

A general habitat assessment was done at each site during the samplings. General stream dimensions at each site can be summarized as follows:

Site	Width (feet)	Depth (feet)	Bottom	Streambank	Land Use
1A	3.0	0.25	Very soft sand/silt	Open/canary grass dominated	Agricultural open wetland/canary grass dominated
1	1.75	0.6	Hard sand/gravel	Open/lawn	Lawn agricultural
2	4.0*	0.5*	Hard to mod. soft sand and silt	Open/canary grass dominated	Open
3	4.5	0.5	Hard gravel, rubble	Wooded/part lawn	Wooded/part lawn
4	8*	0.75*	Hard gravel, rubble, some sand	Grassed and wooded	Wooded
5	2.5	0.5	Varied hard to soft, gravel, rubble to soft sand and silt	Wooded	Wooded
6	3.0	0.3	Mod. soft sand and silt	Grassed	Wooded

* Estimated.

Sites 1A, and 4 were mostly open to the sun and shaded only by streambank vegetation. Sites 3 and 5 were primarily shaded and this shade may have been a factor in the lower temperatures at Site 5. No sites had macrophytes although filamentous algal growth was heavy at most sites (especially Site 3).

CONCLUSIONS AND RECOMMENDATIONS

Data indicate the current conditions of the Stockbridge Tributary to be classifiable as **Limited Forage Fishery (LFF)** during the months of the year spawning is not expected to occur (July-March). The lack of mayflies or even caddisflies above the outfall (Site 1) in addition to all fish (other than the yellow perch) being either low D.O. tolerant or moderately tolerant to low D.O. tolerant indicate current conditions are Limited Forage Fishery. This classification would be valid from Site 1 above the outfall down to the confluence with Mud Creek (see Figure 2). The feeder Tributary in the upper reaches of the Stockbridge Tributary at Site 1A appears to be sufficiently fed with groundwater to be classified at a higher level than the lower reaches of the Tributary. The existence of the Limnephilidae caddisflies and the cool water indicate this. However, due to man-made modifications in the watershed above and in Stockbridge and the fact that the hydrology is unknown to a sufficient enough degree it is believed that the upper reaches at Site 1A have no observable positive impact on the Tributary at Site 1. Since much stream, stormwater and Village reconstruction would likely be needed to obtain this possibility it seems unrealistic to express a higher potential for the Stockbridge Tributary at the WWTP outfall location. Another possibility is a classification between LFF and FFAL which would require less BOD limitation but still require higher D.O. Another factor to consider though is that gamefish such as northern may use the Stockbridge Tributary during spawning. Therefore I am giving the Stockbridge Tributary a seasonal classification of

Full Fish and Aquatic Life for the spawning months of April-June. These limitations are my recommendation for the Stockbridge Tributary to reach its full realistic potential. Another concern in treatment plant design is that this is a small stream and cannot handle large continuous flows.

I have classified the Main Stem of Mud Creek from Site 5 down to Lake Winnebago as **Full Fish and Aquatic Life**. The existence of caddisflies and Sculpin at Site 5, evidence of sustainable groundwater inflow near Site 5 and a good quality macroinvertebrate community at sites 3 and 4 indicate this to be the appropriate classification there. The fishery also became more diverse and contained less tolerant species at Sites 4 and 5.

The watershed as a whole appears to have several zones of micro-habitat with sufficient inflow of groundwater to increase the quality of the surface water. These zones of cooler water are the result of the unique condition of these streams originating at the base of the escarpment east of Lake Winnebago. The existence of such large numbers of brook stickleback at Sites 1 and 2 indicate groundwater inputs are significant. These zones, as with Site 5 and 1A, are documented in this study to add support this conclusion. It is recommended that further work be done to identify these habitat zones and manage accordingly (e.g. restore groundwater rich areas, eliminate groundwater losses etc.).

