TOTAL MAXIMUM DAILY LOAD (TMDL)

For

Siltation & Habitat Alteration

In The

Caney Fork River Watershed (HUC 05130108)

Bledsoe, Cannon, Cumberland, DeKalb, Putnam, Sequatchie,

Smith, Van Buren, Warren, White and Wilson Counties,

Tennessee

Prepared by:

Tennessee Department of Environment and Conservation Division of Water Pollution Control 6th Floor L & C Tower 401 Church Street Nashville, TN 37243-1534

August 1, 2005



TABLE OF CONTENTS

1.0	INTRODUCTION	1
2.0	WATERSHED DESCRIPTION	1
3.0	PROBLEM DEFINITION	6
4.0	TARGET IDENTIFICATION	13
5.0	WATER QUALITY ASSESSMENT AND DEVIATION FROM TARGET	17
6.0	SOURCE ASSESSMENT	17
6.1 6.2	Point Sources Nonpoint Sources	19 23
7.0	DEVELOPMENT OF TOTAL MAXIMUM DAILY LOADS	23
7.1. 7.2. 7.3 7.4 7.5 7.6	Analysis Methodology TMDLs for Impaired Subwatersheds Waste Load Allocations Load Allocations for Nonpoint Sources Margin of Safety Seasonal Variation	24 26 28 29 30 31
8.0 IN	IPLEMENTATION PLAN	31
8.1 8.2 8.3	Point Sources Nonpoint Sources Evaluation of TMDL Effectiveness	31 32 33
9.0 P	UBLIC PARTICIPATION	33
10.0 I	FURTHER INFORMATION	34
REFE	RENCES	35

APPENDICES

		<u>Page</u>
APPENDIX A	Example of Stream Assessment (Snow Creek)	A-1
APPENDIX B	Watershed Sediment Loading Model	B-1
APPENDIX C	MRLC Land Use of Impaired Subwatersheds & Ecoregion Reference Site Drainage Areas	C-1
APPENDIX D	Estimate of Existing Point Source Loads for NPDES Permitted Mining Sites & Ready Mixed Concrete Facilities	D-1
APPENDIX E	Summary of NPDES Permit No. TNR10-0000, General NPDES Permit for Storm Water Discharges Associated With Construction Activity	E-1
APPENDIX F	Site-Specific Analysis of Subwatershed 051301080805	F-1
APPENDIX G	Public Comments Received	G-1

LIST OF FIGURES

		<u>Page</u>
Figure 1	Location of the Caney Fork River Watershed	2
Figure 2	Level IV Ecoregions in the Caney Fork River Watershed	4
Figure 3	MRLC Land Use in the Caney Fork River Watershed	5
Figure 4	Waterbodies Impaired Due to Siltation/Habitat Alteration (Documented on the 2002 303(d) List)	10
Figure 5	Reference Sites in Level IV Ecoregions 68a, 68c, 71f, & 71hi	16
Figure 6	Caney Fork River Watershed – HUC-12 Subwatershed Boundaries	18
Figure 7	NPDES Regulated Mining Sites Permitted to Discharge TSS and Located in Impaired Subwatersheds	20
Figure 8	Location of NPDES Permitted Construction Sites in the Caney Fork River Watershed	22

LIST OF FIGURES (continued)

		Dado
Figure F-1	Ferguson Branch Field Sheet - July 29, 1998	F-2
Figure F-2	Ferguson Branch Field Sheet - August 22, 2002	F-3
Figure F-3	Ferguson Branch - August 22, 2002	F-5
Figure F-4	Rock Springs Branch Field Sheet - July 29, 1998	F-6
Figure F-5	Rock Springs Branch Field Sheet - August 22, 2002	F-7
Figure F-6	Rock Springs Branch (RM 1.3) - Upstream	F-9
Figure F-7	Rock Springs Branch (RM 1.3) - Upstream	F-10
Figure F-8	Rock Springs Branch (RM 1.3) Pond Construction With No Erosion Control	F-10
Figure F-9	Rock Springs Branch (RM 1.3) Pond Construction With No Erosion Control	F-11
Figure F-10	Indian Creek Field Sheet - July 29, 1998	F-12
Figure F-11	Indian Creek Field Sheet (RM 2.4) - July 29, 1998	F-14
Figure F-12	Indian Creek Field Sheet (RM 4.85) - July 29, 2004	F-14
Figure F-13	Indian Creek Field Sheet - August 24, 2002	F-15
Figure F-14	Indian Creek Riparian Removal And Bank Grading	F-17
Figure F-15	Indian Creek Gravel Dredging And Bank Disturbance	F-17
Figure F-16	Indian Creek tobacco row crops near stream	F-18
Figure F-17	Indian Creek Cattle With Stream Access	F-18
Figure F-18	Indian Creek Cattle With Stream Access	F-19

Page 3 Table 1 Land Use Distribution - Caney Fork River Watershed Table 2 2002 303(d) List – Stream Impairment Due to Siltation/Habitat Alteration in the Caney Fork River Watershed 8 Table 3 Water Quality Assessment of Waterbodies Impaired Due to Siltation/Habitat Alteration 11 Table 4 Average Annual Sediment Loads of Level IV Ecoregion Reference Sites 15 Table 5 Existing Sediment Loads in Subwatersheds With Impaired Waterbodies 17 Table 6 NPDES Regulated Mining Sites Permitted to Discharge TSS and Located In Impaired Subwatersheds 21 Table 7 Sediment TMDLs for Subwatersheds With Waterbodies Impaired For Siltation/Habitat Alteration 27 Table 8 Determination of Assigned TMDLs for Subwatershed 051301080805 28 Table 9 Summary of WLAs for MS4s, WLAs for Construction Storm Water Sites & LAs for Nonpoint Sources 30 Table B-1 Calculated Erosion - Subwatersheds With Waterbodies on the 2002 303(d) List B-6 Table B-2 Calculated Sediment Delivery to Surface Waters - Subwatersheds With Waterbodies on the 2002 303(d) List B-7 Unit Loads - Subwatersheds With Waterbodies on the 2002 303(d) List B-7 Table B-3 Table C-1 Caney Fork River Watershed – Impaired Subwatershed Land Use Distribution C-2 Table C-2 Level IV Ecoregion Reference Site Drainage Area Land Use Distribution C-5 Table D-1 Estimate of Existing Load – NPDES Permitted Mining Site D-2 Table D-2 Estimate of Existing Point Source Load in Impaired HUC-12 Subwatersheds D-3

LIST OF TABLES

LIST OF ABBREVIATIONS

ARS	Agricultural Research Station
BMP	Best Management Practices
CFR	Code of Federal Regulations
CFS	Cubic Feet per Second
DEM	Digital Elevation Model
DWPC	Division of Water Pollution Control
EPA	Environmental Protection Agency
HUC	Hydrologic Unit Code
LA	Load Allocation
MGD	Million Gallons per Day
MOS	Margin of Safety
MRLC	Multi-Resolution Land Characteristic
MS4	Municipal Separate Storm Sewer System
NED	National Elevation Dataset
NHD	National Hydrography Dataset
NPS	Nonpoint Source
NPDES	National Pollutant Discharge Elimination System
NSL	National Sediment Laboratory
Rf3	Reach File v.3
RM	River Mile
RMCF	Ready Mixed Concrete Facility
SABS	Suspended and Bedded Sediments
STATSGO	State Soil and Geographic Database
SSURGO	Soil Survey Geographic Database
TDEC	Tennessee Department of Environment & Conservation
TMDL	Total Maximum Daily Load
TSS	Total Suspended Solids
USGS	United States Geological Survey
USLE	Universal Soil Loss Equation
WCS	Watershed Characterization System
WLA	Waste Load Allocation
WMD	Water Management Division
WTP	Water Treatment Plant
WWTF	Wastewater Treatment Facility

SUMMARY SHEET

CANEY FORK RIVER WATERSHED (HUC 05130108)

Total Maximum Daily Load for Siltation / Habitat Alteration in Waterbodies Identified on the State of Tennessee's 2002 303(d) List

Impaired Waterbody Information:

State: Tennessee

Counties: Bledsoe, Cannon, Cumberland, DeKalb, Putnam, Sequatchie, Smith, Van Buren, Warren, White and Wilson

Watershed: Caney Fork River (HUC 05130108)

Watershed Area: 1796.8 mi²

Constituent of Concern: Siltation / Habitat Alteration (excess loading of sediment produced by erosional processes – see Section 3.0)

Impaired Waterbodies: 2002 303(d) List

Waterbody ID	Waterbody	RM
05130108001_0100	Snow Creek	7.6
05130108001_0200	Ferguson Branch	5.8
05130108001_0400	Rock Springs Branch	8.1
05130108002_2000	Hickman Creek	22.2
05130108024_1000	Rocky River	8.7
05130108025_0400	Hickory Valley Branch	8.2
05130108033_0310	Bradden Creek	10.7
05130108033_1000	Bee Creek	17.5
05130108036_0810	Flynn Creek	2.8
05130108036_3000	Unnamed Tributary to Caney Fork River	3.5
05130108043_0300	Blue Spring Creek	10.1
05130108045_0150	Cane Creek	12.0
05130108045_0300	Hudgens Creek	6.7
05130108045_0400	Pigeon Roost Creek	2.4
05130108045_0450	Pigeon Roost Creek	3.2
05130108045_0500	Post Oak Creek	8.3
05130108045_1000	Falling Water River	8.8
05130108048_1000	Indian Creek	31.0
05130108684_1000	Fall Creek (DeKalb)	9.8
05130108684_2000	Fall Creek (DeKalb)	6.7

Note: There are three waterbodies identified on the 2002 303(d) List as impaired due to other habitat alterations. These waterbodies were determined to be impaired due to causes other than excess sediment loading and are not addressed in this document (ref.: Section 3.0).

- Designated Uses: Fish & aquatic life, irrigation, livestock watering & wildlife, and recreation. Some waterbodies in watershed also classified for domestic and/or industrial water supply.
- Applicable Water Quality Standard: Most stringent narrative criteria applicable to fish & aquatic life use classification:
 - Biological Integrity: The waters shall not be modified through the addition of pollutants or through physical alteration to the extent that the diversity and/or productivity of aquatic biota within the receiving waters are substantially decreased or adversely affected, except as allowed under 1200-4-3-.06.

Interpretation of this provision for any stream which (a) has at least 80% of the upstream catchment area contained within a single bioregion, (b) is of the appropriate stream order specified for the bioregion and (c) contains the habitat (riffle or rooted bank) specified for the bioregion, may be made using the most current revision of the Department's Quality System Standard Operating Procedure for Macroinvertebrate Stream Surveys and/or other scientifically defensible methods.

Interpretation of this provision for all other streams, plus large rivers, reservoirs, and wetlands, may be made using Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers (EPA/841-B-99-002) and/or other scientifically defensible methods. Effects to biological populations will be measured by comparisons to upstream conditions or to appropriately selected reference sites in the same bioregion if upstream conditions are determined to be degraded.

Habitat: The quality of instream habitat shall provide for the development of a diverse aquatic community that meets regionally based biological integrity goals. The instream habitat within each subecoregion shall be generally similar to that found at reference streams. However, streams shall not be assessed as impacted by habitat loss if it has been demonstrated that the biological integrity goal has been met.

TMDL Development

General Analysis Methodology:

- Analysis performed using the Watershed Characterization System Sediment Tool (based on Universal Soil Loss Equation) applied to impaired HUC-12 subwatershed areas to calculate existing sediment loads.
- Target sediment loads (lbs/acre/year) are based on the average annual sediment loads from biologically healthy watersheds (Level IV Ecoregion reference sites).
- TMDLs are expressed as the percent reduction in average annual sediment load required for a subwatershed containing impaired waterbodies relative to the appropriate target load.
- 5% of subwatershed target loads are reserved to account for WLAs for regulated mining sites and RMCFs. Most loading from these sources are small compared to total loading.
- TSS from WWTF effluent was not considered as part of the TMDL analysis (see Sections 3.0 & 6.0).
- WLAs for Municipal Separate Storm Sewer Systems (MS4s), WLAs for NPDES regulated construction storm water discharges, and LAs for nonpoint sources are expressed as the percent reduction in average annual sediment load required for a subwatershed containing impaired waterbodies relative to the appropriate reduced target load (target load minus 5% reserved WLAs for mining sites and RMCFs).

Critical Conditions: Methodology takes into account all flow conditions.

Seasonal Variation: Methodology addresses all seasons.

Margin of Safety (MOS): Implicit (conservative modeling assumptions).

TMDL/Allocations

TMDLs, WLAs for MS4s & Construction Storm Water Sites; LAs for Nonpoint Sources:

			Level IV Ecoregion	TMDL (Required Overall Load Reduction)	Required Load Reduction	
HUC-12 Subwatershed	Waterbody ID	Waterbody Impaired by Siltation/ Habitat Alteration			WLA (MS4s & Constr. SW)	LA (Nonpoint Sources)
				[%]	[%]	[%]
0101	05130108036_3000	UT to Caney Fork River	68a	54.5	56.8	56.8
0102	05130108036_0810	Flynn Creek	68a	46.6	49.3	49.3
0104	05130108025_0400	Hickory Valley Branch	68c	46.0	48.7	48.7
0202	05130108033_0310	Bradden Creek	68a	48.9	51.5	51.5
0203	05130108033_1000	Bee Creek	68a	24.3	28.1	28.1
0406	05130108684_1000	Fall Creek (DeKalb)	71a	67.8	69.4	60.4
0406	05130108684_2000	Fall Creek (DeKalb)	/ ig			09.4
0503	05130108043_0300	Blue Spring Creek	68c	62.6	64.4	64.4
0602	05130108024_1000	Rocky River	68c	45.7	48.4	48.4
	05130108045_0300	Hudgens Creek	71g	13.8	18.1	
0702	05130108045_0400	Pigeon Roost Creek				18 1
0102	05130108045_0450	Pigeon Roost Creek				10.1
	05130108045_0500	Post Oak Creek				
0703	05130108045_1000	Falling Water River	71g	26.0	29.7	29.7
0704	05130108045_0150	Cane Creek	71g	48.4	51.0	51.0
	05130108001_0200	Ferguson Branch			31.8	
0805	05130108001_0400	Rock Springs Branch	71h	26.6		31.8
	05130108048_1000	Indian Creek				
0806	05130108001_0100	Snow Creek	71h	62.4	64.3	64.3
0807	05130108002_2000	Hickman Creek	71h	11.3	15.8	15.8

WLAs for Mining Sites and RMCFs:

WLAs for NPDES regulated mining sites are equal to existing permit limits for total suspended solids (TSS). There are no RMCFs located in impaired subwatersheds.

Mines Permitted to Discharge TSS and Located in Impaired Subwatersheds

HUC-12 Subwatershed	NPDES Permit No	Name	Area	TSS Daily Max Limit
(05130108)	F CITIIL NO.		[acres]	[mg/l]
0702	TN0062910	American Sand Supply Sand Processing Plant	18.00	40
0806	TN0004227	Pasminco Zinc, Inc. Elmwood Mine	158.00	30
0000	TN0069124	Rogers Group, Inc. Gordonsville Plant	91.01	40

TOTAL MAXIMUM DAILY LOAD (TMDL) FOR SILTATION/HABITAT ALTERATION CANEY FORK RIVER WATERSHED (HUC 05130108)

1.0 INTRODUCTION

Section 303(d) of the Clean Water Act requires each state to list those waters within its boundaries for which technology based effluent limitations are not stringent enough to protect any water quality standard applicable to such waters. Listed waters are prioritized with respect to designated use classifications and the severity of pollution. In accordance with this prioritization, states are required to develop Total Maximum Daily Loads (TMDLs) for those water bodies that are not attaining water quality standards. State water quality standards consist of designated use(s) for individual waterbodies, appropriate numeric and narrative water quality criteria protective of the designated uses and an antidegradation statement. The TMDL process establishes the maximum allowable loadings of pollutants for a waterbody that will allow the waterbody to maintain water quality standards. The TMDL may then be used to develop controls for reducing pollution from both point and nonpoint sources in order to restore and maintain the quality of water resources (USEPA, 1991).

2.0 WATERSHED DESCRIPTION

The Caney Fork River Watershed (HUC 05130108) is located in Middle Tennessee (Figure 1), primarily in Bledsoe, Cannon, Cumberland, DeKalb, Putnam, Sequatchie, Smith, Van Buren, Warren, White and Wilson Counties. The Caney Fork River Watershed lies within two level III Ecoregions (Southwestern Appalachians and Interior Plateau) and contains four level IV Ecoregions as shown in Figure 2 (USEPA, 1997):

- The Cumberland Plateau's (68a) tablelands and open low mountains are about 1000 feet higher than to the west and receive slightly more precipitation with cooler annual temperatures than the surrounding lower-elevation ecoregions. The plateau surface is less dissected with lower relief compared to the Cumberland Mountains or the Plateau Escarpment (68c). Elevations are generally 1200-2000 feet, with the Crab Orchard Mountains reaching over 3000 feet. Pennsylvania-age conglomerate, sandstone, siltstone, and shale is covered by mostly well-drained, acidic soils of low fertility. The region is forested, with some agriculture and coal mining activities.
- The Plateau Escarpment (68c) is characterized by steep, forested slopes and high velocity, high gradient streams. Local relief is often 1000 feet or more. The geologic strata include Mississippian-age limestone, sandstone, shale, and siltstone, and Pennsylvania-age shale, siltstone, sandstone, and conglomerate. Streams have cut down into the limestone, but the gorge talus slopes are composed of colluvium with huge angular, slabby blocks of sandstone. Vegetation community types in the ravines and gorges include mixed oak and chestnut oak on the upper slopes, more mesic forests on the middle and lower slopes (beech-tulip poplar, sugar maple-basswood-ashbuckeye), with hemlock along rocky streamsides and river birch along floodplain terraces.

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) Page 2 of 36

- The Eastern Highland Rim (71g) has level terrain, with landforms characterized as tablelands of moderate relief and irregular plains. Mississippian-age limestone, chert, shale and dolomite predominate, and karst terrain sinkholes and depressions are especially noticeable between Sparta and McMinnville. Numerous springs and spring-associated fish fauna also typify the region. Natural vegetation for the region is transitional between the oak-hickory type to the west and the mixed mesophytic forests of the Appalachian ecoregions to the east. Bottomland hardwoods forests were once abundant in some areas, although much of the original bottomland forest has been inundated by several large impoundments. Barrens and former prairie areas are now mostly oak thickets or pasture and cropland.
- The Outer Nashville Basin (71h) is a heterogeneous region, with rolling and hilly topography and slightly higher elevations. The region encompasses most all of the outer areas of the generally no-cherty Mississippian-age formations, and some Devonian-age Chattanooga shale, remnants of the Highland Rim. The region's limestone rocks and soils are high in phosphorus, and commercial phosphate is mined. Deciduous forest with pasture and cropland are the dominant land covers. Streams are low to moderate gradient, with productive, nutrient-rich waters, resulting in algae, rooted vegetation and occasionally high densities of fish. The Nashville Basin as a whole has a distinctive fish fauna, notable for fish that avoid the region, as well as those that are present.



Figure 1 Location of the Caney Fork River Watershed

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) Page 3 of 36

The Caney Fork River Watershed has approximately 25,887 lake acres, 2041.5 miles of streams (Rf3) and drains a total area of 1796.8 square miles. Watershed land use distribution is based on Multi-Resolution Land Characteristic (MRLC) databases derived from Landsat Thematic Mapper digital images from the period 1990-1993. Land use for the Caney Fork River Watershed is summarized in Table 1 and shown in Figure 3.

Land Lisa	Area			
	[acres]	[mi ²]	[% of watershed]	
Bare Rock/Sand	7	0.01	0.00	
Deciduous Forest	619,711	968.29	53.89	
Emergent Herbaceous Wetlands	42	0.07	0.00	
Evergreen Forest	88,323	138.00	7.68	
High Intensity Commercial/Industrial/ Transportation	5,210	8.14	0.45	
High Intensity Residential	1,021	1.59	0.09	
Low Intensity Residential	7,362	11.50	0.64	
Mixed Forest	150,871	235.73	13.12	
Open Water	18,663	29.16	1.62	
Other Grasses (Urban/Recreational)	7,775	12.15	0.68	
Pasture / Hay	185,405	289.69	16.12	
Quarries/Strip Mines/Gravel Pits	532	0.83	0.05	
Row Crops	57,498	89.84	5.00	
Transitional	4,742	7.41	0.41	
Woody Wetlands	2,806	4.38	0.24	
Total	1,149,968	1,796.81	100.00	

Table 1 Land Use Distribution - Caney Fork River Watershed

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) Page 4 of 36



Figure 2 Level IV Ecoregions in the Caney Fork River Watershed

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) Page 5 of 36



3.0 PROBLEM DEFINITION

The State of Tennessee's final 2002 303(d) List was approved by the U.S. Environmental Protection Agency (EPA), Region IV in January, 2004 (TDEC, 2004). The list identified a number of waterbodies in the Caney Fork River watershed as not fully supporting designated use classifications due, in part, to siltation and/or habitat alteration associated with agriculture, urban runoff, land development, and bank modification. These waterbodies are summarized in Table 2 and shown in Figure 4. The designated use classifications for the Caney Fork River and its tributaries include fish and aquatic life, irrigation, livestock watering & wildlife and recreation. Some waterbodies in the watershed are also classified for industrial water supply and/or domestic water supply.

A description of the stream assessment process in Tennessee can be found in 2004 305(b) Report, The Status of Water Quality in Tennessee (TDEC, 2004a). This document states that "biological surveys using macroinvertebrates as the indicator organisms are the preferred method for assessing support of the fish & aquatic life designated use." The waterbody segments listed in Table 2 were assessed as impaired based primarily on <u>biological surveys</u>. The results of these assessment surveys are summarized in Table 3. The assessment information presented is excerpted from the EPA/TDEC Assessment Database (ADB) and is referenced to the waterbody IDs in Table 2. Assessment Database information may be accessed at:

http://gwidc.memphis.edu/website/dwpc/

A typical example of a stream assessment (Snow Creek) is shown in Appendix A.

Siltation is the process by which sediments are transported by moving water and deposited on the bottom of stream, river, and lake beds. Sediment is created by the weathering of host rock and delivered to stream channels through various erosional processes, including sheetwash, gully and rill erosion, wind, landslides, dry gravel, and human excavation. In addition, sediments are often produced as a result of stream channel and bank erosion and channel disturbance. Movement of eroded sediments downslope from their points of origin into stream channels and through stream systems is influenced by multiple interacting factors (USEPA, 1999).

Siltation (sedimentation) is the most frequently cited cause of waterbody impairment in Tennessee, impacting over 5,743 miles of streams and rivers (TDEC, 2004a). Unlike many chemical pollutants, sediments are typically present in waterbodies in natural or background amounts and are essential to normal ecological function. Excessive sediment loading, however, is a major ecosystem stressor that can adversely impact biota, either directly or through changes to physical habitat.

Excessive sediment loading has a number of adverse effects on fish & aquatic life in surface waters. As stated in excerpts from *Developing Water Quality Criteria for Suspended and Bedded Sediments (SABS) – Draft* (USEPA, 2003):

In streams and rivers, fine inorganic sediments, especially silts and clays, affect the habitat for macroinvertebrates and fish spawning, as well as fish rearing and feeding behavior. Larger sands and gravels can scour diatoms and cause burying of invertebrates, whereas suspended sediment affects the light available for photosynthesis by plants and visual capacity of animals.

Sedimentation alters the structure of the invertebrate community by causing a shift in proportions from one functional group to another. Sedimentation can lead to embeddedness, which blocks critical macroinvertebrate habitat by filling in the interstices of the cobble and other hard substrate on the stream bottom. As deposited sediment increases, changes in invertebrate community structure and diversity occur.

Invertebrate drift is directly affected by increased suspended sediment load in freshwater streams. These changes generally involve a shift in dominance from ephemeroptera, plecoptera and trichoptera (EPT) taxa to other less pollution-sensitive species that can cope with sedimentation. Increases in sediment deposition that affect the growth, abundance, or species composition of the periphytic (attached) algal community will also have an effect on the macroinvertebrate grazers that feed predominantly on periphyton. Effects on aquatic individuals, populations, and communities are expressed through alterations in local food webs and habitat. When sedimentation exceeds certain thresholds, ensuing effects will likely involve decline of the existing aquatic invertebrate community and subsequent colonization by pioneer species.

Historically, waterbodies in Tennessee have been assessed as not fully supporting designated uses due to siltation when the impairment was determined to be the result of excess loading of the inorganic sediment produced by erosional processes. In cases where impairment was determined to be caused by excess loading of the primarily organic particulate material found in sewage treatment plant (STP) effluent, the cause of pollution was listed as total suspended solids (TSS) or organic enrichment. In consideration of this practice, this document presents the details of TMDL development for waterbodies in the Caney Fork watershed listed as impaired due to siltation (excess inorganic sediment produced by erosional processes) and/or appropriate cases of habitat alteration. The TSS in STP effluent is considered to be a distinctly different pollutant and, therefore, is not used for sediment loading calculations.

Note: Table 2 lists all of the waterbodies in the Caney Fork River watershed that appear on the 2002 303(d) List as impaired due to siltation and/or habitat alteration. Although listing habitat alteration as a cause of pollution, Fall Creek (TN05130108027_0600), Piney Creek (TN05130108027_0700), and Dry Fork (TN05130108027_0850) were determined to be impaired for reasons other than excess sediment loading. Therefore, <u>TMDL development for these waterbodies will not be addressed in this</u> <u>document.</u>

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) Page 8 of 36

Table 2	2002 303(d) List	- Stream Impairment	Due to Siltation/Habi	itat Alteration in the Cane	y Fork River Watershed
---------	------------------	---------------------	-----------------------	-----------------------------	------------------------

Waterbody Segment ID	Waterbody Segment Name	RM Partially Supporting	RM Not Supporting	Cause (Pollutant)	Source (Pollutant)
05130108001_0100	Snow Creek	7.6		Siltation Other Habitat Alterations	Pasture Grazing Removal of Riparian Vegetation
05130108001_0200	Ferguson Branch	5.8		Siltation Other Habitat Alterations	Removal of Riparian Vegetation
05130108001_0400	Rock Springs Branch	8.1		Siltation Other Habitat Alterations	Livestock in Stream Removal of Riparian Vegetation
05130108002_2000	Hickman Creek	22.2		Organic Enrichment/Low DO Other Habitat Alterations	Minor Municipal Point Source Grazing Related Sources
05130108024_1000	Rocky River	8.7		Siltation	Hwy/Road/Bridge Construction
05130108025_0400	Hickory Valley Branch	8.2		Organic Enrichment/Low DO Other Habitat Alterations	Pasture Grazing Removal of Riparian Vegetation
05130108027_0600	Fall Creek (Van Buren)	0.5		Flow Alteration/Other Habitat Alterations/Iron	Upstream Impoundment
05130108027_0700	Piney Creek *	28.8		Metals/PH/Other Habitat Alteration	Abandoned Mining
05130108027_0850	Dry Fork *		16.7	Metals/PH/ Other Habitat Alteration	Abandoned Mining
05130108033_0310	Bradden Creek		10.7	Organic Enrichment/Low DO Other Habitat Alterations	Pasture Grazing Removal of Riparian Vegetation
05130108033_1000	Bee Creek	17.5		Siltation Other Habitat Alterations	Crop Related Sources Bank Modification/Destabilization
05130108036_0810	Flynn Creek	2.8		Siltation	Source Undetermined

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) Page 9 of 36

Table 2 (cont.)	2002 303(d) List - Stream Impairment Due to Siltation/Habitat Alteration in the Caney Fork River	Watershed
	2002 303(d) List - Stream impairment Due to Sitation/habitat Alteration in the Ganey Fork River	WaterSheu

Waterbody Segment ID	Waterbody Segment Name	RM Partially Supporting	RM Not Supporting	Cause (Pollutant)	Source (Pollutant)
05130108036_3000	Unnamed Tributary to Caney Fork River	3.5		Other Habitat Alterations	Livestock in Stream Upstream Impoundment
05130108043_0300	Blue Spring Creek	10.1		Siltation	Bank Modification/Destabilization
05130108045_0150	Cane Creek	12.0		Other Habitat Alterations	Livestock in Stream Removal of Riparian Vegetation
05130108045_0300	Hudgens Creek	6.7		Other Habitat Alterations	Urban Runoff/Storm Sewers Hydromodification
05130108045_0400	Pigeon Roost Creek		2.4	Nutrients/Other Habitat Alterations/Pathogens	Major Municipal Point Source Urban Runoff/Storm Sewers Hydromodification
05130108045_0450	Pigeon Roost Creek	3.2		Nutrients/Other Habitat Alterations/Pathogens	Urban Runoff/Storm Sewers Hydromodification
05130108045_0500	Post Oak Creek	8.3		Siltation Other Habitat Alterations	Grazing Related Sources Removal of Riparian Vegetation
05130108045_1000	Falling Water River	8.8		Siltation	Agriculture
05130108048_1000	Indian Creek	31.0		Siltation Other Habitat Alterations	Dredging (gravel) Highway Maintenance/Runoff
05130108684_1000	Fall Creek (DeKalb)		9.8	Siltation/Organic Enrichment/Low DO/ Pathogens/Other Habitat Alterations	Major Municipal Point Source Upstream Impoundment
05130108684_2000	Fall Creek (DeKalb)	6.7		Other Habitat Alterations	Urban Runoff/Storm Sewers Hydromodification Removal of Riparian Vegetation

* The habitat alteration impairment of these waterbodies was determined to be related to factors other than excessive sediment loading. TMDLs for these waterbodies will be addressed in a separate document.

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) Page 10 of 36





Huc-12 Subwatershed Boundary

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) Page 11 of 36

Table 3	Water Quality Assessment	t of Waterbodies I	mpaired Due to	Siltation/Habitat Alteration
---------	--------------------------	--------------------	----------------	------------------------------

Waterbody Segment ID	Waterbody Segment Name	Cause Source		Comments
05130108001_0100	Snow Creek	Siltation Other Habitat Alterations	Pasture Grazing/Removal of Riparian Vegetation	TDEC biological survey mile 1.4 in 1998. 4 EPT families.
05130108001_0200	Ferguson Branch	Siltation Other Habitat Alterations	Removal of Riparian Vegetation	TDEC biological assessment at 0.8 in 1998. Zero ETP families.
05130108001_0400	Rock Springs Branch	Siltation Other Habitat Alterations	Livestock in Stream/Removal of Riparian Vegetation	TDEC biological assessment at mile 1.1. 1 EPT families.
05130108002_2000	Hickman Creek (Brush Ck. to headwaters)	Organic Enrichment/Low DO/Other Habitat Alterations	Minor Municipal Point Source Grazing Related Sources	TDEC biological survey at mile 12.8 in 1998. 5 EPT families.
05130108024_1000	Rocky River (Caney Fk. to Norton Spring)	Siltation	Hwy/Road/Bridge Construction	TDEC biological survey at mile 9.2. 3 EPT families.
05130108025_0400	Hickory Valley Branch	Organic Enrichment/Low DO/Other Habitat Alterations	Pasture Grazing/Removal of Riparian Vegetation	TDEC biological survey at mile 0.3. General lack of EPT families noted.
05130108033_0310	Bradden Creek	Organic Enrichment/Low DO/Other Habitat Alterations	Pasture Grazing/Removal of Riparian Vegetation	TDEC biological survey at mile 0.8 and 3.4. Zero EPTs at either site.
05130108033_1000	Bee Creek (Caney Fork River to Glade Ck.)	Siltation Other Habitat Alterations	Crop Related Sources/Bank Modification/Destabilization	TDEC biological survey at mile 15.1.4 EPT families.
05130108036_0810	Flynn Creek	Siltation	Source Undetermined	TDEC biological survey at mile 0.1. General absence of EPT families.
05130108036_3000	Unnamed Tributary to Caney Fork River	Other Habitat Alterations	Livestock in Stream Upstream Impoundment	TDEC biological survey at mile 0.2.
05130108043_0300	Blue Spring Creek	Siltation	Bank Modification/Destabilization	TDEC biological site at mile 0.1. Zero EPTs documented.
05130108045_0150	Cane Creek (Lee Seminary Road to headwaters)	Other Habitat Alterations	Livestock in Stream/Removal of Riparian Vegetation	TDEC biological survey at mile 11.8. 2 EPT families.
05130108045_0300	Hudgens Creek	Other Habitat Alterations	Urban Runoff/Storm Sewers Hydromodification	TDEC biological survey at mile 0.7. 4 EPT families.

