SECTION 4: IDENTIFY CRITICAL AREAS

Estimating Critical Loads - Non-point Source Pollution Modeling

Nonpoint source pollution is a type of the pollution generated from diffused sources in both: public and private domains. As defined by EPA, the pollution from nonpoint sources originates from urban runoff, construction activities, manmade modification of hydrologic regime of a watercourse (i.e. retention, detention, channelization, etc.), silviculture, mining, agriculture, irrigation return flows, solid waste disposal, atmospheric deposition, stream bank erosion, and individual or zonal sewage disposal. Therefore, nonpoint pollution sources have their origin in a wide spectrum of public and private activities and, when not known or properly controlled, could affect, in a large percentage, the water and quality of living in a certain area.

Nonpoint source pollution management is highly dependent on hydrologic simulation models, and use of computer modeling is often the only viable means of providing useful input information for adopting the best management decisions.

As previously mentioned, the nonpoint pollution sources are generated by activities that are spatially distributed on the analyzed watershed or study area. Due to this spatial distribution of nonpoint pollution sources, the computation models used to study pollutant transport and stream bank erosion require large amounts of data for analysis in even a small watershed.

Since runoff from the rainfall flows over or through the land and collects pollutants and nutrients prior to entering waterways, the overall characteristics and land use types of a watershed greatly influences the water quality. Each land use type includes the cumulative effects of various land covers, and natural and man-made activities. Therefore, each land use type can have an adverse affect on water quality, by contributing different pollutant amounts and concentrations. The cumulative effect of this pollution throughout the watershed represents the contribution of nonpoint source pollution.

For the Sugar Creek Watershed, a tabular based non-point source pollution loading model was used to assess the nonpoint source pollution of three main pollutant parameters that have been identified as elements of concern by both stakeholders and water sampling events. This model is known as the L-THIA Estimate Non-Point Source Pollutant model using Event Mean Concentration created by Kyoung Lim and Bernard Engel. The three main pollutant parameters analyzed are:

- Total Nitrogen
- Total Phosphorus
- Total Suspended Solids (TSS)

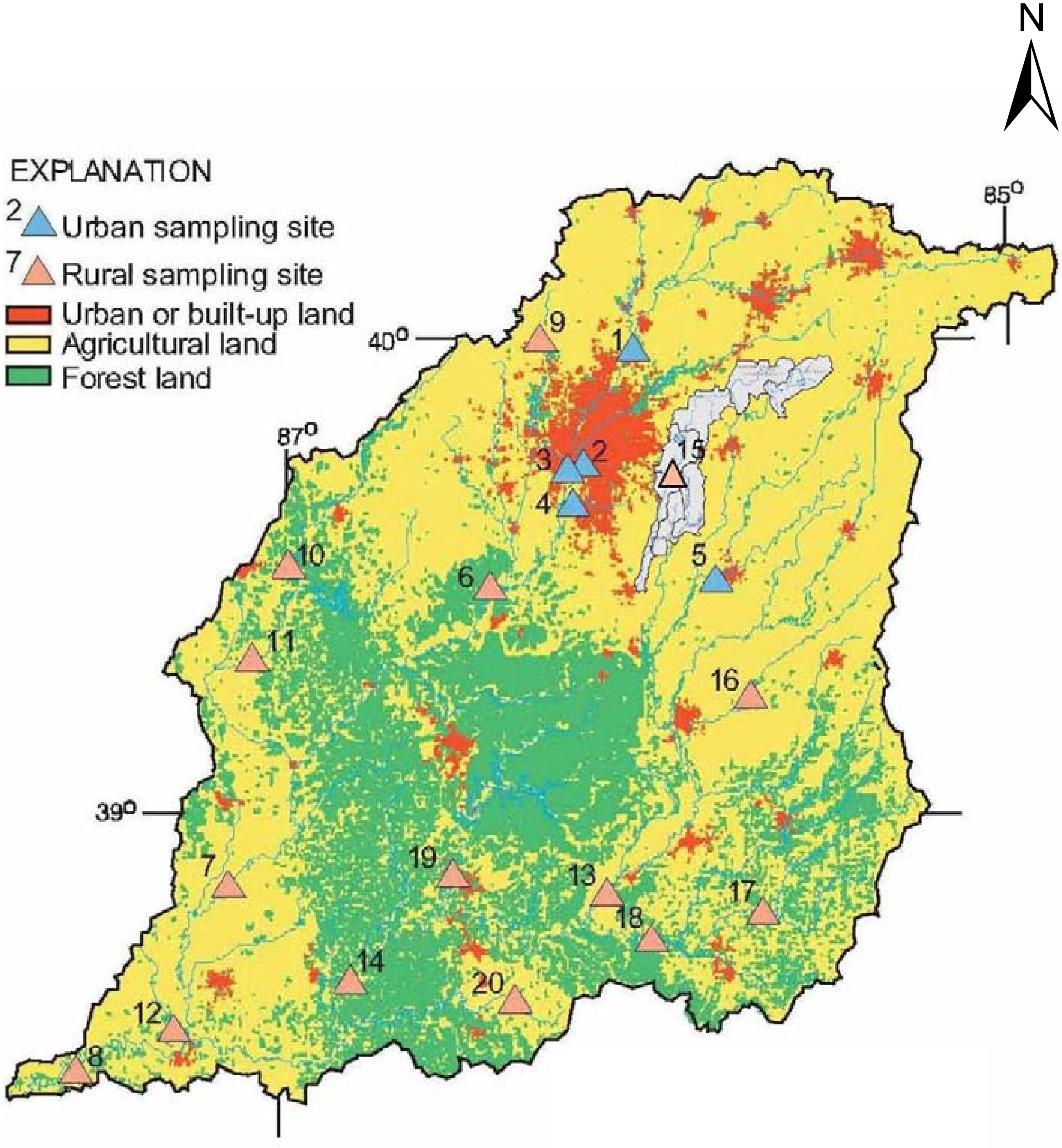
The L-THIA model estimates the runoff volume and nonpoint source pollutant loadings. Non-point source pollutant masses are computed by multiplying runoff depth for a land use area of that land use and the appropriate Event Mean Concentration (EMC) value and converting units. The EMC data used was compiled by the Texas Natural Resource Conservation Commission (Baird and Jennings, 1996).

