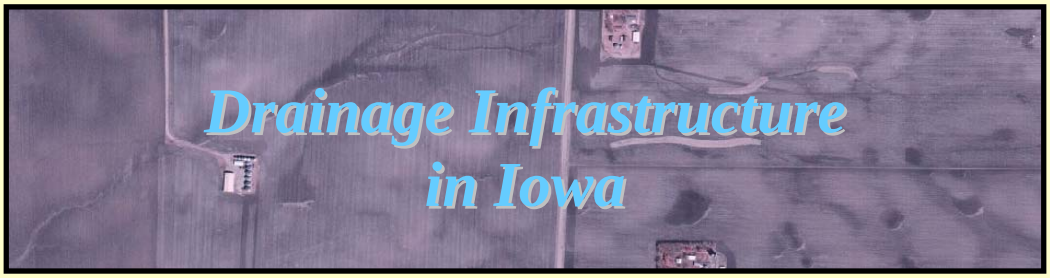
April 2006 - No. 10

WHAT'S HAPPENIN'

The Iowa Geological Survey's Geographic Information Systems Section Newsletter

This month's edition of *What's Happenin'* will discuss the section's efforts to convert county drainage infrastructure information, made up of publicly maintained county drainage districts and tile lines, into a GIS format for the State of Iowa. This information can be used to assess the presence of extensive sub-surface drainage in an area. An update to the National Wetlands Inventory project, initially discussed in the June 2005 Newsletter, will also be included.



There is debate as to whether Iowa has the most altered landscape in the Midwest, North America, or the world. One thing is for certain, Iowa's landscape has been dramatically changed by settlement and the agricultural practices that followed. Nowhere is this more apparent than the prairie pothole region of the Des Moines Lobe (DML) in north-central Iowa. Once covered in prairie and wetlands that both cleaned water and slowed its transport, the DML has been drained and its prairies plowed under, making it conducive for agricultural purposes.

Drainage systems, made up of tile lines and large, excavated ditches have been the method of choice for removing excess water since the mid 1800s. State law provided for counties to organize drainage districts and collect taxes to build and maintain the public tiles and ditches. The districts roughly follow watershed boundaries but not always. Sometimes these drainage systems alter the natural pathways of water, moving it from one watershed to another, at a higher flow rate. This leads to confusion in trying to understand how water moves downstream, along with the contaminants that move with it.

In order to provide a better understanding of watershed dynamics and extent, the Iowa Geological Survey's GIS staff began a project in 1999 to digitize county drainage district maps. A map (Figure 1) from the US Census Bureau's 1940 Census of Agricultural Drainage shows organized drainage enterprises in the State. Only fourteen of Iowa's ninety-nine counties have no publicly maintained drainage districts : Benton, Cherokee, Chickasaw, Clarke, Clayton, Delaware, Henry, Ida, Lucas, Lyon, Monroe, Sioux, Union, and Winneshiek.

Initially work for this project focused on DML drainage districts. This prioritization was based on the intensity of drainage infrastructure here, along with the special characteristics and concerns of agricultural practices and water dynamics on that landform. County drainage representatives were contacted to provide paper maps of their county's drainage districts (in some cases digital maps were available). Through the work of students and GIS staff these drainage maps were digitized and checked for accuracy.

The county drainage districts and tile lines are a fraction of Iowa's drainage infrastructure, but they do show the large publicly maintained trunk lines of this system (Figure 2).

