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## **Section IV. Benchmark Water Quality Assessment**

In order to define a point of comparison, quantify pollutant loads and substantiate stakeholder concerns, an assessment of existing water quality was conducted. The results of this assessment were compiled as a benchmark of water quality: pollutant loads, aquatic habitat, riparian buffers, and upland land uses affecting water quality. In addition to corroboration of stakeholder concerns, this assessment was utilized as part of the critical area identification process.

As a cholesterol test is used by physicians in the identification and monitoring of heart disease, this water quality benchmark will not only be used to identify concerns – It will also be used as a measuring stick for water quality improvements.

Benchmark values were based upon findings from 2000 Source Identification Study (IDEM), 2008 TMDL (IDEM), NPDES violation data, BCWP sampling events, BCWP modeling of nutrient loads, macroinvertebrate sampling, and BCWP habitat assessment, and BCWP analysis of geo-referenced landuse and tree cover data.

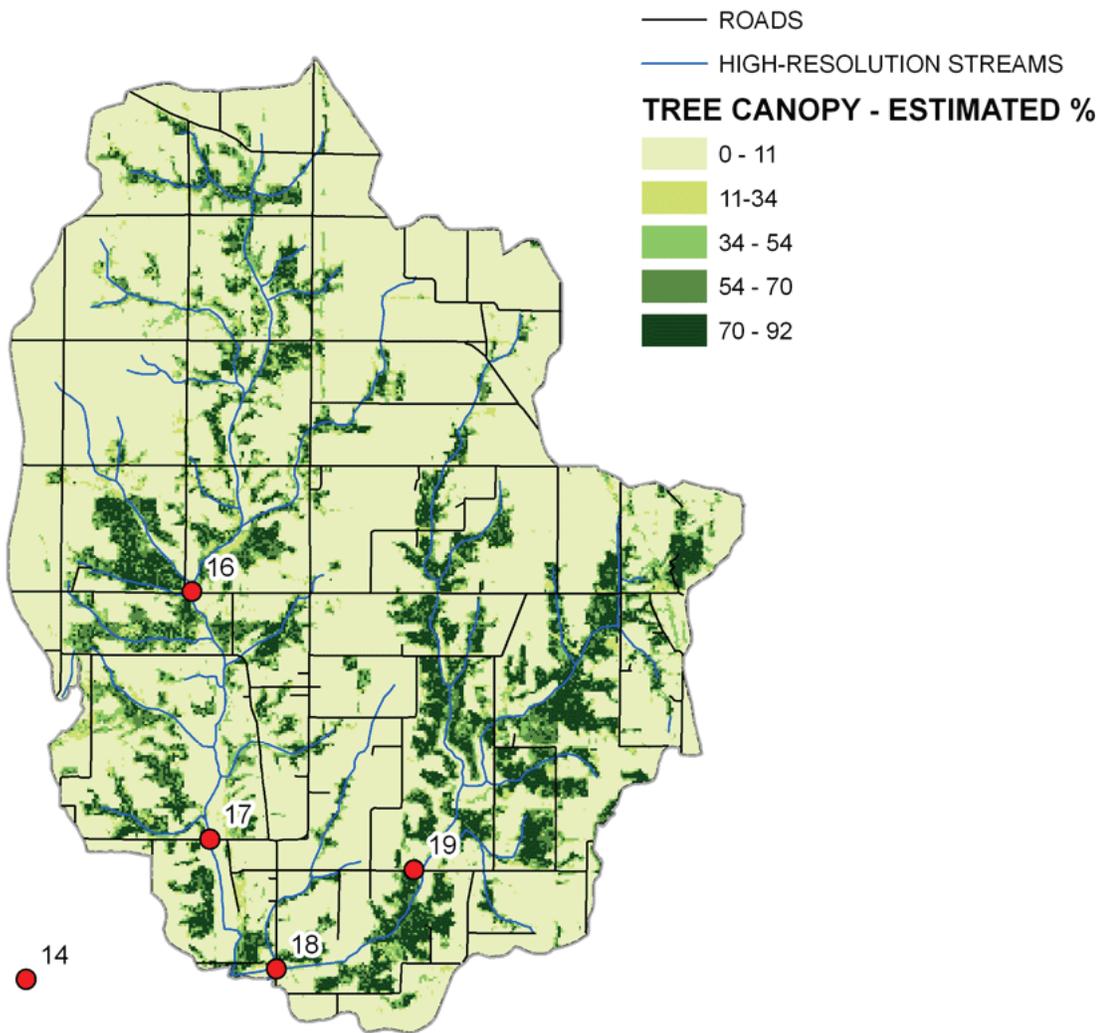
### **4.01 Land & Stream Inventory**

During sampling events in August 2008, habitat assessments were conducted at each BCWP sampling site using the Hoosier Riverwatch Citizens Quality Habitat Evaluation Index (CQHEI) and Biological Monitoring protocol. It should be noted that only the Headwaters Big Branch Subwatershed received an “excellent” (a score of 23 or more) Pollution Tolerance Index Rating. *All* Subwatersheds had “poor” (less than 30) Diversity Index ratings. In particular, the diversity rating correlates to USGS fish survey data collected for the 2008 TMDL (Section 4.02).

In addition, analysis of geo-referenced tree cover data provided a strong benchmark for relative stream health. The geo-referenced tree cover data was clipped to represent riparian corridors along high-resolution streams and analyzed for percentage of tree canopy. Tree canopy data was ground-truthed via windshield surveys conducted during June and July 2009. Tree cover at stream / public road crossings was compared to tree-cover maps. Except for variations found in areas of active coal extraction (West Fork Busseron), commodity crop production (Middle Fork Creek, West Fork Busseron, Sulfur Creek – Busseron Creek, Buttermilk Creek) and landowner-directed clearing in apparent anticipation of coal extraction activities (Middle Fork Creek), the GIS-based analysis was accurate.

See *Figure IV-1* through *Figure IV-12* for survey results.

# Chowning Creek - Busseron Subwatershed Tree Cover



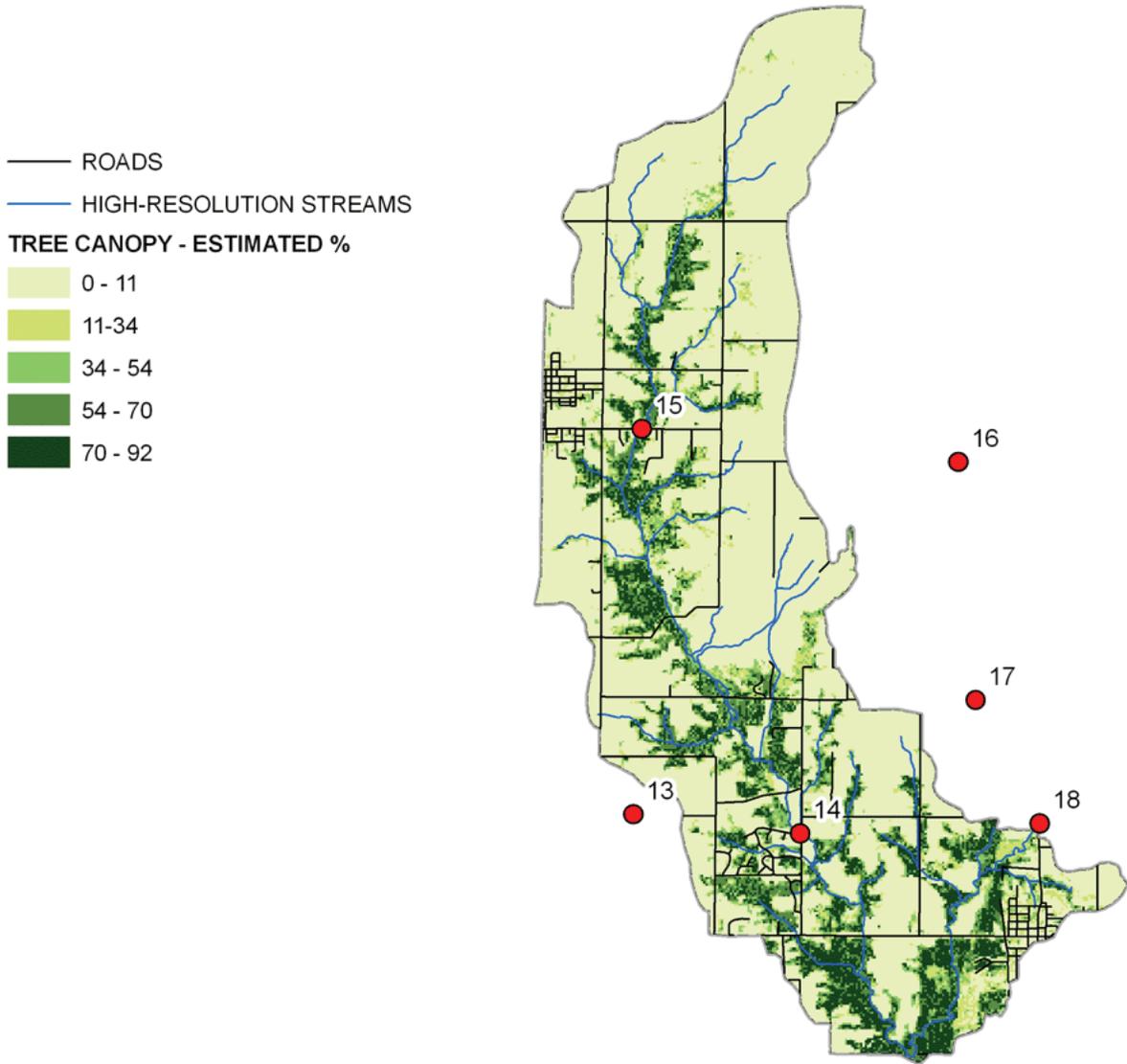
AVERAGE HABITAT ASSESSMENTS (HOOSIER RIVERWATCH)  
- CQHEI 42.2

- Biological Monitoring
  - PTI Rating 18.2 (Good)
  - Diversity Index 11.8 (Poor)



Figure IV-1 – Chowning Creek Tree Canopy and Habitat Evaluation

# West Fork Busseron Creek Subwatershed Tree Cover



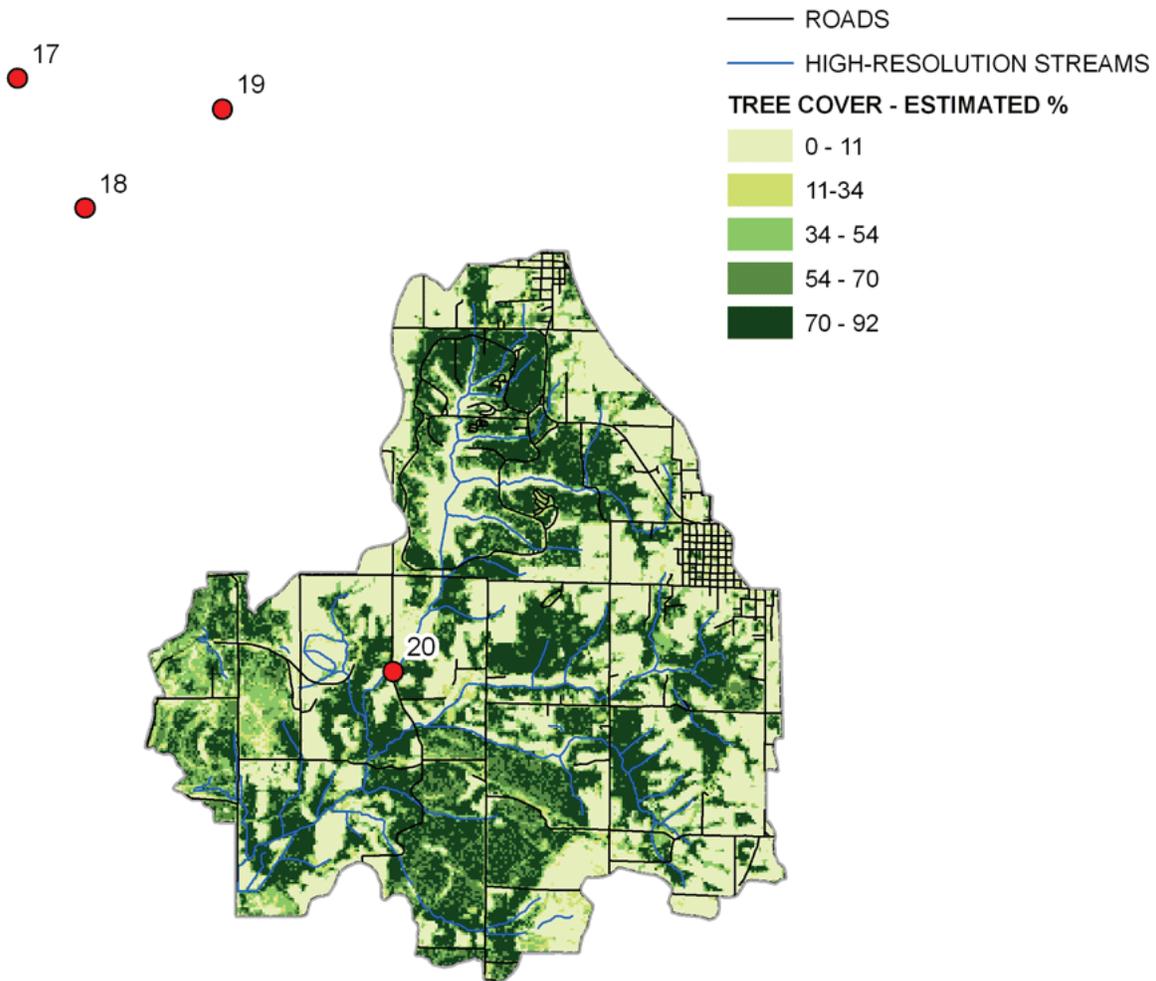
AVERAGE HABITAT ASSESSMENTS (HOOSIER RIVERWATCH)  
- CQHEI 59.7

- Biological Monitoring
  - PTI Rating 18.0 (Good)
  - Diversity Index 12.5 (Poor)



Figure IV-2 – West Fork Busseron Tree Canopy and Habitat Evaluation

# Headwaters Big Branch Subwatershed Tree Cover



AVERAGE HABITAT ASSESSMENTS (HOOSIER RIVERWATCH)  
- CQHEI 75.5

- Biological Monitoring
  - PTI Rating 34 (Excellent)
  - Diversity Index 18.3 (Poor)



Figure IV-3 – Headwaters Big Branch Tree Canopy and Habitat Evaluation

# Mud Creek - Big Branch Subwatershed Tree Cover

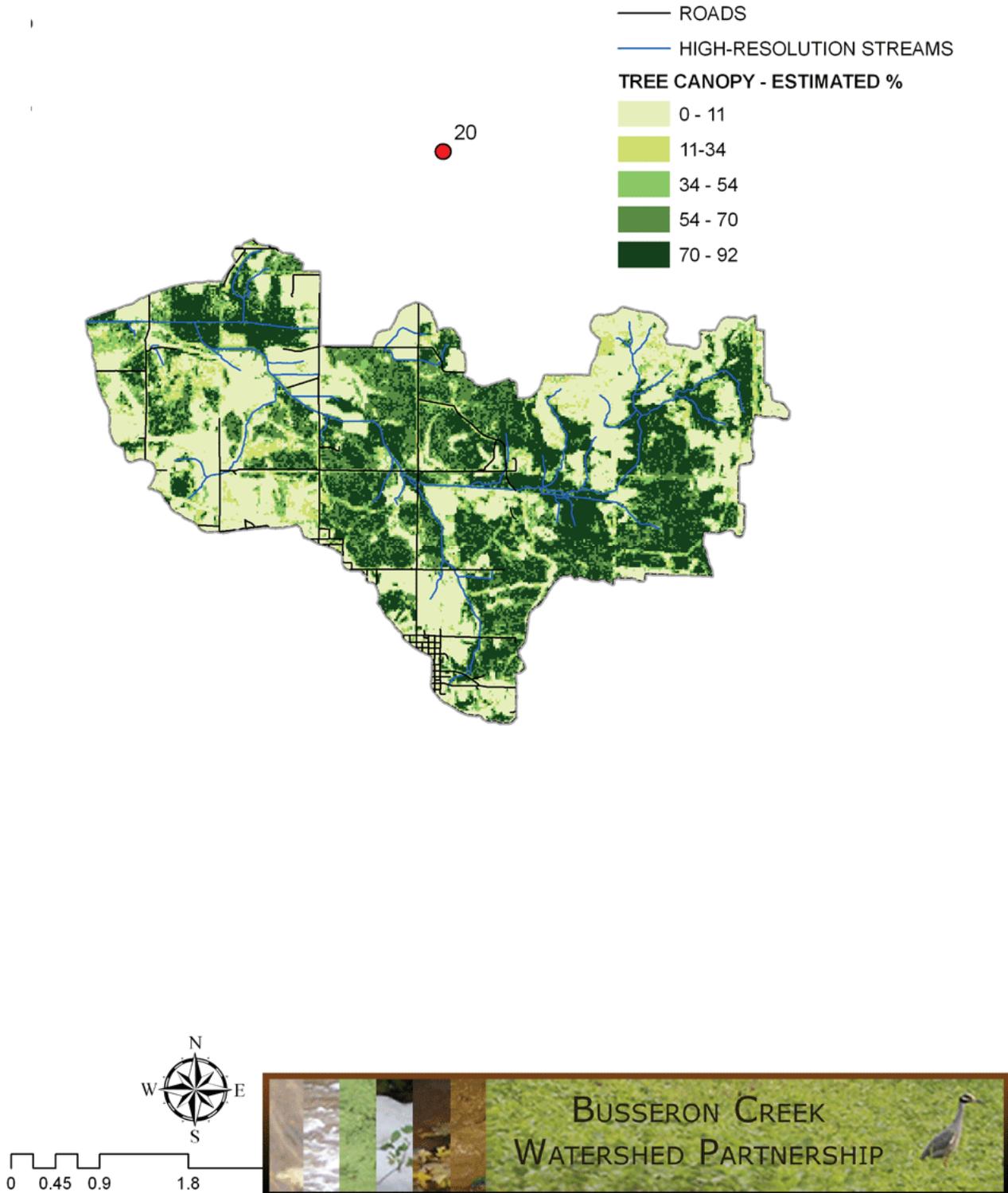
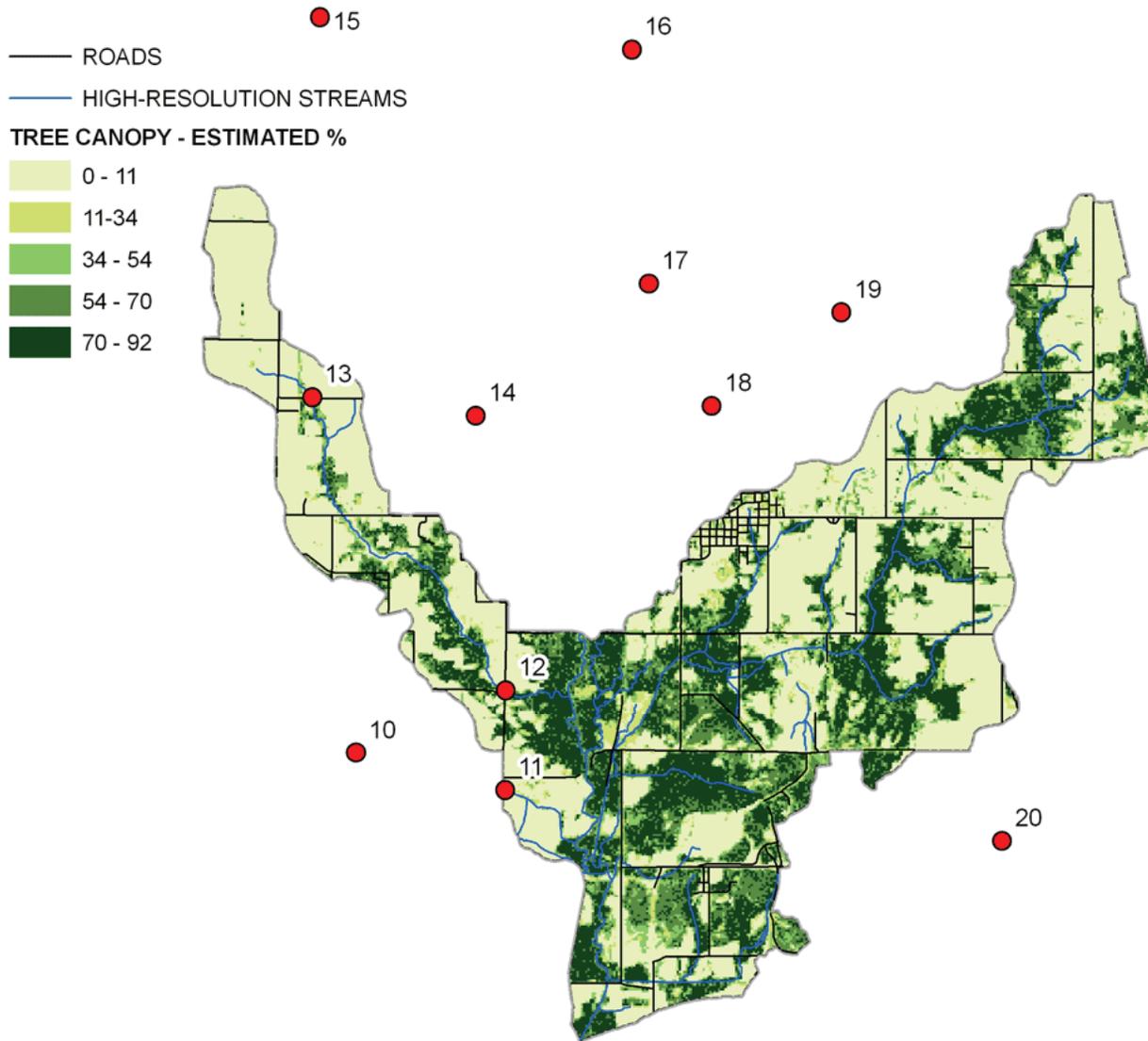


