2013 Project Abstract
For the Period Ending June 30, 2016

PROJECT TITLE: County Geologic Atlases - Part A
PROJECT MANAGER: Dale Setterholm
AFFILIATION: Minnesota Geological Survey
MAILING ADDRESS: 2609 Territorial Road
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WEBSITE: http://www.mngs.umn.edu/
FUNDING SOURCE: Environment and Natural Resources Trust Fund
LEGAL CITATION: M.L. 2013, Chp. 52, Sec. 2, Subd. 03b

APPROPRIATION AMOUNT: $2,040,000

Overall Project Outcomes and Results

The Minnesota Geological Survey maps sediment and rock because these materials control where water can enter the subsurface (recharge), where and how much water can reside in the ground (aquifers), where the water re-emerges (discharge), and at what rates this movement occurs. This information is essential to managing the quality of our water and the quantity that can be sustainably pumped. This project completed geologic atlases for Meeker, Redwood, and Kanabec counties, and contributed to ongoing atlas work in Brown, Wadena, Becker, and Hubbard counties. Information about the geology is gleaned from the records of domestic wells, and from drilling conducted for this project. In Meeker County we used 3,600 wells and 6 cores, in Redwood we used 1,900 wells and 10 cores, in Brown County we used 1,700 wells and 8 cores, in Wadena County we used 2,787 wells and 3 cores, in Becker we used 8,887 wells and 5 cores, in Hubbard we are using 9,550 wells and 3 cores, and in Kanabec we used 4,055 wells and 7 cores. In all cases these are augmented with soil borings and geophysical surveys. From the data we created maps of the geology immediately beneath the soil; the aquifers within the glacial sediment; and the shape, elevation, and rock types of the bedrock surface. These maps and data support monitoring, wellhead protection, water appropriation, clean-ups, and water supply management.
In large portions of Redwood counties the glacial materials are relatively thin, and most of the bedrock types present do not provide much water. This makes the mapping of glacial sand bodies, which are potential aquifers, very important. In Becker, Hubbard, and Wadena counties the glacial deposits are the only viable water source. Irrigation is an important water use in those counties, and the atlas information will be useful in managing water for maximum benefit. In Meeker, Brown, and Kanabec counties, the glacial deposits vary in thickness, and the bedrock includes some formations that can serve as aquifers. In every county the database of well construction records we have compiled is an excellent indicator of which aquifers the population is currently relying on. Printed and digital versions of all these atlases will be delivered to LCCMR.

Project Results Use and Dissemination

County geologic atlases are distributed in print and digital formats. The digital format allows us to include all the data that support the maps and the ability to change the maps or create new ones. The products are available from the MGS web site (http://www.mngs.umn.edu/index.html). We also conduct post-project workshops in the map area to familiarize users with the products and their applications. The products are also distributed to libraries.

Environment and Natural Resources Trust Fund (ENRTF)
M.L. 2013 Work Plan Final Report

Date of Status Update Report: 6/10/16

Date of Next Status Update Report: Final Report

Date of Work Plan Approval: 6/11/2013

Project Completion Date: 6/30/2016 **Is this an amendment request?** no

PROJECT TITLE: County Geologic Atlases - Part A

Project Manager: Dale R. Setterholm

Affiliation: Minnesota Geological Survey, University of Minnesota

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Telephone Number: (612) 626-5119

Email Address: sette001@umn.edu

Web Address: http://www.mngs.umn.edu/

Location: Meeker, Brown, Redwood, Kanabec, Wadena, Hubbard, and Becker counties.

Total ENRTF Project Budget:		
	ENRTF Appropriation:	**$1,200,000**
	Amount Spent:	**$1,200,000**
	Balance:	**$0**

Legal Citation: M.L. 2013, Chp. 52, Sec. 2, Subd. 03b

Appropriation Language:
$1,200,000 the first year is from the trust fund to the Board of Regents of the University of Minnesota to continue the acceleration of the production of county geologic atlases that define aquifer boundaries and the connection of aquifers to the land surface and surface water resources for the purpose of sustainable management of surface water and groundwater resources. This appropriation is available until June 30, 2016, by which time the project must be completed and final products delivered.

