Agricultural Perspectives on Water Quality Trading in Minnesota and MPCA Rule Development

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PRELIMINARY DRAFT

1.0 INTRODUCTION

The Minnesota Pollution Control Agency (MPCA) is currently undertaking a process to develop statewide rules for Water Quality Trading (WQT). MPCA is the state-delegated regulatory agency under the U.S. Environmental Protection Agency (EPA) for Clean Water Act (CWA) programs. MPCA therefore holds the authority to structure the requirements of a WQT program. WQT rules are intended to streamline the National Pollution Discharge Elimination System (NPDES) permit process when trading is employed for permit compliance. The use of WQT is recognized as a valuable management and compliance tool under conditions for:

1. Managing fully allocated waters before or after approved Total Maximum Daily Load (TMDL) requirements
2. Securing economic efficiencies in permittee compliance, and
3. Continued streamlining of the NPDES permitting process.

WQT rule development represents one step MPCA is pursuing in response to placing more stringent wastewater treatment limitations on NPDES permittees to meet CWA goals. Stringent discharge limits can eventually result in high costs of treatment with limited overall benefits to the receiving waters. The balance between protecting waters of the state and creating an efficient system that can be used to implement corrective actions makes WQT a priority for the MPCA. In an effort to inform WQT rule development, MPCA has initiated a stakeholder process that includes a stakeholder advisory committee and a dedicated web-based homepage (http://www.pca.state.mn.us/water/wqtrading/index.html). The rule development process is being lead by Mr. Gene Soderbeck, Supervisor and Mr. Marco Graziani of MPCA.

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Though WQT is viewed both as a management and a compliance tool by regulators and the regulated community, trading also provides financial and operational management opportunities for agriculture. Agriculture can voluntarily participate in trading programs by implementing Best Management Practices (BMPs) on their farms whereby the water quality benefits of implementing such practices become the tradable "credits" (or units of exchange) sought by the regulated community. Most often, these credits are recognized as pounds of sediment, phosphorus or nitrogen reduced through BMP implementation. WQT program rules define the conditions under which such credits can be generated and traded to ensure that public interests and water resources are protected and improved.

Because of the potential benefits for agriculture, and related risks associated with binding commitments with credit trading, this white paper provides a summary of dominant agricultural perspectives related to WQT applications in Minnesota. Perspectives reported here draw on a wide variety of individuals participating in agricultural production or supporting agricultural industry in the state. The white paper is one product of a Conservation Innovation Grant (CIG) awarded by the USDA-Natural Resources Conservation Service (NRCS) in 2006 to Agflex, Inc. and project partners including the American Farmland Trust, Kieser & Associates, LLC and the Minnesota River Joint Powers Board[4]. The project seeks to improve conservation and agricultural economics in Minnesota using water quality credit trading and the "BMP challenge"[5]. With supporting funds from the Bush Foundation[6], project partners have also examined approaches to advance the adoption of WQT and the BMP Challenge risk guarantee program specific to the Minnesota River.

The objective of this paper is to identify issues, barriers and opportunities for Minnesota agricultural participation in WQT. Findings reported here will be used to engage and promote trading and BMP Challenge opportunities with farmers in this project, as well as to provide valuable insight and feedback to MPCA in their rule-making efforts. Absent input from agricultural stakeholders, rule-making has the potential to overlook important perspectives necessary for farmer participation, or diminish the potential benefits of trading between NPDES permittees and agriculture.

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[5] The BMP Challenge is an income guarantee program that protects producers from potential losses as a result of reducing the nutrients applied to their field, or with adoption of conservation tillage. See: http://www.bmpchallenge.org/.

[6] Bush Foundation, 332 Minnesota Street, Suite East 900, St. Paul, Minnesota 55101. As part of the Bush Foundation's goal to improve the ecological health of the region, funds were provided for a planning grant to American Farmland Trust to examine the benefits of water quality trading in the Minnesota River.

2.0 APPROACH

The project partners in this CIG grant (i.e., the Project Team) collected information from agriculture by conducting interviews with various agricultural representatives in the state of Minnesota (see Attachment A). These efforts were supplemented with input from a CIG advisory committee (separate from MPCA's stakeholder advisory committee) to strengthen the connection between CIG project objectives and MPCA efforts on WQT rule development. (See Attachment B for the CIG advisory committee.)

The Project Team gathered opinions from one-on-one interviews, conversations held at working meetings for the Project Team and CIG advisory committee, and/or comments provided during MPCA stakeholder advisory committee meetings. This process also drew upon information gathered from a 2007 American Farmland Trust "listening session"[7] in the state of Iowa regarding parallel carbon market issues with many commonly identified hurdles.

Interviewed individuals were selected based on three main attributes: 1) their recognized standing in the agricultural sector; 2) their personal awareness of WQT in general; and, 3) their personal awareness of watershed management. The breadth of participants is not exhaustive, yet is reflective of the many commonly held and voiced opinions on WQT. Such opinions include support for the advancement of the WQT process, and inversely, concerns with improperly conceived WQT programs. Interviews were free-flowing in nature with a set of basic questions developed to stimulate discussion and better ensure the completeness of the exchange. Often the enthusiasm of the participant on the subject of WQT trading made it unnecessary to stay with the basic questions, except to review notes at the end of the interview to capture all relevant comments.

Results of the interviews are used here to assess the interest and perspectives of agriculture on WQT in Minnesota. These findings are integrated with additional analyses of potential trading opportunities in select Minnesota watersheds to preliminarily identify the likely locations and level of agricultural trading opportunities. Interview and trading analysis findings are presented in this report in the following sections:

3.0 Findings

- **Salient Issues** - The most notable issues with regards to agricultural representatives working with, or in WQT programs.
- **Additional Considerations** - A summary of other WQT issues identified.
- **Evaluation of Agricultural Credit Generation Potential** - Estimates of the potential for agricultural producers to generate credits by adopting BMPs in the Rice Creek and Seven Mile watersheds using a GIS spatial analysis and empirical nonpoint source modeling techniques.

[7] "Challenges and Opportunities in Managing Agricultural Operations for a Low-carbon Economy", July 18, 2007, West Des Moines, Iowa
http://www.aftresearch.org/ecosystems/iowa/docs/IA%20Workshop%20proceedings.pdf

- **Evaluation of Potential Credit Demand** - Estimates of credit demand in the larger parent watersheds that include the Rice Creek and Seven Mile Creek drainages.
- **Best Management Practices Selection Issues** - A discussion of factors related to BMP selection for credit generation.
- **Associated Costs** - WQT costs related to program facilitation, program start-up and farmer participation.
- **Ecosystem Service Markets** - The possibility of stacking multiple ecosystem service payments from programs parallel to WQT such as the greenhouse gas market or wetland mitigation banking.

4.0 Conclusions - A wrap-up of key interview findings trading opportunities in relation to overall agricultural participation in WQT.

5.0 Recommendations - Key issues for consideration by agriculture and MPCA during the WQT Rule writing process and for future WQT pilot projects.

3.0 FINDINGS

The perspectives reported here reflect a wide diversity of agricultural opinions that extend into environmental stewardship considerations and the role that government should play in achieving environmental protection. The diversity of opinion expressed in this document is not unexpected given the variety and size of the agricultural sector in Minnesota which is a blend of independent business people with widely varying professional backgrounds.

Specific to WQT program development, discussions with agricultural representatives allowed individuals to offer creative solutions to concerns. A vast majority of the participants were interested in advancing watershed management goals in an economically efficient manner using WQT. They could recognize the potential for WQT as a valuable tool when WQT is grounded in science, and embodies integrity and respect.

Based on these interviews, and feedback from project meetings and advisors, this chapter provides a synthesis of relevant issues and opportunities for agricultural participation in Minnesota trading.

3.1 Salient Issues

Participants provided many valuable insights. The following points have been selected because agricultural representatives have emphasized their importance for a successful and trusted WQT program involving agricultural producers. These salient issues are summarized here, with additional elaboration in the remainder of Section 3.1.

- Avoid Rewarding Producers with Poor History of BMP Implementation
- Third Party Site Inspections
- Emphasis on Sustainable Farming
- Setting Equitable Baselines
- Administrative Support
- No Regulatory Mandates to Participate

Each of these salient points is additionally addressed as follows.

3.1.2 Avoid Rewarding Producers with Poor History of BMP Implementation

The WQT program design needs to recognize the value of agricultural producers that have histories of high BMP adoption. In WQT programs, sometimes the program framework can over-emphasize the buyer concerns and be set up solely as a low cost driven program. Similar to prioritization schemes in certain cost-share programs, the emphasis can be placed on achieving the highest amount of reduction for the cheapest cost per credit, or per dollar expended. The perspective on what solution is equitable depends on which seat the individual is occupying. For instance, in a market-based incentive program, the buyer of a credit wants the lowest cost per credit available. For those farmers generating credits, a market-based program may pit a site with previous poor decisions and high reduction potential against a site where the previous management

has been superior resulting in a limited reduction potential that is costly. In this case, the potential to reward poor decision makers is relatively high as they capitalize on this new program. Indeed many WQT programs prefer to find the cheapest cost per credit as it benefits both the buyer and the watershed management aspects of WQT.

The current MPCA guidance on point source to nonpoint source WQT recommends that credits be based on new or "additional" implementation efforts rather than paying for credits generated on practices that have already been in place. This can be at odds with achieving a workable solution to this issue. Producers and representatives from producer organizations who were interviewed seem to struggle with these issues of "fairness" versus payments for additional reduction measures. They feel strongly that WQT should be an incentive for both early adopters of BMPs and those producers with high reduction potentials.

