

## 4.2 Wabash River Subwatersheds

### 4.2.1 Wabash River Headwaters to below Bear Creek

The Wabash River Headwaters to below Bear Creek subwatershed drains a southern portion of the Wabash watershed and the area that drains to Bear Creek. The majority of the subwatershed is located in Darke County, and the remainder is located in Mercer County. The acres, square miles, and percent of subwatershed are shown below. The Wabash River Headwaters to below Bear Creek subwatershed, according to percentages, is the third largest of the eight subwatersheds draining to the Wabash River. Of the entire Grand/Lake Wabash Watershed, it is the third largest of fifteen subwatersheds.

TABLE 54

<b>WABASH RIVER HEADWATERS TO BELOW BEAR CREEK</b>	
Acreage	20,190
Square Miles	31.55
% of Wabash Watershed Total Land Area	16.7%
% of Grand Lake/Wabash Watershed Total Land Area	11.2%

#### *Water Quality Status*

The Wabash River Headwaters to below Bear Creek has been designated as a warm water habitat (WWH). This aquatic life use designation has been established by Ohio EPA, and based on recent data sampling, the water resource is shown as not meeting that use designation, or in a “non-attainment” status. Furthermore, the subwatershed is shown as NPS impacted. Suspected or proven impacts to these streams include: Agriculture-crop production, confined animal feeding operations, on-site wastewater treatment systems, channelization, removal of riparian vegetation and streambank destabilization. Definitions and criteria for these descriptives can be found in Appendix C aquatic life use designations and assessment terms.

A TMDL report for the Wabash River watershed was finalized by US EPA in August of 2004. The report showed that on average, all samples collected in this subwatershed were over the recommended total phosphorus level of 0.17 mg/L. On average, 50% of the samples were over the recommended nitrate-nitrite level of 1.5 mg/L, and 67% of the samples were over the recommended total suspended solids level of 32 mg/L.

#### *Water Supplies and Discharges*

There are no community water supplies within the Wabash Headwaters to below Bear Creek subwatershed, no Ohio EPA regulated point source discharge, no non-transient non-community water supplies, no transient non-community water supplies and no Ohio EPA regulated point source discharges.

Based on recent aerial photographs, areas where 10 or more household wastewater treatment and disposal systems were present in close proximity was determined. As with any individual treatment system operating in an area with poorly drained soils, the effects of the effluent on the receiving water body is a concern. These effects grow as the number of systems in a given area increases, thus clusters or groups of 10 or more systems has been used to analyze the potential effects of those systems on the water quality. Regarding the Wabash River Headwaters to below Bear Creek subwatershed, there were a total of two clusters identified comprised of 21 individual treatment systems.

### *Highly Erodible Land*

Map 48 at the end of this subsection illustrates the highly erodible land locations within the Wabash River Headwaters to below Bear Creek subwatershed. Of the eight subwatersheds within the Wabash River watershed, Wabash River Headwaters to below Bear Creek ranks seventh in the amount of highly erodible land present within the subwatershed. The highly erodible land information was developed from the 2003 online NRCS Soil Data Mart.

### *Riparian Corridor Status*

The chart on the following page shows the riparian corridor status for the Wabash River Headwaters to below Bear Creek subwatershed. The chart indicates the number of miles that has various widths of tree canopy, or riparian corridor. The numbers account for both sides of the streams; therefore, the number of actual stream miles is half of that shown. The divisions are less than 10 feet in total width, 10 feet to 40 feet in total width, and greater than 40 feet in total width. The chart is also divided into perennial and intermittent streams under each of the corridor width column headings. MAP 49 illustrates the stream sections under each division.

The chart shows that with a total of 108.56 miles of stream network, the Wabash River Headwaters to below Bear Creek subwatershed has 86.54 miles of stream with less than 10 feet of canopy and vegetation, 5.18 miles of stream with 10 feet to 40 feet canopy and vegetation, and 16.84 miles of stream with greater than 40 feet of canopy and vegetation. Overall, the Wabash River Headwaters to below Bear Creek subwatershed has the second highest number of stream miles within the Wabash River Watershed, which is 19.2%. Of the entire Grand Lake/Wabash Watershed, this subwatershed has the second highest number of stream miles, which is 15.4%.

TABLE 55

Riparian Corridor Status

<b>WABASH RIVER HEADWATERS TO BELOW BEAR CREEK</b>										
RIPARIAN STATUS	TREE CANOPY <10' IN TOTAL WIDTH			TREE CANOPY 10 to 40' IN WIDTH			TREE CANOPY >40' IN WIDTH			TOTAL STREAM MILES
	PEREN- NIAL	INTER- MITTENT	SUB- TOTAL	PEREN- NIAL	INTER- MITTENT	SUB- TOTAL	PEREN- NIAL	INTER- MITTENT	SUB- TOTAL	
	25.55	60.99	86.54	2.39	2.79	5.18	5.21	11.63	16.84	108.56
% of Subwatershed Total	23.5%	56.2%	79.7%	2.2%	2.6%	4.8%	4.8%	10.7%	15.5%	100.0%
% of Wabash Watershed Total	4.5%	10.8%	15.3%	0.4%	0.5%	0.9%	0.9%	2.1%	3.0%	19.2%
% of Grand Lake/Wabash Watershed Total	3.6%	8.6%	12.3%	0.3%	0.4%	0.7%	0.7%	1.6%	2.4%	15.4%

### *Operations and Animal Units*

The table on the following page shows the number of operations and the animal units by species for the Wabash River Headwaters to below Bear Creek subwatershed. According to the table, there are 23 poultry operations, 20 dairy operations, 19 hog operations, 27 beef operations and four horse and sheep operations within the entire subwatershed. The Wabash River Headwaters to below Bear Creek subwatershed ranks third within the entire Grand Lake/Wabash River Watershed when considering the total number of operations with 93 or 9.4%. Animal units within the subwatershed ranks second of 15 with 18.0%.

Totals of animal units for each species are also listed on the table. The inventory for this subwatershed was completed during November of 2006. At the time of the inventory animal units were determined by the number of animals present. Although this is not a 1:1 ratio for all species, it is for beef cattle. The following chart shows the number of each type of animal that makes up 1,000 animal units.

Animal Type	1,000 Animal Unit Equivalent
Beef Cattle	1,000
Dairy Cattle	700
Hogs (over 55 lbs)	2,500
Turkeys	55,000
Layer Chickens	82,000
Pullet Chickens	125,000
Sheep	10,000
Horses	500

Table 56  
Operations and Animal Units

WABASH HEADWATERS TO BELOW BEAR CREEK														
ANIMAL TYPE	POULTRY		DAIRY		HOG		BEEF		OTHER		TOTAL		Total as % of Wabash Watershed	
# Farms and Animals	# OPER.	# A.U.s	# OPER.	# A.U.s	# OPER.	# A.U.s	# OPER.	# A.U.s	# OPER.	# A.U.s	# OPER.	# A.U.s	# OPER.	# A.U.s
	13 (Trky)	42,509 2,945	20	3,493	19	10,408	27	2,020	(sheep) 1 (hrs) 3	0.5 20	93	61,395	13.5%	26.0%
% of subwatershed total	24.7%	74.0%	21.5%	5.7%	20.4%	17.0%	29.0%	3.3%	4.3%	0.0%	100.0%	100.0%		
Total as % of Wabash Watershed	3.3%	19.2%	2.9%	1.5%	2.7%	4.4%	3.9%	0.9%	0.6%	0.0%	13.5%	26.0%		
Total as % of Grand Lake/Wabash Watershed	2.33%	13.30%	2.02%	1.02%	1.92%	3.05%	2.73%	0.59%	0.40%	0.01%	9.40%	17.97%		

## Manure Production

After considering the number of livestock operations and animal units present in the subwatershed, it is only fitting to consider the by-products of these animals. The table on the opposite page is used to represent the manure and nutrient production for the Wabash River Headwaters to below Bear Creek drainage area. The subwatershed ranks second overall, of 15, in terms of manure production per annum. Approximately 283,025 tons of manure is produced annually. The remainder of the columns on the table indicates the approximate pounds of nutrients contained in that manure. Nitrogen, potassium, and phosphate, are all important to the agricultural community and are provided to the crops via manure or commercial fertilizer applications.

These nutrients are also important in regards to water quality. According to the table, in the Wabash River Headwaters to below Bear Creek subwatershed, the amount of phosphorus that is contained in the manure produced annually would need to be applied at 242 pounds per acre. The table below indicates the average crop removal rates for phosphorus for the major crops produced in the watershed. Values were obtained from the Ohio Agronomy Guide.

<b>CROP</b>	<b>P<sub>2</sub>O<sub>5</sub> REMOVAL (lb/ac)</b>
Alfalfa (6T)	80
Corn (150 bu) Grain	55
Corn (25 T) Silage	80
Soybean (50 bu)	40
Wheat (75 bu) Grain	48

Considerations are given to the nutrient phosphorus due to its importance to crop production and the problems associated with the relationship between excessive phosphorus applications and degradation of water quality. Because much of the poultry manure is brokered out of the watershed, it seemed important to reflect the nutrient values assuming that 70% of the poultry manure is moved to locations outside the watershed. Local manure haulers estimated this value to be 90%; however, to be conservative, 70% was assumed for this plan. Under this assumption, the amount of phosphorus that is contained in the manure produced annually in this subwatershed would need to be applied at 106 pounds per acre.

What this seems to indicate throughout the watershed is that according to manure production and crop removal rates for limiting nutrient factors, there are not enough acres for proper manure application methods. The caveat on this statement is that the numbers are best estimates, variations in soil types and tith can vary throughout the fields which may increase, or decrease, crop removal rates, and more importantly, some of the manure produced in each of the subwatersheds may be applied to acreages outside of that subwatershed, or even outside of the Grand Lake/Wabash watershed. It should be noted that several producers own or rent land both in the Grand Lake/Wabash watershed and in neighboring watersheds such as Loramie Creek or the St Marys River.

**Table 57**  
**Manure and Nutrient Production**

<b>WABASH HEADWATERS TO BELOW BEAR CREEK</b>						
Manure Production	Tons Raw Manure/Year	Lbs. N per Year	Lbs. K <sub>2</sub> O per Year	Lbs. P <sub>2</sub> O <sub>5</sub> per Year	Acres Cropland	Lbs. P <sub>2</sub> O <sub>5</sub> per Crop Acre
	283,025	5,856,410	3,359,027	4,543,160	18,756	242
Less 70% Poultry Manure**	168,975	2,741,516	1,791,105	1,992,375	18,756	106
Approximate \$ Value Per Year		\$1,288,410	\$503,854	\$908,632		
Total Nutrient Value Per Year =	\$2,700,896					

\*\*Based on conversations with poultry manure brokers, it was estimated that at least 70% of the poultry manure is brokered out of the watershed.

The dollar values associated with each nutrient were obtained from OSU Extension Bulletin 604-06, "Ohio Livestock Manure Management Guide." The value for nitrogen is estimated at \$0.22 per pound, the value for P<sub>2</sub>O<sub>5</sub> is \$0.20 per pound and the value for K<sub>2</sub>O is \$0.15 per pound.

*Distance Between Livestock Operations and Streams*

The table on the following page shows the distance between various livestock operations located in the Wabash River Headwaters to below Bear Creek subwatershed and the waterways that drain to the Wabash River. It can be assumed that the greater the distance between a livestock operation and a water system, the potential of pollution from the operation reaching the stream is lessened.

Of notable interest is the number of all livestock operations located less than 1,000 feet from the waterbody. In this particular subwatershed, out of 93 operations, 43 operations, or 46.2%, fall into the category. Also, 32 operations, 34.4%, are in within 2,000 feet and the remaining 19.4%, 18 operations, are less than 3,000 feet from the nearest stream.

Table 58  
Livestock Operations and Proximity to Streams

WABASH RIVER HEADWATERS TO BELOW BEAR CREEK																		
ANIMAL TYPE	POULTRY			DAIRY			HOG			BEEF			OTHER			TOTAL		
	Distance to Stream			Distance to Stream			Distance to Stream			Distance to Stream			Distance to Stream			Distance to Stream		
	<1000'	<2000'	<3000'	<1000'	<2000'	<3000'	<1000'	<2000'	<3000'	<1000'	<2000'	<3000'	<1000'	<2000'	<3000'	<1000'	<2000'	<3000'
	16	5	2	8	8	4	8	4	7	9	14	4	2	1	1	43	32	18
% of Subwatershed Total	17.2%	5.4%	2.2%	8.6%	8.6%	4.3%	8.6%	4.3%	7.5%	9.7%	15.1%	4.3%	2.2%	1.1%	1.1%	46.2%	34.4%	19.4%

### *Non-Point Source Pollution Potential*

In order to provide a comparison of the pollution potential of each of the 15 subwatersheds, a ranking system for each of the main potential pollution sources was developed. These potential sources are stream miles with less than 10 feet of vegetation, the number of livestock or poultry operations less than 1,000 feet from a stream, the tons of raw manure produced yearly, the pounds of phosphorus per cropland acre available from the manure, the number of household wastewater disposal systems contained in clusters of ten or more) and the number of homes built pre-1973. Values of 1 (less potential) to 10 (great potential) were given based on ranges shown in the table of the following page. Indicator scores are then summed to obtain a total pollution potential score for the subwatershed.

Subwatershed pollution potential scores can range from a maximum of 60 points to a minimum of six points. The Wabash River Headwaters to below Bear Creek subwatershed ranks of third (tie) out of 15, with 73.3% of the maximum points for pollution potential. Most significantly for the subwatershed is the number of stream miles with less than 10 feet of vegetation on the streambanks and the tonnage of raw manure generated per year. Wabash River Headwaters to below Bear Creek subwatershed scored the maximum points for both indicators and scored the second highest amount of points for the number of operations within 1,000 feet of streams.

## NONPOINT SOURCE POLLUTION POTENTIAL SCORING MATRIX

MAXIMUM DRAINAGE UNIT SCORE = 60 (Highest Pollution Potential)

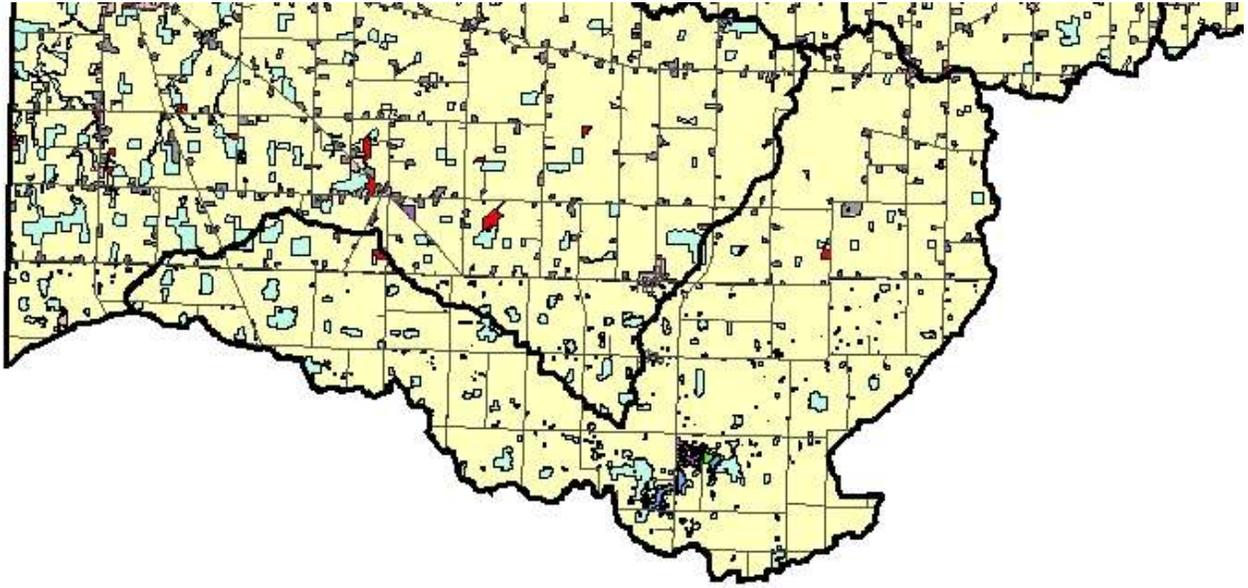
SCORE	Stream Miles with <10' Vegetation	Operations <1,000' to stream	Tons Raw Manure per Year	Lbs. P <sub>2</sub> O <sub>5</sub> per Crop Acre	Household Disposal Systems in Groups	No. Homes Built pre-1973
10	72.00+	46+	180,000+	225+	90+	226+
9	64.00 - 71.99	41 - 45	160,000 - 179,999	200 - 224	80 - 89	201 -225
8	56.00 - 63.99	36 - 40	140,000 - 159,999	175 - 199	70 - 79	176 -200
7	48.00 - 55.99	31 - 35	120,000 - 139,999	150 - 174	60 - 69	151 - 175
6	40.00 - 47.99	26 - 30	100,000 - 119,999	125 - 149	50 - 59	126 - 150
5	32.00 - 39.99	21 - 25	80,000 - 99,999	100 - 124	40 - 49	101 - 125
4	24.00 - 31.99	16 - 20	60,000 - 79,999	75- 99	30 - 39	76 - 100
3	16.00 - 23.99	11 - 15	40,000 - 59,999	50 - 74	20 - 29	51 - 75
2	8.00 - 15.99	6 - 10	20,000 - 39,999	25 - 49	10 - 19	26 - 50
1	0.00 - 7.99	0 - 5	0 - 19,999	0 - 24	0 - 10	0 - 25

MINIMUM DRAINAGE UNIT SCORE = 6 (Lowest Pollution Potential)

**TABLE 59**  
**NPS Pollution Potential**

<b>WABASH HEADWATERS TO BELOW BEAR CREEK</b>							
SUBWATERSHED ATTRIBUTE	Stream Miles with <10' Vegetation SCORE	Operations <1,000' to stream SCORE	Tons Raw Manure per Year SCORE	Lbs. P <sub>2</sub> O <sub>5</sub> per Crop Acre SCORE	Household Disposal Systems in Groups SCORE	No. Homes Built pre-1973 SCORE	TOTAL SCORE
	10	9	10	5	3	7	44

MAP 49  
Wabash River Headwaters to below Bear Creek Land Use



**Legend**

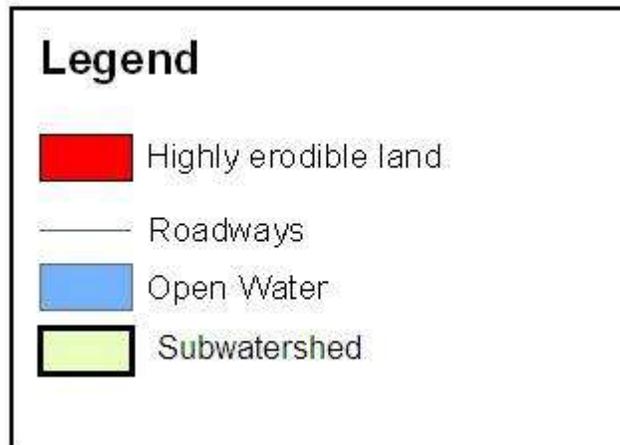
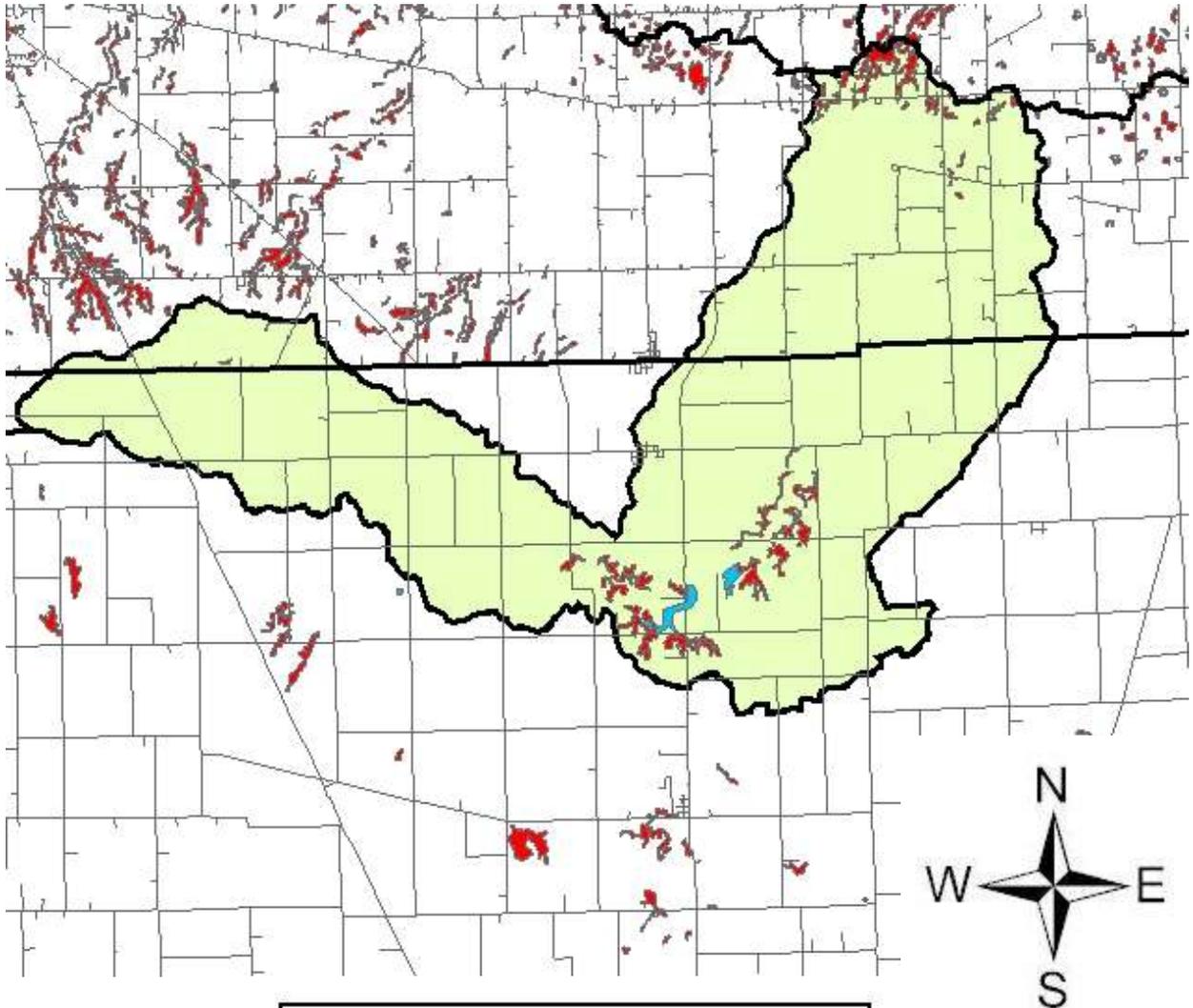
-  Grand Lake/Wabash Watershed
-  Roadways

**Land Use**

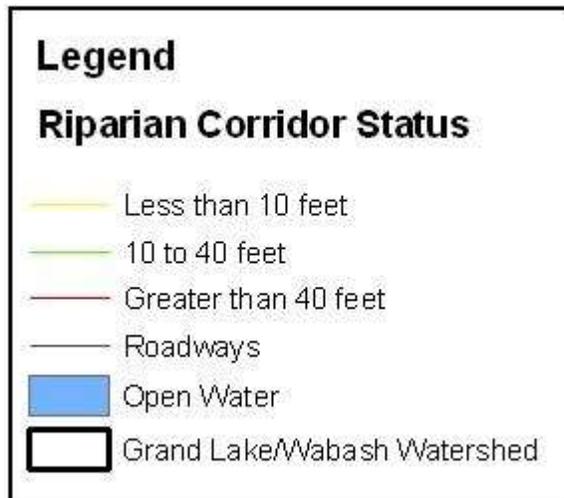
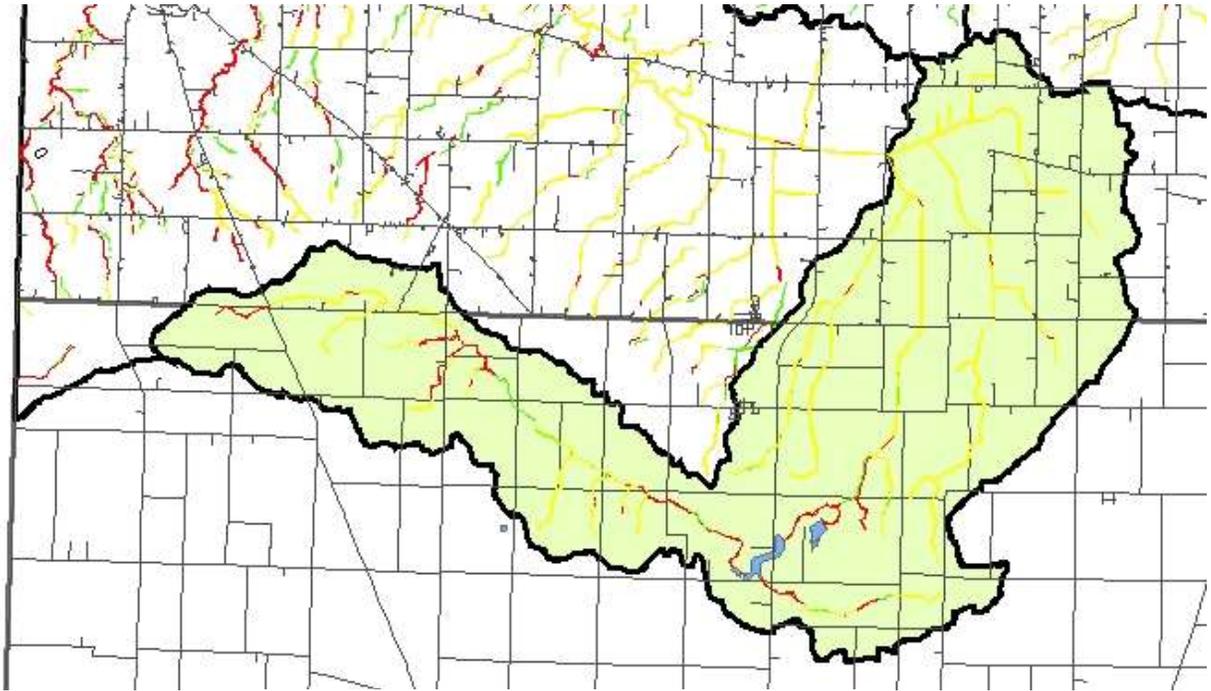
-  Cropland
-  Urban
-  Farmsteads
-  Shrub\_Brush
-  Deciduous Forest
-  Open Water
-  Wetlands
-  Barren/Undeveloped



MAP 50  
Wabash River Headwaters to below Bear Creek Highly Erodible Land



MAP 51  
Wabash River Headwaters to below Bear Creek Riparian Corridor Status



#### 4.2.2 Wabash River above Bear Creek below Stony Creek

The Wabash River above Bear Creek below Stony Creek subwatershed drains a large portion of southern side of the Wabash watershed. The majority of the subwatershed is located in Mercer County, and a small portion is located in Darke County. The acres, square miles, and percent of subwatershed are shown below. The Wabash River above Bear Creek below Stony Creek subwatershed, according to percentages, is the largest of the eight subwatersheds draining to the Wabash River. Of the entire Grand/Lake Wabash Watershed, it is the largest of fifteen subwatersheds.

