

1993 Work Program**FOR THE PERIOD ENDING JUNE 30, 1995**

This project was supported by Environment and Natural Resources Trust Fund

Title: County Geological Atlases and Regional Hydrogeologic Assessments -- Continuation
Program Manager: David Southwick (MGS) and Sarah Tufford (DNR)
Organization: Minnesota Geological Survey and Minnesota Department of Natural Resources-Division of Waters
Legal Citation: M. L. 93, Ch. 172, Sec. 14, Subd. 11(g)
Appropriation Amount: \$850,000

STATEMENT OF OBJECTIVES: The objectives of this program were: (1) To expand multi-county regional hydrogeologic assessments, (2) To expand production of county geologic atlases, and (3) To establish a County Services Office.

OVERALL PROJECT RESULTS: County geologic atlases (CGAs) and regional hydrogeologic assessments (RHAs) are map compilations of geologic and hydrologic information that are designed to assist planners and resource managers with decision making. The geological components of CGAs for Fillmore, Rice, and Stearns Counties were completed during this biennium. These maps and accompanying explanatory texts will be published within the next three months as GIS coverages and as conventional printed materials. The hydrologic components of the atlases, including groundwater sensitivity maps, are at varying stages of completion and will be published on a staggered schedule within the coming biennium. In addition, geological components were completed for RHAs that cover southwestern Minnesota and the southern part of the Red River valley. These also will be released in the very near future in GIS and printed format. As with the CGAs, the hydrologic components of the RHAs are at various stages of completion and will be published in the next biennium.

The geologic components of a CGA include a database and plates (maps plus explanatory materials) that describe the surficial geology, Quaternary stratigraphy, bedrock geology, depth to bedrock, bedrock topography, and mineral resources of a county. The hydrologic components include plates that describe the flow paths and composition of groundwater and the sensitivity of the groundwater system to pollution. The geologic components of an RHA include a database and plates that describe the surficial geology and the Quaternary stratigraphy of a multi-county area. The hydrologic components of an RHA are the same as those of a CGA, but are compiled at a less detailed scale.

A service office (CSO) was established at the MGS to assist users of atlases and assessments with their informational needs. Customers include government officials, geologic, hydrogeologic, and engineering consultants, the academic community, and the general public.

PROJECT RESULTS, USE, AND DISSEMINATION: Atlases and assessments may be purchased in GIS or print format from the Map and Publication Sales Office of the Minnesota Geological Survey and from county sources. Field trips, seminars, and workshops are also offered to help local government officials and interested individuals use CGA/RHAs to their best advantage. The CSO will be a continuing part of MGS information services. It will provide information and training as required to maximize use of CGA/RHA products.

*Original
6064*

Submission Date: July 1, 1995

LCMR Final Workprogram Update Report

I. Project Title: County Geologic Atlases and Regional Hydrogeologic Assessments -- Continuation

Program Managers:

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A. M.L.93 Ch. 172 Sec. 14, Subd: 11(g)

Total Biennial LCMR Budget: \$850,000
Balance: \$00

Appropriation Language as drafted 7/27/92:

\$425,000 is from the trust fund to the University of Minnesota, Minnesota Geological Survey, and \$425,000 is from the trust fund to the commissioner of natural resources to expand production of county geologic atlases and regional hydrogeologic assessments. This project must comply with the data compatibility requirements set forth in subdivision 14.

B. LMIC Compatible Data Language:

During the biennium ending June 30, 1995, the data collected by the projects funded under this section that have common value for natural resources planning and management must conform to information architecture as defined in guidelines and standards adopted by the Information Policy Office. Data review committees may be established to develop

or comment on plans for data integration and distribution and shall submit semiannual status reports to the Legislative Commission on Minnesota Resources on their findings. In addition, the data must be provided to and integrated with the Minnesota Land Management Information Center's geographic data bases with the integration costs borne by the activity receiving funding under this section.

C. Status of Match Requirement: not applicable

II. Narrative:

This continuation project expands production of county geologic atlases and regional hydrogeologic assessments. The purpose is to respond to state, regional, and local needs for geologic and hydrologic data and interpretations essential to the wise use and protection of Minnesota's groundwater, pursuant to the Groundwater Protection Act of 1989 and recommendations of the EQB Water Resources Committee. Continuation of 92-93 Trust Fund project with 47% cut for MGS, 29% cut for DNR.

