Report for 2003MI31B: Investigating the Groundwater Quantity Effects on Ecosystems and Human Activities

There are no reported publications resulting from this project.

Report Follows

BASIC INFORMATION

Title: Investigating the Groundwater Quantity Effects on Ecosystems and Human Activities
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Primary PI: William J. Northcott, Asst. Professor, Dept. Ag Engineering
Co-PI: Steve Miller, Institute of Water Research and Dept. Ag Engineering
Other PI's: Pamela Hunt, Research Assistant, Institute of Water Research

Investigating the Groundwater Quantity Effects on Ecosystems and Human Activities

By Pam Hunt

Project Relevance

The Michigan Legislature enacted water use and natural resources legislation entitled Public Acts 148 and 177 of 2003. Public Act 148 of 2003 addresses water use themes and Public Act 177 concentrates on aquifer protection and dispute resolution. "With no regulation, Michigan landowners maintain virtually own all rights to the water underneath their property" stated in a fiscal analysis by Jessica Runnells. However, Michigan citizens are being confronted with water use conflicts within the State. Cases brought to light in the news include; agricultural irrigation is being singled out as dewatering the local water supplies in Saginaw and Monroe Counties, the high capacity water withdrawals by a recently built water-bottling plant has been accused by a citizen's group of harming and most likely will harm the environment, and toxic levels of contaminants in nearby domestic wells have been traced to rock mining operations lowering the water levels. The distribution of water use data and subsequent educational materials are needed for dissemination for policy-makers to formulate plans and enact further legislative initiatives plus allowing the citizens to understand the policies and need for legislation.

Project Objectives and Deliverables

Based on the legislative initiatives, the public's knowledge of known water use conflicts, and a steering committee recommendation, one outreach material focused on reporting water use data compiled by the Michigan Department of Environmental Quality into a county and watershed format in a web site maintained by IWR-MSU. Michigan water use data can be retrieved by years, 1997-2001, for the five major sectors of water withdrawal: Thermoelectric Power

Generation, Public Water Supply, Self Supplied Industrial, Agricultural Irrigation, and Golf Course Irrigation. This site sorts the water withdrawal data by location and then respectively by category and years. The URL address is http://www.hydra.iwr.msu.edu/iwr/wateruse/index.html.

Due to the awareness of the hydrological relational properties of water quantity and quality by the local units of government and citizens groups (for example, watershed management organizations), a handout was created to indicate programs sponsored by the Federal and Michigan agencies to protect and manage their water resources at the local level. This material collates the varied programs in one document to serve as a one-stop shopping approach for best management practices, conservation easements, ordinance examples, planned units developments, wetlands and many other water-related topics. Many of these programs are supplemented by grant monies allotted for the restoration or facilitation of managing their resources.

Future Plans

Updating and entering the next year's available water use data to the MSU-IWR web site on an annual basis. The web site would be enhanced with graphical charts to illustrate the water withdrawal rates for each county or watershed selected.

The next step is to create a web site for the local units of government and citizen's groups illustrating the various programs and incentives for managing and protecting their resources locally.

Other Outreach Materials and Education Opportunities
Conferences and Exhibits

The MSU Natural Resources Programs Coalition provided a Natural Resources Stakeholder Reception which included a forum to review posters and exhibits from related MSU natural resources departments on March 6, 2003 during the MSU's annual Agriculture and Natural Resources Week. IWR-MSU displayed a flash program depicting the water and land alliance. Also, the web-based program, Know your Watershed was online. Participants were encouraged to navigate the sight and hone into their area of interest to review the land and water features provided by the aerial photography of the chosen locale. Explanations were provided on the connection of the land and water features for protecting the water resources.

An exhibit was created utilizing interactive software and web sites developed by the Institute of Water Research (IWR) – MSU at the Agriculture Conference on the Environment (ACE) sponsored by the Michigan Agriculture Environmental Assurance Program (MAEAP) on March 24, 2003. This forum was designed to illustrate tools that are available to plan and implement environmental stewardship programs for all agricultural producers. Two interactive software programs developed by the IWR-MSU, EZ-Mapper and Know Your Watershed, were demonstrated to conference participants to enhance their knowledge of the surrounding environs.

