

There are 2 NPDES permits active within the Deer Creek Subwatershed. The Middletown Wastewater Treatment Plant, permit number IN0020770, is located at 215 S, 8th Street in Middletown. The treatment plant along with 3 outfalls is located within the Deer Creek Subwatershed. According to compliance records, there has been no formal enforcement actions within the last 5 years at the treatment plant, however there have been 22 noted effluent exceedances within the last 3 years. These exceedances were reported for both total residue chlorine and total suspended solids. The Shenandoah Middle and High School, permit number IN0031712, is located at 5100 N Raider Road in Middletown. According to compliance records for the school, there has been no formal enforcement actions within the last 5 years, however there have been 20 noted effluent exceedances within the last 3 years. These exceedances were reported for *E.coli*, Nitrogen and total suspended solids.

Prairie Creek Subwatershed

The Prairie Creek Subwatershed (HUC 12 – 051202010804) is within Madison County as shown in Exhibit 19. The subwatershed encompasses approximately 25,410 acres and includes the Prairie Creek tributary.

Water Quality Information

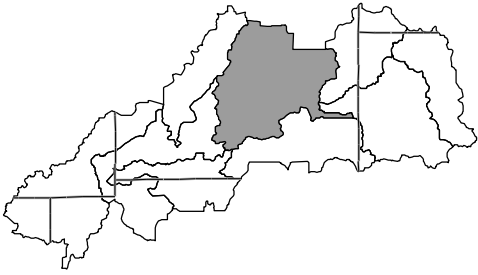
According to the IDEM 305(b) list, the streams within the Prairie Creek Subwatershed are designated for Recreational, Fishable, and Aquatic Life Use. Recreational uses within the subwatershed fall within category 5A, signifying that the available data indicates that at least one designated use is not supported impaired or is threatened, and a TMDL is needed and category 2, signifying that available data indicates that some but not all of the designated uses are supported. The fishable uses fall within category 3, signifying that there is insufficient available data to make a use support determination, and the aquatic life uses fall within both categories 2 and 5A. The 303(d) list indicates that approximately 11.2 miles of streams within the subwatershed are impaired for *E.coli*, which includes Fall Creek and Prairie Creek.

A total of 8 IDEM water quality sampling stations are located within the Prairie Creek Subwatershed. Seven of these stations have water quality sampling information. Available data at these stations included sampling from the 1996 Watershed Study, 2001 *E.coli*- UFWR Study, 2008 Fall Creek IBC Study and 2008-2009 Upper Fall Creek Water Quality Monitoring Program.

A total of 4 CIWRP sampling sites are located within the Prairie Creek Subwatershed, however one of the sampling sites is located at the upstream end and therefore would not be representative of the water quality of the subwatershed. Therefore, the other three sites were used to represent the subwatershed.

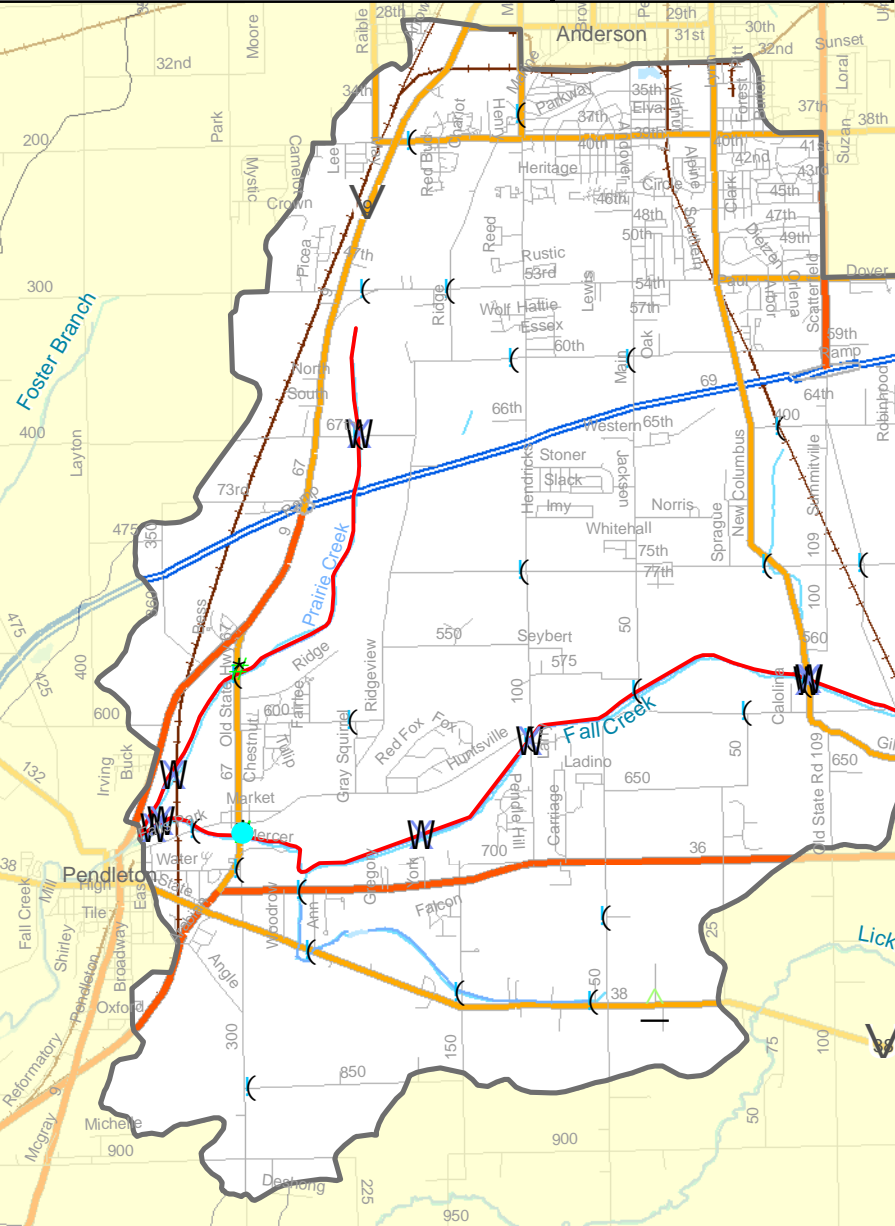
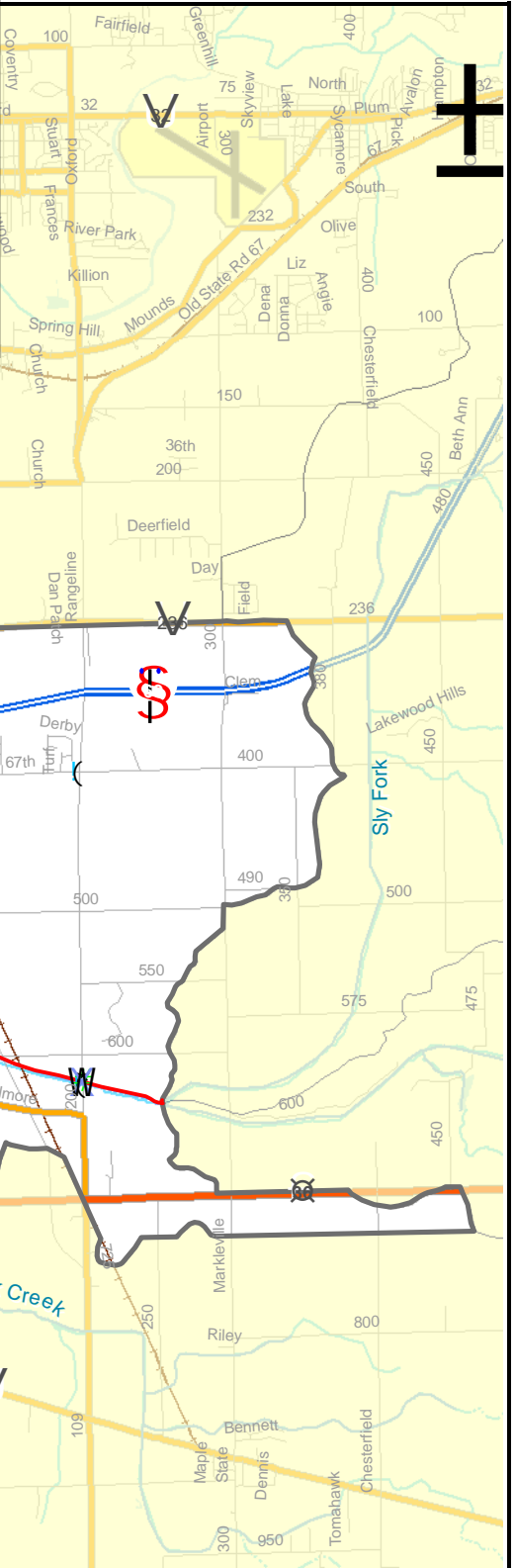
Table 18 below summarizes the IDEM and CIWRP sampling mean value of each parameter screened and the corresponding water quality target.

Location Map



Legend

- IDEM Sampling Locations
- CIWRP Sampling Locations
- Windshield Survey Locations
- NPDES Facility Permit Locations
- NPDES Outfall Permit Locations
- Active CFO Locations
- Unpermitted CFO Locations
- Voided CFO Locations
- IDEM 303(d) Impaired Streams



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<p>TITLE: Prairie Creek Subwatershed Map (HUC-12: 051202010804)</p>	<p>PROJECT: Geist Reservoir/Upper Fall Creek Watershed Management Plan</p>		
<p>BASE LAYER: StreetMap USA</p>	<p>PROJECT NO. 09006</p>	<p>EXHIBIT: 19</p>	<p>SHEET: 1 OF: 1</p>
<p>CLIENT: Upper White River Watershed Alliance P.O. Box 2065 Indianapolis, Indiana 46206</p>	<p>QUADRANGLE: N/A</p>	<p>DATE: 09/30/10</p>	<p>SCALE: 1" = 7000'</p>

Table 18: Prairie Creek IDEM and CIWRP Water Quality Sampling Summary			
Water Quality Parameter	IDEM Mean Value	CIWRP Mean Value	Water Quality Target
Dissolved Oxygen	9.1 mg/L	11.0 mg/L	between 4.0 and 12.0 mg/L
<i>E. coli</i>	3646 CFU/100mL	47007 CFU/100mL	235 CFU/100mL
Nitrate + Nitrite	1.4 mg/L	1.8 mg/L	1.6 mg/L
pH	8.0	7.8	between 6.0 and 9.0
Total Phosphorus	0.062 mg/L	0.120 mg/L	0.076 mg/L
TSS	19.9 mg/L	48.0 mg/L	30.0 mg/L
Turbidity	32.2 NTU	47.8 NTU	10.4 NTU
Atrazine	0.0019 mg/L	Not Sampled	0.003 mg/L

Based on the available water quality information, the Prairie Creek Subwatershed consistently tests higher than the water quality targets for *E. coli*, Nitrate + Nitrite, Total Phosphorus and TSS all tested higher than the water quality targets in the CIWRP Study; however all parameters were lower than the targets based on the IDEM data. Atrazine was not sampled during the CIWRP study and it was detected at lower levels than the target in the IDEM data. Dissolved Oxygen and pH fall within the acceptable ranges in both data sets and therefore are not a concern for this subwatershed.