III. Statement of Objectives

- A. Expand multi-county regional hydrogeologic assessments (RHAs)
- B. Expand production of county geologic atlases
- C. MGS County Services Office

IV. Objectives

A. Title of Objective: Expand multi-county regional hydrogeologic assessments (RHAs)

A.1. Narrative: Complete Red River RHA. Complete 70% of Southwest RHA. Southwest RHA covers 4764 square miles in Rock, Nobles, Pipestone, Murray, and parts of Redwood, Cottonwood, Jackson, Lincoln and Lyon Counties; Red River RHA covers 3691 square miles in Clay, Norman, Wilkin, and part of Traverse, Grant, Otter Tail, Becker, and Mahnommen Counties. Due to budget cut, no new project starts and slower production schedule. MGS lead agency for GIS data base, glacial deposit geology; DNR is lead for sensitivity mapping and hydrogeology. Maps produced in state standard digital ARC Info GIS format and analog color plates.

A.2. Procedures: Regional hydrogeologic assessments are produced at a scale of 1:200,000. They are designed to cover large areas in a shorter time and in less detail than county atlases. They provide new regional geologic mapping and hydrogeologic evaluations of the upper part of the geologic section, concentrating on the distribution and

stratigraphy of glacial (Quaternary) deposits. Evaluation is made from surficial geologic mapping, water well logs, supplemental shallow drilling, surface and borehole geophysics, water level measurements, and ground-water geochemistry where required.

A.3. Budget:

- a. Amount budgeted \$350,000 (MGS \$150,000; DNR \$200,000)
b. Balance: MGS: \$00 DNR: \$00

A.4. Timeline

7/93 1/94 6/94 1/95 6/95

Red River RHA

Geologic and hydrologic mapping

Technical review, editing, map production

XX

GIS data base, digital product development

Southwestern RHA

Geologic and hydrologic mapping

XX

Technical review, editing, map production

XX

GIS data base, digital product development

XX

A.5. MGS Status 7/1/95:

General: David L. Southwick became Program Manager for the MGS component as of 9/1/93.

Red River Valley RHA

MGS started work on the Red River RHA on 7/1/91. We have completed geologic mapping and map preparation for the RRV RHA. Final editing, generation of composite negatives, and publication will be accomplished during JUL 1995. The percentages given indicate the proportion of the tasks, related to geologic mapping and GIS development, that have been completed.

The project database of water well information is assembled (100%), and we have assembled the GIS basemap layers (100%). Work on the surficial geology and Quaternary stratigraphy plates is completed (100%). GIS thematic layers for the surficial geology and Quaternary stratigraphy plates are assembled. Final editing and generation of the composite negatives will be done within days and printing of the final map products will follow soon thereafter.

Southwest RHA

MGS started work on the SW RHA on 7/1/91. We have completed geologic mapping and map preparation for the SW RHA. GIS production work will be completed during JUL 1995. The percentages given indicate the proportion of the tasks, related to geologic mapping and GIS development, that have been completed.

The project database of water well information is assembled (100%), and we have assembled the GIS basemap layers (100%). Work on the surficial geology and Quaternary stratigraphy plates is completed. GIS thematic layers for the surficial geology and Quaternary stratigraphy plates are assembled. Final editing and generation of the composite negatives will be done within days and printing of the final map products will follow soon thereafter.

DNR Status 7/1/95:

Anoka Sand Plain RHA - No further work required.

Red River Valley RHA - Although the project hydrologist position has been vacant since December 1993 the former project hydrologist continues technical analysis as a volunteer on a time-available basis. The program GIS specialist position is currently filled by an intern. Three alternate models of sensitivity for the project area have been investigated and their results compared. Hydrology layers have been captured in GIS. A draft Hydrology Plate design is available. The pollution sensitivity plate will be developed during FY96. All pre-press for both map sheets will be delayed until FY96; printing and distribution will be completed next biennium.

Southwest Minnesota RHA -Field data collection complete. Hydrologic analysis and development of GIS layers to be completed by December 95. Project is on schedule and will be completed next biennium.

A.6. Benefits: Regional hydrogeologic assessments are designed to identify high

sensitivity areas on a broad scale. The data then are available to local decision makers who may find them adequate for managing and planning, or who may wish to proceed with further studies at a more detailed county atlas scale. The products generated are a computerized subsurface database, a map of surficial geology, an interpretation of the glacial stratigraphy, and an analysis of hydrogeology and

geologic sensitivity. Regional hydrogeologic assessments provide the foundation for future, more detailed, county atlases.

