

M.L 2019 Project Abstract

For the Period Ending June 30, 2022

PROJECT TITLE: County Geologic Atlases - Continuation

PROJECT MANAGER: Barbara Lusardi

AFFILIATION: Minnesota Geological Survey, University of Minnesota

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FUNDING SOURCE: Environment and Natural Resources Trust Fund

LEGAL CITATION: M.L. 2019, First Special Session, Chp. 4, Art. 2, Sec. 2, Subd. 03n

APPROPRIATION AMOUNT: \$2,000,000

AMOUNT SPENT: \$2,000,000

AMOUNT REMAINING: \$0

Sound bite of Project Outcomes and Results

County Geologic Atlases were completed in two counties and work continued in 17 counties. Based on the time spent, this is equivalent to “completing” about five atlases. Atlas maps and data provide foundational information that supports water management activities to the benefit of drinking water and aquatic habitat.

Overall Project Outcome and Results

A Geologic Atlas provides the geologic framework of our state. It describes the materials and features at the land surface and extends all the way down to the bedrock surface. An atlas provides information useful for resource management and land-use planning. Each Atlas typically requires more than 7,000 person-hours of work. Some of that work is in the field: drilling test borings, examining, sampling, and describing outcrops. Much of the work follows afterward: interpreting field measurements, recognizing and formally naming geologic units described in well records, and making maps. The result is a detailed account of the distribution and properties of the rock and sediment that lie below the land surface. These materials, and their ability to store or transmit water, determine where we can find water, and how we can protect and make wise use of that water. This includes our lakes and rivers as well as groundwater.

As part of this 2019 award, Rock and Nobles counties were completed. Over 8,000 well construction records, primarily located by County staff, were compiled into the database to support mapping, document water use in specific aquifers, and to help resolve well problems. Progress continued on mapping the bedrock and surficial geology, subsurface Quaternary stratigraphy, bedrock topography and glacial sediment thickness in 17 other counties. We’ve described hundreds of outcrops, taken thousands of hand samples, and drilled 13 continuous cores allowing us to sample rocks and sediment up to 300 feet deep.

Continuing under the M.L 2020 award, atlases for St. Louis, Aitkin, and Steele counties should be complete within the next three months. Lake, Ottertail and Lac Qui Parle counties should be finished within the next 12-18 months. Work on the remaining counties, Lincoln, Pipestone, Pennington, Cook, Yellow Medicine, Polk and Chippewa, will continue. The County Geologic Atlas program began in 1981 and continues with support of the Environment and Natural Resources Trust Fund as well as the Clean Water Fund, the Department of Natural Resources, and the U.S. Geological Survey. To date we have completed atlases for 46 counties, 29 are underway; and 16 have yet to be started. All of our mapping products and data are available in print or digital formats.

Project Results Use and Dissemination

Completed atlas products have been posted to the MGS website and linked to the University’s Digital Conservancy as noted above. PDF products as well as all of the related GIS data are available on these pages. 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.



Environment and Natural Resources Trust Fund (ENRTF) M.L. 2019 ENRTF Work Plan (Final Report)

Today's Date: June 1, 2022

Date of Next Status Update Report: June 1, 2022

Date of Work Plan Approval: June 5, 2019

Project Completion Date: June 30, 2022

Does this submission include an amendment request? NO

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

Project Manager: Barbara A. Lusardi

Organization: Minnesota Geological Survey

College/Department/Division: University of Minnesota/College of Science and Engineering

Mailing Address: 2609 Territorial Road

City/State/Zip Code: St. Paul, MN 55114

Telephone Number: 612-626-5119

Email Address: luser001@umn.edu

Web Address: <https://cse.umn.edu/mgs>

Location: Statewide

Total Project Budget: \$2,000,000

Amount Spent: \$2,000,000

Balance: \$0

Legal Citation: M.L. 2019, First Special Session, Chp. 4, Art. 2, Sec. 2, Subd. 03n

Appropriation Language: \$2,000,000 the first 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.

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 5 complete atlases.

