



Gore trumpets GIS use in communities

Dane County Demonstration Project announced in speech

by Ted Koch

GIS tools and the geospatial data that fuel them have gained the attention of major policy makers in the nation's capitol. The latest evidence of this trend is a major address in early September by Vice President Al Gore.

This interest arises from the direct benefits that are becoming evident when GIS is applied to societal concerns. Now it appears likely that the interest will be translated into a federal commitment to help build a more robust set of widely useful geospatial data and institutional relationships, commonly termed the National Spatial Data Infrastructure.

In his September 2 speech, Gore called for stronger efforts nationwide to enhance the livability and economic competitiveness of American communities. In his speech, the Vice President highlighted the need for smart sustainable growth in cities, suburbs and rural areas saying "in the future livable communities will be the basis for our competitiveness and economic strength."

As one avenue to reach this goal, Gore offered that geographic information technologies (GIS) will help communities help themselves by putting "more control, more information, more decision-making power into the hands of families, communities, and regions to give them all the freedom and flexibility they need to reclaim their own unique place in the world."

Three-pronged approach

To this end, Gore announced three federally supported community-based GIS initiatives. In the first, the federal government will expand its support for communities with tools, information, and new computer software to "enable them to make easy-to-understand maps that show the different aspects of their region—from farmlands to parks to buildings—and to provide predictions for future growth." GIS technologies he said, will make it easier for communities to come together to envision and adopt land growth that suits them.

The second initiative involves community-federal information partnerships. Gore said the President's Year 2000 budget would significantly expand grants for communities to gain access to the National Spatial Data Infrastructure clearinghouse, a public-private resource that is part of Gore's re-inventing government initiative of 1993. That proposed budget, for the federal fiscal year beginning in October, 1999, will be unveiled this coming January.

A demo project in Wisconsin

Finally, the Vice President announced the start of six community demonstration projects across the country to provide technical support for locally-driven efforts to address issues such as land use and crime prevention. Dane County, WI is one of the six approved projects.

The Dane County project will be done through cooperation of the County and the University of Wisconsin's Land Information and Computer Graphics Facility, with federal funding support over an 18-month period. Using data and processes developed as part of the County's Land Information Program, the project's objective will be to develop a citizen-based land use planning process that will help the county preserve its rural heritage while encouraging economic growth and lessening impact to the environment. The demonstration projects will help evaluate the effectiveness of using information, modern technology, and citizen involvement to achieve desired goals in community economic growth and environmental protection.

(source: Federal Geographic Data Committee)

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WLIB News

by Ted Koch

The Wisconsin Land Information Board last met on Thursday, August 20 in Madison. The board's next meeting is scheduled in Madison on Monday, November 9 at the Department of Agriculture, Trade and Consumer Protection Building on Madison's east side. Meeting dates for 1999 have not yet been set.

Program revenue increasing

The Land Information Program's designated real estate transaction fees collected at the 72 County Register of Deeds Offices across the state have increased significantly during the past two years. The total for the 12-month period ending in June this year is nearly \$8.3 million, a more than 18% increase over the same 12-month period a year earlier. As a result, forthcoming grant awards may be higher than projected earlier.

Romportl appointed to board

As reported in our previous issue (July, 1998), Wisconsin Act 247 which took effect this summer adds two new seats to the board. The first part of the act changed the status of the Secretary of Revenue from a non-voting, advisory board member to a voting member. The second part of the act creates a new member category to be "nominated to the governor by a statewide association whose purposes include support of a network of land information systems." Under this provision, the Wisconsin Land information Association submitted several names to the governor, who in turn has recently appointed Michael Romportl, Land Information Manager in Oneida County, to the new board seat.

Office of Land Information Services

In our previous issue we also detailed in our lead story the reorganization of several of the state's land information functions into the Office of Land Information Services (OLIS) and its further staffing. The first announced staff addition is Linda Keegan, a Program and Planning Analyst. Linda, who has degrees in journalism and urban and regional planning, comes to the OLIS from the State Insurance Office.

August 20, 1998 meeting

At its most recent meeting, the board took a number of actions to strengthen the program, and to begin building a relationship with the new Wisconsin Land Council (WLC).

Concerning the WLC, the board approved a draft version of a Memorandum of Understanding (MOU) between itself and the WLC. As a final step, the draft MOU will be reconciled with the WLC, and then returned to the board for final approval.



In other actions at its August meeting, the board approved a twelve-month, three-phase project for the Land Information and Computer Graphics Facility at UW-Madison to collect information on the status, progress and benefits of the Land Information Program. The project will build on previous county Land Information Office inventories and other statewide surveys.

Also, the board appointed Kathy Heuer, Dept of Revenue representative on the board, to chair a committee to review the board's current strategic plan; accepted a report from the WLIA on their recommendations for the 1999-2003 WLIP grant program; and rejected a proposal that would have required County Land Information Offices, as a condition of receiving grant awards, to have Internet access no later than January 1, 1999.

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WLC News

WLC News

The Wisconsin Land Council held its inaugural meeting on July 30 in Madison, and its second and third meetings on September 20 and October 29, respectively, also in Madison. The council's next meeting is scheduled in Madison for December 3rd. Further council meetings after the 3rd have not yet been scheduled.

Council officers

At its first meeting, the council elected Tim Hanna, Mayor of Appleton as vice chair, and Arnold Clement, Director of Planning and Development for Racine County, as secretary. Mark Bugher, appointed by the governor, serves as chair.

Council working groups

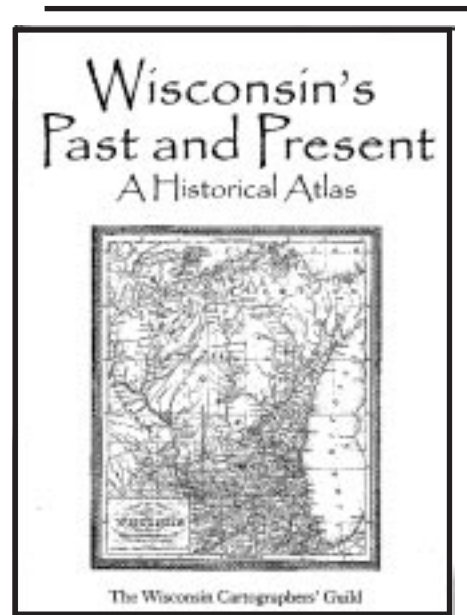
At its first meeting, Chair Mark Bugher announced that Kathy Heuer, Dept. of Revenue representative to the council, was appointed to chair the State Agency Resource Working Group which will have the responsibility to collect and disseminate information about state agency land use plans, and create a system to provide training and technical assistance for the development of intergovernmental land use planning.

