



Environment and Natural Resources Trust Fund

M.L. 2024 Approved Work Plan

General Information

ID Number: 2024-223

Staff Lead: Noah Fribley

Date this document submitted to LCCMR: June 5, 2024

Project Title: Geologic Atlases for Water Resource Management

Project Budget: \$1,236,000

Project Manager Information

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Project Reporting

Date Work Plan Approved by LCCMR: June 20, 2024

Reporting Schedule: June 1 / December 1 of each year.

Project Completion: June 30, 2027

Final Report Due Date: August 14, 2027

Legal Information

Legal Citation: M.L. 2024, Chp. 83, Sec. 2, Subd. 03w

Appropriation Language: \$1,236,000 the second year is from the trust fund to the Board of Regents of the University of Minnesota, Minnesota Geological Survey, to continue producing county geologic atlases to inform management of surface water and groundwater resources. This appropriation is to complete Part A, which focuses on the properties and distribution of earth materials to define aquifer boundaries and the connection of aquifers to the land surface and surface water resources.

Appropriation End Date: June 30, 2027

Narrative

Project Summary: Geologic atlases provide maps/databases essential for improved management of ground and surface water. This proposal will complete current projects and start new projects to equal about 4 complete atlases.

Describe the opportunity or problem your proposal seeks to address. Include any relevant background information.

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 4 complete atlases.

Atlases are complete or underway for 72 of the 87 counties in Minnesota with recent starts in Murray, Freeborn, Traverse, Stevens and Koochiching counties. This project continues an effort to complete county geologic atlas coverage statewide. The current spending rate of about \$2 million per year (all sources) would allow about 3 new starts each year—a plan in which we start the 87th county in 2029 and completing the entire state in this format in 2033.

What is your proposed solution to the problem or opportunity discussed above? Introduce us to the work you are seeking funding to do. You will be asked to expand on this proposed solution in Activities & Milestones.

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 groundwater. 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).

Atlases begin with compilation of a database of subsurface information including well records. The county 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, geochemical, and geochronologic 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.

What are the specific project outcomes as they relate to the public purpose of protection, conservation, preservation, and enhancement of the state's natural resources?

This proposal will complete current projects and start new projects to equal about 4 complete atlases. Specific outcomes are as follows:

1. Create database of well construction records to support the mapping, to document water use in specific aquifers, and to help resolve well problems
2. Complete any unfinished ENRTF supported County Geologic Atlas projects in progress (ex; from 2020/2021 appropriations)
3. Make progress on maps of bedrock geology, surficial geology, subsurface Quaternary geology, bedrock topography, and thickness of glacial deposits

Atlases support: permitting, land use planning, wellhead protection, remediation, nutrient management, monitoring, modeling, and well construction.

Project Location

What is the best scale for describing where your work will take place?

Statewide

What is the best scale to describe the area impacted by your work?

Statewide

When will the work impact occur?

In the Future

Activities and Milestones

Activity 1: Initiate about 2 new county geologic atlases; continue existing projects—equivalent of about 4 atlases total

Activity Budget: \$1,023,000

Activity Description:

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, geochemical, and geochronologic 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.

Activity Milestones:

Description	Approximate Completion Date
Conduct field work for counties in years 1 and 2 (surficial and bedrock) ~2 counties	June 30, 2027
Drill and log cores for counties in years 2 and 3 (subsurface and bedrock) ~2	June 30, 2027
Collect bedrock data (seismic, drill logs, etc) (topography, depth to bedrock) (~3 counties)	June 30, 2027
Compile and draft surficial, bedrock, topography and thickness maps (years 2-4)(~4 counties)	June 30, 2027
Compile, draw, and process cross sections and sand models (subsurface geology; Sand Distribution models)(~4)	June 30, 2027

Activity 2: Compile, edit and print atlas plates

Activity Budget: \$150,000

Activity Description:

In order to convey the meaning of the data we've collected, geologists must write text that describes the geologic framework of the county and why certain materials are important to map and identify. The associated text and figures help to add context to the map and associated data. Once all of the pieces for a particular plate are assembled (map, text, figures, data, etc.) they are submitted for internal and external review. Upon revision and acceptance, the pieces are edited and formatted to fit the page. Professional printing and posting the digital files are the final steps.