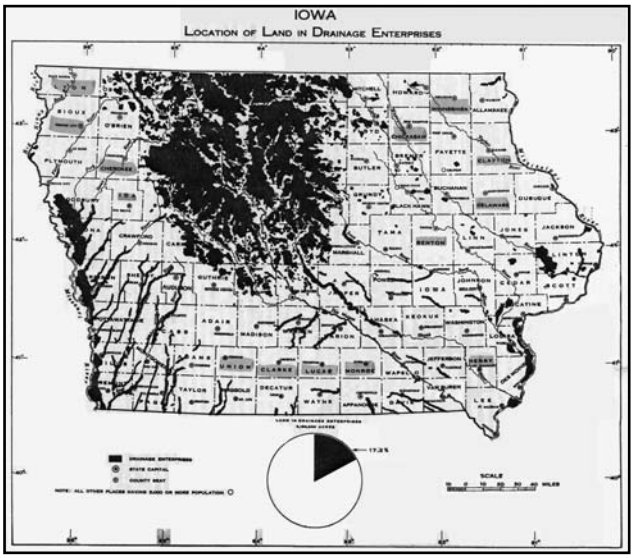


Figure 1. From 1940 Census of Drainage for Iowa. Dark areas represent extent of drainage enterprises.

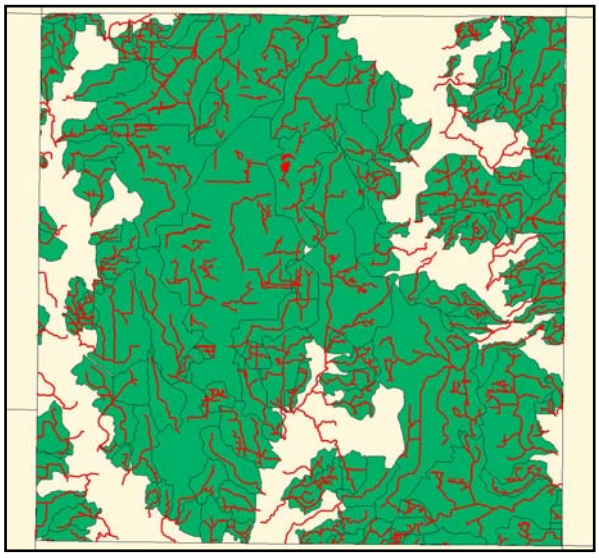


Figure 2. Wright County drainage districts (green areas) and tile lines (red lines).

Status of the Project

Figure 3 shows the status of all Iowa counties for this project. Currently thirty-one counties have been completed (shown in brown). These can be accessed on the NRGIS Library by selecting *"Data available by Theme"* under *"County-Wide Data."* Then from the drop down menu select either *"Drainage Districts"* or *"Drainage District Infrastructure."* This will give a listing of all counties that are available on the NRGIS Library with drainage information completed. This data is also included in the Watershed Atlas IMS as a layer found under the *"Infrastructure"* folder.

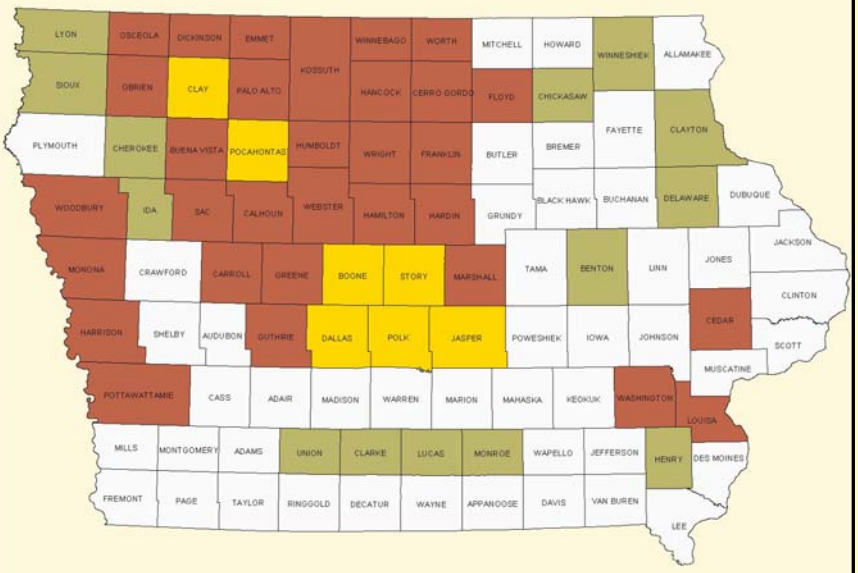


Figure 3. Status of counties in Drainage Infrastructure project. ***Brown*** *represents counties done,* ***yellow*** *are counties in progress,* ***green*** *counties have no infrastructure according to the 1940 Census of Drainage and* ***gray*** *counties have not yet been mapped under this project.*

