LOSING GROUND: TRACKING THE RATE OF FARMLAND LOSS IN WISCONSIN COUNTIES, 1992 TO 2010

By Aaron Thompson, Ph.D., Assistant Professor and Land Use Specialist, Center for Land Use Education

In 2009, the U.S. Department of Agriculture, Natural Resources Inventory (NRI) reported that more than 41 million acres of farmland in the United States had been converted to developed uses between 1982 and 2007. This statistic underscores the concerns felt by many that loss of farmland to urban development threatens benefits provided by the rural landscape (i.e. food production, wildlife habitat, water infiltration). Wisconsin is not immune to these changes. According to the Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP), Wisconsin lost an average of 22,500 acres of farmland to urban development each year between 2002 and 2007 (DATCP, 2011).

Wisconsin Farmland Preservation Statistics

Compared with other Midwestern states, Wisconsin has taken a proactive policy approach to address the threat of urban development to farmland. In 2009, the state legislature authorized the Working Lands Initiative which requires all 72 counties in the state to develop a new or updated farmland preservation plan (Wis. Stat. ch. 91).

This requirement has revealed a critical data gap. NRI does not provide county-level statistics on farmland loss. This leaves local decision-makers with only one national dataset to determine the rate of farmland loss in counties — the National Agricultural Statistics Service (NASS), Census of Agriculture. Unlike the NRI which analyzes land cover change at 800,000 sampling points nationwide to create a representative picture of farmland loss at the state scale; the Census of Agriculture uses a survey methodology to ask landowners how much land they own or cultivate for agricultural production.
While the Census of Agriculture is a great resource for tracking trends in agriculture within the United States, its utility for tracking farmland conversion to urban development has been questioned (Thompson & Prokopy, 2009; Kline, 2000). The primary concern is that variations in the self-reported measures of how much acreage a landowner holds in their farm operation or in total harvested acreage is difficult to attribute directly to farmland being converted to urban development.

Spatial Analysis Methodology
The article describes an alternative approach to assess the rate and spatial distribution of farmland loss in Wisconsin. Instead of relying on survey data (Census of Agriculture) or land use sampling procedures (NRI), this approach uses GIS software (ArcGIS ver. 9.2) to overlay two different sets of land cover data. The data identifies different land cover types such as urban, farmland and forests. It was developed using remote sensing techniques and is represented in a series of tiles, each approximately a quarter acre in size (or 900 square meters). By overlaying datasets from 1992 and 2010 it is possible to produce county-level estimates of farmland conversion to developed uses.

A brief description of the steps used to conduct this analysis are provided below. A more detailed description is provided in Thompson and Prokopy (2009).

► Step 1: Create consistent land use classifications for the 1992 Wisconsin DNR WISCLAND dataset and the 2010 NASS Cropland Data Layer (CDL).

► Step 2: Integrate 2006 National Land Cover Database (NLCD) Impervious Cover layer with 2010 CDL to improve tracking of urban areas identified using aerial photograph comparisons.

► Step 3: Overlay modified 2010 CDL layer on 1992 WISCLAND layer to identify areas where land use classification has changed from farmland to urban or developed uses.

► Step 4: Clean the results by creating a buffer that removes existing roadways and urban areas from the dataset. This step is critical to correct for differences in the methods used to create the 1992 and 2010 datasets.

► Step 5: Extract the final results for each county. Results are displayed in the tables on page 3 and summarized on the map on page 4.

Figure 1: The results of the initial overlay (Step 3) show a few of the issues associated with overlaying land cover datasets. Specifically, roadways and areas within existing urban areas show up as farmland conversion.

Figure 2: A data cleaning procedure (Step 4) uses roadway and urban area overlays to remove problem areas from the final farmland conversion results.
Testing the Results

In order to compare the results from the spatial analysis ‘farmland converted’ to the NASS Census of Agriculture ‘land in farms,’ a correlation analysis was conducted using population change from the U.S. Census. This analysis revealed an extremely strong, significant relationship ($r = 0.833$) between the spatial analysis results and the population change variable that was not seen with the Census of Agriculture ‘land in farms’ variable ($r = -0.122$). These findings suggest that the spatial analysis is providing local decision makers with a better estimate of farmland conversion.

