

**Environment and Natural Resources Trust Fund  
2017 Request for Proposals (RFP)**

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**Project Title:**

**ENRTF ID: 001-A**

Minnesota Geological Survey Geologic Atlases for Water Management

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**Category:** A. Foundational Natural Resource Data and Information

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**Total Project Budget:** \$ 3,784,700

**Proposed Project Time Period for the Funding Requested:** 3 years, July 2017 - June 2020

**Summary:**

Continued acceleration of Part A Geologic Atlases to support water management. The atlas products describe the distribution of earth materials that define aquifers and control surface and groundwater movement.

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**Location**

**Region:** Statewide

**County Name:** Statewide

**City / Township:**

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**Alternate Text for Visual:**

map shows completed atlases, those underway, revisions, and future projects

_____ Funding Priorities	_____ Multiple Benefits	_____ Outcomes	_____ Knowledge Base
_____ Extent of Impact	_____ Innovation	_____ Scientific/Tech Basis	_____ Urgency
_____ Capacity Readiness	_____ Leverage	_____ TOTAL	_____ %



**Environment and Natural Resources Trust Fund (ENRTF)**

**2017 Main Proposal**

**Project Title:** *Minnesota Geological Survey Geologic Atlases for Water Management*

**PROJECT TITLE: Minnesota Geological Survey Geologic Atlases for Water Management**

**I. PROJECT STATEMENT**

Geologic atlases provide maps and databases essential for improved management of ground and surface water. This is foundational data that supports management of drinking water, domestic and industrial supply, irrigation, and aquatic habitat. County Geologic Atlases are specifically identified as essential data in the Statewide Conservation Plan, and in the efforts of the Environmental Quality Board, DNR Eco-Waters, and the Water Resources Center at the University of Minnesota to design a sustainable water management process. The distribution of geologic materials defines aquifer boundaries and the connection of aquifers to the land surface and to surface water resources to enable a comprehensive water management effort. This proposal will complete current projects and start new projects to equal about 9 complete atlases.

This project continues an effort to accelerate county geologic atlas coverage statewide. The first atlas was initiated in 1979. Funding from ENRTF in the early 1990s and from 2007 to the present has greatly accelerated production (see attached map). At this time 30 counties have a completed Part A atlas, 13 new atlases and 3 revisions are underway. Of the 41 counties without an atlas, 6 have committed to participation. Annual funding of \$1,750,000 (aggregate from all sources) would achieve statewide coverage in about 11 years.

A complete geologic atlas consists of Part A constructed by the Minnesota Geological Survey (MGS) and focused on geology and the County Well Index, and Part B constructed by the DNR Eco-Waters Division (funded separately) and focused on hydrology. Local participation is a primary factor in determining which counties are chosen for this work, while ground water sensitivity, water demand, and the size of the population served are also considerations. The counties are required to provide funds or in-kind service. A queue of counties that have committed to the program has formed, and these counties are working on their in-kind tasks.

Atlases enhance natural resource management and regulation, and facilitate wise use of water resources. They support: permitting, land use planning, wellhead protection, remediation, nutrient management, monitoring, modeling, and well construction. Atlas information is used by citizens, local government, counties, and state agencies (SWCDs, MDH, DNR, MPCA, Ag). The atlases document current water levels and quality so that changes in the water system can be recognized and evaluated. A User's Guide to geologic atlases strives to make the products accessible to users of all backgrounds.

**II. PROJECT ACTIVITIES AND OUTCOMES**

**Activity 1: Initiate about 5 new county geologic atlases; continue existing projects- equivalent of about 9 atlases total**      **Budget: \$3,679,700**

Atlases begin with compilation of a database of subsurface information including well records. The local project partner establishes accurate digital locations for these wells. Concurrently, geologists visit the project area to describe and sample landforms, and exposures of rock or sediment.

An initial assessment of the geologic data is then completed to focus additional data gathering including shallow and deep drilling programs and geophysical and geochemical surveys. Analysis of the data set is then completed and maps and associated databases are formalized and prepared for use in geographic information systems and distribution via DVD and web. Most of the products are also printed for use in the field, and by users who prefer this format. The number of counties we can map with these funds will be affected by the size, geologic complexity, and data availability of the counties that are chosen.



