WATER WITHDRAWALS AND WATER DEMAND ESTIMATES FOR EAST-CENTRAL ILLINOIS: 2015 UPDATE

Prepared for the
East-Central Illinois Regional Water Supply Planning Committee
of the
Mahomet Aquifer Consortium

Prepared by

May 2015

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Acronyms and Abbreviations

C&I	Commercial and Industrial Water Sector
CT	Critical Trends Scenario
DCEO	Illinois Department of Commerce and Economic Opportunity
EIA	Energy Information Administration
EtOH	Ethanol
GPCD	Gallons Per Capita Per Day
GPED	Gallons Per Employee Per Day
IDES	Illinois Department of Employment Security
IDNR	Illinois Department of Natural Resources
IDPH	Illinois Department of Public Health
IEPA	Illinois States Environmental Protection Agency
IR&AG	Irrigation and Agriculture Water Sector
ISGS	Illinois State Geological Survey
ISWS	Illinois State Water Survey
IVWA	Imperial Valley Water Authority
IWIP	Illinois Water Inventory Program
LRI	Less Resource Intensive Scenario
MGD	Million Gallons Per Day
MRI	More Resource Intensive Scenario
MW	Megawatt
PG	Power Generation Sector
PWS	Public Water Supply Water Sector
RWSPC	Regional Water Supply Planning Committee
USDA-FSA	United States Dept. of Agriculture – Farm Services Administration
USDA-NASS	United States Dept. of Agriculture – National Agricultural Statistics Service
USGS	United States Geological Survey
WHPA	Wittman Hydro Planning Associates

Water Withdrawals and Water Demand Estimates for East-Central Illinois: 2015 Update

Abstract

Total water withdrawals estimated by the U.S. Geological Survey (USGS) for 2010 for the 15-county east-central Illinois regional water supply planning area, excluding withdrawals for power generation, were 328 million gallons per day (mgd), approximately 140 mgd less than in 2005. Comparison of the USGS estimated 2010 withdrawals with 2010 withdrawals modeled in 2008 (WHPA, 2008) found generally good agreement across all water use sectors. Such comparison should be viewed cautiously because there has been only one year (2010) with which to compare estimated and modeled withdrawals.

Whenever possible, plausible explanations are provided for major differences between the reported uses and the predicted water use. For two priority sectors, public water supply and irrigation, the 2010 scenario withdrawals were recalculated with updated input to the equations used to calculate the scenario withdrawals. This generally resulted in improved withdrawal estimates, suggesting the models are structurally correct and the greatest uncertainty involves the prediction of input variables, such as population and climate.

Recommendations are made to improve water withdrawal data collection and subsequent sector classification, and for modeling irrigation withdrawals in Mason and Tazewell Counties. Given the unpredictability of predicting the weather, and hence irrigation withdrawals in any given year, it seems more appropriate to assess water resource impacts from irrigation under a range of conditions based on historical experience, particularly recent drought conditions.

Water Withdrawals and Water Demand Estimates for East-Central Illinois: 2015 Update

Introduction

In 2006, under a Governor's Executive Order (EO2006-01), two priority regional water supply planning areas in Illinois were selected to begin a process for assessing water supply demand and the impact of meeting those demands on the region's water resources. Those two areas were an 11-county area in northeastern Illinois and a 15-county area in east-central Illinois. For each of the two areas, water demand "scenarios" were developed to portray water-user needs from 2010 out to the year 2050. While those demand scenarios were being developed, models of each region's surface water and groundwater resources were also being developed with which future water demands could be input. The ability of the region's rivers, reservoirs, and aquifers to meet future demand and the impact of such water resource development could then be assessed and, most importantly, plans formulated to address water resource shortcomings.

Of concern for this report is the east-central Illinois region, a planning area overlying one of the state's major groundwater resources, the Mahomet Aquifer, plus the Mackinaw, Sangamon, and Vermilion river watersheds and including the region's major water supply reservoirs: Lake Springfield, Lake Decatur, Lake Bloomington, Evergreen Lake, and Vermilion Lake. The 15 counties within the east-central Illinois water supply planning region include Cass, Champaign, DeWitt, Ford, Iroquois, Logan, Macon, Mason, McLean, Menard, Sangamon, Tazewell, Vermilion, and Woodford (Figure 1).

Three principal reports were developed for this region: 1) a report laying out the details of scenarios of water demand to 2050 (Wittman Hydro Planning Associates, WHPA, 2008), 2) a report assessing the impacts of meeting those water demands on the region's water resources (Roadcap et al., 2011), and 3) a water supply planning document containing goals and recommendations for managing the region's water resources (East-Central Illinois Regional Water Supply Planning Committee, RWSPC, 2009). The planning document's recommendations included maintaining and updating the water resource models in light of new geologic and hydrologic data, and, just as importantly, tracking each year's water withdrawal data for comparison to the water demand scenarios.

The focus of this report is to document reported 2010 water withdrawals in the planning region, by major water use sector, and compare those data with the WHPA (2008) modeled withdrawal scenarios for 2010. Whenever possible, plausible explanations are provided for major differences between the reported uses and the predicted water use. For two priority sectors, public water supply and irrigation, it was possible to recalculate the 2010 scenario withdrawals with updated input to the equations used to calculate the scenario withdrawals. Principal sources of data in this assessment were population data for 2010 from the U.S. Bureau of Census and water withdrawal data for 2010 provided by the Illinois State Water Survey (ISWS) Illinois Water Inventory Program (IWIP) and the U.S. Geological Survey (Maupin et al., 2014). Maupin et al. (2014) present estimated uses of water across the whole of the United States and statewide totals.

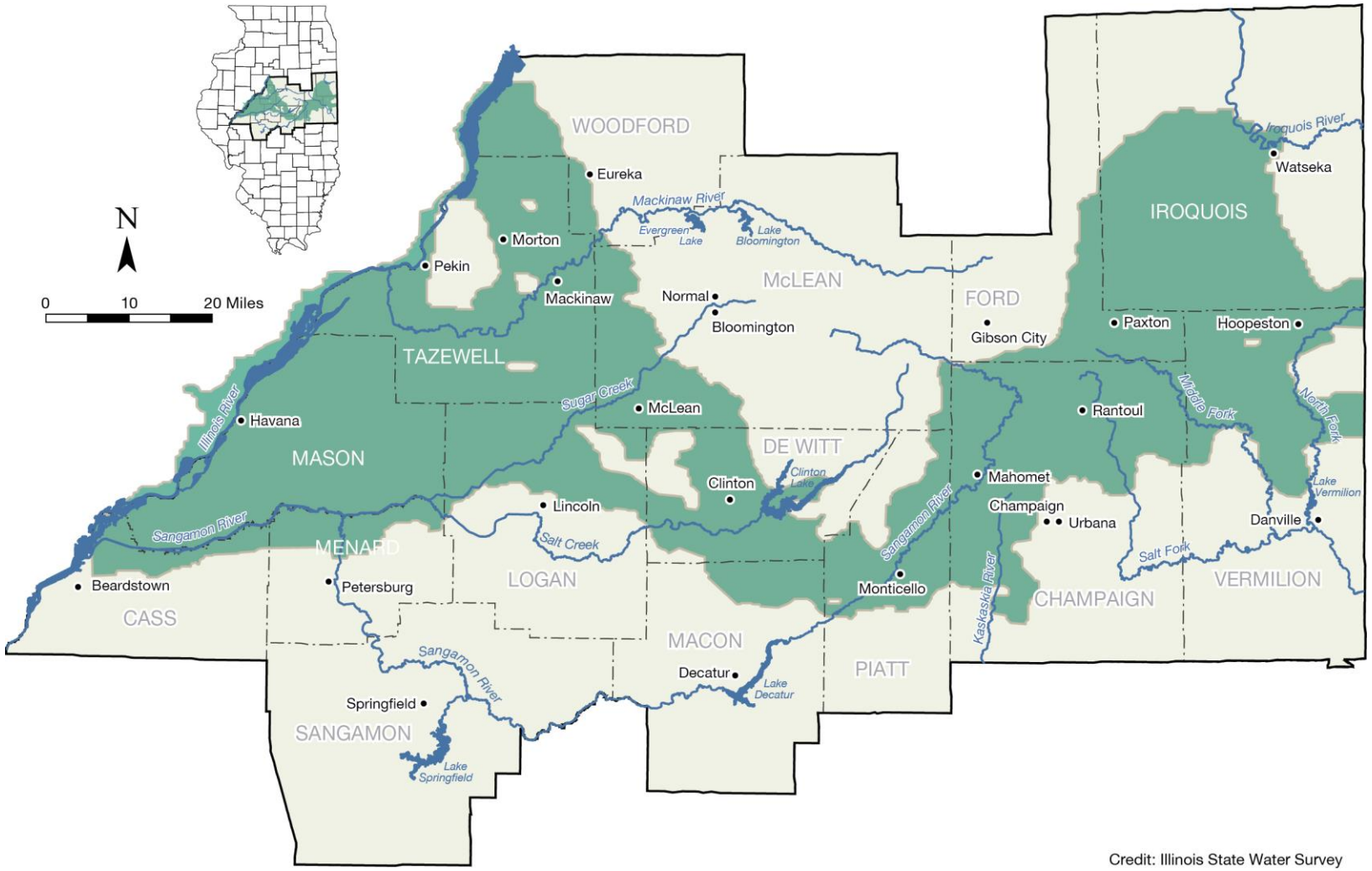

Figure 1. The east-central Illinois water supply planning region (from Roadcap et al., 2011).

However, of greater use to this report were detailed county-level withdrawal estimates published by the USGS on-line at: http://water.usgs.gov/watuse/data/2010/index.html. The USGS data also include estimates of the total county population served by PWS as well as county estimates of irrigated acreage. Much of the data compiled by the USGS for Illinois was provided by IWIP. Data from IWIP were provided to INTERA by Conor Healy. Pat Mills compiled the 2010 Illinois data for the USGS, including estimations for irrigation and agricultural sector withdrawals. Mr. Mills also provided insight to the data via personal communication on several occasions.

Comparison of 2005 and 2010 reported withdrawals

Except for the Commercial and Industrial (C&I) sector, withdrawals decreased or stayed approximately the same from 2005 to 2010 (Table 1). This is predominantly an effect of the difference in weather in 2005 and 2010. The year 2005 was hotter and drier than most years, while 2010 was cooler and wetter than average.

Table 1. Water sector withdrawals reported in 2005 and 2010 in the 15-county region

Sector	2005 MGD	2010 MGD
Power Generation (PG)	1,443.80	1,105.99
Irrigation (IR&AG)*	235.14	87.85
Public Water Supply (PWS)	142.98	127.77
Commercial & Industrial (C&I)**	88.54	100.35
Self-supplied Domestic	12.42	12.36
Total With PG	1,922.88	1,434.32
Total Without PG	479.08	328.33

*Excludes Aquaculture withdrawals
**Includes Mining and Aquaculture withdrawals

As an indicator of weather differences, Table 2 and Figure 2 show the normalized, or average, precipitation deficit (1985-2005) and the precipitation deficits for 2005 and 2010. The deficit for 2005 was higher than the normal in all counties, whereas, the 2010 deficits were all lower than the normal. In fact, the deficit in 2005 was on average 36 percent greater than the normal, and in 2010, the deficit was 50 percent lower than normal.

