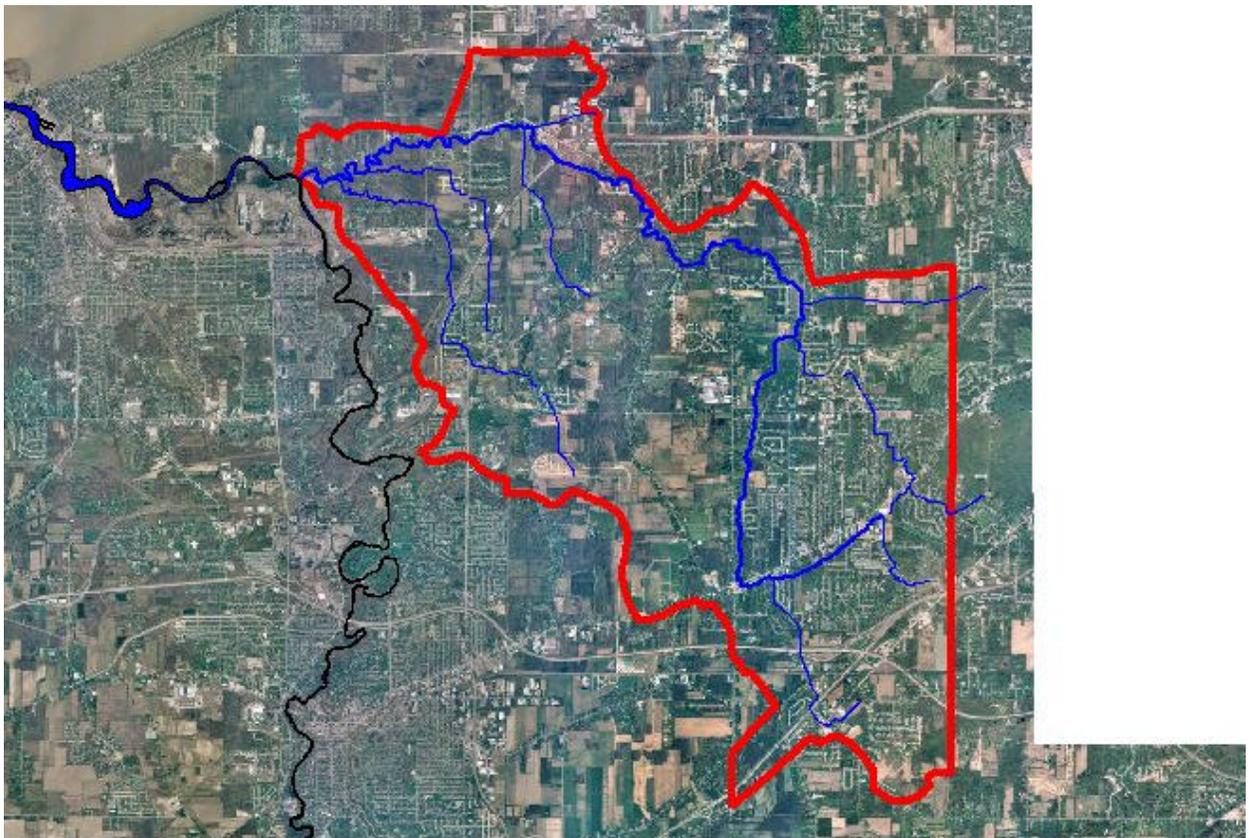


U.S. Army Corps of Engineers - Buffalo District

**Black River Area of Concern/Remedial Action
Plan (AOC/RAP)
French Creek Watershed Survey
Lorain County, Ohio**



July 2004

TABLE OF CONTENTS

	<u>Page</u>
LIST OF ACRONYMS	iii
1.0 INTRODUCTION	1
1.1 Study Authority	1
1.2 Background	1
1.3 Study Participants and Coordination	2
2.0 STUDY RESULTS	3
2.1 Methods	3
2.2 Study Findings	6
2.2.1 QHEI Survey Results	6
2.2.1.1 River Mile 0.1 – 6.9	7
2.2.1.2 River Mile 7.65 – 14.1	9
2.2.2 Water Quality Data and Trends	11
2.2.3 Priority Areas	13
2.2.3.1 French Creek Priority Areas	13
2.2.3.2 Tributary Priority Areas	14
3.0 RECOMMENDATIONS	17
3.1 French Creek – Main Stem	17
3.1.1 Mouth of Creek to East River Road (RMs 0.0 - 0.54)	17
3.1.2 East River Road to Abbe Road (RMs 0.54 - 3.2)	17
3.1.3 Abbe Road to I-90 (RMs 3.2 - 4.5)	17
3.1.4 I-90 to Detroit Road (RMs 4.5 - 6.1)	17
3.1.5 Detroit Road to Stony Ridge Road (RMs 6.1 - 6.9)	17
3.1.6 Stony Ridge Road to Center Road (RMs 6.9 - 7.65)	18
3.1.7 Center Road to Riegelsberger Road (RMs 7.65 - 8.9)	18
3.1.8 Riegelsberger Road to Mills Road (RMs 8.9 - 10.4)	18
3.1.9 Mills Road to Center Ridge Road (RMs 10.4 - 12.4)	18
3.1.10 Center Ridge Road to Lear-Nagle Road (RMs 12.4 - 14.1)	18
3.1.11 Lear-Nagle Road to Cuyahoga County line (RMs 14.1 - end)	19
3.2 Tributaries	19
3.2.1 Quarry Ditch	19
3.2.2 Jungbluth Ditch	19
3.2.3 Walker Ditch	19
3.2.4 Kline Ditch	19
3.2.5 Avins Ditch	19
3.2.6 Schwartz Ditch	19
3.2.7 Mills Creek	20
3.2.8 French Ditch	20
3.2.9 Nagle Ditch	20
3.3 Watershed-wide Recommendations	20
4.0 CONCLUSIONS	21
5.0 REFERENCES	22

**SUBJECT: U.S. Army Corps of Engineers, Buffalo District - Survey of French Creek
Final Report - July 2004**

List of Figures

	<u>Page</u>
Figure 1: French Creek Watershed	4
Figure 2: Schematic of the French Creek Watershed with QHEI Scores	7
Figure 3: French Creek – River Miles 0 – 7	8
Figure 4: French Creek – River Miles 7 – 14	10

List of Tables

	<u>Page</u>
Table 1: Survey Sampling Locations	4
Table 2: Water Quality Sampling Data	12

List of Photographs

	<u>Page</u>
Photograph 1: French Creek at RM 10.4 (Mills Road)	13
Photograph 2: Rust-colored discharge noted near RM 12.4 (Center Ridge Road)	14
Photograph 3: Construction impacts along Schwartz Ditch	15
Photograph 4: Detention basin/ponding within Mills Creek	15
Photograph 5: Black contaminant pool located along Kline Ditch	16

Appendices

Appendix A: QHEI Matrix Table
Appendix B: Field notes, Photographs and Data Sheets

LIST OF ACRONYMS

AOC	Area of Concern
BMP	Best Management Practice
BRCC	Black River RAP Coordinating Committee
DO	Dissolved Oxygen
HHEI	Primary Headwaters Habitat Evaluation Index
HSDS	Home Sewage Disposal System
LRW	Limited Resource Water
MWH	Modified Warmwater Habitat
N/SPDES	National/State Pollutant Discharge Elimination System
OEPA	Ohio Environmental Protection Agency
ORAM	Ohio Rapid Assessment Method
QHEI	Qualitative Habitat Evaluation Index
RAP	Remedial Action Plan
RM	River Mile
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USDOI	United States Department of Interior
USEPA	United State Environmental Protection Agency
WWH	Warmwater Habitat

**SUBJECT: U.S. Army Corps of Engineers, Buffalo District - Survey of French Creek
Final Report - July 2004**

1.0 INTRODUCTION

1.1 Study Authority

The following report and associated work conducted by the U. S. Army Corps of Engineers – Buffalo District (USACE) has been authorized under the Water Resources Development Act of 1990, as amended. This Act authorizes the USACE to support the development and implementation of Remedial Action Plans (RAP) at designated Areas of Concern (AOC) on the Great Lakes within the United States. Specifically, Section 401 of the Water Resources Development Act of 1990 (Public Law 101-640) authorizes the USACE to provide technical, planning, and engineering assistance to States and local governments in the development and implementation of RAPs for AOCs in the Great Lakes identified under the Great Lakes Water Quality Agreement of 1978.

