

Stream Status

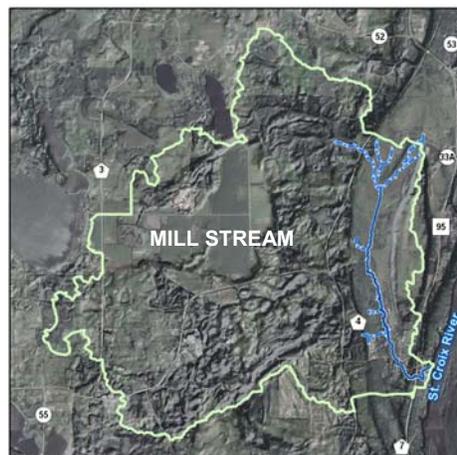
Overall Strategy: Routine Watershed Management

Water Quality Rating: A

Stream Class: Upper – Groundwater Large Watershed Nonurban (GWL); Lower – Groundwater Urban Watershed (GWU)

Stream Type: Slightly entrenched, meandering, gravel dominated, riffle/pool channel.

Subwatershed Land Cover: 12% developed, 31% forests and woodlands, 12% grassland/shrubland/sparse vegetation, 27% planted or cultivated, 17% wetlands.



BASIC FACTS

Section	1
Township	31
Range	20
Stream Length	0.55 miles
Subwatershed Area	4294 acres
Baseflow	4.52 cfs
Bankfull Flow	6.73 cfs
Entrenchment Ratio	2.80
Width:Depth Ratio	20.00
Sinuosity	1.40
Slope	0.03
Rosgen Class	C4
DNR Trout Stream	Yes

Macroinvertebrate Data (2002-2003)*

Metric	Score	Mean of Spring Creeks
Chironomidae Species Richness	20	21
Invertebrate Taxa Richness	35	31.75
HBI	4.13	4.4
% EPT	64.4	36.9
% Dominance	39.1	35.5
Most Common Families	Midges, Small Minnow Mayfly, Netspinner Caddisfly	

Water Chemistry (2000-2002)*

Parameter	Site Mean	Site σ	MPCA NCHF Benchmark MIS/St. Croix River		Mean of Spring Creeks
TP [$\mu\text{g/L}$]	28.4	21.0	90	55	42.47
NO ₂ +NO ₃ [mg/L]	0.98	0.26	0.1	0.203	2.15
TSS [mg/L]	3.27	2.03	8.8	7.50	15.96
Temperature [C]	10.80	5.80	13.0	10.30	9.95

Fish Species:

Brook Trout

CMSCWD References:

Lower St. Croix River Spring Creek Stewardship Plan ('03)
 Marine WMO NRI ('01)
 Mill Stream NRI ('00)

*Refer to 2010 Watershed Management Plan Section V, Stream Management Plans for definitions of macroinvertebrate metrics and water chemistry parameters.

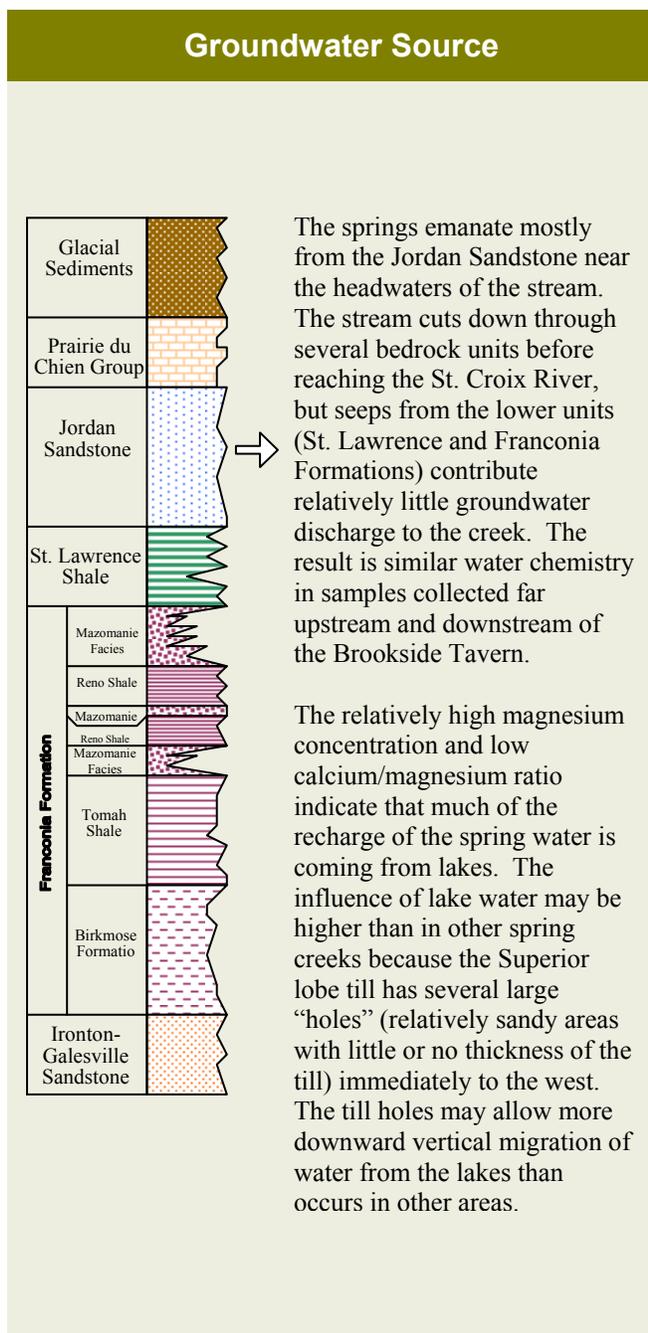
Overall Assessment: Mill Stream

The Mill Stream watershed is just over 2000 acres. Much of the upper watershed includes small depressions that may only hold water on a seasonal basis. Unless very wet conditions prevail, most of the water within these depressions either infiltrates into the ground or is lost to evapotranspiration. During wet conditions, particularly frozen-ground, snowmelt-runoff periods, these depressions may fill up with enough water to outlet to Mill Stream. This relationship also holds true for the two headwaters lakes, Sand Lake and Hay Lake.

