



Wisconsin MAPPING BULLETIN

Legislature lands agreement on Board and Council

by Ted Koch

A measure that reconciles the continued existence of the Wisconsin Land Information Board (WLIB) with the proposal to create the Wisconsin Land Council (LC) was passed by the Legislature's Joint Finance Committee early this summer. The matter was then passed along to the State Senate, where it remains as of our publication deadline.

With an approval vote of 16 to 3 on June 5, the committee, which has equal representation from both houses of the legislature, approved an amendment to the proposed 1997-99 budget bill that essentially preserves understandings previously agreed upon by the leadership of the Wisconsin Department of Administration (DOA), the WLIB and the Wisconsin Land Information Association. The bipartisan amendment to the budget bill was introduced by Representative Sheila Harsdorf and Senator Joseph Wineke.

Land Council restored, WLIB preserved

The Joint Finance Committee's amendment includes a number of significant features. Most importantly the committee's action does two things: retains the separate Land Information Board with its current powers and duties, and restores the provision, previously removed from the budget, to create the Wisconsin Land Council. For background, see the lead article in the last issue of the *Bulletin* (April, 1997).

In addition to preserving the board and creating the council, the Committee's action includes other specific provisions:

- provides for a common staff for both the board and the council of 8 total positions, which includes the 2.5 existing WLIB positions and 5.5 new positions. The new positions will be funded from both WLIB and LC appropriations. Both the WLIB and LC would share one director.

- requires that the WLIB and LC enter into a *memorandum of understanding* related to cooperation and the avoidance of duplication of functions.
- requires both organizations to establish an evaluation process of their activities.
- establishes a concurrent sunset date of September 1, 2003 for both organizations.
- provides authority for the DOA to develop and maintain geographic information systems on the condition that the proposed activities and their funding are approved by the Joint Finance Committee. A proposal in the budget to fund DOA's GIS activities from the state's recycling fund was removed in this amendment.

Budget not yet law

The state budget has yet to emerge from the senate. When it does, it will go to the State Assembly and eventually to the governor.

The State's new fiscal year has already begun (July 1) under automatic extension of the previous budget. As a result, until the new budget is enacted there will be no changes to the WLIB, and the LC will not yet exist.

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by Ted Koch

Board Meetings

The Wisconsin Land Information Board (WLIB) met most recently on June 24 in Madison. The next scheduled meeting of the board is August 27 in Madison which will be followed by another Madison meeting in the third full week of October.

Grant action rescinded

In a split vote of 6-5, the Board at its June 24 meeting rescinded its April 9 action that had approved a July, 1997 grant application period for local governments. In its April action, the board had decided that each county could apply, using a simplified process, for a July, 1997 grant or grants equal to the amount of money it had submitted to the board during the July, 1995 through June 30, 1996 period.

The board's April decision was based on its understanding of the funds available at that time. Later that month, the state Department of Administration's (DOA) Bureau of Financial Management notified the board that it may not have enough money to make July grant awards because none of the financial assumptions the board was working under were correct. Historically, the board has relied on its own accounting system. This year, the DOA began a fiscal year-end reconciliation of WLIB accounts and official state financial records. This reconciliation revealed a long-standing discrepancy between the board's and DOA's method of accounting.

By adhering to the DOA's accounting policies, the board currently has no money available for grant awards. Given this situation, the purpose of its June 27 rescind action is to give the board a short time to analyze its financial situation and develop a grant award strategy based on the amount and rate of collection of future revenues.

In another action related to local government, the board at its June 27 meeting voted unanimously to return proposed grant program rule modifications to its Executive Committee for further study and refinement. The proposed rule modifications are intended to provide the guidelines for a revised grant program beginning in January, 1998.

Planning instructions approved

At its June 24 meeting, the board approved a new comprehensive set of land information planning instructions to be used by both counties and state agencies. The instructions were developed by the WLIB Planning Work Group last summer, reviewed by the Wisconsin Land Information Association, and the WLIB Executive Committee. Plans developed in accordance with the new rules will be posted on the Internet for peer review.

Standards approved

The WLIB at its June 27 meeting gave final approval for two standards presented to it by the Wisconsin Land Infor-

mation Association (WLIA). The first of the standards establishes a uniform method for developing a geographical locator for parcels of all types using the WLIB recommended numbering scheme. The purpose of the standard is to facilitate data exchange between automated land information systems. The second standard approved by the board covers the method of exchanging geographic data between Wisconsin public agencies. This standard establishes a minimum requirement for data exchange, but it does not preclude data exchange by other means where there is mutual agreement between the organizations involved.

DOA offers advice on data access policy

In response to an issue brought before the board by a private citizen concerning access to data created by WLIB funds, Department of Administration Counsel has issued the following opinion:

The custodian of land records created with Wisconsin Land Information Program funds is responsible for complying with the provisions of Wisconsin Open Records Law. While the WLIB is the legal custodian of the program, it is not the legal custodian of the land records produced by entities funded by the program. If legal remedies are needed to obtain land records created by WLIB funds, these remedies will have to be pursued through a local district attorney office or through the Office of the Wisconsin Attorney General.

Executive Committee membership expanded

In response to direction given to him by the board, WLIB Chair John Laub has appointed Ben Niemann to be a member of the Executive Committee. Niemann will serve on the committee in the capacity as the representative from the Wisconsin Land Information Association. Up to the April 9, 1997 board meeting, Niemann had served as the board's Vice Chair. The appointment of a WLIA representative to the Executive Committee had been supported by the WLIA's Board of Directors.

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Can feds, states, and locals cooperate on the NSDI?

Sec'y Babbitt opens the discussions

by Bob Gurda

"If we fail to make this work, we will have missed a colossal opportunity. It will not be easy to succeed. But if we do, the taxpayers will be served."

With those words, Bruce Babbitt emphasized that efficient and effective investments in geospatial databases (particularly the National Spatial Data Infrastructure, or NSDI) can only be achieved through cooperation. Babbitt, the Secretary of the Interior as well as chair of the Federal Geographic Data Committee (FGDC), used this theme to introduce a late spring meeting of the FGDC's Steering Committee to which representatives of 18 states had been invited.

I attended as Wisconsin's representative, a role that both the Wisconsin Land Information Board and WISCLAND had asked the SCO to take on. While we can point to some successes in our state where federal and other organizations jointly fund geospatial data development, the federal players are a subset of a larger group that could all be involved, and on a sustained basis.

Secretary Babbitt clearly understood the status quo when he characterized the federal participation to date as episodic rather than routine and continuous. Under current operating principles, it is typically only possible for a federal agency to help fund a statewide or regional mapping effort as a one-time "project" activity. There is no mechanism available to allow the agencies to more generally underwrite a range of continuing activities.

The Secretary also reminded everyone that major federal funds would not

be forthcoming for the task of building and maintaining the NSDI as they might have been 20 or 30 years ago. The federal budget is shrinking and while there needs to be federal participation in this task, the funds available will nowhere near cover the costs. Sharing the burden with partners is the only hope.

