

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY  
SURFACE WATER QUALITY DIVISION  
MAY 1998

STAFF REPORT

A BIOLOGICAL SURVEY OF TAMARACK CREEK IN MONTCALM COUNTY  
JULY 9 AND SEPTEMBER 19, 1996

As part of the nonpoint source surveillance activity of Surface Water Quality Division, staff of the Great Lakes and Environmental Assessment Section (GLEAS) conducted a qualitative biological survey of Tamarack Creek in Montcalm County. The biological survey was conducted according to GLEAS Procedure 51 (available upon request). Water samples were collected, preserved as required (MDNR 1994), and transported to the MDEQ Environmental Laboratory for analyses. The survey objectives were to document the existing fish and macroinvertebrate communities, physical habitat, and instream nutrient concentrations.

The reaches of Tamarack Creek evaluated in this survey are second (Station 4) and third order (Stations 1-3) coldwater stream segments in the Southern Michigan Northern Indiana Till Plain ecoregion. Tamarack Creek flows in a generally westward direction to its confluence with the Little Muskegon River in Newaygo County. Two lake system outlets drain to the creek between Stations 1 and 2 and probably account for some portion of the increase in flow observed between these two stations. The upper portion of the watershed has substantial agricultural development while the lower portion has more forested and relatively undeveloped lands. Tamarack Creek is a managed trout stream. The creek was chemically reclaimed in 1992 and was subsequently restocked with substantial numbers of trout. The creek was first assessed in July but a return trip in September was required to assess the fish community because of malfunctions in the electrofishing equipment during the first visit.

SUMMARY

1. The locations of the four sampling stations are shown in Figure 1. The fish and macroinvertebrate community, physical habitat, and chemistry data are presented in Tables 1-4 respectively.
2. Overall, the creek between Almy Road and the county line would be rated as fair to excellent. The fair rating would be for the area around Almy Road and reflects a best professional judgement (BPJ) adjustment of the excellent macroinvertebrate rating given to Station 4 (Tables 2A, 2B).
3. The fish community data (Tables 1A, 1B) show that trout were present at all four stations. The actual number of trout/station was lowest at Stations 3 and 4. Brook trout, brown trout and rainbow trout were present at Station 1, brook trout were absent at Station 2, and only brown trout were present at Stations 3 and 4. With the exception of one three inch brook trout at Station 1, all trout captured were  $\geq$  five inches in length. Very high numbers of sculpins and blacknose dace were present at Station 3.

Blacknose dace and longnose dace numbers are under-represented at Station 2 because all individuals at some locations were not captured due to stream depth or velocity. Warmwater species (centrarchids) were present at both Stations 1 and 4 and their presence is probably due to the lake outlets near or upstream of these two stations.

4. The macroinvertebrate community (Tables 2A and 2B) was rated as excellent (non-impaired) at all four stations. Stoneflies were found at all stations although only one family was found at Station 4. This suggests that there is not a continual water quality problem in the creek with respect to toxicants. However, based on the relative number or biomass of macroinvertebrates present, a BPJ assessment of the site at Station 4 would suggest that a fair to good rating would be more appropriate. The presence of macroinvertebrates at Station 4 was limited to the "microhabitat" zones along the channel margins because of the excessive sand deposits present in this reach.
5. The habitat quality (Table 3) was rated as good (slightly impaired) at Stations 1 and 3, excellent (non-impaired) at Station 2, and fair (moderately impaired) at Station 4. Station 1 was more affected by sand deposits than Station 3 and consequently scored lower than Station 3.

Station 4 exhibited severe sand sedimentation in the channel. During the July site visit, there was a large plume of sand moving downstream at Station 4. The plume of unconsolidated sand, which was on top of an already excessively sandy bottom, was 8-10" high at the leading edge and covered about 75% of the channel width. The leading edge was about 30' upstream of the Almy Road Bridge. Based on observations at upstream road crossings, the sand source was apparently downstream of M-46. By the time of the September visit, the leading edge of the sand plume had extended to somewhere downstream of the bridge. The main effect resulting from the previous sand inputs combined with the new sand plume noted was that most of the channel was only 4-6" deep with a flat, featureless bottom. The only depth or habitat present was along the stream margins where undercut banks occurred alone or in combination with an occasional log. A decent stream velocity is the only reason that the channel margins exist as habitat. This cover may be present only because of sidecutting, or widening of the stream, as a hydrologic response to the filling of the central channel. All of the trout and most of white suckers came from one 15' long undercut bank area. Macroinvertebrate production was similarly limited to primarily the run/undercut bank areas along the channel margins. Although "good" macroinvertebrate taxa were present, their overall numbers were restricted by the limited availability of habitat.