As mentioned above the Stockbridge Tributary is a small stream and cannot handle large continuous flows year around. This should be considered when designing new wastewater treatment and stormwater management. Also, it is important that no more dredging occur on this stream. It is obvious that some has occurred in the vicinity of the WWTP. It is also of concern that modifications to the watershed may occur in areas where this stream is not navigable and therefore may not be regulatable under Chapter 30. The micro habitats that exist there could be degraded considerably if modifications are done.

It is also recommended that the area within and around Stockbridge be studied hydrologically to determine if uses can be modified to enhance the quality of the Stockbridge Tributary. It is obvious that the Tributary has been subject to significant modifications in the recent and distant past.

A recommendation for further study which could provide significant information for habitat improvement would be the hydrologic study of the entire watershed to evaluate groundwater recharge and discharge areas. It appears this stream can only reach its full potential if the groundwater system works properly and losses are not significant.

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Table 1A. Chemical data from the 8/2-8/3, 2000 sampling of Mud Creek.

Parameter	Site						
	1A	1	1-O	2	3	4	5
BOD5 (mg/l)	0.9	<2.0	3.1	<2.0	<2.0	1.0	1.1
Chloride (mg/l)	35.2	55.9	97.4	81.8	83.5	75.0	15.3
Cond. (umhos)	819.	827.	1010.	947.	899.	*	690.
Lab pH (s.u.)	8.44	8.33	8.07	8.14	8.64	*	8.47
Field pH (s.u.)	7.3	7.6	7.2	7.3	8.6	7.7	7.6
Alkalinity (mg/l)	351.	345.	267.	300.	315.	*	302.
NH3-N (mg/l)	0.027	0.05	0.38	0.25	0.04	0.043	<0.013
NO3+NO2-N (mg/l)	8.06	1.18	21.0	12.8	4.19	1.11	0.416
TKN (mg/l)	0.60	0.72	1.67	1.20	1.04	0.97	0.75
Total P as P (mg/l)	0.120	0.082	3.08	1.86	1.04	0.770	0.199
SS (mg/l)	23.	7.	6.	<5.	10.	*	26.
Field Temp. Deg. C	14.8	20.6	-	19.3	20.8	21.2	19.8
Aluminum (ug/l)	350.	100.	47.	270.	650.	660.	1800.
Calcium (mg/l)	92.	77.	57.	65.	65.	64.	56.
Hardness (mg/l)	460.	430.	340.	370.	380.	370.	400.
Iron (mg/l)	0.46	0.15	0.06	0.13	0.57	0.79	1.4
Magnesium (mg/l)	55.	57.	48.	52.	53.	52.	62.
Sodium (mg/l)	10.	22.	90.	66.	57.	39.	9.2
D.O. (mg/l)	8.8	8.4	-	6.1	7.2	6.7	7.6
Sample Time (24-hr)**	09:51	08:03	07:58	07:55	08:55	09:15	09:30
% D.O. Saturation***	87	94	-	66	81	75	84

*Insufficient sample to analyze.

**Sample time for 8/2/2000 sampling of all parameters other than metals (metals collected on 8/3/2000).

***Estimated using Table 421:1 in Standard Methods (1980).

Table 1B. Mud Creek D.O. survey (5-19-2000).

Site	Temp. (Deg. C)	D.O. (mg/l)	Time
1	11.1	10.8	10:10
2	11.0	10.6	10:12
3	9.6	10.2	10:25
4	9.2	10.2	10:30
5	8.8	11.0	10:40

Table 2B. Mud Creek D.O. survey (6-7-2000 in conjunction with the fish survey).

Site	Temp. (Deg. C)	D.O. (mg/l)	Time
1	19.0	13.1	10:45
2	17.4	11.7	10:50
3	17.3	11.2	11:30
4	19.3	12.4	13:40
5	16.7	10.4	14:20

Table 3B. Mud Creek D.O. survey (6-19-2000).

