Innovative Springshed Mapping for Trout Stream Management
Subd. 5g $270,000

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RESEARCH

Overall Project Outcomes and Results

Trout streams depend on a steady supply of clean, cold water to exist. The U of M's Geology and Geophysics Dept. and the DNR Waters worked to identify and map the karst springs and their recharge areas that supply water to southeastern Minnesota's 173 trout streams and to assess the impacts that both land and aquatic development are having on these springs.

Delineation of the recharge areas or springsheds of the trout springs is a crucial first step in the protection of the trout fisheries and the restoration of those that have been degraded. Established fluorescent dye tracing techniques were refined, accelerated and expanded into springsheds parts of southeastern Minnesota not previously traced. Traces in Fillmore and Olmsted counties defined new trout stream springsheds and expanded and refined information on previously known trout stream springsheds in the Galena Aquifer. The traces in Winona and Houston Counties began the definition of trout stream springsheds draining the Prairie du Chien Aquifer. Prairie du Chien springs supply water to several major fish hatcheries and trout streams.

Although many of southeastern Minnesota's trout stream are headed by springs flowing from the St. Lawrence Formation, the St. Lawrence has been assumed to be an aquitard in Minnesota Rules. Three successful traces through the St. Lawrence Formation in Winona and Houston Counties demonstrated that water flows rapidly through the St. Lawrence to trout springs. This unexpected discovery is a major advance in our understanding and management of these trout springs and is resulting in a significant reevaluation the hydrogeology of the St. Lawrence Formation.

In addition to dye tracing, four innovative Trout Springshed Assessment protocols were investigated. The first was the use of data logger technology to characterize time variations in the thermal and chemical properties of trout springs. The temperature loggers identified at least four distinct patterns of temperature variations present in trout springs which inturn yield information about the respective springsheds. The second innovative technique was the construction of new, high precision structural contour maps of the geologic strata hosting trout springsheds. This tool looks promising but will require more precise mapping that is currently

available. The third innovation was an investigation of the relationship between the size of springsheds and the base flow volume of the trout springs. This technique is promising but requires more well defined springsheds to become a practical tool. The last technique investigated was the measurement of dissolved organic compounds (DOC) in the springs. Significant differences in the amount and composition of the DOCs were observed which may be relatable to varying land uses in the springsheds.

The springsheds defined by the tracing and the other tools allow an accurate documentation of the rapid, direct impact of surface land uses in the springsheds and the water quality in the trout streams. This inturn allows better management of the springsheds to protect the trout streams and groundwater resources.

Project Results, Use and Dissemination

The dissemination and use of the results of the trout springsheds delineation has varied depending on the level of the user. At the local level one of the most effective dissemination tools has been to get the landowners and users involved in the research itself. This has included getting Harmony High School students involved in the traces around Harmony, Minnesota. Getting many of the local residents involved in the tracing. Getting the County staffs, local organizations, the trout fishing community and the trout hatchery staffs involved in the tracing. We send copies of the reports into the hands to the affected landowners and residents involved. All of these people now know the speed at which the surface runoff can reach their trout streams. They are the "first line of defense" in maintaining and improving the water quality in the trout streams.

At the regional and state levels Alexander and Green have made numerous presentations various state water management and ground water meetings. We have led field trips highlighting the results of this project. Contribute the results of this information at a variety of levels inside the Minnesota State Government. The information is built into short courses, training sessions, technical comments and University of Minnesota courses. The discovery that water moves rapidly through the St. Lawrence "aquitard" is already impacting management rules and practices in several State Agencies. The increasingly detailed knowledge of the springsheds is an important part of the TMDL effort to protect and improve water quality in trout streams in southeasten Minnesota.

At the national level the results obtained in this project were presented at the 11th Multidisciplinary Conference on Sinkhole and the Engineering and Environmental Impacts of Karst, at Geological Society of America meetings and published in their Proceedings. National Science Foundation summer interns have participated in the research effort and taken the knowledge and experience back to other states.

