Report as of FY2006 for 2004WI82G: "Groundwater sustainability in a humid climate: Groundwater pumping, groundwater consumption, and land use change. "

Publications

- Conference Proceedings:
  - Gotkowitz, M. 2006. Sustainable Pumping From Regional Aquifers: Quantifying Water Use. GSA National Meeting. Philadelphia. Abstracts with Programs Vol. 38, No. 7.

Report Follows

Annual Progress Report

Reporting Period: 7/1/2006 - 6/30/2007

Submitted By: Jim Hurley
Submitted: 6/19/2007

Project Title

WR04R009: Groundwater Sustainability in a Humid Climate: Groundwater Pumping, Groundwater Consumption and Land Use Change

Project Investigators

Madeline Gotkowitz, Wisconsin Geological and Natural History Survey

Progress Statement

We completed all planned data collection and analysis. Findings include:
1. Municipal wells supply 75% of the groundwater pumped in Waukesha County, where about 30% of the land is in suburban and urban development.
2. In Sauk County, where 8% of the land is similarly developed, municipal systems supply only 25% of the groundwater used in the County.
3. Growth in municipal water use over the last 75 years is highly correlated to population growth in both study areas.
4. Rates of pumping from non-municipal wells in both counties reflect historical trends in agricultural irrigation.
5. The population of Waukesha County is four times greater than Sauk County, but we estimate that total groundwater use in Waukesha County is only 20% greater than in Sauk County. This suggests that while urbanization accompanied by a reduction in irrigated agriculture reduces overall water use, it concentrates pumping within a smaller geographic region (that is, within municipal well fields).
6. We have compiled some suggestions for tracking water use that will reduce uncertainty in current estimates of groudnwater withdrawals in these settings.

We are writing the final project report and preparing a manuscript for a peer-reviewed journal.

Impacts

Description

We completed compilation of pumping records and compared these to population growth and land use change in the study areas. These provide the basis for recommendations for water use tracking in Wisconsin that will be presented in the final project report.

Interactions

Description

Hart and Gotkowitz discussed project findings with Daniel Feinstein and Cheryl Buchwald of the USGS Wisconsin Water Science Center. We discussed use of the Wisconsin high capacity well database to estimate pumping rates for the USGS's Southeast Wisconsin groundwater modeling effort.

	Alternatives to this data set include agriculture statistics compiled by the Wisconsin Agricultural Statistics Service and housing estimates compiled from U.S. Bureau of the Census data. In addition to this discussion of results, we provided Feinstein and Buchwald with the project database.
Event Date	5/4/2007

Presentations & Public Appearances

Title	Evaluating Groundwater Use in Southern Wisconsin
Presenter(s)	Rozumalski, Laura L., Madeline B. Gotkowitz, David J. Hart, Charles P. Dunning, Kenneth W. Potter
Presentation Type	Poster session
Event Name	Wisconsin Section of American Water Resources Association
Event Location	Elkhart Lake Wisconsin
Event Date	3/2/2006
Target Audience	Scientific audience
Audience Size	150
Description	

Title	SUSTAINABLE PUMPING FROM REGIONAL AQUIFERS: QUANTIFYING WATER USE
Presenter(s)	Gotkowitz
Presentation Type	Professional meeting
Event Name	GSA National Meeting
Event Location	Philadelphia
Event Date	10/23/2006
Target Audience	Scientific audience
Audience Size	100
Description	GSA Abstracts with Programs Vol. 38, No. 7.

Title	Estimating groundwater use in urban and rural areas of Wisconsin
Presenter(s)	Gotkowitz
Presentation Type	Professional meeting
Event Name	Wisconsin Section American Water Resources Assocaition
Event Location	Wisconsin Dells, Wisconsin
Event Date	3/2/2007
Target Audience	Scientific audience
Audience Size	75
Description	Our study of pumping rates in representative urban (Waukesha County) and rural (Sauk County) areas of Wisconsin illustrates the impact of withdrawals to the water budgets of regional aquifers. Although pumping rates can be measured more accurately than hydrogeologic parameters such as recharge and permeability, Wisconsin has no requirement to meter or report non-municipal groundwater withdrawals. This results in significant uncertainty about total withdrawals from the state's regional aquifers. Groundwater flow models are well-suited to evaluate sustainable use of

groundwater resources, but uncertainty in pumping rates increases uncertainty in model calibration and simulation of aquifer response to pumping.
On the basis of well records and land use information, we estimate that municipal wells supply 75% of the groundwater pumped in Waukesha County, where about 30% of the land is in suburban and urban development. In Sauk County, where 8% of the land is similarly developed, municipal systems supply only 25% of the groundwater used in the County. Growth in municipal water use over the last 75 years is highly correlated to population growth in both study areas. Rates of pumping from non-municipal wells in both counties reflect historical trends in agricultural irrigation. Currently, the population of Waukesha County is four times greater than Sauk County, but we estimate that total groundwater use in Waukesha County is only 20% greater than in Sauk County. This suggests that while urbanization accompanied by a reduction in irrigated agriculture reduces overall water use, it concentrates pumping within a smaller geographic region. We found that relatively simple improvements in tracking water use will reduce uncertainty in current pumping rates and improve our understanding of the impacts of groundwater withdrawals.

Title	GROUNDWATER PUMPING IN URBAN AND RURAL AREAS OF WISCONSIN
Presenter(s)	Gotkowitz
Presentation Type	Government briefing
Event Name	Wisconsin Groundwater Coordinating Council
Event Location	Madison, Wisconsin
Event Date	5/25/2007
Target Audience	State government agency
Audience Size	8
Description	Presented project results to administrators from Wisconsin Departments of Natural Resources, Dept. of Agriculture, Trade and Consumer Protection, Department of Transportation, and Department of Health and Family Services.

Students & Post-Docs Supported

Student Name	Jonathon Carter
Campus	University of Wisconsin-Madison
Advisor Name	Mary Anderson
Advisor Campus	University of Wisconsin-Madison
Degree	Expected Masters
Graduation Month	December
Graduation Year	2007
Department	Geology and Geophysics
Program	Hydrogeology
Thesis Title	
Thesis Abstract	

Student Name	Tara Root
Campus	University of Wisconsin-Madison
Advisor Name	Jean Bahr
Advisor Campus	University of Wisconsin-Madison
Degree	PhD
Graduation Month	August
Graduation Year	2005
Department	Geology and Geophysics
Program	Hydrogeology
Thesis Title	unrelated to current project
Thesis Abstract	unrelated to current project