Figure IV-4 – Mud Creek-Big Branch Tree Canopy and Habitat Evaluation

# Sulfur Creek - Busseron Creek Subwatershed Tree Cover



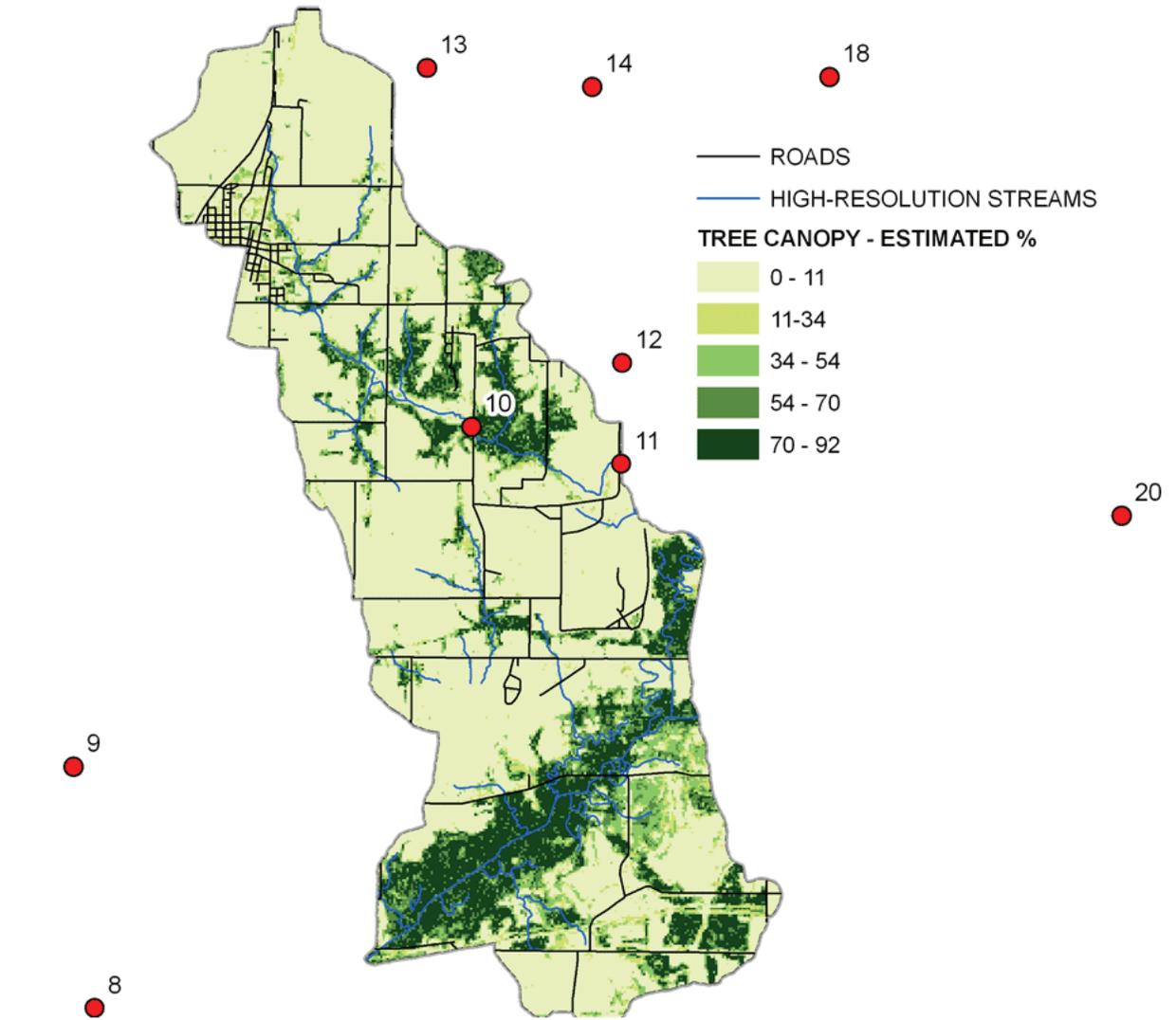
AVERAGE HABITAT ASSESSMENTS (HOOSIER RIVERWATCH)  
- CQHEI 56.3

- Biological Monitoring
  - PTI Rating 15.5 (Fair)
  - Diversity Index 6.6 (Poor)



Figure IV-5 – Sulfur Creek Tree Canopy and Habitat Evaluation

# Kettle Creek - Busseron Subwatershed Tree Cover



AVERAGE HABITAT ASSESSMENTS (HOOSIER RIVERWATCH)  
- CQHEI 70.8

- Biological Monitoring
  - PTI Rating 9.5 (Poor)
  - Diversity Index 11.5 (Poor)

A scale bar at the bottom left shows distances of 0, 0.45, 0.9, and 1.8 units. To its right is a compass rose with cardinal directions N, S, E, and W. Further right is a banner for the Busseron Creek Watershed Partnership, featuring a collage of nature images and a blue heron on the right side.

Figure IV-6 – Kettle Creek Tree Canopy and Habitat Evaluation

# Buttermilk Creek Subwatershed Tree Cover

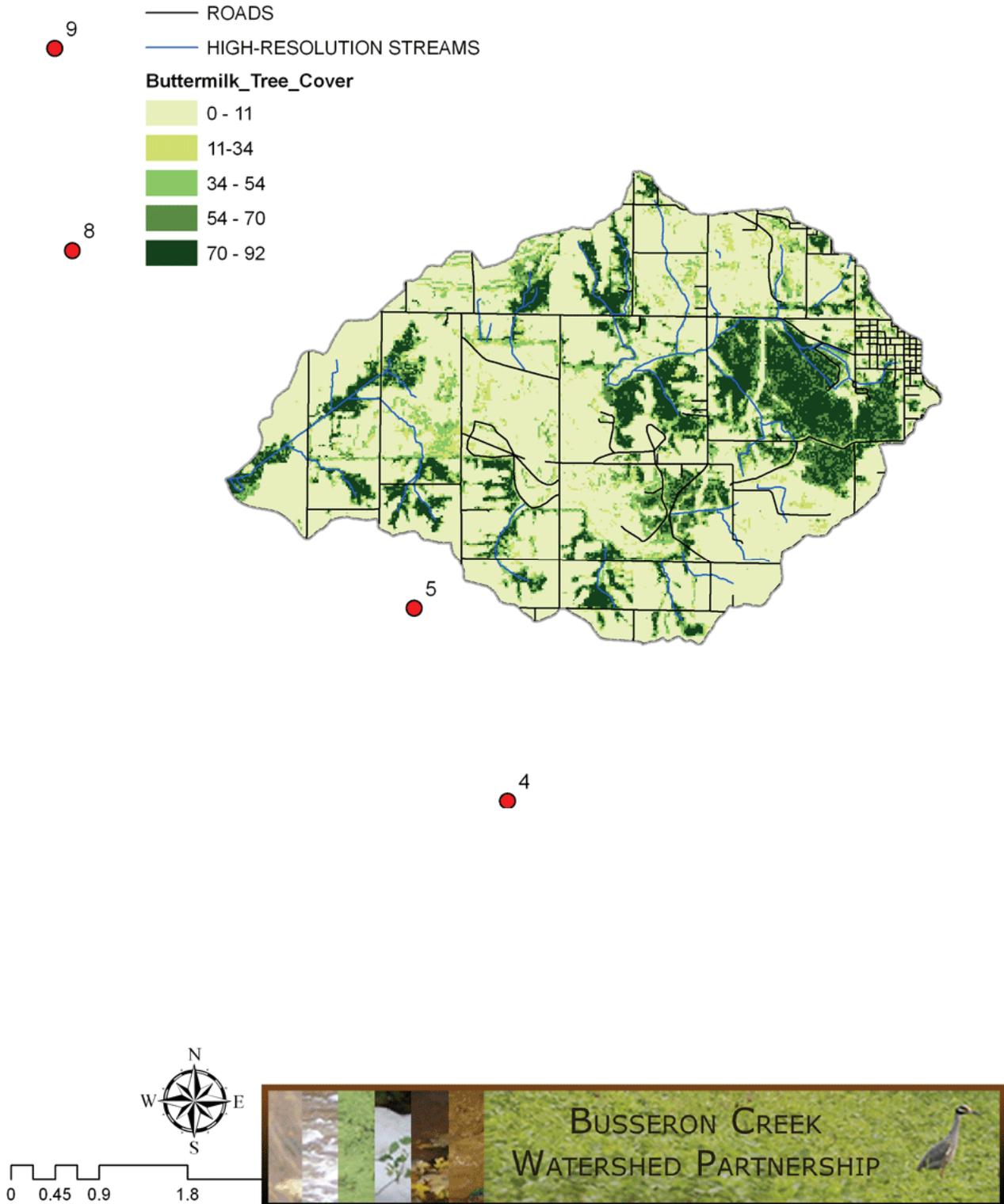


Figure IV-7 – Buttermilk Creek Tree Canopy and Habitat Evaluation

# Morrison Creek - Busseron Subwatershed Tree Cover

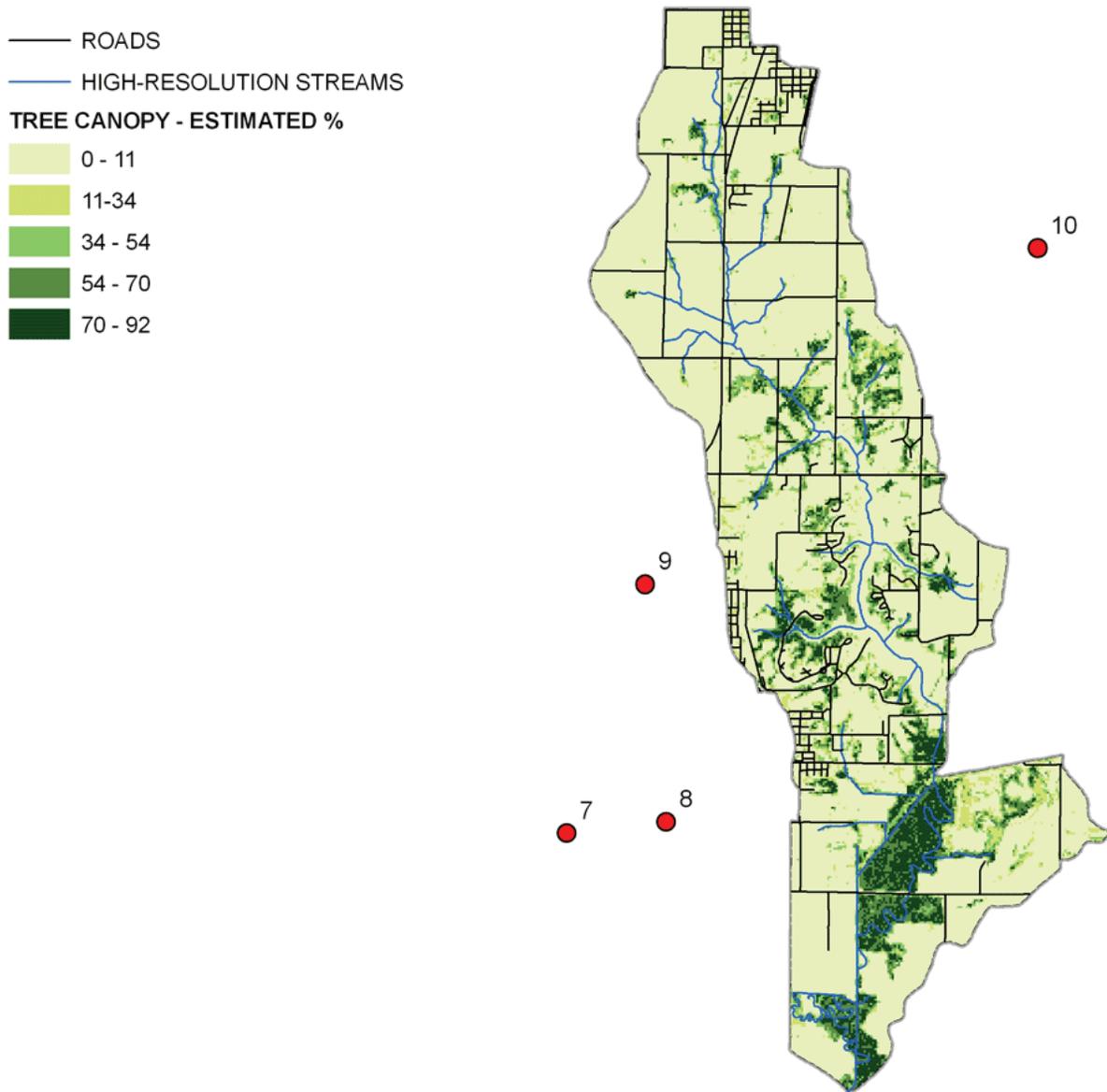
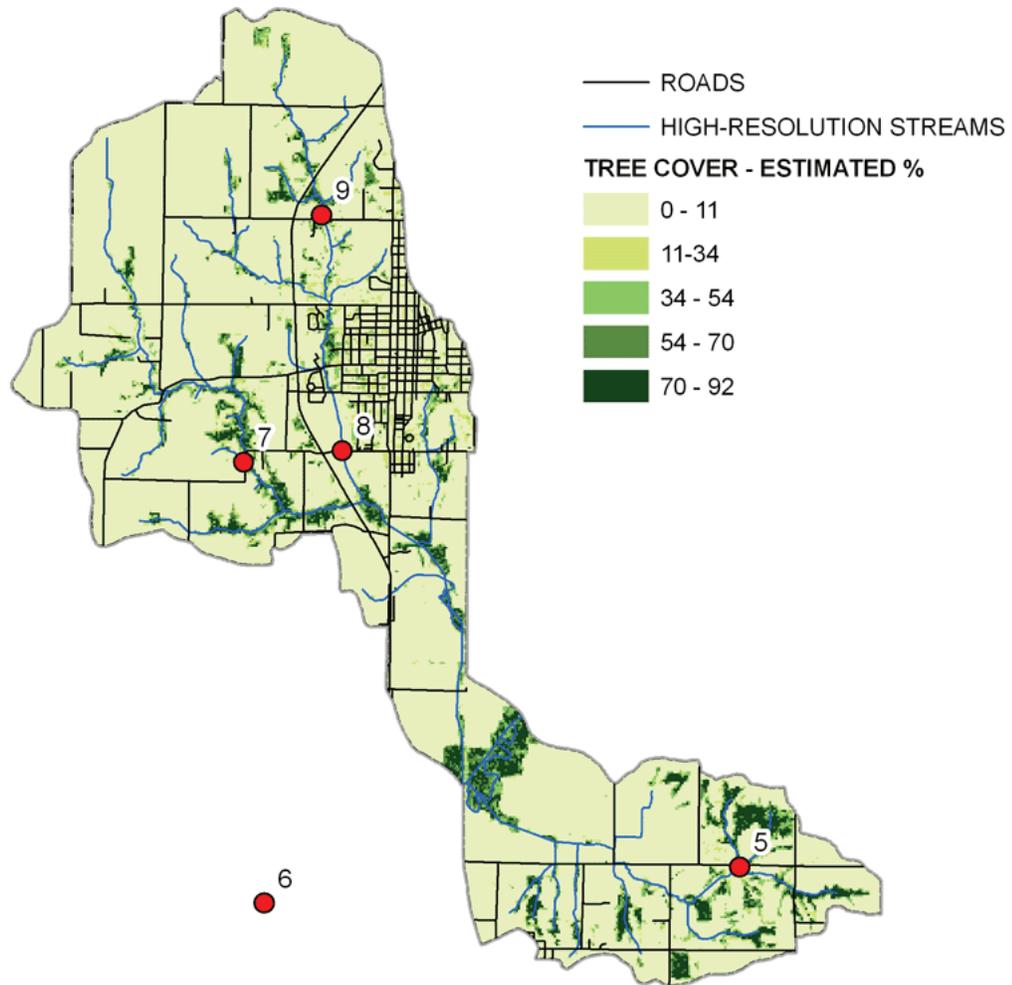