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) Page 12 of 36

Waterbody Segment ID	Waterbody Segment Name	Cause	Source	Comments
05130108045_0400	Pigeon Roost Creek (Falling Water River to Cookeville STP outfall)	Nutrients/Other Habitat Alterations/Pathogens	Major Municipal Point Source/Urban Runoff/Storm Sewers/ Hydromodification	TDEC biological surveys at mile 1.3. Water has an odor and algae growth is excessive. NO2+NO3 of 2.55 on 3/8/99 and 5.82 on 11/13/98. 1999 and 2000 Tenn. Tech biorecon surveys just d/s of STP outfall. 1 EPT in 11/00.
05130108045_0450	Pigeon Roost Creek (Cookeville STP outfall to cave at mile 5.6 where creek emerges from underground)	Nutrients/Other Habitat Alterations/Pathogens	Urban Runoff/Storm Sewers Hydromodification	TDEC biological & chemical sampling above STP. Fecal & nutrients elevated. 1999 and 2000 Tenn. Tech biorecon surveys just u/s of STP outfall at mile 2.5. 5 EPT, 16 total families in 5/99. 4 EPT, 23 total families in 6/00. 6 EPT, 13 total in 11/00.
05130108045_0500	Post Oak Creek	Siltation Other Habitat Alterations	Grazing Related Sources Removal of Riparian Vegetation	TDEC biological survey at mile 0.7. 4 EPT families.
05130108045_1000	Falling Water River (Center Hill embayment to Pigeon Roost Creek)	Siltation	Agriculture	Ambient monitoring station at mile 10.5. Biological survey at mile 18.0. 6 EPT families. COE performed biological survey at mile 18 in 1996. 11 EPT genera documented,
05130108048_1000	Indian Creek	Siltation Other Habitat Alterations	Dredging (gravel) Highway Maintenance / Runoff	TDEC biological surveys a miles 1.0 & 4.8. 4 EPT families at mile 1.0. Much evidence of gravel dredging.
05130108684_1000	Fall Creek (DeKalb) (Lower Fall Creek from embayment to and including Calverts Lake)	Siltation/Organic Enrichment/Low DO/Pathogens/Other Habitat Alterations	Major Municipal Point Source Upstream Impoundment	TDEC biological survey at mile 4.7. 2 EPT families. COE performed biological survey in 1996 at mile 5.4. 18 EPT genera documented.
05130108684_2000	Fall Creek (DeKalb) (Calvert's Lake to headwaters)	Other Habitat Alterations	Urban Runoff/Storm Sewers/ Hydromodification/Remov al of Riparian Vegetation	TDEC biological survey at 7.0. 5 EPT families

4.0 TARGET IDENTIFICATION

Several narrative criteria, applicable to siltation/habitat alteration, are established in *Rules of Tennessee Department of Environment and Conservation, Tennessee Water Quality Control Board, Division of Water Pollution Control, Chapter 1200-4-3 General Water Quality Criteria, January, 2004* (TDEC, 2004b):

Applicable to all use classifications (Fish & Aquatic Life shown):

Solids, Floating Materials, and Deposits – There shall be no distinctly visible solids, scum, foam, oily slick, or the formation of slimes, bottom deposits or sludge banks of such size and character that may be detrimental to fish and aquatic life.

Other Pollutants – The waters shall not contain other pollutants that will be detrimental to fish or aquatic life.

Applicable to the Domestic Water Supply, Industrial Water Supply, Fish & Aquatic Life, and Recreation use classifications (Fish & Aquatic Life shown):

Turbidity or Color – There shall be no turbidity or color in such amounts or of such character that will materially affect fish and aquatic life.

Applicable to the Fish & Aquatic Life use classification:

Biological Integrity - The waters shall not be modified through the addition of pollutants or through physical alteration to the extent that the diversity and/or productivity of aquatic biota within the receiving waters are substantially decreased or adversely affected, except as allowed under 1200-4-3-.06.

Interpretation of this provision for any stream which (a) has at least 80% of the upstream catchment area contained within a single bioregion, (b) is of the appropriate stream order specified for the bioregion and (c) contains the habitat (riffle or rooted bank) specified for the bioregion, may be made using the most current revision of the Department's Quality System Standard Operating Procedure for Macroinvertebrate Stream Surveys and/or other scientifically defensible methods.

Interpretation of this provision for all other streams, plus large rivers, reservoirs, and wetlands, may be made using Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers (EPA/841-B-99-002) and/or other scientifically defensible methods. Effects to biological populations will be measured by comparisons to upstream conditions or to appropriately selected reference sites in the same bioregion if upstream conditions are determined to be degraded.

Habitat - The quality of instream habitat shall provide for the development of a diverse aquatic community that meets regionally based biological integrity goals. The instream habitat within each subecoregion shall be generally similar to that found at reference streams. However, streams shall not be assessed as impacted by habitat loss if it has been demonstrated that the biological integrity goal has been met.

These TMDLs are being established to attain full support of the fish and aquatic life designated use classification. TMDLs established to protect fish and aquatic life will protect all other use classifications for the identified waterbodies from adverse alteration due to sediment loading.

In order for a TMDL to be established, a numeric "target" protective of the uses of the water must be identified to serve as the basis for the TMDL. Where State regulation provides a numeric water quality criteria for the pollutant, the criteria is the basis for the TMDL. Where State regulation does not provide a numeric water quality criteria, as in the case of siltation/habitat alteration, a numeric interpretation of the narrative water quality standard must be determined. For the purpose of these TMDLs, the average annual sediment loading in lbs/acre/yr, from a biologically healthy watershed, located within the same Level IV ecoregion as the impaired watershed, is determined to be the appropriate numeric interpretation of the narrative water quality standard for protection of fish and aquatic life. Biologically healthy watersheds were identified from the State's ecoregion reference sites. These ecoregion reference sites have similar characteristics and conditions as the majority of streams within that ecoregion. Detailed information regarding Tennessee ecoregion reference sites can be found in Tennessee Ecoregion Project, 1994-1999 (TDEC, 2000). In general, land use in ecoregion reference watersheds contain less pasture, cropland, and urban areas, and more forested areas compared to the impaired watersheds. The biologically healthy (reference) watersheds are considered the "least impacted" in an ecoregion and, as such, sediment loading from these watersheds may serve as an appropriate target for the TMDL.

Using the methodology described in Appendix B, the Watershed Characterization System (WCS) Sediment Tool was used to calculate the average annual sediment load for each of the biologically healthy (reference) watersheds in Level IV ecoregions 68a, 68c, 71g, and 71h. The geometric mean of the average annual sediment loads of the reference watersheds in each Level IV ecoregion was selected as the most appropriate target for that ecoregion. Since the impairment of biological integrity due to sediment build-up is generally a long-term process, using an average annual load is considered appropriate. The average annual sediment loads for reference sites and corresponding TMDL target values for Level IV ecoregions 68a, 68c, 71g, and 71h are summarized in Table 4. Reference site locations are shown in Figure 5.

Level IV Ecoregion	Reference Site	Stream	Drainage Area	Average Annual Sediment Load	
			(acres)	[lbs/acre/year]	
	ECO68A01	Rock Creek	3,717	41.8	
	ECO68A03	Laurel Fork	10,827	86.3	
	ECO68A08	Clear Creek	98,904	159.1	
	ECO68A13	Piney Creek	8,946	156.1	
68a	ECO68A20	Mullens Creek	7,388	122.1	
	ECO68A26	Daddy's Creek	39,923	367.1	
	ECO68A27	Island Creek	11,836	179.3	
	ECO68A28	Rock Creek	16,036	104.4	
Geometric Mean (Target Load				128.7	
68c	ECO68C12	Ellis Gap Branch	810	91.6	
	ECO68C13	Mud Creek	2,627	233.3	
	ECO68C15	Crow Creek	14,106	223.8	
	ECO68C20	Crow Creek	12,617	183.8	
		172.3			
71g	ECO71G03	Flat Creek	14,146	340.0	
	ECO71G04	Spring Creek	17,090	496.3	
	ECO71G10	Hurricane Creek	3,565	269.3	
		356.9			
71h	ECO71H03	Flynn Creek	8,318	735.7	
	ECO71H06	Clear Fk. Creek	8,778	559.3	
	ECO71H09	Carson Fork	7,934	518.6	
		597.7			

Table 4 Average Annual Sediment Loads of Level IV Ecoregion Reference Sites

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) Page 16 of 36



Figure 5 Reference Sites in Level IV Ecoregions 68a, 68c, 71g, & 71h

Note: Ecoregion reference sites are continually reviewed, with sites added or deleted as circumstances warrant. The stations shown were determined as ecoregion reference sites as of June 3, 2003.

5.0 WATER QUALITY ASSESSMENT AND DEVIATION FROM TARGET

Using the methodology described in Appendix B, the WCS Sediment Tool was used to determine the average annual sediment load, due to precipitation based sources, for all HUC-12 subwatersheds in the Caney Fork River watershed (Figure 6). Existing precipitation based sediment loads for subwatersheds with waterbodies listed on the 2002 303(d) List as impaired for siltation/habitat alteration are summarized in Table 5.

Huc-12 Subwatershed	Level IV Ecoregion	Existing Sediment Load	
(05130108)	Loorogion	[lbs/ac/yr]	
0101	68a	283	
0102	68a	241	
0104	68c	319	
0202	68a	252	
0203	68a	170	
0406	71g	1,109	
0503	68c	460	
0602	68c	317	
0702	71g	415	
0703	71g	482	
0704	71g	692	
0805	71h	555	
0806	71h	1,590	
0807	71h	675	

Table 5 Existing Sediment Loads in Subwatersheds With Impaired Waterbodies

6.0 SOURCE ASSESSMENT

An important part of the TMDL analysis is the identification of individual sources, source categories, or source subcategories of siltation in the watershed and the amount of pollutant loading contributed by each of these sources. Under the Clean Water Act, sources are broadly classified as either point or nonpoint sources. Under 40 CFR §122.2, a point source is defined as a discernable, confined and discrete conveyance from which pollutants are or may be discharged to surface waters. The National Pollutant Discharge Elimination System (NPDES) program regulates point source discharges. Regulated point sources include: 1) municipal and industrial wastewater treatment facilities (WWTFs); 2) storm water discharges associated with industrial activity (which includes construction activities); and 3) certain discharges from Municipal Separate Storm Sewer Systems (MS4s). A TMDL must provide Waste Load Allocations (WLAs) for all NPDES-regulated point sources. For the purposes of these TMDLs, all sources of sediment loading not regulated by NPDES are considered nonpoint sources. The TMDL must provide a Load Allocation (LA) for these sources.

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) Page 18 of 36





Impaired Waterbody - Siltation /Habitatat Alteration (TMDL Developed) Huc-12 Subwatershed (05130108____) NHD (05130108)

6.1 Point Sources

6.1.1 NPDES-Regulated Municipal and Industrial Wastewater Treatment Facilities

As stated in Section 3.0, the TSS component of WWTF discharges is generally composed of primarily organic material and is considered to be different in nature than the sediments produced from erosional processes. Therefore, TSS discharges from WWTFs are <u>not</u> included in the TMDLs developed for this document.

6.1.2 NPDES Regulated Ready Mixed Concrete Facilities

Discharges from regulated Ready Mixed Concrete Facilities (RMCFs) may contribute sediment to surface waters as TSS discharges (TSS discharged from RMCFs is composed of primarily inorganic material and is therefore included as a source for TMDL development). Most of these facilities obtain coverage under NPDES Permit No. TNG110000, *General NPDES Permit for Discharges of Storm Water Runoff and Process Wastewater Associated With Ready Mixed Concrete Facilities (TDEC, 2003)*. This permit establishes a daily maximum TSS concentration limit of 50 mg/l on process wastewater effluent and specifies monitoring procedures for storm water. Facilities are also required to develop and implement storm water pollution prevention plans (SWPPPs). Discharges from RMCFs are generally intermittent, and contribute a small portion of total sediment loading to HUC-12 subwatersheds (ref.: Appendix D). In some cases, for discharges into impaired waters documented on the 303(d) List, sites may be required to obtain coverage under an individual NPDES permit. There is only one permitted RMCF in the Caney Fork River watershed and it is not located in an impaired subwatershed.

6.1.3 NPDES Regulated Mining Sites

Discharges from regulated mining activities may also contribute sediment to surface waters as TSS (TSS discharged from mining sites is composed of primarily inorganic material and is therefore included as a source for TMDL development). Discharges from active mines may result from dewatering operations and/or in response to storm events, whereas discharges from permitted inactive mines are only in response to storm events. Inactive sites with successful surface reclamation contribute relatively little solids loading. There are 17 mining sites permitted to discharge TSS in the Caney Fork River Watershed (as of September 1, 2004). Three of these 17 permitted mining sites are located in impaired subwatersheds. These three sites are shown in Figure 7 and permit limits are summarized in Table 6. Sediment loads (as TSS) to waterbodies from mining site discharges are very small in relation to total sediment loading (ref.: Appendix D).

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) Page 20 of 36



Figure 7 NPDES Regulated Mining Sites Permitted to Discharge TSS and Located in Impaired Subwatersheds

HUC-12 Subwatershed	NPDES Permit No.	Name	Area	TSS Daily Max Limit
(05130108)			[acres]	[mg/l]
0702	TN0062910	American Sand Supply Sand Processing Plant	18.00	40
0806	TN0004227	Pasminco Zinc, Inc. Elmwood Mine	158.00	30
0800	TN0069124	Rogers Group, Inc. Gordonsville Plant	91.01	40

Table 6NPDES Regulated Mining Sites Permitted to Discharge TSS and Located in
Impaired Subwatersheds

6.1.4 NPDES-Regulated Construction Activities

Discharges from NPDES-regulated construction activities are considered point sources of sediment loading to surface waters and occur in response to storm events. Currently, discharges of storm water from construction activities disturbing an area of one acre or more must be authorized by an NPDES permit. Most of these construction sites obtain coverage under NPDES Permit No. TNR10-0000, *General NPDES Permit for Storm Water Discharges Associated With Construction Activity* (TDEC, 2000a). The permit requires the development and implementation of a SWPPP to minimize the discharge of pollutants to surface waters and prohibits discharges that would result in the violation of a State water quality criteria. Additional requirements are specified for discharges into impaired waterbodies documented on the 303(d) List, and, in some cases, sites may be required to obtain coverage under an individual NPDES permit. Since construction activities at a site are of a temporary, relatively short-term nature, the number of construction sites covered by the general permit at any instant of time varies. In the Caney Fork River watershed, there were seven permitted active construction sites on September 1, 2004 (ref.: Figure 8).

6.1.5 NPDES-Regulated Municipal Separate Storm Sewer Systems

Municipal separate storm sewer systems (MS4s) may also discharge sediment to waterbodies in response to storm events through road drainage systems, curb and gutter systems, ditches and storm drains. These systems convey urban runoff from surfaces such as bare soil and wash-off of accumulated street dust and litter from impervious surfaces during rain events. Large and medium MS4s serving populations greater than 100,000 people are required to obtain an NPDES storm water permit. At present, there are no MS4s of this size in the Caney Fork River Watershed. As of March 2003, small MS4s serving urbanized areas, or having the potential to exceed instream water quality standards, are required to obtain coverage under the NPDES General Permit for Discharges from Small Municipal Separate Storm Sewer Systems (TDEC, 2002). An urbanized area is defined as an entity with a residential population of at least 50,000 people and an overall population density of 1,000 people per square mile. The City of Cookeville (TNS075256) and Wilson County (TNS075809) are covered under Phase II of the NPDES Storm Water Program. Both Notices of Coverage (NOCs) were issued July 3, 2003, became effective July 7, 2003 and expire February 26, 2008. The Tennessee Department of Transportation (TDOT) is also being issued an MS4 permit (TNS077585, target public notice 7/5/2004) for State roads in urban areas. Information regarding storm water permitting in Tennessee may be obtained from the TDEC website at:

http://www.state.tn.us/environment/wpc/stormh2o/.



Figure 8 Location of NPDES Permitted Construction Sites in the Caney Fork River Watershed

6.2 Nonpoint Sources

Nonpoint sources account for the vast majority of sediment loading to surface waters. These sources include:

- Natural erosion occurring from the weathering of soils, rocks, and uncultivated land; geological abrasion; and other natural phenomena.
- Erosion from agricultural activities can be a major source of sedimentation due to the large land area involved and the land-disturbing effects of cultivation. Grazing livestock can leave areas of ground with little vegetative cover. Unconfined animals with direct access to streams can cause streambank damage.
- Urban erosion from bare soil areas under construction and washoff of accumulated street dust and litter from impervious surfaces.
- Erosion from unpaved roadways can be a significant source of sediment to rivers and streams. It occurs when soil particles are loosened and carried away from the roadway, ditch, or road bank by water, wind, or traffic. The actual road construction (including erosive road-fill soil types, shape and size of coarse surface aggregate, poor subsurface and/or surface drainage, poor road bed construction, roadway shape, and inadequate runoff discharge outlets or "turn-outs" from the roadway) may aggravate roadway erosion. In addition, external factors such as roadway shading and light exposure, traffic patterns, and road maintenance may also affect roadway erosion. Exposed soils, high runoff velocities and volumes, and poor road compaction all increase the potential for erosion
- Runoff from abandoned mines may be significant sources of solids loading. Mining activities typically involve removal of vegetation, displacement of soils, and other significant land disturbing activities.
- Soil erosion from forested land that occurs during timber harvesting and reforestation activities. Timber harvesting includes the layout of access roads, log decks, and skid trails; the construction and stabilization of these areas; and the cutting of trees. Established forest areas produce very little soil erosion.

For the listed waterbodies within the Caney Fork River Watershed, the primary sources of nonpoint sediment loading come from agriculture, roadways, and urban sources.

7.0 DEVELOPMENT OF TOTAL MAXIMUM DAILY LOADS

The TMDL process quantifies the amount of a pollutant that can be assimilated in a waterbody, identifies the sources of the pollutant, and recommends regulatory or other actions to be taken to achieve compliance with applicable water quality standards based on the relationship between pollution sources and in-stream water quality conditions. A TMDL can be expressed as the sum of all point source loads (Waste Load Allocations), non-point source loads (Load Allocations) and an

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) Page 24 of 36 appropriate margin of safety (MOS) which takes into account any uncertainty concerning the relationship between effluent limitations and water quality:

$$\mathsf{TMDL} = \Sigma \mathsf{WLAs} + \Sigma \mathsf{LAs} + \mathsf{MOS}$$

The objective of a TMDL is to allocate loads among all of the known pollutant sources throughout a watershed so that appropriate control measures can be implemented and water quality standards achieved. 40 CFR §130.2 (i) states that TMDLs can be expressed in terms of mass per time, toxicity or other appropriate measure.

TMDL analyses are performed on a 12-digit hydrologic unit area (HUC-12) basis for subwatersheds containing waterbodies identified as impaired due to siltation or habitat alteration on the 2002 303(d) List. HUC-12 subwatershed boundaries are shown in Figure 6.

7.1. Analysis Methodology

Sediment analysis for watersheds can be conducted using methods ranging from simple, gross estimates to complex dynamic loading and receiving water models. The choice of methodology is dependent on a number of factors that include watershed size, type of impairment, type and quantity of data available, resources available, time, and cost. In consideration of these factors, the procedure outlined in Section 7.1.1 was selected as the most appropriate for first phase sediment TMDLs in the Caney Fork River watershed. This procedure was modified as noted in Section 7.1.2 for subwatershed 051301080805.

7.1.1 WCS Sediment Tool

Sediment loading analysis for waterbodies impaired due to siltation/habitat alteration in the Caney Fork River watershed was accomplished using the Watershed Characterization System (WCS) Sediment Tool. This ArcView geographic information system (GIS) based model is described in Appendix B and was utilized according to the following procedure:

- The Watershed Characterization System (WCS) Sediment Tool was used to determine sediment loading to Level IV ecoregion reference site watersheds. These are considered to be biologically healthy watersheds. The average annual sediment loads in lbs/acre/year of these reference watersheds serve as target values for Caney Fork River watershed sediment TMDLs.
- The Sediment Tool was also used to determine the existing average annual sediment loads of impaired subwatersheds located in the Caney Fork River watershed. Impaired subwatersheds are defined as 12-digit HUCs containing one or more waterbodies identified as impaired due to siltation/habitat alteration on the State's 2002 303(d) List (ref.: Figure 4).
- The existing average annual sediment load of each impaired HUC-12 subwatershed was compared to the average annual load of the appropriate reference (biologically healthy) watershed and an <u>overall</u> required percent reduction in loading calculated. For each impaired HUC-12 subwatershed, the TMDL is equal to this <u>overall</u> required reduction:

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) Page 25 of 36

Although the Sediment Tool uses the best road, elevation, and land use GIS coverages available, the resulting average annual sediment loads should not be interpreted as an absolute value. The calculated loading reductions, however, are considered to be valid since they are based on the relative comparison of loads calculated using the same methodology.

- In each impaired subwatershed, 5% of the ecoregion-based target load was reserved to account for WLAs for NPDES permitted mining sites and RMCFs. The existing loads from these facilities were determined to be less than the five percent reserved in each impaired HUC-12 subwatershed. Any difference between these existing loads and the 5% reserved load provide for future growth and additional MOS (ref.: Appendix D).
- For each impaired HUC-12 subwatershed, WLAs for construction storm water sites, WLAs for MS4s, and LAs for nonpoint sources were considered to be the percent load reduction required to decrease the existing annual average sediment load to a level equal to 95% of the target value.

$$WLA_{Const.SW} = WLA_{MS4} = LA =$$

$$(Existing Load) - [(.95) (Target Load)]$$

$$(Existing Load) x 100$$

TMDLs, WLAs for construction storm water sites and MS4s, and LAs are expressed as a
percent reduction in average annual sediment loading. WLAs for mining sites and RMCFs
are equal to loads authorized by their existing permits. Since sediment loading from these
facilities are small with respect to storm water induced sediment loading, further reductions
were not considered warranted (ref.: Appendix D).

It is considered that the reduction of sediment loading as specified by WLAs and LAs in impaired watersheds will result in the attainment of fully supporting status for all designated use classifications, with respect to siltation/habitat alteration. According to 40 CFR §130.2 (i), TMDLs can be expressed in terms of mass per time, toxicity, or other appropriate measure.

Details of the analysis methodology are more fully described in Appendix B. This approach is recognized as an acceptable alternative to a maximum allowable mass load per day in the *Protocol for Developing Sediment TMDLs* (USEPA, 1999).

7.1.2 Sediment Tool Analysis Anomalies

There is one HUC-12 subwatershed in the Caney Fork River watershed that has been assessed (primarily on the basis of biological surveys as stated in Section 3.0) as impaired due to siltation or habitat alteration, for which the results of the Sediment Tool based analysis indicate that the existing sediment load is smaller than the target load. This subwatershed is:

051301080805 (Ferguson Branch, Indian Creek, & Rock Springs Branch)

This subwatershed requires a more thorough investigation to determine site-specific causes of impairment. A detailed analysis is presented in Appendix F. In consideration, however, of the assessment of waterbodies in these subwatersheds as impaired due to siltation or habitat alteration, TMDLs, WLAs for construction storm water sites, WLAs for MS4s, and LAs for nonpoint
sources were assigned based on the predominant Level IV ecoregion in each HUC-12 subwatershed using the following procedure:

- Assigned TMDLs were determined to be equal to the geometric mean of the <u>overall</u> required load reductions (TMDLs) of other impaired HUC-12 subwatersheds predominantly in the same Level IV ecoregion.
- Assigned WLAs for construction storm water, WLAs for MS4s, and LAs for nonpoint sources for the subwatersheds were determined to be equal to the geometric mean of the WLA & LA load reductions of other impaired HUC-12 subwatersheds predominantly in the same Level IV ecoregion.

7.2 TMDLs for Impaired Subwatersheds

Sediment TMDLs for subwatersheds containing waterbodies identified as impaired for siltation/habitat alteration are summarized in Table 7. The determination of assigned TMDLs for HUC-12 subwatersheds where the Sediment Tool analysis resulted in existing loads lower than target loads are shown in Table 8.

HUC-12 Subwatershed	Waterbody ID	Waterbody Impaired by Siltation/ Habitat Alteration	Level IV Ecoregion	Existing Sediment Load	Target Load	TMDL (Required Overall Load Reduction)	
				[lbs/ac/yr]	[lbs/ac/yr]	[%]	
0101	05130108036_3000	UT to Caney Fork River	68a	283	128.7	54.5	
0102	05130108036_0810	Flynn Creek	68a	241	128.7	46.6	
0104	05130108025_0400	Hickory Valley Branch	68c	319	172.2	46.0	
0202	05130108033_0310	Bradden Creek	68a	252	128.7	48.9	
0203	05130108033_1000	Bee Creek	68a	170	128.7	24.3	
0406	05130108684_1000	Fall Creek (DeKalb)	710	1 100	356.0	67.8	
0400	05130108684_2000	Fall Creek (DeKalb)	/ ig	1,103	550.9	07.0	
0503	05130108043_0300	Blue Spring Creek	68c	460	172.2	62.6	
0602	05130108024_1000	Rocky River	68c	317	172.2	45.7	
	05130108045_0300	Hudgens Creek					
0702	05130108045_0400	Pigeon Roost Creek	71a	414	356.9	13.8	
0102	05130108045_0450	Pigeon Roost Creek	, 'g		000.0	10.0	
	05130108045_0500	Post Oak Creek					
0703	05130108045_1000	Falling Water River	71g	482	356.9	26.0	
0704	05130108045_0150	Cane Creek	71g	692	356.9	48.4	
	05130108001_0200	Ferguson Branch					
0805	05130108001_0400	Rock Springs Branch	71h	555	597.6	26.6 *	
	05130108048_1000	Indian Creek					
0806	05130108001_0100	Snow Creek	71h	1,589	597.6	62.4	
0807	05130108002_2000	Hickman Creek	71h	674	597.6	11.3	

Table 7	Sediment TMDLs for Subwatersheds with	h Waterbodies Imr	paired for Siltation/Habitat	Alteration
		i mator source min		

* Assigned TMDL . Ref.: Section 7.1.2 & Table 8.

		Required Load Reduction					
Level IV Ecoregion	Impaired HUC-12 Subwatershed	TMDL (Overall)	WLAs (Constructio n SW & MS4s)	LAs (Nonpoint Sources)			
		[%]	[%]	[%]			
	0806	62.4	64.3	64.3			
71h	0807	11.3	15.8	15.8			
	Geometric Mean	26.6	31.8	31.8			

Table 8 Determination of Assigned TMDLs for Subwatershed 051301080805

Note: WLAs for construction storm water, WLAs for MS4s, & LAs for nonpoint sources are based on the information in Sections 7.3.3, 7.3.4, & 7.4 and Table 11 and are shown here for convenience.

7.3 Waste Load Allocations

7.3.1 Waste Load Allocations for NPDES Regulated Ready Mixed Concrete Facilities

There are no NPDES permitted ready mixed concrete facilities (RMCFs) located in impaired subwatersheds in the Caney Fork River watershed.

7.3.2 Waste Load Allocations for NPDES-Regulated Mining Activities

Of the 17 NPDES regulated mining sites in the Caney Fork River watershed, three are located in impaired subwatersheds (ref.: Table 6). Since sediment loading from mining sites is small (ref.: Appendix D) compared to the total loading for impaired subwatersheds, WLAs are considered to be equal to the existing permit requirements for these sites.

7.3.3 Waste Load Allocations for NPDES-Regulated Construction Activities

Construction activities disturbing one or more acres are regulated by the State's NPDES program (ref.: Section 6.1.4) and discharges from these sites must be authorized by a permit. This includes clearing, grading or excavating that results in an area of disturbance of one or more acres, and activities that result in the disturbance of less than one acre if it is part of a larger common plan of development or sale. Since these construction activities may discharge sediment to surface waters, WLAs are provided for this category of activities. WLAs are established for each subwatershed containing a waterbody identified on the 2002 303(d) List as impaired due to siltation or habitat alteration (ref.: Table 2). WLAs are expressed as the required percent reduction in the estimated average annual sediment loading for the impaired subwatershed, relative to the estimated average annual sediment loading (minus the amount allocated to RMCFs and regulated mining sites (5%)) of a biologically healthy (reference) subwatershed located in the same Level IV ecoregion (ref.: Table 9).

The WLAs provided to the NPDES regulated construction activities will be implemented as Best Management Practices (BMPs), as specified in NPDES Permit No. TNR10-0000, *General NPDES Permit for Storm Water Discharges Associated With Construction Activity* (TDEC, 2000a). It is not technically feasible to incorporate numeric sediment limits into construction storm water permits at this time. WLAs should not be construed as numeric permit limits. Ambient monitoring may be required

for specific discharges to determine compliance with the TMDL for a particular segment. Properly designed and well-maintained BMPs are expected to provide attainment of WLAs. In some cases, it may be necessary to go beyond standard practices in the application of BMPs to assure compliance with the WLA (ref.: Section 8).

7.3.4 Waste Load Allocations for NPDES-Regulated Municipal Separate Storm Sewer Systems (MS4s)

Municipal separate storm sewer systems (MS4s) are regulated by the State's NPDES program (ref.: Section 6.1.5). Since MS4s have the potential to discharge TSS to surface waters, WLAs are specified for these systems. WLAs are established for each HUC-12 subwatershed containing a waterbody identified on the 2002 303(d) List as impaired due to siltation or habitat alteration (ref.: Table 2). WLAs are expressed as the required percent reduction in the estimated average annual sediment loading for an impaired subwatershed, relative to the estimated average annual sediment loading (minus the amount allocated to RMCFs and regulated mining sites (5%)) of a biologically healthy (reference) subwatershed located in the same Level IV ecoregion (ref.: Table 9).

WLAs provided to NPDES regulated MS4s will be implemented as Best Management Practices (BMPs) as specified in Phase I & II MS4 permits. It is not technically feasible to incorporate numeric sediment limits into MS4 permits at this time. WLAs should <u>not</u> be construed as numeric permit limits. Ambient monitoring may be required for specific discharges to determine compliance with the TMDL for a particular segment. Properly designed and well-maintained BMPs are expected to provide attainment of WLAs. In some cases, it may be necessary to go beyond standard practices in the application of BMPs to assure compliance with the WLA (ref.: Section 8).

7.4 Load Allocations for Nonpoint Sources

Sources of sediment loading to surface waters not covered by the NPDES program are provided a Load Allocation (LA) in these TMDLs. LAs are established for each HUC-12 subwatershed containing a waterbody identified on the 2002 303(d) List as impaired due to siltation or habitat alteration (ref.: Table 2). LAs are expressed as the required percent reduction in the estimated average annual sediment loading for the impaired subwatershed, relative to the estimated average annual sediment loading (minus the amount allocated to RMCFs and regulated mining sites) of a biologically healthy (reference) subwatershed located in the same Level IV ecoregion (ref.: Table 9). Properly designed and well-maintained BMPs will be necessary to assure that LAs are achieved.