Counties in yellow (7 total) are those that are currently in progress. These are near completion and need to be checked for accuracy before being added to the NRGIS Library. In some cases more information is being gathered to complete these counties. Counties in green are those fourteen counties that were identified by the US Census Bureau's 1940 Census of Agricultural Drainage as not having drainage enterprises. These counties certainly have some drainage improvements but they are not publicly maintained. The counties in gray probably have drainage infrastructure, but we have not contacted them for the availability of maps. Many times the county's paper drainage maps are in poor condition, many are nearly a hundred years old. Some counties do not have the resources to copy their maps and others are not interested in participating. Work will continue on this project until a complete data set for the entire state is compiled or there are no participating counties left to map.

Upon realizing that the data collected from counties is the main drainage infrastructure of trunk lines for the county drainage districts, the user might pose the question: "What about the smaller, privately owned, tile lines that make up the entire drainage system?" Members of the GIS staff have been contemplating this as well. Advances in technology, remote sensing in particular, have presented possibilities for filling in the gaps. Figure 4 shows a technique that uses remote sensing to detect tile lines. Lighter soils indicate where the actual drainage infrastructure is (drier soil), while darker soils are those that have more moisture present. While this is promising for detecting tiles the conditions must be nearly ideal for it to work. First, the ground must be barren, no crops can be present. Second, the image must be acquired soon after rainfall in order to capture the active drainage system. These conditions limit the applicability of this technology because those hoping to acquire this data rely on the timing of data capture, something that is not usually under their control. To do this on any large scale, a special project would have to be organized that would contract with an aerial photography firm to quickly react to rainfall events in the spring.

Contacts for the Drainage Infrastructure project are Jim Giglierano (jgiglie@igsb.uiowa.edu) and Michael Bounk (mbounk@igsb.uiowa.edu).

Figure 4. Using remote sensing, tile lines are indicated by lighter soil (active drainage), while darker (moist) soils indicate slower drainage.

Photo from "A Farmer's Guide to Remote Sensing in Midwestern Agriculture," From the Iowa Soybean Assn., 2003.

A contribution by the Fish and Wildlife Service (FWS) for the fiscal years of 2007 and 2008 has kept on track the State's goal of updating its National Wetland Inventory (NWI) by 2008.

Once completed, the new NWI, which is based upon 2002 imagery, will revise the FWS's original NWI dataset that was based upon aerial photography captured between 1983 and 1984. To date, the immediate goal of remapping the water bodies for the thirty-five counties of the Des Moines Lobe by July of 2006 is within reach (Figure 1). Thirty-three counties are already available for distribution via the NRGIS Library. Access them by selecting *"Data available by Theme"* under *"County-Wide Data."* From the drop down menu select *"National Wetland Inventory Update."*

Once the first thirty-five counties are updated, priority will shift to counties that fall within the Upper Mississippi River Basin - essentially the remainder of eastern Iowa. By the end of this summer, forty counties will have been completed. After the counties in eastern Iowa have been finished, the remaining counties in western Iowa should be completed rapidly to conclude the update.