Habitat/Biological Information

IDEM has completed several habitat and biological studies within the Geist Reservoir/Upper Fall Creek Watershed. Within the Prairie Creek Subwatershed, there are 7 IDEM sampling sites with habitat/biological information available. Sampling data was available from the 1992 Macroinvertebrate Study and the 2008 Fall Creek IBC Study. Table 19 summarizes the IDEM mean value for the Macroinvertebrate Index of Biotic Integrity (mIBI), the Index of Biotic Integrity (IBI) and the QHEI habitat assessment for the available data.

Table 19: Prairie Creek IDEM Habitat/Biological Sampling Summary	
Habitat/Biological Parameter	IDEM Mean Value
mIBI	3.8
IBI	39.0
QHEI	55.3

With a mIBI score of 3.8, the Prairie Creek Subwatershed is moderately impaired for macroinvertebrate communities and an IBI score of 39.0 indicates that the fish community is fair. A QHEI score of 55.3 correlates to a good habitat scoring which would indicate that the moderate impairment seen in the macroinvertebrate community is not likely caused by the lack/quality of habitat. As stated in the Water Quality Information section *E. coli* is the only water quality parameter (within the IDEM data) that consistently exceeds the water quality target. Therefore, it is difficult to conclude if the moderate impairment to the macroinvertebrate community is due solely to the water chemistry at the site.

Landuse Information

Landuse within the Prairie Creek Subwatershed consists primarily of agricultural uses. Low and medium intensity development is concentrated in the northern portion of the subwatershed associated with Anderson, and in the western portion of the subwatershed associated with Pendleton. Development is also concentrated along several major roadways within the subwatershed including Interstate 69, US Route 36, State Road 9, and State Road 38.

During October/November 2009, the Steering Committee volunteers conducted a windshield survey at 18 stream crossing sites and 9 land/field sites within the Prairie Creek Subwatershed. Observations including streambank erosion, stream buffers and debris were recorded for each site and the results are summarized in Table 20 below.

Table 20: Prairie Creek Windshield Survey Summary	
Parameter	Observations
Streambank Erosion	2/18 sites with erosion >3' 1/18 site with erosion <3'
Stream Buffers	2/18 sites with no buffers 8/18 sites with buffers <50'
In-stream Debris	6/18 sites with debris
Animal Access to Streams	0/18 sites with animal access
Conventional Till	0/27 sites under conventional till

The Prairie Creek Subwatershed contains one voided confined feeding operation located east of the intersection of State Road 38 and 50 W in Madison County.

There are no active NPDES permits within the Prairie Creek Subwatershed.

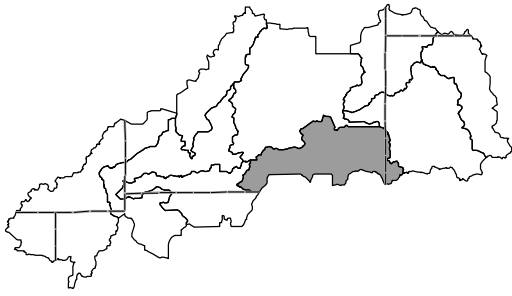
Headwaters Lick Creek Subwatershed

The Headwaters Lick Creek Subwatershed (HUC 12 – 051202010805) is located primarily in Madison County with a small portion in Henry County as shown on Exhibit 20. The subwatershed encompasses approximately 13,761 acres and includes the Lick Creek tributary and several smaller tributaries.

Water Quality Information

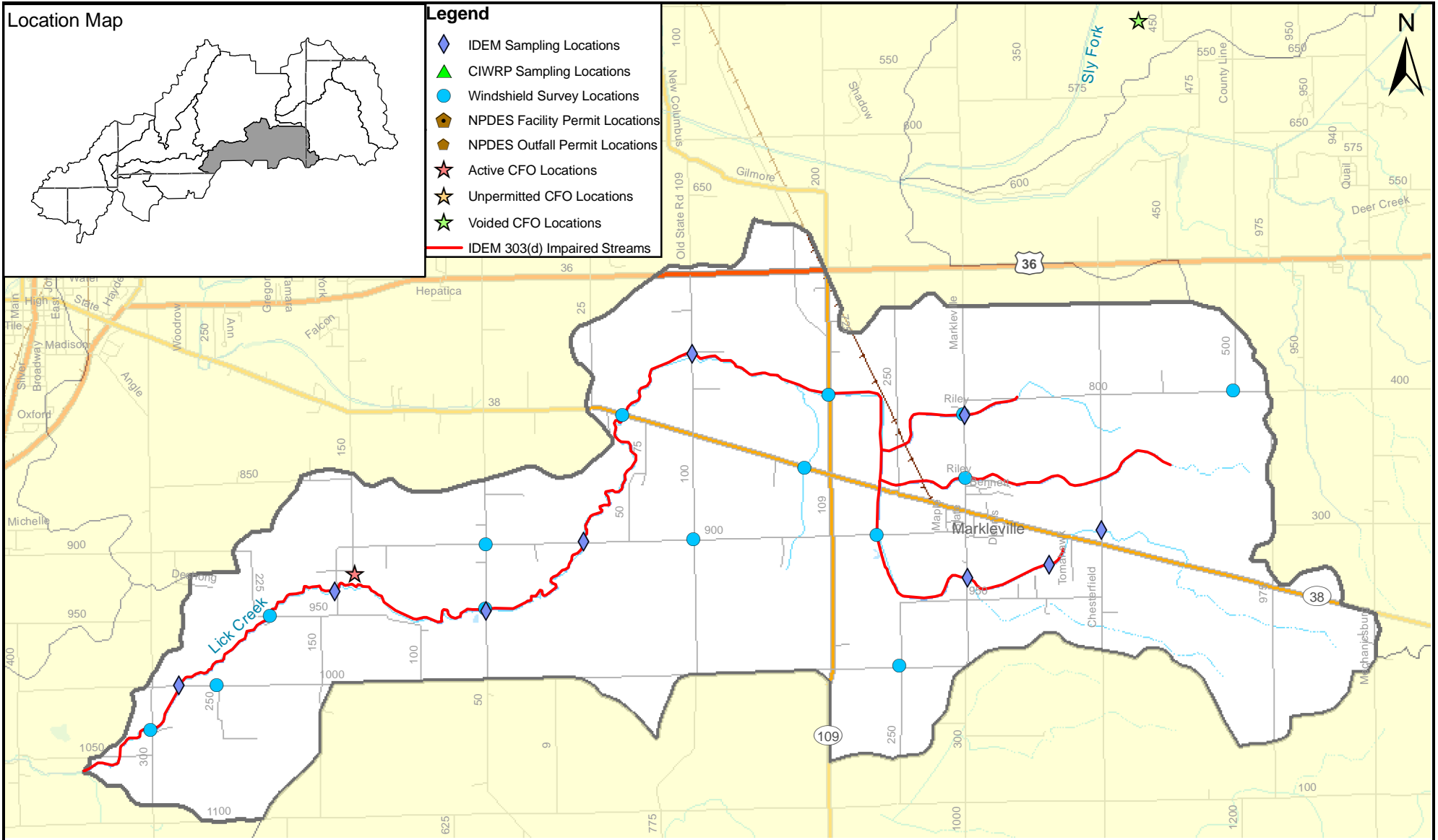
According to the IDEM 305(b) list, the streams within the Headwaters Lick Creek Subwatershed are designated for Recreational, Fishable, and Aquatic Life Use. Recreational uses within the subwatershed fall within category 5A, signifying that the available data indicates that at least one designated use is not supported impaired or is threatened, and a TMDL is needed. The fishable uses fall within category 3, signifying that there is insufficient available data to make a use support determination, and the aquatic life uses fall within category 2 signifying that available data indicates that some but not all of the designated uses are supported. The 303(d) list indicates that approximately 15.4 miles of streams within the subwatershed are impaired for *E.coli*, which includes all of the streams within this subwatershed.

Location Map



Legend

- ◆ IDEM Sampling Locations
- ▲ CIWRP Sampling Locations
- Windshield Survey Locations
- NPDES Facility Permit Locations
- NPDES Outfall Permit Locations
- ★ Active CFO Locations
- ★ Unpermitted CFO Locations
- ★ Voided CFO Locations
- IDEM 303(d) Impaired Streams




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TITLE:	Headwaters Lick Creek Subwatershed Map (HUC-12: 051202010805)
BASE LAYER:	StreetMap USA
CLIENT:	Upper White River Watershed Alliance P.O. Box 2065 Indianapolis, Indiana 46206

PROJECT:	Geist Reservoir/Upper Fall Creek Watershed Management Plan		
PROJECT NO.:	09006	EXHIBIT:	20
QUADRANGLE:	N/A	DATE:	09/30/10
		SHEET:	1 OF 1
		SCALE:	1" = 5500'

A total of nine IDEM sampling stations are located within the Headwaters Lick Creek Subwatershed. All of these stations have water quality sampling information. Available data at these stations included sampling from the 2001 *E.coli*- WFWR Study, 2006 Corvallis and 2006 Corvallis *E.coli* Studies, 2008 Fall Creek IBC Study and 2008-2009 Upper Fall Creek Water Quality Monitoring Program.

No CIWRP sampling sites were located within the Headwaters Lick Creek Subwatershed; therefore it was grouped with the Prairie Creek Subwatershed sampling location.

Table 21 below summarizes the IDEM and CIWRP sampling mean value of each parameter screened and the corresponding water quality target.

Table 21: Headwaters Lick Creek IDEM and CIWRP Water Quality Sampling Summary			
Water Quality Parameter	IDEM Mean Value	CIWRP Mean Value	Water Quality Target
Dissolved Oxygen	8.9 mg/L	12.0 mg/L	between 4.0 and 12.0 mg/L
<i>E.coli</i>	3771 CFU/100mL	14383 CFU/100mL	235 CFU/100mL
Nitrate + Nitrite	1.8 mg/L	2.5 mg/L	1.6 mg/L
pH	8.0	7.8	between 6.0 and 9.0
Total Phosphorus	0.069 mg/L	0.132 mg/L	0.076 mg/L
TSS	15.2 mg/L	48.9 mg/L	30.0 mg/L
Turbidity	27.6 NTU	67.3 NTU	10.4 NTU
Atrazine	0.002 mg/L	Not Sampled	0.003 mg/L

Based on the available water quality information, the Headwaters Lick Creek Subwatershed consistently tests higher than the water quality targets for *E. coli*, Nitrate + Nitrite and Turbidity. Total Phosphorus and TSS both tested higher than the water quality targets in the CIWRP Study; however both parameters were lower than the targets based on the IDEM data. Atrazine was not sampled during the CIWRP study and it was detected at lower levels than the target in the IDEM data. Dissolved Oxygen and pH fall within the acceptable ranges in both data sets and therefore are not a concern for this subwatershed.

Habitat/Biological Information

IDEM has completed several habitat and biological studies within the Geist Reservoir/Upper Fall Creek Watershed. Within the Headwaters Lick Creek Subwatershed, 8 of the IDEM sampling sites have habitat/biological information available. Sampling data was available from the 2008 Fall Creek IBC Study. Table 22 summarizes the IDEM mean value for the Index of Biotic Integrity (IBI) and the QHEI habitat assessment for the available data.

