

Minnesota Statutes Chapter 103F Soil Erosion Law: History, Perspectives and Recommendations

Foreword: A comprehensive review of soil erosion, its history and legal framework written for the present day must include a discussion of government agencies and programs, technical and financial assistance for landowners and the role of soil erosion in water quality. This paper was not intended to be a comprehensive treatise about soil erosion control in Minnesota. Rather, this paper was intended to be general and frame questions and comments around a few key points in relation to the Minnesota's present soil erosion law. This paper recognizes that there are sources of sediment beyond upland erosion such as stream bank and bluff erosion but they are not addressed in this paper.

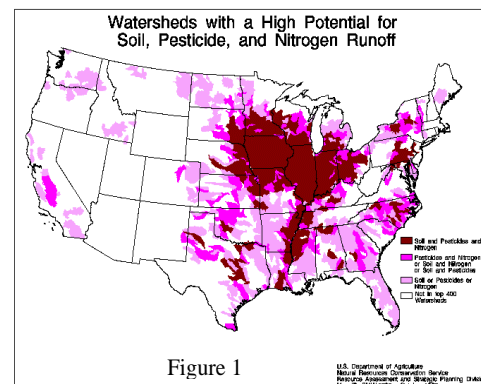
A. Erosion

Soil erosion, and the nutrients it carries with it, is a significant environmental pollutant in the nation and in the State of Minnesota. Impairments to surface water can be categorized into two general forms, physical and chemical. The portion of eroded soil that ends up in rivers, streams, and lakes is called sediment. Sediment by itself can impair fish and wildlife habitat by the physical covering up of habitat, such as fish spawning areas. Sediment that accumulates in navigation channels and water impoundments reduces not only the effectiveness of these projects but also increases public maintenance costs. Another physical constituent of eroded soil is organic matter. Organic matter introduced into surface water creates a biological oxygen demand resulting in reduced oxygen levels. If oxygen levels fall to low mortality can occur in aquatic species.

Chemical pollutants generally associated with eroded soil are phosphorous, nitrogen, and pesticides. Water quality impairments such as excessive algae blooms and exceedences in water quality standards for potable water are most commonly associated with soil erosion and subsequent sedimentation.

On a national level Figure 1 shows watersheds with a high potential for soil, pesticide and nutrient runoff. Data used to develop the map was derived from the United States Department of Agriculture, Natural Resources Conservation Service's, National Resources Inventory (NRI). A detailed description of the National Resources Inventory can be found at www.nrcs.usda.gov/technical/land.

NRIs that provide for state level statistically valid estimates of water and wind erosion were conducted in 1977, 1982, 1987, 1992 and 1997. Since 2000, NRI data have been gathered annually, although data is released at approximate five year intervals. Data for 2010, released September 2013, provides nationally consistent data for the 28-year period 1982-2010. The estimated average annual sheet, rill, and wind erosion on non-federal cultivated land, in Minnesota, in tons per acre per year for this 28-year period is listed below. In every reporting year soil loss from wind and



Minnesota Statutes Chapter 103F Soil Erosion Law: History, Perspectives and Recommendations

water erosion has exceeded acceptable tolerable soil loss limits which in Minnesota range from 3 to 5 tons per acre per year.

It needs to be noted that the USDA NRI (discussed in more detail on page 7) was downsized after the 1982 inventory and since that time data is no longer valid at the sub state scale.

Estimated average annual sheet, rill and wind erosion on non-federal cultivated land in tons per acre per year – 2010 National Resources Inventory Summary Report

1982	1987	1992	1997	2002	2007	2010
8.42	9.22	8.65	7.83	7.72	6.59	7.28

B. Minnesota’s Soil Erosion Law (103F.401-.455)

Enacted in 1984 the law set forth a broad public policy regarding excessive soil loss. It simply states that “A person may not cause, conduct, contract for, or authorize an activity that causes excessive soil loss”. Excessive soil loss is defined as meaning soil loss that is greater than the soil loss limits, and soil loss limits is defined as meaning the maximum amount of soil loss from water or wind erosion, expressed in tons per acre per year, that is allowed by local regulations on a particular soil. Agricultural soil loss limits, often referred to as “T” are set forth in the United States Department of Agriculture, Natural Resources Conservation Service, Field Office Technical Guide. In Minnesota “T” ranges from 3 to 5 tons/per acre/year.