Land use categories were defined by Baird and Jennings and divided into eight categories including: 1) industrial, 2 transportation, 3 commercial, 4) residential, 5) agricultural cropland (dry land and irrigated), 6) range land, 7) undeveloped/open, and 8) marinas. The total pollutant load for various non-point source pollutants divided by the runoff volume during a runoff event yields the EMC. With some pollutant concentrations varying over time for rainfall events, flow averaged sample values are used as EMC. Therefore, EMCs should be reliable for determining average concentrations and calculating constituent loads.

The L-THIA model was executed for each HUC 12 subwatershed within the Sugar Creek Watershed. The results are illustrated graphically in Exhibits 39 through 42 (4 total exhibits) and in Table 30. It should be noted that all computation models have assumptions and limitations. The conditions of the model, based on mathematical computations, provide useful information for targeting and prioritizing subwatersheds.

Table 30. Current Loads for Each Subwatershed

HUC 12	HUC Name	Acreage	Current Nitrogen Load lbs/year	Current Phosphorus Load lbs/year	Current TSS Load tons/year
051202040401	Sugar Creek-Pee Dee Ditch	13,257	86,218	3,379	1,393
051202040402	Sugar Creek-Marsh & Trees Ditch	15,541	101,250	3,970	1,638
051202040403	Sugar Creek-Barrett Ditch	14,091	86,718	3,391	1,396
051202040404	Little Sugar Creek - Wilson Ditch	20,290	127,849	5,005	2,073
051202040405	Sugar Creek - Boyd Ditch	21,571	123,884	4,827	1,987



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7325 Janes Avenue
Woodridge, IL 60517
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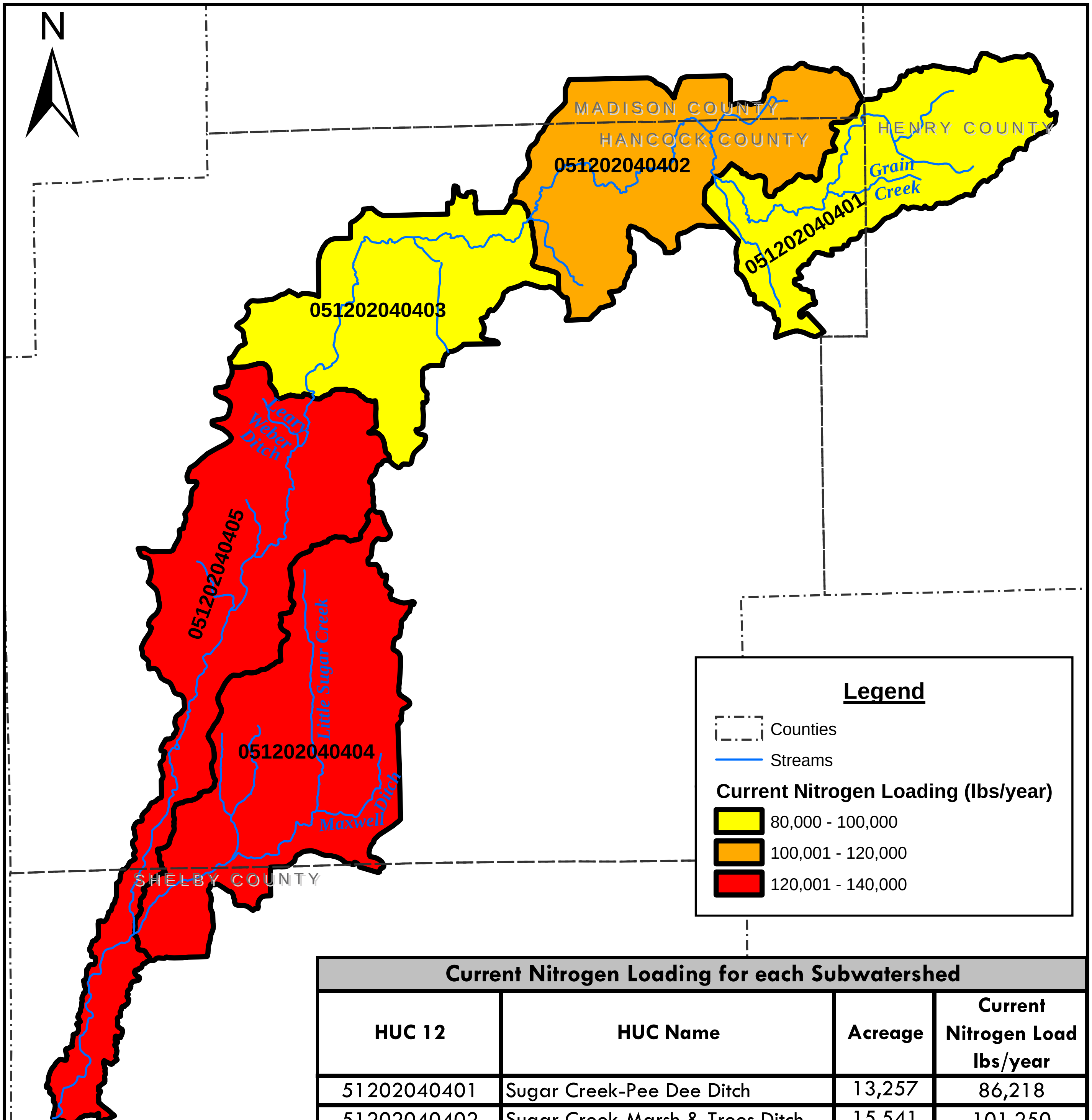
630.724.9202 fax
www.v3co.com

TITLE: **USGS White River Basin Study Locations**	PROJECT: **Sugar Creek Watershed Project**			
BASE LAYER: N/A	PROJECT NO. 07065	EXHIBIT: 38	SHEET: 1 OF: 1	
CLIENT: Hancock County SWCD 1101 W. Main Street, Ste N Greenfield, IN 46140	QUADRANGLE: N/A	DATE: 7/8/08	SCALE: NTS	



Current Nitrogen Loading for each Subwatershed			
HUC 12	HUC Name	Acreage	Current Nitrogen Load lbs/year
51202040401	Sugar Creek-Pee Dee Ditch	13,257	86,218
51202040402	Sugar Creek-Marsh & Trees Ditch	15,541	101,250
51202040403	Sugar Creek-Barrett Ditch	14,091	86,718
51202040404	Little Sugar Creek - Wilson Ditch	20,290	127,849
51202040405	Sugar Creek - Boyd Ditch	21,571	123,884