Water temperatures remained in the low 60's at all stations suggesting significant groundwater inputs throughout the stream reach assessed. The absence of a temperature increase between Stations 1 and 2 suggests that the lake outlet flows are not the major source of the flow increase between these two stations or that the outflows were relatively cool at the time of the survey.

6. The chemistry data (Table 4) show that total phosphorus concentrations for the four stations are somewhat elevated (by approximately 25-50%) for a trout stream. The data also suggest that a significant phosphorus source(s) exists below Station 3. Compared to Station 3, flow at Station 2 increased by about 18% but total phosphorus increased by about 40%. Ammonia and Kjeldahl nitrogen also increased between Station 2 and 3. Also notable are the high nitrite/nitrate concentrations, which

remained elevated by a factor of 2-10x when compared to other trout streams, down to the most downstream station. Elevated levels for these nutrient groups may be at least partially an effect of the agricultural activities in the upper watershed. There was some rain in the watershed the night before the sampling and the effect of the rainfall on the instream nutrient levels observed is not known. Suspended solids levels were somewhat elevated at Station 1 and this too may be related to the rain event.

#### REFERENCES

MDNR. 1994. Quality Assurance Manual for Water, Sediment, and Biological Sampling. Surface Water Quality Division. Michigan Department of Natural Resources.

Field work by: Bruce R. Walker, Aquatic Biologist  
Sylvia Heaton, Aquatic Biologist  
Jack Wuycheck Aquatic Biologist  
Michael Alexander, Aquatic Biologist

Report by: Bruce R. Walker, Aquatic Biologist  
Water Quality Appraisal Unit  
Great Lakes and Environmental Assessment Section