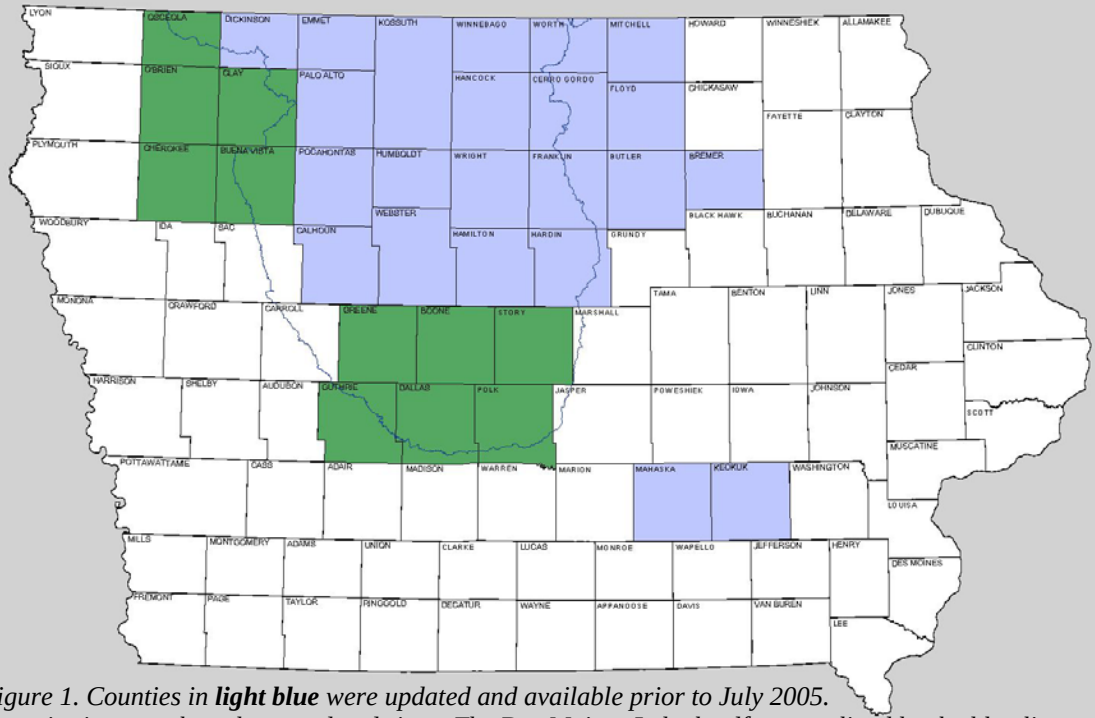


*Figure 1. Counties in **light blue** were updated and available prior to July 2005. Counties in **green** have been updated since. The Des Moines Lobe landform, outlined by the blue line, was overrun by the last advance of glaciers to enter the State (15-12,000 years ago) leaving behind a relatively flat landscape dotted with wetlands of varying size, shape and depth.*

Please refer to the IDNR-GIS Newsletter from June 2005 if you would like to read more about the history of this project. For more information regarding the status or other developments regarding the NWI project, contact Chris Ensminger at Chris.Ensminger@dnr.state.ia.us (515) 281-4216 or Todd Bishop at Todd.Bishop@dnr.state.ia.us (515) 281-7127.

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In the July of 2005 IDNR GIS Newsletter, the section pertaining to the Iowa Wetland Inventory incorrectly stated that "…another thirty-five counties will be mapped in the upcoming year…" It should have stated that "…thirty-five counties will be mapped by this time next year…"

Updates and New Data

A listing of updates and new data added to the NRGIS Library in the last year can be accessed by selecting "*Updates*" in the upper left corner of the library website link, or go to http://www.igsb.uiowa.edu/nrgislibx/updates_frame.asp .

Contact Us

If you would like to contribute to this newsletter, or if you have questions, concerns, or suggestions regarding this newsletter contact:

Chris Kahle (ckahle@igsb.uiowa.edu) or Andy Asell (aasell@igsb.uiowa.edu).

GIS User Group Meeting

The GIS Section will host its next GIS Users' Group meeting on Wednesday, May 24, 2006 in Des Moines. Users' Group meetings are a forum to share ideas and information with the GIS section and other GIS users in the DNR. Anyone interested is encouraged to participate. An agenda will be mailed out toward the beginning of May.