

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
SURFACE WATER QUALITY DIVISION
FEBRUARY 1998

STAFF REPORT

A BIOLOGICAL SURVEY OF STONY CREEK AND ITS
TRIBUTARIES, AMOS PALMER DRAIN AND ROSS DRAIN,
MONROE COUNTY, JULY 1997

As part of the point source surveillance activities, staff from the Great Lakes and Environmental Assessment Section (GLEAS) conducted a qualitative biological survey of Stony Creek and tributaries, Amos Palmer Drain and Ross Drain. The biological survey was conducted according to GLEAS Procedure #51 (available upon request). Water samples were collected at selected locations, preserved, and transported to the MDEQ-Environmental Laboratory for chemical analysis (MDNR, 1994).

This survey was conducted to evaluate the effects of the point source discharge from London Aggregates to the biological communities and habitat of Amos Palmer Drain and Stony Creek.

SUMMARY

1. Sampling locations are shown in Figure 1. Fish community ratings, macroinvertebrate ratings, and habitat evaluations are given in Tables 1A and 1B, 2A and 2B, and 3, respectively. A summary of overall biological and habitat ratings is given in Table 4. Water chemistry results are given in Table 5.
2. Qualitative fish sampling was only conducted at station 6. The fish community at station 6 rated "acceptable" with a raw data score of -2, indicating slight impairment. The fish community was dominated by taxa tolerant of degraded conditions.
3. The macroinvertebrate community at station 1, Stony Creek upstream of Amos Palmer Drain, rated "acceptable" tending towards poor (moderate impairment). The macroinvertebrate community at this station was dominated by Isopods and lacked taxa diversity and density in groups such as Empheroptera, Tricoptera, and Plecoptera. This macroinvertebrate community can likely be attributed to lack of available habitat. The habitat at station 1 was rated "fair," tending towards poor, with the bottom substrate being dominated by sand and muck. The majority of habitat available for macroinvertebrate colonization consisted of woody debris covered by a fine layer of silt. This habitat can be attributed to agricultural and other land use activities upstream of this location.
4. The macroinvertebrate community at station 2b, North Branch of Amos Palmer Drain downstream of the outfall from London Aggregates, rated "poor" (severely impaired). The macroinvertebrate community at this station consisted of only two taxa, 98 percent being chironomids. The habitat at this location was rated "fair," just above poor. This drain appears to have been channelized and had the riparian canopy removed with the past ten years. The bottom substrate consisted mostly of organic muck covered by an aquatic plant (*Chara sp*) and emanated a hydrogen sulfide smell when stepped on. The *Chara sp* appeared to be covered with a white unknown substance, possibly a precipitate from the dissolved solids in the effluent from London Aggregates. While the habitat at this location is degraded, it is unlikely the poor

macroinvertebrate community can be attributed totally to habitat. Results from a chronic toxicity test conducted in July of 1997 (Dimond, 1997) showed the effluent from London Aggregates to be chronically toxic (1.4 TUc). Based on the chronic toxicity data, the poor macroinvertebrate community at this station can be attributed to poor water quality more so than poor habitat.

A site visit was also conducted on Amos Palmer Drain at Gramlich Road (station 2a), just upstream from its confluence with the North Branch of Amos Palmer Drain. It also appeared to have been recently channelized and had the riparian canopy removed. At the time of the survey, there was no flow at this station; therefore, a biosurvey could not be conducted. Station 2a lacked the hydrogen sulfide smell, the aquatic plant, *Chara sp*, and white precipitate associated with station 2b on the North Branch of Amos Palmer Drain. From the confluence of Amos Palmer Drain with the North Branch of Amos Palmer Drain and until it empties in to Stony Creek, Amos Palmer Drain was covered with the aquatic plant, *Chara sp*, and the white precipitate found at station 2b.

5. Station 3, Stony Creek just downstream of its confluence with Amos Palmer Drain, received a macroinvertebrate rating of "acceptable" tending toward poor. The macroinvertebrate community at this station was dominated by Isopods and surface air breathers. It also lacked taxa diversity and density in groups such as Empheroptera, Tricoptera, and Plecoptera. The habitat at this station was rated "good" tending towards fair. This location had adequate diversity in available habitats including pools, riffles, and runs. However, this station did have some problems with sedimentation; siltation and was found to be lacking in stream side cover. Much of the available habitat at station 3 was covered with a white substance, similar to what was seen at station 2b on the North Branch of Amos Palmer Drain.