Federal concerns

Just like state agencies who worry about different data formats and content potentially being developed in each county or municipality, federal agencies would like to find a way to smoothly access and use spatial information that spans state boundaries. Consider the difficulty of integrating water-related information across the Missouri River basin.

NSGIC's leadership role

Orchestrating the states' participation is a critical role, one that the National States Geographic Information Council (NSGIC) has undertaken. This way any states that are members of NSGIC but that are not officially recognized by the FGDC as cooperating groups can still participate in the process.

Other players

Also attending the meeting were representatives of the National Association of Counties (NACo), the National League of Cities, and the Open GIS Consortium. NACo president Randy Johnson (from the Twin Cities area) emphasized the quality of data collected in support of local government management.

Recommendations and actions

For a day prior to the FGDC meeting, the state representatives met with NSGIC, NACo, and federal staff to

craft a set of key recommendations.

Then, at the FGDC meetings, several individuals from the group addressed the committee after which Babbitt directed actions to address the recommendations (see below).

The thrust of the recommendations is simple: make the states and the federal agencies more equal partners in the quest to build the NSDI.

Where are we headed?

It is far too early to tell where this initial meeting will lead. However, several key ingredients for success are present. First, budgetary pressures will continue to make cooperation look appealing. Second, both Babbitt and the FGDC staff seem committed to the concept. Third, there is a growing understanding that geospatial data is truly a form of infrastructure and needs to be constantly maintained.

On the other hand, Babbitt was careful to be realistic particularly in response to suggestions that a specific federal agency or program that ought to be participating in building the infrastructure. He made it clear that his authority to steer federal resources exists only within his own department, a very small portion of the federal budget. Perhaps with the force of enlightened self-interest from the states this kind of shared funding can become a reality across the federal government.

Those of us who represent the states in these discussions also need to remember that we have our own examples of units that don't cooperate and help fund geospatial data, but which would benefit if it were available. This situation probably exists within almost any organization one might look at.

Recommendation 1: Increase resources for development of foundational data sets to enhance collaborative decision-making.

Action: NSGIC will solicit states and others to develop a short list of federal programs that might require spatial data and thus could help fund the NSDI. Also, data needed for Environmental Impact Statements will be reviewed to see how it might mesh with the NSDI.

Action: Examine incentive and funding models that might be propagated across the country.

Recommendation 2: Improve understanding and ensure participation of federal field offices in local spatial data coordination and development.

Action: FGDC staff, with input from state representatives, will draft guidance for governments and coordinating groups at all levels to enhance sharing.

Recommendation 3: Assure participation of state and local representatives in the collaborative development of national standards.

Action: NSGIC and NACo will identify representatives to participate in the current process of revising the metadata standard.

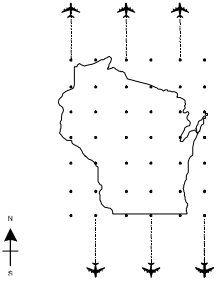
Statewide Data Developments

NAPP imagery last acquired in 1992

Aerial photo plan developing for '98

by Ted Koch

A consortium of federal agencies has scheduled statewide aerial photography coverage to be flown sometime in 1998. The agencies, which fund the National Aerial Photography Program* (NAPP), currently use a national acquisition plan that follows a recently revised 7-year cycle. NAPP photo coverage over Wisconsin was last obtained in the spring of 1992. Under the current plan, the states of Illinois, Indiana and Michigan are also scheduled for next year.



NAPP is billed as a cooperative federal-state program, where a state that commits 50% of the cost of the acquisition is guaranteed to be flown in its scheduled year. To ensure flight in 1992, five Wisconsin organizations together contributed \$140,000 of its \$194,000 (50%) share for spring (leaf-off) black-and-white photos. For 1998, the 50% state share for spring coverage is estimated at \$220,000, a 13% increase over 1992 prices.

Are contributions necessary?

The need now for a state contribution to the NAPP program may be much less than it was to assure acquisition in 1992. NAPP has lengthened its previous 5-year cycle to the current 7-year plan which results in fewer states to be flown in any one year. Also, if a state is not flown in its scheduled year, NAPP policy now states that it will be flown the following year. In the past, if a state was not flown, it was rescheduled to the end of the cycle.

The most important advantage that a contribution to NAPP earns a state is the selection the flying season (leaf-on vs. leaf-off). There have been some hints recently that the NAPP Steering Committee may choose to acquire leaf-on coverage in 1998 in Wisconsin since the flying season is much longer in the summer than spring, and leaf-off photos were acquired in 1992.

Raw material for orthos

The greatest benefit to the state in acquiring NAPP coverage next year will be its potential conversion to digital orthophotography. Primarily through the cooperative funding efforts of the Natural Resources Conservation Service and the U.S. Geological Survey, digital orthophotography based on 1992 NAPP photos has been obtained for 25 entire counties, significant portions of several others, with three more counties in production.

The very significant infusion of federal dollars to national orthophoto production goals made last year by the FDA Farm Service Agency (See the January, 1997 *Bulle-*

tin), and the plan to complete orthophoto coverage nationwide by early in the next century, has a direct impact on Wisconsin in that remaining areas of no orthophoto coverage could be completed using the 1998 NAPP imagery.

The "state" cost share for a digital orthophoto quarter-quad (one-quarter of a 7.5-minute quadrangle) at 1:12,000-scale has been reduced to 25% of the total cost. Now, federal agencies will pick-up the remaining 75%. At 1997 prices, this has reduced the needed state or local contribution to \$255 per quarter-quad. This translates to an approximate cost of \$16,000 for an average sized Wisconsin County. Approximately 22 counties remain today with little or no orthophoto coverage of any type.

* NAPP images are normally exposed at an elevation of nearly 4 miles (20,000 feet) above the ground surface. This gives a photo scale of approximately 1:40,000 or 1" = 3333'. A single 9" x 9" frame covers about 32 square miles.

Now searchable via the web

New way to select federal photos

by Bob Gurda

The U.S. Geological Survey (USGS) has built a Internet website interface through which you can search for aerial photographs held at their EROS Data Center. You can also use this device to order prints via an on-line form.

At this point, the entire NAPP holdings at EROS have been indexed for searching. (For background on NAPP, see the companion article on this page). Eventually, other older photography series will also be similarly searchable.

The interface uses a generalized base map to help you identify features in the vicinity of your area of interest. USGS also has plans to upgrade the base information to help make searching even more effective.

This tool is a major improvement over the microfiche flight indexes that previously were the only way to identify the area covered by any individual photo frame.

While it is not possible to view a scanned image of a particular frame, the interface provides a quick way to home in on an area of interest and to search for various photography projects over a specified span of time, to specify film type, and even to locate an area of interest simply by reference to a place name.

To access this website, point your browser to:
edcwww.cr.usgs.gov/webglis.

