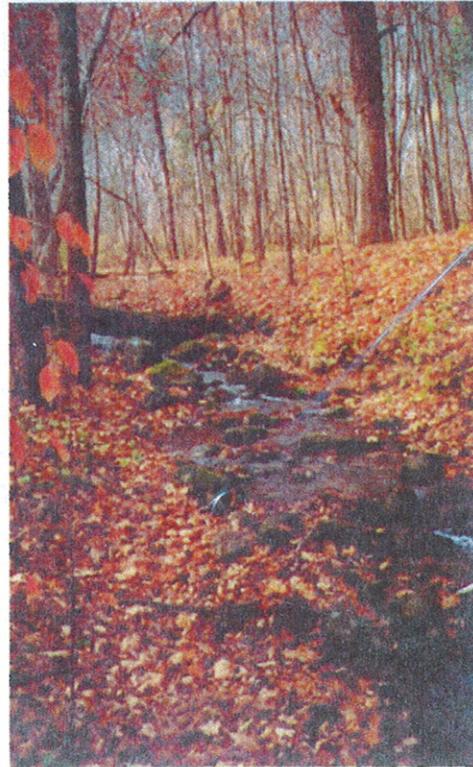
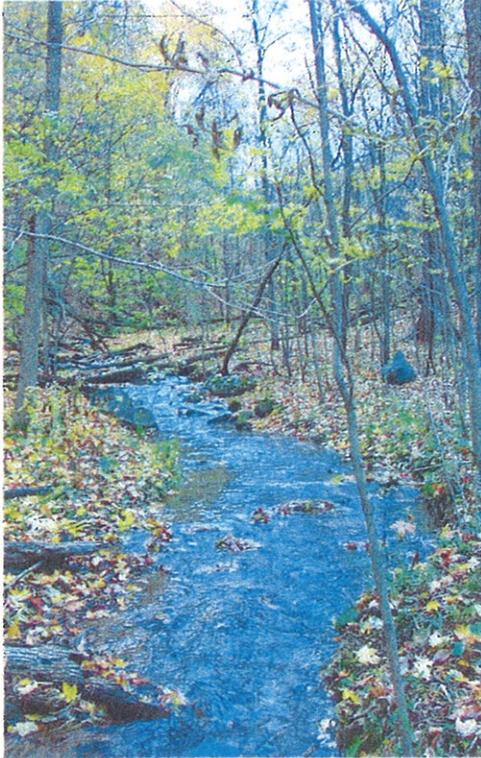


Lower St. Croix River Spring Creek Stewardship Plan

November 2003



Marine-on-St. Croix Watershed Management Organization

Carnelian-Marine Watershed District

New Scandia Township



November 19, 2003

Jim Shaver, President
Marine-on-St. Croix WMO
P.O. Box 159.
Marine-on-St. Croix, MN 55047

RE: Final Report, St. Croix Spring Survey Stewardship Plan

Dear Jim

This is the Final Report for the Lower St. Croix River, Spring Creek Stewardship Plan. We have incorporated the input of the Marine-on-St. Croix Watershed Management Organization (MWMO) Board of Managers into this Final Plan.

This Final Report is designed to facilitate easy dissemination to the general public. The more technical information including data summary and analysis is contained within the Appendices. A series of "fact sheets", one for each of the twenty streams included in this Report, provides a detailed and concise description. The fact sheets also include specific and policy recommendations to guide the MWMO and local units of government as they review projects with potential impact to the streams. At your request, this report will be made available to the MWMO in PDF Format. This format will enable you to post the entire document on a web site.

On behalf of all the staff at EOR, we would like to thank you for giving us the opportunity to collaborate with you on this innovative project.