I. PROJECT TITLE: County Geologic Atlases - Part A

II. PROJECT STATEMENT: Geologic atlases provide maps and databases necessary for improved management of ground and surface water resources to the benefit of the people, fish, wildlife, and habitat that depend on water. County Geologic Atlases are specifically identified as essential data in the Statewide Conservation Plan, and in the efforts of the Environmental Quality Board, DNR Waters, and the Water Resources Center at the University of Minnesota to design a sustainable water management process.
Atlases:

- Define aquifer boundaries and the connection of aquifers to the land surface and to surface water resources to enable a comprehensive water management effort.
- Facilitate and enhance natural resource management, regulation, and wise use of water resources.
- Support management activities designed to evaluate sustainable water use and to protect or improve water quality such as: permitting, land use planning, wellhead protection, source water protection, planning and development of public and private water supplies, remediation and spill response, monitoring, modeling, addressing TMDL problems.
- Document existing conditions so that changes in the water system can be recognized, analyzed, explained, and remedied where appropriate.
- 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 Division of Waters and focused on hydrology (not funded by this proposal). 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 must request an atlas and provide funds or in-kind service.

This project continues an effort to provide county geologic atlases statewide. The first atlas was initiated in 1979 but the program languished without a reliable source of funding. Funding from ENRTF in the early 1990s and from 2007 to the present has greatly accelerated production (see attached map). This funding would cover the costs of 3 or 4 county atlases depending on their size, complexity, and location.
Users include local government units involved in environmental services, land use and water planning, and permitting; state and federal agencies responsible for water and mineral management and planning; contractors and other businesses, including well drillers, onsite wastewater treatment installers, road and building construction; and homeowners and cities with wells and wastewater treatment systems.

III. PROJECT STATUS UPDATES:

Project Status as of December 30, 2013: Agreements were reached with Becker, Hubbard, and Wadena counties to create geologic atlases. Each county has been given the materials and training to allow them to establish accurate locations for wells with construction records and this work is underway. MGS staff are editing existing well data and supervising the county efforts. MGS geologists have begun field work, mostly observing and sampling landforms and surface features by hand or by power auger. Some work has been done on interpreting landforms with LiDAR and air photos. Some bedrock data has been compiled, but most work will have to wait until the well data is available.

Project Status as of June 30, 2014: The work in Becker, Hubbard, and Wadena counties is on schedule, and proceeding as planned. The current focus is on completing the well location work that is necessary to support all subsurface mapping. Mapping of the surficial geology is proceeding, and has some federal cost-sharing support. As the 2011 LCCMR grant funds are expended, we will use this grant to finish the work in Redwood, Meeker, and Brown counties, and we will also support finishing the Kanabec CGA with this grant (outcome 2). This grant also contributed $4,809 toward finishing the Wright CGA, and $14,040 to print the Morrison CGA.

Project Status as of February 4, 2015: The locations of wells have been established for Becker and Wadena counties but the work in Hubbard County is lagging behind. This is a local responsibility, and if progress is not made soon MGS will have to stop work on that project because the necessary data is not available. Work is well underway on the surficial geology maps and the Rotasonic drilling has been completed for Becker and Wadena countieis. These cores have been described and samples taken for analyses. The bedrock topography maps are also well along with draft versions available. All of this work is in step with the expected schedule. This grant is also covering work underway to complete the atlases of Meeker, Redwood, and Brown counties which were initiated and funded by our 2011 grant. They are in their final stages, and details are available in the final report for the 2011 grant. This grant is also funding completion of the Kanabec County atlas. The database, surficial geology, bedrock topography, drilling, and bedrock geology are completed, and only part of the subsurface glacial geology remains.