Table 2. County precipitation deficits for 2005, 2010, and the normal deficit (average deficit from 1985-2005)

County	Normal Deficit (inches)	2005 Deficit (inches)	2010 Deficit (inches)
Cass	9.86	15.31	1.85
Champaign	9.17	11.77	5.60
DeWitt	9.21	12.52	5.38
Ford	9.45	11.68	6.54
Iroquois	10.55	11.06	6.23
Logan	9.92	14.28	6.40
Macon	10.34	11.67	4.01
Mason	9.81	15.99	2.15
McLean	10.34	14.93	7.30
Menard	10.15	16.21	3.42
Piatt	9.10	11.68	4.25
Sangamon	10.15	13.60	4.31
Tazewell	10.63	14.50	5.42
Vermilion	9.17	10.90	4.44
Woodford	10.20	15.96	6.26

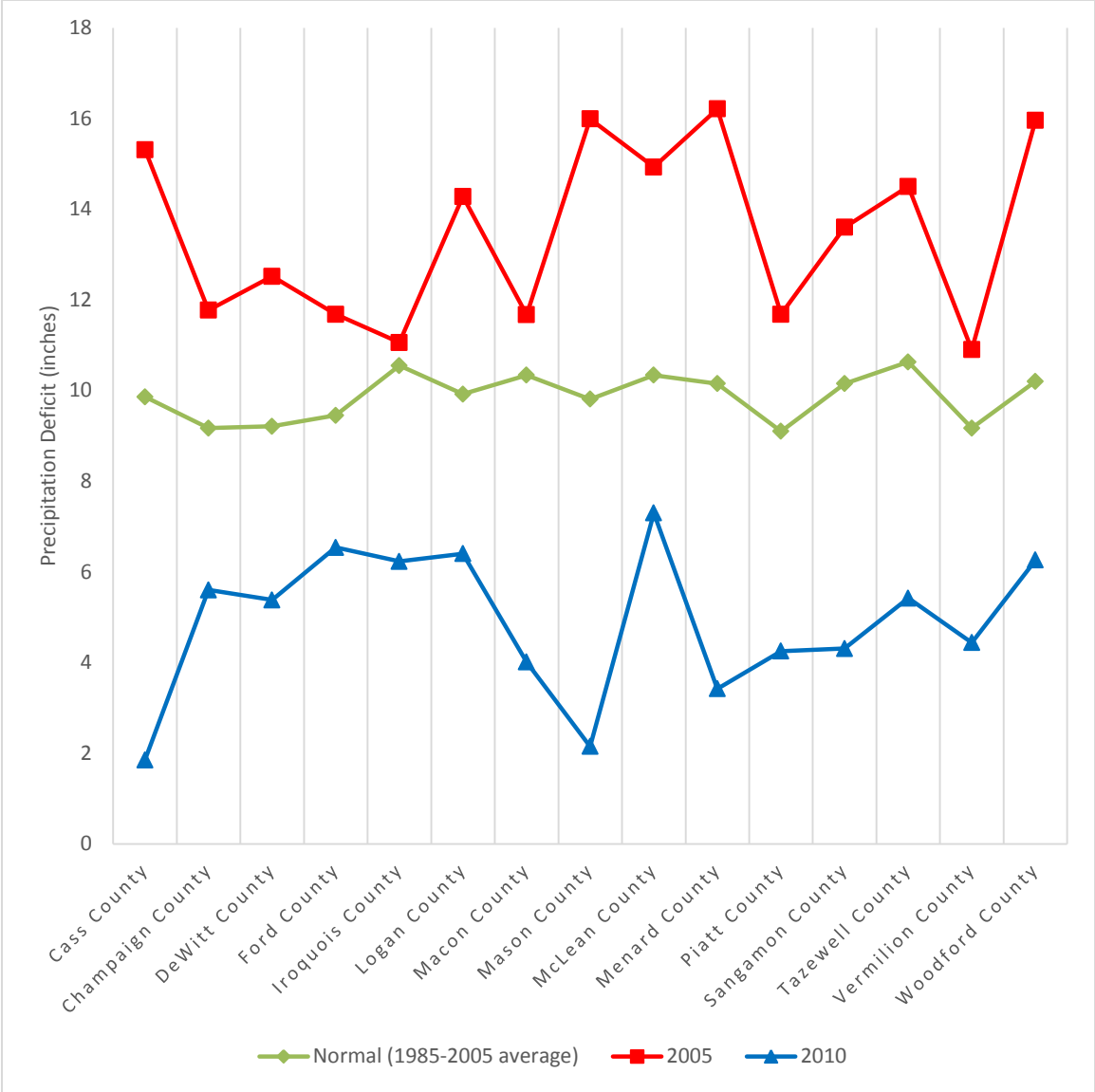

Figure 2. Normal, 2005, and 2010 county precipitation deficits

The extreme weather difference between these two years is likely a major factor for differences in water withdrawals. When the weather is hot and dry, demand increases. This is particularly evident in the irrigation sector because irrigators must compensate for the lack of rain to ensure the survival of their crops. In 2005, irrigation withdrawals were over double what was reported in 2010 (Table 1). Demand also increases in the public supply sector in hot years because people use more water for lawn and garden watering and recreation. Similarly, cooling requirements in hotter, dryer weather require greater withdrawals in the C&I and Power Generation (PG) sectors. As a result, withdrawals decreased in each county for nearly every water use sector (Table 3).

While it is generally accepted that energy demand increases when it is hotter and drier, it is difficult to correlate local power demand with local power generation. Due to the nature of the electric power market, it cannot be assumed that an increased demand for power inside the study

area will be met with power generated inside the study area. However, a decrease from 2005 to 2010 was seen in all of the power facilities, which may be, in part, due to weather effects.

A more detailed discussion comparing the USGS estimated 2010 water withdrawals with the WHPA model scenario withdrawals for each water-use sector is presented in the following sections. While a short description of model inputs is provided in each section, the reader is encouraged to review the original water demand report (WHPA, 2008). For the IR&AG and PWS sectors, model scenario withdrawals were recalculated with known 2010 input variables.

Table 3. USGS reported county withdrawals by water-use sector in 2005 and 2010 (mgd)

County	PWS		Self-Supplied Domestic		PG		C&I*		IR&AG**	
	2005	2010	2005	2010	2005	2010	2005	2010	2005	2010
Cass	1.53	1.04	0.34	0.23	--	--	1.83	1.68	16.84	2.66
Champaign	26.58	25.20	1.38	1.50	--	--	5.54	2.55	5.10	3.05
DeWitt	2.91	1.25	0.45	0.42	934.6	765.21	0.00	0.00	0.93	0.17
Ford	1.67	1.48	0.27	0.28	--	--	3.09	1.52	0.90	0.66
Iroquois	2.19	2.16	0.86	0.76	--	--	0.08	0.07	2.68	2.70
Logan	3.57	2.92	0.74	0.66	--	--	1.01	9.49	2.16	0.44
Macon	23.93	23.01	0.07	0.68	--	--	15.88	15.26	0.43	0.43
Mason	0.84	0.64	0.58	0.49	109.4	31.24	4.28	6.42	160.92	59.80
McLean	11.88	11.65	1.21	1.11	--	--	0.73	0.61	2.15	1.08
Menard	0.79	0.84	0.22	0.06	--	--	0.08	0.10	2.81	1.01
Piatt	1.24	1.31	0.48	0.42	--	--	1.09	3.72	0.51	0.31
Sangamon	30.46	24.10	2.98	2.66	371.2	288.02	5.06	8.08	1.65	0.69
Tazewell	17.69	15.17	0.28	0.43	25.9	21.20	43.46	48.49	36.16	13.65
Vermilion	9.68	9.24	0.94	1.55	2.7	0.32	3.37	2.21	0.43	0.63
Woodford	8.02	7.76	1.62	1.11	--	--	3.04	0.15	1.47	0.57
TOTAL	142.98	127.77	12.42	12.36	1,443.80	1,105.99	88.54	100.35	235.14	87.85

*Includes Mining and Aquaculture withdrawals
**Excludes Aquaculture withdrawals

Power Generation Sector

"It is reasonable to expect that the future demand for electricity within the 15-county study area will change because of population growth and the concomitant increase in economic activity. The current use of electricity within the study area is difficult to determine precisely. There is no accurate or predictable correlation between local demand for power and local generation, both now and in the future, due to the nature of the electric power market. Increasing future electric demand may not be met by the six plants currently within the study area." WHPA, 2008

A corollary to the above quotation is that the six plants within the study area may serve more than the local demand. As a result, no real "predictions" of water withdrawals for power generation were made by WHPA (2008). Instead, approximate withdrawals reported for 2005 were extended to 2050 (Table 4); changes to existing and potential new plant operations were assumed to formulate lower and higher demand scenarios – note the highlighted column for 2010 and that all future scenario withdrawals are the same until 2020 with minor modifications afterward.

Table 4. Future water withdrawal scenarios for power generation (WHPA, 2008)

County	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
DeWitt	810.4	**810.4**	810.4	810.4	810.4	810.4	810.4	810.4	810.4	810.4
Mason	105.0	**105.0**	105.0	105.0	105.0	105.0	105.0	105.0	105.0	105.0
Sangamon	371.3	**331.5**	331.5	331.5	331.5	331.5	331.5	331.5	331.5	331.5
Tazewell	25.9	**25.9**	25.9	25.9	25.9	25.9	25.9	25.9	25.9	25.9
Vermilion	2.8	**2.8**	2.8	2.8*	2.8*	2.8*	2.8‡	2.8‡	2.8‡	2.8‡
Woodford	0.0	**0.0**	0.0	0.0	0.0	0.0†	0.0†	0.0†	0.0†	0.0†
Total	1,315	**1,275**	1,275	1,275	1,275	1,275	1,275	1,275	1,275	1,275

*Reduced to 1.6 mgd for LRI Scenario
‡Reduced to 0.0 mgd for LRI Scenario
†Increased to 73.5 mgd for MRI Scenario

USGS estimates of power generation (in gigawatt-hours) and water withdrawals (in million gallons per day, mgd) for 2005 and 2010 are summarized in Table 5. As presented, some power was generated in Macon County in 2005 but, according to the USGS, was classified by IWIP as a C&I withdrawal in 2010 (P.C. Mills, personal communication). No power plant exists in Woodford County currently, but a new closed-loop 650 MW plant was assumed to be built there in the future under the MRI scenario. The Lakeside Plant in Sangamon County was retired by 2010, replaced by Springfield's Dallman Plant, an undoubtedly more efficient production plant, as production went up while water use went down. There is also some uncertainty regarding the power production in Vermilion County. This plant was closed in 2011 and may have been in the process of shutting down in 2010. According to the USGS (P.C. Mills, personal communication), reports to the U.S. Department of Energy, Energy Information Administration for this plant were essentially the same for 2010 as for 2005; however, water withdrawals reported to IWIP, as

reflected in Table 5, were much lower in 2010 than 2005, suggesting power production was much lower, too. While power production was slightly greater in Mason, Sangamon, and possibly Vermilion Counties, total power production across the planning region, and hence, water withdrawals, were lower in 2010 than in 2005.