Sincerely,

Anthony DeMars
Senior Natural Resource Specialist

Marcey Westrick
Aquatic Ecologist

Making A Difference Through Integrated Resource Management

EOR, INC. · 651 Hale Avenue North · Oakdale, MN · 55128 · Tel: (651) 770-8448 · Fax: (651) 770-2552

Spring Creek Name : Zavoral's Stream 5U

General Watershed Description

Zavoral's Stream starts as a ditch draining a portion of a large agricultural field. This drainage system crosses Highway 95 just north of Highway 97. In the lower portion of Zavoral's Stream, below Highway 95, it flows through a deep, rocky, canyon-like reach with several waterfalls. It is within this lower reach that the perennial flows occur. Near its confluence with the St. Croix River, Zavoral's Stream disappears (infiltrates into the ground) into a mixed hardwood seepage swamp approximately 200 to 300 feet before reaching the St. Croix River. Within this area, the single channel becomes a braided channel as it seeps across and through the seepage swamp. For this reason, there is no visible channel when viewed from the St. Croix River.

Significant Features

Zavoral's Stream is one of the better quality streams evaluated as part of this study. The hydrology is complex in that the stream appears to lose and then gain flows within a relatively short distance. Flows just downstream of the railroad tracks are probably at least double what they are at the monitoring station (upstream of the railroad tracks). Moving downstream from the railroad tracks, flows largely disappear before the stream reaches the St. Croix River. Although no formal fisheries survey has been completed for this stream, based on numerous sightings during field surveys, a healthy, naturally reproducing population of brook trout appears to be present. This stream is also unique in that it contains some short reaches of excellent habitat, with deep pools, cut banks, woody debris and a good distribution of riffles, runs and pools.

Plant communities include an excellent quality (A-rank) maple-basswood forest, bedrock bluff prairie, mixed hardwood seepage swamp and an exceptionally beautiful area of moist to wet cliff and talus slope with bryophyte communities. South-facing areas of this ravine contain undisturbed dry cliff grading into bedrock bluff prairie. There are no known DNR MCBS Records for the lower reaches of Zavoral's Stream.

Key Management Recommendations

1. The driveway crossing the stream (located approximately 300 feet upstream of the St. Croix River) has a partially collapsed culvert. If this culvert is replaced, it should be placed to ensure that fish movement through the culvert is maintained.
2. Activity within the gravel pit, located near the intersection of Hwy 95 and Hwy 97, should be closely monitored to ensure that sediment does not wash into Zavoral's Stream. Additionally, any dewatering of gravel pit ponds should be evaluated to assess potential impacts to groundwater flows.

Spring Creek Name : Zavoral's Stream 5U

Watershed Size 815.96 acres
Total Stream Length 0.58 miles
Stream Type
 Low sinuosity, gravel and sand dominated, gently graded channel with very low width to depth ratio. This stream is relatively stable and will likely remain so as long as stream banks are not disturbed.

Land Cover Category	%
Grassland	16.4
Agricultural Land	25.2
Forest and Woodlands	30.8
Lakes and Open Water Wetlands	0.1
Maintained Natural Areas	0
Wetlands	6.8
0%-10% Impervious Cover	4.2
11%-25% Impervious Cover	13.7
26%- 50% Impervious Cover	0.04
51%-75% Impervious Cover	0
76%-100% Impervious Cover	2.8

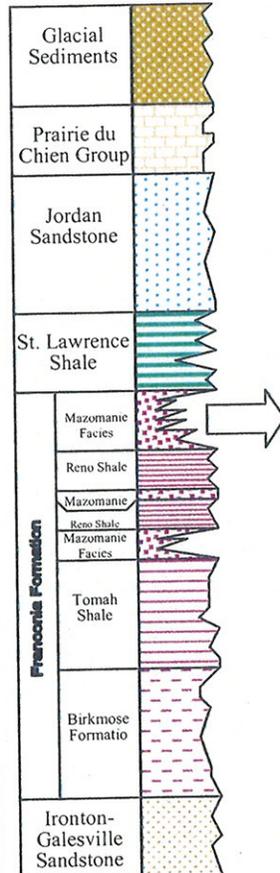
Macroinvertebrate Data

Metric	Score	Among Springs Mean ^c
Chironomidae Species Richness	19	21
Invertebrate Taxa Richness	36	31.75
HBI	3.92	4.4
%EPT	41.97	36.9
% Dominance	45.77	35.5
Most Common Families	Midges, Small Minnow Mayfly, Nemourid Broadback	

