

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY  
WATER RESOURCES DIVISION  
APRIL 2012

STAFF REPORT

BIOLOGICAL SURVEYS OF SELECTED LAKE ST. CLAIR SHORELINE TRIBUTARIES  
FLOWING TO ANCHOR BAY IN  
MACOMB AND ST. CLAIR COUNTIES  
JULY-OCTOBER 2003, AND AUGUST 2008

INTRODUCTION

Qualitative biological sampling of selected Lake St. Clair (LSC) shoreline tributaries was conducted by staff of the Surface Water Assessment Section, between July and October 2003 and during August 2008. These tributaries fall within the Southern Michigan/Northern Indiana Till Plains, and Huron/Erie Lake Plain ecoregions (Omernik and Gallant, 1988).

OBJECTIVES

This biological survey was conducted to:

- Assess the status/condition of the biological and physical parameters of the individual tributaries and determine attainment of Michigan Water Quality Standards.
- Generate background water chemistry data for selected locations.
- Identify potential point or nonpoint sources of water quality impairment.

BACKGROUND

The selected shoreline tributaries flow into Anchor Bay, found in the northern portion of LSC. By and large, most streams flowing to Anchor Bay pass through surficial soils that typically are poorly drained and have high clay content (Fishbeck et al., 2006). Consequently, along with effects from ditching, under-tiling of agriculture fields, and urbanization, many of the area streams and drains display ephemeral or intermittent flow regimes, especially in the upper reaches.

METHODS

Qualitative macroinvertebrate and habitat surveys were performed according to the Surface Water Assessment Section (SWAS) Procedure 51 (MDEQ, 1990; Creal, et al, 1996). The fish community was not sampled in either year. Water samples were collected, preserved as required (MDNR, 1994), and transported to the Michigan Department of Environmental Quality (MDEQ) Environmental Laboratory for analyses. In the 2003 surveys, stream sites were selected on the basis of: onsite reconnaissance and the presence of flows suitable for assessment and; specific information gathered from prior surveys and staff recommendations. The sites, based on specific information or data needs, are currently referred to as targeted sites. In July, reconnaissance observations were made and water chemistry samples were collected. The biological surveys were conducted in early October. Two site selection methods were used to assess LSC tributaries in 2008, stratified random and targeted. A probabilistic monitoring approach (MDEQ, 2006 draft), based on a stratified random site selection process to

address statewide and regional questions about water quality, was used to select sampling station locations on a random basis throughout the overall LSC basin.

Rivers in Michigan have been delineated into individual types called river segments that are based on flow and temperature characteristics as related to available groundwater and local geology/geomorphology. All streams used in these surveys fell into one flow/temperature regime based on an assemblage of attributes (Wehrly et al., 1997 and 1999; Seelbach and Wiley, 1997). These streams were considered to be in the small warm category due to their classification as low volume warm water headwater streams with insignificant groundwater influence draining a basin less than 40 square miles.

The 2003 survey included Procedure 51 assessments at four stations and reconnaissance observations were recorded for three other locations. During the 2008 survey, Procedure 51 assessments were conducted at five stations and reconnaissance observations were recorded for 17 other locations. The 2008 survey included four randomly selected Procedure 51 sites for probabilistic monitoring needs and one targeted Procedure 51 site. Water chemistry samples were collected at seven stations in 2003 (Table 6) and at five stations in 2008 (Table 7).

## RESULTS

1. The locations of the 2003 and 2008 stations are shown in Figure 1a and 1b. Qualitative macroinvertebrate community, physical habitat, and chemistry data are presented in Tables 2-3, 4-5, and 6-7, respectively.
2. In 2003, macroinvertebrate communities rated at the lower end of acceptable at three out of four stations and poor for the remaining station with total taxa ranging from 14-24 (Table 2a). In 2008, macroinvertebrate communities at randomly selected sites rated at the lower end of acceptable at three out of four stations and poor for the remaining station with total taxa ranging from 21-23 (Table 3a). At the targeted site (S6), an acceptable macroinvertebrate community rating was met. Applying the probabilistic monitoring methodology to the 2008 macroinvertebrate community data for the randomly selected LSC tributaries, the designated use attainment estimate and its 95 percent confidence interval is 75 percent  $\pm$  77 percent. Effects from flow alterations and habitat modifications, such as ditching and channelization are the likely causes of the poor macroinvertebrate community rating.
3. Station S6 had the best macroinvertebrate community of all sampled sites over both years.
4. The presence of a more stable flow and higher velocity due to this site's location below the Richmond Waste Water Treatment Plant (WWTP) most likely reflect the observed macroinvertebrate community.
5. Overall habitat quality scores for the Procedure 51 stations assessed in the 2003 and 2008 surveys ranged from mid-marginal to upper good. Current stream conditions reflected adverse in-stream effects from flow and/or habitat alterations. A substantial portion of the streams within this watershed area has been ditched and/or channelized. This channel alteration activity has resulted in channels that generally have: reduced amounts of hard substrate and cover, less variability for in-stream habitat features, adversely affected flow regimes and increased siltation and sedimentation.