The conference participants also received brochures on the applicability of the web sites, which they could access on at their home businesses. An enclosed brochure was created to highlight the features of EZ-Mapper.

Ag Expo is an annual event sponsored by Michigan State University (MSU) and is largest farm show in the State scheduled in July. Educational exhibits highlighting MSU research and extension have always been the mainstay of the expo. IWR featured two interactive web sites, EZ-Mapper and Know Your Watershed to illustrate imagery available by the internet. Additionally, a color printout of their farm or another point of interest was printed for the visitors depicting aerial photography presenting water bodies, topography and land use features. IWR-MSU brochures were made available to the expo participants emphasizing the education components of protecting one's water resources.

Correspondence with Agriculture and Natural Resources Agents, MSU County Extension reviewing the mapping service provided by the IWR-MSU web-based EZ-Mapper with regards to individual Comprehensive Nutrient Management Plans. The attributes of EZ-Mapper fulfilled some of the following requirements needed for the completed plan, for example, a farm headquarters map, soils maps with legends for all fields that will receive manure, identification of fields for winter spreading, and other mandates as well.

Resource Systems

Articles and PowerPoint presentations about this project as well as the companion projects, *Groundwater, Groundwater Modeling, Groundwater Flow and Transport (2003MI30B), and Evaluation and Decision Support System for the Regulation of High Capacity Groundwater Withdrawal in Michigan's Lower Peninsula (2003MI25B)* were posted via the Watershed Post. The Watershed Post is an online news source provided by the IWR-MSU which is emailed to over 2,000 subscribers and also accessible on the IWR-MSU home page. Questions and comments were received on all three projects via email.

Designed the enclosed companion bulletin for *Evaluation and Decision Support System for the Regulation of High Capacity Groundwater Withdrawal in Michigan's Lower Peninsula (2003MI25B)* entitled Regulations in the Great Lakes States for High Capacity Groundwater Withdrawals and integrating the water use web site as well. The audience for this outreach material has included staff at MSU-Extension, Michigan Department of Agriculture, and Michigan Farm Bureau.

MICHIGAN STATE UNIVERSITY

Institute of Water Research

Regulations in the Great Lakes States for High Capacity Groundwater Withdrawals

Reliable supplies of fresh water are an important resource for industry, agriculture and the general public. While surface water supplies can be seen and pollution or overuse can be readily recognized, groundwater is hidden and changes in quality/quantity are often not apparent.

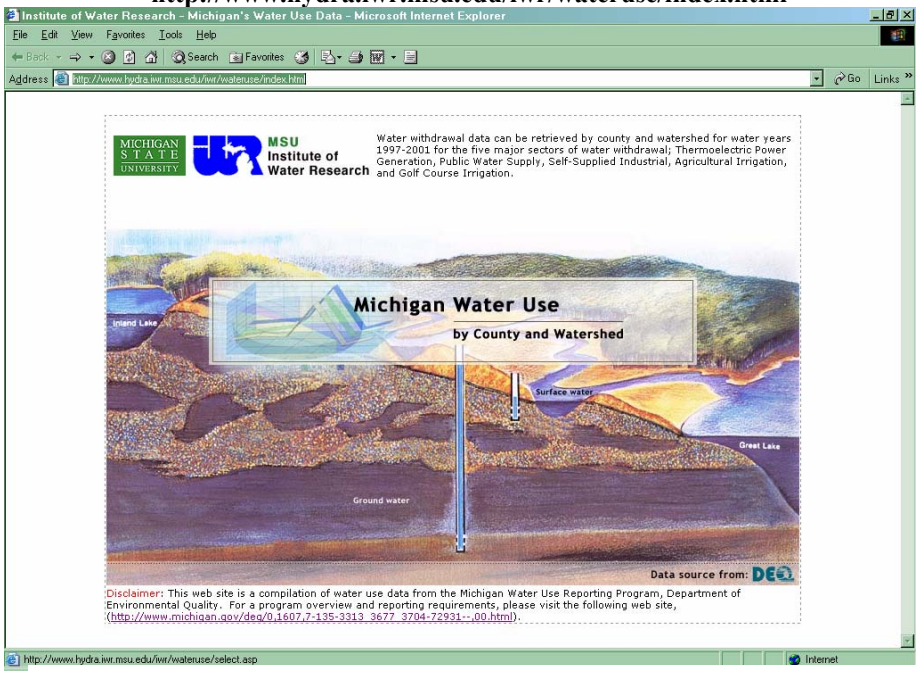
Groundwater is that water that occurs in the pores between the grains of soil or rock. Groundwater is found nearly everywhere and is the primary source of water for most rural and many suburban residents. Groundwater is also a major source of water for public water supplies, agricultural irrigation and increasingly for industry, in addition to supplying water for streams and wetlands.