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**2017 Main Proposal**

**Project Title:** *Minnesota Geological Survey Geologic Atlases for Water Management*

<b>Outcome</b>	<b>Completion Date</b>
1. Create database of well construction records to support the mapping, to document water use in specific aquifers, and to help resolve well problems	June 30, 2020
2. Complete any unfinished ENRTF supported County Geologic Atlas projects in progress (ex; from 2015 appropriation).	June 30, 2020
3. Make progress on maps of bedrock geology, surficial geology, subsurface Quaternary geology, bedrock topography, and thickness of glacial deposits.	June 30, 2020

**Activity 2: Geochemical and geochronological analyses to define aquifers. Budget: \$105,000**

These techniques will enhance our ability to differentiate glacial deposits and connect the sands we see in drill holes into aquifer systems based on distinct chemical signatures. Adding a new technique for dating aquifer material will augment current techniques that only work on younger deposits and enhance our ability to recognize the sequence of geologic events and deposits and improve mapping.

<b>Outcome</b>	<b>Completion</b>
1. Geochemical/ geochronological data supporting mapping and aquifer delineation.	June 30, 2020
2. Ability to establish the age of aquifer material and map aquifer boundaries.	June 30, 2020

**III. PROJECT STRATEGY**

**A. Project Team/Partners**

- MGS team of as many as 20 staff members including database specialists, geologists, geophysicists, geographic information system specialists, and an editor.
- DNR team will follow and construct Part B of the atlas which addresses water levels, water chemistry, and sensitivity using separate funding.
- The local partner (county office) will establish accurate well locations, and identify specific project needs.
- We will apply to federal geologic mapping cost-share programs to leverage additional funds.

**B. Project Impact and Long-Term Strategy**

MGS is the geologic mapping agency of the state and is striving to provide comprehensive geologic mapping and associated databases at appropriate scales statewide as quickly as possible, primarily via the County Geologic Atlas Program. Atlases are complete or underway for 46 of the 87 counties in Minnesota. MGS atlas development is also supported by Clean Water Funds (\$305,000 from July 2010 to June 2013; and \$1,230,000 from July 1, 2013 to June 30, 2018). The attached chart of recent and future funding of the program illustrates how ENRTF and CWF appropriations have increased activity to a level of approximately \$1,750,000 per year. At this level of spending statewide coverage and updating of several existing atlases could be achieved in approximately 11 years.

**C. Timeline Requirements**

Work will be initiated in 2017 and continue for three years. Most atlases require 3 to 4 years to complete, so projects started in this proposal may not be finished and require additional funding. The funding level of this proposal is sized to continue the overall funding of atlases at the MGS to complete 5 counties per year, and covering the entire state by about 2027.