Project Status as of June 30, 2015: The location of wells in Hubbard County has improved with about 70% of the wells completed. It appears this work will not delay our progress significantly if it continues at this pace. Surficial geology maps of Wadena and Hubbard counties are in draft form (completed with Federal cost-share) and the surficial map of Becker County is about 80% complete. Rotasonic drilling will take place in Hubbard County this fall and winter. Those cores will be described and samples taken for analyses. The bedrock topography maps are in draft form and all supporting geophysical data collection is complete. The Hubbard map will be modified as necessary when all the well locations are complete. Bedrock geologic mapping is about 70% complete for Becker and Wadena counties and less complete in Hubbard. All of this work is in step with the expected schedule. The focus in the next year is completing products that describe the glacial sediment in the subsurface. This grant is also covering work underway to complete the atlases of Meeker, Redwood, and Brown counties which were initiated and funded by our 2011 grant. The Meeker CGA is complete, printed, and delivered. The Brown and Redwood CGAs need the subsurface glacial products which are under construction. This grant is also funding completion of the Kanabec County atlas. The database, surficial geology, bedrock topography, drilling, and bedrock geology are completed, and only part of the subsurface glacial geology remains. As soon as our new 2015-2016 contract with DNR is executed I expect to move the Kanabec project back to that source of funding. I have also funded preparatory work for future CGA projects (ex: Olmsted, Kandiyohi) on this award so that work can begin immediately when our new grant is available.

Project Status as of December 31, 2015: This grant is currently supporting work on the atlases of Redwood, Brown, and Wadena counties. The Hubbard and Becker CGAs are now supported by the 2015 LCCMR grant to MGS and progress on those projects is included in the progress report for that grant. Completion of the Kanabec CGA is now supported by our biennial DNR contract. The modeling of sand bodies in the glacial sediments is always the last geologic hurdle, and in both counties we are beyond the draft stage of that process and another iteration should finalize those products. The editing and production work that follows should be complete before the end date of this grant. The Wadena CGA is now focused on the characterization of the glacial sediment. The well database and surficial geologic map are complete, and the bedrock geology and bedrock topography are in draft form and will be complete prior to the end of this grant. Closely-spaced cross-sections of the glacial materials are under construction. Work on those products is cost-shared with an award from the Great Lakes Geologic Mapping Coalition ($27,476 in federal funds) and the work will be complete by mid-August. There will still be editing and GIS work to follow, so I don't anticipate this atlas will be complete by the end of this grant, but it will be close.

Final Report Summary June 10, 2016: The Minnesota Geological Survey maps sediment and rock because these materials control where water can enter the subsurface (recharge), where and how much water can reside in the ground (aquifers), where the water re-emerges (discharge), and at what rates this movement occurs. This information is essential to managing the quality of our water and the quantity that can be sustainably pumped. This project completed geologic atlases for Meeker, Redwood, and Kanabec counties, and contributed to ongoing atlas work in Brown, Wadena, Becker, and Hubbard counties. Information about the geology is gleaned from the records of domestic wells, and from drilling conducted for this project. In Meeker County we used

3,600 wells and 6 cores, in Redwood we used 1,900 wells and 10 cores, in Brown County we used 1,700 wells and 8 cores, in Wadena County we used 2,787 wells and 3 cores, in Becker we used 8,887 wells and 5 cores, in Hubbard we are using 9,550 wells and 3 cores, and in Kanabec we used 4,055 wells and 7 cores. In all cases these are augmented with soil borings and geophysical surveys. From the data we created maps of the geology immediately beneath the soil; the aquifers within the glacial sediment; and the shape, elevation, and rock types of the bedrock surface. These maps and data support monitoring, wellhead protection, water appropriation, clean-ups, and water supply management.
In large portions of Redwood counties the glacial materials are relatively thin, and most of the bedrock types present do not provide much water. This makes the mapping of glacial sand bodies, which are potential aquifers, very important. In Becker, Hubbard, and Wadena counties the glacial deposits are the only viable water source. Irrigation is an important water use in those counties, and the atlas information will be useful in managing water for maximum benefit. In Meeker, Brown, and Kanabec counties, the glacial deposits vary in thickness, and the bedrock includes some formations that can serve as aquifers. In every county the database of well construction records we have compiled is an excellent indicator of which aquifers the population is currently relying on. Printed and digital versions of all these atlases will be delivered to LCCMR.

