.011	0.011	0.012	0.012	0.013	0.009	0.009	0.008	0.008	0.007
All Counties	**637.61**	**556.05**	**493.083**	**-----**	**451.46**	**472.95**	**496.07**	**520.90**	**547.53**	**403.93**	**378.61**	**355.31**	**333.81**	**313.94**

Note: Counties with no reported commercial or industrial withdrawals were assumed to not have future self-supplied C&I water use and were not included in the above table.

CHAPTER 5 ANNEX

Table 5A.1 Estimated Self-Supplied C&I Withdrawals:1990, 1995, and 2000

County	1990 Self-Supplied Comm.	1990 Indus.	1990 *Total C&I*	1995 Self-Supplied Comm.	1995 Indus.	1995 *Total C&I*	2000 Self-Supplied Comm.	2000 Indus.	2000 *Total C&I*
Adams	0.00	10.28	*10.28*	0.00	12.62	*12.62*	0.00	10.45	*10.45*
Alexander	0.07	0.01	*0.08*	0.00	0.01	*0.01*	0.06	0.00	*0.06*
Bond	0.00	0.00	*0.00*	0.00	0.00	*0.00*	0.00	0.00	*0.00*
Boone	0.00	0.07	*0.07*	0.23	0.18	*0.41*	0.09	0.39	*0.47*
Brown	0.00	0.00	*0.00*	0.00	0.00	*0.00*	0.00	0.00	*0.00*
Bureau	0.72	0.02	*0.74*	1.17	0.02	*1.19*	5.21	0.03	*5.24*
Calhoun	9.63	0.00	*9.63*	7.32	0.00	*7.32*	10.17	0.00	*10.17*
Carroll	7.87	1.96	*9.83*	0.19	2.24	*2.43*	0.10	1.97	*2.07*
Cass	0.03	1.70	*1.73*	0.00	1.60	*1.60*	0.00	2.00	*2.00*
Champaign	1.64	3.61	*5.25*	0.13	2.27	*2.40*	0.14	0.79	*0.93*
Christian	0.01	0.00	*0.01*	0.01	0.00	*0.01*	0.00	0.00	*0.00*
Clark	0.00	0.00	*0.00*	0.00	0.00	*0.00*	0.00	0.00	*0.00*
Clay	0.00	0.00	*0.00*	0.00	0.00	*0.00*	0.00	0.00	*0.00*
Clinton	0.00	0.00	*0.00*	0.00	0.00	*0.00*	0.00	0.00	*0.00*
Coles	0.00	0.00	*0.00*	0.00	0.00	*0.00*	0.00	0.00	*0.00*
Cook	74.12	179.43	*253.55*	32.55	110.55	*143.10*	0.58	94.94	*95.53*
Crawford	0.00	4.26	*4.26*	0.00	5.03	*5.03*	0.00	4.16	*4.16*
Cumberland	0.00	0.00	*0.00*	0.00	0.00	*0.00*	0.00	0.00	*0.00*
De Kalb	0.03	0.64	*0.67*	0.08	0.70	*0.78*	0.01	0.18	*0.18*
De Witt	0.04	0.00	*0.04*	0.04	0.00	*0.04*	0.04	0.00	*0.04*
Douglas	0.01	5.48	*5.49*	0.03	3.32	*3.35*	0.01	0.00	*0.01*
Du Page	6.04	0.39	*6.43*	4.59	0.36	*4.95*	5.18	0.30	*5.48*
Edgar	0.00	0.00	*0.00*	0.00	0.00	*0.00*	0.00	0.00	*0.00*
Edwards	0.00	0.00	*0.00*	0.00	0.00	*0.00*	0.00	0.00	*0.00*
Effingham	0.00	0.00	*0.00*	0.00	0.00	*0.00*	0.00	0.00	*0.00*
Fayette	4.05	0.00	*4.05*	2.56	0.00	*2.56*	3.84	0.00	*3.84*
Ford	0.00	0.00	*0.00*	0.09	0.10	*0.19*	0.01	0.00	*0.01*
Franklin	0.00	0.00	*0.00*	0.00	0.00	*0.00*	0.00	0.00	*0.00*
Fulton	2.52	0.00	*2.52*	19.62	0.00	*19.62*	2.61	0.00	*2.61*
Gallatin	0.00	0.00	*0.00*	0.00	0.00	*0.00*	0.00	0.00	*0.00*
Greene	0.00	0.00	*0.00*	0.00	0.00	*0.00*	0.00	0.00	*0.00*
Grundy	0.00	6.31	*6.31*	0.00	6.80	*6.80*	0.10	6.97	*7.07*
Hamilton	0.00	0.00	*0.00*	0.00	0.00	*0.00*	0.00	0.00	*0.00*
Hancock	0.00	0.00	*0.00*	0.00	0.00	*0.00*	0.00	0.00	*0.00*
Hardin	0.00	0.00	*0.00*	0.00	0.00	*0.00*	0.00	0.00	*0.00*

Table 5A.1 *(cont'd)* Estimated Self-Supplied C&I Withdrawals:1990, 1995, and 2000

County	1990 Self-Supplied Comm.	1990 Self-Supplied Indus.	1990 Self-Supplied *Total C&I*	1995 Self-Supplied Comm.	1995 Self-Supplied Indus.	1995 Self-Supplied *Total C&I*	2000 Self-Supplied Comm.	2000 Self-Supplied Indus.	2000 Self-Supplied *Total C&I*
Henderson	0.00	0.00	*0.00*	0.00	0.00	*0.00*	0.00	0.00	*0.00*
Henry	0.01	0.03	*0.04*	0.04	0.01	*0.05*	0.04	0.01	*0.05*
Iroquois	0.00	0.07	*0.07*	0.01	0.08	*0.09*	0.00	0.07	*0.07*
Jackson	24.53	0.00	*24.53*	2.39	0.00	*2.39*	2.36	0.00	*2.36*
Jasper	0.00	0.00	*0.00*	0.00	0.00	*0.00*	0.00	0.00	*0.00*
Jefferson	1.89	0.00	*1.89*	0.02	0.00	*0.02*	17.09	0.00	*17.09*
Jersey	7.39	0.00	*7.39*	4.81	0.00	*4.81*	4.76	0.00	*4.76*
Jo Daviess	0.31	1.72	*2.03*	0.33	2.62	*2.95*	0.16	2.56	*2.72*
Johnson	0.00	0.00	*0.00*	0.11	0.00	*0.11*	0.00	0.00	*0.00*
Kane	0.98	1.52	*2.50*	0.37	1.68	*2.05*	0.51	1.06	*1.57*
Kankakee	0.05	0.12	*0.17*	0.00	0.18	*0.18*	0.07	0.09	*0.16*
Kendall	0.01	0.32	*0.33*	0.01	0.30	*0.31*	0.00	0.29	*0.29*
Knox	0.00	0.00	*0.00*	0.00	0.00	*0.00*	0.00	0.00	*0.00*
Lake	0.82	12.30	*13.12*	0.61	16.34	*16.95*	0.37	20.24	*20.61*
LaSalle	0.05	7.18	*7.23*	0.06	3.48	*3.54*	0.06	3.59	*3.66*
Lawrence	0.00	0.00	*0.00*	0.00	0.09	*0.09*	0.00	0.05	*0.05*
Lee	0.16	0.05	*0.21*	0.04	2.44	*2.48*	0.02	1.11	*1.13*
Livingston	0.00	0.09	*0.09*	0.21	0.08	*0.29*	0.04	0.09	*0.12*
Logan	0.00	0.00	*0.00*	0.00	0.00	*0.00*	0.00	0.00	*0.00*
McDonough	0.00	0.02	*0.02*	0.00	0.02	*0.02*	0.00	0.02	*0.02*
McHenry	0.37	3.65	*4.02*	0.16	3.76	*3.92*	2.19	2.73	*4.92*
McLean	0.11	0.03	*0.14*	0.12	0.00	*0.12*	0.16	0.00	*0.16*
Macon	0.08	8.50	*8.58*	0.01	4.96	*4.97*	0.06	1.57	*1.63*
Macoupin	0.00	0.00	*0.00*	0.00	0.00	*0.00*	0.00	0.00	*0.00*
Madison	2.29	56.29	*58.58*	0.34	81.11	*81.45*	2.23	40.54	*42.77*
Marion	0.00	0.00	*0.00*	0.00	0.00	*0.00*	0.00	0.00	*0.00*
Marshall	0.00	1.24	*1.24*	0.00	1.12	*1.12*	0.00	0.99	*0.99*
Mason	6.75	0.00	*6.75*	13.52	0.00	*13.52*	13.75	0.00	*13.76*
Massac	1.39	4.87	*6.26*	0.41	3.81	*4.22*	3.81	3.74	*7.56*
Menard	0.00	0.00	*0.00*	0.00	0.00	*0.00*	0.00	0.00	*0.00*
Mercer	0.00	0.00	*0.00*	0.00	0.00	*0.00*	0.00	0.00	*0.00*
Monroe	0.00	0.00	*0.00*	0.00	0.00	*0.00*	0.00	0.00	*0.00*
Montgomery	0.00	0.44	*0.44*	0.00	0.43	*0.43*	0.00	0.00	*0.00*
Morgan	0.00	3.91	*3.91*	0.00	5.03	*5.03*	0.00	5.60	*5.60*
Moultrie	0.99	0.00	*0.99*	0.80	0.00	*0.80*	0.02	0.00	*0.02*
Ogle	0.01	0.68	*0.69*	0.26	0.44	*0.70*	0.17	0.64	*0.81*
Peoria	0.00	27.20	*27.20*	0.00	81.16	*81.16*	0.02	107.13	*107.15*

Table 5A.1 *(cont'd)* Estimated Self-Supplied C&I Withdrawals:1990, 1995, and 2000

	1990 Self-Supplied			1995 Self-Supplied			2000 Self-Supplied		
County	**Comm.**	**Indus.**	***Total C&I***	**Comm.**	**Indus.**	***Total C&I***	**Comm.**	**Indus.**	***Total C&I***
Perry	0.00	0.61	*0.61*	0.00	0.02	*0.02*	0.00	0.00	*0.00*
Piatt	0.02	0.74	*0.76*	0.02	0.79	*0.81*	0.02	0.90	*0.91*
Pike	0.00	0.00	*0.00*	0.00	0.00	*0.00*	0.00	0.00	*0.00*
Pope	0.00	0.00	*0.00*	0.00	0.00	*0.00*	0.00	0.00	*0.00*
Pulaski	0.16	0.00	*0.16*	0.04	0.00	*0.04*	0.05	0.00	*0.05*
Putnam	0.79	4.40	*5.19*	1.10	4.01	*5.11*	1.45	0.14	*1.59*
Randolph	0.00	0.00	*0.00*	0.00	0.00	*0.00*	0.00	0.00	*0.00*
Richland	0.00	0.00	*0.00*	0.00	0.01	*0.01*	0.00	0.00	*0.00*
Rock Island	0.03	48.99	*49.02*	0.12	6.37	*6.49*	0.08	3.58	*3.66*
St Clair	8.18	2.73	*10.91*	0.21	22.07	*22.28*	0.83	13.61	*14.43*
Saline	0.00	0.00	*0.00*	0.00	0.00	*0.00*	0.00	0.00	*0.00*
Sangamon	0.00	0.00	*0.00*	0.00	0.00	*0.00*	0.00	0.00	*0.00*
Schuyler	0.00	0.00	*0.00*	0.00	0.00	*0.00*	0.00	0.00	*0.00*
Scott	0.00	0.00	*0.00*	0.00	0.04	*0.04*	0.00	0.04	*0.04*
Shelby	0.00	0.29	*0.29*	0.29	0.00	*0.29*	0.22	0.00	*0.22*
Stark	0.00	0.00	*0.00*	0.00	0.00	*0.00*	0.00	0.00	*0.00*
Stephenson	0.01	1.82	*1.83*	0.00	1.78	*1.78*	0.00	1.45	*1.45*
Tazewell	0.01	23.94	*23.95*	0.02	35.83	*35.85*	0.20	37.00	*37.20*
Union	0.85	0.00	*0.85*	0.75	0.00	*0.75*	7.34	0.00	*7.34*
Vermilion	0.01	2.96	*2.97*	0.03	2.65	*2.68*	0.04	2.20	*2.25*
Wabash	0.02	0.00	*0.02*	0.02	0.00	*0.02*	0.00	0.00	*0.00*
Warren	0.00	0.00	*0.00*	0.00	0.00	*0.00*	0.00	0.00	*0.00*
Washington	0.00	0.00	*0.00*	0.00	0.11	*0.11*	0.00	0.00	*0.00*
Wayne	0.00	0.00	*0.00*	0.00	0.00	*0.00*	0.00	0.00	*0.00*
White	0.00	0.00	*0.00*	0.00	0.00	*0.00*	0.00	0.00	*0.00*
Whiteside	0.18	7.65	*7.83*	0.46	4.52	*4.98*	0.00	4.16	*4.16*
Will	0.32	21.72	*22.04*	0.42	15.29	*15.71*	0.14	11.82	*11.96*
Williamson	7.74	0.40	*8.14*	7.12	0.00	*7.12*	15.78	0.00	*15.78*
Winnebago	0.08	3.59	*3.67*	0.17	3.59	*3.76*	0.01	1.72	*1.73*
Woodford	0.00	0.01	*0.01*	0.01	0.01	*0.02*	0.00	0.00	*0.00*
State Total	173.37	464.24	*637.61*	104.02	452.03	*556.05*	102.17	390.91	*493.08*

Source: USGS water use inventories, various years. Commercial self-supplied deliveries data for 2000 was obtained from the USGS from preliminary estimates and was not released in the official 2000 inventory report. Total C&I was calculated as the sum of the self-supplied commercial and industrial withdrawals.

Table 5A.2 Projected Total County Employment: 2005 - 2025

County	2005	2010	2015	2020	2025
Adams	33,046	34,098	35,184	36,304	37,460
Alexander	2,571	2,632	2,694	2,758	2,823
Boone	13,812	14,070	14,334	14,602	14,876
Bureau	11,988	12,304	12,628	12,961	13,302
Calhoun	954	966	978	989	1,001
Carroll	5,067	5,171	5,277	5,386	5,496
Cass	5,303	5,359	5,416	5,473	5,531
Champaign	93,003	97,173	101,531	106,084	110,841
Christian	11,590	11,906	12,231	12,564	12,907
Coles	29,032	30,210	31,436	32,712	34,039
Cook	2,846,121	3,042,555	3,252,547	3,477,032	3,717,011
Crawford	7,489	7,656	7,826	8,000	8,178
De Kalb	34,417	36,235	38,148	40,163	42,283
De Witt	5,999	6,127	6,258	6,391	6,528
Douglas	8,200	8,333	8,469	8,608	8,748
Du Page	612,752	657,274	705,032	756,260	811,210
Fayette	6,784	6,903	7,024	7,147	7,273
Ford	4,501	4,606	4,714	4,824	4,937
Fulton	9,056	9,274	9,497	9,725	9,959
Grundy	14,844	15,656	16,513	17,418	18,371
Henderson	1,118	1,134	1,150	1,166	1,183
Henry	15,128	15,500	15,882	16,272	16,672
Iroquois	8,871	9,040	9,213	9,388	9,567
Jackson	27,130	28,310	29,542	30,827	32,168
Jefferson	19,038	19,745	20,478	21,237	22,026
Jersey	4,760	4,953	5,154	5,364	5,582
Jo Daviess	8,395	8,571	8,750	8,933	9,120
Johnson	2,538	2,590	2,644	2,698	2,754
Kane	204,454	219,234	235,081	252,075	270,296
Kankakee	43,867	45,433	47,056	48,736	50,477
Kendall	15,954	16,658	17,393	18,161	18,962
Lake	320,742	342,007	364,683	388,862	414,645
La Salle	44,995	46,427	47,906	49,431	51,005
Lawrence	4,670	4,796	4,926	5,059	5,196
Lee	13,116	13,450	13,792	14,142	14,502
Livingston	15,945	16,227	16,513	16,804	17,101
McDonough	16,317	16,925	17,556	18,210	18,888
McHenry	89,881	94,409	99,166	104,162	109,410

Table 5A.2 *(cont'd)* Projected Total County Employment: 2005 - 2025

County	2005	2010	2015	2020	2025
McLean	88,760	93,308	98,089	103,115	108,398
Macon	59,774	61,645	63,575	65,566	67,619
Macoupin	12,334	12,655	12,984	13,321	13,668
Madison	98,106	102,294	106,660	111,214	115,961
Marshall	3,309	3,354	3,400	3,447	3,494
Mason	3,957	4,031	4,106	4,183	4,261
Massac	4,980	5,112	5,247	5,385	5,527
Montgomery	11,388	11,673	11,966	12,266	12,574
Morgan	16,985	17,460	17,949	18,452	18,969
Moultrie	3,968	4,058	4,150	4,244	4,340
Ogle	17,845	18,251	18,667	19,093	19,528
Peoria	107,228	112,462	117,951	123,708	129,746
Perry	6,271	6,423	6,579	6,739	6,903
Piatt	3,599	3,668	3,739	3,811	3,884
Pike	4,375	4,439	4,503	4,568	4,634
Pulaski	2,194	2,242	2,290	2,339	2,390
Putnam	2,061	2,085	2,109	2,133	2,158
Richland	7,836	8,079	8,329	8,587	8,853
Rock Island	82,563	85,360	88,252	91,242	94,332
St Clair	93,892	99,073	104,539	110,307	116,394
Scott	1,539	1,569	1,599	1,630	1,661
Shelby	5,792	5,861	5,931	6,002	6,074
Stephenson	21,501	22,102	22,720	23,355	24,008
Tazewell	58,082	59,855	61,683	63,566	65,507
Union	5,724	5,894	6,070	6,251	6,437
Vermilion	33,300	34,309	35,348	36,419	37,522
Wabash	4,266	4,391	4,519	4,652	4,788
Washington	5,631	5,742	5,856	5,971	6,089
Whiteside	23,889	24,562	25,253	25,964	26,695
Will	148,799	157,994	167,756	178,122	189,129
Williamson	23,127	23,999	24,903	25,842	26,816
Winnebago	149,001	155,362	161,994	168,910	176,120
Woodford	10,248	10,557	10,875	11,202	11,539

Table 5A.3 Projected Percent of Sectoral Employment (2005-2025)

	Percent Employment: SIC 20					Percent Employment: SIC 33					Percent Employment: SIC 72				
County	**2005**	**2010**	**2015**	**2020**	**2025**	**2005**	**2010**	**2015**	**2020**	**2025**	**2005**	**2010**	**2015**	**2020**	**2025**
Adams	2.879	2.706	2.544	2.391	2.247	0.157	0.149	0.142	0.135	0.128	0.940	0.956	0.972	0.988	1.005
Alexander	3.771	3.721	3.671	3.622	3.574	0.000	0.000	0.000	0.000	0.000	0.272	0.266	0.260	0.254	0.248
Boone	4.100	3.895	3.701	3.517	3.341	0.000	0.000	0.000	0.000	0.000	1.253	1.297	1.343	1.391	1.440
Bureau	0.219	0.215	0.211	0.208	0.204	0.008	0.008	0.007	0.007	0.007	1.733	1.771	1.811	1.851	1.892
Calhoun	0.714	0.687	0.660	0.635	0.611	0.000	0.000	0.000	0.000	0.000	0.426	0.427	0.429	0.430	0.432
Carroll	0.158	0.155	0.152	0.149	0.146	0.118	0.116	0.114	0.111	0.109	0.808	0.830	0.854	0.877	0.902
Cass	35.943	36.276	36.612	36.951	37.293	0.000	0.000	0.000	0.000	0.000	0.435	0.452	0.469	0.487	0.506
Champaign	2.076	2.027	1.979	1.932	1.886	0.201	0.190	0.179	0.169	0.159	0.817	0.823	0.830	0.836	0.843
Christian	0.060	0.059	0.057	0.056	0.054	0.000	0.000	0.000	0.000	0.000	0.969	0.989	1.010	1.032	1.054
Coles	1.416	1.339	1.266	1.196	1.131	0.620	0.596	0.573	0.550	0.529	1.088	1.120	1.153	1.187	1.222
Cook	1.669	1.534	1.410	1.296	1.191	0.528	0.468	0.416	0.369	0.327	1.061	1.057	1.052	1.048	1.043
Crawford	9.408	9.343	9.278	9.214	9.150	0.000	0.000	0.000	0.000	0.000	0.827	0.848	0.871	0.894	0.917
De Kalb	0.211	0.197	0.184	0.172	0.160	1.838	1.656	1.492	1.344	1.211	0.798	0.807	0.816	0.825	0.834
De Witt	0.050	0.050	0.049	0.049	0.048	0.000	0.000	0.000	0.000	0.000	0.857	0.880	0.904	0.929	0.954
Douglas	0.000	0.000	0.000	0.000	0.000	0.384	0.372	0.360	0.348	0.337	0.320	0.330	0.341	0.352	0.363
Du Page	0.779	0.714	0.654	0.599	0.548	0.355	0.314	0.278	0.246	0.217	1.126	1.118	1.110	1.101	1.093
Fayette	3.674	3.502	3.338	3.181	3.032	0.029	0.028	0.027	0.027	0.026	0.495	0.510	0.526	0.543	0.559
Ford	3.206	3.140	3.075	3.011	2.948	0.000	0.000	0.000	0.000	0.000	0.210	0.215	0.221	0.226	0.232
Fulton	0.515	0.500	0.484	0.469	0.455	0.410	0.380	0.353	0.328	0.304	0.834	0.855	0.876	0.897	0.919
Grundy	0.156	0.148	0.141	0.135	0.128	0.483	0.456	0.430	0.406	0.383	0.818	0.825	0.833	0.841	0.848
Henderson	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.407	1.456	1.506	1.558	1.612
Henry	0.308	0.297	0.287	0.277	0.268	0.000	0.000	0.000	0.000	0.000	0.844	0.869	0.895	0.922	0.950
Iroquois	2.165	2.160	2.154	2.148	2.143	0.000	0.000	0.000	0.000	0.000	0.485	0.499	0.514	0.529	0.545
Jackson	0.193	0.182	0.173	0.163	0.154	1.055	0.977	0.906	0.839	0.778	0.959	0.964	0.970	0.975	0.980
Jefferson	0.011	0.010	0.010	0.009	0.009	0.000	0.000	0.000	0.000	0.000	0.617	0.624	0.632	0.639	0.646
Jersey	0.211	0.204	0.197	0.190	0.184	0.000	0.000	0.000	0.000	0.000	0.968	0.996	1.025	1.055	1.086
Jo Daviess	2.091	1.986	1.887	1.793	1.703	1.039	0.997	0.957	0.918	0.881	0.362	0.372	0.383	0.393	0.404

Table 5A.3 *(cont'd)* Projected Percent of Sectoral Employment (2005-2025)

