Minnesota's Lake Superior Coastal Program

Evaluation of Problems and Solutions relating to Stormwater Runoff from Roadside Ditches

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October 31, 2008

Project No. 306-STAR02-08

Contract No. B11991

This project was funded in part under the Coastal Zone Management Act, by NOAA's Office of Ocean and Coastal Resource Management, in cooperation with Minnesota's Lake Superior Coastal Program.

NRRI/TR-2008/35

Introduction

Ditches along roads in rural areas are a dominant conveyor of stormwater to streams along the north shore. Loss of forest cover as well as increased rural development can increase runoff amounts, but ditches provide the structure that moves this water quickly to nearby stream channels (Forman and Alexander 1998, Wemple *et al.* 1996). Ditches capture overland flow from nearby forests, wetlands, homes, and businesses in rural areas and channel the flows to discharge points, often into streams (e.g., Duke *et al.* 2006). Much of this runoff would have otherwise infiltrated into the ground, evaporated, drained into wetlands, or flowed slowly across the landscape until reaching a natural stream channel (Forman and Alexander 1998). The result is more water reaching streams much faster after rainfall events (Trombulak and Frissell 2000).

The resulting high stream flows during and after storms can increase the erosion of susceptible clay banks, increase bank failure rates, damage aquatic habitats, and impair water quality (Forman and Alexander 1998, Wemple *et al.* 1996). Road runoff and excess sediment are then delivered to the sensitive nearshore zone of oligotrophic Lake Superior. Eleven north shore streams are currently on the state's impaired waters list for turbidity (http://www.pca.state.mn.us/water/tmdl/tmdl-303dlist.html), and evaluations on both the Knife and Poplar rivers have indicated that increased flows and bank erosion are major contributing factors (Brady and Breneman 2007, 2008). We have also recently seen an increase in the frequency of large rainfall events, consistent with climate change predictions for this region, indicating that the need for runoff control will only increase in importance.

Despite their critical role, ditches are seldom the target of active runoff management programs. Governmental officials who are responsible for ditches in the region have not had the resources and techniques available to address this issue comprehensively, even though ditch maintenance and culvert repair often use up large amounts of local government road budgets, and local and state governments (LGUs) are actively seeking solutions to ditch issues.

We brought together a cross-section of experts on rural road and ditch issues to identify the role of ditches in protecting water quality, enumerate the most pressing issues and problems with existing ditches, identify ditch stormwater best management practices (BMPs), and prioritize research, technical, and educational needs on ditch runoff management for the North Shore. The outcomes of this project identify the major ditch problems in northeastern Minnesota, identify appropriate BMPs to solve these problems, the obstacles to the installation of these BMPs, and suggest solutions to overcoming these obstacles. We also identify needed research on ditch BMPs and suggest next steps for improving ditches so that they can help protect our streams and our coast.

Work Completed

We brought together a number of experts on roadside ditches (App. 1), including representatives from the Minnesota Department of Transportation (representing state roadways and highways), the civil engineer for several northern Minnesota Soil and Water Conservation Districts (representing county and township roadways), representatives from the City of Duluth Utilities who work on stormwater runoff, and several specialists on stream stormwater runoff issues.

These experts gathered for two small workshops to discuss the issue of stormwater and ditches, the potential solutions, and the obstacles to implementing those solutions. Finally, these experts ranked the problems and suggested ways to overcome the obstacles.

Results

Ditch problems in northeastern Minnesota

Regional experts on ditch and stormwater issues identified the problems related to stormwater runoff that we have with roadside ditches in the Arrowhead region, and were able to provide locations of examples for visual reference (Table 1). The top three problems in terms of severity were 1) poor maintenance, 2) older ditch design, and 3) runoff velocity on steep slopes.

Many ditches are constructed properly, and have proper Best Management Practices installed when they are created, but then maintenance is neglected or done improperly. Some of the crews that do ditch maintenance in the Arrowhead do not know that clay ditches on sloping roadways need to be manually revegetated because of the slow re-establishment of vegetation in clay soils and the potential for erosion due to the slope of the ditch. In other cases, the timing of the maintenance is poor, being neglected too long, cleaned out too frequently, or having maintenance done in the wrong season.

Table 1. List of ditch problems relating to stormwater runoff for roads in the Arrowhead region of Minnesota. The first three problems listed were those deemed the most severe by a group of representative experts.