Copies and electronic versions of 15 reports were transmitted to the LCCMR staff.

FINAL REPORT
Project completed: 6/30/2009

Trust Fund 2007 Work Program

Date of Report: 23 December 2009 (completion report)
Date of Next Status Report:
Date of Work program Approval:
Project Completion Date: 30 June 2009

I. PROJECT TITLE: Innovative Springshed Mapping for Trout Stream Management

Project Manager: E. Calvin Alexander, Jr.
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Location: Houston, Fillmore, Mower, Olmsted, Winona, Wabasha, Goodhue, Dakota and Washington Counties.

Total Trust Fund Project Budget:	**Trust Fund Appropriation:**	**$** 270,000
	Minus Amount Spent:	**$** 270,000
	Equal Balance:	**$** 0

Legal Citation: ML 2007, [Chap. 30], Sec.[2], Subd. 5g .

Appropriation Language: (g) Innovative Springshed Mapping for Trout Stream Management. $270,000 is from the trust fund to the University of Minnesota to identify and delineate supply areas and springsheds, for springs serving as coldwater sources for modern and historic trout streams, and to assess the impacts from development and groundwater appropriations.

II. PROJECT SUMMARY AND RESULTS: Trout streams depend on a steady supply of clean, cold water to exist. Minnesota's karst lands contain 173 designated trout streams each of which is sourced from springs. Those trout springs are under increasing pressure from changing land use. Additional large groundwater withdrawals for energy production and other development loom in the future. Delineation of the recharge areas or springsheds of the trout springs is a crucial first step in the protection of the trout fisheries and the restoration of those that have been degraded. This project is to develop innovative identification and delineation tools to determine the supply areas (springsheds) for springs serving as coldwater sources for modern and historic trout streams and assessing impacts on them from land and water development.

III. PROGRESS SUMMARY AS OF *(30 June 2009)***:**

The personnel on this project, in addition to the Project Manager and Project Partner included Andrew Peterson (DNR), Andrew Luhmann (UM) and Scott Alexander (UM). We profited from NSF REU summer interns Sarah Eagle (2007)[1], Shannon Flynn (2008)[4,5] and Kelsey Peterson (2008)[6,7] at UM whose various research project in southeastern Minnesota karst hydrogeology were significant additions to the LCCMR effort. Matthew Covington, a NSF Post-Doctoral researcher, has also contributed significantly to the overall project since his arrival at UM in January 2009. Two High School student groups, their Science Teacher and the owner of Niagara Cave helped run a successful series of traces on the northwest side of Harmony. Both high school student projects, summer interns and the Post-Doc were means of leveraging the LCCMR resources against outside resources to accelerate the overall process.

IV. OUTLINE OF PROJECT RESULTS*:*

Result 1: Innovative Trout Streamshed Maps and Reports

Springsheds that feed source springs of trout streams will be delineated in the Galena and Prairie du Chien karst lands. Only about 8% of trout streams springsheds have had any dye tracing conducted in them. We propose to double that number while developing techniques and supplemental mapping tools for rapid accurate springshed delineation. We will prioritize the watersheds for work based on their current condition and the threat to their water quality from current and proposed land usage and groundwater appropriations.

Summary Budget Information for Result 1:	**Trust Fund Budget:**	**$ 163,025**
	Amount Spent:	**$ 163,025**
	Balance:	**$ 0**

Deliverable 1	**Completion Date**	**Budget**	**Status**
GIS based maps and written reports identifying and describing the springsheds delineated.	30 June 2009	$163,025	

Final Report Summary: 30 June 2009:

Thirty-six dye traces were conducted between 1 July 2007 and 30 June 2009 to define the springsheds of trout stream. These traces were run in Fillmore, Houston, Olmsted and Winona Counties. The traces in Fillmore and Olmsted counties defined new trout stream springsheds and expanded and refined information on previously known trout stream springsheds in the Galena Group[1,2,3,4,5,10,11,14,15]. The traces in Winona and Houston Counties began the definition of trout stream springsheds draining the Prairie du Chien Group. Prairie du Chien springs several major fish hatcheries and trout streams.