Several suggestions arose on how to begin to balance this perceived inequity. Two common themes emerged:

1. Proper consideration of baseline expectations - Certain expectations of stewardship should be set and achieved prior to a land manager being able to generate a credit for sale.

- Possible program framework could set up tiers to provide incentives for good decisions. For instance:
  - Tier 1 must be a prerequisite for a site before a credit could be generated (examples: high residue cover and nutrient management).
  - Tier 2: the next BMPs adopted will have a *trading ratio* of 2.5 to 1.
  - Tier 3: when a farmer has implemented a whole-farm management plan the *trading ratio* drops to 2:1.

A ***trading ratio*** is applied to a buyer as a credit multiplier. If a buyer is discharging 200 units, they will need 400 units for a WQT at a 2:1 trading ratio. This multiplier is applied to address issues such as margins of safety, geographic discounts, net benefits for the water resource or, in this case, to resolve inequity between sites.

2. Incentives for BMPs that recognize and honor long-term commitment to implementation. Certain BMPs take longer to establish their highest performance levels. Incentives could be placed in the WQT program to encourage their adoption. One example is nutrient management for phosphorus reductions. Dr. Gyles Randall of the University of Minnesota published a paper[8] that documented the drop in phosphorus concentration in soil with nutrient management. Since many crediting schemes across the nation credit soil-attached phosphorus and not dissolved phosphorus, the phosphorus soil test can be a strong factor used in estimating the site's potential for phosphorus credits. Years of nutrient

[8]Randall, G.W., T.K. Iragavarapu, and S.D. Evans. 1997. Long-term P and K applications: I. Effect on soil test incline and decline rates and critical soil test levels. J. Prod. Agric. 10 :565-571

management at agronomic rates significantly correlate with a slow decline in soil test phosphorus concentrations. The resulting phosphorus drop was less than 2.7 ppm per year.

When considering the conversion that accounts for differences in terrestrial mass units versus the mass in the eroded material, it is helpful to keep in mind that 500 ppm per ton of eroded soil reflects 1 pound per ton of soil (or 1000 pounds per acre in the first six inches). One year's phosphorus reduction of 2 ppm from nutrient management would result in a 4 pound per acre reduction in the top six inches or 0.004 pounds reduction per ton of eroded material. Likewise, reducing a soil test value from 150 ppm to a lower soil test of 50 ppm over many years corresponds to a 200 lb per acre reduction in the top six inches of the field (or 0.2 pounds of phosphorus reduction in the parent material per ton eroded). The WQT program could recognize the phosphorus soil test level results and apply an incentive in the exchange of units for progressive managers versus those that have excessive rates.

A second example is woody vegetative buffers which take years to establish and can provide numerous ancillary benefits such as temperature relief, riparian habitat and aquatic life habitat. While these buffers can take years to establish, poor management decisions can breach these buffers within a single year. Therefore, an incentive could be place in the WQT program based on the estimated age of the oldest tree or bush in the buffer. For example, one could assume a general program trading ratio is 2:1. A new site would receive credits to be exchanged at a trading ratio of 2.5:1. After five years the trade ratio would drop to 2.4:1 and every five years after that, until the minimum trade ratio of 2:1 is achieved.

These two examples show plausible steps to overcome the perceived inequity involved in implementing a WQT program with farmers having varied histories of BMP adoption.

3.1.2 Third Party Site Inspections

WQT credit certification and site inspections are recognized as necessary, but should be done by trusted agricultural professionals. Participants were asked to discuss the issue of allowing an entity to enter a farm with the intention of inspecting BMP construction or its current functioning capability. All recognized that a WQT credit is a commodity and as such, that it must be verified to be sold. It is a commonly held belief that the integrity of agricultural producers is high. Producers and WQT program managers both see the necessity in verifying that something of value is being traded, i.e., actual reductions in the field. This will help avoid situations where a sham credit is exchanged with value occurring in the paper trail without actual reductions occurring at the site.

There exists a sizeable concern that the inspector of a BMP may have unrealistic interpretations or allow the site visit to spill over into inspections of unrelated farming aspects. Certain individuals in the agricultural community are anxious that an inspector

for the WQT program may take an aggressive site stance on other farming-related issues not under the provisions of the trade. This anxiety can be addressed to a large degree if the overseers of the inspection program build trust with the producers by hiring qualified individuals, and calling ahead to access the site with the individual. A trusted third party already established in the community could also perform these site inspections.

Inspections and inspectors can possibly be tied to other program farm site visits if performed by Soil and Water Conservation District staff, Natural Resource Conservation Service staff, Technical Service Providers (TSPs), licensed professionals such as professional engineers or Certified Crop Advisors. In addition, these types of professionals often have already established a level of trust with the producer. Their level of understanding in the agricultural setting and farming practice details make them even more valuable in a third party verification role.

3.1.3 Emphasis on Sustainable Farming

The WQT program should be structured to emphasize the use of BMPs amenable to cash cropping and livestock production. The sound bite, "Keep Working Lands Working" applies here whereby the trading programs provide incentives that combat actively producing acres from being converted into retirement programs. Such retirement programs may convert productive lands into natural vegetation or wetlands and lose the cash cropping aspects of farming.

Likewise, the concept behind another sound bite, "Farm the Best and Buffer the Rest" can also be complemented by a WQT program. This issue revolves around land management functions that the WQT program values or provides incentives to implement. The concern with these applications is that, if credits are generated by selecting the highest reduction value per implementation cost, then outright land conversion into native grasses or woody vegetation might dominate the targeted practices in a WQT program.

Two mitigating factors exist in WQT programs that may limit this tendency:

1) WQT programs so far only supplement the income of the producer and have difficulty competing with high value cash crops on a whole farm basis, and
2) Credit value will be heavily dependent on the proximity of an erosion site to the nearest water body as distance affects the delivery of the pollutant (and thus the amount of credit one could produce with the practice).

While both of these factors make the wholesale conversion of a farm's cropland into entirely native grass less likely, it was felt by some that targeting cash crop sustainability within the WQT program could be important. Participants surveyed understood that some riparian corridor lands should be protected with perennial vegetation, but desired that a significant portion of the generated credits be produced by BMPs on working lands.

3.1.4 Setting Equitable Baselines

The question of how much should be expected of a producer prior to being eligible to generate credits from additional reductions was discussed at length. These discussions recognized that a strong WQT market must balance the advancement of water quality, credit buyer considerations as well as the economic considerations on behalf of the credit producers. In some existing WQT programs, a TMDL's agricultural load allocation requirement must be met before a farmer is able to generate a credit. However, in non-TMDL waters, or impaired waters where TMDLs do not exist yet, other options exist for setting the baseline above which BMP implementation and performance may generate a credit. Such baseline examples include:

- Using the three most recent years of farming practices (where good records have been maintained by the producer)
- State policy or guidance provided by a public panel
- Local watershed policy or guidance set by a public panel
- Tiered processes (as previously mentioned), and
- Tributary attainment of water quality numeric criteria

It is generally acknowledged that there are differences of opinion regarding this issue. A well-balanced public panel could help find the solution, being a correct mix of prior expectations and cost-effective WQT provided that the panel carefully considers the politics, science and economics of the watershed.

3.1.5 Administrative Support

To participate in a WQT program, the learning curve and access to the market must be low cost, readily available and as simple as possible. Participation in a WQT program can be seen as a rather rigorous endeavor for producers. Steps should be taken to simplify the information or its delivery so that producers readily understand the program and its commitments. This may include short, simple contracts, easy to understand educational materials and knowledgeable program staff.

Even with efforts to simplify the WQT process for producers, challenges and difficulties faced by most producers could remain. Areas of WQT complexity include:

- Complicated credit estimation processes
- Inability to evaluate and select the optimum BMP(s) for a given site to be cost competitive in the market, and
- Paperwork and reporting requirements for facilitation of credit certification and annual tracking.

To overcome potential participation barriers created by the complexity associated with these procedures, a trained facilitator or service provider can assist the producer. Producers are already wrestling with many complex decisions even prior to considering WQT and would rather have trusted representatives (preferably ones with which they have already developed a relationship) to walk them through these steps.

3.1.6 No Regulatory Mandates to Participate

The concern was raised whether or not WQT can be punitive; for example, will livestock managers be forced to participate? To date, trading has always been voluntary. Participation has been left up to the buyers and sellers by considering the costs involved, risk management concerns and their needs to maintain compliance. It was strongly expressed by participants that water quality trading remain a flexible option, and that at no time would it be a mandatory requirement placed on agricultural activities.

3.2 Additional Considerations

This section is meant to briefly summarize the remaining issues discussed in the interviews and meeting conversations. These were notable, however, not necessarily deemed to require specific attention with trading rule development.

3.2.1 Predisposed Opinions

Those agricultural representatives interviewed indicated or exhibited that there is typically some level of predisposition with WQT. This naturally results in a basis for either concern or enthusiasm absent a thorough exposure to specific trading program design. Perceptions of those interviewed ranged widely. On one end was a high desire to push the program forward because of the potential revenue gains to be made. The opposite opinion was expressed as a lack of trust in the process, "assuming that this is a way for polluters to buy their way out" of a treatment obligation.

A consensus was observed regarding the desire for careful construction of the WQT program framework prior to any hasty trading. Also desired was a threshold for high programs standards, but with flexibility to assert local controls. Thus, state-developed rules should provide broader trading guidelines while allowing latitude for local decisions to appear in the program structure. Such program balance can be hard to achieve, but obtainable if the rules are written in a concise manner with performance expectations instead of prescriptive stipulations.

