

Guidebook to: Priority GIS Data

Minnesota Governor's Council
on Geographic Information

JULY 1999

The **Minnesota Governor's Council of Geographic Information** was created to provide leadership in the development, management and use of geographic information and related technology in Minnesota. With support from Minnesota Planning, the council provides policy advice and makes recommendations regarding efficient investments, management practices, institutional arrangements, and data standards and education.

Minnesota Planning is charged with developing a long-range plan for the state, stimulating public participation in Minnesota's future and coordinating activities with state agencies, the Legislature and other units of government.

Upon request, the *Guidebook to Priority GIS Data* will be made available in alternate formats, such as Braille, large print or audiotape. For TTY, contact Minnesota Relay Service at 800-627-3529 and ask for Minnesota Planning.

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MINNESOTA PLANNING LAND MANAGEMENT INFORMATION CENTER



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For additional information or copies of the *Guidebook to Priority GIS Data*, contact the council staff coordinator at 651-296-1208 or via e-mail at gc@mnplan.state.mn.us. An electronic copy of the *Guidebook to Priority GIS Data* is available over the Internet by visiting the council's home page at www.gis.state.mn.us.

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We need your feedback and input!

As this report tries to document, there has been considerable activity since 1994 in developing Minnesota GIS layers. However, there is still much work that needs to be done at both the state and local level to bring needed information into digital map form and then make it available.

If you have data that you would like others to know about, please inform the Minnesota Geographic Data Clearinghouse. Contact LMIC at clearinghouse@mnplan.state.mn.us or (651) 296-1211 for information on how to create and submit documentation for your data to the Clearinghouse. See <http://www.lmic.state.mn.us/chouse.html> for links to Clearinghouse activities.

We are looking for your information and feedback. Please tell us if there is data that you need that is not available at all, that is incomplete or that needs improvements to meet your needs. Please send your comments to the Governor's Council on Geographic Information via e-mail at gc@mnplan.state.mn.us or through the regular mail at:

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History

A survey of GIS data needs in Minnesota was conducted in 1994 in a cooperative effort between the Governor's Council on Geographic Information and the Minnesota GIS/LIS Consortium. In this survey, some 230 users, from all levels of government and from the private sector, identified the need for new or improved GIS data.

The 1994 survey results that were summarized across the various government sectors identified digital soil and parcel mapping as the two most important needs, followed in sequence by wetlands, land use/cover, elevation, Public Land Survey, satellite/orthophoto and road and utility mapping. The 1994 survey was summarized in a technical report entitled "Survey of Current GIS Data and Needs" published jointly in 1995 by the Governor's Council and the GIS/LIS Consortium. Contact the Governor's Council for a photocopy of the report at gc@mnplan.state.mn.us.

Prioritized Listing of 1994 Survey Highest

1. [Digital County Soil Surveys](#)
2. [Parcel Mapping](#)
3. [Wetlands](#)
4. [Land Use/ Land Cover Mapping](#)
5. [Digital Elevation Data](#)
6. [Public Land Survey \(PLS\)](#)
7. [Orthophoto and Satellite Data](#)
8. [Transportation Basemap and Right of Way Data](#)
9. [Utilities](#)
10. [Hydrography](#)
11. [Well Informantion](#)

[Do you have any additional data to share?](#)

[Do you have any comments?](#)

Analysis of the 1994 survey showed that state and federal government units favor smaller scale map products, while county and city units have the need for more detailed large scale data. Soils data was the top ranked item for federal, state and county agencies. While parcel mapping data ranked second in overall need, it was rated of high importance by the city, county and private respondents.

1999 Update

In this report we will attempt to update what has been happening since the 1994 survey was conducted in those areas with the highest rated GIS data needs identified in the above list. The report updates small-scale statewide data

collection programs. For many of the reviewed datasets, the small-scale, statewide coverages provide an interim source of information until more comprehensive local programs are completed.

With the time and resources available to the workgroup, it was not able to do a comprehensive inventory of the many large-scale or highly detailed data collection efforts (on topics such as parcels, land records and public utilities) that have been developed by local units of government or on a project basis by larger government units. Usual sources for this type of data are larger cities and many counties. The Governor's Council encourages local government units that have developed large-scale data to both document and promote the availability of their data through the Minnesota Geographic Data Clearinghouse. See <http://www.lmic.state.mn.us/chouse.html> for links to Clearinghouse activities, or contact LMIC at clearinghouse@mnplan.state.mn.us or (651) 296-1211 for information on how to create and submit documentation for your data to the Clearinghouse.