(source:USGS)

Internet Website Developments

Expansion continues in several directions

SCO website news

by Esteban Chiriboga

We have modified the SCO web page through several updates and additions. This trend will continue in the future at our site and at the Wisconsin Land Information Clearinghouse (WISCLINC) page which we also maintain.

The on-line version of the *Wisconsin Catalog of Aerial Photography* will be enhanced to include all missions flown since last year's 1996 update. In addition, new links and recent information about satellite imagery resources will be on-line in the near future.

We continue to maintain an up-to-date list of on-line links to pages of interest, notices of mapping and GIS related jobs as well as our calendar of important events throughout Wisconsin and the United States.

More available to download

This edition of the *Mapping Bulletin* will be available online as a .PDF format file. At the present time the January and April editions are available for download and can be viewed with (free) Adobe Acrobat software.

Feedback regarding the SCO and WISCLINC web pages is very important to us. Please contact us with information or suggestions regarding our on-line resources so that the ongoing evolution of our Internet services can better serve Wisconsin's mapping community.

Please check out the SCO home page at:
feature.geography.wisc.edu/sco/sco.html
and WISCLINC at:

badger.state.wi.us/agencies/wlib/sco/pages/wisclinc.html.

Listings of compliant metadata take a big jump

WISCLINC swells with recent additions

by Esteban Chiriboga

Substantial additions have been made over the last several months to the metadata holdings in WISCLINC (the Wisconsin Land Information Clearinghouse):

Wisconsin Department of Natural Resources (WiDNR)

- Land Surface Elevation Data
- 1:24,000-scale Watersheds
- 1:100,000-scale Hydrography Points
- 1:2,000,000-scale Hydrography
- Land Use and Land Cover
- Bedrock Depth
- Bedrock Type
- Groundwater Contamination Susceptibility Model
- Soil Associations
- Soil Characteristics
- Surficial Deposits

- State Soil Geographic (STATSGO) data base for Wisconsin
- 1:250,000-scale Hydrologic Units

Department of Agriculture, Trade and Consumer Protection (DATCP)

- Atrazine Use Prohibition Areas

Wisconsin Department of Transportation (WisDOT)

- 1:100,000-scale Roadway Chain.

Wisconsin Geological and Natural History Survey

- Pleistocene Geology of Lincoln County, WI

Land Information and Computer Graphics Facility (LICGF)

- Dane County, WI, Hillshade. Shaded Relief Image
- Dane County, WI, Digital Elevation Model

We expect to add several more metadata items in the near future. Note that several data files are also available to download from WISCLINC.

Development and maintenance of WISCLINC at the SCO is supported in part by funds from the Wisconsin Land Information Board. The data and metadata reside on a computer managed by the Wis. Department of Administration.

To visit WISCLINC, point your web browser to:
badger.state.wi.us/agencies/wlib/sco/pages/wisclinc.html.

Easy access to USGS data

Microsoft to offer orthos via Internet

The U.S. Geological Survey and Microsoft Corporation have signed an agreement to participate in a cooperative commercial geospatial data website development. This agreement will run for at least 18 months and will present vast amounts of USGS geospatial data over the Internet.

The initial effort will be focused on the storage and presentation of aerial imagery and will make available to the public the entire USGS digital orthophoto quadrangle (DOQ) dataset currently in the USGS archives. Microsoft will edit and package the DOQ information in such a way that it can be searched on the Internet and downloaded on the average home computer over low-speed connections. These "Internet-sized" images will be very small portions of the DOQ.

With this agreement the USGS hopes to increase public awareness of and access to USGS information and involve private sector expertise in the marketing, public access and distribution of USGS data and information. It will present USGS data in an easy-to-use interface available to the general public over low-speed connections and streamline the process of finding, ordering, and purchasing USGS data.

(source: USGS)

Statewide digital orthos are within our reach

For this issue we talked with Ken Lubich, the State Soil Scientist for the USDA Natural Resources Conservation Service (NRCS). He has been active in helping arrange cost-share funding for a large proportion of the digital orthophotos developed to date in Wisconsin.*

You have been a tireless advocate of digital orthophotos, as among other uses they provide an ideal image backdrop for digitized soil survey maps. How do you feel about the growth of orthophoto coverage across Wisconsin?

Ken-

I'm excited that so much has been developed and that additional projects are in work. People are already making good use of these images and we at NRCS are happy to have been able to participate in many of the orthophoto development projects.

We are well ahead of many other states although Minnesota has been able to accomplish theirs more quickly and effi-

...it is a goal worthy of a concerted effort to marshal the necessary resources, and soon.

ciently because a state program specifically targeted funds. In Wisconsin we've struggled to accomplish ours piecemeal through a variety of funding approaches and sometimes complicated institutional arrangements.

But, we are now in the position of being able to envision statewide coverage. I believe that it is a goal worthy of a concerted effort to marshal the necessary resources, and soon. Right now, federal funds for this work are actually in better supply than they were earlier.

So far, Wisconsin's digital orthophoto coverage has been developed in a number of different formats and coordinate systems. Is this practical for a statewide coverage?

Ken-

While it might be preferable to have a uniform product statewide, our office has been successful in working with

The NDOP has reduced the portion needed from a cost-sharing partner to 25%.

orthophoto files of various flavors, especially where they are uniform across a particular county.

It is also possible to convert from one coordinate system to another, although it is a complicated process.

My stronger concern is about access to this data. For those areas where we have used the National Digital Orthophoto Program (NDOP) to develop files, the data is not copyrighted. Accessibility is less clear in other areas, even where the state's Land Information Board has helped fund the work.

You mentioned that federal funds are more plentiful now than earlier. This seems surprising given the continued retrenchment of federal spending in general.

Ken-

What has happened at the federal level is just what has happened at the state and local levels. That is, more and more people are seeing the value of digital orthophotography. It's not inexpensive but it provides so many benefits that arguing for funds has become easier.

In particular, our sister USDA organization, the Farm Services Agency has allocated considerable funds nationally

for orthophotos over agricultural areas through the National Digital Orthophoto Program (NDOP). By pooling their funds with others from my agency and the USGS, we have reduced the portion needed from a cost-sharing partner to 25%.

The NDOP produces images with a resolution (cell size) of 1 meter. Yet, a number of Wisconsin counties have produced higher resolution images which in some cases cost more. Are federal funds available for this kind of work?

Ken-

Under the NDOP, this has not been possible. Other federal agencies have in some cases helped fund urban projects at higher resolutions. But, USDA and USGS are quite happy with the benefit/cost ratio of the NDOP product over the great bulk of the nation's landscape.

At NRCS we have been working with this product now for several years and it more than meets our needs. A number of counties also have been using the product successfully.

More resolution is great and the NDOP Steering Committee would like to better understand the demand that drives the additional investment. However, it has not committed to fund higher resolution products at this time. Right now there would be such broad benefits to so many organizations from simply finish-

continued on page 7...

**Ken Lubich has been the State Soil Scientist for Wisconsin since 1991, working out of the NRCS state office in Madison. He can be reached by telephone at 608/264-5341 ext. 148, or email to: klubich@wi.nrcs.usda.gov.*

— Guest Interview, continued —

ing statewide coverage that, to me, the resolution issue is marginal.