Discretion granted to proper local authorities should be laid out in the rules such that these local entities may guide the development of their own prescriptive measures. This type of process could require an approval step by MPCA prior to implementation. A performance or outcome based rule rather than a prescriptive rule was believed to best. For example, minimum trading ratios should be set by the state rule, yet the rule should allow justification for margins of safety or other factors to alter the trading ratio to reflect local decisions and conditions.

3.2.2 Leveraging Current Business Opportunities

Many of the individuals interviewed representing existing agricultural cooperatives in the Minnesota River Basin indicated a desire to have the flexibility for point source to

nonpoint source trading, as well as for the already established point source to point source trading[9]. The desire to keep the revenue stream with the shareholders combines with the desire to enhance local water quality while resolving downstream impacts. In addition, WQT provides an added value for entities like certified crop consultants and cooperatives to offer WQT as a value added service to their clients and shareholders. The facilitation or aggregation of credits can be another means of building a trusted relationship between the two.

3.2.3 Minimizing WQT as an Isolated Program

A desire to have WQT programs work with initiatives already focused on water quality protection was expressed by the interviewed participants. This came from two entirely different perspectives: 1) producers are faced with ever-increasing program rules and hurdles to cross and would appreciate WQT programs that parallel other program guidance; and, 2) water quality without a holistic environmental fit is of limited value. Future WQT efforts should be allowed to work closely with parallel environmental programs to minimize paperwork and learning curves while maximizing the integration of holistic functions and values. To this end, one entity stressed that the WQT Rule should have incentives that recognize a BMP's value for other ancillary benefits such as habitat, other parameters of concern or benefits for offsetting global warming.

Livestock producers wondered whether the difference between a Minnesota State permit and the NPDES permit would affect water quality trading baselines. These individuals also pondered whether water quality trading site visits could take place during CAFO or state permit inspections. The connection with WQT might potentially reduce permitting costs, or reduce WQT transaction costs. The goal would be to fund more corrections and streamline administrative overhead.

3.2.4 Private Funding versus Publicly Funded Programs

Overall many individuals preferred private WQT markets over government run programs, but only when the program integrity regarding protecting the environment is intact. In addition, these individuals stressed that the WQT process should contain mechanisms for early verification of in-stream benefits. They should also contain mechanisms to verify or stimulate adjustment in the credit estimation process and associated modeling efforts.

3.2.5 Balancing Individual Privacy and Equity

Different watershed equity issues were raised from a desire to treat all producers fairly. For instance, the WQT program should be as transparent as possible for large-scale tracking but allow personal contact information to remain private where possible. Also stated was a desired consistency in the types of contracts for legally binding agreements

[9] Minnesota River Basin General Phosphorus Permit – Phase 1
http://proteus.pca.state.mn.us/water/basins/mnriver/mnriver-phosphoruspermit.html

offered in a program, and mechanisms to avoid wild swings in credit valuation and prices.

Agricultural sector participants shared a concern that municipalities might unfairly dictate conditions of the WQT program to produce a "buyers market". This should be avoided as much as possible as the ancillary benefits from nonpoint source BMPs would be lost.

3.2.6 Recognition of Rental Land

The economic benefits of WQT being placed on rented lands has not yet been defined. The ownership versus tenancy issues are:

- Who gets the payment when a credit is generated – landowner or tenant?
- Tenancy affects length of contracts available to renters as contracts are generally year-to-year, and
- Tenancy may double the number of decisions necessary to proceed with WQT participation (i.e., convincing two parties instead of one).

3.3 Evaluation of Agricultural Credit Generation Potential

To preliminarily assess whether agricultural BMP implementation could supply ample credits for a robust trading program, a cursory evaluation of water quality credit generation potential was completed for two diverse Minnesota watersheds. The first watershed is Seven Mile Creek in Nicollet County. The second is the Rice Creek Watershed in Rice County (commonly called Springbrook)[10]. Both of these basins are part of larger watersheds where pollutant loading reductions are required to address identified water quality impairments. These reductions will drive demand for WQT credits. Thus, these two basins are ideally situated for generating credits to meet such demand (see Section 3.4).

This evaluation used two different analysis techniques to estimate current soil losses and the potential for reduction. The first technique used a GIS spatial analysis featuring the RUSLE model for soil erosion estimation. GIS data layers were used to evaluate differences in soil characteristics and types, current land uses, and streams locations while estimating sheet and rill erosion and reduction potential in each watershed with RUSLE. The second method evaluated the presence of mass wasting sites such as bank erosion, field gully and gully/ravine erosion on steep valley walls adjacent to fields. The results from both assessments are promising for each watershed, yet point out the variability in potentials for different watersheds and BMPs because of the diversity of their respective characteristics. These are discussed as follows.

[10] Assistance in completing this analysis was provided by Mr. Kevin Keuhner, formerly of the Brown Nicollet Cottonwood Environmental Health Department, and Mr. Aaron Wills of the Cannon River Watershed Partnership.

3.3.1 Seven Mile Creek

Seven Mile Creek is a small watershed just south of St. Peter, Minnesota on Highway 169. The watershed is approximately 23,500 acres in size with 88 percent of the watershed in row crop cultivation of corn and soybeans. The stream network consists of multiple ditches connected by two main ditches in the upland farmed area, both flowing into the same natural channel. The natural channel drops down the Minnesota River's bluff, a steep valley wall and then passes through the final reach that is bordered predominantly by a County Park. Here it is considered a Trout Water before terminating at the confluence with the Minnesota River.

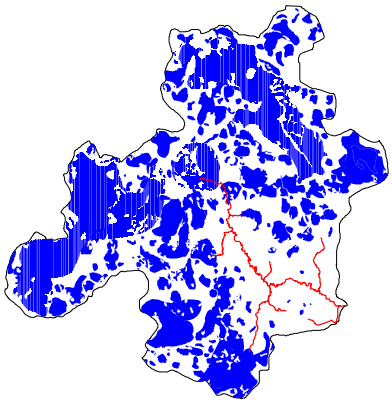
The watershed has undergone significant hydrologic alteration as illustrated in the following schematics and photo (provided by K. Keuhner). In 1851 presettlement conditions (Figure 3.3.1-1A), public land survey mapping showed that approximately 11,000 acres of wetland existed in this watershed. Over the course of the following 130 years, surface ditching and subsurface tiling converted much of the 11,000 acres of wetlands and adjacent wetter soils into productive row cropping systems (Photo 3.3.1-1). The watershed loss of wetlands peaked in 1985 with 1,307 acres remaining (Figure 3.3.1-1B). The conversion has included the installation of approximately seven surface tile intakes per square mile that connect surface depressions with the extensive subsurface drainage now underlying the cropped fields (Figure 3.3.1-2). Today, restoration efforts are occurring. In 2003, 1561 acres of wetlands existed. Thus, in this highly altered basin, there exist a number of opportunities to make additional changes in land management practices to generate phosphorus loading reductions.

To facilitate the analysis of potential credit generation in this watershed, it was assumed that the average depressional area was 14 acres in extent and had a delivery ratio of 20 percent. The baseline residue management in Seven Mile Creek measured through the Transect Survey method developed by CTIC at Purdue University is 65 percent in conservation tillage and 35 percent in more conventional tillage operations.[11]

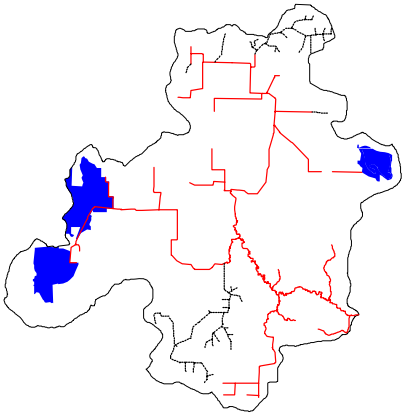
The process to estimate loading begins with the current condition and then compares the loading estimate after BMPs have been applied using the same formulas. The equations used are similar to national WQT credit estimation methods; sheet and rill erosion has a RUSLE foundation and the volume-voided equations provide mass wasting estimates. The Seven Mile Creek land coverage includes 20,591 acres of row crop, and a possible 198 acres of buffer. The results of the load reduction estimation using these conditions are provided in Table 3.3.1-1.

[11] A list of available data and reports regarding this watershed is available on line at: http://mrbdc.mnsu.edu/org/bnc/sevenmile.html

Figure 3.3.1-1A and 1B. Wetland Coverage in Seven Mile Creek in 1851 and 1985, respectively.