TABLE 60

<b>WABASH RIVER ABOVE BEAR CREEK BELOW STONY CREEK</b>	
Acreage	33,347
Square Miles	52.10
% of Wabash Watershed Total Land Area	27.6%
% of Grand Lake/Wabash Watershed Total Land Area	18.6%

#### *Water Quality Status*

The Wabash River above Bear Creek below Stony Creek has been designated as a warm water habitat (WWH). This aquatic life use designation has been established by Ohio EPA, and based on recent data sampling, the water resource is shown as not meeting that use designation, or in a “non-attainment” status. Furthermore, the subwatershed is shown as NPS impacted. Suspected or proven impacts to these streams include: Agriculture-crop production, confined animal feeding operations, on-site wastewater treatment systems, channelization, removal of riparian vegetation and streambank destabilization. Definitions and criteria for these descriptives can be found in Appendix C aquatic life use designations and assessment terms.

A TMDL report for the Wabash River watershed was finalized by US EPA in August of 2004. The report showed that on average, all samples collected in this subwatershed were over the recommended total phosphorus level of 0.17 mg/L. On average, 33% of the samples were over the recommended nitrate-nitrite level of 1.5 mg/L, and 67% of the samples were over the recommended total suspended solids level of 32 mg/L.

#### *Water Supplies and Discharges*

There is one community water supply within the Wabash River above Bear Creek below Stony Creek subwatershed, the village of Fort Recovery. There are eight transient non-community water supplies, including; American Legion Post #345, Burkettsville Park PWS, Neil’s Restaurant & Bar, the Ranch Tavern, Saint Joe Store, VFW Post #6515 PWS, the Wagon Wheel Nite Club and Wendelin Tavern. Additionally, there is one non-transient, non-community water supply, Fort Recovery Industries.

Three Ohio EPA regulated point source discharges within this subwatershed include; Fort Recovery Industries, Inc., Fort Recovery WWTP and BP Amoco Oil Corporation.

Based on recent aerial photographs, areas where 10 or more household wastewater treatment and disposal systems were present in close proximity was determined. As with any individual treatment system operating in an area with poorly drained soils, the effects of the effluent on the receiving water body is a concern. These effects grow as the number of systems in a given area increases, thus clusters or groups of 10 or more systems has been used to analyze the potential effects of those systems on the water quality. Regarding the Wabash River above Bear Creek below Stony Creek subwatershed, there were a total of four clusters identified comprised of 52 individual treatment systems.

### *Highly Erodible Land*

Map 51 at the end of this subsection illustrates the highly erodible land locations within the Wabash River above Bear Creek below Stony Creek subwatershed. Of the eight subwatersheds within the Wabash River watershed, Wabash River above Bear Creek below Stony Creek ranks first in the amount of highly erodible land present within the subwatershed. The highly erodible land information was developed from the 2003 online NRCS Soil Data Mart.

### *Riparian Corridor Status*

The chart on the following page shows the riparian corridor status for the Wabash River above Bear Creek below Stony Creek subwatershed. The chart indicates the number of miles that has various widths of tree canopy, or riparian corridor. The numbers account for both sides of the streams; therefore, the number of actual stream miles is half of that shown. The divisions are less than 10 feet in total width, 10 feet to 40 feet in total width, and greater than 40 feet in total width. The chart is also divided into perennial and intermittent streams under each of the corridor width column headings. MAP 52 illustrates the stream sections under each division.

The chart shows that with a total of 181.63 miles of stream network, the Wabash River above Bear Creek below Stony Creek subwatershed has 98.36 miles of stream with less than 10 feet of canopy and vegetation, 33.09 miles of stream with 10 feet to 40 feet canopy and vegetation, and 50.18 miles of stream with greater than 40 feet of canopy and vegetation. Overall, the Wabash River above Bear Creek below Stony Creek subwatershed has the highest number of stream miles within the Wabash River Watershed, which is 32.2%. Of the entire Grand Lake/Wabash Watershed, this subwatershed has the highest number of stream miles, which is 25.8%.

TABLE 61

Riparian Corridor Status

<b>WABASH RIVER ABOVE BEAR CREEK BELOW STONY CREEK SUBWATERSHED</b>										
RIPARIAN STATUS	TREE CANOPY <10' IN TOTAL WIDTH			TREE CANOPY 10 to 40' IN WIDTH			TREE CANOPY >40' IN WIDTH			TOTAL STREAM MILES
	PEREN- NIAL	INTER- MITTENT	SUB- TOTAL	PEREN- NIAL	INTER- MITTENT	SUB- TOTAL	PEREN- NIAL	INTER- MITTENT	SUB- TOTAL	
	16.43	81.93	98.36	6.53	26.56	33.09	14.97	35.21	50.18	181.63
% of Subwatershed Total	9.0%	45.1%	54.2%	3.6%	14.6%	18.2%	8.2%	19.4%	27.6%	100.0%
% of Wabash Watershed Total	2.9%	14.5%	17.4%	1.2%	4.7%	5.9%	2.7%	6.2%	8.9%	32.2%
% of Grand Lake/Wabash Watershed Total	2.3%	11.6%	13.9%	0.9%	3.8%	4.7%	2.1%	5.0%	7.1%	25.8%

### *Operations and Animal Units*

The table on the following page shows the number of operations and the animal units by species for the Wabash River above Bear Creek below Stony Creek subwatershed. According to the table, there are 98 poultry operations, 40 dairy operations, 43 hog operations, 58 beef operations and 11 horse and sheep operations within the entire subwatershed. The Wabash River above Bear Creek below Stony Creek subwatershed ranks first within the entire Grand Lake/Wabash River Watershed when considering the total number of operations with 250 or 25.3%. Animal units within the subwatershed ranks first of 15 with 29.9%.

Totals of animal units for each species are also listed on the table. The inventory for this subwatershed was completed during October and November of 2006. At the time of the inventory animal units were determined by the number of animals present. Although this is not a 1:1 ratio for all species, it is for beef cattle. The following chart shows the number of each type of animal that makes up 1,000 animal units.

Animal Type	1,000 Animal Unit Equivalent
Beef Cattle	1,000
Dairy Cattle	700
Hogs (over 55 lbs)	2,500
Turkeys	55,000
Layer Chickens	82,000
Pullet Chickens	125,000
Sheep	10,000
Horses	500

Table 62  
Operations and Animal Units

WABASH RIVER ABOVE BEAR CREEK BELOW STONY CREEK														
ANIMAL TYPE	POULTRY		DAIRY		HOG		BEEF		OTHER		TOTAL		Total as % of Wabash Watershed	
	# OPER.	# A.U.s	# OPER.	# A.U.s	# OPER.	# A.U.s	# OPER.	# A.U.s	# OPER.	# A.U.s	# OPER.	# A.U.s	# OPER.	# A.U.s
# Farms and Animals	50 (Trky) 48	69,277 11,182	40	5,179	43	12,136	58	4,473	(sheep) 4 (hrs) 7	6 30	250	102,282	36.2%	43.2%
% of subwatershed total	39.2%	78.7%	16.0%	5.1%	17.2%	11.9%	23.2%	4.4%	4.4%	0.0%	100.0%	100.0%		
Total as % of Wabash Watershed	14.2%	34.0%	5.8%	2.2%	6.2%	5.1%	8.4%	1.9%	1.6%	0.0%	36.2%	43.2%		
Total as % of Grand Lake/Wabash Watershed	9.91%	23.55%	4.04%	1.52%	4.35%	3.55%	5.86%	1.31%	1.11%	0.01%	25.28%	29.93%		

## *Manure Production*

After considering the number of livestock operations and animal units present in the subwatershed, it is only fitting to consider the by-products of these animals. The table on the opposite page is used to represent the manure and nutrient production for the Wabash River above Bear Creek below Stony Creek drainage area. The subwatershed ranks first overall, of 15, in terms of manure production per annum. Approximately 503,909 tons of manure is produced annually. The remainder of the columns on the table indicates the approximate pounds of nutrients contained in that manure. Nitrogen, potassium, and phosphate, are all important to the agricultural community and are provided to the crops via manure or commercial fertilizer applications.

These nutrients are also important in regards to water quality. According to the table, in the Wabash River above Bear Creek below Stony Creek subwatershed, the amount of phosphorus that is contained in the manure produced annually would need to be applied at 305 pounds per acre. The table below indicates the average crop removal rates for phosphorus for the major crops produced in the watershed. Values were obtained from the Ohio Agronomy Guide.

<b>CROP</b>	<b>P<sub>2</sub>O<sub>5</sub> REMOVAL (lb/ac)</b>
Alfalfa (6T)	80
Corn (150 bu) Grain	55
Corn (25 T) Silage	80
Soybean (50 bu)	40
Wheat (75 bu) Grain	48

Considerations are given to the nutrient phosphorus due to its importance to crop production and the problems associated with the relationship between excessive phosphorus applications and degradation of water quality. Because much of the poultry manure is brokered out of the watershed, it seemed important to reflect the nutrient values assuming that 70% of the poultry manure is moved to locations outside the watershed. Local manure haulers estimated this value to be 90%; however, to be conservative, 70% was assumed for this plan. Under this assumption, the amount of phosphorus that is contained in the manure produced annually in this subwatershed would need to be applied at 124 pounds per acre.

What this seems to indicate throughout the watershed is that according to manure production and crop removal rates for limiting nutrient factors, there are not enough acres for proper manure application methods. The caveat on this statement is that the numbers are best estimates, variations in soil types and tith can vary throughout the fields which may increase, or decrease, crop removal rates, and more importantly, some of the manure produced in each of the subwatersheds may be applied to acreages outside of that subwatershed, or even outside of the Grand Lake/Wabash watershed. It should be noted that several producers own or rent land both in the Grand Lake/Wabash watershed and in neighboring watersheds such as Loramie Creek or the St Marys River.

Table 63  
Manure and Nutrient Production

<b>WABASH RIVER ABOVE BEAR CREEK BELOW STONY CREEK</b>						
Manure Production	Tons Raw Manure/Year	Lbs. N per Year	Lbs. K <sub>2</sub> O per Year	Lbs. P <sub>2</sub> O <sub>5</sub> per Year	Acres Cropland	Lbs. P <sub>2</sub> O <sub>5</sub> per Crop Acre
	503,909	10,659,868	6,305,234	8,526,877	27,943	305
Less 70% Poultry Manure**	276,928	4,644,907	3,050,530	3,475,907	27,943	124
Approximate \$ Value Per Year		\$2,345,171	\$945,785	\$1,705,375		
Total Nutrient Value Per Year = \$4,996,332						

\*\*Based on conversations with poultry manure brokers, it was estimated that at least 70% of the poultry manure is brokered out of the watershed.

The dollar values associated with each nutrient were obtained from OSU Extension Bulletin 604-06, "Ohio Livestock Manure Management Guide." The value for nitrogen is estimated at \$0.22 per pound, the value for P<sub>2</sub>O<sub>5</sub> is \$0.20 per pound and the value for K<sub>2</sub>O is \$0.15 per pound.

#### *Distance Between Livestock Operations and Streams*

The table on the following page shows the distance between various livestock operations located in the Wabash River above Bear Creek below Stony Creek subwatershed and the waterways that drain to the Wabash River. It can be assumed that the greater the distance between a livestock operation and a water system, the potential of pollution from the operation reaching the stream is lessened.

Of notable interest is the number of all livestock operations located less than 1,000 feet from the waterbody. In this particular subwatershed, 181 operations, or 72.7%, fall into the category. Also, 42 operations, 16.9%, are in within 2,000 feet and the remaining 10.4%, 26 operations, are less than 3,000 feet from the nearest stream.

Table 64  
Livestock Operations and Proximity to Streams

WABASH RIVER ABOVE BEAR CREEK BELOW STONY CREEK																		
ANIMAL TYPE	POULTRY			DAIRY			HOG			BEEF			OTHER			TOTAL		
	Distance to Stream			Distance to Stream			Distance to Stream			Distance to Stream			Distance to Stream			Distance to Stream		
	<1000'	<2000'	<3000'	<1000'	<2000'	<3000'	<1000'	<2000'	<3000'	<1000'	<2000'	<3000'	<1000'	<2000'	<3000'	<1000'	<2000'	<3000'
	71	20	7	30	3	7	29	8	5	44	9	5	7	2	2	181	42	26
% of Subwatershed Total	28.5%	8.0%	2.8%	12.0%	1.2%	2.8%	11.6%	3.2%	2.0%	17.7%	3.6%	2.0%	2.8%	0.8%	0.8%	72.7%	16.9%	10.4%

### *Non-Point Source Pollution Potential*

In order to provide a comparison of the pollution potential of each of the 15 subwatersheds, a ranking system for each of the main potential pollution sources was developed. These potential sources are stream miles with less than 10 feet of vegetation, the number of livestock or poultry operations less than 1,000 feet from a stream, the tons of raw manure produced yearly, the pounds of phosphorus per cropland acre available from the manure, the number of household wastewater disposal systems contained in clusters of ten or more) and the number of homes built pre-1973. Values of 1 (less potential) to 10 (great potential) were given based on ranges shown in the table of the following page. Indicator scores are then summed to obtain a total pollution potential score for the subwatershed.

Subwatershed pollution potential scores can range from a maximum of 60 points to a minimum of six points. The Wabash River above Bear Creek below Stony Creek subwatershed ranks of first out of 15, with 85% of the maximum points for pollution potential. Most significantly for the subwatershed is the number of stream miles with less than 10 feet of vegetation on the streambanks, the tonnage of raw manure generated per year, the number of operations within 1000 feet of streams and the number of homes built pre-1973. Wabash River above Bear Creek below Stony Creek subwatershed scored the maximum points for all four indicators.

## NONPOINT SOURCE POLLUTION POTENTIAL SCORING MATRIX

MAXIMUM DRAINAGE UNIT SCORE = 60 (Highest Pollution Potential)

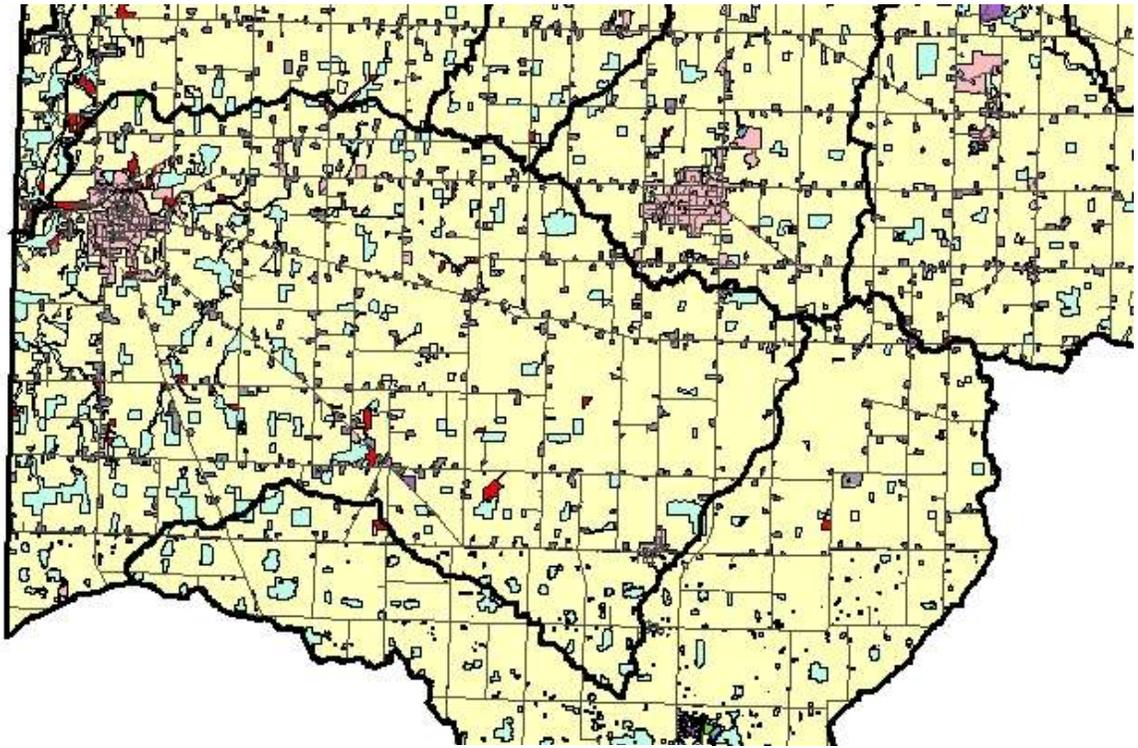
SCORE	Stream Miles with <10' Vegetation	Operations <1,000' to stream	Tons Raw Manure per Year	Lbs. P <sub>2</sub> O <sub>5</sub> per Crop Acre	Household Disposal Systems in Groups	No. Homes Built pre-1973
10	72.00+	46+	180,000+	225+	90+	226+
9	64.00 - 71.99	41 - 45	160,000 - 179,999	200 - 224	80 - 89	201 -225
8	56.00 - 63.99	36 - 40	140,000 - 159,999	175 - 199	70 - 79	176 -200
7	48.00 - 55.99	31 - 35	120,000 - 139,999	150 - 174	60 - 69	151 - 175
6	40.00 - 47.99	26 - 30	100,000 - 119,999	125 - 149	50 - 59	126 - 150
5	32.00 - 39.99	21 - 25	80,000 - 99,999	100 - 124	40 - 49	101 - 125
4	24.00 - 31.99	16 - 20	60,000 - 79,999	75- 99	30 - 39	76 - 100
3	16.00 - 23.99	11 - 15	40,000 - 59,999	50 - 74	20 - 29	51 - 75
2	8.00 - 15.99	6 - 10	20,000 - 39,999	25 - 49	10 - 19	26 - 50
1	0.00 - 7.99	0 - 5	0 - 19,999	0 - 24	0 - 10	0 - 25

MINIMUM DRAINAGE UNIT SCORE = 6 (Lowest Pollution Potential)

**TABLE 65**  
**NPS Pollution Potential**

<b>WABASH RIVER ABOVE BEAR CREEK BELOW STONY CREEK</b>							
SUBWATERSHED ATTRIBUTE	Stream Miles with <10' Vegetation SCORE	Operations <1,000' to stream SCORE	Tons Raw Manure per Year SCORE	Lbs. P <sub>2</sub> O <sub>5</sub> per Crop Acre SCORE	Household Disposal Systems in Groups SCORE	No. Homes Built pre-1973 SCORE	TOTAL SCORE
	10	10	10	5	6	10	51

MAP 52  
Wabash River above Bear Creek below Stony Creek Land Use



**Legend**

 Grand Lake/Wabash Watershed

 Roadways

**Land Use**

 Cropland

 Urban

 Farmsteads

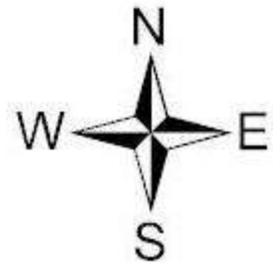
 Shrub\_Brush

 Deciduous Forest

 Open Water

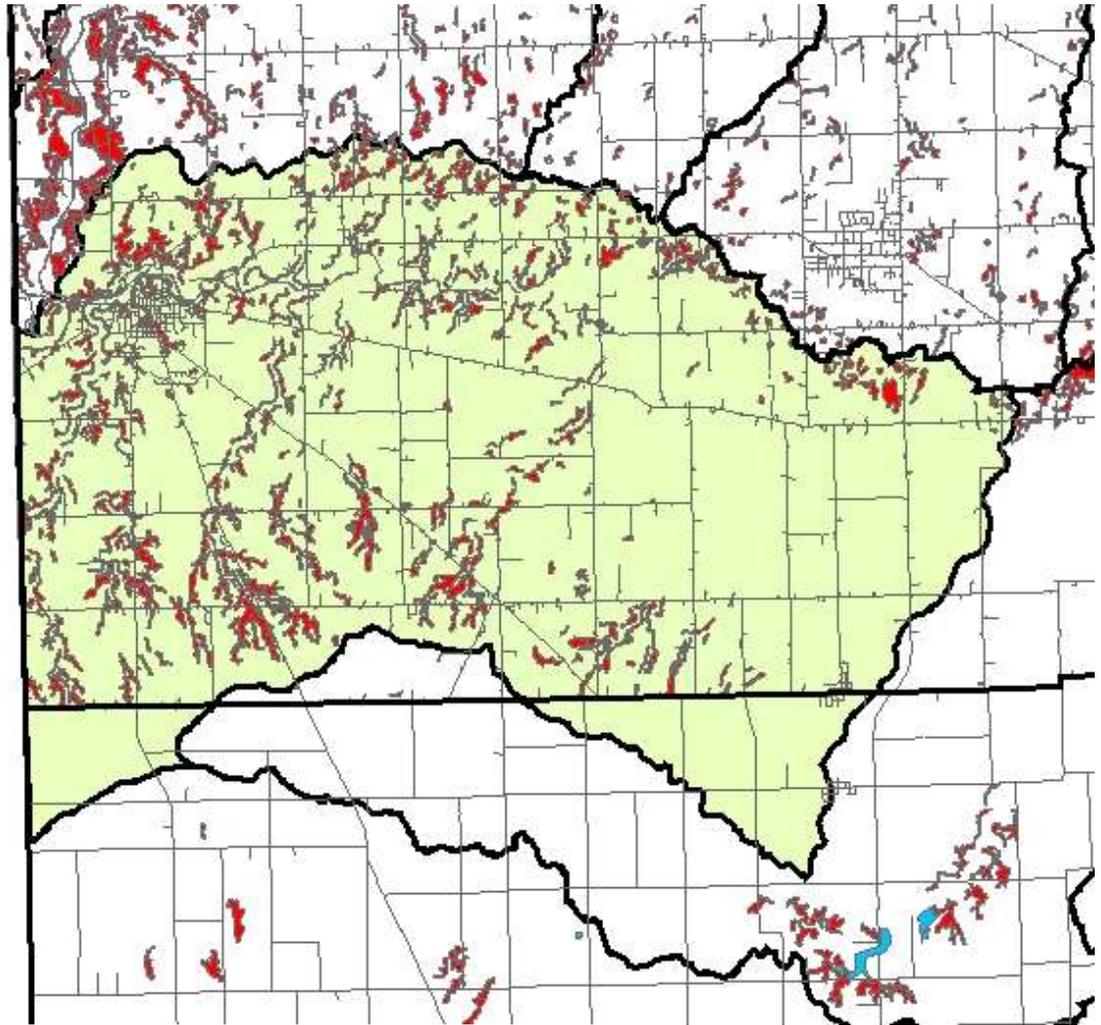
 Wetlands

 Barren/Undeveloped



# MAP 53

Wabash River above Bear Creek below Stony Creek Highly Erodible Land



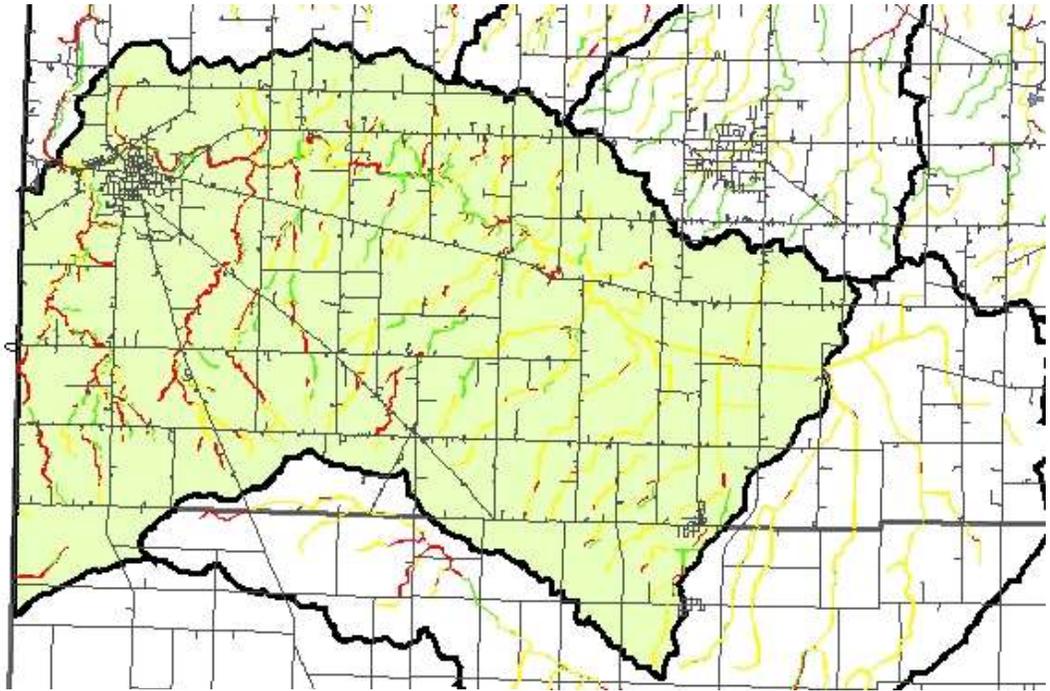
**Legend**

-  Highly erodible land
-  Roadways
-  Open Water
-  Subwatershed



# MAP 54

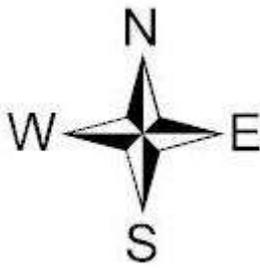
## Wabash River above Bear Creek below Stony Creek Riparian Corridor Status



**Legend**

**Riparian Corridor Status**

- Less than 10 feet
- 10 to 40 feet
- Greater than 40 feet
- Roadways
- Open Water
- Grand Lake/Wabash Watershed



#### 4.2.3 Wabash River below Stony Creek above Beaver Creek

The Wabash River below Stony Creek above Beaver Creek subwatershed drains the northern area of the Wabash River drainage basin. The entire subwatershed is located in Mercer County. The acres, square miles, and percent of subwatershed are shown below. The Wabash River below Stony Creek above Beaver Creek subwatershed, according to percentages, is the second largest of the eight subwatersheds draining to the Wabash River. Of the entire Grand/Lake Wabash Watershed, it is the second largest of fifteen subwatersheds.