		Percent Reduction in Average Annual Sediment Load					
Subwatershed (05130108)	Level IV Ecoregion	WLAs (Construction SW & MS4s)	LAs (Nonpoint Sources)				
		[%]	[%]				
0101	68a	56.8	56.8				
0102	68a	49.3	49.3				
0104	68c	48.7	48.7				
0202	68a	51.5	51.5				
0203	68a	28.1	28.1				
0406	71g	69.4	69.4				
0503	68c	64.4	64.4				
0602	68c	48.4	48.4				
0702	71g	18.1	18.1				
0703	71g	29.7	29.7				
0704	71g	51.0	51.0				
0805	71h	31.8 *	31.8 *				
0806	71h	64.3	64.3				
0807	71h	15.8	15.8				

Table 9Summary of WLAs for MS4s, WLAs for Construction Storm Water Sites,
& LAs for Nonpoint Sources

* Assigned WLA or LA. Ref.: Section 7.1.2, Table 8, & Appendix F

7.5 Margin of Safety

There are two methods for incorporating a Margin of Safety (MOS) in the analysis: a) implicitly incorporate the MOS using conservative model assumptions to develop allocations; or b) explicitly specify a portion of the TMDL as the MOS and use the remainder for allocations. In these TMDLs, an implicit MOS was incorporated through the use of conservative modeling assumptions. These include:

- Target values based on Level IV ecoregion reference sites. These sites represent the least impacted streams in the ecoregion.
- The use of the sediment delivery process that results in the most sediment transport to surface waters (ref.: Method 2 in Appendix B).

In most presently impaired subwatersheds, some amount of explicit MOS is realized due to the WLAs specified for NPDES permitted mining sites and RMCFs being less than the 5% of the target load reserved for these facilities.

7.6 Seasonal Variation

Sediment loading is expected to fluctuate according to the amount and distribution of rainfall. The determination of sediment loads on an average annual basis accounts for these differences through the rainfall erosivity index in the USLE (ref.: Appendix B). This is a statistic calculated from the annual summation of rainfall energy in every storm and its maximum 30-minute intensity.

8.0 IMPLEMENTATION PLAN

8.1 Point Sources

8.1.1 NPDES Regulated Ready Mixed Concrete Facilities

There are no NPDES permitted ready mixed concrete facilities (RMCFs) located in impaired subwatersheds in the Caney Fork River Watershed.

8.1.2 NPDES Regulated Mine Sites

WLAs for mining sites located in impaired HUC-12 subwatersheds will be implemented through each site's NPDES permit. Since discharges from these facilities are small compared to the total sediment loading in impaired subwatersheds, WLAs are equal to existing permit requirements.

8.1.3 NPDES-Regulated Construction Storm Water

The WLAs provided to existing and future NPDES-regulated construction activities disturbing one acre or more will be implemented through Best Management Practices (BMPs) as specified in NPDES Permit No. TNR10-0000, *General NPDES Permit for Storm Water Discharges Associated With Construction Activity* (TDEC, 2000a). It is not technically feasible to incorporate numeric sediment limits into permits for these activities at this time. WLAs should <u>not</u> be construed as numeric permit limits. This permit requires (ref.: Appendix E):

- Development and implementation of a site-specific Storm Water Pollution Prevention Plan (SWPPP) that addresses erosion and sediment control.
- Good engineering and best management practices in the design, installation, and maintenance of erosion and sediment controls.
- Erosion and sediment controls must be designed to function properly in a two-year, 24-hour storm event.

In addition, a number of special requirements in the permit apply to discharges entering waterbodies that have been identified on the 303(d) List as being impaired due to siltation. These additional requirements include:

- More frequent (weekly) inspections of erosion and sediment controls.
- Inspections and the condition of erosion and sediment controls must be reported to the Division of Water Pollution Control (DWPC).
- The SWPPP must be submitted to the DWPC prior to disturbing soil at the construction site.

• In order to assure that the WLA is achieved, the application of BMPs that go beyond the typical minimum elements generally undertaken to comply with the General Permit may be necessary.

Strict compliance with the provisions of the *General NPDES Permit for Storm Water Discharges Associated With Construction Activity* can reasonably be expected to achieve reduced sediment loads to streams. The primary challenge for the reduction of sediment loading from construction sites to meet WLAs is in the effective compliance monitoring of all requirements specified in the permit and timely enforcement against construction sites not found to be in compliance with the permit.

8.1.4 NPDES-Regulated Municipal Separate Storm Sewer Systems (MS4s)

For regulated discharges from municipal separate storm sewer systems, WLAs will be implemented through Phase II MS4 permits. These permits will require the development and implementation of a Storm Water Management Plan (SWMP) that will reduce the discharge of pollutants to the "maximum extent practicable" and not cause or contribute to violations of State water quality standards. The individual permittees will be responsible for identifying the specific BMPs to be applied to attain appropriate reduction in sediment loads. The SWMP will also include a number of programs/activities to identify sources of pollutants in municipal storm water runoff and verify SWMP effectiveness.

8.2 Nonpoint Sources

Reductions of sediment loading from nonpoint sources will be achieved using a phased and adaptive management approach. Voluntary, incentive-based mechanisms will be used to implement NPS management measures in order to assure that measurable reductions in sediment loadings can be achieved for the targeted impaired water. Cooperation and active participation by the general public and various industry, business, and environmental groups is critical to successful implementation of TMDLs. Local citizen-led and implemented management measures offer the most efficient and comprehensive avenue for reduction of loading rates from nonpoint sources. TMDL implementation activities will be accomplished within the framework of Tennessee's Watershed Approach (ref.: http://www.state.tn.us/environment/wpc/watershed/).

The Watershed Approach is based on a five-year cycle and encompasses planning, monitoring, assessment, TMDLs, WLAs/LAs, and permit issuance. It relies on participation at the federal, state, local and nongovernmental levels to be successful. The *Caney Fork River Watershed Management Plan* was developed in 2003 and describes, in general, the partnerships among government agencies and stakeholder groups and the roles that each play in the effort to improve water quality in the Caney Fork River Watershed, including the reduction of pollutant loading.

Governmental agencies include:

- Natural Resources Conservation Service, <u>http://prms.nrcs.usda.gov/prms</u>
- USGS Water Resource Programs—Tennessee District, <u>http://water.usgs.gov/</u>
- U.S. Environmental Protection Agency, <u>http://epa.gov/</u>
- U.S. Fish and Wildlife Service, http://www.fws.gov, (931)-528-6481
- Tennessee Valley Authority, <u>http://www.tva.gov</u>
- TDEC Division of Water Supply, http://www.state.tn.us/environment/dws,
- http://www.state.tn.us/environment/water.php
- Tennessee Department of Agriculture, http://www.state.tn.us/agriculture/
- Tennessee Wildlife Resources Agency, <u>http://www.state.tn.us/twra/</u>

Local stakeholder groups include:

• Caney Fork Watershed Association

With respect to the reduction of nonpoint source sediment loading and habitat alteration, government agency and stakeholders should, at a minimum, be directed to:

- Implement and maintain conservation farming, including conservation tillage, contour strips and no till farming
- Install grass buffer strips along streams
- Reduce activities within riparian areas
- Minimize road and bridge construction impacts on streams
- 8.3 Evaluation of TMDL Effectiveness

The effectiveness of the TMDL will be assessed within the context of the State's rotating watershed management approach. Watershed monitoring and assessment activities will provide information by which the effectiveness of sediment loading reduction measures can be evaluated. Monitoring data, ground-truthing, and source identification actions will enable implementation of particular types of BMPs to be directed to specific areas in the subwatersheds. These TMDLs will be reevaluated during subsequent watershed cycles and revised as required to assure attainment of applicable water quality standards.

9.0 PUBLIC PARTICIPATION

In accordance with 40 CFR §130.7, the proposed sediment TMDLs for the Caney Fork River watershed was placed on Public Notice for a 35-day period (March 21, 2005 through April 25, 2005) and comments solicited. Per request, the comment period was extended to July 31, 2005. Steps that were taken in this regard include:

- 1) Notice of the proposed TMDLs was posted on the Tennessee Department of Environment and Conservation website. The notice will invite public and stakeholder comments and provide a link to a downloadable version of the TMDL document.
- 2) Notice of the availability of the proposed TMDLs (similar to the website announcement) was included in one of the NPDES permit Public Notice mailings.
- 3) A letter was sent to the Caney Fork Watershed Association advising them of the proposed sediment TMDLs and their availability on the TDEC website.
- 4) A draft copy of the proposed sediment TMDLs was sent to the City of Cookeville, Wilson County and Tennessee Department of Transportation (TDOT). These entities are covered by MS4 permits under the Phase II storm water regulations.
- 5) A public meeting was held on June 21, 2005 in Cookeville to present information regarding the proposed Caney Fork Sediment TMDLs and answer questions. The meeting was attended by nine persons representing various governmental and stakeholder groups.

 An additional meeting was held on July 18, 2005 with the Save Our Cumberland Mountains stakeholder group to further discuss Tennessee's TMDL program and the Caney Fork Sediment TMDLs.

By the end of the extended public comment period, written comments were received from the Caney Fork Watershed Association and the Save Our Cumberland Mountains stakeholder group. These comments are included as Appendix G.

10.0 FURTHER INFORMATION

Further information concerning Tennessee's TMDL program can be found on the Internet at the Tennessee Department of Environment and Conservation website:

http://www.state.tn.us/environment/wpc/tmdl/

Technical questions regarding <u>these TMDLs</u> should be directed to the following members of the Division of Water Pollution Control staff:

Mary L. Wyatt, Watershed Management Section e-mail: <u>Mary.Wyatt@state.tn.us</u>

Bruce R. Evans, P.E., Watershed Management Section e-mail: <u>Bruce.Evans@state.tn.us</u>

Sherry H. Wang, Ph.D., Watershed Management Section e-mail: <u>Sherry.Wang@state.tn.us</u>

REFERENCES

- Midwest Plan Service. 1985. Livestock Waste Facilities Handbook, 2nd Edition. US Department of Agriculture and various universities. MWPS-18.
- OMAFRA. 2000. *Factsheet: Universal Soil Loss Equation (USLE)*. Ontario Ministry of Agriculture, Food and Rural Affairs website: <u>www.gov.on.ca/OMAFRA/english/engineer/facts/00-001.htm</u>.
- Sun, G. and S.G. McNulty. 1998. *Modeling Soil Erosion and Transport on Forest Landscape*. Proceedings of Conference 29, International Erosion Control Association. pp.187-198.
- Swift, Lloyd W. 2000. *Equation to Dissipate Sediment from a Gridcell Downslope*. U.S. Forest Service.
- TDEC. 2000. *Tennessee Ecoregion Project 1994 1999.* State of Tennessee, Department of Environment and Conservation, Division of Water Pollution Control, December, 2000.
- TDEC. 2000a. General NPDES Permit for Storm Water Discharges Associated With Construction Activity. State of Tennessee, Department of Environment and Conservation, Division of Water Pollution Control, June 2000. This document is available on the TDEC website: <u>http://www.state.tn.us/environment/permits/conststrm.php</u>.
- TDEC. 2002. NPDES General Permit for Discharges from Small Municipal Separate Storm Sewer Systems. State of Tennessee, Department of Environment and Conservation, Division of Water Pollution Control, February 2003. This document is available on the TDEC website: http://www.state.tn.us/environment/wpc/stormh2o/MS4II.php.
- TDEC. 2003. General NPDES Permit for Discharges of Storm Water Runoff and Process Wastewater Associated With Ready Mixed Concrete Facilities (Permit No. TNG110000). State of Tennessee, Department of Environment and Conservation, Division of Water Pollution Control, December 2003. This document is available on the TDEC website: http://www.state.tn.us/environment/permits/concrete.php.

TDEC. 2004. *Final Version, Year 2002 303(d) List.* State of Tennessee, Department of Environment and Conservation, Division of Water Pollution Control, January, 2004.

- TDEC. 2004a. 2004 305(b) Report, The Status of Water Quality in Tennessee. State of Tennessee, Department of Environment and Conservation, Division of Water Pollution Control, August, 2004.
- TDEC. 2004b. Rules of Tennessee Department of Environment and Conservation, Tennessee Water Quality Control Board, Division of Water Pollution Control, Chapter 1200-4-3 General Water Quality Criteria, January, 2004.
- USDASCS. 1983. *Sedimentation*. National Engineering Handbook, Section 3, Chapter 6. U.S. Department of Agriculture Soil Conservation Service.

- USEPA. 1991. *Guidance for Water Quality–based Decisions: The TMDL Process.* U.S. Environmental Protection Agency, Office of Water, Washington, DC. EPA-440/4-91-001, April 1991.
- USEPA. 1997. *Ecoregions of Tennessee*. U.S. Environmental Protection Agency, National Health and Environmental Effects Research Laboratory, Corvallis, Oregon. EPA/600/R-97/022.
- USEPA. 1999. *Protocol for Developing Sediment TMDLs*. U.S. Environmental Protection Agency, Office of Water, Washington, DC. EPA 841-B-99-004, October 1999.
- USEPA. 2001. Watershed Characterization System User's Manual. U.S. Environmental Protection Agency, Region 4, Atlanta, Georgia.
- USEPA. 2003. Developing Water Quality Criteria for Suspended and Bedded Sediments (SABS) Draft. U.S. Environmental Protection Agency, Office of Water, Office of Science and Technology, Washington, DC. August, 2003.
- Yagow, E.R., V.O. Schanholtz, B.A. Julian, and J.M. Flagg. 1998. *A Water Quality Module for CAMPS*. American Society of Agricultural Engineers Meeting Presentation Paper No. 88-2653.

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) Page A-1 of A-7

APPENDIX A

Example of Stream Assessment (Snow Creek)

Page A-2 of A

	0 01	SN0W.001.4	45M		oupportoit	(PS)
STREAM:	SNOW CRK	0 // 0				V	
STREAM LOCATION:	tory Horese	Bend Rom	Smow CR	ERQ?) O	meetox	to condit !	6/19
COUNTY	SHE estab	10/21/98		ASSESSO	RS:	H M Good	ehi
MA IOR BASIN	Smith	2		DATE:		595 08/24	102
WBID#/HUC:	TILACIZ.	10801		TIME:		6:00 - 8:0	open
WBID NAME:		+ TPize		STREAM	ILE:	<u>R[n:]. Y</u>	11.
LAT/LONG DEC:	36.23 /9.4	44/-85 88 2:	222	ADB SEGN	FNT.	- sna	(\mathcal{F})
USGS QUAD:	322 NW 6	selos suil.	TN	3020:		·	
Drainage:	C.F. RM2.	8).		ELEVATIO	N (ft):	480-500	- 10
ECOLOGICAL SUBREGI	ION: 7/6 (ONB)	36 13	55"(GAZETTEE	R PAGE:	0.55	
OBJECTIVES:	ws ss	185 53	14"1	Field #	# four	CFY TRIBS=0	C/60
SAMPLES COLLECTE	D		METERS	SED:	H.yoes 19	B I MINI	Some
pH	8.15 / 8	16 SU	Aman	DISSOI VED	OXYGEN	221/00	2 00
CONDUCTIVITY	2621 12	29UMHOS	067 00	TIME	CATOLI	6.10	PPI
TEMPERATURE	23.69 12	2.69 0	a67	OTHERS	Batt	ung1 /11	for some
Previous 48 hours Precip:	UNKNOWN NC	NE INTE	MODEHATA	HEAL	FLOODING	15.0/0/99	10 6
Ambient Weather:	SUNDO / CL	OUDY BREEZ	Y BAIN	SNOW	Current Tem	nº good no	
CHEMICAL SAMPLES COL	LECTED: Mone	6) Present			- an one roll	- 10 year	rse
Photographs : Slides Pri	ints Digitad Ph	oto #5: #114	#12 dis = (For	01 SNO 1.4	u.d		
BIOLOGICAL ASSESSMEN	T: Be	nthics) Fish	Algae	Other:			
Type of benthic sample:	STORECON	SQ KICK SQ BAI	NK DENDY	SURBER	OTHER:		
Taxa List Attached? (Ye	≥ / No Sp	ecimens collected	?FYOT N	Sample Log	Numbers:	N0208614	
WATERSHED CHARAC	CTERISTICS		App. % of	watershed ob	served:	2.7	- 18 1
UPSTREAM SURROUND	ING LAND USE: (e	stimated %)		NOTES:			
PASTURE 53-652	URBAN	RES	10/Rd 2.3				
Row Crops	INDUSTRY	OTHE	B	1			
OREST 15-252	MINING			_	÷.,		
MPACTS OBSERVED	AND POSSIBLE	SOURCES	Describe cau	icoc naturo o	ad rate man	oltude.	
la vena	al lander	and total	Describe cau	ises, nature, a	ind rate mag	nitude	_
	of second use	and and a	upore				
			PREV=10/	21/98 = W.	SWBA(1	AMG)=(PS	-)
		THE STRUCTURES AND ADDRESS OF ADDRESS AND ADDRESS AND ADDRESS	C212064241				
OVERALL ASSESSME	NT & SUMMARY:						
OVERALL ASSESSME	NT & SUMMARY:						
DVERALL ASSESSME	NT & SUMMARY: Yad clean fl	low in figh	sitt (pa	nd (ble	intering	ingreas	
DVERALL ASSESSME THis creak 1 also crek 15	NT & SUMMARY: Had clean fe	ow in the	sitt for	nd (ble	interior	in areas	
DVERALL ASSESSME THIS real 1 also ret 1s flambed by	Had clean fe incised of Nords + pa	ow in their	sitt laa Jitle to M	nd (ble to vorus Tideo re	meting m y c	th areas	
DVERALL ASSESSME THIS CROCK / also cake /s flambed by observed	NT & SUMMARY Had clean fe incised of nords, + pa it should h	low in the line when the second se	att laa Title to M malucturi	nd Colle to marine title n ty = 262	mating m y c Like 1/2629	in areas et being	ae
DVERALL ASSESSME THIS CROCK / also crek /s flynked by Observed iga Multi	NT & SUMMARY Had clean fe incised of nords + par it should h auma to wa	low in figh imeliands it wands be noted a te= uniden	att lpa Title to M molucturi tifiable	nd (bla to varue Tideo n 4 = 262 Huis cr	meting m y c c kin 1/2629 ue loo	in areas ek being (2) the br simil	an an
DVERALL ASSESSME THIS CROCK / also cet /s flynked by Observed is Multi to if app	NT & SUMMARY Had clian fe Micised D Nords, + pa it Should I suma to war earance 4 d	low in the interview of iting lands the noted of ter= unident itars ago.	sitt foa Title to M moluction tifiable	nd (bla to varia Tide n 4 = 262 Hui Cr (Tart = 4	1/2629 1/2629 1/2629	in areas et being (2) the be semile very low	ne
DVERALL ASSESSME THis creal 1 also cref 15 flynked by Observed is Multi to If's app Munters,	NT & SUMMARY Had clean fe incised of Nords + par it should to suma to was canance 4 de Mucro &	low in file interview and the noted of ter= unident fears ago.	pitt /pa little to M moluction tifiatte err/or	rd (bla to varue Tide a 4 = 262 This or Text = 4 ened co	1/2629 1/2629 1/2629 1/2629 1/18/2 =	in areas et being (2) the be semile very low	ne
DVERALL ASSESSME THis creal 1 also cref 15 flynked by Observed is Multip ports app Munters, + is abund	NT & SUMMARY Had clean for incised of Nords + par it should to suma to was earance 4 d Mucro & lant ous	low up fight meluhands itustands ter noted a ter unident lears ago lae brigt hall, et n	alt las little to M moluction tiliatte emplose to aver lo aver	rd (bla to varue Tide o Tide o 4 = 262 Huis Or Taxt = 4 ened co raffle o	1 2629 1 2629 12 200 18/2 = 100/2 = 100/2 = 100/2 = 100/2 =	in areas ek being (2) the be semile very low ut that te a	ne
DVERALL ASSESSME This creek / also crek /s flanked by Observed ira Multi to if app Mumbers, f it aprino darkened	NT & SUMMARY Had clian fe Macised D Nords + pa it should I sioma to was canance 4 d micro & ant ors appeare on	low in fight interviews ter= unident pars ago cally it g	att fa Liffe to M moluction tiliate err/or les a Slice las après d turne a	rd (bla to varia Tite n 4 = 262 Hais Cr Tat = 4 ened co raffle o ref 12 (1)	1 2629 1 269 1 269	in areas ek being D The En simile Very for Ultrate Ex a	ae ae
DVERALL ASSESSME THis creat 1 also irek 15 Agnked by Observed iga Multi is if's app numbers, + is abund darkened TWHE a Low	NT & SUMMARY Had clean fe incised o Nords + pa if Should sioma to was canance 4 d micro a lant origination appearance	low in fight interview ands the noted of the unident that ago the bright in ally it go ally it go ally it go ally it go ally it go	sitt fa ittle to M molicetion tiliate err/for les a slice les	rd (bla to varue Tide a tide a	1 2629 1 2629 12 200 18/2 = 100/2 50 100/2 50 100/	in areas ek being (2) the bi simile very low ut that te a Fy A hip	ne aa
DVERALL ASSESSME This creek / also cek /s flanked by Observed ira Multi to if appo Mumbers, + is alumbers, (Note: a faul	NT & SUMMARY Had clian fe Macised D Nords + fa it Should I auma to war earance 4 d Mucro & appearance appearance poor Habis	low in fight interviews it in lands be noted is ter= unidens inters ago. inter inidens inter ago. interviews intervi interviews inte	sitt fa Title to M molice turi tifiable to en /or les a slice les agrès d les agrès d les agrès d les agrès d	nd (bla to varia Tideo A Tideo A 4 = 262 Hai CA Tax = 4 and co raffle o raffle o raffle o	1/2629 1/269 1/200 1/200 1/200 1/200 1/200 1/200 1/200 1/2000 1/200000 1/20000000000	in areas et being (2) the bi simile very low ulthous te a	de
DVERALL ASSESSME This creat 1 also ret 15 Janbed by Jobsened is ret appoint Mumbers, + is alund Mode a faut BIORECON Seare -	NT & SUMMARY Had clean fe Mads + pa it should h auma to wa earance 4 d Micro b ant or appearance poor Habe	low in fight come who is if we lands be noted is ter= unidens pars ago. lang bright ially it g affect of the bat score = 1 18= 30 4	ait fa it lo to M molucturi til able til able to a Shall las quer 1 a theme of Habitats 3	rd (ble to norm Tide n Tide n 4 = 262 Hui Ch Hui Ch Int = 4 ened co refue o refue o refue o refue o refue o refue o refue o refue o	1/2629 1/269 1/200 1/200 1/200 1/200 1/200 1/200 1/200 1/200 1/200 1/200 1/200 1/200 1/200 1/200 1/200 1/2000 1	in areas ek being D the bi simile very low ultitote te a Fy H hip of gruss	A
DVERALL ASSESSME This creat 1 also irek 15 Lanbed by Observed ira Multi to 174 app Muniters, 4 is abund larcened Urte a faul BIORECON Seare- PT Families (+ add. taxa)	NT & SUMMARY Had clean fe incised of Nords, + pa. it should h auoma to war conance 4 h mucro b ant origination appearance prove Habei Tim = 4 Total	low 4 fight come who had the lands be noted () ter= unidens fars ago- lang bright had score =) 10 = 90 4 a) Families (+ add.	sitt faa itte to M maficetrus tifiable to a shiel to a shi	rd (ble to reprint Tisko ni ty = 262 Hui Chi Text = 9 ened co raffle o ref is (8 RiFF +	inteting In y C 2629 1006 102629 1006	in areas et being (2) the bi simile very low ultitote te a Fy A hip of guess xa = 2	12.
DVERALL ASSESSME This creat 1 also irek 15 Lanked by Inserved ira Multi to 175 appo Munters, + is alund larcened INDE: a faul BIORECON Geores 4 EPT Families (+ add. taxa) EPA Habitat Assessment	NT & SUMMARY Had clean fe incised of Nords, + fa. it should h auoma to war canance 4 h mucro b ant orisi appearance prove Habei = 4 Total Completed ?	low 44 fight come what if we lands be noted (1) ter= unident fars ago- gae bright half score =) 18 = 30 4 a) Families (+ add. SCORE	aitt Jaa itte to M maluetturi tiliable tiliable tes a slice las appèr 1 a turne a 106 Habitats = 3. taxa) = 18 (+2)	rd (ble to reprint Tisko ni ty = 262 This On This On This On This On This On the O Calle O Cal	intering m y C 1/2629 1/262	An areas et being bi simili bi simili very low ulthole to guess xa = 2 (HIGH)	2

Example of Stream Assessment – Snow Creek at RM 1.4 (6 pages)

revised 8-10-98

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) Page A-3 of A-7

	STE	REAM SURVE	YFORM	÷			×
PHYSICAL STREAM C	HARACTERISTICS		Length of str	eam reach as	ssessed =	1000'	а т _{ар}
	SURROUNDING LAND L	USE (facing dow	(nstream) :	olong per la constante			
ESTIMATE % RDB	LDB	RDB	LDB		RDB	LDB	
PASTURE 152	70-659 URBAN			BESID			
CROPS	INDUSTRY	,+		HESID.			
	INDUSTRY	r		ROAD	802	206	
FOREST 54	10-152 MINING			OTHER	-273		
% CANOPY COVER: Est	imated: 40 - 70 Open(0-10)) Pertly Shad	ed(11-45)	Mostly Shaded	(46-80P	Shaded(>80)	
Meas	ured: U/S	D/S		IB /			
BANK HEIGHT (m): A. 2	-0.01	HIGHIN			<u>.</u>	no <u></u>	
		Inter I		(11).	(4)	100	
SEDIMENT DEPOSITS:	NONE SLIGHT	MODERATE)	EXCESSIVE /	BLANKED		. 12 · *	25
TUPPIDITY SLUDGE	MUD SAND	SILT '	NONE	OTHER	Co	ntaminated	Y or N
TURBIDITY CLEAR /	SLIGHT MODERATE	E molt	OPAOLIE				
ALGAE PRESENT?	NONE SLIGHT	MODERATE	CHOKING	TYPE	montal	an	
AQUATIC VEGET.	ROOTED FLOATING	TYPE MU	nimal		aland	land .	2
RAPID PERIPHYTON ASS	ESS: 1% Filament	tous - Wate	u cress-	of Ichionizah	- Cubatrat	san	
% Direct Sunlig	ht = / Mean Thick	iness Bank -/ik	se they	11			
WATER OUALITY COMM	ENITE (all choose adas asta	ulcos Hallin -	-11	art	1	11	
WATER GOALTT COMMI	ENTS: (oil sheen, odor, coloi	rs, etc) _	pigh	selt peo	ument	Joand -	
_ alight aroms	yo waler (?)			/	/		124
		90 - E	1. S.	-		V	() (, , , , , , , , , , , , , , , , , ,
SUBSTRATE (%)	(Visual estimates	s)					
	RIFFLE RUN	POOL		B	FELE		001
BOULDER (> 10")	15 % 5	% ~ %	-	EDTU (m)	of ull		UUL I
COBBLE (2.5.10")		70 3 70			2-9	9-1.0 1	0-2-0
	43 % 13	% 10 %	v	VIDTH (m)	2-41	4-8	5-10-
GRAVEL (0.1-2.5")	10 % 30	% 15 %	REACH LE	NGTH (m)	8'	15 41	10'
BEDROCK	~ % _	% %		17			
SAND (gritty)	5 % 20	% 30 %		Staff Gauga	Banch Lite		
SILT (fine)	20 % 20	0/ 20 0/		VEL OOITU	Sencir HL.		
	20 10 20	70 30 70		VELOCITY (F	s) .		+
CLAY (SIICK)	- % - 0	% %		FLOW (C	FS)		
DETRITUS (CPOM)	5 % 10 9	% 10 %	1	HABITAT AS	SESSMENT	SCORE #:	101
MUCK-MUD (FPOM)	- % - 0	% - %		BR #		GP #	06
MARL (shell frags.)	- % - «	% - %				· · · · ·	
Gradient (sample reach):	Elat Low Martin	70 70	0				
Circulation (Sumple reach).	LOW AND	High.	Cascade			<u></u>	
Size (stream width) :	10-25 V. Small (<1	1.5m) Small (1	.5-3m Med	(3=10m) a	rge (10-25n	n) Very Lrg	(>25m)
HABITAT QUALITY COMM	IENTS: (bank erosion, ripar	rian, pool/riffle va	riety, etc)	Det 1	ncised	4, hia	2
gesement & Ban	k eroreom - one a	rea of A	askly an	of nill	1. 14 0	Khlak	· · · · · ·
Mynimal Ba	mb sents a	1011.0-161	n- bohl	sall	10	Anan t	
	1111. 1120 0 0 0 1 70	The me	pop	angues	co p	usen -	
STREAM SKETCH	Carlor Andrew College and the second s	www.www.autoration.com		/			
STREAM SKETCH		H CHILDREN CHILD	2-				- Kon
0		-16					ALC.
	- 60		/)-	past	une -	- 6	D R
	- IN	M	~-	-T		-11	NA
CAL WH		Sol y	26	A	1	- Charles	1/21
	-V. W. Cisto	1 AMIT	THAL	SVA.	2)/	~)~	KY IN
	BIA ALL COOL		White S		20	HVA	1-111
PICK LIP	- Charles Cont	gall	-0-		E X	- ull	/MAN /
Storigt	The ALL	17.		20510	<u>n</u> 7	VY	/ XANY/
		1 000				TA I	/ //
1 top		(poor	to	All I		JAN/	XXXX
100	- R'I-		アノケ	scont	un -	The the	INYT
11 00	DH DH	\sim	All	E In	O - Real	111	XVIX
	perm ff	Run 1	KING Y	2012	1990	000 /10/	VIII-
	- AN	MAILLA	UNIL 4	4 of othe	Sr A	3 60	1197
1	115	THE	SALIT	LUMP VC	2000	A. M. M	$\gamma / \langle \rangle$
	IMAL A B	TIMAN	>xx	ACTUNT.	00	111181	100
19 1. 1. 1	MA SP	IN WAL	The o	MTASTE	501	ARAA NAT U	ICN
		Ma in	1 MON	174	RATIN	MYY A	91
in the		MA ROD	anan	K I	-1	WA	Ale
NANTO	Then Imi		9-P	MITT	TIM	1E)"
, all a D	1 11 11/ 1	VU UN	60	·un	N	R	/
UN TI	y y yer	v vv -1			a	KI	
			LOAD	m	(S)	-	
Unda	2 CONE	\mathcal{D}		a	h	T	>
- and		Page 2	11-	= 71		revised 8-	0-98

1 :

HABITAT ASSESSMENT FIELD DATA SHEET-HIGH GRADIENT STREAMS (FRONT)

ς,

60

STREAM NAME	Smow Opt (D)	LOCATION 4/5 All Horeas His Bend RD
STATION #	RIVERMILE	STREAM CLASS
LAT	LONG	RIVER BASIN OF USS
STORET #	TNOOI (D)	AGENCY ///PC
INVESTIGATORS	Ame	
FORM COMPLETE	ED BY AMG	DATE OR by 103, SAT REASON FOR SURVEY

0.0	Habitat	Contract, All 25, 2000	Conditio	n Category	an a		
	Parameter	Optimal	Suboptimal	Marginal	Poor		
	1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.		
-	SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1.0		
n sampling reac	2. Embeddedness	Gravel, cobble, and boulder particles are 0- 25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25- 50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50- 75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.		
ipa	SCORE /0	20 19 18 17 16	15 14 13 12 1	10 9 7 6	5 4 3 2 1 0		
rs to be evalua	3. Velocity/Depth Regime	All four velocity/depth regimes present (slow- deep, slow-shallow, fast- deep, fast-shallow). (Sow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast- shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).		
mete	SCORE 15	20 19 18 17 16	3 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		
Para	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% (<20% for low-gradient streams) of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% (20-50% for low- gradient) of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% (50-80% for low-gradient) of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% (80% for low- gradient) of the bottom changing frequently; pools almost absent due to substantial sediment deposition.		
	SCORE 5	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	(5) 4 2 1 0		
	5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very nitle water in channel and mostly present as standing pools.		
	SCORE 19	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0		

(see comments on SS Form) 4 on BACK

Total= 106

.