	Percent Employment: SIC 20					Percent Employment: SIC 33					Percent Employment: SIC 72				
County	**2005**	**2010**	**2015**	**2020**	**2025**	**2005**	**2010**	**2015**	**2020**	**2025**	**2005**	**2010**	**2015**	**2020**	**2025**
Johnson	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.075	1.105	1.136	1.168	1.200
Kane	1.236	1.132	1.037	0.951	0.871	0.793	0.702	0.621	0.549	0.486	0.941	0.935	0.928	0.921	0.915
Kankakee	1.832	1.680	1.540	1.412	1.295	0.996	0.864	0.750	0.651	0.565	1.321	1.348	1.377	1.405	1.435
Kendall	2.943	2.770	2.606	2.452	2.307	0.375	0.340	0.309	0.281	0.255	1.281	1.306	1.332	1.358	1.384
Lake	0.424	0.391	0.360	0.332	0.306	0.488	0.434	0.386	0.344	0.306	1.043	1.041	1.040	1.038	1.036
La Salle	1.528	1.436	1.350	1.269	1.193	0.462	0.438	0.416	0.395	0.375	1.299	1.321	1.343	1.365	1.388
Lawrence	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.629	0.643	0.657	0.671	0.685
Lee	4.695	4.441	4.200	3.972	3.757	0.000	0.000	0.000	0.000	0.000	0.656	0.671	0.687	0.703	0.719
Livingston	0.383	0.365	0.348	0.332	0.316	1.055	0.974	0.900	0.831	0.768	0.467	0.482	0.497	0.512	0.528
McDonough	0.241	0.235	0.228	0.222	0.216	0.763	0.716	0.671	0.630	0.591	0.669	0.676	0.684	0.692	0.700
McHenry	0.977	0.914	0.855	0.800	0.748	1.307	1.181	1.066	0.963	0.869	1.183	1.199	1.215	1.232	1.248
McLean	0.692	0.640	0.592	0.548	0.507	0.150	0.135	0.122	0.111	0.100	1.144	1.148	1.153	1.157	1.162
Macon	7.281	7.001	6.733	6.475	6.227	1.392	1.275	1.169	1.071	0.982	1.199	1.229	1.260	1.292	1.325
Macoupin	1.989	1.881	1.778	1.680	1.588	0.000	0.000	0.000	0.000	0.000	0.647	0.661	0.676	0.691	0.707
Madison	0.823	0.777	0.733	0.691	0.652	7.760	6.819	5.992	5.266	4.628	1.267	1.301	1.337	1.373	1.411
Marshall	12.246	12.298	12.351	12.403	12.456	0.000	0.000	0.000	0.000	0.000	0.309	0.312	0.315	0.318	0.321
Mason	1.611	1.601	1.591	1.580	1.570	0.000	0.000	0.000	0.000	0.000	0.610	0.628	0.647	0.666	0.686
Massac	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.906	0.926	0.947	0.968	0.989
Montgomery	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.728	0.745	0.762	0.780	0.799
Morgan	2.758	2.602	2.455	2.316	2.185	0.000	0.000	0.000	0.000	0.000	0.951	0.971	0.991	1.011	1.032
Moultrie	0.435	0.431	0.428	0.425	0.421	0.000	0.000	0.000	0.000	0.000	0.529	0.543	0.557	0.571	0.586
Ogle	6.941	6.806	6.674	6.544	6.416	0.027	0.026	0.024	0.023	0.022	0.538	0.555	0.572	0.590	0.609
Peoria	0.627	0.581	0.538	0.498	0.462	2.183	1.937	1.718	1.525	1.353	1.017	1.023	1.029	1.036	1.042
Perry	3.990	3.778	3.577	3.387	3.207	2.705	2.516	2.340	2.177	2.025	0.468	0.480	0.492	0.503	0.516
Piatt	0.000	0.000	0.000	0.000	0.000	4.250	4.141	4.034	3.931	3.830	0.700	0.720	0.741	0.763	0.786
Pike	0.905	0.905	0.905	0.906	0.906	0.000	0.000	0.000	0.000	0.000	0.070	0.071	0.071	0.072	0.073

Table 5A.3 *(cont'd)* Projected Percent of Sectoral Employment (2005-2025)

	Percent Employment: SIC 20					**Percent Employment: SIC 33**					**Percent Employment: SIC 72**				
County	**2005**	**2010**	**2015**	**2020**	**2025**	**2005**	**2010**	**2015**	**2020**	**2025**	**2005**	**2010**	**2015**	**2020**	**2025**
Pulaski	0.000	0.000	0.000	0.000	0.000	0.729	0.714	0.699	0.684	0.669	0.519	0.527	0.534	0.542	0.549
Putnam	0.000	0.000	0.000	0.000	0.000	29.323	27.553	25.890	24.327	22.858	0.050	0.051	0.052	0.053	0.054
Richland	1.287	1.211	1.139	1.071	1.008	0.000	0.000	0.000	0.000	0.000	0.375	0.382	0.388	0.395	0.402
Rock Island	3.029	2.742	2.481	2.246	2.032	0.310	0.281	0.255	0.231	0.210	0.936	0.955	0.975	0.995	1.016
St Clair	0.893	0.832	0.776	0.723	0.674	1.390	1.207	1.048	0.910	0.790	1.419	1.441	1.463	1.485	1.507
Scott	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.066	0.065	0.065	0.064	0.064
Shelby	0.349	0.348	0.348	0.347	0.346	0.000	0.000	0.000	0.000	0.000	0.489	0.507	0.526	0.545	0.565
Stephenson	2.603	2.456	2.317	2.186	2.062	0.000	0.000	0.000	0.000	0.000	0.805	0.822	0.839	0.856	0.874
Tazewell	0.470	0.443	0.418	0.394	0.371	0.388	0.350	0.316	0.286	0.258	1.270	1.301	1.332	1.364	1.397
Union	0.356	0.335	0.316	0.297	0.280	0.000	0.000	0.000	0.000	0.000	0.807	0.822	0.837	0.853	0.869
Vermilion	3.285	3.092	2.911	2.740	2.580	0.253	0.241	0.229	0.218	0.207	0.803	0.818	0.833	0.848	0.864
Wabash	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.058	1.078	1.099	1.120	1.142
Washington	0.054	0.053	0.053	0.052	0.052	0.000	0.000	0.000	0.000	0.000	0.484	0.498	0.513	0.528	0.543
Whiteside	0.309	0.291	0.275	0.259	0.244	6.271	5.976	5.695	5.427	5.172	0.637	0.650	0.663	0.677	0.691
Will	0.682	0.631	0.584	0.540	0.500	0.312	0.278	0.249	0.222	0.198	0.975	0.978	0.980	0.983	0.985
Williamson	1.741	1.690	1.639	1.591	1.543	0.805	0.745	0.689	0.638	0.590	0.844	0.853	0.863	0.872	0.882
Winnebago	1.438	1.335	1.239	1.150	1.068	0.642	0.580	0.525	0.475	0.429	1.358	1.374	1.390	1.406	1.423
Woodford	0.559	0.527	0.497	0.469	0.442	0.010	0.009	0.009	0.008	0.008	1.122	1.150	1.178	1.207	1.236

5A.1 VARIABLE DEFINITIONS AND DATA SOURCES: SELF-SUPPLIED COMMERCIAL AND INDUISTRIAL MODEL

INTRODUCTION

This section of the Chapter 5 Annex documents the data sources and specification of the dependent and independent variables used in the analysis of the self-supplied commercial and industrial water use, regardless of whether or not the variables actually appeared in the final model. The description of each variable includes the variable name, units (in parenthesis), source of raw data, the method used to specify the variable, and any modifications or adjustments made to the original data. Variables that are estimated as ratios or percentages based on other variables are also described in this section.

Projected values developed only for those variables that were included in the final C&I projection model. These are described in detail in the main body of the Chapter 5.

DEPENDENT VARIABLE

Total self-supplied commercial and industrial water withdrawals (mgd)

Source: USGS water use inventories.
http://water.usgs.gov/watuse/
Estimation/Modification:
This variable was created by summing the self-supplied commercial withdrawals (both ground water and surface water) and the self-supplied industrial (both ground water and surface water) withdrawals for 1990, 1995, and 2000. Changes in USGS inventory procedures were changed for the 2000 inventory and self-supplied commercial withdrawals was no longer a required reporting element. Unpublished estimates of the 2000 self-supplied commercial withdrawals were obtained from the USGS and were used in the preparation of the dependent variable.

INDEPENDENT VARIABLES

Total population (thousands)

Source: USGS water use inventories
http://water.usgs.gov/watuse/

Personal income per capita ($ 1995)

Source: Bureau of Economic Analysis
Estimation/Modification:
Data are downloaded from the website:
http://www.bea.doc.gov/bea/regional/reis/
Nominal values were converted to 1995 dollars using the consumer price index-all urban consumers (*http://www.bls.gov/cpi/*).

Median family income (1995 $ in thousands)

Source: Bureau of Census.

Estimation/Modification:

1979 and 1989 data are downloaded from the website
http://www.census.gov/hhes/income/histinc/county/county2.

1999 data are downloaded from the website
http://factfinder.census.gov/servlet/BasicFactsServlet Table STF3

The 1985 and 1995 values are estimated by midpoints.

Nominal values were converted to 1995 dollars using the consumer price index-all urban consumers (*http://www.bls.gov/cpi*).

GSP per capita (1995 $ in thousands)

Source: Bureau of Economic Analysis
http://www.bea.doc.gov/bea/regional/gsp/action.cfm

Estimation/Modification:

Nominal values were converted to 1995 dollars using the consumer price index-all urban consumers
http://data.bls.gov/servlet/SurveyOutputServlet

Total employment (BEA) (thousands)

Source: Bureau of Economic Analysis.

Data are downloaded from the website:
http://www.bea.gov/bea/regional/reis/ Table CA25

Total employment (CBP) (thousands)

Source: County Business Pattern.

Data are downloaded from the website:
http://fisher.lib.virginia.edu/cbp/county.html

Total employees in manufacturing

Source: Country Business Pattern
http://fisher.lib.virginia.edu/cbp/state.html

Percentage of total manufacturing employment

Source: Country Business Pattern
http://fisher.lib.virginia.edu/cbp/state.html

Total employment (CBP) divided by CBP manufacturing employment

Total county employment (IDES)

Source: Illinois Department of Employment Security

Estimation/Modification:

Two-digit SIC employment data) was obtained through a special arrangement with the Illinois Department of Employment Security (see below). Total employment for each county was calculated as the sum of reported 2-digit employment.

Total county employment in SIC *XX*

Source: Illinois Department of Employment Security

Estimation/Modification:

The two-digit SIC employment data available from CBP contains many "missing" data points due to Census Bureau non-disclosure policies. Therefore, employment data from eighty-three two-digit SICs (01-99) was obtained through a special arrangement with the Illinois Department of Employment Security, and tested in the public supply model.

Percentage of county employment in SIC *XX* (%)

Source: Illinois Department of Employment Security

Estimation/Modification:

The two-digit SIC employment data provided by the Illinois Department of Employment Security was divided by the county total employment calculated from the IDES data (see above).

Percentage of self-supplied commercial and industrial withdrawals (%)

Source: USGS water use inventories: 1990, 1995, 2000

http://water.usgs.gov/watuse/

Estimation/Modification:

This variable was created by first calculating the *total* commercial and industrial withdrawals by summing the Public Supply *deliveries* to commercial and industrial users and self-supplied commercial and industrial *withdrawals*. Self supplied commercial and industrial *withdrawals* were then divided by the *total* commercial and industrial withdrawals and multiplied by 100. Both withdrawals and delivery data were available from USGS published sources for 1990 and 1995. Commercial self-supplied withdrawals and Public Supply deliveries to commercial and industrial users in 2000 were obtained from unpublished USGS sources.

Monthly precipitation (Inches)

Source: National Oceanic and Atmospheric Administration

Estimation/Modification:

Precipitation data for 344 climatic divisions are downloaded from the website:

ftp.ncdc.noaa.gov/pub/data/cirs/hold/0105.pcp

Using GIS software, each county was assigned to the climate division where the centroid of that county is located. The weather data for that climate division is used to represent the weather in the county. This same method was used for all weather variables (below).

Total precipitation of summer months (Inches)

Source: National Oceanic and Atmospheric Administration

Estimation/Modification:

It is calculated as the sum of monthly precipitation from May to September.

Monthly temperature (°F)

Source: National Oceanic and Atmospheric Administration

Estimation/Modification:

Temperature data for 344 climatic divisions are downloaded from the website:

ftp.ncdc.noaa.gov/pub/data/cirs/hold/0105.tmp

Average summer temperature (°F)

Source: National Oceanic and Atmospheric Administration

Estimation/Modification:

It is calculated as the average of monthly temperature from May to September.

Monthly Palmer drought severity index

Source: National Oceanic and Atmospheric Administration

Estimation/Modification:

Drought index data for 344 climatic divisions are downloaded from the website:

ftp.ncdc.noaa.gov/pub/data/cirs/hold/0105.pdsi

Minimum monthly Palmer drought severity index

Source: National Oceanic and Atmospheric Administration

Estimation/Modification:

The minimum monthly value of the Palmer drought severity index is used.

CHAPTER 6

IRRIGATION WATER USE

INTRODUCTION

Estimates of irrigation water use (disaggregated by ground or surface water source) have been one of the major components of the USGS inventories, since the first report was published in 1950. The designation of *irrigation* water use includes "all water artificially applied to farm and horticultural crops as well as self-supplied water used to irrigate public and private golf courses" (Solley et al., 1998, p. 32). Although some irrigation water can be supplied by irrigation companies or districts, all irrigation withdrawals compiled by the USGS are self-supplied. The USGS began to include estimates of the number of irrigated acres, water provided from reclaimed water sources, and conveyance losses in the 1960 report. The 1985 report was the first to feature the disaggregation of the number of irrigated acres irrigation by two types (spray or flood) which was expanded to include a third type (micro) in 1995.

USGS IRRIGATION WATER WITHDRAWAL ESTIMATION PROCEDURE

In Illinois, irrigation water use in each county is estimated by multiplying the county's irrigated crop acreage by its rainfall deficit during the crop-growing season (between May 1 and August 31), without any differentiation of crop types that are being irrigated (Avery, 1992; Kirk, 1987). The acreage of golf courses began to be included in irrigation estimates in 1995.

The amount of rainfall deficit during the growing season was determined based on the weekly precipitation at each county using the following procedure:

1. If more than 1.25 inches of rain falls during the first week of the growing season, one-half the amount of rain exceeding 1.25 inches is added to the rain amount during the following week. If less than 1.25 inches of rain falls during the first week, the difference between the actual rainfall and 1.25 inches is the rainfall deficit that is assumed to be the quantity of water, in inches, applied by irrigation that week.
2. For each subsequent week during the growing season, one-half of the cumulative rainfall during the previous week in excess of 1.25 inches is added to the rainfall amount for the week. If the cumulative rainfall amount for a week is less than 1.25 inches, then the difference is the rainfall deficit that is assumed to be the quantity of water, in inches, applied by irrigation that week. The rainfall deficits for each week are then added to determine the total irrigation water use in the growing season.
3. Total irrigation water use in the growing season is divided by 365 days to obtain a flat daily irrigation water use rate for the calendar year (Avery, 1992).

IRRIGATION WATER USE IN ILLINOIS

Irrigation water use in Illinois is relatively small, consistently accounting for less than 0.2 percent of national irrigation water use, and less than one percent of State total water use. Most irrigation water is applied during the growing season (May to August), and the main water source for irrigation is groundwater. All water used for irrigation is applied by spray methods, and conveyance losses during the process of irrigation are not considered to be significant enough to estimate (Avery, 1999).

Irrigation water use in Illinois was reported as "negligible" in the first (1950) USGS inventory, and estimated at only 8.0 mgd for the whole State in the second (1955). The number of irrigated acreage in Illinois increased steadily from 1955 to 1980, resulting in increased water use. However, while the number of irrigated acres has continued to increase since 1980, USGS estimates of irrigation water use have fluctuated considerably (Figure 6.1). While the quantity of irrigation water use in Illinois is small from a national perspective, irrigation withdrawals nonetheless have the potential to impact local economies and water balances and have been examined in several State-funded research studies (Bowman and Kimpel, 1991, Bowman, et al., 1990; Bowman and Collins, 1987; Changnon and Winstanley, 1999; Stout, et al., 1983).

The estimated amount of irrigation water use dropped from 110 mgd in 1980 to 71 mgd in 1985, followed by an increase to 78 mgd in 1990, and a more than doubling to 180 mgd in 1995. After 1995, the amount of irrigation water use decreased to 154 mgd (2000), even though the number of irrigated acres increased continuously from 150,000 acres (1980) to 365,150 (2000), a 143 percent increase.

Characteristics of County-Level Irrigation Water Use

While USGS has estimated irrigation withdrawals in every county in Illinois in at least one reporting year, in general, irrigation practices are concentrated in a few counties of the State (Table 6A.1). From 1985 to 2000, Mason County consistently accounted for more than 20 percent of state total irrigation water withdrawals. Other counties that have relatively large irrigation water withdrawals include Tazewell, Whiteside, Gallatin, Kankakee, Henderson, Cass, Champaign, and Lee. These nine counties accounted for approximately 66 percent of state total irrigation withdrawals in 2000. There are 76 other counties with irrigation water withdrawals of less than 1 mgd, and these counties accounted for about 11 percent of state total irrigation withdrawals in 2000.

Although irrigation withdrawals have been relatively unchanged during the 1985 to 2000 period, several factors could contribute to increased irrigation withdrawals in Illinois (Bowman, 1987). First, changes in tax depreciation laws could provide advantages for large farming operations or for farms where capital investments are desired, making the installation of irrigation systems more cost-effective. Second, irrigation development has begun to occur on the silt and clay loam and clay pan soils of the State. Irrigation on these finer soils appears to stabilize yields and maintain higher grain quality, especially during droughts, and the practices of irrigating these soils could expand. Finally, irrigation on any soil appears to offer the farmer insurance against drought with greater assurance of stable crop yields, and growing awareness of the benefits of irrigation may cause its increased adoption throughout the State.

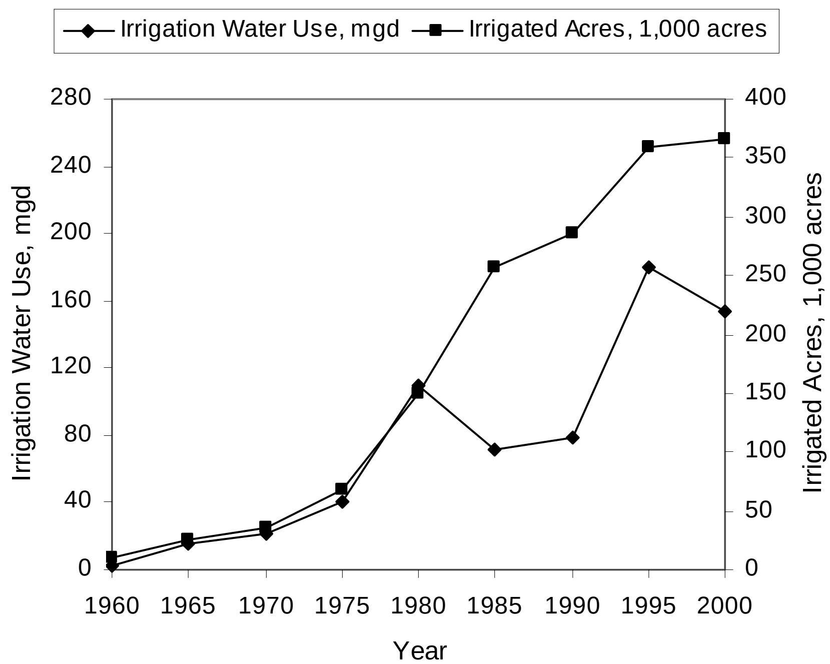

Figure 6.1. Historical Irrigation Water Use and Irrigated Acres in Illinois: 1960-2000
Source: USGS, various years

IRRIGATION WATER USE PROJECTION PROCEDURE

As stated above, the USGS irrigation estimates in Illinois were based on the number of irrigated acres and the amount of precipitation during the growing season, rather than on pumping records or other methods of accounting for actual volumes of withdrawals. The development of a statistical model linking water use to potential explanatory factors (i.e., weather patterns, crop prices, pumping costs, etc.) is not likely to be successful without actual measures of water withdrawals. Therefore, the approach adopted in this study was to develop projections following the estimation approach used by USGS to determine historical irrigation withdrawals.

This approach requires projections of both the number of irrigated acres and the rainfall deficit in each county. A thorough search of government and industry sources failed to find any projections of the number of irrigated acres. (Note: The U.S. Department of Agricultural does develop projections for the future acreage of some crops. However, development of methods to apply these projections to county-level cropping practices was beyond the scope of this project.) Therefore, projections were developed based on the historical trends in Illinois agriculture. The general approach was to use these trends to estimate both the future number of cropland acres and the future percentage of these acres that would be irrigated.

No attempt was made to project future weather conditions, even though the effects of climate change are relevant to issue of irrigation water use. Rather, long term "normal" weather conditions were calculated from historical weather patterns, and held constant throughout the projection period. The procedure for estimating future irrigated acres and "normal" weather conditions are described in the following section.

Projection Methodology

The projection methodology to estimate future irrigation water use consisted of the following steps:

1. Preparation of projections of the *total cropland acres* in each county

Data on total cropland acres in each county were obtained from Census of Agriculture (COA) for 1987, 1992, and 1997 (Table 6A.1). In general, there was little change reported in number of irrigated acres over the 10-year period. Growth rates were calculated for the period 1987 to 1997, and 1992 to1997 period using Equation 6.1:

$$CA_{t_2} = CA_{t_1} \times (1+r)^{t_2 - t_1} \qquad \text{(Equation 6.1)}$$

where, CA_{t_2} is the number of cropland acres in year t_2, CA_{t_1} is the number of cropland acres in year t_1, and r is the annual growth rate between year t_1 and t_2. The average of the two growth rates was applied to the 1997 COA estimate of cropland acres in each county to prepare projections for the future number of cropland acres (Table 6A.2).

2. Preparation of projections of the *percentage of irrigated cropland* in each county

Data on the *irrigated land* (acres) and *irrigated land, harvested cropland* (acres) in each county were obtained from Census of Agriculture for 1987, 1992, and 1997. However, this data contains "non-disclosures" for some counties, in some years. For the counties with non-disclosures, the number of *irrigated* and *irrigated harvested* cropland acres were estimated based upon the number of total cropland acres, irrigated farms, and practices in years for which data were available in each county.

The percentage of irrigated acres in each county was then calculated for 1987, 1992, and 1997, based on irrigated, harvested cropland acres and total cropland acres. Projections of the percentage of irrigated acres for 2005, 2010, 2015, 2020, and 2025 were then made based upon the linear trend in the 1987, 1992, and 1997 estimates. Two series of projections were prepared, one based on the linear trend utilizing three years of data (1987, 1992, and 1997), and one based upon only the two most recent years (1992 and 1997). The two sets of projections for each county were examined, and the projection values were selected based upon what seemed most reasonable to the research team (i.e., both negative trends and very high trends were considered to be "unreasonable"). The projection values of the percentage of future irrigated cropland that were used in projecting future irrigation water use are presented in Table 6A-3.