Perhaps the most exciting results, however, are three successful traces through the St. Lawrence Formation in Winona and Houston Counties[9,12]. Although many of southeastern Minnesota's trout stream are headed by springs in this part of the geologic column, up until these traces the St. Lawrence Formation has been assumed to be an aquitard. The St. Lawrence traces demonstrates that dye tracing can be conducted to St. Lawrence springs and is a major step forward in our understanding and management of these trout springs.

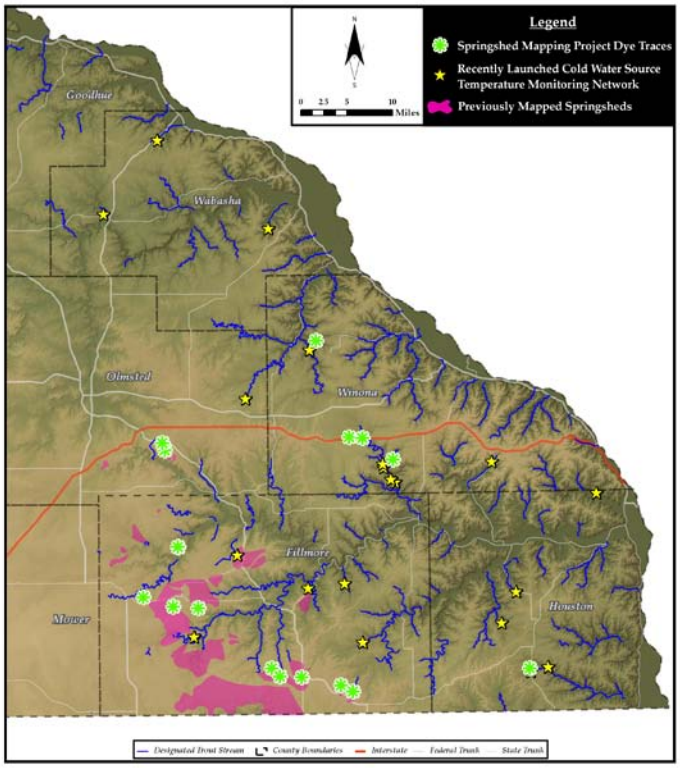

Figure 1. Location of Dye Traces and Temperature Monitoring Network

Figure 1 shows the location of the dye traces and the spring monitoring network discussed below.

Result 2: <u>Trout Springshed Assessment Protocols</u>

The assessment of impacts of land use changes and new large water withdrawals and the offsetting improvements in recharge and water quality of the springs' flows requires new protocols in addition to dye tracing and all of the protocols need to be documented. We propose to use data logger technology and Karst Landscape Unit mapping to develop protocols for karst hydrogeology-based springshed assessment.

Summary Budget Information for Result 2:	**Trust Fund Budget:**	**$ 90,000**
	Amount Spent:	**$ 90,000**
	Balance:	**$ 0**

Deliverable 2	**Completion Date**	**Budget**	**Status**
Reports describing the Springshed Assessment Protocols for the springsheds analyzed.	30 June 2009	$ 90,000	

Final Report Summary: 30 June 2009:

Four innovative Trout Springshed Assessment protocols were investigated. The first innovative technique was the use of data logger technology to characterize time variations in the chemical and properties of trout springs[8,12]. Figure 1 shows the network of spring thermal monitoring points that has been established. These temperature data loggers have found that there are at least four distinct patterns of

temperature variations present in SE Minnesota trout springs. These patterns can be correlated with the hydrogeology of the respective springsheds[8,9,12]. The second innovative technique was the construction of new, high precision structural contour maps of the geologic strata hosting the trout springsheds[8]. This tool is promising but will require more detailed structural contour mapping than is currently available. The third innovative technique is the use of well defined springsheds to determine a relationship between the size of the springheds and their base flows. This technique is promising but needs more, better defined springsheds to become a practical tool. The fourth innovative technique is to use the dissolved organic carbon (DOC) compounds in the springs to deduce the properties of the spring sheds. The analytical equipment used to measure the fluorescent dyes in the dye trace studies can also be used to measure the DOC in the water. One of our summer interns initiated a study on this tool and obtained encouraging results[6,7].