To date, the NDOP products in Wisconsin have used photographs acquired in 1992. Is the age of this imagery a significant issue?

Ken-

Yes, it is. However, the National Aerial Photography Program (NAPP) has scheduled a flight over all of Wisconsin

...we clearly are headed in the right direction. Who knows where we'll be in a few years now.

next year. By getting our funding organized soon we can be ready to finish statewide orthophoto coverage when that film is available.

A few years ago, would you have predicted that by now our orthophoto coverage would be as extensive as it is?

Ken-

I certainly would have hoped, but probably would not have predicted it. I know that some of us believed in the concept and have tried to find funds to make it happen in pieces.

Our belief apparently was well-founded because now we're seeing large organizations steering their funds in this direction. At the same time, my agency has dramatically accelerated its work on digitizing soil surveys.

Along with all the other GIS data that is emerging practically daily, we clearly are headed in the right direction. Who knows where we'll be in a few years.

As a follow-on, how do you see the prospect of getting all of our published Soil Surveys digitized?

Ken-

Very good, if we can get the orthophotography completed. Every year I have to submit a list of soil surveys to our national headquarters for soil survey digitizing funding. Authorization and funding is largely dependent on the availability of orthophotography and local cost-share funding. The national funding for orthophotography and soil survey digitizing will be spent somewhere and with local partnerships we can make sure Wisconsin is on the top of the list.

Of course, there are several counties for which we don't yet have the soils mapped, and some others where field work is needed to update old surveys. As those are ready they will be digitized.

Sept. 4th in La Crosse

Meeting set to complete orthos

by Bob Gurda

Mark your calendar for the first Thursday evening in September. From 7-9 p.m. that day the SCO is sponsoring a gathering with the purpose of encouraging the completion of Wisconsin's digital orthophotos.

The event is part of the Wisconsin Land Information Association's (WLIA) fall quarterly meeting to be held at the Radisson Inn in downtown La Crosse on September 4. The evening program is co-sponsored by WISCLAND and the WLIA's Digital Orthophoto Task Force.

Only 30% left to do

To date, coverage of almost 70% of our state's land area has been delivered or is in work. If the remaining 30% were completed, not only would the counties and other entities in those areas benefit, but by completing statewide coverage a host of programs across a variety of organizations would benefit.

Digital orthophotos are, in simple terms, images scanned from aerial photographs and then processed to make the image function like an accurate map. There are many ways in which these images can be exploited, and several examples of common uses will be displayed at the meeting.

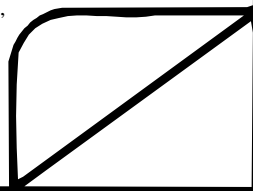
Opportunities and experience abound

Especially because the federal funds available for producing one type of digital orthophoto product have increased recently, it is timely to review the state's progress to date with an eye toward completing this valuable information resource statewide. Also, a disproportionate amount of the area yet to be covered is the western part of the state, not far from the La Crosse area.

There are a number of different ways in which to produce digital orthophotos, each with its own costs and benefits. The state's coverage to date includes at least half a dozen examples of different approaches, and these will be explained at the meeting.

Let us know if you'll be there.

Anyone may attend the meeting free, but please contact us at the SCO to let us know you plan to attend (608/262-3065). For information on the balance of the WLIA meeting, which runs Thursday noon through Friday afternoon, see the article on page 14.



Quad mapping—a future?

by Ted Koch

On page 9 of this issue we carry an article on the DRG map product produced by the US Geological Survey. DRG stands for Digital Raster Graphic, technical wording for the electronic version of a standard USGS paper “topo” map sheet. DRGs are now available for all quadrangles covering the state: 1154 7.5-minute maps, nearly 60 of the 1:100,000-scale and about 20 of the 1:250,000-scale maps.

The DRG is an interesting map product that will no doubt find many applications in digital desktop mapping. Having the familiar USGS topo quad in digital form, where it can be displayed on a computer monitor, used as a backdrop reference image for other data, plotted at different scales, or joined with adjacent sheets should prove handy to many users. However, the DRG is not a panacea and in fact carries a number of limitations inherent in the paper map from which it is scanned.

An aging map series

The “age” factor of the map images is a major consideration. It’s been 12 years since the last remaining 7.5-minute series map sheets were completed to provide entire state coverage for the first time. Since then, less than 65 (5.5%) of the quad sheets have been revised. Well over 50% of the maps in this series are now over 17 years old.

Between 1960 and 1985, the State of Wisconsin allocated almost \$4.6 million in cooperative funds to complete the series. Money was contributed to this effort by both the Departments of Transportation and Natural Resources, and the Wisconsin Geological and Natural History Survey. With cooperative matching funds and other contributed money from the federal government, the total investment was over \$11.9 million.

We have no quad maintenance program

The current state share of funding for the 7.5-minute series is \$0 (yes, I mean “zero”). With the federal government match to our contribution, the amount currently spent on quadrangle revision is \$0. With no prospect of that situation changing anytime in the future, the state’s quad map coverage will continue to age, and the age is becoming significant.

With the large amounts of money currently being invested by the state’s Land Information program in various types of mapping, many question the value of the smaller-scale topo quadrangle products and their usefulness as reference maps. No doubt, that view has much merit, particularly from the aspect of having current, detailed and accurate digital data for geographic information system applica-

tions. However, many projects covering larger areas need medium-scale base data that is filled nicely by the quad series. That usefulness certainly is compromised by the age factor.

Considering the investment in quad mapping made over past decades by this state, a decision on future investment in quad mapping needs a thorough and thoughtful evaluation process.



Walk-in or by mail

Many sites for buying topos

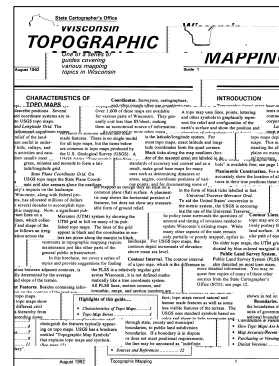
by Bob Gurda

Despite the fact that the U.S. Geological Survey’s various topographic maps series continue to age, they continue to be popular for a variety of uses. Maps for anywhere in the country can be ordered from USGS, but there are also sites in Wisconsin that carry some or all of the maps for our state.

We compiled a list and companion location map in our 1992 guide “Wisconsin Topographic Mapping” which is still available free, a 12-page publication. There have been some changes to that listing, and we have reflected them in both a list as well as a linked map posted on our website.

Also viewing sites

A number of libraries maintain complete sets of USGS topo maps with public access. These sites are also linked and listed on our website.



Topographic Maps

...A layman's view

New USGS DRG product is useful

by AJ Wortley

What is a DRG?

So, you've heard a lot of buzz about the new digital data product called a DRG or Digital Raster Graphic and wonder what exactly one is? A DRG is a scanned image of a standard series 7.5-minute USGS topographic map with digital registration information included for georeferencing.