This project continues an effort to accelerate county geologic atlas coverage statewide. The current spending rate of about \$2 million per year (all sources) would allow about 5 or 6 new starts each year. 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 in-kind service. The MGS grant for 2018 will likely initiate projects in the counties classified as pending on the status map. Funds from this proposal are most likely to be applied to projects in southwest, west-central, and northwestern Minnesota. Based on the factors listed above, potential counties include, but are not limited to:

- | | | |
|------------------|----------|-----------|
| •Swift | •Grant | •Itasca |
| •Chippewa | •Douglas | •Beltrami |
| •Yellow Medicine | •Stevens | •LeSueur |

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. 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. OVERALL PROJECT STATUS UPDATES:

First Update December 26, 2019

We are in the process of transitioning to this grant from the 2018 award (money that remains on 2018 award is earmarked for professional services contracts for drilling and geochemical analyses). Under the 2019 grant, work continues on pre-existing projects in St. Louis, Lake, Aitkin, Rock, Nobles, Steele, Pennington, Lac Qui Parle, Otter Tail, Lincoln, Pipestone, Yellow Medicine and Cook counties and on new projects that were initiated this summer in Chippewa and Polk counties. Work continues in Dodge, Olmsted, Dakota and Red Lake counties on non-ENRTF funding. New atlas starts on non-ENRTF funding include Douglas, Grant, Faribault, Waseca, and Lake of the Woods. We expect to print the Dodge and Olmsted atlases in the period ahead. Rock and Nobles counties should be printed within the next 6 months. In St. Louis and Lake counties we have open-filed completed subproject products so that they can be used immediately. The bedrock map for Lake County is being compiled and completed this year with federal cost-sharing. Glacial mapping in these counties is nearly complete. A rotary sonic drilling program is underway in Pennington, Otter Tail, Lac Qui Parle and Dakota counties. Drilling generally marks the culmination of field operations and a shift from geology at the land surface to subsurface elements. This marks about two-thirds completion of an atlas. Work on the subsurface

elements is currently underway in Steele and Aitkin counties. Field work will continue next spring in Lincoln, Pipestone, Yellow Medicine, Cook, Chippewa, Polk, and Red Lake counties. In the new project areas—Douglas, Grant, Faribault, Waseca and Lake of the Woods counties—the focus is on the water well database.

Amendment Request of 03/05/2020:

We have really just started spending on this award and have about 75% of the funds remaining. Thus, most of the categories are well within their original estimates and require no adjustments. I am submitting this amendment request in order to account for two weeks of travel during which our staff stayed in Grand Forks, North Dakota.

It has just come to my attention that LCCMR funds should not be used for out of state travel expenses. This has never been a problem for us before, but with our current work in northwestern Minnesota, we have been able to make use of the core library in Grand Forks, North Dakota to store and log our cores. This is a tremendous cost and safety benefit as it reduces the need for our staff drive back and forth between distant field sites and our offices in St. Paul. The core can be dropped off generally within an hour of the drill site instead of driving 6 hours (one way) to bring it here. The core library, part of the North Dakota Geological Survey, has graciously allowed for us to log the cores at their facility as well. This provides a wonderful avenue for collaboration between our state surveys. If the folks at the North Dakota Geological Survey and the Core Library continue to allow us access to their facility, I anticipate that we could benefit from this arrangement for several years to come as we start atlases in more counties in that part of the state.

Unknowingly, our staff members stayed on the North Dakota side of the border while working at the core library. While this is the safest and most efficient course of action for our staff, I will request that they stay in East Grand Forks, Minnesota in the future.

We therefore request that \$1348 in Minnesota travel expenses be reallocated to cover the expenses incurred out of state (see budget spreadsheet for updates as well).

Amendment Approved by LCCMR 3/12/2020

Second Update June 30, 2020

Both Dodge and Olmsted counties (LCCMR 15 as well as Clean Water and DNR funding) are printed and complete. Rock and Nobles counties are in editing and should be ready for printing within the next 3 months or so. Work continues on St. Louis, Lake, Steele and Aitkin counties. All field work for these counties is complete. We continue to process and interpret data as well as draw maps and cross sections. Elements of these atlases require at least another year of effort before they will be ready for editing and production. Rotary sonic drilling in Pennington, Lac Qui Parle, Otter Tail, and Dakota counties is complete and analysis of the cores is underway (description, sampling, analyses for texture and grain counts). Geochemistry of till samples is now a regular part of our analysis. Once the samples from these cores have been interpreted, we will select samples for geochemical analyses. Work in Lincoln, Pipestone, Yellow Medicine, Cook, Chippewa, Polk, and Red Lake counties is in various stages of completion. We hope to do rotary sonic drilling in several counties this fall. Depending on the available budget these counties may include: Lincoln, Pipestone, Yellow Medicine, Chippewa, Polk and Red Lake. New counties that are just getting underway include Douglas, Grant, Faribault, Waseca, and Lake of the Woods. Well locating is underway in these counties. Field work is slowing getting started as much as COVID travel and distancing guidelines permit.

Third Update December 31, 2020

And so continues the strangest year on record. Because of the nature of our work, the University allowed us early access to our building and laboratory, and we have been allowed to conduct limited field work under strict Covid protocols. This has enabled us to make progress on all of our active projects, albeit not as much progress as we might have made with all things being normal.

