Minnesota Geological Survey

NEWSLETTER Winter 1992-93

Anniversary Issue

From the Director

In 1992, we celebrate the 120th anniversary of the founding of the Minnesota Geological Survey at the University of Minnesota. It has certainly been a roller-coaster year for Survey staff. The cold winds of January saw the Survey threatened with abolition by the 1991 veto of the Institute of Technology State Special Appropriation. But an anniversary present was in the offing—the Legislature passed a new bill restoring the State Specials by a vote of 196 to 1, which the Governor promptly signed into law. The Survey emerged with more friends than we ever knew we had—from K-12 to the National Academy of Sciences, from soil and water conservation districts to Canadian Precambrian geologists, from the University Libraries to private consulting companies. Now we have to work really hard to deserve all the help we received!

For our anniversary year, the Survey staff produced a wonderful array of new products. Val Chandler and Lynn Swanson finished the colorful new state aeromagnetic and gravity maps (highly recommended as office wall hangings). Val even arranged for the Survey's first CDs—all the aeromagnetic data were put on two disks by the NOAA National Geophysical Data Center in Boulder. Gary Meyer and the Ramsey County Geologic Atlas crew (including MGS, Ramsey Soil and Water Conservation District, and Department of Health staff) produced the ten plates of the new Ramsey Atlas. Tim Wahl and Joyce Meints have put the digital

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New Bedrock Geologic Map of Minnesota

The year 1992 is the 120th anniversary not only of the Minnesota Geological Survey, but also of the first statewide bedrock geologic map. That map, compiled by N.W. Winchell, recognized eight units of sedimentary strata, exposed primarily in southeastern and northwestern Minnesota, and a ninth undivided igneous and metamorphic unit beneath the remainder of the state. Twenty-eight years later, Winchell produced a second statewide map that further refined our knowledge of the sedimentary rocks and, even more importantly, unraveled the stratigraphic succession in the previously undivided igneous and metamorphic basement where it is exposed in the northern part of the state. Thus, by the end of the nineteenth century, geologic mapping had established the distribution of all the major rock units in areas of the state where bedrock is exposed.

The most recent statewide bedrock geologic map was published in 1982; however, it was compiled mostly in 1979 as part of a regional study of the Lake Superior region. Although they differ in detail, the 1982 map was broadly similar to a 1970 version compiled by P.K. Sims and subsequently included as Plate 1 in *Geology of Minnesota: A Centennial Volume* (1972). The 1970 map was one of the first attempts in the United States to use regional aeromagnetic data systematically to interpret bedrock geology in drift-covered areas of the state where exposure of the bedrock is lacking. Thus it represented the first true statewide bedrock geologic map.

Statewide geologic mapping in the 1970s was constrained by the available aeromagnetic database, which had been flown mostly in the 1950s and 1960s. That problem was addressed in the 1980s by a statewide high-resolution aeromagnetic database obtained with the recommendation of the Legislative Commission on Minnesota Resources. The ability to manipulate the aeromagnetic data digitally to produce a variety of images, and the concurrent development of new geologic concepts, have made it possible to produce geologic interpretations far superior to those embodied in the 1982 map. Therefore this anniversary year is an appropriate time to compile a new statewide bedrock map.

In reality, we have produced three different bedrock geologic maps. Compilation at a 1:1,000,000 scale was accomplished using a variety of large- and medium-scale maps that were photographically reduced to either the final or some intermediate scale. As all geologists know, the generalization process is highly subjective. Some items of the original maps are easily sacrificed; for example, subdivision within larger stratigraphic units, convolutions of contacts produced by erosion or topography, small faults unrelated to the gross structural pattern, and small patches of younger rocks scattered over older bedrock. Other, more painful generalizations include the combining and generalizing of widely different lithologic units or structural breaks, to emphasize significant geologic features or some tectonic grain that the compiler, but not necessarily the original mapper, believes to be significant. In the end, a new geologic interpretation was produced at a 1:1,000,000 scale; the map will be published sometime in mid-1993. This map was again reduced and generalized to produce a 1:3,000,000 scale map that is currently in press. It will be available in early 1993. Geologic interpretation was constrained mostly by the limits of the legible printing of lines and units on a given size sheet of paper. Lastly, the 1:3,000,000 scale map was again reduced and generalized to produce a postcard-size map. Although the compiler indulged in considerable fantasy, the maps do present a digest of the significant parts of the state's geology.