TABLE 66

<b>WABASH RIVER BELOW STONY CREEK ABOVE BEAVER CREEK</b>	
Acreage	20,640
Square Miles	32.25
% of Wabash Watershed Total Land Area	17.1%
% of Grand Lake/Wabash Watershed Total Land Area	11.5%

#### *Water Quality Status*

The Wabash River below Stony Creek above Beaver Creek has been designated as a warm water habitat (WWH). This aquatic life use designation has been established by Ohio EPA, and based on recent data sampling, the water resource is shown as not meeting that use designation, or in a “non-attainment” status. Furthermore, the subwatershed is shown as NPS impacted. Suspected or proven impacts to these streams include: Agriculture-crop production, confined animal feeding operations, on-site wastewater treatment systems, channelization, removal of riparian vegetation and streambank destabilization. Definitions and criteria for these descriptives can be found in Appendix C aquatic life use designations and assessment terms.

A TMDL report for the Wabash River watershed was finalized by US EPA in August of 2004. The report showed that on average, all samples collected in this subwatershed were over the recommended total phosphorus level of 0.17 mg/L. On average, 50% of the samples were over the recommended nitrate-nitrite level of 1.5 mg/L, and 14% of the samples were over the recommended total suspended solids level of 32 mg/L.

#### *Water Supplies and Discharges*

There are no community water supplies within the Wabash River below Stony Creek above Beaver Creek subwatershed, no Ohio EPA regulated point source discharges, no non-transient non-community water supplies and no transient non-community water supplies.

Based on recent aerial photographs, areas where 10 or more household wastewater treatment and disposal systems were present in close proximity was determined. As

with any individual treatment system operating in an area with poorly drained soils, the effects of the effluent on the receiving water body is a concern. These effects grow as the number of systems in a given area increases, thus clusters or groups of 10 or more systems has been used to analyze the potential effects of those systems on the water quality. Regarding the Wabash River Below Stony Creek Above Beaver Creek subwatershed, there were a total of four clusters identified comprised of 60 individual treatment systems.

### *Highly Erodible Land*

Map 54 at the end of this subsection illustrates the highly erodible land locations within the Wabash River Below Stony Creek Above Beaver Creek subwatershed. Of the eight subwatersheds within the Wabash River watershed, Wabash River Below Stony Creek Above Beaver Creek ranks second highest in the amount of highly erodible land present within the subwatershed. The highly erodible land information was developed from the 2003 online NRCS Soil Data Mart.

### *Riparian Corridor Status*

The chart on the following page shows the riparian corridor status for the Wabash River below Stony Creek above Beaver Creek subwatershed. The chart indicates the number of miles that has various widths of tree canopy, or riparian corridor. The numbers account for both sides of the streams; therefore, the number of actual stream miles is half of that shown. The divisions are less than 10 feet in total width, 10 feet to 40 feet in total width, and greater than 40 feet in total width. The chart is also divided into perennial and intermittent streams under each of the corridor width column headings. MAP 55 illustrates the stream sections under each division.

The chart shows that with a total of 91.74 miles of stream network, the Wabash River below Stony Creek above Beaver Creek subwatershed has 48.58 miles of stream with less than 10 feet of canopy and vegetation, 21.02 miles of stream with 10 feet to 40 feet canopy and vegetation, and 22.14 miles of stream with greater than 40 feet of canopy and vegetation. Overall, the Wabash River below Stony Creek above Beaver Creek subwatershed has the third highest number of stream miles within the Wabash River Watershed, which is 16.2%. Of the entire Grand Lake/Wabash Watershed, this subwatershed has the third highest number of stream miles, which is 13.0%.

TABLE 67

Riparian Corridor Status

WABASH RIVER BELOW STONY CREEK ABOVE BEAVER CREEK										
RIPARIAN STATUS	TREE CANOPY <10' IN TOTAL WIDTH			TREE CANOPY 10 to 40' IN WIDTH			TREE CANOPY >40' IN WIDTH			TOTAL STREAM MILES
	PEREN- NIAL	INTER- MITTENT	SUB- TOTAL	PEREN- NIAL	INTER- MITTENT	SUB- TOTAL	PEREN- NIAL	INTER- MITTENT	SUB- TOTAL	
	16.98	31.60	48.58	9.82	11.20	21.02	11.93	10.21	22.14	91.74
% of Subwatershed Total	18.5%	34.4%	53.0%	10.7%	12.2%	22.9%	13.0%	11.1%	24.1%	100.0%
% of Wabash Watershed Total	3.0%	5.6%	8.6%	1.7%	2.0%	3.7%	2.1%	1.8%	3.9%	16.2%
% of Grand Lake/Wabash Watershed Total	2.4%	4.5%	6.9%	1.4%	1.6%	3.0%	1.7%	1.4%	3.1%	13.0%

### *Operations and Animal Units*

The table on the following page shows the number of operations and the animal units by species for the Wabash River below Stony Creek above Beaver Creek subwatershed. According to the table, there are 19 poultry operations, 15 dairy operations, 27 hog operations, 62 beef operations and 10 horse and sheep operations within the entire subwatershed. The Wabash River below Stony Creek above Beaver Creek subwatershed ranks second within the entire Grand Lake/Wabash River Watershed when considering the total number of operations with 133 or 13.5%. Animal units within the subwatershed ranks fifth of 15 with 8.7%.

Totals of animal units for each species are also listed on the table. The inventory for this subwatershed was completed during October and November of 2006. At the time of the inventory animal units were determined by the number of animals present. Although this is not a 1:1 ratio for all species, it is for beef cattle. The following chart shows the number of each type of animal that makes up 1,000 animal units.

Animal Type	1,000 Animal Unit Equivalent
Beef Cattle	1,000
Dairy Cattle	700
Hogs (over 55 lbs)	2,500
Turkeys	55,000
Layer Chickens	82,000
Pullet Chickens	125,000
Sheep	10,000
Horses	500

Table 68  
Operations and Animal Units

WABASH RIVER BELOW STONY CREEK ABOVE BEAVER CREEK														
ANIMAL TYPE	POULTRY		DAIRY		HOG		BEEF		OTHER		TOTAL		Total as % of Wabash Watershed	
	# OPER.	# A.U.s	# OPER.	# A.U.s	# OPER.	# A.U.s	# OPER.	# A.U.s	# OPER.	# A.U.s	# OPER.	# A.U.s	# OPER.	# A.U.s
# Farms and Animals	10 (Trky) 9	9,239 2,400	15	1,236	27	13,320	62	3,394	(sheep) 1 (hrs) 9	3 74	133	29,665	19.2%	12.5%
% of subwatershed total	14.3%	39.2%	11.3%	4.2%	20.3%	44.9%	46.6%	11.4%	7.5%	0.3%	100.0%	100.0%		
Total as % of Wabash Watershed	2.7%	4.9%	2.2%	0.5%	3.9%	5.6%	9.0%	1.4%	1.4%	0.0%	19.2%	12.5%		
Total as % of Grand Lake/Wabash Watershed	1.92%	3.41%	1.52%	0.36%	2.73%	3.90%	6.27%	0.99%	1.01%	0.02%	13.45%	8.68%		

## *Manure Production*

After considering the number of livestock operations and animal units present in the subwatershed, it is only fitting to consider the by-products of these animals. The table on the opposite page is used to represent the manure and nutrient production for the Wabash River below Stony Creek above Beaver Creek drainage area. The subwatershed ranks fifth overall, of 15, in terms of manure production per annum. Approximately 167,028 tons of manure is produced annually. The remainder of the columns on the table indicates the approximate pounds of nutrients contained in that manure. Nitrogen, potassium, and phosphate, are all important to the agricultural community and are provided to the crops via manure or commercial fertilizer applications.

These nutrients are also important in regards to water quality. According to the table, in the Wabash River below Stony Creek above Beaver Creek subwatershed, the amount of phosphorus that is contained in the manure produced annually would need to be applied at 121 pounds per acre. The table below indicates the average crop removal rates for phosphorus for the major crops produced in the watershed. Values were obtained from the Ohio Agronomy Guide.

<b>CROP</b>	<b>P<sub>2</sub>O<sub>5</sub> REMOVAL (lb/ac)</b>
Alfalfa (6T)	80
Corn (150 bu) Grain	55
Corn (25 T) Silage	80
Soybean (50 bu)	40
Wheat (75 bu) Grain	48

Considerations are given to the nutrient phosphorus due to its importance to crop production and the problems associated with the relationship between excessive phosphorus applications and degradation of water quality. Because much of the poultry manure is brokered out of the watershed, it seemed important to reflect the nutrient values assuming that 70% of the poultry manure is moved to locations outside the watershed. Local manure haulers estimated this value to be 90%; however, to be conservative, 70% was assumed for this plan. Under this assumption, the amount of phosphorus that is contained in the manure produced annually in this subwatershed would need to be applied at 77 pounds per acre.

What this seems to indicate throughout the watershed is that according to manure production and crop removal rates for limiting nutrient factors, there are not enough acres for proper manure application methods. The caveat on this statement is that the numbers are best estimates, variations in soil types and tith can vary throughout the fields which may increase, or decrease, crop removal rates, and more importantly, some of the manure produced in each of the subwatersheds may be applied to acreages outside of that subwatershed, or even outside of the Grand Lake/Wabash watershed. It should be noted that several producers own or rent land both in the Grand Lake/Wabash watershed and in neighboring watersheds such as Loramie Creek or the St Marys River.

Table 69  
Manure and Nutrient Production

<b>WABASH RIVER BELOW STONY CREEK ABOVE BEAVER CREEK</b>						
Manure Production	Tons Raw Manure/Year	Lbs. N per Year	Lbs. K <sub>2</sub> O per Year	Lbs. P <sub>2</sub> O <sub>5</sub> per Year	Acres Cropland	Lbs. P <sub>2</sub> O <sub>5</sub> per Crop Acre
	167,028	2,802,833	1,903,854	2,141,849	17,744	121
Less 70% Poultry Manure**	130,794	1,840,427	1,371,460	1,364,676	17,744	77
Approximate \$ Value Per Year		\$616,623	\$285,578	\$428,370		
Total Nutrient Value Per Year = \$1,330,571						

\*\*Based on conversations with poultry manure brokers, it was estimated that at least 70% of the poultry manure is brokered out of the watershed.

The dollar values associated with each nutrient were obtained from OSU Extension Bulletin 604-06, "Ohio Livestock Manure Management Guide." The value for nitrogen is estimated at \$0.22 per pound, the value for P<sub>2</sub>O<sub>5</sub> is \$0.20 per pound and the value for K<sub>2</sub>O is \$0.15 per pound.

#### *Distance Between Livestock Operations and Streams*

The table on the following page shows the distance between various livestock operations located in the Wabash River below Stony Creek above Beaver Creek subwatershed and the waterways that drain to the Wabash River. It can be assumed that the greater the distance between a livestock operation and a water system, the potential of pollution from the operation reaching the stream is lessened.

Of notable interest is the number of all livestock operations located less than 1,000 feet from the waterbody. In this particular subwatershed, of 133 operations, 75 operations, or 56.4%, fall into the category. Also, 37 operations, 27.8%, are in within 2,000 feet and the remaining 15.8%, 21 operations, are less than 3,000 feet from the nearest stream.

Table 70  
Livestock Operations and Proximity to Streams

<b>WABASH RIVER BELOW STONY CREEK ABOVE BEAVER CREEK</b>																		
<b>ANIMAL TYPE</b>	POULTRY			DAIRY			HOG			BEEF			OTHER			TOTAL		
	Distance to Stream			Distance to Stream			Distance to Stream			Distance to Stream			Distance to Stream			Distance to Stream		
	<1000'	<2000'	<3000'	<1000'	<2000'	<3000'	<1000'	<2000'	<3000'	<1000'	<2000'	<3000'	<1000'	<2000'	<3000'	<1000'	<2000'	<3000'
	14	3	2	8	3	4	13	9	5	35	19	8	5	3	2	75	37	21
% of Subwatershed Total	10.5%	2.3%	1.5%	6.0%	2.3%	3.0%	9.8%	6.8%	3.8%	26.3%	14.3%	6.0%	3.8%	2.3%	1.5%	56.4%	27.8%	15.8%

### *Non-Point Source Pollution Potential*

In order to provide a comparison of the pollution potential of each of the 15 subwatersheds, a ranking system for each of the main potential pollution sources was developed. These potential sources are stream miles with less than 10 feet of vegetation, the number of livestock or poultry operations less than 1,000 feet from a stream, the tons of raw manure produced yearly, the pounds of phosphorus per cropland acre available from the manure, the number of household wastewater disposal systems contained in clusters of ten or more) and the number of homes built pre-1973. Values of 1 (less potential) to 10 (great potential) were given based on ranges shown in the table of the following page. Indicator scores are then summed to obtain a total pollution potential score for the subwatershed.

Subwatershed pollution potential scores can range from a maximum of 60 points to a minimum of six points. The Wabash River below Stony Creek above Beaver Creek subwatershed ranks second out of 15, with 75% of the maximum points for pollution potential. Most significantly for the subwatershed is the number of operations within 1000 feet of streams. Wabash River below Stony Creek above Beaver Creek subwatershed scored the maximum points for this indicator and scored the second highest amount of points for the number of homes built pre-1973.

## NONPOINT SOURCE POLLUTION POTENTIAL SCORING MATRIX

MAXIMUM DRAINAGE UNIT SCORE = 60 (Highest Pollution Potential)

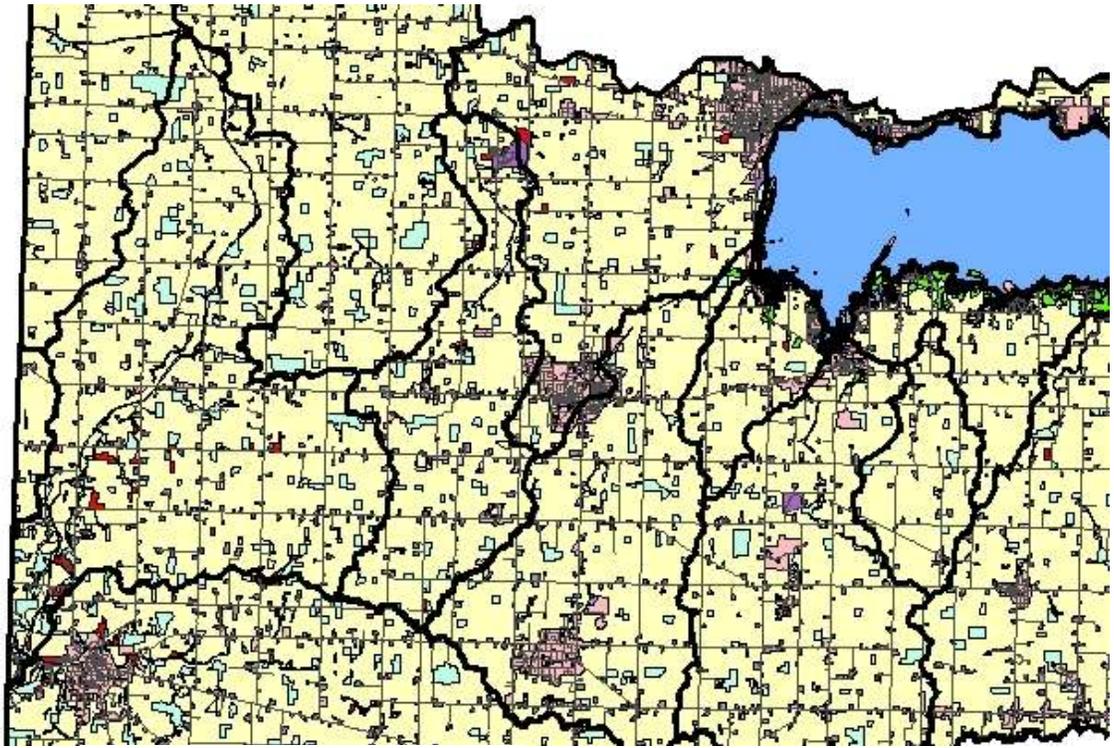
SCORE	Stream Miles with <10' Vegetation	Operations <1,000' to stream	Tons Raw Manure per Year	Lbs. P <sub>2</sub> O <sub>5</sub> per Crop Acre	Household Disposal Systems in Groups	No. Homes Built pre-1973
10	72.00+	46+	180,000+	225+	90+	226+
9	64.00 - 71.99	41 - 45	160,000 - 179,999	200 - 224	80 - 89	201 -225
8	56.00 - 63.99	36 - 40	140,000 - 159,999	175 - 199	70 - 79	176 -200
7	48.00 - 55.99	31 - 35	120,000 - 139,999	150 - 174	60 - 69	151 - 175
6	40.00 - 47.99	26 - 30	100,000 - 119,999	125 - 149	50 - 59	126 - 150
5	32.00 - 39.99	21 - 25	80,000 - 99,999	100 - 124	40 - 49	101 - 125
4	24.00 - 31.99	16 - 20	60,000 - 79,999	75- 99	30 - 39	76 - 100
3	16.00 - 23.99	11 - 15	40,000 - 59,999	50 - 74	20 - 29	51 - 75
2	8.00 - 15.99	6 - 10	20,000 - 39,999	25 - 49	10 - 19	26 - 50
1	0.00 - 7.99	0 - 5	0 - 19,999	0 - 24	0 - 10	0 - 25

MINIMUM DRAINAGE UNIT SCORE = 6 (Lowest Pollution Potential)

**TABLE 71**  
**NPS Pollution Potential**

<b>WABASH RIVER BELOW STONY CREEK ABOVE BEAVER CREEK</b>							
SUBWATERSHED ATTRIBUTE	Stream Miles with <10' Vegetation SCORE	Operations <1,000' to stream SCORE	Tons Raw Manure per Year SCORE	Lbs. P <sub>2</sub> O <sub>5</sub> per Crop Acre SCORE	Household Disposal Systems in Groups SCORE	No. Homes Built pre-1973 SCORE	TOTAL SCORE
	7	10	8	4	7	9	45

MAP 55  
Wabash River below Stony Creek above Beaver Creek Land Use

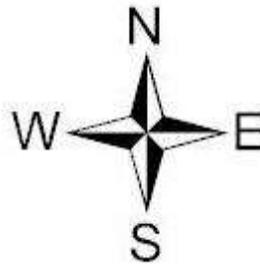


**Legend**

- Grand Lake/Wabash Watershed
- Roadways

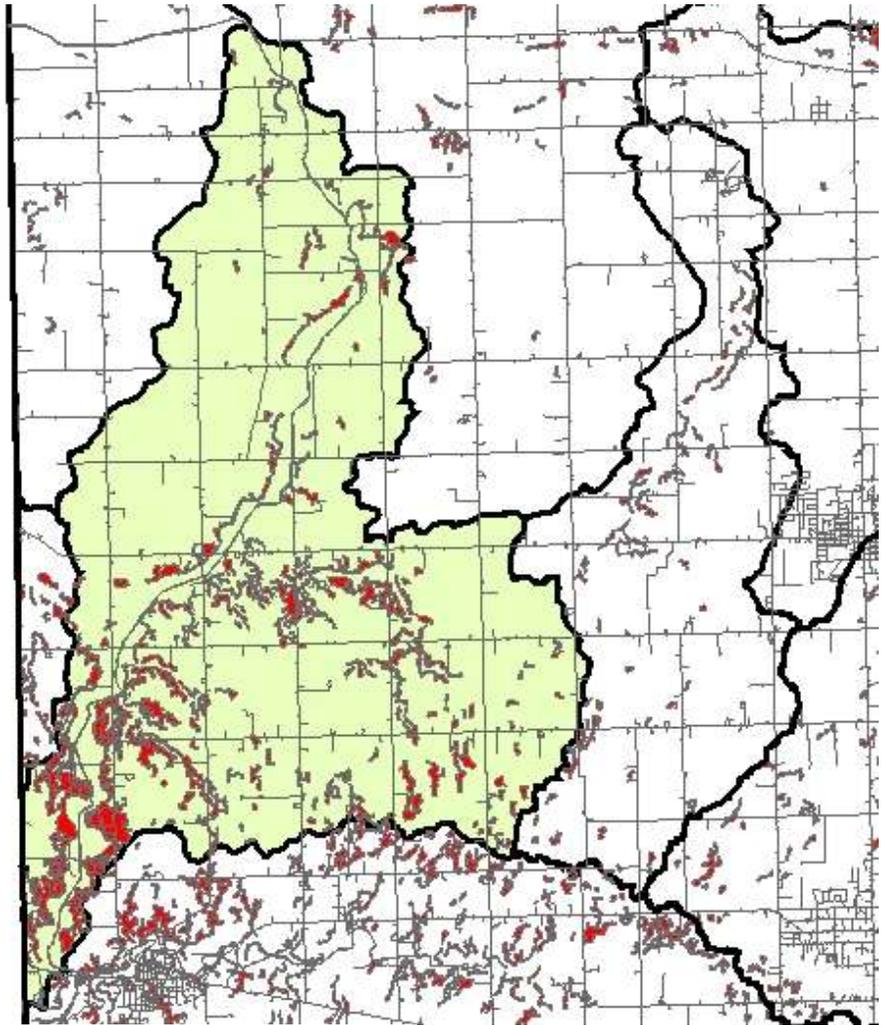
**Land Use**

- Cropland
- Urban
- Farmsteads
- Shrub\_Brush
- Deciduous Forest
- Open Water
- Wetlands
- Barren/Undeveloped



# MAP 56

Wabash River below Stony Creek above Beaver Creek Highly Erodible Land



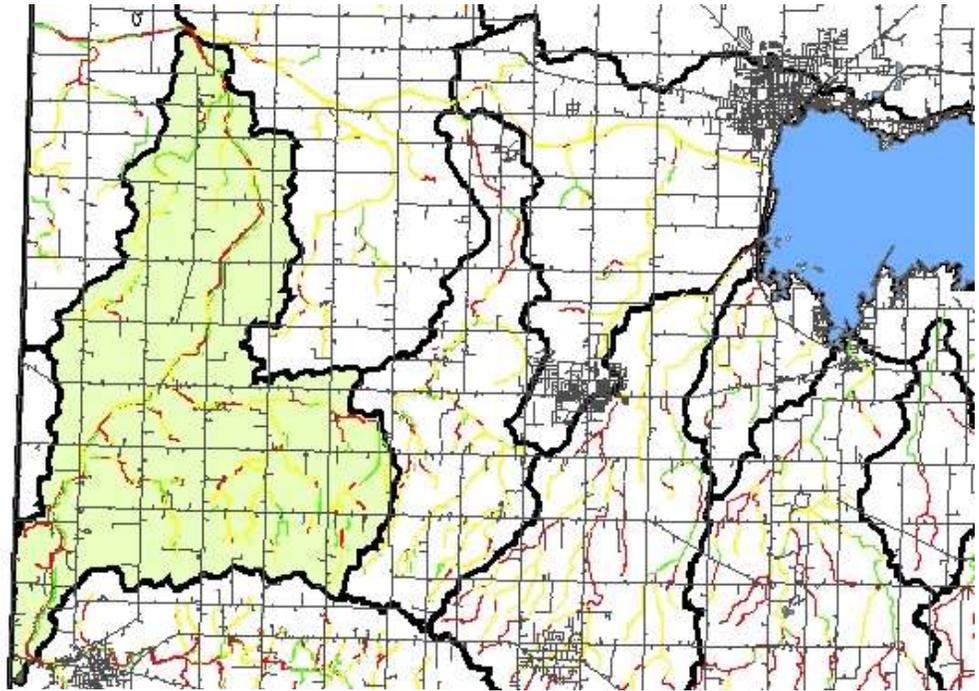
**Legend**

-  Highly erodible land
-  Roadways
-  Open Water
-  Subwatershed



# MAP 57

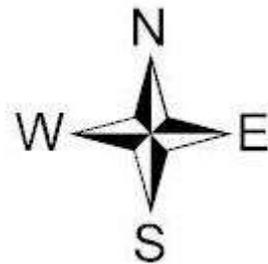
## Wabash River below Stony Creek above Beaver Creek Riparian Corridor Status



**Legend**

**Riparian Corridor Status**

-  Less than 10 feet
-  10 to 40 feet
-  Greater than 40 feet
-  Roadways
-  Open Water
-  Grand Lake/Wabash Watershed



#### 4.2.4 Beaver Creek from Grand Lake to above Little Beaver Creek

The Beaver Creek from Grand Lake to Above Little Beaver Creek subwatershed drains the eastern area of the Wabash River drainage basin, directly west of Grand Lake St. Marys. The entire subwatershed is located in Mercer County. The acres, square miles, and percent of subwatershed are shown below. The Beaver Creek from Grand Lake to Above Little Beaver Creek subwatershed, according to percentages, is the fifth largest of the eight subwatersheds draining to the Wabash River. Of the entire Grand/Lake Wabash Watershed, it is the seventh largest of fifteen subwatersheds.

