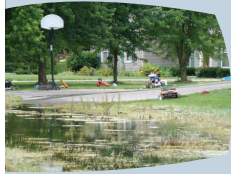


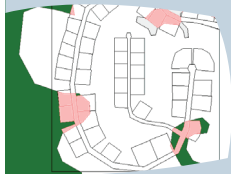
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# Land Use Tracker

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Center for Land Use Education



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## Solar Permitting Update

The Summer 2011 Tracker reported on the role of local government in planning for solar power and provided a link to the Rooftop Solar Challenge offered by the U.S. Dept. of Energy. The Midwest Renewable Energy Association, together with the cities of Marshfield, Madison and Milwaukee recently received a grant under this program totaling more than \$467,000. The grant will allow the team to create a web portal with toolkits and best practices that can be used by other communities looking to streamline and standardize the solar permitting process. For more information, visit: [www.jsonline.com/blogs/business/134851423.html](http://www.jsonline.com/blogs/business/134851423.html).

[WWW.UWSP.EDU/CNR/LANDCENTER](http://WWW.UWSP.EDU/CNR/LANDCENTER)

## Planning for High Water

By Madeline Gotkowitz, Wisconsin Geological and Natural History Survey, and David S. Liebl, University of Wisconsin– Extension

### Wet Weather is Causing Problems in Wisconsin

Seventeen inches of rain fell over parts of southern Wisconsin during a ten-day period in June 2008 following a very wet spring. This came after record snowfall in the winter and record high rainfall in August 2007. The wet weather brought reports from across the state of flooded basements, flooded subdivisions, and households devastated by related property loss.

Prolonged rainfall and large snowmelt events can result in an unusual type of flooding: *groundwater flooding*. Since this type of flooding is not triggered by a river over-topping its banks, it often occurs far from river valleys and mapped floodplains. When the water table rises to the land surface, saturated soil conditions cause water to collect in low areas. The problem is exacerbated if no direct drainage routes are present on the site. Pumping water from ditches or operating a sump pump may not overcome the constant inflow of groundwater and rainfall in the flooded area. In fact, discharge from sump pumps can actually serve to recycle water within the local groundwater system and contribute to flooding on adjacent properties under certain conditions.

High water tables can also increase the amount of groundwater flow to wetlands, streams and lakes. Springs may develop along exposed rock formations along valley walls. When groundwater recharge continues at high levels, it can cause long-term flooding of low-lying fields and re-emergence of dried wetlands.

What causes the high water table conditions that lead to groundwater flooding?

Rainfall either drains directly to culverts, ditches and streams, or infiltrates through soil to the water table, thereby recharging groundwater. Frequency, intensity and duration of precipitation, air temperature, plant growth, and the extent of frozen ground are a just few of the variables that affect the amount of rainfall or snowmelt that infiltrates the ground. This infiltration, or *groundwater recharge*, causes a rise in the water table that may last a few days, a few months, or for longer periods of time.

### Extreme Events Are Often Ignored

Large regions of Wisconsin and the upper Midwest can experience successive years of dry conditions and several years of low water tables. Wet and dry periods may last for just a few seasons or be a predominant pattern over several years. Because problems related to high groundwater are relatively rare in Wisconsin, the groundwater system is often ignored when planning for new development.

As we move into the middle of this century, weather patterns like those of 2007-2008 are likely to happen more often in Wisconsin. With more rain and snow during seasons that favor groundwater recharge, Wisconsin communities and farms can expect more flooding of farm fields and developments in low-lying areas.



*High water table conditions caused flooded basements and road closures in the Country Bliss Estates subdivision in Waukesha County.*



*Algal blooms and odor problems resulted from ditches inundated by high water.*

Several recent devastating cases of groundwater flooding in Wisconsin are a good reminder to consider local groundwater conditions (e.g. depth to water table), the historic record (e.g. record high lake levels, historic locations of springs and wetlands), and climate projections to ensure the adequacy of basement and foundation design and proper routing of surface water runoff.

### Two Example Communities

► **Country Bliss Estates in Waukesha County**  
How much groundwater levels change from year to year depends on the weather and local geology. The water table normally rises and falls each year, but the extent of highs and lows fluctuates with weather. The graph on page 3 shows the depth to the water table from 1993 through 2011 near the Country Bliss Estates subdivision in Waukesha County. Even though the average depth to the water table is about 4 feet, the water table rose to the ground surface (0 feet) in 2004 and 2008. This illustrates that landowners and local governments should not rely upon on a single measurement or an “average” high water table condition when selecting the depth for a basement that will remain dry in very wet years.