Figure IV-8 – Morrison Creek Tree Canopy and Habitat Evaluation

# Buck Creek - Busseron Subwatershed Tree Cover



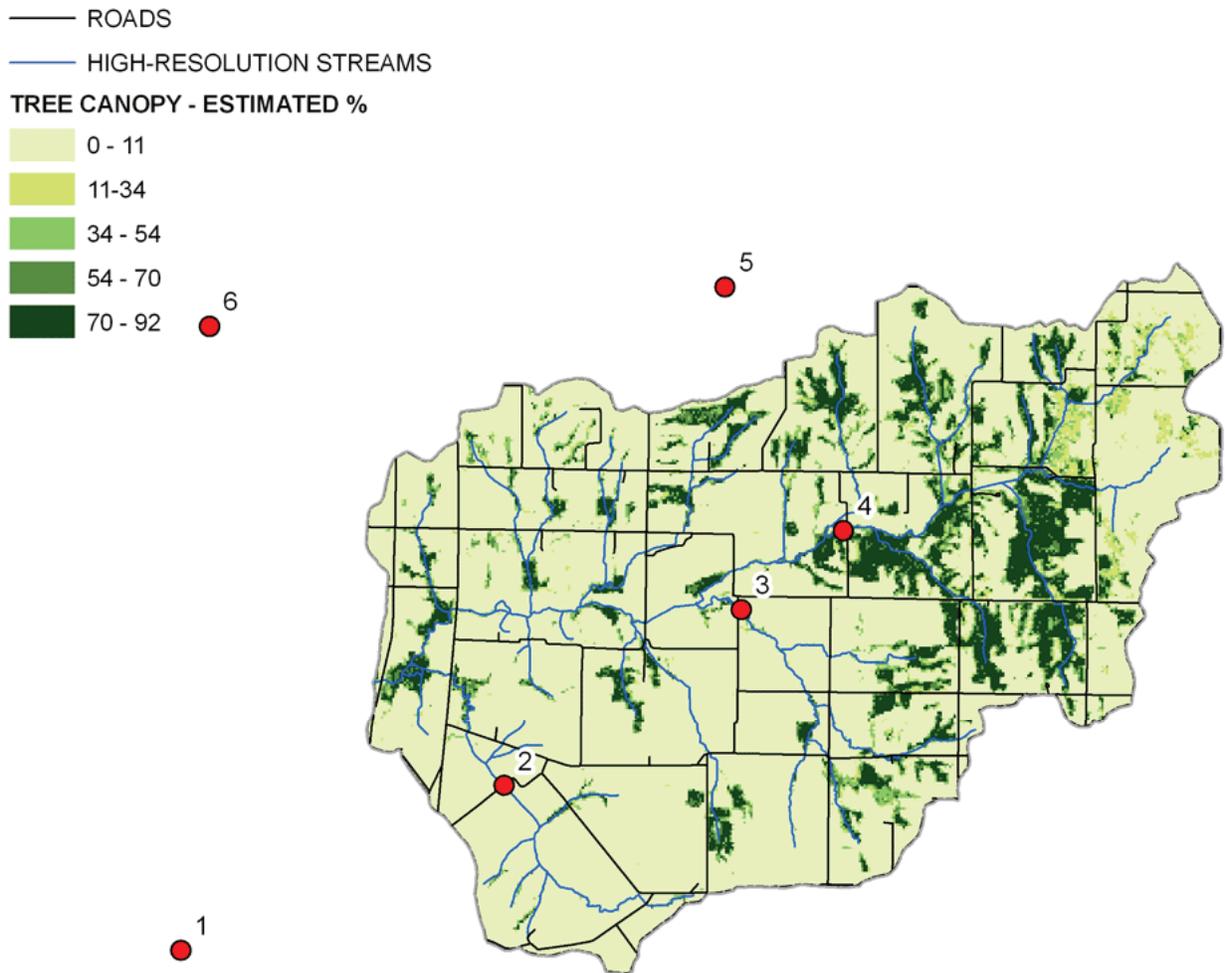
AVERAGE HABITAT ASSESSMENTS (HOOSIER RIVERWATCH)  
- CQHEI 43.6

- Biological Monitoring
  - PTI Rating 8.3 (Poor)
  - Diversity Index 17.1 (Poor)



Figure IV-9 – Buck Creek Tree Canopy and Habitat Evaluation

# Middle Fork Creek Subwatershed Tree Cover



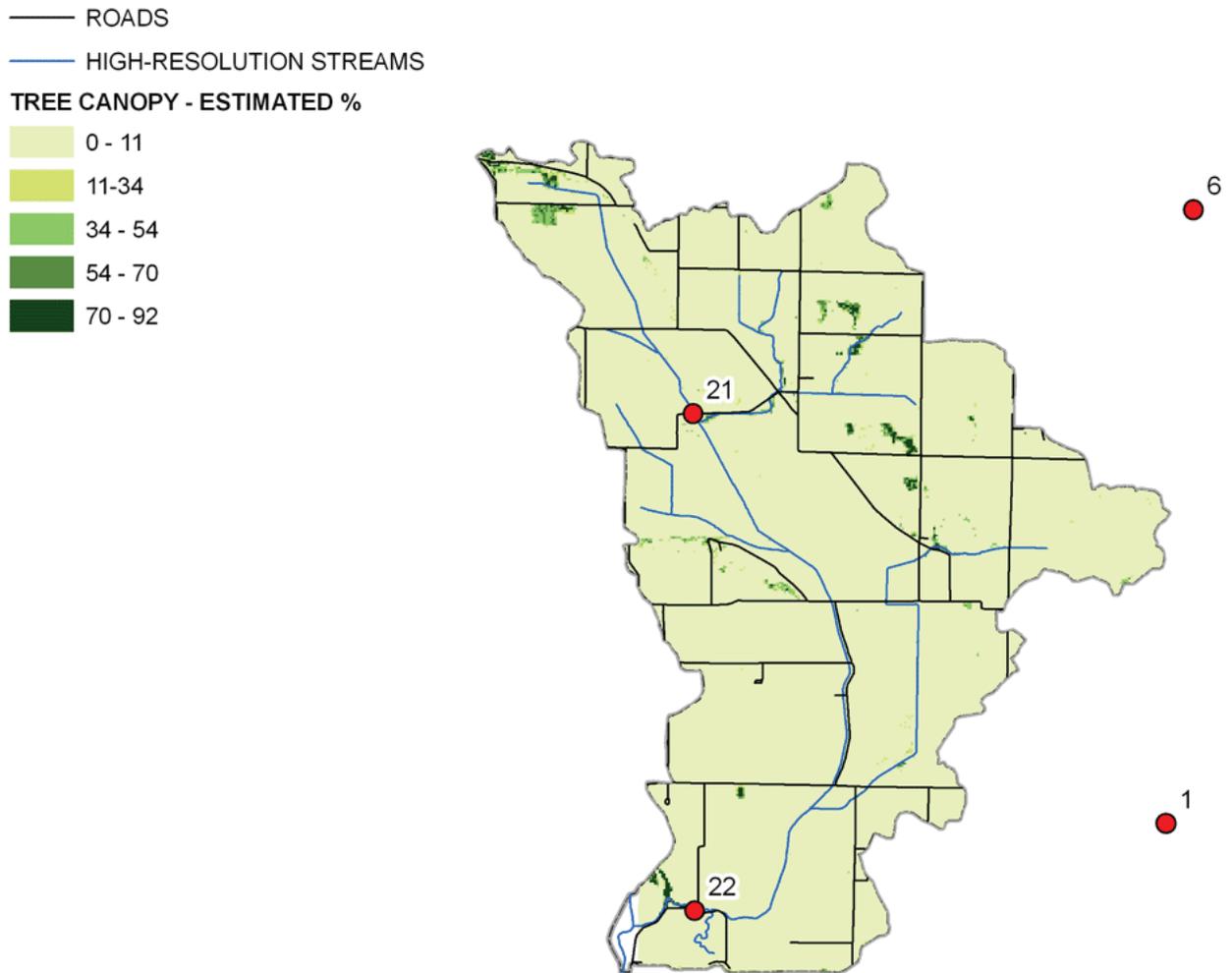
AVERAGE HABITAT ASSESSMENTS (HOOSIER RIVERWATCH)  
- CQHEI 49.0

- Biological Monitoring
  - PTI Rating 18.7 (Good)
  - Diversity Index 16.2 (Poor)



Figure IV-10 – Middle Fork Creek Tree Canopy and Habitat Evaluation

# Rogers Ditch Subwatershed Tree Cover



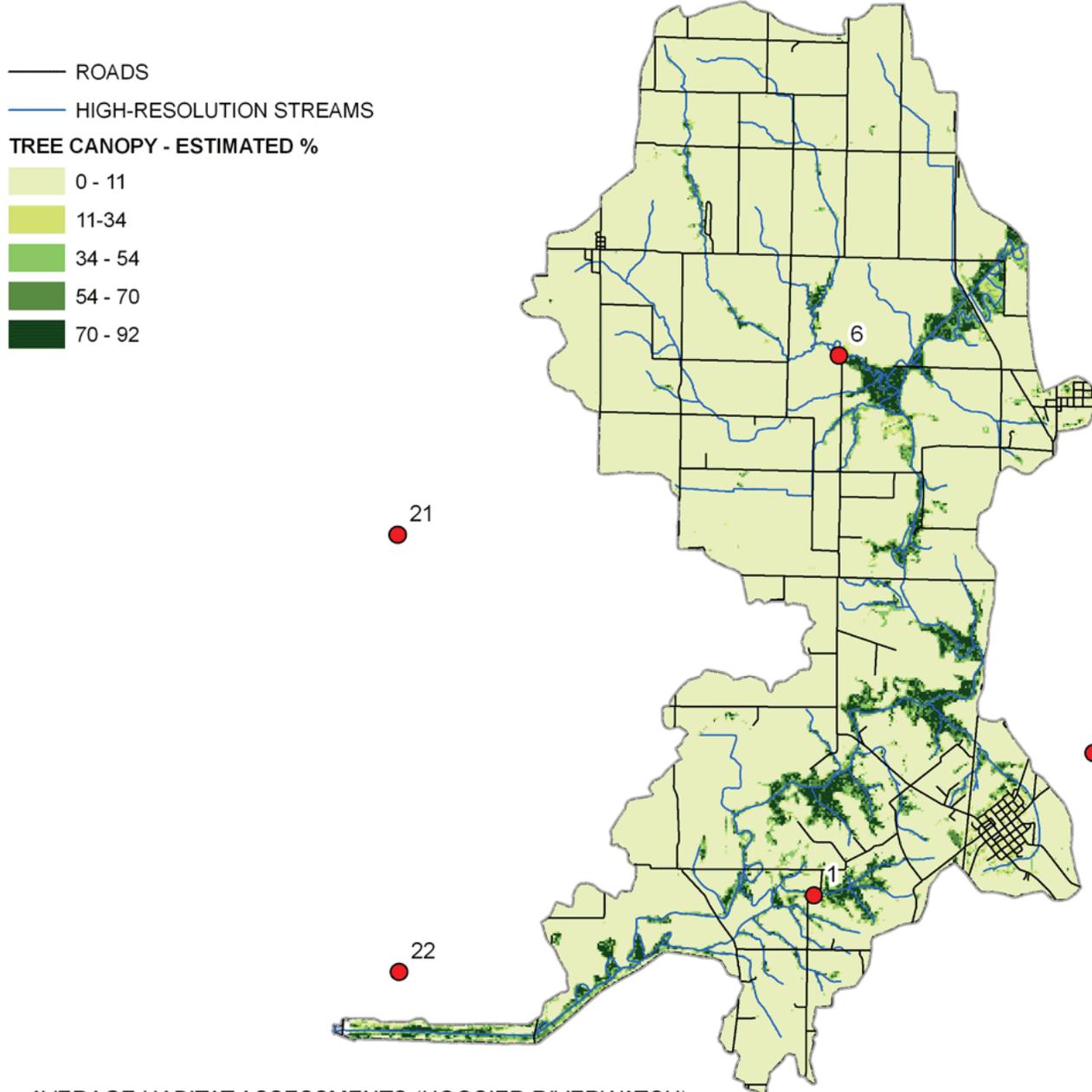
AVERAGE HABITAT ASSESSMENTS (HOOSIER RIVERWATCH)  
- CQHEI 23.8

- No Biological Monitoring (Safety)



Figure IV-11 – Rogers Ditch Tree Canopy and Habitat Evaluation

# Tanyard Branch - Busseron Subwatershed Tree Cover



AVERAGE HABITAT ASSESSMENTS (HOOSIER RIVERWATCH)  
- CQHEI 42.8

No Biological Monitoring (Health / Safety)



Figure IV-12 – Tanyard Branch Tree Canopy and Habitat Evaluation

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## 4.02 Historic Water Quality Data

### (a) Abandoned Mine Lands

Data from the Indiana Department of Natural Resources – Division of Reclamation was compiled for areas within the Busseron Creek Watershed. This sampling data was also incorporated into the Indiana Department of Environmental Management 2008 TMDL as sites 7, 8 12, and 16 in the Mud Creek area. sampling and lab results are listed in Appendix D(a).

### (b) NPDES

The bulk of NPDES permit violations have been from municipal wastewater treatment facilities *Table IV-1 NPDES Permit Violations* summarizes industrial, active mining, and wastewater treatment facility violations for a four-year period ending December 2007. Exceedingly large numbers of violations across all WWTPs in the watershed may indicate point source concerns in undiluted areas downstream from these facilities. In addition, the two Combined Sewer Overflow locations in the town of Sullivan most likely exacerbate raw sewage-related conditions in the Buck Creek Subwatershed. See *Figure IV-13 – Waste Water Treatment Plant and Combined Sewer Overflow Locations*. Additional violation information is listed in Appendix D(b)

Table IV-1 NPDES Permit Violations

Facility	Permit No.	Outfall	Date		Total Number of Violations	Parameter												Receiving Body of Water	
			First Violation	Last Violation		Dissolved Oxygen	Biochemical Oxygen Demand	E. Coli	pH	Settleable Solids	Total Suspended Solids	Total Residual Chlorine	Cyanide	Nitrogen, Ammonia Total (as N)	Total Recoverable Aluminum	Total Iron (as Fe)	Total Recoverable Iron		Total Manganese (as Mn)
<b>Industrial</b>																			
Allomatic Products	INP000149	001	Jul-04	Jun-06	3														Sullivan STP (Busseron Cr via Buck Cr)
Glendora Test Facility	IN0059633	001	Dec-03	Jun-05	2											2			
<b>Active Mineral Extraction</b>																			
Black Beauty Coal, Farmersburg	ING040062	027	Mar-04	Mar-04	1									1					Busseron Cr, Spunge Cr, Turman Cr
Coal Field Development, Hymera	ING040198	001	Feb-03	Aug-05	1									1					Sulphur Cr, Busseron Cr
Black Beauty Coal, Farmersburg Mine	ING040127	004	Jan-07	Dec-07	5												4	1	Kettle Cr, Mud Cr, Buttermilk Cr, Busseron Cr
Black Beauty Coal, Farmersburg Mine	ING040127	011	Feb-03	Aug-05	13									2					Kettle Cr, Mud Cr, Buttermilk Cr, Busseron Cr
Black Beauty Coal, Farmersburg Mine	ING040127	013	Mar-05	Mar-05	1									1					Kettle Cr, Mud Cr, Buttermilk Cr, Busseron Cr
Black Beauty Coal, Farmersburg Mine	ING040127	022	Feb-03	Feb-03	1									1					Kettle Cr, Mud Cr, Buttermilk Cr, Busseron Cr
Black Beauty Coal, Farmersburg Mine	ING040127	029	Mar-03	Mar-03	1									1					Kettle Cr, Mud Cr, Buttermilk Cr, Busseron Cr
Black Beauty Coal, Farmersburg Mine	ING040127	030	Jan-04	Nov-06	3									1			2		Kettle Cr, Mud Cr, Buttermilk Cr, Busseron Cr
Black Beauty Coal, Bear Run	ING040128	16	Jan-03	Jan-03	3									1			2		Buttermilk Cr, Middle Fork Cr
Black Beauty Coal, Bear Run	ING040128	18	May-03	May-04	9									9					Buttermilk Cr, Middle Fork Cr
Black Beauty Coal, Bear Run	ING040128	22	Jan-03	Jun-04	21									12			9		Buttermilk Cr, Middle Fork Cr
Black Beauty Coal, Hawthorn Mine	ING040010	002	Jun-07	Jun-07	1									1					Black Cr, Mariah Cr, Middle Fork Cr
<b>Wastewater</b>																			
Carlisle Municipal WWTP	IN0039837	001	Oct-04	Oct-04	1														Unnamed Ditch, Busseron Cr
Dugger WWTP	IN0039322	001	Feb-03	Nov-07	122	4	4							11			85		Buttermilk Cr, Busseron Cr
Farmersburg Municipal STP	IN0021148	001	Feb-03	Dec-07	226	10	36	17	1	92	30			40					W Fork Busseron Cr
Hymera Municipal STP	IN0040134	001	Apr-03	Dec-07	165	11	16	21	2	59	21			35					Sulphur Cr
Shakamak State Park	IN0030228	001	Jan-03	May-07	76	6	2	8	1	13	16			30					Busseron Cr via Mill Cr / Big Branch
Shelburn Municipal STP	IN0020389	001	Nov-04	Dec-07	51	3	2	9	1	16	4			11				5	Kettle Cr, Shelburn Lake
Sullivan Municipal STP	IN0024554	001	Jan-03	Nov-05	20	10	2	6		1				1					Busseron Cr via Buck Cr
Sullivan Municipal WWTP	IN0024554	001	Apr-06	Sep-07	12	1	8				3								Busseron Cr via Buck Cr

## WWTP Sites

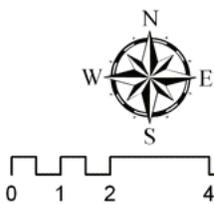
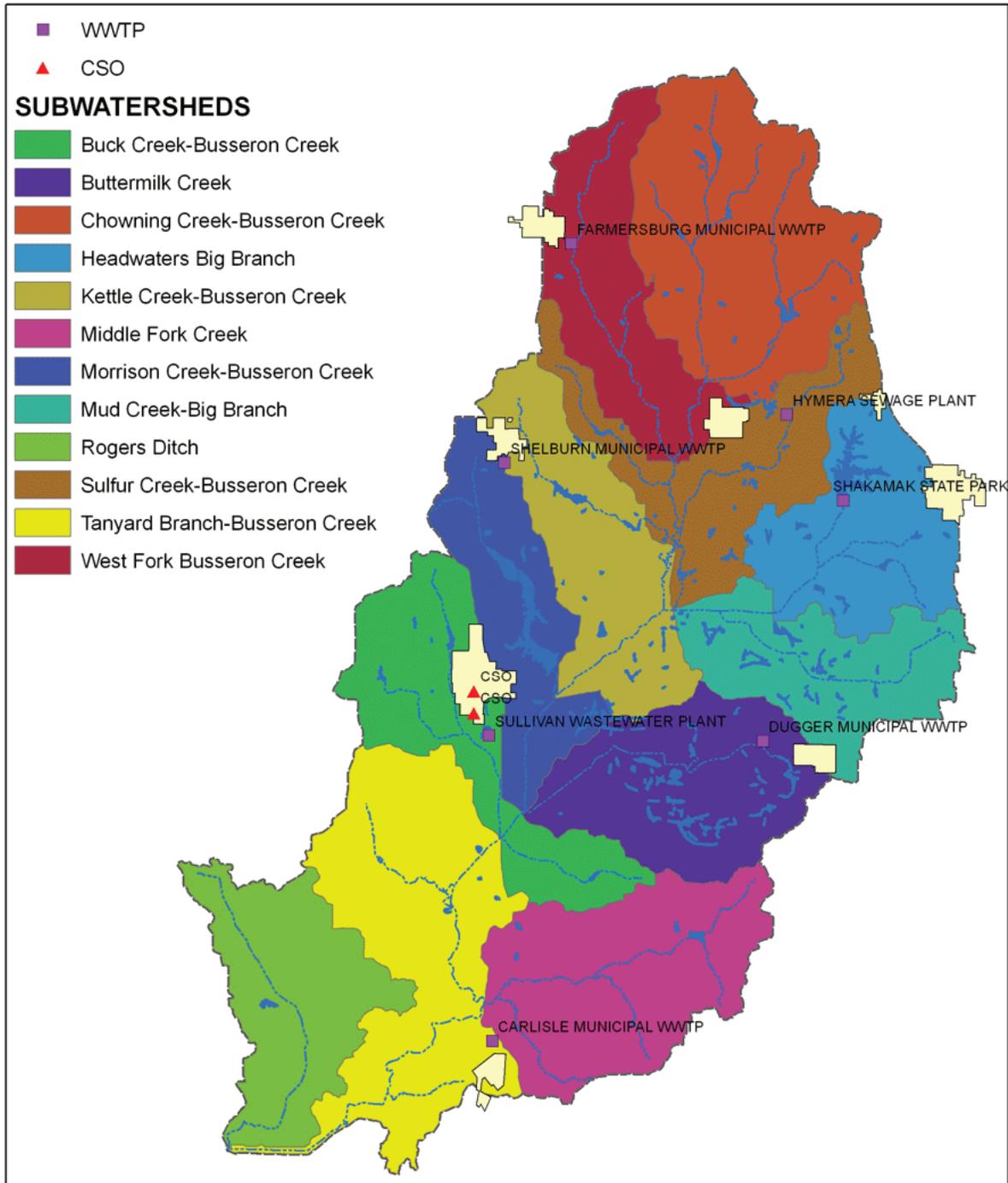


Figure IV-13 – Waste Water Treatment Plant and Combined Sewer Overflow Locations

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### **(c) USGS**

Summary findings from a USGS 1978 Water Quality Assessment noted similar conditions to those currently experienced. Impacts of coal mine operations included high sulfates, dissolved solids, and metal concentrations. Human waste from municipal areas contributed to high bacterial counts, large phytoplankton populations, and high sodium and chloride concentrations.