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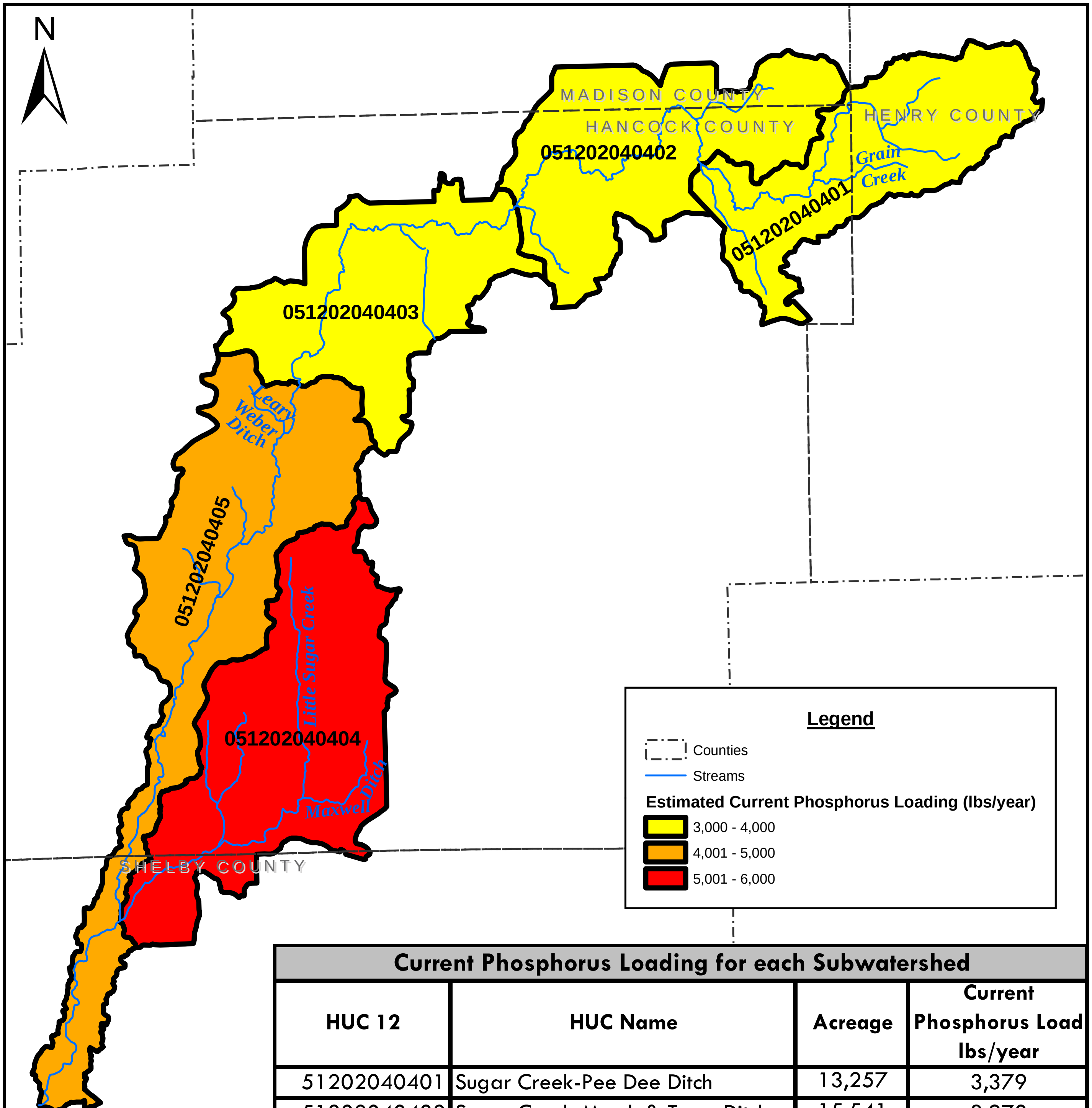
TITLE: Estimated Nitrogen Loading	PROJECT: Sugar Creek Watershed Project		
BASE LAYER: N/A	PROJECT NO. 07065	EXHIBIT: 39	SHEET: 1 OF: 1
CLIENT: Hancock County SWCD 1101 W. Main Street, Ste N Greenfield, IN 46140	QUADRANGLE: N/A	DATE: 3/1/09	SCALE: NTS



Current Phosphorus Loading for each Subwatershed

HUC 12	HUC Name	Acreage	Current Phosphorus Load lbs/year
51202040401	Sugar Creek-Pee Dee Ditch	13,257	3,379
51202040402	Sugar Creek-Marsh & Trees Ditch	15,541	3,970
51202040403	Sugar Creek-Barrett Ditch	14,091	3,391
51202040404	Little Sugar Creek - Wilson Ditch	20,290	5,005
51202040405	Sugar Creek - Boyd Ditch	21,571	4,827