The Results

According to this analysis, Wisconsin lost a total of 396,583 acres of farmland to urban development between 1992 and 2010. This includes a loss of 267,798 acres of cropland and 126,768 acres of pasture or grassland. As shown on the map on page 4, some farmland was lost in each county, but the effects are not equally distributed throughout the state.

Table 1: Wisconsin Farmland Loss by the Numbers

<table>
<thead>
<tr>
<th>Source</th>
<th>Timeframe</th>
<th>Total Farmland Conversion</th>
<th>Annual Rate of Farmland Conversion</th>
</tr>
</thead>
<tbody>
<tr>
<td>NRCS National Resources Inventory</td>
<td>1982 to 2007</td>
<td>(loss) 520,500 acres</td>
<td>(loss) 20,820 ac / yr.</td>
</tr>
<tr>
<td>*Spatial Analysis Results</td>
<td>1992 to 2010</td>
<td>(loss) 396,583 acres</td>
<td>(loss) 22,032 ac / yr.</td>
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Table 2: Farmland Loss by County

<table>
<thead>
<tr>
<th>County</th>
<th>Acres</th>
<th>County</th>
<th>Acres</th>
<th>County</th>
<th>Acres</th>
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<tr>
<td>DNR Region 2: South Central</td>
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<tr>
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<td>Green</td>
<td>4009</td>
<td>Richland</td>
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<tr>
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<td>Iowa</td>
<td>6424</td>
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<td>7558</td>
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<td>Lafayette</td>
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<td>DNR Region 3: West Central</td>
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<td>Outagamie</td>
<td>16516</td>
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<td>DNR Region 5: Northern</td>
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<td></td>
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<td>Forest</td>
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<td>Price</td>
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<td>Iron</td>
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<td>Rusk</td>
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<td>Douglas</td>
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<td>829</td>
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<td>Florence</td>
<td>539</td>
<td>Polk</td>
<td>3863</td>
<td>Washburn</td>
<td>3027</td>
</tr>
</tbody>
</table>

Table 3: Counties with the Highest Rate of Farmland Conversion

<table>
<thead>
<tr>
<th>County</th>
<th>Acres Farmland Converted to Developed Uses 1992 to 2010</th>
<th>U.S. Census 1990 to 2009 Population Change</th>
</tr>
</thead>
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<tr>
<td>Waukesha</td>
<td>21,768</td>
<td>78,439</td>
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<td>Dane</td>
<td>20,466</td>
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<td>Outagamie</td>
<td>16,516</td>
<td>36,645</td>
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<td>Brown</td>
<td>14,974</td>
<td>52,725</td>
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<td>Winnebago</td>
<td>11,817</td>
<td>23,050</td>
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<td>Racine</td>
<td>10,357</td>
<td>25,567</td>
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<td>Washington</td>
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<tr>
<td>Kenosha</td>
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<td>37,201</td>
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<td>Grant</td>
<td>9,382</td>
<td>-301</td>
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<tr>
<td>Vernon</td>
<td>9,274</td>
<td>3,707</td>
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to urban development than the Census of Agriculture, which is not specifically designed to track this change.

Summary and Conclusions
The spatial analysis described in this article provides local decision-makers with an alternative source of county-level farmland loss statistics. It demonstrates that available land cover datasets (even with their imperfections) can provide critical information for local decision-makers. While the focus of this analysis is on farmland loss, forests and other open spaces are also being threatened as urban areas expand into the rural landscape. Similar analyses could be also be performed for these resources.

Figure 3: The results of the spatial analysis show that Wisconsin lost a total of 396,583 acres of farmland to urban development from 1992 to 2010. Some farmland was lost in each county, but the effects are not equally distributed throughout the state.
The University of Wisconsin-Stevens Point GIS Center recently unveiled several new training opportunities:

Fundamentals of GIS is a self-paced, online course that prospective students may sign up for at any time. The $250 course, aimed at individuals with no prior GIS experience, includes online training materials and access to a demo version of ArcGIS 10.0.

GIS for Farmland Preservation Planning is an online, self-paced course which guides learners through the process of acquiring and analyzing geographic data for farmland preservation planning. The course cost is $250 and participants may sign up at any time.

GIS and GPS Applications in Forestry is an instructor-led course which will split its time between the UW-Stevens Point campus and the Treehaven Field Station. This course is aimed at foresters who want to integrate GIS and GPS into their workflow. This course is being offered August 21-24 for $1,475.