Activity Milestones:

Description	Approximate Completion Date
Draft text and figures for plates (~4 counties)	June 30, 2027
Submit materials for peer review, editing, and production (~4 counties)	June 30, 2027
Print final CGA plates and process files for DVD and digital posting (~4 counties)	June 30, 2027

Activity 3: Create database of well construction records and other data to support the mapping.

Activity Budget: \$38,000

Activity Description:

Geologists compile all of the data that has been gathered in a certain region in order to make the best map. Drilling records are by far the most numerous data available. Water-well records are required by the state and include a description of the materials that were drilled through. This information is vital to our geologists as they interpret and map the sediment and rock layers that may be buried and out of reach to sample. Well construction records are also used to interpret the depth to bedrock (and drift thickness) (plate 5 or 6), draw the cross sections that are used to create the Quaternary stratigraphy (plate 4) and sand distribution models (plate 5 or 6) of the County Geologic Atlases.

Activity Milestones:

Description	Approximate Completion Date
Description Mentor County staff to locate water wells (pre-MGS field work) (~2 counties)	June 30, 2027
Compile location data and collect subsurface data from other agencies; Enter stratigraphic interpretations (~3 counties)	June 30, 2027
Update water well (CWI) database and compile CGA database plate (~4 counties)	June 30, 2027

Activity 4: Construct statewide geochemistry database

Activity Budget: \$25,000

Activity Description:

Identification of the glacial sediment layers is a key step to correlating those layers from place to place. This is important because geologic contaminants may be associated with specific sediments. In an effort to mitigate the effect of these contaminants in drinking water a driller needs to know the provenance of the glacial sediment, and how thick is the unit. Geochemical analyses of the sediments will help correlate the aquifers and delineate their extent. Identifying glacial aquifers is done as part of the Quaternary Stratigraphy and sand model distribution (plates 4 and 5 of the County Geologic Atlas). This is an ongoing effort whereby we analyze samples from current drilling and compare with samples from other parts of the state.

Activity Milestones:

Description	Approximate Completion Date
Collect samples from new or existing drill cores for analyses (ongoing)	June 30, 2027
Compile and interpret results county by county stratigraphy (part of completed CGA)(~2 counties)	June 30, 2027
Compile and interpret regional/statewide stratigraphy (ongoing)	June 30, 2027

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
MN Counties	MN Counties	The counties are required to provide funds or in-kind service to help us build our database. Counties establish accurate well locations and identify specific project needs.	No
Vanessa Barrata	MN Dept. of Natural Resources- Ecological and Water Resources	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 groundwater--water levels, water chemistry, and sensitivity.	Yes

Dissemination

Describe your plans for dissemination, presentation, documentation, or sharing of data, results, samples, physical collections, and other products and how they will follow ENRTF Acknowledgement Requirements and Guidelines.

Every atlas is produced in portable document format (PDF), as geographic information system files (GIS), and in printed form. The digital files are available as a DVD, and are also available from the University of Minnesota Digital Conservancy, and via link from the MGS web page <https://cse.umn.edu/mgs/county-geologic-atlas>. Funding support by Environment and Natural Resources Trust Fund is acknowledged through use of the trust fund logo or attribution language on project print and electronic media, publications, signage, and other communications. Each project culminates with a meeting held in the project area to present the results to the county staff, and any other interested parties. At these meetings the products are described, access to the products is explained, and examples of applications of the products to common resource management situations are demonstrated. The printed copies are shared with the county, who in turn can distribute them to libraries, schools, townships, and other agencies. They are also distributed by the MGS map sales office. Products are also made available to earth science teachers and other educators for classroom exercises. Atlas products are also displayed and explained at educational events for agencies and organizations such as SWCD staff, sewage treatment system contractors, well drillers, and even hazmat responders. In addition, the MGS hosts an Open Data Portal on which many of our county geologic atlases are presented as “Story Maps” that allow for direct access of the data without any special software or interface. Representatives from MGS and DNR participated in various field trips, meetings, and strategic planning sessions highlighting aspects of the CGA program and discussing geology and groundwater issues.

Long-Term Implementation and Funding

Describe how the results will be implemented and how any ongoing effort will be funded. If not already addressed as part of the project, how will findings, results, and products developed be implemented after project completion? If additional work is needed, how will this work be funded?