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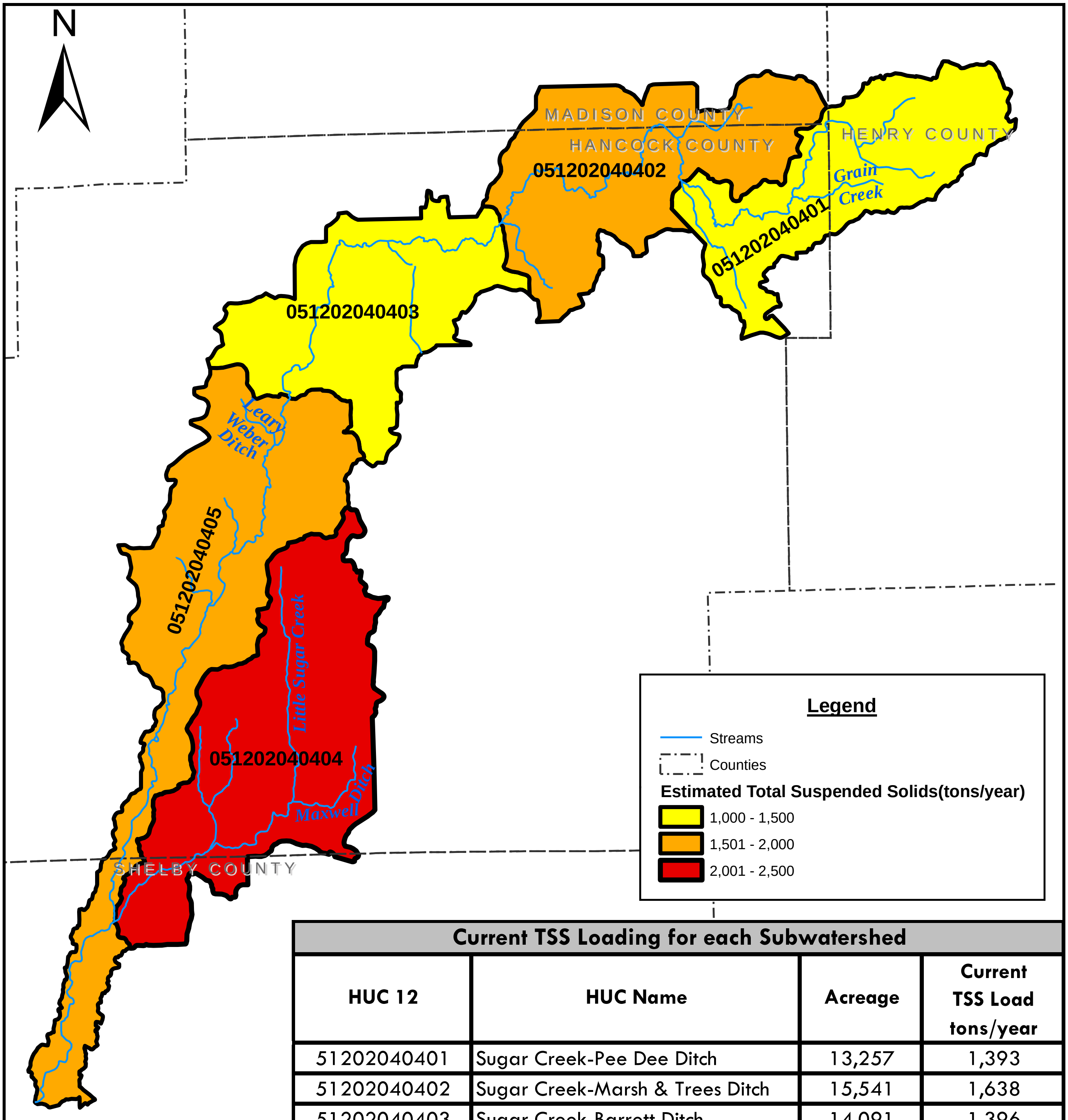
www.v3co.com

TITLE: Estimated Phosphorus Loading	PROJECT: Sugar Creek Watershed Project			
BASE LAYER: N/A	PROJECT NO. 07065	EXHIBIT: 40	SHEET: 1 OF: 1	
CLIENT: Hancock County SWCD 1101 W. Main Street, Ste N Greenfield, IN 46140	QUADRANGLE: N/A	DATE: 3/1/09	SCALE: NTS	



Current TSS Loading for each Subwatershed

HUC 12	HUC Name	Acreage	Current TSS Load tons/year
51202040401	Sugar Creek-Pee Dee Ditch	13,257	1,393
51202040402	Sugar Creek-Marsh & Trees Ditch	15,541	1,638
51202040403	Sugar Creek-Barrett Ditch	14,091	1,396
51202040404	Little Sugar Creek - Wilson Ditch	20,290	2,073
51202040405	Sugar Creek - Boyd Ditch	21,571	1,987

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630.724.9202 fax
www.v3co.com

TITLE: **Estimated Total Suspended Solids**

PROJECT: **Sugar Creek Watershed Project**

BASE LAYER: N/A

PROJECT NO. 07065

EXHIBIT: 41

SHEET: 1 OF: 1

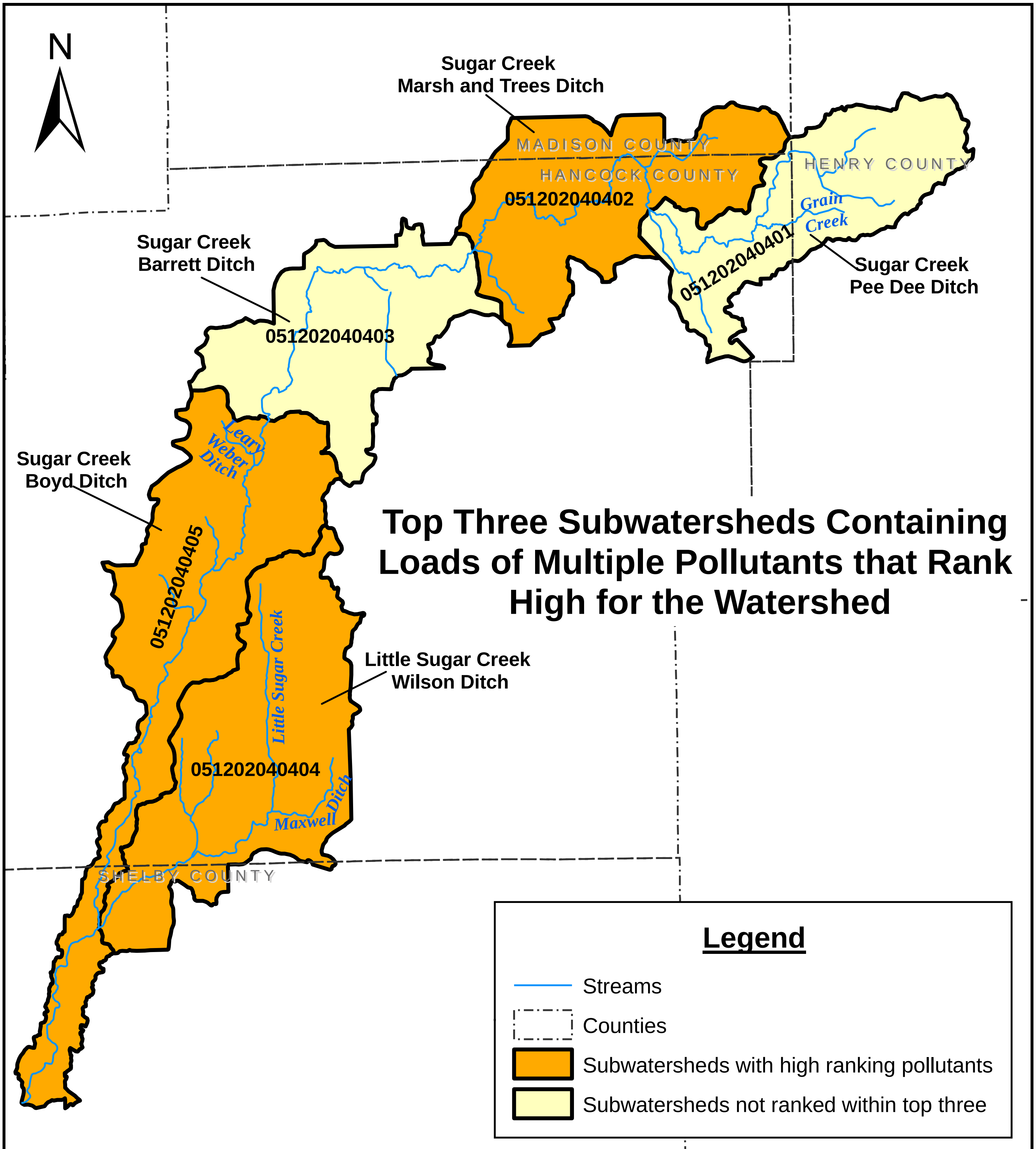
CLIENT: Hancock County SWCD
1101 W. Main Street, Ste N
Greenfield, IN 46140