6. Both survey periods commonly found elevated instream total phosphorus (TP) concentrations, ranging from 0.09 mg/l to 0.84 mg/l. The highest TP concentration was observed in 2008 at Station C1 which was downstream of the New Baltimore WWTP. Sodium was found at elevated concentrations at most stations in both surveys and the 2008 survey also found elevated chloride concentrations. Station C2 samples contained the highest sodium, hardness, and dissolved solids concentrations over both sampling events (Tables 6 and 7). The Fistler Drain samples from Stations Mc10 and S6 had high nitrite/nitrate concentrations which likely resulted from the conversion of ammonia in the treatment process at the upstream Richmond WWTP (Table 6 and 7). Results of the water chemistry analyses were likely influenced by rainfall that occurred a few days prior to both sampling events.
7. Both surveys found heavy metal concentrations that were low or below quantification levels although quantifiable low concentrations of copper and arsenic were found at most stations. In 2008, station C3 had a high aluminum concentration (3100 ug/l) which probably reflects the very high suspended solids in that sample (Table 7). The stream was an opaque, milky color due to the suspended clays carried along by the storm flow; the stream had been dry to stagnant at Station C3 prior to the noted rain event.
8. No stations in the 2003 or 2008 surveys were specifically selected to help evaluate nonpoint source issues or effects. However, the information generated in these two surveys serve to characterize existing conditions and can provide a comparison point for habitat and macroinvertebrate community conditions relative to landscape or riparian feature changes.

Field Work By:

2008 - Bruce R. Walker, Senior Aquatic Biologist  
Kay Edly, Aquatic Biologist

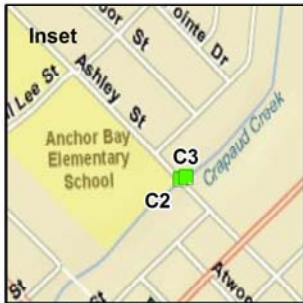
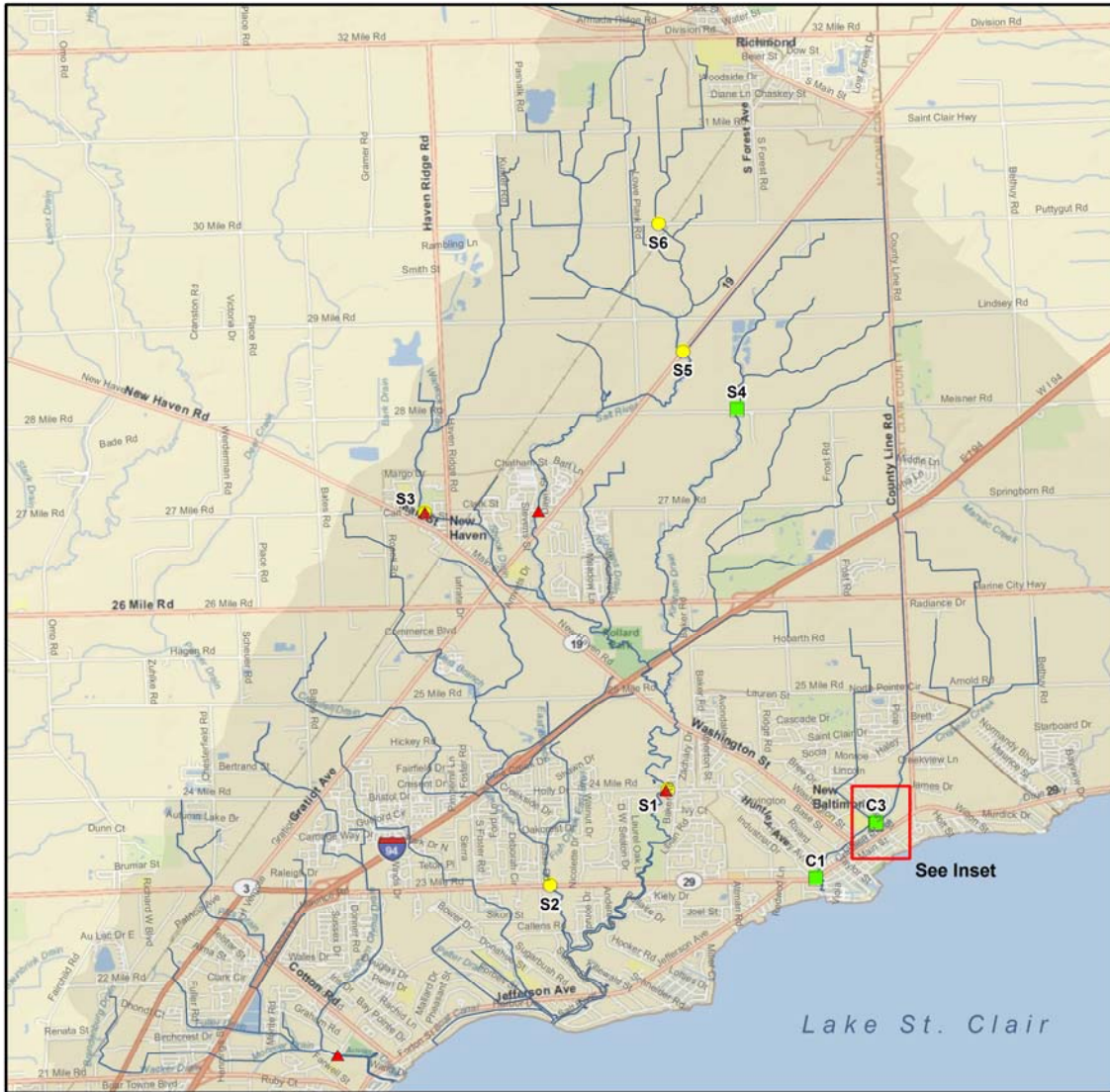
2003 - Kevin Goodwin, Senior Aquatic Biologist  
Tamara Lipsey, Aquatic Biologist  
Surface Water Assessment Section  
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Report By: Bruce R. Walker, Senior Aquatic Biologist  
William D. Keiper, Aquatic Biologist  
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**Figure 1: 2008 Site locations in the Lake St. Clair watershed, Macomb County.**