: 1

	Habitat			T		Condi	tion Cat	ion Category						
	Parameter	Optimal		S	ubopt	imal		Mar	ginal			Pe	oor	
6. Channel Alteration		dredging absent or minimal; stream with normal pattern.		of the channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.			s Cha exte or si pres and reac disn	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.			Banks shored with s gabion or cement; ov 80% of the stream re- channelized and a disrupted. Instream habitat greatly altered removed entirely.			ith it; over m rea am tered
	SCORE 14	20 19 18 17	16	15 14	13	12 1	1 10	9	3 7	6	5	4 3	2	1
man 9 mil	7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; rat of distance between riffles divided by widd of the stream <7:1 (generally 5 to 7); variety of habitat is ke; In streams where riffle; are continuous, placement of boulders other large, natural obstruction is importan	io h y. s or	Occurren infrequen between r by the wi stream is 15.	ce of i it; dist iffles dth of betwe	riffles ance divided the en 7 to	Occa bend provi distan divid the st to 25	sional ri bottom de some ice betw ed by th ream is	ffle or contou habitat cen riff e width between	rs les of 15	Gener or sha habita riffles width ratio o	ally all llow rif t; distar divided of the s f >25.	flat fles: nce l d by treat	wate poo betwo the m is
	SCORE 16	20 19 18 17	6	15 14	13	12 11	10	9 8	7	6	5 4	3	2	1
	8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimai; little potential for future problems. <5% of bank affected.	11 core	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in teach has areas of erosion.			Mode 60% c areas erosio floods	Moderately unstable; 30- 60% of bank in reach has areas of erosion; high erosion potential during floods.			Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughin; 60-100% of bank has erosional scars.			oded ight ghing nas
	SCORE 4 (DD)	Left Bank 10 9	+	8	7	6	5	4	G		2	1		0
	SCORE (RB)	Right Bank 10 9		8	7	6	5	4	3		2	1		0
	9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	7 st cv o rec fu po has tr re	0-90% of treambank overed by egetation, f plants is presented vident but ill plant gr otential to ctent; mor- alf of the p ubble heig maining.	the surfa native but of not w ; disru not af owth any g e than otentight	ces ell- iption ffecting reat one- ial plant	50-70% stream covered disrupt patches closely vegetat than on potentia height n	6 of the bank surd d by veg ion obvis of bare cropped ion com e-half o al plant e-mainin	faces etation; ous; soil or i mon; le: f the stubble ig.	55	Less tha streamb covered disruption vegetation removed 5 centim average	an 50% ank sur by veg on of st on is ve on has l to teters of stubble	of the face etation rean rean rean rean rean rean rean rea	he s ion; hban iigh; s in ght.
	SCORE 6 (LB)	Left Bank 10 9		8	7	(\circ)	5	4	3	1	2	1		0
-	SCORE (RB)	Right Bank 10 9		8	7	6	5	4	3	1	1	1		0
10. Riparian Vegetative Zone Width (score each bank riparian zone)		Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear- cuts, lawns, or crops) have not impacted zone.	W 12 ac zo	idth of rip -18 meter tivities hav ne only m	arian s; hun ve inn inima	zone nan pacted lly.	Width o 6-12 me activitie zone a g	f riparia ters; hui s have in reat dea	n zone man mpacted l.		Width of 6 meter iparian v 6 human	s: little vegetati activit	or n or n on d ies.	ne lo lue
S	SCORE (LB)	Left Bank 10 9		8 7	7	6	5	4	3	+	2	R		0
S	CORE (RB)	Right Bank 10 9							2000	+-	-	2	_	

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

76

Total Score 106 35 High seelement & Majon Niparian love...

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) Page A-6 of A-7



١,

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final)



Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) Page B-1 of B-7

APPENDIX B

Watershed Sediment Loading Model

WATERSHED SEDIMENT LOADING MODEL

Determination of target average annual sediment loading values for reference watersheds and the sediment loading analysis of waterbodies impaired for siltation/habitat alteration was accomplished utilizing the Watershed Characterization System (WCS) Sediment Tool (v. 2.6). WCS is an ArcView geographic information system (GIS) based program developed by USEPA Region IV to facilitate watershed characterization and TMDL development. WCS consists of an initial set of spatial and tabular watershed data, stored in a database, and allows the incorporation of additional data when available. It provides a number of reporting tools and data management utilities to allow users to analyze and summarize data. Program extensions, such as the sediment tool, expand the functionality of WCS to include modeling and other more rigorous forms of data analysis (USEPA, 2001).

Sediment Analysis

The Sediment Tool is an extension of WCS that utilizes available GIS coverages (land use, soils, elevations, roads, etc), the Universal Soil Loss Equation (USLE) to calculate potential erosion, and sediment delivery equations to calculate sediment delivery to the stream network. The following tasks can be performed:

- Estimate extent and distribution of potential soil erosion in the watershed.
- Estimate potential sediment delivery to receiving waterbodies.
- Evaluate effects of land use, BMPs, and road network on erosion and sediment delivery.

The Sediment Tool can also be used to evaluate different scenarios, such as the effects of changing land uses and implementation of BMPs, by the adjustment of certain input parameters. Parameters that may be adjusted include:

- Conservation management and erosion control practices
- Changes in land use
- Implementation of Best Management Practices (BMPs)
- Addition/Deletion of roads

Sediment analyses can be performed for single or multiple watersheds.

Universal Soil Loss Equation

Erosion potential is based on the Universal Soil Loss Equation (USLE), developed by Agriculture Research Station (ARS) scientists W. Wischmeier and D. Smith. It has been the most widely accepted and utilized soil loss equation for over 30 years. The USLE is a method to predict the average annual soil loss on a field slope based on rainfall pattern, soil type, topography, crop system, and management practices. The USLE only predicts the amount of soil loss resulting from sheet or rill erosion on a single slope and does not account for soil losses that might occur from gully, wind, or tillage erosion. Designed as a model for use with certain cropping and management systems, it is also applicable to non-agricultural situations (OMAFRA, 2000). While the USLE can be used to estimate long-term average annual soil loss, it cannot be applied to a specific year or a specific storm. Based on its long history of use and wide acceptance by the forestry and agricultural communities, the USLE was considered to be an

adequate tool for estimating the relative long-term average annual soil erosion of watersheds and evaluating the effects of land use changes and implementation of BMP measures.

Soil loss from sheet and rill erosion is primarily due to detachment of soil particles during rain events. It is the cause of the majority of soil loss for lands associated with crop production, grazing areas, construction sites, mine sites, logging areas and unpaved roads. In the USLE, five major factors are used to calculate the soil loss for a given area. Each factor is the numerical estimate of a specific condition that affects the severity of soil erosion in that area. The USLE for estimating average annual soil erosion is expressed as:

$$A = R \times K \times LS \times C \times P$$

where:

A = average annual soil loss in tons per acre

R = rainfall erosivity index

K = soil erodibility factor

LS = topographic factor - L is for slope length and S is for slope

C = crop/vegetation & management factor

P = conservation practice factor

Evaluating the factors in USLE:

R - Rainfall Erosivity Index

The rainfall erosivity index describes the kinetic energy generated by the frequency and intensity of the rainfall. It is statistically calculated from the annual summation of rainfall energy in every storm, which correlates to the raindrop size, times its maximum 30-minute intensity. This index varies with geography.

K - Soil Erodibility Factor

This factor quantifies the cohesive or bonding character of the soil and its ability to resist detachment and transport during a rainfall event. The soil erodibility factor is a function of soil type.

LS - Topographic Factor

The topographic factor represents the effect of slope length and slope steepness on erosion. Steeper slopes produce higher overland flow velocities. Longer slopes accumulate runoff from larger areas and also result in higher flow velocities. For convenience L and S are frequently lumped into a single term.

C – Crop/Vegetation & Management Factor

The crop/vegetation and management factor represents the effect that ground cover conditions, soil conditions and general management practices have on soil erosion. It is the most computationally complicated of USLE factors and incorporates the effects of: tillage management, crop type, cropping history (rotation), and crop yield.

P - Conservation Practice Factor

The conservation practice factor represents the effects on erosion of Best Management Practices (BMPs) such as contour farming, strip cropping and terracing.

Estimates of the USLE parameters, and thus the soil erosion as computed from the USLE, are provided by the Natural Resources Conservation Service's (NRCS) National Resources Inventory (NRI) 1994. The

NRI database contains information of the status, condition, and trend of soil, water, and related resources collected from approximately 800,000 sampling points across the country.

The soil losses from the erosion processes described above are localized losses and not the total amount of sediment that reaches the stream. The fraction of the soil lost in the field that is eventually delivered to the stream depends on several factors. These include, the distance of the source area from the stream, the size of the drainage area, and the intensity and frequency of rainfall. Soil losses along the riparian areas will be delivered into the stream with runoff-producing rainfall.

Sediment Modeling Methodology

Using WCS and the Sediment Tool, average annual sediment loading to surface waters was modeled according to the following procedures:

1. A WCS project was set up for the watershed that is the subject of these TMDLs. Additional data layers required for sediment analysis were generated or imported into the project. These included:

DEM (grid) – The Digital Elevation Model (DEM) layers that come with the basic WCS distribution system are shapefiles of coarse resolution (300x300m). A higher resolution DEM grid layer (30x30m) is required. The National Elevation Dataset (NED) is available from the USGS website and the coverage for the watershed (8-digit HUC) was imported into the project.

Road – A road layer is needed as a shape file and requires additional attributes such as road type, road practice, and presence of side ditches. If these attributes are not provided, the Sediment Tool automatically assigns default values: road type - secondary paved roads, side ditches present and no road practices. This data layer was obtained from ESRI for areas in the watershed.

Soil – The SSURGO (1:24k) soil data may be imported into the WCS project if higher-resolution soil data is required for the estimation of potential erosion. If the SSURGO soil database is not available, the system uses the STATSGO Soil data (1:250k) by default.

MRLC Land Use – The Multi-Resolution Land Characteristic (MRLC) data set for the watershed is provided with the WCS package, but must be imported into the project.

 Using WCS, the entire watershed was delineated into subwatersheds corresponding to USGS 12-digit Hydrologic Unit Codes (HUCs). These delineations are shown in Figure 6. Land use distribution for the impaired subwatersheds is summarized in Appendix C. All of the sediment analyses were performed on the basis of these drainage areas.

The following steps are accomplished using the WCS Sediment Tool:

3. For a selected watershed or subwatershed, a sediment project is set up in a new view that contains the data layers that will be subsequently used to calculate erosion and sediment delivery.

- 4. A stream grid for each delineated subwatershed was created by etching a stream coverage, based on Reach File v. 3 (Rf3) or National Hydrography Dataset (NHD), to the DEM grid.
- 5. For each 30 by 30 meter grid cell within the subwatershed, the Sediment Tool calculates the potential erosion using the USLE based on the specific cell characteristics. The model then calculates the potential sediment delivery to the stream grid network. Sediment delivery can be calculated using one of the four available sediment delivery equations:
 - Distance-based equation (Sun and McNulty 1998) Mad = M * (1-0.97 * D/L) where: Mad = mass moved (tons/acre/yr) M = sediment mass eroded (ton) D = least cost distance from a cell to the nearest stream grid (ft) L = maximum distance the sediment may travel (ft)
 Distance Slope based equation (Yagow et al. 1998)
 - Distance Slope-based equation (Yagow et al. 1998) DR = exp(-0.4233 * L * So) So = exp (-16.1 * r/L+ 0.057)) - 0.6 where: DR = sediment delivery ratio L = distance to the stream (m) r = relief to the stream (m)
 - Area-based equation (USDASCS 1983) DR = 0.417762 * A^(-0.134958) - 1.27097, DR <= 1.0 where: DR = sediment delivery ratio A = area (sq miles)
 - WEEP-based regression equation (Swift 2000) $Z = 0.9004 - 0.1341 * X^2 + X^3 - 0.0399 * Y + 0.0144 * Y^2 + 0.00308 * Y^3$ where: Z = percent of source sediment passing to the next grid cell X = cumulative distance down slope (X > 0) Y = percent slope in the grid cell (Y > 0)

The distance slope based equation (Yagow et al. 1998) was selected to simulate sediment delivery in the Caney Fork River Watershed.

- 6. The total sediment delivered upstream of each subwatershed "pour point" is calculated. The sediment analysis provides the calculations for six new parameters:
 - Source Erosion estimated erosion from each grid cell due to the land cover
 - Road Erosion estimated erosion from each grid cell representing a road
 - Composite Erosion composite of the source and road erosion layers
 - Source Sediment estimated fraction of the soil erosion from each grid cell that reaches the stream (sediment delivery)
 - Road Sediment estimated fraction of the road erosion from each grid cell that reaches the stream
 - Composite Sediment composite of the source and erosion sediment layers

The sediment delivery can be calculated based on the composite sediment, road sediment, or source sediment layer. The sources of sediment by each land use type is determined showing the types of land use, the acres of each type of land use, and the tons of sediment estimated to be generated from each land use.

7. For each subwatershed of interest, the resultant sediment load calculation is expressed as a long-term average annual soil loss expressed in pounds per year calculated for the rainfall erosivity index (R). This statistic is calculated from the annual summation of rainfall energy in every storm (correlates with raindrop size) times its maximum 30-minute intensity.

Calculated erosion, sediment loads delivered to surface waters, and unit loads (per unit area) for subwatersheds that contain waterbodies documented on the 2002 303(d) List as impaired for siltation and/or habitat alteration are summarized in Tables B-1, B-2 and B-3, respectively.

HUC-12	EROSION								
Subwatershed	Source Road		Total	% Source	% Deed				
(05130108)	[tons/yr]	[tons/yr]	[tons/yr]	//source	/%KUau				
0101	5872	7787	13659	43.0	57.0				
0102	2252	5162	7414	30.4	69.6				
0104	10249	11058	21307	48.1	51.9				
0202	5255	4788	10043	52.3	47.7				
0203	322	1681	2002	16.1	83.9				
0406	12305	2910 15215 8		80.9	19.1				
0503	15361	8288	23650	65.0	35.0				
0602	14842	6940	21782	68.1	31.9				
0702	15808	11958	27766	56.9	43.1				
0703	16740	4997	21737	77.0	23.0				
0704	11609	4339	15948	72.8	27.2				
0805	10810	19237	30046	36.0	64.0				
0806	31558	9511	41068	76.8	23.2				
0807	16623	7292	23915	69.5	30.5				

Table B-1 Calculated Erosion - Subwatersheds With Waterbodies Impaired Due to Siltation/Habitat Alteration

HUC-12	SEDIMENT								
Subwatershed	Source Road		Total	%Sourco	%Poad				
(05130108)	[tons/yr]	[tons/yr]	[tons/yr]	//source	70ROau				
0101	1987	3316	5303	37.5	62.5				
0102	927	2313	3239	28.6	71.4				
0104	3325	4704	8029	41.4	58.6				
0202	1433	1815	3248	44.1	55.9				
0203	123	707	707 830		85.2				
0406	4537	1120	5657	80.2	19.8				
0503	5882	3525	9408	62.5	37.5				
0602	3123	2488	5611	55.7	44.3				
0702	3584	3401	6985	51.3	48.7				
0703	3662	1291	4953	73.9	26.1				
0704	3588	1798	5386	66.6	33.4				
0805	4325	8299	12624	34.3	65.7				
0806	14708	4594	19303	76.2	23.8				
0807	6058	3602	9660	62.7	37.3				

Table B-2Calculated Sediment Delivery to Surface Waters - Subwatersheds with
Waterbodies Impaired Due to Siltation/Habitat Alteration

Table B-3	Unit Loads - Subwatersheds With Waterbodies Impaired Due to Siltation/Habitat
	Alteration

HUC-12		UNIT LOADS	
Subwatershed	Erosion	Sedin	nent
(05130108)	[tons/ac/yr]	[tons/ac/yr]	[lbs/ac/yr]
0101	0.364	0.142	283
0102	0.276	0.121	241
0104	0.423	0.159	319
0202	0.389	0.126	252
0203	0.205	0.085	170
0406	1.492	0.555	1109
0503	0.578	0.230	460
0602	0.616	0.159	317
0702	0.824	0.207	414
0703	1.057	0.241	482
0704	1.024	0.346	692
0805	0.660	0.277	555
0806	1.691	0.795	1589
0807	0.834	0.337	674

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) Page C-1 of C-7

APPENDIX C

MRLC Land Use of Impaired Subwatersheds & Ecoregion Reference Site Drainage Areas

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) Page C-2 of C-7

	1			Subwa	atershed	(051301	08)			
L and Use	01	01	01/	02	01	04	02	02	02	03
	[acres]	[%]	[acres]	[%]	[acres]	[%]	[acres]	[%]	[acres]	[%]
Bare Rock/Sand/Clay										
Deciduous Forest	20972	56.0	15203	56.6	29121	57.9	11086	42.9	5377	55.0
Emergent Herbaceous Wetlands			0	0.0			5	0.0		
Evergreen Forest	4922	13.1	5198	19.4	8718	17.3	2454	9.5	2666	27.3
High Intensity Commercial/Industrial/Transportation	35	0.1	19	0.1	17	0.0	32	0.1	2	0.0
High Intensity Residential	0	0.0			1	0.0	3	0.0		
Low Intensity Residential	150	0.4	32	0.1	36	0.1	26	0.1	1	0.0
Mixed Forest	5257	14.0	3310	12.3	5806	11.5	4837	18.7	1516	15.5
Open Water	24	0.1	259	1.0	156	0.3	55	0.2	1	0.0
Other Grasses (Urban/Recreational)	114	0.3	8	0.0	29	0.1	32	0.1		
Pasture/Hay	4669	12.5	2290	8.5	4984	9.9	6039	23.4	167	1.7
Quarries/Strip Mines/Gravel Pits										
Row Crops	589	1.6	173	0.6	841	1.7	865	3.3	0	0.0
Transitional	725	1.9	259	1.0	619	1.2	32	0.1	47	0.5
Woody Wetlands		1	105	0.4			347	1.3		
Total	37456	100.0	26856	100.0	50328	100.0	25815	100.0	9777	100.0

Table C-1 Caney Fork River Watershed – Impaired Subwatershed Land Use Distribution

	1									
				Subwa	atershed	(051301	08)		•	
Land Use	04	06	05	0503		02	07	02	07	03
	[acres]	[%]	[acres]	[%]	[acres]	[%]	[acres]	[%]	[acres]	[%]
Bare Rock/Sand/Clay					0	0.0			3	0.0
Deciduous Forest	3086	30.3	24660	60.3	21707	61.4	14283	42.4	6694	32.6
Emergent Herbaceous Wetlands			8	0.0	1	0.0				
Evergreen Forest	290	2.8	1396	3.4	1591	4.5	1295	3.8	845	4.1
High Intensity Commercial/Industrial/Transportation	228	2.2	46	0.1	142	0.4	1600	4.7	172	0.8
High Intensity Residential	169	1.7	1	0.0	24	0.1	326	1.0	12	0.1
Low Intensity Residential	552	5.4	113	0.3	183	0.5	1493	4.4	283	1.4
Mixed Forest	1052	10.3	4292	10.5	3972	11.2	4087	12.1	2532	12.3
Open Water	194	1.9	67	0.2	189	0.5	18	0.1	58	0.3
Other Grasses (Urban/Recreational)	407	4.0	107	0.3	194	0.5	1496	4.4	563	2.7
Pasture/Hay	2719	26.7	7470	18.3	5204	14.7	7433	22.1	6247	30.4
Quarries/Strip Mines/Gravel Pits	19	0.2					44	0.1		
Row Crops	1475	14.5	1649	4.0	2100	5.9	1624	4.8	3154	15.3
Transitional	6	0.1	1	0.0	7	0.0	1	0.0		
Woody Wetlands			1104	2.7	39	0.1				
Total	10197	100.0	40914	100.0	35353	100.0	33699	100.0	20563	100.0

Table C-1 (cont.) Caney Fork River Watershed – Impaired Subwatershed Land Use Distribution

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) Page C-4 of C-7

			Subwa	tershed	(051301	08)		
Land Use	07	04	0805		08	06	08	07
	[acres]	[%]	[acres]	[%]	[acres]	[%]	[acres]	[%]
Bare Rock/Sand/Clay								
Deciduous Forest	4215	27.1	30731	67.6	12173	50.1	8514	29.7
Emergent Herbaceous Wetlands								
Evergreen Forest	518	3.3	2738	6.0	1543	6.4	2413	8.4
High Intensity Commercial/Industrial/Transportation	139	0.9	207	0.5	96	0.4	91	0.3
High Intensity Residential	70	0.5			2	0.0	28	0.1
Low Intensity Residential	498	3.2	106	0.2	105	0.4	291	1.0
Mixed Forest	1807	11.6	6056	13.3	3880	16.0	5926	20.7
Open Water	66	0.4	275	0.6	354	1.5	2	0.0
Other Grasses (Urban/Recreational)	497	3.2	101	0.2	211	0.9	303	1.1
Pasture/Hay	5852	37.6	4792	10.5	4689	19.3	9367	32.7
Quarries/Strip Mines/Gravel Pits		_			276	1.1		
Row Crops	1891	12.1	472	1.0	956	3.9	1701	5.9
Transitional	10	0.1				_		
Woody Wetlands								
Total	15563	100.0	45479	100.0	24284	100.0	28638	100.0

Table C-1 (cont.) Caney Fork River Watershed – Impaired Subwatershed Land Use Distribution

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) Page C-5 of C-7

					Eco	osite Su	bwatersh	ned				
Land Use	Eco68a01		Eco6	8a03	Eco6	8a08	Eco6	8a13	Eco6	8a20	Eco6	8a26
	[acres]	[%]	[acres]	[%]	[acres]	[%]	[acres]	[%]	[acres]	[%]	[acres]	[%]
Bare Rock/Sand	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deciduous Forest	1427.0	38.4	3536.0	32.7	46284.0	46.8	4070.0	45.5	4550.0	61.6	20301.0	50.9
Emergent Herbaceous Wetlands	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
Evergreen Forest	921.0	24.8	3011.0	27.8	15790.0	16.0	2365.0	26.4	519.0	7.0	6396.0	16.0
High Intensity Commercial/ Industrial / Transportation	0.0	0.0	2.0	0.0	176.0	0.2	0.0	0.0	3.0	0.0	136.0	0.3
High Intensity Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0
Low Intensity Residential	0.0	0.0	11.0	0.1	258.0	0.3	1.0	0.0	25.0	0.3	107.0	0.3
Mixed Forest	1369.0	36.8	3977.0	36.7	24815.0	25.1	942.0	10.5	2217.0	30.0	10817.0	27.1
Open Water	0.0	0.0	0.0	0.0	73.0	0.1	9.0	0.1	0.0	0.0	182.0	0.5
Other Grasses (Urban/ Recreational)	0.0	0.0	3.0	0.0	236.0	0.2	0.0	0.0	10.0	0.1	201.0	0.5
Pasture / Hay	0.0	0.0	259.0	2.4	9207.0	9.3	501.0	5.6	9.0	0.1	1317.0	3.3
Quarries / Strip Mines/ Gravel Pits	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	68.0	0.2
Row Crops	0.0	0.0	28.0	0.3	1564.0	1.6	40.0	0.4	7.0	0.1	219.0	0.5
Transitional	0.0	0.0	0.0	0.0	501.0	0.5	725.0	8.1	48.0	0.6	175.0	0.4
Woody Wetlands	0.0	0.0	0.0	0.0	0.0	0.0	292.0	3.3	0.0	0.0	0.0	0.0
Total	3717.0	100.0	10827.0	100.0	98904.0	100.0	8946.0	100.0	7388.0	100.0	39923.0	100.0

 Table C-2
 Level IV Ecoregion Reference Site Drainage Area Land Use Distribution

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) Page C-6 of C-7

					Eco	osite Su	bwatersh	ned				
Land Use	Eco6	8a27	Eco6	8a28	Eco6	8c12	Eco6	8c13	Eco6	8c15	Eco6	8c20
	[acres]	[%]	[acres]	[%]	[acres]	[%]	[acres]	[%]	[acres]	[%]	[acres]	[%]
Bare Rock/Sand	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deciduous Forest	6654.0	56.2	10209.0	63.7	518.0	64.0	1935.0	73.7	11337.0	80.4	9931.0	78.7
Emergent Herbaceous Wetlands	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Evergreen Forest	1485.0	12.5	1487.0	9.3	48.0	5.9	81.0	3.1	878.0	6.2	871.0	6.9
High Intensity Commercial/ Industrial / Transportation	4.0	0.0	21.0	0.0	0.0	0.0	9.0	0.3	48.0	0.3	48.0	0.4
High Intensity Residential	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.0	0.1	11.0	0.1
Low Intensity Residential	2.0	0.0	89.0	0.6	0.0	0.0	22.0	0.8	111.0	0.8	111.0	0.9
Mixed Forest	3626.0	30.6	3574.0	22.3	244.0	30.1	390.0	14.8	1291.0	9.2	1233.0	9.8
Open Water	3.0	0.0	1.0	0.0	0.0	0.0	3.0	0.1	37.0	0.3	37.0	0.3
Other Grasses (Urban/ Recreational)	0.0	0.0	44.0	0.3	0.0	0.0	12.0	0.5	40.0	0.3	40.0	0.3
Pasture / Hay	62.0	0.5	469.0	2.9	0.0	0.0	109.0	4.1	193.0	1.4	181.0	1.4
Quarries / Strip Mines/ Gravel Pits	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Row Crops	0.0	0.0	139.0	0.9	0.0	0.0	64.0	2.4	41.0	0.3	38.0	0.3
Transitional	0.0	0.0	3.0	0.0	0.0	0.0	2.0	0.1	119.0	0.8	116.0	0.9
Woody Wetlands	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	11836.0	100.0	16036.0	99.9	810.0	100.0	2627.0	100.0	14106.0	100.0	12617.0	100.0

Table C-2 (Cont.) Level IV Ecoregion Reference Site Drainage Area Land Use Distribution

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) Page C-7 of C-7

					Eco	osite Su	bwatersh	ned				
Land Use	Eco7	1g03	Eco7	1g04	Eco7	1g10	Eco7	1h03	Eco7	1h06	Eco7	1h09
	[acres]	[%]	[acres]	[%]	[acres]	[%]	[acres]	[%]	[acres]	[%]	[acres]	[%]
Bare Rock/Sand	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deciduous Forest	6703.0	47.4	9087.0	53.2	2726.0	76.5	6784.0	81.6	7788.0	88.7	6264.0	79.0
Emergent Herbaceous Wetlands	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Evergreen Forest	1206.0	8.5	384.0	2.2	80.0	2.2	137.0	1.6	137.0	1.6	245.0	3.1
High Intensity Commercial/ Industrial / Transportation	13.0	0.1	143.0	0.0	23.0	0.6	20.0	0.2	2.0	0.0	6.0	0.1
High Intensity Residential	0.0	0.0	4.0	0.0	0.0	0.0	14.0	0.2	0.0	0.0	0.0	0.0
Low Intensity Residential	90.0	0.6	132.0	0.8	3.0	0.1	136.0	1.6	2.0	0.0	36.0	0.5
Mixed Forest	2635.0	18.6	1612.0	9.4	169.0	4.7	757.0	9.1	604.0	6.9	722.0	9.1
Open Water	2.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
Other Grasses (Urban/ Recreational)	175.0	1.2	33.0	0.2	54.0	1.5	52.0	0.6	0.0	0.0	0.0	0.0
Pasture / Hay	3138.0	22.2	4331.0	25.3	335.0	9.4	395.0	4.7	193.0	2.2	494.0	6.2
Quarries / Strip Mines/ Gravel Pits	0.0	0.0	42.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Row Crops	184.0	1.3	1319.0	7.7	170.0	4.8	23.0	0.3	50.0	0.6	167.0	2.1
Transitional	0.0	0.0	0.0	0.0	5.0	0.1	0.0	0.0	1.0	0.0	0.0	0.0
Woody Wetlands	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	14146.0	100.0	17090.0	99.2	3565.0	100.0	8318.0	100.0	8778.0	100.0	7934.0	100.0

 Table C-2 (Cont.)
 Level IV Ecoregion Reference Site Drainage Area Land Use Distribution

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) Page D-1 of D-3

APPENDIX D

Estimate of Existing Point Source Loads for Ready Mixed Concrete Facilities & NPDES Permitted Mining Sites with TSS Limits

Determination of Existing Point Source Sediment Loads

Existing point source sediment loads for several classes of permitted facilities located in impaired HUC-12 subwatersheds were estimated using the methodologies described below.

Mining Sites

Existing loads for permitted mining sites are based on an assumed runoff from the site drainage area, the daily maximum permit limit for TSS, and the area of the HUC-12 subwatershed in which the mining site is located (ref.: Table D-1). Site runoff was estimated by assuming that one half of the annual precipitation falling on the site area results in runoff. Annual precipitation for the Caney Fork watershed is approximately 52 in/yr.

AAL_{Mining} = (A_d) (DMax) (Precip) (0.2266 lb-l/ac-in-mg) (0.5) (A_{HUC-12})

where: AAL_{Mining} = Average annual load [lb/yr] A_d = Facility (site) drainage area [acres] DMax = Daily maximum concentration limit for TSS [mg/l] Precip = Average annual precipitation for watershed [in/yr] A_{HUC-12} = Area of impaired HUC-12 subwatershed [acres]

 Table D-1
 Estimate of Existing Load – NPDES Permitted Mining Sites

HUC-12 Subwatershed (05130108)	Subwatershed Area	Precip. ^a	NPDES Permit No.	Site Drainage Area	Daily Maximum TSS Limit	Annual Average Load
	[acres]	[in/yr]		[acres]	[mg/l]	[lb/ac/yr]
0702	33,699	52	TN0062910	18.00	40	0.126
0806	24 294	50	TN0004227	158.00	30	1.150
	24,284	52	TN0069124	91.01	40	0.883

^a Livestock Waste Facilities Handbook, 2nd Edition, 1985, Figure 11-12b

Ready Mixed Concrete Facilities (RMCFs)

Total loading from RMCFs is the sum of loading from process wastewater discharges and storm water runoff. Estimates of loading from this source was not determined since the only facility was not in an impaired subwatershed.

Total Existing Point Source Loads for Impaired HUC-12 Subwatersheds

Estimated point source loads were summed for each impaired HUC-12 subwatershed and then compared to both existing and target subwatershed sediment loads (ref.: Table D-2).