One final word. The 120th anniversary versions of the statewide bedrock geologic map probably will be the last to be produced by the time-honored methods involving photographic reductions and manual generalizations and

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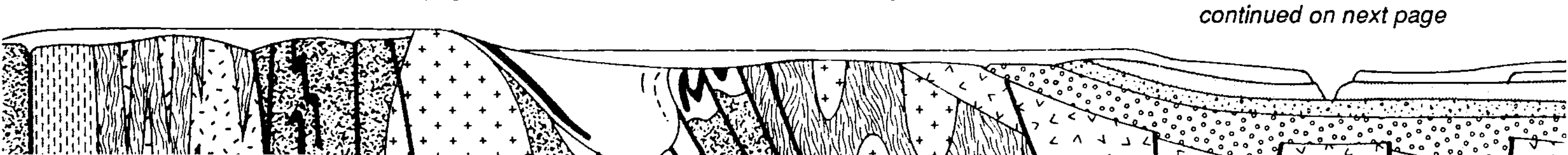

Director, continued from p. 1

data for Ramsey into ARC/VIEW, and presented our first work station display for LCMR staff in November. Dave Southwick helped WCCO-TV produce a TV mini-series called "Go 4 Rocks," directed at fourth to sixth graders in Minnesota and Wisconsin. G.B. Morey decided to celebrate our 120th by making a new state geologic map—a complimentary copy is enclosed with this issue. Just think how many of your family and friends would like a postcard of Minnesota with rocks instead of the usual loons and lady slippers.

As 1992 closes, the Survey faces the real possibility of an overall budget cut of about 20 percent in the next biennium, starting July 1, 1993. Although the State Special Legislative budget request is slightly up, thanks to strong support for the Survey within the University, our prospects for external funding are grim. The Legislative Commission on Minnesota Resources has recommended a 47 percent cut in the Survey's current funding from the state lottery proceeds for the county geologic atlas and regional assessment programs. Also, Survey funding from the Mineral Diversification program is expected to be cut substantially, and contracts from the U.S. Bureau of Mines for manganese research are being discontinued. If these cuts are implemented, it is likely that the Survey will face its first layoffs since 1983. Thus the 120-year-old MGS is very much up-to-date in sharing the financial uncertainties of the '90s—we can certainly sympathize with many of you who are in other university units, agencies, and companies facing similar budget problems. Let's hope that 1993 will bring increased prosperity to Minnesota, in which all of us can share.

Priscilla C. Grew

Bedrock, continued from p. 1

recompilations. Each map is being digitally reproduced, and digital mapping techniques will make it much easier to revise these maps in the future, when new data and ideas become available. Digital mapping techniques also will make it easier to integrate geologic maps with other kinds of data using a geographic information system (GIS). However, cartographic design, whether of the hand-colored maps of the nineteenth century or of contemporary maps displayed on a color computer monitor using GIS techniques, depends on the same fundamental principle. It is the quality of the geologic interpreation that defines the map, and that quality depends on the skill and knowledge of the geologist.

G.B. Morey

Reevaluation of the Cuyuna Range

The Cuyuna Range was a major supplier of ferromanganese ores from 1904 to 1984. Before mining stopped in the early 1960s, geologists made many studies of the area's stratigraphy and structural geology, and of the source of the ores. Regional mapping in the late 1980s radically changed our ideas of the stratigraphy of east-central Minnesota. As a result, the main iron formations of the Cuyuna Range are no longer thought to be correlative with those of the Mesabi Range.

As part of a cooperative project with the U.S. Bureau of Mines, the Minnesota Geological Survey (G.B. Morey, P.L. McSwiggen, J.M. Cleland) is reevaluating the origin of the manganese-rich iron formations of the Cuyuna Range. The results so far have been very exciting. Components of the main iron formation, the Trommald Formation, are more suggestive of volcanic-exhalative deposits than of classic Superior-type sedimentary iron formations. The presence of minerals such as aegirine, Ba-feldspar, tourmaline, and Sr-rich barite suggest that volcanic fluids may have been involved in the deposition of the iron formation. This is significant for mineral exploration in the Cuyuna Range, because of the association of lead-zinc deposits with exhalative manganese deposits.