GIS Customization & Python Programming will also be offered later this Fall as an online course. However, details have not yet been released.

For More Information

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Doug.Miskowiak@uwsp.edu
www.uwsp.edu/cols-ap/GIS/Pages/LearningPathways/trainingProgram.aspx

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Aaron.Thompson@uwsp.edu
www.uwsp.edu/cnr-ap/clue/Documents/FarmlandPreservationStudy.pdf

References


ISOLATED FOREST PATCHES LOSE SPECIES, DIVERSITY

By Jill Sakai, University of Wisconsin-Madison News

Failing to see the forest for the trees may be causing us to overlook the declining health of Wisconsin’s forest ecosystems. Even areas with apparently robust trees and lush canopies are threatened as forests are increasingly fragmented by roads and development, becoming isolated green islands in a sea of agricultural fields, housing tracts, and strip malls.

A recent study by University of Wisconsin researchers is revealing that decades of fragmentation in Wisconsin’s forests have taken a largely unseen toll on the sustainability of these natural ecosystems. The long generation times of trees and other plants have masked many of the ecological changes already under way in the patches of forest that remain, says study co-author Don Waller, a professor in the Department of Botany and Nelson Institute for Environmental Studies at UW-Madison. "Things may look healthy, but over time we see an erosion of biodiversity," he says.

To better catalog the changes at work, he and colleagues looked beyond the trees to the forest understory — the shrubs, grasses, and herbs covering the forest floor — to witness how Wisconsin’s forests are really faring. Their results show that fragmentation is reducing the abundance and diversity of native plants in southern Wisconsin forests.

The findings highlight the effects of increasing urban development and road density, especially in the southeastern part of the state. Land use changes have a pronounced impact on the islands of forest that remain, even when these areas are protected as parks or natural areas.

"Forest patches are not just losing species — their whole biological nature is changing," says David Rogers, an assistant professor of biological sciences at UW-Parkside who led the study with a...
UW-Madison graduate student. "Surrounding landscape factors, like urbanization and agricultural dominance, are now determining which species can survive in these little patches."

One unique quality of the current work is that it builds on a detailed trove of historical data collected throughout the state in the 1940s and 1950s by renowned UW-Madison ecologist John Curtis. More than 50 years later, Rogers and others revisited many of Curtis's sites in southern Wisconsin to see what changes time has wrought.

Though negative effects of fragmentation on biodiversity have gone largely unrecognized in the past, the impacts appear to be intensifying over time, the researchers say. Nearby cities and towns now strongly affect local woodlots, causing smaller plots in particular to lose species. "When we isolated these forest patches 50 or 100 years ago, we were dooming species to extinction," says Waller. "It may not happen right away — and in that sense it's an 'extinction debt' — but it will accumulate over time."

They believe that isolation takes its biggest toll on forest plant diversity by cutting off routes for native plants to re-colonize areas where local populations may have disappeared. "Plant species might go locally extinct for lots of different reasons," including natural cycles of turnover, Waller says. "But typically the area will be re-colonized very soon by nearby populations of the same species. That's what does not happen once a habitat becomes isolated or that patch becomes smaller."

The connections between local plant communities and more distant landscapes have increased markedly. The bottom line is that humans appear to be having larger cumulative impacts on Wisconsin's forest communities than even ecologists previously appreciated. This realization has important implications for how we should manage southern Wisconsin's remaining forests, Rogers says. The scientists are now working to identify the specific factors driving the observed ecological changes.

"People are a really important part of the system," Rogers says. "We are having a greater influence over our local ecology, whether we want to or not. That puts the responsibility on people to take care of it, protect it and maintain it."

Recommended Reading

"Like many biotic declines, the population and economic growth that drive landscape changes usually creep along at a steady rate in a manner that attracts little notice. Each incremental change seems minor, and we are all now used to these changes. Indeed, politicians and chambers of commerce urge us to pursue and celebrate this growth, boasting about the benefits it will bring. Those concerned about too much growth or growth in the wrong places are accused of being elitist, myopic, or antiprogress. Local skirmishes increasingly erupt, but city and rural zoning codes still view natural habitats as undeveloped real estate more often than valuable assets deserving protection. This will continue to be the case until we recognize the threats posed by cumulative environmental effects. Although ecology teaches limits to growth, many pursue a different gospel."