Amendment Request June 10, 2016: When the proposal for this grant was written, it was not known which counties would be involved, what cost-sharing opportunities might arise, or the timing of some of the events that affect spending. Our estimate of drilling costs was accurate. Our estimate of printing costs was for printing 3 atlases, and only two were ready for printing. Our supply budget estimate was reasonably accurate, but we spent less on travel than expected. This is affected by how far away the projects are from our base. The savings from those categories that didn't spend the estimated amount were used to fund more activity, in the form of wages. This allowed us to take projects closer to completion. We are asking to amend the budget to fit the actual costs incurred. The overall project cost is not changed.

Amendment Approved by LCCMR June 10, 2016

IV. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1: Create geologic atlases for 3 or more counties (yet to be named)
Description: Atlases begin with compilation of a database of subsurface information. The most abundant data source is the construction records of water wells. With the cooperation of the local project partner, accurate digital locations are established for these wells to support their use in mapping. 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. Analysis of the complete 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. As soon as the funds for this project are secured counties will be contacted to find willing and able local partners. This effort will begin with counties prioritized on the basis of need that may be driven by growth, resource demand, resource vulnerability, or opportunities for cooperation with other water management activities.

Summary Budget Information for Activity 1:

ENRTF Budget: $ 1,200,000
Amount Spent: $ 1,200,000
Balance: $ 0

Activity Completion Date:

Outcome	Completion Date	Budget
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, 2014	$ 120,000
2. Complete any unfinished ENRTF supported County Geologic Atlas	June 30, 2016	$ 100,000

projects (ex: from 2010 appropriation).		
3. Make progress on maps of bedrock geology, surficial geology, subsurface Quaternary geology, bedrock topography, and thickness of glacial deposits.	June 30, 2016	$ 980,000

Activity Status as of December 31, 2013: Agreements were reached with Becker, Hubbard, and Wadena counties to create geologic atlases. Each county has been given the materials and training to allow them to establish accurate locations for wells with construction records and this work is underway. MGS staff are editing existing well data and supervising the county efforts. MGS geologists have begun field work, mostly observing and sampling landforms and surface features by hand or by power auger. Some work has been done on interpreting landforms with LiDAR and air photos. Some bedrock data has been compiled, but most work will have to wait until the well data is available.

Activity Status as of June 30, 2014: Wadena County has completed their work to establish locations for wells (1,500). Mapping of the surficial geology is about 50% complete, and bedrock topography is about 40% complete. Hubbard County has established locations for more than 2,000 wells, but this is less than half of the total. The surficial geologic map is about 20% complete. Becker County has established locations for about half of the more than 5,000 wells available. The surficial map is well along. The surficial maps of Wadena and Hubbard counties are receiving federal cost-sharing of $58,437. Rotasonic drilling of these three counties will take place this fall and winter. Acceleration of the atlas program requires that we drill every year now, rather than every other year. Funding to augment the drilling program from DNR was expended last year, and none remains to support additional holes in these three counties. We will either drill a standard program (fewer holes) or allocate more of the LCCMR funds toward drilling and less elsewhere (request an amendment). Federal cost-sharing of the surficial maps may offset the cost of additional drilling.