## 2017 Detailed Project Budget

**Project Title: Minnesota Geological Survey Geologic Atlases for Water Management**

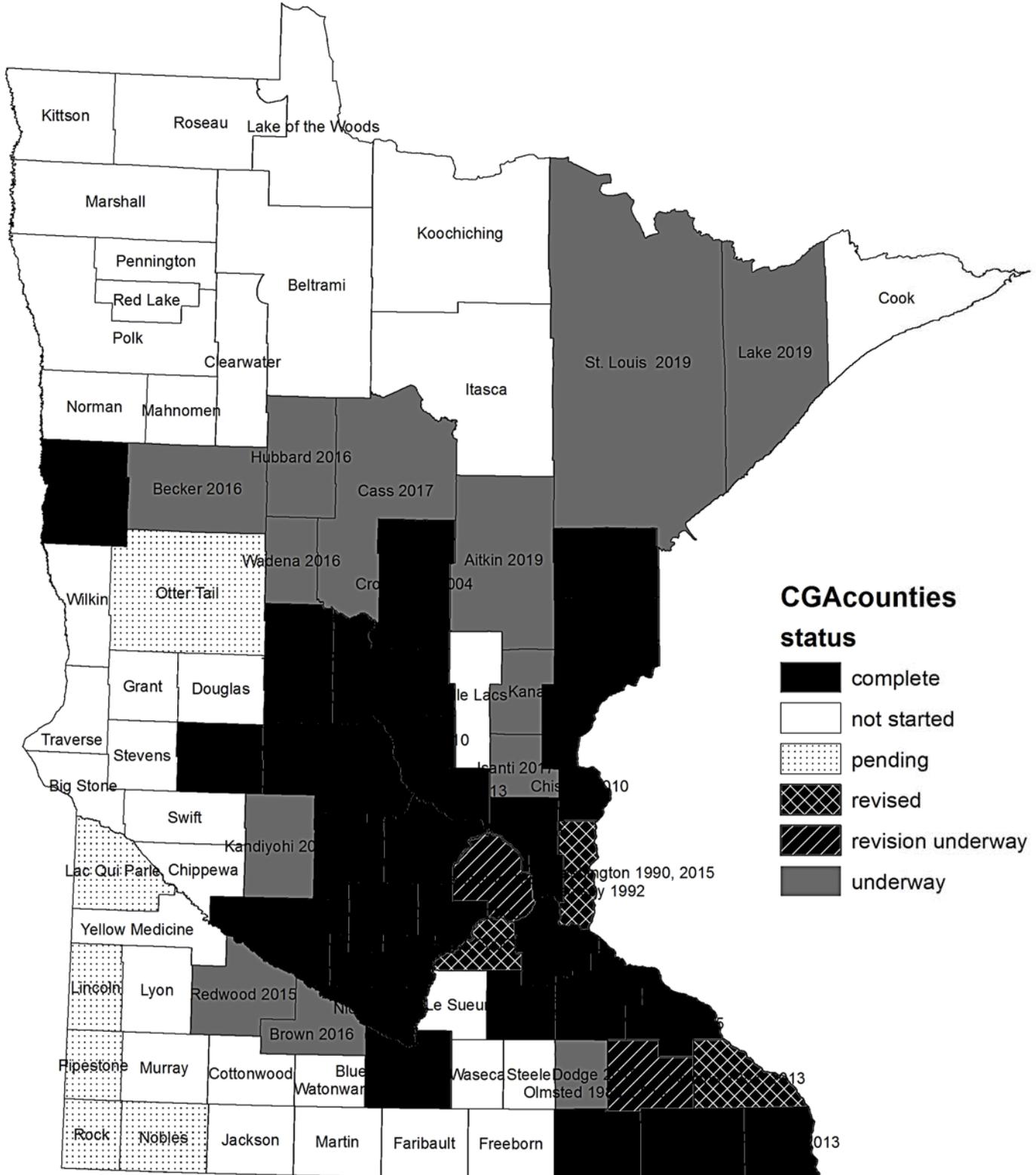
### IV. TOTAL ENRTF REQUEST BUDGET 3 years

<u>BUDGET ITEM</u>	<u>AMOUNT</u>
<b>Personnel:</b> Between 15 and 20 MGS staff (mostly geologists but also GIS, hydrogeologist, editor, database specialists, field assistants) will be assigned to work on geologic atlases on a part time basis; chosen based on the skill sets necessary for the geology of the selected counties. The total effort averages about 4 FTE per atlas or about 32 FTE for this proposal. The cost includes the University fringe benefits (27.4%).	\$ 2,671,200
<b>Professional/Technical/Service Contracts:</b> rotasonic test hole drilling (awarded by a competitive bidding process). Generally 3-6 holes per county, based on 10 counties. Rotasonic method yields 4" undisturbed core of unconsolidated deposits. Average hole cost is \$16,500 but varies with depth. Depth corresponds to depth of bedrock surface. Drilling costs are shared with support from our DNR contract (about one third).	\$ 550,000
<b>Professional/Technical/Service Contracts:</b> offset printing; awarded by competitive bid; typically 500 copies of each of 6 plates (each 3' by 3' and four color) per county, current prices about \$14,000 per county. Print run has been lowered as there are more online users.	\$ 140,000
<b>Professional/Technical/Service Contracts:</b> geochemical and geochronological analyses to support aquifer correlation and delineation; laboratories will be evaluated based on cost and capabilities in accordance with U of M purchasing rules. Contracts or bids as necessary. We anticipate about 1,875 geochem analyses (\$85,000) and 20 geochron analyses (\$20,000).	\$ 105,000
<b>Equipment/Tools/Supplies:</b> Field and lab expendables (batteries, sample bags, augers, Giddings Probe repair parts, maps, core boxes (\$71,000), distilled water)	\$ 85,000
<b>Travel:</b> vehicle rental and mileage (approx. \$245 to \$275 per week, \$0.17 to \$0.37 per mile); meals (up to \$46 per day); lodging (\$89 to \$142 per day). Amounts cannot be calculated until project locations (counties) are known. Rentals from U Fleet Services as needed, typically on weekly basis.	\$ 199,500
<b>Additional Budget Items:</b> Replacement of dedicated transport vehicle for borehole geophysical logging equipment. The equipment is permanently mounted in the vehicle. Borehole geophysics operations support atlases, but also Department of Health operations, DNR observation well program, and other uses.	\$ 34,000
<b>TOTAL ENVIRONMENT AND NATURAL RESOURCES TRUST FUND \$ REQUEST =</b>	<b>\$ 3,784,700</b>