Hydrology

Base flow 0.34 cfs
 Estimated Bank full flow 4.08 cfs

Groundwater source

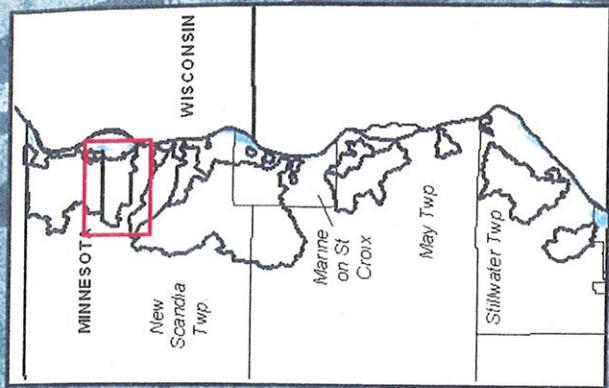


Springs emanate from the upper Mazomanie Member of the Franconia Formation.

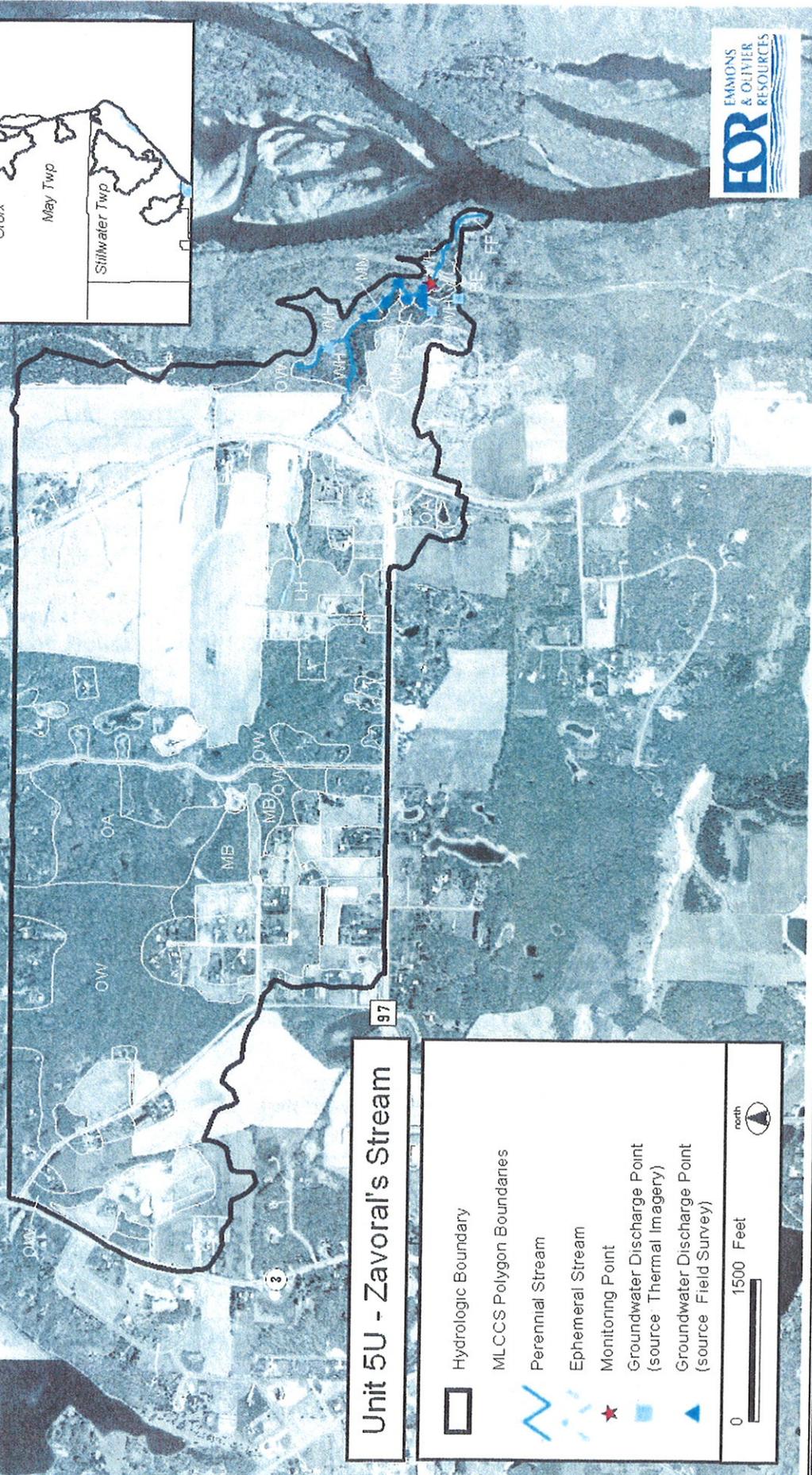
Chloride to bromide ratios of about 1000/1 indicate some influence from human sources of chloride close to the spring. Eskers (glacial rivers) carved holes in the Superior Lobe till less than two miles to the west. These till holes could provide a pathway for recently recharged groundwater to enter lower aquifers. A buried bedrock valley that cuts through the Prairie du Chien Group and into the Jordan Sandstone also leads to the spring. Potential human sources of chloride include gravel operations in the esker deposits as well as road salt from Highway 96