At its second meeting, Executive Director Mike Blaska announced that Doug King, former WLIB Executive Director, had been appointed to chair the Council's Technical Working Group, which will have the charge to study the development of a computer-based Wisconsin land information system, and then to recommend how such a system would be implemented.

Strategic vision

At its first three meetings, the council spent some time discussing its long range strategic direction. These discussions were general in nature, with a wide variety of potential issues presented, but with no weeding of ideas or adoption of anything specific.

Common themes expressed by council members included defining a comprehensive land use plan, developing a common state or state agency land use "vision", performing a comprehensive survey and listing of state statutes related to land use, identifying where the statutes may be in conflict, enabling communities to accomplish effective planning including dispute resolution, and developing measures of council success in accomplishing its goals. Council strategic vision will be an item on the council's agency for many meetings into the future.



New atlas focuses on the formative

Where did we come from?

by Bob Gurda

In our state's sesquicentennial year there have been special events, TV programs, newspaper articles, exhibits, and more. To cap off the year we now have a splendid new atlas, *Wisconsin's Past and Present*.

A product of the non-profit Wisconsin Cartographer's Guild in Madison, this 9" x 12", 123-page hardbound book includes 135 color maps. The individual maps are complemented with text, photographs, charts, and graphs in a series of 42 two-page spreads.

These spreads cover themes as diverse as conflicts over native resources, ethnic Milwaukee, historical weather hazards, Great Lakes shipping, county boundary history, the military in Wisconsin, and glacial landscapes. Each spread's references are listed in a bibliography. A full index is included, also.

This thematic approach focuses on the key historical facts and trends that together have made Wisconsin what it is today. The atlas is the first to look at Wisconsin from a historical perspective since 1878.

Resources to produce the atlas were provided by the Wisconsin Sesquicentennial Commission. The atlas is published by the University of Wisconsin Press and lists for \$39.95. Check your local retailer or order directly from the UW Press: phone (773) 568-1550 or visit their web site (linked from the SCO web site under "New").

(source: UW Press)

Mapping the mapping world on the WWW

SCO web site has new look & feel

by Brian Van Pay

The SCO web page has undergone a huge redesign beginning this summer. We have done this work to make it easier for you to navigate our site, and to make more logical connections amongst its growing parts.

Among the more extensive renovations is an **index frame** that lists the major topic areas on the left side of the screen. This lets you easily **jump to any major section** of the SCO web site with a simple click, no matter what part of the site you have traveled to.

Another addition to our web site includes an **expanded and better organized Address Book** that lists local, state, and federal agencies, non-profits, and other organizations that deal with the broad field of mapping in Wisconsin. Also, the NAPP section has expanded to include the results of the aerial photography taken over Wisconsin this past spring.



If you are **curious about a particular word or acronym**, we have built some tools to help you. Check out the new Glossary of Terms, or the List of Acronyms; complete with full explanations. Finally, the links page has been greatly expanded. And, as always, the content is continually being updated.

Shortcuts to links mentioned in the Bulletin

To make it easier for you to find Internet resources that we refer to in articles in the *Bulletin*, we will construct a listing



keyed to each new issue. To find this list, look in the "New" section. You will also find these kind of link lists for several previous issues.

What is the IGLD?

Also new to the SCO web site is an explanation of the IGLD. IGLD stands for the International Great Lakes Datum, a vertical reference system developed to standardize elevation measurements around the Great Lakes. The system was revised in 1985. For an expanded explanation of IGLD see the SCO web page under Geodetic Control, or follow the link from IGLD in our List of Acronyms.

WISCLAND on the move

WISCLAND's primary web presence has moved from the DNR web site to the SCO. We have given those pages a face-lift and have added links to the 26 partners involved in the WISCLAND project. The *Articles of Participation*, a document every organization signed before cooperating in WISCLAND, is also there to download in PDF format.

Where is the nearest GPS base station?

Our GPS page now includes a more comprehensive explanation of that technology with particular emphasis on differential correction. In addition, we compiled a list of all the known base stations in Wisconsin with links to the organizations operating these sites.



SCO web site facts

Our web site is passing from adolescence into adulthood. In sheer size it has become even bigger than we knew:

- 995 files total
- 59.4 megabytes of information
- 569 text web pages
- 426 graphics

Future Directions

After substantially revamping the SCO web site, the web team is not resting for a moment. Future additions to the web page will include organizing the index list into an interactive image, and a central links page that is better organized and more comprehensive.

The SCO web team is also researching the details of installing a search engine to help users more quickly find what they are looking for.

Clearinghouse Connection



A special report...

by AJ Wortley

We interrupt your regularly scheduled *Mapping Bulletin* reading to bring you this **special report** on your state land information clearinghouse, metadata news, and more.

As we march into autumn and approach the end of 1998, here's a look at what's going on in national, state, and local affairs helping to shape the future of the WISCLINC Clearinghouse.

An international metadata standard...

For some time now, the Federal Geographic Data Committee (FGDC) has been working with the International Organization for Standardization (ISO) on an international metadata standard. Over the summer, this standard was put into draft form and made available through a **registered review process**. The review process is over and comments are now being compiled for consideration in the finalization of the standard. The standard is projected to be passed sometime in 1999.

According to the FGDC, upon adoption, the ISO standard will supersede version 2 of the FGDC Content Standard for Digital Geospatial Metadata which was passed just this last June. This new standard is nothing to fear, however. The FGDC was a primary contributor to the draft process and many aspects of the FGDC standard have been incorporated into the ISO version.

The FGDC is also already working on ways to convert current FGDC-compliant metadata to the new standard once it becomes available. So there's still **no better time than the present** to create metadata and submit it to the Wisconsin clearinghouse.

Elsewhere around the country...

In the news around the country, Vice President Gore delivered a speech in Washington D.C. emphasizing the need to expand the Administration's support of geographic information technologies. (See *lead story, page 1*). He also spoke of encouraging **increased public access and sharing of geographic data** to give more control, information, and decision-making power to the local community. This attention raises the stakes: for people to access and then understand available data, we need to document and post it.

In other developments, two major GIS software companies, Intergraph and ESRI, each have announced separate cooperative programs to help county or local-level governments integrate GIS into local operations. These announcements appear promising in providing a way for local government units to gain access to soft-

ware and technology, and to focus more local funds on development of data and documentation using some of these tools.

These larger software companies are also realizing the value of metadata creation. ESRI, for one, has announced plans to incorporate better automated metadata collection functions into its software model in the near future. We'll be watching.

