



Drainage Law – How it Works and Why it Matters

BWSR Academy

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Breezy Point Conference Center

Al Kean, Chief Engineer, BWSR



Three Part Presentation

1. The evolution of drainage law in Minnesota – 1858 to 2010
2. Key aspects of how drainage law works
3. Why drainage and drainage law matters to conservation in Minnesota



Part 1 – Evolution of Minnesota Drainage Law

- Minnesota drainage law has evolved - - at least some!
- Related state water law has typically been a driver of changes in drainage law
- State programs, such as RIM, have also been a factor
- Drainage Law has been MN Statutes Chapter 103E since 1990 recodification



A History of Drainage Law in Minnesota.., K. Elton King, Nov. 1980

- <http://conservancy.umn.edu/handle/91295>
- 3 general periods from MN statehood and first drainage act in 1858 to 1980
 - Drainage Period 1 (1858 – 1920)
 - Drainage Period 2 (1920 – 1960)
 - Drainage Period 3 (1960 – 1980)
- I'll add Drainage Period 4 (1980 -2010)



Drainage Period 1 (1858-1920)

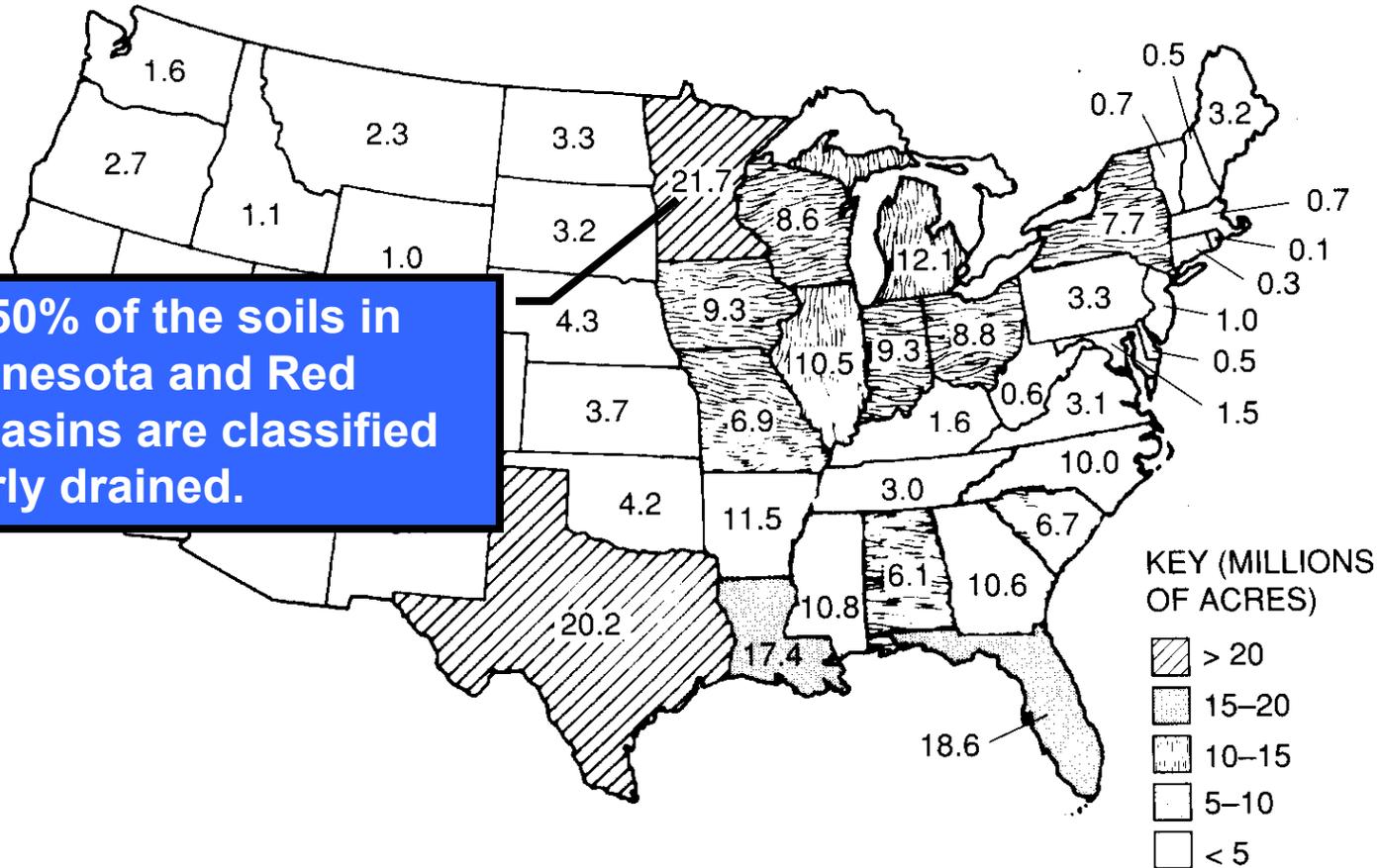
Surface Water is a “Common Enemy”

- In some areas of MN, approximately 70% - 80% of current ditches were dug by 1920 (many 1900-1920)
- Key attitudes:
 - Flooded lands, marshes and swamps breed disease
 - Overflowed areas were agriculturally unproductive
 - Surface water accumulations hinder transportation
 - Shallow wetlands restrict human progress and development
- Wet periods in mid to late 1800s and early 1900s spurred drainage activity



Wet Soils of the U.S.

About 50% of the soils in the Minnesota and Red River Basins are classified as poorly drained.