Table 22: Headwaters Lick Creek IDEM Habitat/Biological Sampling Summary	
Habitat/Biological Parameter	IDEM Mean Value
mIBI	Not Sampled
IBI	41.3
QHEI	60.0

The Headwaters Lick Creek Subwatershed was not sampled for macroinvertebrate communities. An IBI score of 41.3 indicates that the fish community is fair, and a QHEI score of 60.0 correlates to a good habitat scoring. As stated in the Water Quality Information section, E. coli and Nitrogen consistently exceed the water quality targets indicating the fair fish community may be influenced by the impaired water chemistry within the subwatershed.

Landuse Information

Landuse within the Headwaters Lick Creek Subwatershed consists primarily of agricultural uses. Several areas of deciduous forest are located along the corridor of Lick Creek. Low and medium intensity development is concentrated in the eastern portion of the subwatershed associated with Markleville.

During October/November 2009, the Steering Committee volunteers conducted a windshield survey at 9 stream crossing sites and 5 land/field sites within the Headwaters Lick Creek Subwatershed. Observations including streambank erosion, stream buffers, debris, animal access and conventional tillage practices to streams were recorded for each site and the results are summarized in Table 23 below.

Table 23: Headwaters Lick Creek Windshield Survey Summary	
Parameter	Observations
Streambank Erosion	0/9 sites with erosion >3' 4/9 site with erosion <3'
Stream Buffers	2/9 sites with no buffers 6/9 sites with buffers <50'
In-stream Debris	2/9 sites with debris
Animal Access to Streams	1/9 site with animal access
Conventional Till	5/14 sites under conventional till

The Headwaters Lick Creek Subwatershed contains one active confined feeding operation located south of the intersection of 900 S and 150 W in Madison County. There was one violation reported for the CFO within the subwatershed based on the inspection reports obtained from IDEM. The violation was from 2008 and was for lack of record keeping.

There are no other active NPDES permits within the Headwaters Lick Creek Subwatershed.

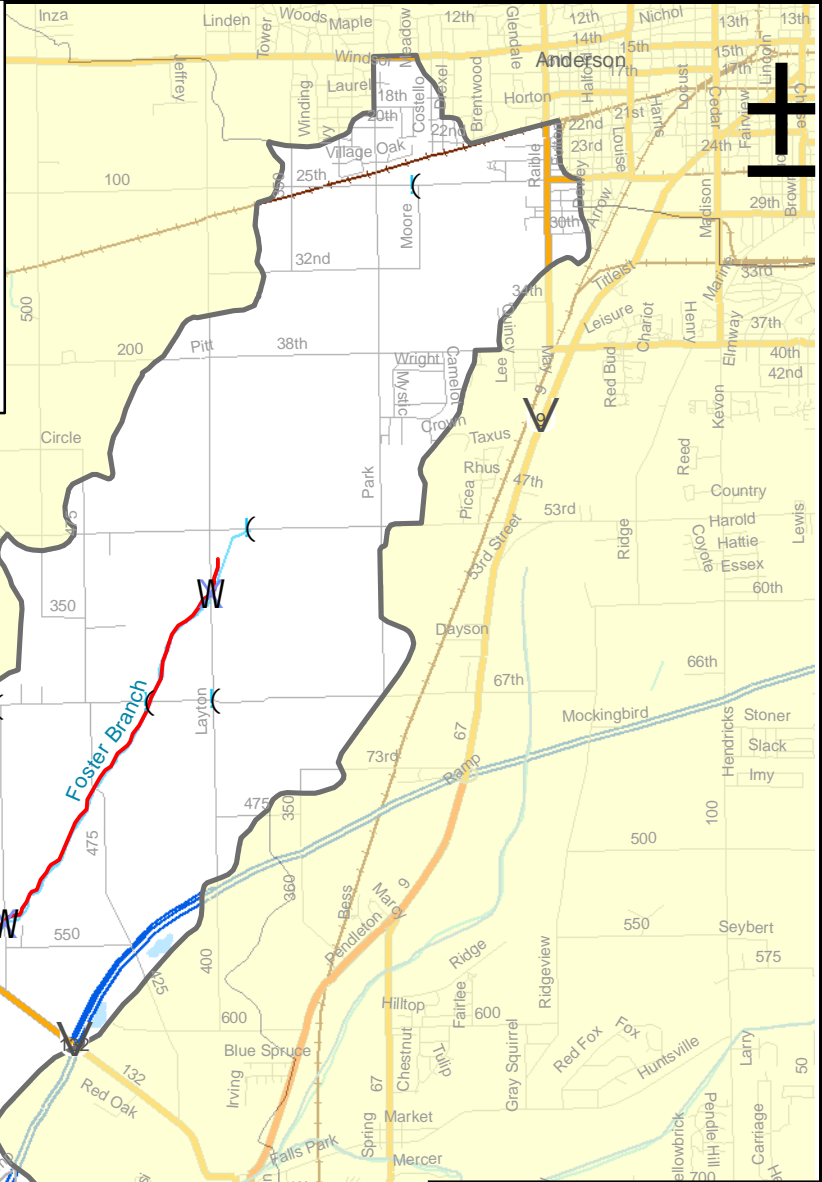
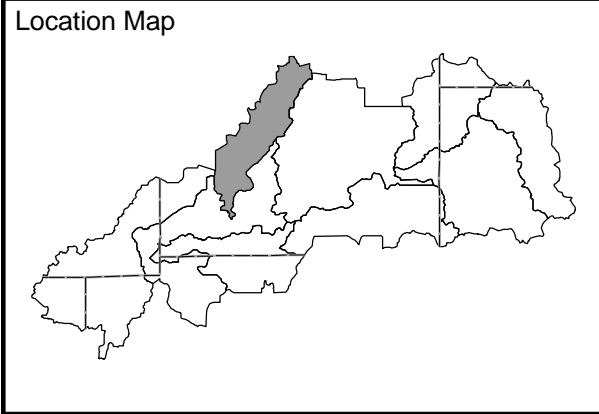
Foster Branch Subwatershed

The Foster Branch Subwatershed (HUC 12 – 051202010806) is located within Madison County as shown in Exhibit 21. The subwatershed encompasses approximately 10,114 acres and includes the Foster Branch tributary.

Water Quality Information

According to the IDEM 305(b) list, the streams within the Foster Branch Subwatershed are designated for Recreational, Fishable, and Aquatic Life Use. Recreational uses within the subwatershed fall within category 5A, signifying that the available data indicates that at least one designated use is not supported impaired or is threatened, and a TMDL is needed. The fishable uses fall within category 3, signifying that there is insufficient available data to

Location Map



Legend

- W** IDEM Sampling Locations
- #** CIWRP Sampling Locations
- (** Windshield Survey Locations
- \$** NPDES Facility Permit Locations
- \$** NPDES Outfall Permit Locations
- ▲** Active CFO Locations
- Unpermitted CFO Locations
- Voided CFO Locations
- IDEM 303(d) Impaired Streams



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TITLE:
Foster Branch Subwatershed Map
(HUC-12: 051202010806)

BASE LAYER: StreetMap USA

CLIENT:
Upper White River Watershed Alliance
P.O. Box 2065
Indianapolis, Indiana 46206

PROJECT: Geist Reservoir/Upper Fall Creek Watershed Management Plan		
PROJECT NO. 09006	EXHIBIT: 21	SHEET: 1 OF: 1
QUADRANGLE: N/A	DATE: 09/30/10	SCALE: 1" = 6000'

make a use support determination, and the aquatic life uses fall within category 2 signifying that available data indicates that some but not all of the designated uses are supported. The 303(d) list indicates that approximately 7.1 miles of the Foster Branch Tributary within the subwatershed are impaired for *E.coli*.

A total of 3 IDEM sampling stations are located within the Foster Branch Subwatershed. All of these stations have water quality sampling information. Available data at these stations included sampling from the 2008 Fall Creek IBC Study and 2008-2009 Upper Fall Creek Water Quality Monitoring Program.

Only one CIWRP sampling site is located within the Foster Branch Subwatershed.

Table 24 below summarizes the IDEM and CIWRP sampling mean value of each parameter screened and the corresponding water quality target.

Table 24: Foster Branch IDEM and CIWRP Water Quality Sampling Summary			
Water Quality Parameter	IDEM Mean Value	CIWRP Mean Value	Water Quality Target
Dissolved Oxygen	9.2 mg/L	11.9 mg/L	between 4.0 and 12.0 mg/L
<i>E.coli</i>	5669 CFU/100mL	15321 CFU/100mL	235 CFU/100mL
Nitrate + Nitrite	2.4 mg/L	3.2 mg/L	1.6 mg/L
pH	8.0	7.7	between 6.0 and 9.0
Total Phosphorus	0.064 mg/L	0.146 mg/L	0.076 mg/L
TSS	5.7 mg/L	16.9 mg/L	30.0 mg/L
Turbidity	15.9 NTU	43.5 NTU	10.4 NTU
Atrazine	0.0026 mg/L	Not Sampled	0.003 mg/L

Based on the available water quality information, the Foster Branch Subwatershed consistently tests higher than the water quality targets in *E. coli*, Nitrate + Nitrite and Turbidity. Total Phosphorus tested higher than the water quality targets in the CIWRP Study; however it was lower than the standards based on the IDEM data. Atrazine was not sampled during the CIWRP study and it was detected at lower levels than the target in the IDEM data. Dissolved Oxygen, pH and TSS fall within the acceptable ranges in both data sets and therefore are not a concern for this subwatershed.

Habitat/Biological Information

IDEM has completed several habitat and biological studies within the Geist Reservoir/Upper Fall Creek Watershed. Within the Foster Branch Subwatershed, all 3 IDEM sampling sites have habitat/biological information available. Sampling data was available from the 2008 Fall Creek IBC Study. Table 25 summarizes the IDEM mean value for the Index of Biotic Integrity (IBI) and the QHEI habitat assessment for the available data.

Table 25: Foster Branch IDEM Habitat/Biological Sampling Summary	
Habitat/Biological Parameter	IDEM Mean Value
mIBI	Not sampled
IBI	35.3
QHEI	37.3

The Foster Branch Subwatershed was not sampled for macroinvertebrate communities. An IBI score of 35.3 indicates that the fish community is poor, and a QHEI score of 37.3 correlates to a poor habitat scoring which would indicate that the poor fish community is likely caused by lack/quality of habitat. As stated in the Water Quality Information section, E. coli and Nitrogen consistently exceed the water quality targets indicating the poor fish community may also be influenced by the impaired water chemistry within the subwatershed.

Landuse Information

Landuse within the Foster Branch Subwatershed consists primarily of agricultural uses. Several areas of deciduous forest are located along the corridor of Lick Creek. Low and medium intensity development is concentrated in the northern portion of the subwatershed associated with Anderson, and in the southeastern portion of the subwatershed associated with Pendleton.

