



Protecting groundwater-sourced drinking water:

An assessment of the needs and barriers faced by local water management professionals

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Cover image: East Otter Tail SWCD Irrigation Scheduler Technician Arnie Rethemeier recently retired. The district is helping landowners carry on the important work of addressing groundwater demands. Photo courtesy of EOTSWCD.

EXECUTIVE SUMMARY

The Minnesota Department of Health (MDH) is charged with safeguarding the state’s drinking water, which is done through a combination of pollution prevention, treatment, and monitoring strategies. Given the significant influence of land uses and management practices on water quality, prevention strategies necessarily include a major focus on promoting land uses and practices that minimize threats in wellhead protection areas. Consequently MDH recognizes the need to improve collaboration with SWCD and other local water management professionals in agricultural regions of the state who provide natural resource services and advice to landowners and communities.

Protecting groundwater sources of drinking water entails a long-term investment in sound land use planning and management. This kind of work will rarely be urgent for local water resource professionals, and therein lies a pronounced dilemma. Successful groundwater protection hinges upon effectively guiding land management decisions. Groundwater protection requires prioritizing, targeting, and allocating resources for the essential work of educating landowners and their communities, providing technical assistance, monitoring resources, and planning long-term projects. This work is not urgent. It is methodical, but it is nonetheless critical. In this context, the MDH Source Water Protection unit seeks to understand how to improve their support for these key local staff, in order to help them prioritize, improve, and/or accelerate this work.

MDH engaged the Freshwater Society (FWS) to conduct a qualitative needs assessment with the primary research question: “How can state-level agencies best match resources with local needs in order to accelerate the adoption and implementation of groundwater and drinking water protections?” In order to answer this question, FWS and MDH staff designed a two-stage process – an online survey followed by in-person structured group conversations -- to gather input from local water management professionals in targeted regions regarding their needs for, and barriers to, effective groundwater-sourced drinking water protection. Both stages were also designed to invite participant recommendations for objectives or specific strategies that could improve or accelerate this work.

Among the many findings from the study, we highlight the very clearly expressed need for staff to receive education in hydrogeology and agronomy, and to be supported in carrying out education of multiple community sectors in order to raise essential baseline awareness of and value for groundwater. In addition, our results point out significant funding needs in order to improve groundwater protection work, in particular funding for cost-share and incentive programs that target groundwater and would motivate individual landowner practice changes. In addition, our study highlights a core problem in funding critically needed public health work through the inherently cyclical and interrupted model of a competitive grant program (i.e. the Clean Water Fund grants). The essential work of implementing long-term changes, investing in relationships and building trust, and doing education and outreach doesn’t align well with the time-limitations and competitive nature of a grant model.

In this report we summarize the needs and barriers described by study participants, according to thematic categories. We also present the participant-generated objectives that could serve to guide the allocation of state resources in order to improve or accelerate groundwater-sourced drinking water protection efforts (Table 1 and below.) The Freshwater Society endorses these objectives as important goals that could guide

MDH resource allocation planning. In addition to these objectives, we present the participants' specific strategy ideas for how the recommended objectives could be accomplished (Table 1). The inclusion of these strategies does not imply an endorsement by the Freshwater Society, rather our intent to accurately represent the voices of study participants. As noted above, MDH is a relatively new partner to SWCDs. Much of the SWCDs' work has focused on surface waters. Field staff may be unaware of resources that already exist to fill their expressed needs, and support the work they do to protect drinking water sources by protecting sensitive lands, wellhead protection areas, and recharge zones. This report also seeks to highlight, and close, that information gap.

Finally we compare the recommended objectives and strategies to the Groundwater Restoration and Protection Strategies (GRAPS) framework – currently proposed as a primary vehicle for improving local watershed-based groundwater-sourced drinking water protection in Minnesota – in order to shed light on its potential strengths and limitations (Table 2). Following are the participant-recommended objectives for resource planning and allocation to improve or accelerate protection of groundwater-sourced drinking water:

1. Education/Outreach

1A. Support development of staff communication skills, including how to tailor communication and messaging for priority audiences (landowners, local businesses, and local elected officials).

1B. Prioritize and support staff time dedicated to outreach (especially to landowners, but also community members, agricultural advisors, and local businesses).

1C. Expand and support education of all community sectors in order to raise baseline understanding of 1) local and general hydrogeology; 2) health and quality-of-life importance of drinking water protection; 3) interconnectedness of surface and groundwater; 4) financial cost of impaired waters/economic value of clean groundwater; and 5) the long-term nature of groundwater protection.

1D. Support dynamic outreach/public relations campaign(s) to deliver clear and consistent messaging about groundwater value to all community sectors; strategically utilize media outlets.

1E. Educate absentee landowners to promote understanding that the health of their land and local natural resources is part of their long-term investment.

2. Staff Capacity

2A. Prioritize needed education and training for SWCD and other local water management professionals specifically on relevant content in 1) hydrogeology 2) agronomy 3) state and local water management jurisdictions.

2B. Prioritize and support communications, education, and outreach skill development and time allocation within SWCD offices, or through region-wide shared staff positions or consultants.

2C. Prioritize agronomic expertise and certification within local SWCD offices in agriculture-intensive regions.

3. Local program implementation

3A. Enhance the tools and technical support available to SWCDs in order to improve, target and support resource protection efforts.

3B. Improve and/or expand monitoring and data in order to better understand local groundwater status, high pollution sensitivity areas, and specific BMP impacts, to more effectively implement protection.

4. Funding

4A. Increase the level of stable, consistent funding for SWCDs in order to build staff capacity, improve effectiveness, and accelerate conservation in sensitive and priority areas.

4B. Promote policy changes that could improve funding access or increase funding available for groundwater/drinking water protection, education and outreach, BMPs, and conservation programs.

4C. Promote policies that offer tax incentives or credits for land uses and BMPs that protect drinking water resources.

5. Regulation/Mandates

Pursue modifications to existing or emerging regulatory authorities that would accelerate landowner participation in conservation and monitoring programs on sensitive lands and in WHPAs.

6. Collaboration/Leadership

Improve collaboration among state agencies and with local agricultural partners to reduce jurisdictional overlaps, streamline planning processes, reduce duplication, coordinate priorities and programs, and maximize the impact of water protection efforts.

I. INTRODUCTION

Access to safe and sufficient drinking water is fundamental to protecting public health and maintaining economically and socially vibrant communities. Recent surface water contamination crises in Flint MI, Toledo OH, and Des Moines IA have brought the vulnerabilities of public drinking water systems into the national spotlight. Thankfully Minnesota has not thus far experienced a drinking water crisis on such a large or public scale. Yet our state is clearly not immune to the possibility of a drinking water crisis. Indeed a number of rural Minnesota communities have already seen smaller-scale crises, most due to contamination or shortage of groundwater supplies. Of those having to do with quality impairments, the majority involved excess nitrate resulting from agricultural practices. These smaller-scale (but nonetheless problematic for those affected) crises are indicative of the widespread vulnerability of many rural community water supplies, because agricultural practices are such a major contributor to groundwater quality impairments, and because much of Minnesota's rural landscape is heavily dominated by intensive row-crop agriculture.

Multiple state agencies are involved in managing Minnesota's water resources, namely MDH, DNR, PCA, and MDA. Among them, MDH has a relatively smaller role that centers on safeguarding drinking water quality and enforcing the federal Safe Drinking Water Act (SWDA). MDH approaches this charge through a combination of prevention, treatment, and monitoring strategies, working with relevant partners in each strategic category. In the area of prevention, many strategies focus on influencing land uses and practices, given their significant role in groundwater quality. Consequently MDH recognizes the need to collaborate with SWCD staff and county local water management professionals who are uniquely tasked with managing natural resource programs at the local level and providing natural resource services and advising to private landowners. Given the importance of these local partners, it behooves MDH to assess the needs and barriers they face in order to better support their effectiveness in carrying out this vital community health work.

Protecting groundwater sources of drinking water entails a long-term investment in sound land use planning and management. This kind of work will rarely be *urgent* for local water resource professionals, and therein lies a pronounced dilemma: their success hinges upon prioritizing, targeting, and allocating resources for the non-urgent but nonetheless essential work of educating, monitoring, planning, and influencing land management. Although they have a goal of preventing water impairment crises, the threat of a crisis does not clearly propel this work. If or when a crisis occurs, the onus for immediate and practical response does not fall on these local water resource staff. Rather, it falls on rural water suppliers who treat, repair treatment facilities, or install new wells. So, while the local staff are tasked with this critically important long-term public health work, they do not benefit from the urgency or clarity of purpose that bearing ultimate responsibility for crisis response might convey. Nor would they be likely to benefit from the added public attention and allocation of resources if or when crises occur. They need the support of guiding policies, adequate funding, and public and political demand to drive the prioritization of this work.

II. METHODS

This study included two stages. First we conducted an online survey designed to elicit opinions on funding, staffing, training, and technical needs. The survey link was sent to 152 SWCD and other local water management professionals in four regions selected because they have known groundwater concerns: SE Minnesota (Dakota, Goodhue, Fillmore, Nobles, Pipestone, Lincoln, and Wabasha SWCDs and counties); SW Minnesota (Nobles, Pipestone, Lincoln, and Rock SWCDs and counties; Heron Lake, Lac Qui Parle, and Yellow Medicine watershed districts); North Central/Straight River groundwater management area (GWMA) (Becker, Hubbard, Wadena counties), and West Central MN/Bonanza Valley GWMA (Douglas, Kandiyohi, Pope, Stearns, and Todd SWCDs and counties, Sauk River Watershed District, North Fork Crow Watershed District).

The survey consisted of 17 questions -- 15 focused on content and 2 on demographic identification. Of the 15 content-specific questions, 12 were multiple choice and 5 were open-ended (Survey questions provided in Appendix 1). Eighty people completed the survey by the conclusion of a three-week response window in October 2015 (53% response rate).