Problem	Description	Example
Poor maintenance	• Poor timing, poor decision-making about when to do maintenance, lack of enforcement and inspections. • Lack of access to maintain ditches • Obstructions (vegetation and trash) in BMPs and ditches • Lack of revegetation and bank stabilization after maintenance • Lack of restoration after clean-up of toxic spills, accidents, and improper ditch use.	• Former dump site in Two Harbors • Sinclair gas station near McQuade Rd on Hwy 61 • Hwy 61 as it enters Two Harbors (no revegetation)
Older ditch design	• Ditches were designed under older standards. Ditches simply need to be upgraded to current standards and BMPs.	• Just about everywhere
Velocity on steep slopes	• Flow rate is too high • Flow volume is too large • Difficult to protect water quality of “first flush”, which may contain fecals, trash, sediment, etc.	• One mile south of Grand Marais on Hwy 61 • Grand Marais’ new stormwater pond
Narrow right-of-ways	• No room to properly slope ditches due to narrow roads and right-of-ways • No room to create swales.	• Two Harbors cemetery • Willow St. at Arlington, Duluth • Glenwood Rd, Duluth
Outlet to surface water	• Older design or improper design that allows too much flow too fast and does not trap impurities.	• Lake Superior College, Duluth
Improper usage	• Destructive use of ditches by ATVs, snowmobiles, dirt bikes.	

Table 1 (cont).

Problem	Description	Example
Parking lot drainage	• First flush of stormwater contains toxic chemicals, trash, fecals, sediment, etc. • Ditches and BMPs must be able to treat/contain this "SNERT" runoff	• Grand Portage rest area
Private drive entrances	• On gravel roads, stormwater from private drives often runs out onto the road and washes out road shoulders • The runoff is not properly captured by road, driveway, or ditch design	• Many county gravel roads
Stormwater storage	• New stormwater standards require ditches along new roads to contain and treat the first inch of rain. This is very difficult in areas of the Arrowhead with poor infiltration.	• Jean Duluth Rd rock checks • Parking lots on Hwy 61 • Grand Portage rest area
Few professionals	• Lack of trained professionals entering the civil engineering field. Need to attract young professionals	

Ditches that were created more than 10 to 15 years ago simply do not meet current standards or use BMPs because they were built before we knew as much about stormwater management and stormwater issues. The same is often true for the ditch outlet to surface water (where the ditch discharges into a stream, lake, or Lake Superior). These ditches and outlets need to be brought up to current standards. Ditches on steeper slopes often suffer from high velocity and high volume during large storm events, with the result that the "first flush" of stormwater carries with it contaminants, sediment, and other impurities that need to be kept out of streams. Ditches along steep streets in urban areas often do not have the right-of-way room for the proper ditch size and slope to be created. Ditches that drain parking lots also must be designed to capture the "SNERT" (all kinds of impurities) that are washed off parking lots during storm events.

Another common problem is the improper use of ditches by the public. Along many roads, ditches are used as the "safe" place for young people to ride ATVs and dirt bikes in the summer and snowmobiles in the winter. Summer ATV and dirt bike use in particular can be quite damaging to ditches, especially to the ditch vegetation that encourages infiltration and protects the ditch from erosion. Another problem relating to the general public occurs at the intersection between private driveways and gravel roads (and even paved roads, but to a much lesser extent). Runoff from driveways onto the roadway often washes out the road shoulder next to the driveway as the water then enters the ditch.

Soils with very slow infiltration exacerbate ditch stormwater issues in the Arrowhead because the ditches infiltrate water very slowly. This is especially an issue during large rainstorms because new stormwater standards require that new ditches be designed to contain all the water from the first inch of rain that hits the road's surface. For areas with slow infiltration, this means that very large ditches or stormwater storage areas are often necessary.

Finally, the experts noted that there are few young civil engineers interested in working on ditches, but the field really needs smart young people to work on these problems and to bring new energy and enthusiasm to create innovative solutions.

Ditch stormwater Best Management Practices

Despite the long list of ditch problems, the expert panel had a number of ideas for Best Management Practices (BMPs) that would help alleviate the stormwater runoff situation (Table 2). At the top of the list was the desire for Operations and Management plans for each type of ditch (e.g. cross section type) and BMP. This would provide guidance for maintenance crews to understand how and when to work on ditches and BMPs; such guidance and understanding are currently lacking for most ditch maintenance crews and contractors. The plans should be coupled with regulation and enforcement of proper ditch and BMP construction and maintenance, current regulations, and stormwater plans. Part of the problem may be that regulations are lagging behind knowledge about stormwater impacts and solutions, but regulations may be what is needed to move implementation forward.