### V. OTHER FUNDS

<u>SOURCE OF FUNDS</u>	<u>AMOUNT</u>	<u>Status</u>
<b>Other Non-State \$ To Be Applied To Project During Project Period:</b> MGS competes for federal cost-sharing of geologic mapping through the STATEMAP Program, the Great Lakes Geologic Mapping Coalition, and the USGS Data Preservation Program. Each requires a 1:1 match of federal dollars with non-federal dollars. MGS has used these programs to fund map elements of geologic atlases, or improvement of databases utilized in geologic atlas work. The figure provided represents pending proposals.	\$ 180,000	<i>pending</i>
<b>Other State \$ To Be Applied To Project During Project Period:</b> <i>MGS biennial contract with DNR</i>	\$ 285,000	<i>pending</i>
<b>Other State \$ To Be Applied To Project During Project Period:</b> remaining Clean Water Funds to 6/30/18	\$ 400,000	<i>secured</i>
<b>In-kind Services To Be Applied To Project During Project Period:</b> <i>each county participant is asked to establish accurate locations for wells with construction records; value varies with number of records and size of county; probably \$10,000 to \$50,000 cost savings to MGS</i>	\$ 225,000	<i>pending</i>
<b>Funding History:</b> ENRTF 2007-2015 \$5,202,199; Clean Water Funds 2010-2015 \$1,135,000; DNR contracts 2006-2015 \$2,525,694; Fed cost-share 2008-2015 \$864,291	\$ 9,727,184	<i>spent</i>
<b>Remaining \$ From Current ENRTF Appropriation:</b> <i>M.L. 2015 Chp. 76, Sec. 2, Subd. 03a \$2,040,000 (about \$1,500,000 will remain on 6/30/16); DNR contract \$570,000 over 2 years (\$200,000 will remain on 6/30/16).</i>	\$ 1,700,000	<i>unspent</i>

# County Geologic Atlas Part A Status, February 2016



## **MGS Geologic Atlases- Foundational Water Management Information**

Project Manager: Dale R. Setterholm

Qualifications:

### Education

MS in Management of Technology, Carlson School of Management  
University of Minnesota, Minneapolis, MN, 1999

Capstone Project: *A Project Management System for the  
Minnesota Geological Survey*

BS in Geology, Institute of Technology, University of Minnesota,  
Minneapolis, MN 1979

### Professional Experience

Geologist, Minnesota Geological Survey, 1979-2016  
Assistant to the Director, Minnesota Geological Survey 1997-2006  
Associate Director, Minnesota Geological Survey 2007-2016

Participate in strategic planning, budget development, program administration, project management, personnel administration, purchasing, facilities management, information systems planning, search and hiring procedures, contract development, grants administration, and client relations.

Geologic interests and experience include:

- building subsurface geologic databases and applying them to geologic mapping and water resource management.
- the relationship of geologic settings and ground water sensitivity.
- the influence of geologic settings on water levels and water quality in lake management.

Organization Description:

The Minnesota Geological Survey is the geologic mapping agency for the State of Minnesota, as directed by its enabling legislation. Its goal is to produce comprehensive geologic mapping and related databases statewide at a scale of 1:100,000 or more detailed. This mapping supports informed land use management and decision-making that protects and wisely allocates resources. The MGS is part of the N.H. Winchell School of Earth Sciences in the College of Science and Engineering at the University of Minnesota. It has existed since 1872 and has a current staff of approximately 32.