B. Title of Objective: Expand production of county geologic atlases

B.1. Narrative: Complete atlases for Rice, Fillmore. Stearns County Atlas will be 50% complete by 6/95. MGS lead agency for GIS data base, bedrock geology, glacial deposit geology and stratigraphy, and mineral resources mapping. DNR lead for hydrogeology, sensitivity mapping, hydrologic studies. Atlases in digital ARC Info format and printed color plates, scale 1:100,000.

B.2. Procedures: MGS will produce by 6/95 the database map, surficial geologic map, Quaternary stratigraphy plate, bedrock geologic map, bedrock topographic map, and special plates as appropriate to local needs; DNR produces hydrology and sensitivity plates.

DNR will provide services to the program that include contract drilling and geophysics, performing and interpreting aquifer tests, hydrologic monitoring, ground-water geochemistry, and collecting water level data. DNR may involve the USGS through its joint funding agreement in these activities.

B.3. Budget:

- a. Amount budgeted: \$425,000 (\$200,000 to MGS, \$225,000 to DNR)
b. Balance: MGS: \$ 00 DNR: \$00

B.4. Timeline

7/93 1/94 6/94 1/95 6/95

Rice County:

Geologic and hydrologic mapping

XX

Technical review, editing, and map production

GIS data base, digital product development

XX

Fillmore county:

Geologic and hydrologic mapping

XX

Technical review, editing, and map production

GIS data base, digital product development

XX

7/93

1/94

6/94

1/95

6/95

Stearns County:

Geologic and hydrologic mapping

XX

Technical review, editing, production, and publication

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Stearns County:

GIS data base, digital product development

XX

B.5. MGS Status 7/1/95:

Fillmore CGA

MGS started work on the Fillmore CGA on 7/1/91. We have completed geologic mapping and map preparation. GIS production work will be completed during JUL 1995. The percentages given indicate the proportion of the tasks, related to geologic mapping and GIS development, that have been completed.

The project database of water well information has been completed (100%) and we have assembled the GIS basemap layers (100%). The surficial geology, bedrock geology, depth-to-bedrock/bedrock topography, and mineral resources plates are completed (100%). Work on the GIS thematic layers is in the final stages and composite negatives are being prepared for printing.

A booklet that supplements explanatory text for the atlas plates is being edited and will be distributed with the Fillmore County Geologic Atlas. It contains chapters that discuss the Quaternary geology, bedrock geology, Karst conditions, Karst springheds, and groundwater chemistry.

Rice CGA

MGS started work on the Rice CGA on 7/1/91. We have completed geologic mapping and map preparation. GIS production work will be completed during JUL 1995. The percentages given indicate the proportion of the tasks, related to geologic mapping and GIS development, that have been completed.

The project database of water well information has been completed (100%), and we have assembled the GIS basemap layers (100%). The surficial geology, Quaternary stratigraphy, bedrock geology, depth-to-bedrock/bedrock topography, and mineral resources plates are completed (100%). Work on the GIS thematic layers is in the final stages and composite negatives are being prepared for printing.

Stearns CGA

MGS started work on the Stearns CGA on 7/1/92. We have completed geologic mapping and map preparation for all plates except the mineral resources plate. Final editing, generation of composite negatives, and publication will be accomplished during JUL 1995. The percentages given indicate the proportion of the tasks, related to geologic mapping and GIS development, that have been completed.

The project database of water well information has been completed (100%), and we have assembled the GIS basemap layers (100%). Work on the surficial geology, bedrock, and depth-to-bedrock/bedrock topography plate is completed (100%). Compilation of the Quaternary stratigraphy plates is nearly completed (95%). GIS thematic layers for the database, bedrock geology, surficial geology, and bedrock topography have been assembled; thematic layers for the Quaternary and Mineral resources plates are being assembled (70%). Final editing and generation of the composite negatives, and publication remains to be done. The target date for publication of the geological components of the Stearns atlas is September 30, 1995.

DNR Status 7/1/95:

Fillmore County CGA - All hydrologic GIS layers completed. Potential yield analysis completed. Safe yield analysis completed. GIS model for sensitivity coverage developed and map prepared. Map sheet text 75% completed. Text for Educational Supplement nearly complete. All pre-press for map sheets will be completed shortly; printing and distribution will be completed next biennium.