Activity Status as of February 4, 2014: Wadena and Becker counties have completed their work to establish well locations, and Hubbard County is still in the process. We drilled 3 Rotasonic holes in Wadena County where we also have 2 test holes from previous LCCMR funded Aeromagnetic Program drilling, and geophysical logging of 3 city wells. In Becker County we drilled 3 Rotasonic holes and also obtained information from 2 holes drilled by DNR, and 2 holes drilled for the Aeromagnetic Program. In Hubbard County DNR drilled 1 Rotasonic hole and we also obtained information from 2 holes drilled for the Aeromagnetic Program and 2 holes previously drilled by USGS. Further drilling is planned for Hubbard County this fall. All of the cores we drilled have been described and sampled. Draft surficial geologic maps are underway and may be field checked for accuracy after the snow melts. The bedrock geology is based on geophysical data and any drilling that intercepted bedrock. There are no exposures of bedrock and this work progresses without field work. The next step in these atlases is to construct closely-spaced cross-sections to identify the boundaries of potential aquifers.

Activity Status as of June 30, 2015: Of the four atlases started previously, Meeker has been completed, printed, delivered, and a user's workshop held. The Brown, Redwood, and Kanabec atlases are in their final stage with a focus on products that describe the glacial sediment in the subsurface. Those are always the last products completed. Of the newer projects the Becker and Wadena atlases are furthest along and the Hubbard atlas is slightly behind. The establishment of well locations by Hubbard County was delayed, but is now making good progress. Rotasonic drilling will take place in Hubbard County this fall and winter. Preparatory work for new projects is complete, and the Kandiyohi and Olmsted atlases will be part of our new ENRTF grant.

Activity Status as of December 31, 2015: The Kanabec atlas is very nearly complete. Editing of the sand models and the products that characterize the glacial sediment in the third dimension is the only task remaining before we send files out for printing. Similarly those same products are nearly complete for the Redwood and Brown CGAs and should be finished before this grant ends. The subsurface products for the Wadena CGA will not be finished until August 2016, but the project should wrap up shortly after that. This will require that I support the project with funds from the other ENRTF grant or from a Clean Water Funds grant currently in hand.

Final Report as of June 10, 2016: This project picked up the Redwood, Brown, and Meeker atlases that were started on a previous LCCMR grant. Redwood and Meeker have been completed, and Brown is very nearly done. The last product is in review and then it will go to the printer. This project initiated atlases for Wadena, Becker, and Hubbard counties. The Wadena and Becker atlases are working on the final product (sand distribution models) and will then enter editing and printing. The Wadena project is now being supported by Clean Water Funds, and Becker is being supported by our 2015 LCCMR grant. The Hubbard atlas was delayed by one of the principal scientists leaving MGS, and compounded by drilling one year later than the other two atlases. Hubbard is now being funded by our 2015 LCCMR grant until it is completed. This grant also supported the Kanabec atlas for a period, and that atlas has also been completed and printed.

V. DISSEMINATION:

Description: County Geologic Atlases are created in digital and print forms. Printed copies are useful in the field, and for users without computers. 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. The atlas content is also provided as portable document files (pdfs) that can be accessed by free software, as geographic information system (GIS) files that can be accessed and manipulated to create new or customized maps by those with GIS software, and as GIS files that can be accessed by free GIS software. The digital files are available on a DVD, from the county, or from a digital conservancy through the MGS web site.

MGS provides project status reports to each county, and at the completion of our work we hold a workshop in the county to introduce the products and demonstrate their uses. A field trip is usually conducted to relate the map units to landforms and geologic materials at locations around the county.

Status as of December 31, 2013: There are no products to disseminate at this time. We do meet with the county people who are working on establishing well locations to check their work and deal with any problems they may be having.

Status as of June 30, 2014: There are no products to disseminate at this time. As we receive well locations from the counties and enter the data into the County Well Index database, this new information becomes immediately available via the web for other related water management such as the DNR Straight River Groundwater Management Area Project.

Status as of February 4, 2015: There are no final products to disseminate at this time. The County Well Index database has been updated to include the well locations established in Becker and Wadena counties. The surficial geologic maps of Hubbard and Wadena counties will be completed before the next report, and these will be available from the MGS web page.