Other USGS work in the area has included sampling that was incorporated into the 2008 TMDL report. It is of note that the in TMDL Index of Biotic Integrity, 50% of the sites were classified as "Very Poor" and 25% of the sites were classified as "Poor". Only one site was classified as "Good". All others were classified as "Fair".

### **(d) Sullivan County Park & Lake**

The Sullivan County Park and Lake is concurrently developing nutrient and sediment load data for a Lake and River Enhancement program grant (an IDNR program). This data is specific for the Morrison Creek area. This information will be incorporated into future revisions of this Watershed Management Plan.

### **(e) 2000 IDEM Source Identification Study**

In order to investigate sulfate, total dissolved solids, and ammonia stream standard violations, 115 sites were sampled over a period of three days in October of 2000 (*Figure IV-14 – 2000 IDEM Source Identification Study Sample Sites*). The focus of this study was to determine the sources and magnitude which these sources were impacting Busseron Creek for sulfate and total dissolved solids, and ammonia in Buck Creek. The three largest contributing tributary systems of total dissolved solids and sulfate were Sulfur Creek (2.6% TDS, 3.4% Sulfate), Big Branch – Mud Creek (19% TDS, 55% Sulfate), and Buttermilk Creek (5.2% TDS, 8.2% Sulfate). These results can be attributed to known acid mine drainage issues in the Sulfur Creek and Big Branch-Mud Creek watershed. Upstream sites in the Buttermilk Creek watershed also appeared to indicate issues associated with acid mine drainage.

No ammonia violations were observed. It should be noted that although pre-survey work observed cattle wading upstream of Buck Creek sampling sites – a possible cause of earlier violations - no mention was made of the 2 CSOs upstream of Buck Creek sampling sites – another possible cause of earlier violations.

Field sampling and lab results are listed in Appendix D(c).

# 2000 IDEM Source Identification Study Sample Points

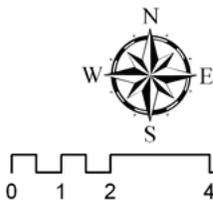
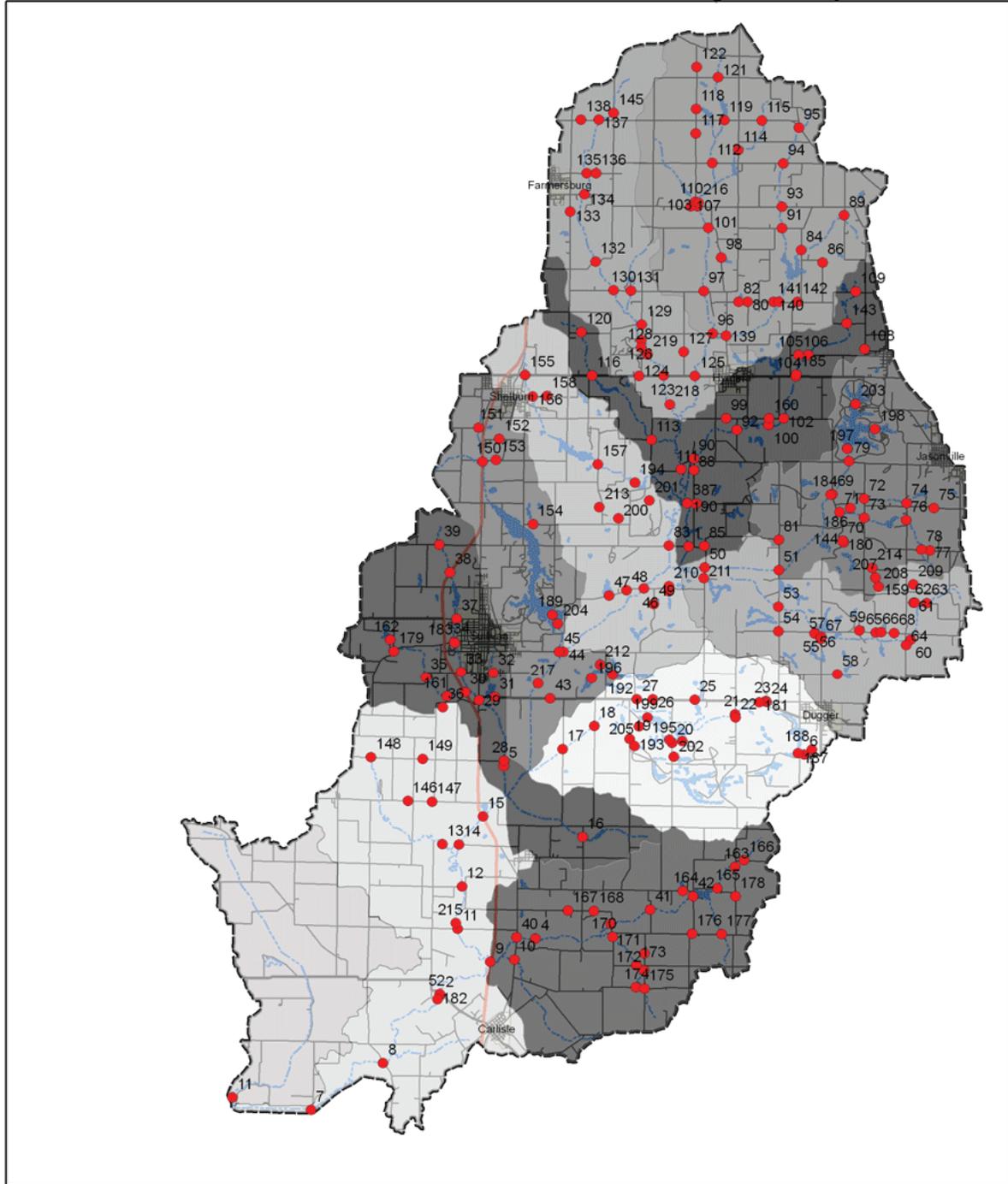


Figure IV-14 – 2000 IDEM Source Identification Study Sample Sites

**(f) 2008 TMDL**

In 2006, samples were collected from 25 sites in the Busseron Creek Watershed as part of a Total Maximum Daily Load Development (See *Figure IV-15 – TMDL Sample Sites*). As a result of this study, seven of the twelve BCW subwatersheds contain streams which have been listed on the 303d list and classed as 5A (See *Figure IV-16 – 303(d) Impaired Streams – identical to Figure III-25*). *Table IV-2 303(d) Causes of Impairment* identifies both 2006 and 2008 causes for impairment listings.

For further review, sample point drainage basins were delineated along with land uses and soil drainage classes for each point (*Figure IV-17 – TMDL Sample Site 1 Drainage Basin through Figure IV-41 - TMDL Sample Site 25 Drainage Basin*). As noted in Section 3.01(e), the majority of land uses are either agricultural (58%) or forested (31%), followed by developed property (7%). Although the abandoned mine lands are not classified as a separate land use, locations of samples exceeding standards for metals were generally located downstream from known sites of acid mine drainage. In other areas, exceedance of dissolved oxygen, total phosphorus, and total suspended solids appeared to correlate with land uses.

Field sampling and lab results are listed in Appendix D(d).

# TMDL Sample Points & Sample Point Drainage Areas

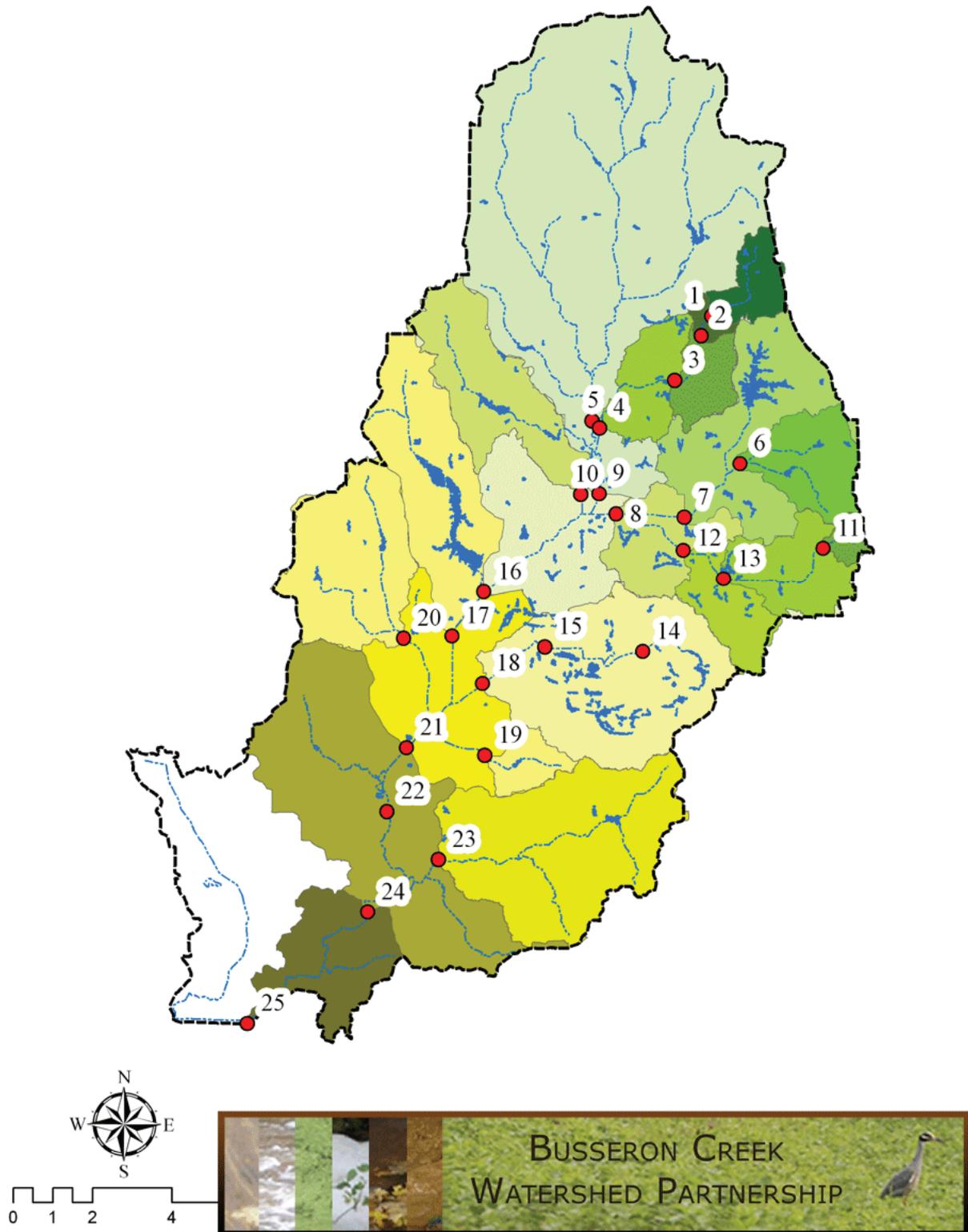


Figure IV-15 – TMDL Sample Sites

# 303(d) Impaired Streams



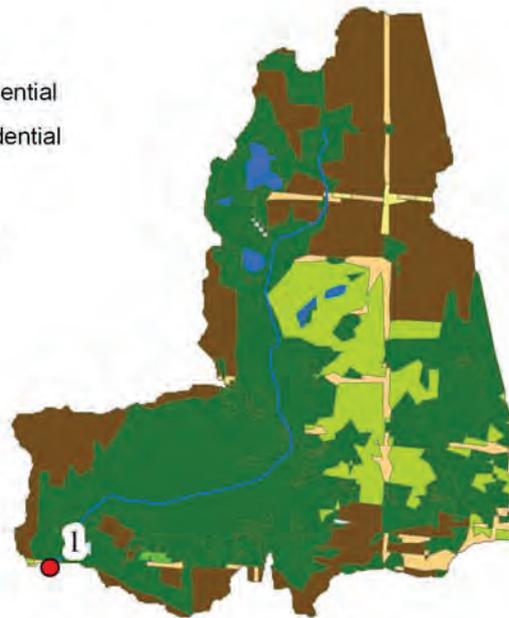
Figure IV-16 – 303(d) Impaired Streams



## TMDL 1 - Drainage Basin (1,853 Ac)

### LANDCOVER

-  Open Water
-  Developed, LD Residential
-  Developed, HD Residential
-  Wooded
-  Herbaceous / Scrub
-  Hay / Pasture
-  Cultivated Crops
-  Wetland



### SOIL DRAINAGE CLASS

-  A Low Runoff Potential
-  B Moderately Low Runoff Potential
-  C Moderately High Runoff Potential
-  D High Runoff Potential

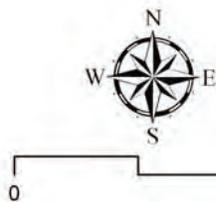
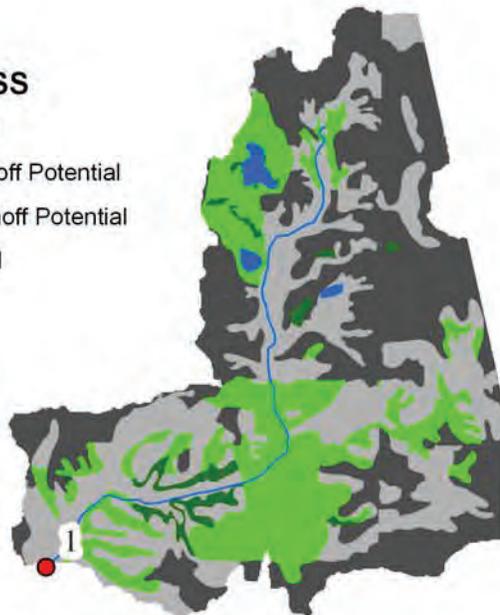
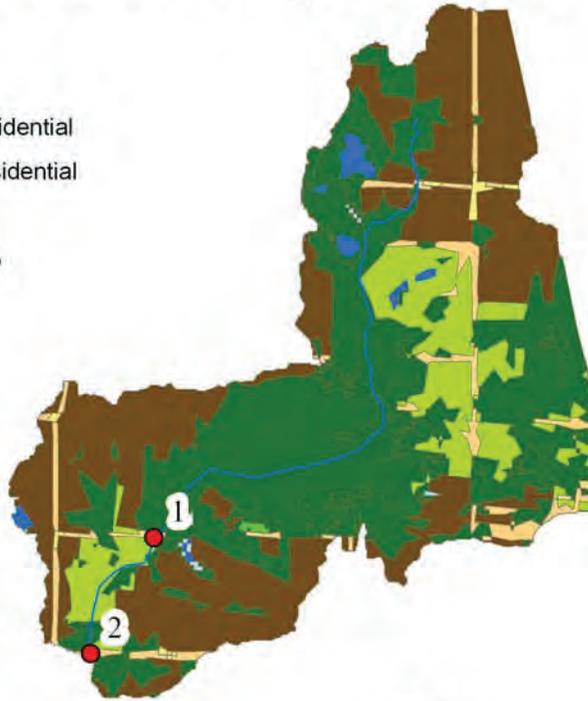


Figure IV-17 – TMDL Sample Site 1 Drainage Basin

## TMDL 2 - Drainage Basin (2,358 Ac)

### LANDCOVER

-  Open Water
-  Developed, LD Residential
-  Developed, HD Residential
-  Wooded
-  Herbaceous / Scrub
-  Hay / Pasture
-  Cultivated Crops
-  Wetland



### SOIL DRAINAGE CLASS

-  A Low Runoff Potential
-  B Moderately Low Runoff Potential
-  C Moderately High Runoff Potential
-  D High Runoff Potential

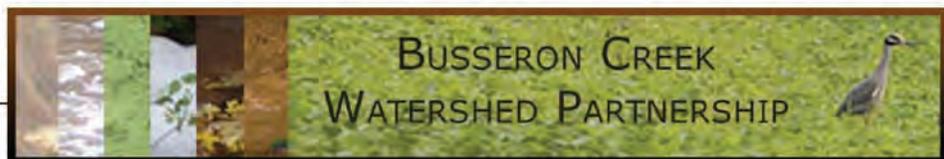
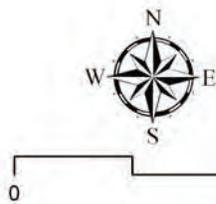
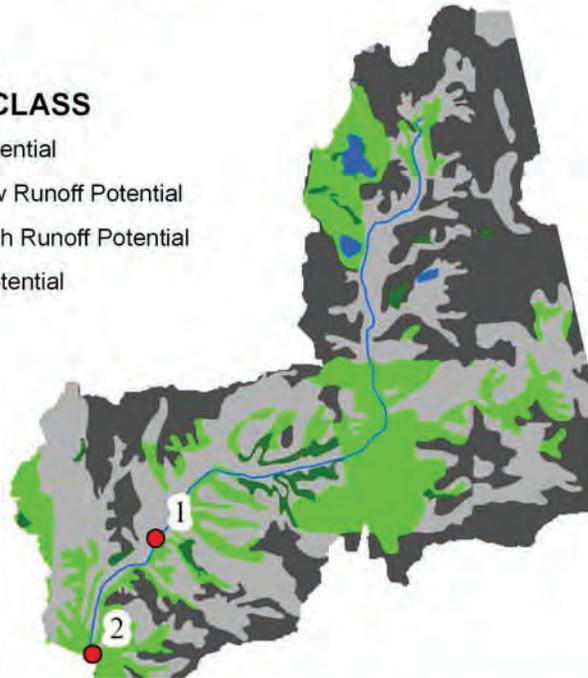


Figure IV-18 – TMDL Sample Site 2 Drainage Basin

## TMDL 3 - Drainage Basin (4,224 Ac)

### LANDCOVER

-  Open Water
-  Developed, LD Residential
-  Developed, HD Residential
-  Wooded
-  Herbaceous / Scrub
-  Hay / Pasture
-  Cultivated Crops
-  Wetland



### SOIL DRAINAGE CLASS

-  A Low Runoff Potential
-  B Moderately Low Runoff Potential
-  C Moderately High Runoff Potential
-  D High Runoff Potential

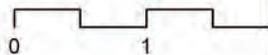
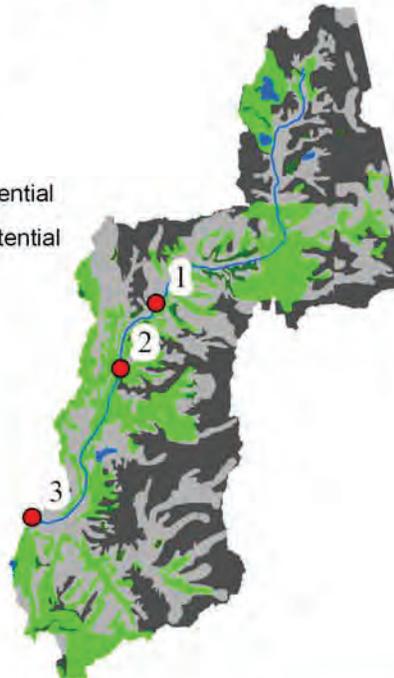
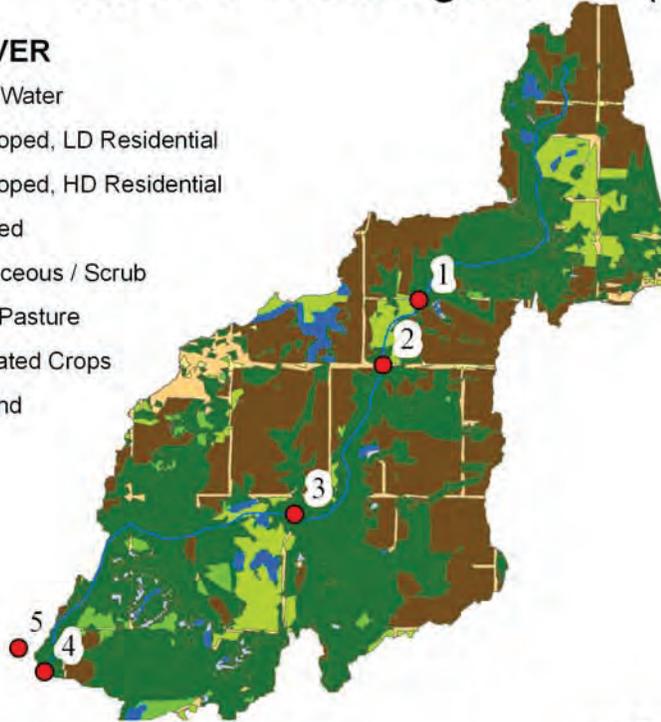