3. Estimation of the golf course acreage in each county

An extensive search of industry and government sources was made in order to try to determine the total golf course acreage in each county, as well as any trends that might be use to estimate future golf course acreage in Illinois. However, this information was either not available or not found, and therefore the following estimation procedure was adopted.

First, the State total golf course acreage was assumed to be the difference between the 2000 irrigated acreage reported by USGS, and the irrigated cropland acreage reported in 1997 Census of Agriculture. Second, the number of golf courses in each county in 2000 was obtained from County Business Patterns (SIC 7992 and 7997). Golf courses in the state were found to be spatially concentrated, with more than 70 percent of the 501 golf courses located in 27 counties. Finally, the estimated State total golf course acreage was divided by the number of golf courses, to estimate the average acreage per golf course. Golf course acreage was then allocated to each county based on their number of golf courses. While it is likely that this allocation procedure may have introduced some errors in estimation, the procedure was assumed to be satisfactory considering the relatively small acreage of golf course and its highly uneven spatial distribution.

Because of the lack of information on potential growth of golf courses acreage in Illinois, golf course acreage was held constant at the 2000 estimated value for all projections years.

4. Preparation of estimates of "normal" weather

Historical daily "normal" precipitation data from May to August were used to estimate the rainfall deficit for each county, and these estimated normal values were held constant for all projection years. County daily normal precipitation data were estimated based on the historical normal values of 186 weather stations in Illinois that were published in the NOAA's CLIM 84 series: *Daily Station Normals 1971-2000*. For the counties with more than one normal weather station, county normal precipitation was calculated as the average of all weather stations. For the seven counties (Boone, Calhoun, Johnson, Kendall, Moultrie, Pulaski, and Scott) with no normal weather station located in them, county normal precipitation was estimated as the average of all the adjacent counties. The estimated rainfall deficit under normal weather conditions for each county is presented in Table 6.1.

5. Preparation of projections for *total irrigated acres* in each county

The acreage of irrigated cropland in each county was forecast by multiplying the projections of total cropland acres (from Step 1) by projections of the percent of irrigated cropland (from Step 2). The projection of *total irrigated acres* in each county were calculated as the sum of the estimated acreage of irrigated cropland for each period, and the 2000 estimated golf course acreage. The forecasted values of total irrigated acres in each county are shown in Table 6A-4.

6. Preparation of projections of irrigation withdrawals in each county

The amount of irrigation water use in each county was forecast by multiplying the projected irrigated acres and rainfall deficit. The projected irrigation water use for each county and projection year is shown in Table 6.1.

IRRIGATION WATER USE PROJECTIONS

Based upon the analysis presented here statewide irrigation water use is projected to nearly double during the forecast period, increasing from 154 mgd in 2000 to 289 mgd in 2025. This increase is the result of statewide growth in irrigated acreage that is projected to increase from 365,000 acres in 2000 to 610,000 in 2025. The projected increase in irrigated acreage assumes that there will be an increase in irrigation practices even though the total cropland acreage in the State is expected to decline.

Twenty-five counties are projected to have declining irrigation withdrawals (2000 to 2025) with Kankakee and Champaign Counties having the largest declines of about 3.0 mgd each. Seventy-two counties are projected to see increasing withdrawals with four counties projected to see growth in excess of 10 mgd: Mason (29 mgd), Gallatin (18 mgd), Whiteside (16 mgd), and Tazewell 13 mgd). Table 6.1 presents the final estimates of the projected irrigation water withdrawals.

Table 6.1 "Normal" Weather Irrigation Deficit and Projected Irrigation Water Withdrawals in Illinois Counties: 2005-2025

County	"Normal" Irrigation Deficit (inch)	Irrigation Water Use (mgd)				
		2005	2010	2015	2020	2025
Adams	6.50	1.22	1.26	1.29	1.32	1.35
Alexander	6.80	2.17	2.45	2.72	2.98	3.23
Bond	6.98	0.04	0.04	0.04	0.04	0.04
Boone	5.66	1.22	1.51	1.79	2.08	2.36
Brown	6.48	0.02	0.02	0.02	0.02	0.02
Bureau	5.83	2.87	3.24	3.59	3.94	4.27
Calhoun	8.15	0.00	0.00	0.00	0.00	0.00
Carroll	5.02	4.94	6.04	7.18	8.34	9.53
Cass	7.23	5.33	5.60	5.80	5.93	6.01
Champaign	5.06	1.84	1.81	1.78	1.75	1.72
Christian	8.09	0.06	0.06	0.06	0.06	0.06
Clark	6.43	4.99	6.21	7.43	8.65	9.88
Clay	6.72	0.14	0.15	0.15	0.16	0.16
Clinton	7.18	0.29	0.29	0.28	0.28	0.28
Coles	6.58	0.12	0.12	0.12	0.11	0.11
Cook	6.57	1.50	1.45	1.45	1.44	1.44
Crawford	6.03	4.05	4.82	5.52	6.15	6.72
Cumberland	6.47	0.01	0.01	0.01	0.01	0.01
DeKalb	5.10	0.33	0.35	0.37	0.39	0.41
De Witt	6.36	0.40	0.40	0.40	0.39	0.39
Douglas	6.59	0.09	0.08	0.08	0.08	0.08
DuPage	6.08	0.42	0.42	0.42	0.42	0.41
Edgar	5.10	0.04	0.03	0.03	0.03	0.03
Edwards	6.41	0.00	0.00	0.00	0.00	0.00
Effingham	6.73	0.09	0.09	0.09	0.09	0.09
Fayette	7.74	0.07	0.07	0.07	0.07	0.07
Ford	6.99	0.35	0.36	0.37	0.38	0.40
Franklin	7.35	0.03	0.03	0.03	0.03	0.03
Fulton	5.84	0.07	0.07	0.07	0.07	0.07
Gallatin	6.37	13.42	16.42	19.74	23.37	27.36
Greene	8.16	0.93	0.97	1.03	1.08	1.14
Grundy	6.85	0.06	0.06	0.05	0.05	0.05
Hamilton	7.53	0.13	0.13	0.13	0.13	0.13
Hancock	6.01	0.91	0.97	1.03	1.09	1.14
Hardin	5.58	0.01	0.01	0.01	0.01	0.01
Henderson	6.37	5.29	5.39	5.48	5.56	5.63
Henry	6.04	2.77	3.07	3.37	3.65	3.91
Iroquois	5.97	2.90	3.61	4.30	5.00	5.69
Jackson	5.87	0.24	0.26	0.28	0.29	0.31
Jasper	6.25	0.12	0.12	0.13	0.13	0.13

Table 6.1 *(cont'd)* "Normal" Weather Irrigation Deficit and Projected Irrigation Water Withdrawals in Illinois Counties: 2005-2025

County	"Normal" Irrigation Deficit (inch)	Irrigation Water Use (mgd)				
		2005	2010	2015	2020	2025
Jefferson	7.53	0.22	0.21	0.20	0.19	0.18
Jersey	8.29	0.05	0.05	0.05	0.05	0.05
Jo Daviess	6.11	0.10	0.10	0.10	0.10	0.09
Johnson	6.08	0.02	0.02	0.02	0.02	0.02
Kane	5.74	1.23	1.35	1.46	1.57	1.69
Kankakee	6.36	4.70	3.59	3.48	3.38	3.27
Kendall	5.97	0.26	0.26	0.26	0.26	0.26
Knox	5.91	0.10	0.10	0.10	0.10	0.10
Lake	7.87	0.89	0.87	0.85	0.84	0.82
La Salle	6.52	1.27	1.51	1.72	1.91	2.08
Lawrence	4.93	3.79	4.08	4.38	4.70	5.05
Lee	5.66	6.55	7.02	7.43	7.80	8.12
Livingston	7.28	0.16	0.16	0.16	0.15	0.15
Logan	5.99	0.24	0.25	0.25	0.25	0.26
McDonough	6.73	0.17	0.19	0.20	0.22	0.24
McHenry	6.53	3.67	3.58	3.50	3.41	3.33
McLean	7.03	0.49	0.48	0.47	0.46	0.45
Macon	5.45	0.19	0.19	0.19	0.19	0.20
Macoupin	7.76	0.77	0.92	1.06	1.19	1.32
Madison	7.46	1.36	1.39	1.40	1.41	1.41
Marion	6.66	0.18	0.21	0.23	0.25	0.27
Marshall	6.51	3.39	4.30	5.31	6.42	7.63
Mason	7.02	50.57	54.51	58.45	62.37	66.28
Massac	6.43	1.52	1.56	1.60	1.65	1.70
Menard	7.10	0.51	0.50	0.50	0.49	0.49
Mercer	6.21	1.75	1.80	1.85	1.89	1.93
Monroe	7.07	1.01	1.06	1.10	1.14	1.18
Montgomery	7.11	0.34	0.43	0.52	0.61	0.69
Morgan	6.08	0.93	0.90	0.86	0.83	0.80
Moultrie	6.19	0.05	0.05	0.05	0.05	0.05
Ogle	7.18	1.13	1.06	1.00	0.94	0.89
Peoria	6.89	2.26	2.51	2.74	2.96	3.17
Perry	6.00	0.33	0.30	0.28	0.25	0.23
Piatt	5.40	0.13	0.15	0.16	0.17	0.18
Pike	7.99	0.66	0.67	0.68	0.69	0.70
Pope	6.22	0.00	0.00	0.00	0.00	0.00
Pulaski	6.48	0.18	0.18	0.18	0.18	0.18
Putnam	6.58	0.19	0.17	0.16	0.14	0.13
Randolph	6.80	0.14	0.14	0.14	0.14	0.14
Richland	5.99	0.04	0.04	0.04	0.04	0.04
Rock Island	5.78	1.92	1.98	2.03	2.06	2.07

Table 6.1 *(cont'd)* "Normal" Weather Irrigation Deficit and Projected Irrigation Water Withdrawals in Illinois Counties: 2005-2025

County	"Normal" Irrigation Deficit (inch)	Irrigation Water Use (mgd)				
		2005	2010	2015	2020	2025
St. Clair	7.01	0.60	0.59	0.59	0.58	0.57
Saline	5.88	0.03	0.03	0.03	0.03	0.03
Sangamon	7.73	0.46	0.49	0.52	0.55	0.58
Schuyler	6.03	0.10	0.10	0.10	0.10	0.10
Scott	7.41	2.15	2.27	2.40	2.53	2.68
Shelby	6.92	0.11	0.11	0.11	0.11	0.11
Stark	7.50	0.09	0.11	0.12	0.13	0.14
Stephenson	6.40	0.21	0.18	0.16	0.14	0.12
Tazewell	6.54	20.56	23.82	26.89	29.78	32.49
Union	6.21	0.50	0.64	0.80	0.96	1.15
Vermilion	5.87	0.06	0.06	0.06	0.06	0.06
Wabash	5.83	0.45	0.49	0.54	0.59	0.64
Warren	5.62	0.07	0.08	0.08	0.09	0.10
Washington	8.33	1.08	1.23	1.39	1.56	1.72
Wayne	7.11	0.56	0.56	0.56	0.55	0.54
White	6.05	3.37	3.71	4.06	4.43	4.80
Whiteside	5.80	18.53	20.70	22.81	24.86	26.85
Will	5.57	2.27	2.39	2.47	2.52	2.55
Williamson	5.64	0.15	0.16	0.17	0.17	0.18
Winnebago	5.36	0.53	0.52	0.52	0.51	0.50
Woodford	7.51	0.28	0.27	0.25	0.24	0.22
State Total	--	205.16	225.40	246.54	267.59	288.65

CHAPTER 6 ANNEX

Table 6A.1 Estimated Irrigation Water Withdrawals and Irrigated Acres: 1985-2000

County	Annual Withdrawals (mgd)				Irrigated acres (1,000s)			
	1985	1990	1995	2000	1985	1990	1995	2000
Adams	0.04	0.03	0.53	0.97	0.15	0.14	2.30	2.38
Alexander	0.16	0.35	0.99	1.77	0.91	0.70	2.73	3.35
Bond	0.01	0.00	0.04	0.00	0.05	0.00	0.08	0.06
Boone	0.10	0.06	0.76	0.25	0.39	0.26	1.03	1.78
Brown	0.00	0.00	0.01	0.01	0.00	0.00	0.02	0.02
Bureau	0.35	0.49	2.36	2.81	1.26	2.27	4.11	5.10
Calhoun	0.01	0.00	0.01	0.00	0.03	0.00	0.03	0.01
Carroll	1.18	0.60	2.92	2.15	5.29	2.80	5.10	9.04
Cass	0.37	1.29	5.28	4.56	1.57	3.22	7.81	8.76
Champaign	0.13	0.81	5.32	4.50	0.80	2.66	8.51	6.43
Christian	0.00	0.08	0.16	0.13	0.03	0.19	0.32	0.32
Clark	0.73	2.07	1.91	0.86	3.91	5.39	3.83	6.39
Clay	0.02	0.00	0.03	0.01	0.10	0.00	0.12	0.12
Clinton	0.02	0.27	0.54	0.00	0.11	0.54	1.87	1.09
Coles	0.00	0.00	0.08	0.02	0.01	0.00	0.13	0.13
Cook	5.73	3.85	2.85	1.82	15.73	15.41	3.74	3.77
Crawford	0.08	0.12	1.45	1.10	0.39	0.32	3.20	6.15
Cumberland	0.01	0.00	0.01	0.01	0.04	0.02	0.10	0.04
De Kalb	0.17	0.00	0.69	0.30	0.65	0.00	0.94	0.92
De Witt	0.00	0.13	0.38	0.52	0.00	0.59	0.63	0.84
Douglas	0.00	0.00	0.02	0.07	0.00	0.00	0.18	0.15
Du Page	2.46	2.36	1.00	0.46	9.49	9.42	1.41	1.38
Edgar	0.01	0.00	0.11	0.04	0.03	0.00	0.17	0.17
Edwards	0.00	0.07	0.08	0.00	0.00	0.12	0.12	0.01
Effingham	0.01	0.08	0.13	0.00	0.10	0.20	0.32	0.32
Fayette	0.00	0.10	0.09	0.01	0.06	0.25	0.20	0.12
Ford	0.04	0.09	0.62	0.48	0.19	0.30	1.53	0.71
Franklin	0.00	0.35	0.09	0.04	0.00	0.63	0.18	0.18
Fulton	0.34	0.16	0.48	0.09	1.35	0.68	9.82	0.16
Gallatin	0.75	3.24	5.16	9.21	3.50	5.76	14.16	19.36
Greene	0.31	0.48	1.34	0.56	1.20	1.21	2.30	1.38
Grundy	0.05	0.00	0.35	0.02	0.20	0.00	0.40	0.07

Table 6A.1 *(cont'd)* Estimated Irrigation Water Withdrawals and Irrigated Acres: 1985-2000

County	Annual Withdrawals (mgd)				Irrigated acres (1,000s)			
	1985	1990	1995	2000	1985	1990	1995	2000
Hamilton	0.00	0.08	0.08	0.07	0.00	0.14	0.16	0.16
Hancock	0.17	0.28	0.59	0.82	0.80	1.16	1.64	1.78
Hardin	0.00	0.00	0.01	0.03	0.00	0.00	0.04	0.04
Henderson	1.83	1.24	8.14	5.86	6.65	5.15	12.30	9.84
Henry	1.32	0.65	2.01	3.28	4.55	3.05	3.51	5.18
Iroquois	0.46	0.19	0.73	2.45	2.00	0.63	1.27	4.52
Jackson	0.04	0.38	0.30	0.00	0.20	0.77	0.61	0.42
Jasper	0.00	0.02	0.02	0.03	0.00	0.03	0.05	0.12
Jefferson	0.01	0.00	0.14	0.10	0.05	0.00	0.47	0.37
Jersey	0.14	0.00	0.02	0.01	0.55	0.00	0.04	0.03
Jo Daviess	0.08	0.00	0.20	0.13	0.30	0.00	0.33	0.30
Johnson	0.00	0.00	0.02	0.04	0.00	0.00	0.07	0.07
Kane	0.66	0.65	1.67	0.86	2.60	2.63	2.71	2.56
Kankakee	1.73	3.76	11.89	6.19	8.00	12.38	17.56	14.10
Kendall	0.03	0.11	0.44	0.15	0.13	0.43	0.59	0.60
Knox	0.00	0.01	0.13	0.08	0.00	0.03	0.32	0.16
Lake	1.35	1.27	1.58	0.53	5.33	5.09	2.17	1.98
La Salle	0.09	0.00	0.78	0.80	0.38	0.00	1.05	1.67
Lawrence	0.99	2.75	4.65	1.60	4.92	7.15	11.57	7.41
Lee	4.02	2.44	6.99	3.50	12.00	11.38	12.04	13.42
Livingston	0.00	0.10	0.29	0.14	0.00	0.34	0.51	0.36
Logan	0.00	0.06	0.64	0.65	0.00	0.27	1.43	1.15
McDonough	0.00	0.00	0.10	0.15	0.00	0.00	0.22	0.26
McHenry	1.29	1.13	8.79	2.18	4.68	4.50	10.10	8.62
McLean	0.16	0.06	0.26	0.75	0.71	0.25	0.05	1.24
Macon	0.00	0.02	0.26	0.18	0.00	0.07	0.33	0.33
Macoupin	0.08	0.00	0.20	0.17	0.33	0.00	0.43	0.75
Madison	0.37	0.86	0.51	0.00	1.50	2.15	16.80	2.36
Marion	0.01	0.00	0.03	0.02	0.07	0.00	0.17	0.23
Marshall	0.45	0.36	1.07	2.56	2.00	1.61	2.48	4.41
Mason	24.64	20.27	35.57	37.23	82.79	90.83	75.89	84.84
Massac	0.32	0.86	1.73	2.43	1.59	1.53	4.31	3.98
Menard	0.00	0.11	0.52	0.52	0.00	0.50	0.96	0.95
Mercer	0.40	0.62	2.26	1.61	1.22	2.88	3.54	3.67
Monroe	0.35	0.75	0.28	0.26	0.86	1.52	1.50	1.65
Montgomery	0.00	0.00	0.03	0.00	0.02	0.00	0.05	0.26

Table 6A.1 *(cont'd)* Estimated Irrigation Water Withdrawals and Irrigated Acres: 1985-2000

County	Annual Withdrawals (mgd)				Irrigated acres (1,000s)			
	1985	**1990**	**1995**	**2000**	**1985**	**1990**	**1995**	**2000**
Morgan	0.25	0.26	0.75	0.92	1.03	0.63	2.24	2.20
Moultrie	0.00	0.00	0.02	0.03	0.00	0.00	0.04	0.07
Ogle	0.49	0.26	2.45	0.49	2.00	1.22	3.82	1.61
Peoria	1.58	0.22	1.65	3.06	6.25	1.00	3.08	3.70
Perry	0.08	0.68	0.42	0.23	0.50	1.38	1.41	0.51
Piatt	0.00	0.13	0.15	0.12	0.03	0.42	0.24	0.27
Pike	0.28	0.56	0.60	0.44	1.15	1.39	1.64	1.14
Pope	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01
Pulaski	0.02	0.00	0.20	0.41	0.08	0.00	0.61	0.61
Putnam	0.16	0.14	0.26	0.18	0.80	0.64	0.34	0.34
Randolph	0.09	0.07	0.14	0.06	0.50	0.14	0.38	0.22
Richland	0.00	0.01	0.02	0.00	0.00	0.02	0.08	0.08
Rock Island	0.88	0.55	2.79	1.81	2.47	2.56	3.95	4.20
St Clair	0.16	0.66	0.47	0.04	0.90	1.35	1.75	0.99
Saline	0.00	0.00	0.04	0.03	0.00	0.00	0.19	0.07
Sangamon	0.06	0.07	0.49	0.39	0.25	0.18	0.69	0.75
Schuyler	0.02	0.04	0.04	0.09	0.10	0.16	0.18	0.18
Scott	0.39	1.06	1.76	1.13	1.54	2.64	4.30	3.54
Shelby	0.02	0.04	0.25	0.07	0.30	0.10	0.37	0.21
Stark	0.20	0.00	0.50	0.55	0.91	0.00	0.93	0.93
Stephenson	0.24	0.00	0.43	0.11	0.91	0.01	0.51	0.45
Tazewell	5.54	5.80	11.61	19.02	19.60	25.99	22.95	30.81
Union	0.04	0.14	0.14	0.37	0.24	0.29	0.28	0.76
Vermilion	0.00	0.00	0.25	0.18	0.01	0.00	0.44	0.28
Wabash	0.03	0.22	0.07	0.08	0.16	0.39	0.39	0.39
Warren	0.00	0.00	0.02	0.03	0.00	0.00	0.06	0.06
Washington	0.08	0.59	0.13	0.13	0.50	1.20	1.07	1.32
Wayne	0.00	0.22	0.42	0.22	0.00	0.39	1.03	1.03
White	0.38	4.74	2.20	2.20	1.64	8.42	5.39	6.31
Whiteside	4.35	4.75	17.93	11.33	15.00	22.15	29.40	34.63
Will	1.02	0.16	3.33	1.30	3.51	0.64	4.43	4.87
Williamson	0.01	0.00	0.02	0.06	0.03	0.00	0.07	0.10
Winnebago	0.80	0.69	1.49	0.42	3.25	3.21	2.01	1.56
Woodford	0.25	0.11	0.26	0.24	0.97	0.47	0.50	0.45
State Totals	71.49	78.28	180.02	153.9	256.4	286.54	359.43	365.15

Source: USGS water use inventories, various years.