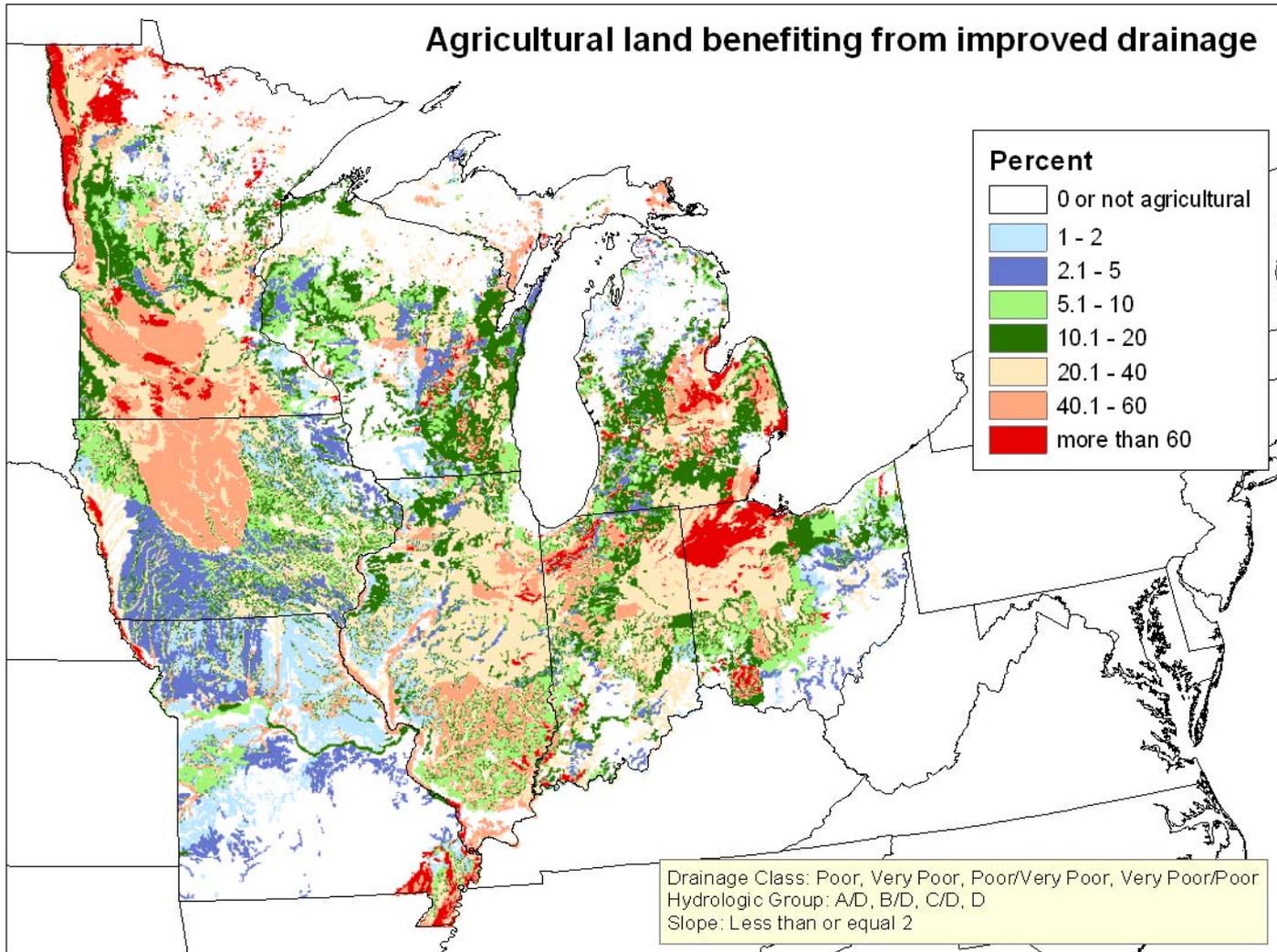


Wet soils of the continental US (USDA, Resource and Conservation Appraisal, Part I: Soil, Water, and Related Resources in the United States, 1980).



Midwest Ag Land Benefiting from Improved Drainage

Agricultural land benefiting from improved drainage



Source:
National
Soil
Tilth
Laboratory



Drainage Period 1 (1858-1920)

Surface Water is a “Common Enemy”

- Focus of drainage law evolution was on **enabling joint drainage systems** across ownership, township and county boundaries, **minimizing conflict - -drainage was king!**
- First involved registrar of deeds, then by justice of the peace and jury (1866), township supervisors (1877), county commissioners (1879), state drainage commission (1897) (State Ditches 76?), and district courts (1902)
- (1882) “Viewers” were established in law to define benefits and damages
- Concerns about protecting meandered water bodies and defining public waters began in law (1867, 1897, 1905)
Authority of county commissioners limited in 1919 case law



Drainage Period 2 (1920-1960)

Growing Emphasis on Public Water

- (1925) can't drain a meandered lake without state approval
- (1931) Office of State Drainage Commissioner dissolved and duties assigned to new Department of Conservation (predecessor of DNR)
- (1937) all navigable waters considered public waters
- (1947) Dept. of Conservation, Division of Waters and Engineering authority to authorize establishment of ditches or petition a district court was repealed and the State Drainage Board was eliminated – Drainage Law interpretation became primarily by drainage authority legal counsel and case law



Drainage Period 2 (1920-1960)

Growing Emphasis on Public Water

- (1955) drainage law amended to **give due consideration to conservation of soil, water, forests, wild animals and related natural resources, and to other public interests** (beginnings of current *Section 103E.015 Considerations Before Drainage Work is Done, Subd. 2. Determining Public Utility, Benefit, or Welfare*)
- (1955) **Watershed District law** created new drainage authorities for transfer, establishment, or improvement
- (1959) **permissive authority for 1-rod grass buffer strips and to level spoil banks** when viewers are appointed added to drainage law, presumably to reduce maintenance by improving ditch bank stability and some say to trap wind blown sediment



Drainage Period 3 (1960-1980)

More Focus on Public Waters

- (1963) Public waters redefined in drainage law to correspond to other state statutes
- (1971) MN environmental rights act
- (1973) MN environmental policy requiring EAW, EIS
- (1973) Drainage law amended to include what became *103E.015, Subd. 1. Environmental and Land Use Criteria* (for drainage establishment or improvement projects)
- (1976) MN Water Bank Program established
- (1977) Drainage law amended to make 1-rod grass buffer strips required when viewers are appointed (establishment, improvement, redetermination of benefits, some repairs)