Supplemental contract for sinkhole and springshed map sheets and GIS layers 95% complete. Pre-press for sinkhole sheet complete; it is ready for press. Pre-press for springshed sheet is in final stages; printing and distribution will be completed early FY96. Text for Educational Supplement nearly complete. ES will be completed by end of biennium.

Rice County CGA -Progress has been delayed due to project hydrologist's maternity leave. Hydrologic analysis 90% complete. Sensitivity evaluation 25% complete. Continuing to build GIS layers. All GIS layers and all pre-press for map sheets will be completed by December 1995. Printing and distribution will be completed next biennium.

Stearns CGA - Data collection begun. Development of water level network about 10% complete. All data collection to be complete this calendar year. Project to be completed by end of next biennium.

Misc.: Successful use of digital composition of map sheets for negative preparation. The Land Management Information Center provided technical preparation and sub-contractor management.

B.6. Benefits: Expansion of the atlas program into Stearns County will develop the approach for handling large, complex counties. Geologic and hydrogeologic information will be readily accessible at the local level for planning and resource decision making. County staff will be trained in the acquisition and use of geologic and hydrologic data. The maps and interpretations become instructional aids for environmental and resource education.

C. Title of Objective: MGS County Services Office

C.1. Narrative: Provides technical advisory services and training to county personnel on use of County Well Index (CWI) on personal computers, assists county updating of atlases and RHAs. Helps counties not yet mapped to access available geologic and hydrogeologic information, supports water-well helpline and CWI updates.

C.2. Procedures: MGS geologists and student assistants familiar with use of CWI will assist county personnel of counties with and without atlases. Interpretive advice and assistance on request to counties and regional groups through telephone calls, assistance with digitized hydrogeologic databases, regional geologic setting of water wells. Due to budget cut, workshops and field demonstrations will be eliminated and county services will be reduced.

C.3. Budget:
a. Amount budgeted: \$75,000 (MGS)
b. Balance: \$00

C.4. Timeline:

	7/93	1/94	6/94	1/95	6/95
County assistance	xx				

C. 5. MGS Status 7/1/95:
The MGS County Services Office (MGS/CSO) has been in operation since JUL 1, 1991 (48 months). During the last six months of this biennium the MGS/CSO has provided the following technical advisory services and training county personnel:

* Answered 1000 phone calls about well records and groundwater geology from well drillers, consultants, home owners, real estate agents, teachers, and the public.

- * Responded to inquiries from 15 counties about suggestions to update county water plans with summaries of the CGA/RHA program, and a description of CWI.
- * Reviewed the Ramsey County Groundwater Management Plan and the draft of the Benton County Water Plan.
- * Prepared an abstract with Jan Falteisek (MN DNR) on technical innovations in the CGA/RHA program for the annual Water Resources Conference sponsored by the Minnesota chapter of ASCE, to be held in October on the St. Paul campus of the University of Minnesota.
- * Prepared a talk on regional hydrogeology and an exercise on the use of the atlas for Fillmore County Geologic Atlas workshop held on JUN 22 and 23, 1995.
- * Participated in a review with DNR on JUN 21, 1995 of the aquifer sensitivity maps developed by Mankato State University for the 13 south-central counties.

C.6. Benefits: The County Services Office will interpret hydrologic and geologic information for the public and provide counties and regional multi-county groups with technical assistance that will maximize use of published atlases. Services provided by the County Services Office permit the atlas staff to concentrate on meeting mapping deadlines, and work with county personnel on atlases that are in progress.

V. Evaluation:

The work program provides for acquisition, verification, interpretation, and transfer of geologic and hydrogeologic information at an appropriate scale for planners, resource managers, and educators. In this way, geologic and hydrologic information is made readily available so that relevant environmental factors and sensitivity to pollution can be taken into account when decisions are made about land use and resource management.

In the short term, the program can be evaluated by its ability to reach the interim goals indicated on the timelines. In the long term the program can be evaluated by how well geologic and hydrologic information is disseminated to, and used by, resource planners and decision makers at the state, regional, and local levels.

VI. Context

A. The first seven county atlases (Scott, Winona, Olmsted, Hennepin, Washington, Dakota and Ramsey Counties) covered counties with 46 percent of the state's

population, but only 4 percent of the state's land area. Addressing future land- and water-use questions will require sound geologic and hydrologic information in much of the remaining 96 percent of the state's land area.