TABLE 72

<b>BEAVER CREEK FROM GRAND LAKE TO ABOVE LITTLE BEAVER CREEK</b>	
Acreage	12,347
Square Miles	19.29
% of Wabash Watershed Total Land Area	10.2%
% of Grand Lake/Wabash Watershed Total Land Area	6.9%

#### *Water Quality Status*

The Beaver Creek from Grand Lake to Above Little Beaver Creek subwatershed has been designated as a warm water habitat (WWH). This aquatic life use designation has been established by Ohio EPA, and based on recent data sampling, the water resource is shown as not meeting that use designation, or in a “non-attainment” status. Furthermore, the subwatershed is shown as NPS impacted. Suspected or proven impacts to these streams include: non-irrigated crop production, animal feeding operations, channelization, removal of riparian vegetation and stream bank destabilization. Definitions and criteria for these descriptives can be found in Appendix C aquatic life use designations and assessment terms.

A TMDL report for the Wabash River watershed was finalized by US EPA in August of 2004. Ohio EPA is also completing a TMDL report for Beaver Creek and Grand Lake St. Marys, which is currently in process of being finalized. The 2004 report showed that on average, all samples collected in this subwatershed were over the recommended total phosphorus level of 0.17 mg/L. On average, 80% of the samples were over the recommended nitrate-nitrite level of 1.5 mg/L, and 40% of the samples were over the recommended total suspended solids level of 32 mg/L. The draft TMDL report currently being completed calls for an 86% reduction in phosphorus, a 12% reduction in nitrate and a 34% reduction in fecal coliform for this subwatershed.

#### *Water Supplies and Discharges*

There are one community water supply within the Beaver Creek from Grand Lake to above Little Beaver Creek subwatershed, the City of Celina. There are two transient

non-community water supplies, Lefeld Implement, Inc. and ODOT-Mercer County Garage PWS, and there is one non-transient non-community water supply, Pax Machine Works, Inc.

There are seven Ohio EPA regulated point source discharges, including; the Celina Municipal WTP, the Celina WWTP, the Coldwater WWTP, CW Services Bulk Plant, the Mercer County Home WWTP, the Mercer County Community Wagner WWTP and Pax Machine Works, Inc.

Based on recent aerial photographs, areas where 10 or more household wastewater treatment and disposal systems were present in close proximity was determined. As with any individual treatment system operating in an area with poorly drained soils, the effects of the effluent on the receiving water body is a concern. These effects grow as the number of systems in a given area increases, thus clusters or groups of 10 or more systems has been used to analyze the potential effects of those systems on the water quality. Regarding the Beaver Creek from Grand Lake to Above Little Beaver Creek subwatershed, there were a total of ten clusters identified comprised of 178 individual treatment systems.

#### *Highly Erodible Land*

Map 57 at the end of this subsection illustrates the highly erodible land locations within the Beaver Creek from Grand Lake to Above Little Beaver Creek subwatershed. Of the eight subwatersheds within the Wabash River watershed, Beaver Creek from Grand Lake to Above Little Beaver Creek ranks last in the amount of highly erodible land present within the subwatershed. The highly erodible land information was developed from the 2003 online NRCS Soil Data Mart.

#### *Riparian Corridor Status*

The chart on the following page shows the riparian corridor status for the Beaver Creek from Grand Lake to Above Little Beaver Creek subwatershed. The chart indicates the number of miles that has various widths of tree canopy, or riparian corridor. The numbers account for both sides of the streams; therefore, the number of actual stream miles is half of that shown. The divisions are less than 10 feet in total width, 10 feet to 40 feet in total width, and greater than 40 feet in total width. The chart is also divided into perennial and intermittent streams under each of the corridor width column headings. MAP 58 illustrates the stream sections under each division.

The chart shows that with a total of 39.14 miles of stream network, the Beaver Creek from Grand Lake to Above Little Beaver Creek subwatershed has 30.62 miles of stream with less than 10 feet of canopy and vegetation, 5.26 miles of stream with 10 feet to 40 feet canopy and vegetation, and 3.26 miles of stream with greater than 40 feet of canopy and vegetation. Overall, the Beaver Creek from Grand Lake to Above Little Beaver Creek subwatershed has the sixth highest number of stream miles within the Wabash River Watershed, which is 6.9%. Of the entire Grand Lake/Wabash Watershed, this subwatershed has the ninth highest number of stream miles, which is 5.6%.

TABLE 73

Riparian Corridor Status

<b>BEAVER CREEK FROM GRAND LAKE TO ABOVE LITTLE BEAVER CREEK</b>										
RIPARIAN STATUS	TREE CANOPY <10' IN TOTAL WIDTH			TREE CANOPY 10 to 40' IN WIDTH			TREE CANOPY >40' IN WIDTH			TOTAL STREAM MILES
	PEREN- NIAL	INTER- MITTENT	SUB- TOTAL	PEREN- NIAL	INTER- MITTENT	SUB- TOTAL	PEREN- NIAL	INTER- MITTENT	SUB- TOTAL	
	11.11	19.51	30.62	0.00	5.26	5.26	0.65	2.61	3.26	39.14
% of Subwatershed Total	28.4%	49.8%	78.2%	0.0%	13.4%	13.4%	1.7%	6.7%	8.3%	100.0%
% of Wabash Watershed Total	2.0%	3.5%	5.4%	0.0%	0.9%	0.9%	0.1%	0.5%	0.6%	6.9%
% of Grand Lake/Wabash Watershed Total	1.6%	2.8%	4.3%	0.0%	0.7%	0.7%	0.1%	0.4%	0.5%	5.6%

### *Operations and Animal Units*

The table on the following page shows the number of operations and the animal units by species for the Beaver Creek from Grand Lake to Above Little Beaver Creek subwatershed. According to the table, there are two poultry operations, two dairy operations, three hog operations, 17 beef operations and 11 horse and sheep operations within the entire subwatershed. The Beaver Creek from Grand Lake to Above Little Beaver Creek subwatershed ranks tenth within the entire Grand Lake/Wabash River Watershed when considering the total number of operations with 35 or 3.5%. Animal units within the subwatershed ranks eleventh of 15 with 1.4%.

Totals of animal units for each species are also listed on the table. The inventory for this subwatershed was completed during October of 2006. At the time of the inventory animal units were determined by the number of animals present. Although this is not a 1:1 ratio for all species, it is for beef cattle. The following chart shows the number of each type of animal that makes up 1,000 animal units.

Animal Type	1,000 Animal Unit Equivalent
Beef Cattle	1,000
Dairy Cattle	700
Hogs (over 55 lbs)	2,500
Turkeys	55,000
Layer Chickens	82,000
Pullet Chickens	125,000
Sheep	10,000
Horses	500

Table 74  
Operations and Animal Units

BEAVER CREEK FROM GRAND LAKE TO ABOVE LITTLE BEAVER CREEK														
ANIMAL TYPE	POULTRY		DAIRY		HOG		BEEF		OTHER		TOTAL		Total as % of Wabash Watershed	
# Farms and Animals	# OPER.	# A.U.s	# OPER.	# A.U.s	# OPER.	# A.U.s	# OPER.	# A.U.s	# OPER.	# A.U.s	# OPER.	# A.U.s	# OPER.	# A.U.s
	1	640	2	229	3	2,820	17	865	(sheep) 1	1	35	4,930	5.1%	2.1%
	(Trky) 1	327							(hrs) 10	48				
% of subwatershed total	5.7%	19.6%	5.7%	4.6%	8.6%	57.2%	48.6%	17.5%	31.4%	1.0%	100.0%	100.0%		
Total as % of Wabash Watershed	0.3%	0.4%	0.3%	0.1%	0.4%	1.2%	2.5%	0.4%	1.6%	0.0%	5.1%	2.1%		
Total as % of Grand Lake/Wabash Watershed	0.20%	0.28%	0.20%	0.07%	0.30%	0.83%	1.72%	0.25%	1.11%	0.01%	3.54%	1.44%		

## *Manure Production*

After considering the number of livestock operations and animal units present in the subwatershed, it is only fitting to consider the by-products of these animals. The table on the opposite page is used to represent the manure and nutrient production for the Beaver Creek from Grand Lake to Above Little Beaver Creek drainage area. The subwatershed ranks eleventh overall, of 15, in terms of manure production per annum. Approximately 30,783 tons of manure is produced annually. The remainder of the columns on the table indicates the approximate pounds of nutrients contained in that manure. Nitrogen, potassium, and phosphate, are all important to the agricultural community and are provided to the crops via manure or commercial fertilizer applications.

These nutrients are also important in regards to water quality. According to the table, in the Beaver Creek from Grand Lake to Above Little Beaver Creek subwatershed, the amount of phosphorus that is contained in the manure produced annually would need to be applied at 37 pounds per acre. The table below indicates the average crop removal rates for phosphorus for the major crops produced in the watershed. Values were obtained from the Ohio Agronomy Guide.

<b>CROP</b>	<b>P<sub>2</sub>O<sub>5</sub> REMOVAL (lb/ac)</b>
Alfalfa (6T)	80
Corn (150 bu) Grain	55
Corn (25 T) Silage	80
Soybean (50 bu)	40
Wheat (75 bu) Grain	48

Considerations are given to the nutrient phosphorus due to its importance to crop production and the problems associated with the relationship between excessive phosphorus applications and degradation of water quality. Because much of the poultry manure is brokered out of the watershed, it seemed important to reflect the nutrient values assuming that 70% of the poultry manure is moved to locations outside the watershed. Local manure haulers estimated this value to be 90%; however, to be conservative, 70% was assumed for this plan. Under this assumption, the amount of phosphorus that is contained in the manure produced annually in this subwatershed would need to be applied at 29 pounds per acre.

Table 75  
Manure and Nutrient Production

<b>BEAVER CREEK FROM GRAND LAKE TO ABOVE LITTLE BEAVER CREEK</b>						
Manure Production	Tons Raw Manure/Year	Lbs. N per Year	Lbs. K <sub>2</sub> O per Year	Lbs. P <sub>2</sub> O <sub>5</sub> per Year	Acres Cropland	Lbs. P <sub>2</sub> O <sub>5</sub> per Crop Acre
	30,783	459,003	332,066	328,475	8,916	37
Less 70% Poultry Manure**	27,199	359,830	277,952	259,943	8,916	29
Approximate \$ Value Per Year		\$100,981	\$49,810	\$65,695		
Total Nutrient Value Per Year = \$216,485						

\*\*Based on conversations with poultry manure brokers, it was estimated that at least 70% of the poultry manure is brokered out of the watershed.

The dollar values associated with each nutrient were obtained from OSU Extension Bulletin 604-06, "Ohio Livestock Manure Management Guide." The value for nitrogen is estimated at \$0.22 per pound, the value for P<sub>2</sub>O<sub>5</sub> is \$0.20 per pound and the value for K<sub>2</sub>O is \$0.15 per pound.

#### *Distance Between Livestock Operations and Streams*

The table on the following page shows the distance between various livestock operations located in the Beaver Creek from Grand Lake to Above Little Beaver Creek subwatershed and the waterways that drain to the Wabash River. It can be assumed that the greater the distance between a livestock operation and a water system, the potential of pollution from the operation reaching the stream is lessened.

Of notable interest is the number of all livestock operations located less than 1,000 feet from the waterbody. In this particular subwatershed, of 35 operations, 11 operations, or 31.4%, fall into the category. Also, nine operations, 25.7%, are in within 2,000 feet and the remaining 42.9%, 15 operations, are less than 3,000 feet from the nearest stream.

Table 76  
Livestock Operations and Proximity to Streams

BEAVER CREEK FROM GRAND LAKE TO ABOVE LITTLE BEAVER CREEK																		
ANIMAL TYPE	POULTRY			DAIRY			HOG			BEEF			OTHER			TOTAL		
	Distance to Stream			Distance to Stream			Distance to Stream			Distance to Stream			Distance to Stream			Distance to Stream		
	<1000'	<2000'	<3000'	<1000'	<2000'	<3000'	<1000'	<2000'	<3000'	<1000'	<2000'	<3000'	<1000'	<2000'	<3000'	<1000'	<2000'	<3000'
	1	0	1	1	0	1	0	2	1	6	5	6	3	2	6	11	9	15
% of Subwatershed Total	2.9%	0.0%	2.9%	2.9%	0.0%	2.9%	0.0%	5.7%	2.9%	17.1%	14.3%	17.1%	8.6%	5.7%	17.1%	31.4%	25.7%	42.9%

### *Non-Point Source Pollution Potential*

In order to provide a comparison of the pollution potential of each of the 15 subwatersheds, a ranking system for each of the main potential pollution sources was developed. These potential sources are stream miles with less than 10 feet of vegetation, the number of livestock or poultry operations less than 1,000 feet from a stream, the tons of raw manure produced yearly, the pounds of phosphorus per cropland acre available from the manure, the number of household wastewater disposal systems contained in clusters of ten or more) and the number of homes built pre-1973. Values of 1 (less potential) to 10 (great potential) were given based on ranges shown in the table of the following page. Indicator scores are then summed to obtain a total pollution potential score for the subwatershed.

Subwatershed pollution potential scores can range from a maximum of 60 points to a minimum of six points. The Beaver Creek from Grand Lake to Above Little Beaver Creek subwatershed ranks ninth out of 15, with 46.7% of the maximum points for pollution potential. Most significantly for the subwatershed is the number of household disposal systems in groups. Beaver Creek from Grand Lake to Above Little Beaver Creek subwatershed scored the maximum points for this indicator.

## NONPOINT SOURCE POLLUTION POTENTIAL SCORING MATRIX

MAXIMUM DRAINAGE UNIT SCORE = 60 (Highest Pollution Potential)

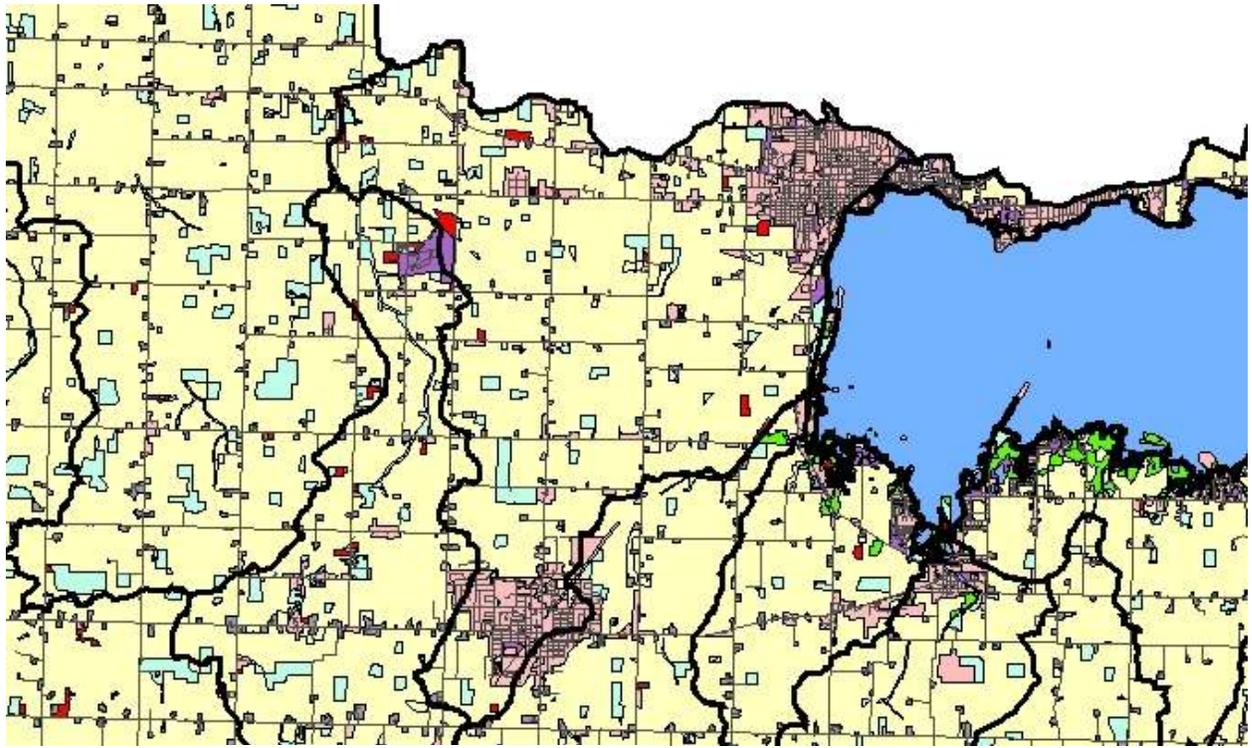
SCORE	Stream Miles with <10' Vegetation	Operations <1,000' to stream	Tons Raw Manure per Year	Lbs. P <sub>2</sub> O <sub>5</sub> per Crop Acre	Household Disposal Systems in Groups	No. Homes Built pre-1973
10	72.00+	46+	180,000+	225+	90+	226+
9	64.00 - 71.99	41 - 45	160,000 - 179,999	200 - 224	80 - 89	201 - 225
8	56.00 - 63.99	36 - 40	140,000 - 159,999	175 - 199	70 - 79	176 - 200
7	48.00 - 55.99	31 - 35	120,000 - 139,999	150 - 174	60 - 69	151 - 175
6	40.00 - 47.99	26 - 30	100,000 - 119,999	125 - 149	50 - 59	126 - 150
5	32.00 - 39.99	21 - 25	80,000 - 99,999	100 - 124	40 - 49	101 - 125
4	24.00 - 31.99	16 - 20	60,000 - 79,999	75 - 99	30 - 39	76 - 100
3	16.00 - 23.99	11 - 15	40,000 - 59,999	50 - 74	20 - 29	51 - 75
2	8.00 - 15.99	6 - 10	20,000 - 39,999	25 - 49	10 - 19	26 - 50
1	0.00 - 7.99	0 - 5	0 - 19,999	0 - 24	0 - 10	0 - 25

MINIMUM DRAINAGE UNIT SCORE = 6 (Lowest Pollution Potential)

**TABLE 77**  
**NPS Pollution Potential**

<b>BEAVER CREEK FROM GRAND LAKE TO ABOVE LITTLE BEAVER CREEK</b>							
SUBWATERSHED ATTRIBUTE	Stream Miles with <10' Vegetation SCORE	Operations <1,000' to stream SCORE	Tons Raw Manure per Year SCORE	Lbs. P <sub>2</sub> O <sub>5</sub> per Crop Acre SCORE	Household Disposal Systems in Groups SCORE	No. Homes Built pre-1973 SCORE	TOTAL SCORE
	4	3	2	2	10	7	28

MAP 58  
Beaver Creek from Grand Lake to above Little Beaver Creek Land Use



**Legend**

 Grand Lake/Wabash Watershed

 Roadways

**Land Use**

 Cropland

 Urban

 Farmsteads

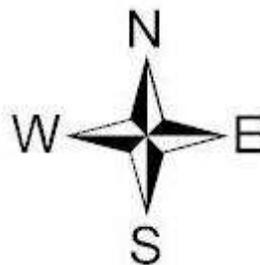
 Shrub\_Brush

 Deciduous Forest

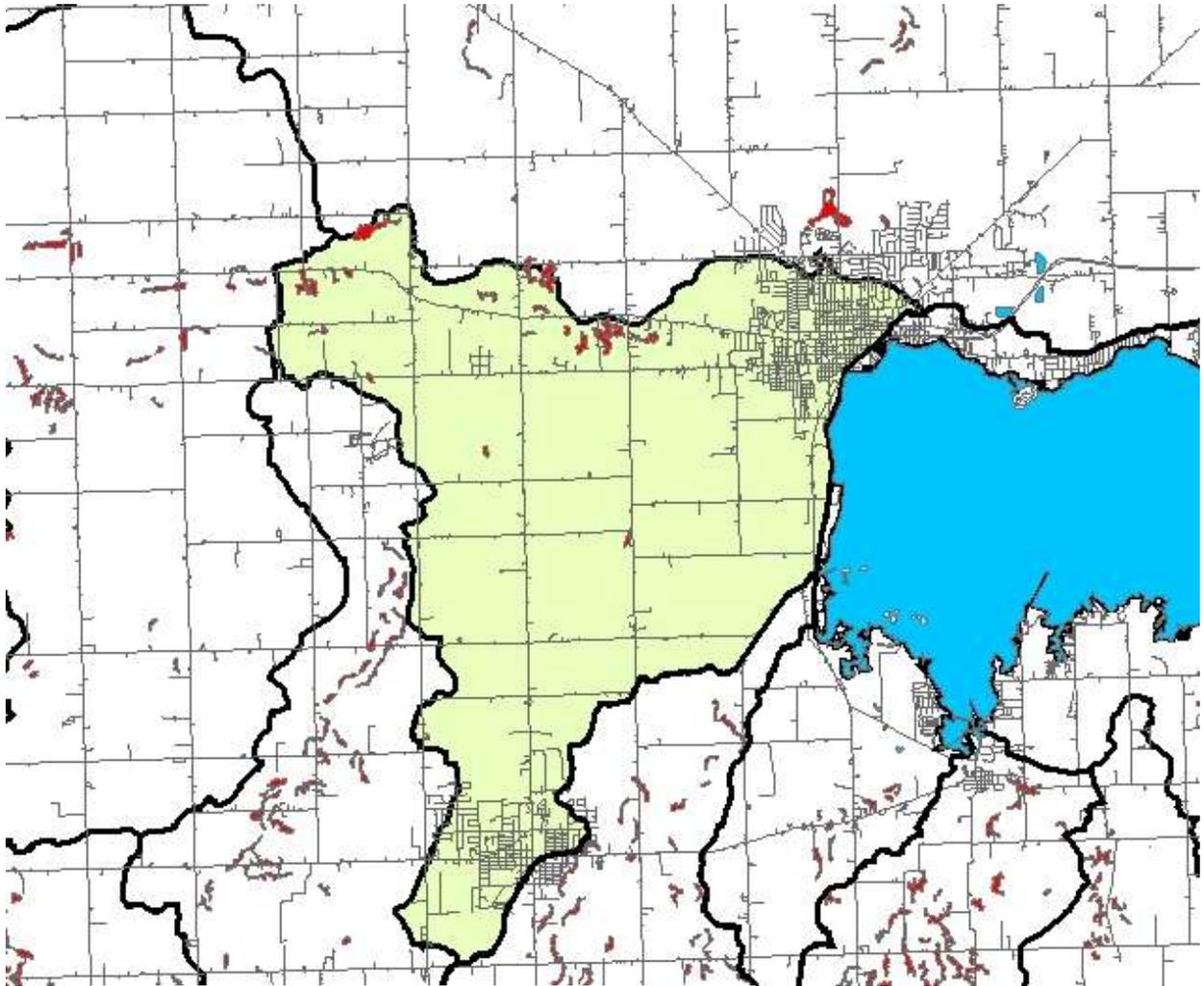
 Open Water

 Wetlands

 Barren/Undeveloped

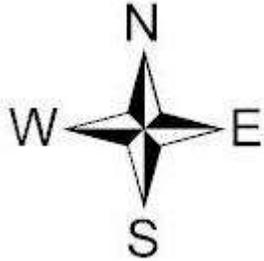


MAP 59  
Beaver Creek from Grand Lake to above Little Beaver Creek Highly Erodible Land

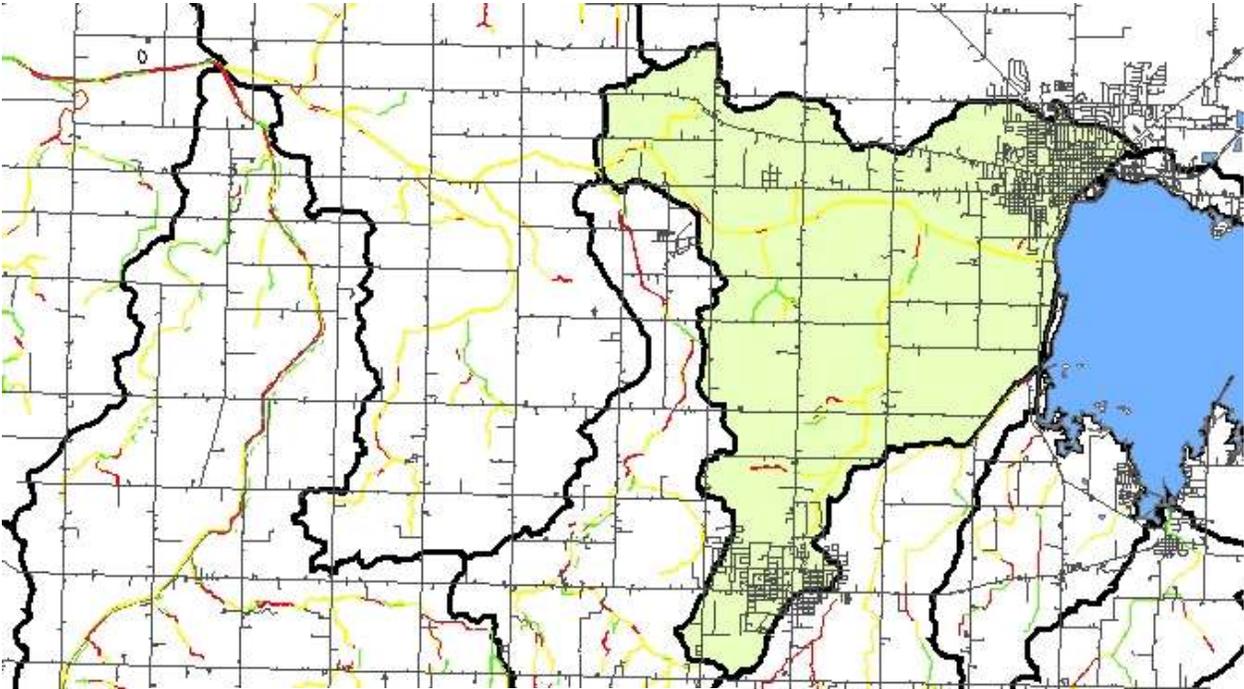


**Legend**

-  Highly erodible land
-  Roadways
-  Open Water
-  Subwatershed



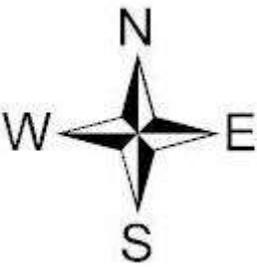
MAP 60  
Beaver Creek from Grand Lake to above Little Beaver Creek Riparian Corridor  
Status



**Legend**

**Riparian Corridor Status**

- Less than 10 feet
- 10 to 40 feet
- Greater than 40 feet
- Roadways
- Open Water
- Grand Lake/Wabash Watershed



#### 4.2.5 Little Beaver Creek

The Little Beaver Creek subwatershed drains the Little Beaver Creek watershed and is in the center portion of the Wabash River drainage basin. Little Beaver Creek enters Beaver Creek prior to Beaver Creek entering the Wabash River. The entire subwatershed is located in Mercer County. The acres, square miles, and percent of subwatershed are shown below. The Little Beaver Creek subwatershed, according to percentages, is the sixth largest of the eight subwatersheds draining to the Wabash River. Of the entire Grand/Lake Wabash Watershed, it is the ninth largest of fifteen subwatersheds.