During October/November 2009, the Steering Committee volunteers conducted a windshield survey at 7 stream crossing sites and 4 land/field sites within the Foster Branch Subwatershed. Observations including streambank erosion, stream buffers, debris and animal access to streams were recorded for each site and the results are summarized in Table 26 below.

Table 26: Foster Branch Windshield Survey Summary	
Parameter	Observations
Streambank Erosion	1/7 site with erosion >3' 0/7 sites with erosion <3'
Stream Buffers	0/7 sites with no buffers 3/7 sites with buffers <50'
In-stream Debris	1/7 site with debris
Animal Access to Streams	1/7 site with animal access
Conventional Till	0/11 sites under conventional till

The Foster Branch Subwatershed contains no confined feeding operations.

There are no active NPDES permits within the Foster Branch Subwatershed.

McFadden Ditch Subwatershed

The McFadden Ditch Subwatershed (HUC 12 – 051202010807) is located primarily in Madison and Hancock Counties with a small portion in Hamilton County as shown in Exhibit 22. The subwatershed encompasses approximately 10,673 acres and includes the McFadden Ditch tributary.

Water Quality Information

According to the IDEM 305(b) list, the streams within the McFadden Ditch Subwatershed are designated for Recreational, Fishable, and Aquatic Life Use. . Recreational uses within the subwatershed fall within category 5A, signifying that the available data indicates that at least one designated use is not supported impaired or is threatened, and a TMDL is needed. The fishable uses fall within category 3, signifying that there is insufficient available data to make a use support determination, and the aquatic life uses fall within category 2 signifying that available data indicates that some but not all of the designated uses are supported. The 303(d) list indicates that approximately 9.0 miles of the McFadden Ditch within the subwatershed are impaired for *E.coli*.

A total of 8 IDEM sampling stations are located within the McFadden Ditch Subwatershed. Seven of these stations have water quality sampling information. Available data at these stations included sampling from the 1996 Synoptic Study, 2001 *E.coli*- WFWR Study, 2008 Fall Creek IBC Study and 2008-2009 Upper Fall Creek Water Quality Monitoring Program.

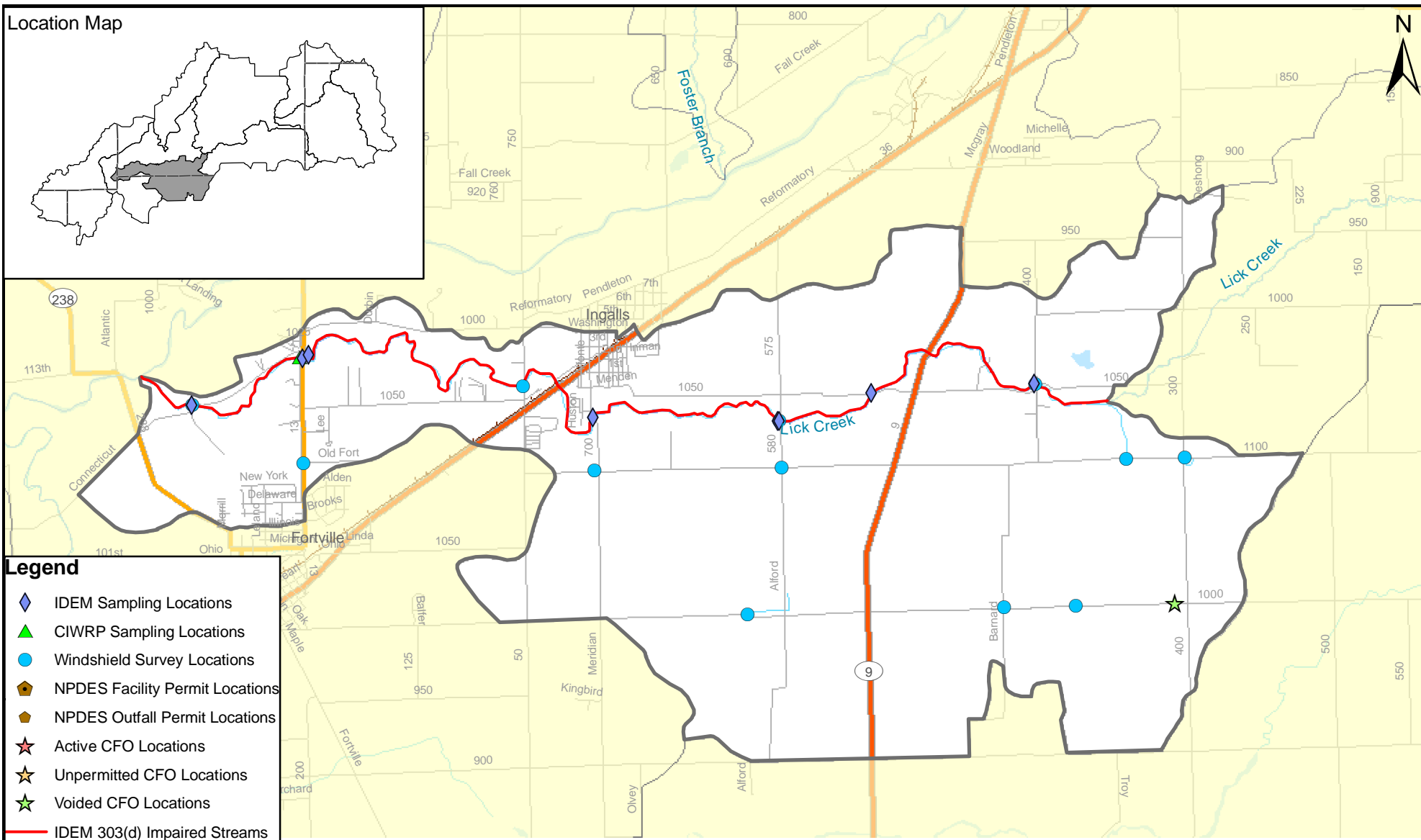
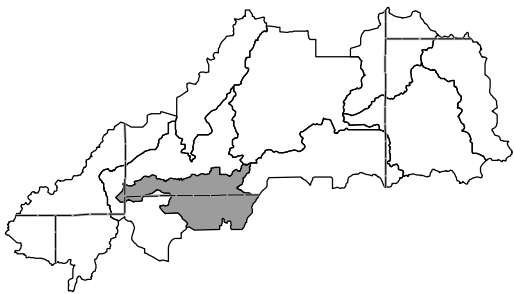
One CIWRP sampling site was located within the McFadden Ditch Subwatershed.

Table 27 summarizes the IDEM and CIWRP sampling mean value of each parameter screened and the corresponding water quality target.

Water Quality Parameter	IDEM Mean Value	CIWRP Mean Value	Water Quality Target
Dissolved Oxygen	9.5 mg/L	12.0 mg/L	between 4.0 and 12.0 mg/L
<i>E.coli</i>	1436 CFU/100mL	14383 CFU/100mL	235 CFU/100mL
Nitrate + Nitrite	1.8 mg/L	2.5 mg/L	1.6 mg/L
pH	8.1	7.8	between 6.0 and 9.0
Total Phosphorus	0.081 mg/L	0.132 mg/L	0.076 mg/L
TSS	17.1 mg/L	48.9 mg/L	30.0 mg/L
Turbidity	29.5 NTU	67.3 NTU	10.4 NTU
Atrazine	0.0017 mg/L	Not Sampled	0.003 mg/L

Based on the available water quality information, the McFadden Ditch Subwatershed consistently tests higher than the water quality targets for *E. coli*, Nitrate + Nitrite, Total Phosphorus and Turbidity. TSS tested higher than the water quality targets in the CIWRP Study; however it was lower than the targets based on the IDEM data. Atrazine was not sampled during the CIWRP study and it was detected at lower levels than the target in the IDEM data. Dissolved Oxygen and pH fall within the acceptable ranges in both data sets and therefore are not a concern for this subwatershed.

Location Map



Legend

- IDEM Sampling Locations
- CIWRP Sampling Locations
- Windshield Survey Locations
- NPDES Facility Permit Locations
- NPDES Outfall Permit Locations
- Active CFO Locations
- Unpermitted CFO Locations
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TITLE: McFadden Ditch Subwatershed Map (HUC-12: 051202010807)		PROJECT: Geist Reservoir/Upper Fall Creek Watershed Management Plan		
BASE LAYER: StreetMap USA		PROJECT NO.: 09006	EXHIBIT: 22	SHEET: 1 OF: 1
CLIENT: Upper White River Watershed Alliance P.O. Box 2065 Indianapolis, Indiana 46206		QUADRANGLE: N/A	DATE: 09/30/10	SCALE: 1" = 5000'

Habitat/Biological Information

IDEM has completed several habitat and biological studies within the Geist Reservoir/Upper Fall Creek Watershed. Within the McFadden Ditch Subwatershed, 6 of the IDEM sampling sites have habitat/biological information available. Sampling data was available from the 1992 Macroinvertebrate Study and the 2008 Fall Creek IBC Study. Table 28 summarizes the IDEM mean value for the Macroinvertebrate Index of Biotic Integrity (mIBI), the Index of Biotic Integrity (IBI) and the QHEI habitat assessment for the available data.

Table 28: McFadden Ditch IDEM Habitat/Biological Sampling Summary	
Habitat/Biological Parameter	IDEM Mean Value
mIBI	3.6
IBI	45.2
QHEI	71.8

With a mIBI score of 3.6, the McFadden Ditch Subwatershed is moderately impaired for macroinvertebrate communities and an IBI score of 45.2 indicates that the fish community is fair to good. A QHEI score of 71.8 correlates to an excellent habitat scoring which would indicate that the moderate impairment seen in the macroinvertebrate community is not likely caused by the lack/quality of habitat. As stated in the Water Quality Information section, E. coli, Nitrogen and Phosphorus all consistently exceed the water quality targets indicating the moderate impairment seen within the macroinvertebrate community may be influenced by the impaired water chemistry within the subwatershed.

Landuse Information

Landuse within the McFadden Ditch Subwatershed consists primarily of agricultural uses. Several areas of deciduous forest are located along the corridor of Lick Creek. Low and medium intensity development is concentrated in the north central portion of the subwatershed associated with Ingalls, and in the western portion of the subwatershed associated with Fortville.

During October/November 2009, the Steering Committee volunteers conducted a windshield survey at 8 stream crossing sites and 4 land/field sites within the McFadden Ditch Subwatershed. Observations including streambank erosion, stream buffers, debris and animal access to streams were recorded for each site and the results are summarized in Table 29 below.

Table 29: McFadden Ditch Windshield Survey Summary	
Parameter	Observations
Streambank Erosion	0/8 sites with erosion >3' 7/8 sites with erosion <3'
Stream Buffers	2/8 sites with no buffers 7/8 sites with buffers <50'
In-stream Debris	3/8 sites with debris
Animal Access to Streams	1/8 site with animal access
Conventional Till	0/12 sites under conventional till

The McFadden Ditch Subwatershed contains one voided confined feeding operation located west of the intersection of 1000 N and 400 E in Hancock County.

There are no active NPDES permits within the McFadden Ditch Subwatershed.

Flatfork Creek Subwatershed

The Flatfork Creek Subwatershed (HUC 12 – 051202010808) is located primarily in Hancock and Madison Counties with a small portion in Hamilton County as shown in Exhibit 23. The subwatershed encompasses approximately 17,798 acres and includes the Flatfork Creek tributary and Fall Creek.