Historically, groundwater use was, and in many areas still is, regarded as a part of the rights of property ownership. Landowners are viewed as having the right to use the groundwater found under their property subject only to the doctrine of beneficial or reasonable use. That doctrine states that the water may be used as the property owner sees fit as long as the water is not wasted.

That view of water ownership is increasingly being challenged as increasing demand has led to the use of high capacity wells for industrial process water, agricultural irrigation and other uses. High capacity wells are commonly defined as those capable of producing 70 gallons of water per minute or 100,000 gallons per day. Such wells frequently cause interference with neighboring low capacity domestic wells.

Governments are being asked to resolve such conflicts in water use. Adopting regulations that provide adequate water supplies for all users while respecting important property rights is a challenge to legislatures. Some states have adopted policies for resolving conflicts between well owners after well interference has occurred. Other states regard groundwater as a public resource held in trust for the people by state government. These states prevent groundwater conflicts by requiring a water allocation permit prior to installing a high capacity well. As Michigan becomes more involved in this debate, it is helpful to examine how groundwater withdrawals are regulated in other Great Lake States.

http://www.hydra.iwr.msu.edu/iwr/wateruse/index.html



Michigan water use data can be retrieved by county or watershed for years 1997-2001 for the five major sectors of water withdrawal; Thermoelectric Power Generation, Public Water Supply, Self-Supplied Industrial, Agricultural Irrigation, and Golf Course Irrigation. This web site is a compilation of water use data from the Michigan Water Use Reporting Program, Department of Environmental Quality.

For additional information on water use: contact Pam Hunt, Institute of Water Research, Michigan State University, 115 Manly Miles Bldg., East Lansing, MI 48823 Phone (517) 432-4555

For more information on Regulations in the Great Lakes States, contact:
Lee Kettren, Institute of Water Research, Michigan State University,
115 Manly Miles Building, East Lansing, MI 48823 Phone: (517) 353-3742

Summaries of State Regulations within the Great Lakes Basin

Illinois
The procedures for the regulation of groundwater conflicts are administered by the Department of Agriculture through County Soil and Water Conservation Districts. The procedures are specified in the Illinois Water Use Act of 1983, (525 ILCS 45). No permit is required. Any person who plans to install a well that can be reasonably expected to withdraw more than 100,000 gallons per day must notify the local Soil and Water Conservation District, who in turn, notifies the Illinois Geological Survey, Illinois State Water Survey, local units of governments and other interested parties. The agencies evaluate the proposed withdrawal and its effect on other users and make a public report. The operator of the withdrawal must register with the local Soil and Water Conservation District. In water emergencies, a Conservation District may recommend to the Department of Agriculture that it impose restrictions on groundwater withdrawals. The Department reviews and may approve or disapprove the recommendation.

Web Site: www.legis.state.il.us

Indiana
No permit is required prior to installing a high capacity well. Legislation enacted in 1983 requires significant water withdrawal facilities to register and report annually to the Natural Resources Commission. Significant withdrawals are defined as at least 100,000 gallons per day. Groundwater disputes are triggered by a complaint from an owner of a low capacity well. High capacity facilities that cause failure of a smaller user can be required to provide an alternative water source. The Indiana Department of Natural Resources may restrict high-capacity groundwater pumping if the withdrawal exceeds the recharge capacity of the aquifer.