1.2 Background

In 1978, the Great Lakes Water Quality Agreement between the U.S. and Canada defined persistently polluted trouble spots in the Great Lakes as AOCs. It also recommended the development of AOC-specific RAPs, which comprise a comprehensive ecosystem approach to restoring and protecting an AOC in order to define corrective measures to restore all beneficial uses to each AOC. In 1990, the entire Black River watershed was designated as an AOC. The Black River AOC is the only AOC in Ohio that has designated the entire watershed.

The Black River watershed, located in north-central Ohio, covers 467 square kilometers (180 square miles). The watershed is located primarily in Lorain County, but includes drainage from Medina, Ashland, Huron, and Cuyahoga counties and includes the municipalities of Lorain and Elyria. The east and west branches of the Black River join within Cascade Park in the city of Elyria to form the main channel. The main stem of the Black River then flows 16 miles north and discharges into Lake Erie at the port of the city of Lorain. The only major tributary to this 16-mile reach of the river is French Creek, which flows west and enters the Black River about five miles from its mouth.

Overall, 51% of the land within the AOC is used for agriculture, while only 1% is truly industrial. Between these two extremes are rural (38%), urban residential (7%) and commercial uses (3%). The problems associated with land use within the AOC vary widely from heavily urban areas to rural agricultural spaces. Industrial and municipal wastewater discharges have improved from the past, but nevertheless continue to impact water quality. Non-point source pollution and specific land uses exhibit increasingly pronounced impacts to the Black River water quality. Of specific concern is the problem of low dissolved oxygen (DO) concentrations in the lower reaches of the Black River. This problem has been experienced mainly in the last five miles of the river, a stretch that is dredged for ship traffic. It is suspected that interrelationships of many environmental impacts are causing the low DO levels. The impacts considered here include:

1. The combined pollutant loadings of three municipal wastewater treatment facilities and one steel mill;

**SUBJECT: U.S. Army Corps of Engineers, Buffalo District - Survey of French Creek
Final Report - July 2004**

2. The non-point source loadings of sediment, nutrients and other chemicals from the urban, the developing suburban, and the upstream agricultural areas;
3. Pollutant loadings of nutrients and bacteria from combined sewer overflows;
4. Pollutant loadings of nutrients and bacteria from failed and failing home sewage disposal systems (HSDS).

In an attempt to better understand and address the problem of low DO concentration in the lower reaches of the river, the Black River RAP has requested assistance from the USACE, Buffalo District, to conduct an inventory study of the French Creek sub-watershed.

French Creek is the largest tributary to the Black River main stem. The French Creek sub-watershed is beginning to suffer from the development pressures of urban sprawl from the Cleveland metropolitan area to the East. In addition, French Creek has been suffering from a toxicity source that has not been identified. The toxicity has been evident through both sporadic fish kills and poor fish and macroinvertebrate community biotic indices.

The RAP has requested this watershed inventory study to determine the best means of preservation and/or restoration for this waterway, and to identify the source of toxicity described above, so that remediation efforts can be proffered.

This inventory study may also help determine the contribution of the DO impact items numbered 1 through 4 above. Remediation efforts may then be identified that would remove the toxic effects and alleviate some of the DO impacts associated with the French Creek sub-watershed.

1.3 Study Participants and Coordination

The Lorain County General Health District is the non-Federal sponsor for the project. The primary customers are the Lorain County General Health District, the Black River Remedial Action Plan Coordinating Committee (BRCC), and the Ohio Environmental Protection Agency (OEPA). The following individuals/organizations have coordinated the scope of work for the sub-watershed investigation and participated in the study:

Local, State, and Federal Coordinators:

Ken Pearce	Chair, Lorain County General Health District; Chair, BRCC
Ted Conlin	Black River RAP Coordinator, OEPA
Anthony Friona	Project Manager, USACE – Buffalo District

Principal Investigators:

Jay Miller	Biologist, USACE – Buffalo District
Scott Livingstone	Biologist, USACE – Buffalo District

**SUBJECT: U.S. Army Corps of Engineers, Buffalo District - Survey of French Creek
Final Report - July 2004**

2.0 STUDY RESULTS

2.1 Methods

Beginning in the summer of 2002, USACE – Buffalo District personnel initiated a comprehensive survey of the French Creek watershed. The purpose of the survey was to perform evaluations on all of the streams and tributaries within the French Creek watershed utilizing:

- Qualitative Habitat Evaluation Index (QHEI) – used for larger streams,
- Primary Headwater Habitat Evaluation Index (HHEI) – used for smaller streams (with drainage areas of less than 1 square-mile), and

In addition, any adjacent wetland areas were evaluated using the Ohio Rapid Assessment Method (ORAM).

The objective of conducting the QHEI, HHEI and/or ORAM evaluations was to facilitate a comprehensive ‘walk-over’ of the watershed to ascertain baseline conditions of the riverine habitat. By utilizing numeric habitat assessments, such as those noted above, any changes to the habitat ‘health’ of the watershed can be monitored over time.

The initial intent of this evaluation was to identify areas within the watershed where conditions have low impairment, and more importantly, identify areas where conditions exhibit moderate or high impairment. The French Creek survey also provides for the development of recommendations to improve the overall condition of these areas and the watershed as a whole.

The stream segments investigated during this survey included portions of the following (reference Figure 1):

- French Creek
- Unnamed Tributary to French Creek at River Mile 0.38 (Quarry Ditch¹)
- Jungbluth Ditch (Sugar Creek²)
- Walker Ditch (Fish Creek²)
- Kline Ditch
- Avins Ditch
- Unnamed Tributary to French Creek at River Mile 8.9 (Schwartz Ditch¹)
- Mills Creek
- Unnamed Tributary to French Creek at River Mile 12.8 (French Ditch¹)
- Unnamed Tributary to French Creek at River Mile 14.3 (Nagle Ditch¹)

¹ Named given by USACE field personnel – not ‘official’ name

² According to the French Creek Reservation Trail Guide

**SUBJECT: U.S. Army Corps of Engineers, Buffalo District - Survey of French Creek
Final Report - July 2004**

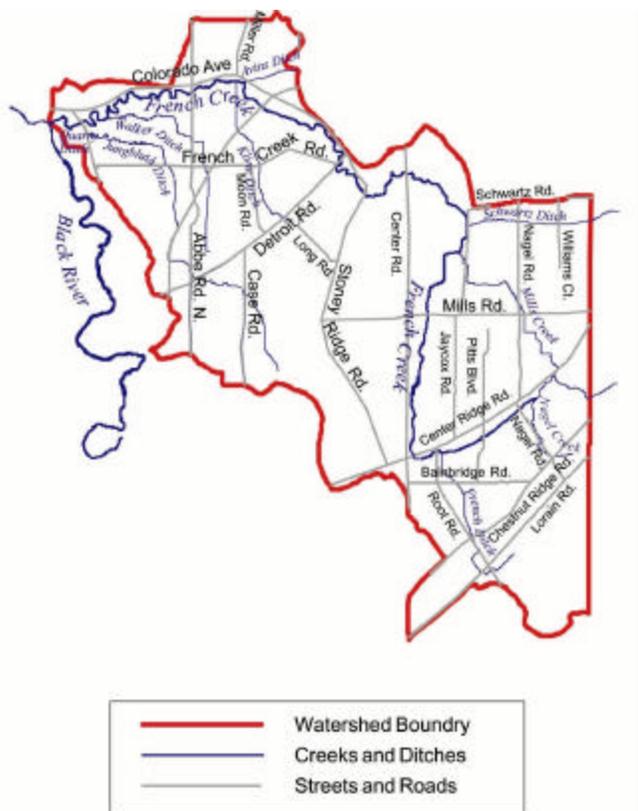


Figure 1: French Creek Watershed.

Aerial photographs, existing GIS databases, and traditional paper maps were used to determine potential sampling points for the investigation. Points were selected mainly at road crossings, access trails, or other readily accessible features. A total of 70 locations were identified as potential sampling points, however, actual evaluations were conducted at only 51 of these sites (Table 1). Although formal QHEI/HHEI evaluations were not conducted at the remaining 19 sites, mainly due to lack of access, photographs and general site notes were taken at all 70 sites.