Table 6A.2 Projected Acres of Cropland in Illinois: 2000-2025

County	2000	2005	2010	2015	2020	2025
Adams	331,828	318,102	304,944	292,330	280,238	268,646
Alexander	57,009	55,964	54,937	53,929	52,940	51,969
Bond	153,241	148,408	143,728	139,195	134,805	130,554
Boone	130,203	129,817	129,431	129,048	128,665	128,283
Brown	102,934	106,658	110,516	114,513	118,655	122,947
Bureau	436,462	429,450	422,550	415,761	409,081	402,509
Calhoun	58,921	58,587	58,255	57,924	57,595	57,269
Carroll	215,198	218,030	220,899	223,806	226,751	229,735
Cass	152,744	141,011	130,180	120,180	110,949	102,426
Champaign	543,427	534,414	525,550	516,834	508,261	499,831
Christian	359,942	349,340	339,051	329,064	319,372	309,965
Clark	225,142	225,505	225,868	226,232	226,596	226,961
Clay	212,207	221,259	230,697	240,538	250,798	261,497
Clinton	209,490	207,320	205,173	203,049	200,946	198,865
Coles	231,504	222,476	213,800	205,463	197,451	189,751
Cook	27,040	23,230	19,957	17,145	14,730	12,654
Crawford	177,917	170,150	162,722	155,619	148,825	142,328
Cumberland	144,601	138,792	133,217	127,866	122,729	117,799
DeKalb	351,503	345,415	339,432	333,553	327,776	322,098
De Witt	194,712	190,770	186,907	183,122	179,414	175,781
Douglas	233,111	223,174	213,661	204,552	195,833	187,484
DuPage	11,928	9,659	7,822	6,334	5,129	4,153
Edgar	316,919	308,533	300,369	292,421	284,683	277,150
Edwards	90,144	82,815	76,083	69,897	64,214	58,994
Effingham	221,346	220,537	219,731	218,928	218,128	217,331
Fayette	273,400	268,950	264,572	260,266	256,029	251,862
Ford	306,557	317,264	328,345	339,812	351,681	363,964
Franklin	156,505	164,176	172,224	180,666	189,522	198,813
Fulton	318,555	318,208	317,862	317,516	317,170	316,825
Gallatin	170,302	180,094	190,449	201,400	212,980	225,227
Greene	269,827	285,106	301,250	318,309	336,334	355,379
Grundy	180,184	164,387	149,975	136,827	124,832	113,888
Hamilton	182,073	183,852	185,649	187,463	189,294	191,144
Hancock	350,404	344,402	338,503	332,705	327,007	321,406
Hardin	25,503	27,398	29,434	31,621	33,971	36,496
Henderson	165,934	161,044	156,298	151,692	147,222	142,884
Henry	407,796	399,531	391,433	383,500	375,727	368,112
Iroquois	632,924	630,909	628,899	626,896	624,900	622,909

Table 6A.2 *(cont'd)* Projected Acres of Cropland in Illinois: 2000-2025

County	2000	2005	2010	2015	2020	2025
Jackson	164,506	171,307	178,389	185,764	193,444	201,441
Jasper	221,543	215,799	210,204	204,754	199,445	194,274
Jefferson	183,672	182,962	182,255	181,550	180,848	180,148
Jersey	124,891	115,862	107,486	99,716	92,508	85,820
Jo Daviess	182,368	172,497	163,160	154,329	145,976	138,075
Johnson	71,622	74,920	78,371	81,980	85,756	89,705
Kane	197,335	197,695	198,056	198,417	198,779	199,142
Kankakee	331,796	321,297	311,130	301,285	291,751	282,520
Kendall	152,746	143,697	135,184	127,175	119,640	112,552
Knox	316,562	313,648	310,761	307,900	305,065	302,256
Lake	33,984	24,340	17,433	12,486	8,943	6,405
La Salle	537,647	513,808	491,025	469,252	448,445	428,561
Lawrence	165,420	171,515	177,834	184,386	191,180	198,224
Lee	358,885	343,059	327,931	313,470	299,647	286,434
Livingston	577,935	559,403	541,465	524,102	507,296	491,029
Logan	363,588	368,778	374,042	379,382	384,797	390,290
McDonough	288,171	282,075	276,108	270,268	264,551	258,955
McHenry	216,283	210,433	204,742	199,205	193,817	188,575
McLean	655,885	639,537	623,596	608,052	592,896	578,118
Macon	301,783	299,907	298,043	296,190	294,349	292,520
Macoupin	330,021	320,031	310,343	300,949	291,839	283,004
Madison	235,258	216,151	198,596	182,467	167,647	154,032
Marion	200,180	195,425	190,783	186,252	181,828	177,509
Marshall	203,634	215,121	227,256	240,076	253,619	267,926
Mason	264,143	263,688	263,233	262,779	262,326	261,874
Massac	85,929	88,379	90,900	93,492	96,159	98,901
Menard	151,766	149,955	148,164	146,396	144,648	142,921
Mercer	257,121	250,506	244,061	237,781	231,663	225,703
Monroe	152,073	148,568	145,144	141,799	138,530	135,337
Montgomery	318,492	309,092	299,970	291,118	282,526	274,188
Morgan	265,552	263,256	260,980	258,724	256,487	254,270
Moultrie	160,263	152,888	145,851	139,139	132,736	126,627
Ogle	333,486	318,693	304,557	291,047	278,137	265,799

Table 6A.2 *(cont'd)* Projected Acres of Cropland in Illinois: 2000-2025

County	2000	2005	2010	2015	2020	2025
Peoria	220,943	215,320	209,840	204,499	199,294	194,222
Perry	147,107	150,580	154,134	157,772	161,497	165,309
Piatt	243,438	240,521	237,639	234,792	231,979	229,200
Pike	344,413	349,245	354,145	359,114	364,152	369,261
Pope	42,777	42,521	42,266	42,012	41,760	41,510
Pulaski	70,222	69,684	69,150	68,620	68,094	67,572
Putnam	63,841	61,291	58,843	56,493	54,237	52,071
Randolph	207,256	205,330	203,421	201,530	199,657	197,801
Richland	176,436	179,256	182,122	185,033	187,991	190,997
Rock Island	129,707	120,872	112,638	104,966	97,816	91,153
St. Clair	235,572	229,955	224,472	219,120	213,895	208,795
Saline	111,170	105,147	99,450	94,062	88,966	84,146
Sangamon	440,480	447,298	454,221	461,251	468,390	475,639
Schuyler	144,357	144,273	144,190	144,107	144,024	143,940
Scott	121,403	128,330	135,652	143,392	151,573	160,221
Shelby	378,924	384,320	389,793	395,344	400,974	406,685
Stark	166,371	168,689	171,039	173,422	175,839	178,289
Stephenson	272,585	265,128	257,875	250,820	243,959	237,285
Tazewell	300,357	292,159	284,185	276,428	268,883	261,544
Union	98,839	104,715	110,940	117,535	124,523	131,925
Vermilion	456,220	453,399	450,594	447,807	445,037	442,285
Wabash	114,146	118,079	122,147	126,356	130,709	135,212
Warren	274,961	269,828	264,791	259,848	254,998	250,238
Washington	281,442	285,221	289,050	292,930	296,863	300,849
Wayne	262,912	245,772	229,750	214,772	200,770	187,681
White	226,324	230,564	234,884	239,284	243,768	248,335
Whiteside	350,491	345,848	341,267	336,746	332,285	327,884
Will	261,229	239,408	219,411	201,084	184,287	168,894
Williamson	64,963	61,434	58,097	54,941	51,956	49,134
Winnebago	175,727	172,354	169,046	165,801	162,618	159,497
Woodford	276,597	278,846	281,114	283,400	285,705	288,028
State Total	23,695,188	23,344,417	23,023,595	22,730,944	22,465,017	22,224,629

Table 6A.3 Projected Percentage of Irrigated Cropland in Illinois: 2005-2025

County	2005	2010	2015	2020	2025	County	2005	2010	2015	2020	2025
Adams	0.75	0.81	0.87	0.93	0.99	Lee	4.51	5.05	5.60	6.15	6.70
Alexander	7.66	8.82	9.98	11.14	12.29	Livingston	0.03	0.03	0.03	0.03	0.03
Bond	0.01	0.01	0.01	0.01	0.01	Logan	0.14	0.14	0.14	0.14	0.14
Boone	2.19	2.72	3.25	3.78	4.31	McDonough	0.08	0.10	0.11	0.13	0.15
Brown	0.01	0.01	0.01	0.01	0.01	McHenry	3.26	3.26	3.26	3.26	3.26
Bureau	1.49	1.71	1.94	2.17	2.39	McLean	0.11	0.11	0.11	0.11	0.11
Calhoun	0.01	0.01	0.01	0.01	0.01	Macon	0.12	0.12	0.13	0.13	0.13
Carroll	6.05	7.31	8.57	9.83	11.09	Macoupin	0.35	0.45	0.54	0.64	0.74
Cass	7.01	7.98	8.94	9.91	10.88	Madison	0.88	0.98	1.08	1.18	1.28
Champaign	0.89	0.89	0.89	0.89	0.89	Marion	0.12	0.15	0.18	0.21	0.24
Christian	0.01	0.01	0.01	0.01	0.01	Marshall	3.21	3.87	4.53	5.19	5.85
Clark	4.61	5.73	6.85	7.97	9.09	Mason	36.73	39.67	42.61	45.55	48.48
Clay	0.10	0.10	0.10	0.10	0.10	Massac	3.55	3.55	3.55	3.55	3.55
Clinton	0.23	0.23	0.23	0.23	0.23	Menard	0.60	0.60	0.60	0.60	0.60
Coles	0.05	0.05	0.05	0.05	0.05	Mercer	1.50	1.58	1.67	1.75	1.83
Cook	0.63	0.20	0.20	0.20	0.20	Monroe	1.16	1.25	1.34	1.43	1.51
Crawford	5.27	6.57	7.87	9.17	10.48	Montgomery	0.17	0.24	0.31	0.37	0.44
Cumberland	0.02	0.02	0.02	0.02	0.02	Morgan	0.76	0.73	0.71	0.69	0.67
De Kalb	0.21	0.23	0.24	0.26	0.28	Moultrie	0.03	0.03	0.03	0.04	0.04
De Witt	0.41	0.42	0.42	0.43	0.43	Ogle	0.60	0.59	0.58	0.56	0.55
Douglas	0.05	0.05	0.05	0.05	0.05	Peoria	1.95	2.23	2.52	2.80	3.08
Du Page	1.04	1.27	1.50	1.73	1.96	Perry	0.46	0.42	0.38	0.33	0.29
Edgar	0.03	0.03	0.03	0.03	0.03	Piatt	0.13	0.14	0.15	0.17	0.18
Edwards	0.01	0.01	0.01	0.01	0.01	Pike	0.30	0.30	0.30	0.30	0.30
Effingham	0.04	0.04	0.04	0.04	0.04	Pope	0.02	0.02	0.02	0.02	0.02
Fayette	0.01	0.01	0.01	0.01	0.01	Pulaski	0.50	0.50	0.50	0.50	0.50
Ford	0.20	0.20	0.20	0.20	0.20	Putnam	0.57	0.54	0.50	0.47	0.44
Franklin	0.01	0.01	0.01	0.01	0.01	Randolph	0.07	0.07	0.07	0.07	0.07
Fulton	0.01	0.01	0.01	0.01	0.01	Richland	0.03	0.03	0.03	0.03	0.03
Gallatin	15.72	18.20	20.68	23.16	25.64	Rock Island	3.51	3.89	4.27	4.65	5.03
Greene	0.50	0.50	0.50	0.50	0.50	St Clair	0.30	0.30	0.30	0.30	0.30
Grundy	0.03	0.03	0.03	0.03	0.03	Saline	0.01	0.01	0.01	0.01	0.01
Hamilton	0.10	0.10	0.10	0.10	0.10	Sangamon	0.11	0.11	0.12	0.13	0.14
Hancock	0.56	0.61	0.66	0.71	0.77	Schuyler	0.16	0.16	0.16	0.16	0.16
Hardin	0.00	0.00	0.00	0.00	0.00	Scott	3.01	3.01	3.01	3.01	3.01
Henderson	6.91	7.25	7.60	7.94	8.29	Shelby	0.03	0.03	0.03	0.03	0.03
Henry	1.48	1.69	1.89	2.10	2.30	Stark	0.10	0.11	0.12	0.13	0.14
Iroquois	1.02	1.28	1.53	1.79	2.04	Stephenson	0.11	0.10	0.08	0.07	0.05
Jackson	0.27	0.28	0.29	0.30	0.30	Tazewell	14.41	17.17	19.94	22.70	25.46
Jasper	0.11	0.11	0.12	0.12	0.13	Union	1.01	1.22	1.44	1.65	1.86
Jefferson	0.13	0.12	0.11	0.09	0.08	Vermilion	0.01	0.01	0.01	0.01	0.01
Jersey	0.01	0.01	0.01	0.01	0.01	Wabash	0.88	0.93	0.98	1.04	1.09
Jo Daviess	0.03	0.03	0.03	0.03	0.03	Warren	0.05	0.06	0.07	0.07	0.08

Table 6A.3 *(cont'd)* Projected Percentage of Irrigated Cropland in Illinois: 2005-2025

County	2005	2010	2015	2020	2025	County	2005	2010	2015	2020	2025
Johnson	0.05	0.05	0.05	0.05	0.05	Washington	0.60	0.68	0.76	0.83	0.91
Kane	1.19	1.33	1.46	1.59	1.72	Wayne	0.42	0.45	0.47	0.50	0.53
Kankakee	3.04	2.38	2.38	2.38	2.38	White	3.24	3.50	3.76	4.03	4.29
Kendall	0.36	0.38	0.41	0.43	0.46	Whiteside	12.38	14.02	15.66	17.31	18.95
Knox	0.01	0.01	0.01	0.01	0.01	Will	2.00	2.31	2.62	2.92	3.23
Lake	0.80	0.89	0.99	1.08	1.18	Williamson	0.16	0.20	0.24	0.28	0.33
La Salle	0.45	0.57	0.69	0.81	0.93	Winnebago	0.60	0.60	0.60	0.60	0.60
Lawrence	5.98	6.21	6.44	6.68	6.91	Woodford	0.13	0.12	0.11	0.10	0.09
						State Total	1.85	2.06	2.29	2.51	2.74

Table 6A.4 Projected County Total Irrigated Acres in Illinois: 2005-2025

County	2005	2010	2015	2020	2025
Adams	2,526	2,608	2,679	2,740	2,791
Alexander	4,288	4,845	5,381	5,895	6,389
Bond	81	80	80	80	79
Boone	2,904	3,581	4,255	4,924	5,590
Brown	44	44	45	45	45
Bureau	6,614	7,468	8,293	9,089	9,858
Calhoun	6	6	6	6	6
Carroll	13,226	16,183	19,214	22,323	25,511
Cass	9,914	10,416	10,783	11,032	11,179
Champaign	4,889	4,810	4,733	4,657	4,582
Christian	101	100	99	98	97
Clark	10,435	12,977	15,528	18,086	20,653
Clay	287	297	307	317	328
Clinton	543	538	533	528	523
Coles	244	240	236	232	228
Cook	3,072	2,967	2,960	2,956	2,951
Crawford	9,026	10,754	12,314	13,718	14,975
Cumberland	28	27	26	25	24
DeKalb	883	932	980	1,026	1,070
De Witt	856	848	840	832	824
Douglas	178	173	168	164	160
DuPage	932	930	926	920	912
Edgar	93	90	88	85	83
Edwards	8	8	7	6	6
Effingham	187	187	187	186	186
Fayette	126	126	125	125	124
Ford	668	690	713	736	761
Franklin	49	50	51	52	53
Fulton	165	165	165	165	165
Gallatin	28,308	34,659	41,645	49,321	57,742
Greene	1,525	1,605	1,691	1,781	1,876
Grundy	115	111	107	103	100
Hamilton	224	225	225	226	227
Hancock	2,027	2,169	2,305	2,436	2,561
Hardin	33	33	33	33	33
Henderson	11,156	11,367	11,556	11,724	11,871
Henry	6,160	6,840	7,489	8,110	8,703
Iroquois	6,536	8,119	9,692	11,255	12,808
Jackson	561	596	632	671	712
Jasper	262	267	272	277	281
Jefferson	401	379	357	335	314
Jersey	78	77	76	75	75
Jo Daviess	218	215	212	210	207
Johnson	38	39	41	43	45

Table 6A.4 *(cont'd)* Projected County Total Irrigated Acres in Illinois: 2005-2025

County	2005	2010	2015	2020	2025
Kane	2,891	3,157	3,424	3,692	3,960
Kankakee	9,951	7,593	7,370	7,143	6,923
Kendall	578	583	586	586	584
Knox	230	230	230	230	229
Lake	1,524	1,486	1,453	1,427	1,405
La Salle	2,627	3,114	3,552	3,946	4,299
Lawrence	10,323	11,113	11,947	12,828	13,757
Lee	15,558	16,676	17,665	18,535	19,294
Livingston	301	295	290	285	280
Logan	549	557	564	572	579
McDonough	334	372	409	445	478
McHenry	7,558	7,373	7,192	7,016	6,846
McLean	936	918	901	884	868
Macon	467	471	476	480	485
Macoupin	1,326	1,589	1,836	2,066	2,281
Madison	2,458	2,504	2,529	2,538	2,532
Marion	370	419	466	510	552
Marshall	6,996	8,885	10,966	13,253	15,763
Mason	96,890	104,457	111,996	119,510	126,997
Massac	3,171	3,260	3,352	3,447	3,544
Menard	966	955	944	934	924
Mercer	3,796	3,900	3,996	4,085	4,166
Monroe	1,926	2,014	2,097	2,175	2,248
Montgomery	638	818	988	1,147	1,296
Morgan	2,060	1,984	1,909	1,835	1,762
Moultrie	106	110	113	115	118
Ogle	2,110	1,988	1,873	1,765	1,662
Peoria	4,402	4,888	5,347	5,780	6,188
Perry	733	682	628	571	511
Piatt	334	362	390	416	442
Pike	1,114	1,128	1,143	1,159	1,174
Pope	9	9	8	8	8
Pulaski	384	379	376	374	371
Putnam	383	349	317	288	260
Randolph	277	275	274	273	272
Richland	86	85	84	83	82
Rock Island	4,473	4,612	4,712	4,777	4,814
St. Clair	1,155	1,138	1,122	1,107	1,091
Saline	77	76	75	75	74
Sangamon	803	852	903	956	1,010
Schuyler	231	231	231	230	230
Scott	3,896	4,116	4,349	4,595	4,856
Shelby	214	216	218	219	221
Stark	170	189	209	229	250
Stephenson	431	385	341	299	260

Table 6A.4 *(cont'd)* Projected County Total Irrigated Acres in Illinois: 2005-2025

County	2005	2010	2015	2020	2025
Tazewell	42,256	48,963	55,273	61,203	66,767
Union	1,092	1,391	1,723	2,089	2,492
Vermilion	144	144	144	144	143
Wabash	1,035	1,137	1,245	1,358	1,478
Warren	169	186	203	219	235
Washington	1,742	1,992	2,248	2,510	2,780
Wayne	1,065	1,060	1,052	1,040	1,026
White	7,500	8,257	9,039	9,847	10,683
Whiteside	42,984	48,019	52,913	57,670	62,290
Will	5,488	5,763	5,959	6,086	6,156
Williamson	363	382	399	414	426
Winnebago	1,333	1,313	1,294	1,275	1,256
Woodford	504	478	451	424	397
State Total	431,496	474,715	519,844	564,807	609,780

CHAPTER 7

MINING WATER USE

INTRODUCTION

Mining water use includes water for the extraction of naturally occurring minerals, solids (such as coal and ores), liquids (such as crude petroleum), and gases (such as natural gas). Water use estimates for this sector also include uses “associated with quarrying, well operations, milling (crushing, screening, washing, floatation, and so forth) and other preparations customarily done at the mine site or as part of a mining activity” (Solley et al., 1998). All of the water use in this sector is self-supplied, and some of the water comes from saline water sources.

USGS MINING WATER WITHDRAWAL ESTIMATION PROCEDURE

Information on mining water withdrawals in Illinois is collected by Illinois State Water Survey (ISWS) using questionnaires that are sent to mining companies in the State. If the companies do not respond to the questionnaire, a second questionnaire is sent, and a follow-up phone call is also made as a final recourse. If it is determined that certain mining companies cannot provide the data, an amount of water use is estimated either by extrapolating data from previous years or obtaining information on the pumping capacity and duration. If estimates for a mining company cannot be made, no water withdrawal data for the company is entered into the database. County total mining water withdrawals are estimated by aggregation of the water use data of the mining companies located in that county (Avery, 1999). USGS did not report mining water use as a separate category until 1985. For the 2000 water use inventory, the estimation and reporting of mining water use was only mandated in those states with the largest mining water use. Illinois did not publish official estimates of mining withdrawals in 2000 and the estimates that appear in this report were obtained through special arrangements with the USGS, and do not include estimates of withdrawals from saline sources for any county.

MINING WATER USE IN ILLINOIS

Water withdrawals for mining in Illinois come from both ground water and surface water. Total mining withdrawals estimates include both fresh and saline water.

Mining water withdrawals in Illinois have consistently accounted for between 2 and 3 percent of national mining water withdrawals, and less than 1 percent of the State total water withdrawals. Both the estimated quantity of mining water withdrawals and mining employment have been declining since water use in this sector was first reported in 1985. The amount of mining water withdrawals decreased from 104 mgd in 1985 to 23 mgd in 2000, a 78 percent decrease. At the same time, the number of mining employees also decreased from 47,807 in 1985 to 18,358 in 2000, a 62 percent decrease

(Figure 7.1). However, the low estimate for the year 2000 may represent an underestimate because a number of counties with zero withdrawals in 2000 were reported to have significant mining water use in 1995 (particularly from saline water sources).

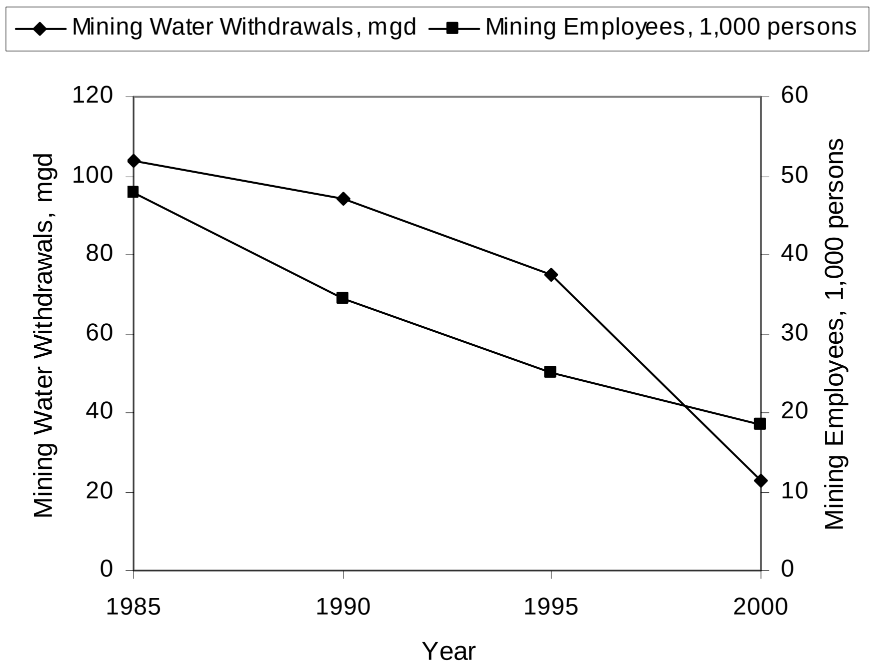

Figure 7.1. Historical Mining Water Use in Illinois: 1985-2000
Source: USGS, various year; BEA, 2003

Characteristics of County Mining Water Use

Mining water withdrawals in Illinois are concentrated in a few counties. Between 1985 and 2000, the 15 counties that have the largest mining water withdrawals in the State accounted for more than 70 percent of total water withdrawals in mining sector. Forty-six (46) counties were estimated to have had zero withdrawals between the 1990 and 2000 inventories. McLean County was estimated to have had zero withdrawals in 1990 and 1995, and only 0.03 mgd in 2000. Table 7.1 displays the distribution of county mining water use between 1985 and 2000. There is a steady increase in the number of counties with zero mining water withdrawals from 1985 to 1995 followed by a significant leap to 84 in 2000. Most of the counties with mining water withdrawals belong to the group with water withdrawals less than 3 mgd.

There are large variations in the estimates of mining withdrawals for those non-zero counties in this water use sector. For example, the county reporting the largest amount of mining water withdrawals in 1985 (11.2 mgd in Perry County) reported zero withdrawals in 2000. In Kankakee, however, the amount of mining water withdrawals increase from zero in 1985 to 3.3 mgd in 2000, ranking second in the State (Table 7A.1).