Outflow from Sand Lake through the ephemeral channel within William O'Brien State Park has occasionally occurred in the past. Downstream of the ephemeral channel that outlets from Sand Lake, the perennial portion of Mill Stream starts within a rich fen/cattail swamp located just west of the Park Headquarters. From this northerly point, Mill Stream flows south for about 1.5 miles to the village of Marine-on-St. Croix. Within this 1.5 mile reach, flows increase significantly, as groundwater discharges off the terrace slope located to the west of Mill Stream.

Within the lower-most portion of this reach, DNR Parks has restored wetland communities and approximately 1000 feet of tributary channel that historically flowed to Mill Stream from the numerous springs within this reach. This restoration site, referred to as the Minnow Farm Site, historically consisted of a series of four large ponds and several smaller ponds contained by berms and water control structures. The ponds were fed by numerous groundwater seeps along the terrace slope to the west.

Downstream of the Minnow Farm Site, Mill Stream is impounded (Upper Mill Pond) behind a concrete weir constructed across what was historically a waterfall. Below the Upper Mill Pond, Mill Stream flows as a high gradient stream over bedrock within a deep valley for several hundred feet. Approximately 200 feet upstream of Highway 95, the gradient of Mill Stream lessens considerably as it flows across the middle terrace of the St. Croix River and through the center of Marine-on-St. Croix. Just above Judd Street, Mill Stream is again impounded behind a concrete weir, forming the Lower Mill Pond. Below the concrete weir, Mill Stream flows under the Brookside Bar and outlets over a second waterfall. Below the second waterfall, Mill Stream flows several hundred more feet through a floodplain forest where it discharges into the St. Croix River.



The watershed of Mill Stream is a diverse mixture of agricultural land, large-lot residential, forest, and woodland and grassland. The lower section of the stream flows through a relatively dense urban community with substantial direct drainage of impervious surfaces, mostly from a combination of residential streets, Highway 95 and CR 4, which all converge near the lower end of the creek and convey storm flows directly to Mill Stream.

Mill Stream is the largest spring creek in the Watershed District in terms of base flow and stream length. Brook Trout (*Salvelinus fontinalis*) are known to occur throughout the entire stream, including the recently restored tributaries on the Minnow Farm site. The best habitat, however, is within the lower sections of the creek below the Upper Mill Pond. In particular, the section directly above Highway 95 contains good habitat and contains fish as large as ten inches. The headwaters of Mill Stream within William O'Brien State Park contain a large, groundwater-dependent wetland complex. This wetland complex has probably been ditched and altered from past grazing more than other wetlands in the area. However, some portions of this wetland complex do include good quality tamarack swamp, mixed hardwood seepage swamp and rich fen. Below Highway 95, Mill Stream flows through an additional groundwater-fed wetland complex. This second wetland complex encompasses many of the same wetland types and is generally of higher quality than wetlands within the headwaters.

Based on macroinvertebrate data from the 2003 *Lower St. Croix River Spring Creek Stewardship Plan*, Mill Stream has a very good water quality rating of 'A.' Hilsenhoff's biotic index (HBI) is very good, and the data show an excellent percent EPT (percent of pollutant intolerant mayflies, stoneflies and caddisflies in the sample) with other values also indicating good stream health. In addition, the Blanding's turtle (*Emydoidea blandingii*) is a state-listed threatened species that may be encountered throughout the watershed.

Key Management Recommendations

- Stabilize streambank of Mill Stream on cut bank just above footbridge in Zoller's Ravine.
- Within Zoller's Ravine, establish shade-tolerant understory shrubs and groundcover species to stabilize stream bank and improve fish habitat.
- Encourage landowners to retain woody debris within stream channel to improve fish habitat.
- Within Mill Stream just upstream of Highway 95, place rock or stone deflectors within channel to reverse aggrading.
- The Highway 95 culvert should be replaced, with the upstream and downstream culvert invert placed below the existing stream grade. Alternatively, options to raise the grade of the stream (to reduce the head between the upstream and downstream end of the culvert) should be considered.
- Work with Marine-on-St. Croix and private landowners to create a continuous vegetative buffer of native vegetation between Highway 95 and the Brookside Bar and Grill at Judd Street.
- Work with Marine-on-St. Croix to install stormwater infiltration and rainwater gardens to intercept stormwater runoff that is currently discharging into Mill Stream from impervious surfaces.
- Remove sediment from City Mill Pond and partially route Mill Stream around pond. Install native vegetative buffer around edges of pond.
- Where Mill Stream crosses under Judd Street, install trench drains to intercept stormwater and discharge it to water quality treatment waterway/vegetative swale.

* See 2010 *Watershed Management Plan* Section V, *Stream Management Plans* for additional information on District stream management activities.

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