Surface Hydrology of Minnesota

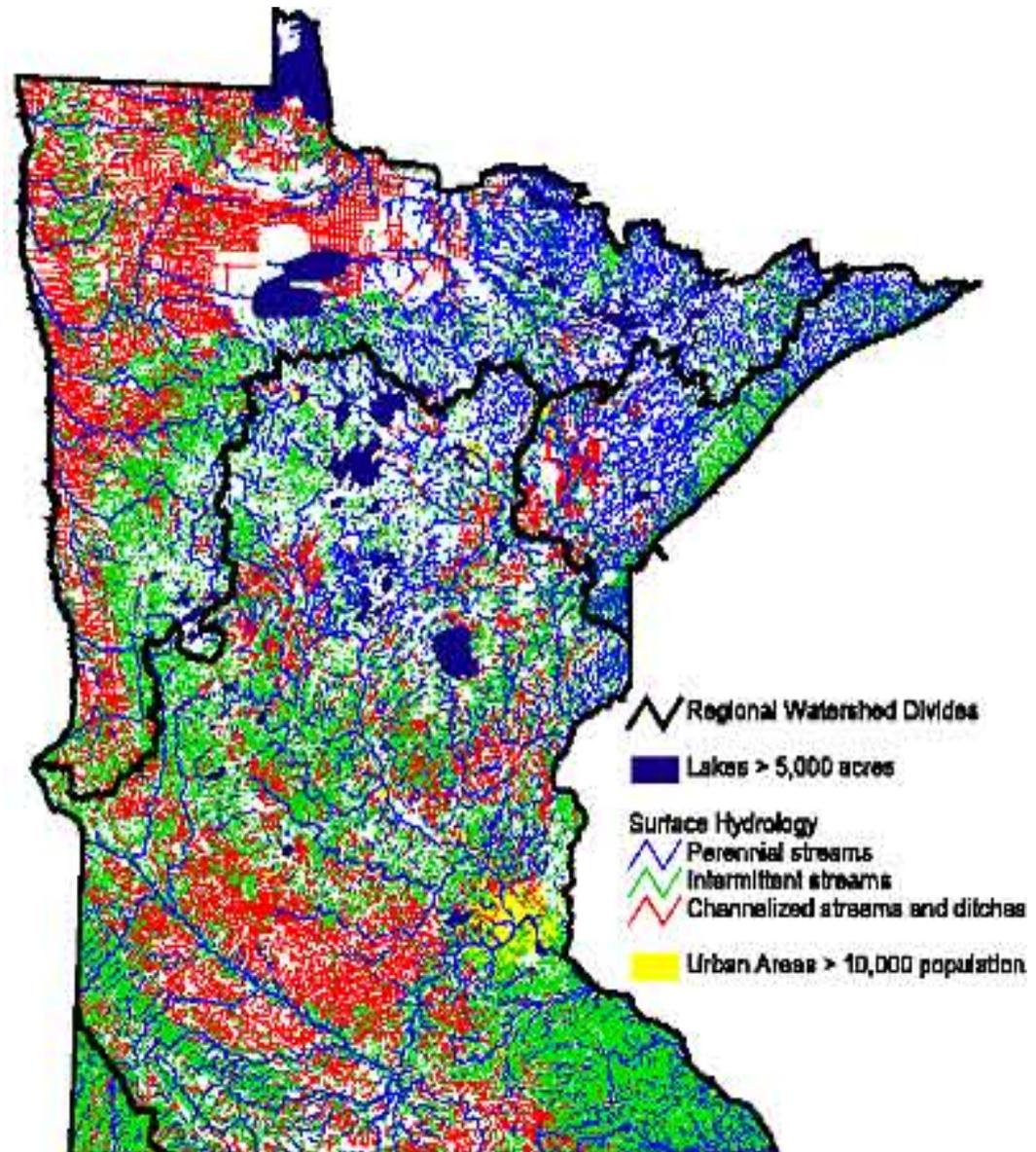
(Source: DNR)

Blue = Perennial Streams

Green = Intermittent

Red = Channelized
Streams and Ditches

(Approx. 21,000 miles of
public ditches)





Drainage Period 4 (1980-2010)

More Focus Water Quantity and Quality

- (1987) Drainage law was amended to current Section 103E.015, Subd. 1 language
- (1991) Minnesota Public Drainage Manual published (DNR), including a section about environmental considerations
- (1991) Wetland Conservation Act – protection of ≥ 25 -yr. old Type 3, 4, or 5 wetlands on public drainage systems
- (1991?) *Section 103E.701 Repairs, Subd. 6. Wetland Restoration and Mitigation* added to drainage law
- (2000) *Section 103E.011 Drainage Authority Powers, Subd. 5. Use or External Sources of Funding*, added for wetland preservation or restoration, WQ, or flood control (RIM)



Drainage Period 4 (1980-2010)

More Focus Water Quantity and Quality

- (2006) “Public Drainage Ditch Buffer Strip Study” lead by BWSR and stakeholder Drainage Work Group created
- (2007) *Section 103E.021 Ditches Must be Planted with Perennial Vegetation*, updated to clarify ditch buffer strip requirements and enable incremental buffer strips or side inlet controls using drainage system repair funds
- (2007) *Section 103E.067 Ditch Buffer Strip Annual Reporting*, added (drainage authorities report to BWSR)
- (2007) *Section 103E.705 Repair Procedure, Subd. 1. Inspection*, revised to require annual inspections where violation of buffer strip until violation resolved



Drainage Work Group Membership

Drainage Authorities	AMC – Association of Minnesota Counties
	MAWD – Minnesota Association of Watershed Districts
Farm Groups	MFB – Minnesota Farm Bureau
	MFU – Minnesota Farmers Union
	Reps. of other Ag and Producer Groups (MAWRC, MCGA, etc.)
Environmental Groups	MCEA – Minnesota Center for Environmental Advocacy
	FWLA – Fish and Wildlife Legislative Alliance
	MCF – Minnesota Conservation Federation
Other Associations	MASWCD – MN Assn. of Soil and Water Conservation Districts
	MVA – Minnesota Viewers Association
	MACO – Minnesota Association of County Officers
	MADI – Minnesota Association of Drainage Inspectors
	RRWMB – Red River Watershed Management Board
State Agencies	BWSR, DNR, MDA, MPCA
Legislature	Legislators and/or House and Senate committee staff



Drainage Period 4 (1980-2010)

More Focus Water Quantity and Quality

- (2010) Update *Section 103E.227 Impounding, Rerouting and Diverting Drainage System Waters*, to work better for wetland restorations on 103E drainage systems
- (2010) Update *Section 103E.805 Removal of Property from a Drainage System and 103E.806 Partial Abandonment of a Drainage System*, to work better for wetland restorations on 103E drainage systems
- (2010) Update *Section 103E.065 Drainage Inspectors*, to require a drainage authority to appoint a drainage inspector if the authority has any Chapter 103E drainage systems



LCCMR Project: MN Drainage Law Analysis and Evaluation

- LCCMR 2009 funding
- Smith Partners, PLLP (Louis Smith lead)
- Evaluated 3 representative scenarios (semi-hypothetical)
 - Repair project in Red River Basin
 - Improvement project in Minnesota River Basin
 - Repair in Metro Area involving wetlands and local CWPMP
- Final report August 15, 2011
- Drainage Work Group reviewing recommended drainage law and associated statute revisions
- BWSR, DNR and others need to review wetland and related law recommendations
- http://www.bwsr.state.mn.us/drainage/Drainage_Law_Eval_Smith_Partners_LCCMR_Final_Report_08-15-11.pdf