Web Site: www.in.gov/nrc/policy/water.html

Michigan
Michigan does not require permits prior to installing a high capacity well. Recent legislation, Public Act 148 of 2003, requires annual reporting of high capacity withdrawals defined as 100,000 gallons per day over a 30-day period; $100 reporting fee to Department of Environmental Quality (DEQ); require agricultural wells with a capacity to pump over 100,000 gallons per day to register with DEQ and pay the reporting fee or register with Michigan Department of Agriculture (MDA) by submitting a water use conservation plan; produce a groundwater inventory and map; require the MDA to report the data gathered from the water use conservation plan and consumptive use by township to the DEQ for the inventory and map; create the Groundwater Advisory Council to the study the sustainability of the State's groundwater use, monitor the Great Lakes Charter and make recommendations on Annex 2001 compliance. Other recent legislation, Public Act 177 of 2003, establishes a procedure for the investigation and resolution of conflicts between high capacity wells and neighboring low capacity wells.

Web Site: www.michigan.gov/deq

Minnesota
Water Allocation Permits are required for withdrawals greater than 70 gallons per minute or 100,000 gallons per day. There are separate permits for agricultural, non-agricultural and general

Minnesota - continued
(temporary) withdrawals. Permit holders must report monthly water withdrawal in an annual report. Permit applications must show need and in certain cases, have approval of the legislature. If adequate water supplies are available and the proposed uses are reasonable and proper, but there is probable interference with public water supplies or private domestic wells as shown in the permit application, the applicant must provide all available construction details for existing public water and private domestic wells in the area. Aquifer tests may be required. The State Department of Natural Resources determines the probable interference based on computations, aquifer tests and hydrologic studies.

Web Site: www.dnr.state.mn.us/waters

New York
Permits are required for all withdrawals greater than 45 gallons per minute in Long Island counties. The Great Lakes Water Withdrawal Registration Program requires that water withdrawal greater than 100,000 gallons per day averaged over a 30-day period or 3,000,000 gallons during any 30-day period from the Great Lakes Basin be registered.

Web Site: www.dec.state.ny.us/website/dow

Ohio
In Ohio, groundwater withdrawals must be registered and reported. No permit is required. Groundwater stress legislation enacted in 1990 allows the Chief of the Division of Water to designate groundwater stress areas and require registration of withdrawals less than 100,000 gallons per day. This action requires registration of small withdrawal facilities and does not involve restrictions of groundwater withdrawal.

Web Site: www.dnr.state.oh.us/water/waterinv

Pennsylvania
Pennsylvania has no mechanism for addressing well interference conflicts. The Water Resource Planning Act recognizes that surface and groundwater are the same resource and requires registration of withdrawals greater than 10,000 gallons per day as a basis for collaborative planning. Permits are required for high-capacity wells installed for public water systems.

Web Site: www.dep.state.pa.us/dep/deputate/watermgt

Wisconsin
Groundwater withdrawals must be registered; permits are required for withdrawals greater than 70 gallons per minute. Wisconsin regulates high capacity wells per 281.17 Wis Statute and NR 812 WI Admin Code, Well Construction and Pump Installation. The Wisconsin Department of Natural Resources (DNR) may specify more stringent regulation on well location and construction if necessary to protect public safety, safe drinking water and the groundwater resource. The DNR may deny a permit, limit a permit, or modify an existing permit on depth, location, pumping rate and ultimate use so that water for a public utility is not impaired. Current rules don't give DNR authority to restrict pumping rates beyond that needed to protect municipal water utility operations.