Stage two consisted of structured in-person World Café-style conversations with water resource professionals in the four target regions. Invitations were sent to the same list of 152 local professionals, with 65 attending. World Café is a tool for engaging groups of people in meaningful small-group conversations focused on specific topics. Facilitators establish clear expectations that everyone present participate in sharing and recording ideas within each small group. The World Café methodology is excellent for facilitating participants to share knowledge, capture ideas, and coalesce and identify themes.

The effectiveness of World Café conversations hinges upon the focused and carefully crafted questions that spark and direct the thinking of participants. The responses and comments generated by the questions serve as qualitative data that can then guide the participant groups, or those overseeing them, in decision-making, program development, and prioritization. For this study, FWS staff worked with the MDH Source Water Protection unit to craft four questions designed to explore more deeply the needs and concerns identified in survey responses and to elicit even more detailed, nuanced information. The four questions used were:

1. What do you think has to happen to bring more targeted funding to protect drinking water resources to your area?
2. What do you urgently need to help your organization more effectively engage landowners in protecting drinking water resources in your area?
3. What kinds of skill, knowledge or training are most urgently needed to help your organization protect or improve drinking water resources, and who needs them?
4. What do you need from local decision-makers and community members to make drinking water a higher priority?

We conducted 5 World Café sessions (1 in each of 3 regions and 2 in the 4th region) over the course of one month (Dec 2015 – Jan 2016), and 65 people participated in total (42% participation rate). Between the conversations and the open-ended survey questions, we collected 1017 discrete participant comments,

each focused on a need, barrier, objective or strategy for improving or accelerating local groundwater-sourced drinking water protection. All participant comments were entered into a spreadsheet and coded by question, region, participant-identified theme, and multiple themes that emerged from qualitative data analysis. We then sorted and re-sorted this dataset multiple times and in multiple ways to comprehensively read and analyze the “stories” that emerged from participant comments and themes. Through this process, we identified six categories that we felt best clarified the participant needs and ideas expressed: Education/Outreach/Communications, Staff Capacity, Local Program Implementation, Funding, Regulation/Mandates, and Collaboration/Leadership.

The final step in this study was to compare needs expressed by study participants to the proposed Groundwater Restoration and Protection Strategies (GRAPS) template. The goal of this comparison was to shed light on the adequacy or limitations of the GRAPS process in supporting the specific needs expressed by the field staff. This report concludes with a summary of that comparison.

We note that our focus on groundwater sources of drinking water determined the demographic of participants: water resource professionals working in rural agricultural communities reliant upon groundwater-sourced drinking water and where threats to groundwater from land use practices exist. Given this demographic, we were able to assume a common understanding that references to drinking water implied groundwater-sourced. Also in light of this demographic, we recognize that our recommended objectives and the participants’ strategy ideas likely have limited applicability to urban and surface-water-dependent communities. A different study, audience, and set of questions would be necessary to explore the needs and barriers for drinking water protection in those communities.

Finally, we note that there was an extremely high degree of similarity among the comments generated by distinct conversations within each region and among the different regions. Therefore we were able to capture the majority of comments and ideas in the six identified categories. There were a small number of comments or strategy recommendation given by study participants that did not fit in the common categories or themes and thus are not reflected in this report. We have made the entire dataset of comments and sorting categories available to the members of the MDH Source Water Protection unit for further investigation should they wish to do so.

III. NEEDS AND RECOMMENDED OBJECTIVES

1. Education / Outreach/Communication

This category contains by far the largest quantity of comments from the study. Regardless of the specific question at hand, or the region in which the comments were made, many participants found their way to stressing the critical importance of education, outreach, and communications work if they are to improve or accelerate drinking water protection. They emphasized both their needs to GET more education themselves, and to DO more education within many sectors and at multiple levels in their communities. They felt that groundwater is a mysterious resource to many audiences and, with limited understanding or knowledge, people are often inclined to take it for granted and not to value the work, effort, or land use changes necessary to protect it. Education and outreach work is essential to raise baseline public understanding and value of the resources, which in turn motivates demand for, and support of, drinking water protection efforts, and sufficient funding for local projects.

Local staff need support to DO more education and outreach

Study participants emphasized the need to do more education and outreach work in their communities, targeting multiple audiences and at multiple levels. In particular, they emphasized the need to undertake a top-down approach, focused on reaching state and local decision-makers who shape and drive water protection work through policy and funding decisions. Participants felt that local- and state-level decision-makers need to understand more about the science and complexities of groundwater, the interconnectedness of all water resources, the groundwater quality and quantity trends in a given area, and the impacts of the land use decisions or policies they make or influence, in order for the local water protection work to be improved or accelerated. Improved knowledge and understanding is essential to motivate these elected officials to advocate for local programs and necessary resources, guide priority setting, make constructive decisions in line with local priorities, instill public confidence, and create, endorse, expand, or better coordinate supportive policies.

Multiple participants suggested the need to conduct groundwater and conservation education specifically for local government officials (particularly county and SWCD board members), as they felt this is generally a neglected audience with regard to conservation education programming. Some even urged that a “Conservation 101” training should be a requirement for anyone assuming local public leadership positions. Participants suggested that this training should cover the following topics:

- The basics of groundwater, surface water, and how they interact locally
- Important local conservation issues
- Land-use planning for conservation
- Where does my drinking water come from and where does it go
- What their role is and the impact their decisions will have
- Who is responsible for what – state agencies vs. local
- The basics of effective/responsible leadership (e.g. an elected official’s responsibility to come to meetings prepared to make decisions, to read materials prepared by staff before the meeting, and refrain from overstepping management boundaries with staff)

Study participants also stressed the need for a bottom-up educational approach focused on educating landowners and other community members, in order to develop a community's demand for clean, safe, secure, drinking water resources. Local residents and community members must understand the value of the resource to the community and the true costs of providing clean, safe, and sufficient water to meet their needs. Landowners in particular need a thorough understanding of how and to what extent their individual land use decisions affect groundwater. Participants also felt that those doing local education must utilize approaches that engage citizens in understanding the problems and their personal connection to it, without blame. Past patterns of blaming and pointing fingers have not been helpful. Everyone involved must be willing to not only engage, but also to learn, change how decisions are made, and try new approaches to protecting drinking water.

Effective groundwater education and outreach efforts will require substantial time and effort by local water management staff. The time required can't be conjured out of their "spare" staff hours. There is a need to prioritize staff time spent on these endeavors, invest state and local dollars in staff capacity and resources specifically for this category of work, and/or explore options for providing specialized consultants, resources, or shared staff positions across districts (more in Staff Capacity section below).

Need for outreach and communication materials

In addition to time and training, local staff need support in developing or obtaining outreach materials that are written in clear, understandable, and accurate language, and that are tailored to specific audiences. Community members, landowners, water professionals, and decision-makers are vastly different audiences with different informational needs, and differing stakes in the issue. Along with materials, staff need support in exploring and utilizing alternative, effective communication strategies to reach desired audiences, and to recruit the "right" people to attend informational meetings or target outreach efforts (e.g. owners of sensitive lands, absentee landowners, local opinion leaders). Holding meetings with landowners who are already doing conservation practices, or are not on sensitive landscapes, accomplishes little.

Challenges and barriers to groundwater protection

In addition to describing many needs and opportunities, study participants were also very clear about the many factors that complicate or impede the daunting task of groundwater protection in general, and education and outreach work in particular. These challenges are worth noting and keeping in mind as objective or strategy decisions are weighed. Among the challenges stressed by participants were the following:

- As mentioned, many people are not aware of their drinking water sources and take the resource for granted. According to study participants, as long as people can turn on the tap and water comes out, many don't want to think about where it comes from, how it is managed, or what is needed to keep it clean. Multiple study participants in multiple locations expressed the cynical opinion that it would take a local or nearby significant water crisis to turn the attention of community members to drinking water.
- A strong value of self-reliance and widespread mistrust of government among many rural landowners means that many landowners are resistant to land management advice from government

representatives. To be effective, local water management staff need to build trusting relationships over extended time periods; they also need to approach landowners with understanding and respect for their individual situation and constraints and work with agricultural partners who are already in relationships of trust with farmers.

- Absentee landowners are an increasingly significant demographic in rural MN and may be especially difficult to access with messages about the importance of protecting local groundwater and strategies for doing so (e.g. incorporating conservation measures into farm lease agreements)
- Groundwater can be a difficult concept to understand. It is unseen, and therefore difficult to prioritize in comparison to surface waters. Surface waters garner more attention from local policy makers, and from state and local agencies that influence local policy decisions. Separate surface and groundwater management processes have led to a public misconception, shared by many community members, landowners, and policy-makers, that surface water and groundwater are separate resources. That misconception of separation creates a barrier to more effective water management. The “silo-ing” of surface and groundwater in policy and management has also meant that local water protection staff and landowners sometimes feel torn by competing expectations and priorities imposed on them by different agencies.

Selected participant quotes related to education, outreach, and communications:

“We need public awareness in order to raise awareness at the legislature”

“Individual citizens are needed to drive targeted funding. Make these issues ‘personal’”

“Need education for legislators to explain that outcomes might not be measurable within the short-term or 3-yr grant cycle. It took us 150 years to get to this place. We’re not going to fix the problems within a 3-yr grant cycle”

“Conservationists often do a poor job teaching. Need professional educators and communicators.”

“Everyone needs to understand that groundwater doesn’t follow watershed boundaries”

“Sometimes we do the same thing expecting a different result -- same outreach type, same meeting. We need new methods.”

“Groundwater is a tough concept to teach. Need fresh tools, fresh methods, short consistent messages – what can landowners do?”

2. Staff Capacity

As mentioned, competent, educated local water staff with the right skills, knowledge and experience, are essential to improving or accelerating groundwater protection efforts. Education of current staff could partially meet this need. Yet participants also expressed a strong need to expand the groundwater protection capacity of SWCDs by creating shared, regional positions. For example, they felt that all agriculture-intensive counties or districts should have at least one resource person with very specialized expertise and experience in agronomy.

Also, given the importance of communications and outreach, SWCDs may benefit from adding staff with specific responsibilities and expertise in this area. As with agronomic expertise, there is a strong case to be made for a shared regional position that focuses on developing effective outreach campaigns, materials

that field staff can distribute to landowners, and clear, compelling, location-specific messages that resonate with the wide range of audiences.