Beyond the public policy statement the law is crafted differently than other State environmental laws such as exist for shorelands, floodplains, wetlands, and feedlots in that its adoption and administration by local government is not required. Instead the law encourages each statutory or home rule charter city, town, or county that has planning and zoning authority to adopt a soil loss ordinance.

Implementation of the law is structured around the following four basic tenants.

- Voluntary – local units of government are encouraged to adopt a soil loss ordinance
- Reasonableness - A land occupier of agricultural land is not in violation if the occupier is farming by methods that implement the best practicable conservation practices.
- Complaint Driven - An adversely affected landowner, an elected or appointed official of the local government, or a soil and water conservation district board member may submit a written complaint to the local government if conditions exist that indicate there is excessive soil loss from a tract of land that affects another tract of land or body of water
- Enforcement Linked to Available Technical and Financial Assistance - A landowner who has filed a mediated settlement or who has received a court order may request the soil and water conservation district to assist in the planning, design, and application of practices necessary to reduce soil loss to the applicable soil loss limit amounts or to the greatest practical extent. The soil and water

Minnesota Statutes Chapter 103F Soil Erosion Law: History, Perspectives and Recommendations

conservation district must give the landowner a high priority for technical and cost-sharing assistance.

C. Chronology of Minnesota's current law¹ and extent of local adoption

1984: Soil Erosion Law passed [Chapter 569]

1985: Soil Erosion Law revised [Chapter 256]

1986: Excessive Soil Loss Control Rule promulgated by the Board of Water and Soil Resources²

1994: Model Ordinance for Agricultural Erosion Control Issued by the Board of Water and Soil Resources³

The 1984 and 1985 Laws were, and remain permissive. The law encourages local units of government to adopt a soil loss ordinance. By definition the State's Soil and Water Conservation Districts are not considered a local unit of government, but can serve as a designated agent. To aid adoption by local units of government, a model ordinance was developed by the Board of Water and Soil Resources. As of this writing, no counties have adopted the model ordinance. However, five counties (Mower, Fillmore, Olmsted, Goodhue and Winona) include provisions in their county zoning ordinances⁴ specific to agricultural-related soil erosion.

Although not directly tied to 103F.401 some watershed districts, principally in the Red River Valley, include a provision in their rules that compel landowners to remove sediment from drainage ditches. The rules focus on wind-blown sediment moving from fields into drainage ditches and reducing their capacity. Reportedly, there have been very few actions by Watershed Districts taken against landowners for wind erosion.

D. Summary of comments from SWCD and county officials in the five counties (Mower, Fillmore, Olmsted, Goodhue and Winona) that have adopted ordinances related to agriculture-related soil erosion

- Regulations are complaint-driven in all five counties. The process varies by ordinance, but complaints can be made by citizens to county, SWCD or township officials. SWCDs provide technical assistance to administering officials. Typically, three or fewer complaints are lodged in a year. Landowners are reluctant to complain about soil erosion-related problems. Mower

¹ Codified as 103F.401

² Rule 8400.4000

³ As stated in the introduction to the model ordinance, as of August 1994, 55 of the 79 approved local water management plans report that erosion control regulations will be considered or adopted before the year 2000. Further, 37 (of the 55) counties have specifically identified agricultural sources of erosion to be among the first erosion sources to be regulated.

⁴ Many local units of government regulate erosion or sedimentation related to storm water or construction sites. Local zoning ordinances, however, typically exempt agricultural-related soil erosion.

Minnesota Statutes Chapter 103F Soil Erosion Law: History, Perspectives and Recommendations

County officials indicated, however, that the potential for a complaint to be filed has produced good compliance.