In developed areas, water table rise can complicate management of groundwater *and* surface water. At the Country Bliss subdivision, high groundwater recharge brought a large volume of groundwater to basement drainage systems, stormwater facilities and small streams and ponds. High water table conditions contribute to saturated soil, which in turn increases runoff and exacerbates problems associated with storm water management. This can be surprising to homeowners because these conditions are unusual, and may only occur long after a housing development is complete or other significant investment in the property has taken place.

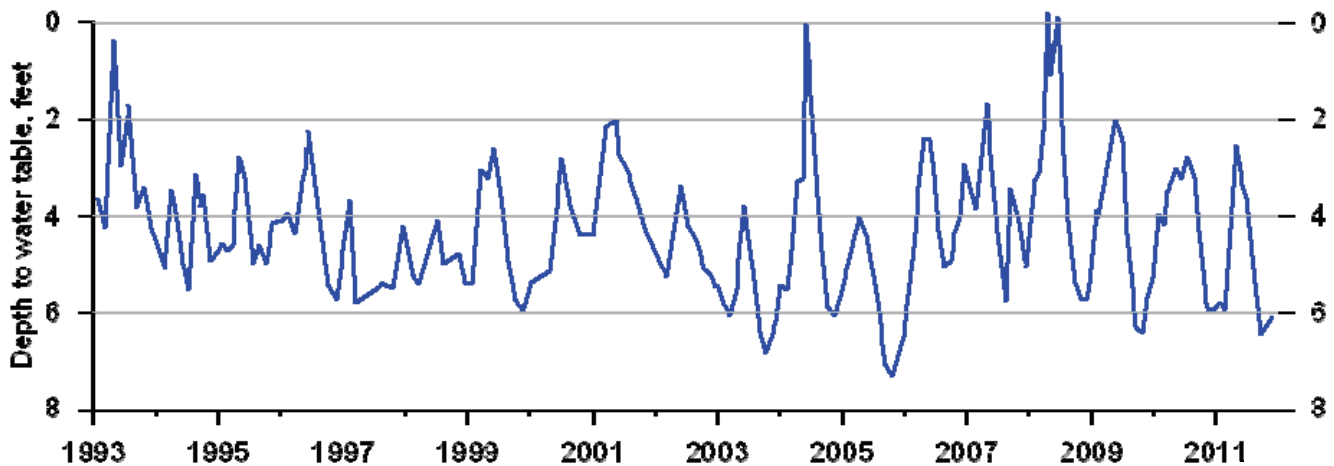
► **Sunrise Meadows in Calumet County**

In many areas of Wisconsin, the water table is less than ten feet below ground surface. Lower areas in the landscape (for example, near wetlands or small streams) may be only a few feet above the water table during years of average rain and snowfall. In these areas, *hydric soils* show evidence of saturated conditions in the past. As shown in the photo at right, the soil develops a structure, texture and color that are telltale signs of susceptibility to water table rise. Homes constructed in areas with hydric soil face problems caused by intense rain storms because the ground is normally close to fully saturated, resulting in reduced infiltration and increased runoff.



*Hydric soil is fully saturated with water during soil formation. The lack of air in the soil pores results in a grey or mottled color. Photo courtesy of USDA NRCS.*

*This long-term record of the depth to the water table in Waukesha County shows a 7-foot change in the depth of the water table from 2004 to 2006.*



### Local governments can take the following steps to plan for high groundwater:

- Use information that identifies areas susceptible to rising groundwater levels. Hydric soils are delineated on soil survey maps. While communities may choose to develop in such areas, they should prevent construction with basements or the use of on-site septic or water supply systems.
- Check Wisconsin's Groundwater Observation Network for the locations of existing groundwater records. Information and data from the Network is available on the internet at <http://wisconsingeologicalsurvey.org/mapdata.htm>
- Consider developing your own groundwater monitoring program to monitor groundwater levels at several critical locations. Such monitoring is relatively inexpensive and provides local information about extremely high, extremely low, and typical water table elevations.
- Require qualified soil and groundwater site analysis to identify areas vulnerable to groundwater flooding or shallow depth to groundwater before platting subdivisions or granting building permits.
- Inventory all recent flooding, roadway overtopping, serious erosion, and other similar problems. Evaluate the potential impact from increased rainfall at these and other locations.
- Enact ordinances to control the flow of surface runoff from existing and future development.
- Establish a runoff management maintenance program that ensures existing and future stormwater infrastructure is functioning at full capacity. This may be as simple as performing a semi-annual check of all culverts and drainage grates.
- Establish a long-term citizen flood awareness program that emphasizes both historic and projected climate to minimize damage to property and ensure public safety.