Table 5. USGS estimates of power generation and water withdrawals for 2005 and 2010

County	2005		2010	
	Power generation (gigawatt-hrs)	Water Withdrawals (mgd)	Power generation (gigawatt-hrs)	Water Withdrawals (mgd)
DeWitt	8,692.07	934.57	8,612.00	765.21
Macon	1,591.67	0.06	0.00	0.00
Mason	2,934.59	109.41	3,007.11	31.24
Sangamon	2,292.56	371.24	2,552.00	288.02
Tazewell	9,468.95	26.21	9,013.20	21.2
Vermilion	633.27	2.71	687.46	0.32
Woodford	0.00	0.00	0.00	0.00
Total	25,613.11	1,444.20	23,871.77	1,105.99

The estimated and scenario water withdrawals for Power Generation are presented graphically in Figure 3. While there is a very general agreement, the WHPA scenario withdrawals, by somewhat mirroring the 2005 reported withdrawals, consistently overestimated the 2010 reported water withdrawals. This is a result of decreased energy demand in 2010, possibly due to milder weather in 2010 than in 2005, and to the general economic downturn experienced across the U.S. and Illinois. It is also possible some 2010 power demand was met by the numerous wind power generators in the region. Further, as mentioned earlier, the nature of the U.S. energy market is such that local electrical power demand is not necessarily related to the local energy production and vice versa.

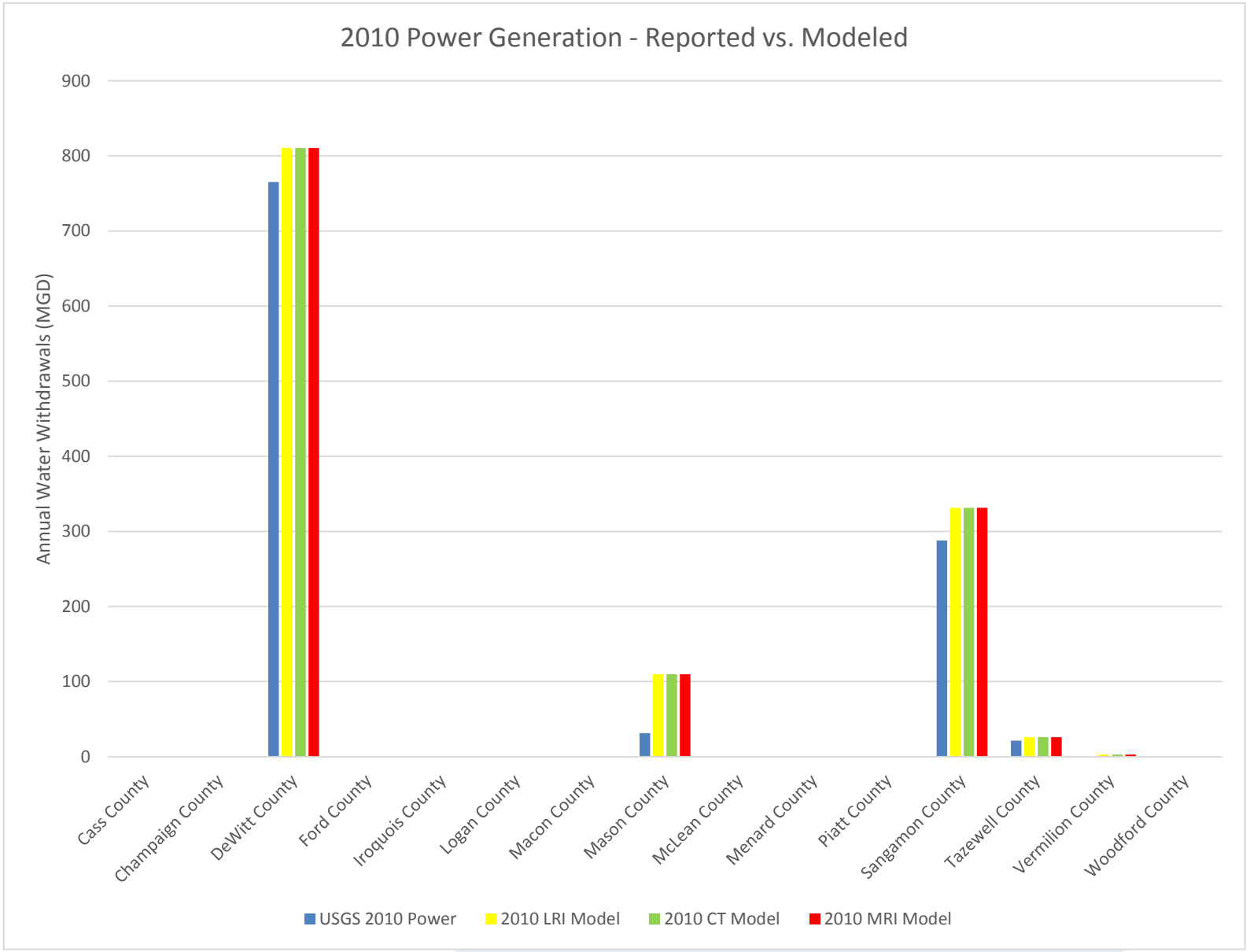

Figure 3. 2010 USGS estimated and WHPA model scenario PG withdrawals.

Self-Supplied Commercial and Industrial Sector

Typically, water withdrawal projections for self-supplied commercial and industrial (C&I) uses are forecast in terms of production factors such as the number of units produced and the amount of water needed per unit produced. An example of this is the amount of water needed to produce a gallon of ethanol (EtOH), from 3 to 5 gallons of water per gallon of EtOH produced; these assumptions were used in the placement of surrogate industrial plants to simulate future industrial growth in selected study area counties (Table 6). Recall that to account for potential new water intensive industries in the region, several ethanol plants were introduced as surrogates in the WHPA C&I scenario models. Existing IEPA air permits for new ethanol facilities provided the locations and water withdrawals for the model resulting in the addition of four new water intensive industries and the expansion of two existing industries.

Table 6. Ethanol plants included in the 2010 model for self-supplied C&I withdrawals (WHPA, 2008)

Proposed Ethanol Plants	Ethanol Production (Mgal/yr)	LRI Model [3 gal/gal EthOH] (Mgd)	CT Model [4 gal/gal EthOH] (Mgd)	MRI Model [5 gal/gal EthOH] (Mgd)
Champaign – Champaign Co.	125	1.03	1.37	1.71
Danville – Vermilion Co.	118	0.97	1.29	1.62
Gilman – Iroquois Co.	118	0.97	1.29	1.62
Gibson City – Ford Co.	118	0.97	1.29	1.62
Pekin Exp. 05 -Tazewell	57	0.47	0.62	0.78
Pekin Exp. 06 – Tazewell	108	0.89	1.18	1.48

Unfortunately, for many products water inputs are unknown or proprietary. As a result, other factors are used. In the case of the WHPA (2008) study, model inputs included weather-related variables (annual cooling degree days and summer precipitation) and selected business employment figures (health services, retail, and manufacturing) to calculate a quantity of water used per employee for various types of businesses. Population employment and water use estimates per employee were not evaluated for this project. Rather than examining model inputs, a simple comparison between the USGS estimates of 2010 C&I withdrawals and the WHPA scenario C&I withdrawals is presented. Where major differences exist, explanations are provided.

Table 7 summarizes that comparison and includes the USGS C&I estimated withdrawals for 2005. These data are displayed in Figure 4; an explanation for differences is provided in Table 8.

Table 7. USGS 2005 and 2010 estimated and WHPA 2010 scenario C&I withdrawals

County	USGS Est. Withdrawals (mgd)		WHPA 2010 Scenario Withdrawals (mgd)		
	2005	2010	LRI	CT	MRI
Cass	1.83	1.68	1.37	1.55	1.90
Champaign	5.54	2.55	5.65	6.60	8.13
DeWitt	0.00	0.00	0.01	0.02	0.02
Ford	3.09	1.52	3.66	4.34	5.35
Iroquois	0.08	0.07	1.07	1.40	1.75
Logan	1.01	9.49	0.80	0.91	1.12
Macon	15.88	15.26	14.29	16.16	19.85
Mason	4.28	6.42	3.05	3.45	4.24
McLean	0.73	0.61	0.38	0.43	0.53
Menard	0.08	0.10	0.00	0.00	0.00
Piatt	1.09	3.72	0.94	1.06	1.31
Sangamon	5.06	8.08	4.19	4.74	5.82
Tazewell	43.46	48.49	29.07	33.16	40.77
Vermilion	3.37	2.21	3.29	3.92	4.85
Woodford	3.04	0.15	0.01	0.01	0.02
TOTAL	**88.54**	**100.35**	**67.78**	**77.75**	**95.66**

In their published estimates for withdrawals, the USGS maintains a separate category for Mining withdrawals. Because IWIP and WHPA (2008) include mining withdrawals in the C&I withdrawals, the USGS Mining withdrawals were added to their C&I withdrawals to produce the numbers summarized here. Further, when IWIP included power plants and golf courses in their C&I sector raw data, those withdrawals were removed for this sector summary. Also, the USGS considers fish hatcheries as Aquaculture and categorizes those withdrawals in the Irrigation and Agriculture (IR&AG) sector while IWIP, and hence the WHPA scenarios, includes those withdrawals in C&I. This is principally an issue in Mason County and because Aquaculture withdrawals are not a part of the WHPA structural model for IR&AG, were moved to the C&I sector for this summary.

Examination of Table 7 and Table 8 shows general agreement between what was reported by the USGS and the WHPA C&I scenario model for most counties, with reasonable explanations for most differences (Table 8). Reasons for major differences between the USGS reported and WHPA modeled withdrawals include a) the expansion or reduction of C&I facilities, including year-to-year production variability, b) variable withdrawals in response to the weather, c) attribution of the reported withdrawal to a different water use sector (e.g., C&I vs. IR&AG), and d) non-reporting of annual withdrawals by an industry or industries. These reasons are difficult to predict, yet the WHPA model did reasonably well.

Although four new EtOH plants were projected in the scenario withdrawals, only one of the plants was actually built in Ford County using roughly the amount of water prescribed in the model; an existing plant in Tazewell County reported significantly increased withdrawals, greater than the 1.80 mgd total attributed to the two plant expansions shown in Table 6.