1851



1985

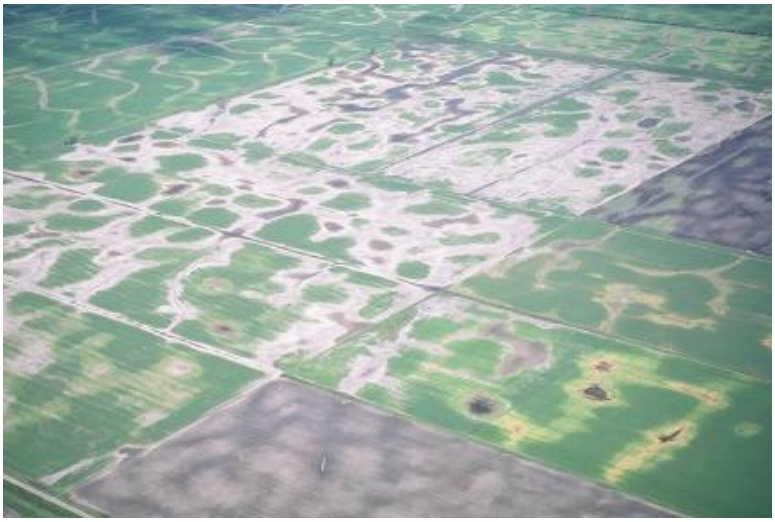
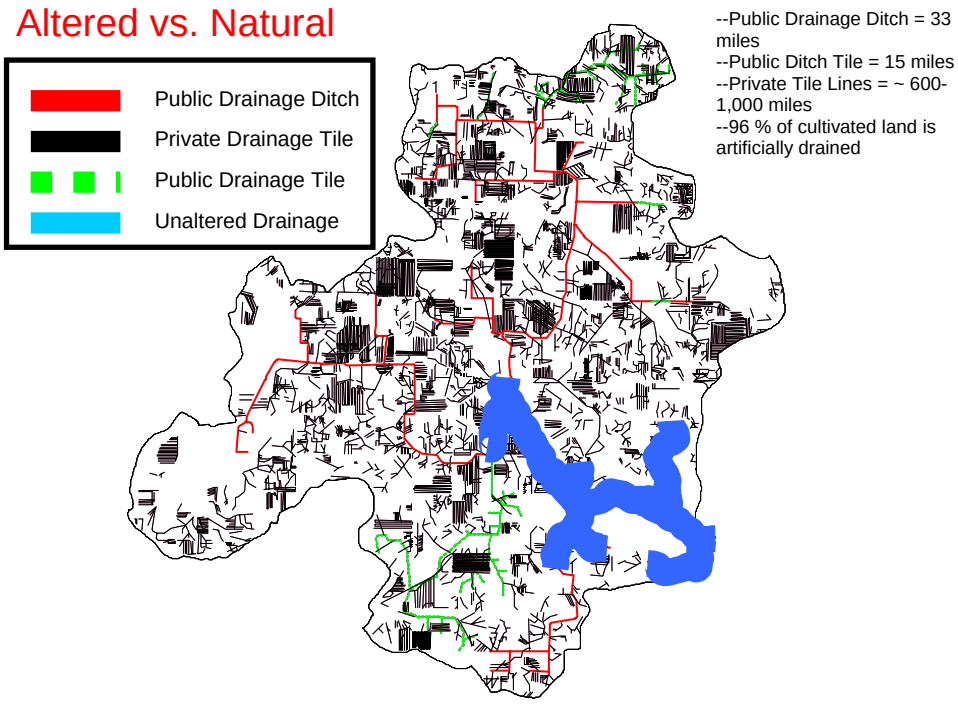


Photo 3.3.1-1. Recent Aerial Photo of Row-cropping in Seven Mile Creek Watershed. (Courtesy: Mr. Kevin Kuehner, Brown Nicollet Cottonwood Environmental Health Services)

Figure 3.3.1-2. Current Surface Drainage in Seven Mile Creek Watershed.



This spatial analysis process used to calculate load reductions, solved for a Sediment Delivery Ratio (SDR) by comparing two different subwatersheds, each with its own monitoring station. Available water quality and flow data were loaded into the FLUX model[12] to determine annual loadings for each monitored subwatershed. Using literature values and best professional judgment, proximity grouped SDR values were selected for one subwatershed and adjusted to align with the FLUX results. This served as the calibration for SDR values. These values were then applied in the second subwatershed for model validation. In the first attempt, an overestimate occurred in the validation subwatershed prediction versus monitored loads. Further site inspection revealed significant bank erosion contributions in the calibration subwatershed. When bank erosion was included in the calibration subwatershed load, validation subwatershed loads were reasonably estimated with the calibrated SDRs.

The final results from this method indicated a 7.5 percent upland sediment delivery ratio, 20 percent from surface tile intakes and a 95 percent sediment delivery ratio from riparian corridors. (A trading credit scheme might round off to 5, 15 and 95 percent, respectively as a conservative measure.)

[12] "FLUX, PROFILE and BATHTUB: Simplified Procedures for Eutrophication Assessment and Prediction", Environmental Laboratory, U.S. Army Engineer Waterways Experiment Station, 3909 Halls Ferry Road, Vicksburg, MS 39180 http://el.erdc.usace.army.mil/elmodels/emiinfo.html

Table 3.3.1-1. Seven Mile Creek BMP Reduction Potential Estimates.

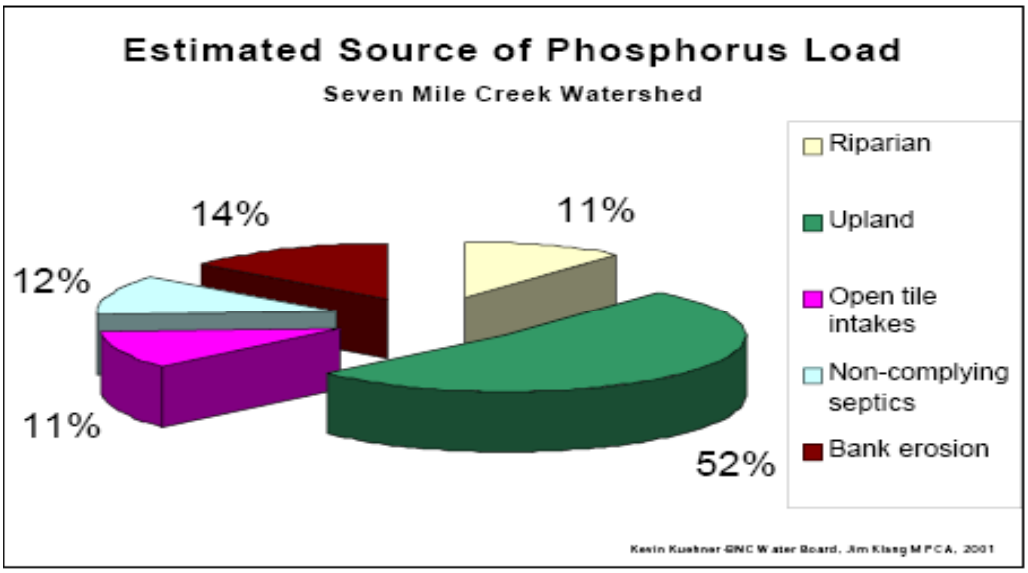
Scenarios For Protection of Cropland	*Before Loading* or Total Potential Sediment Reduction (tons/yr)	*Before Loading* or Total Potential Phosphorus Reduction (lbs/yr)
***Current Conditions* (20,591 Acres)**	*3,240*	*5,599*
With High Residue	855	1,251
With Contour Farming	486	432
With Contour Farming + High Residue	1,202	1,581
Buffer Corridor - before values	*2,644*	*3,661*
Buffer applications (30 foot each side 198 acres total)	444	732
***Surface Intake Protection* Before**	*128*	*351*
After	64	222

To estimate buffer BMP loading reductions, the area buffered included farmstead lands as well as cropland. The technique assumes a 30-foot wide grass buffer directly adjacent to ditches and streams. The first estimation step quantifies soil erosion reduction of the land converted into grass plantings using the Revised Universal Soil Loss Equation (RUSLE). The second step credited the sediment being transported from the adjacent 200 feet of upland with a buffer treatment efficiency of 35 percent. The buffer comparisons are limited to the land adjacent to water conveyance systems and therefore where given a SDR of 95 percent.

To estimate the related phosphorus loading reductions, one pound of phosphorus per ton of soil was assumed. Soil total phosphorus testing in the basin confirms this is a conservative estimate of phosphorus. For sheet and rill erosion estimation, the process described in the CREAMS[13] model documentation for the nutrient enrichment algorithm was used. Enrichment accounts for the documented increase in concentration of phosphorus per ton of eroded material transported. This accounts for unequal losses associated to redeposition. Clay and silt materials hold more phosphorus than sands; because of this characteristic, as larger materials are re-deposited, the concentration of phosphorus in the material remaining in transport increases.
The staff of the Brown Nicollet Cottonwood Environmental Health Services, working with MPCA staff, calculated a preliminary budget for contributions of phosphorus loading to the watershed. This is shown in Figure 3.3.1-1.

[13] CREAMS A Field Scale Model for Chemicals, Runoff, and Erosion From Agricultural Management Systems Volume 1. Model Documentation Chapter 4. The Nutrient Submodel M. H. Frere, J. D. Ross, and L. J. Lane, Soil Scientist, USDA-SEA-AR, Southern Region Office, New Orleans, LA; mathematician, USDA-SEA-AR, Durant, OK; and hydrologist, USDA-SEA-AR Tucson AZ, respectively.

Figure 3.3.1-1 Estimated Sources of Phosphorus Load in Seven Mile Creek.



Significant portions of the bank erosion contributions are treatable, however, they hold less phosphorus. The sediment source from the steep valley wall ravines is significant. Over 40 percent of the delivered material is from this portion of the watershed. The subsoil phosphorus content is not as high as topsoil on fields where fertilizer amendments are placed. This is shown by the bank erosion component contributing an estimated loading around 15 percent of the total phosphorus watershed load. The corrections for this type of source are readily available and affordable. A protective buffer at the top of a bluff, with a drop tube structure to direct runoff into piping and carry it through the existing ravine, would allow natural vegetation to re-stabilize the gully type feature. There is evidence that the ravine erosion rates may even have accelerating over the 2001 estimates. This is being investigated as part of the Minnesota River turbidity TMDL process.