All of these activities at the national level point to an overall recognition of the importance of GIS and data sharing from the local level on up and we believe the clearinghouse plays an important role in providing a mechanism for support of data documentation and data sharing in Wisconsin.

Statewide News

Here at WISCLINC, we have begun to incorporate some projected changes into the clearinghouse website. A **new frames version of WISCLINC** is now available. We anticipate that this new front door provides a better way to navigate through the clearinghouse quickly and efficiently and provides an easier way for us to present new information as it becomes available.

Inspired by discussion at the WLIA's Metadata Taskforce meeting, we've also added a **new metadata browse page** to the site. This page lists all the metadata available at the clearinghouse, grouped by contributing agency. This is a valuable resource for those looking to browse other metadata sets as examples or to compare with their own. This page also provides an overall view of what we have here and who is contributing.

Other new sections on the WISCLINC page include a **What's New page** for those wondering what has changed recently, as well as an expansion of the Other Geospatial Data Sources section. This section now includes links to state and local agencies that house data at their own site.

See something we missed or anything you would like to see on WISCLINC? Please let us know and we'll work to include it soon. (The URL is on page 16 of this newsletter).

Rounding up updates to metadata

We've also begun reaching out to current metadata contributors in an effort to update what we have here on WISCLINC and to collect any new metadata efforts. Of course, we're always open to new contributors. Just drop us a line and we'll arrange to make your metadata available here at your clearinghouse connection.

We now return you to your regularly scheduled *Mapping Bulletin* already in progress...



Two students join staff

by Bob Gurda

Recently we have welcomed a new graduate student and a new undergraduate student to the ranks of the SCO staff.

Brian Van Pay is a graduate student in the Environmental Monitoring Program. His special interests lie in the use of remote sensing and GIS to identify potential archeological sites. A native of Green Bay, Brian replaces Haidy Ear-Dupuy in the role of our web site coordinator. At the end of this summer Haidy decided to devote full-time to her Ph.D. studies.

Mimi Cheng, an undergraduate with a double major in geography and cartography/GIS, has filled the slot vacated by Jeff Bogenschneider who following his spring graduation is now working for the Census Bureau in Chicago. Mimi hails from Hong Kong.

Technology: friend or foe?

Why your previous issue was late...

by Bob Gurda

You may have noticed that you didn't receive your copy of our July, 1998 issue until September. We apologize for that. A seemingly unending string of technical snafus rose up and threatened to defeat our attempt to make that issue our first to go through a totally digital process prior to printing.

After a long struggle, we were pleased with the visual quality of the final product. We have now worked out the processing kinks and as a result you will be seeing more and better gray-scale illustrations in the *Bulletin*, and a more legible newsletter generally.

1998 NAPP photos yet to see light of day

by Bob Gurda

Delays in the inspection process have postponed release of this spring's Wisconsin coverage acquired under the National Aerial Photography Program (NAPP). As reported in our previous issue, we had expected to know by the end of summer which photographs had been deemed unacceptable.

The NAPP office, operated by the USGS in Reston, VA, has pushed back their expected date for completion of their inspection process several times since. Now, we are hoping for a report by mid-December. We do know approximately what percentage of any given county had photographs acquired by the contractors this spring, but we don't know which if any of those images do not meet quality standards.

Orthophoto projects delayed

NAPP photographs are the imagery used to produce digital orthophoto quarter quadrangles (DOQQs), one common type of digital orthophotos. A number of counties are waiting see if this spring's photograph acquisition provides sufficient coverage to begin the orthophoto processing work.

It's time for serious progress

What's our state motto, again?

by Bob Gurda

We have just been through a bruising election season, the results of which surprised many of us. After an inundation of TV ads that came from dozens of directions and sources, the results might have been muddled. Yet, the voters sent at least one clear message: that government needs to focus on delivering the goods, plain and simple.

It's also been our state's sesquicentennial year, a time to look back with pride. One and a half centuries behind us, and still moving forward.

That's it !! FORWARD!! Our state motto. Remember?

I'm drawn to this word because Wisconsin is positioned to move forward in building a serious and multi-purpose spatial data infrastructure, better positioned than we have been for years. The signs are all around us, so much so that we may be at risk of missing the forest for the trees.

Lots of players make a big team

People new to our state can easily become puzzled over the mass of organizations involved in our spatial data arena, much like many of us were confused during the election about who had paid for one TV ad or another, and why.

Yet, there really is a common goal: a well-designed, built, and maintained spatial data infrastructure. It doesn't matter which institution you look at: the WLIB, the WLC, WISCLAND, WLIA, WSLS, WRPLA, WCA, WTA, WLM, and the list goes on. Each has its slightly different view on what is most important.

Notice one thing, though: all those acronyms begin with the letter W (as in "Wisconsin"). If we are going to deliver the kind of progress that the public deserves, all of these groups need to communicate with each other, help define their common goal, and figure out how to pay for it.

Marshaling the resources

Our state Land Information Program is known across the nation for its innovative approach to modernizing local land records. However, it's also clear that completing that job quickly will take more resources than that program has. In addition, there are some existing "foundational elements" that could already be upgraded to produce significant benefits, and that will require resources too.

Happily, we're seeing more recognition from the federal level that investments at the state and local level can be very sensible. We're also seeing growing interest in using neutral spatial data to mediate the land use planning process. And, high level state agency representatives have begun to believe that having good spatial data is critical in meeting a variety of goals.

The time is now

There is a great opportunity in the upcoming months. If we fail to recognize it or to act, the costs will be borne for years to come.

The voters said "action is what counts". In our state, that means "move forward". There couldn't be a better time to refocus on the nuts and bolts of our spatial data infrastructure.

Times change, but the themes persist

As reported on page 10, Professor Phillip Muehrcke retired earlier this year from the University of Wisconsin-Madison. We asked him to talk with us about the evolution in cartography over his career.

What major trends in cartography have you experienced in your three decades plus in this field?

In some respects there have been huge changes, both in the technology of mapping as well as in how geographers and others perceive the use and value of maps. The technology has, fundamentally, made it much easier for the general public and diverse professionals to make their own maps. In some other ways, though, familiar themes keep recurring despite these major trends.

One major shift has been away from the traditional and necessary intensive planning before beginning a map. Instead, a person can develop a map through a process of trial and error. This changes the design process dramatically.

...the best maps are those that effectively simplify.

How has the discipline of geography changed its view of maps?

When I started out, the “quantitative revolution” was in full force. Data was being collected as never before, and lots of number crunching was in vogue. To some extent, that took attention away from maps, but it also provided new understandings that could be mapped.