- Absentee ownership is a significant issue. Land stewardship by tenants is often poorer than would be practiced by an owner-operator. It was noted in a number of the counties that landowners were often unaware that existing conservation practices had been removed or abandoned until a complaint was made. Upon receipt of a complaint, the Mower SWCD contacts the owner, not the operator. Tenant/operator response to a call from the owner usually results in the complaint being resolved satisfactorily.
- The erosion control threshold for county ordinances is “T”, soil loss tolerance.⁵ Soil tolerance values are typically 3, 4 or 5 tons per acre per year. There is misconception by landowners/operators that if they are meeting the planning standard for USDA conservation compliance for highly erodible cropland then they should be in compliance with the county ordinance. While compliance with the USDA highly erodible cropland provision is a “substantial reduction in erosion” it often results in tons per acre per year values of 2 times the “T” value. This difference makes it difficult to enforce the more restrictive county erosion control standard.
- Since the county ordinances were adopted in the late 1980’s/ early 1990’s, “excessive” erosion is viewed more liberally. As opposed to sheet and rill erosion exceeding “T”; today, excessive erosion is more likely associated with a visible gully or sediment crossing a property boundary.
- Many farmers own or operate land in multiple counties. Hence, it would be very difficult for a county/SWCD to undertake a program of erosion control unless neighboring counties had a similar requirement. Significantly different requirements would also be confusing to farmers.
- County ordinances were written with erosion control performance standards based on the Universal Soil Loss Equation (USLE). The USLE has been replaced by the Revised USLE, Version 2.0 (RUSLE 2). Other factors being equal, RUSLE 2 will generate a lower soil loss estimate than USLE.
- Since county ordinances were adopted, water quality concerns have become paramount. Soil loss tolerance values have little relevance to water quality.
- Considerable effort is underway concerning the optimum location, design and efficiency of best management practices for water quality. Soil health initiatives are also receiving attention. A

⁵ Soil loss tolerance (T) values are defined by the NRCS as the average annual soil erosion rate (tons/acre/year) that can occur in a field with little or no long-term degradation of the soil resource thus permitting crop productivity to be sustained for an indefinite period of time. Soil Loss Tolerance values have been used by USDA since the 1960’s for conservation planning. The use of soil loss tolerance (“T”) values is limited to the relationship between soil erosion and productivity losses. Water quality and off-farm sedimentation damages are beyond the scope of T values. To minimize sediment-related water quality problems, soil loss in some cases must be less than T.

Minnesota Statutes Chapter 103F Soil Erosion Law: History, Perspectives and Recommendations

comprehensive program for soil protection is best accomplished if made a part of ongoing water quality and soil health initiatives.

- It was expressed that cover crops, as part of a conservation cropping system, has great potential to reduce soil erosion.

Comments:

A retooled agriculture soil loss control law might include the following provisions:

1. *Statewide, similar to the Wetland Conservation Act and other land management and resource protection provisions in State law.*
2. *Compliance based or complaint based, with systematic assessments.*
3. *Tied to existing or similar authorities to achieve compliance or address complaints.*
4. *Implemented by soil and water conservation districts.*
5. *State-established performance standards hinging on “substantial reduction in erosion” rather than a standard based on “T”.*
6. *A phased-in adoption period for landowners/operators considering the extent of soil erosion and related water quality problems in the jurisdiction.*
7. *The control of soil erosion should be incorporated into water quality efforts and include a system of best management practices, including cover crops, residue management, buffers, and structural practices such as water and sediment control basins.*
8. *The mix and location of practices would be based on watershed assessment reports (WRAPS) and other studies that identify critical areas.*

E. Summary of other state soil loss limit laws

As part of this discussion paper it was determined that a review of the approach that other states have taken with respect to their soil loss limit laws and programs would be valuable to provide perspective and ideas to our work. Some 12 states have statewide erosion- and sediment control laws. In 8 of these 12 states these laws apply to some, or all, agricultural activities. Following is list of those 8 states and a short synopsis of their soil loss limits laws. Table A which provides a side by side comparison of select aspects of each state program is attached to this document.

Minnesota – Enacted in 1984, Chapter 103F.415. Beyond the broad policy statement the law is structured to encourage local governments, not including soil and water conservation districts, to adopt local soil loss limit ordinances. The State’s role is to adopt rules and prepare a model ordinance for use by counties and cities. Implementation of local adopted soil loss limit regulations is through a complaint based system with investigation and corrective plan done by the local soil and water conservation district and enforcement by the local unit of government.