Need for staff education in hydrogeology and agronomy

The challenging work of protecting groundwater-sourced drinking water requires competent, educated local water staff with right skills, knowledge and experience to understand the state of the resource, and to talk about it with various audiences. In both the survey and World Café sessions, participants emphasized their needs for more education and training in hydrogeology and agronomy. Water professionals who land at SWCDs and in county water management roles typically have strong natural resource science backgrounds, but less or no formal education in these specialized areas.

General knowledge of hydrogeology is obviously important for those tasked with groundwater protection. But to be truly effective in their communities, those with this responsibility need highly specific knowledge of local conditions, resources, and impacts. Minnesota's groundwater is a scientifically complex and spatially variable resource. Depths, characteristics, quantities, and sensitivities to contamination vary enormously across the state and even within some individual counties.

Participants also identified a clear need for more specialized agronomic training and education. Farming is a predominant land use activity in much of Minnesota and its practices comprise a major source of groundwater contamination, and therefore the major arena in which protection measures must be implemented. Local staff must be able to work well and closely with local farmers, to "talk their talk," understand their priorities, pressures, options, and questions, to translate scientific information about groundwater, economics, and health risks into language and priorities that matter and make sense to them, and to promote appropriate land use practices in the right places. This is no small challenge. Investments in the agronomic education and/or capacity of field staff are clearly needed.

Need for staff training in outreach and communications

Participants identified a need for training in outreach and communication in order to work more effectively within their communities. Local water staff must be skilled in communicating not only with landowners, but with a very wide audience including crop consultants and other agricultural advisors, private well owners, local decision-makers, and conservation partners. Effective communication and outreach entails a distinct set of skills that can be developed and improved through training and education.

Beyond access to the kinds of education listed above, participants also identified the underlying need for the funding, time, and support from local boards, to pursue needed training and professional development. As we will discuss in the Collaboration/Leadership section, it will take a solid foundation of leadership and political will to focus resources on groundwater and drinking water protection.

3. Local Program Implementation

Participants in both the survey and conversations identified needs for better tools, data, and monitoring that would help them 1) understand and talk about their local groundwater resources, sensitive areas, and the potential or actual sources of contamination; and 2) persuasively promote alternative land uses and practices.

Need for more and better data

Local water management staff need good quality data to fuel their outreach efforts in the broader community. Such data, combined with the ability to analyze and translate into clear and understandable communications, provides a convenient entry point for water professionals to engage community members in drinking water protection. In addition to bolstering education, outreach, and communication efforts, better data will help staff and decision-makers attract, prioritize, and direct funding and protection measures. Even more critically, water management staff need local, accurate, and comprehensive data in order to confidently promote land-use decisions.

Participants named many specific data needs. Among those mentioned include: the baseline condition of groundwater, the supply available for all community uses, and the specific and accurate costs associated with providing safe and clean drinking water. In addition, they felt more data are needed on local sources and rates of contamination; more precise boundaries of vulnerable wellhead protection areas; flow directions, and quality trends over time; more detailed correlations between specific BMPs and groundwater impacts.

Need for more and better monitoring

Study participants also listed many needs for specific kinds of monitoring to generate the data that could help them better understand their local groundwater situation and/or work more effectively to protect resources. Among the monitoring needs, they listed: monitoring that would help to quantify the correlation between certain ag practices and water quality outcomes; edge-of-field monitoring to gain more site-specific information; more frequent or continuous testing of municipal wells to better identify resource concerns; monitoring stormwater infiltration near public water supplies; overall expansion of DNR monitoring to include more sites; and establishing regionally coordinated groundwater quality monitoring to better track long-term trends (See Table 1 for more complete list of participant-requested data and monitoring).

Need for modeling and information tools

Participants also stated the need for modeling tools that can yield helpful information related to groundwater protection. For example, they specified the need for better runoff modeling (similar to [MinnFarm model for feedlots](#)); and a modeling tool would help show benefits of BMPs as they are multiplied on the landscape, and the extent to which benefits increase over time.

A County geologic atlas is a useful tool that provides extensive data, and participants felt that every county needed one. At the same time, this is unlikely to fulfill all the data needs of local water management staff. Also, related to the need for data and monitoring, study participants expressed a need for strong multi-district networks in order to foster more data sharing.

Selected participant quotes related to program implementation:

“I don’t think we know well enough what the public knows or understands”

“We need all the relevant data that is needed to make the best decisions”

“BMPs need to be demonstrated to be effective at protecting water quality”

“We need to get a handle on the cumulative impacts of water usage”

“Clarify the goals for groundwater – we can’t go for funding if we don’t know the goals”

“We need to know how vulnerable we are and which areas need the greatest protection”

4. Funding

Participants identified funding for drinking water protection work as a critical need; lack of sufficient funding presents a major barrier for local water management staff to improve or accelerate their efforts. Participants clearly pointed out two distinct areas of need related to funding: first, increased funding *levels* for groundwater protection work or specific aspects of it; and second revisions in the *processes* and *policies* related to funding access and distribution.

Funding level/target

Participants stressed the need for more, consistent general operating funds for their offices, if they are to dedicate more time to drinking water protection efforts. Although 75% of respondents in our online survey ranked drinking water protection as a medium or high priority in their district, 74% reported spending 0-25% of their time working on drinking water protection in the past year. Currently, SWCDs rely heavily on Clean Water Fund grants to finance drinking water quality work – project by project. More general funding is essential because more effective drinking water protection would involve a significantly greater investment of staff time and resources in non-project-specific work areas such as data collection, developing staff knowledge and expertise, long-range planning, and outreach/communications. Increased and more secure base funding would also improve staff retention, as frequent staff turnover was identified as yet another barrier to effectiveness. Districts invest in the skills, knowledge and networking of a staff member, then the individual leaves for a better-paying entity and the investment is lost.

As previously mentioned, there is a critical need to fund education and outreach work in order to raise public awareness and value of groundwater resources, as well as generate motivation and public and political support for on-the-ground projects. Currently the Clean Water Fund guidelines exclude education and outreach as a focus of grant proposals. Most SWCDs do not have other sources of access to funding for education and outreach, nor do they have the staff capacity to thoroughly undertake this work.

Beyond general operations and education/outreach work, participants raised many specific funding needs related to drinking water protection. For example, funding is needed for maintenance of water-protective BMPs after installation, and small-scale alternative or innovative practices for landowners with smaller, or specialized, operations. They proposed that additional drinking water protection funding should be specifically allocated to those counties where land uses directly impact (or could protect) drinking water sources for major cities or the metropolitan area. They also stressed that it may make good financial sense for counties to fund easements or outright purchase of key parcels in vulnerable wellhead protection areas (thus taking the parcels out of row crop production) rather than treat water after it becomes impaired by status quo land usage. Funding accurate and comprehensive cost-benefit and cost-comparison modeling of such scenarios is key. There is also a need for increased funding specifically for low-income property owners in vulnerable wellhead areas to update septic systems or implement BMPs. Participants also mentioned a related significant need for financial assistance for low-income landowners to install new wells when current ones exceed nitrate standards.

Above all, participants repeatedly stressed the need for, and the current insufficiency of, funding specifically for cost-share and incentive programs that help landowners implement beneficial practices and cease practices that adversely impact groundwater in vulnerable wellhead areas. Again, addressing land usage is key to protecting groundwater resources. Cost-share and incentive programs are also invaluable tools for facilitating local staff outreach efforts to landowners. Being able to promise, and follow through in a reasonable timeframe, with helping landowners access cost-share and incentive funding boosts credibility and the effectiveness of the local field staff outreach efforts.

Funding process/policy

The processes and policies around funding access and distribution present many barriers to effective groundwater/drinking water protection. In particular, participants spoke about challenges related to Clean Water Fund grants. Among them, grant application and reporting requirements are excessively time-consuming and the paperwork involved is onerous, cutting into time that local staff might be spending on landowner outreach and education. Many questioned why the districts must go through a competitive process in order to access these funds, given the public health imperative of the work. The competitive nature of the process creates many barriers. The larger districts typically win out over smaller districts, perhaps in part because the smaller districts don't have equivalent capacity to carry out comparable or multiple projects. Also, grant writing is a very specialized skill set that is lacking in some districts. But even in districts with staff skilled or experienced in grant-writing, the task is time-consuming and thus a significant challenge. A multi-area grant writer/administrator position could reduce this burden on field staff and improve access to grant funds for many districts, and foster cross-jurisdictional collaboration.

Another major barrier related to Clean Water Funds is that groundwater does not compete well against surface water under current guidelines and scoring requirements; surface water projects typically "win" over groundwater projects. This bias toward surface waters may be due in large part to the fact that Clean Water Fund grants require measurable water quality outcomes demonstrated by the end of a three-year grant cycle. Groundwater impairments have developed over a long time period and are the result of multiple, complex environmental factors. Improvements may be comparably slow to develop. Moreover groundwater improvements are much more difficult to measure and observe, in comparison to surface water quality improvements. It may be difficult or impossible to demonstrate with certainty the groundwater outcomes resulting from any one project within three years. As long as the measurable-quality-outcomes requirement stands, groundwater protection grant proposals will always be poorly ranked. There is a need to explore possible alternative outcome and evaluation criteria in order to make groundwater and drinking water protection projects more competitive in grant funding streams.

In general, participants identified a core problem in funding critically needed public health work through the inherently cyclical and interrupted model of a competitive grant system. The essential work of implementing long-term changes, investing in relationships and building trust, and doing education and outreach doesn't align well with the time-limitations and competitive nature of a grant model.

As mentioned, cost-share and incentive funding is critical for promoting and implementing BMPs and alternative land uses important for drinking water protection. At the same time, these funding streams often have constraints on which activities are covered. For example, participants felt that the RIM program is under-utilized because land use specifications are too restrictive for many landowners.

In addition to limits on possible activities, participants felt that available cost-share and incentive programs often have excessive constraints related to application and fund distribution procedures. Many have limited and specific signup windows. If a landowner misses the signup, he has to wait a year for another opportunity. Funding distribution can also be prolonged or delayed. Study participants expressed a strong need for more flexible or continuous signup and prompt fund distribution in cost-share and incentive programs.