GIS came along shortly thereafter, and provided the power to see the results of mapping much more quickly. Some geographers saw this as more of a graphics solution than something with inherent geographic interest, although that sentiment seems to have waned more recently.

We now have much more data that is available for analysis and mapping. How has that affected cartography?

I’ve always argued that the best maps are those that effectively simplify. One thing that masses of data along with GIS has done is let people easily make maps that are so packed with information that they are difficult to understand. More isn’t nec-

For millenia people have made maps because they are useful.

essarily better; often, less is actually more useful. One solution is to make a series of simpler maps, each with a different approach.

The use of zooming in digital mapping on a computer screen is handy but over-rated. In reality, the concept that a map is intended to convey may disappear at certain scales. On the other hand, some of the more recent scale-dependent mapping tools are a step in the right direction.

Because various tools such as GPS have made measurement easier, should we expect maps to become better?

For millenia, people have made maps because they are useful. In many cases, the absolute accuracy is a secondary question. What is ultimately important is whether the map is useful, and that depends on what your needs are. For some purposes, geodetic accuracy is important, but for much of what the general population needs on a daily basis, it is something that doesn’t deliver much value.

Cartographers naturally want to see more and better maps made, but the resources have to come from somewhere, and the society has many critical needs that are of higher priority. So, our maps are a balance between what we need and what we can afford.

With the digital revolution in mapping, are cartographers less important than previously?

I believe that we have always had a large proportion of non-cartographers making our maps. Mapping is a natural way for people to communicate. Even though a student can be trained in its principles, cartography is not so different from writing. Some people have a flair for it, but most everyone can benefit from training and practice.

In fact, graphics more generally have become accepted as one of the tools we all need to master, whether for making clear graphs or designing effective text documents. Even the ability to interpret graphics is becoming recognized as important. After all, IQ and higher education tests are partly based on how we read graphics.

Often, color is overused in today’s maps, sometimes to the point of confusing the message.

So, there continues to be a role for the person who understands both the role of graphics as well as the geographic phenomenon being mapped.

Is there one factor in graphics that is the biggest problem?

Color has always been a complex yet powerful force. Often, color is overused in today’s maps, sometimes to the point of confusing the message that the map is supposed to deliver. Flip through a magazine and note what draws your attention. Often it will be something that uses color, but not too much color. Pay attention to the other graphical techniques that complement the use of color.

What is the greatest promise of the digital mapping age?

I think that visualization, especially interactive exploration, will open up new worlds to many people. The digital tools are emerging, more good data is arriving, and computer processing speed is sufficient. But, again, it’s the abstraction process where the map is made better by removing detail that will make the difference.

.....Access to WISCLAND data

View or download from DNR web site

WTM DRGs are now on the 'net

by Bob Gurda

Maybe you've heard about the scanned topographic maps for a few years now, but still don't have a copy to view. Well, it's easier than ever now thanks to a new Internet service hosted by the Wisconsin Department of Natural Resources (DNR).

All you need is access to the Internet, some time to burn while the download takes place, and some space on your computer's hard disk. The system is easy to navigate by clicking on a state map on your screen. And you don't have to know the name or obscure code for the file you want.

What makes this easy is that you're first presented with a map of the state with county boundaries, overlaid with quadrangle map cells. By zooming in, you find a topo map cell's name, then either view or download the DRG.

Customized for statewide display

The DRGs available from DNR are somewhat different than the federal standard product developed by the U.S. Geological Survey. The Wisconsin product is derived from the federal originals by two processing steps.

While the federal product is registered to the UTM coordinate system, the Wisconsin product has been converted to the WTM coordinate system. Second, the raster grid cells that make up the collar of each map have been given new color codes. This makes it possible to hide the map collars when using certain viewing software, which allows maps of adjacent areas to be viewed seamlessly.

Go through the SCO web site to get there

As with other Internet web sites mentioned in this issue of the *Bulletin*, you can visit the SCO web site and look in our "New" section for a direct link into the part of the DNR site where you can view or download DRGs.

Background information available too

We have a section on the SCO web site that explains and illustrates DRGs and similar products. We also maintain links to sites of producers and distributors of these types of topo map image files and related software.



Web provides view or download of state-wide file

WISCLAND's land cover data available

by Bob Gurda

You can now use the Internet to view or download the completed WISCLAND land cover GIS layer.

These services are supported by the Wisconsin Department of Natural Resources (DNR), the agency that managed the 4-year task of interpreting Landsat Thematic Mapper images.



The finished data set represents a quantum leap over previous maps of the state's land cover (some of which mixed land cover and land use in a single map). It is much higher resolution and has many more categories. In addition, accuracy statistics are published for each geographic sub-unit.

What is waiting for you on the web?

Several things are available over the web. First, you can download the statewide land cover layer as a single file in either of two formats: Arc/Info grid, or TIFF. The file sizes are 50 MB and 76 MB, respectively, after being uncompressed.

Important companion products are the documentation and metadata files that explain the origins and content of the data file. In fact, you should read these before downloading the data files.

One piece of information that may affect your plans to use the land cover data is that it is provided in the Wisconsin Transverse Mercator (WTM) coordinate system. It is also available only as a statewide file at this time.

Use the on-line viewer

DNR is also developing a web-based service that allows you to view a simplified (17-class) version of the statewide file. You can zoom in to any point of interest using your web browser, and can print the resulting image.

To access both the data and the viewing program, visit the WISCLAND web site which is hosted on the SCO web site (*see page 16*), then navigate through "Theme Layer Summaries" to "Rural Vegetation Land Cover Mapping" where you'll find the link to the DNR's web site.

The land cover file is also available on CD-ROM as part of DNR's GeoDisc3.

Progress towards a printed map

WISCLAND has a work group that is preparing to print a map of the state's land cover, derived from the recent WISCLAND interpretation. Right now, it looks like printing will occur sometime this winter. The map will be at a scale of 1:500,000, and will measure roughly 41 X 49 inches. Watch for an announcement in our next issue.

Q: *What are some considerations in selecting a GPS receiver to be used for field work that doesn't need to support surveying-level accuracy?*

A: The Wisconsin Department of Transportation has a great deal of experience with GPS equipment, and Paul Hartzheim of their staff offers the following advice:

Several inquiries have been made recently to our Geodetic Surveys Unit concerning purchasing Resource Grade Global Positioning System (GPS) Receivers. These types of receivers can provide meter level positioning for a variety of different applications that do not require centimeter (or survey grade) accuracy.