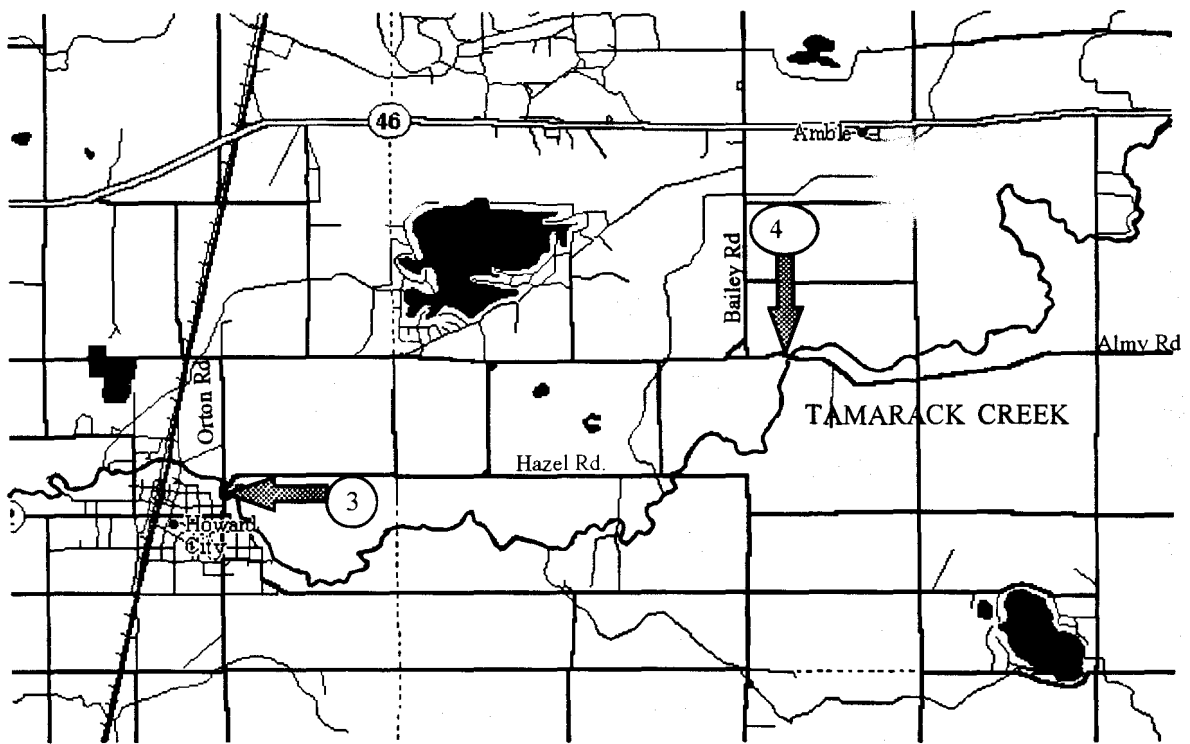
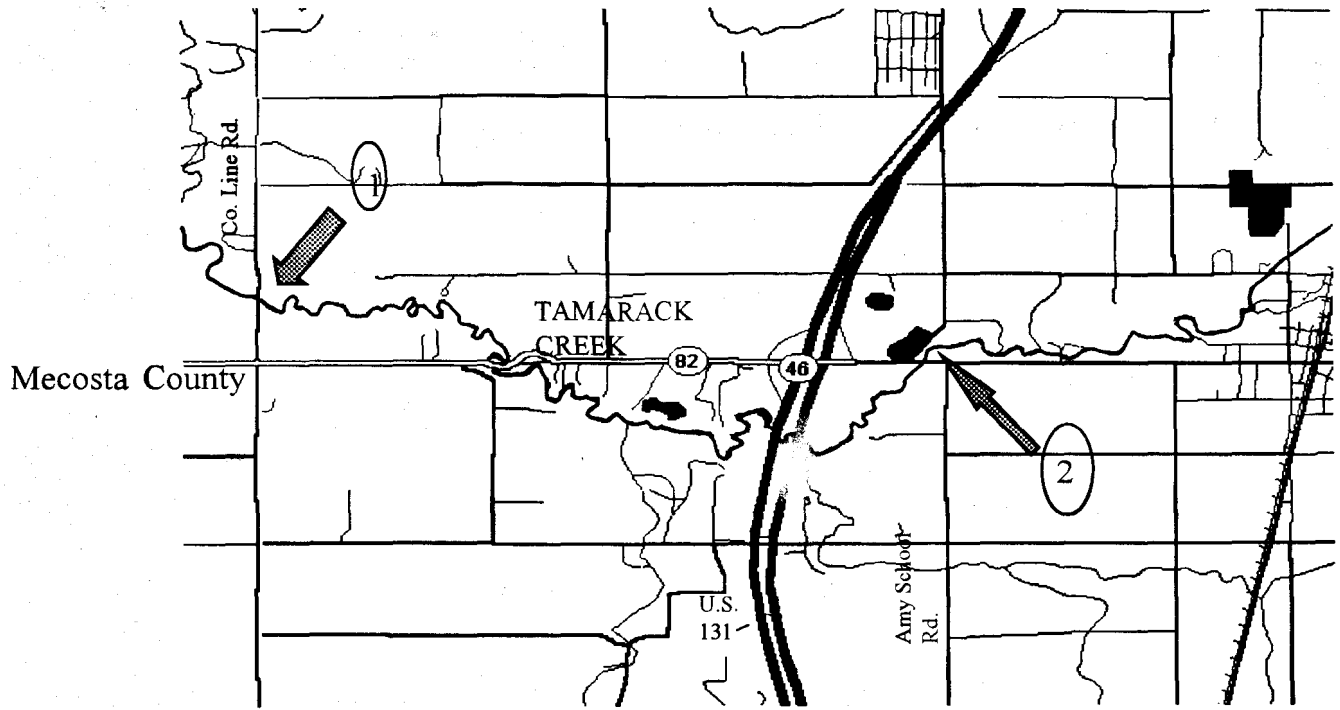


Figure 1. Sampling locations on Tamarack Creek, Montcalm County, on July 9 and September 19, 1996.

Table 1A. Qualitative fish sampling results for Tamarack Creek, Montcalm County, on September 19, 1996.