Station 3 was selected to compare to station 1, in order to assess any impacts to Stony Creek from London Aggregates effluent. The macroinvertebrate communities at stations 1 and 3 both had community ratings of "acceptable" tending towards poor with raw data scores of -3 and -4, respectively. The habitat at these two stations were, however, different; fair tending towards poor for station 1 and good for station 3. With the improved habitat at station 3, one would expect the macroinvertebrate community score to be higher compared to station 1. Based on a comparison from these two station, it appears that the macroinvertebrate community at station 3 is due to poor water quality caused by the effluent from London Aggregates.

6. The macroinvertebrate community in Stony Creek at Exeter Road (station 6) also received a community rating of "acceptable" tending towards poor. The macroinvertebrate community at this station was dominated by surface air breathers and lacked taxa diversity and density in groups such as Empheroptera, Tricoptera, and Plecoptera. The habitat at station 6 was rated fair, with the bottom substrate being dominated by sand and muck. The habitat available for macroinvertebrate colonization consisted of woody debris, small patches of gravel, and some undercut banks. This degraded habitat can be attributed to agricultural and other land use activities upstream of this location. Based on the similarities of the macroinvertebrate communities and available habitat at stations 1 and 6, it was not possible to distinguish any effects on Stony Creek at station 6 from the effluent from London Aggregates.
7. The macroinvertebrate community at station 5, Ross Drain at South Stony Creek Road, received a community rating of "poor" (severely impaired). The macroinvertebrate community at this station was dominated by surface air breathers and lacked taxa diversity and density in groups such as Empheroptera, Tricoptera, and Plecoptera. The poor macroinvertebrate community can attributed to the "poor" habitat at this location. Ross Drain appeared to be a maintained drain with the bottom substrate being dominated by sand and an overall lack of available habitat for macroinvertebrate colonization. A site visit was also conducted on Ross

Drain at Doty Road (station 4). This location also appeared to be a maintained drain and lacked available habitat, with no flow during our visit.

8. Water chemistry results (Table 5) showed total dissolved solids in excess of the Water Quality Standards limits of 500 mg/L (average) and 750 mg/L (maximum) as far downstream as Exeter Road in Stony Creek. Hydrogen sulfide was estimated at a concentration of 58 ug/L at station 2b in Amos Palmer Drain, well above the Water Quality Standard of 0.088 ug/L (average) and 1.6 ug/L (maximum). Also conductivity, sulfate, and calcium were elevated at station 2b, 3, and 6 compared to the background concentrations at station 1. These water quality results indicate that the effluent from London Aggregates is impacting the water quality of Amos Palmer Drain and Stony Creek.
9. In 1995, a similar biological survey (Walterhouse, 1996) was conducted to determine the effects of the effluent from London Aggregates on Amos Palmer Drain and Stony Creek. The results of the 1995 survey showed similar results as this current survey at stations evaluated during both surveys. The macroinvertebrate communities and habitat do not appear to have changed during the time between surveys. As with the current survey, the effluent from London Aggregates had a definitive effect on water quality in Amos Palmer Drain and Stony Creek.

LITERATURE CITED

- Dimond, W. 1997. Chronic Toxicity Assessment of Londontown Inc - London Sand Outfall 001 Effluent. MDEQ, Surface Water Quality Division. MI/DEQ/SWQ-97/121.
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- MDNR. 1994. Quality Assurance for Water and Sediment Sampling. Environmental Protection Bureau, Lansing, Michigan.