Inspection of all ditches on a routine basis is also lacking. Presently, inspections are primarily linked with construction of new roads or major roadwork projects, with other ditches only being inspected if problems arise, instead of being inspected for problems on a routine basis. Ditch maintenance itself can lead to erosion if not done properly. In areas with erodible soils, ditch maintenance should be accompanied by the use of erosion control blankets and other erosion prevention strategies. Because of the northland's clay soils, ditches here may need to be seeded to get vegetation re-growing quickly enough following maintenance or construction to prevent excessive erosion.

BMPs that actually involve putting things into the ditches include adding large rock to either fill the ditch as it goes down a steep slope or to form ditch "blocks", which are like mini-dams in ditches. Both of these help to reduce velocity, provide water storage within the ditch, and remove garbage and sediment from the runoff. Another tactic to reduce runoff velocity and increase storage is to make the ditch sinuous, so that it mimics a natural stream channel in shape. Carrying the "natural ditch" idea even further, ditches can be allowed to grow brushy vegetation, which helps them to act as a sponge. This effect can be enhanced by digging out some of the silt and clay at the bottom of the ditch and replacing it with sand or loam. Many rural ditches naturally grow water-tolerant bushes, which overzealous maintenance crews often remove as they "clean out" the ditch. While ditches will naturally aggrade, particularly if they are trapping sediment, maintenance clean-out should not be done until the ditch can no longer handle the volume of water coming off of the road. Too frequent clean-out leaves the ditch devoid of deep rooted plants and bushes which both use water themselves, but also more importantly help the water to infiltrate into the ground.

Creating ditches that are actually dry swales can also help handle large volumes of water. These ditches usually have a drain pipe beneath them to pipe the excess water elsewhere. In many situations, the use of curbs, gutters, and pipes may be necessary to move stormwater elsewhere to treat. Often in urban and suburban areas there is not enough room in the right-of-way to properly deal with the volume of water coming off the streets. Thus, pipes can be used to move the water

to areas where there is enough room to store and treat it. An alternative is to condemn property rights to increase the right-of-way, but this is usually an unpopular option.

Table 2. List of Best Management Practices to solve Arrowhead roadside ditch stormwater runoff problems, and examples of BMPs.

BMP	Solution for	Example
O & M plans	• Poor maintenance • Overzealous maintenance	• BWSR guidance • MN Stormwater Manual
Regulation and enforcement	• Poor maintenance • Poor design • Poor construction	
Rock-filled ditch	• Velocity on steep slopes • Storage where there's no infiltration • Parking lot first flush removal • Poor outlet design to surface water	• 22nd Ave West • Onion River and Cut Face Creek • Morris Thomas Rd.
Ditch blocks	• Velocity on steep slopes • Storage where there's no infiltration • Parking lot first flush removal • Improper use by public	• Zimmerman Rd • Glensheen Mansion • Hwy 61
Sinuosity	• Velocity on steep slopes • Storage where there's no infiltration • Narrow right-of-ways	• State of North Carolina
Condemnation of property	• Narrow right-of-ways	
Ditch sponges	• Velocity on steep slopes • Storage where there's no infiltration • Narrow rights-of-way • Parking lot drainage • Fixing older ditches	• Fall River • Duluth Township shrubby ditches • Silver Creek tunnel
Dry swale	• Velocity on steep slopes • Storage where there's no infiltration • Narrow right-of-ways • Parking lot drainage • Fixing older ditches	• UMD Labovitz Business School
Erosion control blankets	• Maintenance • Velocity on steep slopes • Improper use by public	
Pipes, curb and gutter	• Velocity on steep slopes • Narrow right-of-ways • Improper use by public	• Trinity Rd, Duluth • Piedmont/Duluth Heights
Swirl chambers	• Parking lot drainage • Emergency response after an "event" • Sediment in urban environments	• Wallace Ave by Tischer Creek • Hanson's gas station -Trinity Rd. • Railroad St., Duluth

Finally, local residents need to be informed of the detrimental environmental effects of the destructive use of ditches, such as riding ATVs, bikes, or dirt bikes down the ditch. Information about the adverse effect on downstream areas may be enough to get many riders, or their parents, to curb their behavior. An alternative is to design ditches with wide shoulders that could potentially better handle such traffic.