Rock County has been printed. Nobles is awaiting final approval and should be off to the printers within the next week or so. St. Louis and Lake Counties have been mapped in sections over the last several years. We are now in the process of compiling the various pieces into final atlas products. I anticipate that work will be completed later this year. Aitkin and Steele Counties are also nearing completion. The final products are underway. There are still several steps that need to happen before publication. I hope to see these counties finished and printed within the next 6-9 months. Drilling in Dakota, Otter Tail, Lac Qui Parle and Pennington counties was completed last year. The cores have been logged and sampled. Interpretation of those data is underway. Cross sections are either already underway or ready to start. These elements may take at least another year of effort before they are ready for editing and production. Drilling in Lincoln, Pipestone, Chippewa and Yellow Medicine counties is currently underway. Due to budget constraints, drilling in Polk and Red Lake counties will not commence until next fall. Work has basically just gotten started in Douglas, Grant, Faribault, Waseca and Lake of the Woods counties. With the unusual field season this past year, we got off to a slower start in these new map areas.

Future updates may be included under Activity 1—LCCMR 2/19/21

Final Report between project end (June 30) and August 15, 2022

Overall Project Outcome and Results

A Geologic Atlas provides the geologic framework of our state. It describes the materials and features at the land surface and extends all the way down to the bedrock surface. An atlas provides information useful for resource management and land-use planning. Each Atlas typically requires more than 7,000 person-hours of work. Some of that work is in the field: drilling test borings, examining, sampling, and describing outcrops. Much of the work follows after: interpreting field measurements, recognizing and formally naming geologic units described in well records, and making maps. The result is a detailed account of the distribution and properties of the rock and sediment that lie below the land surface. These materials, and their ability to store or transmit water, determine where we can find water, and how we can protect and make wise use of that water. This includes our lakes and rivers as well as groundwater.

As part of this 2019 award, Rock and Nobles counties were completed. Over 8,000 well construction records, primarily located by County staff, were compiled into the database to support mapping, document water use in specific aquifers, and to help resolve well problems. Progress continued on mapping the bedrock and surficial geology, subsurface Quaternary stratigraphy, bedrock topography and glacial sediment thickness in 17 other counties. We've described hundreds of outcrops, taken thousands of hand samples, and drilled 13 continuous cores allowing us to sample rocks and sediment up to 300 ft deep.

Continuing under the M.L 2020 award, atlases for St. Louis, Aitkin, and Steele counties should be complete within the next 3 months. Lake, Ottertail and Lac Qui Parle counties should be finished within the next 12-18 months. Work on the remaining counties, Lincoln, Pipestone, Pennington, Cook, Yellow Medicine, Polk and Chippewa, will continue. The County Geologic Atlas program began in 1981 and continues with support of the Environment and Natural Resources Trust Fund as well as the Clean Water Fund, the Department of Natural Resources, and the U.S. Geological Survey. To date we have completed atlases for 46 counties, 29 are underway; and 16 have yet to be started. All of our mapping products and data are available in print or digital formats.

III. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1: Initiate about 2 new county geologic atlases; continue existing projects—equivalent of about 5 atlases total

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 1 ENRTF BUDGET: \$2,000,000

Outcome	Completion Date
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, 2022
2. Complete unfinished ENRTF supported County Geologic Atlas projects in progress (ex; from 2018 appropriation)	June 30, 2022
3. Make progress on maps of bedrock geology, surficial geology, subsurface Quaternary geology, bedrock topography, and thickness of glacial deposits.	June 30, 2022

First Update December 26, 2019

Dodge County is at the printers. Olmsted County is in final production and should be ready to print within the next 3 months. Rock and Nobles counties are in editing and should be ready for printing within the next 6 months or so. Work continues on St. Louis, Lake, Steele and Aitkin counties. All field work is complete. We are currently processing and interpreting data as well as drawing maps and cross sections. Elements of these atlases require at least another year of effort before they will be ready for editing and production. Rotary sonic drilling in Pennington, Lac Qui Parle, Otter Tail, and Dakota counties started this fall and will be complete early next year. Work in Lincoln, Pipestone, Yellow Medicine, Cook, Chippewa, Polk, and Red Lake counties is in various stages of completion. Lincoln and Pipestone are further along while other counties have just finished their first field season. New counties that have just signed on for an atlas include Douglas, Grant, Faribault, Waseca, and Lake of the Woods.