- ▲ 2003 Macroinvertebrate and Habitat Sites
- 2008 Macroinvertebrate, Habitat, and Chemistry Sites
- 2008 Water Chemistry Only Sites



**Table 1a. 2003 Lake St. Clair Shoreline Tributary Sampling Station Summary**

Station ID	Waterbody Name	Location	STORET	Data	Latitude	Longitude
Mc1	Rosso Hwy Drain	Selfridge ANGB, north side	500484	C	42.63057	-82.82677
M2	Auvase Creek	At Sugarbush Road	500479	MH	42.64869	-82.81893
Mc3	Harms Drain	At Chester TWP Hall off Sugarbush	500485	C	42.64925	-82.82143
Mc4	Sutherland&Oemig Drn	Iris Road	500482	C	42.65895	-82.81850
Mc5	Crapaud Creek	County Line Road	500487	C	42.69641	-82.72887
M6 *	Salt River	24 Mile Road	500480	MH	42.69049	-82.76709
Mc7	W. Br. Fish Creek	Sass Rd	500483	C	42.68227	-82.78330
M8	Salt River	27 Mile Road	500466	MH	42.73439	-82.78739
M9 *	Shook Drain	cemetary off 27 Mile Rd	500481	MHC	42.73414	-82.80522
Mc10	Fistler Drain	31 Mile Road	500486	C	42.79432	-82.76486

**Table 1b. 2008 Lake St. Clair Shoreline Tributary Sampling Station Summary**

Station ID	Waterbody Name	Location	STORET	Data	Latitude	Longitude
S1 *	Salt River	24 Mile Road	500480	MH	42.69049	-82.76709
S2	W. Br. Fish Creek	23 Mile Road	500531	MH	42.67548	-82.78555
S3 *	Shook Drain	cemetary off 27 Mile Rd	500481	MH	42.73414	-82.80522
S4	Kirkham Drain Trib	28 Mile Road, landfill outlet flow	500548	C	42.75045	-82.75621
S5	Salt River	M-19, North Crossing	500281	MH	42.75956	-82.76471
S6	Fistler Drain #	30 Mile Road	500544	MHC	42.77969	-82.76854
C1	Crapaud Creek #	Jefferson Avenue	500545	C	42.67653	-82.74386
C2	Unnamed Drain #	at mouth, just d/s of Ashley Rd	500547	C	42.68530	-82.73451
C3	Crapaud Creek #	Ashley Rd	500546	C	42.68534	-82.73434

All 2008 stations are upstream of the noted road crossing except Station C2.

# - Denotes a targeted stream in 2008.

\* - P-51 Station common to 2003 and 2008 surveys

#### **Data Categories**

M - Macroinvertebrate

H -Habitat

C - Chemistry

Table 2A. Qualitative macroinvertebrate sampling results for the Wadeable Stations in the Lake St. Clair watershed in Macomb County on October 2, 2003.