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) Page D-3 of D-3

HUC-12 Subwatershed (05130108_)	NPDES Permit No.	Facility Type	Average Annual Point Source Load	Existing Subwatershed Load	Point Source Percentage of Existing Load	Subwatershed Target Load	Point Source Percentage of Target Load
			[lb/ac/yr]	[lb/ac/yr]	[%]	[lb/ac/yr]	[%]
0702	TN006291	Mining	0.126	452	0.03	356.9	0.04
	TN000422	Mining	1.150				
0806	TN006912	Mining	0.883				
	Subwatersh	ned Total	2.033	1,589	0.13	597.6	0.34

 Table D-2
 Estimate of Existing Point Source Loads in Impaired HUC-12 Subwatersheds

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) E-1 of E-3

APPENDIX E

Summary of NPDES Permit No. TNR10-0000 General NPDES Permit for Storm Water Discharges Associated With Construction Activity
NPDES Permit No. TNR10-0000 General NPDES Permit for Storm Water Discharges Associated With Construction Activity

Information regarding permitting requirements for construction storm water may be downloaded from the TDEC website at:

http://www.state.tn.us/environment/permits/conststrm.php

NPDES Permit No. TNR10-0000, *General NPDES Permit for Storm Water Discharges Associated With Construction Activity*, may also be downloaded from the TDEC website at:

http://www.state.tn.us/environment/permits/conststrmrul.pdf

The following is a summary of key provisions of NPDES Permit No. TNR10-0000, *General NPDES Permit for Storm Water Discharges Associated With Construction Activity*, that relate directly to implementation of Waste Load Allocations (WLAs) for sediment in impaired waterbodies in the Caney Fork River watershed.

Tennessee General Permit No. TNR10-0000, *General NPDES Permit for Storm Water Discharges Associated With Construction Activity* became effective on July 1, 2000 and is required for construction sites that disturb five acres or more. The permit authorizes storm water discharges from construction activities, storm water discharges from construction support activities, and certain non-storm water discharges associated with construction activities. The permit also covers discharges from construction sites that disturb less than five acres if the Director of the Division of Water Pollution Control has determined that the discharge from the site contributes to, or is likely to contribute to, a violation of a State water quality standard, or is likely to be a significant contributor of pollutants to the waters of the State. Discharges that result in violations of State water quality standards are prohibited. Construction activities are required to be carried out in such a manner to prevent violations of State water quality standards.

The permitted construction activity is required to develop, maintain, and implement a <u>site-specific</u> Storm Water Pollution Prevention Plan (SWPPP) to minimize erosion of soil and the discharge of pollutants to waters of the State. <u>At a minimum</u>, the SWPPP must include:

- Description of the site, description of the intended sequence of major activities which disturb soil, estimates of total area of the site and area disturbed, any data describing the soil or the quality of any site discharge, site location, identification of storm water outfalls, and identification of receiving waters.
- Description of appropriate control measures and the general timing during the construction process that measures will be implemented. (The permit describes in some detail minimum requirements for: 1) erosion and sediment controls designed to retain sediment on site; 2) stabilization practices for disturbed portions of the site; 3) structural practices to divert flows from exposed soils, store flows, or otherwise limit runoff and pollutant discharge resulting from a 2 year, 24 storm (approximately 3.5 inches/24 hours

for the Caney Fork River watershed); and 4) storm water management measures that will be installed after construction operations have been completed).

- Maintenance procedures to ensure that vegetation, erosion and sediment control measures are kept in good and effective operating condition.
- A schedule of inspections by qualified personnel of disturbed areas of the construction site that are not fully stabilized, storage areas exposed to precipitation, structural control measures, outfall points and locations where vehicles enter and exit the site. These inspections must be performed before certain anticipated storm events, within 24 hours after storm events of 0.5 inches, or greater, and at least once every two weeks (once per week for receiving streams identified as impaired on the 303(d) List for siltation). Based on the results of inspections, inadequate or damaged control measures must be modified or repaired as necessary before the next anticipated storm event (within seven days maximum). Also based on the results of inspections, pollution prevention measures must be revised as necessary within a specified time frame. Inspections must be documented.
- Sources of authorized non-storm water that are combined with storm water discharges associated with construction activity must be identified in the plan and appropriate pollution prevention measures for the non-storm water component of the discharge identified and implemented.

Additional requirements are specified for discharges into waters identified on the Tennessee <u>303(d) List for siltation</u>. These additional requirements include:

- The SWPPP must be submitted to the local Environmental Assistance Center (EAC) prior to the start of construction.
- More frequent (weekly) inspections of erosion and sediment controls. Inspections and the condition of erosion and sediment controls must be certified to TDEC on a weekly basis.
- If TDEC learns that a discharge is causing a violation of water quality standards or contributing to the impairment of a water identified as impaired on the 303(d) List, the discharger will be notified that the discharge is no longer eligible for coverage under the general permit and that additional discharges must be covered under an individual permit.

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) G-1 of G-8

APPENDIX F

Site-specific Analysis of Subwatershed 051301080805

F.1 Sediment Tool Analysis Anomalies

The Watershed Characterization System (WCS) Sediment Tool (v.2.6) can be used to determine an existing average annual sediment load at a watershed scale (ref.: Appendix B). This GIS based tool uses the best available spatial data and the universal soil loss equation (USLE) to calculate the annual sediment load. The spatial data are neither current enough nor at a fine enough scale to model in-stream bank erosion or riparian sediment loads.

The current Multi-Resolution Land Characteristic (MRLC) land use data used by the Sediment Tool was produced from satellite imagery acquired during the period from 1992 through 1995 in a 30meter by 30-meter cell sized grid. Since only one specific land use type was assigned to each grid cell, some loss of resolution in the data was possible. Also, the National Hydrography Dataset (NHD) stream data used by the Sediment Tool was created at 1:100,000 scale. Consequently, small streams may not be represented in the model, resulting in local or site-specific sediment sources not being accounted for.

Ferguson Branch, Rock Springs Branch, and Indian Creek, all located in HUC-12 subwatershed 051301080805, were assessed as impaired due to siltation and other habitat alterations. Analysis using the Sediment Tool, however, indicated that the existing sediment load for the subwatershed was lower than the target load for Level IV ecoregion 71h (no reduction in sediment loading required). A more comprehensive, site-specific analysis of Ferguson Branch, Rock Springs Branch, and Indian Creek is needed to determine the causes of impairment.

F.2 Ferguson Branch Subwatershed Analysis

(PS)

Ferguson Branch (TN05130108001_0200) was placed on the 2002 303(d) List as not fully supporting designated uses due to siltation and habitat alteration associated with riparian loss.

Ferguson Branch was monitored in 1998 by the Nashville Environmental Field Office (NEFO). A waterbody assessment at RM 0.8 found no clean water indicator organisms (zero EPT). Notes report a substrate of slick bedrock with a fine silt covering and thinned stream bank riparian areas with some healed over erosion areas. The assessment further indicated 40% canopy and yards mowed to the edge of the stream, with grass cuttings thrown into the stream (Figure F-1).

Date: 69/29/98, 6	Stream: A	ERGUSON BRMNCH	WBA: Indian (et(e) RF3#
CREEK/WBA/	QUAD/COUNTY/	RM & DRAINAGE INTO:@ RM	D: 10'-18" STATUS/COMMENTS SZE L: SZE' CAUSE/SOURCE SALE SLOCK
Ferguson BR WAR(E)	- 3,22 NE Buttink Valle Smith Co	RMO SO to Caney took RM 12.1	Storte and ~ 4-6' with some parted over areas or argan (carry ~402, Rote House & yord present to edge some oregoenthe prover areason theing to
#21 4/5, #22 #s	A St Man's Ref +	LATITUDE/	1000, gener killing talana off of the line (we be) the are we have be a line of the second for
STREAM ORDER	· 85 F ~ sun. Hamil	36° 09 '33.0 7 CPS 85° 50' 53.73	dimattion (mate mitails soul) but no EFT () = of this tim

Figure F-1 Ferguson Branch Field Sheet - July 29, 1998

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) G-3 of G-8

Ferguson Branch was monitored again in 2002 by the NEFO. A biorecon at RM 0.8 showed the stream was partially supporting at this location and looked similar to what it had at the previous visit except that during the last visit it was noted that the stream was clear. The stream had biological scores of 7 EPT, 3 intolerant, and 22 total families and was assessed as partially supporting due to sediment load and habitat alteration (Figure F-2). During this visit, there were opaque pools with blanketing sediment and riffle kicks producing thick red mud plumes. Notes show evidence of thinned riparian (ref.: Figure F-3).

STREAM SURVEY INF	ORMATION			Support	Status
/			repairmes	u	Tr lock
STREAM:	Feed	queon Branch	FERGULO.03	art I	(P/PST)
STREAM LOCATION:	STOR	rewall CLUB	Speaks Port	OST Marie	January Hallow
STATION NUMBER:	(Site es	PhilisHada 1998)	1	ASSESSORS	A w A AL
COUNTY	Smit	6		DATE	11 Cood une
MAJOR BASIN	CEA	15		TIME	10,00/22/02
WBID#/HUC:	TNO	5130108001		STREAM MILE	5:40-1:00 pm
WBID NAME:	CF	Lower (F) + TRI	85	STREAM ORDER	
LAT/LONG DEC:	36.159	167 1-85.84	7500	ADB SEGMENT:	310
USGS QUAD:	322NE	BKflats Valler, 71	20)	3Q20:	
Drainage:	Ceney	Fork (RM11.1)		ELEVATION (ft):	480-5001
ECOLOGICAL SUBREGI	ON: 1/4/0	NB) (3609)	33' 7	GAZETTEER PAGE	22.0
OBJECTIVES:	WS SS	185.50	'51"	Field #	(E
SAMPLES COLLECTE	D		METERS US	SED: Hung	LAS TO AL
		-		Try Des	1413 DE MINISONDE
pH	7.74	17.70 SU 7.72		DISSOLVED OXYGEN	6.96/6.92004 /s
CONDUCTIVITY	310.3 1	370.9UMHOS 370.0		TIME	5.45/5:5000
TEMPERATURE	22.44 1	29.44 C 22.4	4	OTHERS BAH	50.204 1000
Previous 48 hours Precip:	UNKNOWN	NONE LITTLE	MODEBATE	HEAVY ELOODIA	100.3 for 70.76
Ambient Weather:	SUNNY	CLOUDY / BREEZ	YRAIND	SNOW Current T	emo: @"E
CHEMICAL SAMPLES COLI	LECTED : _To	ne & present		State Contail I	unp. 10 /-
Photographs : Slides Prir	nts DigitaD	Photo #s # 24	6#4d- 1	EMIEROR	0
BIOLOGICAL ASSESSMENT	1:	Benthics) Fieh	Aloga	roorree 0.0 4	α,
Type of benthic sample:	BIORECOND	SO KICK SO BAL	Myae NK DENDY	Other:	
Taxa List Attached?	D / No	Coopiment collected	DENDY	SUHBER OTHER	
WATERSHED CHARAC	TEDISTICS	opecimens conected	IT LET N	Sample Log Numbers	N0208510
IDSTREAM SURPOUND	21cmonros		App. % of v	watershed observed:	362
OF STREAM SURROUNDI	ING LAND USE:	: (estimated %)			
BACTURE 110 - 2+5			10	NOTES:	
PASTURE 40-202	URBAN	RESI	0/RA 202	NOTES:	
PASTURE 40-202 Row Crops	URBAN	RESI OTHE	D/RD 202	NOTES:	
PASTURE 40-202 Row Crops FOREST 40-602	URBAN INDUSTRY MINING	PESI OTHE	D/R& 202	NOTES:	
PASTURE Row Crops FOREST 40 - 602 MPACTS OBSERVED	URBAN INDUSTRY MINING		0/R0 202	NOTES:	
PASTURE 40 - 202 Row Crops FOREST 40 - 602 IMPACTS OBSERVED		E SOURCES	Describe cau	NOTES:	agnitude
PASTURE 40-202 PART Crops POREST 40-602 MPACTS OBSERVED See general		LE SOURCES	Describe cau	NOTES:	agnitude
PASTURE 40-202 PAGE Crops POREST 40-602 MPACTS OBSERVED See general	URBAN INDUSTRY MINING AND POSSIBL	E SOURCES	p/Ra 202 Para Describe cau	NOTES:	agnitude
PASTURE 40-202 ANY Crops OREST 40-602 MPACTS OBSERVED See OFFEND OVERALL ASSESSMEN	URBAN INDUSTRY MINING AND POSSIBL	LE SOURCES	p/Ra 202 IB Describe cau above Prev	NOTES:	agnitude 07/24/98 = (PS)
PASTURE 40-202 Row Crops COREST 40-602 MPACTS OBSERVED DVERALL ASSESSMEN	URBAN INDUSTRY MINING AND POSSIBI	LE SOURCES	Describe cau Describe cau alore Prev	NOTES: ses, nature, and rate m	on/24/98 = (PS)
PASTURE 40-202 Row Crops COREST 40-602 MPACTS OBSERVED DVERALL ASSESSMEN MUE 000	URBAN INDUSTRY MINING AND POSSIBL AL LANA	LE SOURCES	Describe cau Describe cau <i>alore</i> <i>Pew</i>	NOTES:	agnitude 07/24/98 = (PS)
PASTURE 40-202 Prove Crops POREST 40-602 MPACTS OBSERVED DVERALL ASSESSMEN THis CRee 2 1	URBAN INDUSTRY MINING AND POSSIBL AL LAND	RY:	p/Ab 202 Describe cau above Pau And lookes	NOTES: ses, nature, and rate m ws work (Amr.)=	agnitude 07/24/98 = (PS)
PASTURE 40-202 POREST 40-602 MPACTS OBSERVED DVERALL ASSESSMEN THIS CREES MESENT 2	URBAN INDUSTRY MINING AND POSSIBL AL UAND I NT & SUMMAR	LE SOURCES (1405) Listed RY: an addition	p/As 202 Be Describe cau above Pau And lookes March d	NOTES: ses, nature, and rate m was wan (Amr.)=	agnitude 07/24/98 = (PS) 0. 16 145 0. lel Hui
PASTURE Row Crops POREST 40-602 IMPACTS OBSERVED MPACTS OBSERVED MPACTS OBSERVED OVERALL ASSESSMEN THIS (Rect b Present a Time up a	URBAN INDUSTRY MINING AND POSSIBL Al land l NT & SUMMAR URAL SUMMAR Hate	RY: A Addition A	Describe cau Describe cau alore Pau And lookes Mergh df + Mergh df	NOTES: Ses, nature, and rate m Los work (Amic) = Long symila Long symila	agnitude 07/24/98 = (PS) A B 175 pleb Their
PASTURE 40-202 Row Crops FOREST 40-602 IMPACTS OBSERVED DVERALL ASSESSMEN THIS (Rece 1 Plesent 2 Thing (4 0) 22/3/3.	URBAN INDUSTRY MINING AND POSSIBI Al land I NT & SUMMAR Ind Land I NT & SUMMAR Ind Land I Ind Land I I Ind Land I Ind Land I Ind Land I Ind Land I I Ind Land I I Ind Land I I I	RY: RY: RY: RY: RY: RY: RY: RY:	Describe cau Describe cau alore Peer I cookes I	NOTES: Ses, nature, and rate m (US W 874 (AMG)= (US W 874 (AMG)	agnitude 07/29/98 = (B) 1 1/3 aled This 1 4 Was
PASTURE 40-202 Row Crops FOREST 40-602 IMPACTS OBSERVED DVERALL ASSESSMEN THIS CROCK 0 Present 0 Time 42 1/22/2	URBAN INDUSTRY MINING AND POSSIBL AL DANA DATE SUMMAR ALC AL Gutter A ALC AL	ESOURCES (Aes) listed RY: additional Hill ava Had offer	Describe cau above Pew and loskes March df + The cri we proke uf	NOTES: ses, nature, and rate m (us w str (Amc)= (us w str (Amc)	agnitude 07/24/98 = (PS) A B its pled this fa Was sediment
PASTURE 40-202 Row Crops FOREST 40-602 IMPACTS OBSERVED See Option OVERALL ASSESSMEN THis (Ree & 1) Passent at Time 4 a 7/22/5 4 Mille to	URBAN INDUSTRY MINING AND POSSIBL AL UAND I NT & SUMMAR URAS ALEAN TALE A ALEAN THIS COSA	RY: An additional Had opage Had opage Had opage	p/A 202 Describe cau above Pau And lookes March df + Ha con in pools up red muy	NOTES: ses, nature, and rate m (us work (Amc)= (us y similar (us y similar (tory similar)	agnitude 07/24/98 = (PS) n b its pled thei fa was sedimint ufs of
PASTURE Row Crops FOREST HPACTS OBSERVED MPACTS OBSERVED MPACTS OBSERVED OVERALL ASSESSMEN THIS CREE PLESENT TIME UP A TIME UP A TIME F TIME F TI	URBAN INDUSTRY MINING AND POSSIBL Al land I And Land And Land I And Land	ESOURCES (1202) Listod RY: an addition offe area Had opage Had opage hucof Hull agets, 44 Jac	Describe cau Describe cau alore Pau Alore Pau Alore	NOTES: Ses, nature, and rate m (us w or (Ame)= (us w o	agnitude 07/24/98 = (PS) A B its aled their the Was sectionisent us of d, yards +
PASTURE Row Crops FOREST FOREST JUPACTS OBSERVED JUPACTS OBSERVED OVERALL ASSESSMEN OVERALL ASSESSMEN THIS (Rece & c Plessent da Three (4) Along the Along the	URBAN INDUSTRY MINING AND POSSIBI Al land I Int & SUMMAR Int & SUMMAR	RY: RY: RY: RY: RY: RY: RY: RY:	Describe cau Describe cau alore Peer Alore Per Alore Peer Alore Peer Alore Peer Alore Peer Alore Peer Alore Peer Alore Peer Alore Peer Alore Peer Alore Peer	NOTES: Ses, nature, and rate m US W SA (AMG)= Lery Similar S / Lery Similar Jan Lange trag planketing planketing planketing for the formation	agnitude 07/24/98 = (B) n 10 175 aled This Ja Was sediminist Ufs of Ufs of Varias + 5 / Ino
PASTURE Row Crops FOREST FOREST IMPACTS OBSERVED See OFFEND OVERALL ASSESSMEN THIS CREES MESSENT OF THIS CREES MESSENT THIS CREES MESSENT THIS CREES MESSENT THIS CREES MESSENT THIS CREES MESSENT THIS CREES MESSENT THIS CREES MESSENT MESSE	URBAN INDUSTRY MINING AND POSSIBL AL Vand I AL Vand I AL Vand I AL VAND I VAND	ESOURCES (120) Isted RY: An additional additional Isted open Isted open Isted open Isted open Ister for an Ister for a	Describe cau altore Per And loskes Ind Ind loskes Ind losk	NOTES: Ses, nature, and rate m Ses, nature, and rate m (US W SA (AMG) = (US	agnitude 07/24/98 = (PS) A 16 ifs aled their the Wass sediment US of A Varbs + 5 mo US of Ak
PASTURE Row Crops FOREST FOREST IMPACTS OBSERVED See Optimized OVERALL ASSESSMEN THIS CREE Present S This CREE THIS CREE	UFBAN INDUSTRY MINING AND POSSIBI Al land I al land I I I I I I I I I I I I I I I I I I I	RY: An additional Had open Had op	altore Par Par Par Altore Par And loskes I May di t The con to pools of red my stream to be impact to the ceek in the	NOTES: Ses, nature, and rate m (US W SA (AMC)= (US W S	agnitude 07/24/98 = (PS) A B 1/5 aled Their fa Was sediminist US of 4 Vards + 6 /no While d/s, 2 / 4 /07 -
PASTURE POREST 40-202 POREST 40-602 IMPACTS OBSERVED DVERALL ASSESSMEN OVERALL ASSESSMEN THIS CREE PRESENT OF PRESENT OF THIS CREE PRESENT OF PRESENT OF THIS CREE PRESENT OF PRESENT OF THIS CREE PRESENT OF PRESENT OF PRESENT	URBAN INDUSTRY MINING AND POSSIBI al land I	ESOURCES (1202) listed RY: an addition add	Describe cau Describe cau alore Pau Alore	NOTES: Ses, nature, and rate m Los work (Ame) = Long simila Long simila Long simila planketing planketing for little sing throng for little	agnitude 07/20/98 = (PS) A B its pled thei the Was sedimint us of a Vards + b no uhile de, 2 / feellos -
PASTURE POREST 40-202 POREST 40-602 IMPACTS OBSERVED DEC OFFICE OVERALL ASSESSMEN OVERALL ASSESSMEN THIS (Rece & C PLESSENT 20 PLESSENT 20	URBAN INDUSTRY MINING AND POSSIBI Al land I Int & SUMMAR Int & Sum Int &	RY: RY: RY: RY: RY: RY: RY: RY:	Describe cau Describe cau alove Peer Peer Alove Pe	NOTES: Ses, nature, and rate m US W SA (AMG)= (US W SA (AMG)= (US W SA (AMG)= (US W SA (AMG)= (IS W SA (AMG)= (IS W SA (AMG))= (IS	agnitude 07/29/98 = (B) n 10 175 aled This fa Was sediminist While ds, 2 feetos - tol)
PASTURE 40-202 POREST 40-602 IMPACTS OBSERVED DEC OFFERE OVERALL ASSESSMEN THIS CREES I PRESENT ON THIS CREES I PRESENT OF THIS CREES I THIS CREES I THIS CREES I PRESENT OF THIS CREES I THIS	URBAN INDUSTRY MINING AND POSSIBI Al Vand I AL Vand I I Int & SUMMAR Ato A Getter Int Con Int	RY: RY: RY: RY: RY: RY: RY: RY:	Describe cau alove Per Alove Per Ind Costes I very di + The con ve ports up stream to stream to ear, uere panain 1 panain 1	NOTES: Ses, nature, and rate m Les work (Amc) = Les sample (Act, Sample planeting planeti	agnitude 07/29/98 = (PS) A 16 its aled this the Was sediment US of d. Vards + 6 mg uhile de, 2 / feellos - hal () this
PASTURE Row Crops FOREST FOREST IMPACTS OBSERVED See OFFEL OVERALL ASSESSMEN THIS CREE PLESENT OF THIS CREE THIS CREE PLESENT OF THIS CREE THIS C	UFBAN INDUSTRY MINING AND POSSIBI Al land I al land I al land I mining AND POSSIBI Al land I mining Marker	ESOURCES (1400) Listed (1400) List	altore Per 20°2 Describe cau altore Per and loskes and loskes fred my strike my strike my cas, une panan 1 cas un fre and loskes and loskes	NOTES: Ses, nature, and rate m (US W SA (AMG)= (US (A) (AMG)= (US (A) (A) (US (A) (A	agnitude 07/24/98 = (PS) A B IS aled Their A Was Advinent US of A Vards + 6 / No Wards + 6 / No 1 feetos - 1 feetos - 1 - D This
PASTURE POREST FORES	URBAN INDUSTRY MINING AND POSSIBI al land I	ESOURCES (1202) Listod RY: an addition add	p/As 202 Describe cau alove Pau Alove Alove.	NOTES: Ses, nature, and rate m LOS W OA (AML)= LON ALMAN LON A	agnitude 07/20/98 = (PS) A B its pled thei the Was sediminist af Wards + b Mo akile dk, akile dk, akile dk, akile dk, akile dk, akile sediminist 0.5 gruss
PASTURE POREST FORES	URBAN INDUSTRY MINING AND POSSIBI al land land in a summar hate faite	ESOURCES (1420) Listed RY: An addition add	Describe cau alore A	NOTES: Ses, nature, and rate m US W ort (AMG)= US W ort (AMG)= US W ort (AMG)= US W ort (AMG)= US W ort (AMG)= Constant Constant (AMG)= Constant (Constant) Constant (Constant) Constant (Constant) Constant) Constant (Constant) Constant) Constant (Constant) Constant) Constant (Constant) Cons	agnitude 07/24/98 = (B) n B 175 aled this fa Was sed minut ufs of ufs of ufs of ufs of ufs of 10 fields + 10 fields - 10 f
PASTURE POREST FORES	URBAN INDUSTRY MINING AND POSSIBI Al land I Int & SUMMAR Int & Summar	RY: RY: RY: RY: RY: RY: RY: RY:	Describe cau alore Per Alore.	NOTES: Ses, nature, and rate m us war (AMG) = (us war (AMG) = (AMG) = (us war (AMG) = (AMG) = (us war (AMG) = (us war	agnitude 07/24/98 = (B) A 10 1/5 aled this the lither A lither aled this the lither aled this aled this the lither aled this the lither aled this the lither aled this aled the aled this aled this aled the aled the al

Figure F-2 Ferguson Branch Field Sheet - August 22, 2002

Page 1

revised 8-10-98

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) G-4 of G-8

PHYSICAL STREAM CH	ARACTERISTICS		ength of stream	reach assessed	10001	
	SURROUNDING LAND US	SE (facing dow	nstream) :		- 7000	
ESTIMATE % RDB	LDB	RDB	LDB	RDB	LDB	
PASTURE 45-35	20-602 URBAN			RESID. 40-S	25 252	
CADPS	INDUSTRY			ROAD 10 2	40-103	2.2
FOREST 52	102(F) MINING			OTHER		
% CANOPY COVER: Estin	mated: 10-805 Open(0-10)	Pertly Shade	Most	y Shaded(46-80)	> Shaded(>80)	
Measu	red: U/s	D/S	LB_	2	RB	
BANK HEIGHT (m): 3.0	/	HIGH WA	TER MARK (m):	30 (+)		100
SEDIMENT DEPOSITS:	NONE SLIGHT	MODERATE (EXCESSIVE	NKE		1
TURBIDITY CLEARD- 194	MUD (SAND)		NONE OTHE	R (Contaminated	Y or N
ALGAE PRESENT?	NONE PLICET	HODERATE	OPAQUE) = pa	25=2.01		
AQUATIC VEGET.	ROOTED FLOATING	TYPE	attal ina tal	ing man 1/2	r alge	2.1
RAPID PERIPHYTON ASS	ESS : / % Filamento	US =	% C	nionitable Substra	10 -	Tar
% Direct Sunligh	t = Mean Thickn	ess Rank =	// "	SIGNIZACIO GUUSIII	~	
WATER QUALITY COMME	NTS: (oil sheen, odor, colors	, etc)	numerous	Aigh obse	nored - H	tial
Dediment y	maque pools Y	wille kick	producal	High Mu	& plum	6
		//	/	1	/	
SUDSTRATE (%)	(Visual estimates)	0001		law-		
BOULDER (> 10")	A % QO N	POOL	0.000	RIFFLE	RUN P	OOL
COBBLE (2.5-10")	35 % 40 %	00/0 %	DEPT	H(m) 8-6"	6-10	2.0-3.0
GRAVEL (0.1-2.5")	15 % 10 %	000000	BEACHLENGT	H(m) 2-6	3-10 3	-10
BEDROCK	- % t %	N 96	ILLAGIT LENGT	(in) 70.	3-10(1)	5-101
SAND (gritty)	5 % 5 %	10 %	Staff	Gauge/Bench Ht		
SILT (fine)	10 % 10 %	10-20%	VELO	CITY (FS)	-	1
CLAY (slick)	- % - %	- %	FLOW	V (CFS)		
DETRITUS (CPOM)	5 % 10 %	10-20%	HABI	TAT ASSESSME	NT SCORE #: /	102
MUCK-MUD (FPOM)	20 % 20 %	40-50%		RR #	GP #	
MARL (shell trags.)	% _ %	- %	0			1
Size (etreem width) :	Hat, Ow Moders	High	Cascade			
HABITAT QUALITY COMM	T-/S V. Small (<1.	5m) (1	5-3m) Med (3-10	Im) Large (10-2	5m) Very Lrg	(>25m)
Roan II.	Real mul ()	ALCONTINE VAL	nery, etc)	not refle	avant dis	7
noon did	rettle - Array -	maria	n aveg	non	- semi-	0
1 and 1 and 1	The men p	- qui	ace als of	- acriect = V	6	
STREAM SKETCH			11 6	X	0 15	ald
My everon	26ME	00	FAC	NOA	XES	V
1 Sec	AAK C	A	111	IN III SA	110	S
Total.	Page	42/	1 Unil	the fil	1. 1. 11(0 A
1000 (Ma turBiplan	X(Y9)/ /	T. DOVA	niah	WM	
(J) I	(Mulo) Dool (Myung)	2041 A	J' C'	IVYUS A	lit	1
A STAT	A AN	DOP/ /I	1 milia		10 201	K
Mr py	WIN SIZE LAT	GII KC) (ye upo o	trin	7-1	1
1	What the	4/ /lea	10 000	antenin	2 th)7
1/	THEN INTOTH	-11	AX	Sec.	S)	/ /
1//	- A A A	1160	VA	the fairs	X	2 25
///	South .	11 8	THE	DAD) "	
	ESI	16	J D	- Q		
	KAH	1		X		
- will	1 HA	1x	17-	- /		2
1 June	/ / []	1 Tan 1		///	/	and the second second
al the	11	(E)		///		
The fund	/ >1	S	7/			/
THE T	->1	S.	1	E In	~	
THE T	21	J.	-7	Field	52	

Figure F-2 (Cont.) Ferguson Branch Field Sheet - August 22, 2002

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) G-5 of G-8



Figure F-3 Ferguson Branch - August 22, 2002

F.3 Rock Springs Branch Subwatershed Analysis

Rock Springs Branch (TN05130108001_0400) was placed on the 2002 303(d) List as not fully supporting designated uses due to siltation and habitat alteration associated with riparian loss and pasture grazing.

Rock Springs Branch was monitored in 1998 by the Nashville Environmental Field Office (NEFO). A waterbody assessment at RM 1.15 showed depressed biology. Notes report the presence of cattle in the stream with thinned stream bank riparian areas (Figure F-4).

CREEK/WBA/ SLIDES	QUAD/COUNTY/	RM & DRAINAGE	AVE 15" STATUS/COMMENTS SET 0" CAUSE/SOURCE BACK SKETH
-Rock Spenn BR	-322NE RUFFRIAVA	PM1.15 to	Ws of St Mary Ro m Riverian ROBORLOB(see slice #19) with cours
-WRA(C)	- AUTNAM G	Maney Beek PM 20.5	Cold dis more repairing anen / 4/5 monor = 02, d/s amon = 902, sala
#10 4/5 #18 4/5			Bedrock on this ait lauge, banks the 1-2' reactated, and eso runs
	- AT SAKS RA OFF ST.	LATITUDE/	the LOB of some signing the ~ 20-30 / Marson but at revaled (asome
5:00-5730)	MARIN'S R.	LONGITUDE	demultive/cx hate muter marting other del por I hours E
STREAM ORDER		36 07 16.576PS	althe latit tomaled use to Als m Bask port good word - ahould be
n 200	ARING \$ 870F. HUMIN	85 47 32.7	EPT. Athis time represents @ PS) status

Figure F-4 Rock Springs Branch Field Sheet - July 29, 1998

Rock Springs Branch was monitored again in 2002 by the NEFO. A biorecon at RM 0.9 showed the stream was supporting at this location. This site had an established riparian zone and was downstream of the agricultural impacts seen in 1998. However, it was noted that the upstream area still appeared to be impacted per visual inspection. Cattle were still noted in the creek and there was no riparian zone (Figure F-5). This indicates the importance of a healthy riparian area and its ability to protect the stream's health.