Status as of June 30, 2015:

Status as of December 31, 2015: The surficial geologic map of Wadena County and the Bedrock Geologic Map of Kanabec County are available from the MGS web page as are all products of the Meeker CGA. The well construction data compiled for these atlases and for the Redwood and Brown CGAs is available from the Minnesota Well Index database hosted by the Minnesota Department of Health http://www.health.state.mn.us/divs/eh/cwi/, or directly from MGS. A meeting to introduce the products of the Meeker CGA was held June 23, 2015 in Litchfield. Similar meetings will follow completion of the other atlases.

Final Report as of June 10, 2016: The surficial geologic map of Wadena County and the Bedrock Geologic Map of Kanabec County are available from the MGS web page as are all products of the Meeker CGA. The well construction data compiled for these atlases and for the Redwood and Brown CGAs is available from the

Minnesota Well Index database hosted by the Minnesota Department of Health http://www.health.state.mn.us/divs/eh/cwi/, or directly from MGS. A meeting to introduce the products of the Meeker CGA was held June 23, 2015 in Litchfield. Similar meetings will follow completion of the other atlases.

VI. PROJECT BUDGET SUMMARY:

A. ENRTF Budget:

Budget Category	$ Amount	Explanation
Personnel:	$ 885,000	approx. 11 FTE civil service and student workers
Professional/Technical/Service Contracts for drilling:	$ 155,000	Rotasonic drilling- awarded by bid process; costs generally range from $30 to $60 per foot (more expensive at depth) plus $8 per foot for abandonment. This amount would likely drill about 9 holes- 3 per county averaging 200 feet deep. This is typically the minimal coverage and may be augmented if conditions require.
Professional/Technical/Service Contracts for printing:	$ 45,000	bid process; typically 6 plates per county (size about 3' by 3'), four color, and 1,500 copies of each for 3 counties equals 27,000 maps
Equipment/Tools/Supplies:	$ 30,000	expendables for field and laboratory work
Travel Expenses in MN:	$ 85,000	food, lodging, vehicle rental from University Fleet as necessary for field work (typically weekly)
TOTAL ENRTF BUDGET:	**$ 1,200,000**	

Explanation of Use of Classified Staff: MGS will utilize Civil Service staff and student workers. Our staffing level reflects our intention and our experience in obtaining grants and contracts to cover approximately 60% of our staff.

Explanation of Capital Expenditures Greater Than $3,500: none

Number of Full-time Equivalent (FTE) funded with this ENRTF appropriation: approx. 11, cannot calculate until counties are chosen and staff are assigned based on skills required for those counties.

Number of Full-time Equivalent (FTE) estimated to be funded through contracts with this ENRTF appropriation: The number of staff and their time commitment to the printing and drilling contracts are unknown to us. These are complex procedures with many variables, and many kinds of costs other than personnel.

B. Other Funds:

Source of Funds	$ Amount Proposed	$ Amount Spent	Use of Other Funds
Non-state			
STATEMAP (federal cost-sharing)	$18,598 $41,962 $58,437	$18,598 $41,962 $58,437	$18,598 bedrock map of Meeker $41,962 bedrock map of Kanabec $58,437 surficial maps, Hubbard and Wadena
Great Lakes Geologic Mapping Coalition (federal cost-sharing)	$27,476	$27,476	Glacial subsurface products, Wadena County
State			
Clean Water Legacy Funds	$100,000	$100,000	DNR provided CWF to augment drilling in

			Wadena and Becker counties
In-kind Services During Project Period: participating counties are expected to provide accurate locations of water wells. This dollar value is only an estimate of their costs, and will vary depending on which counties are selected.	$90,000		
TOTAL OTHER FUNDS:	**$ 155,000**	**$246,473**	Did not include value of county in-kind

VII. PROJECT STRATEGY:

A. Project Partners: Under a separate workplan and budget DNR Waters and Environmental Services will receive funds to work on Part B of County Geologic Atlases