The counties with the most extreme differences were due to either sudden reported increases or decreases in withdrawals or users not reporting their withdrawals (the USGS is not allowed to contact a user directly, so without supporting input from IWIP must accept a non-report as a zero

withdrawal). In Champaign and Ford Counties, for example, one company with facilities in both counties has not reported their withdrawals since 2006, an interesting dilemma in that their withdrawals through 2005 were a part of the C&I structural model for those counties. Addition of their last reported withdrawals to the USGS 2010 estimate produces a number close to the 2010 CT model withdrawal (for Champaign County, the surrogate EtOH withdrawal should be subtracted from the CT model, while for Ford County, the CT model includes a surrogate EtOH plant whose assigned water withdrawal is very similar to the actual built facility).

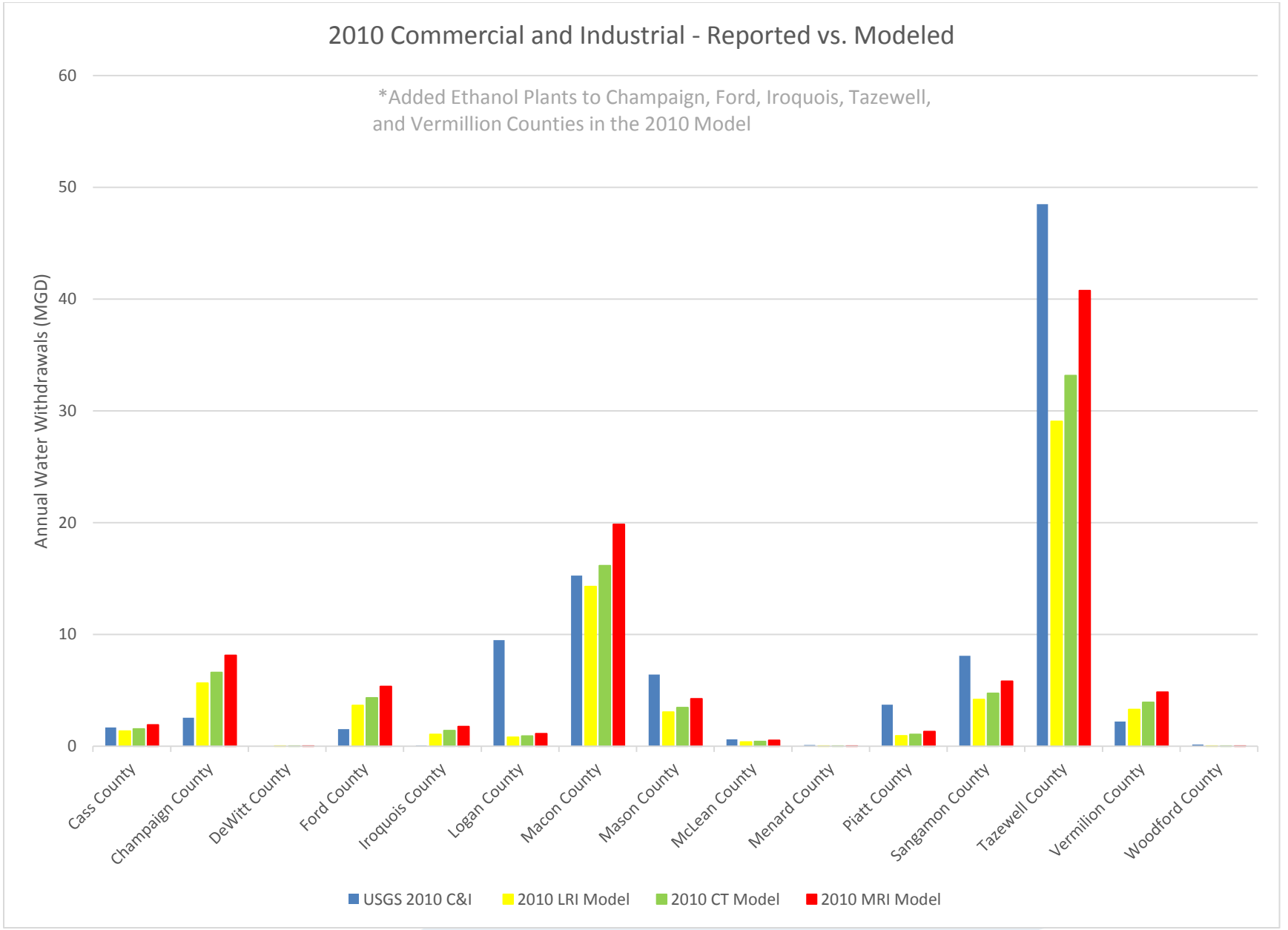

Figure 4. 2010 USGS estimated and WHPA model scenario C&I withdrawals.

Table 8. Comparison of estimated self-supplied commercial & industrial withdrawals

County	2005 USGS (mgd)	2010 USGS (mgd)	2010 IWIP* (mgd)	2010 CT model (mgd)	2011 IWIP* (mgd)	Explanation of major differences between modeled and reported 2010 C&I withdrawals
Cass	1.83	1.68	1.77	1.55	1.73	No major difference.
Champaign	5.54	2.55	3.4	6.60	2.76	Model included 1.4 mgd surrogate EtOH plant. Major user reported 2.7 mgd in 2005 & 2.4 mgd in 2006 has not reported since.
DeWitt	0.00	0.00	0.04	0.02	0.02	No major difference.
Ford	3.09	1.52	4.5	4.34	1.46	Model included 1.3 mgd surrogate EtOH plant which is close to actual EtOH plant Q. Major user of ~3mgd has not reported since 2006.
Iroquois	0.08	0.07	0.003	1.40	0.003	Included 1.3 surrogate EtOH plant.
Logan	1.01	9.49	9.56	0.91	1.07	One facility increased withdrawals between 2006 and 2010 to ~8-10 mgd per year. In 2011 & 2012, reported Q decreased to ~ 1 mgd.
Macon	15.88	15.26	15.26	16.16	15.03	No major difference.
Mason	4.28	6.42	4.44	3.45	2.34	Fish hatchery Q ~ 3.5-4 mgd classed as IR&AG by USGS added here
McLean	0.73	0.61	0.26	0.43	0.26	Reported withdrawals ranged from 0.20-0.42 mgd from 2005 – 2012.
Menard	0.08	0.10	0.00	0.00	0.00	No I/C withdrawals in the county.
Piatt	1.09	3.72	3.74	1.06	3.52	Sudden 2.5 mgd increase in 2010 withdrawal from a single existing water user that has continued thru 2012.
Sangamon	5.06	8.08	8.08	4.74	8.08	In 2009, a facility doubled its reported water withdrawals, accounting for the difference.
Tazewell	43.46	48.49	49.01	33.16	40.89	CT model included 1.8 mgd surrogate EtOH plant; even so, 2010 was an anomalously high withdrawal year. In 2005, top 3 users = 41.4 mgd, averaged 39.4 mgd from 2006-2009, then topped 45.9 mgd in 2010.
Vermilion	3.37	2.21	1.21	3.92	3.26	Model included 1.3 mgd surrogate EtOH plant; existing user reduced its withdrawals beginning in 2009.
Woodford	3.04	0.15	0.6	0.01	0.00	No major difference.
TOTAL	88.54	**100.35**	101.87	**77.75**	77.16	

IWIP = Illinois Water Inventory Program, CT scenario = Current Trends model scenario
**IWIP data manually edited using annual data from 2005 - 2012*

Irrigation and Agriculture Sector

The irrigation and agriculture (IR&AG) sector includes water withdrawals for row and specialty crop irrigation, nurseries, golf courses, and livestock watering (including cattle, sheep, goats, hogs, poultry, dairy, and horses). By far, the greatest percentage of the IR&AG sector withdrawals in the study area is attributable to row crop irrigation, accounting for roughly 95 percent of the estimated IR&AG withdrawals by the USGS in 2010 (Table 9). Irrigation in Mason and Tazewell Counties alone accounts for 85 percent of the IR&AG total and 90 percent of the irrigation withdrawals in the study area.

As mentioned in the C&I discussion, the USGS considers aquaculture as part of the IR&AG sector; however, IWIP generally classifies such withdrawals in the C&I sector. This means that the WHPA IR&AG structural model did not include aquaculture. Therefore, to maintain consistency within the context of this report, when a known aquaculture withdrawal was found, it was removed from the IR&AG county total and moved to the C&I sector for that county. In reality, this only occurred in Mason County for the state fish hatchery withdrawals.

Because of the overwhelming influence of row crop irrigation withdrawals on IR&AG sector estimates, the IR&AG scenario model results are greatly dependent on two principal factors: irrigated acreage and summer precipitation deficit. Unfortunately, irrigated acreage data are difficult to acquire and highly uncertain. And, as one might expect, irrigated acreage is highly variable in response to summer rainfall. Figure 5 presents irrigated acreage estimates from two arms of the U.S. Department of Agriculture, the Illinois Farm Services Administration (USDA-ILFSA) and the National Agricultural Statistics Service (USDA-NASS). The ILFSA data are based on direct accounting of irrigated acreage while the NASS data is based upon a statistical approach. USGS irrigated acreage data are also shown and is primarily based on ILFSA data when available. In addition the irrigated acreages for the WHPA model scenarios are presented – the models propose an asymptotic growth to assumed maximums by 2050. One can see how irrigated acreage changes from year to year, and how low the acreage was in 2010 compared to 2005 and especially to 2013, reflecting the hot, dry summers of 2005 and 2013 compared to a cooler and wetter than normal 2010. The NASS reported irrigated acreage for 2012 was about equal to USGS 2010 and ILFSA 2007 estimates, but lower than the 2011 ILFSA estimate. Given the severe drought conditions across the region and the state in 2012, one would expect a much higher number in 2010. Such differences reflect the uncertainty involved in providing consistent estimates for irrigated acreage.

The first two columns in Table 9 present the “normal” summer precipitation deficit and the 2010 summer precipitation deficit as calculated by the USGS. Rainfall deficits are calculated by accumulating weekly precipitation deficits or surpluses over the consecutive weeks of the May 1 to August 31 irrigation season for each county. The details of this calculation are presented on pages 165-166 of WHPA (2008). The average of this calculation over the 20-year period from 1985-2005 is termed the “normal” deficit and can be considered the number of inches of irrigation water that are applied on average (these calculations do not, however, consider other major variables influencing irrigation applications such as soil type or other weather-related conditions like temperature and wind). According to WHPA (2008), the calculated 2005 rainfall

deficits were generally greater than any of the other historical years (Table 9). The 2010 summer precipitation deficits can be seen to have been far below the average (Figure 2 and Table 9).

Because irrigation withdrawals are not consistently reported to IWIP, the USGS calculates estimates of county irrigation amounts by multiplying county-averaged precipitation deficits by the estimated county irrigated acreages (Table 9). The lone exception is for Mason and Tazewell Counties where the Imperial Valley Water Authority (IVWA) estimates withdrawals within the Authority based on their local electrical cooperative power consumption. Rather than calculate irrigation withdrawals for these two counties, the USGS accepts the IVWA estimates as a reported irrigation withdrawal and incorporates the IVWA into their county-level IR&AG sector data.