Summary Budget Information for Activity 1:

ENRTF Budget: \$ 2,000,000

Amount Spent: \$ 241,909

Balance: \$ 1,758,091

Second Update June 30, 2020

Both Dodge and Olmsted counties are printed and complete. Rock and Nobles counties are in editing and should be ready for printing within the next 3 months or so. Work continues on St. Louis, Lake, Steele and Aitkin counties. All field work is complete. We continue to process and interpret data as well as draw maps and cross sections. Elements of these atlases require at least another year of effort before they will be ready for editing and production. Rotary sonic drilling in Pennington, Lac Qui Parle, Otter Tail, and Dakota counties is complete and analysis of the cores is underway (description, sampling, analyses for texture and grain counts).

Geochemistry of till samples is now a regular part of our analysis. Once the samples from these cores have been interpreted, we will select samples for geochemical analyses. Work in Lincoln, Pipestone, Yellow Medicine, Cook, Chippewa, Polk, and Red Lake counties is in various stages of completion. We hope to do rotary sonic drilling in several counties this fall. Depending on the available budget these counties may include: Lincoln, Pipestone, Yellow Medicine, Chippewa, Polk and Red Lake. New counties that are just getting underway include Douglas, Grant, Faribault, Waseca, and Lake of the Woods. Well locating is underway in these counties. Field

work is slowing getting started as much as COVID travel and distancing guidelines permit. New counties that have recently signed on for an atlas include Ramsey, Swift, Lyon and Scott. Water well locating has begun in these counties and mapping field work will begin sometime next year.

Summary Budget Information for Activity 1:

ENRTF Budget: \$ 2,000,000
Amount Spent: \$ 849,581
Balance: \$ 1,150,419

Third Update December 31, 2020

Rock County has been printed. Nobles is awaiting final approval and should be off to the printers within the next week or so. St. Louis and Lake Counties have been mapped in sections over the last several years. We are now in the process of compiling the various pieces into final atlas products. I anticipate that work will be completed later this year. Aitkin and Steele Counties are also nearing completion. The final products are underway. There are still several steps that need to happen before publication. I hope to see these counties finished and printed within the next 6-9 months. Drilling in Dakota, Otter Tail, Lac Qui Parle and Pennington counties was completed last year. The cores have been logged and sampled. Interpretation of those data is underway. Cross sections are either already underway or ready to start. These elements may take at least another year of effort before they are ready for editing and production. Drilling in Lincoln, Pipestone, Chippewa and Yellow Medicine counties is currently underway. Due to budget constraints, drilling in Polk and Red Lake counties will not commence until next fall. Work has basically just gotten started in Douglas, Grant, Faribault, Waseca and Lake of the Woods counties. With the unusual field season this past year, we got off to a slower start in these new map areas.

ENRTF Budget: \$ 2,000,000

Summary Budget Information for Activity 1:

Amount Spent: \$ 1,350,747
Balance: \$ 649,253

Fourth Update June 30, 2021

Nobles County (*DNR and ENRTF funding) has been printed. St. Louis and Lake Counties (ENRTF, Clean Water Fund, DNR, and USGS funding) as well as Aitkin and Steele Counties (ENRTF and DNR) are nearing completion. The final products are underway. There are still several steps that need to happen before publication. I hope to see these counties finished and printed within the next 2-4 months. Drilling in Lincoln (ENRTF, DNR, and USGS), Pipestone (ENRTF, DNR, and USGS), Chippewa (ENRTF, DNR and USGS) and Yellow Medicine (ENRTF, DNR and USGS) counties was completed last year. The cores have been logged and sampled. Interpretation of those samples is underway. Cross sections may be already underway or ready to start in the near future. These elements may take at least another year of effort before they are ready for editing and production. Drilling in Red Lake (CWF, DNR), Polk (ENRTF, CWF, DNR), Grant (DNR), Douglas (DNR), and possibly other counties will commence this fall. With the covid restrictions limiting our work last field season, work has basically just gotten started in Douglas, Grant, Faribault (DNR), Waseca (DNR) and Lake of the Woods (CWF and DNR) counties. In addition, there are new starts in Ramsey, Swift, Lyon, and Scott counties. As our funding for the next fiscal year has yet to be approved by the legislature, it is uncertain which of these counties will be funded by ENRTF money. **MGS work on Part A of the CGA last at least 4 years. In order to maintain the continuity of our work, a single county may be funded by multiple ENRTF awards as one award ends and another begins. As a budget cycle winds down, a county may be shifted to another funding source all together. Finally, we try to leverage our state funding with federal funding wherever possible. US Geological Survey (USGS) programs require cost-sharing and help to stretch our state funding. We keep track of all of the sources of funding for any given project and credit is given to all sponsors in our final products. As requested by LCCMR staff, I have indicated the funding sources of the active projects listed here.*

Over the past year and with an emphasis on social justice, equity, and inclusion, MGS has revisited our interactions with citizens as well as state, county and tribal representatives. While we have had many positive

interactions with tribal nations throughout the state, events over the past year have opened our eyes to the fact that our efforts may not be welcome everywhere. We are currently investigating ways that we can better communicate who we are and what we do in case there is some misunderstanding of our intent or actions. We only wish to provide quality geologic information for everyone. We will, of course, abide by the wishes of tribal communities within the counties where we are working. Currently, the Lake Superior Band of Chippewa will not grant us access to tribal lands near Grand Portage in Cook County. Tribal lands in this county will be unmapped on our atlas products.

