# Clearwater River Nonpoint Project
# Wild Rice Water Control Structure
# Water Quality Monitoring Plan For 1999

## I. Purpose

The purpose of this plan is to set up a monitoring scheme for sampling several parameters on water associated with the water control structures on wild rice field drains.

The information gathered will be used to report improvements (if any) the water control structures make to water quality along the Clearwater River. The project is part of the multi-faceted Clearwater River Nonpoint Study, aimed at demonstrating improvements in land management for improvement of the Clearwater River water quality.

## II. Background

As part of the Clearwater River Nonpoint Study, the Wild Rice projects were aimed at making water quality improvements in wild rice effluents. The projects involved installing water control structures, which not only utilize sediment basins but also involve underground drainage. The hopes of this project are to demonstrate further prevention of soil loss along with prevention of nutrients moving into fragile rivers and ecosystems.

The water control structures are installed in four types of wild rice paddy drainage. First is simply installing the structure on the end of a drainage ditch without any drainage tile underneath the paddy, all drainage arrives from the surface. This type is called Type I. The second type involves mainline tile, tile connecting the smaller cross-field tile, discharging into ditches or sediment ponds surrounding the water control structure. Drainage at the water control structure arrives from both surface and sub-surface. This type is called Type II. The third type involves installing separate water control structures for surface and sub-surface drainage. Drainage can be managed from both the surface and sub-surface. This type is called Type III. The fourth type is a water control structure installed on the end of a drainage ditch before water enters the Clearwater River. Drainage water originates from several paddies, which discharge to the ditch. This type is called Type IV.

To receive an accurate picture of the water quality associated with each system and show improvement, if any, water quality monitoring of each type is needed. The Red Lake Watershed District (RLWD) provided cost-share for the installation of water control structures in wild rice paddies on farms owned by Paul Imle and John Gunvalson. Both farmers have agreed have allowed access to RLWD staff in order to monitor effluent from the water control structures.

## II. Workplan and Schedule

Water will be monitored from wild rice fields located on Sections 4, 5, 8 and 9 in Johnson Township, Polk County; on Section 33, in Hickory Township, Pennington County; Sections 25 and 36 in North Equality Township, Red Lake County; and Sections 5 and 6 in Hangaard Township, Clearwater County. The sites in Red Lake, Polk and Pennington counties are located on the John Gunvalson farm. The sites in Clearwater County are located on the Pine Lake Wild Rice Farm owned by Paul Imle.

Type I will be monitored on Section 5 in Johnson Township out of rice paddy labeled 5-6 by John Gunvalson. The paddy has an area of 12.1 acres and is located in the northeast corner of Section 5. The water from the structure discharges into a small ravine, which drains into the Clearwater River. If no discharge is occurring the sample will be taken from another paddy discharging from Section 5.

Type II will be monitored on Section 4 in Johnson Township out of rice paddy labeled 4-6 by John Gunvalson. The paddy has an area of 72 acres and is located in the Southeast corner of Section 4. The water from the structure discharges into an adjacent drainage ditch. The drainage ditch flows north and is also controlled by a water control structure. If no discharge is occurring the sample will be taken from another paddy discharging in Section 4, 8 or 9 in Johnson Township or Section 33 in Hickory Township.

Type III will be monitored on Section 36 in North Equality Township out of rice paddies labeled 36-3 and 36-4 by John Gunvalson. The tile drainage water control structure in the southeast corner of paddy 36-3, but the water originates from 36-4. The surface drain from Type III is monitored on a water control structure located on the north side of 36-3. The culvert drains directly into the Clearwater River. If no discharge is occurring the sample will be taken from another paddy discharging in Section 25 in North Equality Township, Section 33 in Hickory Township or Section 4 in Johnson Township.

Type IV will be monitored on Section 6 in Hangaard Township on a ditch labeled Imle 010 by the RLWD staff. Drainage water originates from paddies located in Sections 6, 7, 8, 18, and 17 in Hangaard Township. The sample will be taken from the culvert discharge and not the weir due to height and placement of the weir. RLWD staff will also attempt to monitor the water control outlet structure on the drainage ditch in Section 5 of Hangaard labeled Imle 020 by the RLWD staff. The culvert is at a lower elevation than 010 and is often below the surface of the Clearwater River. The weir at 010 is also difficult to reach because the water surface is often at or above the top of the weir.