TABLE 1: Survey Sampling Locations

#	River Code	River Mile	Location
			<u>FRENCH CREEK SITES</u>
1	FC	0.1	Near Mouth (at Black River)
2	FC	0.38	At Mouth of "Quarry" Ditch
3	FC	0.54	At East River Road (mouth of Jungbluth Ditch)
4	FC	1.4	At FCNP Bridge (mouth of Walker Ditch)
5	FC	3.2	At Abbe Road
6	FC	4.0	At Mouth of Avins Ditch
7	FC	4.5	At I-90 Crossing
8	FC	5.5	At Bridge Point Trail Road
9	FC	6.1	At Detroit Road
10	FC	6.9	At Stony Ridge Road (RTE 611)
11	FC	7.65	At Center Road

**SUBJECT: U.S. Army Corps of Engineers, Buffalo District - Survey of French Creek
Final Report - July 2004**

#	River Code	River Mile	Location
	<i>FC</i>	<i>8.4</i>	<i>At Keller Street</i>
12	FC	8.9	At Jaycox Road (Mouth of "Schwartz" Ditch)
13	FC	10.4	At Mills Road
14	FC	10.7	At Chesterfield Avenue
	<i>FC</i>	<i>11.8</i>	<i>At Mildred Street</i>
15	FC	12.4	At Center Ridge Road
16	FC	12.7	At Root Road
	<i>FC</i>	<i>13.4</i>	<i>At Pitts Blvd</i>
	<i>FC</i>	<i>13.7</i>	<i>At Debbie Drive</i>
17	FC	14.1	Lear-Nagle Road
	<i>FC</i>	<i>14.3</i>	<i>At Brownstone Lane</i>
			<u>"QUARRY DITCH" SITES</u>
18	QD	0.0	At Mouth of Ditch (French Creek RM 0.38)
			<u>JUNGLUTH DITCH SITES</u>
19	JD	0.0	Mouth of Ditch (French Creek RM 0.54)
20	JD	1.0	Upstream of Park Road Bridge
21	JD	1.6	At French Creek Road
	<i>JD</i>		<i>At Wheaton Drive (College Heights Estates)</i>
22	JD	3.15	At Abbe Road
23	JD	4.13	At Case Road
			<u>WALKER DITCH SITES</u>
24	WD	0.0	Mouth of Ditch (French Creek RM 1.23)
25	WD	0.6	At end of FCNP Hiking Trail
26	WD	1.7	At Abbe Road
27	WD	2.2	At French Creek Road
	<i>WD</i>	<i>3.1</i>	<i>At Deercreek Court</i>
28	WD	3.3	At Reserve Way
29	WD	3.45	End - at Reserve Way by Pond
			<u>KLINE DITCH SITES</u>
30	KD	0.0	Mouth of Ditch (French Creek RM 3.9)
31	KD	0.85	At Greenfield Drive
32	KD	1.22	At French Creek Road
33	KD	2.15	At Detroit Road
			<u>AVINS DITCH SITES</u>
34	AD	0.0	Mouth of Ditch (French Creek RM 4.0)
35	AD	0.47	At Chester Industrial Parkway
			<u>"SCHWARTZ DITCH" SITES</u>
36	SD	0.0	Mouth of Ditch at Jaycox Road (RM FC-8.9)
37	SD	0.3	At Schwartz Park
38	SD	0.52	At Sandy Lane
39	SD	0.71	At Nagle Road
	<i>SD</i>	<i>1.25</i>	<i>At Williams Street</i>
	<i>SD</i>	<i>2.12</i>	<i>At Bradley/Hillard Roads (Cuyahoga County)</i>
			<u>MILLS CREEK SITES</u>
	<i>MC</i>	<i>0.0</i>	<i>Mouth of Creek (French Creek RM 9.3)</i>
40	MC	0.22	At Jaycox Road
	<i>MC</i>	<i>0.75</i>	<i>At St. Maron Blvd.</i>
41	MC	1.32	At Nagle Road
42	MC	1.55	At Mills Road
43	MC	2.5	At Mills Creek Lane (in sports park)

**SUBJECT: U.S. Army Corps of Engineers, Buffalo District - Survey of French Creek
Final Report - July 2004**

#	River Code	River Mile	Location
44	MC	2.7	At Center Ridge Road
45	MC	3.21	At Woodland Drive
46	MC	3.45	At Fieldstone Circle
	<i>MC</i>	<i>3.79</i>	<i>At Barton Road</i>
	<i>MC</i>	<i>3.95</i>	<i>At Bradley Road</i>
			"FRENCH DITCH" SITES
47	FD	0.0	Mouth of Ditch (French Creek RM 12.85)
48	FD	0.5	At Bainbridge Road
49	FD	1.3	At Chestnut Ridge Road
50	FD	1.93	At Lorain Road
	<i>FD</i>	<i>2.1</i>	<i>At Root Road (2)</i>
			"NAGLE DITCH" SITES
	<i>ND</i>	<i>0.0</i>	<i>Mouth of Ditch (French Creek RM 14.3)</i>
51	ND	0.37	At Boulder Drive
	<i>ND</i>	<i>0.65</i>	<i>At Lear-Nagle Road</i>
	<i>ND</i>	<i>0.92</i>	<i>At Lear-Nagle Road</i>
	<i>ND</i>	<i>1.0</i>	<i>At Chestnut Ridge Road</i>
	<i>ND</i>	<i>1.54</i>	<i>At Lorain Road</i>

NOTES: River Miles (RM's) for most of the ditches as well as the four most upstream French Creek sites have been estimated using ArcView in conjunction with the 1999 aerial maps. These estimated RM's are not intended to replace the official RM's contained on OEPA's official RM maps, but are instead being used as a reference point for the purposes of these investigations (as actual RM's were unavailable). Likewise, due to discrepancies between several different maps and the lack of assigned names on some creeks, waterway names in quotation marks were assigned by USACE for reference purposes only.

No QHEI/HHEI conducted at sites where names above are depicted in red italics.

2.2 Study Findings

Appendix A contains a QHEI matrix table which lists all of the sites investigated along with their respective river mile location, QHEI score, and site gradient. The table additionally lists the QHEI matrix attributes that are indicative of a warm water habitat (WWH) or modified warm water habitat (MWH), both high and moderate influence, and depicts which of these attributes were identified at each site. All site investigation field notes, photographs, and data sheets are attached in Appendix B.

2.2.1 QHEI Survey Results

In general, the QHEI survey conducted on French Creek and its tributaries showed a downward trend in QHEI scores, starting from the mouth and progressing upstream through the headwaters of the creek. The sites within the first section (RM's 0.1 – 6.9) of the creek received on average favorable scores which attained the creek's designation as WWH. The second section of the creek (RM's 7.65 – 14.1) received scores that would put the creek in non-attainment of its WWH designation. Figure 2 depicts a schematic of the French Creek watershed, and indicates the QHEI scores attained at each of the French Creek sites. Sections 2.2.1.1 and 2.2.1.2 include a brief description of the findings and observations derived from the survey in the downstream and upstream portions of French Creek, respectively.

