

Clearwater River Dissolved Oxygen and Fecal Coliform TMDL Study

March 2007 Stakeholder Advisory Group Meeting

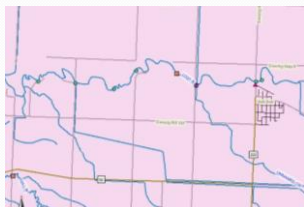
VELKOMMEN!

Past Studies in the Clearwater River Watershed

- Clearwater Nonpoint Study
- Biological studies
- Wild rice paddy water quality
- Clearwater Lake Water Quality Model
- TMDL Study on the trout stream reach of the Clearwater River and Walker Brook
- Clearwater River Environmental Study
- Others

Past Studies – MPCA Lost River Investigation

- 1987 – 1988 Oklee
- Wastewater impact evident
 - Fecal Coliform
 - Ammonia
- More stringent effluent limits



Past Studies – Clearwater River Nonpoint Study

- Phase I: 1992 – 1993
 - River and Lake Water Quality Monitoring
 - Modeling
 - Loads and Yields
 - Provided data for statewide assessments
 - Climatology and Hydrology
 - Biologic Characteristics
 - Recommendations



Past Studies – Clearwater River Nonpoint Study

- Phase I
 - Management Plan
 - Problem Identification, Corrective Measures, and Estimated Costs
 - Erosion
 - Point and Nonpoint Sources
 - Feedlots
 - Rehabilitation of the channelized reach
 - Fish passage
 - Education

Past Studies – Clearwater River Nonpoint Study

- Phase II
 - Implementation
 - Conservation Buffer Strips
 - Wild Rice Water Quality Improvements
 - Stream Bank Stabilization
 - Public Education – River Watch



Wild Rice Studies

- *When Wild Rice is Cultivated*
 - Svedarsky et al.
 - Waterfowl Production
 - Water Quality
- Several Biological Studies
- Clearwater SWCD and RLWD Commercial Wild Rice Production Pilot Project
 - Design and install systems
 - Water quality monitoring
- RLWD Tile Drainage Study

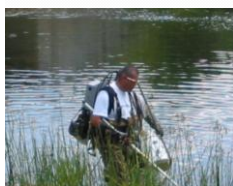


Current Studies/Monitoring Efforts (other than this TMDL study)

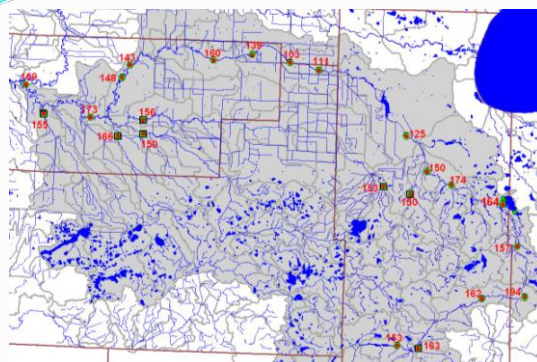
- Tile drainage study
- Habitat/bioassessment
- Ruffy Brook restoration
- Red River Basin Buffer Initiative
- Long-term monitoring sites
 - RLWD
 - Red Lake SWCD
 - Multi-County
 - River Watch
- USGS Flow Monitoring



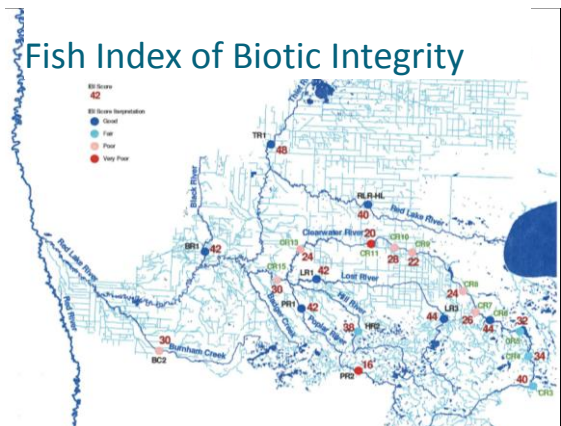
Existing Studies – Habitat/Bioassessment on the Clearwater River