The samples will be taken once a week while water drawdown occurs. Draw-down can be separated into two periods: period 1, when water surface on the

paddy is above ground level and period 2, when water surface is below ground level (Svedarsky, 1998). Since sampling in 1999 will be started late, only period 2 drawdown will be monitored. The expected last samples should be collected in the first half of August. Chemical/Physical parameters to be measured include: dissolved oxygen, water temperature, specific conductance, pH, turbidity, total dissolved solids, total suspended solids, chemical oxygen demand, nitrate+nitrite, ammonia, total kjeldahl nitrogen, orthophosphorus, total phosphorus and fecal coliform bacteria. Samples will be taken using the dip method from either the weir or the end of the culvert assuming minimal disturbance of water integrity.

Dissolved oxygen, water temperature, total dissolved solids, specific conductance, and pH will be measured using a Hydrolab model DataSonde 4 and Surveyor 4. The Hydrolab will be calibrated in the RLWD office each sampling day according to the DataSonde 4 User's Manual. Total suspended solids, nitrate+nitrite, total kjeldahl nitrogen, orthophosphorus, total phosphorus, ammonia samples will be sent to RMB Environmental Laboratories, Inc. in Detroit Lakes, MN, for analysis. RMB Labs is certified by the Minnesota Department of Health for environmental water analysis. Fecal coliform bacteria, chemical oxygen demand, turbidity and a laboratory test on pH, specific conductance and water temperature will be performed at the University of Minnesota Crookston (UMC) water laboratory by RLWD staff. The UMC water lab is also certified by the Minnesota Department of Health for environmental water analysis. All analysis will be performed within specified holding periods for quality assurance. The methods for analysis are found in the RMB QA/QC Manual or the UMC Procedure Manual.

The RLWD staff will also estimate discharge using the equation: $Q=KLH^{1.5}$ for a suppressed rectangular weir, where Q is discharge in $ft^3/sec$, K is a constant estimated at 3.1 ft/sec, L is the length across the top of the weir in ft., and H is the head measured in ft. The head is measured by two steps: 1) using the top of the weir structure as the bench mark and measuring to the water surface, 2) using the same bench mark and measuring to the top of the weir. The difference between them is the head. Care is taken to measure the water surface in an area unaffected by the weir drawdown or any turbidity due to flow of water.

## IV. Reporting

Since the wild rice project is part of the Clearwater River Nonpoint Study, this will be reported along with other projects within the study. The RLWD will compile the data and generate a report for MPCA, RLWD Board of Managers, Soil and Water Conservation Districts and any other interested parties or persons.

## V. Equipment and Labor Needs

Field
Hydrolab model DataSonde 4and Surveyor 4
Plastic Beaker for dip sample
Sulfuric Acid
Staff Gage
Water Quality Data Sheets
2 Coolers with ice
1 1000 ml RMB bottle
1 500 ml RMB bottle
1 1000 ml Sterile bottle
Digital Camera
Field Notebook and pens

Labor
2 Technicians

UMC Lab
Hach model 2100P Turbidimeter
Hach Conductivity meter
pH meter
Hach Spectrophotometer
COD Reactor
COD Vial Adapter
Pipets
Test Tube Rack
Lab Tissue Wipes
COD Reagent Vials
Autoclave
Filtration Apparatus
Gridded Membrane Filters
Culture Dishes
Sterile Absorbent Pads
Syringe Pump Aspirator
Water Bath Incubator
Membrane Filter Culture medium
Distilled Water

## VI. Budget*

| Activity | | Hours | Total Cost |
|---|---|---|---|
| Perform Monitoring | (WQC) | 30 | $1,013.28 |
| | (WQA) | 30 | $525.00 |
| Administrative Costs | | 3 | $100.00 |
| Speedee Shipping | | | $30.00 |
| Crookston Lab Analysis | (WQC) | 25 | $844.40 |
| | (WQA) | 45 | $787.50 |
| Report Generation | (WQC) | 10 | $337.76 |
| | (WQA) | 10 | $175.00 |
| RMB Lab Analysis | | | $1,930.00 |
| **Grand Total for Project:** | | | $5,742.94 |

*This is assuming five samples (over five weeks) will be taken during the drawdown period.

**APPENDIX**

Inlet Imle 010

Outlet Imle 010

36-3 Water Control Structure

36-3 Culvert

36-3 Culvert Side

36-4 Water Control Structure

36-4B Water Control Structure

4-6 Water Control Structure

4-6B Water Control Structure

5-6 Culvert

5-6A Water Control Structure