Briefly, GPS positioning can be divided into two separate categories. These include absolute and differential positioning. **Absolute positioning** means that one receiver determines a position fix from the satellites based on code phase measurements. Because of some Defense Department signal and timing dithering (or scrambling) we can only expect positions from absolute positioning to be within +/- 100 m (95% of the time) of the true position. This accuracy is in the horizontal component. Vertical accuracy is approximately +/- 165 m (95% of the time) of the true position. The vertical uncertainty is significantly higher because of the poor geometry between the satellites and the receiver. Therefore, because of the magnitude of horizontal and vertical error we normally do not consider this for use on any transportation improvement applications.

Our concentration from the early days of GPS has been with **differential positioning**. This type of positioning requires two receivers operating simultaneously, resulting in a cancellation of the errors from dithering (see above). The accuracy results of differential positioning can range from 0.001 to 10

meters. The accuracy range varies because of type of receiver and software; occupation time over point of interest; measurement capability of satellite data; and source of communication.

We have concentrated on 0.001 to 0.100 meter range accuracy for survey grade applications. **For resource grade positioning you can expect the accuracy range between 0.100 to 10 meters.** Resource grade receivers utilize corrections derived from base receivers that are located over precisely known marks. Basically, these corrections are received by the remote receiver (i.e., the user's resource grade receiver) from a base receiver via a radio or satellite link. Several manufacturers offer various receivers and related software for resource grade positioning.

The price of a system depends upon the following:

- number of satellites tracked by the receiver
- capability of processing data when communication link is lost
- capability of data management system (i.e., flexibility of recording information)
- size of system
- editing and mapping characteristics of software
- accuracy of system
- dependability of system
- portability of system
- accessories (bag, number of batteries, etc.)
- extended service agreements

The price of these resource grade receivers can range from approximately \$1,500 to \$10,000. Systems on the low end cannot provide many of the characteristics needed by some users. Systems in the mid-range offer more capabilities. However they have limited software and data management features as compared to the high-end systems. High-end systems offer many features that increases automation capabilities of

current production activities. For example, the resource grade receiver that we have loaned to Districts has been used to automate (and eliminate hand recording) culvert inventory information, sign inventory, wetland delineation, soil boring locations, and collecting attribute information for GIS applications, etc. Low-end and some mid-range systems cannot perform such tasks.

Other specific comments:

1. No matter which GPS system you get, tree canopy will be a problem which will depend upon the extent of obstructions and satellite constellation.
2. I would suggest obtaining a differential correction service outside of the service offered by the Coast Guard. OMNISTAR is one subscription service for differential corrections. The Coast Guard is free. However, it might be intermittent particularly in the central part of the state and might not receive corrections consistently from Milwaukee, Sturgeon Bay or Alma, WI.
3. I cannot recommend a system. Several manufacturers offer a variety of systems and the price will depend on what you want. Trade publications can be helpful, and others who have experience with these types of GPS receivers may be good sources of advice.

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.

Correction:

In our previous (July, 1998) issue, on page 9, we discussed Finley's historic vegetation map which was derived from observations made by the surveyors laying the Public Land Survey in Wisconsin. We said that that survey occurred in the 18th century, when it actually was in the 19th century.

.....People & Organizations.....

Starts "third career"

Phil Muehrcke retires from UW

by Bob Gurda

After teaching cartography to untold thousands of students over his 25 year career, Phillip Muehrcke retired this summer. He's started what he calls his "third career", right on the heels of being granted emeritus professor status in the UW-Madison's Geography Department.

Phil was the mainstay of cartography courses, teaching many semesters of thirteen different courses during his tenure. He also directed 15 Ph.D. students and 60 Master's degrees.

In addition to delivering over 45 professional papers and publishing 22 articles, he is well known for his text *Map Use* (see article on page 12) and as a co-author of the standard text of his field, *Elements of Cartography*.

Support for the State Cartographer's Office

As one campus role, Phil served for 16 years as chair of the advisory body for the SCO, the Committee on State Cartography. He also served as president of the American Cartographic Association and as chair of several of its committees.

Now the landscape beckons

Now retired, Phil has shifted his attention to landscape management, a skill he learned over years of work on rural property he acquired in Iowa County (west of Madison). There he has planted thousands of trees and shrubs and has constructed land conservation devices. He now works with other land owners who wish to similarly install various conservation practices on their lands, by facilitating in conjunction with a variety of public agencies and contractors.

However, he also plans to continue writing and publishing in the cartography arena, most likely in the form of information designed for emerging niches such as advice on using hand-held GPS receivers in the field.

We wish Phil a fulfilling "third career" (the first having been his extensive education prior to becoming a professor). The Department has been authorized to hire a new faculty member into the vacant position, hopefully to begin in September of 1999. In the meantime, various lectureship positions are being used to maintain course offerings.

(source: UW-Madison Geography Department)

New director for the U.S.G.S.

Senate confirms Groat

by Bob Gurda

Dr. Charles Groat was confirmed by the U.S. Senate on October 21 as the new director of the U.S. Geological Survey. He was sworn in shortly thereafter by Interior Secretary Bruce Babbitt who said "In the wake of several natural disas-

ters that have beset our country in recent weeks...there is a pressing need for good science to guide safe and informed decisions."

Groat, 58, has over 25 years of experience in a variety of venues. Most recently, he has served as Assoc. Vice President for Research and Sponsored Projects at the University of Texas at El Paso. Earlier he was associated with Louisiana State University as well as the Louisiana Department of Natural Resources where he administered coastal programs and served as state geologist.

UW-Madison to work with U of Minn. & Mich. State

NASA funds three universities to study Great Lakes satellite imagery potential

by Bob Gurda

What will the next generation of remote sensing satellites provide that we don't have now? How will the ever-growing power of GIS deliver value to people interested in natural resources in the field as well as the office?



These are two of the questions that will be addressed by a three-university consortium in the Upper Great Lakes area as part of a federal grant recently funded by NASA. The University of Wisconsin-Madison's Environmental Remote Sensing Center joined with similar activities at the University of Minnesota and Michigan State University in submitting the grant proposal to NASA this summer. The work will be coordinated from St. Paul, MN.

As major partners with the consortium of universities, the respective departments of natural resources in each of the states is also on board along with key federal field agencies. The major focus of work under this grant will be to prototype mechanisms by which agency field staff can help steer the technological adaptations so that truly useful applications are developed for their everyday use.

The WISCLAND link

In Wisconsin, the cooperative development of the WISCLAND land cover data base provides one model for how the field agencies can work with each other and the university in defining needs, designing products, and delivering results. We hope to inspire parallel organizations in the other two states.