Water Quality Information

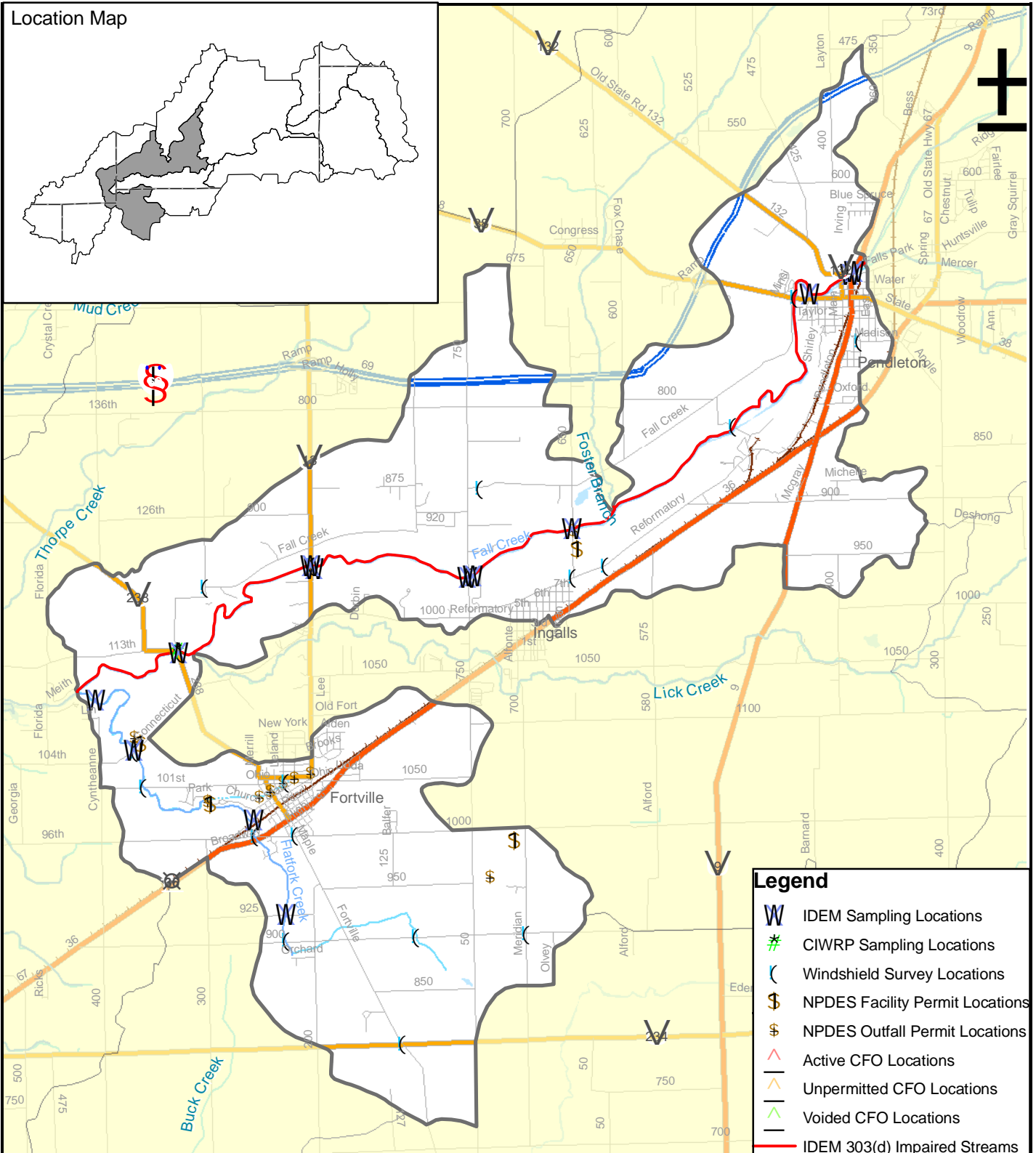
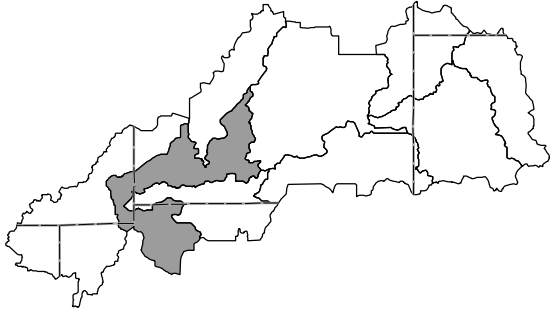
According to the IDEM 305(b) list, the streams within the Flatfork Creek Subwatershed are designated for Recreational, Fishable, and Aquatic Life Use. Recreational uses within the subwatershed fall within category 5A, signifying that the available data indicates that at least one designated use is not supported impaired or is threatened, and a TMDL is needed and category 2, signifying that available data indicates that some but not all of the designated uses are supported. The fishable uses fall within category 3, signifying that there is insufficient available data to make a use support determination, and the aquatic life uses fall within both categories 2 and 5A. The 303(d) list indicates that approximately 10.8 miles of Fall Creek within the subwatershed are impaired for *E.coli*.

A total of 12 IDEM sampling stations are located within the Flatfork Creek Subwatershed. Ten of these stations have water quality sampling information. Available data at these stations included sampling from the 1996 Synoptic Study, 1996 Watershed Study, 1999-2009 Fixed Station, 2001 Corvallis Study, 2001 *E.coli*- Upper WFWR, 2001 Pesticides Study, 2002-2006 Clean Sampling and Ultra-Clean Analyses, 2008 Fall Creek IBC Study and 2008-2009 Upper Fall Creek Water Quality Monitoring Program.

Only one CIWRP sampling site is located within the Flatfork Creek Subwatershed.

Table 30 summarizes the IDEM and CIWRP sampling mean value of each parameter screened and the corresponding water quality target.

Location Map



Legend

- IDEM Sampling Locations
- CIWRP Sampling Locations
- Windshield Survey Locations
- NPDES Facility Permit Locations
- NPDES Outfall Permit Locations
- Active CFO Locations
- Unpermitted CFO Locations
- Voided CFO Locations
- IDEM 303(d) Impaired Streams



V3 Companies
 7325 Janes Avenue
 Woodridge, IL 60517
 630.724.9200 phone
 630.724.9202 fax
 www.v3co.com

TITLE:
**Flatfork Creek Subwatershed Map
 (HUC-12: 051202010808)**

BASE LAYER: StreetMap USA

CLIENT:
 Upper White River Watershed Alliance
 P.O. Box 2065
 Indianapolis, Indiana 46206

PROJECT: Geist Reservoir/Upper Fall Creek Watershed Management Plan		
PROJECT NO. 09006	EXHIBIT: 23	SHEET: 1 OF: 1
QUADRANGLE: N/A	DATE: 09/30/10	SCALE: 1" = 7000'

Table 30: Flatfork Creek IDEM and CIWRP Water Quality Sampling Summary			
Water Quality Parameter	IDEM Mean Value	CIWRP Mean Value	Water Quality Target
Dissolved Oxygen	9.4 mg/L	12.1 mg/L	between 4.0 and 12.0 mg/L
<i>E. coli</i>	487 CFU/100mL	36843 CFU/100mL	235 CFU/100mL
Nitrate + Nitrite	2.6 mg/L	2.5 mg/L	1.6 mg/L
pH	8.1	7.9	between 6.0 and 9.0
Total Phosphorus	0.083 mg/L	0.165 mg/L	0.076 mg/L
TSS	21.3 mg/L	52.2 mg/L	30.0 mg/L
Turbidity	23.0 NTU	67.2 NTU	10.4 NTU
Atrazine	0.0012 mg/L	Not Sampled	0.003 mg/L

Based on the available water quality information, the Flatfork Creek Subwatershed consistently tests higher than the water quality targets in *E. coli*, Nitrate + Nitrite, Total Phosphorus and Turbidity. TSS tested higher than the water quality targets in the CIWRP Study; however it was lower than the targets based on the IDEM data. Atrazine was not sampled during the CIWRP study and it was detected at lower levels than the target in the IDEM data. Dissolved Oxygen and pH fall within the acceptable ranges in both data sets and therefore are not a concern for this subwatershed.

Habitat/Biological Information

IDEM has completed several habitat and biological studies within the Geist Reservoir/Upper Fall Creek Watershed. Within the Flatfork Creek Subwatershed, 8 of the IDEM sampling sites had habitat/biological information available. Sampling data was available from the 1992 Macroinvertebrate Study, the 1996 Macroinvertebrate Study and the 2008 Fall Creek IBC Study. Table 31 summarizes the IDEM mean value for the Macroinvertebrate Index of Biotic Integrity (mIBI), the Index of Biotic Integrity (IBI) and the QHEI habitat assessment for the available data.

Table 31: Flatfork Creek IDEM Habitat/Biological Sampling Summary	
Habitat/Biological Parameter	IDEM Mean Value
mIBI	4.2
IBI	37.0
QHEI	65.9

With a mIBI score of 4.2, the Flatfork Creek Subwatershed is slightly impaired for macroinvertebrate communities and an IBI score of 37.0 indicates that the fish community is poor to fair. A QHEI score of 65.9 correlates to a good habitat scoring which would indicate that the slight impairment seen in the macroinvertebrate community and the poor to fair fish community is not likely caused by the lack/quality of habitat. As stated in the Water Quality Information section, *E. coli*, Nitrogen and Phosphorus all consistently exceed the water quality targets indicating the slight impairment seen in the macroinvertebrate community and the poor to fair fish community may be influenced by the impaired water chemistry within the subwatershed.

Landuse Information

Landuse within the Flatfork Creek Subwatershed consists primarily of agricultural uses. Low and medium intensity development is concentrated in the northeastern portion of the subwatershed associated with Pendleton, the central portion of the subwatershed associated with Ingalls, and in the western portion of the subwatershed associated with Fortville.

During October/November 2009, the Steering Committee volunteers conducted a windshield survey at 13 stream crossing sites and 6 land/field sites within the Flatfork Creek Subwatershed. Observations including streambank erosion, stream buffers, debris and conventional tillage practices were recorded for each site and the results are summarized in Table 32 below.

Table 32: Flatfork Creek Windshield Survey Summary	
Parameter	Observations
Streambank Erosion	2/13 sites with erosion >3' 4/13 sites with erosion <3'
Stream Buffers	2/13 sites with no buffers 11/13 sites with buffers <50'
In-stream Debris	1/13 site with debris
Animal Access to Streams	0/13 sites with animal access
Conventional Till	2/19 sites under conventional till

The Flatfork Creek Subwatershed contains no confined feeding operations.