Very Brief Stand-Up Break

- Please don't leave the room (unless you must)
- Please take your seats within 1 minute





Part 2 – How Drainage Law Works – Key Aspects

- Chapter 103E drainage systems probably best described as **publicly administered, joint private systems**
- Benefited landowners own the drainage system
- Right-of-Way is held by the system
 - Ditch width, and 1-rod buffer, if required
 - Access for maintenance / repair
 - counties beginning to record ROW on property titles



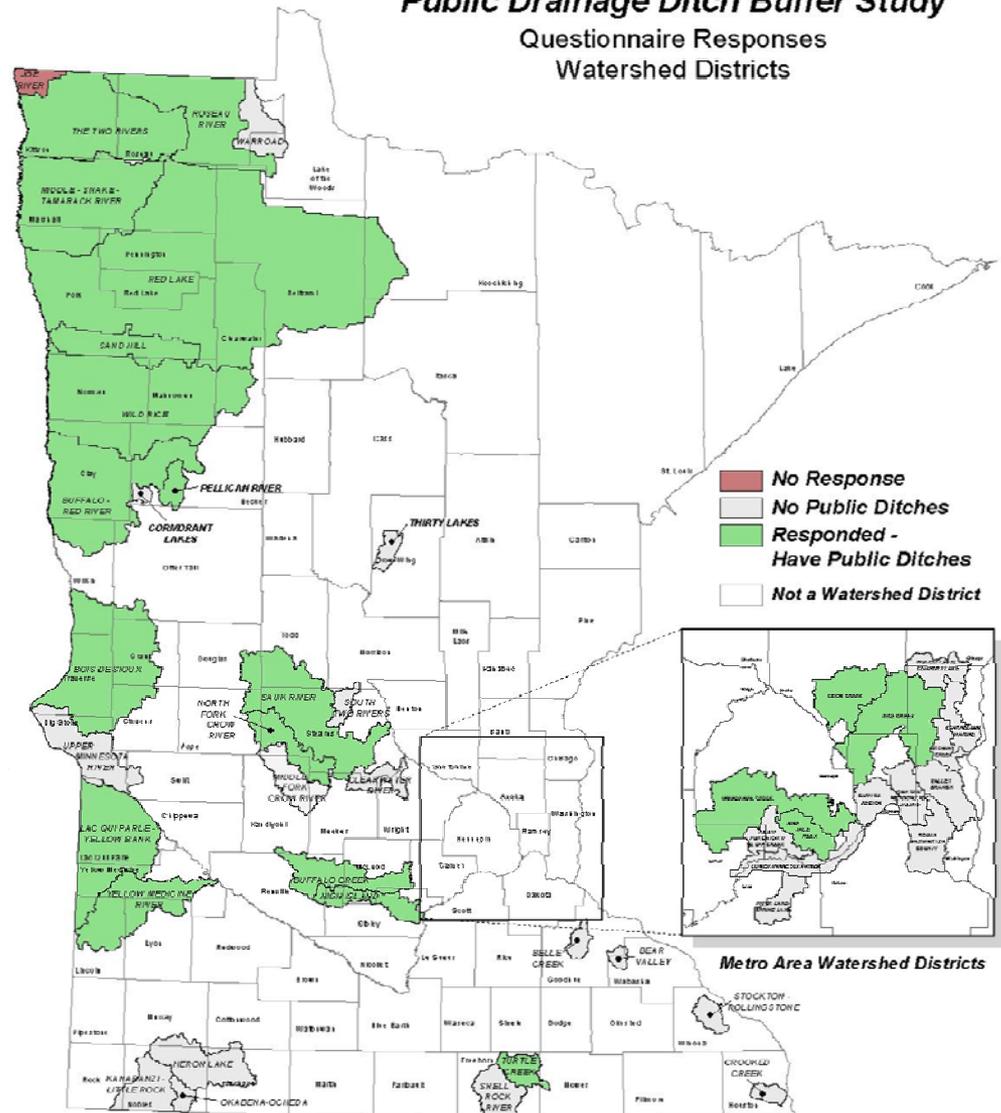
Chapter 103E

Public Drainage Authorities

- **Counties** (approximately 80 of 87 currently administer Chapter 103E drainage systems)
- **Joint County Drainage Authorities** (for drainage systems in more than one county) (5 members, at least 1 from each county board)
- **Watershed Districts** (21 of 46 currently administer Chapter 103E drainage systems)



Public Drainage Ditch Buffer Study
 Questionnaire Responses
 Watershed Districts



Watershed District Drainage Authorities



Roles of Drainage Authorities

- Accept or dismiss petitions and proceedings
- Conduct informal meetings and formal hearings
- Appoint engineers
- Appoint viewers
- Make orders to establish, improve, repair or abandon drainage systems, in accordance with Chapter 103E
- Make orders regarding outlets into a system, or impoundments on a system, and set outlet fees
- Administer drainage system funds
- Appoint drainage inspectors and provide for regular inspection and enforcement



Most Drainage Proceedings Initiated by Petition

- **Establishment** – signed by > 50% of owners, or owners of at least 60% of area drainage system passes over
- **Improvement or Lateral** – signed by at least 26% of the owners, or the owners of 26% of the property, the improvement passes over
- **Improvement of Outlet** – signed by board of an affected county, 26% of owners of overflowed property, or owners of 26% of the overflowed property
- **Impoundment** – petition by a person, public or municipal corporation, state or federal government agency
- **Repairs** – petition by affected individual or entity



Drainage Systems Pay Their Own Way with Some Exceptions

- Construction, repair and administration costs – paid pro rata by benefitted property owners, except 103E.728
- External funding can be used for wetland preservation or restoration, WQ improvements or flood control
- Federal and state cost-share can be used for side inlet stabilization and alternative tile inlets to improve WQ
- CWF Conservation Drainage grants can also be used for controlled subsurface drainage structures and bioreactors
- CCRP buffer strip contract payments if done before required Chapter 103E buffer strips (redeterminations)



Drainage Authority Actions not Requiring a Petition

- Construct flood control works including dams, structures and improvements
- Install incremental buffer strips and side inlet controls
- Conduct drainage system maintenance and repairs
- Up to the annual repair assessment limit of 20% of the drainage system benefits, \$100,000 or \$1,000 per mile of drainage system, whichever is greater
- Hearings required for most of these actions



DNR and BWSR Advisory Reports

- Advisory review of Engineer's Reports
- DNR required for County and Watershed District drainage projects (typically by Area Hydrologists)
- BWSR required for all Watershed District engineer's reports, including drainage (by Chief Engineer or Conservation Drainage Engineer)
- Because advisory only by law, drainage authorities aren't required to comply with recommendations



SWCD Technician Role in Drainage Law

- *Section 103E.701 Repairs, Subd. 2. Repairs Affecting Public Waters:* If the DNR disagrees with the repair depth, the project engineer, a representative appointed by the director and an **SWCD technician** must jointly determine the repair depth....