TAXA	Auvase Ck Sugarbush Station M2 10/2/2003 M2	Shook Drain Cemetery off 27 Mile Rd Station M9 10/2/2003 M9	Salt River 27-Mile Rd Station M8 10/2/2003 M8	Salt River 24 Mile Rd Station M6 10/2/2003 M6
<b>PLATYHELMINTHES (flatworms)</b>				
Turbellaria		1		2
<b>ANNELIDA (segmented worms)</b>				
Hirudinea (leeches)	1	2		
Oligochaeta (worms)		4	20	3
<b>ARTHROPODA</b>				
<b>Crustacea</b>				
Amphipoda (scuds)	8	2	6	4
Decapoda (crayfish)			1	
Isopoda (sowbugs)	3	3	3	12
<b>Arachnoidea</b>				
Hydracarina	1			
<b>Insecta</b>				
<b>Ephemeroptera (mayflies)</b>				
Baetidae				2
Heptageniidae			4	3
<b>Odonata</b>				
<b>Anisoptera (dragonflies)</b>				
Aeshnidae	2	3		2
Libellulidae			1	1
<b>Zygoptera (damselflies)</b>				
Calopterygidae	1	1	1	3
Coenagrionidae	7		3	3
<b>Hemiptera (true bugs)</b>				
Belostomatidae	1		1	2
Corixidae	3		15	
Gerridae	2	2		2
Mesoveliidae				1
Notonectidae				1
Pleidae				1
Saldidae				1
Veliidae			1	3
<b>Trichoptera (caddisflies)</b>				
Hydropsychidae		2		
Limnephilidae		1		
<b>Coleoptera (beetles)</b>				
Dytiscidae (total)		1		1
Haliplidae (adults)	4			5
Elmidae			3	2
Gyrinidae (larvae)	1			
<b>Diptera (flies)</b>				
Chironomidae	15	10	30	10
Culicidae			1	
Dixidae	1			
Tipulidae		5		1
<b>MOLLUSCA</b>				
<b>Gastropoda (snails)</b>				
Ancylidae (limpets)			2	
Hydrobiidae	10			
Lymnaeidae	5			
Physidae	15	15	3	6
Planorbidae	3			
<b>Pelecypoda (bivalves)</b>				
Pisidiidae				2
Sphaeriidae (clams)	3			
Unionidae (mussels)	1			
<b>TOTAL INDIVIDUALS</b>	<b>87</b>	<b>52</b>	<b>95</b>	<b>73</b>

Table 2B. Macroinvertebrate metric evaluation of wadeable stations in the Lake St. Clair watershed in Macomb County on October 2, 2003.

METRIC	Auvase Ck Sugarbush 10/2/2003		Shook Drain Cemetery off 27 Mile Rd 10/2/2003		Salt River 27-Mile Rd 10/2/2003		Salt River 24 Mile Rd 10/2/2003	
	M2		M9		M8		M6	
	Value	Score	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	20	0	14	1	16	0	24	0
NUMBER OF MAYFLY TAXA	0	-1	0	-1	1	-1	2	0
NUMBER OF CADDISFLY TAXA	0	-1	2	0	0	-1	0	-1
NUMBER OF STONEFLY TAXA	0	-1	0	-1	0	-1	0	-1
PERCENT MAYFLY COMP.	0.00	-1	0.00	-1	4.21	0	6.85	0
PERCENT CADDISFLY COMP.	0.00	-1	5.77	0	0.00	-1	0.00	-1
PERCENT DOMINANT TAXON	17.24	1	28.85	0	31.58	0	16.44	1
PERCENT ISOPOD, SNAIL, LEECH	42.53	-1	38.46	-1	8.42	0	24.66	-1
PERCENT SURF. AIR BREATHERS	11.49	0	5.77	1	18.95	0	23.29	-1
TOTAL SCORE		-5		-2		-4		-4
MACROINV. COMMUNITY RATING		POOR		ACCEPT.		ACCEPT.		ACCEPT.



Table 3A. Qualitative macroinvertebrate sampling results for the Wadeable Stations in the Lake St. Clair watershed in Macomb County on August 4-5, 2008.

TAXA	Salt River 24 Mile Road 8/5/2008 S1	West Branch Fish Creek 23 Mile Road 8/5/2008 S2	Shook Drain 27 Mile Road 8/4/2008 S3	Salt River M-19, North Crossing 8/4/2008 S5
<b>PLATYHELMINTHES (flatworms)</b>				
Turbellaria		3		
<b>ANNELIDA (segmented worms)</b>				
Hirudinea (leeches)	2	6	11	2
Oligochaeta (worms)	5	2	5	7
<b>ARTHROPODA</b>				
<b>Crustacea</b>				
Amphipoda (scuds)	52			5
Decapoda (crayfish)	1		8	4
Isopoda (sowbugs)	10		4	8
<b>Arachnoidea</b>				
Hydracarina	2	6		
<b>Insecta</b>				
<b>Ephemeroptera (mayflies)</b>				
Baetidae	4			13
Heptageniidae	42			
<b>Odonata</b>				
<b>Anisoptera (dragonflies)</b>				
Aeshnidae		4	8	1
Libellulidae			1	
<b>Zygotera (damselflies)</b>				
Calopterygidae	6	3	12	1
Coenagrionidae	4	7	1	7
<b>Hemiptera (true bugs)</b>				
Corixidae	11			1
Gerridae	3	4	6	1
Notonectidae			1	
Veliidae		1	2	1
<b>Trichoptera (caddisflies)</b>				
Hydropsychidae		11	5	34
<b>Coleoptera (beetles)</b>				
Dytiscidae (total)			1	
Haliplidae (adults)	3	25		1
Hydrophilidae (total)	1	3	3	1
Elmidae	5	1	1	53
<b>Diptera (flies)</b>				
Ceratopogonidae	1			
Chironomidae	129	104	192	73
Culicidae		1		
Simuliidae		1	17	5
Stratiomyidae	3			
Tipulidae	1		5	1
<b>MOLLUSCA</b>				
<b>Gastropoda (snails)</b>				
Ancylidae (limpets)		2	37	2
Physidae	6	52	12	21
Planorbidae		4		1
<b>Pelecypoda (bivalves)</b>				
Pisidiidae		5		
Sphaeriidae (clams)	3	8	2	38
<b>TOTAL INDIVIDUALS</b>	<b>294</b>	<b>253</b>	<b>334</b>	<b>281</b>

Table 3B. Macroinvertebrate metric evaluation of wadeable stations in the Lake St. Clair watershed in Macomb County on August 4-5, 2008.