**SUBJECT: U.S. Army Corps of Engineers, Buffalo District - Survey of French Creek
Final Report - July 2004**

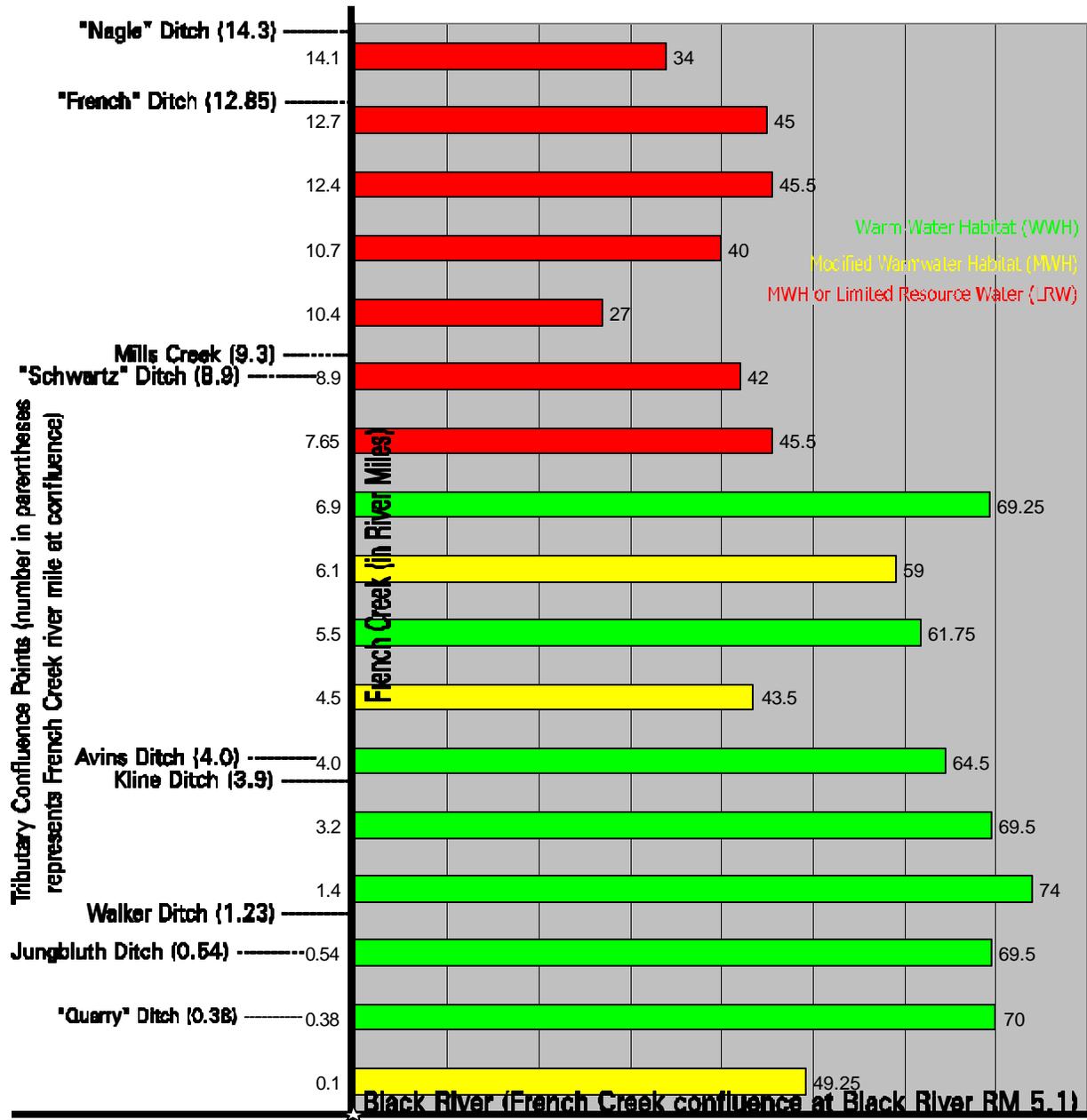


Figure 2: Schematic of the French Creek Watershed with QHEI Scores.

2.2.1.1 River Mile 0.1 through 6.9: With the primary exceptions of the site at the mouth of the creek (RM 0.1) and the site located near the I-90 crossing (RM 4.5), the lower 7 river miles of French Creek received QHEI scores that would be consistent with a designation as WWH, with an average score of 63.3. Figure 3 is an aerial view of the lower 7 miles of French Creek. The site at the mouth of the creek received a low score due to several factors. First, the substrate at the site, while dominated by gravel, was highly embedded with silt. Amplifying this effect is that this portion of the creek is relatively straight, over 1 meter deep, extremely slow moving (back flow effects were also noted from the Black River) and

**SUBJECT: U.S. Army Corps of Engineers, Buffalo District - Survey of French Creek
Final Report - July 2004**

Adjacent riparian habitat was also of good quality. Plants such as black willow (*Salix nigra*), red maple (*Acer rubrum*), sugar maple (*Acer saccharum*), boxelder (*Acer negundo*), pin oak (*Quercus palustris*), red oak (*Quercus rubra*), eastern cottonwood (*Populus deltoides*), American sycamore (*Platanus occidentalis*), American beech (*Fagus grandifolia*), black cherry (*Prunus serotina*), green ash (*Fraxinus pennsylvanica*), red cardinal flower (*Lobelia cardinalis*), duckweed (*Spirodela polyrhiza*), rice cutgrass (*Leersia oryzoides*), arrowhead (*Sagittaria spp.*), cattails (*Typha spp.*), softstem bulrush (*Scirpus validus*), and other sedges and rushes were noted both within the creek and along the banks. Two wetlands were also identified within this portion of the watershed. One is connected to French Creek by “Quarry” Ditch at RM 0.38 and is an approximately 23-acre wetland created by past quarry mining activities. The other is located near the northwest corner of the intersection of French Creek and East River Road. This wetland is a small (around 2.5 acres) forested floodplain wetland, which is seasonally flooded by French Creek.

Although this portion of the main stem of French Creek is of relatively good quality, some unfavorable issues were noted in the five tributaries to French Creek in this section of the watershed. These tributaries include “Quarry” Ditch (at RM 0.38), Jungbluth Ditch (at RM 0.54), Walker Ditch (at RM 1.23), Kline Ditch (at RM 3.9), and Avins Ditch (at RM 4.0). A total of 20 sites were investigated on these tributaries, and 15 of the 20 sites received QHEI scores that were well below the level required for the attainment of WWH designation, with an average score of 47. The only sites that received QHEI scores above the level required for WWH designation attainment were the two most downstream sites taken at both Jungbluth and Walker Ditch where they flow through the French Creek Reservation, and the most downstream site taken at Kline Ditch. The primary problems identified at the remaining sites were associated with extensive residential development. Most sites had little, if any, riparian buffer areas and were maintained (mown grass) up to the streambanks. In many cases, the streams had been re-routed or culverted to accommodate development, or were ‘ponded’ into retention basins. Several instances were noted where construction was ongoing and little, if any, protection was offered to the streams from the impacts of the construction site. These issues are causing significant run-off and sedimentation directly into the streams, are impacting and/or eliminating in-stream habitat and are also having an adverse effect on water quality.

2.2.1.2 River Mile 7.65 through 14.3: The sites on the main stem of French Creek investigated in this portion of the watershed all received scores that indicates non-attainment of its WWH designation. The average QHEI score of the sites in this portion of French Creek was 39.9. These scores indicate that this portion of the creek has scores representing MWH, or in some cases limited resource waters (LRW). This portion of the watershed is developed to a greater extent than the downstream portions, and is dominated by residential and commercial uses. Figure 4 is an aerial view of RMs 7 - 14 of French Creek.

**SUBJECT: U.S. Army Corps of Engineers, Buffalo District - Survey of French Creek
Final Report - July 2004**

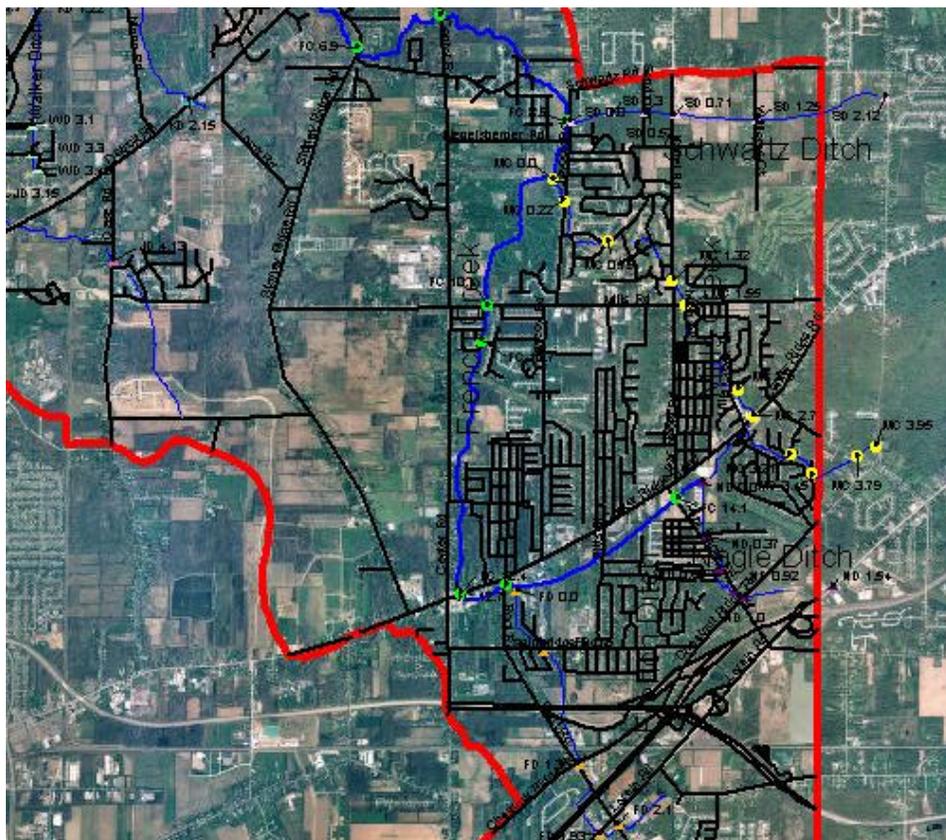


Figure 4: French Creek River Miles 7– 14.