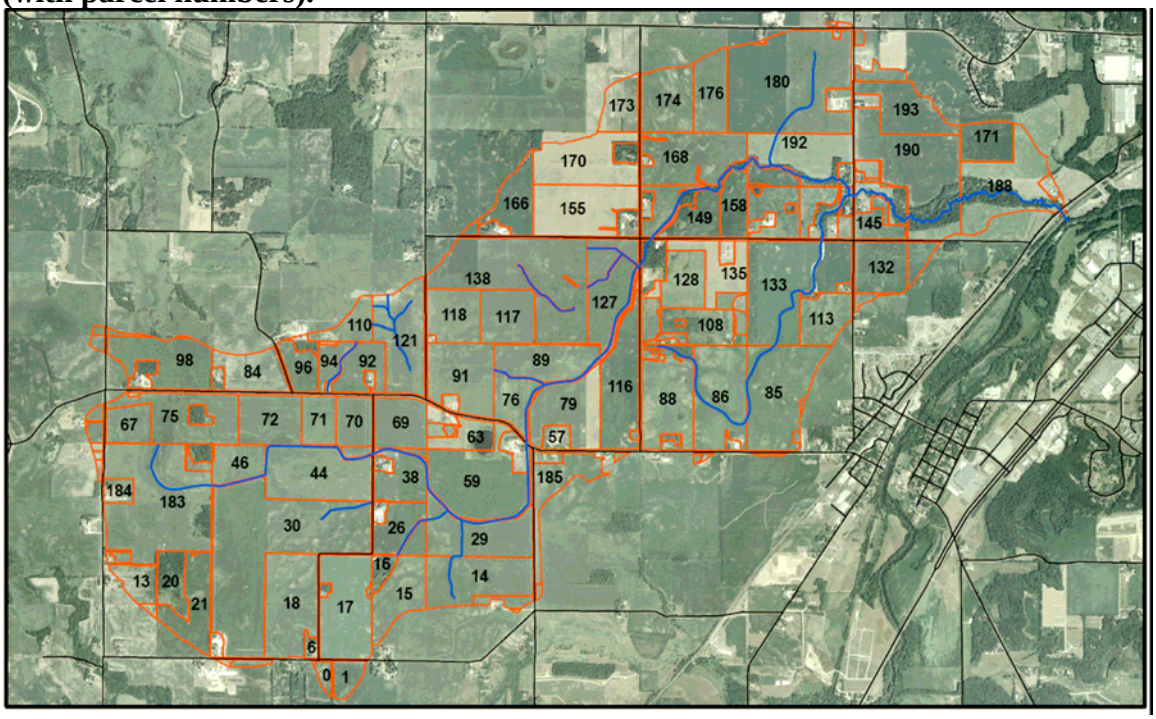
Costs incurred for the use of buffered land can be higher. A typical process could assume land rental rates for the 198 acres, as well as grass establishment and maintenance costs. The costs associated with surface tile intake protection (installation of orifice pipe risers, grass buffers or rock filter intakes) are estimated to be at around $350.00 per intake, making the credit unit cost over $200.00 per phosphorus credit (1 lb TP per year). Because of the lower erosion rates in the depressional areas of Seven Mile Creek, this alternative is less likely to be traded in a WQT market.

While BMP costs vary in different regions, uses of both residue and contour farming can be applied in certain soil conditions with little or no actual cost to the farmer. However, in tighter soils and shorter growing season years, (or further north in colder and shorter seasons), the use of high residue tillage methods may result in a slight yield reduction. Farmers should be aware of the pros and cons of their management decisions and make the appropriate selection for their conditions.

3.3.2 Rice Creek

The Rice Creek watershed just west of Northfield, Minnesota, is much smaller than Seven Mile Creek. At approximately 4,000 acres, 3,660 acres are in corn and soybean row cropping (Figure 3.3.2-1). The stream network in this basin consists of multiple ditches connecting to a natural channel. Approximately one-half of the watershed is gently rolling slopes with very low gradient slopes in the remainder. There is limited bank erosion and no steep valley walls. Also, of note is the lack of surface intakes for subsurface drainage tiling.

Figure 3.3.2-1. The Rice Creek Watershed Plotted Over a 2006 Aerial Photograph (with parcel numbers).



The Rice Creek watershed lacks multiple monitoring stations. This eliminates the ability to use one subwatershed for calibration and a second for validation. Therefore, the delivery ratios assigned to the Seven Mile Creek Watershed were used in this watershed. These delivery ratios are 7.5 percent for upland areas (greater than 500 feet from stream) and 95 percent in riparian areas. Because surface tile intake contributions are such a small proportion of the total load, no delivery ratio was assigned to this phosphorus source. A buffer reduction estimate is applied to farmstead land use consistent with the Seven Mile Creek application.

Loading reduction estimates are presented in Table 3.3.2-1. Because of the gently rolling hills in approximately half the watershed, the use of contour farming produced greater results than computed in Seven Mile Creek. The lack of ravines and gully formations in this watershed also limits credit generation potential via bank stabilization.

Either of these example watersheds will likely have the potential to for significant phosphorus and sediment loading reductions with BMP implementation. The unique characteristics of each watershed demonstrate how BMPs used to generate credits will vary among basins. Ultimately, the WQT program framework applied in Seven Mile Creek and Rice Creek will dictate the volume of WQT credits available to credit buyers in other areas of the larger watershed.

Table 3.3.2-1. Rice Creek BMP Reduction Potential Estimates.

Scenarios	*Current Load* or Total Potential Sediment Reduction (tons/yr)	*Current Load* or Total Potential Phosphorus Reduction (lbs/yr)
Current Conditions (3660 acres)	*4,058*	*5,342*
With High Residue	1,150	1,244
With Contour Farming	1,365	1,481
With Contour Farming + High Residue	2,125	2,375
Buffer corridor - before values	*3,355*	*3,889*
With Buffer applications (30 foot)	624	778

3.4 Evaluation of Potential Credit Demand

Evaluation of potential demand from buyers, and the regulatory mechanism driving this credit demand was evaluated. While the Seven Mile Creek and Rice Creek watersheds do not have a direct discharges of wastewater by NPDES permitted facilities, both are located in larger watersheds that have Total Maximum Daily Load (TMDL) efforts underway. Four current TMDLs provide the potential for a cap and trade demand on NPDES permittees, though there are also conditions in these TMDLs that may actually limit agricultural credit generating options.

3.4.1 Minnesota River TMDL for Dissolved Oxygen via Phosphorus Control

The first TMDL is associated with dissolved oxygen in the Minnesota River at the Twin Cities. Dissolved oxygen levels drop below the water quality standard in late summer periods during dry conditions. In 2004, a TMDL was approved for phosphorus controls upstream of Shakopee, Minnesota. The TMDL study concluded that 70 percent of the oxygen demanding materials causing the low dissolved oxygen conditions were from eutrophication, specifically, algal biomass production, death and decay. The study also concluded that control of phosphorus as the growth-limiting nutrient for these algae can be used to attain water quality goals.

During the summer low flow conditions, over 65 percent of the phosphorus loading is from wastewater treatment plants. To provide for flexibility and cost saving opportunities, a WQT permit was established to allow trading between wastewater

treatment plants (i.e., point source to point source trades). The use of point source to point source trading is assumed to be more viable in this situation as nonpoint source loading drier months, is significantly less than the continuous discharges of wastewater phosphorus. In drought conditions, smaller summer storms are also more unpredictable as to where and when they will occur across the 16 million square mile basin. This would create significant uncertainty with potentially relying upon nonpoint source credits. The Minnesota River Basin General Phosphorus Permit – Phase 1 thus regulates phosphorus for the months of May through September to restrict wasteload contributions at a level the river can assimilate.

TMDL and watershed management nomenclature for wastewater carried in a pipe is "point source" while diffuse stormwater runoff is called "nonpoint".

Though agriculture is contributing only 35 percent of the phosphorus load during the problematic, low flow summer conditions, it was assigned an onerous load allocation in the form of BMP adoption rates. For instance, 75 percent of the land with 3 percent slopes or greater should adopt high residue practices or equivalent BMPs. (High residue is considered to be 30 percent residue average across the cropping rotation.) The flatter lands are to have 50 percent of the surface tile intakes protected by risers, rock filters or grass buffers. As an additional requirement 25 percent of the land is to be fertilized at University of Minnesota agronomic rates (the agronomic rates applied to manure land application are for nitrogen which is assumed to be protective for phosphorus when soil erosion is managed as well).

Therefore, the Minnesota River Summer Low Dissolved Oxygen TMDL provides three significant issues that must be overcome for robust point source to nonpoint source WQT. The first issue is the competition provided by the existing point source to point source permitted trades with credits currently selling from $2.00 to $24.00. The second issue is that the impairment is during low flow conditions; runoff from nonpoint sources predominately occurs in higher flow regimes. It can also be carried downstream and out of the river leaving little behind to exert an internal loading during the critical dry period. The third constraint is that residue and nutrient management requirements on agriculture raise the baseline for producers limiting opportunities to generate creditable reductions.

3.4.2 Lake Pepin TMDL

Both the Cannon River and the Minnesota River are part of the Lake Pepin watershed. The Lake Pepin watershed covers over 50 percent of the state of Minnesota and parts of Wisconsin, North Dakota, South Dakota and Iowa. A Lake Pepin TMDL is being prepared for phosphorus because of the eutrophic conditions triggered by excessive phosphorus loads. This TMDL is scheduled to be approved in 2009.