The USGS distributes DRGs in groups of images that cover a standard 1° x 1° block, encoded on a CD-ROM disc. A wealth of documentation on file and data formats and specifications is included.

Twenty-nine CD-ROMs comprise entire coverage of the state of Wisconsin with nearly two-thirds of those extending across the state border. A block typically includes 67 maps: 64 cover 7.5 x 7.5 minutes each, 2 cover 30 x 60 minutes each, and 1 covers 1° x 2°. (Where no maps exist over large water bodies or state lines, the disc will hold fewer files).

How do I see 'em?

Each disc also includes two software packages for viewing the graphic files, ArcView 1.0 and AVLite. If you already have a graphics software package that will handle fairly large TIFF files, it is not necessary to install one of these. Rather, you can refer directly to the initial documentation on filenames, then refer to the graphic or text index to determine which file to open.

An alternative freeware package that requires less memory, WinCATS, is available for download from the USGS webpage address given in the next column.

How do I get 'em?

Order your CDs from any USGS ESIC office or call 1-800-USA-MAPS.

The ESIC office in Rolla, MO is affiliated with the unit which did much of the DRG product development. Additional or more specific questions about product content or availability may be answered there in addition to taking your order. This office can be reached at 573/308-3500 and accepts Mastercard or VISA over the phone, check or money order mailed ahead, or purchase orders for businesses.

The cost is \$32 for a single CD or \$42 for dense blocks which require a 2-CD set, plus \$3.50 shipping and han-

dling per order. Discs are produced on demand and will take a couple of weeks to arrive.

Where can I find out more?

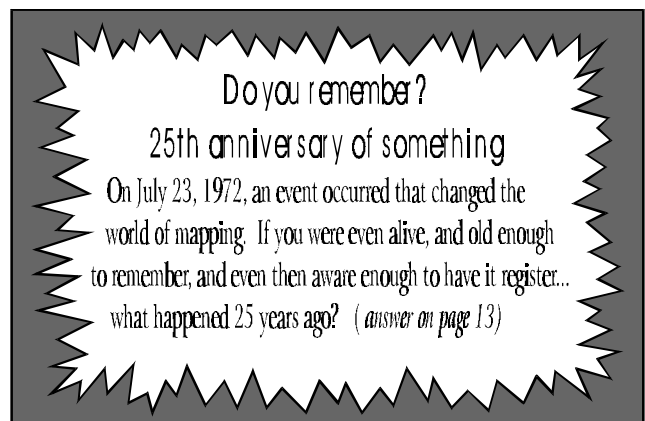
Many more questions about this new product may be answered by visiting the USGS website on DRGs which also contains a status map for the U.S. showing which areas are available in this digital data format. The address for this site is: mcmcweb.er.usgs.gov/drg/. This website has been providing information throughout the development of this product so many questions about development, related products, etc. are fielded here.

Alternative products

As we have covered previously, WISCLAND is converting the USGS DRGs and enhancing them for use in GIS viewers. This work is on schedule to be completed by the end of this summer, using the WTM83 coordinate system. Parallel conversion to other coordinate systems such as the Wisconsin County Coordinate System can be done now more economically than later as a special task.

The SCO is also available for questions regarding all DRG data formats and Wisconsin coverage.

Several private companies are also preparing DRG-like products and, in some cases, companion software. We hope to cover this emerging trend in a future article.



? *Can you point me toward any computerized maps that I can use as a base for showing locations of canoe and hiking routes in the vicinity of my summer camp? I've used printed USGS topo quads in the past, but usually I only need a small portion of one map or two adjacent ones, and they wear out rapidly.*

The recently produced Digital Raster Graphics (DRGs) could work nicely for you. These are scanned versions of USGS topographic maps, available inexpensively and in a widely used format, TIFF. (See the article on page 9 of this issue for details).

The DRGs can be manipulated in a computer using a "paint" program, to add features such as your routes. You might want to create different versions for different purposes. You can "clip" out small portions and print just those areas. A CD-ROM drive is the handiest way to read the original files.

Getting adjacent DRGs to fit together may be somewhat of a trick due to the fact that individual files (each scanned from a single map sheet) do not show the mapped area as a rectangle, and typically do not have true north exactly toward the top of the image. This makes clipping off the map collar a tedious job.

Another factor to consider is that the standard published maps stand up to sunlight better than custom products you print from a color ink-jet device. In either case, clear laminating should improve durability and may reduce fading.

? *Where can I find a standardized set of map symbols? I am thinking of something akin to the universal set of symbols used in building plans by architects and engineers.*

Good question, but one that does not have a conveniently easy answer. Because maps are used to portray such a wide range of information from the extremely detailed to the very general, the specification and use of standardized mapping symbols is, from a practical stand point, nearly impossible. Depending on a specific map's purpose, a map designer may need to use an unlimited variety of graphic symbols to communicate the map's information.

Certainly, map designers over the years have developed many accepted conventions, such as using blue to represent water features, green for parks and vegetation, etc. However, established standards for such things as the thickness of lines, whether a line should appear dashed or solid,

or the size and style of the lettering used for map names is mostly the decision of the map's creator.

The closest we come to standard mapping symbols are the conventions developed by mapping organizations to give their maps a similar "look" from map to map. Examples of this are the symbols used by the U.S. Geological Survey on its various national topographic map series, or the standardization of topographic map products developed over the past 30 years by the Southeastern Wisconsin Regional Planning Commission.

? *I acquired a copy of the WISCON software program from your office, and used it to convert coordinate values from the State Plane Coordinate System into the Rusk County Coordinate System. As part of checking the results, I decided to compute the bearing between several pairs of these points, in both coordinate systems. When comparing these bearings, I noticed to my surprise that they were different. Did I do something wrong?*

Most likely you did nothing wrong because one aspect of planar coordinate systems is that "north" in one is not exactly the same as "north" in another. In fact, only at certain places will "north" relative to a particular coordinate system grid (often called "grid north") be the same as true north (often called "geographic north"). So, it is normal for the bearings between two points, as expressed in different coordinate systems, to be different.

It may seem as though "north" should always be truly "north", but remember that as part of constructing any coordinate system that is based on a plane surface, the curved earth must be mathematically flattened in some way or other. As a result, true north (for instance, a line of longitude heading north from the equator to the north pole) may not be "straight up" on a map.

This effect is visible on a standard USGS topographic map sheet. Try drawing lines between the top and bottom edges of the map, first using the corresponding State Plane Coordinate System ticks, and then the UTM coordinate system ticks. You will notice that "grid north" in one system is rotated relative to the other, and that neither probably is the same as true north (and both will vary depending on the location in the state).

Editor's Note: If you have a question, or had a question for which you found an answer that might be of interest to others, please let us know.

Publications & Products

USGS division maps its future

NMD releases strategic plan

A 29-page strategic plan, intended to chart its course over the next ten years, has been published by the National Mapping Division (NMD) of the U.S. Geological Survey. The NMD is that segment of the USGS which prepares and publishes the familiar 7.5-minute "Topo quads" that provide unified base map coverage over the entire country.