Figure IV-19 – TMDL Sample Site 3 Drainage Basin

# TMDL 4 - Drainage Basin (7,078 Ac)

## LANDCOVER

-  Open Water
-  Developed, LD Residential
-  Developed, HD Residential
-  Wooded
-  Herbaceous / Scrub
-  Hay / Pasture
-  Cultivated Crops
-  Wetland



-  TMDL

## SOIL DRAINAGE CLASS

-  A Low Runoff Potential
-  B Moderately Low Runoff Potential
-  C Moderately High Runoff Potential
-  D High Runoff Potential

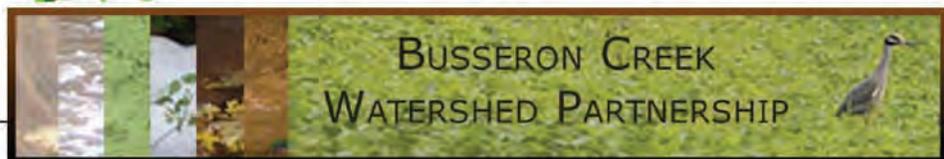
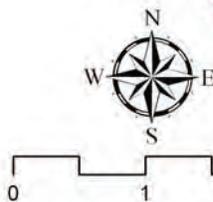
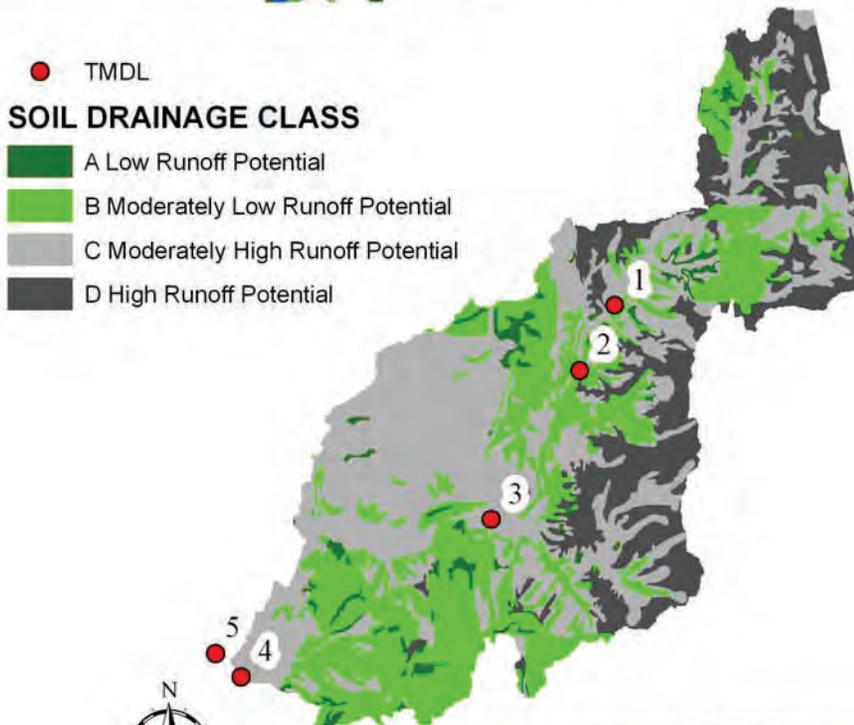
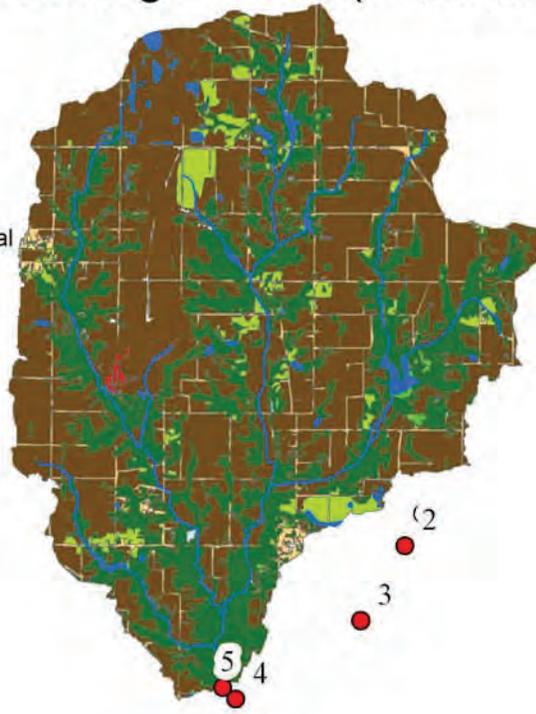


Figure IV-20 – TMDL Sample Site 4 Drainage Basin

# TMDL 5 - Drainage Basin (34,155 Ac)

## LANDCOVER

-  Open Water
-  Developed, LD Residential
-  Developed, HD Residential
-  Developed, Commercial / Industrial
-  Wooded
-  Herbaceous / Scrub
-  Hay / Pasture
-  Cultivated Crops
-  Wetland



## SOIL DRAINAGE CLASS

-  A Low Runoff Potential
-  B Moderately Low Runoff Potential
-  C Moderately High Runoff Potential
-  D High Runoff Potential

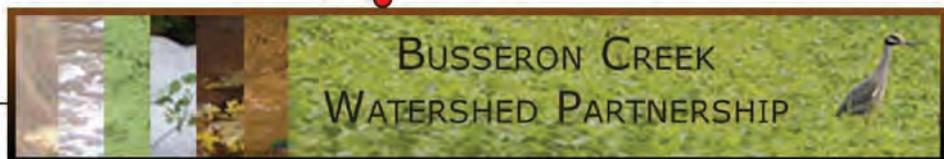
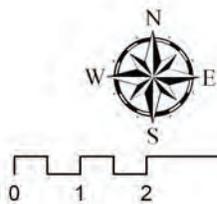
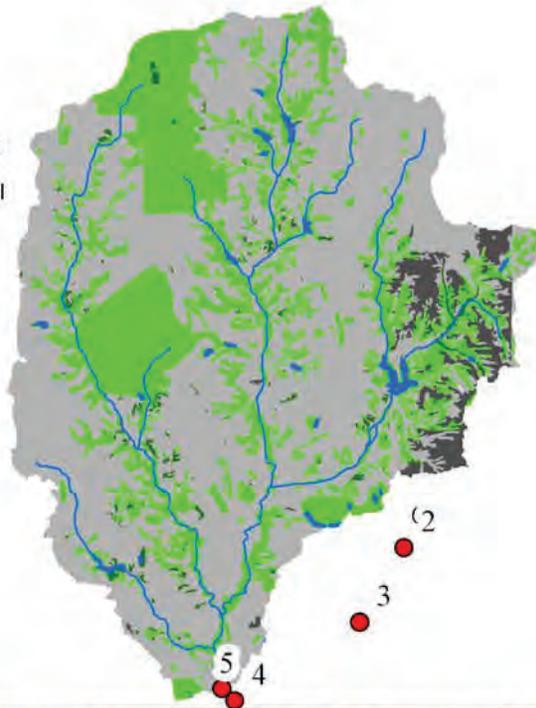
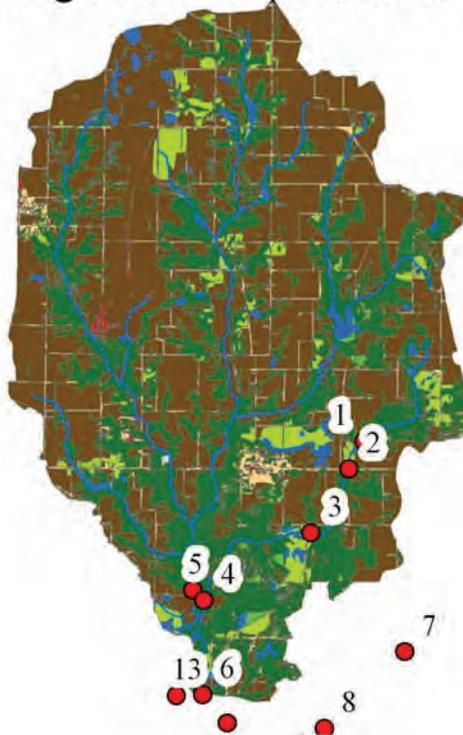


Figure IV-21 – TMDL Sample Site 5 Drainage Basin

# TMDL 6 - Drainage Basin (43,130 Ac)

## LANDCOVER

-  Open Water
-  Developed, LD Residential
-  Developed, HD Residential
-  Developed, Commercial / Industrial
-  Wooded
-  Herbaceous / Scrub
-  Hay / Pasture
-  Cultivated Crops
-  Wetland



## SOIL DRAINAGE CLASS

-  A Low Runoff Potential
-  B Moderately Low Runoff Potential
-  C Moderately High Runoff Potential
-  D High Runoff Potential

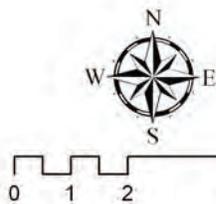
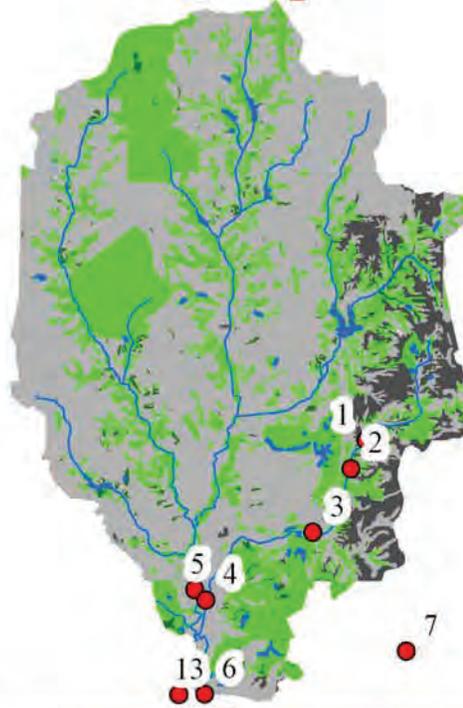
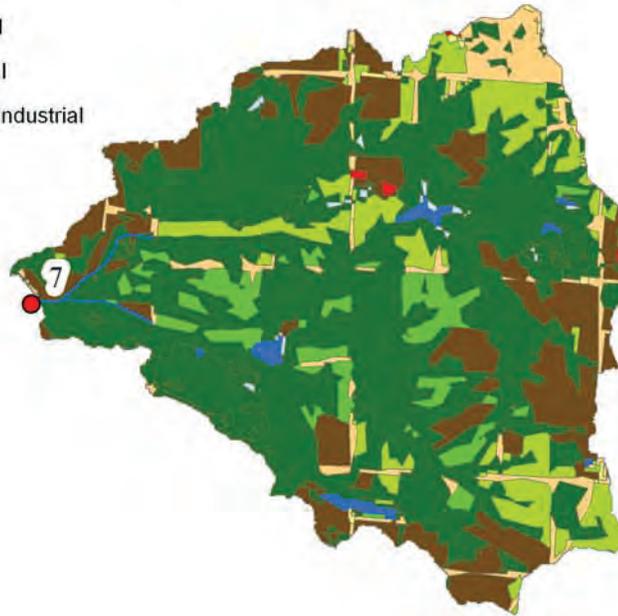


Figure IV-22 - TMDL Sample Site 6 Drainage Basin

## TMDL 7 - Drainage Basin (3,649 Ac)

### LANDCOVER

-  Open Water
-  Developed, LD Residential
-  Developed, HD Residential
-  Developed, Commercial / Industrial
-  Wooded
-  Herbaceous / Scrub
-  Hay / Pasture
-  Cultivated Crops
-  Wetland



### SOIL DRAINAGE CLASS

-  A Low Runoff Potential
-  B Moderately Low Runoff Potential
-  C Moderately High Runoff Potential
-  D High Runoff Potential

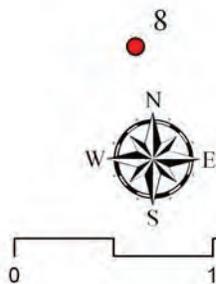
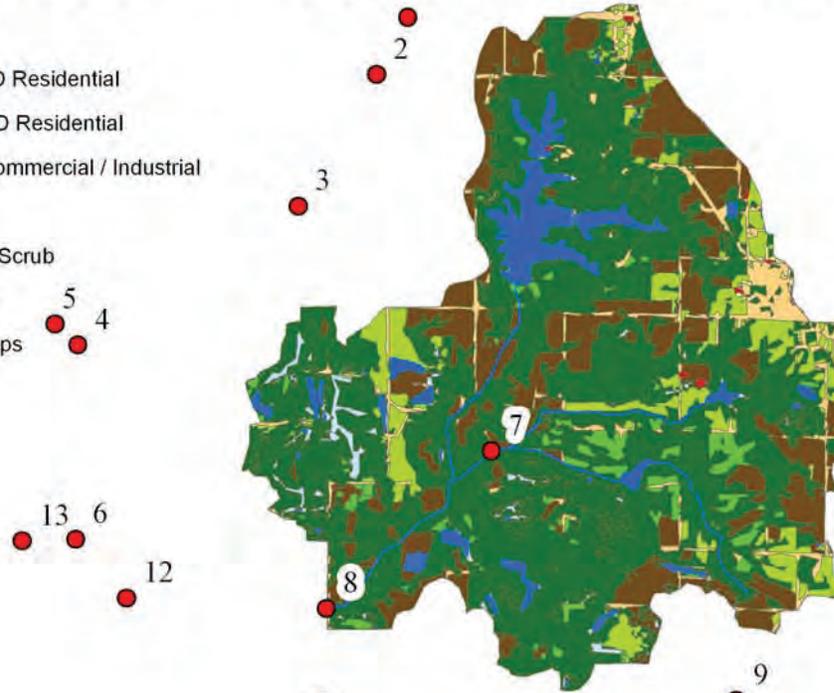


Figure IV-23 - TMDL Sample Site 7 Drainage Basin

## TMDL 8 - Drainage Basin (11,597 Ac)

### LANDCOVER

-  Open Water
-  Developed, LD Residential
-  Developed, HD Residential
-  Developed, Commercial / Industrial
-  Wooded
-  Herbaceous / Scrub
-  Hay / Pasture
-  Cultivated Crops
-  Wetland



### SOIL DRAINAGE CLASS

-  A Low Runoff Potential
-  B Moderately Low Runoff Potential
-  C Moderately High Runoff Potential
-  D High Runoff Potential

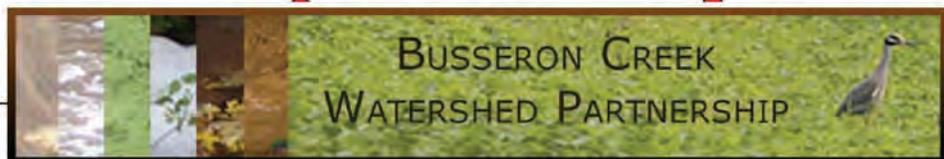
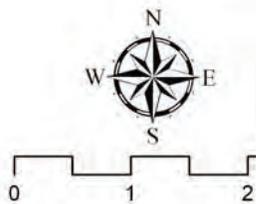
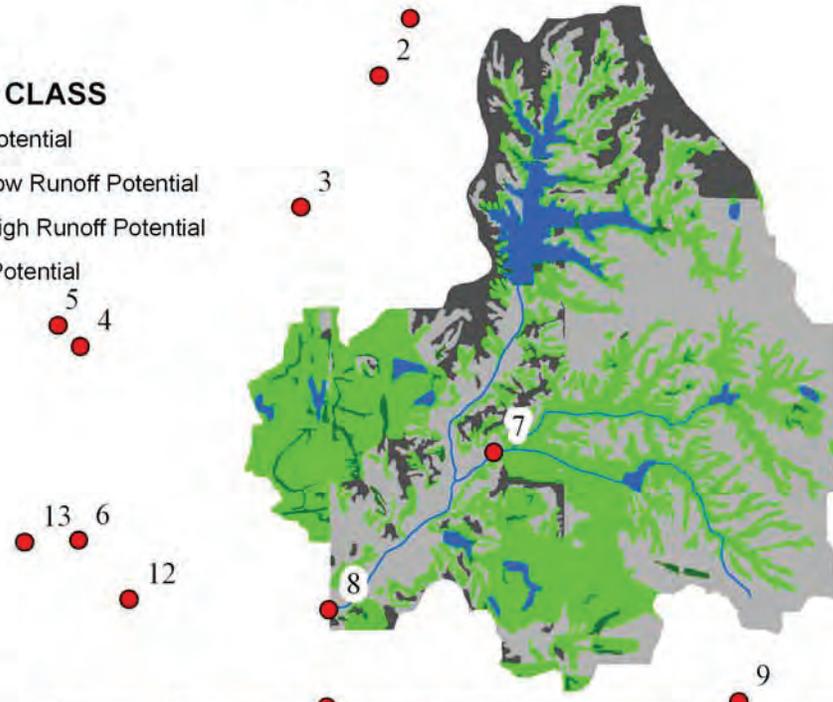
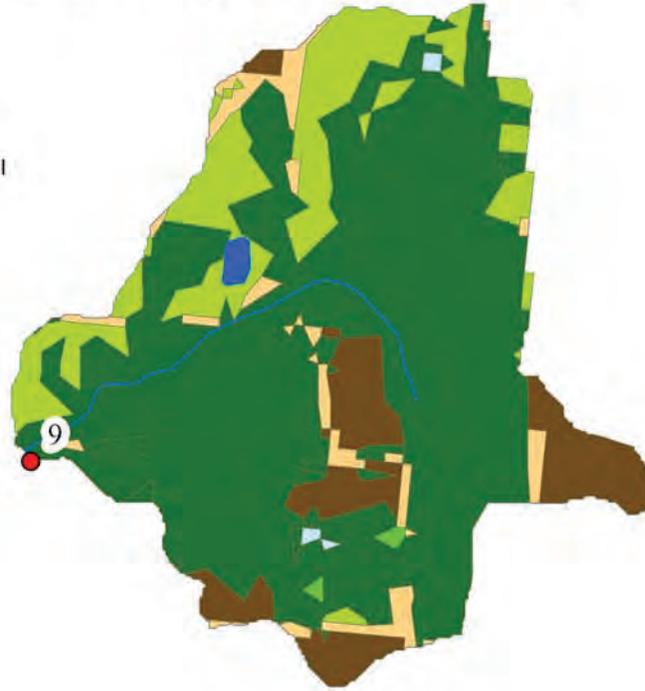