For More Information

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This work was supported by funding from the National Science Foundation and the U.S. Department of Agriculture.
Other highlights from the study include:

- Trends show recent stability in farm and food processing employment. Advances in technology have allowed farmers and food processors to gain significant cost savings through economies of size. Many of these advances have come in the form of labor-saving technologies. Trends suggest that agriculture is a not a declining industry, but that it is becoming less labor intensive.

- Using “clustering analysis” several subsectors are identified as growing strengths of Wisconsin agriculture. These include the farm subsectors: dairy farming, production of animals for fur, and floriculture; and the food processing sectors: dry, condensed and evaporated dairy, breweries, frozen specialty food processing, and fruit and vegetable canning.

- Two broad conclusions are reached from the county level analysis. First, in some, mostly larger, more urban counties, agricultural economic impacts (i.e. employment, business or industry sales and income) are large. However, as a percentage of the entire county economy, the economic impacts are not as large as in more rural counties. Second, in many more rural counties, the agricultural economic impacts may or may not be large. However, as a percentage of the local county economy the impacts are large.

For More Information


To download a full copy of this report or to view individual county impact reports, please visit: www.uwex.edu/ces/ag/wisag
The Economic Impact of Organic Agriculture in Wisconsin

By Laura Paine, Wisconsin Department of Agriculture, Trade, and Consumer Protection

Globally, 87 million acres were farmed organically in 2008, representing almost 1.4 million producers in 154 countries. This acreage represents a nine percent growth in organic production over 2007. Wisconsin has seen even more dramatic growth as the number of certified organic farms in Wisconsin grew from 422 in 2002 to 1,202 in 2007, an increase of 285%. Wisconsin is second in the nation after California in number of organic farms and in the top five states in certified organic acreage (Wisconsin currently has 195,603 acres). The state is in the top five in production of all major organic crops and livestock types. Organic farming, processing and related economic activity account for a small, but rapidly growing portion of Wisconsin’s agricultural economy. The fastest growing areas include vegetable production and dairy.

About 250 farmers raise and sell organic vegetables on about 1,750 acres in Wisconsin. With per acre income levels averaging $3,741, these farms generate about 70% more income per acre than their non-organic counterparts. With our existing vegetable growing expertise and processing infrastructure in the state, and the proven strength in organic produce sales (about 38% of total organic sales nationally), there is great potential for growth in this sector in future years.

Dairy production and processing continue to be an area of strength and growth. About one-third of Wisconsin dairy processing facilities are certified to produce either their own or private label dairy products for other companies, providing multiple marketing options for organic dairy farmers. Wisconsin leads the nation in numbers with 23% of all organic dairy farms (479 farms). About 14% of all dairy cows live in Wisconsin and we produce about 12% of all organic milk produced in the nation.

Wisconsin organic dairy farms tend to be relatively small, averaging about 66 cows. As a result of premiums and low-cost production practices, most can generate a sustainable living for a farm family. Based on data from the University of Wisconsin Center for Dairy Profitability, even in the current economic downturn, Wisconsin organic farms generated nearly $1,000 in net profit per cow in 2009, while farmers receiving conventional prices for their milk lost $147 per cow (Kreigl 2010). The organic farms in the study averaged $65,000 in net farm income in 2009. Both organic dairy and vegetable processing represent a value added opportunity for Wisconsin agriculture.

For More Information
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Wisconsin Department of Agriculture, Trade and Consumer Protection
laura.paine@wi.gov 608-224-5120

NEW PLAN COMMISSION HANDBOOK AVAILABLE

By Rebecca Roberts, Land Use Specialist, Center for Land Use Education

A new Plan Commission Handbook is now available from the Center for Land Use Education. The handbook is designed to orient new members to the roles and responsibilities of the plan commission and to serve as a handy reference for veteran members of the plan commission. Planning and zoning staff, elected officials, and citizens will also find the handbook useful. Chapters in the new handbook include:

1. Introduction to the Commission
2. Procedural Responsibilities
3. Community Planning
4. Public Participation
5. Plan Implementation
6. Ordinance Administration
7. Zoning Regulations
8. Subdivisions Regulations

Each chapter is illustrated with examples from Wisconsin communities, references to applicable state statutes and case law, and worksheets and forms that can be downloaded and modified by local communities.