Obstacles to BMP implementation and potential solutions

Unfortunately, there are a number of obstacles to implementing these BMPs (Table 3). While money and manpower would seem to be paramount, the expert panel primarily was concerned about funding and personnel in the context of ditch maintenance. They suggested setting aside dedicated maintenance money when a ditch was created, with some even going so far as to say that if maintenance money could not be guaranteed, then the road and its ditch should not be built.

Over the long term, overcoming the personnel obstacle includes attracting young enthusiastic engineers to this field of work. Young people need to view the field of civil engineering as interesting and exciting, and an area in which they can really make a difference for the environment. Most children are fascinated by the large vehicles and construction equipment used on many road and ditch projects. A novel way to help capture their interest would be to arrange carefully-controlled and safe tours of road construction sites.

Another unique way to capture the imagination of young people would be for local agencies or governments responsible for roads to team up with university civil engineering classes to solve specific local ditch problems as part of a class project. The class would get experience in solving a real problem, the agency would get survey work and a number of designs, and the "winning" student team could be offered a cash prize (say $1000), which would be much cheaper than the agency or LGU would likely be able to get a survey and design done for the problem. This model has been used with classes at the University of Minnesota Twin Cities (Stenlund, pers. comm.; see App. 1).

Table 3. Obstacles to implementation of ditch stormwater Best Management Practices, and potential solutions to overcome these problems.

Obstacle	Potential solution
Lack of maintenance money, personnel	Dedicated maintenance money set aside when ditch or BMP is created; increase personnel; attract new, young talent
Lack of space (e.g., right-of-way)	Condemnation of property rights
Unknown life cycle costs	Research on cost of BMP, from creation through long-term maintenance
Lack of standardized designs	Create standardized ditch and BMP designs for various regions of the state, types of soil, slopes, etc. Include a list of appropriate plants for "natural" ditches.
Lack of long-term vision	Instead of just fixing the problems, help managers envision the long-term solutions; view ditches as "streams" in watersheds
Public expectations	Inform the public about the benefits of shrubby ditches and ditches that "look different"; inform about detrimental effects of ATVs, etc.
Old design criteria	Need to update ditch design criteria, and then enforce its use.
Lack of ownership	Public and local property owners need to be informed about taking responsibility for the ditches in their area.

After lack of room in the right-of-way as an obstacle, the next major obstacles include some unknowns, including the need to know the long-term cost of ditches and BMPs. Although it is often claimed that various newer styles of ditches and BMPs will reduce long-term maintenance costs, our panel was unaware of any studies demonstrating that for our area. It would be good to know if these BMPs really do reduce overall maintenance costs, and if this differs depending on

soil type, geology, and other factors. If long-term costs truly are lower, this would help convince local governments to allow BMPs to be used along their roads.

Another way to reduce costs would be to create a series of standardized ditch and BMP designs tailored for the Arrowhead, and specifically for the areas in the Lake Superior watershed. This would allow selection from a set list, rather than expensive site-by-site unique designs. Such plans could include the life-cycle cost of each design, allowing users to compare costs, and could be as detailed as suggesting the most appropriate plants for revegetation. Images of how these new types of ditches and BMPs look at construction and over their life-cycle (2, 5, 10, 20 yrs) would also help folks know what to expect. Such plans would go a long way to helping to promote an update of ditch design criteria.

The final obstacles are perhaps the most difficult to overcome because they involve human expectations. For ditch design to truly evolve into something innovative that helps solve stormwater runoff problems, managers need to be able to envision ditches as similar to streams, having "watersheds" (drainage areas) and networks. In turn, the public needs to be able to envision ditches as something other than mown sod, and to accept that to protect downstream areas, ditches should perhaps grow small shrubs, look like rain gardens, or contain large piles of rocks. Finally, our experts would like to see the public take some ownership of the ditches next to their property, to feel responsible for preventing their degradation. Currently, ditches seem to suffer from a 'tragedy of the commons' perception, with everyone feeling that they have the right to use or abuse ditches while feeling no responsibility for ditches' care and maintenance.

Maintenance workshop

Because improper ditch maintenance was identified as one of the major ditch problems, creating appropriate training materials and holding training and certification workshops may be one of the quickest and most cost-effective ways to solve a large portion of the problem. Our experts are highly in favor of finding a way to hold a workshop on ditch maintenance to train all those involved in working on ditches in the Arrowhead region. The workshop could potentially cover both proper ditch and BMP creation and maintenance, and would ideally include real-world examples as part of a field trip to show them good and bad examples.