METRIC	Salt River 24 Mile Road 8/5/2008 S1		West Branch Fish Creek 23 Mile Road 8/5/2008 S2		Shook Drain 27 Mile Road 8/4/2008 S3		Salt River M-19, North Crossing 8/4/2008 S5	
	Value	Score	Value	Score	Value	Score	Value	Score
	TOTAL NUMBER OF TAXA	21	0	21	0	21	1	23
NUMBER OF MAYFLY TAXA	2	0	0	-1	0	-1	1	0
NUMBER OF CADDISFLY TAXA	0	-1	1	-1	1	0	1	-1
NUMBER OF STONEFLY TAXA	0	-1	0	-1	0	-1	0	-1
PERCENT MAYFLY COMP.	15.65	0	0.00	-1	0.00	-1	4.63	0
PERCENT CADDISFLY COMP.	0.00	-1	4.35	0	1.50	-1	12.10	0
PERCENT DOMINANT TAXON	43.88	-1	41.11	-1	57.49	-1	25.98	0
PERCENT ISOPOD, SNAIL, LEECH	6.12	0	25.30	-1	19.16	-1	12.10	-1
PERCENT SURF. AIR BREATHERS	7.14	0	13.44	0	3.89	1	1.78	1
TOTAL SCORE		-4		-6		-4		-2
MACROINV. COMMUNITY RATING		ACCEPT.		POOR		ACCEPT.		ACCEPT.

Table 3A. Qualitative macroinvertebrate sampling results for the wadeable stations in the Lake St. Clair watershed in Macomb County on August 4-5, 2008.

Fistler Drain Upstream 30 Mile 8/5/2008	
TAXA	S6
<hr/> <hr/>	
PLATYHELMINTHES (flatworms)	
Turbellaria	1
ANNELIDA (segmented worms)	
Hirudinea (leeches)	2
Oligochaeta (worms)	8
ARTHROPODA	
Crustacea	
Amphipoda (scuds)	13
Isopoda (sowbugs)	85
Insecta	
Ephemeroptera (mayflies)	
Baetidae	1
Odonata	
Anisoptera (dragonflies)	
Aeshnidae	4
Zygoptera (damselflies)	
Calopterygidae	1
Hemiptera (true bugs)	
Gerridae	1
Veliidae	1
Trichoptera (caddisflies)	
Hydropsychidae	23
Hydroptilidae	2
Coleoptera (beetles)	
Hydrophilidae (total)	1
Elmidae	51
Diptera (flies)	
Ceratopogonidae	1
Chironomidae	23
Simuliidae	3
Tipulidae	2
MOLLUSCA	
Gastropoda (snails)	
Physidae	6
Pelecypoda (bivalves)	
Pisidiidae	2
Sphaeriidae (clams)	66
<hr/> <hr/>	
TOTAL INDIVIDUALS	297

Table 3B. Macroinvertebrate metric evaluation of wadeable stations in the Lake St. Clair watershed in Macomb County on August 4-5, 2008.

Fistler Drain Upstream 30 Mile 8/5/2008 S6		
METRIC	Value	Score
TOTAL NUMBER OF TAXA	21	1
NUMBER OF MAYFLY TAXA	1	1
NUMBER OF CADDISFLY TAXA	2	1
NUMBER OF STONEFLY TAXA	0	-1
PERCENT MAYFLY COMP.	0.34	-1
PERCENT CADDISFLY COMP.	8.42	0
PERCENT DOMINANT TAXON	28.62	-1
PERCENT ISOPOD, SNAIL, LEECH	31.31	-1
PERCENT SURF. AIR BREATHERS	1.01	1
TOTAL SCORE		0
MACROINV. COMMUNITY RATING		ACCEPT.

Table 4. Habitat evaluation for the Wadeable stations in the Lake St. Clair watershed in Macomb County on October 2, 2003