Iowa – Enacted in 1971, Chapter 161A.42 Soil and Water Conservation Practices. Requires all landowners of real property to conduct agricultural operation in a manner so as to sustain agricultural

Minnesota Statutes Chapter 103F Soil Erosion Law: History, Perspectives and Recommendations

and thereby to preserve natural resources, control floods, prevent impairment of dams and reservoirs, assist and maintain the navigability of rivers and harbors, preserve wildlife, protect the tax base, protect public lands and promote the health, safety and public welfare of the people of this state. State division of soil conservation required to adopt rules which guide the development and adoption of individual swcd regulation relating to soil erosion and sedimentation including the establishment of soil loss limits for the various classifications of land within the district. Enforcement of the law is complaint driven and if after investigation by the swcd a violation exists the landowner is required to adopt crop management and soil and water conservation practices necessary to bring the land into compliance. If structural practices are required cost-share must be made available to the landowner.

Wisconsin – Enacted in 1985, Chapters 92 and ATP 50 Soil and Water Conservation and Animal Waste Management. A very robust set of laws, rules and standards which require all land to be managed to maintain soil loss at “T”. Set a statutory goal that the soil erosion rate on each individual cropland field in the state does not exceed the tolerable erosion level on or after January 1, 2000, with interim goals set for the period of time between 1985 and 2000. Each County must adopt local regulations consistent with state law. Enforcement is limited unless the local government first offer cost-sharing that is at least equal to cost sharing rates required in state rules.

South Dakota – Enacted in 1972, chapter 38-8A Soil Erosion and Sediment Damage Control. Law defines land-disturbing activity, and means any clearing, tilling, grazing, grading, excavating, transporting, and filling of land, and the implementation of silviculture activities resulting in soil erosion from water or wind and the movement of sediments into any and all waters, public or private, on the surface of the ground, which are contained within, flow through or border lands in the state; or onto lands in the state. Law requires the State Conservation Commission to develop comprehensive state erosion and sediment control guidelines and then requires the development and adoption of local district conservation standards by each soil and water conservation district. Investigation of violation is typically triggered by complaint/petition.

Illinois – Enacted 1977, (70 ILCS 405/), Soil and Water Conservation Districts Act. Defines “land disturbing activity” which means any change in land, which may result in soil erosion from water or wind and the movement of sediments into state waters or on to lands in the State, including but not limited to, the tilling, clearing, grading, excavating, rehabilitating, transporting, depositing or filling of land, other than federal lands. The act requires the Department of Agriculture to adopt and revise guidelines for erosion and sediment control. Each district in the State is then required, within 2 years after the adoption of the State program and guidelines by the Department, to develop and adopt a soil erosion and sediment control program and standards that are technically feasible, economically reasonable and consistent with the State program and guidelines developed by the Department. The local program is permissive in that any person engaging in any land disturbing activity is only encouraged to comply with the standards for erosion and sediment control established by the district.

Minnesota Statutes Chapter 103F Soil Erosion Law: History, Perspectives and Recommendations

Ohio – Enacted 1979, Chapter 1501:15-5, Animal Waste and Agricultural Pollution. Comprehensive act and administrative rules and procedures which require all agricultural lands to be managed so as not to exceed tolerable soil loss limits (T) as set forth in the USDA Field Office Technical Guide for both water and wind erosion along with prohibiting the management of land in a way that causes gully erosion. Implemented through cooperative agreement with soil and water conservation districts but requires state to implement in soil and water conservation districts without agreements. Requires that land is managed under an approved operation and management plan and provides for a filing and investigation of complaints. Ohio's law also addresses nutrient management planning requirements in state designated watersheds in distress.

Hawaii – Enacted in 1974, Chapter 180C Erosion and Sediment Control. Requires county governments, in cooperation with the soil and water conservation districts and other appropriate state and federal agencies to enact ordinances for the purpose of controlling soil erosion and sediment. By definition the law defines and regulates "Land disturbing activity" which means any land change which may result in soil erosion from water or wind and the movement of sediment into state waters or onto lands in the State including, but not limited to, tilling (agriculture). The law required the department of health to adopt conservation standards within 90 days of passage of the act, followed by counties having to enact soil and sediment control ordinances within one year. If a county failed to enact a soil erosion and sediment control ordinance within the required timeframe then the state is required to promulgate rules and regulations to be effective within the counties failing to enact such ordinance.