Prior to the Lake Pepin TMDL approval, the MPCA is allowing pre-TMDL trading between point sources. This early trading will likely facilitate point source to nonpoint source, but details of how this might occur have not been considered. Physical conditions that will complicate trading over a broader geographic scale are the lakes and large wetland complexes distributed along major sections of the watercourses flowing into

Lake Pepin. Large impoundments capture and retain nutrients. These will reduce the number of trading credits generated far upstream for a downstream buyer closer to Lake Pepin.

This can be illustrated for portions of the Cannon River watershed above Lake Byllesby; these areas would not be eligible for WQT programs designed to protect Lake Pepin. As such, a WQT program could establish that only systems entering the river downstream of larger impoundments would be eligible areas for generating credits. Or, if justified, a fraction of those reductions that pass through the Lake could be eligible as credits.

Reduction in phosphorus loads from the steep valley wall ravines along the Minnesota River, as well as BMPs placed for protection of the Mississippi River bluffs along the Cannon River, would be strong candidates for crediting. The high baselines for farmers in the Minnesota River might restrict their phosphorus credit producing opportunities for Lake Pepin. Similar BMPs in the Cannon River could be assigned different baselines based on the TMDLs in that region or on a policy set by local or state managers.

3.4.3 Minnesota River Turbidity TMDL

The Minnesota River watershed has a turbidity TMDL under development also scheduled for approval in 2009. This TMDL will have requirements for reducing sediment that could either stimulate point source to nonpoint source trading, or diminish WQT possibilities. Possible negative factors on WQT from the turbidity TMDL include:

(A) There may or may not be a NPDES source associated with significant turbidity reduction goals (there is a strong possibility that NPDES stormwater municipalities will have reduction goals, but wastewater treatment plants are typically already discharging at or below the 25 NTU standard), and

(B) Load allocations for agriculture may potentially require even more stringent baseline efforts above the Minnesota River Summer Low Dissolved Oxygen TMDL.

Possible positive attributes the TMDL presents are emerging from discussions that the turbidity TMDL committees are having on streambank erosion contributions. Streambank erosion is considered a significant source of sediment and therefore, of turbidity. Bank erosion rates are accelerating in part due to increases in precipitation and in part because of significant hydrologic alterations as denoted in the Seven Mile Creek case example. The changing hydrology and geomorphology in the watershed may provide a new WQT market based on flow (volume and rate) storage systems in the watershed if buyers and sellers can be identified.

3.4.4 Lake Byllesby TMDL

A TMDL is being developed in the Cannon River Watershed for Lake Byllesby. The portion of the Cannon River watershed that flows into Lake Byllesby would not be eligible for WQT for Lake Pepin, but will be able to offset point source contributions into Lake Byllesby. The Lake Byllesby draft TMDL for phosphorus references WQT and even plans to manage future loading associated with growth by WQT. Currently, the

TMDL does not set any agriculturally related expectations that would determine a baseline for credit generation. Other means of setting baselines would need to be established. There are seven wastewater NPDES permits for continuous dischargers, and six stabilization pond wastewater NPDES permits discharging into the lake. Effluent limits for the larger dischargers are currently slated for less than 1 mg/l of total phosphorus which will likely trigger credit demand.

WQT may provide point source dischargers three windows of beneficial use. The first is during planning and construction phases. The financial and treatment technology planning design and construction period may take a significant amount of time, and WQT can leverage compliance if unforeseen delays bring the facility to miss their compliance schedule. The second period is during excursions from attaining the effluent limits. Having a pool of WQT credits available for purchase would allow excursions to be mitigated by the WQT program. The third is the future loadings of new or expanding facilities that will need to have WQT provide the permitting mechanism to discharge into a fully allocated TMDL water resource.

3.5 Best Management Practice Selection Issues

Questions of which BMPs provide the best opportunities for the agricultural producer to enter the WQT market arise frequently. Using nonpoint source BMPs to offset point source loading is evolving both at the state and national level. State and local government staff are asking some key questions that are best discussed and resolved early in the WQT rules development process. These questions are emerging from both agricultural professionals to support agricultural interests in WQT, and WQT development staff to ensure that whatever WQT credit generation process agriculture puts forth will successfully fulfill EPA, state and local policies and guidelines. The key issues with BMPs are:

- The credit generation process must be contemporaneous with the restrictive discharge periods in point source permits. If the permit specifies monthly averages or monthly maximum loads, then credits must be estimated/generated on a monthly basis that aligns with the NPDES permit. Rolling annual average effluent limits would allow annual credit estimates.
- Could the BMP Challenge for nutrient and high residue management could be used in a WQT program?
- BMP selection must consider competitive pricing, producer operational needs and policy guidelines. An efficient selection process for the most appropriate BMPs is desired earlier rather than later to minimize the potential for denied trades.
- An understanding of expected market responses and pricing is desired, both for the credit buyer and credit generator. Individuals need this information as they consider entering into a new WQT program that does not have a lengthy performance record.

Further discussion of these issues is as follows.

3.5.1 Contemporaneous Credit Generation and Use

The NPDES permit system assigns allowable wastewater discharge standards based on allowable concentrations or mass for a given period of time. Early NPDES permits based on technical processes (or Technology Based Effluent Limits--TBELs) were commonly issued with monthly average limits. Where water quality attainment was not achieved, Water Quality Based Effluent Limits (WQBELs) were assigned. WQBELs need to consider the critical time period during which the water quality stresses occur. A pollutant with an acute toxicity concern, which may have a daily time step, is not tradable. A chronic water quality issue, such as eutrophication, may be resolved by issuing a permit with seasonal or yearly time steps. These discharge conditions are more amenable to contemporaneous credit use. Therefore, pollutants such as phosphorus, nitrogen and sediment are considered tradable. The calculation of credits must in turn, be capable of estimating reductions in time steps consistent with the permit.

Most agricultural WQT credit estimation techniques use the Natural Resources Conservation Service erosion models RUSLE or RUSLE2 as a platform. RUSLE predicts an average soil erosion estimate based on an agricultural field's soil type, slope and length for a given climate. RUSLE2 is a Windows version of that model. This latter version of the model has an output template that provides the long-term average of field soil erosion estimates on a daily or biweekly time step. This allows for non-point source load estimations down to a monthly basis.

In Minnesota, winter months such as January do not produce erosion responses considering the long-term average condition. As such, a January NPDES effluent limit requirement might not necessarily able to use a nonpoint credit when these erosion based reduction method calculations are used (i.e., no credits are generated). A seasonal or yearly permit limit time step would allow for agricultural soil erosion credit generation estimates to be sufficient for WQT program needs.

Another emerging issue from EPA is that for a credit to be valid, the BMP must be fully operational at the time of use. This creates some hardship during the establishment period for vegetative practices like woody vegetative buffers. However, WQT rules can address this issue by recognizing some value for early vegetation establishment and credit the site at a reduced rate.

3.5.2 BMP Challenge Opportunities

The BMP Challenge is a risk guarantee program established by the American Farmland Trust and facilitated by Agflex. A guarantee against profit loss for farmers trying nutrient management or high residue BMPs on 100 acres is a valuable risk management tool. The farmer keeps a check strip in order to compare actual differences in bushels per acre for historic practices versus the new BMPs. Gross input and output costs are evaluated for the final net profit calculation. If farmers lost money on the trial BMP, the program pays them for the loss. If farmers make money using the BMP Challenge, a portion of the profits is requested as a payback to further the program for other producers.

Currently, practices available under the BMP Challenge face two historic impediments regarding their use for WQT in Minnesota. The first regards nutrient management and Minnesota considerations for both phosphorus and nitrogen. Most surface water eutrophication issues in Minnesota target phosphorus as the key limiting nutrient for algal growth. As previously discussed, nutrient management to yield soil phosphorus loading reductions is a long-term process. Enriched soils will show slower responses in soil phosphorus levels to agronomic rates, and year-to-year variability due to micro scale variability on the small test plots used in the BMP Challenge. It will thus be difficult to credit reductions associated with fertilizer applications given a slow soil phosphorus response and no real changes in soil erosion losses. Though nitrogen may be emerging as a pollutant issue for a small set of lakes, or Gulf of Mexico hypoxia issues, it is not a parameter that will likely be traded in Minnesota TMDL settings. Nitrogen reductions with fertilizer management could play a more important role in potential non-regulatory trading programs addressing wellhead protection for drinking water sources. These impediments may be overcome in WQT programs set up to address TMDL required baselines with tiered steps for credit nutrient management, especially given the detailed documentation provided by the BMP Challenge.

Regarding the BMP Challenge with residue, watershed managers in Minnesota have historically preferred the use of high residue. A concern arises though with Minnesota's cooler climate with a slight yield loss occurring in colder shorter growing seasons. These losses may be hidden to some landowners selecting high residue implementation methods as they do not typically have check strips to compare results from the same year. Also, the baselines for generating credits may preclude the use of this BMP as a credit generator in certain watersheds. The use of a tiered crediting system, with tier 1 documenting the baseline and tier 2 documenting BMP for credit generation, could overcome this issue. Valuable cost information for high residue could also be derived from the BMP Challenge. Such data could be used to assess the market viability of this practice.

3.5.3 Optimizing BMP Selection for WQT

Factors that the farmer must consider to optimize the BMP selected for competing in WQT markets will likely consider these features:

- Pollutant reduction potential of the BMP and the BMP site
- Costs associated with BMP implementation
- WQT program incentives providing selected BMPs with a competitive advantage over others, and
- The value of the BMP for improving productivity and yield.