Figure IV-24 - TMDL Sample Site 8 Drainage Basin

## TMDL 9 - Drainage Basin (646 Ac)

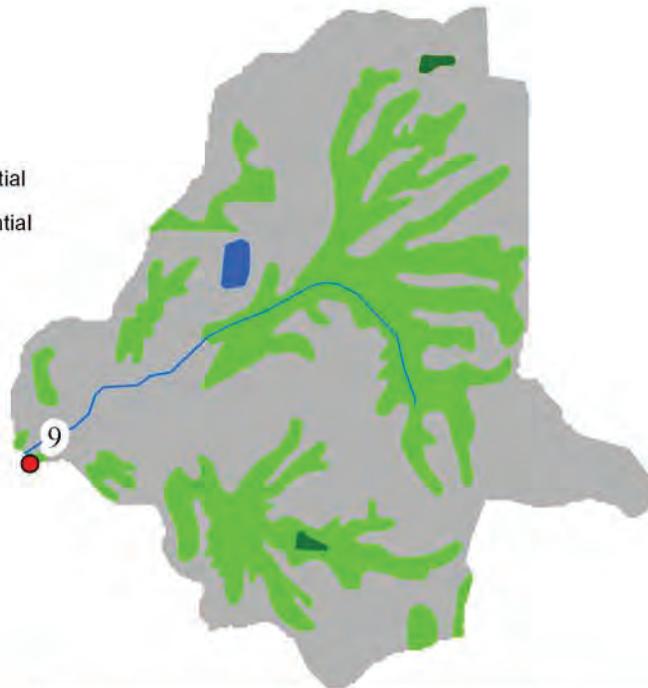
### LANDCOVER

-  Open Water
-  Developed, LD Residential
-  Developed, HD Residential
-  Developed, Commercial / Industrial
-  Wooded
-  Herbaceous / Scrub
-  Hay / Pasture
-  Cultivated Crops
-  Wetland



### SOIL DRAINAGE CLASS

-  A Low Runoff Potential
-  B Moderately Low Runoff Potential
-  C Moderately High Runoff Potential
-  D High Runoff Potential



0

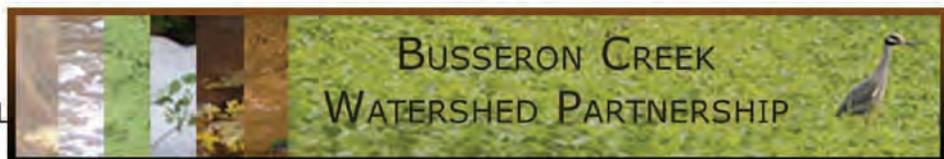
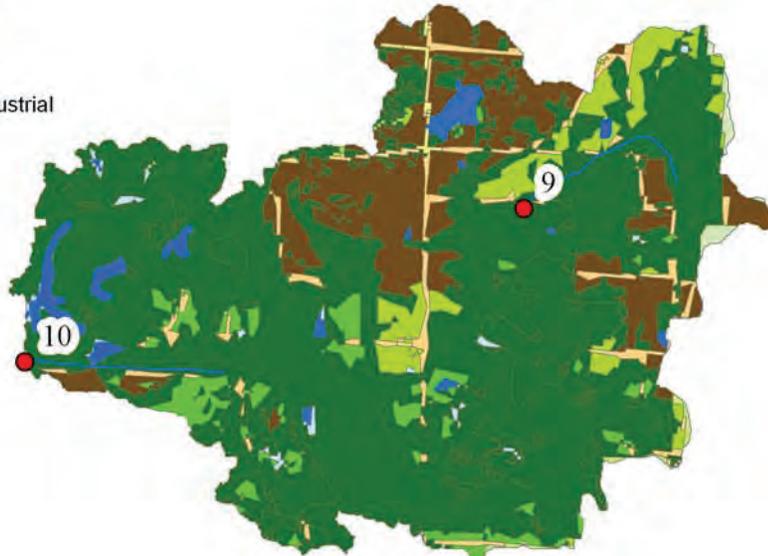


Figure IV-25 - TMDL Sample Site 9 Drainage Basin

## TMDL 10 - Drainage Basin (4,259 Ac)

### LANDCOVER

-  Open Water
-  Developed, LG Residential
-  Developed, HD Residential
-  Developed, Commercial / Industrial
-  Wooded
-  Herbaceous / Scrub
-  Hay / Pasture
-  Cultivated Crops
-  Wetland



### SOIL DRAINAGE CLASS

-  A Low Runoff Potential
-  B Moderately Low Runoff Potential
-  C Moderately High Runoff Potential
-  D High Runoff Potential

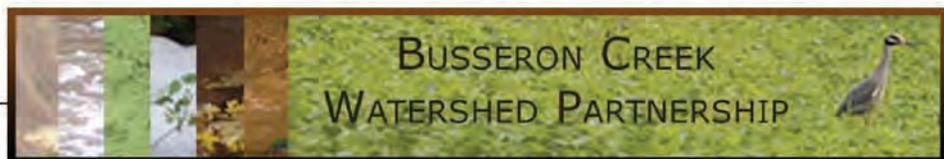
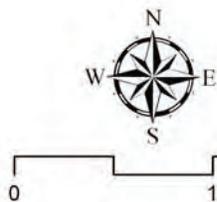
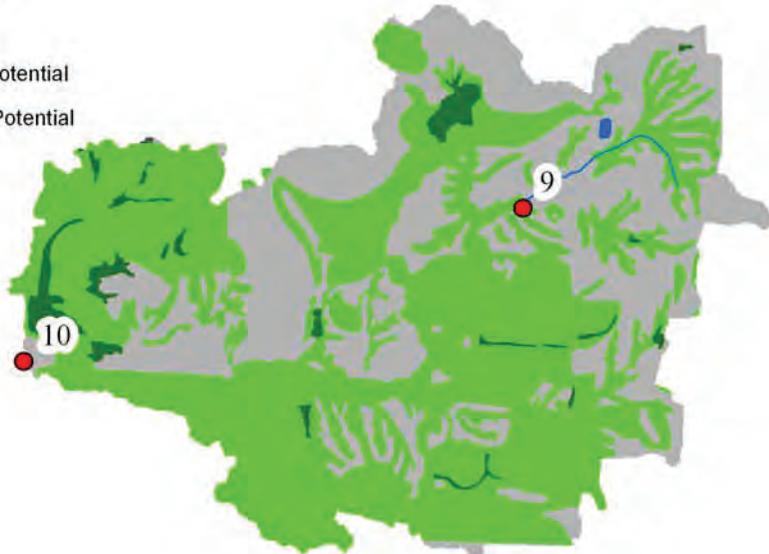
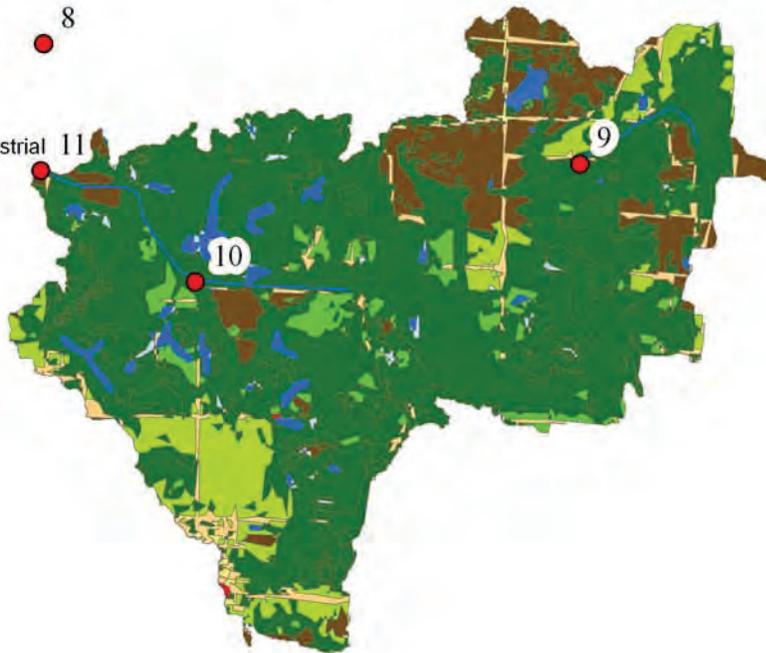


Figure IV-26 - TDML Sample Site 10 Drainage Basin

## TMDL 11 - Drainage Basin (7,018 Ac)

### LANDCOVER

-  Open Water
-  Developed, LD Residential
-  Developed, HD Residential
-  Developed, Commercial / Industrial
-  Wooded
-  Herbaceous / Scrub
-  Hay / Pasture
-  Cultivated Crops
-  Wetland



### SOIL DRAINAGE CLASS

-  A Low Runoff Potential
-  B Moderately Low Runoff Potential
-  C Moderately High Runoff Potential
-  D High Runoff Potential

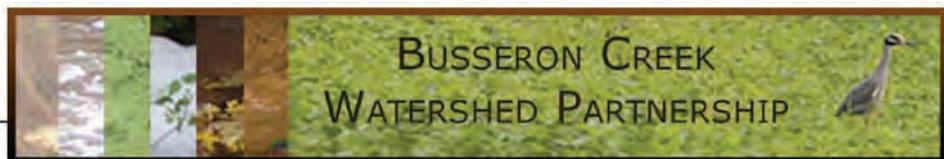
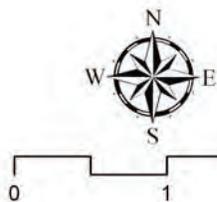
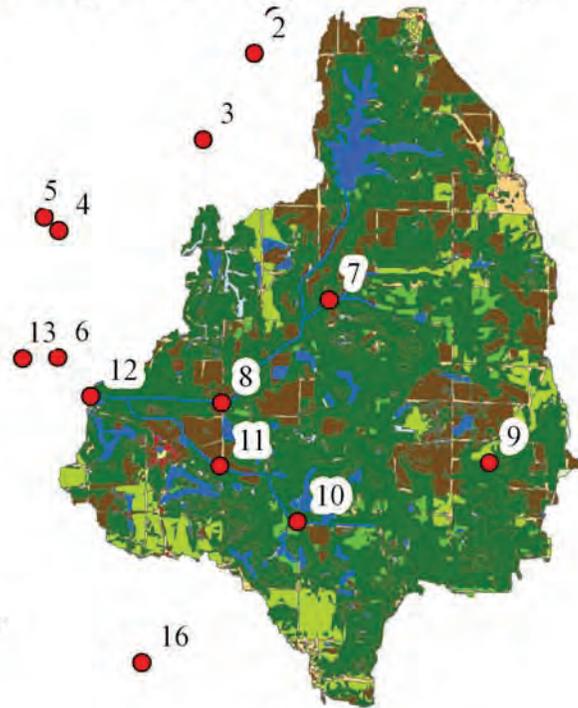


Figure IV-27 - TMDL Sample Site 11 Drainage Basin

## TMDL 12 - Drainage Basin (21,760 Ac)

### LANDCOVER

-  Open Water
-  Developed, LD Residential
-  Developed, HD Residential
-  Developed, Commercial / Industrial
-  Wooded
-  Herbaceous / Scrub
-  Hay / Pasture
-  Cultivated Crops
-  Wetland



### SOIL DRAINAGE CLASS

-  A Low Runoff Potential
-  B Moderately Low Runoff Potential
-  C Moderately High Runoff Potential
-  D High Runoff Potential

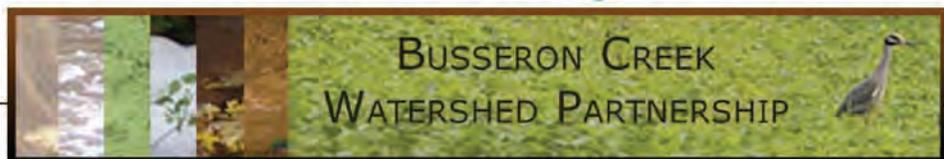
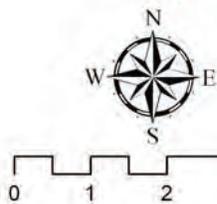
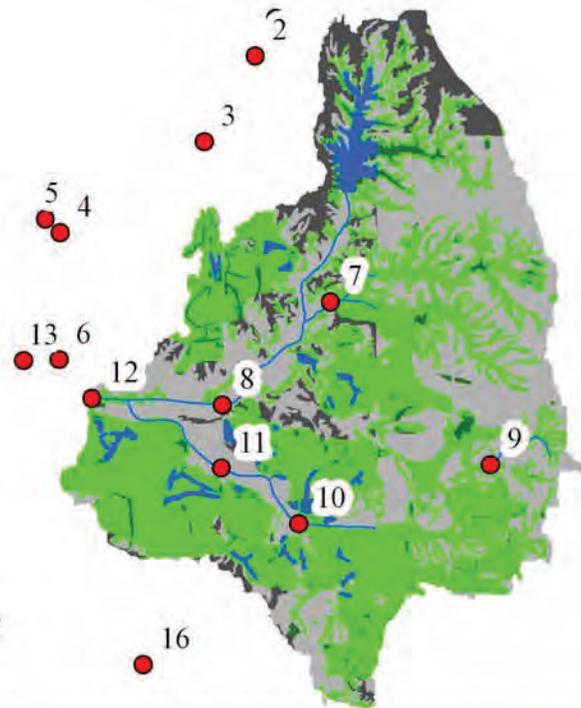


Figure IV-28 - TMDL Sample Site 12 Drainage Basin

# TMDL 13 - Drainage Basin (6,552 Ac)

## LANDCOVER

- Open Water
- Developed, LD Residential
- Developed, HD Residential
- Developed, Commercial / Industrial
- Wooded
- Herbaceous / Scrub
- Hay / Pasture
- Cultivated Crops
- Wetland



## SOIL DRAINAGE CLASS

- A Low Runoff Potential
- B Moderately Low Runoff Potential
- C Moderately High Runoff Potential
- D High Runoff Potential

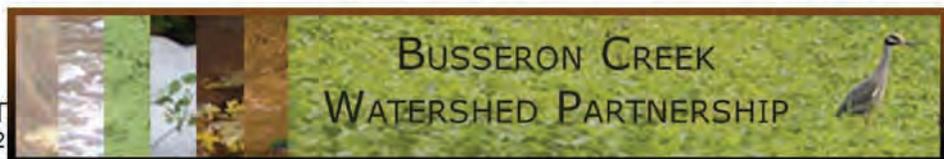
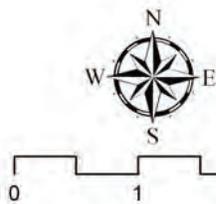
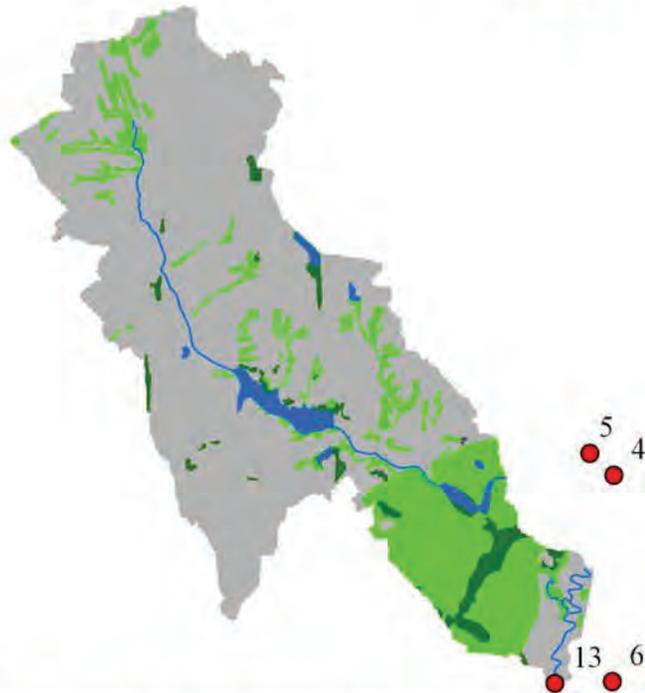
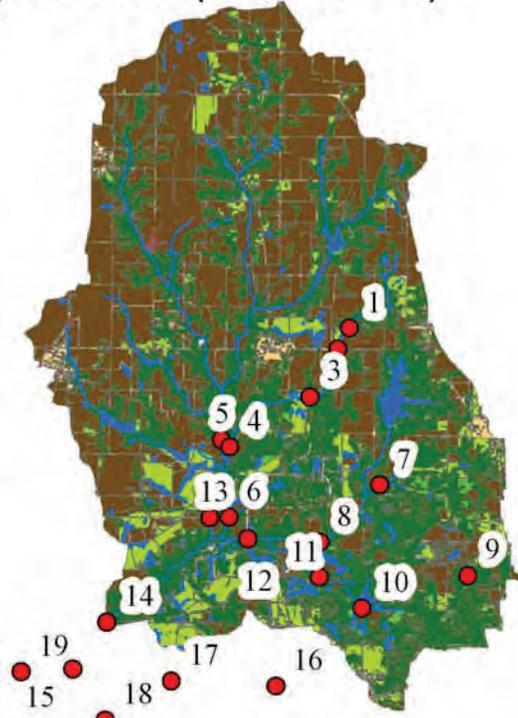


Figure IV-29 - TMDL Sample Site 13 Drainage Basin

## TMDL 14 - Drainage Basin (78,647 Ac)

### LANDCOVER

-  Open Water
-  Developed, LD Residential
-  Developed, HD Residential
-  Developed, Commercial / Industrial
-  Wooded
-  Herbaceous / Scrub
-  Hay / Pasture
-  Cultivated Crops
-  Wetland



### SOIL DRAINAGE CLASS

-  A Low Runoff Potential
-  B Moderately Low Runoff Potential
-  C Moderately High Runoff Potential
-  D High Runoff Potential

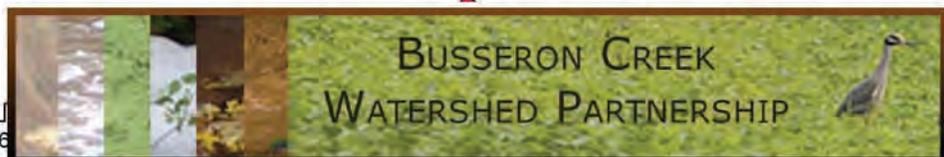
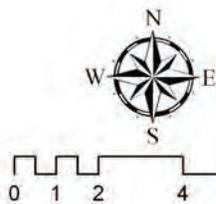
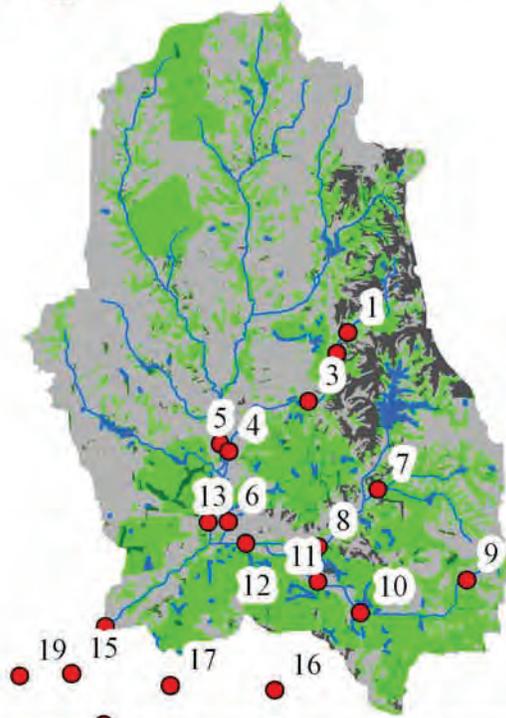
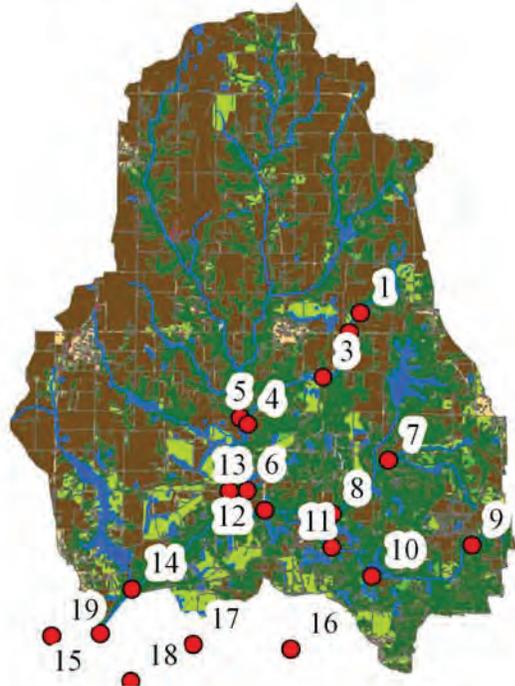