Pennsylvania – Enacted in 1972, Chapter 102 Erosion and Sediment Control. Written E&S plans are required for agricultural plowing or tilling activities and animal heavy use areas. Implementation and maintenance of erosion control BMPs are required to minimize the potential for accelerated erosion and sedimentation. For agricultural plowing and tilling activities, the E&S plan must at minimum, limit soil loss from accelerated erosion to the soil loss tolerance (T) over the planned crop rotation, and for fields with less than 25% plant cover or crop residue cover and within 100 feet of surface water additional BMPs shall be implemented to minimize accelerated erosion and sedimentation. Complaints are responded to by the local conservation district and if necessary enforced by the Pennsylvania Department of Environmental Protection.

F. Measuring progress - Inventory and assessment of soil erosion and related issues

1. USDA Natural Resource Inventories

The first formal assessment of soil erosion in the United States was conducted in 1934. Results from that effort were instrumental in the establishment of the Soil Conservation Service, NRCS's predecessor agency. Since then, many periodic inventories of soil and other natural resources have been conducted by SCS/NRCS. Most recently, these assessments, called National Resource Inventories (NRIs), were conducted in 1977, 1982, 1987, 1992 and 1997. Since 2000, NRI data have been gathered annually, although data is released at approximate five year intervals. Data for 2010, released September 2013, provides nationally consistent data for the 28-year period 1982-2010. With the exception of 1982, the

Minnesota Statutes Chapter 103F Soil Erosion Law: History, Perspectives and Recommendations

sample design is to achieve State-level reliability. The 1982 NRI by comparison was intended to allow natural resource issues to be analyzed at a county level of reliability. It was determined, however, that resources were not sufficient to conduct an inventory with this level of detail, so a compromise was implemented that provided the equivalent of a multi-county level of reliability. As such the data collected and presented by the NRI is very useful for looking at trends at the national or large river basin scale but has limited use at the State level as it cannot differentiate between the significantly different landscapes and soil associations that we have in Minnesota.

Estimated average annual sheet, rill and wind erosion on non-federal cultivated land in tons per acre per year – 2010 National Resources Inventory Summary Report

1982	1987	1992	1997	2002	2007	2010
8.42	9.22	8.65	7.83	7.72	6.59	7.28

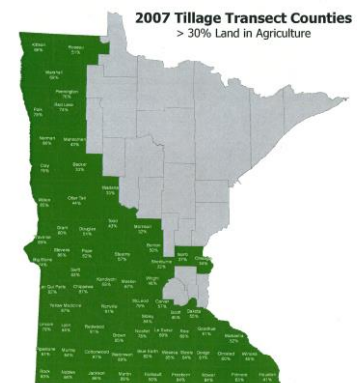
Comments:

By its nature, soil erosion is site-specific. As substantiated by terrain analyses and water quality assessments, a small geographic area can contribute the majority of a soil erosion/sedimentation problem. Consequently, state-level NRI data are of little utility to State and local officials seeking to target erosion control efforts. Conversations with NRCS staff suggest that while it is possible to request NRI officials to conduct a (e.g. watershed-reliable) assessment for Minnesota, the cost and protocols necessary to comply with statistical rigor and FOIA (Freedom of Information Act) would very likely make a request of this nature unfeasible.

2. Tillage Transects

Tillage Transect Surveys (TTS), also referred to Crop Residue Management Surveys, have been conducted in Minnesota Counties since 1989. All surveys follow the protocols developed in conjunction with the Crop Residue Management Program at the Conservation Technology Information Center (CTIC) at Purdue University. The NRCS coordinated the effort between 2000 and 2005. Prior to then, BWSR coordinated several surveys. The last survey in 2007 was coordinated by the Water Resources Center (WRC) at Minnesota State University, Mankato with funding provided by the Board of Water and Soil Resources. The 2007 TTS represents the first electronically available GIS-based inventory for crop residue data for selected counties⁶ and their respective watershed(s). None of the Minnesota surveys provide estimates for water or wind erosion.

By the late 1990's to track progress of their "T by 2000" state laws, Wisconsin, Indiana and Illinois had adapted tillage transects surveys to



⁶ Data for 67 counties are available. Selected counties have at least 30% of their land in agriculture.