Inspection of Table 9 reveals the difference between the USGS estimated 2010 IR&AG withdrawal and the WHPA CT scenario model result. Comparison of the USGS 2010 estimate and all IR&AG scenario model withdrawals is presented in Figure 6. There is generally poor agreement between the USGS estimated IR&AG withdrawals and the WHPA modeled 2010 withdrawals. Such differences are readily understood considering the CT scenario model uses the 2010 CT irrigated acreage of Figure 5 and the normal precipitation deficits presented in the second column of Table 9.

When the model equation is recalculated using the actual 2010 precipitation deficit (third column of Table 9) and 2010 reported county irrigated acreages, the CT model estimated IR&AG withdrawals agree fairly well with the USGS estimated withdrawals (Figure 7 and Table 9) – note that the recalculation greatly reduces the modeled IR&AG withdrawals such that the vertical axes on Figures 6 and 7 are not the same scale. The model does not, however, reproduce the IR&AG estimated withdrawals for Mason and Tazewell Counties very well because the WHPA model was not calibrated on the IVWA data. This disagreement could be improved in several ways by including 1) a factor for soil type - the WHPA IR&AG model does not include any input for the sandy soil types of Mason and Tazewell County which require more irrigation application than the rest of the study area, and 2) an expanded summer precipitation deficit period to include September and October – the current model includes the May 1 through August 31 irrigation period, but the IVWA has often included September and October deficits. These two factors could be combined to simulate past IVWA withdrawal estimates, possibly in combination with a correction factor, to simulate the IVWA estimates.

Table 9. Comparison of precipitation deficits and estimated and modeled IR&AG withdrawals

County	"Normal" Summer Precipitation Deficit (in)	2010 Summer Precipitation Deficit (in)	USGS 2010 IR&AG Estimated Q (mgd)	WHPA 2010 CT Scenario IR&AG Q (mgd)	Recalculated 2010 CT Scenario IR&AG Q (mgd)
Cass	9.86	1.85	2.66	14.0	2.73
Champaign	9.17	5.60	3.05	5.0	2.74
DeWitt	9.21	5.38	0.17	0.8	0.17
Ford	9.45	6.54	0.66	0.8	0.54
Iroquois	10.55	6.23	2.70	2.7	2.34
Logan	9.92	6.40	0.44	1.7	0.45
Macon	10.34	4.01	0.43	0.3	0.17
Mason	9.81	2.15	59.80*	95.4	17.91
McLean	10.34	7.30	1.08	1.7	0.85
Menard	10.15	3.42	1.01	2.5	1.03
Piatt	9.10	4.25	0.31	0.4	0.23
Sangamon	10.15	4.31	0.69	1.3	0.54
Tazewell	10.63	5.42	13.65	33.9	16.88
Vermilion	9.17	4.44	0.63	0.6	0.49
Woodford	10.20	6.26	0.57	1.2	0.51

*Excludes ~3.21 mgd for state fish hatchery (aquaculture) which is included in USGS IR&AG estimates but is classed as C&I by IWIP and so was not part of the WHPA model for the IR&AG sector.

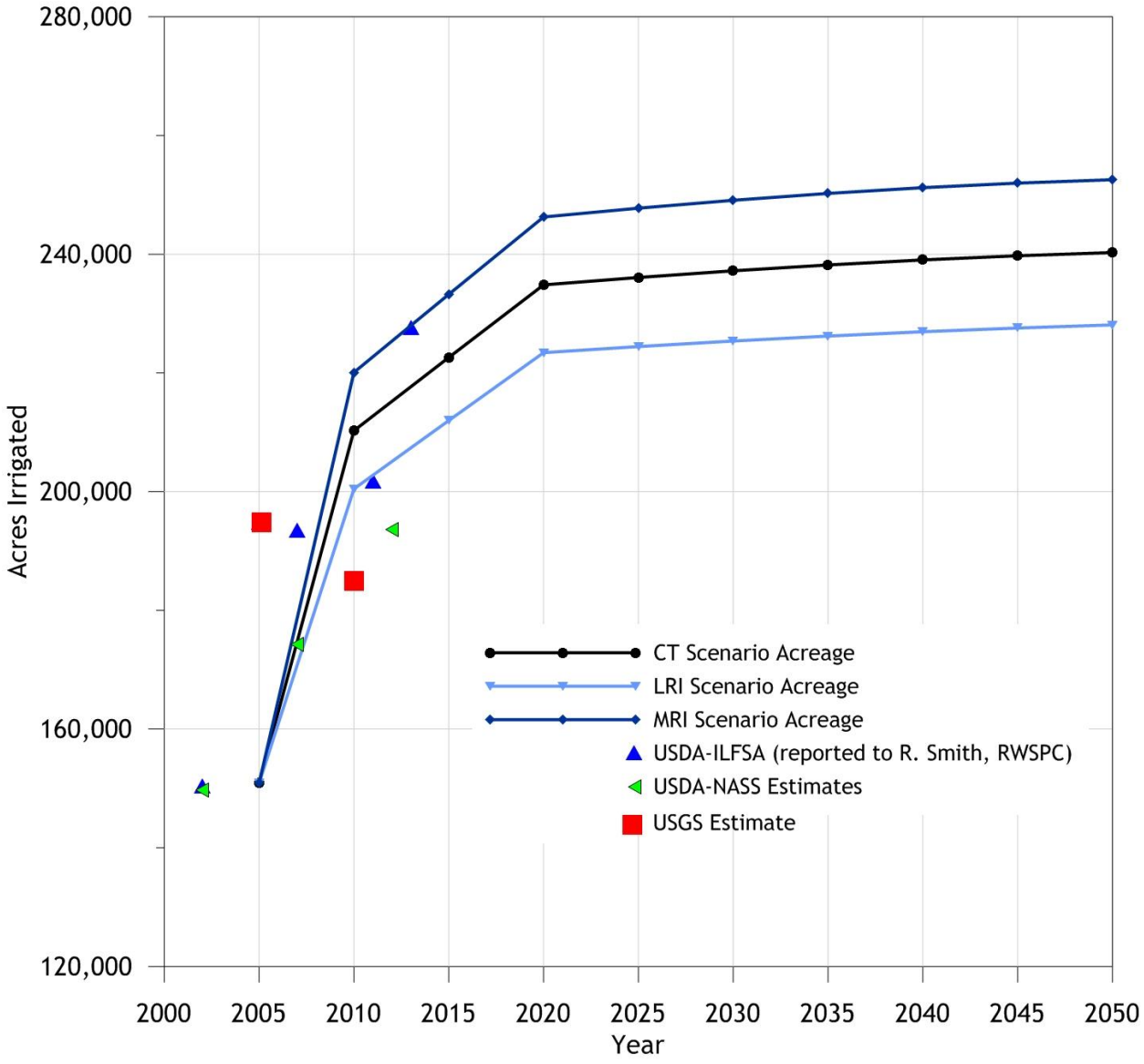

Figure 5. Reported and model scenario irrigated acreage in the 15-county study area.

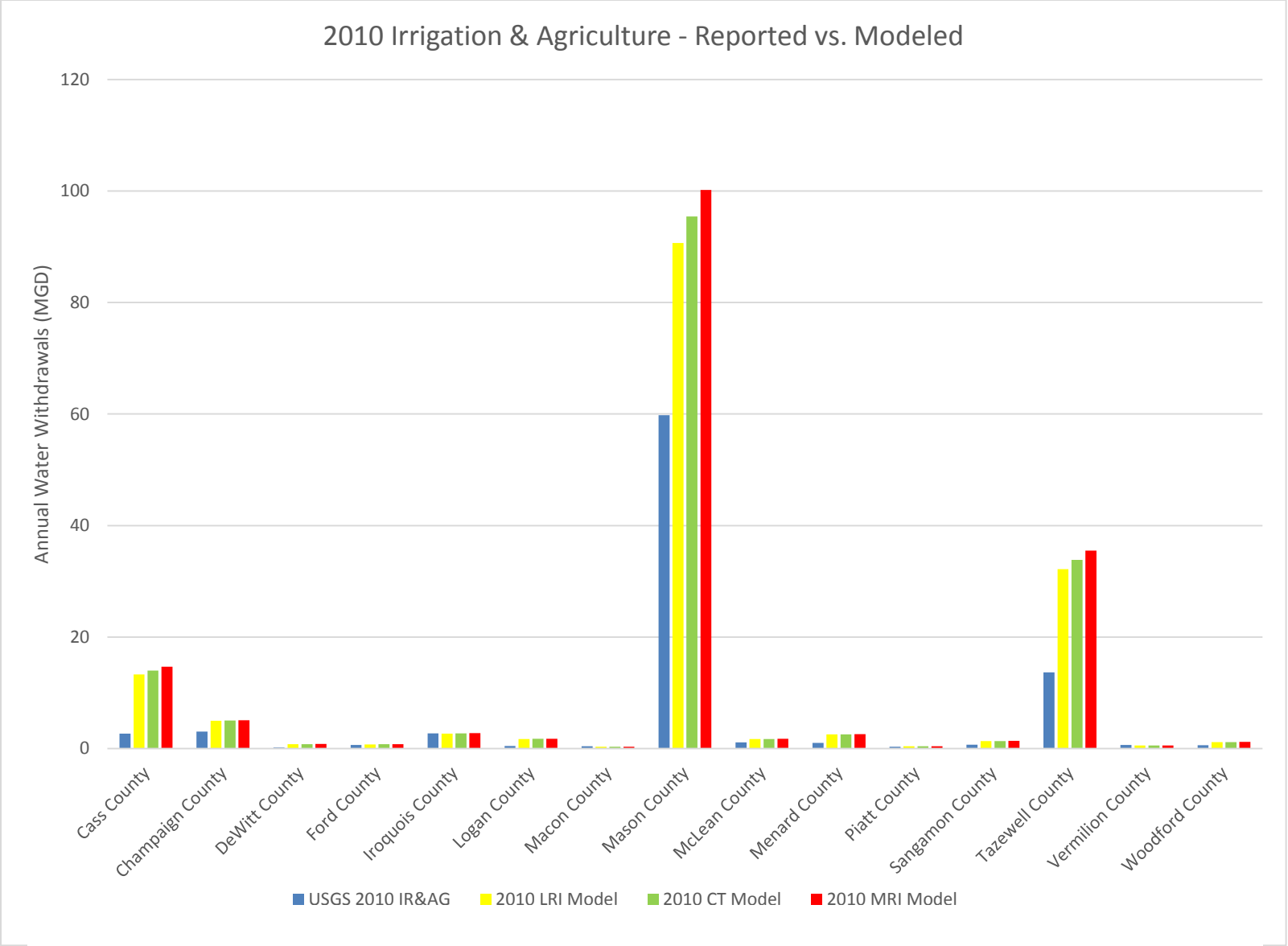

Figure 6. 2010 USGS estimated and 2010 WHPA model scenario IR&AG withdrawals.