The Minnesota Geological Survey Newsletter is published quarterly.

Editor: Ann Rae Jonas

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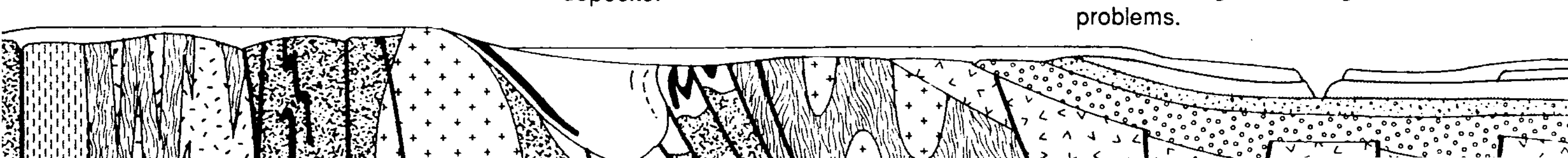
Ground-Water Chemistry in Rock and Nobles Counties

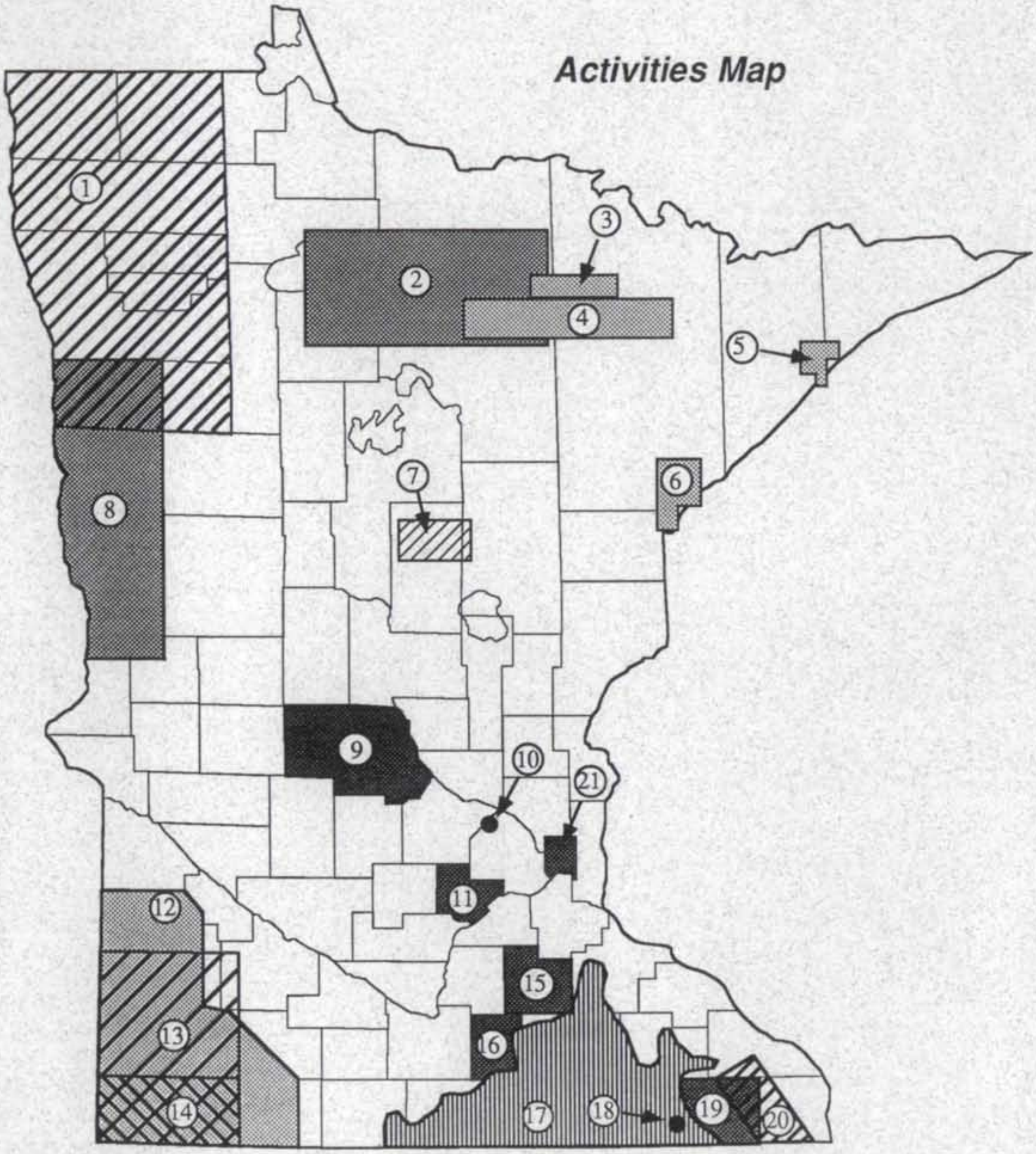
In August 1990 the Rock/Nobles Health Services collected and analyzed 978 samples of domestic well water in Rock and Nobles counties for major cations, anions, nitrates, and some trace elements. The locations of the wells were recorded by township-range-section and quarter section to 40-acre accuracy. Well depths were reported by the owners. The data, which were given to MGS for possible use in the Southwestern Regional Ground-Water Assessment, are being reviewed and analyzed as a project of MGS's County Services Office.