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) G-7 of G-8

	STREAMS	SURVEY FORM	->	
STREAM SURVEY INF	ORMATION	(NOTE: Th	37 200 0	monents
) site is als	Support Status:	abol
STREAM:	Pack Sonna BRanc	1 OF prev. S	stel (5 (57)
STREAM LOCATION:	of BAted Ram		1	-/
STATION NUMBER:	ASADI 000.9 PU)	ASS	SSORS:	ama. nh.
COUNTY	Putnam	DATE	-	alla an
MAJOR BASIN	CFWS	TIME	-44	1:15 - 8:2000
WBID#/HUC:		STRE	AM MILE:	RM: 0.9
LAT/LONG DEC:	21 15 41 LD 1 25 DD	STRE	AM ORDER:	4Hg
USGS QUAD:	322 NE P. 140-14	ADB:	SEGMENT:	THE PROPERTY AND A
Drainage:	CF. (RM 20) ST	NP) FLEV	ATION (#):	1000 001
ECOLOGICAL SUBREGI	DN: 7/4 (ONB) 536°09	15 GA7E	TTEER PAGE	980-500'
OBJECTIVES:	WS SS (85°47	1 42") Fiel	le #	65-501/01
SAMPLES COLLECTE	D	METERS USED:	Hungilan	TT Maritan
	000 1004	THE REPORT OF THE PARTY OF THE	- Inguco 11915 -	LA MINISONde
	1.92 17.89 SU 78.8	DISSO	LVED OXYGEN	.42 / 4.30 PPM 4
TEMPERATURE	372.1 UMHOS	TIME	2	:20/7:25 pm
Previous 48 hours Bresier	26.60 / ×6.59 C 20.0	OTHE	is BAH. 9	7.7% (47.2%
Ambient Weather	UNKNOWN NONE LITTLE	DI MODERATE HE	AVY FLOODING	. /
HEMICAL SAMPLES COLL	ECTED: Dong & CALLER	AIN SNOW	Current Temp:	90°F Sunset
hotographs : Slides Prin	ts Diotrap Photo BC #E	ik the de - and	10 00 1	2
BIOLOGICAL ASSESSMENT	Benthics) Fish	Aloge Other	1 Roc 0.741d	
ype of benthic sample:	BIORECON SQ KICK SQ BA	NK DENDY SUBB	FR OTHER	
Taxa List Attached? (Yes	/ No Specimens collected	2/Yer N Samol	alog Numbers: A/	ADAR SOORCE
WATERSHED CHARAC	TERISTICS	App. % of watersh	ed observed:	1208011
JPSTREAM SURROUNDI	NG LAND USE: (estimated %)	NOTE	2.	3-906
PASTURE 5-702	URBAN	10/RD M-2-2		
Now Crops &	INDUSTRY OTH	ER		
OREST 20-252	MINING			
NDACTE ODEEDVED		and the second se		
ACTS OBSERVED /	AND POSSIBLE SOURCES	Describe causes, nat	ure, and rate magnitud	le
de genero	I land uses listed	above		Antinio Tarmas
		C	1	
VERALL ASSESSMEN	IT & SHMMARY	WS WBA	(AMG) = PREV	· 09/29/98 = P.
THURLE ROOLOGMEN	IT & SUMMART:	(a) u/s RM	11.2	
T. 1090 4	1- 10A .	1 1		
IN IT IS	is deele was assesse	up ~ 0.3 m	that assa	isment
represented	The status of the Che	are in that are	2 No repar	ian u
torus in C	et area etch Tot	This assessme	at the lower	pottom
reach RMO.	o to 1-9 was assessed	The mouth + 1	is for a disk	Encos was
aleper proces	Qualer along Bates	Ros site assessed	= stranian 1	nesent.
Dur Menn	along POB Volue to A	rad - still The	need is san	le well
Ano coeled In	This former reach	Ashlvere ofser	elt abod	abitat
substrato	4 mice colore) was a	trailable EPT	Tor/ Fat= 10	2/29/6
Very grod	numbers at tarta.	tora sudome	narth ADIG	HAR
- Collection	0.5 jabs = Bank los	(5) - this &	maharter	the
fast that	a protestive riggina	n area Has the	ability in de	1-717
the stream	Health = (S/StD if	SHould be noted	He have the	al Sanal.
ORECON Score= 15	Time = 35*	Habitats = 35 Rift	Et 0,5 Pube	any - miles
PT Families (+ add. taxa) =	12 Total Families (+ add	tava) - de	Intelement Tar	K
A Habitat Assessment (Completed ? SCORE	- 120	CRADIENT	
2. 10-0	V GOORE	151	GRADIENT:	LOW
IN 1998, ap	sears (visually) to be	in the same	Indition of	it was in 199
(Hat tin	v = p5)	1.1.2		
	Pag	001		revised 8-10-98
	Property in the			101000 0-10/00

Figure F-5 Rock Springs Branch Field Sheet - August 22, 2002

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) G-8 of G-8

	STREAM CH	ARACTERIS	STICS		Length of s	tream reach a	issessed =	1000'	
	N ST	SURROUND	ING LAND US	SE (facing dov	wnstream):				
ESTIMATE	% RDB	LDB	-	RDB	LDB		RDB	LDB	
PASTURE	202	202	URBAN	· · · ·		RESID.	102	152	
CROPS		2010	INDUSTRY		116.20	BOAD	60%	202	
FOREST	502	102	MINING			OTHER			
% CANOPY	COVER: Esti	mated: 8020	Doen(0-10)	Partly Shar	ied(11-45)	Mostly Shada	diagan)	Shadad/sR/	
	Measu	ired.	11/5	D/S		I.P.	of the Book	DR	
BANK HEIG	HT (m):	2 - 20' 6	2.1	HIGH W	ATER MARK	(m): 24	1 14.	HD_	
CEDIMENT	DEDOCITO	- 000 17	011017	HIGH W	La aland	(iii). de-0	(+)		
TVPE-	SUIDCE	MUD	SLIGHT	MODERATE	EXCESSIVE	BLANKET	~	hotooicotoo	Vert
TURBIDITY	CEAR	ALIGHT	MODERATE	HIGH	OPAQUE	UTHER	_ u	ontaminated	TOTN
ALGAE PRE	ESENT?	NONE	Stand S	MODERATE	CHOKING	TYPE	Munite	1	
AQUATIC V	EGET	BOOTED	ELOATING	TYPE	THORING	TYPE A	mucro a	gae	
RAPID PER	IPHYTON ASS	Ecc. //	% Eilemenie	JIFE	mene	9/ Colonizal	hla Cubatrat		
NAPID PEN	6 Direct Sunlight	233: //	% Filamento	US =	11	% Coloniza	ole Substrat	e = //	
WATER OU	ALITY COMME	AITC. (all hhan	Medar micking	cos nank =	45	1		0 11.	
WATER GO	ALITY COMME	EN 15: (oll sheet	1, odor, colors	, eic) -	fish	pregred	9000	epifa.	und
Suca	50.0 4 K	Jone M	yero a	legae	faul	y clean	flow 4	4 more	2
THE	Eloury AM	100 pat	0	/	/ /		/		
SUBSTRAT	E (70)	, (VISU	al estimates)	0001		5		Incore I	
POLIDER	105	TA C	HUN	POOL		DEDT	TIFFLE	RUN	POOL
BOULDER (> 10")	10 %	10 %	5 %		DEPTH (m)	1.0-3.0	3.0-1.0	1.0-2.0
COBBLE (2.	5-10")	40 %	30_ %	10 %		WIDTH (m)	4-10	4-10	8-10'
GRAVEL (0.	1-2.5")	15 %	15 %	5 %	REACHL	ENGTH (m)	5-10 (+)	10(7)	8-10'
BEDROCK		5 %	5 %	20 %					
SAND (gritty)	10 %	10 %	10 %		Staff Gauge	Bench Ht:	10.5	
SILT (1	fine)	15 %	20 %	30 %		VELOCITY (FS)	1	A ALK DUP
CLAY (slick)	- %	- %	- %		FLOW (CFS)		
DETRITUS (CPOM)	5. %	10 %	20 %		HABITAT AS	SSESSMEN	T SCORE #:	130
									1000
MUCK-MUD	(FPOM)	- %	- %	- %		RR#		GP #	
MUCK-MUD MARL (shell	(FPOM) frags.)	- %	- %	- %		RR #_		GP #	
MUCK-MUD MARL (shell Gradient (sa	(FPOM) frags.) ample reach):	Flat Lo	- %	ate High	Cascade	RR #_		_ GP #_	
MUCK-MUD MARL (shell Gradient (sa Size (stream	(FPOM) frags.) ample reach): h width) : 2	Flat Lo	w Moden	ate High	Cascade	RR #_	arna (10-25	_ GP #_	a (~25m)
MUCK-MUD MARL (shell Gradient (sa Size (stream HABITAT O	(FPOM) frags.) ample reach): n width) :2	Flat Lo	V. Small (<t.< td=""><td>ate High 5m) Small (</td><td>Cascade 1.5-3m) Ke</td><td>RR #</td><td>arge (10-25</td><td>GP #_</td><td>g (>25m)</td></t.<>	ate High 5m) Small (Cascade 1.5-3m) Ke	RR #	arge (10-25	GP #_	g (>25m)
MUCK-MUD MARL (shell Gradient (sa Size (stream HABITAT Q	(FPOM) frags.) ample reach): n width) :2 UALITY COMM	Flat Lo	V. Small (<t.< td=""><td>ate High 5m) Small (an, pool/riffle y</td><td>Cascade 1.5-3m) Ka ariety, etc)</td><td>RR #</td><td>arge (10-25</td><td>GP #</td><td>g (>25m)</td></t.<>	ate High 5m) Small (an, pool/riffle y	Cascade 1.5-3m) Ka ariety, etc)	RR #	arge (10-25	GP #	g (>25m)
MUCK-MUD MARL (shell Gradient (sa Size (stream HABITAT QI	(FPOM) frags.) ample reach): n width) :2 UALITY COMM or	Flat Lo G-30' IENTS: (bank e	V. Small (<t. v. Small (<t. erosign, riparia</t. </t. 	ate High 5m) Small (an, pool/riffle y m-pool	Cascade 1.5-3m) Ma ariety, etc)	RR #_	arge (10-25	GP #_	g (>25m)
MUCK-MUD MARL (shell Gradient (sa Size (stream HABITAT QU Bay	(FPOM) frags.) ample reach): n width) : UALITY COMM m UALITY COMM m UALITY COMM	Flat Lo PENTS: (pank of Flow)	V. Small (<t. prosion, riparia fla - Nil</t. 	ATO High 5m) Small (an, pool/riffle y an-pool	Cascade 1.5-3m) Ma ariety, etc)	RR #_	arge (10-25	GP #	g (>25m)
MUCK-MUD MARL (shell Gradient (sa Size (stream HABITAT Q	(FPOM) frags.) ample reach): n width) :2 UALITY COMM n Clegarad	Flat Lo G-30' FINTS: (pank e Good W flow)	V. Small (<t. v. Small (<t. arosion, riparia flo - Mi</t. </t. 	ate High 5m) Small (an, pool/riffle y m-pool	Cascade 1.5-3m) Ka ariety, etc)	RR #_	arge (10-25	GP #_	g (>25m)
MUCK-MUD MARL (shell Gradient (sa Size (stream HABITAT QI HABITAT QI STREAM S	(FPOM) frags.) ample reach): n width) :2 UALITY COMM n.g. (y C Jeganal) KETCH	Flat Lo G-30' HENTS: chank e	V. Small (<t. V. Small (<t. arosign, riparia</t. </t. 	ata High 5m) Small (an, pool/riffle y	Cascade 1.5-3m) Ko ariety, etc) Dag uo C AP	RR #_	arge (10-25	GP #	g (>25m)
MUCK-MUD MARL (shell Gradient (sa Size (stream HABITAT Q STREAM S	(FPOM) frags.) ample reach): n width) : _2 UALITY COMM n fragment Magnetic KETCH	Flat Lo e-30' HENTS: chank e	V. Small (<t. v. Small (<t. arogion, riparia fla - Mi</t. </t. 	ate High 5m) Small (an, pool/riffle y m-pool	Cascade 1.5-3m) Ka ariety, etc) Dag up E AP	RR # Mode	arge (10-25	GP #	g (>25m)
MUCK-MUD MARL (shell Gradient (sa Size (stream HABITAT Q STREAM S	(FPOM) frags.) ample reach): n width) : UALITY COMM n.Z. 44 CAMP CAMP CAMP CAMP CAMP CAMP CAMP CAMP	Flat Lo BENTS: chank e	V. Small (<t. v. Small (<t. arosion, riparia // P.auto</t. </t. 	ate High 5m) Small (an, pool/riffle y m-pool	Cascade 1.5-3m) Kas ariety, etc) Dag us AR	RR # Mode	arge (10-25 atali of lord be	GP #	g (>25m)
MUCK-MUD MARL (shell Gradient (sa Size (stream HABITAT QI STREAM S	(FPOM) frags.) ample reach): m width) :2 UALITY COMM m.2, Ly Capacita (f) KETCH	Flat Lo o-30' Flat Lo o-30' Flat Lo o-30' Market Flat Lo o-30' Market Flat Lo	- % % W Moder V. Smatt (T. srosign, riparla fle - M fle - M	Ale High 5m) Small (an, pool/riffle y m-pool 2	Cascade 1.5-3m) Ke ariety, etc)	RR # Modes Mode	arge (10-25 atal of lard be		g (>25m)
MUCK-MUD MARL (shell Gradient (sz Size (stream HABITAT QI BO STREAM S	(FPOM) frags.) ample reach): m width) : _2 UALITY COMM m 2 44 Composition Comp	Flat Lo Bassi HENTS: (pank e Flow flow)	- % % W Moden V. Small (T. srosign, riparia fle - Mi - Mi - Mi - Mi - Mi - Mi - Mi - Mi	ATD High Sm) Small (an, pool/iffle y m-pool pes	Cascade 1.5-3m) Ka ariety, etc) Dag ag	RR # dd (3-10m)) Mode to be y the yam sto the yam sto	arge (10-25		g (>25m)
MUCK-MUD MARL (shell Gradient (sa Size (stream HABITAT QI STREAM S	(FPOM) frags.) ample reach): m width) : _2 UALITY COMM m Jack of the second m Jack of the second KETCH	Flat Lo e-30' HENTS: (pank e flaw)	- % - % - % Moden V. Small (T. - NU - NU	ATD High Sm) Small (an, pool/riffley m-pool Pes Porto	Cascade 1.5-3m) Ka ariety, etc) Dane Aff	RR #	arge (10-25	GP #	g (>25m)
MUCK-MUD MARL (shell Gradient (sa Size (strean HABITAT QI STREAM S	(FPOM) frags.) ample reach): n width) : _2 UALITY COMM manual of the second width) : _2 UALITY COMM manual of the second KETCH	Flat Lo 	- % % Wooden V. Small (<t. arosion, riparia // tracko // tracko // Barks</t. 	Alta High Sm) Small (an, pool/riffle y 2 - pool 2 - pool Res Ao	Cascade 1.5-3m) Ke ariety, etc) Dag up AP	RR # (3-10m) Mode uce + uce + uce + uce + on m uce + on m uce + on m uce + on m uce + on m on m onm m onm m on m	arge (10-25	GP #	g (>25m)
MUCK-MUD MARL (shell Gradient (sa Size (strean HABITAT QI STREAM S	(FPOM) frags.) ample reach): n width) : _2 UALITY COMM m	Flat Lo Good W How H	- % % Workson (Transition) / Transition, riparita / Transition, riparita / Transition / Transition / Transition / Transition	Alta High Sm) Small (an, pool/riffle y 2 - 200 2 - 200 Revenue	Cascade 1.5-3m) Ke ariety, etc) Dag up AP	RR # (3-10m) Mode to a f the usen sto the us	arge (10-25	GP #	g (>25m)
MUCK-MUD MARL (shell Gradient (sz Size (stream HABITAT Q STREAM S	(FPOM) frags.) ample reach): ample reach): ample reach): ample reach): ample reach ample reach ample reach): ample re	Flat Lo 	- % % V. Smatt (<t. arosion, riparia / TRacto / TRacto</t. 	Alter High Sm) Small (an, pool/riffle y m-pool Pool Pool Pool	Cascade 1.5-3m) Ke ariety, etc) Dag up Ariety Ariet	RR # (3-10m) Mode the van sto we van sto we van sto mues + contra mues + c	arge (10-25 ataly of area be manus manus annaus	GP #	1 (>25m) 1 (>25m) 1 (>25m)
MUCK-MUD MARL (shell Gradient (sz Size (stream HABITAT QI STREAM S	(FPOM) frags.) ample reach): ample reach): ample reach): ample reach): ample reach ample reach ample reach ample reach): ample reac	Flat Lo o-30' Flat Lo Dod Will Flow	- % % W Moder V. Smatt (T. Frosign, riparia fle - Mi fle - Mi	Art	Cascade 1.5-3m) Kas ariety, etc) Dag up Ariety Ariety Constant Constant Ariety Ariety Constant Constan	RR #_	arge (10-25 atal de lard be mants noneus noneus noneus	GP #	1 (>25m) + + + + + + + + + + + + + + + + + + +
MUCK-MUD MARL (shell Gradient (sz Size (stream HABITAT QI STREAM S	(FPOM) frags.) ample reach): ample reach): ample reach): ample reach): ample reach ample reach ample reach): ample re	Flat Lo - % Flat Lo - % Flat Lo - % Flat Lo - % - % - % - % - % - % - % - %	- % % W Moder V. Small (T. Frosion, riparia fle - Mi fle	Art	Cascade 1.5-3m) Ma ariety, etc) Page 00 Ariety Ar	RR #	arge (10-25 a tal de tars be manus m		
MUCK-MUD MARL (shell Gradient (sz Size (stream HABITAT QI STREAM S	(FPOM) frags.) ample reach): an width) : _2 UALITY COMM and y Company Company KETCH	Flat Lo	- % % W Moden V. Small (T. Arosion, riparia He - Mi - Mi - Mi - Mi - Mi - Mi - Mi - Mi	ATD High Sm) Small (an, pool/riffle y m-pool Res Refeo A	Cascade 1.5-3m) Kas ariety, etc) Carley Carlor Ca	RR #	arge (10-25 atel a lozo be montos mon	GP #	1 (>25m)
MUCK-MUD MARL (shell Gradient (sz Size (stream HABITAT QI STREAM S	(FPOM) frags.) ample reach): m width): 2 UALITY COMM m 2 47 Comment	Flat Lo e-30' HENTS: (pank e flaw) flaw	- % - % - % - % - % - % - % - %	Alton High Sm) Small (an, pool/riffley m-pool Res RerAD KorAD KorAD	Cascade 1.5-3m) Ke ariety, etc) Dag up APA APA APA APA APA APA APA AP	RR #	arge (10-25	GP #	
MUCK-MUD MARL (shell Gradient (sa Size (strean HABITAT QI STREAM S	(FPOM) frags.) ample reach): n width): _2 UALITY COMM mbg uy common reached KETCH RETCH RETCH RETCH	Flat Lo e-30' Flat Lo e-30' Flat Lo e-30' Flat Lo e-30' flaw flaw flaw flaw flaw flaw flaw flaw	- % - % - % - % - % - % - % - %	All High Sm) Small (an, pool/riffley m-pool Res Res Res Res Res Res Res Res	Cascade 1.5-3m) Ke ariety, etc) Dag up AP AP AP AP AP AP AP AP AP AP	RR #	arge (10-25 a tel, or or tel, or tel, or tel, or or tel, or tel, or tel, or or tel, or tel, or tel, or tel, or or tel, or tel,	GP #	1 (>25m) +1-1 m () () () () ()
MUCK-MUD MARL (shell Gradient (sa Size (stream HABITAT Q STREAM S	(FPOM) frags.) ample reach): ample reach): ampl	Flat Lo 6-30' Flat Lo 6-30'	- % - % - % - % - % - % - % - %	All High Sm) Small (an, pool/riffle y 2 - 200 All All All All All All All All All All	Cascade 1.5-3m) Ke ariety, etc) Dag up AP AP AP AP AP AP AP AP AP AP	RR #	arge (10-25 ataly of arge taly of arge tal arge tal a	GP #	1(>25m) HIT MANO () ()
MUCK-MUD MARL (shell Gradient (se Size (stream HABITAT QI STREAM S	(FPOM) frags.) ample reach): ample reach): ample reach): ample reach): ample reach ample reach): ample	Flat Lo 	- % % W Moder V. Smatt (T. Frosign, riparia / TRauto	An pool/iffle view of the second seco	Cascade 1.5-3m) Ma ariety, etc) Ariety Ariety Cascade Ariety Ar	RR #	arge (10-25 tall de tall de tart be mantes mantes montes m	GP #	1(>25m) +
MUCK-MUD MARL (shell Gradient (sz Size (stream HABITAT QI STREAM S	(FPOM) frags.) ample reach): ample reach): ample reach): ample reach): ample reach ample reach): ample	Flat Lo Sold All All All All All All All All All A	- % - % - % - % - % - % - % - %	And Part of the second	Cascade 1.5-3m) Ma ariety, etc) All All Controls C	RR #	arge (10-25 atel de arge (10-25 atel de atel	GP #	1(>25m) +
MUCK-MUD MARL (shell Gradient (sz Size (stream HABITAT QI STREAM S	(FPOM) frags.) ample reach): any width): _2 UALITY COMM any width): _2 UALITY COMM any width KETCH From any purpose Thus purpose Thus purpose T	Flat Lo e.30' HENTS: (pank e flow) f	- % - % - % - % - % - % - % - %	And Pool	Cascade 1.5-3m) Ke ariety, etc) Carley Ariety Carlos Car	RR #	arge (10-25 atel de lozo be montos mo	GP #	1 (>25m) HIT MADOR TO
MUCK-MUD MARL (shell Gradient (sz Size (stream HABITAT QI STREAM S	(FPOM) frags.) ample reach): an width) : _2 UALITY COMM m UALITY COMM m UALITY COMM m M	Flat Lo e-30' HENTS: (pank e grad with flaw)	- % - % - % - % - % - % - % - %	High Sm) Small (an, pool/riffley m-pool Res Res Res Res Res Res Res Res	Cascade 1.5-3m) Ke ariety, etc) Capelon Are Capelon Are Cascade Cascade Are Cascade	RR #		GP #	1 (>25m) HIT MADOM TO A
MUCK-MUD MARL (shell Gradient (sz Size (strean HABITAT QI STREAM S	(FPOM) frags.) ample reach): ample reach): ample reach): ample reach): ample reach ample reach): ample	Flat Lo e-30' HENTS: (pank e flat) HENTS: (pank e f	- % - % - % - % - % - % - % - %	High Sm) Small (an, pool/riffley m-pool RoAD ROAD ROA	Cascade 1.5-3m) Ke ariety, etc) Sagara APA APA APA APA APA APA APA AP	RR #	arge (10-25 a tell or of the manual of the m	GP #	1 (>25m) HIT MAD OT A DA
MUCK-MUD MARL (shell Gradient (se Size (stream HABITAT QI STREAM S	(FPOM) frags.) ample reach): ample reach): ampl	Flat Lo 	- % % W Moder V. Smatt (T. rosign, riparia / treather Barkes	All High Sm) Small (an, pool/riffley 200 200 200 200 200 200 200 20	Cascade 1.5-3m) Ke ariety, etc) Cascade All All All All All All All All All All All All All All All All All All All	RR #	arge (10-25 tall de tall de manuel ma	GP #	1 (>25m) HIT MAD OT TO A
MUCK-MUD MARL (shell Gradient (sz Size (stream HABITAT QI STREAM S	(FPOM) frags.) ample reach): ample reach): ample reach): ample reach): ample reach ample reach ample reach): ample re	Flat Lo 	- % - % - % - % - % - % - % - %	All	Cascade 1.5-3m) Ma ariety, etc) Ariety Ariety Cascade Ariety Cascade Ariety Ariety Cascade Ariety Ariety Cascade Ariety Ariety Cascade Ariety Ariety Cascade Ariety Ariety Cascade Ariety Cascade Ariety Cascade Ariety Cascade Cascade Ariety Cascade Cas	RR #		GP #	1 (>25m) HIT MAD OF TANK

Figure F-5 (Cont.) Rock Springs Branch Field Sheet - August 22, 2002

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) G-9 of G-8

Central office staff returned to Rock Springs Branch on August 1, 2004 to conduct site reconnaissance and photo document any site-specific sediment sources in the watershed. Cattle were seen in the area with free access to the stream. There was no riparian zone present. This particular site also had some recent land disturbance that appeared to be associated with the creation of two ponds (Figures F-6 through F-9). The upper headwater portions of the watershed were more agricultural use with pasture and some row crops.



Figure F-6 Rock Springs Branch (RM 1.3) - Upstream

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) G-10 of G-8



Figure F-7 Rock Springs Branch (RM 1.3) Upstream

Figure F-8 Rock Springs Branch (RM 1.3) Pond Construction With No Erosion Control



Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) G-11 of G-8



Figure F-9 Rock Springs Branch (RM 1.3) Pond Construction With No Erosion Control

F.4 Indian Creek Subwatershed Analysis

Indian Creek (TN05130108048_1000) was placed on the 2002 303(d) List as not fully supporting designated uses due to siltation and habitat alteration associated with gravel dredging and road maintenance.

Indian Creek was monitored in 1998 by the NEFO. A biorecon at RM 1.0 showed the stream to be impaired with 4 EPT, 1 intolerant, and 14 total families (Figure F-10). Notes show evidence of riparian loss and habitat alteration with slight to moderate siltation. Waterbody assessments and two sites further up in the watershed also noted thinned riparian areas but no singular major cause of impairment (Figures F-11 and F-12).