Participants proposed many creative ways to more effectively fund and target groundwater protection measures where they could have maximum impact. Many of these ideas would require state-level acceptance and coordination. For example, they suggested that state agencies could collaborate to target, finance or expand landowner certification through the MDA's MN Ag Water Quality Certification program in sensitive wellhead protection areas. Groundwater/drinking water protection work could be tied to MDA Nitrogen Fertilizer Management Plan township well testing, in order to more precisely target state funds on areas where wells are found to exceed nitrate standards. The results of MDA testing could also be used to reach out to legislators to request additional groundwater protection funding. Many also felt there was a need for tax credits to reward landowners who participate in some designated water protection program or implement specified alternative practices in wellhead protection areas.

Selected participant quotes regarding funding needs:

"Nobody wants to dump money into something when they can't see outcomes."

"We need \$ when the landowner is interested, not 6-8 months later."

"Competitive grants often result in a feast-or-famine mode. Hard to gear up and then shut down when not funded next time."

"Prevention is cheaper than restoration"

"In the past, landowners could come in with a project idea, request funding, and then be implementing the project, say a grass waterway, within a month. Now it can take years for landowners to get funding."

5. Regulation/Mandates

Multiple conversations and participant comments acknowledged that land use decisions are not simply influenced by farmer education and incentivizing strategies. Indeed agricultural land use and practice decisions are heavily influenced, and in some cases perhaps exclusively driven, by federal farm policy. Many participants felt that ultimately policy and pricing changes at the national level would be necessary to truly accelerate groundwater protection work. Clearly this is beyond the scope of MDH to address but we felt it important to acknowledge the multiple comments to this effect.

Beyond changing federal farm policy, some participants felt that many landowners would ultimately make changes only in response to regulatory force. In that vein, participants made many comments suggesting regulatory or mandatory measures to improve landowner participation in conservation programs or require certain water-protective practices on sensitive lands (See Table 1 for more complete list). Here again, this objective and related strategies are likely outside the scope of MDH but seemed necessary to include, given the participant emphasis.

6. Collaboration/Leadership

Several of the previous categories have pointed to the overarching need for more leadership and demand for clean drinking water both from the community/resident level, as well as from elected and administrative leaders whose policies, decisions, and resource pools shape the local work and prioritization. As mentioned in the Education/Outreach/Communications section, education of local and state elected officials is key to bolstering support for local resource protection work. Many comments in the funding category emphasized the need for leadership to secure and protect necessary funding for all aspects of the work, as well as facilitate better access to funding.

Study participants specifically named the following support needs from local elected leaders:

- active engagement and commitment to local water management work, including a stronger commitment to financially support SWCD programs and staff capacity;
- investment in identifying shared goals
- more trust in the skills, knowledge, and instincts of local resource professionals;
- a willingness to change status quo practices;
- consistency in water management decisions across county lines.

Needs for improved collaboration

Study participants also expressed strong needs for improved collaboration at multiple levels and among multiple sectors, if their drinking water protection work is to be improved or accelerated. Under the current state water management scheme, in which responsibility for water management and water quality protection is spread across multiple agencies, each with its own focus, local staff often feel pulled by competing priorities and demands. Moreover, they feel that the “silo-ing” of priorities (for example groundwater and surface water) furthers misunderstandings, impedes support, and creates unnecessary competition among programs.

Local staff expressed a strong need for state agencies to work together on common goals and approaches to protecting water resources. When conversations unintentionally touched on the new GRAPS concept, many study participants reacted negatively (without having seen or been oriented to the new concept, nor how it would be shared with them or what would be expected of them), assuming that the “new” concept would simply imply more work, separate from current projects and reports, and without additional resources to accompany additional expectations. Participants expressed a need for state agencies to collaborate in finding shared and common threads within the entire and interconnected landscape of water management. They also expressed a need for greater focus on finding, promoting, and supporting opportunities to for field staff to collaborate across counties and districts. Groundwater is obviously not constrained by political boundaries. Its management should not be either.

IV. ALIGNMENT WITH RELATED STUDIES

The results of this needs assessment align closely with those generated by the Minnesota DNR community capacity study, conducted by the University of MN Department of Forest Resources in 2015. That study utilized an online survey to assess SWCD staff capacity to engage in groundwater protection. In addition to the survey, that study was designed to evaluate the impact of tailored groundwater education workshops on SWCD staff participants' knowledge and confidence about groundwater protection.

Among the DNR survey's findings, lack of financial resources and technical expertise were identified as the principal constraints to SWCD staff capacity for effective groundwater protection.

According to the study report¹, SWCD staff expressed clear needs for:

- (1) Information on local groundwater quality and quantity trends,
- (2) Funding for groundwater best management practices implementation,
- (3) Information on studies on land use impacts on groundwater, and
- (4) Better understanding of groundwater basics and surface-groundwater connections.

The pre- and post-workshop evaluations, meanwhile, affirmed the value of focused groundwater education trainings for staff. Participants indicated the workshops helped to significantly improve their understanding of groundwater issues and raise confidence in their ability to meet the needs of their clientele.

At the conclusion of the formal curriculum, workshop facilitators Peggy Knapp (Freshwater Society) and Sharon Pfeifer (DNR) informally asked participants to state what they thought they needed to increase the effectiveness of their groundwater protection efforts. The quick, informal assessment was intended to gather input and lay the foundation for this needs assessment. The responses to that inquiry closely align with the results of the DNR survey, as well as those that subsequently emerged from this needs assessment. Staff informally identified needs for:

- 1) Education for multiple audiences including SWCD staff, landowners, local elected officials, and crop consultants;
- 2) Funding for cost-share and incentives for landowners, and;
- 3) Technical assistance for monitoring local conditions.

Finally, our needs assessment results also align closely with conclusions reached through the Freshwater Society's Farmwise study (2011-2012), focused on reducing ag erosion and runoff. That study looked closely at the conservation delivery system, and the unintended barriers presented to SWCDs as they try to get more producers to adopt more conservation farming strategies. That study's final report, entitled "Farm To Stream: Recommendations for Accelerating Soil and Water Conservation"² included four principal recommendations for reducing systemic barriers to on-the-ground conservation work:

¹ Pradhananga, A. Davenport, M, and Perry, V. (2015). Groundwater management: Capacity assessment at the local level. A survey of Minnesota Association of Soil and Water Conservation Districts. A Final Technical Report. Prepared for the Minnesota Department of Natural Resources.

² Knapp, P., Gerber, D. (2015) Farm to Stream: Recommendations for accelerating soil and water conservation. A report of the Freshwater Society.

- 1) Adjust funding structures to make more funding more easily available to more landowners at the point of decision-making
- 2) Invest in local capacity- both staffing levels and staff training
- 3) Invest in relationships and partnerships- cultivate relationships with trusted agricultural partners
- 4) Invest in research that helps agricultural producers make better land use decisions

Looking at all these findings, the commonalities among them are striking. Among other commonly expressed needs, local water professionals clearly need: education (both *for* local staff and *by* staff in their communities); staff capacity development; more funding and technical support; and stronger collaborative relationships. In this latest needs assessment, facilitators dug even deeper into the categories of need.

V. GRAPS COMPARISON

The GRAPS concept presently comprises a two-stage strategy: 1) compiling available scientific, landscape, and resource information that exists (presumably most on a HUC 8 scale) and 2) preparing a report for water management staff in each watershed that will both clearly convey this information and provide action recommendations for protecting local groundwater sources of drinking water. Based on the Pine River Pilot experience and report, recommended actions will include diverse approaches from education to improving contaminant source management. The recommended actions are intended to be included in local water management plans.

Our needs assessment process definitively confirms the staff need for more and clearer information about local hydrogeology, quality, supply and demand, WHPA delineations, contamination sources and pathways, and land use protective strategies that are in place or known to be effective for a given unique landscape and geology. To the extent that such information is known for a watershed, the GRAPS document can potentially meet this need and serve as a very helpful informational and planning tool for local staff.

At the same time, our needs assessment process leads us to make several important qualifications, first related to the local specificity of information. The study participants expressed a strong need for highly localized hydrogeology information, if they are to improve and target their education and outreach efforts, and truly help to shift land use practices. Information at the HUC 8 scale may be sufficient in some situations. But more detailed information would be extremely helpful in some situations to better target priority land parcels and areas, practices, and funding. Future GRAPS documents are being planned that resolve data down to down to a minor watershed, HUC 12, or other scale that is more relevant, and being implemented in watersheds.

Second, in addition to local information, the local water professionals in all four regions, unequivocally and consistently expressed needs for help, support, funding, training, and better coordination for *carrying out* the necessary work of groundwater protection in their districts and watersheds. An information-compiling, documentation, and recommendation process is inherently limited, and likely insufficient in meeting those types of needs. For example, the Pine River GRAPS document recommends, “Educate the public and decision makers about the importance of groundwater and source water protection.” Clearly this is a critically needed action step, yet our assessment makes clear that the local staff do not feel adequately equipped with the time, training, resources, expertise, or prioritization guidance to carry this out effectively. The GRAPS report itself does not serve well as an outreach tool they could use to carry out this education, as it will likely be too technical for many audiences.

Ultimately we conclude that, in addition to the currently conceived GRAPS concept, MDH and state agencies should explore steps they can take to *improve the support and guidance given to* the local water management staff. In other words, MDH may want to consider making GRAPS a multi-pronged *strategy* that includes the information compilation, documentation and action recommendation process as one prong, and the second, a coordinated and planned inter-agency effort to boost support for local staff through funding, policy, staffing, and coordination avenues. MDH recognizes that GRAPS serves as a resource to provide the technical information SWCDs, watersheds and counties request, and plan to evaluate other initiatives to enhance further areas of need.