Geologic and hydrologic interpretation of the data show that ground-water chemistry surveys that include major cations and anions as well as NO_3-N can be useful precursors to county geologic or regional ground-water assessments in several ways. First, they can locate areas of high NO_3-N for intensive investigation. Second, they can permit a preliminary assessment of the applicability of statewide sensitivity guidelines, given local conditions. Third, they can supplement sparse water-well data with additional well locations and depths. Fourth, they can be used to develop hypotheses about geologic and hydrologic conditions in the study area, which then can be tested with techniques not usually available to counties, such as isotope analysis. High nitrates in Minnesota water wells indicate human-caused water-quality problems; data on additional chemical constituents of ground water at such sites are a key to understanding and solving such problems.



MGS Fact Sheet and Order Form

Activities Map



*(1) NW Minnesota Bedrock Geology Study
*(2) Quaternary and Bedrock Mapping
*(3) Quetico-Shebandowan Subprovince Boundary Study
*(4) Archean Geologic Mapping, Soudan-Big Fork
*(5) COGEOMAP - Duluth Complex
*(6) Southern Duluth Complex Mapping Project
(7) Cuyuna Range Manganese
(8) Red River Valley Regional Assessment
(9) Stearns County Geologic Atlas
(10) Volcanic Stratigraphy and Petrochemistry of the Chengwatana Group
(11) Carver County Bedrock Geologic Mapping
*(12) Subsurface Greenstone Belts SW Minn.
(13) SW Regional Assessment
(14) Groundwater Chemistry, Rock / Nobles Co.
(15) Rice County Geologic Atlas
(16) Waseca County Bedrock Geologic Mapping
*(17) Pb-Zn Occurrences
(18) Mystery Cave - Resource Evaluation
(19) Fillmore County Atlas
(20) Pb-Zn Mineral Deposits
(21) Ramsey County Geologic Atlas

* Major Geophysical Component

MGS Phone Numbers

(612)	627-4780	General Information
(612)	627-4778	FAX
(612)	627-4782	Map Sales
(612)	627-4784	Public Water-Well Help Line and County Services Office
(612)	627-4787	GIS Office

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Active Accounts July 1, 1991—June 30, 1993

Institute of Technology State Special Appropriation
University of Minnesota
Minnesota Geological Survey
$ 1,075,000
07/01/91—06/30/92
$ 1,093,736
07/01/92—06/30/93