TABLE 78

LITTLE BEAVER CREEK	
Acreage	9,092
Square Miles	14.2
% of Wabash Watershed Total Land Area	7.5%
% of Grand Lake/Wabash Watershed Total Land Area	5.1%

#### *Water Quality Status*

The Little Beaver Creek subwatershed has been designated as a warm water habitat (WWH). This aquatic life use designation has been established by Ohio EPA, and based on recent data sampling, the water resource is shown as not meeting that use designation, or in a “non-attainment” status. Furthermore, the subwatershed is shown as NPS impacted. Suspected or proven impacts to these streams include: non-irrigated crop production, animal feeding operations, channelization, removal of riparian vegetation and stream bank destabilization. Definitions and criteria for these descriptives can be found in Appendix C aquatic life use designations and assessment terms.

A TMDL report for the Wabash River watershed was finalized by US EPA in August of 2004. Ohio EPA is also completing a TMDL report for Beaver Creek and Grand Lake St. Marys, which is currently in process of being finalized. The 2004 report showed that on average, all samples collected in this subwatershed were over the recommended total phosphorus level of 0.17 mg/L. On average, 50% of the samples were over the recommended nitrate-nitrite level of 1.5 mg/L, and 100% of the samples were over the recommended total suspended solids level of 32 mg/L. The draft TMDL report currently being completed calls for a 92% reduction in phosphorus, a 0% reduction in nitrate and a 55% reduction in fecal coliform for this subwatershed.

### *Water Supplies and Discharges*

There are no community water supplies within the Little Beaver Creek subwatershed. There is one transient non-community water supply, Philothea Country Club, and there is one non-transient non-community water supply, Hemmelgarn & Sons, Inc. PWS. There are two Ohio EPA regulated point source discharges, the Philothea SD WWTP and Stoneco, Inc. Karch Quarry.

Based on recent aerial photographs, areas where 10 or more household wastewater treatment and disposal systems were present in close proximity was determined. As with any individual treatment system operating in an area with poorly drained soils, the effects of the effluent on the receiving water body is a concern. These effects grow as the number of systems in a given area increases, thus clusters or groups of 10 or more systems has been used to analyze the potential effects of those systems on the water quality. Regarding the Little Beaver Creek subwatershed, there were a total of five clusters identified comprised of 115 individual treatment systems.

### *Highly Erodible Land*

Map 60 at the end of this subsection illustrates the highly erodible land locations within the Little Beaver Creek subwatershed. Of the eight subwatersheds within the Wabash River watershed, Little Beaver Creek ranks third highest in the amount of highly erodible land present within the subwatershed. The highly erodible land information was developed from the 2003 online NRCS Soil Data Mart.

### *Riparian Corridor Status*

The chart on the following page shows the riparian corridor status for the Little Beaver Creek subwatershed. The chart indicates the number of miles that has various widths of tree canopy, or riparian corridor. The numbers account for both sides of the streams; therefore, the number of actual stream miles is half of that shown. The divisions are less than 10 feet in total width, 10 feet to 40 feet in total width, and greater than 40 feet in total width. The chart is also divided into perennial and intermittent streams under each of the corridor width column headings. MAP 61 illustrates the stream sections under each division.

The chart shows that with a total of 55.44 miles of stream network, the Little Beaver Creek subwatershed has 38.73 miles of stream with less than 10 feet of canopy and vegetation, 6.47 miles of stream with 10 feet to 40 feet canopy and vegetation, and 10.24 miles of stream with greater than 40 feet of canopy and vegetation. Overall, the Little Beaver Creek subwatershed has the fifth highest number of stream miles within the Wabash River Watershed, which is 9.8%. Of the entire Grand Lake/Wabash Watershed, this subwatershed has the fifth highest number of stream miles, which is 7.9%.

TABLE 79

Riparian Corridor Status

LITTLE BEAVER CREEK										
RIPARIAN STATUS	TREE CANOPY <10' IN TOTAL WIDTH			TREE CANOPY 10 to 40' IN WIDTH			TREE CANOPY >40' IN WIDTH			TOTAL STREAM MILES
	PEREN- NIAL	INTER- MITTENT	SUB- TOTAL	PEREN- NIAL	INTER- MITTENT	SUB- TOTAL	PEREN- NIAL	INTER- MITTENT	SUB- TOTAL	
	11.89	26.84	38.73	2.88	3.59	6.47	6.58	3.66	10.24	55.44
% of Subwatershed Total	21.4%	48.4%	69.9%	5.2%	6.5%	11.7%	11.9%	6.6%	18.5%	100.0%
% of Wabash Watershed Total	2.1%	4.8%	6.9%	0.5%	0.6%	1.1%	1.2%	0.6%	1.8%	9.8%
% of Grand Lake/Wabash Watershed Total	1.7%	3.8%	5.5%	0.4%	0.5%	0.9%	0.9%	0.5%	1.5%	7.9%

### *Operations and Animal Units*

The table on the following page shows the number of operations and the animal units by species for the Little Beaver Creek subwatershed. According to the table, there are three poultry operations, 17 dairy operations, 14 hog operations, 23 beef operations and five horse and sheep operations within the entire subwatershed. The Little Beaver Creek subwatershed ranks seventh within the entire Grand Lake/Wabash River Watershed when considering the total number of operations with 62 or 6.3%. Animal units within the subwatershed ranks eighth of 15 with 3.2%.

Totals of animal units for each species are also listed on the table. The inventory for this subwatershed was completed during October and November of 2006. At the time of the inventory animal units were determined by the number of animals present. Although this is not a 1:1 ratio for all species, it is for beef cattle. The following chart shows the number of each type of animal that makes up 1,000 animal units.

Animal Type	1,000 Animal Unit Equivalent
Beef Cattle	1,000
Dairy Cattle	700
Hogs (over 55 lbs)	2,500
Turkeys	55,000
Layer Chickens	82,000
Pullet Chickens	125,000
Sheep	10,000
Horses	500

Table 80  
Operations and Animal Units

LITTLE BEAVER CREEK														
ANIMAL TYPE	POULTRY		DAIRY		HOG		BEEF		OTHER		TOTAL		Total as % of Wabash Watershed	
# Farms and Animals	# OPER.	# A.U.s	# OPER.	# A.U.s	# OPER.	# A.U.s	# OPER.	# A.U.s	# OPER.	# A.U.s	# OPER.	# A.U.s	# OPER.	# A.U.s
	2 (Trky) 1	1,445 218	17	2,543	14	5,088	23	1,660	(sheep) 2 (hrs) 3	33 26	62	11,013	9.0%	4.7%
% of subwatershed total	4.8%	15.1%	27.4%	23.1%	22.6%	46.2%	37.1%	15.1%	8.1%	0.5%	100.0%	100.0%		
Total as % of Wabash Watershed	0.4%	0.7%	2.5%	1.1%	2.0%	2.2%	3.3%	0.7%	0.7%	0.0%	9.0%	4.7%		
Total as % of Grand Lake/Wabash Watershed	0.30%	0.49%	1.72%	0.74%	1.42%	1.49%	2.33%	0.49%	0.51%	0.02%	6.27%	3.22%		

## *Manure Production*

After considering the number of livestock operations and animal units present in the subwatershed, it is only fitting to consider the by-products of these animals. The table on the opposite page is used to represent the manure and nutrient production for the Little Beaver Creek drainage area. The subwatershed ranks eighth overall, of 15, in terms of manure production per annum. Approximately 85,575 tons of manure is produced annually. The remainder of the columns on the table indicates the approximate pounds of nutrients contained in that manure. Nitrogen, potassium, and phosphate, are all important to the agricultural community and are provided to the crops via manure or commercial fertilizer applications.

These nutrients are also important in regards to water quality. According to the table, in the Little Beaver Creek subwatershed, the amount of phosphorus that is contained in the manure produced annually would need to be applied at 88 pounds per acre. The table below indicates the average crop removal rates for phosphorus for the major crops produced in the watershed. Values were obtained from the Ohio Agronomy Guide.

<b>CROP</b>	<b>P<sub>2</sub>O<sub>5</sub> REMOVAL (lb/ac)</b>
Alfalfa (6T)	80
Corn (150 bu) Grain	55
Corn (25 T) Silage	80
Soybean (50 bu)	40
Wheat (75 bu) Grain	48

Considerations are given to the nutrient phosphorus due to its importance to crop production and the problems associated with the relationship between excessive phosphorus applications and degradation of water quality. Because much of the poultry manure is brokered out of the watershed, it seemed important to reflect the nutrient values assuming that 70% of the poultry manure is moved to locations outside the watershed. Local manure haulers estimated this value to be 90%; however, to be conservative, 70% was assumed for this plan. Under this assumption, the amount of phosphorus that is contained in the manure produced annually in this subwatershed would need to be applied at 76 pounds per acre.

What this seems to indicate throughout the watershed is that according to manure production and crop removal rates for limiting nutrient factors, there are not enough acres for proper manure application methods. The caveat on this statement is that the numbers are best estimates, variations in soil types and tith can vary throughout the fields which may increase, or decrease, crop removal rates, and more importantly, some of the manure produced in each of the subwatersheds may be applied to acreages outside of that subwatershed, or even outside of the Grand Lake/Wabash watershed. It should be noted that several producers own or rent land both in the Grand Lake/Wabash watershed and in neighboring watersheds such as Loramie Creek or the St Marys River.

**Table 81**  
**Manure and Nutrient Production**

<b>LITTLE BEAVER CREEK</b>						
Manure Production	Tons Raw Manure/Year	Lbs. N per Year	Lbs. K <sub>2</sub> O per Year	Lbs. P <sub>2</sub> O <sub>5</sub> per Year	Acres Cropland	Lbs. P <sub>2</sub> O <sub>5</sub> per Crop Acre
	85,575	1,094,876	816,338	694,794	7,875	88
Less 70% Poultry Manure**	80,757	958,589	748,653	596,364	7,875	76
Approximate \$ Value Per Year		\$240,873	\$122,451	\$138,959		
Total Nutrient Value Per Year = \$502,282						

\*\*Based on conversations with poultry manure brokers, it was estimated that at least 70% of the poultry manure is brokered out of the watershed.

The dollar values associated with each nutrient were obtained from OSU Extension Bulletin 604-06, "Ohio Livestock Manure Management Guide." The value for nitrogen is estimated at \$0.22 per pound, the value for P<sub>2</sub>O<sub>5</sub> is \$0.20 per pound and the value for K<sub>2</sub>O is \$0.15 per pound.

*Distance Between Livestock Operations and Streams*

The table on the following page shows the distance between various livestock operations located in the Little Beaver Creek subwatershed and the waterways that drain to the Wabash River. It can be assumed that the greater the distance between a livestock operation and a water system, the potential of pollution from the operation reaching the stream is lessened.

Of notable interest is the number of all livestock operations located less than 1,000 feet from the waterbody. In this particular subwatershed, of 62 operations, 43 operations, or 70.5%, fall into the category. Also, 10 operations, 16.4%, are in within 2,000 feet and the remaining 13.1% are less than 3,000 feet from the nearest stream.

Table 82  
Livestock Operations and Proximity to Streams

<b>LITTLE BEAVER CREEK</b>																		
<b>ANIMAL TYPE</b>	POULTRY			DAIRY			HOG			BEEF			OTHER			TOTAL		
	Distance to Stream			Distance to Stream			Distance to Stream			Distance to Stream			Distance to Stream			Distance to Stream		
	<1000'	<2000'	<3000'	<1000'	<2000'	<3000'	<1000'	<2000'	<3000'	<1000'	<2000'	<3000'	<1000'	<2000'	<3000'	<1000'	<2000'	<3000'
	2	0	1	15	2	0	8	3	2	14	5	4	4	0	1	43	10	8
% of Subwatershed Total	3.3%	0.0%	1.6%	24.6%	3.3%	0.0%	13.1%	4.9%	3.3%	23.0%	8.2%	6.6%	6.6%	0.0%	1.6%	70.5%	16.4%	13.1%

### *Non-Point Source Pollution Potential*

In order to provide a comparison of the pollution potential of each of the 15 subwatersheds, a ranking system for each of the main potential pollution sources was developed. These potential sources are stream miles with less than 10 feet of vegetation, the number of livestock or poultry operations less than 1,000 feet from a stream, the tons of raw manure produced yearly, the pounds of phosphorus per cropland acre available from the manure, the number of household wastewater disposal systems contained in clusters of ten or more) and the number of homes built pre-1973. Values of 1 (less potential) to 10 (great potential) were given based on ranges shown in the table of the following page. Indicator scores are then summed to obtain a total pollution potential score for the subwatershed.

Subwatershed pollution potential scores can range from a maximum of 60 points to a minimum of six points. The Little Beaver Creek subwatershed ranks sixth out of 15, with 63.3% of the maximum points for pollution potential. Most significantly for the subwatershed is the number of household disposal systems in groups. Little Beaver Creek subwatershed scored the maximum points for this indicator and also scored the second highest point value for the number of operations within 1,000 feet of a stream.

## NONPOINT SOURCE POLLUTION POTENTIAL SCORING MATRIX

MAXIMUM DRAINAGE UNIT SCORE = 60 (Highest Pollution Potential)

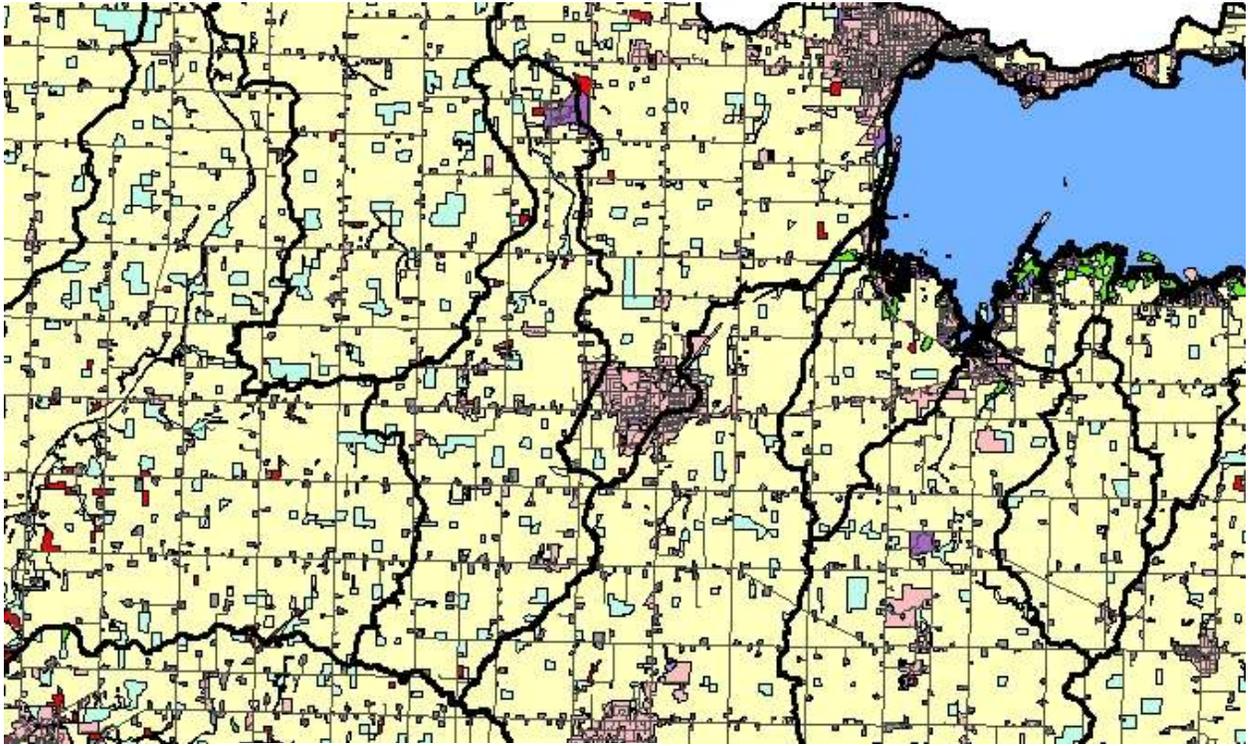
SCORE	Stream Miles with <10' Vegetation	Operations <1,000' to stream	Tons Raw Manure per Year	Lbs. P <sub>2</sub> O <sub>5</sub> per Crop Acre	Household Disposal Systems in Groups	No. Homes Built pre-1973
10	72.00+	46+	180,000+	225+	90+	226+
9	64.00 - 71.99	41 - 45	160,000 - 179,999	200 - 224	80 - 89	201 - 225
8	56.00 - 63.99	36 - 40	140,000 - 159,999	175 - 199	70 - 79	176 - 200
7	48.00 - 55.99	31 - 35	120,000 - 139,999	150 - 174	60 - 69	151 - 175
6	40.00 - 47.99	26 - 30	100,000 - 119,999	125 - 149	50 - 59	126 - 150
5	32.00 - 39.99	21 - 25	80,000 - 99,999	100 - 124	40 - 49	101 - 125
4	24.00 - 31.99	16 - 20	60,000 - 79,999	75 - 99	30 - 39	76 - 100
3	16.00 - 23.99	11 - 15	40,000 - 59,999	50 - 74	20 - 29	51 - 75
2	8.00 - 15.99	6 - 10	20,000 - 39,999	25 - 49	10 - 19	26 - 50
1	0.00 - 7.99	0 - 5	0 - 19,999	0 - 24	0 - 10	0 - 25

MINIMUM DRAINAGE UNIT SCORE = 6 (Lowest Pollution Potential)

**TABLE 83**  
**NPS Pollution Potential**

<b>LITTLE BEAVER CREEK</b>							
SUBWATERSHED ATTRIBUTE	Stream Miles with <10' Vegetation SCORE	Operations <1,000' to stream SCORE	Tons Raw Manure per Year SCORE	Lbs. P <sub>2</sub> O <sub>5</sub> per Crop Acre SCORE	Household Disposal Systems in Groups SCORE	No. Homes Built pre-1973 SCORE	TOTAL SCORE
	5	9	5	4	10	5	38

MAP 61  
Little Beaver Creek Land Use

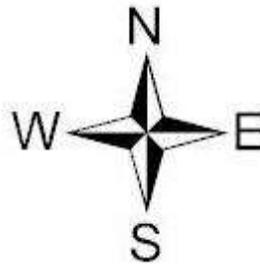


**Legend**

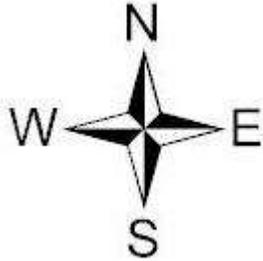
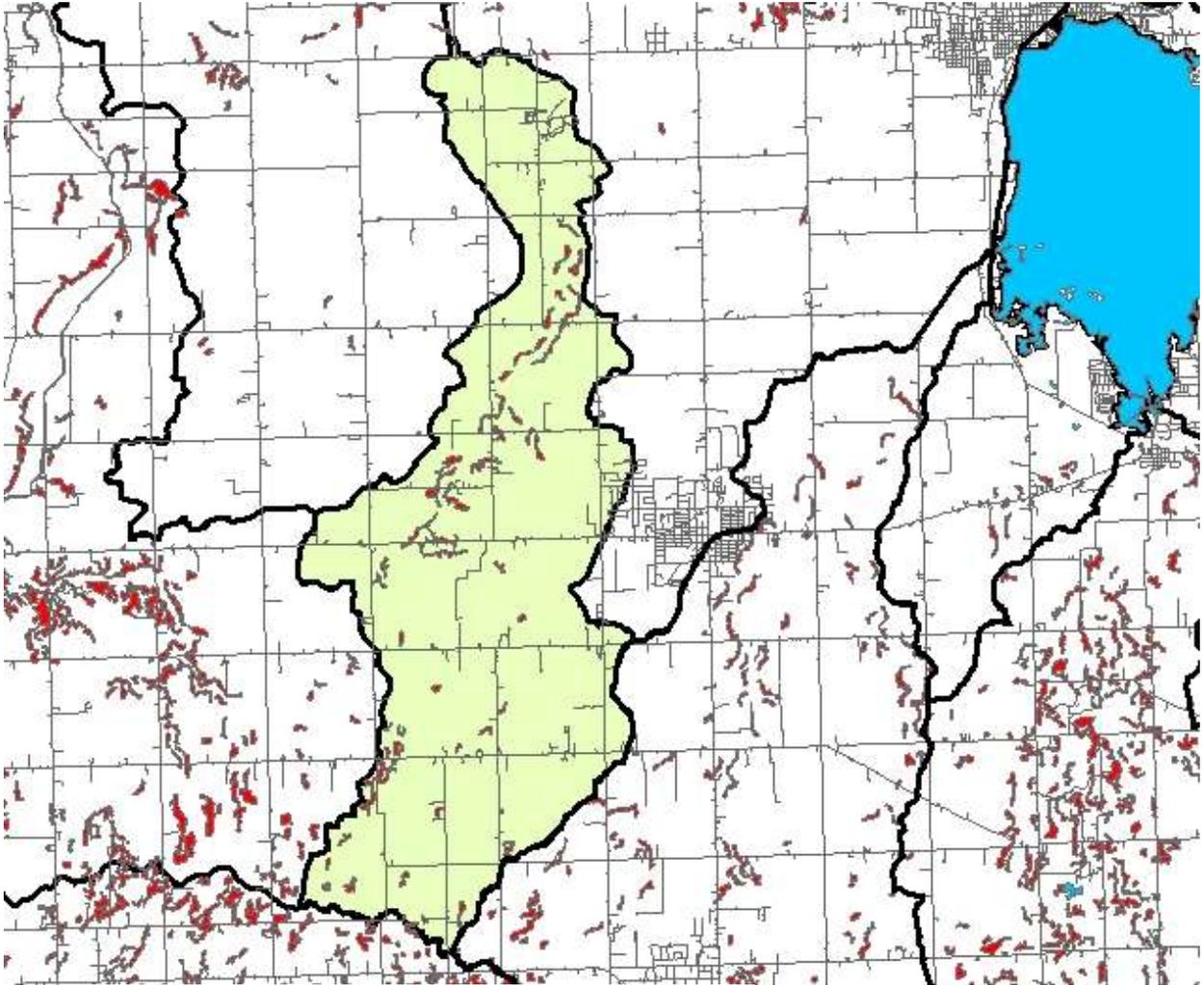
-  Grand Lake/Wabash Watershed
-  Roadways

**Land Use**

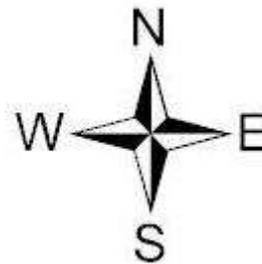
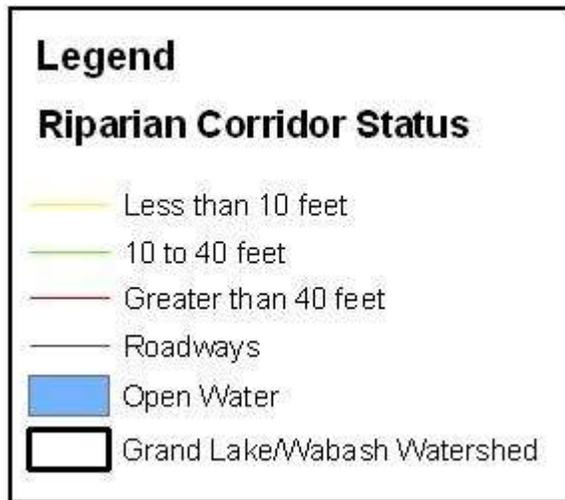
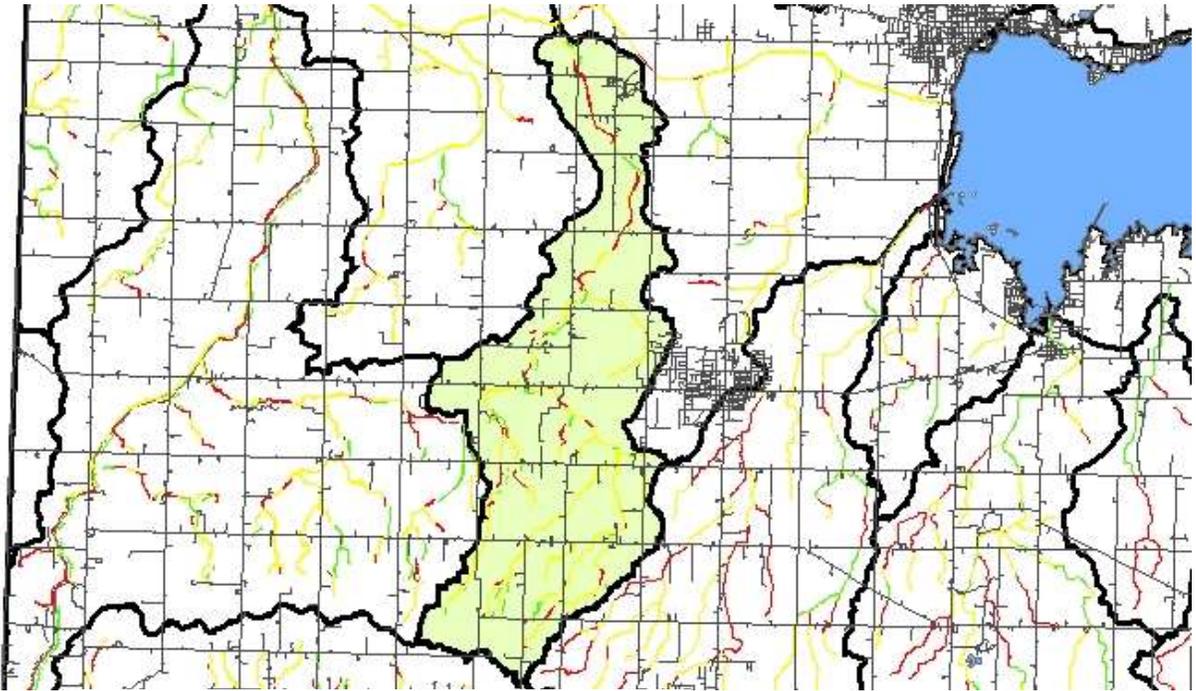
-  Cropland
-  Urban
-  Farmsteads
-  Shrub\_Brush
-  Deciduous Forest
-  Open Water
-  Wetlands
-  Barren/Undeveloped



MAP 62  
Little Beaver Creek Highly Erodible Land



MAP 63  
Little Beaver Creek Riparian Corridor Status



#### 4.2.6 Beaver Creek below Little Beaver Creek to Wabash River

The Beaver Creek below Little Beaver Creek to Wabash River subwatershed drains the western portion of the Beaver Creek watershed prior to Beaver Creek's entrance into the Wabash River. It is in the north-central portion of the Wabash River drainage basin. The entire subwatershed is located in Mercer County. The acres, square miles, and percent of subwatershed are shown below. The Beaver Creek below Little Beaver Creek to Wabash River subwatershed, according to percentages, is the fourth largest of the eight subwatersheds draining to the Wabash River. Of the entire Grand/Lake Wabash Watershed, it is the fifth largest of fifteen subwatersheds.