There are 4 NPDES permits active within the Flatfork Creek Subwatershed. Alcatel-Lucent USA Inc, permit number IN0057720, is located at 9874 N Meridian Road in Fortville. The facility along with one outfall is located within the Flatfork Creek Subwatershed. According to compliance records, there have been no formal enforcement actions within the last 5 years; however there has been one noted effluent exceedance within the last 3 years. This exceedance was reported for pH. The Fall Creek RSD Wastewater Treatment Plant, permit number IN0049026, is located at 9378 S 650 W in Pendleton. The treatment plant along with one outfall is located within the Flatfork Creek Subwatershed. According to compliance records for the treatment plant, there has been no formal enforcement actions within the last 5 years, however there have been nine noted effluent exceedances within the last 3 years. These exceedances were reported for *E.coli* and total phosphorus. The Fortville Municipal Wastewater Treatment Plant, permit number IN0020958, is located at 500 W Church Street in Fortville. The treatment plant along with 7 outfalls is located within the Flatfork Creek Subwatershed. According to compliance records, there has been no formal enforcement actions within the last 5 years at the treatment plant, however there have been 17 noted effluent exceedances within the last 3 years. These exceedances were reported for *E.coli* and nitrogen. The Flatfork Creek Wastewater Treatment Plant, permit number IN0054771, is located at 16266 Connecticut Avenue in Fortville. The treatment plant along with one outfall is located within the Flatfork Creek Subwatershed. No compliance records are available for this facility.

Thorpe Creek Subwatershed

The Thorpe Creek Subwatershed (HUC 12 – 051202010809) encompasses portions of Hamilton, Hancock, Madison, and Marion Counties as shown in Exhibit 24. The subwatershed contains approximately 22,170 acres and includes the Bee Camp Creek and Thorpe Creek tributaries and several smaller tributaries. Geist Reservoir is located in the western portion of the subwatershed.

Water Quality Information

According to the IDEM 305(b) list, the streams within the Thorpe Creek Subwatershed are designated for Recreational, Fishable, and Aquatic Life Use. Geist Reservoir is also designated for Recreational, Fishable, Aquatic Life, and Drinking Water Use. Recreational uses within the streams of the subwatershed fall within category 2, signifying that available data indicates that some but not all of the designated uses are supported. The fishable uses fall within both categories 3, signifying that there is insufficient available data to make a use support determination and 5B, signifying that the available data indicates that at least one designated use is not supported impaired or is threatened, and a TMDL is needed. Aquatic life uses fall within both categories 2 and 5A. Recreational and aquatic life uses within Geist Reservoir fall within category 3, signifying that there is insufficient available data to make a use support determination. While fishable and drinking water uses within the reservoir fall within categories 5B and 5A, respectively signifying that the available data indicates that at least one designated use is not supported impaired or is threatened, and a TMDL is needed. The 303(d) list indicates that approximately 0.8 miles of Fall Creek within the subwatershed are impaired for *E.coli* and that Geist Reservoir is impaired for Algae, Taste/Odor and PCBs in Fish Tissue.

A total of 10 IDEM sampling stations are located within the Thorpe Creek Subwatershed. Nine of these stations have water quality sampling information. Available data at these stations included sampling from the 2008 Fall Creek IBC Study.

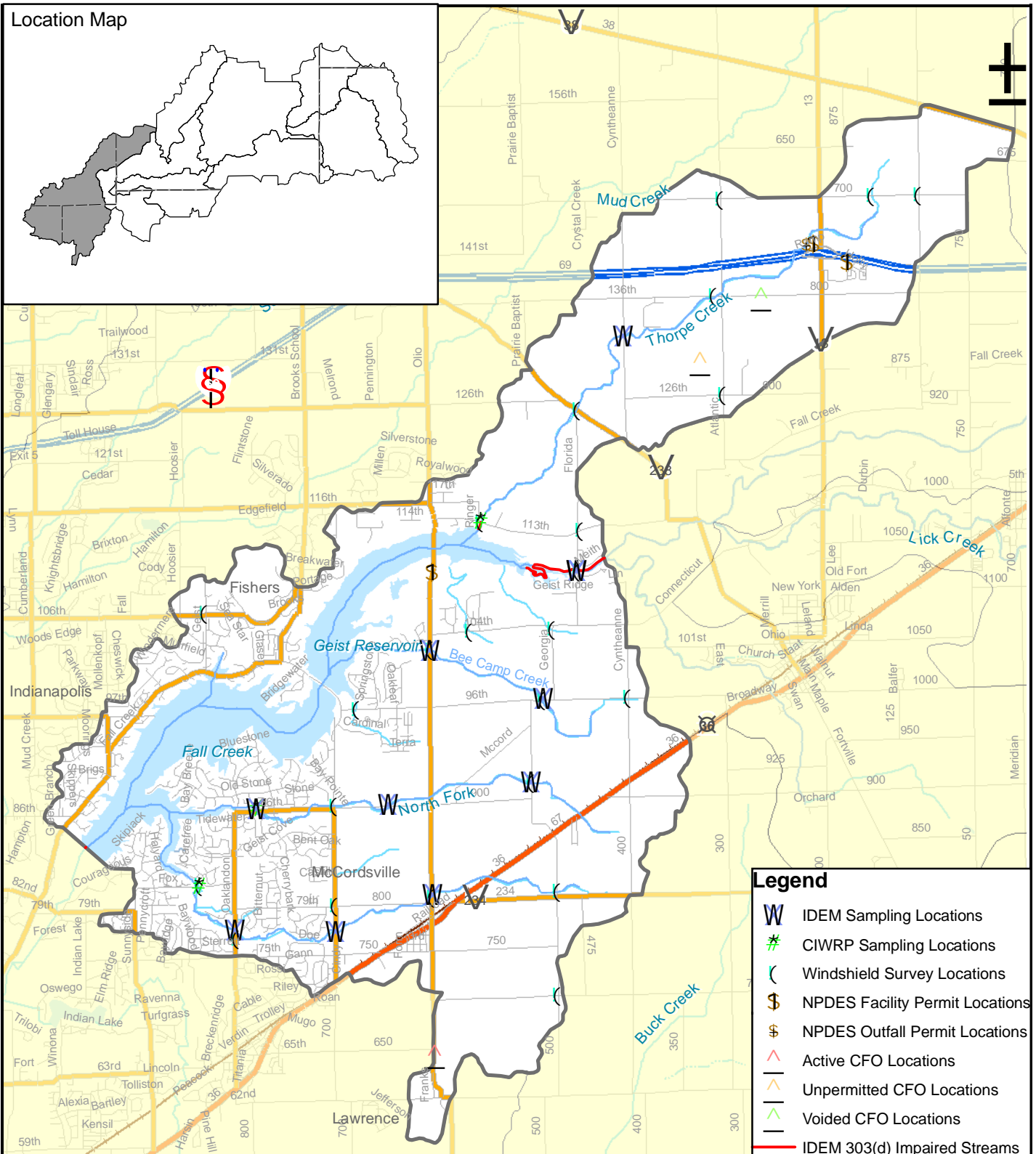
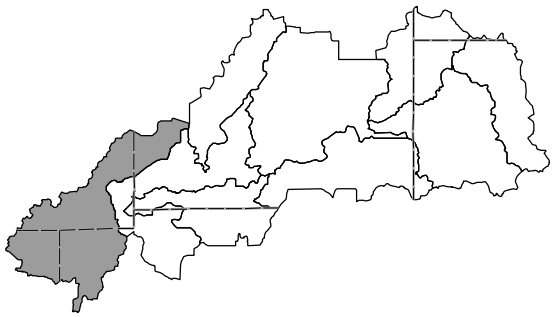
There are 3 CIWRP sampling sites located within the Thorpe Creek Subwatershed.

Table 33 summarizes the IDEM and CIWRP sampling mean value of each parameter screened and the corresponding water quality target.

Table 33: Thorpe Creek IDEM and CIWRP Water Quality Sampling Summary			
Water Quality Parameter	IDEM Mean Value	CIWRP Mean Value	Water Quality Target
Dissolved Oxygen	7.2 mg/L	11.5 mg/L	between 4.0 and 12.0 mg/L
<i>E.coli</i>	Not sampled	38437 CFU/100mL	235 CFU/100mL
Nitrate + Nitrite	4.4 mg/L	3.4 mg/L	1.6 mg/L
pH	7.8	7.7	between 6.0 and 9.0
Total Phosphorus	1.066 mg/L	0.193 mg/L	0.076 mg/L
TSS	20.8 mg/L	53.1 mg/L	30.0 mg/L
Turbidity	43.4 NTU	82.8 NTU	10.4 NTU
Atrazine	0.0016 mg/L	Not Sampled	0.003 mg/L

Based on the available water quality information, the Thorpe Creek Subwatershed consistently tests higher than the water quality targets for Nitrate + Nitrite, Total

Location Map



Legend

- IDEM Sampling Locations
- CIWRP Sampling Locations
- Windshield Survey Locations
- NPDES Facility Permit Locations
- NPDES Outfall Permit Locations
- Active CFO Locations
- Unpermitted CFO Locations
- Voided CFO Locations
- IDEM 303(d) Impaired Streams



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 Woodridge, IL 60517
 630.724.9200 phone
 630.724.9202 fax
 www.v3co.com

TITLE: Thorpe Creek Subwatershed Map (HUC-12: 051202010809)
BASE LAYER: StreetMap USA
CLIENT: Upper White River Watershed Alliance P.O. Box 2065 Indianapolis, Indiana 46206

PROJECT: Geist Reservoir/Upper Fall Creek Watershed Management Plan		
PROJECT NO. 09006	EXHIBIT: 24	SHEET: 1 OF: 1
QUADRANGLE: N/A	DATE: 09/30/10	SCALE: 1" = 7500'

Phosphorus and Turbidity. TSS tested higher than the water quality targets in the CIWRP Study; however it was lower than the targets based on the IDEM data. *E.coli* data was not available in the IDEM data; however the water quality targets for *E.coli* were significantly exceeded in the CIWRP study. Atrazine was not sampled during the CIWRP study and it was detected at lower levels than the target in the IDEM data. Dissolved Oxygen and pH fall within the acceptable ranges in both data sets and therefore are not a concern for this subwatershed.

Habitat/Biological Information

IDEM has completed several habitat and biological studies within the Geist Reservoir/Upper Fall Creek Watershed. Within the Thorpe Creek Subwatershed, 9 of the IDEM sites have habitat/biological information available. Sampling data was available from the 2008 Fall Creek IBC Study. Table 34 summarizes the IDEM mean value for the Index of Biotic Integrity (IBI) and the QHEI habitat assessment for the available data.

Table 34: Thorpe Creek IDEM Habitat/Biological Sampling Summary	
Habitat/Biological Parameter	IDEM Mean Value
mIBI	Not Sampled
IBI	33.6
QHEI	58.4

The Thorpe Creek Subwatershed was not sampled for macroinvertebrate communities. An IBI score of 33.6 indicates that the fish community is poor, and a QHEI score of 58.4 correlates to a good habitat scoring which would indicate that the poor fish community is not likely caused by lack/quality of habitat. As stated in the Water Quality Information section, Nitrogen and Phosphorus consistently exceed the water quality targets indicating the poor fish community may be influenced by the impaired water chemistry within the subwatershed.

Landuse Information

Landuse within the Thorpe Creek Subwatershed consists primarily of agricultural uses however significant development is also located within the subwatershed. Medium and high intensity development is concentrated in western portion of the subwatershed associated with Indianapolis, Fishers, McCordsville, and Lawrence.