Digital County Soil Surveys

Development of digital soil information has rapidly accelerated in the last few years. Minnesota's soils have been mapped at various scales and complexities ranging from page-sized state maps with general soil features to site mapping with great detail. This effort began before the turn of the century and continues today. A survey of Minnesota GIS users in 1994 found that digital soil data was the number one data need. Probably the most widely known set of soil maps in Minnesota is the County Soil Survey series (<http://www.statlab.iastate.edu/soils/soildiv/ncss/ncss.html>) coordinated by the US Department of Agriculture's Natural Resources Conservation Service (NRCS). To help focus a plan for obtaining statewide, seamless soil databases from these surveys, a committee of the Minnesota Governor's Council on Geographic Information published *County Soil Surveys: Guidelines for Digitizing*. The report is on the web at: <http://www.mnplan.state.mn.us/press/soilsrpt.html> or call LMIC at (651) 296-1211 for a printed copy. The report classified each county's soil survey into one of four categories and made recommendations for various digitization options. It also discussed intermediate digital product options that can be used until better data becomes available. The county soil surveys were grouped into four categories based on the vintage of the soil classification scheme and the type of base maps used to present the data. Over the past few years, five efforts have developed to expand the use of existing digital soils data and to produce better data in the future.

RASTER SOIL DATA FROM THE BOARD OF WATER AND SOIL RESOURCES In 1991, the Minnesota Board of Water and Soil Resources (BWSR) saw the need to supply local water planners with a host of digital data, including whatever soil data was available. For the effort, BWSR is compiling previously digitized county soil surveys into a county data set of approximately 60 variables. BWSR is working with LMIC and the University of Minnesota to compile the University's Soil Survey Information System (SSIS) data into county EPPL7 files. The county files are raster-based with a cell resolution of 5 meters. They will be folded into BWSR's county data sets at a resolution of 20 meters. There are also efforts at BWSR to make the SSIS data available in vector format. EPPL7 soil files have been sent to six counties, 15 more counties will be delivered in 1999, and 10 counties will be delivered later. For more information, contact Tim Ogg at BWSR 651-297-8024 or e-mail: tim.ogg@bwsr.state.mn.us

COUNTY SOIL DATA DISTRIBUTED BY LMIC The Land Management Information Center at Minnesota Planning (LMIC) distributes derivatives of the SSIS files to users who do not obtain their data from BWSR (see previous paragraph). This data is meant to be used for general township level or county level planning, rather than for site-specific analysis. For some counties, LMIC distributes both raster and vector formats. This data includes only the soil unit boundaries and soil names; it does not include a database of soil characteristics. The University of Minnesota's Department of Soil, Water and Climate and LMIC converted the SSIS files to EPPL7 GIS format for 31 counties. Once converted to EPPL7 format, LMIC conducted several basic quality checks on most of the files. The checks were limited to: standardizing file names and values assigned to off-site areas, labeling unlabeled polygons, filling sliver areas created when the section data was mosaicked, and documenting any obvious distortions (most of which could not be corrected). The checked data was returned to the U of M which then created ARC/INFO coverage versions for some of the counties, retaining the township file unit. For more information, contact Nancy Rader at LMIC 651-297-3281 or e-mail: nancy.rader@mnplan.state.mn.us. Note: all of these counties are outside of the 7-county Twin Cities metro area. For soil information in the metro area, contact Dave Vessel at the Metropolitan Council 651-602-1642 or david.vessel@metc.state.mn.us.

NRCS SOILS WORK IN MINNESOTA In mid-1998, the Washington D.C. office of the Natural Resources Conservation Service announced the NRCS Soil Survey Digitizing Initiative. NRCS plans to digitize about 2,600 high priority soil surveys over the next five to eight years, depending on available resources. The goal of NRCS in

Minnesota is to produce Soil Survey Geographic (SSURGO) data for all counties. SSURGO is the most detailed level of digital soils data available from the NRCS. The map extent for a SSURGO data set is a soil survey area, which may consist of a county, multiple counties, or parts of multiple counties. A SSURGO data set consists of map data, attribute data and documentation.

Before a soil survey area can be digitized, the soil survey must be modern and the mapping base must meet National Map Accuracy Standards. Nationally, acceptable bases are either orthophoto quadrangles (DOQ's) or 7.5-minute quadrangles. Minnesota has a great advantage over most other states because of the statewide availability of DOQs. If a survey area was originally mapped on another base, the lines are manually transferred to a DOQ base. Digitizing is done by line segment (vector) format in accordance with NRCS digitizing standards and specifications. In Minnesota, work on this effort will be concentrated in Categories 1 and 2 counties as defined in the Governor's Council report. As of April 1, 1999, ten Minnesota counties are SSURGO Certified and four more are in progress. For more information, see the NRCS Minnesota soils home page: <http://www.mn.nrcs.usda.gov/soils/soils.html> or the federal NRCS site: http://www.ftw.nrcs.usda.gov/ssur_data.html.

SSURGO map data are available in modified Digital Line Graph (DLG-3) optional and Arc interchange file formats. Attribute data are distributed in ASCII format with DLG-3 map files and in Arc export format with Arc export map files. Metadata are in ASCII format. SSURGO data is available for free on-line download via: http://www.ftw.nrcs.usda.gov/ssur_ftp.html or on CD for \$50.00 at: http://www.ftw.nrcs.usda.gov/ssur_order.html or 800-672-5559.