TABLE 84

<b>BEAVER CREEK BELOW LITTLE BEAVER CREEK TO WABASH RIVER</b>	
Acreage	16,077
Square Miles	25.1
% of Wabash Watershed Total Land Area	13.3%
% of Grand Lake/Wabash Watershed Total Land Area	8.9%

#### *Water Quality Status*

The Beaver Creek below Little Beaver Creek to Wabash River subwatershed has been designated as a warm water habitat (WWH). This aquatic life use designation has been established by Ohio EPA, and based on recent data sampling, the water resource is shown as not meeting that use designation, or in a "non-attainment" status. Furthermore, the subwatershed is shown as NPS impacted. Suspected or proven impacts to these streams include: non-irrigated crop production, animal feeding operations, channelization, removal of riparian vegetation and stream bank destabilization. Definitions and criteria for these descriptives can be found in Appendix C aquatic life use designations and assessment terms.

A TMDL report for the Wabash River watershed was finalized by US EPA in August of 2004. Ohio EPA is also completing a TMDL report for Beaver Creek and Grand Lake St. Marys, which is currently in process of being finalized. The 2004 report showed that on average, 50 percent of the samples collected in this subwatershed were over the recommended total phosphorus level of 0.17 mg/L. On average, 50% of the samples were over the recommended nitrate-nitrite level of 1.5 mg/L, and 50% of the samples were over the recommended total suspended solids level of 32 mg/L. The draft TMDL report currently being completed calls for a 32% reduction in phosphorus, a 44% reduction in nitrate and a 90% reduction in fecal coliform for this subwatershed.

### *Water Supplies and Discharges*

There are no community water supplies within the Beaver Creek below Little Beaver Creek to Wabash River subwatershed, no Ohio EPA regulated point source discharge, no non-transient non-community water supplies, no transient non-community water supplies and no Ohio EPA regulated point source discharges.

Based on recent aerial photographs, areas where 10 or more household wastewater treatment and disposal systems were present in close proximity was determined. As with any individual treatment system operating in an area with poorly drained soils, the effects of the effluent on the receiving water body is a concern. These effects grow as the number of systems in a given area increases, thus clusters or groups of 10 or more systems has been used to analyze the potential effects of those systems on the water quality. Regarding the Beaver Creek below Little Beaver Creek to Wabash River subwatershed, there were a total of two clusters identified comprised of 29 individual treatment systems.

### *Highly Erodible Land*

Map 63 at the end of this subsection illustrates the highly erodible land locations within the Beaver Creek below Little Beaver Creek to Wabash River subwatershed. Of the eight subwatersheds within the Wabash River watershed, Beaver Creek below Little Beaver Creek to Wabash River ranks sixth highest in the amount of highly erodible land present within the subwatershed. The highly erodible land information was developed from the 2003 online NRCS Soil Data Mart.

### *Riparian Corridor Status*

The chart on the following page shows the riparian corridor status for the Little Beaver Creek subwatershed. The chart indicates the number of miles that has various widths of tree canopy, or riparian corridor. The numbers account for both sides of the streams; therefore, the number of actual stream miles is half of that shown. The divisions are less than 10 feet in total width, 10 feet to 40 feet in total width, and greater than 40 feet in total width. The chart is also divided into perennial and intermittent streams under each of the corridor width column headings. MAP 64 illustrates the stream sections under each division.

The chart shows that with a total of 58.62 miles of stream network, the Beaver Creek below Little Beaver Creek to Wabash River subwatershed has 51.05 miles of stream with less than 10 feet of canopy and vegetation, 2.46 miles of stream with 10 feet to 40 feet canopy and vegetation, and 5.11 miles of stream with greater than 40 feet of canopy and vegetation. Overall, the Beaver Creek below Little Beaver Creek to Wabash River subwatershed has the fourth highest number of stream miles within the Wabash River Watershed, which is 10.4%. Of the entire Grand Lake/Wabash Watershed, this subwatershed has the fourth highest number of stream miles, which is 8.3%.

TABLE 85

Riparian Corridor Status

<b>BEAVER CREEK BELOW LITTLE BEAVER CREEK TO WABASH RIVER</b>										
RIPARIAN STATUS	TREE CANOPY <10' IN TOTAL WIDTH			TREE CANOPY 10 to 40' IN WIDTH			TREE CANOPY >40' IN WIDTH			TOTAL STREAM MILES
	PEREN- NIAL	INTER- MITTENT	SUB- TOTAL	PEREN- NIAL	INTER- MITTENT	SUB- TOTAL	PEREN- NIAL	INTER- MITTENT	SUB- TOTAL	
	20.81	30.24	51.05	0.07	2.39	2.46	1.61	3.5	5.11	58.62
% of Subwatershed Total	35.5%	51.6%	87.1%	0.1%	4.1%	4.2%	2.7%	6.0%	8.7%	100.0%
% of Wabash Watershed Total	3.7%	5.4%	9.0%	0.0%	0.4%	0.4%	0.3%	0.6%	0.9%	10.4%
% of Grand Lake/Wabash Watershed Total	3.0%	4.3%	7.2%	0.0%	0.3%	0.3%	0.2%	0.5%	0.7%	8.3%

### *Operations and Animal Units*

The table on the following page shows the number of operations and the animal units by species for the Beaver Creek below Little Beaver Creek to Wabash River subwatershed. According to the table, there are seven poultry operations, six dairy operations, 18 hog operations, 36 beef operations and 17 horse and sheep operations within the entire subwatershed. The Beaver Creek below Little Beaver Creek to Wabash River subwatershed ranks sixth within the entire Grand Lake/Wabash River Watershed when considering the total number of operations with 84 or 8.5%. Animal units within the subwatershed ranks seventh of 15 with 4.5%.

Totals of animal units for each species are also listed on the table. The inventory for this subwatershed was completed during October of 2006. At the time of the inventory animal units were determined by the number of animals present. Although this is not a 1:1 ratio for all species, it is for beef cattle. The following chart shows the number of each type of animal that makes up 1,000 animal units.

Animal Type	1,000 Animal Unit Equivalent
Beef Cattle	1,000
Dairy Cattle	700
Hogs (over 55 lbs)	2,500
Turkeys	55,000
Layer Chickens	82,000
Pullet Chickens	125,000
Sheep	10,000
Horses	500

Table 86  
Operations and Animal Units

BEAVER CREEK BELOW LITTLE BEAVER CREEK TO WABASH RIVER														
ANIMAL TYPE	POULTRY		DAIRY		HOG		BEEF		OTHER		TOTAL		Total as % of Wabash Watershed	
# Farms and Animals	# OPER.	# A.U.s	# OPER.	# A.U.s	# OPER.	# A.U.s	# OPER.	# A.U.s	# OPER.	# A.U.s	# OPER.	# A.U.s	# OPER.	# A.U.s
	5 (Trky) 2	2,735 436	6	721	18	9,340	36	2,172	(sheep) 4 (hrs) 13	6 100	84	15,511	12.2%	6.6%
% of subwatershed total	8.3%	20.4%	7.1%	4.7%	21.4%	60.2%	42.9%	14.0%	20.2%	0.7%	100.0%	100.0%		
Total as % of Wabash Watershed	1.0%	1.3%	0.9%	0.3%	2.6%	3.9%	5.2%	0.9%	2.5%	0.0%	12.2%	6.6%		
Total as % of Grand Lake/Wabash Watershed	0.71%	0.93%	0.61%	0.21%	1.82%	2.73%	3.64%	0.64%	1.72%	0.03%	8.49%	4.54%		

## *Manure Production*

After considering the number of livestock operations and animal units present in the subwatershed, it is only fitting to consider the by-products of these animals. The table on the opposite page is used to represent the manure and nutrient production for the Beaver Creek below Little Beaver Creek to Wabash River drainage area. The subwatershed ranks seventh overall, of 15, in terms of manure production per annum. Approximately 89,394 tons of manure is produced annually. The remainder of the columns on the table indicates the approximate pounds of nutrients contained in that manure. Nitrogen, potassium, and phosphate, are all important to the agricultural community and are provided to the crops via manure or commercial fertilizer applications.

These nutrients are also important in regards to water quality. According to the table, in the Beaver Creek below Little Beaver Creek to Wabash River subwatershed, the amount of phosphorus that is contained in the manure produced annually would need to be applied at 68 pounds per acre. The table below indicates the average crop removal rates for phosphorus for the major crops produced in the watershed. Values were obtained from the Ohio Agronomy Guide.

<b>CROP</b>	<b>P<sub>2</sub>O<sub>5</sub> REMOVAL (lb/ac)</b>
Alfalfa (6T)	80
Corn (150 bu) Grain	55
Corn (25 T) Silage	80
Soybean (50 bu)	40
Wheat (75 bu) Grain	48

Considerations are given to the nutrient phosphorus due to its importance to crop production and the problems associated with the relationship between excessive phosphorus applications and degradation of water quality. Because much of the poultry manure is brokered out of the watershed, it seemed important to reflect the nutrient values assuming that 70% of the poultry manure is moved to locations outside the watershed. Local manure haulers estimated this value to be 90%; however, to be conservative, 70% was assumed for this plan. Under this assumption, the amount of phosphorus that is contained in the manure produced annually in this subwatershed would need to be applied at 54 pounds per acre.

Table 87  
Manure and Nutrient Production

<b>BEAVER CREEK BELOW LITTLE BEAVER CREEK TO WABASH RIVER</b>						
Manure Production	Tons Raw Manure/Year	Lbs. N per Year	Lbs. K <sub>2</sub> O per Year	Lbs. P <sub>2</sub> O <sub>5</sub> per Year	Acres Cropland	Lbs. P <sub>2</sub> O <sub>5</sub> per Crop Acre
	89,394	1,297,469	948,098	978,455	14,350	68
Less 70% Poultry Manure**	80,460	1,059,250	820,237	781,110	14,350	54
Approximate \$ Value Per Year		\$285,443	\$142,215	\$195,691		
Total Nutrient Value Per Year = \$623,349						

\*\*Based on conversations with poultry manure brokers, it was estimated that at least 70% of the poultry manure is brokered out of the watershed.

The dollar values associated with each nutrient were obtained from OSU Extension Bulletin 604-06, "Ohio Livestock Manure Management Guide." The value for nitrogen is estimated at \$0.22 per pound, the value for P<sub>2</sub>O<sub>5</sub> is \$0.20 per pound and the value for K<sub>2</sub>O is \$0.15 per pound.

*Distance Between Livestock Operations and Streams*

The table on the following page shows the distance between various livestock operations located in the Beaver Creek below Little Beaver Creek to Wabash River subwatershed and the waterways that drain to the Wabash River. It can be assumed that the greater the distance between a livestock operation and a water system, the potential of pollution from the operation reaching the stream is lessened.

Of notable interest is the number of all livestock operations located less than 1,000 feet from the waterbody. In this particular subwatershed, of 84 operations, 32 operations, or 38.1%, fall into the category. Also, 20 operations, 23.8%, are in within 2,000 feet and the remaining 38.1%, 32 operations, are less than 3,000 feet from the nearest stream.

Table 88  
Livestock Operations and Proximity to Streams

BEAVER CREEK BELOW LITTLE BEAVER CREEK TO WABASH RIVER																		
ANIMAL TYPE	POULTRY			DAIRY			HOG			BEEF			OTHER			TOTAL		
	Distance to Stream			Distance to Stream			Distance to Stream			Distance to Stream			Distance to Stream			Distance to Stream		
	<1000'	<2000'	<3000'	<1000'	<2000'	<3000'	<1000'	<2000'	<3000'	<1000'	<2000'	<3000'	<1000'	<2000'	<3000'	<1000'	<2000'	<3000'
	3	1	3	2	1	3	4	8	6	15	7	14	8	3	6	32	20	32
% of Subwatershed Total	3.6%	1.2%	3.6%	2.4%	1.2%	3.6%	4.8%	9.5%	7.1%	17.9%	8.3%	16.7%	9.5%	3.6%	7.1%	38.1%	23.8%	38.1%

### *Non-Point Source Pollution Potential*

In order to provide a comparison of the pollution potential of each of the 15 subwatersheds, a ranking system for each of the main potential pollution sources was developed. These potential sources are stream miles with less than 10 feet of vegetation, the number of livestock or poultry operations less than 1,000 feet from a stream, the tons of raw manure produced yearly, the pounds of phosphorus per cropland acre available from the manure, the number of household wastewater disposal systems contained in clusters of ten or more) and the number of homes built pre-1973. Values of 1 (less potential) to 10 (great potential) were given based on ranges shown in the table of the following page. Indicator scores are then summed to obtain a total pollution potential score for the subwatershed.

Subwatershed pollution potential scores can range from a maximum of 60 points to a minimum of six points. The Beaver Creek below Little Beaver Creek to Wabash River subwatershed ranks eighth out of 15, with 51.7% of the maximum points for pollution potential. Most significantly for the subwatershed is the number of stream miles with less than 10 feet of vegetation and the number of operations within 1,000 feet of a stream. Beaver Creek below Little Beaver Creek to Wabash River subwatershed scored seven out of 10 points for both of these indicators.

## NONPOINT SOURCE POLLUTION POTENTIAL SCORING MATRIX

MAXIMUM DRAINAGE UNIT SCORE = 60 (Highest Pollution Potential)

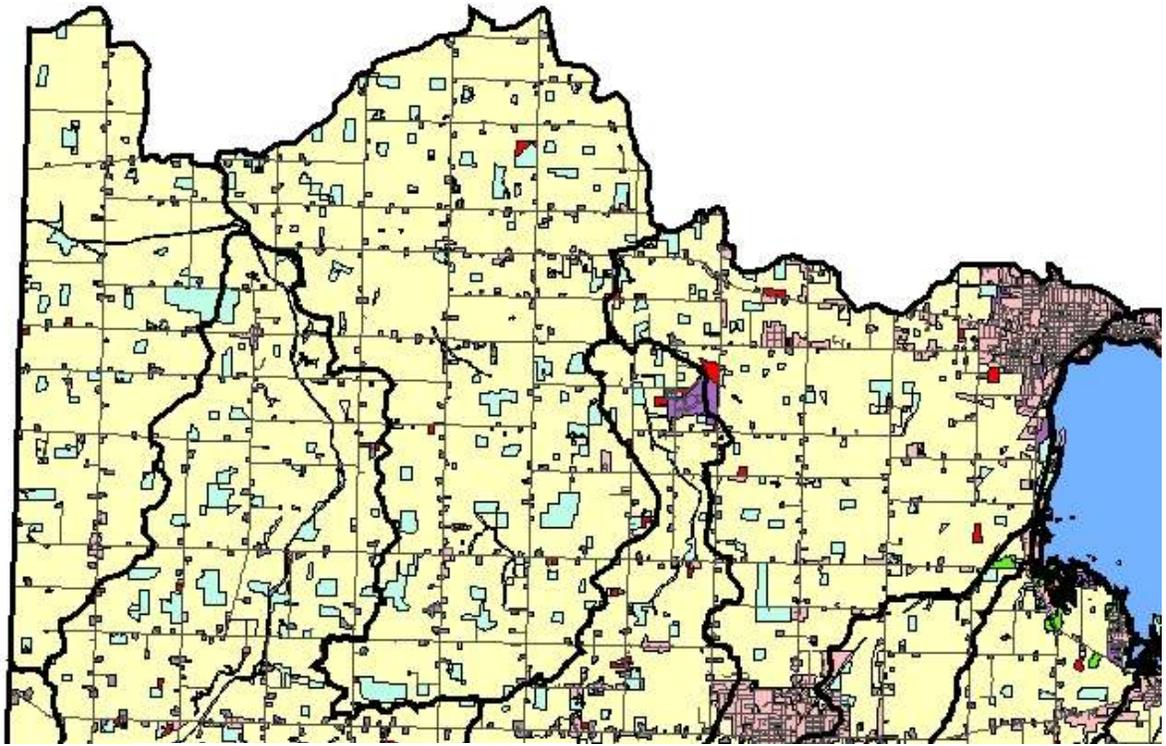
SCORE	Stream Miles with <10' Vegetation	Operations <1,000' to stream	Tons Raw Manure per Year	Lbs. P <sub>2</sub> O <sub>5</sub> per Crop Acre	Household Disposal Systems in Groups	No. Homes Built pre-1973
10	72.00+	46+	180,000+	225+	90+	226+
9	64.00 - 71.99	41 - 45	160,000 - 179,999	200 - 224	80 - 89	201 -225
8	56.00 - 63.99	36 - 40	140,000 - 159,999	175 - 199	70 - 79	176 -200
7	48.00 - 55.99	31 - 35	120,000 - 139,999	150 - 174	60 - 69	151 - 175
6	40.00 - 47.99	26 - 30	100,000 - 119,999	125 - 149	50 - 59	126 - 150
5	32.00 - 39.99	21 - 25	80,000 - 99,999	100 - 124	40 - 49	101 - 125
4	24.00 - 31.99	16 - 20	60,000 - 79,999	75- 99	30 - 39	76 - 100
3	16.00 - 23.99	11 - 15	40,000 - 59,999	50 - 74	20 - 29	51 - 75
2	8.00 - 15.99	6 - 10	20,000 - 39,999	25 - 49	10 - 19	26 - 50
1	0.00 - 7.99	0 - 5	0 - 19,999	0 - 24	0 - 10	0 - 25

MINIMUM DRAINAGE UNIT SCORE = 6 (Lowest Pollution Potential)

**TABLE 89**  
**NPS Pollution Potential**

<b>BEAVER CREEK BELOW LITTLE BEAVER CREEK TO WABASH RIVER</b>							
SUBWATERSHED ATTRIBUTE	Stream Miles with <10' Vegetation SCORE	Operations <1,000' to stream SCORE	Tons Raw Manure per Year SCORE	Lbs. P <sub>2</sub> O <sub>5</sub> per Crop Acre SCORE	Household Disposal Systems in Groups SCORE	No. Homes Built pre-1973 SCORE	TOTAL SCORE
	7	7	5	3	3	6	31

MAP 64  
Beaver Creek below Little Beaver Creek to Wabash River Land Use



**Legend**

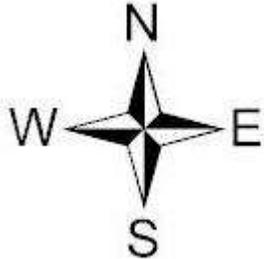
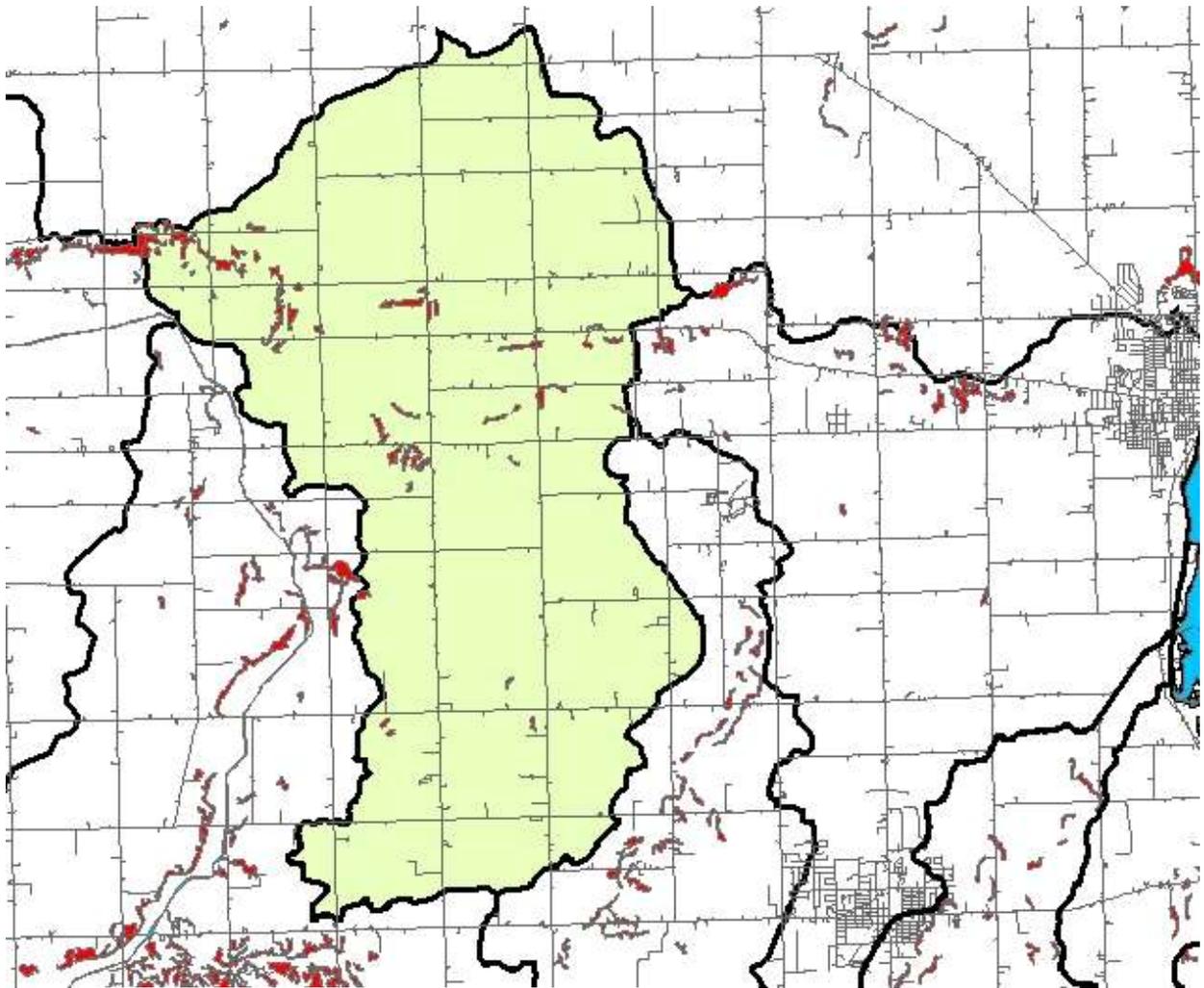
-  Grand Lake/Wabash Watershed
-  Roadways