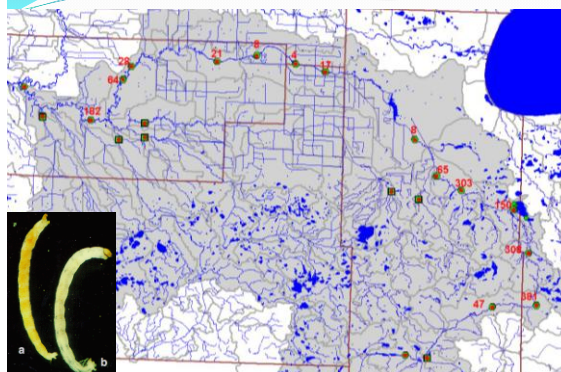
Habitat Assessment Scores

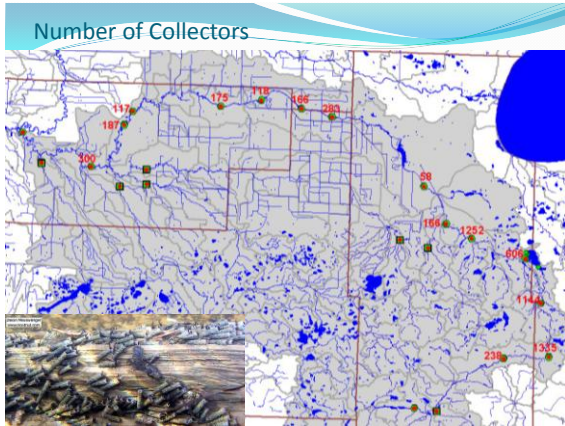


Fish Index of Biotic Integrity



Number of Diptera (flies, midges, mosquitoes, gnats)





Tile Drainage Study

- Conventional Ag
 - Surface → Tile
 - Flow and water quality
- Wild Rice
 - Surface → sfc + tile → main line tile
 - Water quality

Questions?

Clearwater River DO and Fecal Coliform TMDL Study Data Review

- Gather Data from EPA STORET Database
- Assess at each site
- Assess across reach
- Look up original listing data as well

Parameter	Statute	Exceed	% Exceeded	Impaired	Designated	2009
Streambed Obstruction	44	3	6.82%	Yes	Full	Better
Streambank Erosion	42	3	7.14%	Yes	Full	Better
Streambank Instability	38	0	0.00%	Yes	Full	New
Streambank Sediment	40	0	0.00%	Yes	Full	New
Streambank Silt	40	0	0.00%	Yes	Full	Same
Streambank Vegetation	35	0	0.00%	Yes	Full	Same
Streambank Width	40	0	0.00%	Yes	Full	Same
Streambank Stability	37	0	0.00%	Yes	Full	Same
Streambank Permeability	37	0	0.00%	Yes	Full	New
Streambank Temperature	44	0	0.00%	Yes	Partial	New
Streambank Temperature	44	0	0.00%	Yes	Partial	Same
Total Phosphorus	44	21	47.73%	Impaired	occasional 10th	Stable
NO3 & NO2	36	10	27.78%	Impaired	occasional 10th	Better
Conductivity	44	42	95.45%	Impaired	occasional 10th	Evergreen 10th
				10th	Yes	Better

Water Quality Standards

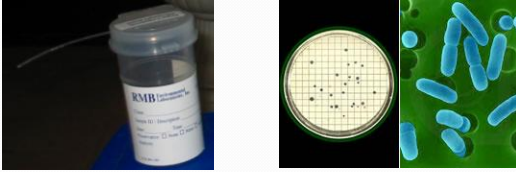
- Fecal Coliform – Aquatic Recreation
 - 200 cfu/100 ml as a monthly geometric mean
 - Can aggregate data by calendar month (last 10 yrs)
 - 2000 cfu/100ml single sample standard
- Dissolved Oxygen – Aquatic Life
 - 5 mg/L for warm water fisheries
 - 7mg/L for cold water fisheries
 - 303(d) List of Impaired Waters
 - >10% are < standard = partially supporting
 - >25% are < standard = not supporting

Monitoring Strategies

- Spot Measurements
- Longitudinal Surveys
- Samples

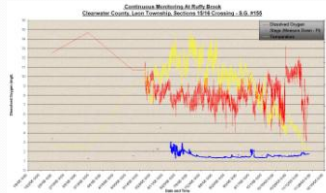
Fecal Coliform Monitoring

- Focus on June, July, August (Possibly May and Sept.)
- We have a limited amount of \$ for sample collection
- Sampling must target priority locations