During October/November 2009, the Steering Committee volunteers conducted a windshield survey at 16 stream crossing sites and 8 land/field sites within the Thorpe Creek Subwatershed. Observations including streambank erosion, stream buffers, debris and conventional tillage practices were recorded for each site and the results are summarized in Table 35 below.

Table 35: Thorpe Creek Windshield Survey Summary	
Parameter	Observations
Streambank Erosion	2/16 sites with erosion >3' 3/16 sites with erosion <3'
Stream Buffers	7/16 sites with no buffers 6/16 sites with buffers <50'
In-stream Debris	7/16 sites with debris
Animal Access to Streams	0/16 sites with animal access
Conventional Till	4/24 sites under conventional till

The Thorpe Creek Subwatershed contains one voided confined feeding operation, one unpermitted CFO and one active CFO. The voided CFO is located east of the intersection of Atlantic Avenue and 800 S in Madison County. The unpermitted CFO is located north of the intersection of 126th Street and Atlantic Avenue in Hamilton County and the active CFO is located south of the intersection of 650 N and 600 W in Hancock County. There were no violations reported for the CFOs within the subwatershed based on the inspection reports obtained from IDEM.

There are 3 other NPDES permits active within the Thorpe Creek Subwatershed. The IMI McCordsville facility, permit number ING490034, is located at 10959 Olio Road in Fortville. According to compliance records, there have been no formal enforcement actions within the last 5 years at the facility; however there has been one noted effluent exceedance within the last 3 years. This exceedance was reported for total suspended solids. The Pilot Travel Center, permit number IN0056375, is located at I-69 and State Road 13 in Pendleton. There are no compliance records available for this facility. The Carefree Mobile Home Park, permit number IN0043281, is located on West Carefree Drive in Pendleton. There are no compliance records available for this facility.

Part Three of the Watershed Inventory

Watershed Inventory Summary and Ranking

As detailed in Part Two of the Watershed Inventory, available water quality, biological and landuse information was analyzed on a subwatershed (HUC 12) scale. The following tables summarize the data that was analyzed and presented in Part Two of the Watershed Inventory for easy comparison between the subwatersheds.

In order to gain an understanding of the relationships between the subwatersheds and identify the areas of highest concern, a ranking system was established. Ranking was assigned based on each data set with the most impacted watershed receiving the lowest score (e.g. 1). The scores were then averaged based on the number of data sets that were available for that subwatershed and the lowest average scoring subwatershed received the lowest overall score (e.g. 1). Therefore a subwatershed with a ranking of 1 is the lowest ranked subwatershed meaning it is the worst ranked subwatershed for that specific data set/pollutant. A subwatershed with a ranking of 10 is the highest ranked subwatershed meaning it is the best ranked subwatershed for that specific data set/pollutant. A value of

NR, or Not Ranked, is given for those subwatersheds where the parameter or pollutant was not collected or sampled. Specific ranking methodologies are explained for each table.

Water Quality Information

The IDEM 303(d) Summary information is ranked based on the number of impairments per subwatershed. For example, Thorpe Creek had three impairments; the highest number of impairments compared to the other subwatersheds and therefore was ranked 1 for this data set. The rest of the subwatersheds have only impairment and therefore were all ranked second.

Subwatershed	IDEM 303(d) Impairments	IDEM 303(d) Ranking
Honey Creek	<i>E.coli</i>	2
Sly Fork	<i>E.coli</i>	2
Deer Creek	<i>E.coli</i>	2
Prairie Creek	<i>E.coli</i>	2
Headwaters Lick Creek	<i>E.coli</i>	2
Foster Branch	<i>E.coli</i>	2
McFadden Ditch	<i>E.coli</i>	2
Flatfork Creek	<i>E.coli</i>	2
Thorpe Creek	Algae, Taste/Odor, PCBs in fish tissue	1

The IDEM Water Quality Sampling Summary information is ranked for each impairment based on the value of the impairment (i.e. Sly Fork Creek had the seventh highest value for Total Phosphorus). The Overall IDEM WQ Rank left column was determined based on adding each impairment rank and dividing by the number of times it was ranked. For example, Honey Creek has a total rank of 4.75 = [(6+2+3+8)/4] and was ranked for all 4 impairments. Similarly, Thorpe Creek has a total rank of 1.67 = [(1+1+3)/3] and was ranked for only 3 impairments. The right column of the Overall IDEM WQ Rank is ranking the left column from 1 to 10 (1 being the worst case and 10 being the best case).

Subwatershed	<i>E.coli</i> (CFU/100ml)		Nitrate + Nitrite (mg/L)		Total Phosphorus (mg/L)		TSS (mg/L)		Overall IDEM WQ Rank	
	Value	Rank	Value	Rank	Value	Rank	Value	Rank		
Honey Creek	1646	6	3.4	2	0.098	3	13.6	8	4.75	4
Sly Fork	5855	1	2.1	6	0.065	7	13.7	7	5.25	5
Deer Creek	3326	5	2.5	4	0.214	2	31.9	1	3	2
Prairie Creek	3646	4	1.4	8	0.062	9	19.9	4	6.25	8
Headwaters Lick Creek	3771	3	1.8	7	0.069	6	15.2	6	5.5	6
Foster Branch	5669	2	2.4	5	0.064	8	5.7	9	6	7
McFadden Ditch	1436	7	1.8	7	0.081	5	17.1	5	6	7
Flatfork Creek	487	8	2.6	3	0.083	4	21.3	2	4.25	3
Thorpe Creek	--	NR	4.4	1	1.066	1	20.8	3	1.67	1

The CIWRP Studies Summary information is has a ranking system that starts with a straight rank for each impairment based on the value of the impairment. Then, each subwatershed has an overall rank based on those individual impairment rankings. This is the same methodology used for the IDEM Water Quality Sampling Summary. It should be noted that the CIWRP data samples were collected during base and storm flow conditions. Depending on the pollutant, both types of samples can result in elevated values. For example, the *E.coli* values shown in the table below are extremely elevated when compared to the IDEM data. This is a major concern in the watershed and is reflected so in the problems and goals described later in the WMP.

Table 38: CIWRP Studies Summary

Subwatershed	<i>E.coli</i> (CFU/100ml)		Nitrate + Nitrite (mg/L)		Total Phosphorus (mg/L)		TSS (mg/L)		Overall CIWRP WQ Rank	
	Value	Rank	Value	Rank	Value	Rank	Value	Rank		
Honey Creek	42940	2	2.6	3	0.173	2	74.1	1	2	2
Sly Fork	42940	2	2.6	3	0.173	2	74.1	1	2	2
Deer Creek	42940	2	2.6	3	0.173	2	74.1	1	2	2
Prairie Creek	47007	1	1.8	5	0.120	6	48.0	5	4.25	4
Headwaters Lick Creek	14383	6	2.5	4	0.132	5	48.9	4	4.75	5
Foster Branch	15321	5	3.2	2	0.146	4	16.9	6	4.25	4
McFadden Ditch	14383	6	2.5	4	0.132	5	48.9	4	4.75	5
Flatfork Creek	36843	4	2.5	4	0.165	3	52.2	3	3.5	3
Thorpe Creek	38437	3	3.4	1	0.193	1	53.1	2	1.75	1

According to the IDEM 303(d) list, the majority of the waterbodies within the watershed do not meet their designated uses. This is supported by the data compiled from IDEM water quality studies and the CIWRP 2003 study. *E.coli* targets were exceeded in all subwatersheds, with Prairie Creek being the greatest contributor in the CIWRP study and Sly Fork in the IDEM data. Nitrate + Nitrite and phosphorus levels were also exceeded in several subwatersheds, with Thorpe Creek being the largest contributor of both in the two data sets.

Total sediment loads were analyzed based on the total suspended solids in the samples. Total suspended solid levels were exceeded in eight of the nine subwatersheds based on the CIWRP data, however only 1 subwatershed exceeded the targets based on the IDEM data. Deer Creek was the largest contributor in the IDEM data, with Deer Creek, Sly Fork and Honey Creek tied in the CIWRP data.

Habitat/Biological Information

The IDEM Habitat/Biological Sampling Summary ranking systems is the same as the IDEM Water Quality Sampling Summary and the CIWRP Studies Summary.

Table 39: IDEM Habitat/Biological Sampling Summary								
Subwatershed	mIBI Score		IBI Score		QHEI Score		Overall IDEM Bio Rank	
	Value	Rank	Value	Rank	Value	Rank		
Honey Creek	5.5	5	41.8	7	59.8	5	5.67	5
Sly Fork	--	NR	35.6	3	44.8	2	2.5	2
Deer Creek	4.4	4	42.9	8	64.9	7	6.33	7
Prairie Creek	3.8	2	39.0	5	55.3	3	3.33	3
Headwaters Lick Creek	--	NR	41.3	6	60.0	6	6	6
Foster Branch	--	NR	35.3	2	37.3	1	1.5	1
McFadden Ditch	3.6	1	45.2	9	71.8	9	6.33	7
Flatfork Creek	4.2	3	37.0	4	65.9	8	5	4
Thorpe Creek	--	NR	33.6	1	58.4	4	2.5	2

Landuse Information

Windshield survey observations were made during October/November 2009 by Steering Committee volunteers. Observations including general site information (i.e. location and weather), land use, land odor, evidence of best management practices, water color/appearance, water odor, evidence of algae, streambank erosion, stream buffers & type, in-stream debris, available shade/stream cover and in-stream habitat were recorded for 150 locations throughout the watershed on standardized survey forms. It was determined by the Steering Committee to collect as much data as possible at all of these sites. While all of this information is valid for an overall understanding of the subwatershed, five of the major parameters (streambank erosion, stream buffers, in-stream debris, conventional till and livestock access) were used as a part of the subwatershed assessments and the identification of subwatershed priority areas and specific source critical areas as these parameters help verify the water quality data and BMP recommendations. The results of the survey are summarized in Table 40. The remainder of the information obtained during the windshield survey should be reevaluated during the feasibility phases of plan implementation.

Identification of streambank erosion was broken up into the following categories: absent, stabilized (rip-rap, coir log, etc.), present > 3 feet tall and present < 3 feet tall. Identification of buffers was broken up into the following categories: absent, present > 50 feet and present (minimum 10 feet) < 50 feet. In-stream debris, conventional till and livestock access were evaluated based on the number of sites identified. The Windshield Survey Summary ranking is a straight rank based on the Value for each parameter.

Table 40: Windshield Survey Summary										
Subwatershed	Streambank Erosion (sites with >3ft/<3ft)		Stream Buffer (sites with absent/insufficient)		In-Stream Debris (number of sites)		Conventional Till (number of sites)		Livestock Access (number of sites)	
	Value	Rank	Value	Rank	Value	Rank	Value	Rank	Value	Rank
Honey Creek	2/1	3	2/6	5	0	7	10	1	0	2
Sly Fork	1/5	5	1/6	6	4	3	3	4	0	2
Deer Creek	1/6	4	2/7	4	3	4	4	3	1	1
Prairie Creek	2/1	3	2/8	3	6	2	0	6	0	2
Headwaters Lick Creek	0/4	8	2/6	5	2	5	5	2	1	1
Foster Branch	1/0	6	0/3	7	1	6	0	6	1	1
McFadden Ditch	0/7	7	2/7	4	3	4	0	6	1	1
Flatfork Creek	2/4	1	2/11	2	1	6	2	5	0	2
Thorpe Creek	2/3	2	7/6	1	7	1	4	3	0	2

The number of instances of streambank erosion, inadequate buffers, in-stream debris, direct livestock access and areas under conventional till were identified during the windshield survey. Thorpe Creek had the largest number of instances for inadequate stream buffers. Flatfork Creek had the largest number of sites with erosion, while Honey Creek had the highest frequency of areas under conventional till. Prairie Creek had the most sites with in-stream debris identified. McFadden Ditch, Foster Branch, Deer Creek and the Headwaters of Lick Creek all tied for the largest numbers of direct livestock access.