Figure IV-30 - TMDL Sample Site 14 Drainage Basin

## TMDL 15 - Drainage Basin (86,977 Ac)

### LANDCOVER

-  Open Water
-  Developed, LD Residential
-  Developed, HD Residential
-  Developed, Commercial / Industrial
-  Wooded
-  Herbaceous / Scrub
-  Hay / Pasture
-  Cultivated Crops
-  Wetland



### SOIL DRAINAGE CLASS

-  A Low Runoff Potential
-  B Moderately Low Runoff Potential
-  C Moderately High Runoff Potential
-  D High Runoff Potential

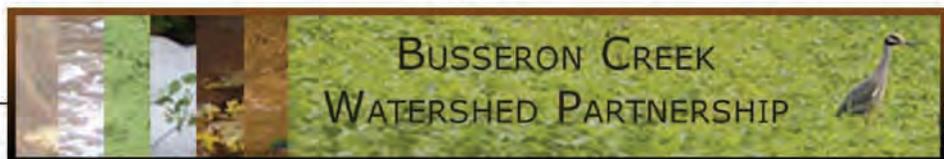
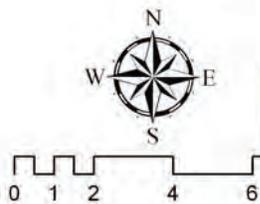
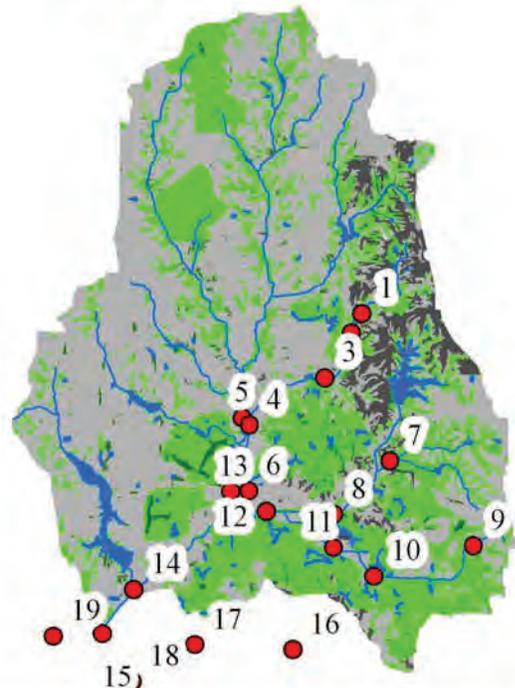
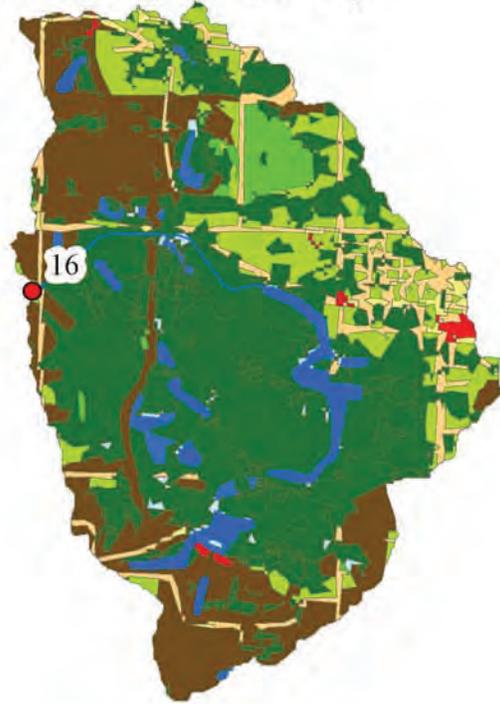


Figure IV-31 - TMDL Sample Site 15 Drainage Basin

## TMDL 16 - Drainage Basin (3,523 Ac)

### LANDCOVER

-  Open Water
-  Developed, LD Residential
-  Developed, HD Residential
-  Developed, Commercial / Industrial
-  Wooded 17
-  Herbaceous / Scrub
-  Hay / Pasture
-  Cultivated Crops
-  Wetland



### SOIL DRAINAGE CLASS

-  A Low Runoff Potential
-  B Moderately Low Runoff Potential
-  C Moderately High Runoff Potential
-  D High Runoff Potential 17

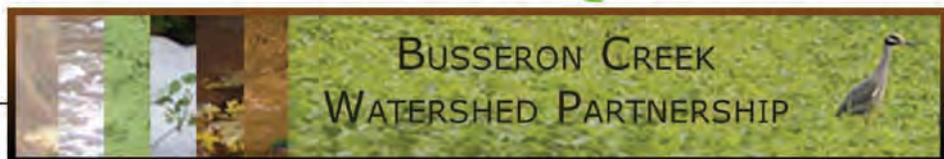
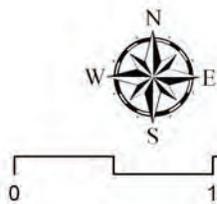


Figure IV-32 - TMDL Sample Site 16 Drainage Basin

## TMDL 17 - Drainage Basin (6,799 Ac)

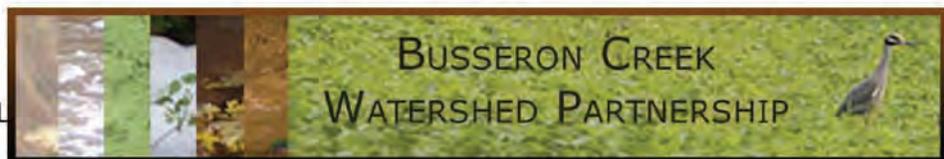
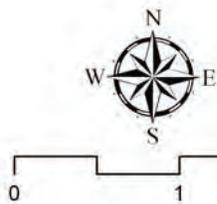
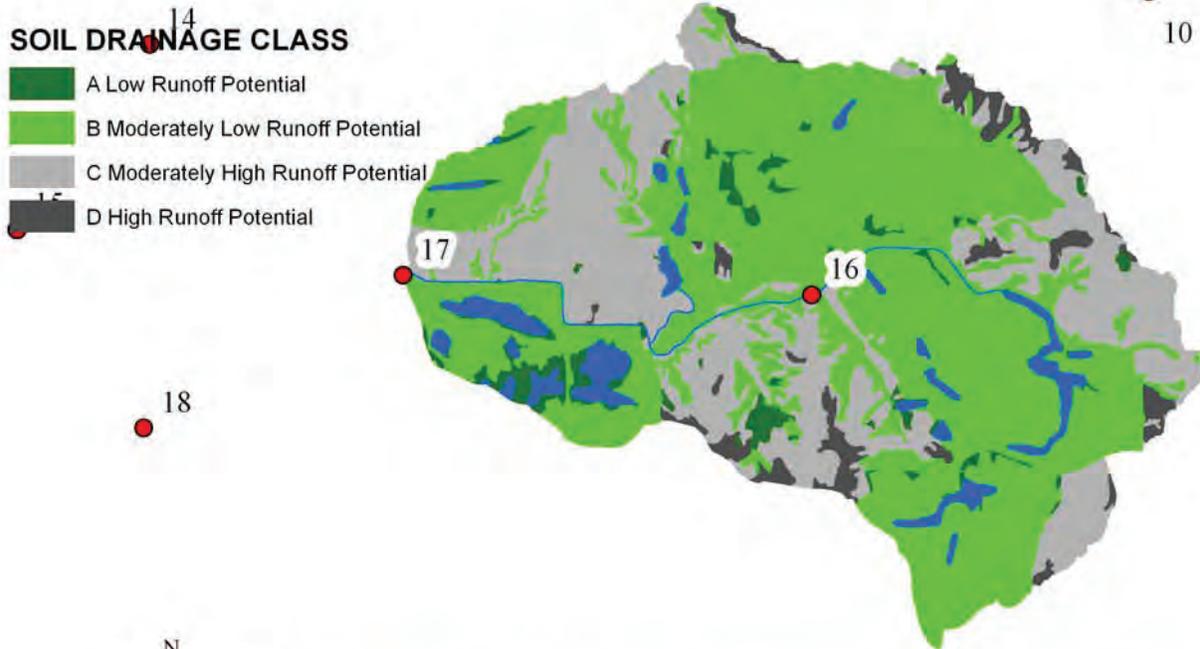
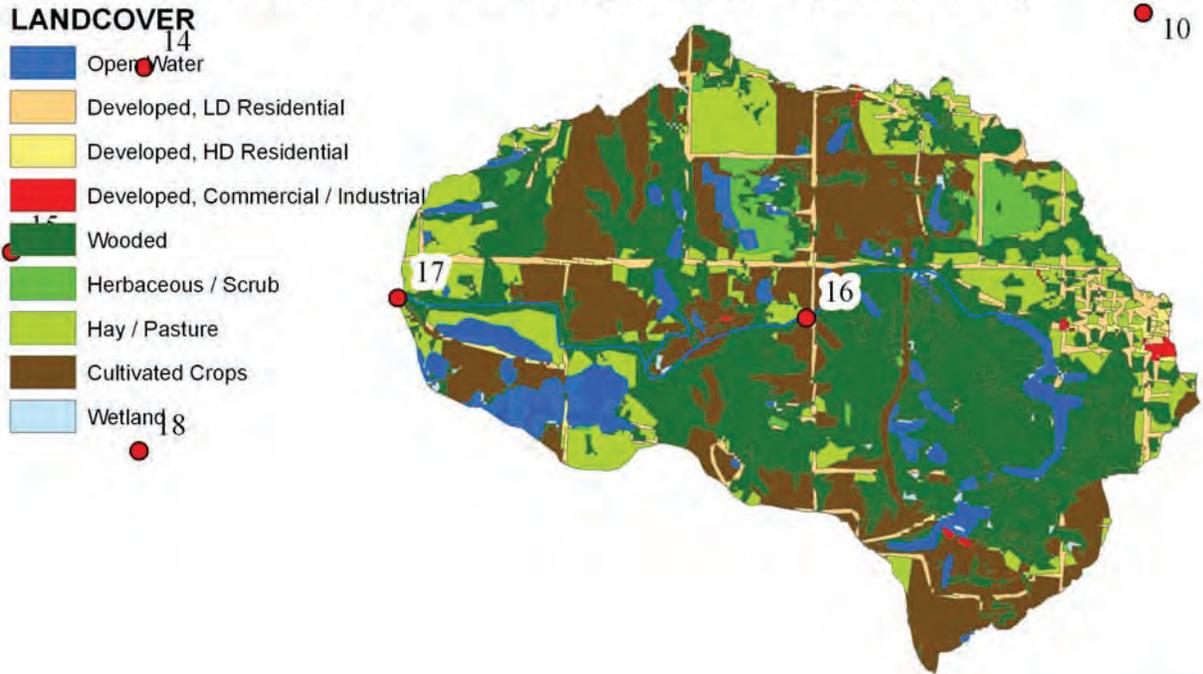
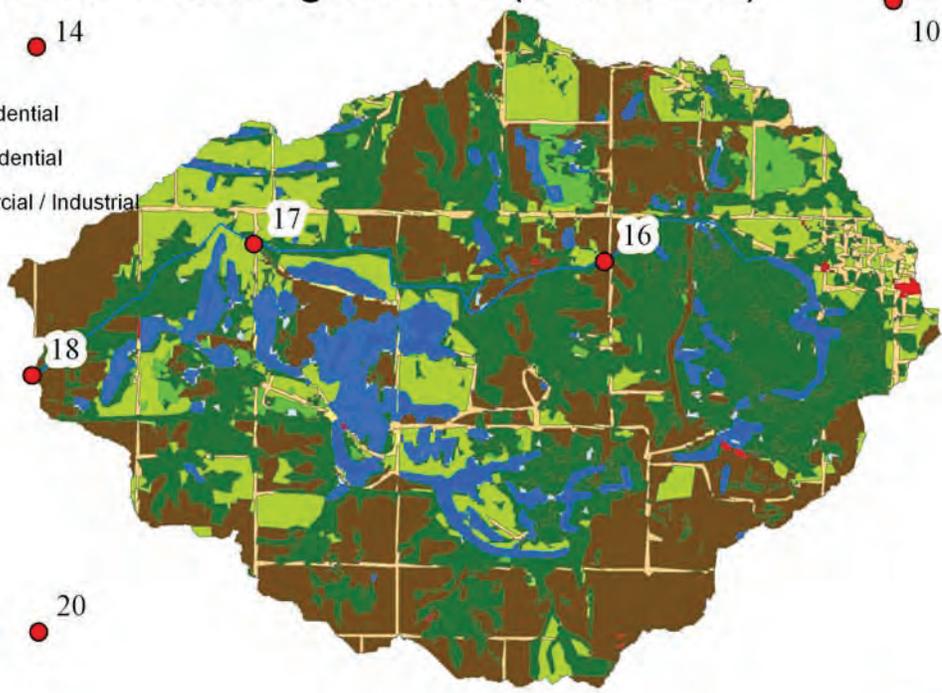


Figure IV-33 - TMDL Sample Site 17 Drainage Basin

## TMDL 18 - Drainage Basin (12,628 Ac)

### LANDCOVER

-  Open Water
-  Developed, LD Residential
-  Developed, HD Residential
-  Developed, Commercial / Industrial
-  Wooded
-  Herbaceous / Scrub
-  Hay / Pasture
-  Cultivated Crops
-  Wetland



### SOIL DRAINAGE CLASS

-  A Low Runoff Potential
-  B Moderately Low Runoff Potential
-  C Moderately High Runoff Potential
-  D High Runoff Potential

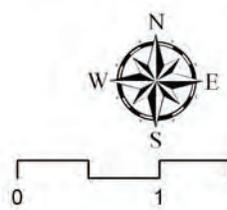
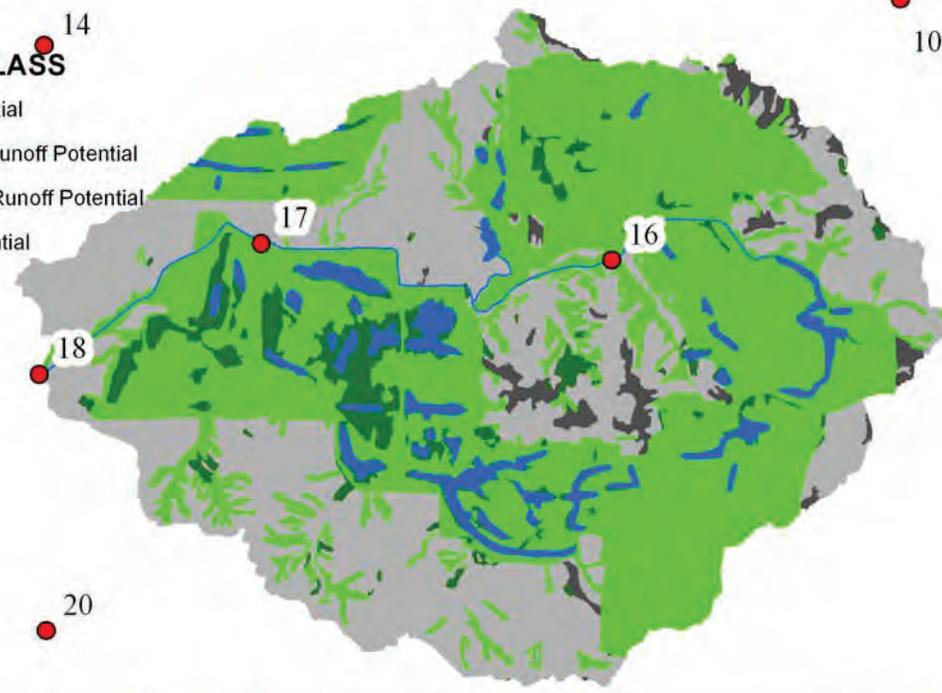
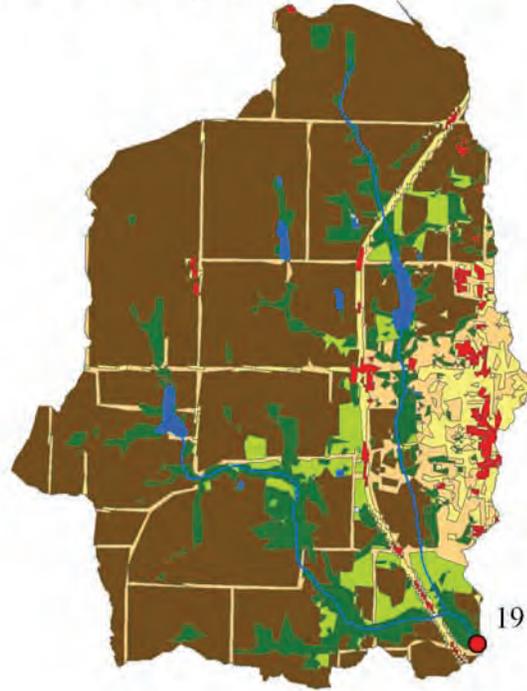


Figure IV-34 - TMDL Sample Site 18 Drainage Basin

## TMDL 19 - Drainage Basin (7,796 Ac)

### LANDCOVER

-  Open Water
-  Developed, LD Residential
-  Developed, HD Residential
-  Developed, Commercial / Industrial
-  Wooded
-  Herbaceous / Scrub
-  Hay / Pasture
-  Cultivated Crops
-  Wetland



### SOIL DRAINAGE CLASS

-  A Low Runoff Potential
-  B Moderately Low Runoff Potential
-  C Moderately High Runoff Potential
-  D High Runoff Potential

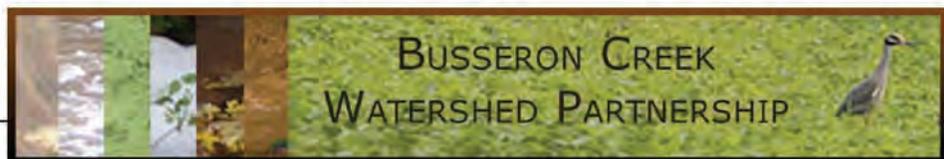
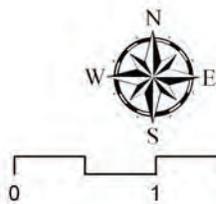
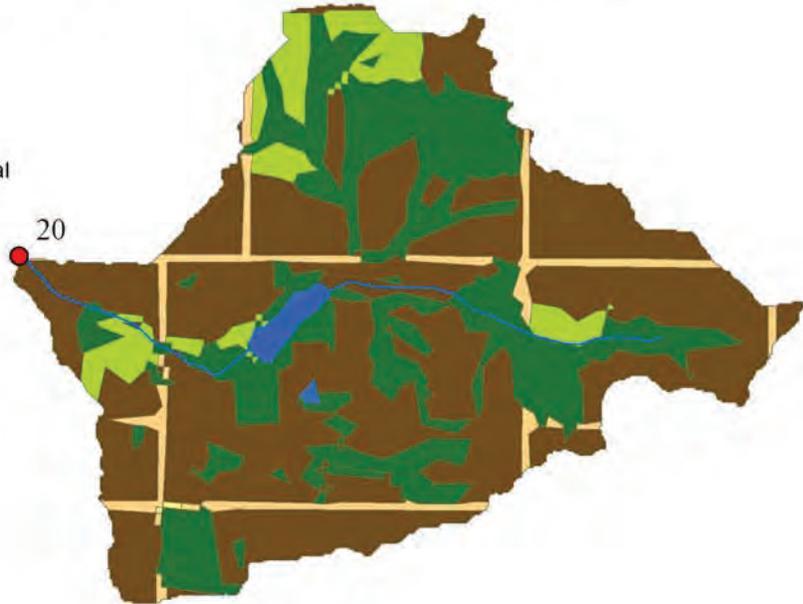