Web Site: www.dnr.state.wi.us/org/water/dwg/hicap.html

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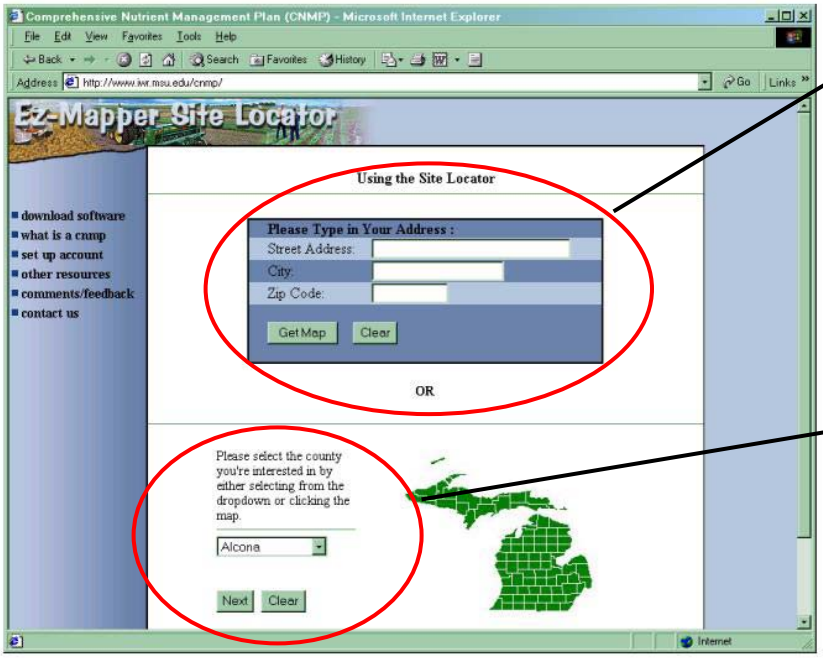
Ez-Mapper Site Locator

This site was created to assist farmers, citizens, and planners in developing digital maps. By typing an address, city, and zip code, users can retrieve a map containing: aerial photos, streets, streams, and soils information. By zooming in and out, users can view the entire area to be mapped. Once an area has been determined, users have the option to download a digital map of the area. The digital map contains the selected area including soil boundaries, labels, and aerial photo.

The web site provides a free map editing software called EZ-Mapper that can be downloaded to your computer. EZ-Mapper will allow you to outline areas of concern, draw field boundaries, label facilities, and title maps to be printed out.



This is the address input box. Type an address here and click the Get Map button to view a map of your designated area.

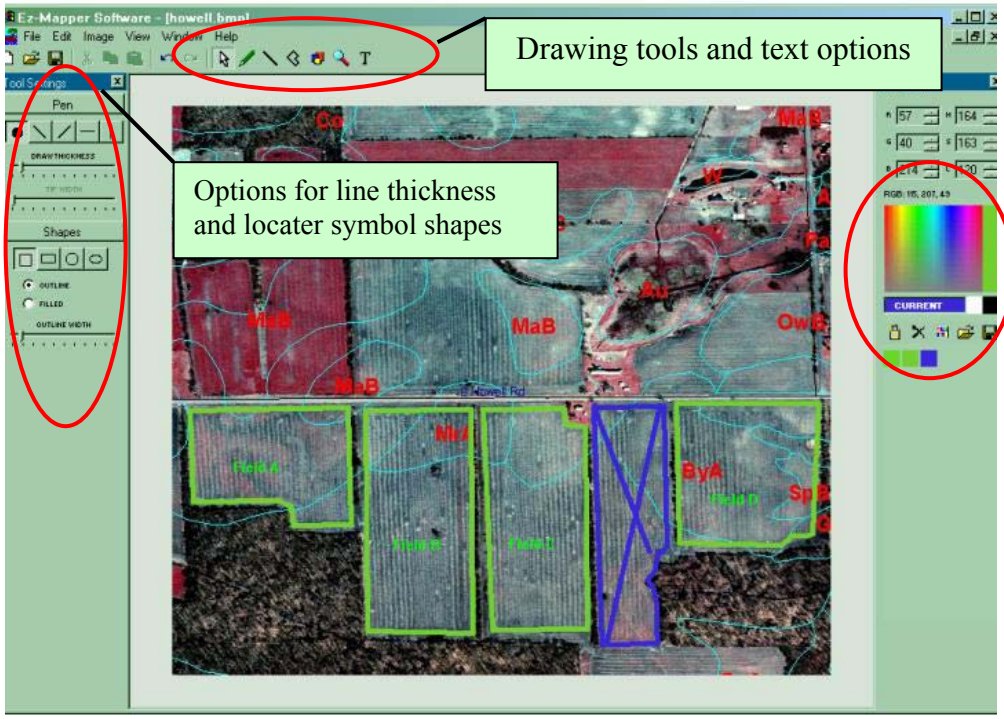
Or select the county option for retrieving a larger mapping area.