Because the landscapes and economies of the three states are quite similar, the academic personnel on the separate campuses will have a strong basis on which to collaborate. Part of their mission will be to address a number of regional environmental and economic issues.

USGS focuses revision efforts

High selling quads draw attention

by Bob Gurda

The U.S. Geological Survey (USGS) has decided to invest some of its budget resources in revising topographic maps that are particularly good sellers. Based on this principle, three topographic quadrangle maps in the Milwaukee area have been targeted for revision: Milwaukee, Wauwatosa, and Greendale. Additional maps may be selected for this program in future years.

Seventeen Wisconsin quadrangle maps are amongst the one thousand best selling such maps in the country. Average sales of these seventeen maps range from 13 to 28 sheets per month. The vintage of these maps range from 1971 to 1994.

7.5-min. quad name	publ./revised	maps/mo.
Madison West	1983	28
Milwaukee	1971	25
Baraboo	1991	24
Black Oak Lake	1981	23
Dundee	1991	22
Whitewater	1991	22
Little Prairie	1987	22
Madison East	1983	21
Eagle	1971	20
Wauwatosa	1994	18
Green Bay West	1992	17
Kewaskum	1974	17
Palmyra	1987	17
La Crosse	1993	16
Oconomowoc	1976	15
Greendale	1976	15
De Forest	1983	13

Highest selling USGS topo quad maps in Wisconsin

Contrary to the USGS assumptions, high sales volume may indicate that users find a map to be adequately current. Following that argument, revision funds might be better aimed at maps that are less popular (perhaps because they are outdated).

At any rate, Wisconsin has minimal leverage on the decision because we haven't been contributing cost-sharing funds in recent years toward revision of USGS topo maps.

(source: USGS)

Adjustment is first in over 10 years

Prices change for USGS digital data

by Bob Gurda

The U.S. Geological Survey has revised prices for some digital cartographic data sets. This includes a number of popular products such as DEMs, DLGs, DRGs, and DOQQs.

The prices have been adjusted to recover costs as allowed under OMB Circular A-130. In general, prices have increased. However, it is important to understand that these data sets are not copyrighted, so they can be freely shared between parties. The fees charged by USGS cover only their reproduction and distribution costs. See table below for price schedule.

Product	Price/File	Base Charge (media)	Base Charge (ftp)
DEM	\$1.00	\$45.00	\$30.00
DLG	\$1.00	\$45.00	\$30.00
DRG	\$1.00	\$45.00	\$30.00
LULC	\$1.00	\$45.00	\$30.00
GNIS	\$1.00	\$45.00	\$30.00
DOQQ (B/W)	\$7.50	\$45.00	\$30.00
DOQQ (CIR)	\$15.00	\$45.00	\$30.00

Revised prices for USGS GeoData products, effective October 1, 1998. A \$3.50 handling fee applies to each order.

DRGs become more (or less?) expensive

In the past, Digital Raster Graphic (DRG) files, which are scanned images of topographic quad maps, have been available on CD-ROM for \$35.50 including shipping. Each CD-ROM held 67 DRG files (covering a block of 1-degree of longitude x 1-degree of latitude).

Under the new price schedule, each DRG file costs \$1, and a \$45 media charge plus \$3.50 handling charge. As a result, an order for a single DRG would cost \$49.50, and the same 67 files previously packaged on one CD-ROM now cost \$115.50.

On the other hand, the new arrangement makes it easier and potentially less expensive for a user to order DRGs for areas that aren't 1 x 1-degree blocks, for instance following the entire course of the Wisconsin River.

Alternative products and sources abound

There are other sources for many of the USGS files, and some of these may be free or at least less expensive than these new prices. In addition, some organizations have acquired the USGS files and enhanced them in various ways (e.g., see the article on page 8). For guidance in understanding your options, visit our web site or contact us directly.

(source: USGS)

Concludes treatment of traditional non-western cultures

History of Cartography issues 4th volume

by Bob Gurda

Another volume has been completed in *The History of Cartography* series. The overall project has been orchestrated by Prof. David Woodward of the UW-Madison's Geography Department over the last 15 years.

The latest book (Volume 2, Book 3) is *Cartography in the Traditional African, American, Arctic, Australian, and Pacific Societies*. Like previous volumes, this one is extensive (over 500 pages) and published by the University of Chicago Press.

Work is proceeding on Volume 3, *Cartography in the European Renaissance*, and Volume 6, *Cartography in the Twentieth Century*. Previous titles are *Cartography in Prehistoric, Ancient, and Medieval Europe and the Mediterranean* (1987), *Cartography in the Traditional Islamic and South Asian Societies* (1992), *Cartography in the Traditional East and Southeast Asian Societies* (1994).

Woodward is again encouraging tax-deductible contributions to the project. These donations can release equivalent federal matching funds.

For details, visit the SCO web site (look under "News" for the October 1998 *Mapping Bulletin* links) and navigate to the History of Cartography and University of Chicago Press web sites.

(source: *History of Cartography Project*)



Now covers GPS use

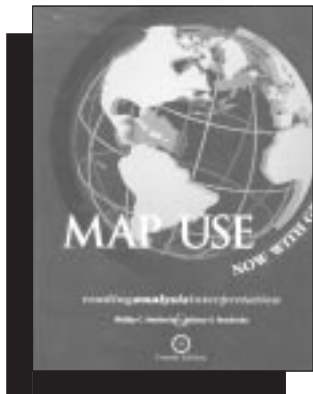
Muehrcke's *Map Use* in 4th edition

by Bob Gurda

Tipping the scales at slightly over 3 pounds, the latest edition of *Map Use* is now available. This fourth edition of this popular guide to how maps work and are used was published earlier this year by Phillip Muehrcke and Juliana Muehrcke. Phil retired from the UW-Madison this summer (see page 10).

In addition to a variety of updates, this edition includes over 40 pages devoted to GPS and Maps, and GPS and Mapping Analysis Software. The total page count is 647 (as compared to 474 for the second edition).

Copies are available from JP Publications, P.O. Box 44173, Madison, WI 53744-4173. The price of \$40 includes shipping and handling.



Why is everyone talking about it?

What is "MrSID" ?

by Bob Gurda

Multi-resolution Seamless Image Database. Now, that's a mouthful!

In short, it's just "MrSID", and it's created a stir in the GIS community. Why?

MrSID is an elegant solution to the problem of displaying large images efficiently and at various zoom levels. This new software, produced by a company in Seattle, WA called Lizard Tech, uses something called wavelet technology to compress images on the order of 20X without significant degradation.

It was used by the Library of Congress to handle scanned panoramic maps efficiently (see article on page 13).