Table 7.1 Distribution of County Mining Water Withdrawals in Illinois: 1985-2000

Distribution by Withdrawals	Year			
	1985	1990	1995	2000
Number of Counties (0 mgd)	47	50	51	84
Number of Counties (0-1 mgd)	28	28	26	11
Number of Counties (1-2 mgd)	13	10	13	2
Number of Counties (2-3 mgd)	3	8	7	2
Number of Counties (3-4 mgd)	3	1	1	2
Number of Counties (4-5 mgd)	2	1	0	0
Number of Counties (>5 mgd)	6	4	4	1
Maximum Water Withdrawals (mgd)	11.2	20.9	9.8	5.2

MINING WATER USE PROJECTIONS PROCEDURE

Ideally projections of mining withdrawals would be based on observable mining outputs that have a direct relationship to water use. However, no publicly available measures of mining output at the county level were located through an investigation of mining industry data sources. Consequently, a modified per-employee coefficient procedure is chosen to make projections for county mining water withdrawals. The federal Standard Industrial Classification system divides employment in mining industry into four major sub-sectors: metal mining (SIC 10), coal mining (SIC 12), oil and gas extraction (SIC 13), and nonmetallic minerals except fuel (SIC 14). The number of employees and the average amount of water use per employee of these four different mining sub-sectors are used to determine mining water withdrawals. The procedure for projecting mining water use employed the following three steps:

1. Development of per employee water withdrawals coefficients for each mining sub-sector in each county
2. Preparation of projections for the number of employees in each mining sub-sector in each county for each projection year
3. Calculation of projections of the total mining withdrawals in each county for each projection year by combining the results of Steps (1) and (2) above.

Estimation of Per Employee Mining Water Withdrawals

While mining in all four sub-sectors does occur in Illinois, the metal mining industry plays a very minor role in the State. The largest reported employment in this sub-sector was 16 workers (in Fulton and Madison counties) in 2000, and mining water withdrawals were estimated to be zero in both of these counties for that year. Therefore, mining water use for SIC 10 (metal mining) was excluded from the mining water use analysis.

In order to forecast future mining water withdrawals in the remaining three mining sub-sectors, county specific per employee water withdrawal coefficients were estimated for each sub-sector that existed in each county. Total employment data in each mining sub-sector were obtained from Illinois Department of Employment Security (IDES). The IDES 2-digit SIC employment data were available in electronic format for 1990, 1995, and 2000 and per employee water withdrawal coefficients were estimated for these three years using Equation 7.1:

$$Y_i = b_{1i} E_{sic12i} + b_{2i} E_{sic13i} + b_{3i} E_{sic14i} \qquad \text{(Equation 7.1)}$$

where, Y_i is total amount of mining water withdrawals in each year (i=1990, 1995, 2000); E_{sic12i} is total employment in SIC 12 in each year; E_{sic13i} is total employment in SIC 13 in each year; E_{sic14i} is total employment in SIC 14 in each year; and b_{1i}, b_{2i}, and b_{3i} are the per employee water withdrawal coefficients to be estimated.

However, this method resulted in a negative per employee water withdrawal coefficients for some counties. For these counties, an “average” per-employee water withdrawal coefficient was calculated using the Equation 7.2:

$$b = \frac{\sum_i Y_i}{\sum_i (E_{sic12i} + E_{sic13i} + E_{sic14i})} \qquad \text{(Equation 7.2)}$$

where, b is the average rate of per employee water withdrawals; Y_i is total amount of mining water withdrawals in each year (i=1990, 1995, 2000); E_{sic12i} is total employment in SIC 12 in each year; E_{sic13i} is total employment in SIC 13 in each year; and E_{sic14i} is total employment in SIC 14 in each year.

It is assumed that the amount of mining water withdrawals will remain zero in the counties with historical zero mining water withdrawals. Estimates of per employee mining water withdrawals were made for the 55 counties with mining water withdrawals (Table 7.2). Sub-sector per employee water withdrawal coefficients were calculated for 10 counties (using Equation 7.1) Per employee water withdrawal coefficients in the remaining 45 counties were estimated using the “average” rate method (Equation 7.2). Per employee water withdrawal coefficients were not estimated for those sub-sectors in counties where no mining employment was reported by IDES.

Table 7.2 Historical Per Employee Water Withdrawals and the Estimated Per Employee Coefficients

County	Historical Per Employee Water Withdrawals (1,000 gal/Emp)			Estimated Sectoral Per Employee Water Withdrawals (1,000 gal/Emp)		
	1990	**1995**	**2000**	**SIC12**	**SIC13**	**SIC14**
Bureau	0.0	15.2	0.0	--	--	15.2
Champaign	174.3	157.1	118.6	--	607.1*	143.4*
Christian	1.2	230.0	NA	476.1*	211.6*	--
Clark	1.9	1.3	0.0	--	2.6*	0.5*
Clay	2.7	4.3	0.0	--	6.7	--
Clinton	2.8	5.9	0.0	3.9	3.9	3.9
Coles	2.2	2.1	0.0	2.2	2.2	2.2
Cook	0.4	1.7	0.5	7.0*	0.8*	0.2*
Crawford	36.4	28.3	0.0	--	18.9*	151.6*
Cumberland	50.0	110.0	NA	--	110.0*	50.0*
De Kalb	51.3	16.8	17.8	--	33.3*	23.1*
Douglas	1.3	17.1	58.6	1.3	--	1.3
Du Page	0.2	0.1	0.0	--	0.2	0.2
Edgar	1.3	NA	NA	1.3	1.3	--
Edwards	5.4	13.6	0.0	--	7.7	--
Effingham	9.6	10.5	0.0	10.0	10.0	10.0
Fayette	10.6	21.3	0.0	--	14.1	14.1
Ford	NA	100.0	NA	--	--	100.0
Franklin	1.7	2.4	1.1	2.0	2.0	--
Fulton	72.9	11.5	0.0	11.5*	--	183.4*
Gallatin	5.1	7.7	0.0	5.7	5.7	5.7
Hamilton	23.7	30.0	0.0	20.1*	4.5*	--
Hardin	7.8	6.9	0.0	--	--	7.2
Jackson	2.5	0.0	0.0	2.6	--	2.6
Jasper	37.9	30.6	0.0	--	33.8	--
Jefferson	1.7	2.7	0.0	2.1	2.1	--
Kane	9.4	12.6	0.0	11.1	11.1	11.1
Kankakee	17.2	0.0	37.5	--	--	30.6
La Salle	44.7	11.3	12.5	--	--	11.9
Lake	5.7	20.3	17.2	--	13.9	13.9
Lawrence	16.9	32.7	0.0	--	22.1	22.1
Logan	1.2	0.2	0.5	0.7	--	0.7
Macoupin	2.7	4.9	0.0	3.7	--	--
Madison	0.6	0.4	0.0	--	0.5	0.5
Marion	4.7	4.2	0.0	--	4.5	--
McDonough	6.2	4.7	11.9	7.4	7.4	7.4
McHenry	27.3	41.8	0.0	--	--	33.3
Montgomery	1.7	1.1	0.0	1.3	--	1.3
Ogle	16.7	0.1	0.2	--	--	2.4
Perry	5.2	14.7	0.0	8.2	--	--
Randolph	1.6	0.9	0.0	1.3	1.3	1.3
Richland	4.8	7.1	0.0	--	5.7	--

Table 7.2 (cont'd) . Historical Per Employee Water Withdrawals and the Estimated Per Employee Coefficients

County	Historical Per Employee Water Withdrawals (1,000 gal/Emp)			Estimated Sectoral Per Employee Water Withdrawals (1,000 gal/Emp)		
	1990	**1995**	**2000**	**SIC12**	**SIC13**	**SIC14**
Rock Island	5.0	0.0	0.0	--	--	5.0
Saline	2.9	0.6	1.0	1.7	1.7	1.7
Sangamon	17.3	33.2	4.8	--	23.5*	23.5*
Schuyler	0.0	0.2	0.0	0.2	--	--
Shelby	6.7	NA	0.0	--	6.7	--
St Clair	1.9	0.0	0.2	1.7	1.7	1.7
Wabash	1.4	1.9	0.5	1.5	1.5	1.5
Washington	10.0	10.9	0.0	--	10.4	--
Wayne	8.1	12.5	0.0	--	9.8	--
White	4.4	4.4	0.2	3.2	3.2	3.2
Will	0.0	6.7	0.0	6.7	6.7	6.7
Williamson	8.8	5.0	0.0	6.5	--	6.5
Winnebago	13.2	10.9	0.0	--	12.4	12.4

Notes:
***** Coefficients derived using Equation 7.1.
-- indicates no withdrawals or no employment in the SIC sector.
NA indicates zero mining water withdrawals in that year.

Projections of Mining Employment

Employment projections are available from the Illinois Department of Employment Security (IDES) for all 2-digit SICs for the year 2008 (Note: IDES released a revised version of these projections for the year 2010 after the projections were developed in this chapter. However, because these were not substantially different, the 2008 estimates were not updated for this analysis). The following procedure was used to extrapolated the 2008 estimates in order to derive the employment projections for the projection years used in this study.

1. The annual growth rate of employment in each mining sub-sector based on the 2000 actual employment data and the 2008 projection values were calculated using Equation 7.3:

$$E_{2008,sicj} = E_{2000,sicj} * (1 + r)^8 \qquad \text{(Equation 7.3)}$$

where, $E_{2008,sicj}$ is total employment in the sector SIC_j (j=12,13,14) in 2008; $E_{2000,sicj}$ is total employment in the sector SIC_j (j=12,13,14) in 2000, and *r* is the annual growth rate to be estimated.

2. The derived annual growth rate was then used to estimate the employment for each sub-sector for each projection year using Equation 7.4:

$$E_{i,sicj} = E_{2000,sicj} * (1+r)^{(i-2000)} \qquad \text{(Equation 7.4)}$$

where, $E_{i,sicj}$ is total employment in the sector SIC_j (j=12, 13,14) in year i (i = 2005, 2010, 2015, 2020, 2025); $E_{2000,sicj}$ is total employment in the sector SIC_j (j=12, 13,14) in 2000, and *r* is the annual growth rate.

In a few cases the 2008 projections from IDES were not available because of confidentiality concerns. To estimate these “non-disclosures”, the ratio of employment in each mining sub-sector in 2000 is used. The projected employment in each mining sub-sector appears in Table 7-3. Individual tables including State totals for each year are included in the Chapter 7 Annex.

Projections of Mining Water Use Coefficients

Mine operators may be able to alter their water consumption in response to changes in technology, mining techniques, or local conditions. However, no systematic evidence of such influences were found during this investigation. Therefore, in the projections of county mining water withdrawals presented in this analysis, the per employee water use coefficients estimated for each sub-sector in each county were assumed to remain constant throughout the projection period.

Calculation of County Mining Water Use

Total mining water use in each county was calculated by multiplying county employment projections by the estimated per mining employee water withdrawal coefficient. The projections for 2005 top 2025, and the USGS estimates for mining withdrawals for 1995 and 2000 are displayed in Table 7.4. Those counties that were estimated to have zero mining withdrawals are not included in the table.

MINING WATER USE PROJECTIONS

Statewide mining withdrawals are projected to increase from 48.9 mgd in 2005 to 68.5 mgd in 2025. Nine counties were projected to experience declining withdrawals in this sector, six counties were projected to have no change, and 40 counties were projected to have increased mining withdrawals. Seven counties were projected to have increases in withdrawals in excess of 2.0 mgd: Jasper and Gallatin (2.0 mgd), Fayette and Wayne (2.6 mgd), Lawrence (6.7 mgd), Champaign (8.6 mgd), and Crawford (10.9 mgd).

Table 7.3 Mining Employment Projections in Illinois: 2005-2025

	SIC 12							SIC 13							SIC 14						
County	**2000**	**2005**	**2008**	**2010**	**2015**	**2020**	**2025**	**2000**	**2005**	**2008**	**2010**	**2015**	**2020**	**2025**	**2000**	**2005**	**2008**	**2010**	**2015**	**2020**	**2025**
Bureau	0	0	0	0	0	0	0	0	0	0	0	0	0	0	44	22	15	11	5	2	1
Champaign	0	0	0	0	0	0	0	2	0	0	0	0	0	0	20	26	31	34	45	59	78
Christian	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0
Clark	0	0	0	0	0	0	0	9	14	20	24	40	66	109	53	52	52	51	51	50	49
Clay	0	0	0	0	0	0	0	137	151	161	167	185	205	226	0	0	0	0	0	0	0
Clinton	15	10	8	6	4	3	2	0	4	7	8	13	17	21	12	8	7	6	4	3	2
Coles	0	0	0	0	0	0	0	10	11	12	12	14	15	17	30	31	32	32	33	35	36
Cook	16	10	8	6	4	2	1	116	76	59	49	32	21	14	602	632	652	665	699	734	772
Crawford	0	0	0	0	0	0	0	75	110	140	163	241	357	527	9	8	8	7	7	6	6
Cumberland	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Dekalb	0	0	0	0	0	0	0	1	1	2	2	3	5	8	84	84	85	85	85	86	87
Douglas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	13	13	12	12	11	11
DuPage	0	0	0	0	0	0	0	31	22	18	15	11	7	5	176	135	116	104	80	62	47
Edgar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Edwards	0	0	0	0	0	0	0	16	22	28	32	45	64	91	0	0	0	0	0	0	0
Effingham	1	1	3	3	7	15	30	14	14	14	14	14	14	14	0	0	0	0	0	0	0
Fayette	0	0	0	0	0	0	0	100	112	120	125	140	157	176	5	5	6	6	7	7	8
Ford	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Franklin	11	0	0	0	0	0	0	16	18	20	21	24	27	32	0	0	0	0	0	0	0
Fulton	1	0	0	0	0	0	0	0	0	0	0	0	0	0	6	4	4	3	2	2	1
Gallatin	269	284	294	300	317	335	355	4	4	4	4	4	4	4	0	0	0	0	0	0	0
Hamilton	0	1	2	2	3	5	6	9	10	12	12	15	18	22	0	0	0	0	0	0	0
Hardin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	150	141	136	132	124	117	110
Jackson	27	30	33	34	39	44	50	0	0	0	0	0	0	0	20	23	26	27	32	38	45
Jasper	0	0	0	0	0	0	0	27	31	35	37	43	51	60	0	0	0	0	0	0	0
Jefferson	455	332	276	243	178	130	95	159	179	193	202	228	258	291	0	0	0	0	0	0	0
Kane	0	0	0	0	0	0	0	0	0	0	0	0	0	0	87	95	101	104	115	126	138
Kankakee	0	0	0	0	0	0	0	0	0	0	0	0	0	0	89	82	79	76	71	66	61
LaSalle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	420	398	386	377	358	340	322
Lake	0	0	0	0	0	0	0	6	5	5	4	4	3	3	180	171	167	163	156	149	142
Lawrence	0	0	0	0	0	0	0	185	203	215	223	245	269	295	6	6	7	7	8	8	9
Logan	248	218	202	191	168	148	130	0	0	0	0	0	0	0	11	10	10	9	9	8	8
Macoupin	511	385	325	290	218	164	124	0	0	0	0	0	0	0	17	15	15	14	13	12	11
Madison	0	0	0	0	0	0	0	48	35	30	26	19	14	11	156	158	160	161	163	166	168
Marion	0	0	0	0	0	0	0	106	113	119	122	131	141	152	7	6	6	5	5	4	4

Table 7.3 *(cont'd)* Mining Employment Projections in Illinois: 2005-2025

	SIC 12							SIC 13							SIC 14						
County	**2000**	**2005**	**2008**	**2010**	**2015**	**2020**	**2025**	**2000**	**2005**	**2008**	**2010**	**2015**	**2020**	**2025**	**2000**	**2005**	**2008**	**2010**	**2015**	**2020**	**2025**
McDonough	63	51	45	41	33	27	22	0	0	0	0	0	0	0	11	9	8	7	6	4	4
McHenry	5	1	1	0	0	0	0	0	0	0	0	0	0	0	81	71	66	62	55	48	42
Montgomery	190	134	109	94	67	47	33	0	0	0	0	0	0	0	36	25	21	18	13	9	6
Ogle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	56	52	50	48	45	42	39
Perry	143	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Randolph	279	311	332	346	386	430	480	3	3	3	3	3	3	3	19	21	23	24	27	30	34
Richland	0	0	0	0	0	0	0	128	129	131	131	133	135	137	0	0	0	0	0	0	0
Rock Island	0	0	0	0	0	0	0	10	0	0	0	0	0	0	68	53	46	41	32	25	20
Saline	823	892	937	967	1049	1138	1234	8	9	10	10	12	13	16	0	0	0	0	0	0	0
Sangamon	180	0	0	0	0	0	0	5	6	8	8	12	16	21	27	20	18	16	12	9	7
Schuyler	170	115	92	78	53	36	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shelby	0	0	0	0	0	0	0	2	1	1	0	0	0	0	15	14	14	13	13	12	12
St. Clair	60	86	108	125	180	260	376	14	12	11	10	8	7	6	55	51	49	47	44	41	38
Wabash	176	132	112	100	75	56	42	122	139	152	160	184	211	242	0	0	0	0	0	0	0
Washington	0	0	0	0	0	0	0	35	38	40	41	44	48	53	0	0	0	0	0	0	0
Wayne	0	0	0	0	0	0	0	100	121	137	148	180	219	267	0	0	0	0	0	0	0
White	233	248	258	264	282	300	320	228	242	251	257	273	289	307	0	0	0	0	0	0	0
Will	0	0	0	0	0	0	0	63	23	13	8	3	1	0	240	241	243	243	245	247	249
Williamson	42	38	37	35	33	30	28	0	0	0	0	0	0	0	1	1	1	1	1	1	1
Winnebago	0	0	0	0	0	0	0	1	0	0	0	0	0	0	13	13	14	14	14	15	16

Table 7.4 Projections of County Mining Water Withdrawals (mgd) in Illinois: 2005-2025

County	1995	2000	2005	2010	2015	2020	2025
Bureau	0.38	0	0.33	0.17	0.08	0.03	0.02
Champaign	5.34	2.61	3.73	4.88	6.45	8.46	11.19
Christian	0.46	0	0.00	0.00	0.00	0.00	0.00
Clark	0.11	0	0.06	0.09	0.13	0.20	0.31
Clay	0.72	0	1.01	1.12	1.24	1.37	1.51
Clinton	2.38	0	0.09	0.08	0.08	0.09	0.10
Coles	0.12	0	0.09	0.09	0.10	0.11	0.11
Cook	1.51	0.35	0.28	0.24	0.22	0.21	0.20
Crawford	3.60	0	3.30	4.15	5.63	7.67	10.89
Cumberland	0.11	0	0.00	0.00	0.00	0.00	0.00
De Kalb	1.36	1.51	1.97	2.03	2.06	2.15	2.27
Douglas	0.24	0.82	0.02	0.02	0.02	0.01	0.01
Du Page	0.01	0	0.02	0.02	0.01	0.01	0.01
Edgar	0.09	0	0.00	0.00	0.00	0.00	0.00
Edwards	0.49	0	0.17	0.25	0.35	0.49	0.70
Effingham	0.22	0	0.15	0.17	0.21	0.29	0.44
Fayette	1.28	0	1.65	1.85	2.08	2.32	2.60
Ford	0.70	2.66	0.00	0.00	0.00	0.00	0.00
Franklin	2.42	0.03	0.04	0.04	0.05	0.05	0.06
Fulton	1.02	0	0.73	0.55	0.37	0.37	0.18
Gallatin	1.27	0	1.64	1.73	1.83	1.93	2.04
Hamilton	0.51	0	0.07	0.09	0.13	0.18	0.22
Hardin	2.27	0	1.02	0.95	0.89	0.84	0.79
Jackson	0	0	0.14	0.16	0.18	0.21	0.24
Jasper	1.10	0	1.05	1.25	1.46	1.73	2.03
Jefferson	1.72	0	1.08	0.94	0.86	0.82	0.81
Kane	1.18	0	1.05	1.15	1.27	1.39	1.53
Kankakee	0	3.34	2.51	2.33	2.17	2.02	1.87
La Salle	5.16	5.23	4.73	4.48	4.25	4.04	3.82
Lake	2.98	3.19	2.45	2.33	2.23	2.12	2.02
Lawrence	7.22	0	4.61	5.07	5.58	6.11	6.70
Logan	0.05	0.13	0.15	0.13	0.12	0.10	0.09
Macoupin	2.57	0	1.42	1.07	0.81	0.61	0.46
Madison	0.09	0	0.09	0.09	0.08	0.08	0.08
Marion	0.65	0	0.50	0.54	0.58	0.63	0.68
McDonough	0.36	0.88	0.45	0.36	0.29	0.23	0.19
McHenry	2.80	0	2.36	2.06	1.83	1.60	1.40
Montgomery	0.19	0	0.20	0.14	0.10	0.07	0.05
Ogle	0.01	0.01	0.13	0.12	0.11	0.10	0.09
Perry	9.80	0	0.00	0.00	0.00	0.00	0.00
Randolph	0.27	0	0.44	0.49	0.54	0.60	0.67
Richland	0.91	0	0.74	0.75	0.76	0.78	0.79
Rock Island	0	0	0.27	0.21	0.16	0.13	0.10

Table 7.4 *(cont'd)* Projections of County Mining Water Withdrawals (mgd) in Illinois: 2005-2025

County	1995	2000	2005	2010	2015	2020	2025
Saline	0.66	0.85	1.54	1.67	1.82	1.97	2.14
Sangamon	1.26	1.02	0.61	0.56	0.56	0.59	0.66
Schuyler	0.01	0	0.02	0.02	0.01	0.01	0.00
Shelby	0.04	0	0.01	0.00	0.00	0.00	0.00
St. Clair	0	0.02	0.25	0.31	0.40	0.53	0.72
Wabash	1.68	0.14	0.40	0.38	0.38	0.39	0.42
Washington	0.35	0	0.40	0.43	0.46	0.50	0.55
Wayne	1.71	0	1.19	1.45	1.77	2.15	2.62
White	2.58	0.09	1.57	1.67	1.78	1.89	2.01
Will	1.18	0	1.76	1.67	1.65	1.65	1.66
Williamson	1.86	0	0.25	0.23	0.22	0.20	0.19
Winnebago	0.36	0	0.16	0.17	0.17	0.19	0.20
Total	75.36	22.88	48.89	50.74	54.52	60.21	68.48

CHAPTER 7 ANNEX

Table 7A.1 USGS Estimates of Fresh, Saline, and Total Mining Withdrawals: 1985-2000