Dissolved Oxygen Monitoring

- Daily Minimums
- Continuous Monitoring
- Longitudinal Surveys



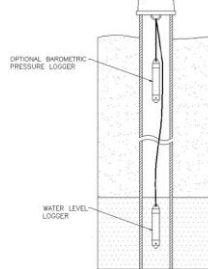
Available Monitoring Equipment

- In-Situ TROLL 9000s
- 3 owned by the RLWD
- DO, Temp, pH, Cond, Stage



Available Monitoring Equipment

- HOBO Water Level Loggers

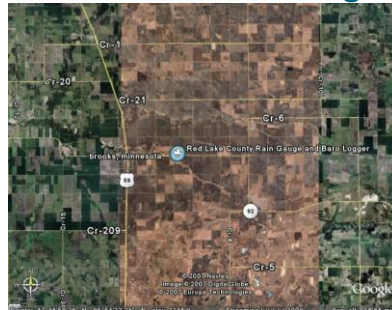


Available Monitoring Equipment

- Eureka Midge
- 5 purchased by the MPCA for this project

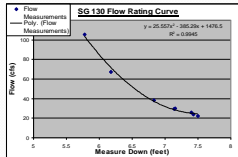


Weather Monitoring



Flow Monitoring

- Continuous water levels at each continuous DO monitoring site and at each fecal coliform sampling site
- HOBO level loggers, In-Situ TROLL depth sensors
- USGS Gauges where possible
- Rating Curves
 - Stream gauging by the RLWD

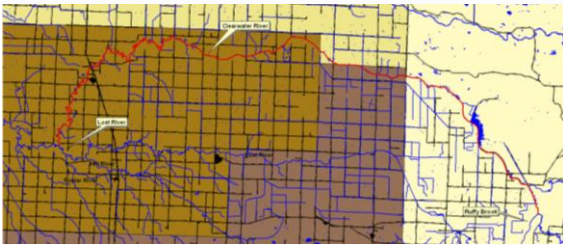


Total Monitoring Budget

Total Monitoring Budget = \$15,000

	# of sites	site visits	samples	Cost of each set of samples	Hours per site visit	Hourly Rate	Labor Cost	Analysis Cost	Total Cost
Dissolved Oxygen									
Poplar River	6	26	0	\$23.00	0.65	\$43.00	\$4,360.20	\$0.00	\$4,360.20
Clearwater River	4	26	0	\$23.00	0.65	\$43.00	\$2,906.80	\$0.00	\$2,906.80
Fecal Coliform									
Silver Creek	2	20	20	\$23.00	0.50	\$43.00	\$860.00	\$460.00	\$1,320.00
Lost River	3	60	60	\$23.00	0.50	\$43.00	\$3,870.00	\$1,380.00	\$5,250.00
Clearwater River	0	20	20	\$23.00	0.50	\$43.00	\$0.00	\$460.00	\$460.00
Combined Total	15	152	100				\$11,997.00	\$2,300.00	\$14,297.00

Clearwater River Fecal Coliform and Dissolved Oxygen Impairments



Clearwater River – Fecal Coliform

- Original Listing Data



Figure 2. Clearwater River Nonpoint Study sites that were used to list the Clearwater River as impaired by fecal coliform

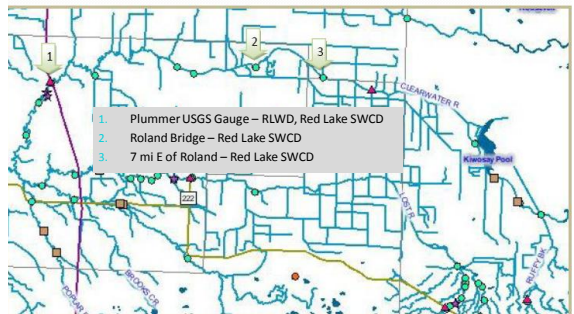
Clearwater River – Fecal Coliform

- Original Listing Data

Month #	Product of Fecal Coliform Concentration	Count of Fecal Coliform Concentration2	Geometric Mean
1	1	1	1.00
2	6	1	6.00
3	24576	5	7.55
4	3.96362E+13	28	3.06
5	1.76793E+19	22	7.50
6	2.96947E+46	32	28.33
7	1.74976E+56	31	65.21
8	5.86537E+56	32	59.43
9	3.87215E+33	19	58.59
10	6.89531E+30	24	19.27
11	2.61386E+12	10	17.45
12	5	1	5.00
Grand Total	5	206	

Clearwater River – Fecal Coliform

- Current Data



Clearwater River – Dissolved Oxygen

- Original Listing Data



Figure 2. Clearwater River Nonpoint Study monitoring sites along the Clearwater River that led to the 303(d) listing of a dissolved oxygen impairment for this reach. Red arrows = partially or not supporting aquatic life. Green arrows = fully supporting aquatic life.