Minnesota Statutes Chapter 103F Soil Erosion Law: History, Perspectives and Recommendations

include data on soil loss. In conjunction with the 2007 TTS, to determine feasibility for use in Minnesota, the WRC conducted an evaluation of the tillage/erosion transects techniques used by the Wisconsin Department of Agriculture Trade and Consumer Protection (DATCP). The WRC concluded that any future tillage transect survey be completed with a soil erosion component capable of providing county reliable data.

Comments:

Conducting TTS based on recommendations from the 2007 study by Minnesota State, Mankato would provide the means to better identify critical areas and track adoption of soil and water conservation practices. Gathering data through the revised TTS about vegetative cover and conservation practice factors would also help calibrate the soil erosion potential model that is part of the "Critical Areas Identifier" developed for BWSR by the University of Minnesota in 2007. Further, vegetative cover and conservation practice factors would improve the output of HSPF and other models used in the development of watershed assessment project reports (WRAPs).

G. USDA Farmbill - conservation compliance and erosion control

1. Highly Erodible Cropland

Highly erodible land is cropland, hayland or pasture that can erode at excessive rates. It would contain soils that have an erodibility index⁷ of eight or more. If a producer has a field identified as highly erodible land, that producer is required to maintain a conservation system of practices that keeps erosion rates at a substantial reduction of soil loss.⁸ Fields that are determined not to be highly erodible land are not required to maintain a conservation system to reduce erosion. A field will be considered highly erodible if either one-third or more of the field is highly erodible, or if the highly erodible land in the field totals 50 acres or more. All county HEL soil lists are posted in Section 2 of the Field Office Technical Guide.

2. Roles of NRCS and FSA in HEL Determinations

NRCS makes technical determinations, such as determining whether land is highly erodible, establishing conservation plans and systems for highly erodible land and determining whether highly erodible land is being farmed in accordance with an approved conservation plan or system. NRCS developed most of the HEL plans in the late 1980's. An important note about HEL compliant plans is that USDA has adopted the concept and use of an Alternative Conservation System that will meet the requirements of the National Food Security Act Manual (NFSAM), for compliance purposes, but will differ from a Basic Conservation System in that it makes only a "Substantial Reduction in Soil Erosion" from that predicted under a non-treatment condition. The

⁷ Erodiability Index is the potential erosion divided by the T value. Potential erosion is determined from the soil, landscape and climate factors in the water and wind erosion prediction equations. Potential erosion does not include residue or conservation practice factors.

⁸ The extent of substantial reduction of soil loss depends on when the plan was approved and if the land was used to produce crops prior to December 23, 1985.

Minnesota Statutes Chapter 103F Soil Erosion Law: History, Perspectives and Recommendations

NFSAM defines a “Substantial Reduction in Erosion” as a 75% reduction of potential erosion not to exceed 2 times the tolerable soil loss limit for the planning soil map unit in each HEL field.

The USDA Farm Service Agency (FSA) determines who is impacted by an NRCS technical determination of non-compliance and what penalties will be applied. The 1985 Act, as amended, provides that, unless exempt, persons who produce an agricultural commodity on a field on which HEL is predominate, or designate land on which HEL is predominate to be set aside, diverted, devoted to conservation uses, or otherwise not cultivated under a program administered by the Secretary to reduce production of an agricultural commodity, shall be ineligible for benefits under certain programs administered by USDA.

3. Extent of Highly Erodible Soils in Selected Counties

County	Total Soil Acres	Total Acres Highly Erodible (HEL) Soils	Percent HEL of Total Soil Acres
Goodhue	499,482	180,403	36
Mower	455,379	3,104	<<<1
Wilkin	481,166	26,220	5

Comments:

The extent and location of highly erodible soils is related to landscape features such as slope and gradient and soil characteristics such as texture and structure. The workload associated with developing and doing follow-up on compliance plans for highly erodible cropland varies greatly by county. There are several hundred HEL plans in Goodhue County and about ten plans in Mower. Conversations with NRCS and SWCS staff suggest that increasing follow-up of HEL plans will result in better compliance by producers. An important consideration remains in that HEL compliance only results in a substantial reduction, or up to 2T. In some counties this can be significant overall reduction in soil erosion but remains well above the established tolerable soil loss limit of T.