Summary Budget Information for Activity 1:

ENRTF Budget: \$ 2,000,000

Amount Spent: \$ 1,780,745

Balance: \$ 219,255

Amendment Request of 12/06/2021:

As we are nearing the end of this award, I have already shifted effort and expenses for most of the active counties to our new awards. At this time, only four counties (St. Louis, Lake, Aitkin, and Steele) are being supported on the balance that remains. It has become clear that the effort required to complete the final plates (including review, editing, and producing the data DVD) will likely use up the last of these funds. Printing costs for these atlases (estimated at \$15,000 each) will have to come from one of our more recent awards.

All of our County Atlas mapping projects extend beyond the life of any one ENRTF award and include so many variables. Thus, it is difficult to estimate a budget that actually comes close to reality. I have tried to use previous awards as examples and still I end up needing to shift things in the end. I appreciate the ability to request changes as we see how things shake down in these final months.

In this case, it would appear that we have already overspent our allocation for Wages and Benefits. We came pretty close to estimates for drilling, geochemistry, and travel. I, therefore, would like to request that the remaining balance in all of the budget categories be reallocated to cover the personnel expenses needed to finish these four counties to publication. The actual printing of these map plates will be covered elsewhere.

We are therefore requesting to transfer \$97,188 to Personnel from the below budget line items, which will reduce the balance of each of the following lines to \$0:

- \$27,941 from contracts/rotary sonic drilling
- \$777 from contracts/geochemical and geochronological analyses
- \$13,662 from equipment/tools/supplies
- \$45,532 from printing
- \$9,276 from travel expenses in Minnesota

Summary Budget Information for Activity 1:

ENRTF Budget: \$ 2,000,000

Amount Spent: \$ 1,977,293

Balance: \$ 22,707

Amendment approved by LCCMR 12/13/2021

Fifth Update December 20, 2021

St. Louis and Lake Counties (ENRTF, Clean Water Fund, DNR, and USGS funding) as well as Aitkin and Steele Counties (ENRTF and DNR) are nearing completion. The final map plates are in editing and production. While I had hoped to see these counties finished and printed by now, it's difficult to put a timetable to this type of work. These are the last active projects still funded by this particular award. I anticipate we will spend down the remaining funds on final review and edits. Printing costs will have to be transferred to one of the new awards as indicated in the amendment request above.

Using new ENRTF awards through the LCCMR, work continues of several counties as indicated below. Interpretation of core samples from drilling in Lincoln (ENRTF, DNR, and USGS), Pipestone (ENRTF, DNR, and USGS), Chippewa (ENRTF, DNR and USGS) and Yellow Medicine (ENRTF, DNR and USGS) counties should be nearly complete. These data are important for modeling the lithostratigraphy and drawing cross sections of the subsurface glacial units. These elements may take at least another year of effort before they are ready for editing and production. Drilling in Red Lake (CWF, DNR), Polk (ENRTF, CWF, DNR), Grant (DNR), Douglas (DNR), and Scott (ENRTF) counties just got underway. A good season of fieldwork was completed in Douglas, Grant, Faribault (DNR), Waseca (DNR) and Lake of the Woods (CWF and DNR) counties. In addition, there are new starts in Ramsey, Swift, Lyon, and Scott counties.

Summary Budget Information for Activity 1:

ENRTF Budget: \$ 2,000,000

Amount Spent: \$1,978,937

Balance: \$ 21,063

Final Report June 1, 2022

As part of this 2019 award, we completed Rock and Nobles counties, and continued working in 17 other counties. Based on the time spent, this is equivalent to "completing" about 5 atlases. St. Louis, Aitkin, and Steele counties are almost ready to print. The final costs for printing these atlases will be on a subsequent award.

As of the Fall 2021, work on the remaining counties has been transferred to the M.L 2020 award. Lake, Ottertail and Lac Qui Parle counties should be finished within the next 12-18 months. Work on the remaining counties, Lincoln, Pipestone, Pennington, Cook, Yellow Medicine, Polk and Chippewa, will continue.