QUADRANGLE: N/A

DATE: 7/8/08

SCALE: NTS

Top Three Subwatersheds Containing Loads of Multiple Pollutants that Rank High for the Watershed



V3 Companies 7325 Janes Avenue Woodridge, IL 60517 630.724.9200 phone 630.724.9202 fax www.v3co.com	TITLE: **Top Ranked Subwatersheds for Containing High Loads of Multiple Pollutants**	PROJECT: **Sugar Creek Watershed Project**		
	BASE LAYER: N/A	PROJECT NO. 07065	EXHIBIT: 42	SHEET: 1 OF: 1
	CLIENT: Hancock County SWCD 1101 W. Main Street, Ste N Greenfield, IN 46140	QUADRANGLE: N/A	DATE: 3/1/09	SCALE: NTS

Total Nitrogen

The nitrogen load model results are shown spatially in Exhibit 39. Table 30 presents the model tabular results. The *Little Sugar Creek-Wilson Ditch* subwatershed and the *Sugar Creek-Boyd Ditch* subwatershed contribute the two highest nitrogen loadings within the entire Watershed at 127,849 lbs/year and 123,884 lbs/year respectively. The subwatershed of *Sugar Creek-Marsh and Trees Ditch* contributes the third highest nitrogen loading in the Watershed at 101,250 lbs/year. The lowest nitrogen loading exists at the *Sugar Creek-Pee-Dee Ditch* subwatershed (86,218 lbs/ year).

Total Phosphorus

The phosphorus load model results are shown in Exhibit 40 and Table 30. The pollution load results show a very similar trend to that of nitrogen. The *Little Sugar Creek-Wilson Ditch* subwatershed and the *Sugar Creek-Boyd Ditch* subwatershed contribute the two highest Phosphorus loadings within the entire Watershed at 5,005 lbs/year and 4,827 lbs/year respectively. The subwatershed of *Sugar Creek-Marsh and Trees Ditch* contributes the third highest Phosphorus loading in the Watershed at 3,970 lbs/year. The lowest phosphorus loading exists at the *Sugar Creek-Pee-Dee Ditch* subwatershed (3,379 lbs/ year).

Total Suspended Solids (TSS)

Exhibit 41 and Table 30 show the TSS model results. The sediment model results range from 1,393 to 2,073 tons/year for the HUC 12 subwatersheds. The *Little Sugar Creek-Wilson Ditch* subwatershed had the highest TSS loading within the entire watershed and contributes approximately 2,073 tons/year. The *Sugar Creek-Boyd Ditch* subwatershed contribute the second highest TSS loadings within the entire Watershed at 1,987 tons/year followed by the subwatershed of *Sugar Creek-Marsh and Trees Ditch* at 1,683 tons/year. The lowest TSS loading exists at the *Sugar Creek-Pee-Dee* subwatershed (1,393 tons/ year).

Pollutant loads are represented in the WMP by lbs/year. It is necessary to represent loading in lbs/year as it will be used in discussing improvement in each critical area. The use of lbs/acre/year demonstrates loading differences between critical areas of varying sizes, as critical areas are not a uniform size.

Overall Summary

The top 40% highest loading subwatersheds based on each pollutant category were tabulated and statistically cross referenced to each other in order to provide an overall nonpoint source evaluation of the Watershed. All of the subwatersheds that had at least two of the three modeled pollutants within the upper 40% rank were used from the data sets. The three HUC 12 subwatersheds that met this criterion and represent the most significant nonpoint source contributions from multiple modeled pollutants are illustrated in Exhibit 42.

Sugar Creek Watershed Critical Areas

On May 13, 2008, the Sugar Creek Watershed's Steering Committee identified 9 critical areas which are located in Appendix F and depicted on Exhibit A. Appendix F also contains a table with acreages of each critical area and the parameters of concern. V3 presented a summary of the existing water quality data, Hancock County SWCD presented the findings of the windshield survey (Exhibit 15) and the Steering committee identified the four most critical water quality components of degradation to the Sugar Creek Watershed as *E. coli*, sediment, nutrients and flooding.

The steering committee members were asked to locate specific sites within the watershed that would function as the critical areas of the Sugar Creek WMP as they relate to each of the causes of the four most significant problems. This accounted for the identification of nine preliminary critical areas. The nine preliminary critical areas account for approximately 15,385 total acres (livestock stream access did not contribute acreages), which is approximately 18% of the Watershed by area. Each of these preliminary critical areas is discussed on the following pages. Preliminary Critical Areas were identified within three of the four counties within the Sugar Creek Watershed being Hancock County, Shelby County, and Madison County. Exhibits identifying each critical area are located in Appendix F.

The Critical Area discussion continued to mature as the sources of the problems in the watershed were tied to specific critical locations. The sources of excess sediment include in-stream sources, river bank erosion, stream flows which scour around log jams, and erosion occurring throughout the Watershed. Sources of sediment in the Sugar Creek Watershed also include the lack of a stable buffer between human activities and the stream itself. Other sources include uncontrolled sheet flow across the land surface and runoff from existing construction sites. Sources specific to agricultural croplands include a lack of proper erosion control methods such as conservation tillage or cover crops which contribute to sedimentation in the runoff that flows overland. Similarly on pasturelands, a lack of proper erosion control methods, such as exclusionary fencing, contributes to livestock degrading streambanks and adding sediment load to the watershed.

E. coli bacteria are found in the intestines of humans and other warm blooded mammals, it is the indicator species used to denote the possibility of other pathogens that may be present in the aquatic system. Sources of *E. coli* include both human and animal origins and can emanate from both point and non-point sources of pollution. Sources in the Watershed include: failing septic systems, package plants, discharge of inadequately treated wastewater, wild and domestic animal waste, domestic animal waste runoff from CAFOs, manure storage facilities, livestock in the stream, runoff from pasture lands without proper erosion control measures, *E. coli* growth occurring in sediment, and from Combined Sewer Overflows (CSOs).