Among the many objectives recommended in this report, FWS urges strong consideration of interagency pursuit of greater collaboration in prioritizing and recommending local water protection actions, for example by integrating or acknowledging overlaps between recommended educational strategies that would benefit surface waters (via WRAPS) and groundwater (via GRAPS). Achieving better collaboration in state agency guidance and management of all waters as one interconnected resource, would greatly support local staff in feeling less beleaguered by “one more report or strategy” and aid in the effectiveness of their water education and outreach efforts in their communities. Steps are being taken toward that end. Agencies have formed an interagency sub-team under the Clean Water Fund Groundwater/Drinking Water team. As a result the GRAPS document is being developed to reflect a unified message on GW/DW from all state agencies.

TABLE 1: RECOMMENDED OBJECTIVES AND PARTICIPANT STRATEGIES

RECOMMENDED OBJECTIVES		PARTICIPANT-GENERATED STRATEGIES	Where might this resource already exist?	Who should lead?
<p><i>Freshwater Society endorses the following objectives to guide MDH resource allocation planning. These objectives derive from the comments participants noted in conversations, and represent the professional opinion of Freshwater Society.</i></p>		<p><i>The following strategies were suggested by study participants as the means to achieve the objectives. Their inclusion does not imply an endorsement by Freshwater Society. They are included in order to accurately represent the voices of study participants.</i></p>		
1 Education/Outreach/Communications				
	Target SWCDs and water resource professionals			
1 A	Work with SWCDs, counties and Executive Branch agencies to prioritize and support staff time dedicated to outreach to a variety of audiences (landowners, absentee landowners, rural residents, agronomists, certified crop advisors, implement dealers, bankers, local businesses, and youth)			SWCD MDH with support from BWSR
	Target community members, including local and absentee landowners, ag advisors, local businesses, and local leaders			
1 B	Expand and support education of all community sectors in order to raise baseline understanding of: 1) local and general hydrogeology; 2) health and quality-of-life importance of drinking water protection; 3) interconnectedness of surface and groundwater; 4) financial cost of impaired waters/economic value of the clean groundwater; 5) locally important conservation issues; 6) long-term nature of groundwater protection	1B.1 Develop a modular and flexible groundwater/drinking water education curriculum that can be tailored for a variety of audiences and local areas		MDH DNR PCA MDA

		1B.2	Develop outreach educational materials/strategies for targeted audiences, including elected officials, youth, and local businesses; for example, outreach materials for local businesses must clearly spell out the economic costs and benefits of protecting drinking water		
		1B.3	Create tailored outreach/informational packets for individual homeowners in priority areas that educate on local WHPA boundaries and concerns, their private well and septic system, local policies and funding opportunities. Personalize the issues for maximum impact.		SWCD Counties MDH PCA
		1B.4	Offer in-depth, personalized planning assistance to individual landowners in target areas		SWCD
		1B.5	Expand water education and outreach work with elementary-age children		SWCD Watershed Districts
		1B.6	Plan and hold regular targeted community education meetings that are designed carefully and thoughtfully to get the "right" people in the room for a clearly defined and specific purpose		SWCD County Water Planners
1 C	Support dynamic outreach/public relations campaign(s) to deliver clear and consistent messaging about groundwater value to all community sectors; strategically utilize media outlets such as newspaper, radio, and community meetings	1C.1	Designate regional or statewide PR specialist (or engage consultant) to maximize effectiveness; engage a well-known spokesperson to draw attention and support		MDH DNR PCA MDA
		1C.2	Instigate collaboration among water management agencies, and bundle water protection messages so as to maximize effectiveness, promote understanding about interconnectedness of water resources, and minimize landowners fatigue and/or confusion related to natural resource management priorities.		
1 D	Educate absentee landowners to promote understanding that the health of their land and local natural resources is part of an absentee owner's long-term investment.	1D.1	Create and communicate explicit guidance for incorporating conservation practices into farm lease agreements.		MDA UMN Extension

	Target state and local elected officials			
1E	Educate local elected officials to improve leadership and promote greater understanding of the impact of their land use and planning decisions on resource management.	1E.1	Develop a "Conservation 101" training program specifically for local elected officials.	MDH DNR
		1E.2	Convene annual (or regular) meetings with both SWCD and county boards present, and MDH and other state agency resource experts, to update on resource information and bolster common understanding and messaging.	MDH DNR County Water Planner BWSR PCA MDA
		1E.3	MN Association of Counties and MASCWD develop guidelines for county boards spelling out the need to address drinking water/groundwater protection	MASCWD AMC
		1E.4	Dedicate MDH staff time and resources to county and SWCD board outreach	MDH
1F	Educate state-level leaders and legislators on 1) the impacts of land use decisions on local resource management and quality of life, and 2) the fundamental problem of requiring measurable outcomes in groundwater and drinking water within the short-term, three-year grant cycle.	1F.1	Utilize existing state training resources and agency staff to undertake conservation training of local and state leaders, and address the surface water bias in Clean Water Fund grant requirements	MDH DNR BWSR
2 Staff Capacity				
2 A	Support needed education and training for SWCD and other local water management professionals specifically on relevant content in 1) hydrogeology 2) agronomy 3) state and local water management jurisdictions and schema	2A.1	Expand and/or continue DNR groundwater education workshop model, begun in summer 2015; ensure that content is maximally tailored for each area including clarification of local WHPA boundaries, supply and demand issues, baseline quality level, trends, and the impact of local land use decisions on drinking water resources.	MDH DNR

	2A.2	Develop and provide training on use and interpretation of county hydrogeologic atlases (where they are available) for local water professionals		DNR
	2A.3	Collaborate to develop and provide agronomic training to cover local ag practices, BMPs, soil health correlations to agricultural practices, individual farm economics, and irrigation management (where applicable)	MDA UMN Extension	MDH MDA UMN Extension
	2A.4	Promote Certified Crop Adviser training for local staff		MDA MASCWD
	2A.5	Clearly establish and support continuous or repeated staff training opportunities		BWSR with all agencies
2 B	2B.1	Create multi-district staff positions or engage specialist consultants in communications, grantwriting and grant administration		BWSR MDH SWCDs
	2B.2	Develop and provide communication skills training, including use of social media and other communications platforms		
2 C	2C.1	Designate ag specialist positions or create multi-district shared positions among SWCD staffs in all ag-intensive districts or regions.		BWSR SWCD MDA MDH
	2C.2	Prioritize SWCD staff getting Technical Approval Authority (TAA) certification to increase the capacity of SWCDs to provide technical assistance for conservation practices (Note: TAA is a technical credentialing system used by the Natural Resources Conservation Service (NRCS), Soil and Water Conservation Districts (SWCDs) and the Board of Water and Soil Resources (BWSR) that grants individuals the AUTHORITY to provide state agencies with services for design and construction of BMPs)		BWSR

3 Local Program Implementation					
3 A	Enhance the tools, technical data, and technical support available to SWCDs in order to improve, target, and support resource protection efforts	3A.1	Precisely identify, delineate, and prioritize sensitive land parcels in wellhead protection areas		MDH DNR collaborating with SWCDs
		3A.2	Clarify and prioritize BMPs that should be recommended and promoted for specific areas, based on hydrogeology, WHPA vulnerability, soil types, and landscape features		MDA BWSR NRCS
		3A.3	Improve and systemitize technical support for local decision-making on local land use issues in WHPAs. Could be set up like a TEP (Technical Evaluation Panel) for wetland permitting		
		3A.4	Accelerate completion of county geologic atlases for all counties		DNR MGS
3 B	Improve and/or expand monitoring and data in order to better understand local groundwater status, high pollution sensitivity areas, and specific BMP impacts, to more effectively implement protection projects (see comprehensive list of data/monitoring needs identified in Appendix 3)	3B.1	Ensure SWCD have access to necessary monitoring, and implementation equipment (see comprehensive list of equipment needs identified in Appendix 1)		MDA DNR PCA
		3B.2	Develop/expand models or research that correlate land use/BMPs and groundwater quality impacts. Disseminate results.		MDA BWSR UMN
		3B.3	Develop models and monitoring to quantify the economic costs and benefits to individual operations/counties if practices are implemented and groundwater quality improves in highly vulnerable areas		DNR UMN MDA
		3B.4	Improve water testing lab access for private well owners (who are currently impeded by the challenge of mailing or hand delivering samples to a distantly located lab)		MDH

4 Funding					
4 A	Increase the level of stable, consistent funding for SWCDs in order to build staff capacity, improve effectiveness, and accelerate conservation in sensitive and priority areas	4A.1	Seek additional, and more secure and consistent general operating funds for local SWCD groundwater protection work		BWSR
		4A.2	Seek increased funding specifically for SWCD education and outreach work		MDH BWSR
		4A.3	Secure more, and more easily accessible, cost-share and incentive funding that can be offered to landowners for BMPs or alternative land uses, particularly in identified priority areas within WHPAs (see Appendix 2 for list of priority practices identified by local staff)	NRCS EQIP	MDH MDA BWSR
		4A.4	Seek funding for easements or outright purchase of key parcels in sensitive wellhead protection areas.	USDA CRP BWSR RIM	BWSR FSA
		4A.5	Seek funding for needed equipment, monitoring, or research showing the effectiveness or impacts of BMPs on local groundwater quality	MDA UMN Extension	MDH MDA DNR BWSR UMN Extension
		4A.6	Increase funding for cost share or incentives specifically for low-income landowners in wellhead protection areas to update septic systems or implement BMPs		MDH MDA BWSR
4 B	Promote policy changes that could increase funding available for groundwater/drinking water protection, education and outreach, BMPs and conservation programs.	4B.1	Evaluate the Clean Water Fund grant process and explore alternatives to competitive grantmaking as the primary vehicle for funding groundwater and drinking water protection		BWSR
		4B.2	Amend Clean Water Fund scoring criteria to explicitly include and prioritize groundwater/drinking water resource protection and improvement as a focus		BWSR
		4B.3	Explore alternative “outcomes” that could be used to demonstrate successful protection projects in		MDH BWSR DNR

		groundwater and drinking water within 3-yr grant cycle.		
	4B.4	Expand Clean Water Fund guidelines to include drinking water education and outreach, and/or find funding to support education and outreach efforts with landowners and other community audiences		BWSR
	4B.5	Revise Clean Water Fund guidelines to allow funding for continuation of existing successful programs.		BWSR
	4B.6	Explore options for targeting and dispatching funds to specific areas where land use practices impact (or could protect) drinking water supplies for cities or metropolitan area	MDH	MDH BWSR
	4B.7	Develop incentives for multi-county or multi-district projects focused on shared waters		BWSR
	4B.8	Develop incentives to make "selling" conservation profitable for local agricultural partners, including agronomists, certified crop advisers and other agricultural partners		MDH MDA BWSR
	4B.9	Accelerate the number of lands being certified under MN Agricultural Water Certification Program (MAWQCP) by providing incentives to certifiers		MDA
	4B.10	Increase the flexibility of state cost-share programs so as to allow more BMP and land use options, and improve tools available for SWCD staff to use in landowner outreach.		BWSR MDA
	4B.11	Facilitate landowner access to cost-share programs by offering multiple or continuous application windows		BWSR
4 C	4C.1	Explore tax credit options for incentivizing and rewarding farmers for participation in designated conservation programs or implementation of designated practices within priority areas		MDH AMC Legislature