The producer must consider all four in their final selection of which BMP best fits their management needs and market conditions.

3.5.3.1 Pollutant reduction potential of the BMP

The volume of credits generated by a practice should be one of the first considerations for WQT applications. A site's erosion rate is typically the first thought a producer might have for plausible credit generation. While this is important, it must be considered in light of the program's approved methods for estimating both the erosion credits and the reductions associated with the delivery ratios to the water body. The delivery ratio is typically a greater factor than the variability in erosion rates. A site in close proximity to the receiving water has higher delivery than a site far removed from the receiving water. Since pollutant loading is directly multiplied by the delivery ratio, close proximity lands become a higher priority for credit generation.

Another defining characteristic is the nutrient content of the eroded material. A bank erosion site may have significantly more erosion and higher delivery than an adjacent field site. Yet the parent material six feet below the surface, laid down by glacial deposits, may have only a fraction of the phosphorus content of the rich top soil augmented by years of fertilization on the field. More often than not, these factors become self evident once WQT program development is underway.

3.5.3.2 BMP costs

Market value of the BMP is primarily influenced by the magnitude of the load and length of the BMP service life. The value of a project with high implementation costs may be limited in a market setting where short-term credit purchases predominate. This might include structural BMPs where the return on investment might take several years in a highly competitive, buyer's market. A long-term contract could induce a producer to pursue this type of BMP, especially where the buyer is seeking a longer, stable credit supply. Other long-term farmer commitments such as row crop conversion to grasses may have a high potential for pollutant reduction but also yield poor returns in a competitive market, particularly if the change eliminates cash crop income. Conversion of the same land into a hay rotation would reduce the erosion marginally less than permanent grass cover; but could still provide a cash crop opportunity. Decisions on BMPs must also factor in establishment and maintenance costs.

Often overlooked by program officials and farmers alike are the cost impacts associated with varying lengths of BMP service life. A trading participant must factor in annual maintenance and operation costs, as well as advantages with generating renewable credits (typically annually) over the life of the BMP. These costs considerations also need to include the indirect cost of administrative overhead with developing new contracts annually, biannually or over longer periods.

3.5.3.3 WQT program framework

Technical and political considerations integrated into WQT program design will either create significant and long lasting barriers to trading, or provide benefits to a broad array of participants and in varied geographic settings. Geographic discount factors are one

example of technical features that may give one site a competitive edge over another. Discount factors may be applied to a credit generation site based on proximity to a buyer, location along a stream course or the location of water quality impairment. This type of discounting factor is justifiable and necessary to provide an equivalent water quality offset for the discharger using the credits.

Yet certain political factors should also be weighed carefully to ensure that intended outcomes of the program can be obtained. WQT program start-up may not have enough information to address all technical issues (for example, to precisely determine discount factors), but program delays with indecision could create undue burdens on agency staff, the permittees and credit generators. Early progress towards goals can also be jeopardized if the political will to proceed is absent. With adaptive management, early trading program activity can be used to adjust program operations as necessary to meet expected outcomes.

Because these WQT markets are new and likely to start small, there is risk with getting too complicated too fast resulting in unforeseen ramifications with an overly prescriptive trading rule. As such, rules should incorporate a certain level of flexibility and let the local WQT program developers involve stakeholders to test the desired systems through an adaptive process.

3.5.3.4 The value of the BMP for improving productivity and yield

It has not yet been demonstrated in other active WQT programs that producers will make significant or large-scale changes in their operations based on the additional income provided by this market. Rather, farmers will likely seek to examine how trading may marginally influence them to implement a BMP or conservation practice that in and of itself, may provide a return over some period of time even absent trading. Other cash crops and increasing prices/demand for corn will not likely be overshadowed by potential income from WQT. As will be suggested in Section 3.7, WQT credits stacked with other potential ecosystem service credits derived from a single practice may in time, be of sufficient value to trigger such larger scale operational or managerial changes.

3.5.4 Initial Market Response

Working in a new WQT market has many unknowns. Uncertainty regarding how many entities will be buying credits, or how many agricultural producers will be generating credits raises doubts regarding the value and stability of the market. This will only serve to discourage potential participants. Early market supply and demand analyses provide a valuable forecast for regulators and potential participants in these regards. Absent sufficient demand, there will be few watershed stakeholders interested in investing time and resources to develop a tool that will not be used.

Until a record of performance is established with actual trades, inefficiencies should be expected. These could relate to high administrative costs, no trades with too high of credit costs, and elaborate and costly certification and approval processes. Inefficiencies can be

minimized with the local market supply and demand assessment by building producer and buyer confidence, identifying technical needs and accelerating the learning curve.

3.6 Associated Program Costs

Few WQT programs have carefully analyzed start-up costs. This is often due to the soft money and in-kind services provided by the range of stakeholders engaged in the program development process for two to three years prior to the first trade. Both the obvious, but also the non-monetary costs are examined here.

3.6.1 Local Program Start-up Costs

Agricultural representatives recognize the potential for substantial hidden costs and barriers to creating an efficiently operating WQT program. If the process is to be successful, some means of supporting the necessary start-up costs and associated monitoring must be provided. Typical project start-up expenses involve costs to develop the administrative framework, increased staffing in supporting offices (many possible program hosts are already managing understaffed programs) and manage the necessary compliance tasks – site visits, monitoring and reporting. While it may be possible to pass many of these costs on as direct overhead in the credit price for a mature program, it is not possible to do this in an early market. There is also a need for educational materials, program guidelines and market information to foster a trusted, robust program. Opportunities will likely be available for certified crop consultants or cooperative crop consultants to facilitate day-to-day program discussions with their agricultural clientele as a value-added service.

3.6.2 Risk Management Costs

Agricultural representatives are concerned about the reliability of this new program and how stable the income from this source would be over time. The WQT program has hidden risk management costs associated with investing in WQT; if the program fails because of poor planning, going back to traditional programs will have cost impacts (possible penalties). Possible opportunity losses on federal farm program payments are associated with the risk of investing in BMPs that reduce the corn base, such as buffers. (The corn base is used to calculate certain farm payments and loss of acres reduces those payments.) Should the BMP income from WQT fail, the loss of farm payments until the corn base is re-established is a notable risk.

3.6.3 Reputation Costs

Regarding personal reputations, participants of the survey voiced an overwhelming concern as to whether WQT is a valid environmental program, and not just "another way for polluters to pay less to continue to pollute." Individuals felt that any participation in such a program could mar their personal reputation. Carefully crafted rules, or organizational structures that provide opportunities to be removed from direct association

with others in the program, is more desirable than direct involvement with another entity of either real or perceived questionable character.

3.7 Ecosystem Service Market Opportunities

The MPCA is writing rules specifically for WQT. However, other environmental markets exist or are developing for trading other ecosystem service credits. Examples include carbon trading in the greenhouse gas market, endangered species habitat banks, and wetland mitigation banking. Agricultural representatives would like Minnesota's trading rule to state how WQT can be integrated with these other programs. The spectrum of opinions on WQT complementing other markets ranged from "the more revenue the better for making the BMP cost-effective compared to $5.00 corn", to concerns over "double dipping" (selling the same credit twice). Both divergent opinions recognized the possibility of various ecosystem services, stemming from the same BMP, being sold to multiple buyers.

While MPCA does not have the authority to establish these other ecosystem service markets, it should be careful to tailor the WQT market such that integration with other markets is acceptable and efficient. It was generally agreed by survey participants that with clear stipulations in the WQT rule that such trades could occur, the idea of stackable credits coming from one practice was more acceptable. The potential does exist for higher administrative costs depending on how the rules are structured in these regards, and if requirements for acceptable reporting documents are overly prescriptive. Utilizing other program documentation augmented by addendums to fulfill the WQT necessary provisions might be one way of reducing duplicative costs.

4.0 CONCLUSIONS

The findings presented in this white paper revealed the need for WQT program integrity and local leadership in order for robust and accepted watershed-based trading to occur. Agricultural professionals surveyed for this evaluation, acknowledged the wide diversity of viewpoints over WQT between members of this sector. However, their views collectively expressed a cautious optimism. They pressed for an open and documented program development process. An operating program should also be led at the local level to overcome the potential barriers and skepticism inherent with new programs.

The most salient points stressed by agricultural representatives included the following:

- **Avoid Rewarding Producers with Poor History of BMP Implementation** - Agricultural managers with high erosion contributions and/or nutrient runoff stemming from previous environmental management decisions (and therefore possibly gaining advantages from inexpensive high credit potential from BMP implementation) should not benefit more from WQT than environmentally sensitive agricultural producers, which have properly managed high erosion sites and/or nutrient applications.
- **Third Party Site Inspections** - Having an agricultural site visited and audited by a representative of the WQT program to verify credit generation is understood and accepted. However, the inspector should be a trained individual who understands agriculture and limits the visit to water quality trading issues.
- **Emphasis on Sustainable Farming** - It is strongly desired to maintain the emphasis of a WQT program on keeping "Working lands working" versus setting up land-retirement programs for BMP credit generation.
- **Setting Equitable Baselines** - It is important to find the right balance for what baseline conservation measures are required of farmers prior to being able to generate credits versus programs that do not require any previous implementation, or those that require such a high standard that WQT is not viable.
- **Administrative Support** - Support should be available to help understand the complexities of WQT, marketing, WQT option identification, certification processes and hidden costs associated with becoming WQT savvy.
- **No Regulatory Mandates to Participate** - Participation in WQT should remain a voluntary option for buyers and sellers and not be forced upon entities.