Ramsey County Geologic Atlas (Ramsey County)
$ 41,715
07/01/91—07/31/92

Rice County Geologic Atlas (Rice County)
$ 90,000
01/01/92—06/30/95

Fillmore County Geologic Atlas (Fillmore County)
$ 90,000
07/01/92—06/30/95

Stearns County Geologic Atlas (Stearns County)
$ 90,000
07/01/92—06/30/95

Mystery Cave Resource Evaluation (LCMR)
$ 43,000
07/01/91—06/30/93

County Geologic Atlas and Groundwater Sensitivity
Mapping and County Services Office (LCMR)
$ 800,000
07/01/91—06/30/93

Subsurface Greenstone Belts in Southwest Minnesota (LCMR)
$ 120,000
07/01/91—06/30/93

Geologic Drilling and Mapping, Northwest Minnesota Bedrock Geology Study (MCC/DNR-Minerals)
$ 313,000
08/01/91—06/30/93

Regional Groundwater Assessment (DNR-Waters)
$ 324,200
08/09/01—06/30/93

County Geologic Atlas Development (DNR-Waters)
$ 327,800
08/09/91—06/30/93

Quaternary Mapping and Stratigraphy (MCC/DNR-Minerals)
$ 92,000
10/03/91—06/30/93

Bedrock Geologic Mapping, Duluth Area (MCC/DNR-Minerals)
$ 100,000
08/01/91—06/30/93

Selective Mining in Minnesota (US Bureau of Mines)
$ 110,015
09/30/91—09/29/92

COGEOMAP Program in the Duluth Complex, Northeastern Minnesota (US Geological Survey)
$ 20,000
08/01/92—07/31/93

Carver County Bedrock Geologic Map (Carver County)
$3,000
10/01/92— 09/30/93

LCMR = Project recommended by Legislative Commission on Minnesota Resources
DNR = Department of Natural Resources
MCC = Minerals Coordinating Committee

New Publications

Guidebook 18	Field trip guidebook for the glacial geology of the Laurentian Divide area, St. Louis and Lake Counties, Minnesota. J.D. Lehr and H.C. Hobbs. 1992. 73 p., 1 pl. $6.00.
Guidebook 19	Kaolinitic clays of the Minnesota River Valley and southwestern Minnesota. D.R. Setterholm and J.J. Heine. 1992. 12 p. $1.00.
Information Circular 36	Radium in the Mt. Simon-Hinckley aquifer, east-central and southeastern Minnesota. R.S. Lively, R. Jameson, E.C. Alexander, and G.B. Morey. 1992. 58 p. $5.00.
Report of Investigations 40	Sedimentary rocks of Dresbachian age (Late Cambrian), Hollandale embayment, southeastern Minnesota. J.H. Mossler. 1992. 71 p. $8.00.
Report of Investigations 41	Bottom sediments and organic geochemical residues of some Minnesota lakes. F.M. Swain. 1992. 65 p. $8.00.
County Atlas C-7	Geologic atlas of Ramsey County, Minnesota. G.N. Meyer and L. Swanson, eds. 1992. Color. Scale 1:48,000 or smaller. 10 pls. $12.50.
Miscellaneous Map M-75	Bedrock geologic map of the Cook to Side Lake area, St. Louis and Itasca Counties, Minnesota. M.A. Jirsa, T.J. Boerboom, V.W. Chandler, and P.L. McSwiggen. 1991. Color. Scale 1:48,000. $10.00. Order flat or folded.
State Map S-17	Aeromagnetic anomaly map of Minnesota. V.W. Chandler. 1992. Scale 1:500,000. $10.00. Order flat or folded.
Open-File Report 91-5	Geologic factors affecting the sensitivity of the Prairie du Chien-Jordan aquifer. D.R. Setterholm and others. 12 plates (Plates 2, 4, 5, 6, 7, 8, 9, 10 and 12 are available as ozalid paper copies at $5.00 each; plates 1, 3 and 11 are paper plots and available for inspection at MGS Library.) 29 p. Text available at $0.20 per page.
Open-File Report 92-2	Contributions to the geology of Upper Mississippi Valley mineral deposits in southeastern Minnesota. G.B. Morey, J.H. Mossler, V.W. Chandler, R.S. Lively, and S.A. Hauck. 140 p. $28.00.
Reprint Series 72	Chemical composition of the eastern Biwabik Iron Formation (Early Proterozoic), Mesabi Range, Minnesota. G.B. Morey. (Reprint from ECONOMIC GEOLOGY, v. 87, 1992, p. 1649-1658.) $1.00.
USGS MF-1835-G	Lithologic cross sections of Phanerozoic rocks in the northern midcontinent, U.S.A. Compiled by D.N. Mugel and W.P. Pratt. 1991. 7 p. Scale 1:1,000,000. 7 pls. $21.75.
Open-File Map 1993-1	Digital version of postcard bedrock geologic map of Minnesota. $2.00.