	1985			1990			1995			2000		
County	**Fresh**	**Saline**	**Total**	**Fresh**	**Saline**	**Total**	**Fresh**	**Saline**	**Total**	**Fresh**	**Saline**	**Total**
Adams	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Alexander	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bond	0.26	0.00	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boone	0.14	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Brown	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bureau	3.77	0.00	3.77	0.00	0.00	0.00	0.38	0.00	0.38	0.00	0.00	0.00
Calhoun	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Carroll	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cass	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Champaign	3.55	0.00	3.55	5.23	0.00	5.23	5.34	0.00	5.34	2.61	0.00	2.61
Christian	1.41	0.47	1.88	0.23	0.46	0.69	0.00	0.46	0.46	0.00	0.00	0.00
Clark	0.14	0.06	0.20	0.10	0.11	0.21	0.00	0.11	0.11	0.00	0.00	0.00
Clay	0.18	0.96	1.14	0.00	0.72	0.72	0.00	0.72	0.72	0.00	0.00	0.00
Clinton	1.44	0.35	1.79	1.76	0.31	2.07	2.07	0.31	2.38	0.00	0.00	0.00
Coles	0.15	0.03	0.18	0.01	0.12	0.13	0.00	0.12	0.12	0.00	0.00	0.00
Cook	0.52	0.00	0.52	0.55	0.00	0.55	1.51	0.00	1.51	0.35	0.00	0.35
Crawford	2.25	2.98	5.23	0.00	3.60	3.60	0.00	3.60	3.60	0.00	0.00	0.00
Cumberland	0.07	0.15	0.22	0.09	0.11	0.20	0.00	0.11	0.11	0.00	0.00	0.00
De Kalb	2.15	0.00	2.15	2.77	0.00	2.77	1.36	0.00	1.36	1.51	0.00	1.51
De Witt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Douglas	1.79	0.00	1.79	0.24	0.00	0.24	0.24	0.00	0.24	0.82	0.00	0.82
Du Page	0.01	0.00	0.01	0.06	0.00	0.06	0.01	0.00	0.01	0.00	0.00	0.00
Edgar	0.00	0.05	0.05	0.00	0.09	0.09	0.00	0.09	0.09	0.00	0.00	0.00
Edwards	0.38	0.30	0.68	0.00	0.49	0.49	0.00	0.49	0.49	0.00	0.00	0.00
Effingham	0.06	0.19	0.25	0.00	0.22	0.22	0.00	0.22	0.22	0.00	0.00	0.00
Fayette	0.08	6.52	6.60	0.00	1.28	1.28	0.00	1.28	1.28	0.00	0.00	0.00
Ford	0.05	0.00	0.05	0.03	0.00	0.03	0.70	0.00	0.70	2.66	0.00	2.66
Franklin	0.61	0.51	1.12	2.49	0.23	2.72	2.19	0.23	2.42	0.03	0.00	0.03
Fulton	0.76	0.00	0.76	1.02	0.00	1.02	1.02	0.00	1.02	0.00	0.00	0.00
Gallatin	2.04	0.21	2.25	2.70	0.27	2.97	1.00	0.27	1.27	0.00	0.00	0.00
Greene	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grundy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hamilton	0.11	0.53	0.64	0.32	0.51	0.83	0.00	0.51	0.51	0.00	0.00	0.00
Hancock	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hardin	1.12	0.00	1.12	1.16	0.00	1.16	2.27	0.00	2.27	0.00	0.00	0.00

Table 7A.1 *(cont'd)* USGS Estimates of Fresh, Saline, and Total Mining Withdrawals: 1985-2000

	1985			1990			1995			2000		
County	**Fresh**	**Saline**	**Total**	**Fresh**	**Saline**	**Total**	**Fresh**	**Saline**	**Total**	**Fresh**	**Saline**	**Total**
Henderson	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Henry	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Iroquois	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Jackson	1.43	0.00	1.43	0.72	0.00	0.72	0.00	0.00	0.00	0.00	0.00	0.00
Jasper	0.02	0.59	0.61	0.00	1.10	1.10	0.00	1.10	1.10	0.00	0.00	0.00
Jefferson	1.48	0.48	1.96	0.83	0.77	1.60	0.95	0.77	1.72	0.00	0.00	0.00
Jersey	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Jo Daviess	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Johnson	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kane	0.55	0.00	0.55	0.79	0.00	0.79	1.18	0.00	1.18	0.00	0.00	0.00
Kankakee	0.00	0.00	0.00	0.79	0.00	0.79	0.00	0.00	0.00	3.34	0.00	3.34
Kendall	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Knox	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lake	0.73	0.00	0.73	1.05	0.00	1.05	2.98	0.00	2.98	3.19	0.00	3.19
La Salle	6.06	0.00	6.06	20.90	0.00	20.90	5.16	0.00	5.16	5.23	0.00	5.23
Lawrence	0.26	6.12	6.38	0.40	7.22	7.62	0.00	7.22	7.22	0.00	0.00	0.00
Lee	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Livingston	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Logan	0.06	0.00	0.06	0.34	0.00	0.34	0.05	0.00	0.05	0.13	0.00	0.13
McDonough	0.00	0.00	0.00	0.58	0.00	0.58	0.36	0.00	0.36	0.88	0.00	0.88
McHenry	3.00	0.00	3.00	2.59	0.00	2.59	2.80	0.00	2.80	0.00	0.00	0.00
McLean	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.03
Macon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Macoupin	1.81	0.00	1.81	1.65	0.00	1.65	2.57	0.00	2.57	0.00	0.00	0.00
Madison	0.01	0.10	0.11	0.00	0.09	0.09	0.00	0.09	0.09	0.00	0.00	0.00
Marion	1.94	10.20	12.14	0.00	0.65	0.65	0.00	0.65	0.65	0.00	0.00	0.00
Marshall	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mason	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Massac	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Menard	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mercer	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Monroe	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Montgomery	0.05	0.00	0.05	0.14	0.00	0.14	0.19	0.00	0.19	0.00	0.00	0.00
Morgan	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Moultrie	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 7A.1 *(cont'd)* USGS Estimates of Fresh, Saline, and Total Mining Withdrawals: 1985-2000

	1985			1990			1995			2000		
County	**Fresh**	**Saline**	**Total**	**Fresh**	**Saline**	**Total**	**Fresh**	**Saline**	**Total**	**Fresh**	**Saline**	**Total**
Ogle	0.11	0.00	0.11	0.35	0.00	0.35	0.01	0.00	0.01	0.01	0.00	0.01
Peoria	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Perry	11.14	0.01	11.15	7.85	0.01	7.86	9.79	0.01	9.80	0.00	0.00	0.00
Piatt	0.22	0.00	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pike	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pope	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pulaski	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Putnam	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Randolph	0.02	0.00	0.02	0.67	0.00	0.67	0.27	0.00	0.27	0.00	0.00	0.00
Richland	0.03	0.92	0.95	0.00	0.91	0.91	0.00	0.91	0.91	0.00	0.00	0.00
Rock Island	0.34	0.00	0.34	0.34	0.00	0.34	0.00	0.00	0.00	0.00	0.00	0.00
St Clair	1.95	0.00	1.95	2.19	0.00	2.19	0.00	0.00	0.00	0.02	0.00	0.02
Saline	3.52	0.31	3.83	3.78	0.35	4.13	0.31	0.35	0.66	0.85	0.00	0.85
Sangamon	1.58	0.00	1.58	1.02	0.00	1.02	1.26	0.00	1.26	1.02	0.00	1.02
Schuyler	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00
Scott	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shelby	0.00	0.03	0.03	0.00	0.04	0.04	0.00	0.04	0.04	0.00	0.00	0.00
Stark	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Stephenson	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tazewell	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Union	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Vermilion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wabash	0.63	0.58	1.21	0.11	1.23	1.34	0.45	1.23	1.68	0.14	0.00	0.14
Warren	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Washington	0.06	0.36	0.42	0.00	0.35	0.35	0.00	0.35	0.35	0.00	0.00	0.00
Wayne	0.31	1.55	1.86	0.00	1.71	1.71	0.00	1.71	1.71	0.00	0.00	0.00
White	0.99	3.24	4.23	0.09	2.49	2.58	0.09	2.49	2.58	0.09	0.00	0.09
Whiteside	0.08	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Will	0.00	0.00	0.00	0.00	0.00	0.00	1.18	0.00	1.18	0.00	0.00	0.00
Williamson	4.61	0.03	4.64	2.10	0.03	2.13	1.83	0.03	1.86	0.00	0.00	0.00
Winnebago	0.37	0.00	0.37	0.74	0.00	0.74	0.36	0.00	0.36	0.00	0.00	0.00
Woodford	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
State Total	66.40	37.83	104.23	68.78	25.47	94.25	49.89	25.47	75.36	22.91	0.00	22.91

Source: USGS water use inventories, various years
Note: 2000 water withdrawal estimates for mining in Illinois were not published. Estimates presented in Table 7A.1 were obtained from preliminary USGS estimates.

Table 7A.2 County Employment Projections for Coal Mining (SIC 12)

County	2000	2005	2008	2010	2015	2020	2025
Bureau	0	0	0	0	0	0	0
Champaign	0	0	0	0	0	0	0
Christian	0	0	0	0	0	0	0
Clark	0	0	0	0	0	0	0
Clay	0	0	0	0	0	0	0
Clinton	15	10	8	6	4	3	2
Coles	0	0	0	0	0	0	0
Cook	16	10	8	6	4	2	1
Crawford	0	0	0	0	0	0	0
Cumberland	0	0	0	0	0	0	0
De Kalb	0	0	0	0	0	0	0
Douglas	0	0	0	0	0	0	0
Du Page	0	0	0	0	0	0	0
Edgar	0	0	0	0	0	0	0
Edwards	0	0	0	0	0	0	0
Effingham	1	1	3	3	7	15	30
Fayette	0	0	0	0	0	0	0
Ford	0	0	0	0	0	0	0
Franklin	11	0	0	0	0	0	0
Fulton	1	0	0	0	0	0	0
Gallatin	269	284	294	300	317	335	355
Hamilton	0	1	2	2	3	5	6
Hardin	0	0	0	0	0	0	0
Jackson	27	30	33	34	39	44	50
Jasper	0	0	0	0	0	0	0
Jefferson	455	332	276	243	178	130	95
Kane	0	0	0	0	0	0	0
Kankakee	0	0	0	0	0	0	0
LaSalle	0	0	0	0	0	0	0
Lake	0	0	0	0	0	0	0
Lawrence	0	0	0	0	0	0	0
Logan	248	218	202	191	168	148	130
Macoupin	511	385	325	290	218	164	124
Madison	0	0	0	0	0	0	0
Marion	0	0	0	0	0	0	0
McDonough	63	51	45	41	33	27	22
McHenry	5	1	1	0	0	0	0
Montgomery	190	134	109	94	67	47	33
Ogle	0	0	0	0	0	0	0
Perry	143	0	0	0	0	0	0
Randolph	279	311	332	346	386	430	480
Richland	0	0	0	0	0	0	0
Rock Island	0	0	0	0	0	0	0
Saline	823	892	937	967	1049	1138	1234
Sangamon	180	0	0	0	0	0	0
Schuyler	170	115	92	78	53	36	24
Shelby	0	0	0	0	0	0	0
St. Clair	60	86	108	125	180	260	376
Wabash	176	132	112	100	75	56	42
Washington	0	0	0	0	0	0	0
Wayne	0	0	0	0	0	0	0
White	233	248	258	264	282	300	320
Will	0	0	0	0	0	0	0
Williamson	42	38	37	35	33	30	28
Winnebago	0	0	0	0	0	0	0
State Total	3,918	3,279	3,182	3,125	3,096	3,170	3,352

Table 7A.3 County Employment Projections for Oil and Gas Extraction (SIC 13)

County	2000	2005	2008	2010	2015	2020	2025
Bureau	0	0	0	0	0	0	0
Champaign	2	0	0	0	0	0	0
Christian	0	0	3	0	0	0	0
Clark	9	14	20	24	40	66	109
Clay	137	151	161	167	185	205	226
Clinton	0	4	7	8	13	17	21
Coles	10	11	12	12	14	15	17
Cook	116	76	59	49	32	21	14
Crawford	75	110	140	163	241	357	527
Cumberland	0	0	2	0	0	0	0
Dekalb	1	1	2	2	3	5	8
Douglas	0	0	0	0	0	0	0
DuPage	31	22	18	15	11	7	5
Edgar	0	0	0	0	0	0	0
Edwards	16	22	28	32	45	64	91
Effingham	14	14	14	14	14	14	14
Fayette	100	112	120	125	140	157	176
Ford	0	0	0	0	0	0	0
Franklin	16	18	20	21	24	27	32
Fulton	0	0	0	0	0	0	0
Gallatin	4	4	4	4	4	4	4
Hamilton	9	10	12	12	15	18	22
Hardin	0	0	0	0	0	0	0
Jackson	0	0	0	0	0	0	0
Jasper	27	31	35	37	43	51	60
Jefferson	159	179	193	202	228	258	291
Kane	0	0	0	0	0	0	0
Kankakee	0	0	0	0	0	0	0
LaSalle	0	0	0	0	0	0	0
Lake	6	5	5	4	4	3	3
Lawrence	185	203	215	223	245	269	295
Logan	0	0	0	0	0	0	0
Macoupin	0	0	0	0	0	0	0
Madison	48	35	30	26	19	14	11
Marion	106	113	119	122	131	141	152
McDonough	0	0	0	0	0	0	0
McHenry	0	0	0	0	0	0	0
Montgomery	0	0	0	0	0	0	0
Ogle	0	0	0	0	0	0	0
Perry	0	0	0	0	0	0	0
Randolph	3	3	3	3	3	3	3
Richland	128	129	131	131	133	135	137
Rock Island	10	0	0	0	0	0	0
Saline	8	9	10	10	12	13	16
Sangamon	5	6	8	8	12	16	21
Schuyler	0	0	0	0	0	0	0
Shelby	2	1	1	0	0	0	0
St. Clair	14	12	11	10	8	7	6
Wabash	122	139	152	160	184	211	242
Washington	35	38	40	41	44	48	53
Wayne	100	121	137	148	180	219	267
White	228	242	251	257	273	289	307
Will	63	23	13	8	3	1	0
Williamson	0	0	0	0	0	0	0
Winnebago	1	0	0	0	0	0	0
State Total	1,790	1,858	1,976	2,038	2,303	2,655	3,130

Table 7A.4 County Employment Projections for Nonmetallic Minerals, Except Fuels (SIC 14)

County	2000	2005	2008	2010	2015	2020	2025
Bureau	44	22	15	11	5	2	1
Champaign	20	26	31	34	45	59	78
Christian	0	0	0	0	0	0	0
Clark	53	52	52	51	51	50	49
Clay	0	0	0	0	0	0	0
Clinton	12	8	7	6	4	3	2
Coles	30	31	32	32	33	35	36
Cook	602	632	652	665	699	734	772
Crawford	9	8	8	7	7	6	6
Cumberland	0	0	0	0	0	0	0
Dekalb	84	84	85	85	85	86	87
Douglas	14	13	13	12	12	11	11
DuPage	176	135	116	104	80	62	47
Edgar	0	0	0	0	0	0	0
Edwards	0	0	0	0	0	0	0
Effingham	0	0	0	0	0	0	0
Fayette	5	5	6	6	7	7	8
Ford	0	0	0	0	0	0	0
Franklin	0	0	0	0	0	0	0
Fulton	6	4	4	3	2	2	1
Gallatin	0	0	0	0	0	0	0
Hamilton	0	0	0	0	0	0	0
Hardin	150	141	136	132	124	117	110
Jackson	20	23	26	27	32	38	45
Jasper	0	0	0	0	0	0	0
Jefferson	0	0	0	0	0	0	0
Kane	87	95	101	104	115	126	138
Kankakee	89	82	79	76	71	66	61
LaSalle	420	398	386	377	358	340	322
Lake	180	171	167	163	156	149	142
Lawrence	6	6	7	7	8	8	9
Logan	11	10	10	9	9	8	8
Macoupin	17	15	15	14	13	12	11
Madison	156	158	160	161	163	166	168
Marion	7	6	6	5	5	4	4
McDonough	11	9	8	7	6	4	4
McHenry	81	71	66	62	55	48	42
Montgomery	36	25	21	18	13	9	6
Ogle	56	52	50	48	45	42	39
Perry	0	0	0	0	0	0	0
Randolph	19	21	23	24	27	30	34
Richland	0	0	0	0	0	0	0
Rock Island	68	53	46	41	32	25	20
Saline	0	0	0	0	0	0	0
Sangamon	27	20	18	16	12	9	7
Schuyler	0	0	0	0	0	0	0
Shelby	15	14	14	13	13	12	12
St. Clair	55	51	49	47	44	41	38
Wabash	0	0	0	0	0	0	0
Washington	0	0	0	0	0	0	0
Wayne	0	0	0	0	0	0	0
White	0	0	0	0	0	0	0
Will	240	241	243	243	245	247	249
Williamson	1	1	1	1	1	1	1
Winnebago	13	13	14	14	14	15	16
State Total	2,820	2,696	2,667	2,625	2,591	2,574	2,584

CHAPTER 8

LIVESTOCK WATER USE

INTRODUCTION

Livestock water use includes water for livestock, feedlots, dairies, fish farms, and other on-farm needs (Solley, 1998). Livestock withdrawals include water used to care for all cattle, sheep, goats, hogs, and poultry, including such animal specialties as horses, rabbits, bees, pets, fur-bearing animals in captivity, and fish in captivity (Avery, 1999).

ESTIMATION PROCEUDRES FOR LIVESTOCK WATER USE

The USGS estimates livestock water use in each county by multiplying the total county population of each type of farm animal by an estimate of the amount of water consumed per animal (Avery, 1999). The estimated daily amounts of water used by each animal type for the year 2000 inventory are shown in Table 8.1. Although other water use coefficients have been used in previous years, these coefficients have been relatively constant since county level estimates were first prepared in 1985.

Table 8.1. Estimated Amount of Unit Water Use by Animal Type

Animal Type	Estimated Water Use, Gallons per Day per Animal
Dairy Cows	35.0
Beef Cattle	12.0
Horses and Mules	12.0
Hogs	4.0
Goats	3.0
Sheep	2.0
Turkeys	0.12
Chickens	0.06
Rabbits	0.05
Mink	0.03

Source: Avery, 1999

In estimating the 2000 county level livestock water use for Illinois the USGS only accounted for five of the ten animal types listed in Table 8.1: hogs, beef-cattle, dairy cows, horses, and sheep. Accordingly, county-level water use projections are only made for these five animal species. A state-level estimate of the potential water use of the other livestock groups in 2000 was also prepared in order to provide a perspective on their scale of water use (page 8-5). In recent years, fish farming has also become a substantial livestock activity in Illinois. Data on fish farming in Illinois from the Census of Agriculture were collected and reviewed and efforts were made to contact government and industry groups in order to obtain documentation of the projected changes in this industry. However, because no clear guidance on USGS water use estimation procedures could be located, no information on fish farming is included in this report.

LIVESTOCK WATER USE IN ILLINOIS

Livestock withdrawals in Illinois consistently account for less than 2 percent of national livestock water use and less than 1 percent of State total water use. Livestock water use in the State has experienced significant fluctuations since 1960. It decreased steadily from 78 mgd in 1960 to 42 mgd in 1970, leveled off between 1970 and 1975, and increased again to 65 mgd in 1980. Livestock water use fluctuated within a range of 10 mgd between 1980 and 1995, but decreased again to 38 mgd in 2000, a more than 30 percent of decrease from 1990 (Figure 8.1).

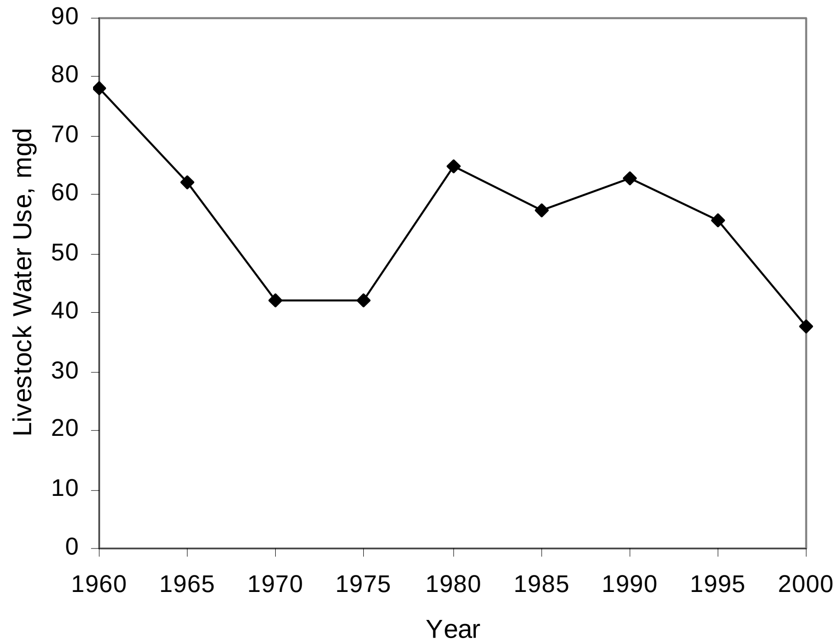

Figure 8.1. USGS Estimates of Livestock Water Use in Illinois: 1960-2000
Source: USGS inventory reports, various years.

Characteristics of County Livestock Water Use

USGS estimates that there is livestock water use in almost every county in Illinois, although in most counties the quantity is quite small. In every data collection year from 1985 to 2000, the amount of livestock water use was less than 1 mgd in more than 85 percent of counties of the state. The counties with relatively high livestock water use include: Adams, Carroll, Clinton, De Kalb, Hancock, Henry, Jo Daviess, Knox, Mason, Ogle, Pike, and Stephenson. Mason is the only county whose estimated amount of livestock water use has ever exceeded 3 mgd. However, it is also the county reporting the largest fluctuations in the amount of livestock water use, increasing from 0.3 mgd in 1985 to 6.8 mgd in 1990 and 1995, before declining to 0.3 mgd again in 2000.

LIVESTOCK WATER USE PROJECTIONS PROCEDURES

A unit-use methodology using the USGS livestock coefficients for 2000 was used to prepare projections of county livestock water use. The estimated amount of water use by each major animal type was assumed to remain constant for all projection years. Relevant government agencies and industry organizations were contacted to request information on livestock projections for each county in Illinois. However, no county-level forecasts were obtained.

The Department of Agriculture's Economic Research Service (ERS) has prepared "baseline" national-level projections of the number of hogs, cattle, and dairy cows for every year between 2001 and 2012. These national-level projections were prorated down to State and county-level in order to prepare projections of the number of animals in each species. No similar projections for horses, mules, or sheep were located from government or industry sources, or personal contacts. Therefore, the number of these animals was fixed at their 2000 levels for all forecast years.

Beef Cattle, Dairy Cows, and Hogs

The projections for beef cattle, dairy cows, and hogs are based upon their 2000 population as estimated by USGS and the national-level baseline projections from ERS. For the purpose of this study, the national changes in livestock were assumed to be reflected in Illinois counties. County-level animal population projections were made for each of these three species with the following procedures:

1. Calculate the growth rate of the ERS baseline projections for each animal type.
2. Prepare projections for the total number of animals of each type in Illinois based on their 2000 base values and the growth rates obtained in Step 1.
3. Prorate the number of animals in each county based upon their share of totals in 2000.