MGS has continued to communicate with Tribal representatives about our mapping programs. Currently, four tribes wish to have their land excluded from MGS geologic mapping, because they do not want maps of their natural resources available to the public. Tribal lands in these counties will be unmapped on our atlas products. Five Tribes have agreed to be included on our geologic maps.

IV. DISSEMINATION:

Description:

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 http://www.mnms.um.edu/county_atlas/countyatlas.htm. 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 products of subprojects in St. Louis and Lake Counties are being released in digital form immediately following technical review. When all the subproject areas are complete county-wide compilations will be created and distributed digitally and in print. 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 SWCD staff and onsite sewage treatment system contractors.

The Minnesota Environment and Natural Resources Trust Fund (ENRTF) will be acknowledged through use of the trust fund logo or attribution language on project print and electronic media, publications, signage, and other communications per the [ENRTF Acknowledgement Guidelines](#)

First Update December 26, 2019

No new atlases have been completed as yet. Dodge County is soon to be printed, and Olmsted County should follow not too far behind. Once completed, we will work with county officials to schedule delivery and a public presentation of the atlas products.

Second Update June 30, 2020

The Olmsted County atlas was published in April 2020.

Olmsted, C-49 (2020) < <https://conservancy.umn.edu/handle/11299/212007>>

Components of the St. Louis and Lake atlas products are being open-filed as they are completed for immediate use. When all components are complete they will be compiled and printed as atlas packages for each county. Recent updates to the open –file page include: <https://conservancy.umn.edu/handle/11299/183258>

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.

Dodge County Story Map < <https://storymaps.arcgis.com/stories/b9d876a3ae4bda9be245283b5c878c>>

Olmsted County Story Map < <https://storymaps.arcgis.com/stories/511dbfd7a5ce406b8b68bf635b23f81b>>

Representatives from MGS and DNR met with representatives of Ramsey, Swift, and Scott counties to discuss the CGA program. All have agreed to move forward with an atlas.

Third Update December 31, 2020

The Rock County Geologic Atlas was published at the end of November 2020. The digital files are being compiled and packaged to post on the MGS website and the University digital conservancy (<https://conservancy.umn.edu/handle/11299/57196>).

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. Rock County will eventually be added to this portal as well.

Nobles County Geologic Atlas is ready for publication and should be sent to the printers within the next couple of weeks. Posting of the digital files will follow on a similar schedule as outlined above.

Fourth Update June 30, 2021

The Nobles County Geologic Atlas was published in January 2021. The digital files are available to view and download on the MGS website and the University digital conservancy (<https://conservancy.umn.edu/handle/11299/219159>).

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. Nobles County may eventually be added to this portal.

St. Louis, Lake, Aitkin and Steele counties are in production and should be ready for publication within the next several weeks. Posting of the digital files will follow on a similar schedule as outlined above.

Fifth Update December 20, 2021

Unfortunately, I spotted an error in my update above. Instead of weeks to complete the St. Louis, Lake, Aitkin and Steele counties, I should have said several *months*. It's difficult to predict how long the final processing will take. These CGA's are nearing completion. Posting of the digital files will follow on a similar schedule as outlined above.

Final Report June 1, 2022

No additional dissemination of products has been done since Rock and Nobles were printed. Due to covid, we have not yet been able to schedule a workshop for these counties.

Project Results Use and Dissemination

Completed atlas products have been posted to the MGS website and linked to the University's Digital Conservancy as noted above. PDF products as well as all of the related GIS data are available on these pages.

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.

V. ADDITIONAL BUDGET INFORMATION:

A. Personnel and Capital Expenditures

Explanation of Capital Expenditures Greater Than \$5,000: N/A

Explanation of Use of Classified Staff: N/A

Total Number of Full-time Equivalents (FTE) Directly Funded with this ENRTF Appropriation:

Enter Total Estimated Personnel Hours for entire duration of project: 37440	Divide total personnel hours by 2,080 hours in 1 yr = = TOTAL FTE: 18
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Total Number of Full-time Equivalents (FTE) Estimated to Be Funded through Contracts with this ENRTF Appropriation:

Enter Total Estimated Contract Personnel Hours for entire duration of project: <i>Not possible to calculate; cost by foot, printed sheet, or analysis</i>	Divide total contract hours by 2,080 hours in 1 yr = TOTAL FTE:
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VI. PROJECT PARTNERS:

- MGS team of as many as 20 staff members including database specialists, geologists, geophysicists, geographic information system specialists, and an editor.
- We will apply to federal geologic mapping cost-share programs to leverage additional funds (current estimate \$169,000 pending)

A. Partners outside of project manager's organization receiving ENRTF funding

Name	Role
MN DNR	Will follow and construct Part B of the atlas which addresses water levels, water chemistry, and sensitivity (using separate funding)

B. Partners outside of project manager's organization NOT receiving ENRTF funding

Name		Role
County office		Will establish accurate well locations and identify specific project needs

VII. LONG-TERM- IMPLEMENTATION AND FUNDING:

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 52 of the 87 counties in Minnesota. The completed atlases are used by townships, counties, state agencies, researchers, consultants, industries, and even homeowners. They support the activities and programs responsible for managing Minnesota resources in a sustainable manner. The attached chart of recent and future funding of the program illustrates how ENRTF appropriations have increased activity to a level of approximately \$2,000,000 per year. At this level of spending statewide coverage could be achieved in approximately 7 years.