Satellite image map: Land and water resources of the Twin Cities Metropolitan Area. Published by the Metropolitan Council and the University of Minnesota. 1992. Scale 1:158,400. $5.00. Order flat only.

Postcard, bedrock geologic map of Minnesota. 1992. Color. 6-1/8" x 8-3/4". One free over the counter. Quantities of 2-9 are $0.65 each; 10-19 are $0.60 each; 20 or more are $0.50 each.

ORDER FORM

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Forthcoming Publications

Information Circular 37	Scientific core drilling in parts of Itasca, St. Louis, and Lake Counties, northeastern Minnesota, 1989-1991: Summary of lithologic, geochemical, and geophysical results. J.P. Meints, M.A. Jirsa, V.W. Chandler, and J.D. Miller, Jr. 1993. In preparation.
Information Circular 38	Analytical results of the public geologic sample program, 1989-1991 biennium. G.B. Morey and L.S. Day. 1992. In press.
Miscellaneous Map M-71	Geologic map of the North Shore of Lake Superior, Lake and Cook Counties, Minnesota: Part 1. Little Marais to Tofte. J.C. Green. 1992. Color. Scale 1:24,000. In press.
Miscellaneous Map M-72	Geologic map of the Doyle Lake and Finland quadrangles, Lake County, Minnesota. J.D. Miller, Jr., J.C. Green, T.J. Boerboom, and V.W. Chandler. 1993. Color. Scale 1:24,000. In preparation.
Miscellaneous Map M-73	Bedrock geologic map of Waseca County. B.A. Bloomgren. In preparation.
State Map S-19	Geologic map of Minnesota: Bedrock geology. Compiled by G.B. Morey. 1993. Color. Scale 1:3,000,000. In press.

To request a complete list of publications, please call or write to the MGS map sales office.

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To place an order, please use the order form on the previous page.

MGS Women Geologists as Role Models

By the time they are in fourth grade, many girls already believe that they are not good at science and math, and they rule out a career in these fields. Three women geologists at the MGS—Jane Cleland, Emily Bauer, and Carrie Patterson—tried to help change this attitude by participating in Project Link, a math and science career education project for fourth through sixth graders. The goal of the project is to encourage girls to maintain an interest in science and math, and to show both girls and boys that such professions are open to women.

Project Link is offered through the Career Education Department in Intermediate District 287, Hennepin Technical Institute, with the Bush Foundation as the primary funder. The success and popularity of the initial years have prompted many "franchise" requests and expansion is expected.

An interested teacher selects a science- or math-related career from an extensive list. The people at Project Link then find a match from their list of volunteers and link the woman scientist with the teacher. Participation involves a preliminary planning session with the teacher, three classroom visits, and a class field trip to the workplace.

The class that Carrie worked with had read a book called *Everybody Needs a Rock* by Byrd Baylor (Aladdin Books). The book had rules for picking out a special rock "...that you find yourself and keep as long as you can—maybe forever"; a rock that feels "easy in your hand" and "jumpy in your pocket when you run," and looks "good by itself in the bathtub." Carrie and the teacher assembled a collection of rocks for the students, who carefully and ceremoniously selected their special rocks.

But is it really a rock? Many students were attracted to quartz, and this was the starting point for a discussion on the difference between rocks and minerals. Rocks can be made up of many different minerals. Carrie used cooking analogies to demonstrate the different ways of making rocks. If sugar and chocolate are minerals, the building blocks, we can make rocks by grinding, breaking, or dissolving them, then mixing them up and cementing them back together again (sedimentary rocks). We can melt them and mix them up, then let them cool (igneous rocks). Or we can bake the rocks and partially remelt or fold them (metamorphic rocks). Equipped with these categories and a few tools, the students determined whether their special "rocks" were minerals or rocks, and if rocks, what basic kind. In this way, their rocks became even more special to them.