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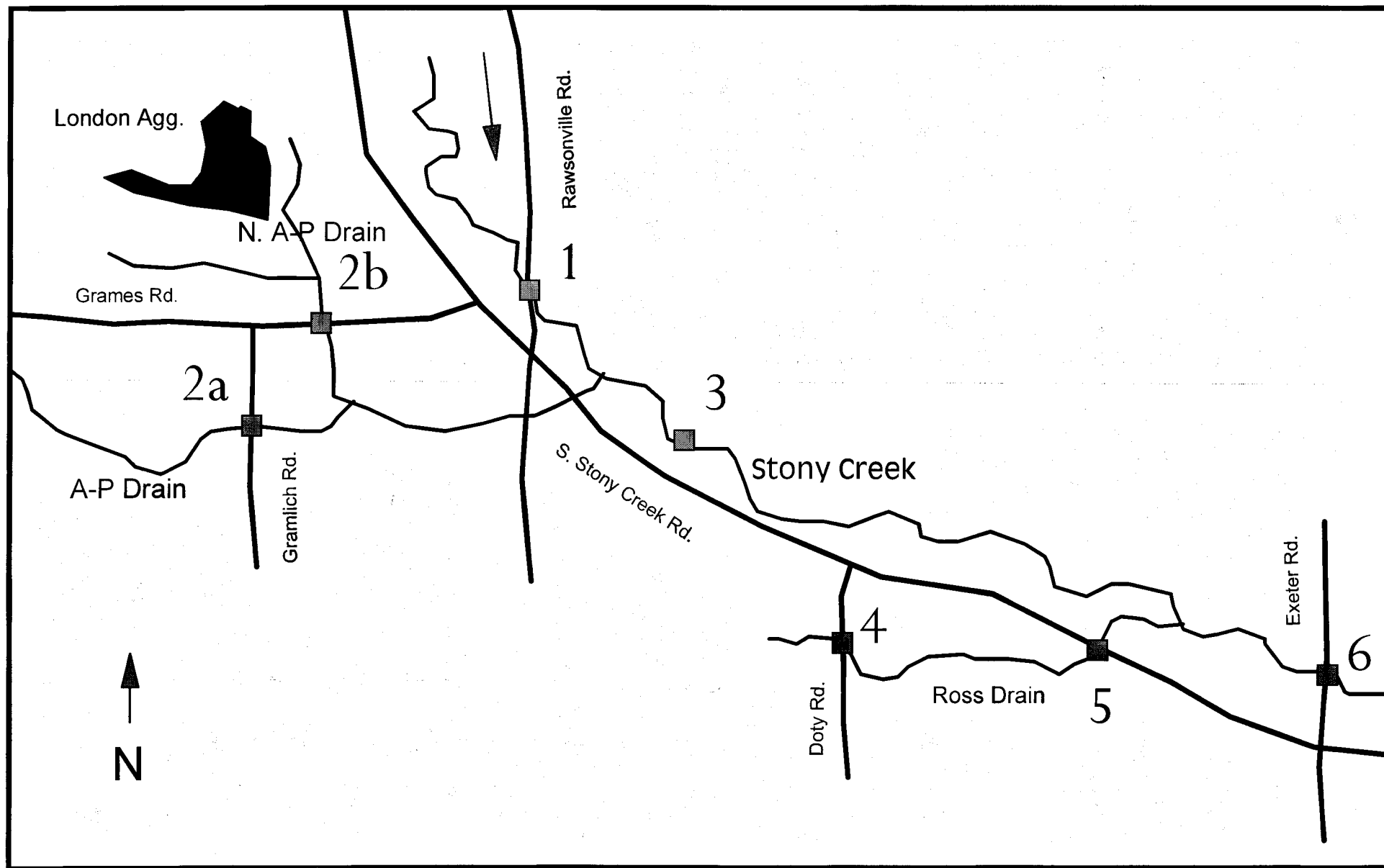


Figure 1: Sampling Stations on Stony Creek, Amos Palmer Drain, and Ross Drain Monroe County, July 14 and 16, 1997.

Table 1A. Qualitative fish sampling results for Stony Creek, Monroe County, July 16, 1997.

TAXA	STATION 6
Umbridae (mudminnows)	
<i>Umbra limi</i> (Central mudminnow)	2
Esocidae (pikes)	
<i>Esox lucius</i> (Northern Pike)	1
Cyprinidae (minnows and carps)	
<i>Cyprinus carpio</i> (Carp)	5
<i>Pimephales promelas</i> (Fathead m.)	2
<i>Pimephales notatus</i> (Bluntnose m.)	1
Catostomidae (suckers)	
<i>Hypentelium nigricans</i> (N. hog sucker)	1
Centrarchidae (sunfish)	
<i>Ambloplites rupestris</i> (Rock bass)	9
<i>Lepomis cyanellus</i> (Green sunfish)	25
<i>Lepomis gibbosus</i> (Pumpkinseed)	1
<i>Lepomis macrochirus</i> (Bluegill)	1
Percidae (perch)	
<i>Percina maculata</i> (Blackside darter)	7
TOTAL INDIVIDUALS	55
Number of hybrid sunfish	0
Number of anomalies	1
Percent anomalies	1.8
Percent salmonids	0
Reach sampled (ft)	550
Area sampled (sq ft)	19800
Density (# fish/sq ft)	0.003
Gear	ss

Table 1B. Fish metric evaluation of Stony Creek, Monroe County, July 16, 1997.