	4C.2	Create tax incentives for BMPs that protect/improve water quality and quantity.		Legislature
	4C.3	Develop policies to hold polluters responsible for treating contaminated drinking water sources		PCA MDA
5 Regulation/Mandates				
Accelerate landowner participation in voluntary conservation and monitoring programs on sensitive lands and in wellhead protection areas, and accelerate compliance with mandatory programs, by pursuing modifications to existing or emerging regulatory authorities.	5.1	Explore options for modifying or incentivizing participation in the MN Agricultural Water Certification Program (MAWQCP) in Drinking Water Supply Management Areas.		MDH MDA PCA DNR BWSR
	5.2	Explore options for accelerating implementation of conservation programs on sensitive lands		MDH MDA BWSR
	5.3	Explore options for improving compliance with university-recommendations on fertilizer application levels	NFMP	MDA
	5.4	Require licensure for anyone applying fertilizer.	NOTE: A license is required for anyone applying fertilizer, except for an individual farmer applying product to his own land.	MDA
	5.5	Require monitoring both water quantity and quality when issuing irrigation permits.	DNR	DNR MDH
	5.6	Explore options for granting enforcement capability to SWCDs		MASWCD AMC all agencies

6 Collaboration/Leadership				
Coordinate Executive Branch resources and efforts, and deepen collaboration with local partners, to: <ul style="list-style-type: none"> - clarify goals - reduce jurisdictional overlaps - streamline planning processes - reduce duplication - coordinate priorities and programs - maximize the impact of water protection efforts. 	6.1	Explore options for collaborating on and/or streamlining water management plans, in particular look at overlaps, and streamlining opportunities within WRAPS, GRAPS, 1W1P, DNR GWMA's, and county water plans		MDH MDA DNR BWSR
	6.2	Pursue increased coordination between counties, SWCDs and MN Rural Water Association		
	6.3	Explore and implement more multi-agency, and multi-district funding and project collaborations to maximize impacts, (e.g., MDH adding additional resources to BWSR's Natural Resource Block Grants in ag-dominated counties.)		
	6.4	Explore options for greater collaboration with MDA fertilizer management plan implementation, i.e. through utilizing township water testing results to target SWCD outreach efforts and funding		

TABLE 2: COMPARISON WITH GRAPS TEMPLATE

OBJECTIVES		STRATEGIES	
Currently in the GRAPS template, but local staff feedback should be sought			
Local Program implementation			
3 A	Enhance the tools, technical data, and technical support available to SWCDs in order to improve, target, and support resource protection efforts	3A.1	Precisely identify, delineate, and prioritize sensitive land parcels in wellhead protection areas
		3A.2	Clarify and prioritize BMPs that should be recommended and promoted for specific areas, based on hydrogeology, WHPA vulnerability, soil types, and landscape features
GRAPS could serve as one tool for accomplishing these, but additional tools would be needed			
Education/Outreach/Communications			
For all community sectors			
1B	Expand and support education of all community sectors in order to raise baseline understanding of: 1) local and general hydrogeology; 2) health and quality-of-life importance of drinking water protection; 3) interconnectedness of surface and groundwater; 4) financial cost of impaired waters/economic value of the clean groundwater; 5) locally important conservation issues; 6) long-term nature of groundwater protection	1B.1	Develop a modular and flexible groundwater/drinking water education curriculum that can be tailored for a variety of audiences and local areas
For SWCD and water resources professionals			
		1B.2	Develop outreach educational materials/strategies for targeted audiences, including elected officials, youth, and local businesses; for example, outreach materials for local businesses must clearly spell out the economic costs and benefits of protecting drinking water
		1B.3	Create tailored outreach/informational packets for individual homeowners in priority areas that educate on local WHPA boundaries and concerns, their private well and septic system, local policies and funding opportunities. Personalize the issues for maximum impact.
		1B.4	Offer in-depth, personalized planning assistance to individual landowners in target areas
		1B.5	Expand water education and outreach work with elementary-age children

OBJECTIVES		STRATEGIES	
		1B.6	Plan and hold regular targeted community education meetings that are designed carefully and thoughtfully to get the "right" people in the room for a clearly defined and specific purpose
1 D	Educate absentee landowners to promote understanding that the health of their land and local natural resources is part of an absentee owner's long-term investment.	1D.1	Create and communicate explicit guidance for incorporating conservation practices into farm lease agreements.
For state and local elected officials			
1E	Educate local elected officials to improve leadership and promote greater understanding of the impact of their land use and planning decisions on resource management.	1E.1	Develop a "Conservation 101" training program specifically for local elected officials.
		1E.2	Convene annual (or regular) meetings with both SWCD and county boards present, and MDH and other state agency resource experts, to update on resource information and bolster common understanding and messaging.
Staff Capacity			
2 A	Support needed education and training for SWCD and other local water management professionals specifically on relevant content in 1) hydrogeology 2) agronomy 3) state and local water management jurisdictions and schema	2A.1	Expand and/or continue DNR groundwater education workshop model, begun in summer 2015; ensure that content is maximally tailored for each area including clarification of local WHPA boundaries, supply and demand issues, baseline quality level, trends, and the impact of local land use decisions on drinking water resources.
		2A.2	Develop and provide training on use and interpretation of county hydrogeologic atlases (where they are available) for local water professionals
		2A.3	Collaborate to develop and provide agronomic training to cover local ag practices, BMPS, soil health correlations to agricultural practices, individual farm economics, and irrigation management (where applicable)
These most likely fall outside the purview of GRAPS			
Education/Outreach/Communications			
For SWCD and water resources professionals			
1 A	Work with SWCDs, counties and Executive Branch agencies to prioritize and support staff time dedicated to outreach to a variety of audiences (landowners, absentee landowners, rural residents, agronomists, certified crop advisors, implement dealers, bankers, local businesses, and youth.)		

OBJECTIVES		STRATEGIES	
1C	Support dynamic outreach/public relations campaign(s) to deliver clear and consistent messaging about groundwater value to all community sectors; strategically utilize media outlets such as newspaper, radio, and community meetings	1C.1	Designate regional or statewide PR specialist (or engage consultant) to maximize effectiveness; engage a well-known spokesperson to draw attention and support
		1C.2	Instigate collaboration among water management agencies, and bundle water protection messages so as to maximize effectiveness, promote understanding about interconnectedness of water resources, and minimize landowners fatigue and/or confusion related to natural resource management priorities.
		1E.3	MN Association of Counties and MASCWD develop guidelines for county boards spelling out the need to address drinking water/groundwater protection
		1E.4	Dedicate MDH staff time and resources to county and SWCD board outreach
1F	Educate state-level leaders and legislators on 1) the impacts of land use decisions on local resource management and quality of life, and 2) the fundamental problem of requiring measurable outcomes in groundwater and drinking water within the short-term, three-year grant cycle.	1F.1	Utilize existing state training resources and agency staff to undertake conservation training of local and state leaders, and address the surface water bias in Clean Water Fund grant requirements requirements
2 Staff Capacity			
		2A.4	Promote Certified Crop Adviser training for local staff
		2A.5	Clearly establish and support continuous or repeated staff training opportunities
2B	Prioritize and support communications, education, and outreach skill development, including how to tailor communication and messages for priority audiences (landowners, local businesses, and local elected officials) and the staff time allocated to these functions within SWCD offices, or through region-wide shared staff positions or consultants.	2B.1	Create multi-district staff positions or engage specialist consultants in communications, grantwriting and grant administration
		2B.2	Develop and provide communication skills training, including use of social media and other communications platforms
2C	Prioritize agronomic expertise and certification within local SWCD offices in ag-intensive regions	2C.1	Designate ag specialist positions or create multi-district shared positions among SWCD staffs in all ag-intensive districts or regions.
		2C.2	Prioritize SWCD staff getting Technical Approval Authority certification, to increase the capacity of

OBJECTIVES		STRATEGIES	
		SWCDs to provide technical assistance for conservation practices	
3 Local Program Implementation			
		3A.3	Improve and systemitize technical support for local decision-making on local land use issues in WHPAs. Could be set up like a TEP (Technical Evaluation Panel) for wetland permitting
		3A.4	Accelerate completion of county geologic atlases for all counties
3B	Improve and/or expand monitoring and data in order to better understand local groundwater status, high pollution sensitivity areas, and specific BMP impacts, to more effectively implement protection projects (see comprehensive list of data/monitoring needs identified in Appendix 3	3B.1	Ensure SWCD have access to necessary monitoring, and implementation equipment (see comprehensive list of equipment needs identified in Appendix 1)
		3B.2	Develop/expand models or research that correlate land use/BMPs and groundwater quality impacts. Disseminate results.
		3B.3	Develop models and monitoring to quantify the economic costs and benefits to individual operations/counties if practices are implemented and groundwater quality improves in highly vulnerable areas
		3B.4	Improve water testing lab access for private well owners (who are currently impeded by the challenge of mailing or hand delivering samples to a distantly located lab)
4 Funding			
4 A	Increase the level of stable, consistent funding for SWCDs in order to build staff capacity, improve effectiveness, and accelerate conservation in sensitive and priority areas	4A.1	Seek additional, and more secure and consistent general operating funds for local SWCD groundwater protection work
		4A.2	Seek increased funding specifically for SWCD education and outreach work
		4A.3	Secure more, and more easily accessible, cost-share and incentive funding that can be offered to landowners for BMPs or alternative land uses, particularly in identified priority areas within WHPAs (see Appendix 2 for list of priority practices identified by local staff)
		4A.4	Seek funding for easements or outright purchase of key parcels in sensitive wellhead protection areas.
		4A.5	Seek funding for needed equipment, monitoring, or research showing the effectiveness or impacts of BMPs on local groundwater quality