This is the case at the Sunrise Meadows subdivision in Calumet County. Sunrise Meadows is surrounded by agricultural fields where poorly drained, clayey soil has little infiltration capacity—the soil retains, rather than drains, water. Sunrise Meadows homes have basement sump pumps that operate year round. This indicates that residential basements are constructed below the water table, and the sumps are continually filling with groundwater. Backfilled utility trenches that extend from the street to each building provided a high-conductivity pathway for groundwater to reach basements and foundations in these settings.

#### What Can Local Governments Do?

Communities can learn from the experiences described here when planning for future developments. One option is to consider the water table elevation prior to determining the depth of basements or other features in areas of hydric soils. Such developments may be wholly unsuited for on-site septic systems or sub-grade basements. Highs and lows in the water table can vary several feet from average conditions. Zoning or building codes that consider the full range of groundwater levels provide

homeowners and communities with a long-term benefit. When groundwater becomes a more predominant factor in building design, protracted legal battles over flooded basements and subdivisions, and failing storm water management systems can be avoided.

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Information on climate and stormwater  
management:  
[www.wicci.wisc.edu](http://www.wicci.wisc.edu)

Effects of drought and deluge on the water table:  
<http://wisconsingeologicalsurvey.org/climatechange.htm>

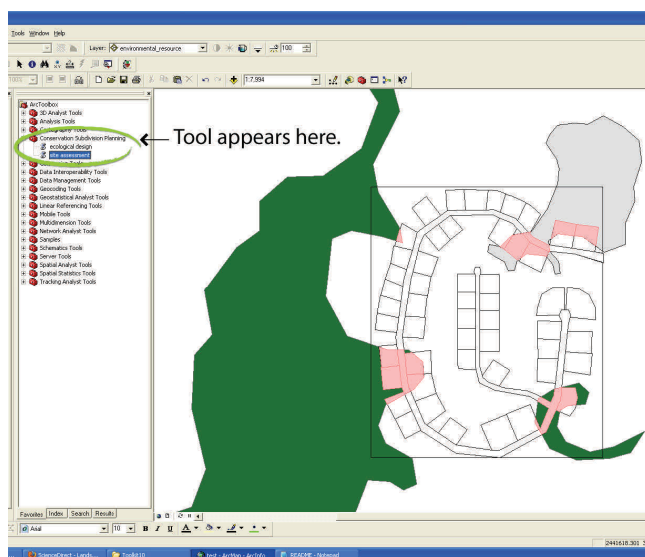
## A NEW GIS-BASED TOOLKIT TO HELP PLANNERS AND DEVELOPERS WITH SUSTAINABLE LAND PLANNING

*Z. Aslıgül Göçmen, University of Wisconsin – Madison/Extension*

Geographic information systems (GIS) have entered the planning field and are here to stay. Indeed, an internet search conducted in December 2011 returned over 37 million hits for *Applications of GIS in Planning* and over 86 million hits for *GIS in Planning*. Applications range from simple inventory mapping and information access to sophisticated modeling and alternative scenario creation and evaluation. Some planners are also making use of GIS-based planning support systems (PSS) such as CommunityViz in their planning activities.

Reflecting primarily the decrease in costs and the efficiencies these technologies have brought, most public planning agencies nowadays have an in-house GIS set up. Yet, recent research in our state shows that GIS is not being used to its maximum capacity and that the use of the analytical applications is limited in public planning agencies (Göçmen, 2009). Lack of training, difficulty sparing time to learn and use the tools, and budgetary problems appear to be among the significant barriers for planning staff to use these tools effectively (Göçmen & Ventura, 2010).