Site	Temp. (Deg. C)	D.O. (mg/l)	Time
1	21.4	11.2	10:14
2	18.0	8.0	10:17
3	19.6	9.7	10:37
4	19.2	9.1	10:41
5	17.3	8.0	10:53
6	20.2	7.4	11:05
1A	15.3	10.0	11:22

Table 1C. Flows for Mud Creek (6-19-2000).

Site	Flow (cfs)
1	0.28
3	0.33
5	0.09
6	0.05
1A	0.10

Table 1D. Data from Site 1 fish sampling (6/7/2000).

Scientific Name	Common Name	Number Collected	Tolerance*
<u>Pimephales promelas</u> Rafinesque	Fathead Minnow	5	HT
<u>Semotilus atromaculatus</u> (Mitchill)	Creek Chub	2	MT
<u>Percina flavescens</u> (Mitchill)	Yellow Perch	1	O
<u>Culaea inconstans</u> (Kirtland)	Brook Stickleback	7	HT

Table 2D. Data from Site 2 fish sampling (6/7/2000).

Scientific Name	Common Name	Number Collected	Tolerance*
<u>Pimephales promelas</u> Rafinesque	Fathead Minnow	2	HT
<u>Culaea inconstans</u> (kirtland)	Brook Stickleback	5	HT
<u>Semotilus atromaculatus</u> (Michill)	Creek Chub	28	MT

Table 3D. Data from Site 3 fish sampling (6/7/2000).

Scientific Name	Common Name	Number Collected	Tolerance*
<u>Rhinichthys atratulus</u> (Hermann)	Blacknose Dace	9	MT
<u>Semotilus atromaculatus</u> (Mitchill)	Creek Chub	2	MT
<u>Catostomus commersoni</u> (Lacepede)	White Sucker	2	MT

Table 4D. Data from Site 4 fish sampling (6/7/2000).

Scientific Name	Common Name	Number Collected	Tolerance*
<u>Semotilus atromaculatus</u> (Mitchill)	Creek Chub	13	MT
<u>Percina caprodes</u> (Rafinesque)	Logperch	1	O
<u>Pimephales promelas</u> (Rafinesque)	Fathead Minnow	5	HT
<u>Catostomus commersoni</u> (Lacepede)	White Sucker	1	MT
<u>Notropis atherinoides</u> Rafinesque	Emerald Shiner	3	O
<u>Lepomis gibbosus</u> (Cuvier)	Pumpkinseed	1	O
<u>Rhinichthys atratulus</u> (Hermann)	Blacknose Dace	4	MT

Table 5D. Data from Site 5 fish sampling (6/7/2000).

Scientific Name	Common Name	Number Collected	Tolerance
<u>Rhinichthys atratulus</u> (Hermann)	Blacknose Dace	2	MT
<u>Cottus bairdi</u> Girard	Mottled Sculpin	1	I
<u>Culaea inconstans</u> (Kirtland)	Brook Stickleback	1	HT

*Tolerance types: High Tolerance (HT); Moderate Tolerance (MT); Intolerant (I); other (O).

1E. Mud Creek macroinvertebrate survey of Site 1 (4-25-2000).

Organisms	Number Picked	Indiv. HBI Value	Total HBI
<u>Gammarus sp</u>	68	4	272
Tipulidae	2	-	-
<u>Ascellus sp</u>	11	8	88
<u>Nehalennia sp</u>	5	-	-
Leeches	6	-	-
<u>Prosimulium sp</u>	4	-	-
Adult Beetles	2	-	-
Chironomidae	2	-	-
<u>Stenelmis sp</u>	1	5	5
Site HBI Value			4.6
Total	102		365

2E. Mud Creek macroinvertebrate survey of Site 2 (4-25-2000).

Organisms	Number Picked	Indiv. HBI Value	Total HBI
<u>Chironomus plumosus</u>	95	10	950
Tipulidae	2	-	-
Leech	1	-	-
Snail	1	-	-
<u>Prosimulium sp</u>	1	-	-
Site HBI Value			10
Total	100		950

3E. Mud Creek macroinvertebrate survey of Site 3 (4-25-2000).