OBJECTIVES	STRATEGIES
	4A.6 Increase funding for cost share or incentives specifically for low-income landowners in wellhead protection areas to update septic systems or implement BMPs
4B Promote policy changes that could increase funding available for groundwater/drinking water protection, education and outreach, BMPs and conservation programs.	4B.1 Evaluate the Clean Water Fund grant process and explore alternatives to competitive grantmaking as the primary vehicle for funding groundwater and drinking water protection
	4B.2 Amend Clean Water Fund scoring criteria to explicitly include and prioritize groundwater/drinking water resource protection and improvement as a focus
	4B.3 Explore alternative “outcomes” that could be used to demonstrate successful protection projects in groundwater and drinking water within 3-yr grant cycle.
	4B.4 Expand Clean Water Fund guidelines to include drinking water education and outreach, and/or find funding to support education and outreach efforts with landowners and other community audiences
	4B.5 Revise Clean Water Fund guidelines to allow funding for continuation of existing successful programs.
	4B.6 Explore options for targeting and dispatching funds to specific areas where land use practices impact (or could protect) drinking water supplies for cities or metropolitan area
	4B.7 Develop incentives for multi-county or multi-district projects focused on shared waters
	4B.8 Develop incentives to make "selling" conservation profitable for local agricultural partners, including agronomists, certified crop advisers and other agricultural partners
	4B.9 Accelerate the number of lands being certified under MN Agricultural Water Certification Program (MAWQCP) by providing incentives to certifiers
	4B.10 Increase the flexibility of state cost-share programs so as to allow more BMP and land use options, and improve tools available for SWCD staff to use in landowner outreach.
4B.11 Facilitate landowner access to cost-share programs by offering multiple or continuous application windows	
4C Explore and develop policy alternatives that reward landowners who protect groundwater resources, and hold those who endanger public drinking water sources responsible for the costs of treatment.	4C.1 Explore tax credit options for incentivizing and rewarding farmers for participation in designated conservation programs or implementation of designated practices within priority areas
	4C.2 Create tax incentives for BMPs that protect/improve water quality and quantity.

OBJECTIVES	STRATEGIES
	4C.3 Develop policies to hold polluters responsible for treating contaminated drinking water sources
5 Regulation/Mandates	
Accelerate landowner participation in voluntary conservation and monitoring programs on sensitive lands and in wellhead protection areas, and accelerate compliance with mandatory programs, by pursuing modifications to existing or emerging regulatory authorities.	5.1 Explore options for modifying or expanding the MN Agricultural Water Certification Program (MAWQCP) in Drinking Water Supply Management Areas.
	5.2 Explore options for accelerating implementation of conservation programs on sensitive lands
	5.3 Explore options for improving compliance with university-recommendations on fertilizer application levels
	5.4 Require licensure for anyone applying fertilizer.
	5.5 Require monitoring both water quantity and quality when issuing irrigation permits.
	5.6 Explore options for granting enforcement capability to SWCDs
6 Collaboration	
Coordinate Executive Branch resources and efforts, and deepen collaboration with local partners, to: <ul style="list-style-type: none"> - clarify goals - reduce jurisdictional overlaps - streamline planning processes - reduce duplication - coordinate priorities and programs - maximize the impact of water protection efforts. 	6.1 Explore options for collaborating on and/or streamlining water management plans, in particular look at overlaps, and streamlining opportunities within WRAPS, GRAPS, 1W1P, DNR GWMA, and county water plans
	6.2 Pursue increased coordination between counties, SWCDs and MN Rural Water Association
	6.3 Explore and implement more multi-agency, and multi-district funding and project collaborations to maximize impacts, (e.g., MDH adding additional resources to BWSR's Natural Resource Block Grants in ag-dominated counties.)
	6.4 Explore options for greater collaboration with MDA fertilizer management plan implementation, i.e. through utilizing township water testing results to target SWCD outreach efforts and funding

Appendix 1. Survey questions

Needs Assessment Survey

The MN Department of Health is conducting this survey to better understand the resources you need and the barriers you face in improving drinking water (DW) protection in your area. Your participation is voluntary and your individual input will be kept confidential. This survey is the first stage in a process designed to improve and strengthen MN Department of Health (MDH) drinking water protection efforts. The second stage will be a roundtable discussion in your community at which time we hope to hear your opinions and experiences in greater depth. **Your input in both this written survey and the round-table discussion will help MDH get you the resources you need to protect drinking water in your area.**

As you read through this survey, you will see there are obvious areas of overlap between and among different questions. Your willingness to address each area distinctly, regardless of repetition, will help us to formulate specific and effective recommendations.

We ask that you please respond to this survey on or before x.

We greatly appreciate, and thank you in advance, for your participation

1. In which Minnesota Association of Soil and Water Conservation District (MASWCD) Area do you primarily work?
 - a. Northwest Area 1
 - b. West Central Area 2
 - c. Northeast Area 3
 - d. Metro Area 4
 - e. Southwest Area 5
 - f. South Central Area 6
 - g. Southeast Area 7
 - h. North Central Area 8

2. What roles do you currently fill? (Mark all that apply.)
 - a. Manager/Administrator
 - b. Conservation Technician/Agriculture
 - c. Conservation Technician/Urban
 - d. Conservation Technician/Forestry
 - e. Soil Conservationist
 - f. Engineering
 - g. Fiscal/Office
 - h. Other (please specify) _____

3. To what extent is drinking water protection (protecting public or private wells) a priority in your work?

4. In the past 12 months, about what percentage of your work time have you spent involved in drinking water protection (wellhead protection or private well issues and concerns)?

5. Rate the following potential **FUNDING** needs as to how significant you think each one is for protecting groundwater sources of drinking water in your area.

	1 not a significant need	2 minor need	3 moderate need	4 strong need	5 absolute need, can't improve effectiveness without this need being met
More funding, specifically designated for your organization's work on drinking water protection (If you answer 3-5, please add clarification in question 6)					
Clearer information on possible funding sources for drinking water protection and how to access them					
Funding for land owners to engage in drinking water protection (e.g. BMPs, incentives, cost share)					
Targeted funding from Clean Water Fund for drinking water projects					

5A. List any other **FUNDING** needs you have related to drinking water protection that we have overlooked.

6. If you ranked **FUNDING** for your organization's drinking water protection work as a moderate to absolute need, please tell us in which category you think the additional funding is most urgently needed

- Staff
- Cost share and incentives
- Technical services
- Operations
- Other (please specify)

7. What do you think keeps you from getting what you most need in **FUNDING**?

8. If you could get what you most need in **FUNDING** for drinking water protection, what could you do differently, additionally, or more effectively?

9. Rate the following potential STAFF needs as to how significant you think each is for protecting groundwater drinking water sources in your area.

	1 not a significant need	2 minor need	3 moderate need	4 strong need	5 absolute need, can't improve effectiveness without this need being met
Designated staff for communications/outreach					
Administrative support for DW/GW protection work					
Increased staffing in general to better distribute /manage entire workload					
Better coordination among staff in different regions					
Better coordination among staff in different state agencies					

10. Rate the following potential organizational RESOURCE needs as to how significant you think each is for protecting groundwater drinking water sources in your area.

	1 not a significant need	2 minor need	3 moderate need	4 strong need	5 absolute need, can't improve effectiveness without this need being met
Local land use maps					
A county hydrologic atlas					
Local wellhead protection area maps (public wells)					
Local data/maps on recharge zones (private wells)					
Local data on high drinking water pollution sensitivity areas					
Resources/data on agronomic practices related to drinking water protection (e.g. nitrogen loss, irrigation impacts, alternative cropping systems)					
Better tools and information that staff could use to inform landowners about, and promote drinking water protection					

11. Rate the following potential **TRAINING/EDUCATION** needs as to how significant you think each one is for improving DW protection in your area.

	1 not a significant need	2 minor need	3 moderate need	4 strong need	5 absolute need, can't improve effectiveness without this need being met
Training on local hydrogeology (e.g. groundwater-surface water interaction, use or interpretation of the geologic atlas, understanding local pollution sensitivity)					
Training on outreach skills (e.g. communications, community organizing, meeting facilitation, one-on-one interactions with ag community members, or managing advisory teams)					
Training on agronomic practices or BMPs related to drinking water protection (e.g. crop nitrogen management, irrigation, alternative crop production)					
Training targeting policymakers, county leadership, or other decision makers on drinking water protection					
Training on outreach and communications					
Training on managing advisory teams(?)					
Training on agronomy skills (e.g. nitrogen management)					
Training on cost-benefit analysis of implementing BMPs for DW protection					
Training on understanding pollution sensitivity in your area?					
GW education targeting specific sectors, e.g, policymakers/leadership, crop consultants					

12. How significant is your need for new or additional equipment in order to protect groundwater drinking water sources in your area?
13. If you ranked your need for equipment as 3-5 and funds were available, which pieces of EQUIPMENT would be your highest priority to purchase for protecting drinking water.
14. Rate the following potential needs for TECHNICAL ASSISTANCE from outside consultants, subject matter experts, or state agencies, as to how significant you think each is for protecting groundwater drinking water sources in your area.

	1 not a significant need	2 minor need	3 moderate need	4 strong need	5 absolute need, can't improve effectiveness without this need being met
Ag-related assistance (e.g. nitrogen management, irrigation, BMPs, or alternative crop consulting)					
General drinking water educational materials that could be shared with land owners and farmers					
Area-specific drinking water educational/outreach materials					
More continuous groundwater monitoring					
Assistance with interpretation of groundwater data					
Assistance with coordinating work teams and advisory committees					

14A. List any other TECHNICAL ASSISTANCE need you have related to drinking water protection that we have overlooked.