Figure 1: Using the site assessment component of the toolkit



In part to help overcome these barriers and in part to aid with ecological planning, we have developed an interactive GIS-based toolkit. This toolkit, “Conservation Subdivision Ecological Design and Site Assessment Toolkit” is intended to improve efficiency and effectiveness in different stages of the subdivision planning process, with a particular emphasis on the conservation subdivision design and permitting process as its name suggests. Empirical evidence suggests that conservation subdivisions are not always designed in ways that maximize their environmental benefits over conventional subdivisions, and this is why the emphasis of the tool is on improving the design and evaluation processes of conservation subdivision planning.

### About the Toolkit

The Conservation Subdivision Ecological Design and Site Assessment Toolkit has two components: ecological design and site assessment. Each can be used separately or together. In a nutshell, the “ecological design” component is intended to help developers, designers, and planners understand the ecological characteristics of the environmental resources falling in and around a proposed subdivision. The characteristics of these environmental resources are computed with the use of landscape quantification methods known as landscape metrics and provided as a table to the user alongside a map. While landscape metrics have been essential for landscape ecologists, they have not been adopted much by planners. Introducing these metrics may prove valuable to planners in a number of ways. For instance, planners can use landscape metrics to help identify significant environmental resources, to evaluate environmental changes that may have taken place, and to help assess environmental impacts

of alternative development proposals (see Leitao et al., 2006). Insight gained from these evaluations may help planners and developers allocate open spaces in a subdivision that best address local conservation priorities.

The “site assessment” component of the toolkit is designed to help planners, local officials, and citizens evaluate a proposed subdivision plan based on local land use regulations and the land preservation principles of conservation subdivision design. The toolkit generates a GIS polygon layer showing the proposed build-up areas where development should have been restricted because the land is environmentally sensitive or ecologically significant. The toolkit also generates a text report, which contains information on whether the proposed subdivision follows the local minimum open space requirements and the extent to which it fails to protect environmentally sensitive or ecologically significant areas.

### Advantages of Using the Toolkit for Planners

This toolkit has several advantages including:

- It is free and available on the internet (it can be downloaded from <http://urpl.wisc.edu/people/gocmen/projects.php>).
- It is easy to use and does not require extensive GIS knowledge of spatial analysis or methods of quantifying landscape patterns. The user just needs to be familiar with basic GIS operations and be able to gather the relevant GIS data for different features.
- It provides an opportunity for planners to learn about landscape ecology and quantification methods.
- It includes self-explanatory and easy-to-use support files including a ReadMe file, two separate Help files for the two components of the toolkit, and a guide to interpreting the results of the “ecological design” component.
- It works with ArcGIS, ESRI’s software that is now in many planning agencies. Specifically, it was developed in ArcGIS version 9 as an ArcToolbox (Figure 1) and

has an updated version for ArcGIS 10; further information can be found in the Help files.

### To Get Started This is What You Need:

- Required GIS data including environmental resources (e.g., habitats, prime farmland), environmental restrictions (e.g., flood plains, steep slopes), and the proposed subdivision layout.
- Information on minimum open space requirements and conservation goals in your jurisdiction.

### References

Göçmen, Z. A. 2009. GIS Use in Planning in Wisconsin’s Public Agencies. Proceedings of the International Conference of Computers in Urban Planning and Urban Management.

Göçmen, Z. A. and S. J. Ventura. 2010. Barriers to GIS Use in Planning. *Journal of the American Planning Association*. 76 (2): 172-183.

Leitao, A. B., Miller, J., Ahern, J., and K. McGarigal. 2006. *Measuring Landscapes: A Planner’s Handbook*. Island Press: Washington, D.C.

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Göçmen, Z. A. and J. Gao. 2011. Assisting with Ecological Land Planning: Introducing the Conservation Subdivision Ecological Design and Site Assessment Toolkit. *Journal of Extension*. 49 (4). <http://www.joe.org/joe/2011august/tt8.php>

<http://urpl.wisc.edu/people/gocmen/projects.php>



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## CALENDAR OF EVENTS

### Milwaukee's Streetcar System

January 9, 2012 - Urban Ecology Center, Milwaukee, WI  
<http://cnuwisconsin.org/CNU%20WI%20Jan%209th%20Flyer.pdf>

### Frac Sand Mining in Wisconsin Towns

January 12, 2012 - Plaza Hotel & Suites, Eau Claire, WI  
[www.wisctowns.com](http://www.wisctowns.com)

### Agricultural Enterprise Area Workshops

January 12, 2012 - Board Room, 1<sup>st</sup> floor, DATCP, Madison  
January 17, 2012 - DNR Service Center, Black River Falls  
January 19, 2012 - J.P. Coughlin Center, Oshkosh  
<https://datcpservices.wisconsin.gov/confreg/AEAworkshops.jsp>