Nutrients are naturally occurring in the environment, but in excess can cause major problems in aquatic ecosystems. Sediments which carry an ion charge can link or bond to nutrients which also carry an ion charge. The loading of sediments throughout the Watershed then becomes a major source of nutrient input throughout the aquatic ecosystem. Many nutrient sources are the same as those that contribute to *E. coli* contamination and include: CAFOs, CFOs, failing septic systems, package plants, discharge of inadequately treated wastewater, overflow from manure storage facilities, and fertilizer applications.

Flooding is a natural component of the floodplain, but flooding can cause major problems in aquatic ecosystems in addition to causing damage to property. Land use changes with increased development results in less open space and more impervious cover in a watershed. Undeveloped open land is able to infiltrate rainfall into the ground, and ponded runoff is stored in numerous natural depressions in the landscape. Vegetation also reduces the amount of surface runoff by intercepting rainfall and through evapotranspiration. Development reduces the capacity of the land to hold water by compacting soils when grading for construction, removing natural vegetation and adding impervious cover such as rooftops, driveways, streets and parking lots. Impervious cover directly influences streams by dramatically increasing surface runoff. The most direct source of flood damage potential is the location of homes, buildings, development and infrastructure in the floodplain. The counties and communities need to abide by proper stormwater management plans. Less obvious, but of equal significance, is the impact an increased volume of runoff generated from upland development has on expanding the floodplain and causing localized flooding problems. Impedance of Sugar Creek's ability to convey stormwater runoff downstream through log jam blockages and lack of proper drainage adds to flooding damages within the watershed.

Critical Area #1, shown on Exhibit A-1, is Pee Dee Ditch and urban areas surrounding Warrington, which are both located in Hancock County. Pee Dee Ditch, a tributary to Sugar Creek, is identified as being a critical area because it contributes to the problem of nutrients, *E. coli*, and sediment. Urban areas associated with Warrington are identified as critical because it contributes to the problem of nutrients, *E. coli*, and sediment. The steering committee noted problems with potential failing septic systems and livestock stream access as contributing to nutrients, *E coli* and sediment. There are 1,678 acres of critical area and approximately 5.4 miles of waterways where the implementation of BMPs would improve the condition of the watershed.

Critical Area #2, shown on Exhibit A-2, consists of the urban area associated with Nashville. Nashville is identified as a critical area as it contributes to the problem of nutrients, *E. coli*, and sediment. The steering committee noted problems with potential failing septic systems. There are 2,242 acres of critical area and approximately 2.5 miles of waterways where the implementation of BMPs would improve the condition of the watershed.

Critical Area #3, shown on Exhibit A-3, consists of the urban area surrounding Eden. Eden is located in Hancock County. This area is identified as critical because it contributes to the problem of nutrients, *E. coli*, sediment, and flooding. The steering committee noted problems with potential failing septic systems. There are 2,420 acres of critical area and approximately 4.2 miles of waterways where the implementation of BMPs would improve the condition of the watershed.

Critical Area #4, shown on Exhibit A-4, consists of the urban area associated with Mohawk and Mohawk Campground, Conservation Club, and Leary Weber Ditch all of which are located in Hancock County. Both the town of Mohawk and the Mohawk Campground have been identified as contributors to the problem of nutrients, *E. coli*, and sediment. The steering committee noted problems with potential failing septic systems. There are 2,334 acres of critical area and approximately 2.6 miles of waterways where the implementation of BMPs would improve the condition of the watershed.

Critical Area #5, shown on Exhibit A-5, is the Heartland Resort, located immediately south of the town of Mohawk, Indiana. Heartland Resort is identified as a contributor to the problem of nutrients and *E. coli*. The steering committee noted problems with potential failing septic systems. There are 128 acres of critical area and approximately 0.6 miles of waterways where the implementation of BMPs would improve the condition of the watershed.

Critical Area #6, shown on Exhibit A-6, consists of the S&H Campground, Philadelphia, Wildwood Subdivision, Spring Lake, and Arrowhead Mobile Park. S&H Campground is located north of the town of Philadelphia, Indiana. These areas have been identified as being critical areas as they contribute to the problems of *E. coli*, sediment and flooding. The steering committee noted problems with potential failing septic systems. There are 5,568 acres of critical area and approximately 6.9 miles of waterways where the implementation of BMPs would improve the condition of the watershed.

Critical Area #7, shown on Exhibit A-7, is the Overlook Subdivision, located north of New Palestine. The Overlook Subdivision is identified as being a critical area as it contributes to the problems of *E. coli* and sediment. There are 29 acres of critical area and 0.15 miles of waterways where the implementation of BMPs would improve the condition of the watershed.

Critical Area #8, shown on Exhibit A-8, consists of the area located between 200 S and 600 S along Sugar Creek. This area is identified as being a critical area as it contributes to the problems of *E. coli*, sediment and flooding. The steering committee noted flood damage and a need for streambank stabilization. There are 838 acres and approximately 5.0 miles of waterways where the implementation of BMPs would improve the condition of the watershed.

Critical Area #9, not shown on an exhibit, is the livestock stream access critical area. Areas in the watershed where livestock have direct access to the stream are identified as being critical as they contribute to the problems of *E. coli* and sediment. Addressing these concerns will also impact concerns regarding streambank degradation. The implementation of BMPs such as exclusion fencing and alternative water supply would improve the condition of the Watershed.

Subsequent discussions between V3, Hancock County SWCD, IDEM and the Steering Committee attempted to correlate BMP implementation project placement to solving the problems and causes of pollutant loading sources. These discussions tied in the findings of the Steering Committee's volunteers through the interpretation of results from the Windshield Surveys. Several of the monthly steering committee meetings focused on defining our targeted critical areas which would encapsulate the locations within the watershed where the sources of pollutant loads are causing the greatest damage through degradation of water quality. The watershed land use best management conservation practices would provide the most significant impact in reduction of pollutant loading when implementation of BMPs and improved responsible land use and homeowner practices are performed in these targeted critical areas.

Several redefined critical area maps, most not displayed in this final report, were developed by the Steering Committee. Some of the additional areas included: larger urban areas surrounding Warrington and Nashville; and the Sugar Creek corridor area between 200 S and 600 S. Exhibits B and B-1 which are located in Appendix F, represent the critical areas as of August 2008 which included the floodplain areas plus 100 foot buffers along Sugar Creek between Nashville and Eden. During these discussions, V3 had updated the HUC boundaries from the previous 14 digit HUC distinction to the required 12 digit HUC distinction. It was clear to the steering committee that the Little Sugar Creek subwatershed HUC-12 number 051202040404 did not possess any preliminarily identified critical areas (Exhibit A and Exhibit B, Appendix F). The final targeted critical areas are listed in Table 31 and depicted on Exhibit 43. The final five critical areas account for approximately 64,460 total acres (livestock stream access did not contribute acreages), which is approximately 76% of the Watershed by area.