The combination of these tools with dye trace work allow a much more robust classification of the trout springsheds.

Result 3: <u>BMP Handbook for Trout Streansheds</u>

A critical examination of existing and new BMPs will be necessary for management of the trout stream springsheds. We will review karst related BMPs from other states and compile, in consultation with the University of Minnesota Extension, DNR, MGS and other interested parties, a Handbook of karst trout stream springshed BMPs for southeastern Minnesota.

Summary Budget Information for Result 3:	**Trust Fund Budget:**	**$ 16,975**
	Amount Spent:	**$ 16,975**
	Balance:	**$ 0**

Deliverable 3	**Completion Date**	**Budget**	**Status**
Handbook of recommending BMPs for trout stream springsheds in southeastern Minnesota.	30 June 2009	$ 16,975	

Final Report Summary: 30 June 2009:

Although there is a considerable literature on water quality BMPs in karst, little of it explicitly includes karst hydrogeology. Most of the literature is about agricultural production. Currens (2001) [J.C. Currens, Changes in groundwater quality in a conduit-flow dominated karst aquifer following BMP implementation, Envirnonmental Geology, v. 42, n. 5, p. 525-531] demonstrated that conventional BMPs when applied in karst actually decrease groundwater quality. A compounding problem is the continued fixation on surface karst features with the assumption that their apparent absence is evidence that karst processes are not operating at a particular place. The formation of a new sinkhole entrance to the previously unknown major new cave, Holy Grail Cave in June 2008 illustrates the problem[13]. The recent recognition that several of the trout streams in SE Minnesota are impaired for nitrates, turbidity or both illustrates the problem. The TMDL process which is focused on water quality may provide a vehicle to more realistically protect trout springsheds.

V. TOTAL TRUST FUND PROJECT BUDGET: $ 270,000

Staff:

$99,800 – DNR Waters staff hydrogeologist, 100% time, Result 1, 2 & 3.
$70,392 – 1 U of Mn graduate student Research Assistant, 50% time, Result 1,2 & 3.
$56,960 – PI 5% time, U o Mn staff scientist, 40% time, Result 1, 2 & 3.

Equipment, Supplies and Field Travel (U of Mn staff):

$5,000 – Travel for field work.
$5,648 – Expendable field and laboratory supplies (dye tracing supplies [dye, sample bottles, chemicals, lab supplies, etc.], field supplies, etc.
$7,000 – Equipment purchase (3 data loggers, 3 pressure transducers, misc. field equipment).

Equipment, Supplies and Travel (MNDNR/Waters staff):

$5,000 – Vehicle mileage costs
$800 – Lodging and meals in MN
$2,000 – Office and field operations (mail, printing, office supplies, cell phone service)
$4,700 – Field equipment (conductivity probes [to use with data loggers previously purchased] notebook computer to download data loggers, water sampling equipment, mapping equipment)
$6,700 – Sample analysis (water chemistry, stable isotopes)
$4,000 – GIS software for field laptop
$2,000 – Presentation of preliminary findings at the 11th International Multidisciplinary Conference on the Environmental and Engineering Aspects of Karst (Sept. 2008, Tallahassee, FL)

Explanation of Capital Expenditures Greater Than $3,500:

A single user license is required by the soft ware provider for use on field laptops.

VI. OTHER FUNDS & PARTNERS:

A. Project Partners:

Jeffrey A. Green, DNR Waters.