B. The Groundwater Act of 1989 established the base-level funding for the MGS county geologic atlas and associated shallow groundwater sensitivity assessment programs in the DNR-Waters budget base. The Trust Fund appropriation of \$1,400,000 in FY 92-93 supplemented this ongoing base activity to respond to state, regional, county, and local needs for accelerated production of geologic and hydrologic information essential to the wise use of Minnesota's natural resources. This accelerated funding permitted the start of atlases for Rice, Fillmore, and Stearns Counties, and two regional hydrogeologic assessments, Red River and Southwest. Also, at county and state agency request, MGS has undertaken work to put the RHA and CGA maps on ARC Info for GIS applications.

MGS will continue to be the lead agency on geologic mapping (surficial glacial deposits, and bedrock geology), database acquisition (MGS water well database), and some other atlas products requested by counties, such as mineral resources maps. MGS will continue to produce the atlas plate for well construction recommendations in cooperation with the Department of Health. DNR will continue lead agency responsibility for hydrogeologic mapping and interpretation of sensitivity of groundwater to pollution, and will ensure that sensitivity mapping complies with state criteria.

DNR will enhance the hydrogeologic component by adding geophysics, geochemistry, and involving the U.S. Geological Survey under an existing cooperative agreement. Additional DNR contributions may include contracted services on specialty areas of hydrogeology and drilling.

C. LCMR recommended funding for the first county geologic atlas (Scott County, published in 1982). Since then six additional county geologic atlases have been completed, funded by counties, soil and water conservation districts, the University of Minnesota State Special Appropriation, and DNR-Waters contracts to MGS pursuant to the Groundwater Protection Act of 1989. LCMR recommended \$15,000 toward the Olmsted County Atlas. Dakota and Washington County atlases were funded jointly by the 1989 Groundwater Bill (funds contracted from DNR to MGS) and the counties involved.

years as a Pleistocene Geologist. In that capacity he has mapped in all parts of the State at various map scales.

- C) Gary Meyer, Geologist
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M.S. Geology, University of North Dakota, 1979

Mr. Meyer is project manager for the Stearns County CGA. His graduate work involved environmental geology in west-central North Dakota. He has worked for the Minnesota Geological Survey for the past 15 years as a Pleistocene Geologist, where he has mapped in all parts of the State at various map scales.

- D) John Mossler, Geologist
Minnesota Geological Survey
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612-627-4780

M.S. Geology, University of Iowa, 1964
Ph.D. Geology, University of Iowa, 1970

Dr. Mossler is project manager for the Fillmore County CGA. His graduate work involved petrology and stratigraphy of Paleozoic bedrock units in Iowa and Kansas. He has worked for the Minnesota Geological Survey for the past 17 years as a geologist/stratigrapher, where he has mapped the bedrock stratigraphy in all parts of the State at various map scales.

- E) Dale Setterholm, Geologist
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(612) 627-4780

B.S. Geology, University of Minnesota, 1979

Mr. Setterholm is project manager for the Southwest RHA. His specialty is the study of the Cretaceous rocks of Minnesota. He has done nationally recognized work on new information about the eastern margins of the Cretaceous seaways of North America, as expressed in the bedrock geology of Minnesota. His work at the MGS has involved stratigraphy, interpretation of downhole geophysical logs, field coordination of MGS and contracted scientific drilling using auger, soil probe, mud and air rotary methods. Managed the MGS component of the 90-91 LCMR project on sensitivity of the Jordan aquifer system.

- F) Brian Rongitsch, Hydrogeologist, Ground Water Unit Supervisor
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B.A. Geology from St. Thomas University, 1969
M.S. Geology from Northern Illinois University, 1971

Mr. Rongitsch has been supervisor of the Ground Water Unit of the Division of Waters since 1988. Prior to that date he held several positions of increasing responsibility in the Division as a hydrogeologist and hydrogeologist supervisor. Before joining the staff of the Department of Natural Resources, Mr. Rongitsch worked for the Department of Transportation from 1971 to 1979 as a geologist.

- G) Jan Falteisek, Hydrogeologist, Supervisor
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Division of Waters
500 Lafayette Road
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(612) 297-3877

B.A. Mathematics from Southwest State University, 1974
M.A. Geology from University of Missouri, 1984.

Ms. Falteisek is currently on leave of absence from the Minnesota Pollution Control Agency where she was a project hydrogeologist for Superfund site cleanup projects for nearly six years. Prior to joining MPCA she was a hydrogeologist with the Missouri coal strip mine enforcement program. At the MDNR, Division of Waters she