TAXA	STATION 1 Co. Line Rd.	STATION 2 Amy School Rd	STATION 3 Minnie Farmer Pk	STATION 4 Almy Rd.
Petromyzontidae (lampreys)				
Lamprey spp. ammocoete	23	30	57	10
Salmonidae (trouts)				
<i>Oncorhynchus mykiss</i> (Rainbow tr.)	1	3		
<i>Salmo trutta</i> (Brown trout)	12	3	2	3
<i>Salvelinus fontinalis</i> (Brook trout)	6			
Umbridae (mudminnows)				
<i>Umbra limi</i> (Central mudminnow)			1	8
Cyprinidae (minnows and carps)				
<i>Semotilus atromaculatus</i> (Creek)	7	47	90	12
<i>Notropis stramineus</i> (Sand shiner)	2			
<i>Rhinichthys atratulus</i> (Blacknose d.)	5	109	198	
<i>Rhinichthys cataractae</i> (Longnose d.)	2	23		
Unknown Shiner	2			
Cottidae (sculpins)				
<i>Cottus bairdii</i> (Mottled sculpin)	60	53	140	75
Catostomidae (suckers)				
<i>Catostomus commersoni</i> (W. sucker)	47	26	66	27
<i>Hypentelium nigricans</i> (N. hog s.)		3	2	
Centrarchidae (sunfish)				
<i>Lepomis cyanellus</i> (Green sunfish)				1
<i>Micropterus salmoides</i> (Lm. bass)	2			
Percidae (perch)				
<i>Etheostoma nigrum</i> (Johnny darter)	7			
<i>Percina caprodes</i> (Logperch)	4	1	2	
<i>Percina maculata</i> (Blackside d.)	4			
<b>TOTAL INDIVIDUALS</b>	<b>182</b>	<b>298</b>	<b>558</b>	<b>136</b>
Number of anomalies	0	0	0	0
Percent anomalies	0	0.3	0.7	0
Percent salmonids	10.4	2.0	0.4	2.2
Reach sampled (ft)	630	699	510	360
Area sampled (sq ft)	20790	18873	13770	7560
Density (# fish/sq ft)	0.009	0.016	0.041	0.018
Gear	SS	SS	SS	BPS

Table 1B. Fish metric evaluation of Tamarack Creek, Montcalm County, on September 19, 1996.

METRIC	STATION 1 Value	STATION 2 Value	STATION 3 Value	STATION 4 Value
TOTAL NUMBER OF TAXA	14	10	9	7
Coldwater Fish Present	Yes	Yes	Yes	Yes

Table 2A. Qualitative macroinvertebrate sampling results for Tamarack Creek, Montcalm County, on July 9, 1996.

TAXA	STATION 1 CO. LINE RD.	STATION 2 AMY SCHOOL RD.	STATION 3 MINNIE FARM. RD.	STATION 4 ALMY RD.
PORIFERA (sponges)			1	
BRYOZOA (moss animals)	1		2	1
ANNELIDA (segmented worms)				
Hirudinea (leeches)			1	
Oligochaeta (worms)		1		
ARTHROPODA				
Crustacea				
Amphipoda (scuds)	4	12	18	7
Decapoda (crayfish)	1	2	10	2
Isopoda (sowbugs)		1	1	
Insecta				
Ephemeroptera (mayflies)				
Bactidae	2	3	4	7
Caenidae			1	
Ephemerellidae	4	3		
Ephemeridae				1
Heptageniidae	12	15	20	15
Oligoneuriidae		4	1	
Tricorythidae		1	4	
Odonata				
Anisoptera (dragonflies)				
Aeshnidae	5	3		
Zygoptera (damselflies)				
Calopterygidae	2			1
Plecoptera (stoneflies)				
Perlidae	16	21	15	5
Pteronarcyidae	9	5	3	
Hemiptera (true bugs)				
Corixidae			6	3
Gerridae			2	
Pleidae			1	
Veliidae			2	
Megaloptera				
Corydalidae (dobson flies)		2		1
Trichoptera (caddisflies)				
Brachycentridae	8	3	2	12
Glossosomatidae		8	2	
Hydropsychidae	8	12	10	12
Hydroptilidae	1	2		
Leptoceridae	3	1		
Limnephilidae	10	9	18	10
Coleoptera (beetles)				
Hydrophilidae (total)	1		1	
Elmidae	1	7	4	2
Melyridae		1		
Haliplidae (larvae)	1		1	
Hydraenidae	1			
Carabidae				2
Diptera (flies)				
Chironomidae	13	10	4	15
Simuliidae	4			5
Tipulidae		2		1
MOLLUSCA				

Gastropoda (snails)				
Ancylidae (limpets)		1	1	
Physidae		1	3	
Viviparidae	1			1
Pelecypoda (bivalves)				
Sphaeriidae (clams)		3		
Unionidae (mussels)				1
<b>TOTAL INDIVIDUALS</b>	<b>109</b>	<b>133</b>	<b>138</b>	<b>104</b>

Table 2B. Macroinvertebrate metric evaluation of Tamarack Creek, Montcalm County, on July 9, 1996.