Training materials to be developed for the workshop would include creating a training handbook specifically for northeastern Minnesota ditches. Ideally, the handbook would contain the following:

- Specific creation and maintenance guidance for each major type of ditch and ditch cross-section, including how to identify when this type of ditch does and, more importantly, does not need maintenance.
- Specific creation and maintenance guidance for ditch BMPs already in use in northeastern Minnesota.
- Estimates of costs of creation and maintenance for each ditch and BMP type, where known.
- Maintenance checklists.
- Pictures of levels of condition (e.g., excellent, good, fair, poor) for ditch and BMP types.
- Recommended inspection schedule and inspection checklist.
- An appendix that compiles all of the regulations about ditches in one place

Examples and source materials for the handbook include the Minnesota Stormwater Manual (http://proteus.pca.state.mn.us/water/stormwater/stormwater-manual.html) and a ditch BMP manual being developed by Al Kean of the Minnesota Board of Water and Soil Resources that is specific to ditch BMPs along Hwy 61.

The workshop should be open to everyone from local contractors to ditch inspectors, and could even include homeowners associations that own roads with ditches that they are responsible for maintaining. If the workshop could include contractor certification, this could then be used as an enticement allowing contractors to show their dedication to protecting area aquatic resources. In addition, local units of government could then hire only contractors that had been certified, and use this as one of their compliance targets in their Stormwater Pollution Prevention Plan (SWPPP) for the MPCA/US EPA.

Research needs

As noted above, there are a number of unknowns associated with the use of ditch BMPs in northeastern Minnesota. BMPs designed for milder climates or soil types that are more permeable may not work as anticipated in our region, may need to be modified, or may have different maintenance requirements, but none of these things have been studied.

The following is the expert panel's "wish list" of research questions about ditch stormwater BMPs for northeastern Minnesota that should be answered in order to move ditch solutions forward:

- Do ditch stormwater BMPs truly work in the northeastern Minnesota to reduce flow, velocity, and turbidity, and remove trash, toxics, etc? Do they create water volume storage?
- Do ditch stormwater BMPs meet both safety standards and road dewatering needs in the Arrowhead's climate and with its soil types? How is this different from other parts of the state and country?
- How can a ditch be properly instrumented to verify that a BMP is effective? What is the "control" for such an experiment?
- What are the true maintenance costs for various BMPS, and do these actually represent a cost-savings over the life of the ditch?
- What are the ditch design standards for areas with shallow clay soil on top of fractured bedrock?
- What are the visual and measurable parameters to assess success for ditch BMPs in the Arrowhead (i.e., how can we easily tell if they are created properly and are working correctly)?

Most, if not all, of these questions could be addressed if funding could be secured to create an outdoor ditch research laboratory and training facility. This facility could build and properly test ditch BMPs, follow their functioning over their life cycle while collecting data on their creation and maintenance costs, their effectiveness, how they need to be maintained, etc. The facility would then be the ideal location to hold training classes for northeastern Minnesota ditch contractors to show them how to build and maintain the BMPs, and also generally how to properly maintain various types of roadside ditches, given our soils and climate. The expert panel

was quite excited about the possibilities that such a facility would provide, but funding sources such as the Department of Transportation would have to be sought, and the panel realized that such a facility is probably quite a long-shot.

In the interim, while seeking funding for a ditch research facility for northern climates, some of the research questions could potentially be addressed by smaller grants if sources of funding can be located. Agencies that might be willing to fund such research include groups that are interested in reducing the impact of road stormwater runoff on northeastern Minnesota streams, wetlands, lakes, and Lake Superior, and could potentially include the US Environmental Protection Agency, US Fish and Wildlife Service, Minnesota and Wisconsin Lake Superior Coastal Programs, Minnesota Sea Grant, Minnesota Pollution Control Agency, and Minnesota Department of Natural Resources, among others.

The other impediment to research, besides the obvious need for funding, is finding interested researchers with the appropriate skills and training who are located in or willing to do research in northeastern Minnesota. The Arrowhead Regional Development Council has indicated interest in helping to pull together the necessary expertise to do such research, and hydrologists at the St. Anthony Falls Laboratory in Minneapolis might be interested.