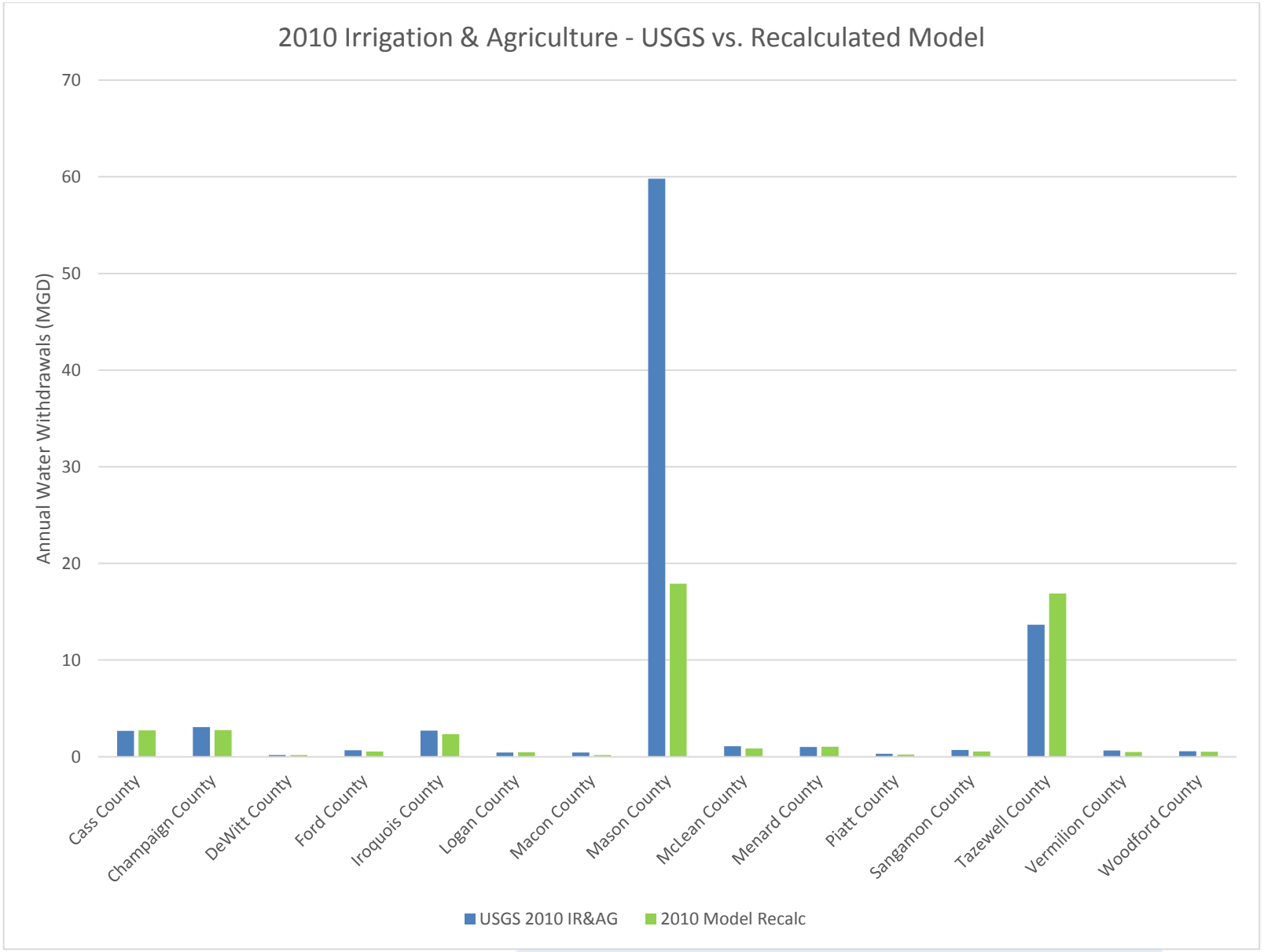

Figure 7. 2010 USGS estimated and recalculated WHPA CT model scenario IR&AG withdrawals. Note the change in vertical scale from Figure 6.

Public Water Supply Sector

As discussed in great detail by WHPA (2008), the principal variables used in the Public Water Supply (PWS) demand model were population served, air temperature, precipitation, employment fraction, price of water, median household income, and a "conservation trend". The principal demand driver, accounting for 97 percent of the variability in PWS withdrawals, is *population served.* This factor was of particular interest because with USGS county-level population served estimates, it is the one readily available input variable to the model to allow recalculation of the 2010 PWS scenario withdrawals.

The WHPA PWS model used population served (by public supply) derived from Illinois Department of Commerce & Economic Opportunity (DCEO) projections of population. Those county-level DCEO projections along with the 2005 and 2010 Census data are presented in Table 10. Excepting Vermilion County, the DCEO consistently projected population growth, often exceeding actual growth, and never population declines. This has direct correlation to the population served estimates and, therefore, PWS modeled scenario withdrawals.

Table 11 presents the U.S. Geological Survey (USGS) estimates of total PWS withdrawals for each county for 2010, the model scenario PWS withdrawals for 2010 (from WHPA, 2008), and recalculated scenario PWS withdrawals for 2010 updated with the USGS estimates of 2010 population served. Figure 8 and Figure 9 graphically present the comparisons between the USGS estimated withdrawals and scenario predictions (Figure 8) and scenario recalculations (Figure 9).

Overall, the PWS scenario withdrawals compare well with the USGS 2010 PWS withdrawal estimates. PWS withdrawals within the 15-county study area totaled an estimated 127.8 mgd while the 2010 predictions by WHPA (2008) ranged from 129.9 to 132.6 mgd and the recalculated model withdrawals ranged from 127.8 to 130.4 mgd. Both prediction estimates are within 5 percent of the USGS estimated 2010 PWS withdrawal.

Absolute differences (i.e., in mgd) can be somewhat misleading in that a small difference in withdrawal may actually represent a large relative difference to the total county withdrawal. Table 12 presents the model differences from the USGS estimate as a percent. Many county model PWS results are within 10 percent of the USGS 2010 estimate. These include Champaign, McLean, Piatt, and Woodford Counties for both the original model estimate and the recalculated model estimate. County PWS withdrawal predictions that fell outside the 10 percent range but improved to less than 10 percent upon recalculation include: DeWitt, Ford, Iroquois, Macon, Mason, and Tazewell. Three county predictions were within 10 percent of the actual, but fell outside the 10 percent range upon recalculation: Menard, Sangamon, and Vermilion. While the original 2010 model scenarios, as well as the model scenario recalculations, were within 1 mgd of actual, Cass County's actual withdrawal was only 1.04 mgd, leaving the modeled withdrawals on the order of 80 percent over the actual. We have no ready explanation for this.

Actual population changes that did not follow moderate growth forecasts provided by the DCEO for the regional water supply planning studies are one reason for why the model predictions do not match actual PWS withdrawals. Even the moderate growth rates predicted by DCEO for 2010 did not mirror population decreases in many counties in the study area (Table 10).

Table 10. County Census and DCEO projected populations

County	2005 Census Population	2010 Census Population	DCEO Projected 2010 Population	Actual Population Change (%)	Projected Population Change (%)
Cass	13,898	13,642	14,722	-1.84	5.93
Champaign	184,905	201,081	194,234	8.75	5.04
DeWitt	16,617	16,561	17,885	-0.34	7.63
Ford	14,157	14,081	14,706	-0.54	3.88
Iroquois	30,677	29,718	32,524	-3.13	6.02
Logan	30,603	30,305	31,353	-0.97	2.45
Macon	110,167	110,768	111,957	0.55	1.62
Mason	15,741	14,666	16,615	-6.83	5.55
McLean	159,013	169,572	168,611	6.64	6.04
Menard	12,738	12,705	13,598	-0.26	6.75
Piatt	16,680	16,729	17,023	0.29	2.06
Sangamon	192,789	197,465	195,115	2.43	1.20
Tazewell	129,999	135,394	139,616	4.15	7.40
Vermilion	82,344	81,625	78,181	-0.87	-5.06
Woodford	37,448	38,664	39,362	3.25	5.11
TOTAL	***1,047,776***	***1,082,976***	***1,085,502***	***3.36***	***3.60***

Further, there is much uncertainty in the population served data. Oftentimes, the IWIP data show communities reporting the same population served for many years in a row. In some cases, the population served reported to IWIP is less than the Census population. And for PWS facilities serving multiple communities, it is not clear whether the population served reported for that facility includes all the communities it serves. Because population served data form the basis for much of the model predictive accuracy, population served uncertainties help to explain why the recalculated model withdrawals do not always match the actual withdrawals.

New population projections, to the year 2025, have recently been prepared by the Illinois Department of Public Health (IDPH). The IDPH projections have the benefit of the 2010 Census, whereas the DCEO projections used in the planning studies to date were necessarily based on the 2000 Census, the most recent data available at that time. A comparison of the DCEO and IDPH projections is presented in Table 13. Because the PWS demand model is based upon population served, not population, no attempt was made to recalculate future PWS demand with the IDPH projections. However, it is obvious that with approximately 72,000 fewer people projected to reside in the planning region than DCEO projected for 2025, less water will be needed than was projected for PWS and, quite probably, other water use sectors as well. Note that these projections are not uniform across all the planning region counties with some counties projected to exceed DCEO population projections.