The NPS Modeling Summary ranking is the same as the ranking system used for Table 37: IDEM Water Quality Sampling Summary.

Table 41: NPS Modeling Summary									
Subwatershed	N Load (lb/ac/yr)		P Load (lb/ac/yr)		Sediment Load (t/ac/yr)		Overall NPS Modeling Rank		
	Value	Rank	Value	Rank	Value	Rank			
Honey Creek	4.85	4	0.90	2	0.22	1	2.33	2	
Sly Fork	4.86	3	0.86	4	0.20	3	3.33	4	
Deer Creek	4.74	7	0.85	5	0.20	3	5	6	
Prairie Creek	5.22	1	0.89	3	0.19	4	2.67	3	
Headwaters Lick Creek	4.86	3	0.89	3	0.21	2	2.67	3	
Foster Branch	5.02	2	0.91	1	0.21	2	1.67	1	
McFadden Ditch	4.75	6	0.86	4	0.20	3	4.33	5	
Flatfork Creek	4.86	3	0.86	4	0.20	3	3.33	4	
Thorpe Creek	4.76	5	0.85	5	0.20	3	4.33	5	

Prairie Creek was the largest contributor of nitrogen concentration (pounds per acre) according to the nonpoint source modeling results. Compared to Deer Creek (the lowest contributor), the percent difference was only 9.7% showing that all subwatersheds

contribute a similar amount of nitrogen based on landuse information. Phosphorus concentration showed a similar trend with Foster Creek being the largest contributor, but only 6.8% different than Deer and Thorpe Creek the lowest contributors. Slightly more variability was seen with the sediment concentration results with 11.8% difference between the largest and lowest contributors, Honey Creek and Prairie Creek, respectively.

The NPDES Permits Summary ranking is a straight rank based on the Value for each parameter.

Table 42: NPDES Permits Summary				
Subwatershed	CFOs (violations active/expired/void)		NPDES Outfalls (Exceedances)	
	Value	Rank	Value	Rank
Honey Creek	0 vio. (0/0/1)	3	1-TSS	3
Sly Fork	0 vio. (0/0/1)	3	No outfalls	NR
Deer Creek	0 vio. (0/0/0)	NR	4- <i>E.coli</i> , 14-N, 2-TSS	2
Prairie Creek	0 vio. (0/0/1)	3	No outfalls	NR
Headwaters Lick Creek	1 vio. (1/0/0)	1	No outfalls	NR
Foster Branch	0 vio. (0/0/0)	NR	No outfalls	NR
McFadden Ditch	0 vio. (0/0/1)	3	No outfalls	NR
Flatfork Creek	0 vio. (0/0/0)	NR	8- <i>E.coli</i> , 9-N, 5-P	1
Thorpe Creek	0 vio. (1/1/1)	2	1-TSS	3

Thorpe Creek has the largest number of confined feeding operations, whereas Flatfork Creek has the largest number of facilities and outfalls permitted through the NPDES program.

Subwatershed Overall Ranking

The available water quality, biological and landuse information summarized above was divided into two criteria: Current Water Quality Impairment and Land Use and Industrial Impairments and Concerns. These categories were then used to determine the overall rank of the individual subwatersheds.

Current Water Quality Impairment

The current water quality impairment category includes all pertinent available water quality studies and quantitative data that were utilized in this analysis. It should be noted that not all available data for the watershed was used in the analysis. This data is easily compared to standard water quality targets and therefore easily used to gage the current health of the

subwatersheds. Table 43 identifies the rankings of the subwatersheds based on the current water quality impairments.

The left column of the Current Rank for the Current Water Quality Impairment Ranking is based on the total of each parameter ranking divided by the number of times it was ranked. For example, Foster Branch has a Current Rank of 3.5 which correlates to $(2+4+7+1)/4$. The right column is a straight ranking based on the left column.

Subbasin	IDEM 303(d)	CIWRP WQ	IDEM WQ	IDEM Bio	CURRENT RANK	
					Value	Rank
Honey Creek	2	2	4	5	3.25	4
Sly Fork	2	2	5	2	2.75	2
Deer Creek	2	2	2	7	3.25	4
Prairie Creek	2	4	8	3	4.25	6
Headwaters Lick Creek	2	5	6	6	4.75	7
Foster Branch	2	4	7	1	3.5	5
McFadden Ditch	2	5	7	7	5.25	8
Flatfork Creek	2	3	3	4	3	3
Thorpe Creek	1	1	1	2	1.25	1

Land Use and Industrial Impairments and Concerns

The land use and industrial impairments and concerns category includes land use and social based data. This data is not easily compared to water quality targets but can be helpful in determining the chances of ongoing or future water quality impairments. The Land Use and Industrial Impairments and Concerns Ranking table includes a summary of the rankings from the Windshield Survey Summary table, the NPS Modeling Summary table and the NPDES Permits Summary table then ranks each subwatershed based on those rankings. The two columns of rankings under the Current Rank column were determined in the same manner as the Current Rank columns in the Current Water Quality Impairment Ranking table.

Subbasin	NPS Modeling	Stream Erosion	Stream Buffer	In-Stream Debris	Conventional Till	Live-stock Access	CFOs	NPDES Facilities	LAND USE RANK	
									Value	Rank
Honey Creek	2	3	5	7	1	2	3	3	3.25	4
Sly Fork	4	5	6	3	4	2	3	NR	3.86	6
Deer Creek	6	4	4	4	3	1	NR	2	3.86	6
Prairie Creek	3	3	3	2	6	2	3	NR	3.14	3
Headwaters Lick Creek	3	8	5	5	2	1	1	NR	3.57	5
Foster Branch	1	6	7	6	6	1	NR	NR	4.5	8
McFadden Ditch	5	7	4	4	6	1	3	NR	4.29	7
Flatfork Creek	4	1	2	6	5	2	NR	1	3	2
Thorpe Creek	5	2	1	1	3	2	2	3	2.38	1

Overall Subwatershed Ranking

Once the subwatersheds were ranked based on the two established criteria, an overall ranking was assigned. The following table shows the Overall Subwatershed Ranking. The right column of the Overall Rank is ranking the left column from 1 to 10 (1 being the worst case and 10 being the best case).

Table 45: Overall Subwatershed Ranking				
Subbasin	Current Rank	Land Use Rank	OVERALL RANK	
Honey Creek	4	4	4	3
Sly Fork	2	6	4	3
Deer Creek	4	6	5	5
Prairie Creek	6	3	4.5	4
Headwaters Lick Creek	7	5	5.5	6
Foster Branch	5	8	6.5	7
McFadden Ditch	8	7	7.5	8
Flatfork Creek	3	2	2.5	2
Thorpe Creek	1	1	1	1

Analysis of Stakeholder Concerns

As discussed in Section 1, stakeholder concerns were gathered at the public meetings. The Watershed Inventory provided a means of verifying these concerns or in some cases developing additional concerns. Further discussion on which concerns the steering committee wanted to focus on occurred during the October and November Steering Committee meetings. Table 46 lists these concerns and identifies which concerns are supported by evidence from the Watershed Inventory (windshield survey, IDEM Data, CIWRP data, etc.) and which concerns will be focused on by the group. This table helps verify which concerns are supported by the collected data versus what is perception, what evidence there is for each concern, whether the concern is quantifiable, and whether the concern is outside the project's scope. For example, Legislative Action on Phosphorus Ban was a concern identified during the May public meetings. This concern is supported by data based on the IDEM and CIWRP water quality data for Phosphorus exceedances in the watershed and therefore shows the linkage between the concerns and the water quality data (as well as the other data sources evaluated as a part of this WMP).

Table 46: Analysis of Stakeholder Concerns

Concern	Supported by Data?	Evidence	Quantifiable?	Outside Scope?	Group Focus?
Quality of drinking water	Yes	IDEM, CIWRP Data (<i>E.coli</i> , N, P, TSS)	Yes	No	Yes
Organic (leaves, grass clippings, pet/wildlife waste) debris	Yes	IDEM, CIWRP Data (<i>E.coli</i> , N, P)	Yes	No	Yes
Quality of surface water runoff	Yes	IDEM, CIWRP Data (<i>E.coli</i> , N, P, TSS)	Yes	No	Yes
Rule 5 erosion control Enforcement	Yes	IDEM, CIWRP Data (TSS)	Yes	No	Yes
Sediment from storm drains	Yes	IDEM, CIWRP Data (TSS)	Yes	No	Yes
Encourage and improve public perception of native landscaping	No	None, brought up during Public Meeting	No	No	Yes
Maintenance of culverts and roadways	No	None, brought up during Public Meeting	No	Yes	No
Changing actions/perceptions towards urban fertilizer use	No	None, brought up during Public Meeting	No	No	Yes
Dredging in the reservoir	Yes	IDEM, CIWRP, Windshield Survey Data (TSS)	Yes	No	Yes
Enhance wildlife habitat and recreational uses of reservoir	Yes	IDEM, Windshield Survey Data (mIBI, IBI, QHEI)	Yes	No	Yes
Encourage public participation	No	None, brought up during Public Meeting	No	No	Yes
Outreach that is solution based	No	None, brought up during Public Meeting	No	No	Yes
Education to the public	No	None, brought up during Public Meeting	No	No	Yes
Education to the recreational users at marinas	No	None, brought up during Public Meeting	No	No	Yes
Exotic species control – Eurasian Watermilfoil	Yes	AVMP	Yes	No	Yes
Concern over blue green algae	Yes	CIWRP Data	Yes	Yes	Yes
Legislative action on phosphorus ban	Yes	IDEM, CIWRP Data (P)	Yes	No	Yes
Lack of funding sources for urban areas	No	None, brought up during Public Meeting	No	No	Yes
Recognition of problems at State level	No	None, brought up during Public Meeting	No	No	Yes
Lack of regulations	No	None, brought up during Public Meeting	No	No	Yes
Lack of Ag Stakeholder Involvement	No	None, brought up during Public Meeting	No	No	Yes
Lack of sufficient buffers	Yes	IDEM, CIWRP Data (N, P, TSS)	Yes	No	Yes
Streambank erosion	Yes	IDEM, CIWRP Data (TSS)	Yes	No	Yes
Lack of conservation tillage	Yes	IDEM, CIWRP Data (TSS)	Yes	No	Yes
Livestock access to streams	Yes	IDEM, CIWRP Data (<i>E.coli</i> , N, P, TSS)	Yes	No	Yes