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. The County Geologic Atlas program is the primary vehicle for completing this goal. Atlases are complete or under construction for 35 of the 87 counties in Minnesota. The MGS receives $250,000 to $350,000 per year from DNR Waters, and also leverages federal cost share dollars from the National Cooperative Geologic Mapping Program of the United States Geological Survey and the Great Lakes Geologic Mapping Coaltion. MGS competes for these cost share dollars annually and they cover half of the costs of each map product incurred in that one-year window. MGS intends to propose project map elements for cost share and if successful may garner up to an additional $125,000. MGS atlas development is also supported by Clean Water Funds (one grant of $305,000 beginning July 2010 currently applied to Houston and Winona CGAs).

C. Spending History:

Funding Source	**M.L. 2007 or FY08**	**M.L. 2008 or FY09**	**M.L. 2009 or FY10**	**M.L. 2010 or FY11**	**M.L. 2011 or FY12-13**
ENRTF Benton and Chisago CGAs	$400,000				
ENRTF Blue Earth, Nicollet, Sibley CGAs		$706,000			
ENRTF Anoka and Wright CGAs			$820,000		
ENRTF Sherburne and Morrison CGAs and related research				$1,130,000	
ENRTF Redwood, Meeker, Brown					$1,200,000

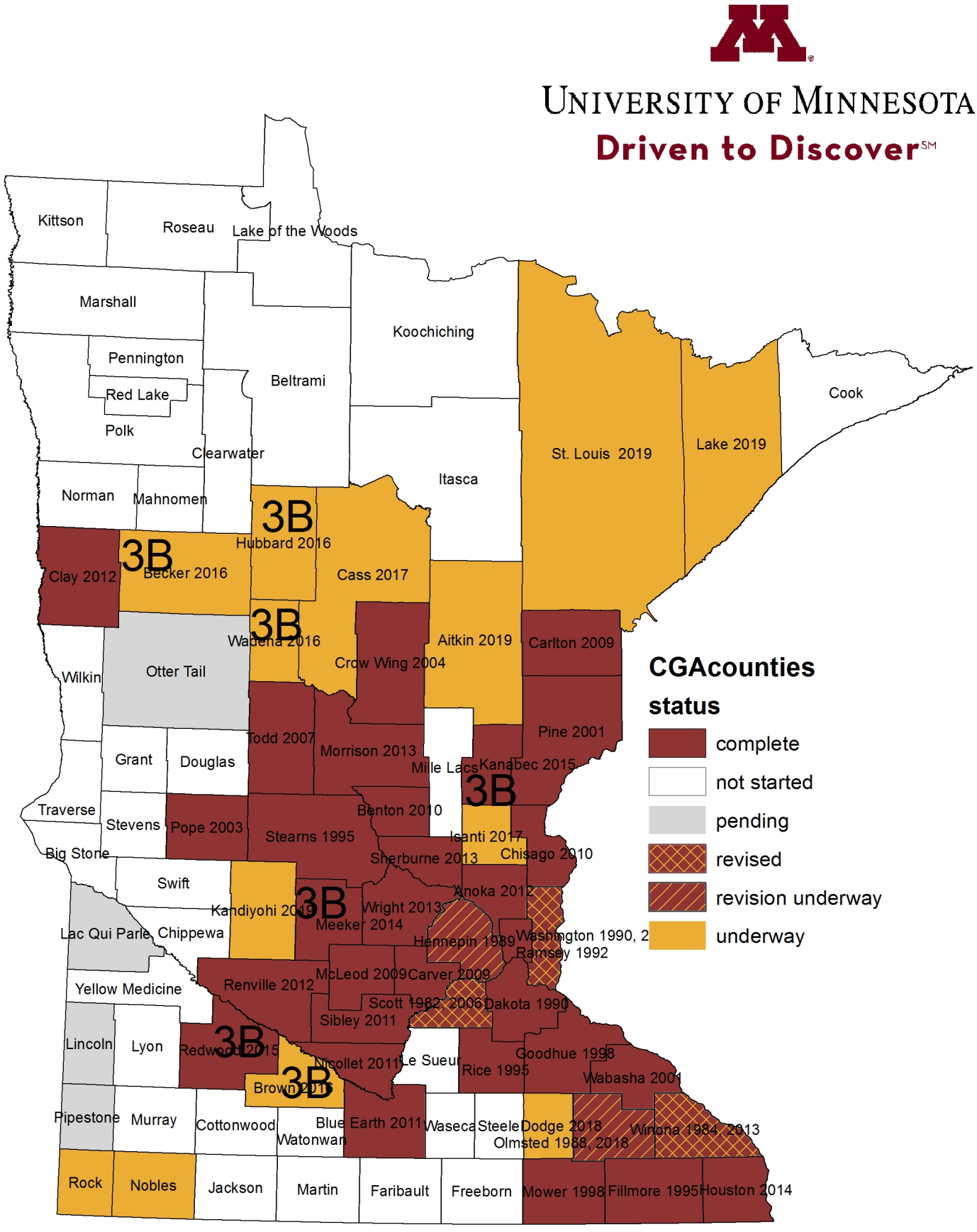
VIII. ACQUISITION/RESTORATION LIST: N/A

IX. MAP(S): N/A

X. RESEARCH ADDENDUM: N/A

XI. REPORTING REQUIREMENTS: Periodic work plan status update reports will be submitted not later than December 31, 2013, June 30, 2014, December 31, 2014, June 30, 2015, December 31, 2015. A final report and associated products will be submitted between June 30 and August 15, 2016 as requested by the LCCMR.

Status of Part A Geologic Atlases June 2016



Counties labeled 3B received support from the 2013 ENRTF grant.

Attachment A: Budget Detail for M.L. 2013 Environment and Natural Resources Trust Fund Projects