Crimes Related to Drainage Systems

- *Section 103E.075 Obstruction of a Drainage System and Section 103E.081 Crimes Related to Drainage Systems; Penalties*
- Obstructions or damage – Drainage Authority must investigate and can order removal or repair and file a lien
- Unauthorized drain into a Chapter 103E drainage system
- Knowingly planting trees over a public or private drain without authorization
- Misdemeanor – County attorney prosecutes
- Conservation Officer can serve warrants and arrest



Part 3 – Why Drainage Law Matters

- Public and private drainage infrastructure is vast and still increasing (primarily via pattern tile)
- Ongoing repair and improvement
- Agricultural nonpoint pollution is a key concern relative to impaired waters
- Aquatic habitat and fish passage also concerns
- Multipurpose drainage management provides opportunity for multiple benefits (including reduced impacts)



Wetland Restorations

RIM, WRP, RIM/WRP & Banking

- Many wetland restorations on Chapter 103E drainage systems
- SWCD and WD staff help coordinate with landowners and drainage authorities
- (2000) Addition of Section 103E.011, Subd. 5 was critical
- (2010) Update of Section 103E.227 and 103E.805 / 103E.806 has helped



Buffers Along Chapter 103E Drainage Ditches

- *Section 103E.021* requires minimum 1-rod buffer when viewers are appointed (establishment, improvement, redetermination and repairs requiring ROW)
- (2007) *Section 103E.067 Ditch Buffer Strip Annual Reporting* (4 pieces of information required to BWSR)
- Landowners can double dip with CCRP, if CCRP contract implemented before Chapter 103E.021
- RIM Buffer Strip easements can widen and make permanent CRP buffer strips



Multipurpose Drainage: Design Concepts and Practices for Multiple Benefits

**Minnesota
Water Resources Conference
October 18-19, 2011
RiverCentre, Saint Paul, MN
Al Kean, Chief Engineer, BWSR**



Drainage isn't a Bad Word

- Infrastructure and land use activities that depend on natural and artificial drainage:
 - **Roads** (about 132,000 miles in Minnesota)
 - **Agriculture** (about 50% of the soils in the Minnesota River Basin and Red River Basin are naturally poorly drained)
 - **Towns and Cities** (stormwater management involves surface and subsurface drainage)
- The issue is how we do drainage!



Drainage Infrastructure in Minnesota as Opportunity

- Rural road ditches (2 X 116,000 miles of roads)
- Publicly administered ag ditches (est. 21,000 miles)
- Private ag ditches (maybe about the same?)
- Publicly administered ag tile (thousands of miles?)
- Private ag tile (tens of thousands of miles?)
- Urban streets, road ditches and other surface drains (est. 2 X 16,000 miles of urban roads, plus thousands of miles of surface drains)
- Urban storm sewers (thousands of miles?)



The Challenge of Terminology – Key Definitions

- **Multipurpose Drainage** – Engineered drainage systems that provide both private drainage benefits and public water management benefits.
- **Conservation Drainage Practices** – A subset of multipurpose drainage, with a focus on water quality protection and improvement, particularly in agricultural areas.
- Common terminology hopefully = more consensus about how to do drainage for multiple benefits

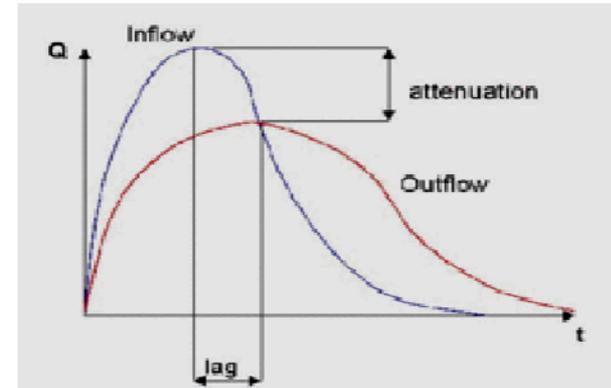


Multipurpose Drainage Goals

1. Provide adequate agricultural drainage for crop growth and productivity;
2. Provide more equitable capacity within agricultural and urban drainage systems (downstream vs. upstream);
3. Reduce peak flows and flood damages;
4. Reduce erosion to improve topsoil sustainability and water quality;
5. Improve water quality by reducing pollutant concentration and carrying capacity;
6. Increase aquatic and/or terrestrial wildlife habitat.

Primary Methods for Multipurpose Drainage

- **Runoff hydrology management** (rate, timing and volume) typically to reduce peak flows and/or volume of runoff
- **Erosion reduction** practices and designs
- **Gravitational and biological treatment** of runoff (e.g. sediment settling, vegetation trapping and use of nutrients, microbial action)





Minnesota River Sediment Source Fingerprinting

- Identified streambanks, bluffs and ravines as the primary sediment sources in recent time
- Are streams unstable because geomorphology is still catching up to changed hydrology?
- What can we do?
- Armor entire streams and rivers? Not!
- Re-modify hydrology to find new stream stability sooner? Many BMPs can and do help!