UNIVERSITY OF MINNESOTA RESEARCH Important research regarding soil survey mapping in Minnesota is taking place at the University of Minnesota Department of Soil, Water and Climate's Soil and Landscape Analysis Lab. Over the past year researchers have focused on developing cost-effective methodologies to convert soil surveys on distorted map bases to geometrically correct map bases that can be utilized in a GIS. A major bottleneck in the process of soil survey digitizing has been recompiling the soil boundary lines from the distorted photo map base to an orthophoto map base that is appropriate for use in a GIS.

The research has focused mainly on Category 2 soil survey data. Category 2 surveys are compiled on rectified photo base maps, which may contain significant spatial errors due

to terrain relief displacement. There are currently 42 counties in Minnesota that fall under this category. If digitized without proper orthorectification, these soil boundary lines will not properly align with other orthorectified data layers in a GIS. Many soil surveys have been digitally "warped" to try to fit correct mapping bases (such as DOQs) using 2-dimensional interpolation techniques, often referred to as "rubber sheeting." This approach does not account for terrain displacement errors and will not provide accurate rectification in landscapes where topographic relief exceeds approximately 15 meters.

The researchers have developed an orthorectification software program using photogrammetric principles to remove existing soil survey base map errors by considering the effect of terrain displacement. The software uses a USGS digital orthophoto (DOQ), a scanned soil survey mapsheet, and a USGS 30-meter digital elevation model (DEM) as input. Preliminary work suggests that this approach is considerably more cost effective, efficient and possibly more accurate than the manual recompilation currently used by the NRCS. As such, this approach could greatly expedite the creation of digital soil survey databases by providing a cost effective and rapid technique for compiling distorted surveys onto orthophoto bases. The research team is currently scaling the approach up to a county to document cost and potential savings of using the approach developed in the Soil and Landscape Analysis Laboratory. For more information contact Dr. Jay Bell (jbelle@soils.umn.edu) or Matt Krusemark (mkrusmar@gis.umn.edu) in the Department of Soil, Water, and Climate at the University of Minnesota.

UPDATING OUTMODED SOIL SURVEYS The Governor's Council Soil Report (<http://www.mnplan.state.mn.us/press/soilsrpt.html>) identified more than 20 counties with outmoded soil surveys. Before these surveys should be digitized to high precision, work is needed on both the soils classification and basemaps.

In 1998, BWSR made a request to the Legislative Commission on Minnesota Resources (LCMR) to begin this process. The 1999 Legislature funded a pilot study for updating and digitizing these soil surveys in two or more counties which will be started in the next biennium. Each of the outdated county soil surveys must be evaluated for current soils classification and recompiled on an orthophoto basemap.

When digitized, the updated soil survey will meet national NRCS Soil Survey Geographic (SSURGO) Database standards and be part of the State of Minnesota digital soil database. Initially, the project will focus on southeastern

Minnesota. Other counties will be undertaken as time and funding permit. Participating counties will be asked to provide matching funds. Work will be started by NRCS and BWSR, with quality assurance provided by NRCS soil scientists in cooperation with the University of Minnesota Department of Soil, Water and Climate. For more information, contact: Greg Larson, Board of Water and Soil Resources, 1 West Water Street, Suite 200, St. Paul, MN 55107, 651-296-0882, greg.larson@bwsr.state.mn.us

Parcel Mapping

Many counties and cities along with some state agencies have been advancing their efforts for digital mapping of parcels over the last several decades. In addition, private firms have developed products, such as scanned plat maps, that are of use to the GIS community. At the county level, surveyors, auditors, assessors and recorders all have an interest in these efforts. It is felt that quite a bit of progress has been made since the findings that were reported in the 1995 report referenced below, however there has been no systematic tracking of activity since then.

Soil Data (SSURGO Standard)

Scale: 1:12,000

Agency/Contact: NRCS State Office, 651-602-7861 or <http://www.mn.nrcs.usda.gov/soils/soils.html>

Vintage: Varies, most field work done since the 1970s

Description: Digital version of published County Soil Surveys

Extent of Coverage: Eventually statewide, county files.

Software/file type: ARC/INFO coverage, ARC export, or DLG3 format

Funding for Development: federal, state, and local match, if available.

Attribute Data: see

http://www.ftw.nrcs.usda.gov/ssur_data.html

Coordinate System: UTM

Fees: free on-line; or \$50 on CD

Shortcomings: Only 10 counties completed, will likely take 10 or more years to complete state

Data Quality: very good. See national information site at: <http://www.ftw.nrcs.usda.gov/ssurgo.html>

Maintenance: reworking old surveys to modern standard for next decade or more.

Issues, Needs and Recommendations:

There is a need to complete a modern statewide seamless GIS layer from county-based soil surveys that is compliant with the federal SSURGO standard.