B. Other Funds Spent during the Project Period:

$50,000, DNR Waters, 0.25 FTE Hydrologist 3 plus expenses.
$5,000, South Branch Root 319 Project for the Governor's Root River Initiative.

$15,000, three NSF REU summer interns, Sarah Eagle (2007), Shannon Flynn (2008) and Kelsey Peterson(2008)

C. Time:

1 July 2007 - Initiate Project

1. Arrange contracts between University and MNDNR/Waters for Jeff Green's section of the project.
2. ASAP initiate multiple dye traces in the priority areas.
3. Contact as many individuals and agencies as possible that can provide information on the trout streams and begin assembling the available information on stream flows, chemistry, isotopes, etc.

4. Contact as many individuals and agencies as possible that can provide information on BMPs for karst aquifers.
5. Evaluate existing watershed data storage/delineation tools at the MNDNR for use in this project.

1 July 2007 to ~ 15 November 2007 – 1st field season.

1. Conduct multiple dye traces in multiple basins. This major activity has a significant weather component. Traces can be conducted in both wet and dry periods and each gives somewhat different, individually useful information on the springsheds. The end of the field season is also very weather dependent. Heavy snowfall terminates dye tracing activities.
2. Interpret the results of the dye traces as they become available. Interim dye trace results will be available as GIS shape files and derived products.
3. Compile and analyze the available data on trout stream flows, chemistry, etc.
4. Compile and evaluate karst BMPs.

~ 15 November 2007 to ~28 February 2008 – Planning for 2nd field season.

1. Evaluate results from 1st Field season and plan strategy for 2nd field season.
2. Progress report to LCCMR on 1st season on 30 Dec 2007.

~1 March 2008 to ~15 November 2008 – 2nd Field season.

1. Conduct multiple dye traces in multiple basins beginning with snowmelt runoff tracing in February/March 2008.
2. Interpret the results of the dye traces as they become available. Post the results of the individual traces.
3. Progress report to LCCMR on 30 June 2008.
4. Compile and analyze the available data on trout stream flows, chemistry, etc.
5. Compile and evaluate karst BMPs.
6. Present preliminary results at 11th International Sinkhole Conference, Sept 2008, Tallahassee, FL.

~ 15 November 2008 to 28 February 2009 – Data reduction and Interpretation.

1. Evaluate results from 2nd Field Season
2. Progress report to LCCMR on 30 December 2008.
3. Draft of karst BMP manual sent out for review and comment by 1 February 2009.

1 Mar 2009 to 30 June 2009 – Interpretation and Report writing.

1. Compiling results from all accumulated traces.
2. Revise and finalize BMP manual.
3. Final report and BMP manual to LCCMR by 30 June 2009

VII. DISSEMINATION: GIS based maps and written reports of the springsheds will be prepared and disseminated to the LCCMR and interested residents and to local, regional and state resource managers and regulators interested in specific targeted areas. Interim dye trace results will be available as GIS shape files and derived products on a dye trace by dye trace basis. Data tables of discharge and chemistry will be available as developed.

Reports will be prepared and disseminated of the springshed delineation protocols will be prepared and disseminated to the LCCMR and interested residents and to local, regional and state resource managers and regulators interested in

specific targeted areas. Interim dye trace results will be available as GIS shape files and derived products on a dye trace by dye trace basis.

A Handbook of BMPs for the protection of trout stream springsheds in karst will be developed and disseminated.

Both the project manager and project partner presented the interim and final results of the project at the 11th International Multidisciplinary Conference on Sinkholes in September 2008 and at other appropriate local, state, and national meetings. The results are being published in appropriate professional journals.