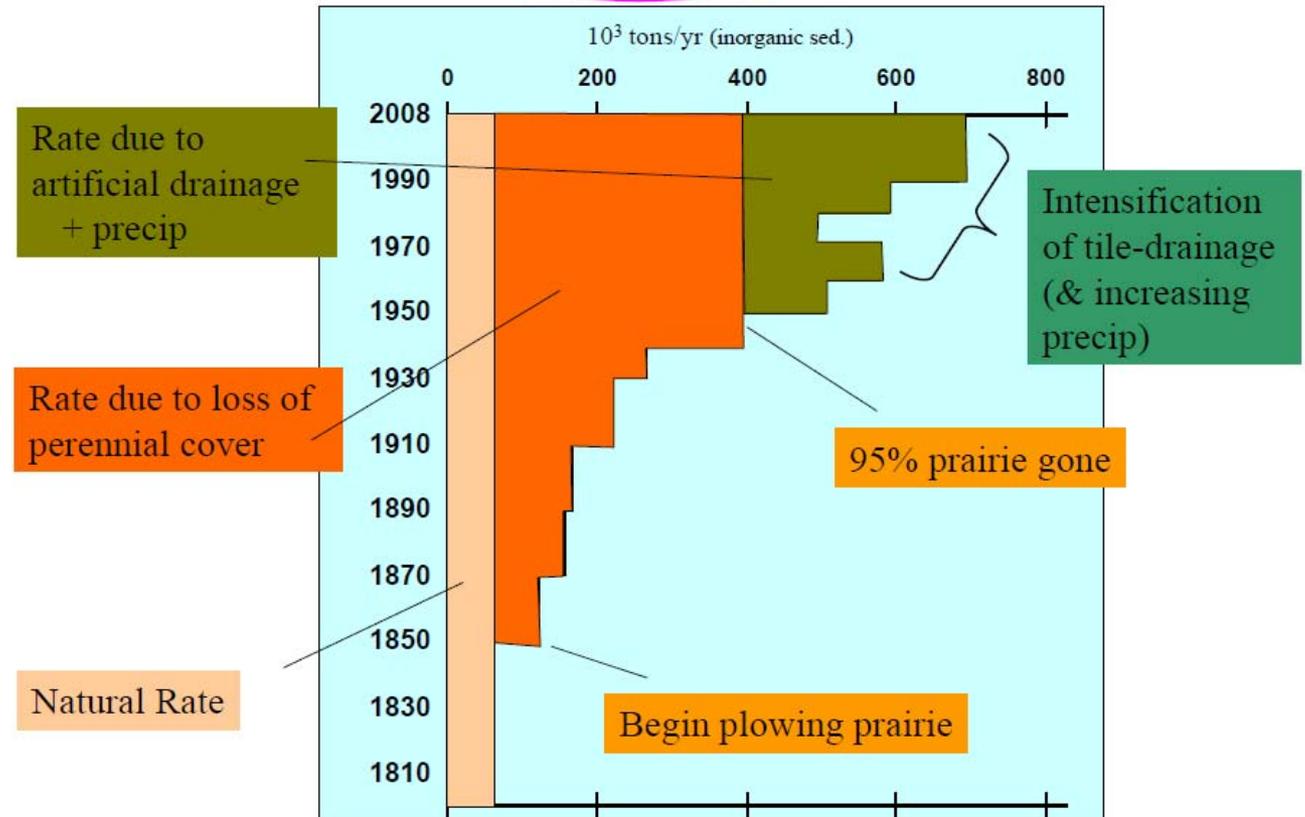


LCCMR Project: Intensified Tile Drainage Evaluation

- 1940 to 1990, Lake Pepin rate of sedimentation nearly doubled.
- Sediment source fingerprinting says 65% streambank, ravine, bluff

Source:
Shawn Schottler,
Science Museum
of Minnesota,
St. Croix
Research
Station

the
...why change: A hypothesis that needs testing
^





LCCMR Project: Intensified Tile Drainage Evaluation

- LCCMR 2009 funding
- Science Museum of MN and Minnesota State University, Mankato, WRC (Shawn Schottler, Dave Engstrom, Rick Moore)
- Born from Lake Pepin sedimentation study (sedimentation rate increase circa 1940)
- Report due summer 2013



Very Brief Stand-Up Break

- Please don't leave the room (unless you must)
- Please take your seats within 1 minute





Old / Traditional Multipurpose Drainage Practices

- Conservation Tillage (residue mgmt., contour strips, etc.)
- Grassed Waterways
- Terraces
- Water and Sediment Control Basins (1,600 in Winona County alone)
- Grade Stabilization Structures (4 types in NRCS Std.)
- Impoundments (Ponds, Rd. Ret., on- or off-channel)
- Vegetated Buffers and Filter Strips
- Alternative Tile Inlets



Conservation Tillage – Contour Strips



Grassed Waterways



Water and Sediment Control Basins



Terraces



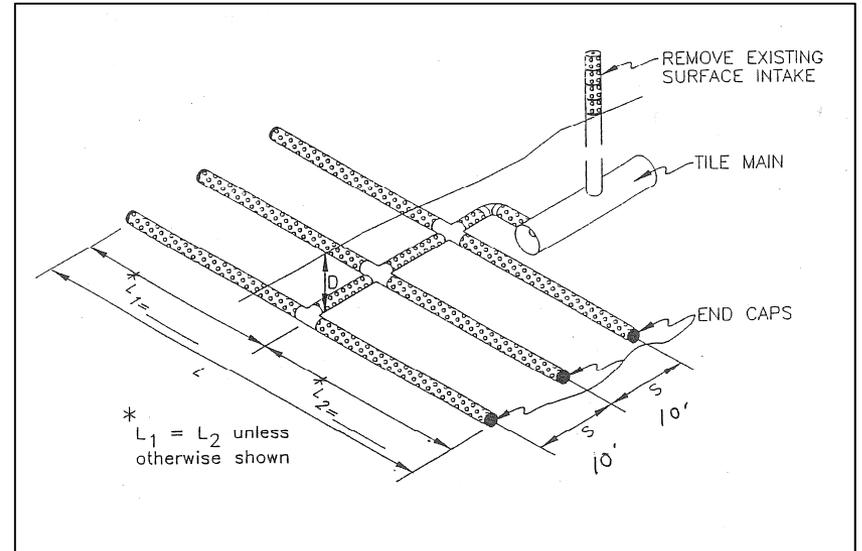
Grade Stabilization – Side Inlet Controls



Impoundments – Ponds, Rd. Ret., etc.



Vegetated Buffers and Filter Strips



Alternative Tile Inlets



New(er) Multipurpose Drainage Practices

- Wetland Restorations and Treatment Wetlands
- Stormwater Ponds
- Raingardens
- Controlled Subsurface Drainage (NRCS - DWM)
- Woodchip Bioreactors
(http://www.wq.illinois.edu/DG/Equations/trifold_Bioreactor.pdf)
- Culvert Sizing
(<http://www.rrwmb.org/files/FDRW/TP15.pdf>)
- Two-stage Ditches