Table 11. Comparison of USGS estimated 2010 PWS withdrawals, 2010 PWS scenario estimates, and recalculated 2010 PWS Scenario estimates (in mgd)

County	USGS 2010 Estimated PWS Withdrawals (mgd)	2010 PWS Scenario Predictions* (mgd)			2010 PWS Scenario Recalculations (mgd)		
		LRI	CT	MRI	LRI	CT	MRI
Cass	1.04	1.84	1.85	1.86	1.90	1.92	1.93
Champaign	25.20	25.26	25.65	25.79	27.67	28.10	28.25
DeWitt	1.25	1.37	1.39	1.40	1.20	1.21	1.22
Ford	1.48	1.76	1.78	1.79	1.52	1.54	1.54
Iroquois	2.16	2.43	2.46	2.48	2.13	2.16	2.17
Logan	2.92	3.33	3.38	3.40	3.24	3.29	3.31
Macon	23.01	24.78	25.13	25.26	24.21	24.55	24.68
Mason	0.64	0.81	0.83	0.83	0.68	0.70	0.70
McLean	11.65	10.96	11.14	11.20	11.02	11.20	11.27
Menard	0.84	0.79	0.80	0.81	0.73	0.74	0.75
Piatt	1.31	1.17	1.19	1.20	1.18	1.20	1.20
Sangamon	24.10	22.56	22.88	23.01	21.08	21.38	21.50
Tazewell	15.17	16.89	17.14	17.24	15.96	16.20	16.28
Vermilion	9.24	8.68	8.81	8.87	7.58	7.69	7.74
Woodford	7.76	7.30	7.43	7.47	7.73	7.86	7.89
TOTAL	***127.77***	***129.94***	***131.88***	***132.60***	***127.82***	***129.74***	***130.44***

Table 12. Differences between USGS estimated 2010 PWS withdrawals, the 2010 PWS scenario estimates, and the recalculated 2010 PWS scenario estimates (in percent)

County	USGS 2010 Estimated PWS Withdrawals (mgd)	2010 PWS Scenario Prediction Differences from USGS Estimated* (%)			2010 PWS Scenario Recalculation Differences from USGS Estimated* (%)		
		LRI	CT	MRI	LRI	CT	MRI
Cass	1.04	77	78	79	83	85	86
Champaign	25.20	0	2	2	10	12	12
DeWitt	1.25	10	11	12	-4	-3	-2
Ford	1.48	19	20	21	3	4	4
Iroquois	2.16	13	14	15	-1	0	0
Logan	2.92	14	16	16	11	13	13
Macon	23.01	8	9	10	5	7	7
Mason	0.64	27	30	30	6	9	9
McLean	11.65	-6	-4	-4	-5	-4	-3
Menard	0.84	-6	-5	-4	-13	-12	-11
Piatt	1.31	-11	-9	-8	-10	-8	-8
Sangamon	24.10	-6	-5	-5	-13	-11	-11
Tazewell	15.17	11	13	14	5	7	7
Vermilion	9.24	-6	-5	-4	-18	-17	-16
Woodford	7.76	-6	-4	-4	0	1	2
TOTAL	***127.77***						

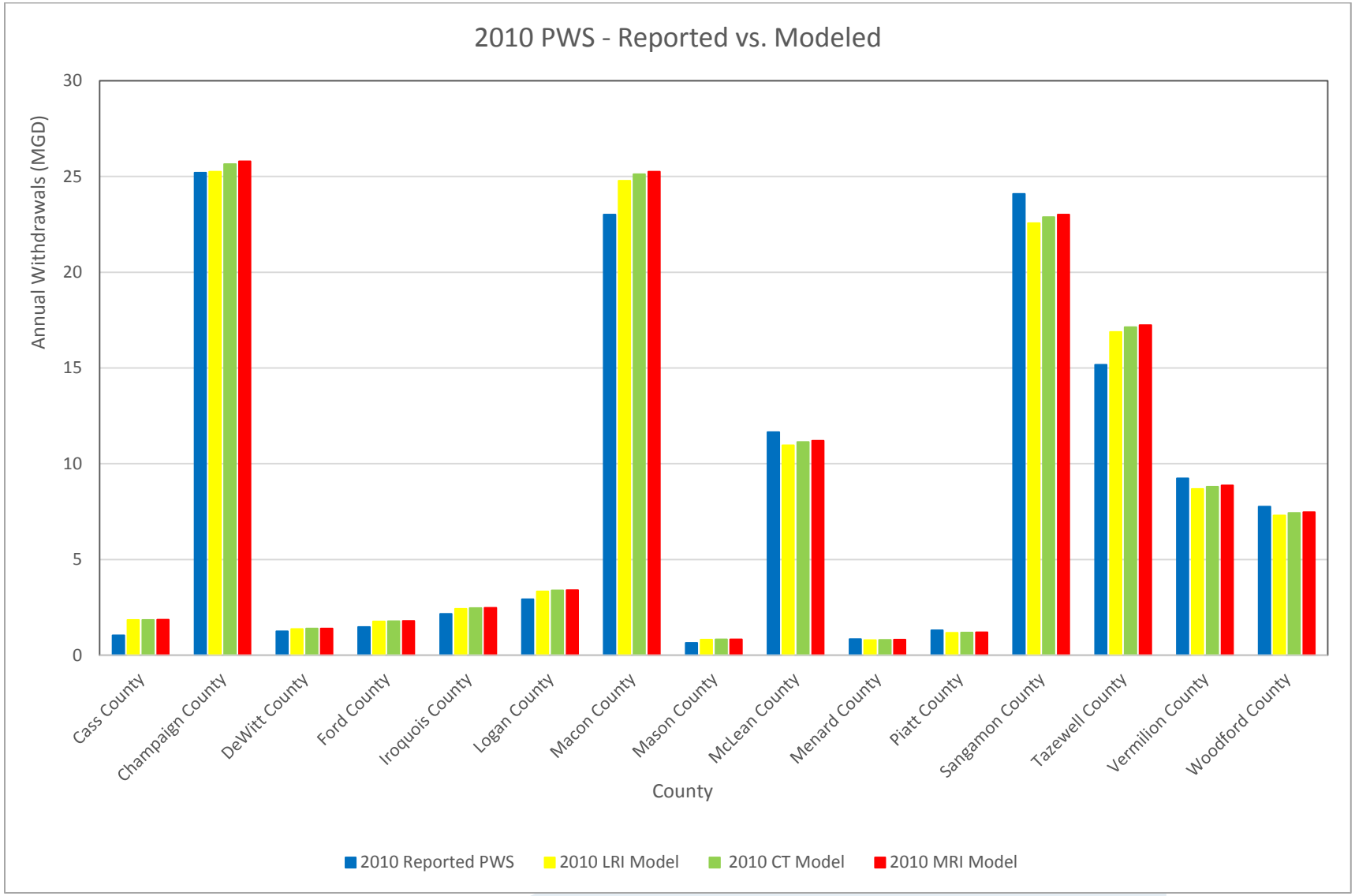

Figure 8. 2010 USGS estimated and WHPA model scenario PWS withdrawals.

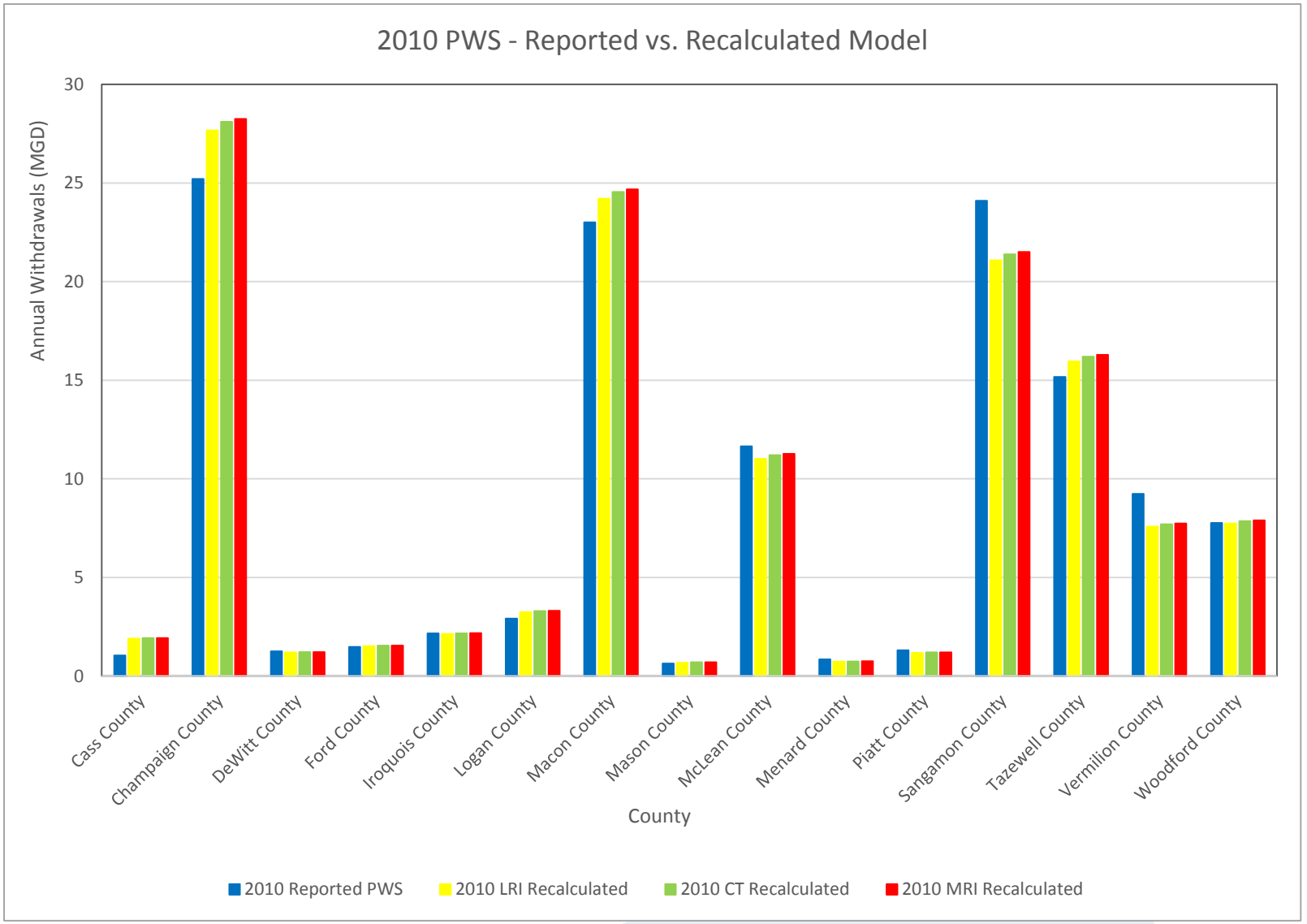

Figure 9. 2010 USGS estimated and recalculated WHPA model scenario PWS withdrawals.