15. Rate the following potential POLICY needs as to how significant you think each is for protecting groundwater drinking water sources in your area.

	1 not a significant need	2 minor need	3 moderate need	4 strong need	5 absolute need, can't improve effectiveness without this need being met
Clearer mandate for, or communication about, drinking water protection from county leadership (including both county and SWCD boards)					
Improved communication, outreach, or engagement with land owners and farmers					
Improved/stronger regulation					
Clearer consequences and/or stronger enforcement for noncompliance with state water requirements					
Improved scoring system for Clean Water Fund proposals that gives preference to drinking water protection					

15A. List any other POLICY needs you have related to drinking water protection that we have overlooked 9C.
What do you think keeps you from getting what you most need in POLICY/LOCAL CONTEXT

In case we missed something important, here's your chance to tell us what you really need, and what keeps you from being more effective in your work related to drinking water protection.

16. Understanding that all needs are significant, please tell us your top three most critical needs for protecting drinking water in your area.

17. Please tell us the top three most significant barriers to protecting drinking water in your area.

Appendix 2. Comprehensive list of stated data needs (Meeting comments transcribed as written by participants)

Resources to make water testing more readily available
Provide an easy method for individuals to test their wells, which could hopefully increase participation and knowledge of water quality
Invest in supplies etc. for local water testing
Readily available and easy testing of wells so people will want to test and know the quality of their own water
MDH invest in Bacteria testing labs
Easy access to water testing
Lack of baseline data to tell us what it was before. Really hard to write a grant focusing on results when you don't know baseline. Current grants are outcome based
Do we know what data and tools we need to see multiple benefits potential?
Provide tools on how improvements could be achieved. (e.g. If you do this: _____ GW quality could increase by: _____)
Landscape/Terrain analysis – GIS databases needed to correctly show outcomes needed, available. Who has responsibility? (DNR? SWCD? MPCA?)
Dig deeper into the concept of multiple benefits – explore how we can layer together benefits expected or known from a single practice/measure/change
We need tools to understand GW impacts of different measures... Science mostly focused on surface water water impacts. Need to develop ways of management for groundwater. groundwater impacts very difficult to measure
We could use better data about current groundwater quality
Monitoring can help target BMPs but many times monitoring is short term. Many communities are short on water quality monitoring
Data that is specific to the land, helps develop a conversation and build a relationship
Specific mapped and scientific information to provide landowners to understand their local situation. Need professionals to be trustable resource for landowners
Specifics to tell landowners when engaging e.g. specific maps or information pertaining to landowner's land or an area before the meeting. Answers to their questions immediately
How to bridge small actions/BMPs leading to future of offsite results
Equipment that can show results. Leisimeters? GIS? showing BMP results
Having data analysis that is acceptable to groups or people who are likely to resist and/or want to debunk
I think we don't know well enough what the public knows or understands
Compelling linkages between the info and relationships on GW-SF water
Having compelling data to help communicate the surface water water vs. groundwater disconnect
Need info and resources, e.g. model of Iowa website showing real-time erosion rates and depicting in a way that makes sense to people
Need watershed-specific informational meetings (e.g. model of DNR education meeting focused on local groundwater resources in Mower County... ask Natalie who organized)
Need more real-time data on groundwater quantity/quality, that anyone could access
As staff – we don't have the information we need. We need to know: 1. what is the extent of problem? 2. what are the sources of pollution?
Identify the GW concerns
We need <u>all</u> the relevant data that is needed to make the best decisions
Gather data and science to identify issues of concern and gaps where more information is needed
Models that incorporate groundwater or surface water water equally or consider karst

Better models for predicting BMP benefits to groundwater
BMPs need to be demonstrated to be effective at protecting water quality
What are the concerns/pollutants of importance
Trend analysis of Nitrogen in wells- historical
GW modeling tool to address amount of reduction in nitrogen or other contaminant
Modeling tool would help show benefits of BMPs as they are multiplied on landscape, needed for grants
Need Historical water quality data analysis – then we can understand what are the trends? what is known about natural background levels?
Modeling tool for BMP effectiveness regarding Nitrogen reduction outcomes
Understanding surface water-groundwater interactions, e.g. relationship between subsurface drainage tile to the influence of groundwater recharge
Importance of groundwater recharge – either good or bad – to drinking water quality (bank slumping, moving contaminated water)
Better karst understanding and groundwater flows/direction
DNR needs better information when considering permit applications
We need to get a handle on cumulative impacts of water usage
We need more info on groundwater dynamics to be able to know what is going on
Identify the threats
Additional studies to better understand the state of groundwater
Clarify the goals for groundwater – we can't go for funds if we don't know the goals
We need to know more about the specific problem and solutions to the problem
We need to know what is being targeted
Local research/data
Geologic atlas in all parts of the state
More clearly identify the threats to groundwater
Need better baseline data so we know what is the current state of local groundwater resources
We need success measures other than water testing – viable outcomes
Record and monitor negatives along with positives
Better data on edge-of-field monitoring, e.g. tiling
More tools
Site specific information about aquifers under farmsteads and farm fields
UMN or other entity to help w/ model on runoff estimates (similar to MNFarm model for feedlots)
Terrain analysis for each watershed (training)
Better info on where problem/vulnerable areas are
Solid data collection. continuous collection for support and education
Less politics, more science
Crisis from water sampling will get noticed for funding
Statewide testing of municipal wells to identify resource concerns (and yank them)
Groundwater quality/quantity assessment for each community to prioritize the funding
More detail on infiltrating storm water in public supply wells, and local direction of flow
Require participation in the local water management plan to be eligible for a lot of possible funding streams
Projects not sexy enough
Tying problem areas to water management plans
BMP research
Supported, proven and cost-effective BMPs for landowners tailored to their individual situation

Better water quality data and better identification of problem/vulnerable areas
More detail about infiltrating stormwater near public water supplies
I didn't see any reference to improving the delivery of delineation of DWSMA's by MDH. This was brought up at the meeting. This is a critical first step in proper civic engagement along with GW monitoring data. I would like to see MDH help DNR (money and staff) with expanded groundwater and surface water monitoring in the Bonanza Valley GWMA: more monitoring wells, more surface water monitoring, and compiling and disseminating the data to the public
Expand targeting beyond wellhead protection area
Utilize the nitrate clinic data from counties to find areas outside Wellhead Protection areas to target
We need to test for more things than just nitrates (e.g. arsenic, pesticides, bacteria, other contaminants)
Monitoring information – what does it mean? What are we testing?
Better data – geological survey and water quality testing for nitrates and other contaminants
Explore use of techniques being piloted in Lincoln/Pipestone area (LCCMR grant) to quantify the correlation between certain ag practices and water quality outcomes (Rich Sewell)
DATA
Good, local data with long-term trends
We don't know how long the aquifer has been contaminated. We don't know how long it will take to fix a nitrate contamination issue
Need local data, local knowledge, agricultural plot work, geologic info. We must have this, use this. It is what producers know and trust. Get this data if you don't have it
BMP pollution reduction monitoring/research
Groundwater well monitoring only occurs once per month in accordance with MNDNR activities so additional funding is not generally sought outright
Expand our programs monitoring to additional sites beyond where the MNDNR directs us to monitor
County wide distribution of water testing. We are trying for county wide but mainly cover the area close to Park Rapids, we are trying to do more outreach, advertising, information, sources for certified labs for testing for pesticides, and agricultural products
Conduct more local research on fertilizer, cover crops, etc
Water sampling equipment and training on how to use it
Possibly purchase a machine to test for nitrates as we don't have one
The newest GIS technology, e.g. Arc Map online.
Additional solinst (in case piece is out for repair), data loggers, data download equipment
Nitrate testing machines in every county, being able to test for other chemicals instead of sending landowners away to a lab
GIS and web technology to present information to the public on how to protect vulnerable groundwater resources
Probes or new wells to monitoring BMP's on a field basis to show effectiveness
Equipment for doing soil samples
Additional computer, GIS software, sampling equipment
Soil probes, gw monitoring wells
No till drill, cover crop inter-seeding equipment
Equipment for water testing and education
Monitoring of water quality
Research and data
Better access for private well owners to labs for testing their water supplies
Local groundwater quality data
We need to know how vulnerable we are and which areas need the greatest protection
Identifying point and non-point source pollution: where and how these affect our groundwater resources

Data – we don't have much groundwater monitoring data to use for education/decision making
Non-point pollution – source tracking
water quality testing of private water wells for agricultural products
Local Hydrology data, more knowledge Local geology of the area and better understanding of how local aquifers are recharged
Difficulty in measuring progress in improving drinking water quality in short term
Lack of research
Difficulty with getting private well water samples analyzed due to problems with mailing samples and the distance one must travel to hand deliver samples to a lab
The need for a coordinated groundwater monitoring system that can track long term trends
Not enough information about our groundwater supply
Lack of available data
Accurate maps (groundwater withdrawals, pollutants) and data
Not enough technical information
Accurate maps

Appendix 3. Comprehensive list of stated equipment needs (Survey Q 7B- List your highest-need equipment.)

- Water sampling equipment and training on how to use it
- ArcGIS software, hardware for field work
- Possibly purchase a machine to test for nitrates as we don't have one
- Lawyers, guns and money
- The newest GIS technology, e.g. Arc Map online
- Additional solinst (in case piece is out for repair), data loggers, data download equipment
- Don't know
- Nitrate testing machines in every county, being able to test for other chemicals instead of sending landowners away to a lab
- Since our organization primarily works with surface water and does not do much with groundwater directly, I am not sure where we would start with purchasing equipment. We would need to start with putting an active groundwater protection plan together prior to purchasing anything
- GIS and web technology to present information to the public on how to protect vulnerable groundwater resources
- Probes or new wells to monitoring BMP's on a field basis to show effectiveness
- Education resources, such as groundwater models and other materials
- Equipment for doing soil samples
- Additional computer, GIS software, sampling equipment
- Soil probes, gw monitoring wells
- No till drill, cover crop inter-seeding equipment