The handbook is over 200 pages in length and is printed on 100% post-consumer, chlorine-free paper. It is bound in a three-ring PVC-free binder to facilitate easy updating and insertion of local resources.

To order a printed copy of the handbook, please contact us with the information requested below. The handbook may also be downloaded and printed for free from our website at: www.uwsp.edu/cnr-ap/clue/Pages/publications-resources/PlanCommissions.aspx

<table>
<thead>
<tr>
<th>Handbook Order Form</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Title</strong></td>
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Shipping address:

Name
Organization
Address
City, State, Zip

☐ Check enclosed (payable to Center for Land Use Education)
☐ Please invoice (indicate if address differs from above)

Mail: Center for Land Use Education
     UWSP College of Natural Resources
     800 Reserve Street
     Stevens Point, WI 54481

Email: landcenter@uwsp.edu
Phone: 715-346-3783
Fax: 715-346-4038
CALENDAR OF EVENTS

“A Home for Everyone” Affordable Housing Conference
July 7-8, 2012 – Hyatt Regency/KI Convention Center, Green Bay, WI
www.wiscap.org

Community Development Society Annual International Conference
July 21-25, 2012 – Cincinnati, Ohio
www.comm-dev.org

ESRI International User Conference
July 23-27, 2012 – San Diego, CA
www.esri.com/events/user-conference/index.html

Small Town Downtown Forums
August 14, 2012 – Greenwood High School, Greenwood, WI
August 15, 2012 – County Administrative Building, Juneau, WI
August 16, 2012 – The Reiter Center, Three Lakes, WI
www.wisconsindowntown.org/events

Chief Executives Workshop
Aug 22-24, 2012 – Tundra Lodge, Green Bay, WI
www.lwm-info.org

Basic Economic Development Course
September 10-13, 2012 – Pyle Center, Madison, WI
http://weda.site-ym.com/?page=BEDC

Wisconsin Counties Association Annual Conference
September 23-25, 2012 – Radisson Hotel, La Crosse, WI
http://wicounties.org

Upper Midwest APA Planning Conference
September 25-26, 2012 – Monona Terrace, Madison, WI
www.wisconsinplanners.org

Wisconsin County Code Administrators Fall Conference
October 3-5, 2012 – Metropolis Resort, Eau Claire, WI
www.wccadm.com/conference_page.htm

International City/County Management Association Conference
October 7-10, 2012 – Phoenix, AZ
http://icma.org/en/conference

Wisconsin Conference on Downtown Revitalization
October 9, 2012 – Radisson Paper Valley Hotel, Appleton, WI
http://wisconsindowntown.org/events

Wisconsin Towns Association Annual Conference
October 14-16, 2012 – Radisson Paper Valley Hotel, Appleton, WI
www.wisctowns.com

League of Wisconsin Municipalities Annual Conference
October 17-19, 2012 – Kalahari Resort, Lake Delton, WI
www.lwm-info.org
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To receive this newsletter by email sign up at: www.uwsp.edu/cnr-ap/clue/Pages/LandUseTracker.aspx

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.

American Planning Association Monthly Webcasts
July 13, 2012 – Embracing New Urbanism in Your Comprehensive Plan
July 20, 2012 – Town Centers
July 27, 2012 – A Tale of Three Waterfronts
August 17, 2012 – Senior Mobility
August 24, 2012 – Communication Towers and the Role of the FCC
September 7, 2012 – Cars, Streets and Policy in 2035
September 14, 2012 – The Columbus Urban Commercial Overlay
www.utah-apa.org/webcasts

ASPRS Geospatial Webinar Series
August 2, 2012 – LIDAR Fundamentals and Applications
August 14, 2012 – Basic Principles of Spatial Data Analysis
September 13, 2012 – Assessing GIS Information from Remotely Sensed Data
November 15, 2012 – Elements of Orthophoto Production
www.asprs.org/Webinar-Series/Webinars-Offered.html

Natural Resources Leadership and Administration Program
(1 credit online continuing education course for natural resource professionals)
July 16 – August 9, 2012 – Natural Resources Policy and the Legislative Process
https://campus.uwsp.edu/sites/cnr-ap/nrla/Pages/default.aspx

For additional dates and information visit the online calendar of events
www.uwsp.edu/cnr-ap/clue/Pages/Calendar.aspx