Stream Name	Auvase Creek	Shook Drain	Salt River	Salt River
Station Location	Sugarbush	Cemetery off 27 Mile Rd	27-Mile Rd	24 Mile Rd
Station ID	M2	M9	M8	M6
HABITAT METRIC				
<b>Substrate and Instream Cover</b>				
Epifaunal Substrate/ Avail Cover (20)	8	15	2	3
Embeddedness (20)*		9		
Velocity/Depth Regime (20)*		9		
Pool Substrate Characterization (20)**	10		6	6
Pool Variability (20)**	4		5	4
<b>Channel Morphology</b>				
Sediment Deposition (20)	9	13	5	5
Flow Status - Maint. Flow Volume (10)	5	3	9	8
Flow Status - Flashiness (10)	2	5	2	2
Channel Alteration (20)	8	13	7	9
Frequency of Riffles/Bends (20)*		17		
Channel Sinuosity (20)**	4		5	5
<b>Riparian and Bank Structure</b>				
Bank Stability (L) (10)	4	6	5	6
Bank Stability (R) (10)	4	6	5	6
Vegetative Protection (L) (10)	7	5	7	8
Vegetative Protection (R) (10)	3	7	7	8
Riparian Veg. Zone Width (L) (10)	3	2	7	7
Riparian Veg. Zone Width (R) (10)	1	8	5	4
<b>TOTAL SCORE (200):</b>	<b>72</b>	<b>118</b>	<b>77</b>	<b>81</b>
<b>HABITAT RATING:</b>	<b>MARGINAL (MODERATELY IMPAIRED)</b>	<b>GOOD (SLIGHTLY IMPAIRED)</b>	<b>MARGINAL (MODERATELY IMPAIRED)</b>	<b>MARGINAL (MODERATELY IMPAIRED)</b>

Note: Individual metrics may better describe conditions directly affecting the biological community while the Habitat Rating describes the general riverine environment at the site(s)

Date:	10/2/2003	10/2/2003	10/2/2003	10/2/2003
Weather:	Partly Cloudy	Partly Cloudy	Sunny	Partly Cloudy
Air Temperature:	Deg. F.	Deg. F.	45 Deg. F.	50 Deg. F.
Water Temperature:	70 Deg. F.	70 Deg. F.	50 Deg. F.	50 Deg. F.
Ave. Stream Width:	30 Feet	4 Feet	20 Feet	18 Feet
Ave. Stream Depth:	0.75 Feet	0.17 Feet	1.5 Feet	1 Feet
Surface Velocity:	0.2 Ft./Sec.	0.1 Ft./Sec.	0.1 Ft./Sec.	0.25 Ft./Sec.
Estimated Flow:	4.5 CFS	0.07 CFS	3 CFS	4.5 CFS
Stream Modifications:	Dredged	None	Dredged	Dredged
Nuisance Plants (Y/N):	N	N	N	N
Report Number:				
STORET No.:	500479	500481	500466	500480
Stream Name:	Auvase Creek	Shook Drain	Salt River	Salt River
Road Crossing/Location:	Sugarbush	Cemetery off 27 Mile Rd	27-Mile Rd	24 Mile Rd
County Code:	50	50	50	50
TRS:	03N14E29	04N14E28	04N14E27	03N14E14
Latitude (dd):	42.64869	42.73414	42.734393	42.69038
Longitude (dd):	-82.81893	-82.80522	-82.787389	-82.76738
Ecoregion:	SMNITP	SMNITP	SMNITP	SMNITP
Stream Type:		Warmwater	Warmwater	Warmwater
USGS Basin Code:	4090002	4090002	4090002	4090002

\* Applies only to Riffle/Run stream Surveys  
 \*\* Applies only to Glide/Pool stream Surveys

COMMENTS: Flow varied during survey

Table 5. Habitat evaluation for the wadeable stations in the Lake St. Clair watershed in Macomb County on August 4-5, 2008

Stream Name Station Location Station ID	Salt River 24 Mile Rd S1	West Branch Fish Creek 23 Mile Road S2	Shook Drain 27 Mile Road S3	Salt River M-19, North Crossing S5	Fistler Drain 30 Mile Road S6
<b>HABITAT METRIC</b>					
<b>Substrate and Instream Cover</b>					
Epifaunal Substrate/ Avail Cover (20)	3	5	13	10	13
Embeddedness (20)*			16		13
Velocity/Depth Regime (20)*			13		14
Pool Substrate Characterization (20)**	6	5		12	
Pool Variability (20)**	4	5		9	
<b>Channel Morphology</b>					
Sediment Deposition (20)	6	7	12	14	18
Flow Status - Maint. Flow Volume (10)	9	9	4	9	9
Flow Status - Flashiness (10)	4	4	6	5	8
Channel Alteration (20)	11	10	14	11	14
Frequency of Riffles/Bends (20)*			16		17
Channel Sinuosity (20)**	6	7		10	
<b>Riparian and Bank Structure</b>					
Bank Stability (L) (10)	6	4	8	7	8
Bank Stability (R) (10)	6	4	8	7	9
Vegetative Protection (L) (10)	9	7	7	8	8
Vegetative Protection (R) (10)	9	7	7	8	10
Riparian Veg. Zone Width (L) (10)	4	4	5	8	3
Riparian Veg. Zone Width (R) (10)	4	4	5	9	4
<b>TOTAL SCORE (200):</b>	<b>87</b>	<b>82</b>	<b>134</b>	<b>127</b>	<b>148</b>

<b>HABITAT RATING:</b>	<b>MARGINAL (MODERATELY IMPAIRED)</b>	<b>MARGINAL (MODERATELY IMPAIRED)</b>	<b>GOOD (SLIGHTLY IMPAIRED)</b>	<b>GOOD (SLIGHTLY IMPAIRED)</b>	<b>GOOD (SLIGHTLY IMPAIRED)</b>
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Note: Individual metrics may better describe conditions directly affecting the biological community while the overall Habitat Rating describes the broader riverine environment at the site(s)