Jane and Emily, in a joint effort, developed a project that demonstrated how a hydrogeologist measures water levels in wells to determine the direction of ground-water flow. They set up an array of tall glass tubes that were filled to different levels with water. These tubes represented the wells. The students measured the water levels in the "wells" and determined which way the water would flow, then decided where they would like to have a well, given the determined flow direction and the location of a hypothetical landfill.

At the end of three class meetings and a workplace visit, the geologists' feelings of exhaustion (and empathy for teachers) were offset by the knowledge that they had reached a group of kids and made a difference.

Geographic Information System at MGS

A geographic information system (GIS) is a computer-based method for storing and organizing spatial information. The user can access and integrate data and then analyze spatial relationships. The analysis can be used in decision-making—for example, to determine which aquifers may be more susceptible to pollution, or to select locations to drill for scientific information. The digital format allows for many variations of scale, analysis, and graphic presentation.

Two years ago MGS acquired the GIS software Arc/Info by ESRI. The Anoka Sand Plain regional assessment served as a pilot project for MGS digital map products. Completed this summer, the project was so successful that all future county and regional assessments will have a digital component.

The Anoka Sand Plain regional assessment was the first to include a georeference base, e.g., county borders, township, range and section lines; and thematic layers, e.g., hydrology, roads, water-well locations, piezometric contours, surficial geology, and pollution sensitivity.

Recently, MGS finished a base and variety of thematic layers for the Ramsey County Atlas and have formatted the data for use in the Arcview software system. Because Arcview allows the user to display data but not to edit it, it should be an excellent way for consultants and counties to access the digital data.

Please direct any questions concerning digital data to Joyce Meints.

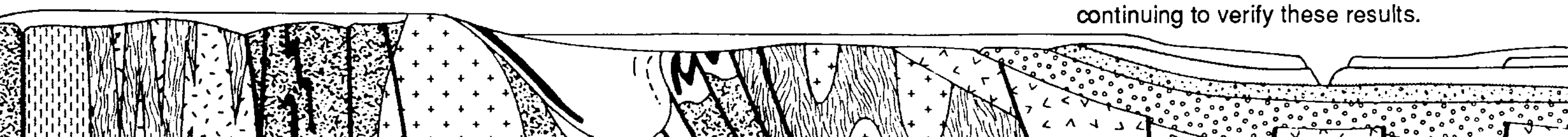
Carver County

Interest in a bedrock geologic map of Carver County arose during recent work on a ground-water protection plan. Little is known about the Paleozoic strata in the county's subsurface. The absence of detailed information about the bedrock geology made it difficult to determine proper well construction and abandonment procedures, and to evaluate the risk for ground-water contamination of bedrock aquifers.

Work on a bedrock geologic map of Carver County began in fall 1992. MGS's Tony Runkel, Bruce Bloomgren, and G.B. Morey are using borehole geophysical logs, cuttings samples, and water-well records to describe and map the bedrock strata. Preliminary results indicate that some Paleozoic units in the area are different from equivalent strata elsewhere in southeast Minnesota. As a result, the existing stratigraphic nomenclature for Paleozoic rocks in Minnesota may not be directly applicable to the strata in Carver County. The project will produce a stratigraphic column applicable to bedrock strata in the county, and a map of the bedrock geology and topography. The project will be completed by the end of October 1993.

Reversed Polarity Till, SW Minnesota

As part of the Southwestern Regional Assessment Project, Val Chandler conducted paleomagnetic work on the lowermost part of the glacial sequence in the Lake Benton area of southwestern Minnesota. Preliminary results from till and lake sediments indicate a reversed polarity, that is, magnetization opposite the Earth's present magnetic orientation. This suggests that the deposits are older than 700,000 years (when the polarity last switched), making it the oldest known till sequence in Minnesota. Work is continuing to verify these results.