Beginning with a brief history of its operations, the plan then details the NMD's current environment and its vision of the future. Within this vision, the plan details 17 goals within the areas of business practices, mapping data collection and integration, earth science information and delivery, and geographic research and applications.

Free copies of the plan may be obtained from USGS-NMD, Mail Stop 512, 12201 Sunrise Valley Drive, Reston, VA 20192, or electronically on the Internet at: www-nmd.usgs.gov/misc/strategic.html.

(source: USGS)

For Macintosh systems, free for teachers

Visit D.C. via CD-ROM

The USGS has developed an educational CD-ROM for middle school students. It is an interactive tour of Washington, D.C. using topographic maps, configured to operate under Macintosh System 7.1 or later.

"The Topographic Field Trip" is a multimedia presentation that lets students navigate through layers of information linked with text, graphics, sounds, and animations. Through a game-like adventure, students learn to measure distance and direction, determine latitude and longitude, recognize map features, determine elevations, and examine historical maps and digital orthophotos.

In addition to System 7.1, your Macintosh needs at least 8 Mb of RAM, a CD-ROM drive, and a monitor that delivers 256 colors.

Teachers can obtain this product free by requesting it on school letterhead from: USGS Information Services, Box 25286, Denver, CO 80225.

(source: USGS)

Lincoln and Dane counties featured

WGNHS offers new geologic maps

by Bob Gurda

Two new maps of Pleistocene geology are now available from the Wisconsin Geological and Natural History Survey (WGNHS). These cover Lincoln County and Dane County, and both are printed at a scale of 1:100,000. Respectively, the sheet sizes are 24 x 32 and 24 x 39 inches.

The most recent glaciation of Wisconsin occurred during the Pleistocene, concluding only several thousand years ago, and left surface materials and landforms that are still evident in the landscape and that significantly influence how people use the land.

Each of these maps is available separately as an unfolded sheet (\$5.00), or folded in conjunction with a printed report (30 pages for Lincoln [\$9.00], 60 pages for Dane [\$15.00]). The Dane County booklet includes an additional folded sheet depicting ten east-west cross sections.

There is an additional charge for shipping and handling of all items. For details or to order, contact WGNHS by telephone at 608/263-7389 or via the World Wide Web at www.uwex.edu/wgnhs/.

tracks train routes

State rail network map updated

by Esteban Chiriboga

A detailed map of Wisconsin's freight railroads has been updated and is available from the Wisconsin Department of Transportation (WisDOT).

The map highlights the locations of currently operational railroad lines. Additional symbols indicate Amtrak stations, lines that are out-of-service, corridors that are owned by the state and lines that have been acquired before abandonment for recreation use.

The map, a computer generated plot on electrostatic paper measuring 22" by 28", can be purchased for \$4.00 by contacting the WisDOT Maps and Publications Sales department at 3617 Pierstorff St. P.O. Box 7713 Madison, WI 53703-7713; phone 608/246-3265.

In addition, WisDOT will soon release a 1:100,000 scale digital railroad data file in GIS format.

(source: WisDOT)

Student staff on the rebound

SCO workforce adjusting to new times

by Bob Gurda

The SCO's student staff is mostly repopulated as new faces have filled gaps left by several departures at the end of the spring semester. You can find articles in this issue as evidence that they're already hard at work.

To keep our website and WISCLINC running and ever improving, we have hired Esteban Chiroboga as a graduate Project Assistant. He is finishing up his Masters degree in Geography and moving on to the PhD program with an interest in GIS and climatology.

We'll be saying goodbye to AJ Wortley by summer's end and have just hired Chin-Chun Tang to be a new undergraduate employee.

Jason Freeman, who had been managing our computer systems since last summer, left for a summer internship and opted for graduate student employment in his field of energy policy next fall. We may be changing the way we carry out this critical role, and at least in the short term are relying on the expertise of Bi-Shing Yen, a graduate student majoring in Industrial Engineering.

product expanded to 3 diskettes

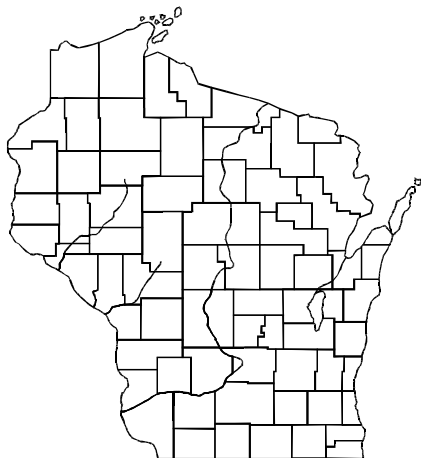
SCO Outline Maps fine-tuned

by Bob Gurda

We have slightly modified our new *Wisconsin Outline Map* package, and it now requires 3 rather than 2 diskettes. However, the price remains \$10.00.

As detailed in our previous issue, this new product provides a set of simple base maps for use as illustrations in newsletters and reports. The maps come in three formats for use on IBM-compatible personal computers, and each format provides a variety of scales and features.

To receive this product, use our order form which is available from our website, or in printed form, or we can fax a copy to you.



Second edition is a first

New Soil Mapping guide

by Bob Gurda

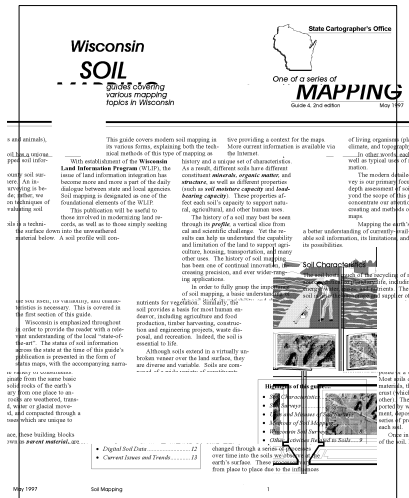
You can find updated information about soil mapping in Wisconsin in the SCO's recently revised guide, the 2nd edition of *Wisconsin Soil Mapping*. This 16-page publication is available free from the SCO.

While the original edition of this guide was not the oldest publication in our guide series begun in 1992, so much had changed that we decided to do a complete revision. Not only had the status of soil mapping and digital versions of soil surveys changed dramatically since 1994, but the institutions and program directions were different too.

The future of revisions: print or web?

Thus, this guide is the first we have revised. Several other of our guides have become somewhat outdated and we are in the process of deciding whether to revise and reprint on paper or to move toward the Internet's World Wide Web with a change in format. The web would let us use color, would be easier to update, and would let us link to many related sites. If you have any opinion on this issue, please let us know.

You can also access this guide in Adobe Acrobat format on our website for viewing and/or printing.



...web addresses can be so devilish

Corrections

In our previous issue we slightly (but critically) erred in listing a web address. On page 8 of that April '97 issue we steered readers to Oddens's Book Marks, for which the correct web address is: kartoserver.frw.ruu.nl/HTML/staff/oddens/oddens.html.