Date:	8/5/2008	8/5/2008	8/4/2008	8/4/2008	8/5/2008
Weather:	Partly Cloudy	Cloudy	Partly Cloudy	Partly Cloudy	Partly Cloudy
Air Temperature:	86 Deg. F.	79 Deg. F.	72 Deg. F.	85 Deg. F.	87 Deg. F.
Water Temperature:	78 Deg. F.	71 Deg. F.	68 Deg. F.	70 Deg. F.	77 Deg. F.
Ave. Stream Width:	16 Feet	10.5 Feet	4 Feet	9 Feet	6 Feet
Ave. Stream Depth:	0.75 Feet	0.33 Feet	0.08 Feet	0.42 Feet	0.17 Feet
Surface Velocity:	0.3 Ft./Sec.	0.3 Ft./Sec.	0.6 Ft./Sec.	0.4 Ft./Sec.	1.3 Ft./Sec.
Estimated Flow:	3.6 CFS	1 CFS	0.2 CFS	1.5 CFS	1.3 CFS
Stream Modifications:	Dredged	Dredged	None	Dredged	Dredged
Nuisance Plants (Y/N):	N	N	N	N	N
Report Number:					
STORET No.:	500480	500531	500481	500281	500544
Stream Name:	Salt River	West Branch Fish Creek	Shook Drain	Salt River	Fistler Drain
Road Crossing/Location:	24 Mile Road	23 Mile Road	27 Mile Road	M-19, North Crossing	30 Mile Road
County Code:	50	50	50	74	50
TRS:	03N14E14	03N14E15	04N14E28	04N14E23	04N14E11
Latitude (dd):	42.69038	42.67548	42.73414	42.75956	42.77969
Longitude (dd):	-82.76738	-82.78555	-82.80522	-82.76471	-82.76854
Ecoregion:	SMNITP	SMNITP	SMNITP	SMNITP	SMNITP
Stream Type:	Warmwater	Warmwater	Warmwater	Warmwater	Warmwater
USGS Basin Code:	4090002	4090002	4090002	4090002	4090002

\* Applies only to Riffle/Run stream Surveys

\*\* Applies only to Glide/Pool stream Surveys

COMMENTS:

Table 6. Water chemistry results for the stations in the Lake St.Clair watershed, Macomb County on July 22, 2003.

<b>Stream Name</b>		Crapaud Creek	Fistler Drain	Shook Drain	W Br Fish Creek	Rosso Hwy Drain
<b>Location</b>		County Line Rd	31 Mile Rd	27 Mile Rd	Sass Rd	Selfridge ANGB
<b>Station</b>		Mc5	Mc10	M9	Mc7	Mc1
<b>STORET ID #</b>		500487	500486	500481	500483	500484
<b>Parameter</b>	<b>Units</b>					
Ammonia	mg N/L	0.13 (PI)	0.06	0.041	0.039	0.02
Calcium	mg/L	62.9	61.4	61.5	52.2	51.0
Chromium	ug/L	1.8	ND	ND	1.6	ND
Conductivity	umho/cm	1299	1073	687	725	846
Hardness-Calculated	mg/L	235	238	217	207	202
Solids-Dissolved	mg/L	760	660	420	460	540
Solids-Suspended	mg/L	25	10	6	10	11
Magnesium	mg/L	18.9	20.6	15.4	18.6	18.0
Nitrate + Nitrite	mg N/L	0.47 (PI)	9.9	0.61	0.43	0.058
Nitrite	mg N/L	0.046 (H)	0.054 (H)	0.011 (H)	0.075 (H)	0.026 (H)
Ortho-phosphate	mg P/L	ND (I)	0.18	0.065	0.057	0.041
Mercury	ug/L	ND	ND	ND	ND	ND
Nitrogen-Kjeldahl	mg N/L	1.43	1.37	0.43	1.35	0.89
Phosphorus-Total	mg P/L	0.107	0.33	0.095	0.107	0.09
Potassium	mg/L	8.8 (D)	8.7 (D)	2.7	7.4 (D)	5.0
Selenium	ug/L	ND	ND	ND	ND	ND
Sodium	mg/L	177 (D)	119 (D)	54.7	58.7	85.2
Arsenic	ug/L	3.0	ND	1.7	2.5	2.6
Barium	ug/L	54	44	36	41	38
Cadmium	ug/L	ND	ND	ND	ND	ND
Cobalt	ug/L	ND	ND	ND	ND	ND
Copper	ug/L	8.5	7.0	1.5	6.0	2.9
Lead	ug/L	ND	ND	ND	1.0	1.1
Manganese	ug/L	61	17	70	25	9.1
Nickel	ug/L	5.1	4.8	2.6	4.9	4.0
Silver	ug/L	ND	0.5	ND	ND	ND
Zinc	ug/L	ND	33	ND	ND	ND
Iron	ug/L	1200	330	270	1200	530
Lithium	ug/L	ND	13	ND	ND	ND

D - Analyte value quantified from a dilution(s); reporting limit (RL) raised.