**Land Use**

-  Cropland
-  Urban
-  Farmsteads
-  Shrub\_Brush
-  Deciduous Forest
-  Open Water
-  Wetlands
-  Barren/Undeveloped

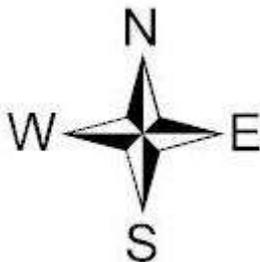
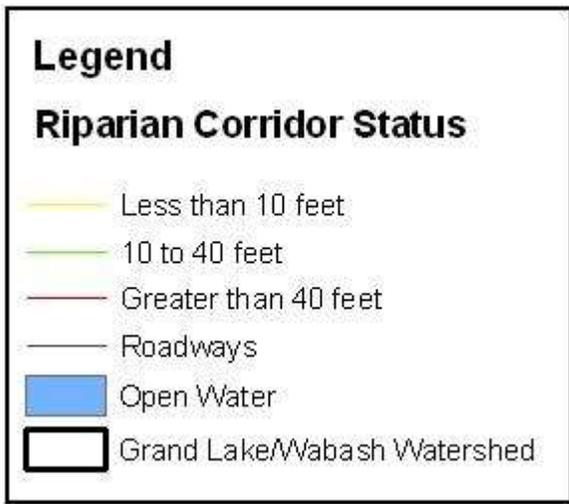
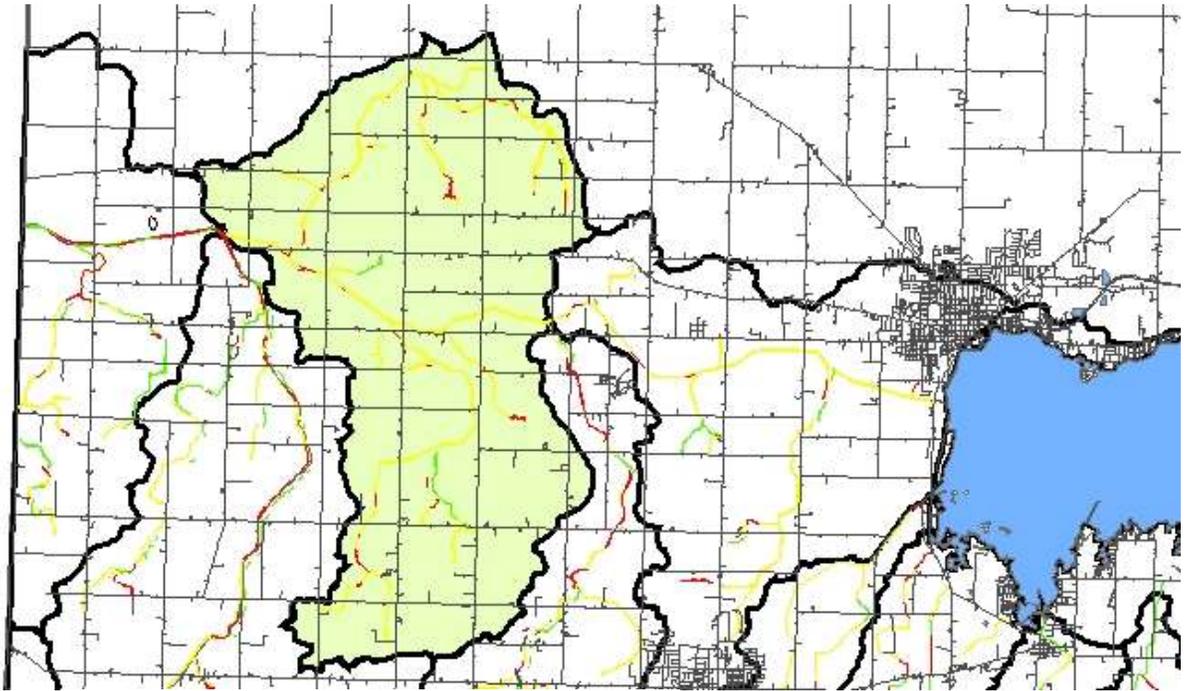


MAP 65  
Beaver Creek below Little Beaver Creek to Wabash River Highly Erodible Land



# MAP 66

## Beaver Creek below Little Beaver Creek to Wabash River Riparian Corridor Status



#### 4.2.7 Wabash River below Beaver Creek to New Corydon

The Wabash River below Beaver Creek to New Corydon subwatershed drains the northwestern portion of the Wabash watershed prior to the river's entrance into Indiana. The subwatershed is located entirely in Mercer County. The acres, square miles, and percent of subwatershed are shown below. The Wabash River below Beaver Creek to New Corydon subwatershed, according to percentages, is the seventh largest of the eight subwatersheds draining to the Wabash River. Of the entire Grand/Lake Wabash Watershed, it is the tenth largest of fifteen subwatersheds.

TABLE 90

<b>WABASH RIVER BELOW BEAVER CREEK TO NEW CORYDON</b>	
Acreage	8,084
Square Miles	12.63
% of Wabash Watershed Total Land Area	6.7%
% of Grand Lake/Wabash Watershed Total Land Area	4.5%

#### *Water Quality Status*

The Wabash River below Beaver Creek to New Corydon has been designated as a warm water habitat (WWH). This aquatic life use designation has been established by Ohio EPA, and based on recent data sampling, the water resource is shown as not meeting that use designation, or in a "non-attainment" status. Furthermore, the subwatershed is shown as NPS impacted. Suspected or proven impacts to these streams include: Agriculture-crop production, confined animal feeding operations, on-site wastewater treatment systems, channelization, removal of riparian vegetation and streambank destabilization. Definitions and criteria for these descriptives can be found in Appendix C aquatic life use designations and assessment terms.

A TMDL report for the Wabash River watershed was finalized by US EPA in August of 2004. The report showed that on average, all samples collected in this subwatershed were over the recommended total phosphorus level of 0.17 mg/L. On average, 50% of the samples were over the recommended nitrate-nitrite level of 1.5 mg/L, and 100% of the samples were over the recommended total suspended solids level of 32 mg/L.

#### *Water Supplies, Withdrawals, and Discharges*

There are no community water supplies within the Wabash River below Beaver Creek to New Corydon subwatershed. There is one transient non-community water supply, the Pit Stop Tavern. There are no Ohio EPA regulated point source discharges in the subwatershed.

Based on recent aerial photographs, areas where 10 or more household wastewater treatment and disposal systems were present in close proximity was determined. As

with any individual treatment system operating in an area with poorly drained soils, the effects of the effluent on the receiving water body is a concern. These effects grow as the number of systems in a given area increases, thus clusters or groups of 10 or more systems has been used to analyze the potential effects of those systems on the water quality. Regarding the Wabash River below Beaver Creek to New Corydon subwatershed, there were a total of one cluster identified comprised of 18 individual treatment systems.

### *Highly Erodible Land*

Map 66 at the end of this subsection illustrates the highly erodible land locations within the Wabash River below Beaver Creek to New Corydon subwatershed. Of the eight subwatersheds within the Wabash River watershed, Wabash River below Beaver Creek to New Corydon ranks fourth highest in the amount of highly erodible land present within the subwatershed. The highly erodible land information was developed from the 2003 online NRCS Soil Data Mart.

### *Riparian Corridor Status*

The chart on the following page shows the riparian corridor status for the Wabash River below Beaver Creek to New Corydon subwatershed. The chart indicates the number of miles that has various widths of tree canopy, or riparian corridor. The numbers account for both sides of the streams; therefore, the number of actual stream miles is half of that shown. The divisions are less than 10 feet in total width, 10 feet to 40 feet in total width, and greater than 40 feet in total width. The chart is also divided into perennial and intermittent streams under each of the corridor width column headings. MAP 67 illustrates the stream sections under each division.

The chart shows that with a total of 24.3 miles of stream network, the Wabash River below Beaver Creek to New Corydon subwatershed has 9.95 miles of stream with less than 10 feet of canopy and vegetation, 8.00 miles of stream with 10 feet to 40 feet canopy and vegetation, and 6.35 miles of stream with greater than 40 feet of canopy and vegetation. Overall, the Wabash River Headwaters to below Bear Creek subwatershed has the seventh highest number of stream miles within the Wabash River Watershed, which is 4.3%. Of the entire Grand Lake/Wabash Watershed, this subwatershed has the tenth highest number of stream miles, which is 3.4%.

TABLE 91

Riparian Corridor Status

<b>WABASH RIVER BELOW BEAVER CREEK TO NEW CORYDON</b>										
RIPARIAN STATUS	TREE CANOPY <10' IN TOTAL WIDTH			TREE CANOPY 10 to 40' IN WIDTH			TREE CANOPY >40' IN WIDTH			TOTAL STREAM MILES
	PEREN- NIAL	INTER- MITTENT	SUB- TOTAL	PEREN- NIAL	INTER- MITTENT	SUB- TOTAL	PEREN- NIAL	INTER- MITTENT	SUB- TOTAL	
	0.19	9.76	9.95	1.89	6.11	8.00	3.36	2.99	6.35	24.30
% of Subwatershed Total	0.8%	40.2%	40.9%	7.8%	25.1%	32.9%	13.8%	12.3%	26.1%	100.0%
% of Wabash Watershed Total	0.0%	1.7%	1.8%	0.3%	1.1%	1.4%	0.6%	0.5%	1.1%	4.3%
% of Grand Lake/Wabash Watershed Total	0.0%	1.4%	1.4%	0.3%	0.9%	1.1%	0.5%	0.4%	0.9%	3.4%

### *Operations and Animal Units*

The table on the following page shows the number of operations and the animal units by species for the Wabash River below Beaver Creek to New Corydon subwatershed. According to the table, there are five poultry operations, four dairy operations, three hog operations, 12 beef operations and three horse and sheep operations within the entire subwatershed. The Wabash River below Beaver Creek to New Corydon subwatershed ranks eleventh within the entire Grand Lake/Wabash River Watershed when considering the total number of operations with 27 or 2.7%. Animal units within the subwatershed ranks tenth of 15 with 2.5%.

Totals of animal units for each species are also listed on the table. The inventory for this subwatershed was completed during October and November of 2006. At the time of the inventory animal units were determined by the number of animals present. Although this is not a 1:1 ratio for all species, it is for beef cattle. The following chart shows the number of each type of animal that makes up 1,000 animal units.

Animal Type	1,000 Animal Unit Equivalent
Beef Cattle	1,000
Dairy Cattle	700
Hogs (over 55 lbs)	2,500
Turkeys	55,000
Layer Chickens	82,000
Pullet Chickens	125,000
Sheep	10,000
Horses	500

Table 92  
Operations and Animal Units

WABASH RIVER BELOW BEAVER TO NEW CORYDON														
ANIMAL TYPE	POULTRY		DAIRY		HOG		BEEF		OTHER		TOTAL		% of Wabash Watershed	
# Farms and Animals	# OPER.	# A.U.s	# OPER.	# A.U.s	# OPER.	# A.U.s	# OPER.	# A.U.s	# OPER.	# A.U.s	# OPER.	# A.U.s	# OPER.	# A.U.s
	2	5,623	4	600	3	480	12	995	(sheep)	0	27	8,470	3.9%	3.6%
	(Trky) 3	764							(hrs) 3	8				
% of subwatershed total	18.5%	75.4%	14.8%	7.1%	11.1%	5.7%	44.4%	11.7%	11.1%	0.1%	100.0%	100.0%		
Total as % of Wabash Watershed	0.7%	2.7%	0.6%	0.3%	0.4%	0.2%	1.7%	0.4%	0.4%	0.0%	3.9%	3.6%		
Total as % of Grand Lake/Wabash Watershed	0.51%	1.87%	0.40%	0.18%	0.30%	0.14%	1.21%	0.29%	0.30%	0.00%	2.73%	2.48%		

## Manure Production

After considering the number of livestock operations and animal units present in the subwatershed, it is only fitting to consider the by-products of these animals. The table on the opposite page is used to represent the manure and nutrient production for the Wabash River below Beaver Creek to New Corydon drainage area. The subwatershed ranks tenth overall, of 15, in terms of manure production per annum. Approximately 46,886 tons of manure is produced annually. The remainder of the columns on the table indicates the approximate pounds of nutrients contained in that manure. Nitrogen, potassium, and phosphate, are all important to the agricultural community and are provided to the crops via manure or commercial fertilizer applications.

These nutrients are also important in regards to water quality. According to the table, in the Wabash River below Beaver Creek to New Corydon subwatershed, the amount of phosphorus that is contained in the manure produced annually would need to be applied at 99 pounds per acre. The table below indicates the average crop removal rates for phosphorus for the major crops produced in the watershed. Values were obtained from the Ohio Agronomy Guide.

<b>CROP</b>	<b>P<sub>2</sub>O<sub>5</sub> REMOVAL (lb/ac)</b>
Alfalfa (6T)	80
Corn (150 bu) Grain	55
Corn (25 T) Silage	80
Soybean (50 bu)	40
Wheat (75 bu) Grain	48

Considerations are given to the nutrient phosphorus due to its importance to crop production and the problems associated with the relationship between excessive phosphorus applications and degradation of water quality. Because much of the poultry manure is brokered out of the watershed, it seemed important to reflect the nutrient values assuming that 70% of the poultry manure is moved to locations outside the watershed. Local manure haulers estimated this value to be 90%; however, to be conservative, 70% was assumed for this plan. Under this assumption, the amount of phosphorus that is contained in the manure produced annually in this subwatershed would need to be applied at 44 pounds per acre.

What this seems to indicate throughout the watershed is that according to manure production and crop removal rates for limiting nutrient factors, there are not enough acres for proper manure application methods. The caveat on this statement is that the numbers are best estimates, variations in soil types and tith can vary throughout the fields which may increase, or decrease, crop removal rates, and more importantly, some of the manure produced in each of the subwatersheds may be applied to acreages outside of that subwatershed, or even outside of the Grand Lake/Wabash watershed. It should be noted that several producers own or rent land both in the Grand Lake/Wabash watershed and in neighboring watersheds such as Loramie Creek or the St Marys River.

Table 93  
Manure and Nutrient Production

<b>WABASH RIVER BELOW BEAVER CREEK TO NEW CORYDON</b>						
Manure Production	Tons Raw Manure/Year	Lbs. N per Year	Lbs. K <sub>2</sub> O per Year	Lbs. P <sub>2</sub> O <sub>5</sub> per Year	Acres Cropland	Lbs. P <sub>2</sub> O <sub>5</sub> per Crop Acre
	46,886	897,457	552,477	718,562	7,232	99
Less 70% Poultry Manure**	29,424	438,521	303,702	321,538	7,232	44
Approximate \$ Value Per Year		\$197,440	\$82,872	\$143,712		
Total Nutrient Value Per Year = \$424,024						

\*\*Based on conversations with poultry manure brokers, it was estimated that at least 70% of the poultry manure is brokered out of the watershed.

The dollar values associated with each nutrient were obtained from OSU Extension Bulletin 604-06, "Ohio Livestock Manure Management Guide." The value for nitrogen is estimated at \$0.22 per pound, the value for P<sub>2</sub>O<sub>5</sub> is \$0.20 per pound and the value for K<sub>2</sub>O is \$0.15 per pound.

*Distance Between Livestock Operations and Streams*

The table on the following page shows the distance between various livestock operations located in the Wabash River below Beaver Creek to New Corydon subwatershed and the waterways that drain to the Wabash River. It can be assumed that the greater the distance between a livestock operation and a water system, the potential of pollution from the operation reaching the stream is lessened.

Of notable interest is the number of all livestock operations located less than 1,000 feet from the waterbody. In this particular subwatershed, out of 27 operations, 11 operations, or 40.7%, fall into the category. Also, five operations, 18.2%, are in within 2,000 feet and the remaining 40.7%, 11 operations, are less than 3,000 feet from the nearest stream.

Table 94  
Livestock Operations and Proximity to Streams

<b>WABASH RIVER BELOW BEAVER TO NEW CORYDON</b>																		
<b>ANIMAL TYPE</b>	POULTRY			DAIRY			HOG			BEEF			OTHER			TOTAL		
	Distance to Stream			Distance to Stream			Distance to Stream			Distance to Stream			Distance to Stream			Distance to Stream		
	<1000'	<2000'	<3000'	<1000'	<2000'	<3000'	<1000'	<2000'	<3000'	<1000'	<2000'	<3000'	<1000'	<2000'	<3000'	<1000'	<2000'	<3000'
	4	0	1	1	0	3	0	0	3	5	5	2	1	0	2	11	5	11
% of Subwatershed Total	14.8%	0.0%	3.7%	3.7%	0.0%	11.1%	0.0%	0.0%	11.1%	18.5%	18.5%	7.4%	3.7%	0.0%	7.4%	40.7%	18.5%	40.7%

### *Non-Point Source Pollution Potential*

In order to provide a comparison of the pollution potential of each of the 15 subwatersheds, a ranking system for each of the main potential pollution sources was developed. These potential sources are stream miles with less than 10 feet of vegetation, the number of livestock or poultry operations less than 1,000 feet from a stream, the tons of raw manure produced yearly, the pounds of phosphorus per cropland acre available from the manure, the number of household wastewater disposal systems contained in clusters of ten or more) and the number of homes built pre-1973. Values of 1 (less potential) to 10 (great potential) were given based on ranges shown in the table of the following page. Indicator scores are then summed to obtain a total pollution potential score for the subwatershed.

Subwatershed pollution potential scores can range from a maximum of 60 points to a minimum of six points. The Wabash River below Beaver Creek to New Corydon subwatershed ranks of eleventh out of 15, with 23.3% of the maximum points for pollution potential.

## NONPOINT SOURCE POLLUTION POTENTIAL SCORING MATRIX

MAXIMUM DRAINAGE UNIT SCORE = 60 (Highest Pollution Potential)

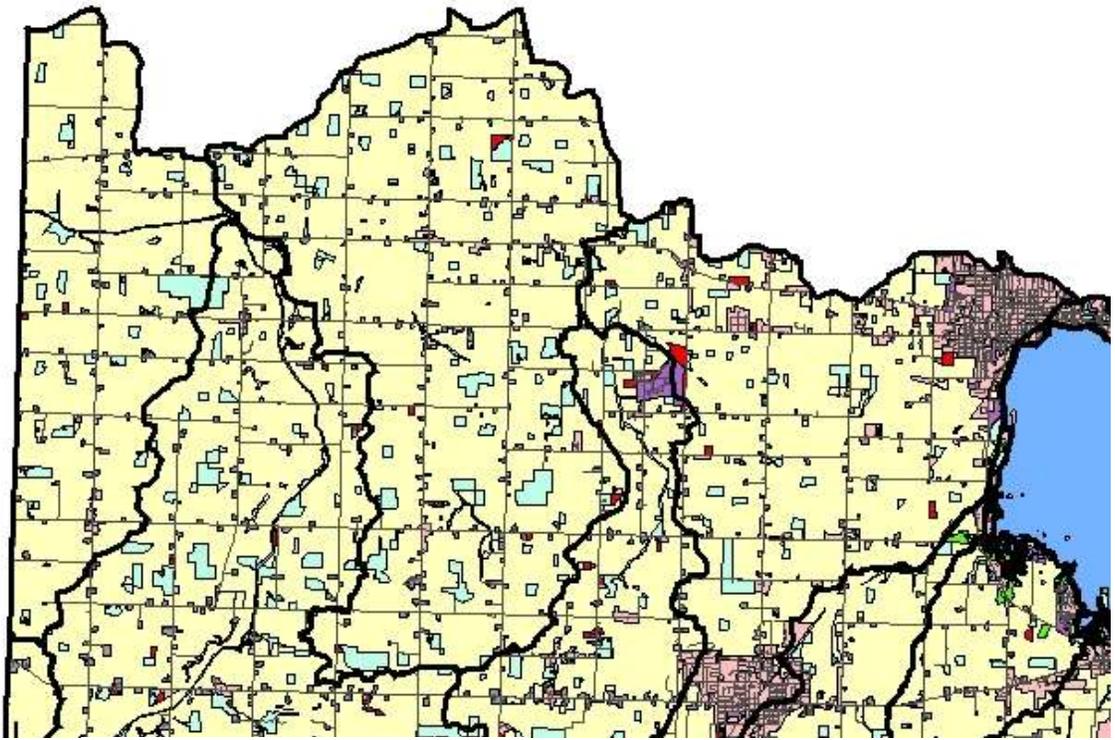
SCORE	Stream Miles with <10' Vegetation	Operations <1,000' to stream	Tons Raw Manure per Year	Lbs. P <sub>2</sub> O <sub>5</sub> per Crop Acre	Household Disposal Systems in Groups	No. Homes Built pre-1973
10	72.00+	46+	180,000+	225+	90+	226+
9	64.00 - 71.99	41 - 45	160,000 - 179,999	200 - 224	80 - 89	201 - 225
8	56.00 - 63.99	36 - 40	140,000 - 159,999	175 - 199	70 - 79	176 - 200
7	48.00 - 55.99	31 - 35	120,000 - 139,999	150 - 174	60 - 69	151 - 175
6	40.00 - 47.99	26 - 30	100,000 - 119,999	125 - 149	50 - 59	126 - 150
5	32.00 - 39.99	21 - 25	80,000 - 99,999	100 - 124	40 - 49	101 - 125
4	24.00 - 31.99	16 - 20	60,000 - 79,999	75 - 99	30 - 39	76 - 100
3	16.00 - 23.99	11 - 15	40,000 - 59,999	50 - 74	20 - 29	51 - 75
2	8.00 - 15.99	6 - 10	20,000 - 39,999	25 - 49	10 - 19	26 - 50
1	0.00 - 7.99	0 - 5	0 - 19,999	0 - 24	0 - 10	0 - 25

MINIMUM DRAINAGE UNIT SCORE = 6 (Lowest Pollution Potential)

**TABLE 95**  
**NPS Pollution Potential**

<b>WABASH RIVER BELOW BEAVER CREEK TO NEW CORYDON</b>							
SUBWATERSHED ATTRIBUTE	Stream Miles with <10' Vegetation SCORE	Operations <1,000' to stream SCORE	Tons Raw Manure per Year SCORE	Lbs. P <sub>2</sub> O <sub>5</sub> per Crop Acre SCORE	Household Disposal Systems in Groups SCORE	No. Homes Built pre-1973 SCORE	TOTAL SCORE
	2	3	2	2	2	3	14

MAP 67  
Wabash River below Beaver Creek to New Corydon Land Use

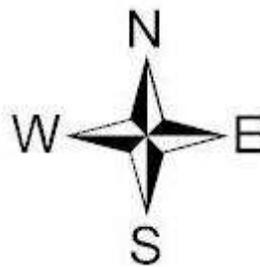


**Legend**

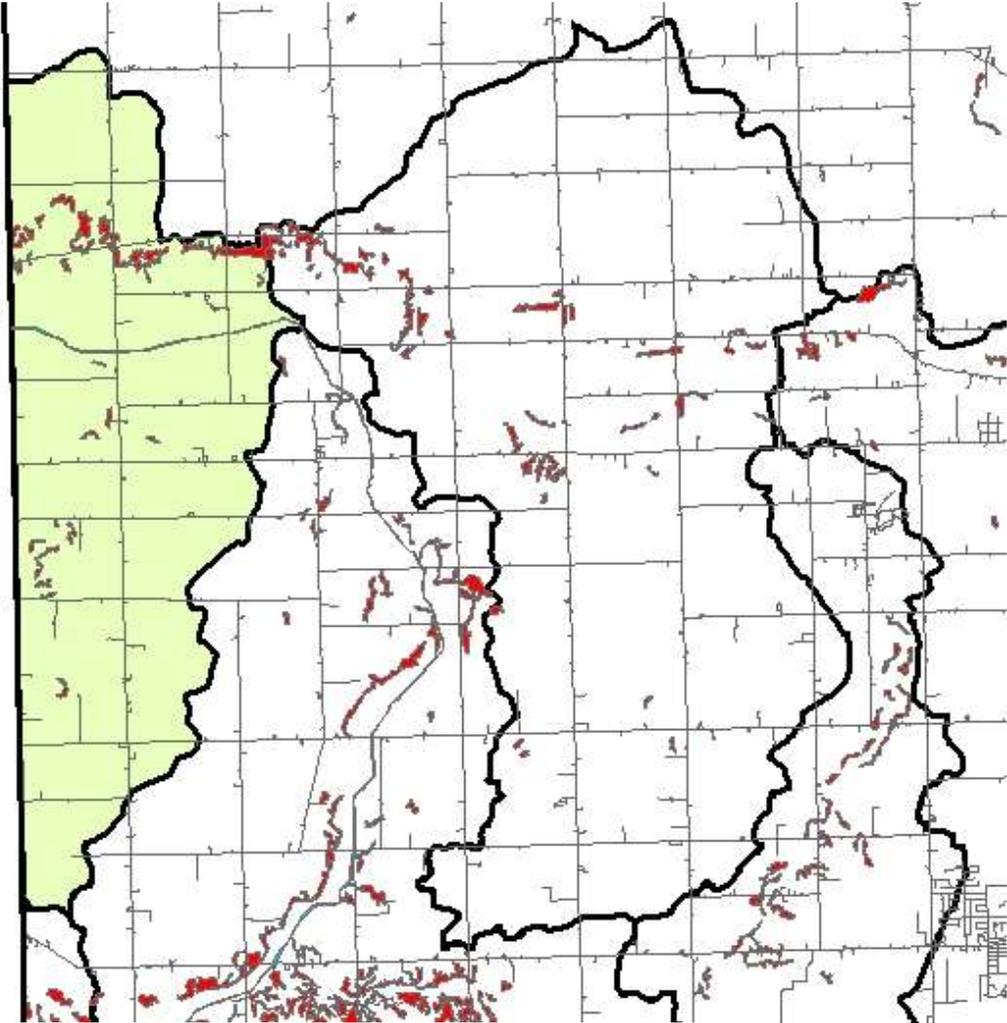
-  Grand Lake/Wabash Watershed
-  Roadways