Water Chemistry

Parameter	Site Mean	Site σ	MPCA NCHF Benchmark MIS ^a /St. Croix River ^b		Among Springs Mean ^c
TP [$\mu\text{g/L}$]	40.93	8.02	90	55	42.47
NO ₂ +NO ₃ [mg/L]	1.99	0.38	0.1	0.203	2.15
TSS [mg/L]	12.50	10.15	8.8	7.5	15.96
Temperature [C]	10.58	3.86	13.0	10.3	9.95



Label	Community Type
BE	Black Ash Swamp Seepage subtype
FF	Floodplain Forest silver maple subtype
LA	Lake Bed
LH	Lowland Hardwood Forest
MB	Maple Basswood Forest
MM	Moderate Cliff
OA	Oak Forest
OW	Oak Woodland Brushland
WH	White Pine-hardwood Forest



Unit 5U - Zavoral's Stream

- Hydrologic Boundary
- MLCSS Polygon Boundaries
- Perennial Stream
- Ephemeral Stream
- Monitoring Point
- Groundwater Discharge Point (source: Thermal Imagery)
- Groundwater Discharge Point (source: Field Survey)

0 1500 Feet

north

Key Policy Recommendations

1. Retain overall groundwater recharge.
2. Maintain stormwater volume for the 2-year event at predevelopment levels.
3. Maintain stormwater peak flow rates for the 2-year event at predevelopment levels.
4. Require phosphorus concentration standard of 50 µg/L for stormwater discharges to tributaries of the St. Croix River.
5. Require an erosion control plan, consistent with the specifications of the MPCA manual "*Protecting Water Quality in Urban Areas*" for all projects that result in 43,560 ft² of disturbance.
6. Ditches, tiles, storm sewers and roadway surfaces should not collect and concentrate stormwater into drainage systems tributary to spring creeks.
7. Identify stream and/or wetland restoration sites that improve and/or protect other important groundwater-dependent resources.
8. Establish protective riparian corridors along streams, and buffers around wetlands.
9. Initiate a citizen monitoring program.