VIII. REPORTING REQUIREMENTS:

- Project status update reports will be submitted December 31 and June 30 each year of the project
- A final report and associated products will be submitted between June 30 and August 15, 2022

IX. SEE ADDITIONAL WORK PLAN COMPONENTS:

A. Budget Spreadsheet

B. Visual Component or Map

Attachment A:
Environment and Natural Resources Trust Fund
M.L. 2019 Final Budget Spreadsheet
Legal Citation: M.L. 2019, First Special Session, Chp. 4, Art. 2, Sec. 2, Subd. 03n
Project Manager: Barbara A. Lusardi
Project Title: Minnesota Geological Survey Geologic Atlases for Water Resource Management
Organization: Minnesota Geological Survey/University of Minnesota
Project Budget: \$2,000,000
Project Length and Completion Date: 3 years, June 20, 2022
Today's Date: June 1, 2022



ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Budget (12/06/21)	Amount Spent	Final Balance
BUDGET ITEM			
Personnel (Wages and Benefits)			
The total effort averages about 4 FTE per atlas or about 18 FTE for this proposal. The cost includes the University fringe benefits (27.2% to 33.5%; different rates for different employee classifications). No overhead is charged. 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.	\$ 1,572,188	\$ 1,572,188	\$ -
Professional/Technical/Service Contracts			
Rotary sonic test hole drilling (awarded by a competitive bidding process). Generally 3-6 holes per county (estimated at \$80,000 per county), based on 4.5 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 \$200,000).	\$ 224,059	\$ 224,059	\$ -
Professional/Technical/Service Contracts			
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 800 geochemical analyses @ \$45 each (\$36,000) and 9 geochronological analyses @\$1,000 each (\$9,000).	\$ 44,223	\$ 44,223	\$ -
Equipment/Tools/Supplies			
Field and lab expendables (batteries, sample bags, replacement augers as needed (\$305 each), Giddings Probe repair parts, maps, core boxes (\$7.75 each, about 950 boxes per county, \$7,362 per county, \$29,450 total, core to Hibbing repository), distilled water)	\$ 37,338	\$ 37,338	\$ -
Printing			
Offset printing; awarded by price comparison; 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.	\$ 24,468	\$ 24,468	\$ -
Travel expenses in Minnesota			
Vehicle rental from U Fleet Services as needed, typically on weekly basis, and mileage (approx. \$245 sedan rental, \$0.17 per miles, \$275 per week truck, \$0.37 per mile); meals (up to \$46 per day); lodging as per University regulations. Amounts cannot be calculated until project locations (counties, distances) are known.	\$ 96,376	\$ 96,376	\$ -
Travel expenses out of state (North Dakota) (NEW)			
Travel: meals (up to \$46 per day); lodging as per University regulations in Grand Forks, North Dakota (only for work in NW counties from now on we'll stay in East Grand Forks, MN)	\$ 1,348	\$ 1,348	\$ -
COLUMN TOTAL	\$ 2,000,000	\$ 2,000,000	\$ -

OTHER FUNDS CONTRIBUTED TO THE PROJECT	Status (secured or pending)	Budget	Spent	Final Balance
Non-State: Project Period: 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.	secured	\$ 183,203	\$ 183,203	\$ -
State: DNR Eco-Waters est. \$550,000 for 2019-2021. reduced	secured	\$ 350,000	\$ 350,000	\$ -
State: Clean Water Funds est. \$1,000,000 for 2019-2021	secured	\$ 500,000	\$ 500,000	\$ -
In kind: 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	secured	\$ -	\$ -	\$ -