METRIC	STATION 6	
	Value	Score
TOTAL NUMBER OF TAXA	11	0
NO. OF DARTER, SCULPIN, MADTOM TAXA	1	-1
NUMBER OF SUNFISH TAXA	4	1
NUMBER OF SUCKER TAXA	1	-1
NUMBER OF INTOLERANT TAXA	2	-1
PERCENT TOLERANT	64	-1
PERCENT OMNIVOROUS TAXA	18	0
PERCENT INSECTIVOROUS TAXA	64	0
PERCENT PISCIVOROUS TAXA	18	1
% SIMPLE LITHOPHILIC SPawner TAXA	15	0
TOTAL SCORE		-2
FISH COMMUNITY RATING		ACCEPT.

Table 2A. Qualitative macroinvertebrate sampling results for Amos-Palmer Drain, Ross Drain, and Stony Creek, Monroe County, July 14 and 16, 1997.

TAXA	STATION 1	STATION 2b	STATION 3	STATION 5
ANNELIDA (segmented worms)				
Hirudinea (leeches)	1			1
ARTHROPODA				
Crustacea				
Amphipoda (scuds)	18			34
Decapoda (crayfish)	9		6	21
Isopoda (sowbugs)	28		17	
Insecta				
Ephemeroptera (mayflies)				
Baetidae			1	
Heptageniidae	3		2	
Odonata				
Anisoptera (dragonflies)				
Aeshnidae	3	2		2
Zygoptera (damselflies)				
Calopterygidae	1			
Hemiptera (true bugs)				
Corixidae	1		12	8
Gerridae	2		2	10
Mesoveliidae	3			
Trichoptera (caddisflies)				
Hydropsychidae	2		2	
Limnephilidae	2			
Philopotamidae			1	
Coleoptera (beetles)				
Dytiscidae (total)			2	2
Gyrinidae (adults)			4	
Halplidae (adults)			6	4
Elmidae	4		8	1
Halplidae (larvae)			1	
Diptera (flies)				
Chironomidae		98	14	7
Simuliidae			2	
MOLLUSCA				
Gastropoda (snails)				
Ancylidae (limpets)			2	
Physidae			3	
Planorbidae				1
TOTAL INDIVIDUALS	77	100	85	91

Table 2B. Macroinvertebrate metric evaluation of

METRIC	STATION 1		STATION 2b		STATION 3		STATION 5	
	Value	Score	Value	Score	Value	Score	Value	Score
TOTAL NUMBER OF TAXA	13	0	2	-1	16	0	11	0
NUMBER OF MAYFLY TAXA	1	-1	0	-1	2	0	0	-1
NUMBER OF CADDISFLY TAXA	2	0	0	-1	2	0	0	-1
NUMBER OF STONEFLY TAXA	0	-1	0	-1	0	-1	0	-1
PERCENT MAYFLY COMP.	3.9	0	0.0	-1	3.5	0	0.0	-1
PERCENT CADDISFLY COMP.	5.2	0	0.0	-1	3.5	-1	0.0	-1
PERCENT CONTR. DOM. TAXON	36	0	98.00	-1	20	0	37	0
PERCENT ISOPOD, SNAIL, LEECH	38	-1	0.0	1	26	-1	2.2	1
PERCENT SURF. AIR BREATHERS	7.8	0	0.0	1	31	-1	26	-1
TOTAL SCORE		-3		-5		-4		-5
MACROINV. COMMUNITY RATING		ACCEPT.		POOR		ACCEPT.		POOR

Table 2A. Qualitative macroinvertebrate sampling results for Stony Creek, Monroe County, July 16, 1997.