Clearwater River – Dissolved Oxygen

- Current Data

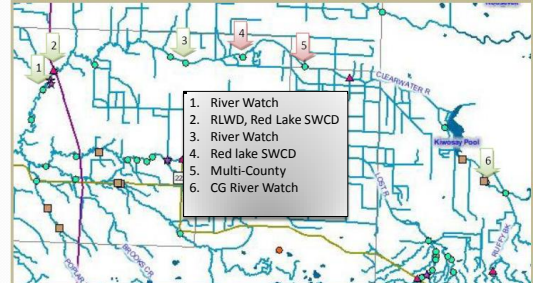


Figure 1. Current Monitoring Site Locations along the Clearwater River with dissolved oxygen data. Red arrows = partially or not supporting of aquatic life. Green arrows = fully supporting of aquatic life.

Clearwater River – Dissolved Oxygen

- Monitoring – 4 sites



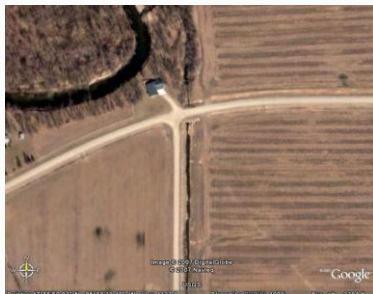
County Ditch 57 Dissolved Oxygen

- Original Listing Data

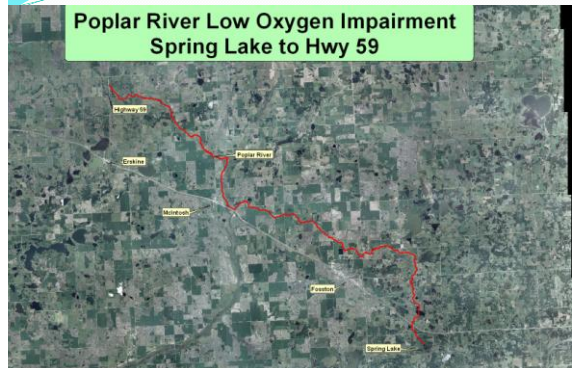


County Ditch 57 – Dissolved Oxygen

- Monitoring



Poplar River Low Oxygen Impairment Spring Lake to Hwy 59



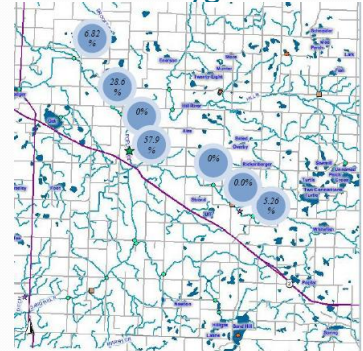
Poplar River Dissolved Oxygen

- Original Listing Data
- High rate of low dissolved oxygen levels at the RLWD long-term monitoring site

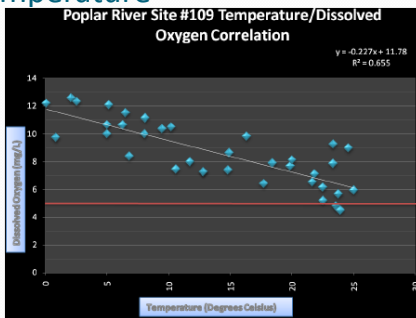


Poplar River Dissolved Oxygen

- Current Data

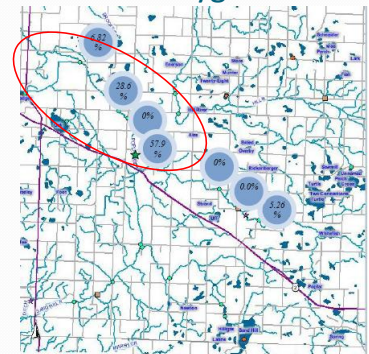


Poplar River – Dissolved Oxygen vs. Temperature



Poplar River Dissolved Oxygen Monitoring

- Continuous Monitoring
- Longitudinal Surveys
- 6 sites
 - Bracket suspected sources of problems