Also, on page 13, in the article about the Lake Michigan map, we inadvertently added a "D" to the end of the web address.

Geodetic Control

Vertical, airports, and integration to benefit

Projects underway to observe HARN

Two current projects will improve the state's High Accuracy Reference Network (HARN). The work will have several benefits for different groups.

Vertical strengthening

Wisconsin has reaped the benefits of being one of the first states to install a HARN using GPS technology in 1991. Since that time numerous efforts have densified horizontal geodetic control locally from the HARN, thereby building a more robust control network than existed previously.

However, there have been some small anomalies in the HARN attributable to weakness in the vertical component. As a result, the National Geodetic Survey (NGS) and the Wis. Dept. of Transportation (WisDOT) will be reobserving all 80 HARN stations this fall. NGS and WisDOT co-operated on the initial development of the HARN.

They expect to derive major improvements in the vertical component of the HARN because of advances in GPS data processing software and the presence of a full GPS satellite constellation as compared to 1991. There likely will also be a few relatively minor changes in horizontal coordinates.

Additional stations at airports

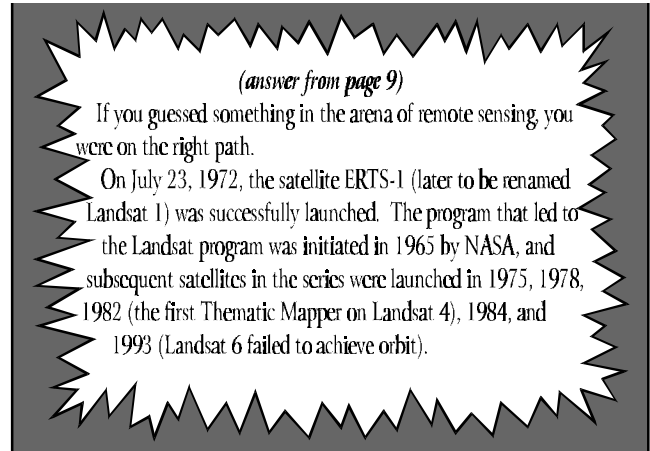
The Wisconsin GPS network will be further strengthened since NGS will also be establishing precise GPS locations for additional geodetic stations at 78 Wisconsin airports. These latter stations are part of the FAA Area Navigation Approach (ANA) network that is being built across the country to support commercial aviation.

The net result of the current work will be an FAA-supported network at many airports to provide safer, all-weather navigation aides for aircraft pilots.

Work in adjacent states

The Illinois HARN has been completed. WisDOT assisted NGS by setting up GPS instruments on seven selected Wisconsin HARN stations and "observing" (i.e., collecting GPS satellite data) at the same time NGS and Illinois DOT crews were collecting similar data for 196 stations in Illinois. By tying in Wisconsin with other states (similar work was done last fall with Iowa), a stronger nationwide network results, with less need for on-going adjustments at state borders.

(source: D. Moyer, NGS State Advisor)



NAD 83 (1991) and NAVD 88 selected

WisDOT revises geodetic policy

by Ted Koch

The NAD 83 (1991) horizontal datum adjustment and the NAVD 88 vertical datum have been selected as the reference foundation for all new project work to be done by the Wisconsin Department of Transportation (WisDOT).

In addition to the policy on datums, WisDOT will base all of its larger-scale project data collection and mapping on the new Wisconsin County Coordinate System.

With these decisions, WisDOT's new data will have similar structure and be more easily integrated with local data produced to the standards of the state's land information program. The new geodetic policy became effective in January this year. The policy was developed by the department's Location Control Policy Committee, and is an attempt to replace the past use of multiple datums and coordinate systems with single up-to-date systems.

(source: WisDOT announcement, 6/12/97)

Events

...now in its 8th year

GIS Expo at DNR rides again

Mark your calendar for the morning of Thursday, October 2 for the 1997 edition of the Wis. Department of Natural Resources' GIS Expo. Anyone is welcome to attend.

Hosted by DNR's Geographic Services Section, the Expo this year will be a series of live demos conducted by staff on the 8th floor of the GEF 2 office building in downtown Madison. These will run continuously from 8:00 am until noon.

For details on the topics that will be covered in the demos, visit the Expo web page at www.dnr.state.wi.us/geo/expo.htm.

(source: Wis DNR)



preparations in full swing

October metadata class takes shape

by Bob Gurda

Video taping, publicity, scheduling.... The operatives are at work months in advance, getting ready for the satellite video-conference on metadata scheduled to be aired from Madison this fall.

A Practical Guide to Metadata Implementation for GIS/LIS Professionals will run from 1:00 - 3:00 pm on Wednesday, October 15. Wisconsin downlink sites can carry the program for \$50 (\$75 after September 26). For other sites the fee is \$250 (\$300 after 9/27).

A brochure on the program is available from David Hart at the Land Information and Computer Graphics Facility on the UW-Madison campus (call 608/263-5534). Or, visit the program website at localis2.lic.wisc.edu/~dhart/metadat.htm.

We also have copies of the brochure here at the SCO.

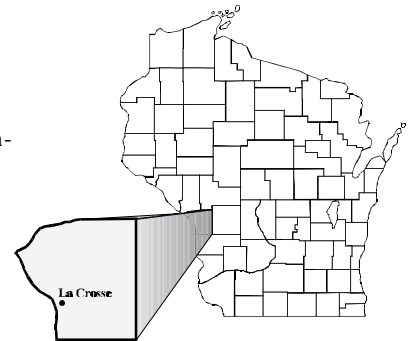
(source: LICGF)

Quarterly meeting set for Sept. 4-5

WLIA to visit La Crosse

by Brenda Hemstead

The fall meeting of the Wisconsin Land Information Association will be held at the Radisson Inn in La Crosse on Thursday and Friday, September 4-5.



Thursday evening

The free Thursday evening program beginning at 7:00 p.m. will feature a presentation and discussion on **Wisconsin Digital Orthophotos: Pathways to Completing State-wide Coverage**. Digital orthophotos currently cover almost 70% (50 counties) of the state. What will it take and how long to complete the remaining 30%? This evening's program will cover a discussion and presentation on the status of orthophoto coverage across the state, and explore how we can complete statewide coverage in the near future. Particular emphasis on how counties are using digital orthophotos will also be included (sponsored by the SCO and co-sponsored by WISCLAND and WLIA Digital Orthophoto Task Force, see related article on page 7).

Friday morning

Friday's program begins at 9:30 a.m., which carries a registration fee of \$20 covering lunch, will include updates and discussion regarding the Wisconsin Land Information Board, the Program, and the Land Use Council as well as presentations by Vernon County, Mississippi Regional Planning Commission, and the Dept. of Transportation.