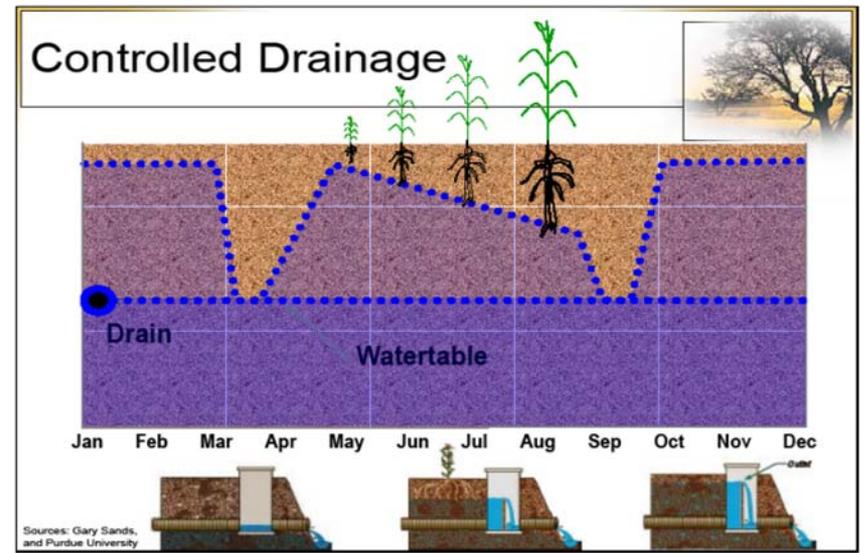
Wetland Restorations



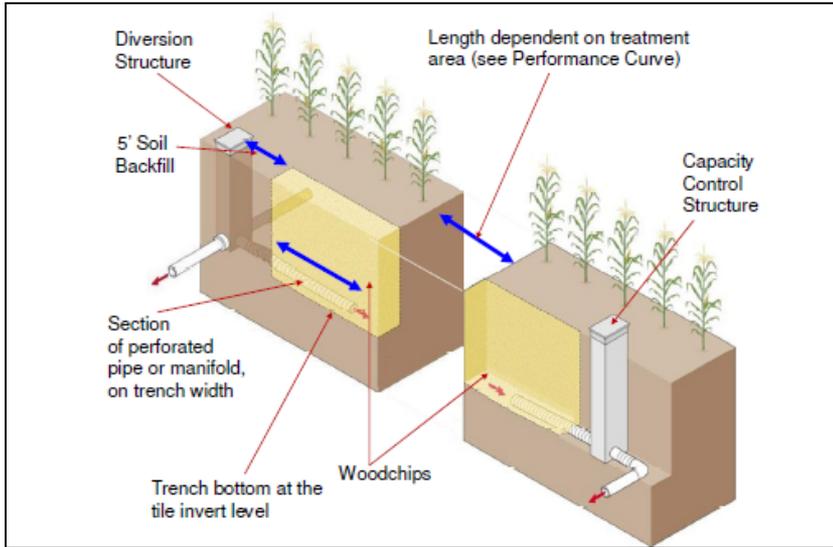
Stormwater Ponds



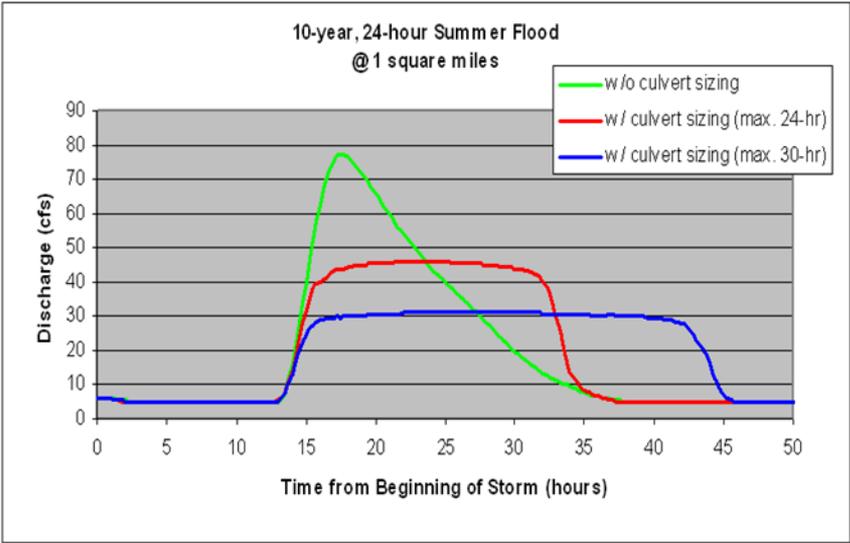
Raingardens



Controlled Subsurface Drainage



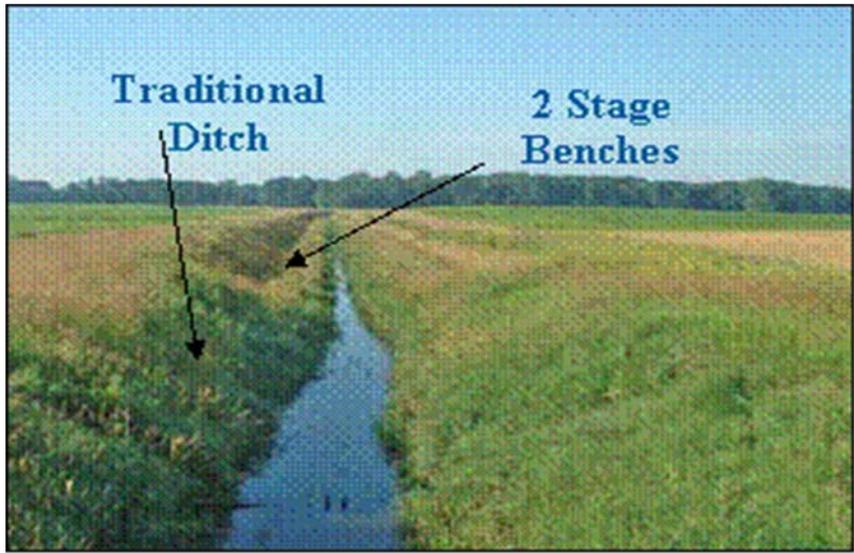
Woodchip Bioreactor



Culvert Sizing



Naturally-Formed Two-Stage Ditch



Created Two-Stage Ditch



Incremental and Watershed Approaches

- **Incremental practice approach:**
 - Random acts of conservation?
 - Or, opportunities to integrate landowner motivation, incremental funding and disbursed technical assistance?
- **Drainage System or Watershed approach:**
 - Various scales (small to large drainage systems or watersheds)
 - Requires more planning, analysis and broader expertise
 - Often can better address multiple goals and opportunities
- Need to pursue multipurpose drainage using multiple approaches – – all with targeting (It's a big endeavor!)



Challenges for Multipurpose Drainage

- **Decision makers believing** – – that multipurpose drainage is worth it and doesn't unreasonably compromise a single drainage purpose (e.g. agricultural productivity or urban development).
- **How to define and integrate private and public benefits and funding, particularly for retrofits?** The intersection of economic, environmental, social and political considerations.