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) G-12 of G-8

1										
REAM SURVEY IN	FORMATION	alian applipting in	pulping Solin	STORET	#	Sector Constants		Ny National	10	
STREAM:	Junip	N Beek	10. AND	10. 0/1		Nol			PEAN CHA	
STREAM LOCATION:	- A Bu	FARIDE Val	ly Rd (1	(ary 96)	Hopewa	RRA		-	-	
COUNTY CODE:(FIPS)	Fatur	· FIELD#	(Full)		ASSESSO	DRS:	Amo	100	-	
MAJOR BASIN	UPPER	Cumberle	ent FI	P141	DATE:		WED 01	129/98	in N	
VBID#/HUC:	TNOST	30/08240	Sh	ste: 71	TIME:		11:35-	1:35	_	
WBID NAME:	JNOIM	ICRK, et Al		_	STREAM	MILE:	~ 1.6	2	Contractory and	
AT/LONG DEG:	36 08	40,7"	GPS	- Collipson	STREAM	ORDER:	~ ym	ORDEN	manut dames	
AT/LONG DEC:	320 4	E PLEAD	Is I to Ila. To	T	KEACH P	ILE #	112	1090 -	-2)	
Drains to: Malan Fr.	et ma	a 2 -> MUR	1 DALICA I	19.2	FLEVATIO	ON (m)-	1.63	(a.s. m)	()	
COLOGICAL SUBREG	ION:	nih ni	UR	100		loo I	-3/0	RIPPER		
BJECTIVES: ALS	Repairing		10-	-	* (1565	579 # 03424	1520 (10	\$ 4/5 .	I40)	
AMPLES COLLECT	ED	Landstein Carr	- with the state of the	ME	TERS USED.	HUNDIA	· mais	- 05. 5.4	the other	
HEMICALS Y ON	Life Assessed	? Macroinvert	ebrates	Fish	Algae	Other:	MIN	yon De	2	
dditional List Attached?	Yes No		Samples re	turned ?(?)	or N Samp	ling Method:	lis ma	no Rise	a.	
IFI D ANALYSIS:				-			US JER	8.98	econ	
H	18 02/	813 9	U		DISSOLVE	DOXYGEN	899	1892000	7	
ONDUCTIVITY	20011	ROD 6 UMHO	S		TIME	D SATGER	11.00-1	11.00		
EMPERATURE	18 20 /	18 29	c		OTHERS		Rott	1.58	P TO BREEN	
revious 48 hours Drosin	UNKNOWN	NONE	TITLD .	TODEDAT	E) HEALO	FLOODING	Conth.	D Shan	Deepart 1	hou
mbient Westher	SUNNY	CLOUDY	BREETV	PAIN	PHONE	ALCODING	1100	lan	.4	10
nuant vveatier.	SUNNT	CLOODE	BREEZY	RAIN	SNOW	1 400 MA	manud	1 0 der ca	41	
ATERSHED CHAR	CTEDISTICS	Ann N of	unhershed of	heamadi	PAD			auhuise au	_	
STURE 50-60	URBAN	E: (estimated %	6) RESIDAR	5 5-15	2					
PSTREAM SURROUNI ASTURE 50 -66 /0 - 25 /0 - 2	ht) Midderate) Control & Control &	E: (estimated %	tude. Blank sources Pont Source Construction U/S Pont Riparian los:	s 5-15	(0100) (2000) (3200) (3200)	Unknown Municipal Mining Road /bridge Urban Runoff Dank destabiliz	(9000) (2000) (5000) (3100) (3100) (4000)	<u>s/m</u>		
PSTREAM SURROUNI ASTURE 50 -66 ACPS 76 - 25 ACPS 76 - 25 AUSES 76 AUSES 76	ING LAND USI URBAN INDUSTRY MINING ht) Midderate) Flow Alter. Habitat Alt Dermal Alt Pathogens Oil & grease Unknown Siltation	E: (estimated %	6) RESUMP OTHER THUE. Blank SOURCES Pont Source Construction U/S D Riparian loss Agriculture:	not observe e: Indust n:Land Devel s Row crop	(0100) (2000) (3200) (7600) 21/H (1000)	Unknown Municipal Mining Road /bridge Urban Runoff Dink destabiliz Intensive Feec	(9000) (2000) (5000) (3100) (4000) cation (7700 diot (1600)	<i>\$/m</i>		
PSTREAM SURROUNI ASTURE 50 - 66 (0 - 25 (0 -	htt Midderate Dama Alter. Habitat Alt. Dermal Alt. Der	E: (estimated %	Construction Construction U/S Construction U/S Constructi	s Row crop	(0100) (2000) (3200) (7600) 7/// (1000)	Unknown Municipal Mining Road /bridge Urban Runoff Sink destabiliz Intensive Feec Dredging	(9000) (2000) (5000) (3100) (4000) (28tion (77000) (1600) (7200)	<i>s/m</i>		
PSTREAM SURROUNI ASTURE 50 -66 ACPS 60 - 25 ACPS 70 - 25 AUSES 70 - 25 A	ht) Midderate) IRAM INDUSTRY MINING ht) Midderate) IRAM Alter. Habitat Alt Pathogens Oil & grease Unknown Siltation D.O.	E: (estimated %	Construction Construction U/S Construction U/S Construction Construction U/S Construction U/S Construction U	s Row crop	(0100) (2000) (3200) (3200) (7600) 21/H (1410)	Unknown Municipal Mining Road /bridge Urban Runoff Sink destabiliz Antensive Feec Dredging	(9000) (2000) (5000) (3100) (4000) cation (7700 liot (1600) (7200)	<i>\$]7</i> 71		
PSTREAM SURROUNI ASTURE 50 -66 (0 - 26 (0 - 25 (0 - 25)) (0 - 25) (0 -	ht) Midderate) Hathogens Hathog	E: (estimated %	Construction U/S Construction Construction U/S Construction Construction U/S Construction Construction U/S Construction Constructi	not observe e: Indust cLand Devei s Row crop	2 (0100) (2000) (3200) (3200) (3200) (7600) 72/// (1400) - (1410)	Unknown Municipal Mining Road /bridge Urban Runoff Dink destability Intensive Feec Dredging	(9000) (2000) (5000) (3100) (4000) (2000) (7000) (7200) (7200)	<u>s/m</u> n		
PSTREAM SURROUNI ASTURE 50 -60 ROPS 0 - 25 /0	ht) Midderate) URBAN INDUSTRY MINING ht) Midderate) DownAlter. Habitat Alt Pathogens Oil & grease Unknown Siltation D.O.	E: (estimated %	Construction Construction Construction Construction U/S Down Riparian loss Agriculturie: Livestoch ge Other:	not observe not o	2 (0100) (2000) (320) (3200) (Unknown Municipal Mining Road /bridge Urban Runoff Dink destabiliz Intensive Feec Dredging	(9000) (2000) (5000) (3100) (4000) cation (7700) liot (1600) (7200)	<i>s/m</i>		
PSTREAM SURROUNI ASTURE 50 -60 ROPS 0 - 25 /0	ht) Midderate URBAN INDUSTRY MINING ht) Midderate Pathogens Oil & grease Unknown Siltation D.O. HARACTERIS SE (facing dow	E: (estimated %	e Resurve other bude. Blank + SOURCES Pont Source Construction U/S Domo Riparian loss Agriculture Livestoch o Other.	not observe indust c. Indust Row crop	"ed	Unknown Municipal Mining Road /bridge Urban Runoff Dink destabiliz Intensive Feec Dredging ED (m):	(9000) (2000) (5000) (3100) (4000) cation (7700) (7200) (7200) (7200)	<u>s/m</u>		
IPSTREAM SURROUNI ASTURE 50 -60 ROPS 0 - 25 /0	And LAND USI URBAN INDUSTRY MINING ht) Midderate Pathogens Oil & grease Unknown Siltation D.O. HARACTERIS SE (facing dow LDB	E: (estimated %	e) RESUMP OTHER CONTER CONTER CONTER CONTECTION CONTENT CO	not observe e: Indust c. Indust Row crop E:STREAM A LDB	*ed (0100) (2000) (320)	Unknown Municipal Mining Road /bridge Urban Runoff Drik destabiliz Intensive Feet Dredging ED (m): RDB	(9000) (2000) (3100) (3100) (4000) (200) (7200) (7200) (7200) (7200) (7200) (7200) (7200)	<i>s/m</i>		
IPSTREAM SURROUNI ASTURE 50 -66 ROPS 0 - 25 /0	ING LAND USI URBAN INDUSTRY MINING INDUSTRY MINING ININ INING INING ININ ININI	E: (estimated %	b) RESUMP OTHER CONTER CONTROLOGY CONSTRUCTION CONSTRUCTI	not observe e: Indust ncLand Devel s Row crop	**************************************	Unknown Municipal Mining Road /bridge Urban Runoff Dink destabiliz Intensive Feec Dredging ED (m): RDB 5 C RDB	(9000) (2000) (5000) (3100) (4000) cation (7700) diot (1600) (7200) diot (1600) (7200)	<i>s/m</i>		
PSTREAM SURROUNI ASTURE 50 -66 (0 - 26) (0 - 25) (0 - 25)	DING LAND USI URBAN INDUSTRY MINING ht) M(bderate) For After. Habitat Alt. Pathogens Oil & grease Unknown Siltation D.O. HARACTERIS SE (facing dow LDB	E: (estimated %	b) RESUM OTHER SOURCES POINT Source Logging Construction U/S Dom Riparian loss Agriculture: Livesboch g Other:	not observe e: Indust ncLand Devel s Row crop adag Hearle E:STREAM A LDB	(0100) (2000) (3200) (3200) (7600) /2/// (1000) (1410) REA ASSESS RESID OTHER	Uniknown Municipal Mining Road /bridge Urban Runoff Ink destabiliz Intensive Feec Dredging ED (m): RDB 572 RDE 572 Rdf=576	(9000) (2000) (5000) (3100) (4000) (4000) (7200) (7	<i>s/m</i>		
IPSTREAM SURROUNI ASTURE 50 -66 ROPS 10 - 25 OREST 10 - 25 IPACTS: rated S(lig AUSES esticides (0200) etals (0500) mmonia (0500) honne (0700) utnents (0900) 1 (1000) rganic Enrichment / Low her: HYSICAL STREAM C IRROUNDING LAND U: ITIMATE % RDB STURE 57 % OPS 40 % IV 7 %	HARACTERIS Effacing dow LDB LDB LDB LDB LDB LDB LDB LDB LDB LDB	E: (estimated %	Construction U/S D Cherric Construction U/S D Construction U/S D Construction U/S D Construction U/S D Construction U/S D Construction U/S D Construction U/S D Cherric Construction U/S D Cherric Construction Construction U/S D Cherric Construction Construction U/S D Cherric Construction	s Row crop LDB	"2" (0100) (2000) (3200) (7600) 1/// (1000) (14470)	Unknown Municipal Mining Road /bridge Urban Runoff Intensive Feec Dredging ED (m): RDB 572 RDB 572 RDB	(9000) (2000) (5000) (3100) (4000) (2000) (2000) (7200) (7200) (7200) (7200) (7200) (7200) (7200) (7200) (7200) (7200) (7200) (7200) (7200) (7200) (4000) (4000) (4000) (4000) (4000) (4000) (4000) (4000) (4000) (4000) (4000) (4000) (4000) (4000) (4000) (4000) (4000) (7000) (4000) (4000) (7000) (4000) (7000) (4000) (7000) (7000) (4000) (7000) (7000) (7000) (4000) (7	<i>s/m</i>		
IPSTREAM SURROUNI ASTURE 50 -66 ROPS 10 - 25 20 - 25 2	HARACTERIS E (facing dow LDB LDB LOB LOB LOB LOB LOB LOB LDB LDB LDB LDB LDB LDB LDB LD	E: (estimated %	Construction U/S Dent Riparian loss Agriculture: Livestoch g Other:	s F. STREAM A LDB	"2" (0100) (2000) (3200) (3200) (7600) #//// (1000) (14470)	Unknown Municipal Mining Road /bridge Urban Runoff Intensive Feec Dredging ED (m): RDB 5 C RDB 5 C RDB	(9000) (2000) (5000) (310) (310)	<i>s/m</i>		
PSTREAM SURROUNI ASTURE 50 -66 (0 - 25 (0 - 25)) (0 - 25	Haracteria	E: (estimated %	e Restricts other sources construction U/S Construction U/S Construction D Other: P Construction RDB	s EINTERAM A LDB ed(11-45)	"2" (0100) (2000) (3200) (7600) ////((1000))	Unknown Municipal Mining Road /bridge Urban Runoff Urban Runoff Jonk destabiliz Intensive Feec Dredging ED (m): RDB 5 °C RDB 5 °C RDB 5 °C RDB	(9000) (2000) (5000) (3100) (4000) sidon (7000) sidon (70	<i>s/m</i>		
PSTREAM SURROUNI ASTURE 50 -60 ROPS 0 - 25 /0	All Control Co	E: (estimated %	RESUMP OTHER OTHER	F STREAM A LDB ed(11-45) (ATER MAR	"2" (0100) (2000) (3200) (3200) (1000) (1410)	Unknown Municipal Mining Road /bridge Urban Runoff Intensive Feec Dredging ED (m): RDB 576 RA=576 RA=576	(9000) (2000) (5000) (3100) (4000) tablen (7700) (7200) (7	<i>s/m</i>		
PSTREAM SURROUNI ASTURE 50 -60 ROPS 0 - 25 /0	HARACTERIS E (facing dow LDB LDB LDB LDB LDB LDB LDB LDB	E: (estimated %	Construction Cons		"2" (0100) (2000) (3200) (0000) (1000	Unknown Municipal Mining Road Abridge Urban Runoff Drak destabiliz Intensive Feet Dredging ED (m): RDB 5 °C RDB 5 °C RDB 5 °C RDS 5 °C RDS 5 °C	(9000) (2000) (3100) (3100) (4000) (200) (200) (720	<i>s/m</i>		
PSTREAM SURROUNI ASTURE 50 -60 ROPS 0 - 25 /0	ING LAND USI URBAN INDUSTRY MINING ht) Midderate Con After. Habitat Alt. Pathogense Unknown Siltation D.O. HARACTERIS SE (facing dow LDB MIDS 16-20 Co-60 %	E: (estimated %	Construction Cons	s FISTREAM A LDB ed(11-45) MATER MARI	"d (0100) (2000) (3200) (3200) (1000) (1000) RESID OTHER MOSELY Sh K (m): BLANKET	Unknown Municipal Mining Road /bridge Urban Runoff Dink destabiliz Intensive Feec Dredging ED (m): RDB 5 C RDB 5 C 8	(9000) (2000) (5000) (3100) (4000) cation (7700) diot (1600) (7200) diot (1600) diot (16	<i>s/m</i>		
PSTREAM SURROUNI ASTURE 50 -66 ROPS 0 - 25 /0	All Carlos Carlo	E: (estimated %	RESUMP R		"2" (0100) (2000) (3200) (7600) 12/// (1000) (1000) (14470)	Uniknown Municipal Mining Road /bridge Urban Runoff Dink destabiliz Intensive Feec Dredging ED (m): RDB 572 RDB 572 RDB 572 RDB 572 RDB 572 RDB 572 RDB 572 RDB 572 RDB 572 RDB 572 RDB 572 RDB 572 RDB	(9000) (2000) (5000) (3100) (4000) (200) (200) (720	s/m))		
PSTREAM SURROUNI ASTURE 50 -60 ROPS 0 - 20 /0 - 20 /0 - 25 /0	AND USI URBAN INDUSTRY MINING ht) Moderate Internation Different Atter Habitat Alt Pathogens Oil & grease Unknown Siltation D.O. HARACTERIS SE (facing dow LDB MUDS / 0-20 SE (facing dow LDB SE (facing dow LDB	E: (estimated %	Construction Cons	s Enot observe e: Indust incland Devel s Row crop S Row crop Company company company ATER MARI ATER MARI ATER MARI ATER MARI S S NONE OPAQUE S NONE	"2" (0100) (2000) (3200) (3200) (1000	Uniknown Municipal Mining Road /bridge Urban Runoff Ink destabiliz Intensive Feec Dredging ED (m): RDB 572 Rdf=572 Rdf=572 S Contami	(9000) (2000) (5000) (3100) (4000) (200) (200) (720	s/m)		
IPSTREAM SURROUNI ASTURE 50 -66 ROPS 0 - 25 PREST 0 PREST 0 P	ING LAND USI URBAN INDUSTRY MINING ht) Moderate International Different Atter Habitat Att Pathogens Oil & grease Unknown Siltation D.O. HARACTERIS SE (facing dow LDB MCDS / 6-20 SE (facing dow LDB SE (facing dow SE (facing dow LDB SE (facing dow)LDB SE (facing	E: (estimated %	Construction Construction Construction Construction U/S Do Construction U/S Do Construction U/S Do Construction Construct	E Indust action observer action observ	"2" (0100) (2000) (3200) (3200) (1000) (1000) (14470)	Unknown Municipal Mining Road /bridge Urban Runoff Intensive Feec Dredging ED (m): RDB 572 RDB 572 RDB 572 RDB 572 RDB 572 RDB 572 RDB 572 RDB 572 RDB 572 RDB 572 RDB 572 RDB 572 RDB 572 RDB 572 RDB 572 RDB 572 RDB	(9000) (2000) (5000) (3100) (4000) (2000) (2000) (7200) (7	<i>s/m</i>		
IPSTREAM SURROUNI ASTURE 50 -60 ROPS 0 - 25 /0	ING LAND USI URBAN INDUSTRY MINING ht) Midderate Low Alter. Habitat Alt Pathogens Oil & grease Unknown Siltation D.O. HARACTERIS SE (facing dow LDB MIDS / 1/-24 SE (facing dow LDB COUST / 1/-24 SE (facing dow LDB SLIGHT SENT? ROOTED	E: (estimated %	Construction Cons	E Indust a Indu	"2" (0100) (2000) (320) (320)<	Unknown Municipal Mining Road /bridge Urban Runoff Intensive Feec Dredging ED (m): RDB 572 RDB	(9000) (2000) (5000) (3100) (2000) (2	s/m))		The second states and the second seco
PSTREAM SURROUNI ASTURE 50 - 66 (0 - 26 (0 - 25 (0 - 25)(0 - 25 (0 - 25)(0 - 2	AND LAND USI URBAN INDUSTRY MINING ht) Midderate Low Alter Habitat Alt Pathogens Oi & grease Unknown Siltation D.O. HARACTERIS SE (facing dow LDB M205 18-24 CO-60 %	E: (estimated %	RESUME OTHER OTHER COURCES SOURCES SOURCES Construction U/S Cource Construction U/S Cource C	e: Indust e: Indust mcLand Devel s Row crop Row crop Row crop ed(11-45) (ATER MARI COPACUE SUGHT NONE OPACUE SUGHT	Image: Contract of the second secon	Unknown Municipal Mining Road /bridge Urban Runoff Urban Runoff Jonk destabiliz Intensive Feec Dredging ED (m): RDB 5 72 RDB 5 72 RDB 75 72 RDB 75 72 RDB 75 72 RDB 75 72 RDB 75 75 8 RDB 75 75 75 8 RDB 75 75 75 75 8 RDB 75 75 75 75 8 RDB 75 75 75 75 8 8 8 8 8 8 75 75 8 75 75 8 8 75 75 75 75 75 75 75 75 75 75 75 75 75	(9000) (2000) (5000) (3100) (4000) (2000) flot (1600) (7200) flot (1600) (7200) flot (1600) (7200) flot (1600) (7200) flot (1600) (7200) flot (1600) (7200) flot (1600) flot (s/m n		

Figure F-10 Indian Creek field sheet - July 29, 1998

								1
UNCOAL STREAM	HARACTERIS	TICS (cont.)			eter Goorgingelige ett	to Carl and	21.74.940	ANY CONTRACTOR
HYSICAL STREAM C	DIEFIE	RUN	POOL	Staff Gaug	e/Bench Ht		0.155	
	a all	2"18" 31	N21	VELOCITY	(CFS)			
EPTH (m)	d-1	4.91		FLOW	(CES)			
VIDTH (m)	12	7-1	9	HADITATA	CEECEMENT	SCORE #		
EACH LENGTH (m)	15'	20-50 (1	HABITATA	ADDEDOMIENT	SP #		
				RR#				
ize (stream width) :	V. Small (<1.5	Mode. High im) Small (1.5	Cascade 5-3m) (MEd	(3-10m) Large (10-25m)	Very Lrg (>25	im)		
UBSTRATE (%)	(Visual estim	ates)			DIEELE	PUN	POOL	
	RIFFLE	RUN	POOL	1	RIFFLE	RUN	· M	
OULDER (> 10")	9%	%	%	CLAY (slick)	76	70	70	
OBBLE (2.5-10")	5-8 %	5-8 %	%	SILT	5 %	5 %	%	
ODDEL (2.0 10)	at as %	85-911 %	%	DETRITUS (CPOM)	%	- %	%	
SRAVEL (0.1-2-0)	96	%	%	MUCK-MUD (FPOM)	%	%	%	
SEDROUR	5 %	5 %	%	MARL (shell frags.)	%	%	%	
AND (gnity)		1 3				internet and the	Cardiaresent?	
IST LOG NUMBERS OF	ENT SAMPLES:	(98	8) = B1	dRecon ! 2 RIFEL	+ 2 BANKS	- -	ABITAT	
CELATIVE ABUNDANCE COMINANT (>=50):	UP IAUA	SEE A	HACHed L	ist		7	44	
/ERY ABUND.(30-49):	all and all	and leaves						
BUNDANT (10-29):		and the second s			and the street	and and of the	- PROPERTY	
COMMON (3-9):								
ARE (<3):				10 2			Git & Charl	
ourse (-a).								
STREAM USE SUPPO	RT:	SPECIFICAL	Y CLASSIFI	ED FOR: (circle)		rukes) di BO		
om, H2O Supply	Ind. H2O Sup	ply	Navigation	TIER INTIER III	Trout >>	Nat. Repr?	· · ·	
MATED MITHORAWI N	OTED			9.54				
WATER WITHDRAWLE IN	UTED	East Teams	Ashda -	Do Not Consume Preca	utionary			
S STREAM POSTED? (0	arcie)	Plan hassoch	Aduin					
		Bacteriological	AUVIS.	- sina seconder a date				
BASED ON OBSERVATIO	ONS AND DATA,	STREAM IS:(C	ircie)	FIRST HILLY OF PROPERTIES 2	NON	CINTROODING	(PM	
FULLY SUPPORTING (FS)	SUPPORTI	NG, BUT THREAT	ENED (TH)	PARTIALLY SUPPORTING P	-SD NON	SUFFORTING	100)	
			,1	01		11. 1		
COMMENTS: photos	Nor N Roll #	Photo # 4	545/#60	15 = at first	dance Th	the stra	m	
A state for	to and 1	no lais	theathing	M MARAMMEN	Marates -	Domina	nee	
appeared to 100	R CHART - C	Ica Al	- Chille	- blan last #2	T= 4 Jan	ulião 11	Ractinan	
- Contrely by	moniprov	· (Jaurs) +	1000000	ala la alla his	C	man	- chaild	
Sound 3. Heat	ogoniidae,	Hydropsky	niday =	CAT + a pacetores	a race - C	NU CUA	Nous	
Mave Lound	MAR Than)	this EPT &	H Anoul	"he moled in	upper all	51-5 14	2040	
used à tri	BUTARNUS	M Jade	m aka	La reference se	ar sua	rost INAL	RIV CR.K.	
WEAF Missik th	Nr. Statu	co Trinali	marino	3 seen here				
VERKIE: An Ainto	Elsules it	= dame he	no toru	nd EPT WHEre are	Vou? thi	5 stream	doesn'FT	
ALL I.	1 Surs Sine	illy our 4	then	1	1			
equilit obvious	Alasons U	NY EPI M	1 roune	201	2010			
STREAM SKETCH	(What and 2	51/1 1	1/10	1111	1.			
11,1,400	om Ret IT	HAT W	NW	MINA	(A DAN)	free		
- CORD acture	vergace)	1111 2	1 21	CUN	17 has	11 1	. 1	1 Meu=
VI IN IN ER	ange a 1 109	111 1	7 '		NON	# A	LAD	(MINRIP)
7000-	M W gm	11/1) NX	29 P	my.	sa y	2
TIC	1 10 T	1.1.4		CAND En		CAD.	S	A SHEVOD YND
e	- Jang 1	1811		RUN		1.00		gravela
6	/ M		E PA	A		TAIP	LN 1	1
- Ar	BANK Rook V	1.1	-	- 1. · 1:		5-5	pravel) /	· anna · · · · ·
de la	4 1-1K		100 1	1 min	1:1		- /	
and the for	80511	itie	21	Y V V	1 De	N		
ALT O	2-14	11	1	APB	~~	5 7	-	
9 053	381	Ut 1	1	CROW DATE	-	al al		
W .	- 11	Hopen	ell Ro			-	- 1001150	- TROPY D
		4.	and the contract of	and a second sec	1.4	- Children -		Le contraction de la contracti
	10				E	winth is	STNBATTS.	are by the line
********	1,154	· · · · · · · ·		and the second s				
	. ha	1		former of the second				
				Page 2				

Figure F-10 (cont.) Indian Creek Field Sheet - July 29, 1998

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) G-14 of G-8

Date: 07/29/98	Wes Stream:	Fridion Cet	WBA: Indian (et (sjedes (2)) RF3#
CREEK/WBA/ SLIDES	QUAD/COUNTY/ LOCATION	RM & DRAINAGE INTO: @ RM	STATUS/COMMENTS (SCE CAUSE/SOURCE (Steeter)
INDIAN Cek	-322 NE BURRALO VAILE	Indian Ock RM 24	My kinold area usol Hogenielled & usha it
WBA(5/10gs(2))	- Pictu Am Ca	to Caney Fork RM 20.8	Inters Indian Cek of Maddus Cometan
1145, 128 a. and. (20K	VIII A	Rel - see Past stath = Motice as travel ent Indian
,	A) Hope well ed and	LATITUDE/	Recel in this area = matin they hille I want
- 3:30 - 4:00	Thatdux Comet, Rd	LONGITUDE	I some uparian hai to and it placed ather alage
STREAM ORDER	Recent thanderbust.	3608 25.3	little to more - Otel knowed substrate of this
RUNOFF to FND. CR	K Jarteren. sun Cloud 879	85° 46' 33.3"	site 1 Indian Cites classification

Figure F-11 Indian Creek Field Sheet (RM 2.4) - July 29, 1998

Figure F-12 Indian Creek Field Sheet (RM 4.85) - July 29, 2004

Date: 01/29/98	Stream: 🞜	Froign Cek	WBA: Juon	nv Oet (F) RF3#	6
CREEK/WBA/ SLIDES	QUAD/COUNTY/ LOCATION	RM & DRAINAGE INTO:@ RM	15-15-18" 1= 15-18" 1= 100	STATUS/COMMENTS CAUSE/SOURCE	Stat statet
THOIM Cet	-326 NW BANKer TN	RM 4.85	The site looked pur	ular to Indian Ock Ful	1 site erced stran
WBA(F)	-	to Caner Fork RM 20.8	one a little small	+ + more could subst	at - anno v 65-202.
# 25 RITEL stlot	-PUTNAM 6	/	Banks + 6- R. Ur how	ledore lisim Alena, LA	B - Arada thin wo
(END OF FILM LON)	- ONDAN Cet RA ~	LATITUDE/	Revenien to this rue	acian in areas, ROBE Da	tare, Loth u unin
7:25-8:15	0.2 mi de leftare	LONGITUDE	baryone angin from	a nove to tais / busy 14	weally armie status
STREAM ORDER	Hollow	36° 09'01.3'7 CPS	as a full str	IT where lave un ?!	Cabble ~ 25-352, GRavel 50-
	- Ausk. 84°F	850 44' 22.5*	62, sold 5-102		,

Indian Creek was monitored again in 2002 by the NEAC. A biorecon at RM 1.0 showed the stream to be partially supporting. The stream had biological scores of 8 EPT, 2 intolerant, and 19 total families. Notes show evidence of thinned riparian and moderate siltation in the form of sand (Figure F-13). Again, no one source turned out to cause the siltation problem.

Central office staff returned to Indian Creek on August 1, 2004 to conduct site reconnaissance and photo document any site-specific sediment sources in the watershed. There were several sediment sources documented including cattle with stream access, row crops, riparian loss, stream bank grading and gravel dredging (Figures F-14 through F-18). All of these are potential sediment sources that are near the stream corridor and likely contribute to stream impairment. The GIS-based model does not account for near-stream sediment sources.