**Land Use**

-  Cropland
-  Urban
-  Farmsteads
-  Shrub\_Brush
-  Deciduous Forest
-  Open Water
-  Wetlands
-  Barren/Undeveloped

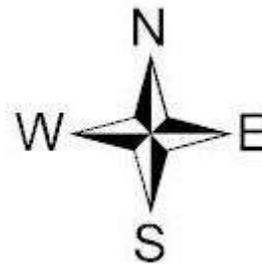
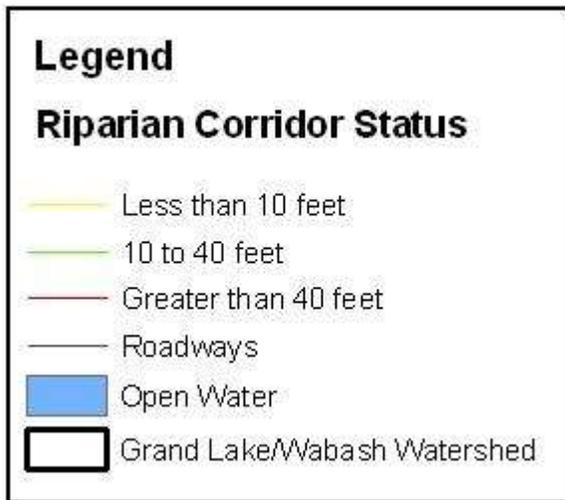
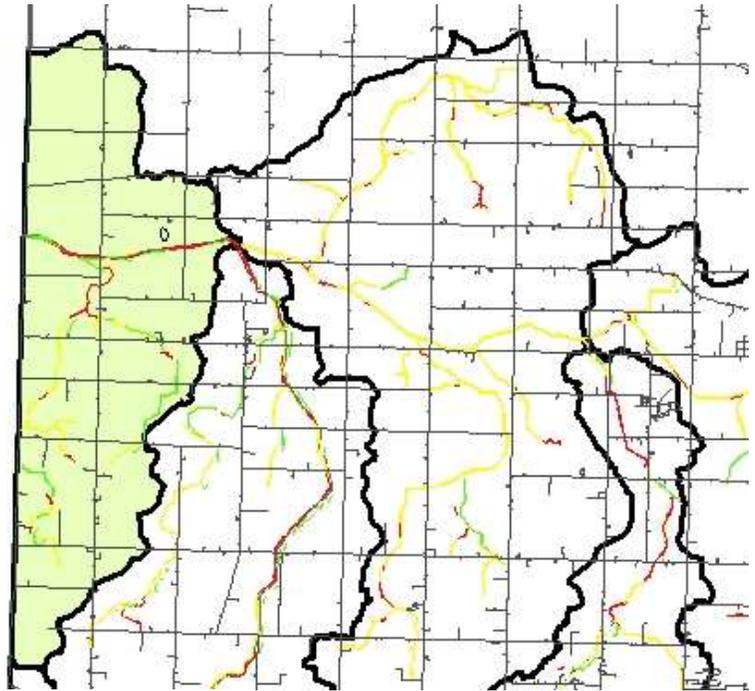


MAP 68  
Wabash River below Beaver Creek to New Corydon Highly Erodible Land



# MAP 69

## Wabash River below Beaver Creek to New Corydon Riparian Corridor Status



#### 4.2.8 Limberlost Creek Headwaters to below Bull Creek (IN)

The Limberlost Creek Headwaters to below Bull Creek (IN) subwatershed drains a small west-central portion of the Limberlost Creek which eventually enters the Wabash River in Indiana. The subwatershed is located entirely in Mercer County. The acres, square miles, and percent of subwatershed are shown below. The Limberlost Creek Headwaters to below Bull Creek (IN) subwatershed, according to percentages, is the smallest of the eight subwatersheds draining to the Wabash River. Of the entire Grand/Lake Wabash Watershed, it is the smallest of fifteen subwatersheds.

TABLE 96

<b>LIMBERLOST CREEK HEADWATERS TO BELOW BULL CREEK (IN)</b>	
Acreage	927
Square Miles	1.44
% of Wabash Watershed Total Land Area	0.8%
% of Grand Lake/Wabash Watershed Total Land Area	0.5%

#### *Water Quality Status*

The Limberlost Creek Headwaters to below Bull Creek (IN) subwatershed has been designated as a warm water habitat (WWH). This aquatic life use designation has been established by Ohio EPA, and based on recent data sampling, the water resource is shown as not meeting that use designation, or in a “non-attainment” status. Furthermore, the subwatershed is shown as NPS impacted. Suspected or proven impacts to these streams include: Agriculture-crop production, confined animal feeding operations, on-site wastewater treatment systems, channelization, removal of riparian vegetation and streambank destabilization. Definitions and criteria for these descriptives can be found in Appendix C aquatic life use designations and assessment terms.

Although a TMDL report for the Wabash River watershed was finalized by US EPA in August of 2004, this subwatershed was not administered as part of the Ohio Wabash Watershed.

#### *Water Supplies, Withdrawals, and Discharges*

There are no community water supplies within the Limberlost Creek Headwaters to below Bull Creek (IN) subwatershed, no Ohio EPA regulated point source discharge, no non-transient non-community water supplies, no transient non-community water supplies and no Ohio EPA regulated point source discharges.

There are no areas within the Limberlost Creek Headwaters to below Bull Creek (IN) where 10 or more household wastewater treatment and disposal systems are present in close proximity.

### *Highly Erodible Land*

Map 69 at the end of this subsection illustrates the highly erodible land locations within the Limberlost Creek Headwaters to below Bull Creek (IN) subwatershed. Of the eight subwatersheds within the Wabash River watershed, Limberlost Creek Headwaters to below Bull Creek (IN) ranks fifth highest in the amount of highly erodible land present within the subwatershed. The highly erodible land information was developed from the 2003 online NRCS Soil Data Mart.

### *Riparian Corridor Status*

The chart on the following page shows the riparian corridor status for the Limberlost Creek Headwaters to below Bull Creek (IN) subwatershed. The chart indicates the number of miles that has various widths of tree canopy, or riparian corridor. The numbers account for both sides of the streams; therefore, the number of actual stream miles is half of that shown. The divisions are less than 10 feet in total width, 10 feet to 40 feet in total width, and greater than 40 feet in total width. The chart is also divided into perennial and intermittent streams under each of the corridor width column headings. MAP 70 illustrates the stream sections under each division.

The chart shows that with a total of 5.40 miles of stream network, the Limberlost Creek Headwaters to below Bull Creek (IN) subwatershed has 3.06 miles of stream with less than 10 feet of canopy and vegetation, 2.05 miles of stream with 10 feet to 40 feet canopy and vegetation, and 0.29 miles of stream with greater than 40 feet of canopy and vegetation. Overall, the Limberlost Creek Headwaters to below Bull Creek (IN) subwatershed has the lowest number of stream miles within the Wabash River Watershed, which is 1.0%. Of the entire Grand Lake/Wabash Watershed, this subwatershed has the third lowest number of stream miles, which is 0.8%.

TABLE 97

Riparian Corridor Status

<b>LIMBERLOST CREEK HEADWATERS TO BELOW BULL CREEK (IN)</b>										
RIPARIAN STATUS	TREE CANOPY <10' IN TOTAL WIDTH			TREE CANOPY 10 to 40' IN WIDTH			TREE CANOPY >40' IN WIDTH			TOTAL STREAM MILES
	PEREN- NIAL	INTER- MITTENT	SUB- TOTAL	PEREN- NIAL	INTER- MITTENT	SUB- TOTAL	PEREN- NIAL	INTER- MITTENT	SUB- TOTAL	
	0.00	3.06	3.06	0.00	2.05	2.05	0.00	0.29	0.29	5.40
% of Subwatershed Total	0.0%	56.7%	56.7%	0.0%	38.0%	38.0%	0.0%	5.4%	5.4%	100.0%
% of Wabash Watershed Total	0.0%	0.5%	0.5%	0.0%	0.4%	0.4%	0.0%	0.1%	0.1%	1.0%
% of Grand Lake/Wabash Watershed Total	0.0%	0.4%	0.4%	0.0%	0.3%	0.3%	0.0%	0.0%	0.0%	0.8%

### *Operations and Animal Units*

The table on the following page shows the number of operations and the animal units by species for the Limberlost Creek Headwaters to below Bull Creek (IN) subwatershed. According to the table, there is one poultry operation, two dairy operations, two hog operations, one beef operation and one sheep operation within the entire subwatershed. The Limberlost Creek Headwaters to below Bull Creek (IN) subwatershed ranks fourteenth within the entire Grand Lake/Wabash River Watershed when considering the total number of operations with seven or 0.71%. Animal units within the subwatershed ranks twelfth of 15 with 0.95%.

Totals of animal units for each species are also listed on the table. The inventory for this subwatershed was completed during October of 2006. At the time of the inventory animal units were determined by the number of animals present. Although this is not a 1:1 ratio for all species, it is for beef cattle. The following chart shows the number of each type of animal that makes up 1,000 animal units.

Animal Type	1,000 Animal Unit Equivalent
Beef Cattle	1,000
Dairy Cattle	700
Hogs (over 55 lbs)	2,500
Turkeys	55,000
Layer Chickens	82,000
Pullet Chickens	125,000
Sheep	10,000
Horses	500

Table 98  
Operations and Animal Units

LIMBERLOST CREEK HEADWATERS TO BELOW BULL CREEK (IN)														
ANIMAL TYPE	POULTRY		DAIRY		HOG		BEEF		OTHER		TOTAL		Total as % of Wabash Watershed	
# Farms and Animals	# OPER.	# A.U.s	# OPER.	# A.U.s	# OPER.	# A.U.s	# OPER.	# A.U.s	# OPER.	# A.U.s	# OPER.	# A.U.s	# OPER.	# A.U.s
	1 (Trky)	2,098 0	2	500	2	440	1	200	(sheep) 1 (hrs)	5 0	7	3,243	1.0%	1.4%
% of subwatershed total	14.3%	64.7%	28.6%	15.4%	28.6%	13.6%	14.3%	6.2%	14.3%	0.2%	100.0%	100.0%		
Total as % of Wabash Watershed	0.1%	0.9%	0.3%	0.2%	0.3%	0.2%	0.1%	0.1%	0.1%	0.0%	1.0%	1.4%		
Total as % of Grand Lake/Wabash Watershed	0.10%	0.61%	0.20%	0.15%	0.20%	0.13%	0.10%	0.06%	0.10%	0.00%	0.71%	0.95%		

## *Manure Production*

After considering the number of livestock operations and animal units present in the subwatershed, it is only fitting to consider the by-products of these animals. The table on the opposite page is used to represent the manure and nutrient production for the Limberlost Creek Headwaters to below Bull Creek (IN) drainage area. The subwatershed ranks thirteenth of 15 in terms of manure production per annum. Approximately 18,224 tons of manure is produced annually. The remainder of the columns on the table indicates the approximate pounds of nutrients contained in that manure. Nitrogen, potassium, and phosphate, are all important to the agricultural community and are provided to the crops via manure or commercial fertilizer applications.

These nutrients are also important in regards to water quality. According to the table, in the Limberlost Creek Headwaters to below Bull Creek (IN) subwatershed, the amount of phosphorus that is contained in the manure produced annually would need to be applied at 272 pounds per acre. The table below indicates the average crop removal rates for phosphorus for the major crops produced in the watershed. Values were obtained from the Ohio Agronomy Guide.

<b>CROP</b>	<b>P<sub>2</sub>O<sub>5</sub> REMOVAL (lb/ac)</b>
Alfalfa (6T)	80
Corn (150 bu) Grain	55
Corn (25 T) Silage	80
Soybean (50 bu)	40
Wheat (75 bu) Grain	48

Considerations are given to the nutrient phosphorus due to its importance to crop production and the problems associated with the relationship between excessive phosphorus applications and degradation of water quality. Because much of the poultry manure is brokered out of the watershed, it seemed important to reflect the nutrient values assuming that 70% of the poultry manure is moved to locations outside the watershed. Local manure haulers estimated this value to be 90%; however, to be conservative, 70% was assumed for this plan. Under this assumption, the amount of phosphorus that is contained in the manure produced annually in this subwatershed would need to be applied at 141 pounds per acre.

What this seems to indicate throughout the watershed is that according to manure production and crop removal rates for limiting nutrient factors, there are not enough acres for proper manure application methods. The caveat on this statement is that the numbers are best estimates, variations in soil types and tith can vary throughout the fields which may increase, or decrease, crop removal rates, and more importantly, some of the manure produced in each of the subwatersheds may be applied to acreages outside of that subwatershed, or even outside of the Grand Lake/Wabash watershed. It should be noted that several producers own or rent land both in the Grand Lake/Wabash watershed and in neighboring watersheds such as Loramie Creek or the St Marys River.

Table 99  
Manure and Nutrient Production

<b>LIMBERLOST CREEK HEADWATERS TO BELOW BULL CREEK (IN)</b>						
Manure Production	Tons Raw Manure/Year	Lbs. N per Year	Lbs. K <sub>2</sub> O per Year	Lbs. P <sub>2</sub> O <sub>5</sub> per Year	Acres Cropland	Lbs. P <sub>2</sub> O <sub>5</sub> per Crop Acre
	18,224	308,467	188,974	226,928	833	272
Less 70% Poultry Manure**	13,552	180,934	127,310	117,147	833	141
Approximate \$ Value Per Year		\$67,863	\$28,346	\$45,386		
Total Nutrient Value Per Year = \$141,594						

\*\*Based on conversations with poultry manure brokers, it was estimated that at least 70% of the poultry manure is brokered out of the watershed.

The dollar values associated with each nutrient were obtained from OSU Extension Bulletin 604-06, "Ohio Livestock Manure Management Guide." The value for nitrogen is estimated at \$0.22 per pound, the value for P<sub>2</sub>O<sub>5</sub> is \$0.20 per pound and the value for K<sub>2</sub>O is \$0.15 per pound.

*Distance Between Livestock Operations and Streams*

The table on the following page shows the distance between various livestock operations located in the Limberlost Creek Headwaters to below Bull Creek (IN) subwatershed and the waterways that drain to the Wabash River. It can be assumed that the greater the distance between a livestock operation and a water system, the potential of pollution from the operation reaching the stream is lessened.

Of notable interest is the number of all livestock operations located less than 1,000 feet from the waterbody. In this particular subwatershed, out of seven operations, three operations, or 42.9%, fall into the category. Also, one operation, 14.3%, is in within 2,000 feet and the remaining 42.9%, three operations, are less than 3,000 feet from the nearest stream.

Table 100  
Livestock Operations and Proximity to Streams

LIMBERLOST CREEK HEADWATERS TO BELOW BULL CREEK (IN)																		
ANIMAL TYPE	POULTRY			DAIRY			HOG			BEEF			OTHER			TOTAL		
	Distance to Stream			Distance to Stream			Distance to Stream			Distance to Stream			Distance to Stream			Distance to Stream		
	<1000'	<2000'	<3000'	<1000'	<2000'	<3000'	<1000'	<2000'	<3000'	<1000'	<2000'	<3000'	<1000'	<2000'	<3000'	<1000'	<2000'	<3000'
	1	0	0	0	0	2	1	1	0	0	0	1	1	0	0	3	1	3
% of Subwatershed Total	14.3%	0.0%	0.0%	0.0%	0.0%	28.6%	14.3%	14.3%	0.0%	0.0%	0.0%	14.3%	14.3%	0.0%	0.0%	42.9%	14.3%	42.9%

### *Non-Point Source Pollution Potential*

In order to provide a comparison of the pollution potential of each of the 15 subwatersheds, a ranking system for each of the main potential pollution sources was developed. These potential sources are stream miles with less than 10 feet of vegetation, the number of livestock or poultry operations less than 1,000 feet from a stream, the tons of raw manure produced yearly, the pounds of phosphorus per cropland acre available from the manure, the number of household wastewater disposal systems contained in clusters of ten or more) and the number of homes built pre-1973. Values of 1 (less potential) to 10 (great potential) were given based on ranges shown in the table of the following page. Indicator scores are then summed to obtain a total pollution potential score for the subwatershed.

Subwatershed pollution potential scores can range from a maximum of 60 points to a minimum of six points. The Limberlost Creek Headwaters to below Bull Creek (IN) subwatershed ranks of thirteenth out of 15, with 18.3% of the maximum points for pollution potential.

## NONPOINT SOURCE POLLUTION POTENTIAL SCORING MATRIX

MAXIMUM DRAINAGE UNIT SCORE = 60 (Highest Pollution Potential)

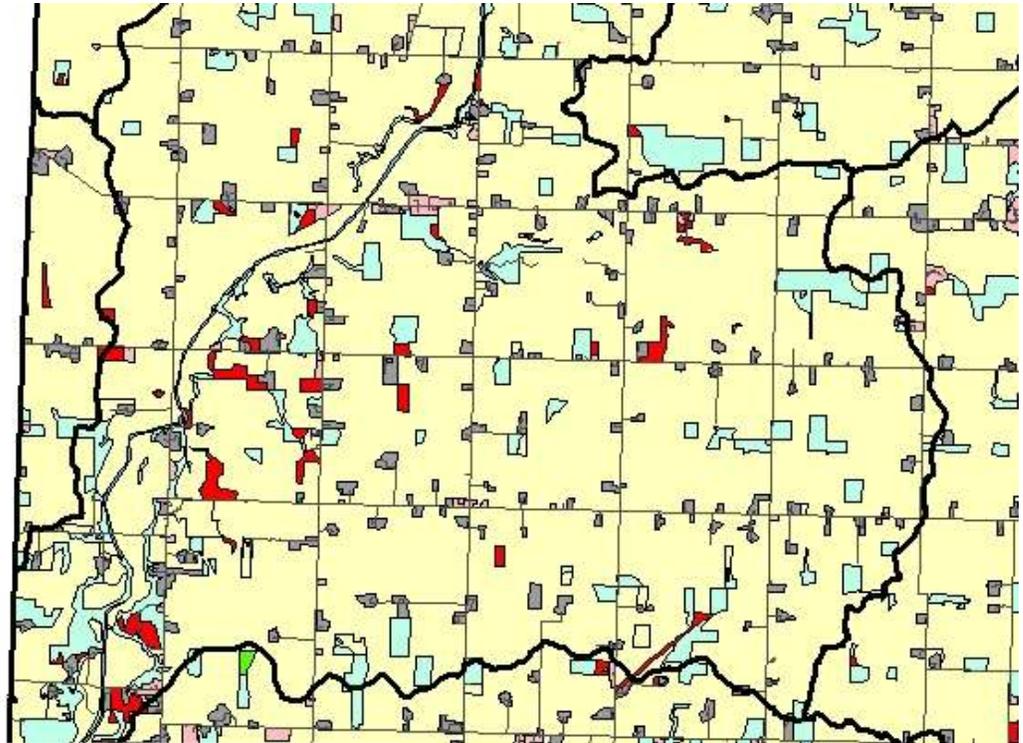
SCORE	Stream Miles with <10' Vegetation	Operations <1,000' to stream	Tons Raw Manure per Year	Lbs. P <sub>2</sub> O <sub>5</sub> per Crop Acre	Household Disposal Systems in Groups	No. Homes Built pre-1973
10	72.00+	46+	180,000+	225+	90+	226+
9	64.00 - 71.99	41 - 45	160,000 - 179,999	200 - 224	80 - 89	201 - 225
8	56.00 - 63.99	36 - 40	140,000 - 159,999	175 - 199	70 - 79	176 - 200
7	48.00 - 55.99	31 - 35	120,000 - 139,999	150 - 174	60 - 69	151 - 175
6	40.00 - 47.99	26 - 30	100,000 - 119,999	125 - 149	50 - 59	126 - 150
5	32.00 - 39.99	21 - 25	80,000 - 99,999	100 - 124	40 - 49	101 - 125
4	24.00 - 31.99	16 - 20	60,000 - 79,999	75 - 99	30 - 39	76 - 100
3	16.00 - 23.99	11 - 15	40,000 - 59,999	50 - 74	20 - 29	51 - 75
2	8.00 - 15.99	6 - 10	20,000 - 39,999	25 - 49	10 - 19	26 - 50
1	0.00 - 7.99	0 - 5	0 - 19,999	0 - 24	0 - 10	0 - 25

MINIMUM DRAINAGE UNIT SCORE = 6 (Lowest Pollution Potential)

**TABLE 101**  
**NPS Pollution Potential**

<b>LIMBERLOST CREEK HEADWATERS TO BELOW BULL CREEK (IN)</b>							
SUBWATERSHED ATTRIBUTE	Stream Miles with <10' Vegetation SCORE	Operations <1,000' to stream SCORE	Tons Raw Manure per Year SCORE	Lbs. P <sub>2</sub> O <sub>5</sub> per Crop Acre SCORE	Household Disposal Systems in Groups SCORE	No. Homes Built pre-1973 SCORE	TOTAL SCORE
	1	1	1	6	1	1	11

MAP 70  
Limberlost Creek Headwaters to below Bull Creek (IN) Land Use

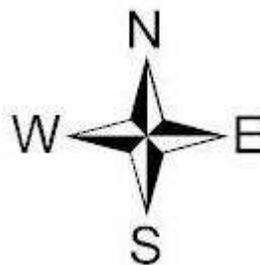


**Legend**

-  Grand Lake/Wabash Watershed
-  Roadways

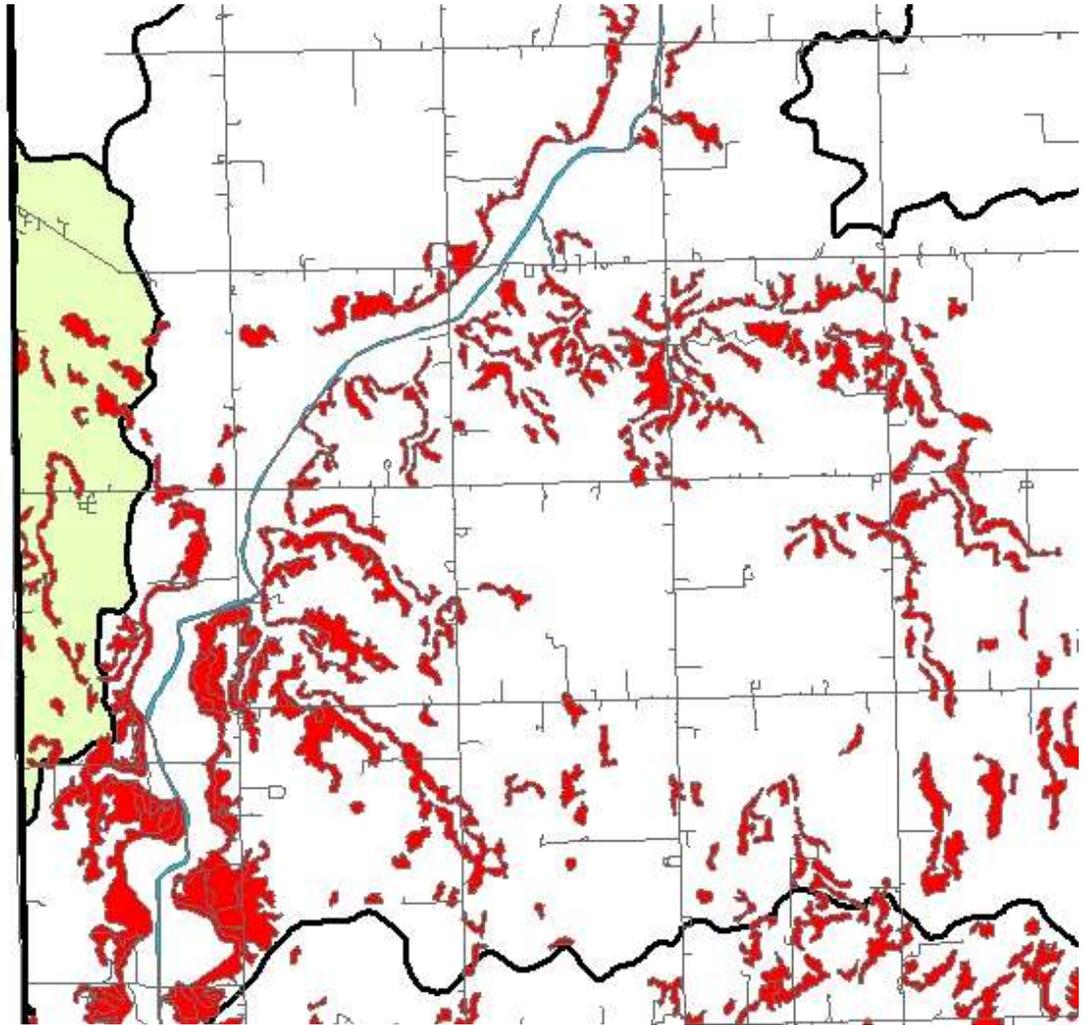
**Land Use**

-  Cropland
-  Urban
-  Farmsteads
-  Shrub\_Brush
-  Deciduous Forest
-  Open Water
-  Wetlands
-  Barren/Undeveloped



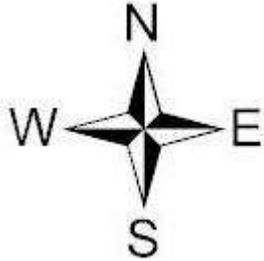
# MAP 71

Limberlost Creek Headwaters to below Bull Creek (IN) Highly Erodible Land



**Legend**

-  Highly erodible land
-  Roadways
-  Open Water
-  Subwatershed



MAP 72  
Limberlost Creek Headwaters to below Bull Creek (IN) Riparian Corridor Status