METRIC	STATION 1		STATION 2		STATION 3		STATION 4	
	Value	Score	Value		Value	Score	Value	Score
TOTAL NUMBER OF TAXA	20	0	25	1	26	1	20	0
NUMBER OF MAYFLY TAXA	3	0	5	1	5	1	3	0
NUMBER OF CADDISFLY TAXA	5	1	6	1	4	0	3	0
NUMBER OF STONEFLY TAXA	2	1	2	1	2	1	1	1
PERCENT MAYFLY COMP.	16.82	0	19.55	1	21.74	1	21.90	1
PERCENT CADDISFLY COMP.	28.04	0	26.32	0	23.19	0	32.38	1
PERCENT CONTR. DOM. TAXON	14.95	1	15.79	1	14.49	1	14.29	1
PERCENT ISOPOD, SNAIL, LEECH	0.93	1	2.26	1	4.35	0	0.95	1
PERCENT SURF. AIR BREATHERS	0.93	1	0.00	1	8.70	0	2.86	1
<b>TOTAL SCORE</b>		<b>5</b>		<b>8</b>		<b>5</b>		<b>6</b>
<b>MACROINV. COMMUNITY RATING</b>		<b>EXCELLENT</b>		<b>EXCELLENT</b>		<b>EXCELLENT</b>		<b>EXCELLENT</b>

Table 3. Habitat evaluation for Tamarack Creek, Montcalm County, on July 9, 1996.

HABITAT METRIC (MAX)	STATION 1	STATION 2	STATION 3	STATION 4
Bottom Substrate Avail. Cover (20):	10	18	13	4
Embeddedness (20):	11	18	16	5
Velocity:Depth (20):	12	16	15	5
Flow Stability (15):	10	10	10	10
Bottom Depos. (15):	11	13	11	2
Pools-Riffles-Runs-Bends (15):	7	13	9	5
Bank Stability (10):	6	8	6	8
Bank Vegetative Stability (10):	8	9	6	8
Stream Cover (10):	9	9	7	7
TOTAL SCORE (135):	84	114	93	54

HABITAT RATING:	GOOD (SLIGHTLY IMPAIRED)	EXCELLENT (NON-IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)	FAIR (MODERATELY IMPAIRED)
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Date:	7/9/96	7/9/96	7/9/96	7/9/96
Weather:	Cloudy	Partly Cloudy	Partly Cloudy	Partly Cloudy
Air Temperature:	62 Deg. F.	69 Deg. F.	70 Deg. F.	72 Deg. F.
Water Temperature:	61 Deg. F.	61 Deg. F.	63 Deg. F.	63 Deg. F.
Ave. Stream Width:	35 Feet	30 Feet	30 Feet	32 Feet
Ave. Stream Depth:	2 Feet	1.5 Feet	1.3 Feet	0.67 Feet
Surface Velocity:	2 Ft./Sec.	2.1 Ft./Sec.	2 Ft./Sec.	1.4 Ft./Sec.
Estimated Flow:	140 CFS	94 CFS	80 CFS	30 CFS
Stream Modifications:				
Nuisance Plants (Y/N):	N	N	N	N
Report Number	97/071			

STORET No.:				
Stream Name:	Tamarack River	Tamarack Creek	Tamarack Creek	Tamarack Creek
Road Crossing/Location:	County Line Road	Amy School Road	Minnie Farmer Pk.	Almy Road
County Code:	59	59	59	59
TRS:				

Latitude (dd):	43.40083	43.39639		43.41056
Longitude (dd):	-85.562	-85.50417		-85.39694
Ecoregion:	SMNITP	SMNITP	SMNITP	SMNITP
Stream Type:	Coldwater	Coldwater	Coldwater	Coldweather

USGS Basin Code: 4060102

COMMENTS:



Table 4. Results of water chemistry analyses of grab samples collected from Tamarack Creek, Montcalm County, on July 9, 1996.

<u>Parameter</u>		<u>Station 1</u> <u>County Line Rd.</u>	<u>Station 2</u> <u>Amy School Rd.</u>	<u>Station 3</u> <u>Orton/Hazel Rd.</u>	<u>Station 4</u> <u>Almy Rd.</u>
Nitrate + Nitrite - N	mg/l	1.59	2.1	2.2	1.36
Ammonia - N	mg/l	0.029	0.044	0.026	0.031
Kjeldahl Nitrogen - N	mg/l	0.61	0.63	0.47	0.5
Total Phosphorous	mg/l	0.062	0.067	0.048	0.047
Suspended Solids	mg/l	21	----	----	10