STATION 6	
TAXA	
ARTHROPODA	
Crustacea	
Amphipoda (scuds)	13
Decapoda (crayfish)	8
Insecta	
Ephemeroptera (mayflies)	
Heptageniidae	2
Odonata	
Anisoptera (dragonflies)	
Aeshnidae	1
Zygoptera (damselflies)	
Coenagrionidae	1
Hemiptera (true bugs)	
Belostomatidae	1
Gerridae	8
Mesoveliidae	17
Trichoptera (caddisflies)	
Limnephilidae	1
Polycentropodidae	1
Coleoptera (beetles)	
Gyrinidae (adults)	2
Elmidae	5
TOTAL INDIVIDUALS	60

Table 2B. Macroinvertebrate metric evaluation of Stony Creek, Monroe County, July 16, 1997.

STATION 6		
METRIC	Value	Score
TOTAL NUMBER OF TAXA	12	0
NUMBER OF MAYFLY TAXA	1	-1
NUMBER OF CADDISFLY TAXA	2	0
NUMBER OF STONEFLY TAXA	0	-1
PERCENT MAYFLY COMP.	3.3	0
PERCENT CADDISFLY COMP.	3.3	-1
PERCENT CONTR. DOM. TAXON	28	0
PERCENT ISOPOD, SNAIL, LEECH	0.0	1
PERCENT SURF. AIR BREATHERS	47	-1
TOTAL SCORE		-3
MACROINV. COMMUNITY RATING	ACCEPT.	

Table 3. Habitat evaluation for Amos-Palmer Drain and Stony Creek, Monroe County, July 14 and 16, 1997.

HABITAT METRIC (MAX)	STATION 1	STATION 2a	STATION 2b	STATION 3
Bottom Substrate				
Avail. Cover (20):	4		4	14
Embeddedness (20):	1		2	10
Velocity:Depth (20):	11		4	17
Flow Stability (15):	4		4	4
Bottom Depos. (15):	0		2	4
Pools-Riffles-Runs-Bends (15):	5		2	11
Bank Stability (10):	3		6	6
Bank Vegetative Stability (10):	4		6	6
Stream Cover (10):	6		5	3
TOTAL SCORE (135):	38		35	75
HABITAT RATING:	FAIR (MODERATELY IMPAIRED)		FAIR (MODERATELY IMPAIRED)	GOOD (SLIGHTLY IMPAIRED)
Date:	7/14/97	7/14/97	7/14/97	7/14/97
Weather:	Sunny	Sunny	Sunny	Sunny
Air Temperature:	84 Deg. F.	85 Deg. F.	88 Deg. F.	90 Deg. F.
Water Temperature:	70 Deg. F.	Deg. F.	80 Deg. F.	74 Deg. F.
Ave. Stream Width:	16 Feet	6 Feet	12 Feet	21 Feet
Ave. Stream Depth:	1.5 Feet	0 Feet	1.5 Feet	1 Feet
Surface Velocity:	0.5 Ft./Sec.	0 Ft./Sec.	1 Ft./Sec.	1 Ft./Sec.
Estimated Flow:	12 CFS	0 CFS	18 CFS	21 CFS
Stream Modifications:	dredged	dredged	dredged, canopy rem.	dredged, canopy rem.
Nuisance Plants (Y/N):	Y	N	Y	Y
Report Number:	97/087	97/087	97/087	97/087
STORET No.:	580078			
Stream Name:	Stoney Creek	Amos-Palmer Drain	N Br Amos Palmer Drain	Stoney Creek
Road Crossing/Location:	Rawsonville Rd	Gramlich Rd	Grames Road	S. Stoney Ck Rd d/s of AP Dr
County Code:	58	58	58	58
TRS:	T05S R07E S12	T05S R07E S14	T05S R07E S12	T05S R08E S17
Latitude (dd):	42.06472	42.0525	42.0575	42.05167
Longitude (dd):	-83.5389	-83.5575	-83.54972	-83.52583
Ecoregion:	SMNITP	SMNITP	SMNITP	SMNITP
Stream Type:	Warmwater	Warmwater	Warmwater	Warmwater
USGS Basin Code:	4090005	4090005	4090005	4090005
COMMENTS:		dry	lots of <i>Chara</i>	

Table 3. Habitat evaluation for Ross Drain and Stony Creek, Monroe County, July 14 and 16, 1997.