All GIS Tools are located here. They are used to maneuver around the map and to zoom in and out of areas. This is also where you download a copy of your final map and software.

These are your map data layers, such as streets, streams, soils, and aerial photos.

The Legend is located on the left side of the map and it is used to describe the colors of the data layers.

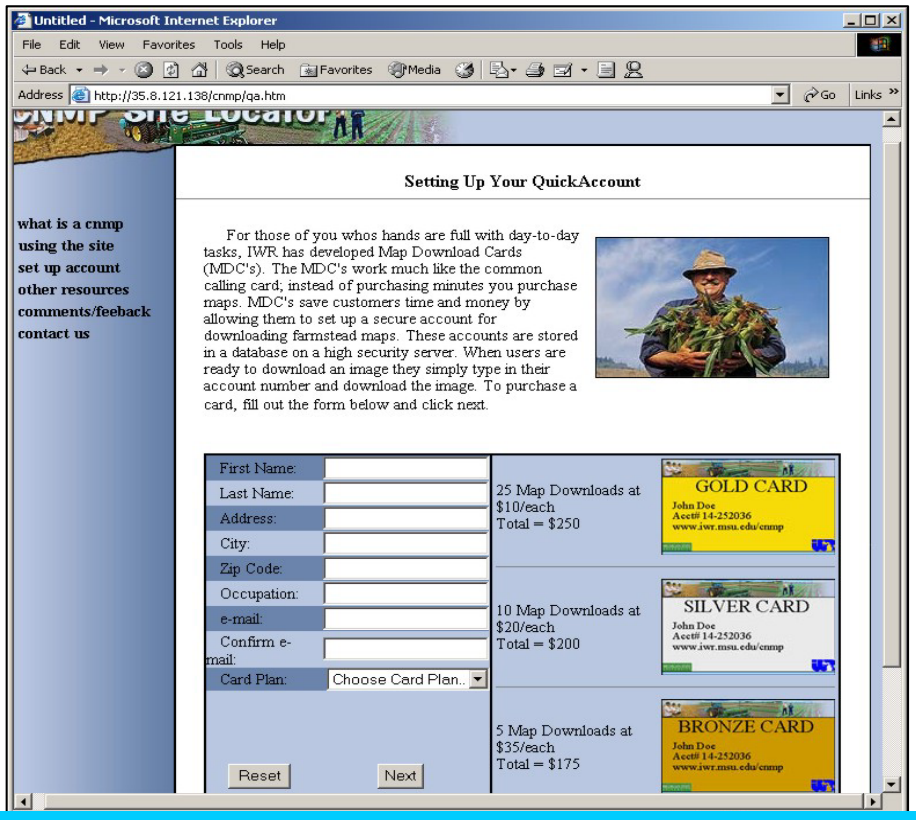
The EZ-Mapper software allows end users the ability to produce maps without the high-end costs of some GIS mapping programs. The software is geared toward those who need to produce digital maps that can be attached to supporting documentation. Anyone can use the online system and software for free, but in order to download the digital maps to your home computer and edit them, you will need to purchase a download card online. The website can be accessed at **www.iwr.msu.edu/ezmapper**



EZ Mapper Software
This is the downloaded image that can be opened in the map editing program. Many tools are available to label the map. **Important note**: Before you use the software for the first time, click on the Help in the upper toolbar for detailed explanations for downloading your map as well the available mapping tools.

Color palette for lines and text

We use a method similar to prepaid calling cards to allow users to download farmstead maps. To set up your account, fill out the information on the set up account page and choose a card plan. You may still use the site and view maps without setting up an account, but you will not be able to download any images or software to edit them until you purchase a download card.



Contact Information

Jeremiah Asher
517-432-5586
Institute of Water Research
Michigan State University
115 Manly Miles Bldg
1405 S. Harrison Rd
East Lansing, MI 48823