Table 13. Comparison of DCEO Population Projection from 2005 and IDPH Population Projections from 2014

County	DCEO Population Projection*				IDPH Population Projection*				DCEO Projection - IDPH Projection			
	2010	2015	2020	2025	2010	2015	2020	2025	2010	2015	2020	2025
Cass	14,722	15,154	15,538	15,750	13,633	13,297	13,019	12,740	1,089	1,857	2,519	3,010
Champaign	194,234	201,770	209,833	215,425	201,370	209,054	217,734	225,625	(7,136)	(7,284)	(7,901)	(10,200)
De Witt	17,885	18,406	18,914	19,330	16,583	16,173	15,832	15,495	1,302	2,233	3,082	3,835
Ford	14,706	15,108	15,530	15,743	14,074	13,709	13,448	13,245	632	1,399	2,082	2,498
Iroquois	32,524	33,486	34,609	35,608	29,657	28,589	27,686	26,816	2,867	4,897	6,923	8,792
Logan	31,353	31,766	32,164	32,358	30,272	30,272	30,379	30,441	1,081	1,494	1,785	1,917
McLean	168,611	177,700	187,086	194,836	169,838	178,627	188,344	197,855	(1,227)	(927)	(1,258)	(3,019)
Macon	111,957	113,207	115,797	117,836	110,757	107,812	105,402	103,126	1,200	5,395	10,395	14,710
Mason	16,615	17,080	17,312	17,178	14,627	13,669	12,839	12,076	1,988	3,411	4,473	5,102
Menard	13,598	14,153	14,740	15,084	12,708	12,773	12,867	12,912	890	1,380	1,873	2,172
Piatt	17,023	17,396	17,748	17,897	16,722	16,419	16,203	16,001	301	977	1,545	1,896
Sangamon	195,115	202,158	210,672	217,252	197,822	200,127	203,502	207,195	(2,707)	2,031	7,170	10,057
Tazewell	139,616	146,850	154,567	161,456	135,439	135,699	136,051	136,438	4,177	11,151	18,516	25,018
Vermilion	78,181	77,295	77,363	78,182	81,588	79,582	77,965	76,442	(3,407)	(2,287)	(602)	1,740
Woodford	39,362	41,551	43,845	45,789	38,664	39,410	40,350	41,358	698	2,141	3,495	4,431
Total	1,085,502	1,123,080	1,165,718	1,199,724	1,083,754	1,095,212	1,111,621	1,127,765	1,748	27,868	54,097	71,959

*DCEO population projection used the 2000 Census as their basis; IDPH population projection used the 2010 Census as their basis. IDPH data source: https://data.illinois.gov/dataset/Population-Projections-2014-Edition/6u8g-w2b6

Summary and Recommendations

A comparison of USGS estimated withdrawals for 2010 with the WHPA (2008) modeled withdrawals found generally good agreement across all water use sectors. Such comparison should be viewed cautiously because there has been only one year (2010) with which to compare estimated and modeled withdrawals. Routine review of withdrawals, both actual and modeled, is a worthwhile process for not only comparing the two, but also for assessing the conditions that cause future changes in withdrawals and the assumptions and inputs to the models used in calculating the future sector withdrawal scenarios. The USGS will be estimating withdrawals again for 2015 and re-examination of the available data when the USGS has completed their work, probably in 2017 at the soonest, is recommended.

For the PG sector, future withdrawals were not actually modeled but were based on a recurrence of present withdrawals (Table 4). As mentioned, the demand for electrical power may, or may not, be generated locally; and, locally generated power may not be consumed locally. While the WHPA (2008) PG scenario withdrawals differed from the USGS 2010 estimate by 170 mgd (Table 5), such withdrawals are all derived from large surface water sources which are returned to the same source. Even so, the WHPA assumptions were within 15 percent of the USGS estimate for power generation in 2010. Closure of Dynegy's Vermilion County station will not impact the estimates to a large degree; however, potential future closure of the Clinton Power Station in DeWitt County will have a profound effect on future PG sector withdrawals.

Numerous differences were found between the 2010 USGS C&I estimated withdrawals and the WHPA modeled C&I withdrawals (Table 8). Nearly all of these differences can be accounted for as a result of unpredictable C&I facility expansion/contraction and weather impacts on C&I demand. Previous users that did not report their withdrawals to IWIP in 2010 accounted for other major differences. To improve data consistency, IWIP classification of sector withdrawals should be reconciled with USGS classifications. This would include IWIP separation of livestock, golf course, aquaculture, and nursery uses of water into a category separate from C&I.

Comparison of the USGS estimated withdrawals for IR&AG with the WHPA IR&AG sector model showed major differences due to overestimation of irrigated acreage and summer precipitation deficit as inputs to the WHPA model. However, when the 2010 irrigated acreages and 2010 summer precipitation deficits are input to WHPA IR&AG model, the model estimates agree very well with the USGS data for all counties except Mason and Tazewell. For these two counties, the USGS accepts the irrigation estimates calculated by the Imperial Valley Water Authority. If the IVWA estimates are considered reasonably close to actual, the WHPA model should be modified via calibration to the IVWA estimates. This could involve a simple multiplier, or modifications involving greater applications due to soil type and an extended irrigation season beyond May 1 – August 31. Improvements in irrigated acreage estimates by USDA, and especially in publicly reporting such acreage estimates, also will aid in IR&AG estimation. New reporting requirements for irrigators effective in 2015, as directed in the Water Use Act of 1983 amendments of 2010, should provide better estimates of irrigation withdrawals.

Because of the uncertainty in predicting summer precipitation, estimating future water withdrawals for irrigation is highly uncertain. Data uncertainties surrounding irrigated acreage

only exacerbate this problem. While the WHPA IR&AG model was able to replicate the USGS estimated IR&AG withdrawals for 2010 (excepting Mason and Tazewell Counties) when input with updated 2010 data, those results don't mean much from a planning perspective. Therefore, rather than trying to "predict" irrigation withdrawals in any particular year, it seems more appropriate to assess water resource impacts from irrigation under a range of conditions based on historical experience. Compared to 2010, 2005 was far worse from the perspective of summer precipitation deficit. The summers of 2012 and 2013 were not evaluated for this report, but those two years present greater precipitation deficits than 2005, judging from annual irrigation estimates made by the IVWA (http://imperialvalleywaterauthority.org). In addition, acreage under irrigation also has significantly increased since 2005 across the planning region. As a result, irrigation withdrawals under drought conditions, possibly a multi-year drought as was done by Clark (1994) in assessing the Imperial Valley groundwater resources, represent those for which planning needs to assess and prepare.

WHPA demand scenario PWS estimates for 2010 generally agreed with the USGS estimates. PWS withdrawals within the 15-county study area totaled an estimated 127.8 mgd while the WHPA CT scenario totaled 131.9 mgd. Recalculation of the model with 2010 estimated population served data from the USGS brought the total CT scenario withdrawal to 129.7 mgd and the LRI scenario withdrawal to 127.8 mgd, both excellent approximations of the USGS PWS estimate. Improvements to the reporting of population served, especially from utilities serving multiple communities, will tremendously help improve the accuracy and consistency of the PWS sector estimates. Based upon new population projections by the IDPH using the 2010 Census, it is quite possible that future planning region populations could be much less than projected by DCEO, approximately 71,000 fewer people than projected by DCEO in 2025. This will translate to less overall future PWS demand across the planning region than was projected in water supply planning studies to-date; however, the IDPH projections suggest the change in population growth is not uniform and some counties may, in fact, exceed the DCEO population projections.

Data Issues

Review of the WHPA (2008) report revealed a set of data issues that bear repeating and assessment given the years that have elapsed since these recommendations were made:

- All water demand sectors should report water withdrawals
- Reporting should be mandatory
- All water withdrawals should be made public
- Withdrawals should be accurately reported as withdrawals, not total water produced or used
- Monthly withdrawals should be reported
- Population served should be accurately reported annually
- Resident population estimates should be projected for the entire water supply planning period
- Employment populations should be projected for the entire water supply planning period
- Public water suppliers should report price annually
- Significant changes (large increases or decreases in annual average) in water withdrawals should be explained

Since the WHPA report was published, the Water Use Act of 1983 was amended to make reporting mandatory for all water sectors, including irrigators. Irrigators were given until 2015 to start reporting, pending approval of estimation methodologies by the Illinois State Water Survey. This essentially means the 2015 irrigation season will be the first season where irrigators across all of Illinois will be asked to report their withdrawals. IWIP acquisition of annual data typically occurs in the year following the data period, so reporting of 2015 irrigation withdrawals will occur in 2016. Although the penalty is minimal for not reporting, the Act makes such reporting mandatory. And, while the ISWS prefers point (well) withdrawal data, the Act allows collective irrigation reporting, such as total withdrawals within a county, following the methods historically practiced by the IVWA.

All other data issues remain largely unaddressed. It is unclear now that reporting is mandatory for all sectors whether individual C&I user withdrawals can be publicly released. Previously, because C&I reporting was voluntary, it was kept confidential by IWIP and was only publicly reported on an aggregate basis (such as total C&I withdrawals per township). Even though reporting is now mandatory, IWIP continues to maintain C&I confidentiality and continues to present aggregated C&I withdrawals (e.g, Hlinka et al., 2014).

Some effort is being spent to gather monthly PWS withdrawal data – such data is reported to the Illinois Environmental Protection Agency (IEPA) but remains a paper-reporting exercise. IEPA and ISWS are working to cooperatively share this data via digital submission of PWS operator reports to a shared ISWS/IEPA site. The timing of when such reporting will be finalized is uncertain, but when completed, would alleviate separate reporting of PWS withdrawals to IWIP while providing access to monthly PWS withdrawals. Monthly reporting by other sectors has not been attempted.

As has been mentioned previously in this report, population-served data are highly uncertain and not consistently reported to IWIP by PWS operators. This is especially true for utilities that serve multiple communities. Given all the other data needs that IWIP must address, this seems a minor point to emphasize, yet one that could be improved if PWS operators made an honest effort to estimate their service population. Unfortunately, most operators consider reporting of withdrawals an unrewarded task and providing accurate population served data is not a high priority.

For the past water supply planning process, resident population projections were made by DCEO to the year 2030. County level employment population projections were provided by the Illinois Department of Employment Security only to the year 2014. Inspection of the IDES web-site suggests employment projections are available to 2020, and possibly to 2022 for some industries. The water supply planning process continues to look forward to at least the year 2050 – Illinois' newly created planning regions is looking out 50 years to 2065 - but we are not aware of any employment projections to that date by either state agency.

Improving PWS model output requires improving model input. This report demonstrated how updated population served information improves the model result. Inaccuracies in population forecasting, and hence population served forecasts, decrease the accuracy of the PWS model.

The IDPH has recently completed population projections to 2025 and these projections suggest far fewer people will reside in the region than was previously projected – this will translate to less overall PWS demand than was projected. The projected population change is not uniform across the planning region with some counties projected to have a greater population than was previously projected.

The price of water, to a much lesser degree, also has an impact of how much water people use and is an input to the PWS model. This project did not attempt to acquire pricing data, simply because of the difficulty in acquiring it. However, if the water pricing schedule were more readily available, such as through IWIP or some other agency database, such data could be used to improve the model output.

An explanation of large increases or decreases in reported withdrawals by any sector user would be extremely helpful in understanding total sector withdrawals. Non-reporting of withdrawals is a problem in that in reviewing the data, one does not know if the entity involved may have actually ceased to operate. Along this same line, IWIP ought to consider in what sector certain withdrawals should be classified and reconciling such classifications with the USGS. For example, a number of entities contained in the C&I data provided to INTERA for this project looked like livestock operations which would more appropriately be classed as Agriculture in the USGS nomenclature. However, IWIP does not have an Agriculture use type in its database so such users must be "teased" out of the C&I data leading to inconsistencies in reporting.

Finally, the quote below is from the RWSPC Water Plan. While the Water Use Act amendments say that water use reporting is no longer voluntary, the data collected under the auspices of the IWIP program are as important as ever and the need for a consistent and stable funding mechanism remains.

"A comprehensive, consistent, reasonably accurate and regularly updated inventory of water withdrawals is necessary for water supply planning and management. The Illinois State Water Survey operates a voluntary water withdrawal reporting system – the Illinois Water Inventory Program. Much progress has been made and, even though some important data gaps remain and funding for the program is unstable, the Illinois Water Inventory Program remains the best source of Illinois water withdrawal data." RWSPC, 2009

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