Most atlases require 4-5 years to complete, so some projects started in this proposal may not be finished and will require additional funding. This funding level is sized to continue the overall funding of geologic atlases (Part A) that are currently underway while initiating about 2 new atlases for an equivalent of about 4 atlases total. At this pace, we estimate that we will complete statewide coverage by about 2032. Funds from this proposal may be applied, but are not limited to, the following counties: Swift, Lyon, Murray, Freeborn, Koochiching, Stevens, Traverse, Beltrami, Le Sueur, Itasca, Clearwater and Martin.

Other ENRTF Appropriations Awarded in the Last Six Years

Name	Appropriation	Amount Awarded
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County Geologic Atlases - Part A	M.L. 2015, Chp. 76, Sec. 2, Subd. 03a	\$2,040,000
County Geologic Atlases - Continuation	M.L. 2017, Chp. 96, Sec. 2, Subd. 03a	\$2,000,000
County Geologic Atlases - Part A	M.L. 2018, Chp. 214, Art. 4, Sec. 2, Subd. 03a	-
County Geologic Atlases - Part A, Mapping Geology	M.L. 2019, First Special Session, Chp. 4, Art. 2, Sec. 2, Subd. 03n	\$2,000,000
Geologic Atlases For Water Resource Management	M.L. 2021, First Special Session, Chp. 6, Art. 5, Sec. 2, Subd. 03a	\$2,000,000
Geologic Atlases for Water Resource Management	M.L. 2021, First Special Session, Chp. 6, Art. 6, Sec. 2, Subd. 03g	\$3,092,000

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount
Personnel								
16 Geologists		Create geologic maps; collect and interpret data, draw map, write text, draft figures , present results			32%	11.19		\$650,000
3 GIS/computer/web development specialists		Create GIS products leading to final print and digital versions of maps, cross sections and sand distribution models; finalize and archive GIS data; develop web accessible content			32%	1.92		\$111,000
2 field assistants		Assist geologists with collection and processing of geologic information in the laboratory, field and office			32%	0.63		\$37,000
3 Database specialists		Database development and support: database development for existing and new projects; train and supervise internal and external staff in well location; data collection of downhole geophysical data			32%	1.59		\$93,000
1 editor		Edit maps, text, and figures for publication; coordinates printing			32%	0.63		\$37,000
							Sub Total	\$928,000
Contracts and Services								
TBD	Professional or Technical Service Contract	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. Includes \$500 for sample shipping.				0		\$25,000
TBD	Professional or Technical Service Contract	Laboratory analyses not relating to geochemistry project outlined elsewhere; includes but not limited to thin sections, pollen counts, radiocarbon dates; laboratories will be evaluated based on cost and capabilities in accordance with U of M purchasing rules. Contracts or bids as necessary.				0		\$4,000
TBD	Professional or Technical	Rotary sonic test hole drilling (competitive bid). Generally 3-6 holes per county. Rotary sonic method yields 4" undisturbed core of				0		\$165,000

	Service Contract	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 DNR contract.						
							Sub Total	\$194,000
	Equipment, Tools, and Supplies							
	Tools and Supplies	Field and lab expendables (batteries, sample bags, distilled water); Giddings probe repairs and parts; maps, core boxes. None of these items will exceed \$5,000 per unit.	These items are needed to collect, process, and store samples					\$25,000
							Sub Total	\$25,000
	Capital Expenditures							
							Sub Total	-
	Acquisitions and Stewardship							
							Sub Total	-
	Travel In Minnesota							
	Miles/ Meals/ Lodging	Vehicle rental as needed (weekly and mileage); meals; lodging; amounts cannot be calculated until specific project locations are known	Geologists must travel to each county in order to collect samples, identify rocks and sediment, interpret landforms, drill and log core, and to train county staff. In order to be most efficient, geologists may spend several days to weeks in the field.					\$65,000
							Sub Total	\$65,000
	Travel Outside Minnesota							
							Sub Total	-
	Printing and Publication							
	Printing	Offset printing; awarded by price comparison; typically 300 copies of each of 6 plates (each 3' by	Map plates are best viewed on a printed page. Digital files are also					\$24,000