Multipurpose Drainage Tools

- **LiDAR topography and GIS** → help target the right practices in the right places
- **Hydrologic modeling** → continues to improve and to help analyze and design for multiple goals
- **Watershed based analyses** → provide more opportunity to identify the best locations for a suite of practices (BMP saturation)
- **Continued research and development** → add new practices and methods to the tool box



Multipurpose Drainage Bottom Line Thoughts

- Drainage is necessary
- Drainage infrastructure provides opportunity
- Many old and new agricultural and urban BMPs support multipurpose drainage goals
- Many of these BMPs work best in the headwaters of natural and artificial drainage systems
- There are far more headwaters than main stems
- **Multipurpose drainage** is worthy of our support!

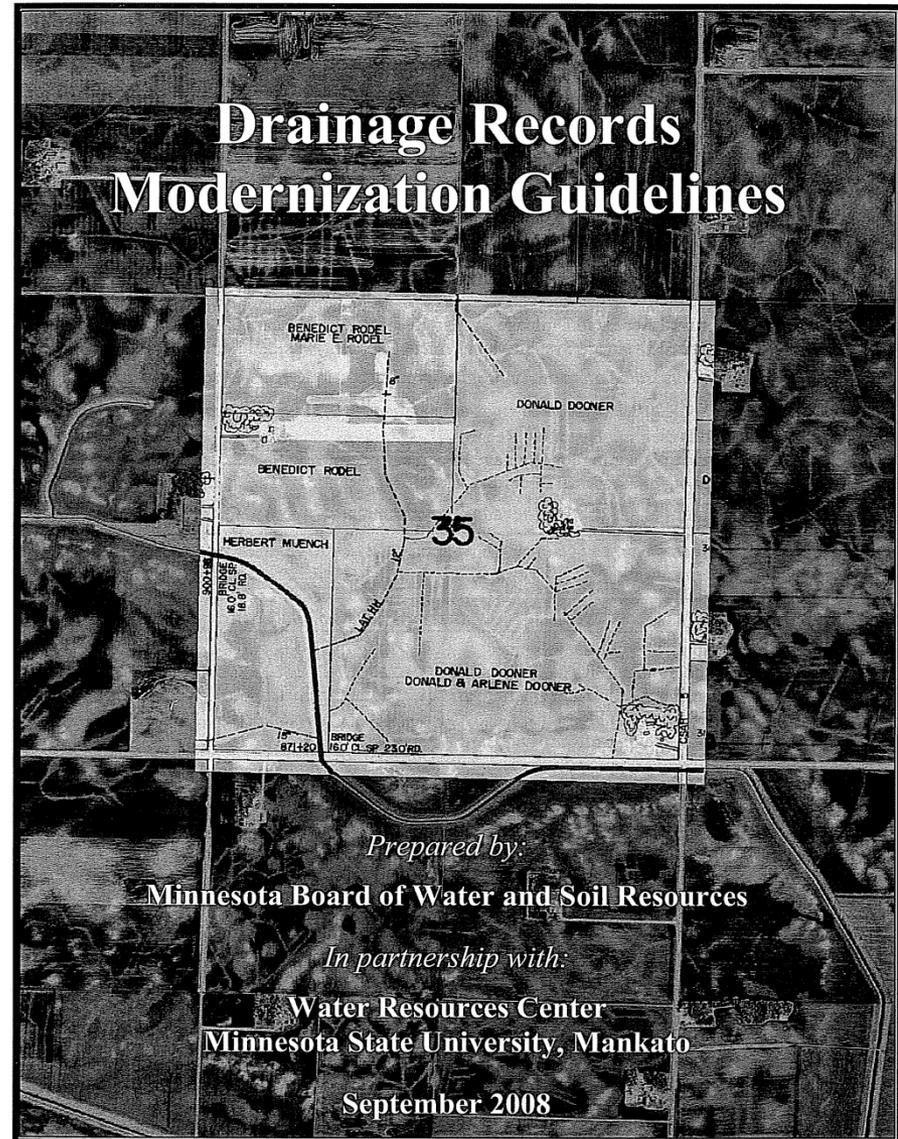


Related Updates If There's Time

- Interagency Drainage Management Team (BWSR, MDA, DNR, MPCA, NRCS, UMN, MSU-M)
- MN-IA 12th Annual Drainage Research Forum (November 22, 2011, Okoboji, IA)
- MN Association of Watershed Districts – Drainage Workshop (December 1, 2011, Arrowwood Resort, Alexandria)
- Stakeholder Drainage Work Group continues to meet



Drainage Records Modernization Guidelines



http://www.bwsr.state.mn.us/drainage/records_guidelines.pdf



BWSR Drainage Records Modernization Grants

- \$500K FY09; \$100K FY11 (1:1 match)
- County and WD drainage authorities eligible
- 44 applications requested \$1.35M
- 23 applications funded
- Some projects complete (records scanning, database, some tied to GIS, some data available online)
- Need to gather lessons learned
- BWSR submitted LCCMR application in 2010 for shared database and cost-share, but unsuccessful



Clean Water Fund Conservation Drainage Program

- Administered by BWSR
- \$200K FY10; \$300K FY11; \$950K FY12 & FY13
- For conservation drainage retrofit practices (side inlet controls, controlled subsurface drainage, culvert sizing technical assistance, alt. tile intakes, bioreactors, other innovative practices)



Types of Conservation Drainage Projects to Date

- Many side inlet controls to drainage ditches (type of Grade Stabilization Structure – 410)
- A few controlled subsurface drainage retrofit structures (Drainage Water Management – 554)
- Substantial number of woodchip bioreactors (Denitrifying Bioreactor, Iowa Interim – 747)
- One culvert sizing master plan for a judicial ditch system to reduce peak flows and erosion



Red River Retention Authority

Basin Technical & Scientific Advisory Committee

- Hydrologists, engineers, professors, soil scientist, agronomist and others
- First question – What is the effect of tile drainage on flood peaks?
- Briefing Paper #1 – General points of agreement based on literature search and discussion, research needs for watershed scale
- Briefing Paper #2 – In process – potential recommendations regarding tile permitting



Conservation Drainage Practice Promotion



Side Inlet – Practice 410 Grade Stabilization Structure

- 3 Benefits:
- 1) Erosion control at inlet (WQ)
 - 2) Peak flow control downstream (WQ & FDR)
 - 3) Sedimentation in temp pond on field (WQ)



Other Questions?