Due to the residential and commercial nature of this portion of the watershed, the primary water quality and river habitat problem noted was the lack of riparian buffers. In most cases, riparian buffers measured less than 5 meters in width, and in many cases no buffer was present. The lack of adequate buffers leads to very flashy storm flows, increased riverbank erosion and increased run-off and sedimentation, which were noted in substrate evaluations. While some moderate amounts of cobble, gravel, and bedrock were present at many of the sites, a predominance of silt and sand substrates was evident. Also attributable to the lack of riparian buffers was a general lack of high quality in-stream cover in this portion of the creek. Most sites investigated within the creek also were channelized, re-routed, or otherwise altered to accommodate residential and commercial development, which has impacted the creek's sinuosity and development of riffle/pool complexes. Riffles and pools tended to be much shallower in this portion of the watershed, also.

Similarly to the mainstem, the sites investigated in the tributaries to French Creek in this portion of the watershed also received QHEI scores that would put them in non-attainment of WWH designation. Four main tributaries flow into French Creek in this portion of the watershed, as follows: "Schwartz" Ditch (at RM 8.9), Mills Creek (at RM 9.3), "French" Ditch (at RM 12.85), and "Nagle" Ditch (at RM 14.3). The average QHEI score of the sites

**SUBJECT: U.S. Army Corps of Engineers, Buffalo District - Survey of French Creek
Final Report - July 2004**

investigated on these tributaries was 42. The main factors contributing to the low scores include extensive development, stream modifications/relocation, lack of riparian buffers, silt embedded substrates, run-off/sedimentation, and construction impacts.

2.2.2 Water Quality Data and Trends

In late May of 2003, water quality data was collected at most sites where QHEI evaluations were conducted. This data was collected using a Hydrolab field monitor, Hach field tests, and a turbidity meter. Parameters tested during this effort included the following:

- TEM - Water Temperature (F°)
- DO - Dissolved Oxygen (mg/L)
- SPC - Conductivity (mS/cm)
- SAL - Salinity (ppt)
- pH
- ORP - Redox Potential
- NH₃ - Ammonia Nitrogen (mg/L)
- F-Cl - Free Chlorine (mg/L)
- T-Cl - Total Chlorine (mg/L)
- PO₄ - Phosphate (mg/L)
- P - Phosphorus (mg/L)
- N - Nitrate nitrogen (mg/L)
- NO₃ - Nitrate (mg/L)
- TBD - Turbidity (ntu)

Table 2 contains the numerical results of the water quality data sampling. In general, no significant exceedances of State water quality standards were noted during the water quality data collection effort. The primary parameters that were found to be at levels of some concern included dissolved oxygen and nitrate nitrogen/nitrate.

Several sites throughout the watershed exhibited low levels of dissolved oxygen. Typically, sites that had low dissolved oxygen levels tended to be the ones that also had elevated levels of nitrate nitrogen/nitrate. The lack of riparian buffers, particularly in the upstream portion of the watershed, allows the elevated levels of nitrogen to enter the river system. Urban runoff containing high levels of fertilizers, organic matter and other compounds containing nitrogen is carried to the creek virtually unfiltered in many cases, and is likely a primary cause for the elevated nitrogen levels. As a consequence, the elevated nitrate nitrogen/nitrate is promoting algal and other undesirable plant growth. While these organisms create oxygen through photosynthesis, they also consume large amounts of DO through respiration and decomposition. Since photosynthesis can only take place during periods with sunlight, and respiration and decomposition occur 24 hours a day, an overabundance of plant growth and organic matter can often reduce DO levels in the water. Exasperating this effect, the lack of buffers in the upper portions of the watershed greatly reduces shading in the water, causing higher water temperatures. Warmer water becomes saturated more easily with oxygen, meaning warmer water can hold less DO, and less is available to aquatic organisms. Elevated turbidity levels

**SUBJECT: U.S. Army Corps of Engineers, Buffalo District - Survey of French Creek
Final Report - July 2004**

were also noted at several sites. This is caused by the introduction of silt-laden runoff that is introduced to the creek and also from bank erosion caused by flashy storm flows, both of which are a direct result of a lack of adequate buffers.