H. Integrated resource management: An opportunity to apply best management practices where most needed, protect the soil resource and improve water quality

The NRCS conservation planning process involves the identification of the most limiting area of significant extent. Planning decisions for these areas involve estimates for sheet and rill erosion (RUSLE 2), Soil Conditioning Index (SCI) and Soil Tillage Intensity (STIR) values.

Conservation farming systems are a combination of practices incorporated into the farm operation based on landscape, crop and livestock goals, conservation goals and management concerns of the farmer.

Minnesota Statutes Chapter 103F Soil Erosion Law: History, Perspectives and Recommendations

Conservation practices have the greatest effect on the more vulnerable areas, such as highly erodible lands or lands in proximity to receiving waters. Combinations of practices that include both erosion control and nutrient management are required to address soil erosion and nutrient losses.

Comments:

Taken together, these points suggest that relying simply on achieving compliance with HEL provision of the Farmbill will not move us toward the levels of soil erosion reduction necessary to meet many water quality goals. As such state and local efforts should be designed with two overarching concepts (a) protection of the soil resource is best accomplished under the auspices of water quality and (b) targeting will be necessary to achieve the greatest effect.

References

1. Boody, George. 2013. White Paper: Comprehensive Pilot Watershed Projects and Payment Options. Land Stewardship Project
2. Fisher, Shannon and R. Moore. 2008. Application of Wisconsin Tillage Erosion Model to Minnesota. Water Resources Center, Minnesota State University, Mankato
3. Fisher, Shannon and R. Moore. 2008. 2007 Tillage Transect Survey. Water Resources Center, Minnesota State University, Mankato
4. Stanton, Amy. 1983. Soil Loss Tolerances-T Values: Their Development and Their Accuracy. Wisconsin Department of Agriculture, Trade and Consumer Protection
5. USDA. 2013. Summary Report 2010 National Resources Inventory. Natural Resources Conservation Service and Iowa State University
6. USDA NRCS. 2012. Summary of Findings Assessment of the Effects of Conservation Practices (CEAP) on Cultivated Cropland in the Upper Mississippi River Basin
7. USDA NRCS. 2011. National Agronomy Manual. 4th edition
8. USDA. 2010. National Food Security Act Manual. 5th edition
9. USDA NRCS. 2004. Most Limiting Area of Significant Extent. Agronomy Technical Note #MN-14
10. USDA NRCS. Minnesota Filed Office Technical Guide.

Minnesota Statutes Chapter 103F Soil Erosion Law: History, Perspectives and Recommendations

Internal Conclusion & Recommendation

- Statewide total soil erosion rates have remained largely unchanged since 1982.
- We know there are landscape differences in soil erosion rates but the NRI does not allow for sub state level statistics.
- Significant reductions in water and wind erosion are needed to assure long term soil productivity and achieve clean water.
- As long as HEL uses alternative cropping systems (less than 2T) it would be unlikely that simply enforcing HEL plans would result in making a significant difference.
- MN's current soil erosion law needs to be modernized.
- Rather than relying solely on "T", state and local standards need to be set to take into account a) substantial reduction in soil erosion tied to water quality, and b) targeting to sensitive landscapes.
- We need a standardized, long term method to track erosion rates at a sub state level. NRI is desirable but is not financially or technical feasible. Tillage Transect Surveys that add soil erosion estimates is the preferred method of collecting both statistically valid numbers on tillage both rate of adoption and retention, as well as estimates of sheet, rill, and wind erosion.
- Significant new resources and staff to develop and implement meaningful soil protection efforts would be required (\$1.5 to 2 million/year)

Philosophically it should be the responsibility of the individual landowner/operator to conduct agricultural operations in a manner so as to sustain agricultural and thereby to preserve natural resources, control floods, prevent impairment of dams and reservoirs, assist and maintain the navigability of rivers and harbors, preserve wildlife, protect the tax base, protect public lands and promote the health, safety and public welfare of the people of this state should be clearly articulated as a policy goal of the legislature of the State of Minnesota. To assist landowners/operators in meeting this responsibility the current soil erosion law should be strengthened, made mandatory, and include provisions that BWSR and each soil and water conservation district develop and enforce soil loss limits for soils in each district. Established soil loss limits would then provide farmers and ranchers with a guide to what is happening and what should be happening on their land relative to soil erosion.