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) G-15 of G-8

	S	STREAM SURVE	Y FORM	-> Bor	deiline stream
STREAM SURVEY INF	ORMATION			Support St	atos:
		INDIA 001.0	PU,		Det /s)
STREAM:	- INDIAN CRA	E (50'	els of Rono)		3/3/
STREAM LOCATION:	- Hary 96 (1	Ammowell Pd) @ Hopewell.	RO	
STATION NUMBER:	_ Six establis	Ked 07/29/98	ASSES	SORS:	Am Borroben
COUNTY	TUTNAM	1	DATE:		SAT. 08/24/02
MAJOR BASIN	CEWS		TIME:		1.00 - 3:20 AM
WBIDI/HUG:		48	STREA	M MILE:	RM21.0
AT/LONG DEC:	- INDIANCRE W	TRIBS	STREA	M ORDER:	RYM
USGS QUAD:	22245 12	15. 18.63 87	ADB SE	GMENT:	stra form
Drainage:	Tana, The + 10	m 24.8	SUZU:	63424520 4/	5 F1.63 (29.8 mi
ECOLOGICAL SUBREGI	ON: 71/ (hur)	[21° 10'41"]	GAZET	TEED BACE	310
OBJECTIVES:	22.24	000 401 46	GALET Gel-	O # IAA	110055
SAMPLES COLLECTE	D	COLORADO CONTRACTOR CONTRACTOR	IETEDE LICED.	Undia	m(ekser0484)
THE POLLOTE		No. Contraction of the last of	IETERS USED:	Mydesli	B IN Minisonde
H and	295.01 2951	a su	DISSOL	EDOWCEN	0.99 /090-
CONDUCTIVITY OF	289 / 089 UN	HOS	TIME	ED OATGEN	1.77 / YATT PPM
EMPERATURE	23.19/22.85	C 22.98	OTHERS	ZAH.	UDIAL WWW
Previous 48 hours Precip:	UNKNOWN NONE	LATER / A		DHTT.	77.170 76.76
mbient Weather:	SUNNY /CLOUDY	> BREEZY B	AIN SNOW	Y FLOODING	NG20FALL
HEMICAL SAMPLES COLL	ECTED: Tone A	Prosent	SHOW SHOW	Current Ten	p. 12 Py Humid
hotographs : Slides Prin	its DiataD Photo Ha	#04, #od	- AC-UD T.	1. 1.	COLUMN A REALING
BIOLOGICAL ASSESSMENT	Benthics	Eich A	- (7098 IN	01.0 4, d	
vpe of benthic sample:	BIORECOND SO KI	CK SO BANK	DENDY SUDDER	OTUER.	
axa List Attached? (Ves	/ No Specime	no collected 20 2	DENDI SUNDER	OTHER:	BEDROOK
ATERSHED CHARAC	TERISTICS	Tradicities and the second	Ann % of wateraba	Log Numbers:	N0208012
DETDEAM CURROUND	NC LAND UCE: (anti-	and of a	App. % of watersned	observed:	60-763
ACTUDE 24 -15	NG LAND USE: (estimat	(ed %)	NOTES:		
10-42 (A = K-9)	E UHBAN	HESID	10-152		
ODEET 10 -75 4	INDUSTRY	OTHER			
011201 10 00 6	Mining				
	the second se	RCES	escribe causes, natur	e, and rate mad	nitude
MPACTS OBSERVED	AND POSSIBLE SOUP	A Second Se		of an of rare may	rittooto
MPACTS OBSERVED	AND POSSIBLE SOUP	letal al-	- 0		
MPACTS OBSERVED	AND POSSIBLE SOUP	listed abo	ve	A .orgenut	MARITAT CHANTER CO
MPACTS OBSERVED,	AND POSSIBLE SOUF	listed also	The and the week	lanus antas	hal erchatiwi in
MPACTS OBSERVED,	AND POSSIBLE SOUF	listed abo	5-ARe WS WBA	(Ame)= 07/29,	ha (et hat wit / Ma
MPACTS OBSERVED. See genero VERALL ASSESSMEN WOFF: Manual	AND POSSIBLE SOUF	listed alo	tre D-Pau WS WBA	(Amic)= 07/29	ha (== 12=1100 / 14
MPACTS OBSERVED. Le general VERALL ASSESSMEN (107E: Miloualy	AND POSSIBLE SOUF al land wees). NT & SUMMARY: ac craced abble 3	listed alo	ve D= Ace sis wear & is clark grown	(AM6)= 09/29, 1800gm 023	to Etration / M
MPACTS OBSERVED. Se general VERALL ASSESSMEN (NOTE: Milowall AT THIS TIME	AND POSSIBLE SOUF 2 Land wees) NT & SUMMARY: 30 Coresed article 3 Triputing Cet Hits a	listed alo	re D-Acu is wea & y dark grown yen in cheeper,	(AMG)= 87/29 15ron vis ands, juits	ha (et last m) / M
MPACTS OBSERVED. See general VERALL ASSESSMEN (NOTE: MIQUES AT MIK Imm Grunel Substra	AND POSSIBLE SOUP 2 Land wees). NT & SUMMARY: 200 Core of active s Two when Cot Has a to your decent op	listed alo	2 - AR US WEA & y clark green yen in clarper atrate bogen	(ma)= on/29 1Brown urs cools, with ap the fo	ha (et hat han / Has ible cevering] a stirting perm of collible
VERALL ASSESSMEN (VOTE: Milowald At Mik time Milles & Sector	AND POSSIBLE SOUP 2 Land wees). NT & SUMMARY: The concel addele s Two in Opt. HAR a to but decent op ns of loga = Wag	Substrate = Sto Substrate = Sto Chan Ploy, et gunal Sub by debus.	TE D- New US WEA & y dark gren yen in cleeper strate bogen good canoou	(mas)= 02/29 1500m vis 2005, Juith ap The fo	ha (et tasting] ble cevering] a Hitting perm of collible decent viorian
MPACTS OBSERVED. See general VERALL ASSESSMEN (NOTE: Milouda At Mik time gavel substra Millos + sector ghisest in the	AND POSSIBLE SOUP 2 Land wees). NT & SUMMARY: as covered actible s Two in Opt. Has a to but decent op ns of loge + Wag i hegen the In	Substrate = Sto Substrate = Sto Chan Ploy, et gunal Sub ly debus	TE D-Acu US WEA & y dart green ven in cleeper strate toper good canopy as, y Light.	(m) = 07/29 1500m vis 2005, juith ap the fo cover it a sectionent	the cerering] the cerering] a shirthis perm of collible decent repartient predominant
VERALL ASSESSMEN (NOTE: MICHOLO At THIN tome Miffles & sector plasent in the Sand in pom	AND POSSIBLE SOUP al land wees. NT & SUMMARY: ac concel abble s Two in Opt Has a to but decent ep ns of loge + Wag is heach the In e Sitt. mumero	Sulstrate - Sti Char Maris - Sti Char Maris - Sti Char Maris - Sta Char - Star Char - Star	Te D-Ac WS W84 & y dark gren en in cleeper atrate boos good canon good canon atrate boos good canon good canon atrate	(m) = 07/29 1800m vrs 2005, juith 20 YRe fo Cover up a sectionent	the cevering] the cevering] a shirthis pern of calible cleant reparts preseminants to man to man to man to to man to to man to to to to to to to to to to to to to t
MPACTS OBSERVED. Le general WERALL ASSESSMEN (NOTE: MICORAL AT THIS AMA AT THIS AMA Gravel substra Milles & secho gravel substra Milles & secho Sec	AND POSSIBLE SOUP al land wees. NT & SUMMARY: ac covered actible . Tapièn Cet 1185 a. ta but decent ep ns of loga + Way a heach the Int e Sitt. mumery The injuncates	Sulstrate - St Char Mon Sub Char Mon Sub Charad Sub Charad Sub Charad Sub Charad Sub Charad Sub Charad Sub West	Te D= Are WS W84 & y dark green yen in cleeper atriate bozen grod Canopy atriate bozen grod Canopy atriate bozen grod Canopy atriate bozen atriate bozen atr	(ma)= 07/29 1800m vrs 2005, juith 20 YRe fo Cover up a cover up a cover up a cover up a cover up a	the cerering] ible cerering] a shirthing per of calible declat reporten present nont to and nont
MPACTS OBSERVED. Le general WERALL ASSESSMEN (NOTE: Microsolg AT THIN time gravef substra Milles & sector present in the Sand y som ure of general Minded too	AND POSSIBLE SOUP al land waes. NT & SUMMARY: ac concel actible. Tapièn Cet Mes a ta part decent ep ns of loga + wag a heach the Me of loga to Magon the inuncation managements be	Sulchate - sto sulchate - sto chan Plons, sub ly debus un fish une forme what	Te D= Pau WS W 84 Le y dark gran yen in cleepen grad canopy grad canopy atrate copen grad canopy atrate copen y set y + 2	(me) = on/29, 15 avon ors 2005, with ap the fe cover it a secondari soundari nice con	the covering] ible covering] a stitute per of chible decent reporten predeminant t Bank rook to rifle was
MPACTS OBSERVED. Le general VERALL ASSESSMEN (NOTE: Microwalg AT THIS time gravef substra Miffles & sector present in the Sand y com Leve of sector Migges for Migges for Migg	AND POSSIBLE SOUP al land waes. NT & SUMMARY: ac concel actible. Tapièn Cet Mes a. ta part decent ep ns of logs + wag a heach the Me (her inundated massonnerte be a din the an	Sulotnate = sta clean Mons , en clean Mons , en claunal sub cly destruction in fish was formewhat ales en por	D= Pau WS W84 D= Pau WS W84 en in cleepen gen in cleepen gend canopy atrate corper gend canopy atrate corper y self y a Heat = 8/17, 2, 4	(Ame) = on/29, 15 avon ors cools, with ap the fe cover it a second and nuce cobs a fits so	the covering] a stitting a stitting bein of collifie decent reparter presone nanty Bank roots le ruffe was read pro-
MPACTS OBSERVED. See general WERALL ASSESSMEN (NOTE: Milowoolg AT THIS time gravef substra Millos & sector glissent in the Sand y com yeu observed pampled for afflo this time afflo this time	AND POSSIBLE SOUF al land waes. NT & SUMMARY: ac concel artible. Tapièn Opt Hos a to put decent ep ns of logs + wag a hegen the the put decent ep thes unundated masterinette au	listed alo suldnate = shi clear Mons, sub clear Mons, sub claunal sub claunal in an un fish were lomewhat ales en por over #'s obse	Te D= Pau WS W84 Le y dark gran yen in cleepen atrate bogen good canopy atrate bogen yen uy high other well Host = 8, 17, 2, 11 wellin 198 (1)	(Ame) = 07/29, 15 avon vis 2005, gits con the for coney is a section of received and mice control nice con	ha (- 12 / 12 / 12 ible covering] a Stirting bern of chible declot reporten present nonto to affe was read 25
MPACTS OBSERVED. Je generic WERALL ASSESSMEN (NOTE: Micoroly AT THIS time gravef substra Miffles f sector ghissent in the Sand y com yeu officiened pampled for althe thigh the galf of the budge	AND POSSIBLE SOUP a land uses AT & SUMMARY: The Core of article : Thomas Of Hoge + Hoge is put decent of ns of loge + Hoge is heach the Ma e S/H Mumery (hes inundates Musiconverteble in difficulty an 7 Has ampled of	Listed alto suldrate = shi clear Mons, e if annal sub ly debus in fish were formewhat ales en por over #'s chee over #'s chee over # chear	The D= Adu WS WBA Wen in cleepen gen in cleepen gend canopy atriate bogen gend canopy atriate bogen gend canopy atriate bogen of convert How = 8, 17, 2, 1 wed in 1998 (+1) and fall. 200	(Ame) = 07/29 15 avon vis 2005, gits an Yhe for Corez id a sectorient Nice Color nice Color ni	ha (= 12 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
MPACTS OBSERVED. See general WERALL ASSESSMEN (NOTE: Microsolg AT THIS time gravel substra Milles & sector present in the Sand y form yere of sensed pampled for althe third # is althe third # is althe of the bridge puck grad Halo	AND POSSIBLE SOUP 2 Land wees WT & SUMMARY: The cores above : Two in Oct Hos a to but decent ep ns of loge + Wag i hegon the Ma e S.H. Mumpro The inundates Massonwerte but in definiting an T Has amples of at in this source	Listed alo substrate = shi clear Mons, e if and sub ly debus linned in an un fish were l forrow that ales er por ner H's clear por I = clear gion, grate	2 - Men US WEA & y dark gren yen in clarper grad canopy atrate boses grad canopy as, y high observed y self y a wed in 1998 (2) grad in Hal. 20 unsty y atrue	(Ame) = 07/29, 1BROWN UNA Cores up a cores up a cores up a cores up a cores up a per values sclances up	ha (= 125/125/12) 18 (= 125/125 2 AITTING Dem of chille decent reparison predeminants to affe was to affe was me of p5 A a little farther) chill for aug be office Fel.
MPACTS OBSERVED. See general OVERALL ASSESSMEN (NOTE: MICHORING AT THIS TIME Gravel Substra Millos F sector present in The Sand y Dem Lieu offernel Mimples for altho thigh # : g altho thigh # : g As of the budg Duck pool Halm - on To ett. #	AND POSSIBLE SOUP 2 Land wees 2 Land wees 2 SUMMARY: 2 Core and abble - Two in Cet Her a to but decent op ns of logs & who a hegon the M Cher inundation Massonwerte but 2 Massonwerte but 2 Ma	Listed alto substrate = shi clear Men, e ifaunal sub by debus Unref in an un fish were formenthat ales er por por 45 obje por 1 = chan gion, grate by por found +	2 - New US WEA & y dark green yen in clean y atrate boses good canopy atrate boses atrate	(Ame) = 07/29, 1Brown vis 2005, with ap the for cover up a cover up a cover up a cover up a per values cover well	ha (== /2=/101/18 ible covering] a Hitting en of collible declart reparison predominantly to angle was to a little farther) of 11 for all to dipected to diagon the
MPACTS OBSERVED. See general VERALL ASSESSMEN (NOTE: Microsold At This time queef substra present in the Sand y Bom use offened Millos & Sector present in the Sand y Bom use offened Minpled for althe thight to g althe thigh the present for althe the althe the present for althe the althe the alth	AND POSSIBLE SOUP 2 Land wees 2 Land wees 2 SUMMARY: 2 Const active - Turin Cet Her a to but decent ep ns of loge + Way a here on the Margan Cher inundates massonwerte but the inundates massonwerte but the inundates massonwerte but the inundates massonwerte but the inundates massonwerte but a steen hule 1th a steen hule 1th	listed alto substrate = sti clago Floris ly debris Unref in an un fish were formenthat ales er por over #'s obse powent = chan gion greater found + mi From Here	D- New US W84 & y dark gren yen in clean good canopy atrate boas good canopy atrate boas atrate boas good canopy atrate boas atrate boas	(Ame) = 07/29, 1Brown vis 2005, Just ap the for cover is a pedientent nice cobil nice cobil ni	ha (= 1/25/100 / 1/2 ible covering] a Hitting en of chible decent reparien predominanty trank rooks to nifle was me of 125 sh a Vittle further in of 1/25 sh a Vittle further auf to Specked decent of presents auf to Specked
MPACTS OBSERVED. See general OVERALL ASSESSMEN (NOTE: Microald AT THIN TIME gavel substra Milles & sector plasent in This Sand y Bom yeu officened Jumpled for althe This budg one of the budg one of the budg one of the budg one of the budg Score of the budg	AND POSSIBLE SOUP al land wees. NT & SUMMARY: The SUMMA	Listed alto Substrate = Sti Chan Plans, en channal Sub- Charles in an Unref in an Unref in an Unref in An Unref in An Unref in An Unref in An Dece H's object posent = Chan gin, greate mi From Plan M	DE Men US WEA E y dare gren sen in closer grad anger grad anger alserved 4 sell + a 152 = 8/17, 2 wed in 128 (+) grad fall. so liversty y alter dentify fant fall. yjelded 12/2 bitats = 2.5 RIFF.	(Ame) = 07/29, 1Brown vis 2005, Juith ap the fo cover if a pediantent nice cobie nice cobie nice cobie nice cobie nice cobie nice cobie nice cobie nice cobie nice cobie 171-Roa + 1.5 Rut-	ha (= 1/25/100 / 1/2 ible covering] a stirting predominantly declast reparient predominantly trank roots to niffle was read for the forther and be depended and
MPACTS OBSERVED. See general WERALL ASSESSMEN (NOTE: Milouolog At THK time gravel substra plasent in the Sand y com yeu of sened sampled for altho thysel # : g altho thysel #	AND POSSIBLE SOUF al land wees. NT & SUMMARY: The SUMMA	Listed alto Sulchate = Shi Chan Plant - Chan Shi Chan - Ho Miles (a add taval	D-Are Wis W84 S-Are Wis W84 Le y dark grown wen in clooper grod canoy atrate boos grod canoy atrate boos grod canoy atrate boos grod canoy atrate boos atrate boos	(mc) = 07/29, 1500m ors 2005, Juith 2005, Juith 2007,	ha (= 1/25/100 / 1/2 ible cevering] a stirting present collible declast reparien present and t Bank reals to niffle was real of 25 sha little forther and be depected and and be depected and
MPACTS OBSERVED. See general OVERALL ASSESSMEN (NOTE: Milouda At THK time gaves substra Milles & second gaves substra Milles & second gaves substra Milles & second gaves substra gaves subst	AND POSSIBLE SOUF al land wees. NT & SUMMARY: The SUMMARY: The Const of the a to but decent of the sout decent of the sout decent of the sout decent of the south of the the south of the south of the	Listed alo Sulchate - Shi Chan Plous , en Chan Plous , en Chan Plous , en Chan es h Chan es h	DE Men dis with DE Pren dis with le in classes gen in classes gen in classes gen an classes gen an anny that and in fail y self y and we in fail so yielder 15/2 yielder 15/2 A (+2)	(Ame) = 07/29 15000 024 2005, Juith 2005, Juith 2007,	the covering
MPACTS OBSERVED. See general OVERALL ASSESSMEN (107E: Milowaly AT THIS time gravef substra Milles & sector gravef substra Milles & sector gravef substra Milles & sector gravef substra gravef sub	AND POSSIBLE SOUP al land wees. NT & SUMMARY: The Concel addoble - Thomas Opt Has a to but decent ep is of loge + Was a head the the e sitt - memory the internet of the internet of t	listed alo sulchate = sti chan Plous, sub ly distris linned in an un fish ung pore #'s obje pore #'s obje pore #'s obje prin, grate, t millies (+ add. taxa) = SCORE = /o	The D= Are as were a in closper atriate bores atriate bores atriate bores atriate bores are an any the solution atrianed in the solution atrianed in atrianed in the solution atrianed in atrianed in atrianed in the solution atrianed in atrianed in	(Ame) = 07/29 1500m 024 2005, Juith 2005, Juith 2007,	ha (the conving
MPACTS OBSERVED. Je genera VERALL ASSESSMEN (NOTE: Milowolg At This time gravef substra Milles t sector pleasest in the Sand y Dorn yeu of gened pampled for altho this tig altho this fill one fan boelle ORECON Score= 9 T Families (+ add. taxa): A Habitat Assessment (altho the	AND POSSIBLE SOUP a land uses NT & SUMMARY: The creed abble : Thomas Of Hara to put decent ep ns of logs + hara a heach the Maran of logs + hara to put decent ep ns of logs + hara to put decent ep the intervented to intervented the intervented the intervented the intervented to a steam h. S. Time = 9 = 8 Total Fam Completed ? Char flow 6) 9	listed alo suldnate = sti clean Plous, sub clean Plous, sub ly debus ly deb	D= Are as were D= Are as were en in cleepen atriate bozen good canopy atriate bozen good canopy atriate bozen good canopy atriate bozen atriate bozen atriate atriate bozen atriate atriate atriate bozen atriate atriate bozen atriate atriate bozen atriate atriate bozen atriate atriate atriate bozen atriate atriate bozen atriate atriate bozen atriate atriate bozen atriate atriate bozen atriate atriate bozen atriate atri	(Ame) = 07/29, 1/3000 024 2005, Juits 2005, Juits 2005, Juits 2000, Juits 200	ha (= 1/25/10)/14 ible covering
MPACTS OBSERVED. Je general VERALL ASSESSMEN (187E: Milowolg At Tilk time gravef Substra Milles & sector phisest in the Sand y Born use of substra phisest in the Sand y Born use of substra phisest in the Sand y Born Use of substra phisest in the Sand y Born Designed for altho the budge ORECON Score= 9 T Families (+ add. taxa) A Habitat Assessment altho The Markeelande	AND POSSIBLE SOUP AND POSSIBLE SOUP (Land wees) ANT & SUMMARY: The consel abble : Thomas Of Loge + Wag is but decent ep ns of loge + Wag is hegen the In e S.H. Mumany (her inundates Musionnereble musionnereble the inundates Musionnereble Musionneble Musionne	listed alo suldrate = sti clear Plous and clear Plous and ly debus ly debus pore #'s obse pore #'s obse	D- Ac us as a star a us dare gran yen in clarger good canopy atrate boses good canopy atrate boses good canopy atrate boses good canopy as, us half or self y a wed in 1998 (r) go in Hal. 20 unesty y about alentiful fant a yielded 13/2 bitt is present i	(Ame) = 07/29 1/Brown use 2005, Juits 2005, Juits 2005, Juits 2007, Juits 200	ha (= 1/25/10) / // 1/16 covering] a stirting decent reparient predeminant frank rook a stirting decent reparient frank rook a still for predeminant frank rook a still for a still be depected to biagon fin decent of predeminant a still be depected sta = 2 High LOW deminant of the still for a still be depected to biagon fin decent of predeminant sta = 2 High LOW

Figure F-13 Indian Creek Field Sheet - August 24, 2002

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) G-16 of G-8

11.000	STREAM CH	ABACTERIS	TICS		Langth of a	trans march	- herees	10001	
	E OTTLEAM OT	SURBOUND	ING LAND US	E (tacing dow	unetream) :	tream reach a	issessed =	1000	
STIMATE	% RDB	IDB	NG LAND 05	RDB	I DB		PDP	IDP	
ACTINE	15-00	124- 127	LIDBAN	NDD	LUD		11. 7	LUB	1 MASILIT
DODE	- 62 · 25 ¥	10- 60 4	INDUSTRY		0 10000	HESIU.	104	200	100303
ODECT	1-207	5-159	MINIMUSIAT			HOAD	106	25.6	Y THUGS
CANOP	COVED. Ectin	5-15 S	200000 (0.10)	Barth Chad	adid an	J OTHER	terite man	l ou dere me	A ROLAN
CANOFI	Maseu	rad:	(COpenio-TO)	Party Shao	100(11-45)	Mostly Shade	0(40-00)	enaded(>80	D
ANK HEI	GHT (m): A 2	- CA	0/3	HIGH W	ATER MAR		in	HB	
EDIMENT	DEPOSITE:	NONE	CLUCLET	Herrer	hutingan	c (m). 6.	0 (7)		
TYPE:	SLUDGE	MUD	SAND	(SUT)	NONE	OTHER	C	hotominator	VorN
URBIDITY	(CLEAR)	BLIGHR	MODERATE	HIGH	OPAQUE	> clear	flow.	eure a c	: and
LGAE PR	ESENT?	NONE	SLIGHT /	MODERATE	CHOKING	TYPE	mund	alano =1	houna
QUATIC	VEGET.	ROOTED	FLOATING	TYPE 2/	none		Porlon 1	5 subst	Sat ha
APID PER	RIPHYTON ASSE	ISS:	%Filamento	JS =	/	% Coloniza	ble Substrat	e= /	//
1299 cm	% Direct Sunligh	t= //	Mean Thickne	ess Rank =	//	28 2 0 2		1.	
VATER OL	JALITY COMME	NTS: (eil sheer	, odor, colors,	etc)	Mume	cous to	sh obse	web, C	Var
Alo	w-even in	deeper a	neas, h	igh sand	uy Der	ne silt.		. ,	11/11/2012
/		1	/ /		/		20140		C. A. C. C. V.
UBSTRAT	re (%)	(Visu	al estimates)						
		RIFFLE	RUN	POOL		0.000	RIFFLE	RUN	POOL
OULDER	(> 10")	15 %	5 %	5 %		DEPTH (m)	2.56,0"	4.6-1.0	3.0(+)
OBBLE (2	.5-10")	55 %	45 %	5 %		WIDTH (m)	4-101	10-15t	6.01
RAVEL (0	.1-2.5")	10 %	20 %	20:35%	REACH	ENGTH (m)	4-10	20 (41	8.0'
EDROCK		%	- %	5 %		ioseff - 1	0110		
AND	(gritty)	15 %	a0 %	25 %		Staff Gauge	/Bench Ht:	SANO DE	ATERS
	(fine)	5 %	16 %	10 %		VELOCITY	FS)	nigenia	UNSIGT25
CAT	(SIICK)	- %	%	%		FLOW (CFS)		
UCK-MUD	(CPOM)	PT 70	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	15-20%		HABITAT A	SSESSMEN	T SCORE #	:125
ARI (chal	I frane)	/0	- /0	- 0/		nn #_		- GP #	
radient (e	ample reach):	Flet Lo	Woders	High	Caecada				
ize (stream	m width) .	00-50 (2)	V Small (-1)	5m) Small (1	(ascaue	12.10ml at	2100 110 05	Wand	(- 05m)
ABITAT	UALITY COMM	ENTS: (bank e	rosion rinaria	n pool/riffle vs	ariety etc)	Rank	arye (10-20	Very L	the
MAN	to be need	mplo 1	annel ne	Ille & al	an dan	+ Dank	Ante	1 and	Time
1 mg	ur le nem	unn Drea	ont hatt	Therned	in Da	man - a	and can	nou hou	
1118	a fair a	Ille - M	n- Dant	RAIDMI	3 in y	hear la	and course	7.000	
110	VI VNING TU	10-1- 1 PM	at fandet and	Juin	2 201 11	de Houses	and I	TA	1
TREAMS	SKETCH	Constant Property and			1.00-	pig last	11	4/1	1
TREAMS	KETCH			Report	RULE	takancorreg]	///	1 .1	
TREAMS	KETCH		2	Real	Fluffe	Lahandored)	115	1:1	1
TREAMS	KETCH	De	D.	Belle	Fluffs	takanara Fram	11	Pin	11
	KETCH		D	TUT	Pluff &	to Hai		Pere	11
TREAM	KETCH C		Del M	TU (9	Played Rd	te Have	A A	Per	
TREAM	KETCH C			TUT (9	Player Rd	te Here	ALL NO	Pier	100
TREAM	KETCH C			TUF (9	Pluffe and Red	te Hence	A LE LE	Pier	100
TREAM	KETCH C			RED LA	Fluff C	te Herer	THE REAL PROPERTY IN	Pier	100 M
TREAMS	KETCH C			RED C	Pluge	te have	A LAND	Pier	travi 28
TREAMS	KETCH C			Sector Contraction	and red	the Henry	ALL REAL	Pier	A Land
TREAMS	KETCH C			Section of the sectio	Pluge and Red	takanarar Pisarar		Pier	the state
TREAMS	KETCH KETCH C.C.C. Run CL	Jage cherry		800	Pluge	takanarar Pisaran De Travar	AT LE LE	Print	Start St
TREAM	Run et ansigned	Jung dum		16-00 48 10 1 10 1 10 10 10 10 10 10 10 10 10 10	Pluge and Red	takanarar Harar	WI LEEP C	Print	the state
TREAM S	Run et	dang dang		Level Here	Pluge of and	the hander	AT LEEP C.	Print	A THE
TREAM	Run et	dang dang	A COMPANY AND A		Pluge and Red	the handered	at least is a run	Print	Re real
TREAM	Run et	dan dann	A CONTRACT OF A	1	Pluge and Red	the hander	the second second	Pier Pier	A THE REAL
TREAM	Run et	dan dann dann dan dan dan dan dan dan da	A COLORED AND A	1	and	the hand a real of the second	all least in the second		A THE REAL
TREAM	Run et	A A A A A A A A A A A A A A A A A A A		1	and	the house	All Marine (A THE REAL PROPERTY OF
TREAM	RETOR	A A A A A A A A A A A A A A A A A A A		1000 100 100 100 100 100 100 100 100 10	and	takanaran Harris Contraction of the second s	Marine C		Real Parts

Figure F-13 (Cont.) Indian Creek Field Sheet - August 24, 2002

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) G-17 of G-8



Figure F-14 Indian Creek Riparian Removal and Bank Grading

Figure F-15 Indian Creek Gravel Dredging and Bank Disturbance



Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) G-18 of G-8



Figure F-16 Indian Creek Tobacco Row Crops Near Stream

Figure F-17 Indian Creek Cattle With Stream Access



Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) G-19 of G-8



Figure F-18 Indian Creek Cattle with Stream Access

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) G-1 of G-8

APPENDIX G

Public Comments Received

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) G-2 of G-8

Comments from Save Our Cumberland Mountains (SOCM)

Paddock & Mastin 360 Roberts Hollow Lane Cookeville, TN 38501-9224 931-268-2938 voice & fax bpaddock@twlakes.net

July 27, 2005

Paul Davis, Director Tennessee Department of Environment and Conservation Division of Water Pollution Control 6th Floor L & C Tower 401 Church Street Nashville, TN 37243-1534

Dear Paul Davis,

The Roaring River Chapter of Save Our Cumberland Mountains offers these comments on the "Proposed Total Maximum Daily Load (TMDL) for Siltation & Habitat Alteration in the Caney Fork River Watershed" (issued January 7, 2005). We thank Environmental Program Manager Sherry Wang for presenting information on this TMDL at our July, 2005 Chapter meeting. We appreciate TDEC's invitation to the public to comment on the proposed TMDL, and the courtesy the Division has shown in providing an extended public comment period for the TMDL.

The Upper Cumberland Group of the Tennessee Chapter of the Sierra Club joins in these comments.

The SOCM Chapter has long had an interest in the Caney Fork Watershed. Our members recreate in this watershed and some are avid fishermen. We have carefully studied the stormwater issue, especially the increasing amount of impermeable surface in Cookeville which is adversely affecting Pigeon Roost Creek. Our members have hiked along the creek and taken photographs. We have studied the karst geology and understand the interactions which belie the simple distinction between surface and ground waters.

The Proposed TMDL is an adequate first cut but it is not clear how it will be translated into active measures to repair and restore our impaired waters. With the data available, the measures proposed appear to reasonably assign sources of the impairment but a real nexus to corrective action with respect to non-point sources is lacking in the implementation section. One of the immediate goals of the new EFO staff who will be coming to support the TMDL program should be to target monitoring to priority areas and to assure that permitting and enforcement staff have the immediate benefit of TMDL staff field observations and data.

We join the Caney Fork watershed Association in noting that very little "margin of safety" is included in this initial TMDL. The 5% of sediment load included as "MOS" in the load calculation is actually used to account for the loads of minor sources. While the modeling is said to provide some margin of safety, it understates the contribution of development and urban runoff because the modeling is based on 1998 source data. Development activity and the amount of impermeable surface has greatly increased in the watershed since that year. Construction activity is highly variable, changing from month to month.

We believe the TMDL should be strengthened by specific requirements from TDEC for more specificity and more immediate action from the City of Cookeville under the MS4 Phase II stormwater permits system. Few if any of the comments or recommendations provided by Dr. Vincent Neary (see attachment), a stormwater advisory committee member, were considered or adopted by the City of Cookeville when they developed their Notice of Intent (NOI) over two years ago. Dr. Neary was later dismissed from the stormwater advisory committee after submitting his comments because he was considered too critical. Without active enforcement of the City's grading permits system the goal of reducing pollution from stormwater will not be met. Cookeville has not established a funding mechanism to implement the Phase II program. This month the City adopted a budget allowing a \$25,000 expenditure for Phase II. This about 25% of the amount needed for the first 12 months according to a statement by the City Manger in the January 3, 2005 Council "work session" on the Phase II program and its funding.

Cookeville has not taken any positive steps to stop the growth of impermeable surface area and to reduce the existing impermeable surface. Last year's changes in parking lot rules did not reduce either the number or size of stall requirements. Nor has the City been willing to waive parking place requirements in exchange for better stormwater best management practices like porous pavers or biodetention filtration, as was suggested for the new Electronic Express store parking adjacent to the Red Kap sinkhole.

The City's Planning and Codes unit seems oblivious to the Phase II requirements and totally unresponsive to the need for modern ordinances that assure that storm water is detained and absorbed rather than simply channelized into the karst system to rise again as Pigeon Roost Creek, assuring the continued listing 303(d) listing. The City has failed to entertain new proposals requiring permeable pavement, or a system of smaller daily needs parking areas with overflow parking on areas left with permeable and grassy cover. It is now recognized that stormwater from parking lots is better handled with depressed vegetated areas to collect and filter stormwater, the most recent city ordinance for retain shopping parking areas apparently requires that planted areas be raised and curbed, directly the opposite of good stormwater control engineering!

Expert advice from Tennessee Technological University has been offered and been ignored. We believe the Water Center and the engineering resources at TTU should be put to good use by the City. It appears to SOCM that the city has failed to follow through on various proposals to identify wetlands, and other wise contract for TTU expertise in understanding and protecting the watershed areas affected by the City.

Absent a prompt and active effort by the City there will be no significant improvement in the quality of Pigeon Roost as a 303(d) listed stream. Moreover, the City's insistence that there be "fifth interchange" and that the area along Mine Lick Creek be developed as an industrial park despite the 303(d) listed status of Mine Lick Creek will further exacerbate water pollution from storm water runoff.

The TMDL summarizes some of the new general stormwater construction permit requirements as including weekly sediment control inspections weekly (apparently by the permit holder) if the potentially receiving waters are 303(d) listed. Pigeon Roost Creek is so listed. How can concerned citizens determine if such weekly inspections are, in fact, occurring?

The "Implementation Plan" measures are modest, probably too modest. They do not impose any unnecessary burden on those who are currently contributing to water quality and habitat degradation. SOCM will continue to insist on strict compliance with both construction and industrial stormwater.

All stakeholders in the community must act to protect the watershed and to remedy the present cases of impaired waters and to prevent future impairment. SOCM has a variety of technical expertise among our members. We also have volunteers that have begun to act as monitors in the field, documenting pollution since the EFO is so understaffed. We welcome the opportunity to cooperate with TDEC in education, facilitation or research efforts directed toward implementation of the proposed TMDL.

In the future and for other proposed TMDLs please recognized the Roaring River Chapter of Save Our Cumberland Mountains and the Sierra club Upper Cumberland Group as stakeholder groups for the Caney Fork River Watershed and the Emory River Watershed.¹ Notification about TMDLs may be sent to the below signed as contact persons on water quality issues and programs.

¹ We inquire as to any grant or assistance that may be available to help our work to implement the TMDLs under 40 C.F.R. PART 25 "Public Participation" and particular Section 25.3 "Policy and objectives" especially subsection (b).

[&]quot;(b) Public participation is that part of the decision-making process through which responsible officials become aware of public attitudes by providing ample opportunity for interested and affected parties to communicate their views. Public participation includes providing access to the decision-making process, seeking input from and conducting dialogue with the public, assimilating public viewpoints and preferences, and demonstrating that those viewpoints and preferences have been considered by the decision-making official. Disagreement on significant issues is to be expected among government agencies and the diverse groups interested in and affected by public policy decisions. Public agencies should encourage full presentation of issues at an early stage so that they can be resolved and timely decisions can be made. In the course of this process, responsible officials should make special efforts to encourage and assist participation by citizens representing themselves and by others whose resources and access to decision-making may be relatively limited.

Siltation/Habitat Alteration TMDL Caney Fork River Watershed (HUC 05130108) (8/1/05 - Final) G-5 of G-8

Sincerely yours,

Brian Paddock for SOCM

cc: Charles Womack, Mayor, City of Cookeville

Mary Mastin, Conservation Chair For the Sierra Club U.C. Group

Comments from Caney Fork Watershed Association (CFWA)



Caney Fork Watershed Association P.O. Box 165 Cookeville, TN 38503-0165 <u>CFWA@blomand.net</u> www.cfwa-tn.org

July 27, 2005

Paul Davis, Director Tennessee Department of Environment and Conservation Division of Water Pollution Control 6th Floor L & C Tower 401 Church Street Nashville, TN 37243-1534

Director Davis,

The Caney Fork Watershed Association (CFWA) is delighted to have the opportunity to comment on the "Proposed Total Maximum Daily Load (TMDL) for Siltation & Habitat Alteration in the Caney Fork River Watershed", issued January 7, 2005. We appreciate the care that Environmental Program Manager Sherry Wang and her staff have taken in presenting and making available to the public the proposed TMDL, and the courtesy the Division has shown in providing an extended public comment period for the TMDL.

The Caney Fork Watershed is a great asset for our region and our country. This watershed provides our drinking water, accommodates and our stormwater runoff, and furnishes and supports the unparalleled recreation opportunities on which both our economy and quality of life depends. It is of utmost importance that all stakeholders in the community partner in protecting the watershed, and in taking measures to remediate the present cases of impaired waters and to prevent future impairment.

The Proposed TMDL is a very good initial basis with which to begin to achieve remediation of our impaired waters. Within the context of the data available, the measures proposed reasonably assign sources of the impairment and suggests measures toward remediation which are fair, will not impose undue burden on any stakeholder, and will likely produce marked improvement in the quality of the 303(d) listed impaired streams.

We note that very little "margin of safety" is included in this initial TMDL. The 5% of sediment load included as "MOS" in the load calculation is actually used to account for the loads of minor sources. While the modeling is said to provide some margin of safety, it likely underestimates the contribution of development and urban runoff, as the modeling is based on satellite imagery data

acquired between 1992 and 1995, and development and development activity have increased in the watershed in the past ten years. Also, CFWA believes that basing target loads on unimpaired reference streams in the same ecoregion is not a conservative measure, but is simply the most reasonable one. While the TMDL is not "conservative" in the sense of including a large margin of safety in assigning target loads, the loads do represent significant reductions, and can be reduced further, and with greater specificity in source allocation, when the effectiveness of the present TMDL has become clear.

The "Implementation Plan" measures are modest and do not appear to represent any unnecessary burden on stakeholders. The requirements on developers are very similar to those presently required. The rational for "singling out" the Cookeville and Smithville STP's for reduced NPDES requirements seems reasonable. It is unfortunate that explicit regulation cannot be applied to the major source of impairment, nonpoint source pollution, as this regulation would stimulate and facilitate better stewardship. However, in making clear the severity of impact of nonpoint sources, the TMDL can furnish a valuable tool in reducing the loads from these sources.

The mission of CFWA is, "The CFWA promotes conservation and improvement of the aquatic ecosystems of the watershed." Our primary activity is education, through our programs, field days, and other activities. An important goal of our organization is to facilitate communication among local stakeholders. We also have significant technical expertise among our supporters, and can implement "citizen science" and other technical projects. We welcome the opportunity to cooperate with TDEC in education, facilitation or research efforts directed toward implementation of the proposed TMDL.

Thank you for your good work!

Sincerely yours,

Mary Jane Ware, Chair CFWA

Cookeville STP Comments (Reference: Caney Fork Watershed Association Comments)

From:Ronnie Kelly <rjk@cookeville-tn.org>To:'Caney Fork Watershed Association' <cfwa@blomand.net>, Paul EstillDavis <Paul.Estill.Davis@state.tn.us>Date:8/1/2005 11:56:53 AMSubject:RE: Comment Letter on TMDL---Caney Fork

Mary Jane,

I received the following e-mail this morning and I have a couple of questions. I missed the meeting in Carthage so I was wondering if these comments were reviewed by the membership before being sent or were they just a product of the board? If the membership did not get a chance to review and agree with the comments then I would suggest that in the future the membership be given a chance for input before comments go out in their name. I consider myself a member and this is the first time that I have had a chance to review the comments.

There is a statement in the comments that refers to the Cookeville and Smithville STP's. This statement states, "The rational for "singling out" the Cookeville and Smithville STP's for reduced NPDES requirements seems reasonable." I had previously reviewed the proposed TMDL and did not remember the Cookeville and Smithville STP being "singled out". I have just gotten off of the TDEC web page and reviewed the proposed TMDL again and I can find no reference to the Cookeville and Smithville plant being "singled out". The only reference to Regulated Municipal Wastewater Treatment Facilities that I could find in the "Proposed Total Maximum Daily Load (TMDL) for Siltation & Habitat Alteration in the Caney Fork River Watershed", refers to the Cookeville and Smithville STP's only in a general sense found on page 19 of the document. It states "As stated in Section 3.0, the TSS component of WWTF discharges is generally composed of primarily organic material and is considered to be different in nature than the sediments produced from erosional processes. Therefore, TSS discharges from WWTF's are not included in the TMDL's developed for this document." Have I missed something somewhere? Please reference the page number where Cookeville and Smithville are "singled out" so that I can review the wording and try to understand the comments that were submitted and why that comment was included.

Ronnie Kelly