Table 2: Water Quality Sampling Data

FRENCH CREEK SITES		TEM	DO	SPC	SAL	pH	ORP	NH3	F-CI	T-CI	PO4	P	N	NO3	TBD
RM	Location	(°F)	(mg/L)	(mS/cm)	(ppt)			(mg/L)	(ntu)						
0.38	At Mouth of Un-named Ditch	63.8	13.9	0.7860	0.41	7.01	342	0.00	0.00	0.20	0.24	0.08	0.3	1.32	3.8
0.54	At East River Road (mouth of Jungbluth Ditch)	55.6	7.05	0.8140	0.42	6.69	169	0.01	0.15	0.18	0.02	0.0066	0.5	2.2	3.8
1.4	At FCNP Bridge (mouth of Walker Ditch)	55.7	7.8	0.8189	0.43	6.40	171	0.01	0.10	0.1	0.01	0.0033	1	4.4	4.4
3.2	At Abbe Road	66.3	10.23	0.8654	0.45	6.60	173	0.00	0.00	0.1	0.13	0.04	0.5	2.2	4.7
4.0	At Mouth of Avins Ditch	71.7	10.5	0.8813	0.46	6.61	166	0.00	0.10	0.1	0.12	0.04	0	0	3.6
4.5	At I-90 Crossing	55	8.1	0.9189	0.48	7.27	354	0.02	0.00	0	0.02	0.0067	0.33	1.45	9.1
5.5	At Bridge Point Trail Road	55.6	8.91	0.9198	0.48	7.24	347	0.00	0.10	0.1	0.02	0.0067	0.2	0.88	5.8
6.1	At Detroit Road	56	7.2	0.9203	0.48	7.20	340	0.00	0.00	0	0.02	0.0067	0	0	7.7
6.9	At Stony Ridge Road (RTE 511)	56.8	7.8	0.9420	0.49	7.24	334	0.20	0.20	0.15	0.36	0.13	0.2	0.88	11
7.65	At RTE 83 (Center Road)	57.5	5.7	0.9575	0.50	7.20	333	0.00	0.05	0.08	0.02	0.0067	0.5	2.2	18
8.9	At Jaycox Road (Mouth of "Schwartz" Ditch)	53.8	8.3	0.8984	0.47	7.25	309	0.00	0.10	0.07	0.02	0.0067	0.1	0.44	17
10.4	At Mills Road	71.4	12.25	0.9551	0.50	7.29	203	0.30	0.10	0.15	0.44	0.14	0	0	6.8
10.7	At Chesterfield Avenue	67.8	12.2	0.9501	0.50	7.22	195	0.20	0.10	0.1	0.42	0.14	2	8.8	6.8
12.4	At Center Ridge Road	58.3	7.14	1.0570	0.55	7.27	181	0.00	0.00	0	0	0	0	0	8.3
12.7	At Root Road	59.9	8.2	1.0330	0.54	6.95	205	0.00	0.10	0.1	0	0	0	0	6.2
14.1	Lear-Nagle Road	59.8	7.2	0.8334	0.43	6.92	165	0.20	0.05	0.07	0.5	0.167	1	4.4	21
QUARRY DITCH		TEM	DO	SPC	SAL	pH	ORP	NH3	F-CI	T-CI	PO	P	N	NO3	TBD
RM	Location	(°F)	(mg/L)	(mS/cm)	(ppt)			(mg/L)	(ntu)						
0.0	At Mouth of Ditch (French Creek RM 0.38)	64.2	11.63	0.7027	0.37	7.13	302	0.00	0.15	0.15	0.13	0.043	0.4	1.76	7.3
0.2		64.4	13.33	0.3608	0.18	7.31	226	0.00	0.20	0.15	0.2	0.066	0.1	0.44	26
JUNGBLUTH DITCH		TEM	DO	SPC	SAL	pH	ORP	NH3	F-CI	T-CI	PO	P	N	NO3	TBD
RM	Location	(°F)	(mg/L)	(mS/cm)	(ppt)			(mg/L)	(ntu)						
0.0	Mouth of Ditch (French Creek RM 0.54)	55.5	8.07	0.7850	0.41	6.67	169	0.02	0.03	0.05	0.01	0.0033	0.3	1.32	5.4
1.0	Upstream of Park Road Bridge	54.8	8.7	0.8718	0.45	6.37	159	0.00	0.15	0.1	0.08	0.026	0	0	8.3
1.6	At French Creek Road	54.9	9.2	0.8727	0.45	6.38	170	0.00	0.17	0.15	0.06	0.02	0.25	1.1	7.7
3.15	At Abbe Road	60.4	12.4	0.5958	0.31	6.58	77	0.10	0.15	0.2	0.48	0.18	0	0	8.6
4.13	At Case Road	63.8	10.4	0.5354	0.27	6.58	70	0.00	0.40	0.2	0.4	0.13	0.2	0.88	8.8
WALKER DITCH		TEM	DO	SPC	SAL	pH	ORP	NH3	F-CI	T-CI	PO	P	N	NO3	TBD
RM	Location	(°F)	(mg/L)	(mS/cm)	(ppt)			(mg/L)	(ntu)						
0.0	Mouth of Ditch (French Creek RM 1.23)	53.5	9.93	0.5916	0.30	6.43	165	0.05	0.02	0.02	0.01	0.0033	1.2	5.25	4.1
0.6	At end of FCNP Hiking Trail	54.2	9.36	0.6234	0.32	6.41	163	0.00	0.10	0.15	0.08	0.026	4	17.6	4.2
1.7	At Abbe Road	51.5	7.3	0.5640	0.29	6.42	275	0.05	0.15	0.15	0.02	0.0067	0.1	0.44	3
2.2	At French Creek Road	54.3	5.6	0.6932	0.36	6.42	153	0.20	0.10	0.1	0.001	0.0033	0	0	4.9
3.3	At Reserve Way	55.8	7.6	0.8527	0.44	6.46	168	0.05	0.01	0.01	0.08	0.25	2.5	1.1	110
3.45	End - at Reserve Way by Pond	53	7.03	1.2960	0.69	6.35	189	0.10	0.10	0.1	0.06	0.02	1.5	6.8	22
KLINE DITCH		TEM	DO	SPC	SAL	pH	ORP	NH3	F-CI	T-CI	PO	P	N	NO3	TBD
RM	Location	(°F)	(mg/L)	(mS/cm)	(ppt)			(mg/L)	(ntu)						
0.0	Mouth of Ditch (French Creek RM 3.9)	69.3	11.9	0.6344	0.33	6.60	210	0.00	0.00	0	0.14	0.047	5	22	4
0.85	At Greenfield Drive	62.8	13.3	0.7049	0.36	6.52	167	0.00	0.20	0.15	0.14	0.048	2.8	12.32	7.5
1.22	At French Creek Road	54.2	10.07	0.7387	0.38	6.41	51	0.00	0.10	0.1	0.14	0.047	0.3	1.32	7.6
2.15	At Detroit Road	59	13.52	0.4121	0.21	6.54	139	0.00	0.20	0.2	0.18	0.06	0.1	0.44	6
AVINS DITCH		TEM	DO	SPC	SAL	pH	ORP	NH3	F-CI	T-CI	PO	P	N	NO3	TBD
RM	Location	(°F)	(mg/L)	(mS/cm)	(ppt)			(mg/L)	(ntu)						
0.0	Mouth of Ditch (French Creek RM 4.0)	68.6	8.72	1.2340	0.65	6.59	183	0.00	0.00	0.2	0.56	0.18	0	0	31
SCHWARTZ DITCH		TEM	DO	SPC	SAL	pH	ORP	NH3	F-CI	T-CI	PO	P	N	NO3	TBD
RM	Location	(°F)	(mg/L)	(mS/cm)	(ppt)			(mg/L)	(ntu)						
0.0	Mouth of Ditch at Jaycox Road (French Creek RM 8.9)	56.2	8.1	0.9756	0.51	7.17	283	0.05	0.05	0.05	0.02	0.0067	0	0	6.7
0.3	At Schwartz Park	54.8	11.19	0.8951	0.47	7.12	227	0.00	0.10	0.15	0.06	0.02	0.2	0.88	5.6
0.52	At Sandy Lane	55	12.4	0.8890	0.46	7.23	228	0.10	0.15	0.15	0	0	0.1	0.44	5.9
0.71	At Nagle Road	59.5	12.7	0.8846	0.45	7.23	215	0.00	0.12	0.1	0.01	0.0033	0	0	8.4
MILLS CREEK		TEM	DO	SPC	SAL	pH	ORP	NH3	F-CI	T-CI	PO	P	N	NO3	TBD
RM	Location	(°F)	(mg/L)	(mS/cm)	(ppt)			(mg/L)	(ntu)						
0.22	At Jaycox Road	70	9.22	0.9557	0.50	7.30	175	0.00	0.00	0	0	0	0	0	6
1.32	At Nagle Road	67.6	11.7	0.9734	0.51	7.28	194	0.00	0.00	0	0.01	0.0033	0	0	4.9
1.55	At Mills Road	68.1	10.98	0.9923	0.52	7.23	192	0.00	0.00	0	0.01	0.0033	1	4.4	4.2
2.5	At Mills Creek Lane (in football park)	68.2	14.7	0.9612	0.50	7.25	167	0.00	0.00	0	0.01	0.0033	1	4.4	5.8
3.21	At Woodland Drive	62.8	15.2	1.0540	0.55	7.22	182	0.00	0.00	0	0.2	0.067	0	0	4.4
3.45	At Fieldstone Circle	64	15.5	1.0920	0.57	7.23	193	0.00	0.00	0	0.16	0.053	1	4.4	4.8
FRENCH DITCH		TEM	DO	SPC	SAL	pH	ORP	NH3	F-CI	T-CI	PO	P	N	NO3	TBD
RM	Location	(°F)	(mg/L)	(mS/cm)	(ppt)			(mg/L)	(ntu)						
0.5	At Bainbridge Road	59.1	7.54	1.1090	0.58	6.93	201	0.00	0.00	0	0	0	0	0	5.6
1.3	At Chestnut Ridge Road	58.6	9.3	1.0470	0.55	6.91	183	0.05	0.00	0	0	0	0	0	5.3
1.93	At Lorain Road	58.7	7.5	1.2740	0.67	6.86	170	0.00	0.10	0	0.38	0.12	1	4.4	5.8
NAGLE DITCH		TEM	DO	SPC	SAL	pH	ORP	NH3	F-CI	T-CI	PO	P	N	NO3	TBD
RM	Location	(°F)	(mg/L)	(mS/cm)	(ppt)			(mg/L)	(ntu)						
0.37	At Boulder Drive	59.3	5.6	1.5260	0.81	6.89	181	0.00	0.15	0.15	0.28	0.063	1	4.4	7.1

**SUBJECT: U.S. Army Corps of Engineers, Buffalo District - Survey of French Creek
Final Report - July 2004**

2.2.3 Priority Areas

During the course of the site investigation, several stream reaches were identified as impaired. These areas were therefore determined to have the greatest potential as well as need for restoration. Section 2.2.3.1 summarizes the stretches of the main stem of French Creek considered to be the most severely impaired. Section 2.2.3.2 lists and describes the four French Creek tributaries considered to be the most severely impaired.

2.2.3.1 French Creek Priority Areas – Two sections of French Creek stood out as the most severely impaired sections during the course of the study. These sections included the stretches from Riegelsberger Road to Mills Road (RMs 9.0 – 10.4) and Mills Road to Center Ridge Road (RMs 10.4 – 12.4).

The impairments noted within the stretch from Riegelsberger Road to Mills Road stem from a rapid expansion of residential development in the community of Avon, including numerous subdivisions and condominium developments. This stretch of the creek also flows through a golf course. The primary impairments noted in this area include a significant lack of riparian buffers, heavy streambank erosion, channel modifications, poor riffle/pool development, and severe overland runoff from adjacent developments and the golf course. Photograph 1 below depicts a view of French creek typical of this stretch. Recommended restoration measures for this stretch of French Creek are outlined in Section 3.1.8.



Photograph 1: French Creek at RM 10.4 (Mills Road).

**SUBJECT: U.S. Army Corps of Engineers, Buffalo District - Survey of French Creek
Final Report - July 2004**

The stream stretch from Mills Road to Center Ridge Road is undergoing similar development pressure to that described above, causing the same concerns. However, this stretch of the creek is additionally impacted by commercial/industrial/municipal development with a series of associated discharges from various culverts and PVC drains from adjacent properties on either side of the creek. These discharges are evidently the cause of a rust-colored sheen in the water column near the upstream portion of this stretch of the creek closest to Center Ridge Road. Photograph 2 below depicts this rust colored discharge. Recommended restoration measures for this stretch of French Creek are outlined in Section 3.1.9.



Photograph 2: Rust-colored discharge noted near RM 12.4 (Center Ridge Road).

2.2.3.2 Tributary Priority Areas - Four tributaries to French Creek were determined to be the most severely impaired during the course of the investigations. These tributaries include Schwartz Ditch, Mills Creek, French Ditch and Kline Ditch.