### Making an Impact on Energy Use in Your Community

January 18, 2012 - EPA Webinar  
[www.epa.gov/greenpower/events/18jan12\\_webinar.htm](http://www.epa.gov/greenpower/events/18jan12_webinar.htm)

### Wisconsin Society of Land Surveyors Annual Conference

January 25-27, 2012 - Kalahari Resort, Wisconsin Dells, WI  
[www.uwsp.edu/conted/ConfWrkShp/Pages/surveyors.aspx](http://www.uwsp.edu/conted/ConfWrkShp/Pages/surveyors.aspx)

### Wisconsin Local Food Summit

January 26-27, 2012 - Lake Lawn Resort, Delavan, WI  
<http://wilocalfood.wordpress.com/discussions>

### Wisconsin Land Information Association Conference

February 15-17, 2012 - Holiday Inn & Convention Center, Stevens Point, WI  
[www.wlia.org](http://www.wlia.org)

### Wisconsin Wetlands Association Conference

February 22-23, 2012 - Lake Geneva, WI  
<http://wisconsinwetlands.org/2012registration.htm>

### Wisconsin Association of Land Conservation Employees Conference

February 29-March 2, 2012 - The Plaza, Eau Claire, WI  
[www.walce.org](http://www.walce.org)

### American Planning Association Wisconsin Chapter Spring Conference

March 1, 2012 - Oshkosh Convention Center, Oshkosh, WI  
[www.wisconsinplanners.org](http://www.wisconsinplanners.org)

### Rural Community Economic Development Conference

March 7-8, 2012 - Peoria, IL  
[www.iira.org](http://www.iira.org)

### Green Energy Summit and Exposition

March 7-10, 2012 - Frontier Airlines Center, Milwaukee, WI  
<http://greenenergysummit.us>

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To receive this newsletter by email sign up at: [www.uwsp.edu/cnr/landcenter/newsletters.html](http://www.uwsp.edu/cnr/landcenter/newsletters.html)

### Submit an Article!

If you would like to submit an article, please contact the managing editor, Rebecca Roberts. Your article should be 1,000 words or less, of statewide concern, and address a land use or community planning issue.

### Local Land Use Planning and Zoning WisLine Series

January 11, 2012 - Using and Amending your Comprehensive Plan  
 February 8, 2012 - State Land Use Program Updates  
 March 14, 2012 - Business Improvement District (BID) Basics  
 April 11, 2012 - Legislation and Case Law Update  
<http://lgc.uwex.edu/program/pdf/LLUPAZ2012.pdf>

### Open Government and Parliamentary Procedure WisLine Series

January 19, 2012 - Open Meetings Law  
 January 26, 2012 - Public Records Law  
 February 2, 2012 - Ethics and Conflicts of Interest  
 February 9, 2012 - Principle of Parliamentary Authority  
 February 16, 2012 - Principles of a Meeting and Majority Rule  
 February 23, 2012 - Principle of Order  
 March 1, 2012 - Minutes of Local Government Meetings  
<http://lgc.uwex.edu/program/pdf/OG2012.pdf>

### American Planning Association Monthly Webcasts

January 13, 2012 - Community Mobility  
 January 20, 2012 - Clean Energy Strategies for Sustainable Communities  
 January 27, 2012 - New Directions in Planning  
 February 3, 2012 - Opportunities and Challenges in Rural Tourism Planning  
 February 10, 2012 - Planning for Waste Management & Recycling  
 February 17, 2012 - Suburban Immigration and Local Government Reactions  
 February 24, 2012 - Planning for Goods Movement  
 February 29, 2012 - Regulating Sand and Gravel Mining  
 March 2, 2012 - Community Development: Gender-Aware Planning  
 March 9, 2012 - Economic Impacts and Opportunities of Families  
 March 16, 2012 - Federal Tools for Aging and Livable Communities  
 March 22, 2012 - Your Ethical Responsibility to Social Equity  
 March 30, 2012 - Technology in Community Building Applications  
[www.utah-apa.org/webcasts](http://www.utah-apa.org/webcasts)

For additional dates and information visit the online calendar of events

[www.uwsp.edu/cnr/landcenter/events.html](http://www.uwsp.edu/cnr/landcenter/events.html)



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