Lost River Fecal Coliform

- Original Listing Data
 - 25% Exceedance rate of the fecal coliform standard.
 - Very high levels observed
 - 1992-1993
 - 2002 List of Impaired Waters



Lost River Fecal Coliform

- Current Data

782 - Lost River at the Oklee USGS Gauging Site
2007 Assessment - Based on RLWD Data Collected Through October 2006

Parameter	# of Samples/ Months	Exceedances	% Exceedance	Impaired ?	Designated Use Support	Compared to 2005 Assessment
Dissolved Oxygen	46	1	2.17%	No	Full	Worse
pH	46	1	2.17%	No	Full	Better
Un-ionized NH3	34	0	0.00%	No	Full	New
Fecal Coliform 200	42	6	14.29%	Yes	Partial	Worse
Fecal Col. 200 GM	12	2	16.67%	Yes	Partial	Same
Fecal Coliform 2000	42	0	0.00%	No	Full	Same
e-Coli 126	7	2	28.57%	Need More Data		New
e-Coli 126 G Mean	6	2	33.33%	Need More Data		New

Lost River Fecal Coliform Monitoring

1. Oklee USGS Gauge
2. Anderson Lake Outlet
3. Mid Reach (Gully 6 or SG 31)



Lost River Fecal Coliform Monitoring

- Oklee USGS Gauge



Lost River Fecal Coliform Monitoring

- Mid Reach Site



Lost River Fecal Coliform Monitoring

- Anderson Lake Outlet



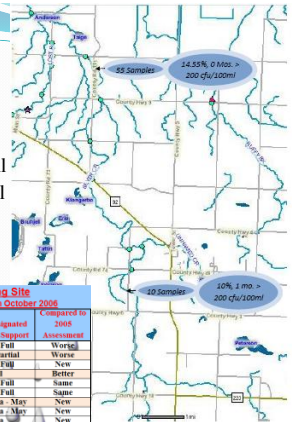
Silver Creek Fecal Coliform

- Original Listing Data – 2006 List of Impaired Waters
 - June and July Geometric Means >200 cfu/100 ml

Parameter	# Samples	Exceedances/Out of Range	% Exceedances	Impaired?	Designated Use Support
Dissolved Oxygen	50	0	0.00%	No	Full
Un-ionized Ammonia	43	1	2.33%	No	Full
Total Phosphorus	51	3	5.88%	No	Full
NO2 & NO3	43	13	30.23%	Yes	Not
Turbidity	27	1	3.70%	No	Full
pH	47	2	4.26%	No	Full
Conductivity	51	0	0.00%	No	Full
Total Suspended Solids	51	2	3.92%	No	Full
Total Dissolved Solids	30	0	0.00%	No	Full
Fecal Coliform	47	8	17.02%	Yes	Non

Silver Creek Fecal Coliform

- Current Data
 - June GM = 40 cfu/100 ml
 - July GM = 150 cfu/100 ml



Site 81 - Silver Creek Long-Term Monitoring Site
2007 Assessment - Based on RLWD Data Collected Through October 2006

Parameter	# of Samples	Exceed	% Exceedance	Impaired?	Designated Use Support	Compared to 2005 Assessment
Dissolved Oxygen	61	1	1.64%	No	Full	Worse
pH	59	4	6.78%	Yes	Partial	Worse
Dissolved Nitrate	48	1	2.08%	No	Full	New
Fecal Coliform 300	45	8	17.78%	Yes	Impaired	Better
Fecal Col. 200 GM	13	0	0.00%	No	Full	Same
Fecal Coliform 1000	45	1	2.22%	No	Full	Same
Coli 126	5	1	20.00%	Need More Data	May	New
Coli 180 Mean	0	0	0.00%	Need More Data	May	New
Coli 1200	0	0	0.00%	Need More Data	May	New

Silver Creek

- Clear Brook



Clear Brook Geometric Mean Summary				
Month	Fecal Coliform	#	eColi	#
January	na	0	na	0
February	na	0	na	0
March	na	0	na	0
April	na	0	na	0
May	9.59	4	na	0
June	62.64	3	na	0
July	4754.59	2	na	0
August	2170.58	3	na	0
September	1102.00	1	2419.00	1
October	114.32	2	114.50	1
November	464.00	1	na	0
December	na	0	na	0
Totals	1239.65	16	1266.75	2