Schwartz Ditch offers examples of some of the most severe impairment in the French Creek watershed. An expansion of residential subdivisions is incurring dramatic impacts to the creek. Impairments include total removal of riparian buffer zones, heavy sedimentation caused by lack of erosion control on construction sites, and channel modification. Photograph 3 depicts some of the construction impacts that were noted along Schwartz Ditch. Section 3.2.6 outlines recommended restoration measures for Schwartz Ditch.

**SUBJECT: U.S. Army Corps of Engineers, Buffalo District - Survey of French Creek
Final Report - July 2004**



Photograph 3: Construction impacts along Schwartz Ditch.

Downstream stretches of Mills Creek have similar impairments to those listed for Schwartz Ditch. Portions have been so impaired that the creek channel is no longer present. Retention ponds have been built within the former channel, portions have been re-routed, culverted and re-shaped. Photograph 4 depicts some of these impacts. Upstream impairments in Mills Creek include a lack of riparian buffer zones and channel modifications (primarily for bank stabilization). Section 3.2.7 outlines recommended restoration measures for Mills Creek.



Photograph 4: Detention Basin/Ponding within Mills Creek.

**SUBJECT: U.S. Army Corps of Engineers, Buffalo District - Survey of French Creek
Final Report - July 2004**

Primary impairments noted within French Ditch include a general lack of riparian buffer zones and possible contamination of petroleum products from adjacent commercial/industrial facilities located in the upstream portion of the ditch. Section 3.2.8 includes recommendations for restoration within French Ditch.

The primary impairments identified within Kline Ditch include significant channelization through/around residential developments, and an associated lack of riparian buffers. Several portions of the ditch flow adjacent to active agricultural fields with little buffer area, increasing the potential for agricultural runoff. Sites investigated in the upstream portions of the ditch exhibited signs of possible contamination from failing HSDS's. These portions of the ditch had little flow and the exposed substrate had a blackish staining. Several PVC discharge pipes and some isolated contaminant pools were also noted. Photograph 5 depicts one of these contaminant pools. Section 3.2.4 includes recommendations for restoration within Kline Ditch.



Photograph 5: Black contaminant pool located along Kline Ditch.

**SUBJECT: U.S. Army Corps of Engineers, Buffalo District - Survey of French Creek
Final Report - July 2004**

3.0 RECOMMENDATIONS

3.1 French Creek – Main Stem

3.1.1 Mouth of Creek to East River Road (RMs 0.0 - 0.54) – The main concerns in the extreme downstream portion of this stretch (mouth to RM 0.3) are stagnant, low-gradient flow and occasional backflow from the Black River, as well as abandoned automobiles and automobile parts on the creek bank. Recommendations for improvement include removal of automobiles and debris along the banks. Due to the strong influence of the creek from past dredging and backflow from the Black River, there are few easily employable recommendations to improve past modifications. The only concern noted along RMs 0.3 - 0.54 is the moderate bank erosion that is currently occurring. Recommendations to improve this stretch include the implementation of bioengineering protection along the most erosive portions of the creek.

3.1.2 East River Road to Abbe Road (RMs 0.54 - 3.2) – This stretch of French Creek is located primarily within the French Creek Reservation. Buffers and riffle/pool development are generally of good quality and would not require any restoration practices. A possible project within this stretch would be to build deflectors to tighten up the channel width and re-alluviate the stretch, which is currently bedrock controlled, creating a wider, shallower creek channel. A secondary recommendation is to ensure detention ponds are built in association with new developments upstream to minimize the increase in water flow.

3.1.3 Abbe Road to I-90 (RMs 3.2 - 4.5) – The main concern in the downstream portion of this stretch is the low sinuosity and presence of debris and household garbage (appliances, etc.) on the banks. Recommendations for improvement in this area include the removal of debris and garbage as well as the installation of deflectors to increase sinuosity. The upstream portion of this stretch has several impairments with potential for corrective measures. Concerns include narrow riparian buffers, low sinuosity in the area immediately upstream of I-90 and heavy erosion from a fly ash dump associated with construction on the north side of the creek to the northwest of I-90. Recommendations in this area include increasing the wooded riparian buffer, construction of deflectors to increase sinuosity and enforcement of National/State Pollutant Discharge Elimination System (N/SPDES) regulations (i.e. installation of silt fences and filtration strips between construction areas and creek).

3.1.4 I-90 to Detroit Road (RMs 4.5 - 6.1) – The main concerns along this stretch of French Creek include narrow buffers and possible contamination from businesses along Colorado Avenue. Since this stretch is in a medium-density residential and commercial area, opportunities for improved riparian buffers are few, but recommended where possible. Enforcement of the existing discharge regulations is strongly encouraged to minimize impacts of contaminated runoff from adjacent structures.

3.1.5 Detroit Road to Stony Ridge Road (RMs 6.1 - 6.9) – This stretch of the creek flows through medium-density residential development. As with most suburban areas, a significant concern is the lack of a significant riparian buffer. Discharges from backyard drainages were also noted. Although there may be limited opportunity to increase buffer zones in this stretch, it is recommended where feasible. In addition, reduction of contamination from backyard drainage

**SUBJECT: U.S. Army Corps of Engineers, Buffalo District - Survey of French Creek
Final Report - July 2004**

is recommended. Possible solutions may include the implementation of filter strips or first flush basins.

3.1.6 Stony Ridge Road to Center Road (RMs 6.9 - 7.65) – The main concerns in this stretch of the creek are low velocity, low sinuosity flow as well as apparent contamination from failing septic systems. Recommendations for improvement include the construction of deflectors and other structures to improve sinuosity and riffle/pool development as well as inspection and enforcement of local health codes with regard to the functionality of nearby septic systems.

3.1.7 Center Road to Riegelsberger Road (RMs 7.65 - 8.9) – The primary impairments noted in this stretch of the creek include minimal riparian buffers and sediment runoff from agricultural areas and new residential developments. Recommendations include expansion of riparian buffer zones, implementation of agricultural Best Management Practices (BMPs) and enforcement of N/SPDES regulations (i.e. installation of siltation ponds and silt fencing). In addition, nitrification from agricultural operations (i.e. fecal matter from animal operations) appeared to create water quality problems. A recommendation is to work with the individual owners of these operations, possibly through the Lorain County Soil and Water Conservation District to correct these issues.

3.1.8 Riegelsberger Road to Mills Road (RMs 8.9 - 10.4) – Concerns abound in this stretch of the creek which stem from a rapid expansion of residential development in the area, including numerous subdivisions and condominium developments. These concerns include a lack of riparian buffers, heavy erosion, channel modification, little riffle/pool development, and runoff from adjacent development. Great opportunities for restoration include, where feasible, development of riparian buffer strips, construction of deflectors to improve riffle/pool development, enforcement of N/SPDES regulations (i.e. installation of silt fencing and siltation ponds) to reduce sedimentation, and protection of those riparian buffers and natural stream segments that still exist.

3.1.9 Mills Road to Center Ridge Road (RMs 10.4 - 12.4) – This stretch of the creek is undergoing similar development pressure as listed in Section 3.1.8, causing similar concerns. In addition, the upstream portion of this stretch (closest to Center Ridge Road) is bordered by commercial/industrial/municipal development with a series of associated discharges from various culverts and PVC drains from adjacent properties on either side of the creek, causing a rust-colored sheen in the creek. Recommendations for improvement, in addition to those recommended in Section 3.1.8, include investigation of the discharges and enforcement of existing regulations.

3.1.10 Center Ridge Road to Lear-Nagle Road (RMs 12.4 - 14.1) – The main concerns noted in this stretch of stream include narrow riparian buffers adjacent to residential and commercial development as well as various discharges from adjacent properties. Since opportunities for the expansion of the buffer zone are generally minimal, restoration should be focused on the preservation and enhancement of the buffer zone that remains. In addition, enforcement of existing codes and regulations regarding discharges are recommended.

**SUBJECT: U.S. Army Corps of Engineers, Buffalo District - Survey of French Creek
Final Report - July 2004**

3.1.11 Lear-Nagle Road to Cuyahoga County line (RMs 14.1 - end) – This stretch of the creek mainly flows through developed residential areas. Primary concerns include the lack of riparian buffers and runoff from lawns. Recommendations include buffer zone expansion, where feasible, and preservation of the remaining buffer zone.

3.2 TRIBUTARIES

3.2.1 Quarry Ditch – The primary concern within this ditch is an unculverted road crossing which impounds the ditch. Other concerns include narrow riparian buffers and the presence of invasive species (purple loosestrife and common reed) in an old quarry which forms the headwaters for the ditch. Recommendations include the installation of a culvert and water control structure at the road crossing, the development of a larger riparian buffer and invasive species control.