Project Reports (copies attached):

[1] Sarah D. Eagle and E. Calvin Alexander, Jr. (2007) *2 July 2007 Morehart Farm Dye Trace*, 16 p. [word Doc]

[2] Jeffrey A. Green Andrew J. Peters, Andrew J. Luhmann, E. Calvin Alexander, Jr. and Scott C. Alexander (2008) *Frego Creek Dye Trace March 11, 2008 to June 16, 2008*, 69 p. [pdf]

[3] Jeffrey A. Green Andrew J. Peters, Andrew J. Luhmann, E. Calvin Alexander, Jr. and Scott C. Alexander (2008) *Harmony Spring 2008 Dye Trace*, 22 p. [pdf]

[4] Shannon Flynn, E. Calvin Alexander, Jr. and Scott Alexander (2008) *A Quantitative Dye Trace in the Bat River System*, 7 p. [word Doc]

[5] Shannon Flynn, E. Calvin Alexander, Jr. and Scott Alexander (2008) *A Quantitative Dye Trace in the Bat River System*, poster. [pdf]

[6] Kelsey Peterson, Scott C. Alexander, E. Calvin Alexander, Jr. and Shannon Flynn (2008) *Peptidoglycan Degradation Fluorescence: Applications to Karst Groundwater Mapping*, 12 p. [word Doc]

[7] Kelsey Peterson, Scott C. Alexander, E. Calvin Alexander, Jr. and Shannon Flynn (2008) *Peptidoglycan Degradation Fluorescence: Applications to Karst Groundwater Mapping*, poster. [pdf]

[8] Scott C. Alexander, Andrew J. Luhmann, E. Calvin Alexander, Jr., Jeffrey A. Green and Andrew J. Peters (2008) *Spring Characterization Methods & Springshed Mapping*. *In:* (Yuhr, Lynn B., Alexander, E. Calvin, Jr. and Beck, Barry F., editors) ***Sinkholes and the Engineering and Environmental Impacts of Karst, Proceedings of the 11th Multidisciplinary Conference***. ASCE/GI Geotechnical Special Publication No. 183, Amer. Soc. Civil Eng., Reston, VA, p. 485-494. [Word doc.]

[9] Jeffrey A. Green, Andrew J. Luhmann, Andrew J. Peters, Anthony C. Runkel, E. Calvin Alexander, Jr., and Scott C. Alexander (2008) *Dye Tracing Within the St. Lawrence Confining Unit in Southeastern Minnesota*. *In:* (Yuhr, Lynn B., Alexander, E. Calvin, Jr. and Beck, Barry F., editors) ***Sinkholes and the Engineering and Environmental Impacts of Karst, Proceedings of the 11th Multidisciplinary Conference***. ASCE/GI Geotechnical Special Publication No. 183, Amer. Soc. Civil Eng., Reston, VA, p. 477-484. [Word doc.]

[10] Jeffrey A. Green Andrew J. Peters, Andrew J. Luhmann, E. Calvin Alexander, Jr. and Scott C. Alexander (2008) *Forestville North Dye Trace*, 9 p. [pdf]

[11] E. Calvin Alexander, Jr., Scott C. Alexander, Andrew J. Luhmann, Cale T. Anger, Jeffrey A. Green and Andrew P. Peters (2009) *Sinks and Rises of the South Branch Root River, Fillmore County, Minnesota*. (abs. 10-4). 2009 Abstracts with Program, North Central Section, Rockford, IL, V. 41, n. 4, p. 18. [Word doc.]

[12] Andrew J. Luhmann, Scott C. Alexander, E. Calvin Alexander, Jr., Jeff A. Green and Andew P. Peters (2009) *Flow Path Characterization using Spring Thermographs* (abs. 10-3). 2009 Abstracts with Program, North Central Section, Rockford, IL, V. 41, n. 4, p. 17. [Word doc.]

[13] John G. Ackerman, Clayton T. Kraus, David W. Gerboth, Daniel S. Dornink and E. Calvin Alexander, Jr. (2009) *Holy Grail Cave, Fillmore County, Minnesota* (abs. 10-5). 2009 Abstracts with Program, North Central Section, Rockford, IL, V. 41, n. 4, p. 18. [Word doc.]