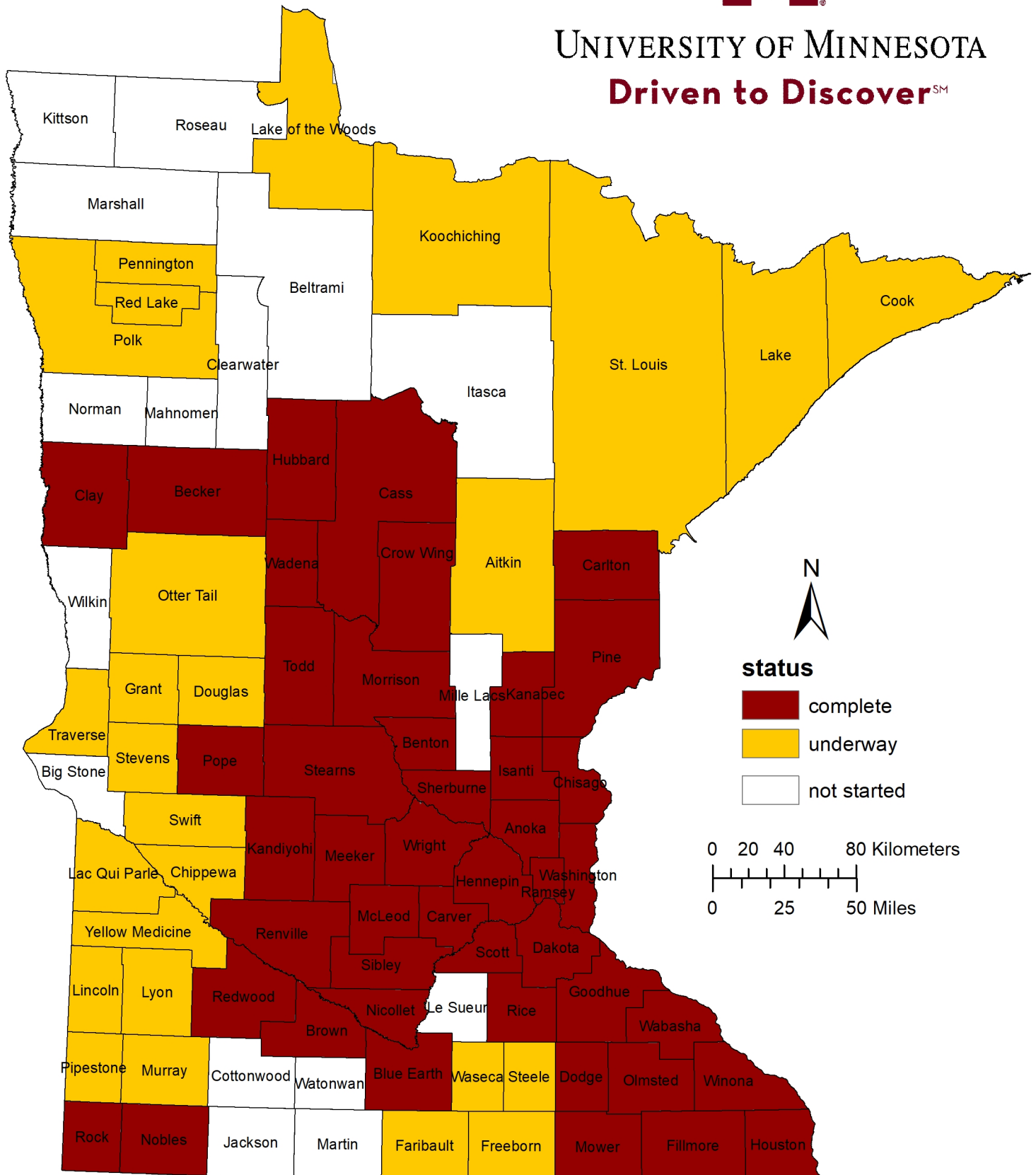
PAST AND CURRENT ENRTF APPROPRIATIONS	Amount legally obligated but not yet spent	Budget	Spent	Final Balance
Current appropriation:				
ML 2018, Ch.214, Art.4, Sed 2,subd 03a		\$ 1,240,000	\$ 1,240,000	\$ -
Past appropriations:				
ML 2007, Ch.30, Sec 2 subd 05j		\$ 400,000	\$ 400,000	\$ -
ML 2009, Ch.143, Sec 2, subd03b		\$ 820,000	\$ 820,000	\$ -
ML 2010, Ch.362, Sec 2, subd 03a		\$ 1,130,000	\$ 1,130,000	\$ -
ML 2011, 1st Spec Sess. Ch.2, subd 03b		\$ 1,200,000	\$ 1,200,000	\$ -
ML 2013, Ch.52, Sec 2, subd 03b		\$ 1,200,000	\$ 1,200,000	\$ -
ML 2015 Ch. 76, Sec 2, subd 03a		\$ 2,040,000	\$ 2,040,000	\$ -
M.L. 2017, Chp. 96, Sec. 2, Subd. 03a (spent as of 8/1/2018)		\$ 2,000,000	\$ 2,000,000	\$ -

Status of County Geologic Atlas Part A



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