3.2.2 Jungbluth Ditch – Most of the impairments associated with this ditch are located in the upstream stretches. Concerns include channelization for residential developments, and the lack of riparian buffers associated with residential development. Although opportunities for restoration are minimal due to existing development, recommendations include installation of deflectors to improve sinuosity and expansion and enhancement of riparian buffers.

3.2.3 Walker Ditch – The lower reaches of Walker Ditch are located within French Creek Reservation Park and are generally healthy and functional. Upstream of the park, impairments include channel modifications due to residential expansion, lack of riparian buffers, and runoff from residential areas. Although opportunities for enhancement may be limited due to the proximity of existing development, creation of riparian buffers is recommended where feasible. Preservation of existing buffers should also be a priority.

3.2.4 Kline Ditch – Lack of riparian buffers and channel modification are concerns along the entire length of Kline Ditch. In the upstream portions, runoff from agricultural fields contributes to bedload concerns. Upstream of Detroit Road, it appears that the ditch has been contaminated with effluent from failing septic systems. Recommendations include expansion and preservation of riparian buffer zones. Installation of deflectors is recommended to correct channel modifications. Inspection of septic systems and enforcement of health codes is strongly recommended in order to reduce the influx of effluent into the ditch.

3.2.5 Avins Ditch – Although Avins Ditch is highly impaired for most of its length, opportunities for restoration are limited due to the industrial nature of the area. The downstream stretch near the confluence with French Creek consists of a concrete channel with riprap on the banks. Upstream, lawns adjacent to industrial development minimize the riparian buffer. It appears the upstream portions are intermittently dredged or are culverted. Where feasible, enhancement and/or creation of riparian buffers are recommended.

3.2.6 Schwartz Ditch – Schwartz Ditch offers examples of some of the most severe impairment in the French Creek watershed. A rapid expansion of residential subdivisions is having dramatic impacts to the creek. Impairments include total removal of riparian buffer zones, heavy sedimentation caused by lack of erosion control on construction sites and channel modification.

**SUBJECT: U.S. Army Corps of Engineers, Buffalo District - Survey of French Creek
Final Report - July 2004**

Recommendations include enforcement of N/SPDES regulations (i.e. installation of silt fences, etc.). Preservation of remaining riparian buffer zones is imperative and creation/enhancement of buffer zones in other areas is strongly recommended. Installation of deflectors is additionally recommended to restore sinuosity.

3.2.7 Mills Creek – Downstream stretches of Mills Creek have similar impairments to those listed in Section 3.2.6 in Schwartz Ditch. Portions of the creek have been so impaired that the creek channel is no longer present. Retention ponds have been built within the former channel, portions have been re-routed, culverted and re-shaped. Upstream, impairments include lack of riparian buffer zones and channel stabilization. Recommendations include enforcement of N/SPDES regulations (i.e. installation of silt fences, etc.), preservation of remaining riparian buffer zones, creation/enhancement of buffer zones and installation of deflectors to restore sinuosity.

3.2.8 French Ditch – Concerns with French Ditch include a lack of riparian buffer zones and possible contamination from petroleum products (parking lot runoff). Recommendations include preservation of existing riparian buffer zones and creation/enhancement of buffer zones. The contamination in the upstream portion should be investigated and rectified, if necessary.

3.2.9 Nagle Ditch – Nagle ditch flows primarily through residential developments. The primary concerns noted in Nagle Ditch include channel modifications (improper culvert installation), lack of riparian buffers, and the presence of an unidentified contaminant derived from a discharge pipe, similar to that noted in French Creek near Center Ridge Road. It is recommended that the culvert be investigated and possibly re-installed and that the contamination source be investigated and rectified, if necessary.

3.3 Watershed-wide Recommendations

Several measures can be taken to encourage an improvement in the habitat and water quality of French Creek and its tributaries, as follows:

- Improved enforcement of existing State and local sediment control regulations. Many construction sites encountered during the French Creek study did not appear to be in compliance. Silt fences were not used regularly where required along stream channels, etc. Local municipalities need to be educated on the regulations and held responsible for compliance.
- Improved enforcement of existing Federal and State Section 404 and 401 regulations. Suggest that municipalities be educated and held responsible for ensuring that compliance with these laws is adhered to prior, during, and after the construction of new residential subdivisions, commercial and industrial developments. Several instances of severe impact to stream channels were encountered during the French Creek study, including drastic alterations to the channels themselves, widespread culverting and constructing retention ponds within the former channels.
- Encourage (both voluntarily and with the use of incentives) the development of wooded buffers adjacent to French Creek and its tributaries. The development of buffers improves both habitat and water quality.

**SUBJECT: U.S. Army Corps of Engineers, Buffalo District - Survey of French Creek
Final Report - July 2004**

- Create filtration wetlands in areas where severe erosion is adding to the bedload of the creek and its tributaries. These wetlands serve the dual purpose of improving water quality and limiting flood damage to adjacent structures.
- Enforce local health department regulations in relation to residential septic systems. Various failures of these systems were noted during the French Creek study. Coordination with the Health Department and OEPA is encouraged to rectify the discharge of raw sewage into the creeks. Opportunities for conducting future projects designed to correct these problems may exist with the USACE through the Ohio Environmental Infrastructure authority (Section 594).
- Construct bioengineering erosion control projects where severe erosion is occurring along stream banks.
- Curtail discharge of stormwater runoff from urban areas directly into French Creek and its tributaries. Encourage the development and use of storm water detention basins (not retention basins).

4.0 CONCLUSIONS

In conclusion, several and varied impairments have been identified in the French Creek sub-watershed through the course of this study. However, most of these impairments can be attributed to the massive expansion of development (both residential and commercial) currently ongoing in the watershed. The extensive development has contributed to a general lack of natural riparian buffer zones, increased runoff from both impervious surfaces such as roads, driveways and parking lots, as well as from maintained lawn surfaces, all of which contribute to unnaturally flashy storm flows which create erosion problems and transport large amounts of sediment from the stream bed. Several portions of the watershed were likewise identified as being impacted by point discharges from storm drains, home drainage, and possible HSDS discharges which contribute to this effect as well. Although one of the goals of this study was to identify an unknown source of toxicity which has contributed to recent fish kills, no single source was readily apparent through site surveys and water quality testing. Instead it is presumed that the source of this toxicity is derived from all of the impairments described in this report combining to decrease DO levels to lethal levels at certain times of the year.

Although individual site-specific restoration activities may not have an immediate dramatic impact on the overall health of the Black River watershed or French Creek sub-watershed, a programmatic approach to restoration and watershed management will, overtime, vastly improve the health of the watershed. Initially, it is recommended that restoration measures be concentrated, as was described in Section 3.0 of this report, at educating local officials and the public on the adverse effects development may have on the watershed, and more importantly, on the concepts of environmentally responsible future development (including enforcement of existing regulations), in conjunction with select site-specific restoration.

REFERENCES

Ohio EPA. 1999. Biological and Water Quality Study of the Black River Basin (Lorain and Medina Counties). Ecological Assessment Section, Division of Surface Water. Columbus, OH.

Ohio EPA. Draft – Methods for Assessing Habitat in Flowing Waters Using the Qualitative Habitat Evaluation Index (QHEI). Ecological Assessment Section, Division of Surface Water. Columbus, OH.

Ohio EPA. 1999. Biological and Water Quality Study of the Black River Basin (Lorain and Medina Counties). Ecological Assessment Section, Division of Surface Water. Columbus, OH.

Rankin, E.T. 1989. The Qualitative Habitat Evaluation Index: Rationale, Methods and Application. Division of Water Quality; Planning and Assessment Section. Columbus, Ohio.

Ohio EPA. 2002. Field Evaluation Manual for Ohio's Primary Headwater Habitat Streams. Ecological Assessment Section, Division of Surface Water. Columbus, OH.

USDA. 1976. Soil Survey of Lorain County. Soil Conservation Service in Cooperation with Ohio Department of Natural Resources and Ohio Agricultural Research and Development Center.

USACE. 2004. Living Along French Creek: A User's Guide. In Cooperation with OEPA and the BRCC.

USDOI. National Wetland Inventory Maps. U.S. Fish and Wildlife Service. Washington, D.C.

USDOI. 7.5 Minute Series Topographical Maps. U.S. Geological Survey. Washington, D.C.

Websites:

<http://www.epa.gov/glnpo/aoc/blackriver.html>

http://www.epa.state.oh.us/dsw/rap/blk_home.html

<http://www.noaca.org/blkrp.html>