		3' and four color) per county, current prices about \$14,000 per county. Print run has been lowered as there are more online users.	made available (PDF, GIS, web browser)					
							Sub Total	\$24,000
Other Expenses								
							Sub Total	-
							Grand Total	\$1,236,000

Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request
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Non ENRTF Funds

Category	Specific Source	Use	Status	\$ Amount
State				
Cash	MN Department of Natural Resources Professional Services Contract Ad hoc: #3505 Sept. 2021-June 2023 This funding will be spent by the end of June 2023. We anticipate the contract will be renewed for an additional 2 years at a similar funding level.	The MGS will work on the following program elements and associated activities during the biennium: 1) Completion and printing of the Part A portion of current atlas projects. 2) Continuation of current and new CGAs. 3) Initiation of preliminary work on new county geologic atlases, if funds are available. 4) Scientific drilling to augment county geologic atlas projects. Funds may be distributed to any or all categories above with at least \$50,000 for item #4.:	Potential	\$400,000
Cash	Clean Water Funds (FY22 distribution): \$450,000 Clean Water Funds (FY23 distribution): \$450,000 Balance as of March 1,2023	Used to supplement other funding sources to complete County Geologic Atlases (Part A) for the entire state; funding to continue ongoing atlases and to start new atlas projects (including but not limited to database development, mapping, drilling, sample analyses, editing and production (print and digital files)	Secured	\$631,000
Cash	Clean Water Funds FY23 recommended: \$1,000,000	Clean Water Funds FY23 recommended: \$1,000,000 Continuation of CGA program	Pending	\$1,000,000
			State Sub Total	\$2,031,000
Non-State				
In-Kind	Individual counties; value varies with the number of records and the size of the county; estimated to be \$10,000 to \$50,000	Individual counties are required to establish accurate locations for water wells with construction records. This helps MGS build a database of geologic information that is vital to our mapping process.	Secured	\$25,000
Cash	USGS Statemap program USGS Great Lakes Geologic Mapping Coalition (estimate pending) \$85,000 Funds listed are for CGA related work and are estimated based on current request and prior awards.	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 is an estimate based on pending proposals.	Pending	\$85,000
			Non State Sub Total	\$110,000
			Funds Total	\$2,141,000

Attachments

Required Attachments

Visual Component

File: [5ac6eb90-308.pdf](#)

Alternate Text for Visual Component

Status map showing the counties for which CGA is complete (48) or underway (24) and not yet been started (15).

Funding graph showing 10-year spending history by sponsor. Estimate amount to complete the state (carry forward, pending, and proposed funding). Future funding is not specified by sponsor nor timeframe....

Supplemental Attachments

Capital Project Questionnaire, Budget Supplements, Support Letter, Photos, Media, Other

Title	File
University of Minnesota/SPA approval	c8cfba76-703.pdf

Difference between Proposal and Work Plan

Describe changes from Proposal to Work Plan Stage

Contact information was updated for the University's financial officer at SPA. Also, the DNR Part B contact has been updated. No other changes were made to the workplan.

Additional Acknowledgements and Conditions:

The following are acknowledgements and conditions beyond those already included in the above workplan:

Do you understand and acknowledge the ENRTF repayment requirements if the use of capital equipment changes?

N/A

Do you agree travel expenses must follow the "Commissioner's Plan" promulgated by the Commissioner of Management of Budget or, for University of Minnesota projects, the University of Minnesota plan?

Yes, I agree to the UMN Policy.

Does your project have potential for royalties, copyrights, patents, sale of products and assets, or revenue generation?

No

Do you understand and acknowledge IP and revenue-return and sharing requirements in 116P.10?

N/A

Do you wish to request reinvestment of any revenues into your project instead of returning revenue to the ENRTF?

N/A

Does your project include original, hypothesis-driven research?

No

Does the organization have a fiscal agent for this project?

Yes, Sponsored Projects Administration

Does your project include the pre-design, design, construction, or renovation of a building, trail, campground, or other fixed capital asset costing \$10,000 or more or large-scale stream or wetland restoration?

No

Do you propose using an appropriation from the Environment and Natural Resources Trust Fund to conduct a project that provides children's services (as defined in Minnesota Statutes section 299C.61 Subd.7 as "the provision of care, treatment, education, training, instruction, or recreation to children")?

No