Project Title: MGS County Geologic Atlases (Part A) for Improved Water Management
Legal Citation: M.L. 2013, Chp. 52, Sec. 2, Subd. 03b
Project Manager: Dale R. Setterholm
M.L. 2013 ENRTF Appropriation: $1,200,000
Project Length and Completion Date: 3 yrs. Complete 6/30/16
Date of Update: 6/10/16

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Revised Activity 1 Budget 6/10/16	Amount Spent	Balance	Revised Total Budget 6/10/16	TOTAL BALANCE
BUDGET ITEM					
Personnel: Wages and Benefits					
Approximately 11 FTE in a team of database managers, surficial geologists, bedrock geologists, geophysicists, student lab technicians, editor, and GIS scientists. Salary 60.4%, fringes 39.6%, except for students (100% salary). Assignments will be made when project locations (counties) are chosen.	937,287	937,287	0	937,287	0
Professional/Technical/Service Contracts					
Scientific drilling services TBD by bidding process; about 9 holes averaging 200' deep including abandonment; may be augmented as necessary	154,005	154,005	0	154,005	0
Printing services TBD by bidding process (typically 6 plates, 1,000 copies, 3 counties; yields 18,000 3' by 3' maps in color	31,495	31,495	0	31,495	0
Equipment/Tools/Supplies:					
photocopying, maps, publications, sample envelopes and bags, core boxes, pallet banding, sieves, batteries; age dating analysis; geochemical analysis; repairs to MGS equipment (soil probe, geophysical equipment, downhole camera); replacement parts as needed	23,083	23,083	0	23,083	0
Travel expenses in Minnesota					
vehicle rental and mileage (approx. $40 to $47 per day, $0.17 to $0.37 per mile), mileage on MGS geophysics van ($0.555 per mile); meals (up to $46 per day); lodging (up to $77 per day). Amounts cannot be calculated until project locations (counties) are known. Rentals from U Fleet Services as needed, typically on weekly basis.	54,130	54,130	0	54,130	0
COLUMN TOTAL	**$1,200,000**	**$1,200,000**	**$0**	**$1,200,000**	**$0**