Make a seamless mosaic

In addition to its powerful compression capabilities, MrSID has another valuable feature. You can compress a group of images that make up a larger image, such as all of the digital orthophotos for an entire county. One experiment in Wisconsin showed that all of the 1-meter resolution digital orthophotos for Rock County could be compressed to less than 300 MB (less than half the capacity of a single CD-ROM). This would allow a user to take the images for the entire county along on a CD for use in a laptop computer, and would free up space on the hard disk.

The effect of MrSID then is that you can view anything from the entire county as one virtually seamless image down to a small area at the common corner of what were four individual orthophotos. Commercial GIS viewing software is beginning to offer MrSID viewing capacity.

Viewing is free

Direct viewer software for MrSID files is available free. By contrast, MrSID software to do the original (one-time) compression is rather expensive, but unless you need to do compressing on a routine basis, you probably don't need it. You can hire a service bureau to do that work for you.

For more information, visit the manufacturer's web site at www.lizardtech.com.

Victorian views of Wisconsin cities on Web

Library of Congress uses MrSID for panoramic maps

by Ted Koch

The panoramic map was a popular cartographic form used to depict U.S. and Canadian cities and towns during the late nineteenth and early twentieth centuries. Known also as bird's-eye views, perspective maps, and aero views, panoramic maps are non-photographic artistic depictions of cities shown as if viewed from above at an angle. These maps generally show street patterns, individual buildings, and major landscape features but usually not to scale.

Today, through the help of recent technological advances, historic panoramic maps of selected communities in nearly all 50 states and four Canadian provinces are available for viewing and download via the Internet. You can find a link to the Library of Congress web site by visiting the SCO web site (look under "New").

Included in the collection are 59 panoramic maps for various Wisconsin cities, ranging in date from 1847-1929.

Using modern techniques with historical images

The digital panoramic map images on the Library of Congress Web site were created by the staff of its Geography and Map Division. They scanned the large format originals at a resolution of 300 dots-per-inch and converted the images to the Tagged Image File Format (TIFF), processed for brightness and several other enhancements.

These processed files were then compressed using a program called Multi-Resolution Seamless Image Database (MrSID). This compression software integrates multiple resolutions of an image in a single file which allows users to "zoom-in" getting more and more crisp detail.

Maps are a reflection of their era

Most Victorian-era panoramic maps were published independently or appeared in state and county atlases. Of-

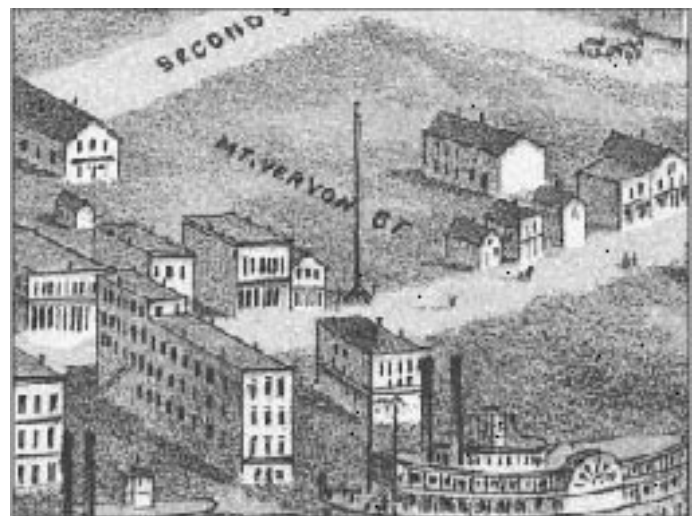
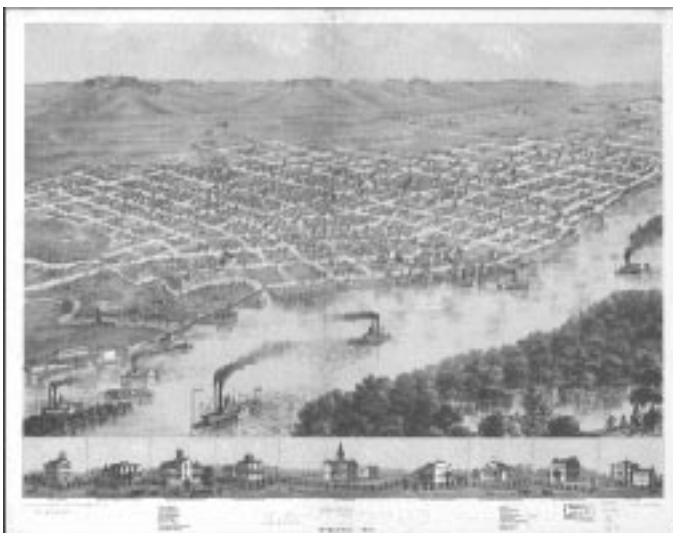
ten they were prepared for and endorsed by chambers of commerce or other civic organizations to advertise the city's commercial and residential potential. Harbors are shown filled with boats, trains move along railroad tracks, people and horse drawn carriages fill the streets, and smoke pours from stacks of industrial plants. The goal was to portray attractive urban and industrial growth and the potential for growth in the empty lands surrounding the vital city centers.

Surviving panoramic maps are popular with collectors, and can command premium prices from map and print dealers. Reproductions of panoramic maps are also in demand. Now with the Library of Congress Web site the uniqueness and beauty of these maps can be viewed and enjoyed by a much wider audience than previously.

(source: Library of Congress)

Full and close-up views of La Crosse, Wisconsin from an 1867 panoramic map

[captured from the Library of Congress web site]



.....Events.....

Quarterly meeting set for Dec. 3-4

WLIA to visit Green Lake

by Brenda Hemstead

The Wisconsin Land Information Association (WLIA) will hold its winter quarterly membership meeting at the Heidel House Resort and Conference Center in Green Lake on December 3 & 4.

Non-members are welcome!



Thursday: workshop & free seminar

On Thursday, December 3rd, plans include a six-hour workshop on "**Highway Right-of-Way**" that includes 4 CEUs that targets the land information professional who needs background information on the creation, vacation, and documentation of streets, highways, and similar rights-of-way in Wisconsin. The registration fee is \$40 member & \$50 non-member and includes lunch.

Scheduled later that evening from 7:00pm - 9:00pm are two free presentations:

✓ State Soil Scientist, Ken Lubich will be discussing the Natural Resource Conservation Service's **new ways to deliver soil surveys in digital format**, digitizing current published soil surveys—new and updated soil surveys, making better use of digital soil surveys, and the completion of initial soil survey of Wisconsin.