Figure IV-35 - TMDL Sample Site 19 Drainage Basin

## TMDL 20 - Drainage Basin (1,443 Ac)

### LANDCOVER

-  Open Water
-  Developed, LD Residential
-  Developed, HD Residential
-  Developed, Commercial / Industrial
-  Wooded
-  Herbaceous / Scrub
-  Hay / Pasture
-  Cultivated Crops
-  Wetland



### SOIL DRAINAGE CLASS

-  A Low Runoff Potential
-  B Moderately Low Runoff Potential
-  C Moderately High Runoff Potential
-  D High Runoff Potential

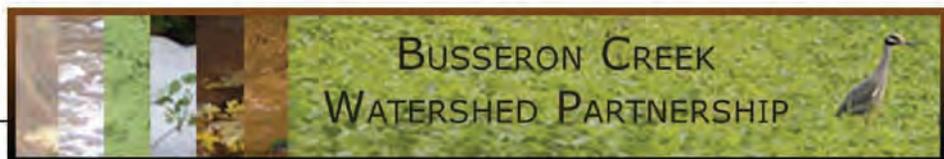
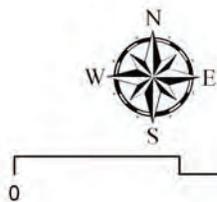
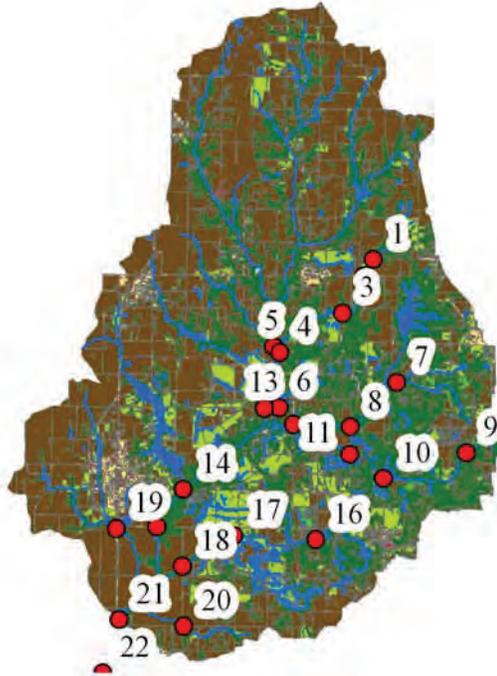


Figure IV-36 - TMDL Sample Site 20 Drainage Basin

# TMDL 21 - Drainage Basin (117,243 Ac)

## LANDCOVER

-  Open Water
-  Developed, LD Residential
-  Developed, HD Residential
-  Developed, Commercial / Industrial
-  Wooded
-  Herbaceous / Scrub
-  Hay / Pasture
-  Cultivated Crops
-  Wetland



## SOIL DRAINAGE CLASS

-  A Low Runoff Potential
-  B Moderately Low Runoff Potential
-  C Moderately High Runoff Potential
-  D High Runoff Potential

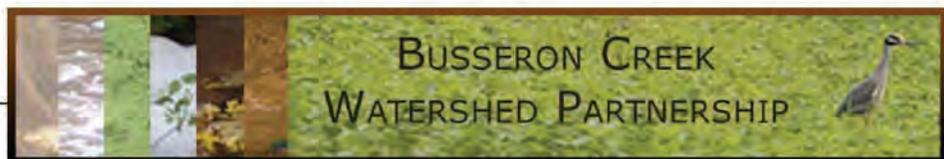
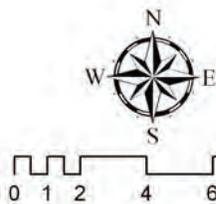
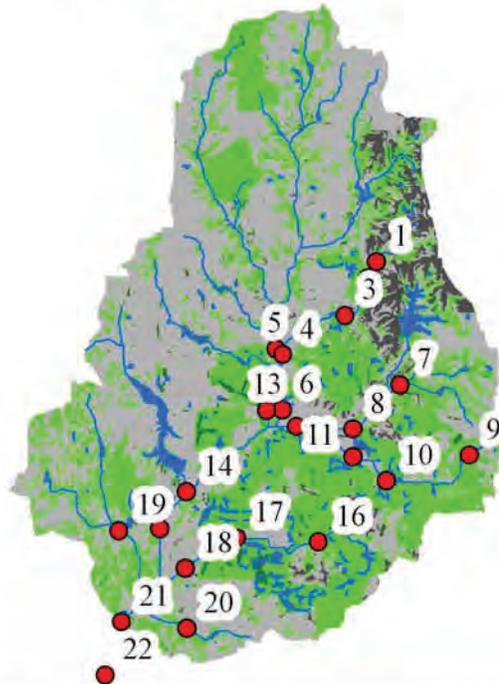
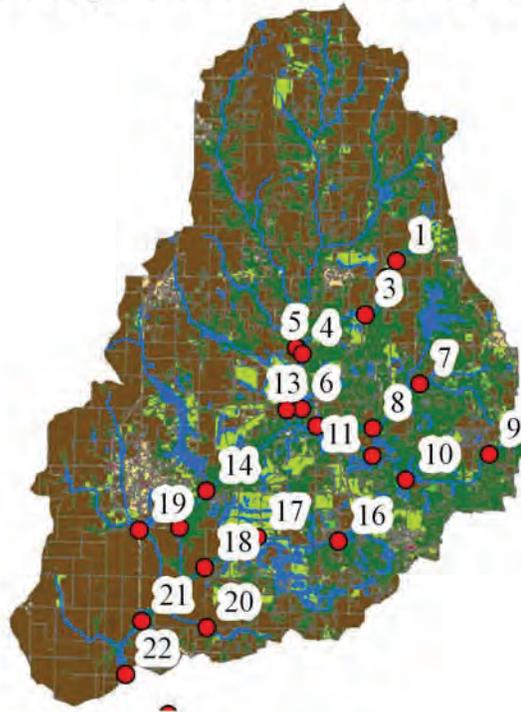


Figure IV-37 - TMDL Sample Site 21 Drainage Basin

## TMDL 22 - Drainage Basin (126,778 Ac)

### LANDCOVER

-  Open Water
-  Developed, LD Residential
-  Developed, HD Residential
-  Developed, Commercial / Industrial
-  Wooded
-  Herbaceous / Scrub
-  Hay / Pasture
-  Cultivated Crops
-  Wetland



### SOIL DRAINAGE CLASS

-  A Low Runoff Potential
-  B Moderately Low Runoff Potential
-  C Moderately High Runoff Potential
-  D High Runoff Potential

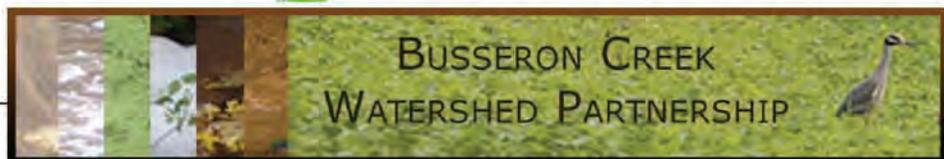
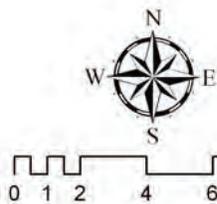
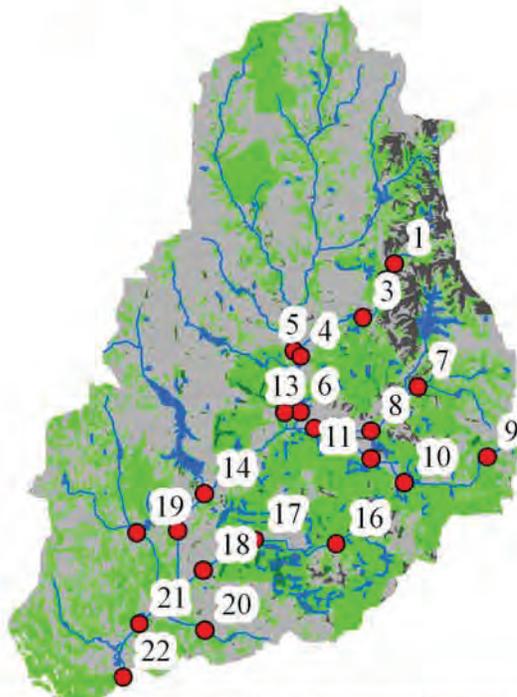
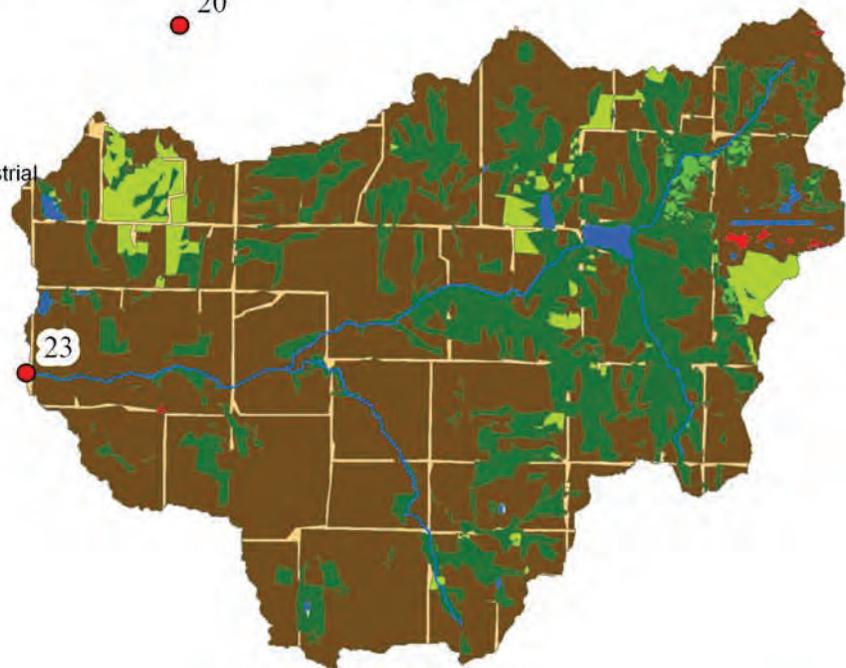


Figure IV-38 - TMDL Sample Site 22 Drainage Basin

## TMDL 23 - Drainage Basin (12,649 Ac)

### LANDCOVER

-  Open Water
-  Developed, LD Residential
-  Developed, HD Residential
-  Developed, Commercial / Industrial
-  Wooded
-  Herbaceous / Scrub
-  Hay / Pasture
-  Cultivated Crops
-  Wetland



### SOIL DRAINAGE CLASS

-  A Low Runoff Potential
-  B Moderately Low Runoff Potential
-  C Moderately High Runoff Potential
-  D High Runoff Potential

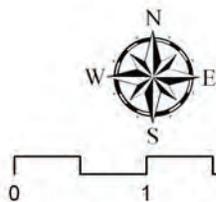
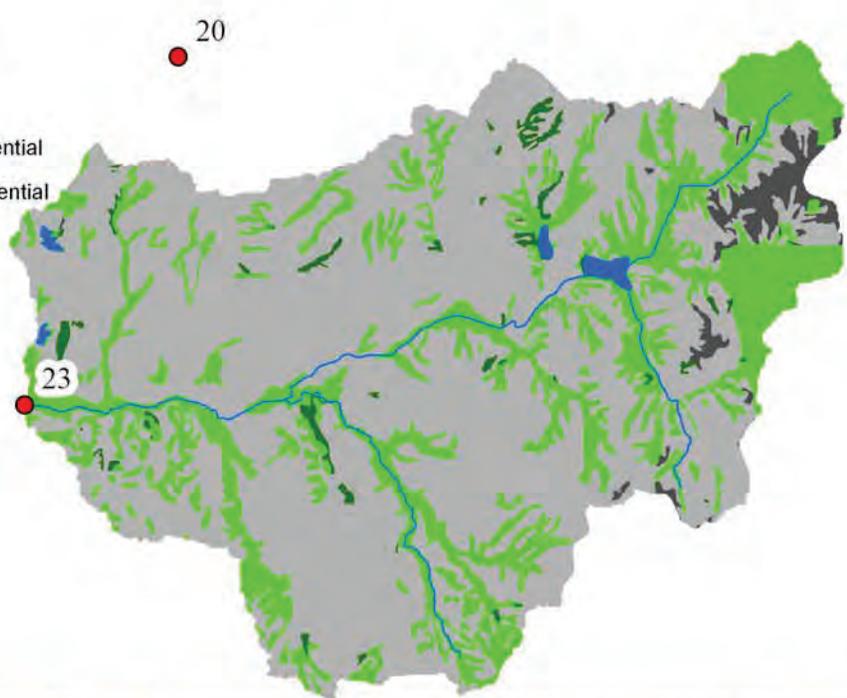
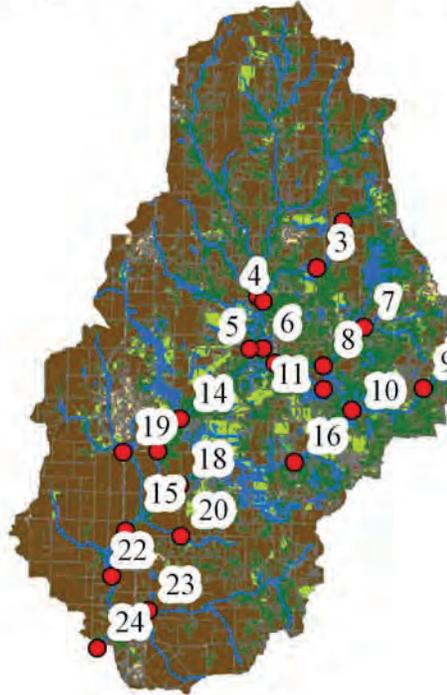


Figure IV-39 - TMDL Sample Site 23 Drainage Basin

# TMDL 24 - Drainage Basin (146,064 Ac)

## LANDCOVER

-  Open Water
-  Developed, LD Residential
-  Developed, HD Residential
-  Developed, Commercial / Industrial
-  Wooded
-  Herbaceous / Scrub
-  Hay / Pasture
-  Cultivated Crops
-  Wetland



## SOIL DRAINAGE CLASS

-  A Low Runoff Potential
-  B Moderately Low Runoff Potential
-  C Moderately High Runoff Potential
-  D High Runoff Potential

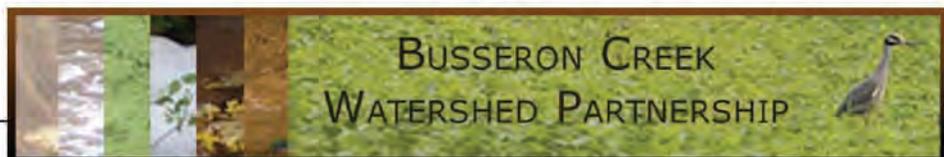
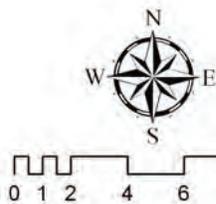
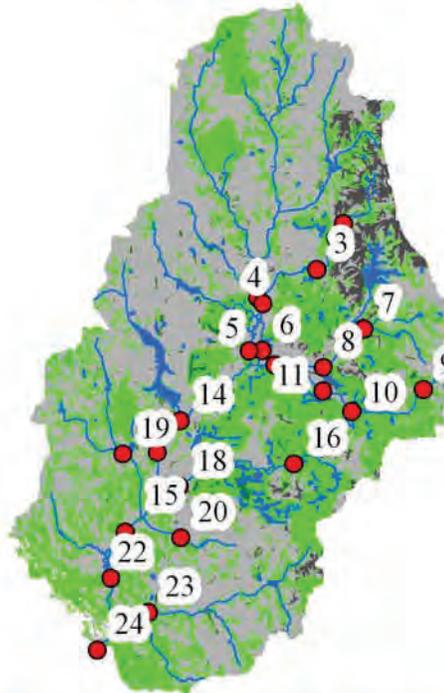
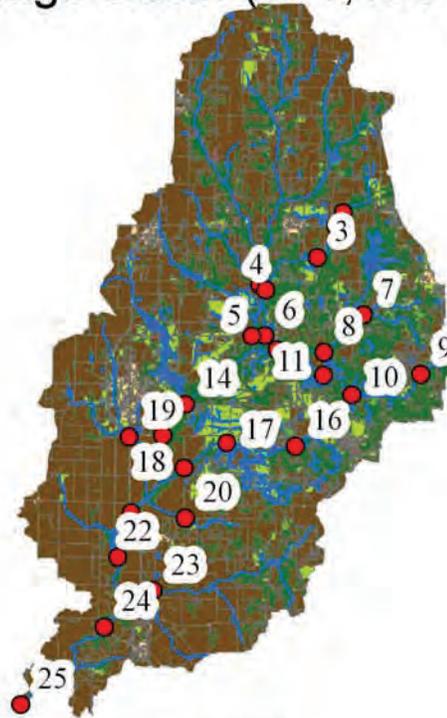


Figure IV-40 - TMDL Sample Site 24 Drainage Basin

## TMDL 25 - Drainage Basin (151,160 Ac)

### LANDCOVER

-  Open Water
-  Developed, LD Residential
-  Developed, HD Residential
-  Developed, Commercial / Industrial
-  Wooded
-  Herbaceous / Scrub
-  Hay / Pasture
-  Cultivated Crops
-  Wetland



### SOIL DRAINAGE CLASS

-  A Low Runoff Potential
-  B Moderately Low Runoff Potential
-  C Moderately High Runoff Potential
-  D High Runoff Potential

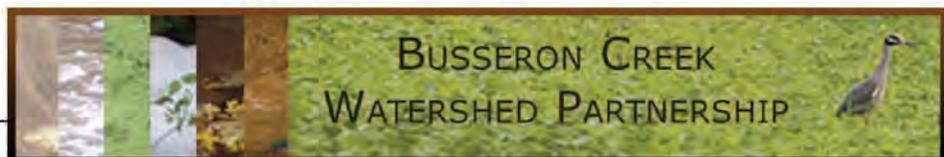
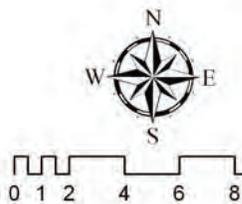
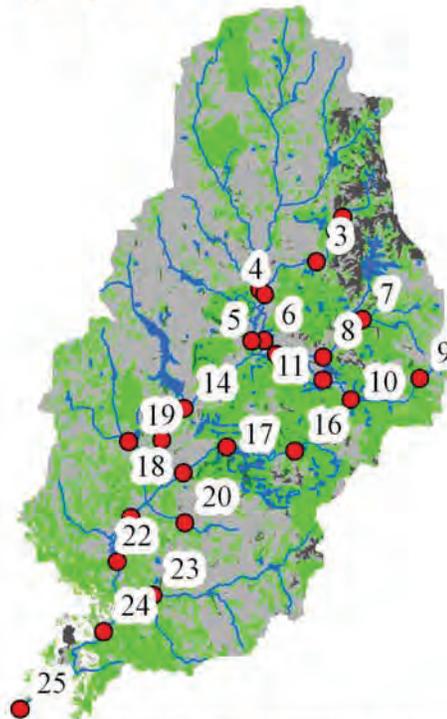


Figure IV-41 - TMDL Sample Site 25 Drainage Basin