Critical Area #1, HUC-12 number 051202040401, includes Pee Dee Ditch, Grain Ditch and urban areas surrounding Warrington. This critical area is 13,257 acres and is located in both Hancock and Henry Counties. Pee Dee Ditch, Grain Ditch, and four other tributaries to Sugar Creek, along with Sugar Creek itself combine for a total of 18 miles of stream reach. This area has been identified as being a critical area because it is a significant contributor of nutrient loading (both nitrogen and phosphorus) within the watershed. Critical Area #1 possesses locations which have the following problems observed by the Steering Committee during the Fall 2007 and Spring 2008 Windshield Surveys:

- Areas of sedimentation
- Log jams
- Areas where bank protection and stabilization are needed
- Areas where excessive streambank erosion is occurring
- Areas where livestock have direct access to Sugar Creek or its tributaries
- Areas where water is stagnant
- Areas where excessive trash and debris are located
- Areas where field drain tiles discharge into Sugar Creek or its tributaries

Critical Area #2, HUC-12 number 051202040402, includes the urban area associated with Nashville and the problematic floodplain area between Nashville and Eden. The critical area is 15,541 acres and is located in both Hancock and Madison Counties. Marsh & Trees Ditch combine with all the other surface water drainageways for a total of 13 miles. This area has been identified as being a critical area because it similarly is a significant contributor of both nitrogen and phosphorus. Critical Area #2 possesses locations which have the following problems observed by the Steering Committee during the Fall 2007 and Spring 2008 Windshield Surveys:

- Areas of sedimentation
- Log jams
- Areas where bank protection and stabilization are needed
- Areas where excessive streambank erosion is occurring
- Areas where flooding occurs
- Areas where livestock have direct access to Sugar Creek or its tributaries
- Areas where water is stagnant
- Areas where excessive trash and debris are located
- Areas where septic system pipes discharge into Sugar Creek or its tributaries
- Areas where field drain tiles discharge into Sugar Creek or its tributaries

Critical Area #3, HUC-12 number 051202040403, includes the urban area associated with Eden and the problematic floodplain area between Nashville and Eden. The critical area is 14,091 acres and is located in Hancock County. Barrett Ditch and three other tributaries, along with Sugar Creek combine for a total of 16 miles of stream reach. This area has been identified as being a critical area because implementing BMPs to control the source of sediment loads and nutrient loads will reduce the amount of TSS, nutrients and phosphorus in the streams. Critical Area #3 possesses locations which have the following problems observed by the Steering Committee during the Fall 2007 and Spring 2008 Windshield Surveys:

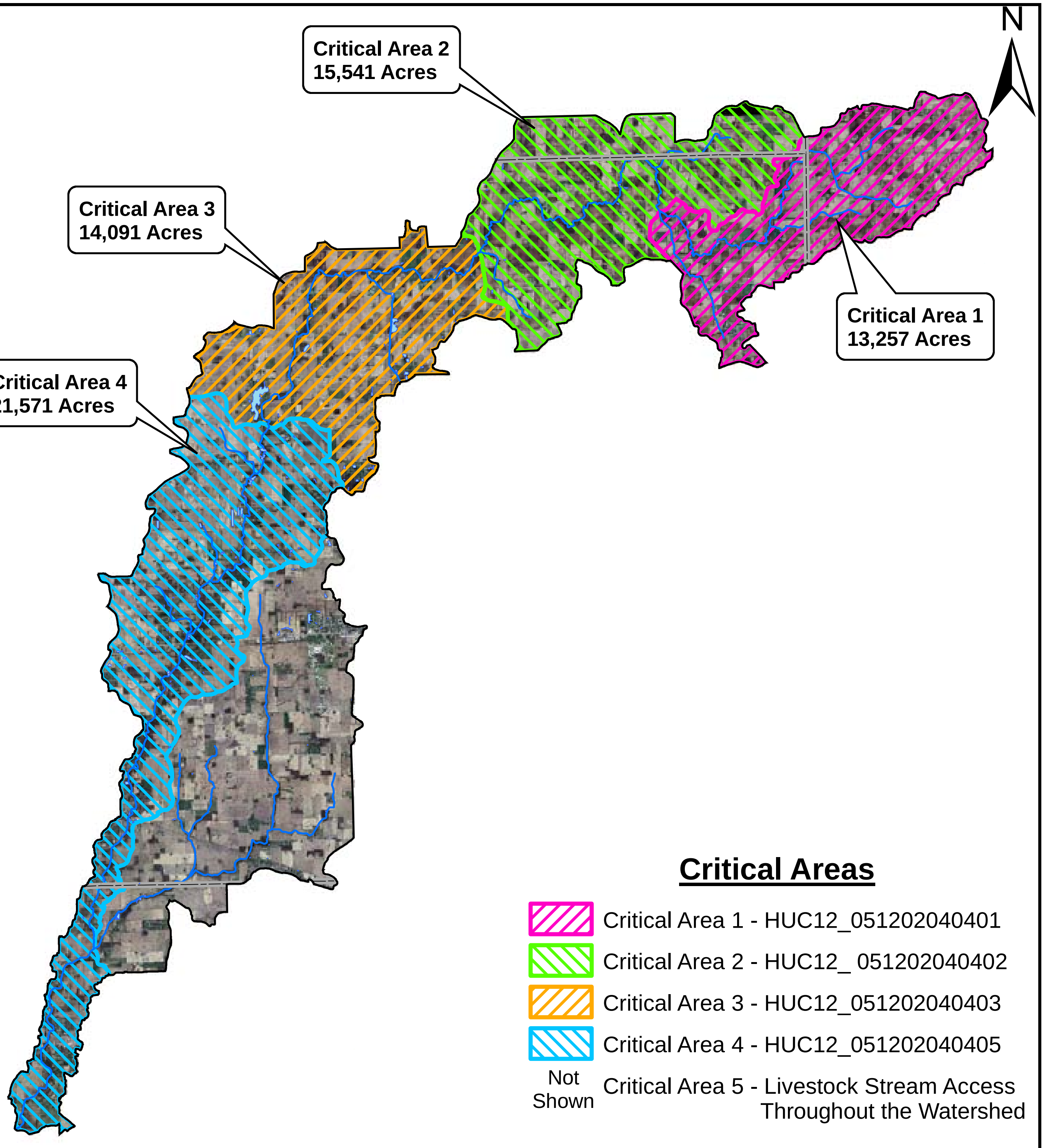
- Areas of sedimentation
- Areas where bank protection and stabilization are needed
- Areas where excessive streambank erosion is occurring
- Areas where flooding occurs
- Areas where livestock have direct access to Sugar Creek or its tributaries
- Areas where excessive trash and debris are located
- Areas where septic system pipes discharge into Sugar Creek or its tributaries