✓ "**Voluntary Shoreland Habitat Preservation/Restoration Project for Developed Areas**" will be presented by Nancy Hill, President of the Green Lake Association. This program is dedicated to encourage the best management practices on riparian properties.

These presentations are free and open to the public.

Friday: Recording right-of-way plats; writing grants for funding sources

The next morning's program begins at 9:30 a.m. (\$20 registration includes lunch) with **program updates** from the Wisconsin Land Information Program (WLIP), Office of Land Information Services (OLIS), and the Wisconsin Land Council (WLC). Updates will be on:

- recent WLIP activities,
- program and grant news from the WLIP,
- a discussion with Mike Blaska on the formation and direction of the new state office (OLIS), and,
- an update on WLC activities, particularly their establishment of two support groups: Technical Resource Working Group & State Agency Resource Group.

Then will follow a presentation on **Recording right-of-way plats** and the effect of 1997 Wisconsin Act 282 by Frank Thousand, WisDOT. This will be of interest if you are in-

involved in creating roads or live next to a highway or plan to in the future.

After lunch and a short business meeting, Tom Cadwallader, Assoc. Prof., UW-Extension Agent will guide the members on **how to write grants for a variety of funding sources** explaining how writing a grant for one project could attract many different supporters.

To register or for further information on WLIA, call 800/344-0421, or visit their web site at: www.wlia.org/

Annual Conference in March

Call for Presentations issued by WLIA

by Brenda Hemstead

The WLIA has issued a "Call for Participation" in conjunction with its upcoming 12th annual conference. Scheduled for March 9-12, 1999 at the Paper Valley Inn in Appleton, the conference theme is

slated as "**Wisconsin Land Information—Many Communities, One Vision**". Proposals for presentations will be extended to December 15, 1998.

For more information on the conference, contact the WLIA at 800/344-0421 or visit their website at www.wlia.org/



August 1999 in Chicago

URISA returns to the Midwest

by Bob Gurda

The Urban and Regional Systems Association (URISA) has begun to prepare for its next annual conference, and for the first time since 1994 it will be held nearby. URISA '99 will be held at the Navy Pier on Chicago's lakefront, August 21-25.

A wide variety of technical sessions and workshops are being planned along with a vendor exhibit area and local tours. The deadline for submitting abstracts for proposed talks, panels, or poster sessions is January 18.

For more information, visit the URISA web site at www.URISA.org.

Wisconsin has a long tradition of involvement with URISA. Several presidents and board members and editors have been from Wisconsin, and the 1994 conference was held in Milwaukee.



.....Selected Regional Conferences and Technical Meetings....

December 1, 1998, **The Land Information & Computer Graphics Facility at UW-Madison** will be offering new one-day class in ArcView and Land-use planning. Contact Tom McClintok at tmccclin@facstaff.wisc.edu and check out their website at www.lic.wisc.edu

December 2-4, 1998, **The Land Information & Computer Graphics Facility at UW-Madison** will be offering a class, Introduction to PC Arc/Info. Visit LICGF's home page www.lic.wisc.edu for more course information. Contact Tom McClintock at 608/263-5534, email:

December 3, 1998, **The Wisconsin Land Council** is scheduled to meet in Madison. Contact: WLC at 608/267-2707.

December 3, 1998, **Highway Right-of-Way Workshop** will be held at the Heidel House in Green Lake, WI. Registration fee is \$40 WLIA member and \$50 non-member, includes lunch and CEUs. Contact: WLIA at 800/344-0421.

December 3-4, 1998, **The Wisconsin Land Information Association Quarterly Meeting** will be held at the Heidel House in Green Lake, WI. Contact: WLIA at 800/344-0421.

December 3-4, 1998, **The 1998 GIS in Illinois Conference** will be held at the Radisson Hotel in Lisle, IL. Contact: ILGISA at 815/753-1906.

December 8-11, 1998, **The Land Information & Computer Graphics Facility at UW-Madison** will be offering a class, Introduction to Workstation ARC/INFO. Visit LICGF's home page www.lic.wisc.edu for more course information. Contact Tom McClintock at 608/263-5534, email: tmccclin@facstaff.wisc.edu.

1999

January 13, 1999, **The WISCLAND Steering Committee** meeting will be held from 1pm-4pm at the USGS-Water Resources Division office located at 8505 Research Way in Middleton, WI. Contact: Bob Gurda at 608/262-6850, email: rfgurda@facstaff.wisc.edu.

January 27-29, 1999, **The Wisconsin Society of Land Surveyors Annual Conference** will be held at the Holiday Inn in Stevens Point, WI. Contact: WSLs at 414/549-1533 or visit their website at <http://www.execpc.com/~wsls>.

March 9, 1999, **The Wisconsin Land Information Board** will tentatively meet at the Paper Valley Hotel & Conference Center at 10:00 a.m. in Appleton, WI. Contact: WLIB at 608/267-2707.

March 9-12, 1999, **The Wisconsin Land Information Association** will have their annual conference at Paper Valley Hotel & Conference Center in Appleton, WI. Contact conference chair: Roxanne Brown at 715/349-2551, email: rbrown@win.bright.net or for registrations: Ann Barrett at 800/344-0421, e-mail: abarrett@uniontel.net.

June 3-4, 1999, **The Wisconsin Land Information Association Quarterly Meeting** will be held at the Chanticleer in Eagle River, WI. Contact: WLIA at 800/344-0421.

August 21-25, 1999, **The Urban and Regional Information Systems Association (URISA)** will hold their 1999 annual conference at Chicago's Navy Pier. Contact person not available yet. For further information, please visit URISA's homepage at www.urisa.org

September 9-10, 1999, **The Wisconsin Land Information Association Quarterly Meeting** will be held at the Best Western Northwoods Lodge in Siren, WI. Contact: WLIA at 800/344-0421.

For Bulletin and web site

Send us your calendar items

We focus 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 a 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 six people—Ted Koch, State Cartographer (608/262-6852), Bob Gurda, Assistant State Cartographer (608/262-6850), A.J. Wortley, Outreach Specialist (608/265-8106), Brenda Hemstead, Administrative Assistant (608/263-4371), Paul Gunther, Information Systems Manager, 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 32.25 (12m). In addressing this role, the SCO functions in a number of ways.

- publishes the *Wisconsin Mapping Bulletin*, catalogs, guides, brochures, and other documents and maintains a web site 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 and one of 16 voting members on the Wisconsin Land Council.
- 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 links mentioned in *Bulletin* articles, 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 metadata files, download certain data 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 January 6, 1999.

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