Organisms	Number Picked	Indiv. HBI Value	Total HBI
<u>Stenacron interpunctatum</u>	30	7	210
<u>Ascellus sp</u>	22	8	176
Tipulidae	3	-	-
<u>Prosimulium sp</u>	2	-	-
<u>Cheumatopsyche sp</u>	4	5	20
<u>Hydropsyche betteni</u>	12	6	72
Chironomidae	10	-	-
Snail	1	-	-
Leeches	1	-	-
Site HBI Value			7.0
Total	85		478

4E. Mud Creek macroinvertebrate survey of Site 4 (4-25-2000).

Organisms	Number Picked	Indiv. HBI Value	Total HBI
<u>Leptophlebia sp</u>	59	4	236
Chironomidae	22	-	-
<u>Gammarus sp</u>	4	2	8
<u>Ascellus sp</u>	32	8	256
<u>Prosimulium sp</u>	2	-	-
<u>Stenelmis sp</u>	1	5	5
Clam	1	-	-
Site HBI Value			5.3
Total	121		505



Photo 2. Stream shocking lower half of Stockbridge Tributary Site 1 (June 7, 2000). Looking downstream.



Photo 3. Stream shocking upstream half of Stockbridge Tributary Site 1 (June 7, 2000).



Photo 4. Fish collected from Stockbridge Tributary Site 1 (June 7, 2000). The largest fish is a yellow perch.



Photo 5. Stream shocking Site 2 (June 7, 2000). This site contained a large number of brook stickleback.



Photo 6. Site 2 looking upstream.

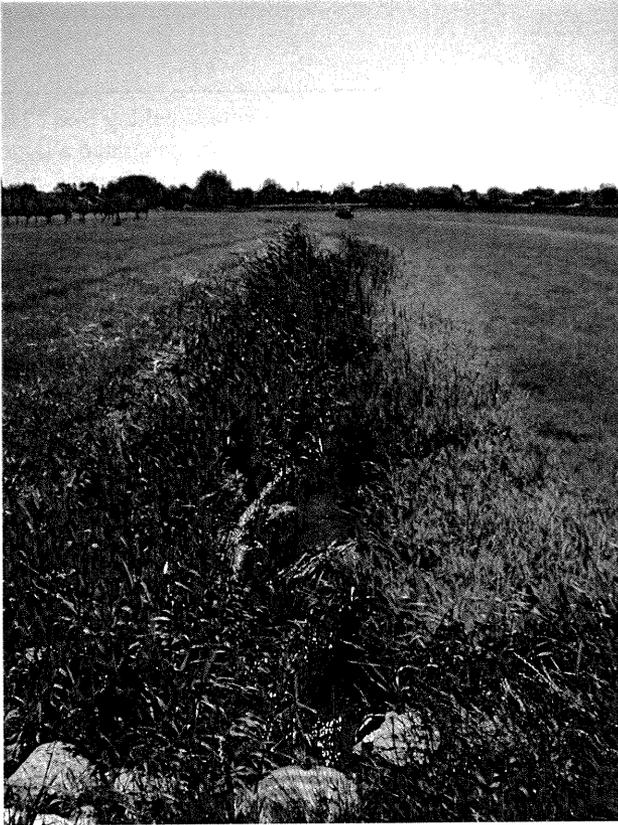


Photo 7. Upstream end of Site 1 (June 19, 2000).



Photo 8. Village of Stockbridge WWTP outfall (June 19, 2000).



Photo 9. Mud Creek Site 3 looking upstream from downstream end (June 19, 2000).



Photo 10. Mud Creek looking downstream from Lakeside Road below Site 3 (June 19, 2000).



Photo 11. Mud Creek Site 4 looking downstream from Mud Creek Road (June 19, 2000).



Photo 12. Stockbridge Tributary to Mud Creek looking downstream from HWY E east of the Village of Stockbridge (June 19, 2000).



Photo 13. Stockbridge Tributary looking downstream toward location of photo 12 (June 19, 2000).