Critical Area #4, HUC-12 number 051202040405, includes: the urban area associated with Mohawk and Mohawk Campground, Conservation Club; the Leary Weber Ditch; the Heartland Resort; the S&H Campground; urban areas surrounding Philadelphia; the Wildwood Subdivision; urban areas surrounding Spring Lake; the Arrowhead Mobile Park; the Overlook Subdivision; and the problematic floodplain corridor along Sugar Creek between 200 S and 600 S. The critical area is 21,571 acres which includes 38 miles of waterway and is located in Hancock and Shelby Counties. Both the town of Mohawk and the Mohawk Campground have been identified as contributors to the problem of nutrients, *E. coli*, and sediment. The Heartland Resort, located immediately south of the town of Mohawk, is identified as a contributor to the problem of nutrients and *E. coli*. The steering committee noted this subwatershed as the most significant contributor of *E. coli*. through failing septic systems. Critical Area #4 possesses locations which have the following problems observed by the Steering Committee during the Fall 2007 and Spring 2008 Windshield Surveys:

- Areas of sedimentation
- Log jams
- Areas where bank protection and stabilization are needed
- Areas where excessive streambank erosion is occurring
- Areas where flooding occurs
- Areas where livestock have direct access to Sugar Creek or its tributaries
- Areas where excessive trash and debris are located
- Areas where septic system pipes discharge into Sugar Creek or its tributaries
- Areas where vegetated buffer is lacking along a waterway within the Watershed

Critical Area #5, not shown on an exhibit, is the livestock stream access critical area. Areas in the watershed where livestock have direct access to the stream are identified as being critical as they contribute to the problems of *E. coli* and sediment. Addressing these concerns will also impact concerns regarding streambank degradation. The implementation of BMPs such as exclusion fencing and alternative water supply would improve the condition of the Watershed.

Table 31. Finalized Critical Area Locations within the Sugar Creek Watershed							
Critical Area #	**Name**	**County(s)**	***E. coli***	**Sediment**	**Nutrients**	**Flooding**	**Critical Area Acreage**
1	Pee Dee Ditch –Sugar Creek	Hancock and Henry Counties	X	X	X	X	13,257
2	Marsh and Trees Ditch – Sugar Creek	Hancock and Madison Counties	X	X	X	X	15,541
3	Barrett Ditch – Sugar Creek	Hancock County	X	X	X	X	14,091
4	Boyd and Leary Weber Ditch - Little Sugar Creek	Hancock and Shelby Counties	X	X	X	X	21,571
5	Livestock Stream Access	Hancock, Henry, Madison and Shelby Counties	X	X	X	X	-
		Totals:	5	5	5	5	64,460



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

TITLE: **Final Nutrient, E. Coli, Sediment, and Flooding Critical Areas**	PROJECT: **Sugar Creek Watershed Project**		
BASE LAYER: 2005 Aerial Indiana University Spatial Data Portal	PROJECT NO. 07065	EXHIBIT: 43	SHEET: 1 OF: 1
CLIENT: Hancock County SWCD 1101 W. Main Street, Ste N Greenfield, IN 46140	QUADRANGLE: N/A	DATE: 9/8/08	SCALE: NTS

Linking Stakeholder Concerns and Critical Areas

The beginning of the planning process included a public meeting held July 17, 2007 where stakeholders voiced their opinions with regards to concerns and problems within the Sugar Creek Watershed. The list of concerns and problems was presented in Section 2 (pg. 42) of this WMP. This process identified six sub-groups of issues which included: Agricultural Issues, Pollution Issues, Development/Urban Issues, Recreational Issues, Wildlife/Habitat Issues, and Other Issues and Concerns. A total of 28 issues/concerns have remained the focus of the Steering Committee with regards to identifying critical areas and setting the goals for this WMP.

Based on the list of concerns provided by the stakeholders, the historical water quality data analyzed within the watershed, the 2007/2008 collected water quality samples, and the Steering Committee's local knowledge of the watershed, the 9 critical areas, as identified in Section 4 (pg. 121) of this WMP, were characterized into 7 major concern categories consisting of:

1) Flooding,
2) *E. coli*,
3) Nutrient Loading,
4) Sedimentation/Erosion,
5) Steering Committee,
6) Education and Outreach, and
7) Preservation/Restoration of open space within the Sugar Creek Watershed.

To develop goals for the WMP, the stakeholder concerns were evaluated and placed into one or more of the seven categories in order to develop problem statements.

Linking Sources and Critical Areas

Through evaluations of several groups and agencies, pathogens (*E. coli*), sediment, nutrients and flooding have been identified as the most significant pollutant and condition in the Sugar Creek Watershed. The Sugar Creek Watershed is composed of five subwatersheds that each has unique challenges in relation to pathogens (*E. coli*), sediment, nutrients and flooding. Pathogens (*E. coli*), sediment, nutrients and flooding have been identified as an issue in each of the four critical areas that are represented by HUC-12 subwatersheds of 051202040401, 051202040402, 051202040403, and 051202040405. The magnitude of each pollutant or condition within these subwatersheds is discussed to determine the extent of the issue within each of the critical areas.

Sources of sediment have been identified as bank erosion, lack of stable buffer, uncontrolled sheet flow, and runoff from existing construction sites.

Sources of pathogens (*E. coli*) have been identified as: failing septic systems, package plants, discharge of inadequately treated wastewater, wild and domestic animal waste, livestock in the stream, runoff from pasture lands without proper erosion control measures, *E. coli* growth occurring in sediment, and from Combined Sewer Overflows (CSOs).

Many nutrient sources are the same as those that contribute to *E. coli* contamination and include: CFOs, failing septic systems, package plants, discharge of inadequately treated wastewater, overflow from manure storage facilities, and fertilizer applications.

Flooding becomes more problematic as land use within the Watershed changes to less open space and more impervious cover as a result of increased development.