[14] Jeffrey A. Green Andrew J. Peters, Andrew J. Luhmann, E. Calvin Alexander, Jr. and Scott C. Alexander (2009) *Harmony Fall 2008 Dye Trace*, 23 p. [pdf]

[15] Jeffrey A. Green Andrew J. Peters, Andrew J. Luhmann, E. Calvin Alexander, Jr. and Scott C. Alexander (2008) *Frego Creek Spring 2009 Dye Trace*, 23 p. [pdf]

VIII. REPORTING REQUIREMENTS: Periodic work program progress reports will be submitted not later than 31 December 2007, 30 June 2008, 31 December 2008. A final work program report and associated products will be submitted between June 30 and August 1, 2009 as requested by the LCCMR.

Attachment A: Budget Detail for 2007 Projects - Summary and a Budget page for each partner (if applicable)

Project Title: Innovative Springshed Mapping for Trout Stream Management, ML 2007, [Chapt. 30], Sec. [2], Subd. 5g.

Project Manager Name: E. Calvin Alexander, Jr.

Trust Fund Appropriation: $ 270,000

$145,000 to U of Mn, $125,000 Contract to DNR/Waters

2007 Trust Fund Budget	Result 1 Budget:	Amount Spent (30 Jun 09)	Balance (30 Jun 09)	Result 2 Budget:	Amount Spent (30 Jun 09)	Balance (30 Jun 09)	Result 3 Budget:	Amount Spent (30 Jun 09)	Balance (30 Jun 09)	TOTAL BUDGET	TOTAL BALANCE
	Springshed Maps and Reports			*Springshed Assessment Protocols*			*Trout Springshed BMPs*				
BUDGET ITEM											
U of MN PERSONNEL: wages and benefits (PM 5% time, Staff Scientist 40% time, RA 50% time)	75,468	74,827	641	42,451	45,204	-2,753	9,433	9,430	3	127,352	-2,109
U of MN Field Equipment: (3 data loggers @ $1,200 each, 3 pressure transduces @ $800 each, misc. field equipment)	4,667	4,667	0	2,333	2,045	288	0	0	0	7,000	288
U of MN Expendable field and laboratory supplies (dye, sample bottles, chemicals, labs supplies, field supplies, etc.)	3,765	4,324	-559	1,883	0	1,883	0	0	0	5,648	1,324
U o Mn In State Travel Expenses for Field Work	3,333	3,436	-103	1,667	1,067	600	0	0	0	5,000	497
Contracts - DNR Waters (Project Partner, Jeffrey Green, SE Minnesota Groundwater Specialist)											
DNR PERSONNEL: wages and benefits (Staff Hydrogeologist 100% time)	59,140	59,140	0	33,267	33,267	0	7,393	7,393	0	99,800	0
DNR Field Equipment: (conductivity probes [to be used with previously purchased data loggers], notebook computer to download data loggers, water sampling equipment, mapping equipment)	3,133	3,133	0	1,567	1,567	0	0	0	0	4,700	0
DNR In State Travel Expenses for Field Work	3,867	3,867	0	1,933	1,933	0		0	0	5,800	0
DNR Out of State Travel (Presentation of preliminary findings at 11th Multidisciplinary Conference on the Environmental and Engineering Aspect of Karst, Sep. 2008, Tallahassee, FL)	1,333	1,333	0	667	667	0	0	0	0	2,000	0
DNR Sample Analyses (water chemistry and stable isotopes)	4,467	4,467	0	2,233	2,233	0	0	0	0	6,700	0
DNR GIS Software for Field Laptop (Manufacturer requires purchase of single user Arcview 9.2 license for use in field laptop.)	2,667	2,667	0	1,333	1,333	0	0	0	0	4,000	0
DNR Office and Field Operations Mail (printing, office supplies,cell phone service.)	1,185	1,185	0	666	666	0	149	149	0	2,000	0
COLUMN TOTAL	**$163,025**	**$163,046**	**-$21**	**$90,000**	**$89,982**	**$18**	**$16,975**	**$16,972**	**$3**	**$270,000**	**$0**