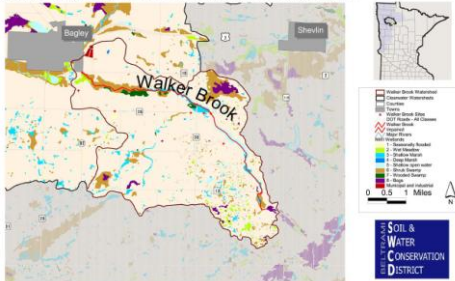
Silver Creek

- Monitoring
 - Monthly sampling will continue at three sites for the RRB Buffer Initiative
 - Increased Frequency at Site #81 (downstream end of watershed)
 - Add a new site near Clear Brook Confluence



Walker Brook Dissolved Oxygen

Walker Brook Wetlands NWI Circular 39 Classification



Walker Brook Dissolved Oxygen

- Reclassification – Won't know until April 15th

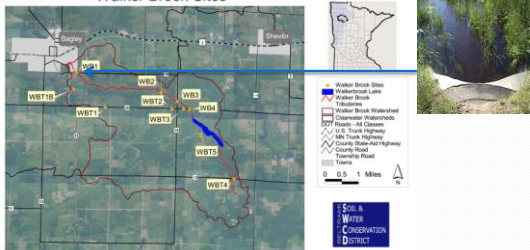
Site 133 - Walker Brook at County Road 19 By Bagley
2007 Assessment - Based on RLWD Data Collected Through October 2006

Parameter	# of Samples/ Months	Exceedances	% Exceedance	Impaired ?	Designated Use Support	Compared to 2005 Assessment
Dissolved Oxygen	48	17	35.42%	Yes	Not	Worse
pH	47	5	10.64%	Yes	Partial	Better
Un-ionized NH3	19	0	0.00%	No	Full	New
Fecal Coliform 200	16	1	6.25%	No	Full	Better
Fecal Col. 200 GM	7	0	0.00%	No	Full	Same
Fecal Coliform 400	16	0	0.00%	No	Full	Same

Walker Brook Monitoring

- RLWD Long-Term Monitoring Site

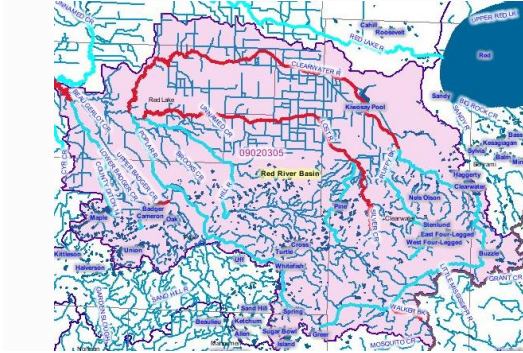
Walker Brook Sites



Questions?



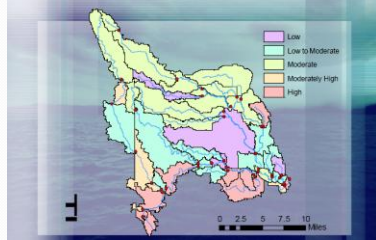
Statewide Water Quality Assessments – Clearwater River



SWAT Model Update

- Bethany Kurz

Relative Dissolved Phosphorus Contributions



Challenge Grant Ideas



Lengby – Spring Lake Fish Passage

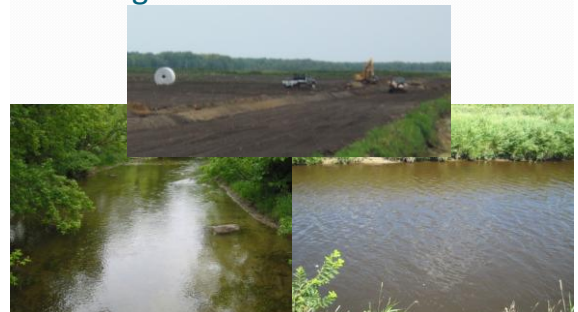


Address Lack of Shade

- Implement/Improve Riparian Buffers



Wild Rice Paddy Main Line Tile Drainage Installation



Next Steps in the TMDL Process

- Equipment Installation
- SWAT Modeling Contract
- Delisting Meeting on April 15th
- Next meeting
 - Completion of monitoring season
 - Findings
 - Next Steps
 - Delistings
 - Stormwater Study Results?
 - Silver Creek Buffer Initiative
- Accomplishments



Thank You!

See You Next Fall!