MGS's County Well Index

1. What is the County Well Index?
The County Well Index (CWI) is a PC-based database system developed by the MGS for the storage, retrieval, and editing of water-well information. It is the only up-to-date, computerized database of well records in Minnesota. The database contains basic information on well records (e.g., location, depth, static water level) for wells drilled in Minnesota. The database also includes information on the well log, construction, and water chemistry for many of the wells. Currently, the database contains approximately 160,000 well records. The data are grouped by county.

2. Is this information available to anyone?
Yes.

3. What kind of computer do I need to run CWI?
An IBM PC, XT, AT, PS/2, or compatible computer. Your machine should have one floppy disk drive plus a hard disk. You also need to run MS-DOS/PC-DOS operating system 2.10 or higher.

4. Is there a Mac version of CWI?
No. However, data from CWI can be downloaded into ASCII (text) files, which then can be loaded into Mac spreadsheet or database software.

5. Who currently uses CWI?

CWI is used by a variety of local and state agencies, and by private groups interested in ground-water resource management.

6. Does the database include all wells drilled in Minnesota?
No. Most of the records in CWI are for wells drilled since 1974. The water-well construction code of 1974 required that well drillers submit well records for wells drilled in Minnesota. These records are sent to the Minnesota Department of Health, which then sends copies to MGS. Some records of wells drilled before 1974 are also included in CWI. These records were obtained through the cooperation of drillers and local government agencies.

7. How often is information updated?
Data is updated continuously at MGS as we receive the well records.

8. How can I find out if my well is on the database?
If you have not already obtained CWI for the county you live in, come by MGS and someone will check the database for you. CWI allows the user to select wells based on location according to the Public Land Survey format (township, range, section). The well address, if available, and owner's name also can be used to limit the search criteria for a particular well.

9. What else can CWI do?
CWI provides a variety of ways to select, sort, and report wells. A group of wells can be selected based on a single criterion or on a combination of criteria. For example, a user can select all wells more than 100 feet deep that have records of nitrate levels above 5 ppm, or wells that pump water from the Jordan aquifer. Once the wells have been selected, the information can be viewed on the screen, sent to a printer, or output to a file for use in another software package.

10. Does the database include other information besides what appears on the well record?
Yes. CWI can store most water-related information associated by well record unique number to a particular well record . This related information includes nitrate and bacteria information and additional water chemistry. CWI also stores historic water-chemistry information associated with a particular well, along with historic static water-level information. In this way, these data can be examined through time. A CWI well record also contains flags indicating whether geophysical information is available for that well, or if information on that well is available in other state databases. A record also can store "remarks," offering additional information not contained in the well record.

11. Are only well records included?
For the most part, yes. Some exploratory boreholes along with monitoring well records are being added to CWI.

12. Can I edit the data?
Yes. CWI includes an interactive screen edit mode that allows you to modify and add data.

13. Is it possible to get hard copy reports of the data?
Yes. CWI includes a command to redirect output to a printer. Output can also be redirected to a file for printing at a later date or on a different machine.

14. Is CWI compatible with other databases?
Not directly. The data should be downloaded to a text file first. The formats of the text files are included in the CWI manual. This format information will allow you to extract the data you need to load into your database.

15. Is CWI compatible with geographic information systems (GIS)?
Yes. CWI contains Universal Transverse Mercator coordinates (UTMs) for wells that have been located and digitized. These coordinates, along with the data to be plotted, can be downloaded from CWI for use in most plotting/GIS software packages. Special unload formats are included to create Minnesota Land Management Information Center's EPPL7 GIS software-compatible files for selected fields.

16. How do I order CWI?
Either send in the order form on the enclosed insert or stop in at the Survey and place an order with map sales. Please allow two to three business days to process your order.

17. How much does CWI cost?
CWI is available to the private sector for $11.00 for the manual and one disk, and $5.00 for each additional disk, plus tax and shipping. Generally, one disk will hold at least one county.

18. How can I receive updates?
If you have not been making changes to the data, simply request disks containing updated information for the counties you need. Generally, county data sets do not grow quickly, and annual updates are sufficient. The files you receive will replace your current data set. The updates cost $5.00 for each disk, plus tax and shipping. If you have made changes to the data and would like to have those changes incorporated into the data set, contact MGS to arrange to merge your data into the updated data set.

Robert Tippi