In the meantime, until the research can be done, most members of our panel have concluded that trying ditch stormwater BMPs, even though untested for this area, is better than doing nothing. They have promoted installation of ditch BMPs in northeastern Minnesota whenever possible (see examples in Table 2) to begin solving as much of the ditch stormwater problem as they are able. Unfortunately, because these BMPs are not being monitored, we cannot easily measure the success of this effort.

Conclusions and Next Steps

In general, our experts agreed that the problems the Arrowhead is experiencing with stormwater runoff from ditches are primarily the result of a legacy effect of older ditch designs combined with poor or improper maintenance. These problems are compounded by the Arrowhead's steep slopes and soils with poor infiltration that are vulnerable to erosion when unvegetated. A major hurdle is funding for ditch work. Most ditch work is only funded in conjunction with road construction or major upgrading or restoration; it is quite uncommon for specific ditches or BMPs to have dedicated maintenance funding. However, our experts agreed that for real progress on ditches to be made, all ditches need to have a dedicated source of funding for maintenance, with emphasis on the word "dedicated", so that the funds cannot be "borrowed" for other uses.

The panel identified a number of BMPs, many of which have been installed in various locations around northeastern Minnesota. They also identified the obstacles to installation of the BMPs and potential solutions to overcome these obstacles. While the panel is aware of BMPs that should work, there are a number of unknowns about using the BMPs in northeastern Minnesota. These unknowns center around the effect on the BMPs that our soils and climate will have on their cost of installation, effectiveness, useful lifespan, and cost and interval for maintenance. An

innovative way to approach these unknowns would be to find funding for a dedicated ditch research facility for northern climates.

While the ultimate goal of a dedicated ditch research facility for northern climates is not likely to be accomplished quickly, there are a number of agencies that could be approached to fund research projects that would answer one or more of the unknowns about the use of ditch BMPs in the Arrowhead. The Arrowhead Regional Development Council has indicated interest in this topic and might be willing to help locate qualified researchers.

One of the quickest and perhaps most cost-effective ways to begin to solve many of the ditch problems would be to tackle the problems related to improper ditch maintenance by creating a ditch maintenance handbook specific to northeastern Minnesota, and then holding training and certification workshops for all who are involved with ditch construction and maintenance. The need for such a workshop and handbook was mentioned repeatedly during our meetings.

Other examples of "low-hanging fruit" to help solve ditch problems include 1) helping local governments or groups with specific ditch problems to partner with university civil engineering classes to both generate a creative solution and get students interested in roads and ditches as a career; 2) informing the general public of the stormwater issues surrounding ditches and the need for their help to protect the ditches from improper use and excess driveway runoff in order to protect downstream aquatic resources; and 3) creating a bibliography of studies on ditch BMPs and studies that demonstrate how road ditches alter local hydrology.

The good news is that the experts believe there are solutions that will eventually allow roadside ditches in northeastern Minnesota to become part of the solution to reducing peak streamflow during storm events. And many of these solutions involve education and information campaigns that can be done at relatively low cost. Even though all of the experts on our panel are extremely overcommitted, they are interested in solving our ditch problems. This interest stems not from regulations requiring them to be interested, but because they understand the environmental impact that the high streamflow peaks are having on area streams, many of which support sensitive species of concern to the public, such as brook trout. To this end, the experts are willing to look at creative solutions and to try to find time in their busy schedules to work on this issue.

Acknowledgements

Funding for this project was provided by the Minnesota Lake Superior Coastal Program (306-STAR02-08) and the Weber Stream Restoration Initiative funding provided to the Natural Resources Research Institute, University of Minnesota Duluth, with additional support provided by the Minnesota Sea Grant College Program. This project could not have been completed without the expertise of the panel participants listed in Appendix 1, or without the facilitation provided by Ms. Cynthia Hagley, Minnesota Sea Grant College Program.

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Appendix

Appendix 1. Names and affiliations of experts providing input on northeastern Minnesota roadside ditch stormwater runoff problems.

Name	Affiliation
Anderson, Keith	South Saint Louis Soil and Water Conservation District
Carlson, Todd	City of Duluth Utilities
Gentz, Cindy	Cook County Soil and Water Conservation District
Kleist, Chris	City of Duluth Utilities
Salmela, Jack	Minnesota Department of Transportation
Schroeder, Nathan	South Saint Louis Soil and Water Conservation District
Seidel, Wayne	Lake County Soil & Water Conservation District, University of Minnesota Extension - Lake County
Stark, Dave	Cook County Soil and Water Conservation District
Stenlund, Dwayne	Minnesota Department of Transportation