Other issues raised by agriculture that did not necessarily rise to the level of consideration in formal rule-making, but nonetheless showed relevance to their participation included: overcoming predisposed opinions of WQT via good communication and program integrity; allowing for opportunities to leverage current business opportunities (such as cooperatives or existing service industries); making sure a WQT program is compatible with and not duplicative of other conservation programs; encouraging the private funding aspect of WQT compared to traditional publicly run programs; and, recognizing the need to balance an individual farmer's privacy and equity issues.

A significant market constraint for agricultural participation in trading was identified. Land rental relationships may likely interfere with or impede WQT given the potential

need to duplicate efforts to deal with two individuals on the credit generating side of trading. No suggestions for resolution of this issue were identified.

A significant potential to generate WQT credits in diverse agricultural landscapes was identified through preliminary nonpoint source modeling exercises for the Seven Mile Creek and Rice Creek watersheds. Effective credit generating BMPs will vary from one basin to the next and be dependent on physical conditions and agriculture specific to the area. Speculation for credit demand was assessed for the larger basins surrounding these smaller agricultural watersheds based on current or pending TMDLs. Some limitations to agricultural credit generation were identified. These related to high performance baselines in load allocations, uncertain demand, or seasonal load restrictions that limit the utility of nonpoint source credits. The Lake Byllesby TMDL for phosphorus, and the likely WLA restrictions on point sources, may provide some of the most imminent opportunities for point source to nonpoint source trading in the Cannon River watershed. Such opportunities will hinge on the TMDL, local trading framework and state-wide trading rule.

WQT in these settings must consider a number of technical issues related to agriculture. These include: contemporaneous generation of credits in alignment with NPDES permits; risk guarantee programs like the BMP Challenge; and, a critical look at credit estimation approaches that yield representative predictions of credits. It would be desirable for each new program to provide an initial market assessment of buyers and sellers. This would be followed by an open and transparent process, price discovery and adaptive management to assure program goals are being met.

Program start-up costs will are substantial. These and others costs not commonly discussed but relevant to agricultural participation include:

(A) Financing for local entities to staff an office, develop policy and protocols based on approved credit estimation and monitoring requirements
(B) Producer risk management costs associated with WQT program stability or impacts on other traditional farm program
(C) Impacts on an individual's personal reputation if the participant is seen as enabling an entity of lesser social character to "continue to pollute".

All three of these cost categories can be managed in a local program if there is a sound mechanism for public involvement to identify and define the issues, outside start-up funding and an open and respectful program development process.

Agricultural participants stressed the need for minimizing paperwork and duplication between programs, as well as simplified access to the trading program. Also acknowledged was a general belief that the trading rule should identify how other environmental markets could function in tandem with trading; so as not to restrict trading multiple ecosystem services generated by one practice but still avoid the potential for a buyer to sell the same credit twice (i.e., double dip).

5.0 RECOMMENDATIONS

The following seven recommendations are put forth for consideration during the MPCA rule-writing process. These encapsulate the goals and objectives of agriculture with regards to participation in a WQT program. While not all perspectives are the same, the purpose of these recommendations is to emphasize the need for a flexible development process that can be tailored to fit the local concerns.

(I) The WQT program must be built on integrity, and advance water quality goals on a science-based platform.

(II) Flexibility for locally-led development policies and protocols is needed to tailor programs to watershed needs within the rule. This promotes the ability to adapt to local program needs and issues.

(III) When considering rule promulgation, reopen and address the 1997 WQT guidance material from MPCA entitled Pollutant Trading for Water Quality Improvement – A Policy Evaluation. An updated glossary and further definitions are needed to effectively promote WQT in Minnesota. There exists a fair amount of confusion with other existing national guidance as well. It would assist local programs to note areas of similarity and the differences between the historic programs and new rules regarding the expectations applied to four main aspects:

- **a.** Economical, the ability for WQT to be more cost-efficient than on-site treatment alterations
- **b.** Equivalent, the ability to develop a WQT program that provides the same or greater loading reduction in the same reach or lake, at the same critical period for the same parameter
- **c.** Accountable, the ability for a WQT program framework to be measurable and reportable through monitoring and estimation techniques, and
- **d.** Additional, that the generated credit be based on a new implementation of a BMP over and above already existing practices.

These will be important definitions for providing open discussion on tailoring a WQT program to address equity issues identified between buyer driven markets and other market structures. These would include issues between a producer with a strong history of adopting conservation BMPs and those that have previously adopted few conservation measures. Other socio-political policies will undoubtedly be identified as the local programs evolve.

(IV) Provide funding for initial market assessments, open or transparent sharing of information respectful of individual privacy, and adequate facilitation of the market by knowledgeable individuals to minimize the complexities of the program dynamics. The provisions for these elements must include adequate funding, guidance and allowance for the private sector to participate and recoup their service costs.

(V) Respect farming and farmers is necessary in order to bridge gaps with regulators and permittees. This must be done on several levels by:

- **a.** Encouraging third party inspections by trained agricultural professionals
- **b.** Allowing for policies that promote a balance of "working lands" as well as the land retirement options
- **c.** Acknowledging the real costs associated with implementing conservation measures, whether they be direct economic costs or ancillary impacts, and
- **d.** Allowing the use of BMP risk guarantee programs to assist in tracking and reporting management concerns during transition periods.

(VI) Provide for flexible options to be created and tried by various programs:

- **a.** Tiered trading ratio structures
  - **i.** Prerequisite baseline performance
  - **ii.** Producers operating just above baseline conditions
  - **iii.** Producers operating well above baseline conditions
- **b.** Acknowledgement of the value of ancillary benefits
- **c.** Acknowledge BMPs that have a higher pay off over the long-term; such as nutrient management or woody vegetative systems
- **d.** Trading ratios that acknowledge the current level of understanding in watershed science and/or BMP effectiveness. For instance, rewarding monitored sites versus those that are unmonitored, or allowing lower margins of safety to exist in watersheds where a higher level of watershed analysis has been performed.

(VII) Provide the necessary funding opportunities for quality, watershed-based WQT program development:

- **a.** Local watershed organizations for start-up costs and public involvement
- **b.** Market information materials
  - **i.** Initial market assessments
  - **ii.** Web based posting
  - **iii.** Educational materials
- **c.** Monitoring
  - **i.** BMP effectiveness
  - **ii.** Resource response
- **d.** Statewide program administration
  - **i.** State office level
  - **ii.** Trading between watersheds on a basin scale such as for Lake Pepin
  - **iii.** Interstate trading opportunities

Acknowledgements

The Project Team commends the MPCA for developing the WQT rule in an open process. The team is grateful for the opportunity to attend stakeholder advisory committee meetings that yielded many valuable perspectives and comments used in this white paper.

The Project Team wishes to further recognize and thank the dedicated agricultural professionals who responded with their time and sometimes travel to participate in these surveys and project meetings. A list of entities interviewed specifically for this white paper is included in Attachment A. Our CIG advisory committee (Attachment B) continues to commit valuable time attending numerous meetings coordinated by the Project Team to advance WQT and the BMP Challenge in Minnesota. These commitments are fostering higher levels of conservation adoption with affordable methods.

ATTACHMENT A

List of Interviewed Parties

1. Paul Burns, Assistant Director, Agriculture Development Section, Minnesota Department of Agriculture, 625 Robert Street North, St. Paul, Minnesota 55155-2538
2. Doug Thomas, Former Assistant Director, Minnesota Board of Soil, and Water Resources, 520 Lafayette Road North, Saint Paul, MN 55155
3. George Boody, Executive Director, Land Stewardship Project; 2200 4th Street, White Bear Lake, MN 55110
4. Scott Thaden, NRCS TSP, Technical Assistant, Anez Consulting Inc., 1025 19th Ave. SW, Suite 1, Willmar, MN 56201
5. Kim Mitchell, US BioEnergy, Vice President of Engineering, 5500 Cenex Drive, Mail Station 175, Inver Grove Heights, MN 55077
6. Mike Valentine, Principal, EARTH TECH, 3033 Campus Dr., #290 Minneapolis, MN 55441
7. David Legvold, Executive Director, Cannon River Watershed Partnership, 8997 Eaves Avenue, Northfield, MN 55057
8. Wayne Edgerton, Agriculture Policy Director, Minnesota Department of Natural Resources, 500 Lafayette Road North, Saint Paul, MN 55155
9. Dennis Fuchs, Administrator, Stearns County Soil and Water Conservation District 110 Second Street South, Suite 128, Waite Park, MN 56387
10. Curt Zimmerman, Livestock Development Specialist, Minnesota Department of Agriculture, 625 North Robert Street, St. Paul, MN 55155-2538
11. Ed Hohenstein, Watershed Specialist, BNC Water Quality, 322 South Minnesota Avenue, Saint Peter, MN 56082
12. Marco Graziani, Water Quality Rule Development staff, Minnesota Pollution Control Agency, 520 Lafayette Road North, Saint Paul, MN 55155
13. Mary Muller, private contractor for ecosystem service programs
14. Lowell Enerson, Sauk River Watershed District Administrator, 524 4th Street South, Sauk Center, MN 56378
15. Steve Olsen, Executive Director, Minnesota Turkey Growers Association, 108 Marty Dr. Buffalo, MN 55313
16. David Preisler, Executive Director, Minnesota Pork Producers Association, 151 Saint Andrews Court, Suite 810, Mankato, MN 56001
17. Paul Torkelson, Vice President, Minnesota Farm Bureau, P.O. Box 64370, St. Paul, MN 55164

ATTACHMENT B

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