Beef Cattle

The ERS national baseline projection of the number of beef cattle from 2001 to 2012 indicates a gradual decrease in the number of beef cattle between 2001 and 2005 followed by a steady and rapid growth between 2005 and 2011 and a small decrease after that (Figure 2). The baseline projection growth rate between 2001 and 2005 (-0.0033) and the rate between 2005 and 2010 (0.0197) are directly used to make projections for the number of beef cattle in Illinois during the period. The projected small decrease between 2011 and 2012 is assumed to continue until 2025. To make projections for the years after 2010, the number of beef cattle in 2011 is projected first. The projected 2011 number and the estimated decrease rate between 2011 and 2012 (-0.0014) are then used to forecast the number of cattle in each projection year after 2010. The total number of beef cattle for Illinois for each projection year was then assigned proportionally to each county based upon the county share of the State total in the year 2000 (Table 8A.2).

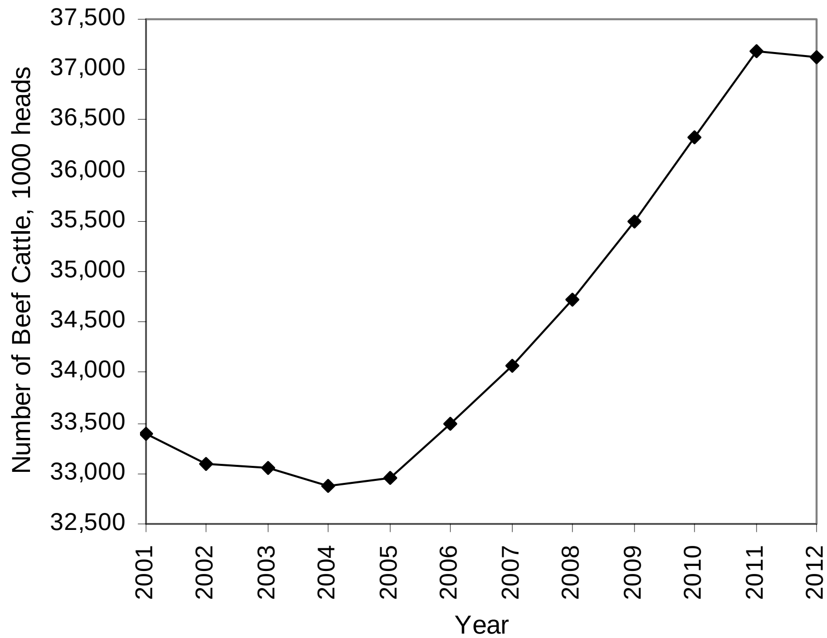

Figure 8.2. ERS Baseline Projections for the Number of Beef Cattle in the U.S.
Source: ERS, 2003

Dairy Cows

Figure 8.3 shows the ERS baseline projection of the number of dairy cows from 2001 to 2012. The projection results indicate a consistent decrease, which was assumed to extend to 2025. To make projections for the Illinois state total number of dairy cows, the baseline projection growth rate between 2001 and 2005 (-0.0097) and the rate between 2005 and 2010 (-0.0070) were used to make projections for the period. The growth rate between 2005 and 2010 was also used to make projections for the years after 2010. The total number of dairy cows for Illinois for each projection year was assigned proportionally to each county based upon the county share of the State total in the year 2000 (Table 8A.3).

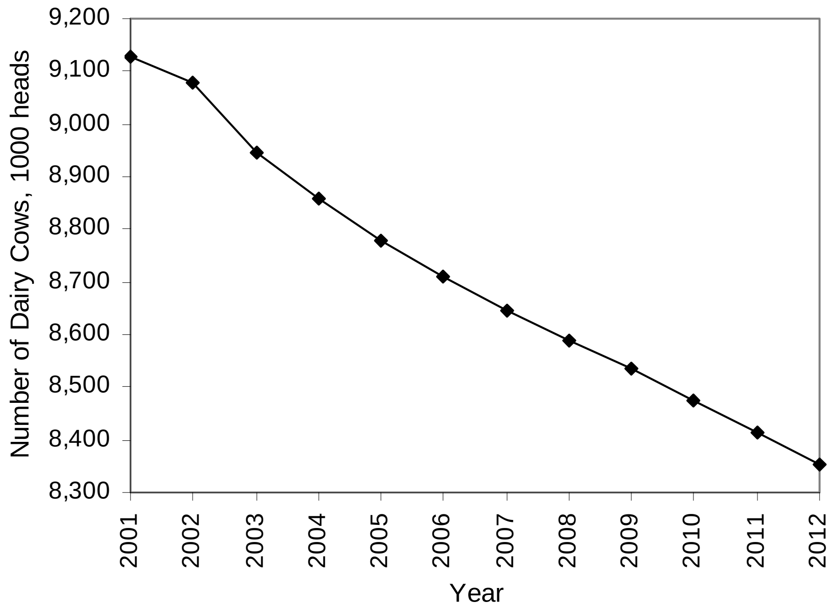

Figure 8.3. ERS Baseline Projections for the Number of Dairy Cows in the U.S.
Source: ERS, 2003

Hogs

Figure 8.4 shows the ERS baseline projection on the number of hogs from 2001 to 2012. The projection results indicated some fluctuation between 2001 and 2004 followed by a steady trend of increase after that. This increasing trend is assumed to continue until 2025. To make projections for the Illinois state total number of hogs, the baseline projection growth rate between 2001 and 2005 (0.0048) and the rate between 2005 and 2010 (0.0099) are directly used to make projections for the period. The growth rate between 2005 and 2010 is also used to make projections for the forecast years after 2010. The total number of hogs for Illinois was projected for each forecast year, and was then assigned proportionally to each county based upon the county share of the State total in the year 2000 (Table 8A.4).

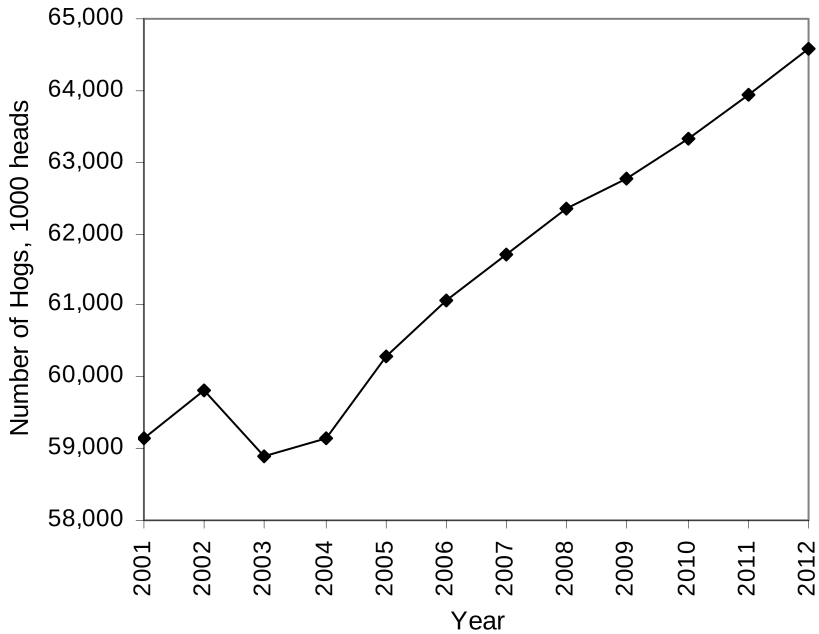

Figure 8.4. ERS Baseline Projections for the Number of Hogs in the U.S.
Source: ERS, 2003

Horses and Sheep

The estimated number of horses and sheep in each county was used to prepare the 2000 livestock water withdrawals estimates in the USGS inventory (Table 8A.5). However, agency or industry projections of the future number these two animal types were not found through a search of literature or contacts with government agencies and industry officials. Therefore, for the forecast of future livestock water use presented in this analysis, the numbers of these two species were assumed to be constant throughout the projection period because historical data indicate there has been little change in the numbers of horses and sheep in Illinois over time.

Chicken, Goats, Mink, Rabbits, and Turkey

The 2000 USGS inventory did not include estimates of water use by chickens, goats, mink, rabbits and turkeys. Thus, these five animal species are not considered in the forecast of county-level livestock water use, and no further efforts were made to make projections for these five livestock species. In order to evaluate the potential impact of the omission of these species, an estimate of their water use based upon the 2000 estimates of their population in Illinois was prepared. Only State level data on the five animal species are available from the State agricultural statistics service (Table 8.2), and their water use was based upon the average water use coefficient listed in Table 8.1. The omission of these five animal species from the livestock forecast does not have much impact on total livestock withdrawals, with the state total water use in 2000 by the five animal species is estimated to be 0.62 mgd, less than 2 percent of the reported state total livestock water use by USGS.

Table 8.2. Illinois State Total of Chicken, Goats, Mink, Rabbits, and Turkey

Species	Number
Chicken[a]	4,048,000
Goat[b]	10,781
Mink[b]	35,908
Rabbit[b]	7,900
Turkey[a]	2,900,000

[a]From IL Agricultural Statistics Service 2001 annual summary
[b]From 1997 Census of Agriculture

Projection of Livestock Water Use

Given the projections of the number of animals and the average water use coefficient for each type of animal, total amount of livestock water use can be projected. Total projected livestock water use in each county is calculated as the sum of water use by each major livestock species, using Equation 8.1:

$$LVW_t = \sum_{i=1}^{5} N_{it} \cdot C_i \qquad \text{(Equation 8.1)}$$

where, LVW_t is the projected amount of county livestock water use at year *t* (*t*=2005, 2010, 2015, 2020, and 2005); N_{it} is the projected number of livestock species *i* (beef cattle, dairy cows, hogs, sheep, and horses) at year *t* in the county; and C_i is the average water use coefficient by the livestock species *i*. Five types of animals (beef cattle, dairy cows, hogs, horses, and sheep) species are included in the county level water forecast, with water use for horses and sheep held constant throughout the projection period. The projected county level livestock water use is shown in Table 8.3.

LIVESTOCK WATER USE PROJECTIONS

Using the methodology described above, total livestock water use is projected to increase by nearly five million gallons per day, from 37 mgd in 2000, to 42 mgd in 2025. Eight counties were projected to have zero increases, and no county was projected to increase by more than 0.2 mgd. Eleven counties had increases greater than 0.1 mgd, but only two counties increased more than 0.14: DeKalb (0.19 mgd) and Henry (0.2 mgd).

Table 8.3 Projected County Level Livestock Water Use: 2005-2025

County	2000	2005	2010	2015	2020	2025
Adams	0.80	0.79	0.84	0.86	0.87	0.88
Alexander	0.03	0.03	0.03	0.03	0.03	0.03
Bond	0.19	0.19	0.21	0.21	0.21	0.21
Boone	0.19	0.19	0.20	0.20	0.21	0.21
Brown	0.21	0.21	0.23	0.23	0.24	0.24
Bureau	0.60	0.61	0.65	0.67	0.69	0.71
Calhoun	0.10	0.10	0.11	0.11	0.11	0.11
Carroll	0.88	0.87	0.93	0.95	0.95	0.95
Cass	0.67	0.68	0.72	0.75	0.78	0.81
Champaign	0.20	0.20	0.21	0.22	0.22	0.23
Christian	0.25	0.25	0.27	0.28	0.29	0.30
Clark	0.20	0.20	0.22	0.22	0.23	0.24
Clay	0.30	0.30	0.32	0.33	0.33	0.34
Clinton	1.68	1.65	1.70	1.72	1.72	1.73
Coles	0.13	0.13	0.14	0.14	0.15	0.15
Cook	0.01	0.01	0.01	0.01	0.01	0.01
Crawford	0.14	0.14	0.15	0.16	0.16	0.17
Cumberland	0.19	0.19	0.21	0.21	0.22	0.22
De Kalb	1.16	1.17	1.24	1.29	1.32	1.35
De Witt	0.06	0.06	0.06	0.06	0.06	0.06
Douglas	0.10	0.10	0.11	0.11	0.11	0.11
Du Page	0.00	0.00	0.00	0.00	0.00	0.00
Edgar	0.61	0.62	0.65	0.68	0.71	0.74
Edwards	0.13	0.13	0.14	0.15	0.15	0.15
Effingham	0.73	0.72	0.76	0.77	0.78	0.79
Fayette	0.32	0.32	0.33	0.34	0.34	0.33
Ford	0.19	0.19	0.20	0.21	0.22	0.23
Franklin	0.17	0.17	0.18	0.19	0.19	0.20
Fulton	0.45	0.44	0.48	0.49	0.50	0.50
Gallatin	0.07	0.07	0.07	0.07	0.07	0.07
Greene	0.67	0.68	0.72	0.75	0.77	0.80
Grundy	0.09	0.09	0.09	0.10	0.10	0.10
Hamilton	0.10	0.10	0.11	0.11	0.11	0.11
Hancock	0.87	0.87	0.94	0.97	0.98	1.00
Hardin	0.09	0.09	0.09	0.09	0.09	0.09
Henderson	0.36	0.36	0.39	0.40	0.40	0.40
Henry	1.22	1.23	1.31	1.36	1.39	1.42
Iroquois	0.40	0.40	0.43	0.44	0.44	0.44
Jackson	0.24	0.24	0.25	0.26	0.26	0.26
Jasper	0.44	0.45	0.48	0.49	0.51	0.52
Jefferson	0.27	0.27	0.29	0.30	0.30	0.31
Jersey	0.22	0.22	0.24	0.24	0.24	0.24

Table 8.3 *(cont'd)* Projected County Level Livestock Water Use: 2005-2025

County	2000	2005	2010	2015	2020	2025
Jo Daviess	1.12	1.10	1.16	1.17	1.16	1.16
Johnson	0.19	0.19	0.21	0.21	0.21	0.21
Kane	0.40	0.40	0.43	0.44	0.45	0.46
Kankakee	0.18	0.18	0.19	0.20	0.20	0.21
Kendall	0.14	0.14	0.15	0.15	0.16	0.16
Knox	0.79	0.79	0.85	0.88	0.90	0.93
Lake	0.04	0.04	0.04	0.04	0.04	0.04
La Salle	0.40	0.39	0.42	0.43	0.44	0.44
Lawrence	0.19	0.19	0.20	0.21	0.22	0.23
Lee	0.36	0.36	0.39	0.40	0.40	0.41
Livingston	0.67	0.68	0.72	0.75	0.78	0.81
Logan	0.47	0.48	0.51	0.53	0.55	0.57
McDonough	0.35	0.35	0.38	0.39	0.39	0.40
McHenry	0.59	0.59	0.61	0.62	0.62	0.62
McLean	0.57	0.58	0.61	0.63	0.65	0.67
Macon	0.14	0.14	0.15	0.15	0.16	0.16
Macoupin	0.57	0.57	0.60	0.62	0.64	0.65
Madison	0.37	0.37	0.40	0.41	0.41	0.42
Marion	0.19	0.19	0.20	0.21	0.21	0.21
Marshall	0.15	0.15	0.16	0.17	0.17	0.17
Mason	0.25	0.25	0.26	0.27	0.28	0.29
Massac	0.19	0.19	0.20	0.21	0.21	0.21
Menard	0.25	0.25	0.26	0.27	0.28	0.29
Mercer	0.45	0.46	0.49	0.50	0.51	0.52
Monroe	0.36	0.37	0.39	0.40	0.41	0.43
Montgomery	0.42	0.42	0.45	0.46	0.48	0.49
Morgan	0.42	0.42	0.45	0.46	0.47	0.48
Moultrie	0.09	0.09	0.09	0.10	0.10	0.10
Ogle	0.91	0.91	0.98	1.00	1.02	1.03
Peoria	0.23	0.23	0.25	0.25	0.25	0.25
Perry	0.19	0.19	0.20	0.21	0.21	0.21
Piatt	0.10	0.10	0.11	0.11	0.12	0.12
Pike	0.70	0.70	0.75	0.77	0.79	0.81
Pope	0.11	0.11	0.11	0.12	0.12	0.12
Pulaski	0.10	0.09	0.10	0.10	0.10	0.10
Putnam	0.05	0.05	0.05	0.06	0.06	0.06
Randolph	0.36	0.35	0.38	0.39	0.39	0.39
Richland	0.34	0.35	0.37	0.38	0.39	0.41
Rock Island	0.29	0.29	0.31	0.32	0.33	0.34
St Clair	0.19	0.19	0.20	0.21	0.21	0.22
Saline	0.22	0.22	0.23	0.24	0.25	0.26
Sangamon	0.43	0.43	0.45	0.47	0.48	0.50

Table 8.3 *(cont'd)* Projected County Level Livestock Water Use: 2005-2025

County	2000	2005	2010	2015	2020	2025
Schuyler	0.23	0.23	0.25	0.26	0.26	0.27
Scott	0.10	0.10	0.10	0.11	0.11	0.11
Shelby	0.60	0.60	0.63	0.64	0.65	0.66
Stark	0.11	0.11	0.11	0.12	0.12	0.12
Stephenson	1.49	1.47	1.53	1.55	1.55	1.55
Tazewell	0.41	0.42	0.44	0.46	0.47	0.49
Union	0.19	0.19	0.20	0.21	0.20	0.20
Vermilion	0.20	0.20	0.21	0.22	0.22	0.23
Wabash	0.07	0.07	0.07	0.07	0.08	0.08
Warren	0.46	0.46	0.49	0.51	0.51	0.52
Washington	0.89	0.89	0.92	0.94	0.95	0.96
Wayne	0.37	0.37	0.40	0.41	0.42	0.43
White	0.17	0.17	0.18	0.18	0.19	0.19
Whiteside	0.74	0.74	0.79	0.81	0.82	0.84
Will	0.13	0.13	0.14	0.14	0.14	0.15
Williamson	0.23	0.23	0.25	0.25	0.26	0.26
Winnebago	0.39	0.38	0.41	0.42	0.43	0.43
Woodford	0.52	0.53	0.56	0.58	0.60	0.62
State Total	37.62	37.56	39.91	41.00	41.69	42.44

CHAPTER 8 ANNEX TABLES

Table 8A.1 USGS Estimated Livestock Water Withdrawals: 1985-2000

County	1985	1990	1995	2000	County	1985	1990	1995	2000
Adams	1.39	1.25	0.96	0.80	Lee	0.77	0.63	0.44	0.36
Alexander	0.06	0.05	0.06	0.03	Livingston	0.72	0.74	0.65	0.67
Bond	0.47	0.43	0.33	0.19	Logan	0.47	0.48	0.45	0.47
Boone	0.48	0.44	0.33	0.19	McDonough	0.72	0.58	0.45	0.35
Brown	0.29	0.29	0.22	0.21	McHenry	1.00	0.97	0.82	0.59
Bureau	0.99	0.94	0.72	0.60	McLean	0.79	0.77	0.53	0.57
Calhoun	0.28	0.32	0.30	0.09	Macon	0.18	0.20	0.12	0.14
Carroll	1.31	1.23	1.07	0.88	Macoupin	1.04	0.94	0.98	0.57
Cass	0.43	0.47	0.86	0.67	Madison	0.67	0.68	0.58	0.37
Champaign	0.29	0.28	0.23	0.20	Marion	0.38	0.35	0.27	0.19
Christian	0.25	0.24	0.26	0.25	Marshall	0.36	0.28	0.21	0.15
Clark	0.45	0.36	0.27	0.20	Mason	0.25	6.83	0.20	0.25
Clay	0.27	0.28	0.19	0.30	Massac	0.28	0.28	0.20	0.19
Clinton	1.20	1.28	1.36	1.68	Menard	0.34	0.32	0.32	0.25
Coles	0.25	0.22	0.17	0.13	Mercer	0.98	0.77	0.62	0.45
Cook	0.03	0.07	0.03	0.01	Monroe	0.34	0.37	0.26	0.36
Crawford	0.31	0.48	0.23	0.14	Montgomery	0.71	0.70	0.63	0.42
Cumberland	0.34	0.36	0.24	0.19	Morgan	0.69	0.63	0.55	0.42
De Kalb	1.15	1.12	1.01	1.24	Moultrie	0.24	0.21	0.16	0.09
De Witt	0.16	0.32	0.10	0.06	Ogle	1.58	1.39	1.02	0.91
Douglas	0.24	0.30	0.18	0.10	Peoria	0.45	0.42	0.32	0.23
Du Page	0.02	0.03	0.01	0.00	Perry	0.38	0.34	0.22	0.19
Edgar	0.51	0.41	0.24	0.61	Piatt	0.20	0.15	0.12	0.10
Edwards	0.36	0.37	0.25	0.13	Pike	1.49	1.28	1.12	0.70
Effingham	0.77	0.76	0.61	0.73	Pope	0.17	0.14	0.13	0.11
Fayette	0.48	0.70	0.38	0.32	Pulaski	0.14	0.18	0.10	0.09
Ford	0.26	0.27	0.25	0.19	Putnam	0.16	0.15	0.12	0.05
Franklin	0.19	0.18	0.19	0.17	Randolph	0.64	0.77	0.43	0.36
Fulton	0.82	0.76	0.49	0.45	Richland	0.28	0.30	0.29	0.34
Gallatin	0.14	0.16	0.09	0.07	Rock Island	0.58	0.52	0.45	0.29
Greene	0.81	0.66	0.55	0.67	St Clair	0.51	0.48	0.36	0.19
Grundy	0.15	0.15	0.11	0.09	Saline	0.17	0.14	0.15	0.22
Hamilton	0.25	0.24	0.13	0.10	Sangamon	0.64	0.62	0.51	0.43
Hancock	1.09	1.06	0.74	0.87	Schuyler	0.44	0.40	0.27	0.23

Table 8A.1 *(cont'd)* USGS Estimated Livestock Water Withdrawals: 1985-2000

County	1985	1990	1995	2000	County	1985	1990	1995	2000
Hardin	0.12	0.13	0.10	0.09	Scott	0.27	0.29	0.20	0.10
Henderson	0.57	0.49	0.37	0.36	Shelby	0.55	0.77	0.47	0.60
Henry	2.04	2.06	1.95	1.22	Stark	0.27	0.22	0.16	0.11
Iroquois	0.88	0.74	0.52	0.40	Stephenson	2.42	2.25	2.15	1.49
Jackson	0.39	1.23	0.28	0.24	Tazewell	0.62	0.77	0.61	0.41
Jasper	0.51	0.56	0.52	0.44	Union	0.30	0.26	0.28	0.19
Jefferson	0.39	0.37	0.31	0.27	Vermilion	0.40	0.36	0.26	0.20
Jersey	0.45	0.35	0.29	0.22	Wabash	0.16	0.14	0.10	0.07
Jo Daviess	1.93	1.65	1.57	1.12	Warren	0.97	0.80	0.57	0.46
Johnson	0.39	0.34	0.23	0.19	Washington	0.78	0.79	0.83	0.89
Kane	0.69	0.61	0.35	0.40	Wayne	0.56	0.73	0.42	0.37
Kankakee	0.27	0.28	0.22	0.18	White	0.27	0.24	0.20	0.17
Kendall	0.31	0.31	0.19	0.14	Whiteside	1.33	1.21	0.95	0.74
Knox	1.25	1.20	1.24	0.79	Will	0.37	0.42	0.16	0.13
Lake	0.12	0.17	0.07	0.04	Williamson	0.20	0.22	0.17	0.23
La Salle	0.69	0.69	0.44	0.39	Winnebago	0.79	0.73	0.46	0.39
Lawrence	0.15	0.22	0.14	0.17	Woodford	0.58	0.65	0.61	0.52
					State Total	57.24	62.74	44.60	37.59