Friday afternoon

After lunch and business meeting, members and guests will be given a tour of Environmental Management Technical Center (EMTC) located 4 miles away in Onalaska with Dan Fitzpatrick. The EMTC is a U.S. Geological Survey science center that freely shares a wide range of biological, physical, spatial, and technical data and information relating to the Upper Mississippi River System. Established in 1986 as a center for ecological monitoring and analysis, the EMTC manages the long term resource monitoring program which is the largest river-related inventory, monitoring, research, spatial analysis, and information sharing program in the United States.

Selected Regional Conferences and Technical Meetings

August 13, 1997, **Northland Area GIS Users Group** will be held from 9:00 am - noon at the Bad River Tribal Administration Center (Chief Blackbird Center) in Odanah. Contact: Dennis Kantan at 715/762-5711.

August 15-16, 1997, **Wisconsin Society of Land Surveyors Annual Summer Meeting** will be held at the Holiday Manor-Best Western, Menomonie, WI. Contact: WSLs at 414/549-1533.

August 27, 1997, **Wisconsin Land Information Board Meeting** will be held from 10:00 a.m. to 2:00 p.m. at the Dept. of Agriculture, Trade and Consumer Protection in Madison, WI. Contact: WLIB at 608/267-2707.

September 4-5, 1997, **Wisconsin Land Information Association Quarterly Meeting** will be held at the Radisson Inn in LaCrosse, WI. Contact: WLIA at 800/344-0421.

September 17-19, 1997, **Wisconsin Real Property Listers Association Annual Meeting** will be held at the Monona Terrace, Madison, WI. Contact: Cindy Wisinski at 715/346-1483.

September 19-20, 1997, **Wisconsin Geographical Society 1997 Annual Meeting** will be held at the Hamilton Center on the Whitewater campus. Contact: Dr. Renae Prell, Program Chair, Dept. of Geography, 414/472-5270.

October 1-3, 1997, **Minnesota GIS/LIS Consortium: 7th Annual Conference** will be held at the St. Cloud Civic Center in St. Cloud, Minnesota. For more information visit the www.lmic.state.mn.us/gislis/gislis.htm conference web page.

October 2, 1997, **Wisconsin Dept. of Natural Resources' 1997 GIS Expo** will be held from 8am - noon on the 8th floor of the GEF 2 building in downtown Madison. For more information visit their web page at www.dnr.state.wi.us/geo/expo.htm.

October 2, 1997, **The WISCLAND Steering Committee** will meet at the Dept. of Natural Resources in Madison, WI from 1pm - 4pm. Contact: Bob Gurda at 608/262-6850.

October 13-14, 1997, **Wisconsin Register of Deeds Conference** will be held in Chippewa Falls, WI.

October 14-17, 1997, **The First North American Symposium on Small Format Aerial Photography** will be held at the University of Minnesota Cloquet Forestry Center in Cloquet, Minnesota. For more information visit the www.asprs.org/asprs/meetings/smallformat/small.html conference web page.

October 15, 1997, **A Practical Guide to Metadata Implementation for GIS/LIS Professionals, A National Satellite Video-Conference** will be held from 1:00 to 3:00 p.m. Contact David Hart at 608/263-5534; email: dhart@macc.wisc.edu on registering as a downlink site for the satellite conference.

October 21 or 23, 1997, **Wisconsin Land Information Board Meeting** will be held from 10:00 a.m. to 2:00 p.m. at the Dept. of Agriculture, Trade and Consumer Protection in Madison, WI. Contact: WLIB at 608/267-2707.

December 4-5, 1997, **Wisconsin Land Information Association Quarterly Meeting** will be held at the Paper Valley Inn in Appleton, WI. Contact: WLIA at 800/344-0421.

December 4-5, 1997, **GIS in Illinois Conference** will be held at the Hyatt Hotel in Oak Brook, IL. Contact: IL-GISA at 815/753-1906.

January 21-23, 1998, **Wisconsin Society of Land Surveyors Annual Conference** will be held at the Holiday Inn in Stevens Point, WI. Contact: WSLs at 414/549-1533.

For Bulletin and web site

Send us your calendar items

We are now focusing our calendar listing on events scheduled in Wisconsin and the nearby region. When you keep us informed of your organization's meetings, workshops, classes, etc. we can help spread the word to several thousand people.

Even if you are not seeking additional people to attend an event, announcing it keeps others informed and helps us all coordinate our schedules.

Often, events are scheduled and then occur in time frame that is too short to get them listed here before they have taken place. To deal with this problem, we also maintain a list of scheduled events on our web site.

To deal with the events outside our region which we formerly included in the *Bulletin* calendar, we now provide links through our web site to national and international calendars maintained by other organizations. These listings are similar to what has been carried for years in several publications that serve the mapping and GIS fields, but which many people in our state may not have seen regularly.

Between the *Bulletin* and our web site, plus the linked sites, you now have access to much more information about events than previously.

About the SCO...

The State Cartographer's Office (SCO), established in 1973, is a unit of the University of Wisconsin-Madison. The SCO is located on the 1st Floor of Science Hall.

Our permanent staff consists of four people—Ted Koch, State Cartographer (608/262-6852), Bob Gurda, Assistant State Cartographer (608/262-6850), Brenda Hemstead, Administrative Assistant (608/263-4371), and Liz Krug, Program Assistant (608/262-3065), plus several part-time graduate and undergraduate students.

The State Cartographer's position and mission is described in Wis. Statute 36.25 (12m). In addressing this role, the SCO functions in a number of ways:

- publishes the *Wisconsin Mapping Bulletin*, catalogs, guides, brochures, and other documents to inform the mapping community.
- inventories mapping practices, methods, accomplishments, experience, and expertise, and further acts as a clearinghouse by providing information and advice in support of sound mapping practices and map use.
- participates on committees, task forces, boards, etc. The State Cartographer is one of the 13 voting members of the Wisconsin Land Information Board.
- develops experimental and prototype products.
- serves as the state's affiliate for cartographic information in the U.S. Geological Survey's Earth Science Information Center (ESIC) network.

About our Internet Web site...

We maintain a "homepage" on the World Wide Web.

Here, you will find information on a wide range of mapping topics, news items, functions and activities of the SCO, our on-line aerial photography catalog, a calendar of events, and links to related web sites. We encourage those of you with Internet access and browsing software to check out the SCO's homepage at

<http://feature.geography.wisc.edu/sco/sco.html>



About the WISCLINC Web site...

A second Internet resource is the on-line Wisconsin Land Information Clearinghouse (WISCLINC). Its address is:

<http://badger.state.wi.us/agencies/wlib/sco/pages/wisclinc.html>

At this site you can search prototype metadata files, learn about our continuing work in this area, and link to other state clearinghouses.

Wisconsin Mapping Bulletin

Published quarterly by the Wisconsin State Cartographer's Office. A University of Wisconsin-Madison outreach publication distributed free upon request.

News is welcome on completed or ongoing projects, published maps or reports, or conferences/workshops. Local and regional information is especially encouraged. The editor makes all decisions on content. Deadline for the next issue is October 3, 1997.

Editor: Bob Gurda

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Tang, Esteban Chiriboga, and AJ Wortley

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