HABITAT METRIC (MAX)	STATION 4	STATION 5	STATION 6
Bottom Substrate			
Avail. Cover (20):		2	2
Embeddedness (20):		0	2
Velocity:Depth (20):		2	11
Flow Stability (15):		1	8
Bottom Depos. (15):		1	2
Pools-Riffles- Runs-Bends (15):		1	4
Bank Stability (10):		6	6
Bank Vegetative Stability (10):		6	8
Stream Cover (10):		5	8
TOTAL SCORE (135):		24	51

HABITAT RATING:

POOR
(SEVERELY
IMPAIRED)

FAIR
(MODERATELY
IMPAIRED)

Date:	7/14/97	7/14/97	7/16/97
Weather:	Sunny	Sunny	Sunny
Air Temperature:	Deg. F.	88 Deg. F.	84 Deg. F.
Water Temperature:	Deg. F.	76 Deg. F.	74 Deg. F.
Ave. Stream Width:	3 Feet	4 Feet	36 Feet
Ave. Stream Depth:	0 Feet	0.33 Feet	3 Feet
Surface Velocity:	0 Ft./Sec.	0.1 Ft./Sec.	0.33 Ft./Sec.
Estimated Flow:	0 CFS	0.132 CFS	36 CFS
Stream Modifications:	dredged	dredged, canopy rem.	
Nuisance Plants (Y/N):	N	N	N
Report Number:	97/087	97/087	97/087

STORET No.:

Stream Name:	Ross Drain	Ross Drain	Stoney Creek
Road Crossing/Location:	Doty Road	S. Stony Creek Rd	Exeter Road
County Code:	58	58	58
TRS:	T05S R08E S29	T05S R08E S25	T05S R08E S25

Latitude (dd):	42.02278	42.025	42.02361
Longitude (dd):	-83.4989	-83.434167	-83.4194
Ecoregion:	SMNITP	SMNITP	SMNITP
Stream Type:	Warmwater	Warmwater	Warmwater
USGS Basin Code:	4090005	4090005	4090005

COMMENTS: dry

Table 4. Summary of biological community and habitat ratings for Stony Creek, Amos Palmer Drain, and Ross Drain, July 14 and 16, 1997.

Station	Fish Community Category	Fish Metric Score	Macroinvertebrate Community Category	Macroinvertebrate Metric Score	Overall Biological Quality	Habitat Category
1	NR		Acceptable	-3	Acceptable	Fair
2b	NR		Poor	-5	Poor	Fair
3	NR		Acceptable	-4	Acceptable	Good
5	NR		Poor	-5	Poor	Poor
6	Acceptable	-2	Acceptable	-3	Acceptable	Fair

Table 5. Water chemistry results for Stony Creek and Amos Palmer Drain, Monroe County, July 14 and 16, 1997.

Parameter	units	Station 1 Stony Creek	Station 2b Amos Palmer	Station 3 Stony Creek	Station 6 Stony Creek
Total Dissolved Solids	mg/L	580	1960	1280	1350
Total Suspended Solids	mg/L	22	K 4	13	30
Hardness	mg/L	345	1105	730	
pH	pH	8.17	7.3	7.65	8.00
Conductivity	umho/cm	792	2035	1492	1529
Nitrite	mg N/L	0.012	T .001	0.010	0.006
Nitrate + Nitrite	mg N/L	0.77	T .004	0.32	0.31
Ammonia	mg N/L	0.032	0.033	0.011	0.032
Kjeldahi Nitrogen	mg N/L	0.51	0.35	0.011	0.43
Ortho Phosphorus	mg P/L	0.018	0.003	0.004	0.013
Total Phosphorus	mg P/L	0.059	0.009	0.035	0.048
Total Sulfide	mg/L		0.21		
Total Sulfate	mg/L	49	931	501	539
Total Silver	ug/L	K 0.5	K 0.5	K 0.5	K 0.5
Total Arsenic	ug/L	2.3	1.1	2.2	2.0
Total Calcium	mg/L	96.3	298	197	207
Total Cadmium	ug/L	K 0.2	K 0.2	K 0.2	K 0.2
Total Copper	ug/L	1.2	K 1.0	K 1.0	1.1
Total Mercury	ug/L	K 0.2	K 0.2	K 0.2	K 0.2
Total Magnesium	mg/L	K 2.0	K 2.0	58	57
Total Lead	ug/L	1.1	K 1.0	K 1.0	K 1.0
Total Selenium	ug/L	49	931	K 1.0	K 1.0
Total Zinc	ug/L	4.1	K 4.0	K 4.0	6.0
Total Organic Carbon	mg/L	0.51	0.35	3.7	3.7