Wetland Restorations
For Hydrology and Water Quality

A Collaborative Effort Supported by the McKnight Flora/Flora, Seven Mile Creek Watershed Project, Clean Water Partnership Program, Conservation Reserve Establishment Program, Conservation Reserve Program.

Conservation Drainage
1) Controlled Drainage Structures
2) Shallow Drainage vs. Deep Drainage
3) Bio-Reactors
4) Alt. Ditch Design
5) Linking Drainage with Restored Wetlands

Conservation Drainage Structures

Open Ditch 250
Tile 150
Private Tile ????
TOTAL 350+ Miles

Seven Mile Creek Watershed
An Historical Perspective of Drainage Management

Fox Lake 1955

Fox Lake 1990

1938

1955

1985
Open Ditch
Private Tile
Tile
Natural

The Engineered System

The Engineered System

440+ Miles of Artificial Drainage

Water Quality

Water Quality

Monthly Nitrate-Nitrogen Levels
City of St. Peter Drinking Water Wells

Nitrate-N

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<th>Growing Season Year</th>
<th>Yield (lbs./acre)</th>
<th>Conc (mg/L)</th>
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**Hydrology**

- **Desired**
- **Undesired**

**Flow**

**Time**

**Design Considerations**

- Minimize cropland taken out of production while maximizing nitrate treatment
- Ensure proper drainage above and below the restoration
- Surface topography has elevation differences of 5-8 feet

**Outletting tile into restored wetlands**

**Summary of Wetland Restorations**

*Brown and Nicollet County*

- 34 Wetland Restorations.
- Over 500 acres of wetlands and buffers established in a three-year time period.
- It was technically feasible to outlet tiles into restored wetlands about 20% of the time.
Wetland Restorations

Performance Monitoring

Nitrate Treatment Effectiveness
Site 3, 2005 and 2006

Nitrate Reduction Performance
April-Oct, Site 3, 2005 and 2006

82% Average Reduction
19.6 mg/l → 3.6 mg/l

>75% Reduction
Performance Monitoring

- More sustained and regulated flow
- Wetland flow continues about one month longer than the tile flow
- Peak tile flow rates are reduced by 25%-75%
- Tile flows from east tile are affected by other wetland
- Landowner testimonies

Lessons Learned

1) Technical Limitations
2) Opportunities to bridge gaps
   a) Technical Service Representatives and Conservation Liaisons
   b) Assistance with installation and follow-up
3) Need an integrated approach
4) Need further analysis

Wildlife Habitat

Solar/Wind Powered Pumps?
Acknowledgements
Special thanks to the many project partners and especially to:
- McKnight Foundation
- Clean Water Partnership Program
- BWSR

Kevin Kuehner
507-934-4140
http://mrbdc.mnsu.edu/org/bnc/

Conservation Drainage Demo Farm
1) Conventional depth (80ft spacing, 4ft depth)
2) Shallow depth (60ft spacing 3ft depth)
3) Controlled drainage (50ft spacing, with 2ft water outlet structure)
4) Same as #3 but with a woodchip bioreactor

Nicollet County Drainage Ditch Buffer Status
Total Ditch Miles = 276
% of Ditch without Buffer = 85%
% of Ditch with Buffer = 15%

Drainage Records Modernization
- Digital conversion of County Ditch Maps
- Historical Air photo Rectification
- Geo-referenced Drainage Inspection
- Integration into ArcGIS, ArcReader and ArcIMS Applications