H - Recommended laboratory holding time was exceeded.

ND - Not detected at respective quantification level.

PI - Possible interference.

Metal values given are as total metals.

Table 6 (cont.). Water chemistry results for the stations in the Lake St.Clair watershed, Macomb County on July 22, 2003.

<b>Stream Name</b>		<b>Harms Drain</b>	<b>Sutherland &amp; Oemig Drain</b>
<b>Location</b>		<b>Chester Twp Hall</b>	<b>Iris Rd</b>
<b>Station</b>		<b>Mc3</b>	<b>Mc4</b>
<b>STORET ID #</b>		<b>500485</b>	<b>500482</b>
<b>Parameter</b>	<b>Units</b>		
Ammonia	mg N/L	0.052	0.071
Calcium	mg/L	47.4	59.7
Chromium	ug/L	1.7	ND
Conductivity	umho/cm	700	1209
Hardness-Calculated	mg/L	177	237
Solids-Dissolved	mg/L	440	760
Solids-Suspended	mg/L	18	5
Magnesium	mg/L	14.3	21.4
Nitrate + Nitrite	mg N/L	0.24	0.187
Nitrite	mg N/L	0.029 (H)	0.031 (H)
Ortho-phosphate	mg P/L	0.075	0.027
Mercury	ug/L	ND	ND
Nitrogen-Kjeldahl	mg N/L	0.76	1.2
Phosphorus-Total	mg P/L	0.11	0.085
Potassium	mg/L	5.2 (D)	5.1 (D)
Selenium	ug/L	ND	ND
Sodium	mg/L	63.7	159 (D)
Arsenic	ug/L	2.1	2.8
Barium	ug/L	49	46
Cadmium	ug/L	ND	ND
Cobalt	ug/L	ND	ND
Copper	ug/L	4.8	2.8
Lead	ug/L	1.6	ND
Manganese	ug/L	35	43
Nickel	ug/L	4.7	4.4
Silver	ug/L	ND	ND
Zinc	ug/L	ND	ND
Iron	ug/L	1300	460
Lithium	ug/L	ND	ND

D - Analyte value quantified from a dilution(s); reporting limit (RL) raised.

H - Recommended laboratory holding time was exceeded.

ND - Not detected at respective quantification level.

Metal values given are as total metals.



Table 7. Water chemistry results for the stations in the Lake St.Clair watershed, Macomb County on August 4, 2008.

<b>Stream Name</b>		Crapaud Creek	Unnamed Drain	Crapaud Creek	Fistler Drain	Kirkham Drain-Landfill
<b>Location</b>		Jefferson Avenue	Ashley Road	Ashley Road	30 Mile Road	28 Mile Road
<b>Station</b>		C1	C2	C3	S6	S4
<b>STORET ID #</b>		500545	500547	500546	500544	500548
<b>Parameter</b>	<b>Units</b>					
Alkalinity	mg/L	163	261	151	162	--
Ammonia	mg N/L	4.9	0.04	0.02	0.07	0.03
Boron	ug/L	120	68	86	400	100
Calcium	mg/L	57.6	94.5	61	73.5	48
Chloride	mg/L	178 (D)	510 (D)	160 (D)	276 (D)	--
Chromium	ug/L	1.6	1.3	5.5	ND	1.4
COD	mg/L	32	38	32	21	22
Conductivity	umho/cm	998	2136	931	1517	--
Hardness-Calculated	mg/L	209	342	225	293	218
Solids-Dissolved	mg/L	550	1200	560	900	--
Solids-Suspended	mg/L	36	11	200	10	--
Magnesium	mg/L	15.8	25.6	17.6	26.6	23.9
Nitrate + Nitrite	mg N/L	0.4 (D)	0.95	0.03	23	0.66
Phosphorus-Total	mg P/L	0.84	ND	0.28	0.51	ND
Potassium	mg/L	9.0 (D)	5.5 (D)	15.0 (D)	12.1 (D)	4.6
Selenium	ug/L	ND	ND	ND	ND	1.7
Sodium	mg/L	100 (D)	275 (D)	95.7	173 (D)	20.9
Sulfate	mg/L	40 (D)	53 (D)	41 (D)	72 (D)	--
TOC	mg/L	9.9	11	8.1	6.7	8.0
Aluminum	ug/L	870	220	3100 (D)	110	770
Antimony	ug/L	ND	ND	1.7	ND	ND
Arsenic	ug/L	2.5	1.9	2.6	1.6	2.8
Barium	ug/L	45	56	80	49	25
Beryllium	ug/L	ND	ND	ND	ND	ND
Cadmium	ug/L	ND	ND	ND	ND	ND
Copper	ug/L	4.6	4	7.6	4.8	2.9
Lead	ug/L	1.3	ND	4.1	ND	ND
Nickel	ug/L	4.5	4.6	11.0	6.0	4.4
Silver	ug/L	ND	ND	ND	ND	ND
Zinc	ug/L	12	ND	30	20	11

D - Analyte value quantified from a dilution(s); reporting limit (RL) raised.

ND - Not Detected.

Metal values given are as total metals.