Table 8A.2 Projection Results for the Number of Beef Cattle in Illinois: 2000-2025

County	2000	2005	2010	2015	2020	2025
Adams	35,800	35,209	38,809	39,503	39,236	38,970
Alexander	2,079	2,045	2,254	2,294	2,279	2,263
Bond	9,780	9,618	10,602	10,792	10,719	10,646
Boone	9,110	8,959	9,876	10,052	9,984	9,917
Brown	10,415	10,243	11,290	11,492	11,415	11,337
Bureau	18,918	18,605	20,508	20,875	20,734	20,593
Calhoun	6,548	6,440	7,098	7,225	7,176	7,128
Carroll	44,400	43,666	48,132	48,993	48,661	48,332
Cass	8,557	8,416	9,276	9,442	9,378	9,315
Champaign	5,705	5,611	6,184	6,295	6,252	6,210
Christian	4,514	4,439	4,893	4,981	4,947	4,914
Clark	4,843	4,763	5,250	5,344	5,308	5,272
Clay	11,489	11,299	12,455	12,677	12,592	12,506
Clinton	36,800	36,192	39,893	40,606	40,332	40,059
Coles	5,792	5,696	6,279	6,391	6,348	6,305
Cook	0	0	0	0	0	0
Crawford	4,368	4,296	4,735	4,820	4,787	4,755
Cumberland	7,596	7,471	8,234	8,382	8,325	8,269
De Kalb	33,435	32,883	36,245	36,893	36,644	36,396
De Witt	2,795	2,749	3,030	3,084	3,063	3,043
Douglas	3,798	3,735	4,117	4,191	4,162	4,134
Du Page	0	0	0	0	0	0
Edgar	8,831	8,685	9,573	9,744	9,678	9,613
Edwards	4,920	4,839	5,334	5,429	5,392	5,356
Effingham	19,000	18,686	20,597	20,965	20,823	20,682
Fayette	12,300	12,097	13,334	13,572	13,480	13,389
Ford	3,328	3,273	3,608	3,672	3,647	3,623
Franklin	6,691	6,580	7,253	7,383	7,333	7,284
Fulton	28,368	27,899	30,752	31,302	31,090	30,880
Gallatin	3,149	3,097	3,414	3,475	3,451	3,428
Greene	15,892	15,629	17,228	17,536	17,417	17,299
Grundy	3,099	3,048	3,359	3,420	3,396	3,373
Hamilton	3,837	3,774	4,159	4,234	4,205	4,177
Hancock	38,981	38,337	42,257	43,013	42,722	42,433
Hardin	5,510	5,419	5,973	6,080	6,039	5,998
Henderson	22,913	22,534	24,839	25,283	25,112	24,942
Henry	44,370	43,637	48,099	48,959	48,628	48,299
Iroquois	22,154	21,788	24,016	24,445	24,280	24,116
Jackson	13,985	13,754	15,160	15,432	15,327	15,223
Jasper	11,489	11,299	12,455	12,677	12,592	12,506
Jefferson	14,070	13,838	15,253	15,525	15,420	15,316
Jersey	12,695	12,485	13,762	14,008	13,913	13,819

Table 8A.2 *(cont'd)* Projection Results for the Number of Beef Cattle in Illinois: 2000-2025

County	2000	2005	2010	2015	2020	2025
Jo Daviess	59,500	58,517	64,501	65,654	65,210	64,769
Johnson	11,434	11,245	12,395	12,617	12,531	12,447
Kane	10,895	10,715	11,811	12,022	11,941	11,860
Kankakee	6,656	6,546	7,215	7,344	7,295	7,245
Kendall	2,630	2,587	2,851	2,902	2,882	2,863
Knox	26,285	25,851	28,494	29,004	28,808	28,613
Lake	1,127	1,108	1,222	1,244	1,235	1,227
La Salle	16,154	15,887	17,512	17,825	17,704	17,584
Lawrence	2,279	2,241	2,471	2,515	2,498	2,481
Lee	18,918	18,605	20,508	20,875	20,734	20,593
Livingston	9,603	9,444	10,410	10,596	10,525	10,453
Logan	4,659	4,582	5,051	5,141	5,106	5,072
McDonough	20,929	20,583	22,688	23,094	22,938	22,782
McHenry	16,900	16,621	18,320	18,648	18,522	18,397
McLean	13,417	13,195	14,545	14,805	14,705	14,605
Macon	3,727	3,665	4,040	4,113	4,085	4,057
Macoupin	17,397	17,110	18,859	19,196	19,067	18,938
Madison	15,422	15,167	16,718	17,017	16,902	16,788
Marion	9,400	9,245	10,190	10,372	10,302	10,232
Marshall	6,801	6,689	7,373	7,504	7,454	7,403
Mason	6,988	6,873	7,575	7,711	7,659	7,607
Massac	9,544	9,386	10,346	10,531	10,460	10,389
Menard	6,336	6,231	6,869	6,991	6,944	6,897
Mercer	19,211	18,894	20,826	21,198	21,055	20,912
Monroe	8,315	8,178	9,014	9,175	9,113	9,051
Montgomery	13,165	12,948	14,271	14,527	14,428	14,331
Morgan	14,388	14,150	15,597	15,876	15,769	15,662
Moultrie	3,703	3,642	4,014	4,086	4,058	4,031
Ogle	44,272	43,541	47,993	48,851	48,521	48,192
Peoria	11,460	11,271	12,423	12,645	12,560	12,475
Perry	9,355	9,200	10,141	10,323	10,253	10,183
Piatt	1,997	1,964	2,165	2,204	2,189	2,174
Pike	23,791	23,398	25,791	26,252	26,074	25,898
Pope	7,478	7,354	8,106	8,251	8,196	8,140
Pulaski	5,858	5,761	6,350	6,464	6,420	6,377
Putnam	2,046	2,012	2,218	2,258	2,242	2,227
Randolph	18,993	18,679	20,589	20,958	20,816	20,675
Richland	7,311	7,190	7,925	8,067	8,013	7,958
Rock Island	10,727	10,550	11,629	11,837	11,756	11,677
St Clair	7,465	7,342	8,092	8,237	8,181	8,126
Saline	5,510	5,419	5,973	6,080	6,039	5,998
Sangamon	10,250	10,081	11,111	11,310	11,234	11,158

Table 8A.2 *(cont'd)* Projection Results for the Number of Beef Cattle in Illinois: 2000-2025

County	2000	2005	2010	2015	2020	2025
Schuyler	12,895	12,682	13,979	14,229	14,133	14,037
Scott	4,702	4,624	5,097	5,188	5,153	5,118
Shelby	17,400	17,113	18,862	19,200	19,070	18,941
Stark	3,168	3,116	3,434	3,496	3,472	3,449
Stephenson	48,100	47,305	52,143	53,075	52,716	52,359
Tazewell	8,851	8,705	9,595	9,767	9,700	9,635
Union	13,229	13,010	14,341	14,597	14,499	14,400
Vermilion	8,557	8,416	9,276	9,442	9,378	9,315
Wabash	2,952	2,903	3,200	3,257	3,235	3,213
Warren	22,714	22,339	24,623	25,063	24,894	24,725
Washington	24,700	24,292	26,776	27,255	27,070	26,887
Wayne	15,743	15,483	17,066	17,371	17,254	17,137
White	6,199	6,097	6,720	6,840	6,794	6,748
Whiteside	35,203	34,621	38,162	38,844	38,581	38,320
Will	4,790	4,711	5,193	5,285	5,250	5,214
Williamson	8,788	8,643	9,527	9,697	9,631	9,566
Winnebago	22,234	21,867	24,103	24,534	24,368	24,203
Woodford	8,199	8,064	8,888	9,047	8,986	8,925
State Total	1,353,044	1,330,690	1,466,761	1,492,996	1,482,893	1,472,859

Table 8A.3 Projection Results for the Number of Dairy Cows in Illinois: 2000-2025

County	2000	2005	2010	2015	2020	2025
Adams	3,200	3,048	2,942	2,840	2,741	2,646
Alexander	121	115	111	107	104	100
Bond	620	590	570	550	531	513
Boone	590	562	542	524	505	488
Brown	85	81	78	75	73	70
Bureau	482	459	443	428	413	399
Calhoun	352	335	324	312	302	291
Carroll	4,200	4,000	3,861	3,727	3,597	3,472
Cass	543	517	499	482	465	449
Champaign	295	281	271	262	253	244
Christian	286	272	263	254	245	236
Clark	257	245	236	228	220	212
Clay	611	582	562	542	523	505
Clinton	19,700	18,762	18,110	17,481	16,874	16,288
Coles	308	293	283	273	264	255
Cook	0	0	0	0	0	0
Crawford	232	221	213	206	199	192
Cumberland	404	385	371	358	346	334
De Kalb	2,165	2,062	1,990	1,921	1,854	1,790
De Witt	205	195	188	182	176	169
Douglas	202	192	186	179	173	167
Du Page	0	0	0	0	0	0
Edgar	469	447	431	416	402	388
Edwards	80	76	74	71	69	66
Effingham	5,200	4,952	4,780	4,614	4,454	4,299
Fayette	2,900	2,762	2,666	2,573	2,484	2,398
Ford	172	164	158	153	147	142
Franklin	109	104	100	97	93	90
Fulton	232	221	213	206	199	192
Gallatin	51	49	47	45	44	42
Greene	1,008	960	927	894	863	833
Grundy	201	191	185	178	172	166
Hamilton	63	60	58	56	54	52
Hancock	319	304	293	283	273	264
Hardin	90	86	83	80	77	74
Henderson	187	178	172	166	160	155
Henry	1,130	1,076	1,039	1,003	968	934
Iroquois	1,146	1,091	1,054	1,017	982	947
Jackson	815	776	749	723	698	674
Jasper	611	582	562	542	523	505
Jefferson	230	219	211	204	197	190
Jersey	805	767	740	714	690	666

Table 8A.3 *(cont'd)* Projection Results for the Number of Dairy Cows in Illinois: 2000-2025

County	2000	2005	2010	2015	2020	2025
Jo Daviess	8,700	8,286	7,998	7,720	7,452	7,193
Johnson	666	634	612	591	570	551
Kane	705	671	648	626	604	583
Kankakee	344	328	316	305	295	284
Kendall	170	162	156	151	146	141
Knox	215	205	198	191	184	178
Lake	73	70	67	65	63	60
La Salle	1,046	996	962	928	896	865
Lawrence	121	115	111	107	104	100
Lee	482	459	443	428	413	399
Livingston	497	473	457	441	426	411
Logan	341	325	313	303	292	282
McDonough	171	163	157	152	146	141
McHenry	5,300	5,048	4,872	4,703	4,540	4,382
McLean	983	936	904	872	842	813
Macon	273	260	251	242	234	226
Macoupin	1,103	1,050	1,014	979	945	912
Madison	978	931	899	868	838	809
Marion	500	476	460	444	428	413
Marshall	499	475	459	443	427	413
Mason	512	488	471	454	439	423
Massac	156	149	143	138	134	129
Menard	464	442	427	412	397	384
Mercer	489	466	450	434	419	404
Monroe	485	462	446	430	415	401
Montgomery	835	795	768	741	715	690
Morgan	912	869	838	809	781	754
Moultrie	197	188	181	175	169	163
Ogle	1,128	1,074	1,037	1,001	966	933
Peoria	840	800	772	745	719	694
Perry	545	519	501	484	467	451
Piatt	103	98	95	91	88	85
Pike	1,509	1,437	1,387	1,339	1,293	1,248
Pope	122	116	112	108	104	101
Pulaski	342	326	314	303	293	283
Putnam	52	50	48	46	45	43
Randolph	1,107	1,054	1,018	982	948	915
Richland	389	370	358	345	333	322
Rock Island	273	260	251	242	234	226
St Clair	435	414	400	386	373	360
Saline	90	86	83	80	77	74
Sangamon	650	619	598	577	557	537

Table 8A.3 *(cont'd)* Projection Results for the Number of Dairy Cows in Illinois: 2000-2025

County	2000	2005	2010	2015	2020	2025
Schuyler	105	100	97	93	90	87
Scott	298	284	274	264	255	246
Shelby	4,000	3,810	3,677	3,549	3,426	3,307
Stark	232	221	213	206	199	192
Stephenson	14,700	14,000	13,514	13,044	12,591	12,154
Tazewell	649	618	597	576	556	537
Union	771	734	709	684	660	637
Vermilion	443	422	407	393	379	366
Wabash	48	46	44	43	41	40
Warren	186	177	171	165	159	154
Washington	7,500	7,143	6,895	6,655	6,424	6,201
Wayne	257	245	236	228	220	212
White	101	96	93	90	87	84
Whiteside	897	854	825	796	768	742
Will	310	295	285	275	266	256
Williamson	512	488	471	454	439	423
Winnebago	566	539	520	502	485	468
Woodford	601	572	552	533	515	497
State Total	117,654	112,051	108,159	104,401	100,775	97,274

Table 8A.4 Projection Results for the Number of Hogs in Illinois: 2000-2025

County	2000	2005	2010	2015	2020	2025
Adams	61,100	62,584	65,749	69,074	72,567	76,237
Alexander	0	0	0	0	0	0
Bond	12,900	13,213	13,882	14,584	15,321	16,096
Boone	13,300	13,623	14,312	15,036	15,796	16,595
Brown	19,900	20,383	21,414	22,497	23,635	24,830
Bureau	87,700	89,831	94,373	99,146	104,159	109,427
Calhoun	2,100	2,151	2,260	2,374	2,494	2,620
Carroll	49,500	50,703	53,267	55,960	58,790	61,763
Cass	136,300	139,611	146,671	154,088	161,880	170,067
Champaign	27,700	28,373	29,808	31,315	32,899	34,562
Christian	45,000	46,093	48,424	50,873	53,445	56,148
Clark	32,000	32,777	34,435	36,176	38,006	39,928
Clay	32,800	33,597	35,296	37,081	38,956	40,926
Clinton	135,900	139,202	146,241	153,636	161,405	169,568
Coles	11,000	11,267	11,837	12,436	13,064	13,725
Cook	0	0	0	0	0	0
Crawford	19,300	19,769	20,769	21,819	22,922	24,081
Cumberland	21,300	21,817	22,921	24,080	25,298	26,577
De Kalb	169,100	173,208	181,967	191,169	200,836	210,992
De Witt	3,700	3,790	3,982	4,183	4,394	4,617
Douglas	7,700	7,887	8,286	8,705	9,145	9,608
Du Page	0	0	0	0	0	0
Edgar	120,800	123,735	129,992	136,565	143,471	150,727
Edwards	16,700	17,106	17,971	18,879	19,834	20,837
Effingham	76,900	78,768	82,751	86,936	91,332	95,951
Fayette	16,600	17,003	17,863	18,766	19,715	20,712
Ford	35,400	36,260	38,094	40,020	42,044	44,170
Franklin	20,200	20,691	21,737	22,836	23,991	25,204
Fulton	22,100	22,637	23,782	24,984	26,248	27,575
Gallatin	6,100	6,248	6,564	6,896	7,245	7,611
Greene	110,600	113,287	119,016	125,034	131,357	138,000
Grundy	10,100	10,345	10,869	11,418	11,996	12,602
Hamilton	11,500	11,779	12,375	13,001	13,658	14,349
Hancock	94,400	96,693	101,583	106,720	112,117	117,786
Hardin	3,500	3,585	3,766	3,957	4,157	4,367
Henderson	18,600	19,052	20,015	21,027	22,091	23,208
Henry	158,800	162,658	170,883	179,525	188,603	198,141
Iroquois	23,100	23,661	24,858	26,115	27,435	28,823
Jackson	8,600	8,809	9,254	9,722	10,214	10,731
Jasper	70,200	71,905	75,542	79,362	83,375	87,591
Jefferson	21,600	22,125	23,244	24,419	25,654	26,951
Jersey	10,200	10,448	10,976	11,531	12,114	12,727

Table 8A.4 *(cont'd)* Projection Results for the Number of Hogs in Illinois: 2000-2025

County	2000	2005	2010	2015	2020	2025
Jo Daviess	23,100	23,661	24,858	26,115	27,435	28,823
Johnson	6,600	6,760	7,102	7,461	7,839	8,235
Kane	55,900	57,258	60,154	63,195	66,391	69,749
Kankakee	21,000	21,510	22,598	23,741	24,941	26,202
Kendall	23,300	23,866	25,073	26,341	27,673	29,072
Knox	114,800	117,589	123,535	129,782	136,345	143,240
Lake	0	0	0	0	0	0
La Salle	37,800	38,718	40,676	42,733	44,894	47,164
Lawrence	38,300	39,230	41,214	43,298	45,488	47,788
Lee	28,700	29,397	30,884	32,446	34,086	35,810
Livingston	133,800	137,051	143,981	151,262	158,911	166,947
Logan	100,300	102,737	107,932	113,390	119,124	125,148
McDonough	22,100	22,637	23,782	24,984	26,248	27,575
McHenry	44,330	45,407	47,703	50,115	52,650	55,312
McLean	91,600	93,825	98,570	103,555	108,791	114,293
Macon	19,800	20,281	21,307	22,384	23,516	24,705
Macoupin	77,600	79,485	83,505	87,727	92,164	96,824
Madison	35,100	35,953	37,771	39,681	41,687	43,796
Marion	13,400	13,726	14,420	15,149	15,915	16,720
Marshall	12,900	13,213	13,882	14,584	15,321	16,096
Mason	35,700	36,567	38,416	40,359	42,400	44,544
Massac	16,000	16,389	17,217	18,088	19,003	19,964
Menard	37,100	38,001	39,923	41,942	44,063	46,291
Mercer	50,200	51,420	54,020	56,752	59,621	62,636
Monroe	60,200	61,662	64,781	68,057	71,498	75,114
Montgomery	57,300	58,692	61,660	64,778	68,054	71,495
Morgan	53,500	54,800	57,571	60,482	63,541	66,754
Moultrie	6,000	6,146	6,457	6,783	7,126	7,486
Ogle	81,500	83,480	87,701	92,136	96,796	101,691
Peoria	13,600	13,930	14,635	15,375	16,152	16,969
Perry	13,800	14,135	14,850	15,601	16,390	17,219
Piatt	17,700	18,130	19,047	20,010	21,022	22,085
Pike	89,100	91,265	95,880	100,728	105,822	111,173
Pope	2,100	2,151	2,260	2,374	2,494	2,620
Pulaski	2,600	2,663	2,798	2,939	3,088	3,244
Putnam	5,300	5,429	5,703	5,992	6,295	6,613
Randolph	21,000	21,510	22,598	23,741	24,941	26,202
Richland	59,900	61,355	64,458	67,717	71,142	74,739
Rock Island	35,900	36,772	38,632	40,585	42,638	44,794
St Clair	19,700	20,179	21,199	22,271	23,397	24,580
Saline	36,100	36,977	38,847	40,811	42,875	45,043
Sangamon	67,200	68,833	72,313	75,970	79,812	83,848

Table 8A.4 *(cont'd)* Projection Results for the Number of Hogs in Illinois: 2000-2025

County	2000	2005	2010	2015	2020	2025
Schuyler	17,800	18,232	19,154	20,123	21,141	22,210
Scott	7,100	7,272	7,640	8,027	8,433	8,859
Shelby	61,800	63,301	66,502	69,865	73,398	77,110
Stark	14,500	14,852	15,603	16,392	17,221	18,092
Stephenson	97,100	99,459	104,488	109,772	115,323	121,155
Tazewell	69,400	71,086	74,681	78,457	82,425	86,593
Union	0	0	0	0	0	0
Vermilion	19,300	19,769	20,769	21,819	22,922	24,081
Wabash	7,000	7,170	7,533	7,914	8,314	8,734
Warren	42,200	43,225	45,411	47,707	50,120	52,655
Washington	83,300	85,324	89,638	94,171	98,934	103,937
Wayne	40,200	41,177	43,259	45,446	47,745	50,159
White	20,700	21,203	22,275	23,402	24,585	25,828
Whiteside	69,100	70,779	74,358	78,118	82,069	86,219
Will	11,700	11,984	12,590	13,227	13,896	14,599
Williamson	24,400	24,993	26,257	27,584	28,979	30,445
Winnebago	22,100	22,637	23,782	24,984	26,248	27,575
Woodford	98,400	100,791	105,887	111,242	116,867	122,777
State Total	4,132,330	4,232,720	4,446,765	4,671,634	4,907,875	5,156,063

Table 8A.5 Number of Horses and Sheep in Illinois: 2000

County	Horses	Sheep	County	Horses	Sheep
Adams	794	400	Lee	251	400
Alexander	64	400	Livingston	347	400
Bond	271	400	Logan	162	400
Boone	402	400	McDonough	554	400
Brown	156	400	McHenry	2,337	400
Bureau	589	1,600	McLean	626	2,200
Calhoun	160	400	Macon	246	400
Carroll	405	400	Macoupin	591	400
Cass	102	400	Madison	1,033	400
Champaign	677	400	Marion	663	400
Christian	318	400	Marshall	161	400
Clark	456	400	Mason	255	400
Clay	517	400	Massac	362	400
Clinton	279	400	Menard	333	400
Coles	568	400	Mercer	464	400
Cook	1,173	0	Monroe	330	400
Crawford	375	400	Montgomery	365	400
Cumberland	294	400	Morgan	215	400
De Kalb	596	1,800	Moultrie	1,069	400
De Witt	151	400	Ogle	821	2,500
Douglas	1,665	400	Peoria	917	400
Du Page	272	0	Perry	239	400
Edgar	350	400	Piatt	138	400
Edwards	159	400	Pike	538	400
Effingham	721	1,600	Pope	293	400
Fayette	553	400	Pulaski	149	400
Ford	145	400	Putnam	142	400
Franklin	466	400	Randolph	416	400
Fulton	625	1,700	Richland	128	400
Gallatin	65	400	Rock Island	714	400
Greene	483	400	St Clair	645	400
Grundy	161	400	Saline	315	400
Hamilton	246	400	Sangamon	836	400
Hancock	1,040	400	Schuyler	326	400
Hardin	177	400	Scott	173	400

Table 8A.5 *(cont'd)* Number of Horses and Sheep in Illinois: 2000

County	Horses	Sheep	County	Horses	Sheep
Henderson	331	400	Shelby	653	400
Henry	812	4,000	Stark	256	400
Iroquois	432	400	Stephenson	844	2,000
Jackson	692	400	Tazewell	553	400
Jasper	299	400	Union	474	400
Jefferson	591	400	Vermilion	389	400
Jersey	224	400	Wabash	76	400
Jo Daviess	842	400	Warren	424	2,300
Johnson	558	400	Washington	132	400
Kane	1,602	400	Wayne	900	400
Kankakee	449	400	White	426	400
Kendall	452	400	Whiteside	487	400
Knox	436	400	Will	1,224	400
Lake	1,692	400	Williamson	793	400
La Salle	828	2,000	Winnebago	951	400
Lawrence	218	400	Woodford	221	1,700
			State Total	51,890	59,000

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