

**BIOLOGICAL BASELINE CONDITIONS IN THE  
LITTLE RIVER WATERSHED (2003)**

**Final Project Report**

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Nonpoint Source Implementation Grant**

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## **Executive Summary**

1) Nutrients, pathogens and siltation continue to be serious impairments of the mainstem and tributaries of the Little River, located in the Lower Cumberland drainage basin in western Kentucky. Non-point sources of nutrients, pathogens, and siltation result from agriculture and other crop-related inputs. Urban-suburban runoff from the Hopkinsville area also contributes non-point pollutants. The Little River has been identified as a “first priority” river for future TMDL development (KWRI 1999).

2) The main objective of this study was to assess the biological integrity of the Little River by achieving the following.

a) An assessment of habitat, fish, macroinvertebrate, and algal data using biological metric criteria provided by KDOW for the Little River and its tributaries,

b) Identification of biological indicators that are sensitive to, and/or specific for, non-point source pollution, and

c) Comparison of biological data collected and habitat assessments conducted in 2003 with a previous survey carried out in 2000 at the same sites by the Center for Reservoir Research (Murray State University), and with other similar KDOW historical data (1988) for the Little River.

3. Ten study sites were sampled on the Little River (including North and South Forks), three on Casey/Skinner Creek, and three on Sinking Fork during May and September of 2003. (Fig.

1).

4. Physical and chemical data, algae, macroinvertebrates and fish were collected, visual habitat assessments were carried out, and a photographic log of all sites was established.



5. Multimetric scoring systems were used to integrate biological data (algae, macroinvertebrates, fish) in order to identify sites in the Little River basin impacted by non-point source pollution.
6. Algae and macroinvertebrates were collected in May and September of 2003; fish were collected in July and September. For May, 156 diatom taxa, and 144 macroinvertebrate taxa were identified; 35 fish taxa were identified for July. For September, 198 diatom taxa, 116 macroinvertebrate taxa, and 38 fish taxa were identified.
7. Casey/Skinner Creeks (CRR200014 and CRR 200015) were rated as Good and Excellent for diatoms and Fair for fish, but Poor for macroinvertebrates. The uppermost sites on Sinking Fork (CRR200010 and CRR200011) were rated as Good or Fair for diatoms and fish, but Poor for macroinvertebrates. Use-support based on habitat assessments rated only three sites as Partially Supporting of aquatic life (South Fork sites CRR200001 and CRR200002, Casey Creek site CRR200014). All other sites in the Little River were rated as Non-Supporting of aquatic life (Table 15).
8. Diatom Bioassessment Indices (DBIs) in 2003 were generally more complementary of Little River habitats than either the Macroinvertebrate Biotic Indices (MBIs) or Fish Index of Biotic Integrity (IBIs), resulting in several Good ratings of sites (19/32 sites or 59%). This is probably attributable to the changes in which metrics were used and how they were weighted in the DBI calculation. Improved methods in DBI calculations have emphasized such metrics as the highly silt tolerant % *Navicula+Nitzschia+Surirella* group and % *Cymbella* Total Richness, rather than previously used metrics such as % Sensitive Species and 'non-diatom taxa' presence. The improvement brings the DBIs more in line with other biological indices when assessing overall stream health.

9. MBIs classified only three sites as Fair (CRR200001, CRR20002 and CRR200011) during either May or Septemeber, 2003; all other sites during both sampling times were deemed as Poor. No Excellents occurred at any sites for macroinvertebrates.

10. IBIs (KIBIs) classified three Little River sites (CRR200001, CRR200002 and CRR200005) and two upper Sinking Fork sites (CRR200010 and CRR200011) as Good in 2003. Other sites were either Fair or Poor for fish. No Excellents occurred at any sites.

11. The most common disturbances encountered at sites in the Little River basin in 2003 continue to be lack of habitat for aquatic organisms, deep, highly eroded and channelized streambeds, limited riparian zone area and vegetation, and agricultural runoff.

12. Overall comparisons of indices and assessments from this study to previous studies carried out in 1988 and 2000 were mixed depending on the index. In some cases, some sites seemed to be improving while others showed continued degradation of water quality (Tables 19-11). The best scores were found in Casey/Skinner Creeks while the worst were consistently found along the mid-reaches of the Little River and at some North and South Fork sites.

13. Based on the 2003 study and comparisons with previous studies of 1988 and 2000 using improved methods for calculating DBIs, MBIs and IBIs, the Little River remains a highly impaired habitat for aquatic biota due to nonpoint source inputs and disturbances characteristic of agricultural activity, riparian destruction, and in-stream disturbances.

## **Introduction**

This study was conducted by the Center for Reservoir Research (CRR, Murray State University) in agreement with the Kentucky Division of Water (KDOW). The agreement laid the basis for the implementation of the Kentucky Nonpoint Source Management Program, as required by Section 319 of the Federal Clean Water Act Amendments of 1987.

The Little River basin, located in the Lower Cumberland drainage basin in western Kentucky, has been identified as a “first priority” river for future TMDL development (KWRRRI 1999). Nutrients, pathogens and siltation continue to be serious impairments of the mainstem of the Little River. Non-point sources of nutrients, pathogens, and siltation result from agriculture and other crop-related inputs. The North Fork of the Little River, although considered a non-priority for future TMDL development (KWRRRI 1999), is considered to be highly impaired by siltation and pathogens, but only slightly impaired by nutrients. Agriculture, resource extraction, urban runoff and storm sewers are major non-point sources contributing to impairment. Nutrients and siltation also contribute to serious impairment of the South Fork of the Little River, although the South Fork is a “non-priority” for future TMDL development. Agriculture as the most important non-point source of pollutants; industrial point sources make a moderate contribution to impairment (KWRRRI 1999).

The main objectives of the above-stated agreement with KDOW included

- (1) comparing resulting fish, macroinvertebrate, and algal data using biological metric criteria provided by KDOW for the Little River and its tributaries,
- (2) identifying biological indicators that are sensitive to, and/or specific for, non-point source pollution, and

(3) comparing May and September, 2003, biological data collected from the Little River sites with the previous CRR/HBS survey carried out in 2000 at the same sites and with other similar KDOW historical data (1988) for the Little River.

The goal was to assess and identify streams in western Kentucky impacted by nonpoint source pollution (e.g., runoff from fields, impermeable urban surfaces). Algae, fish, and macroinvertebrates were collected and identified to assess the biological integrity of each stream. Habitat assessments were conducted to supplement biological data. The protocols used for collection and metrics were established and detailed in KDOW (1993). The KDOW methods were modified from those developed by the United States Environmental Protection Agency (US EPA) and are detailed in Barbour et al. (1999). Historical reference data collected from the least disturbed streams in the region were used as a foundation with which to compare our data.

### **Site Selection**

The general area of each site was pre-selected by personnel at KY Division of Water and was approximately at the same locations as in a previous KDOW investigation (KDOW 1996). The land uses indicated the potential for non-point source pollution, predominantly from agriculture fields (corn, soybeans, cattle). Detailed maps (7.5 minute USGS Topographical Maps) were used to locate the sampling sites. Locations were recorded using a Global Positioning System (Trimble Navigator Pro X R GPS unit) and entered into a Geographic Information System (GIS, Fig. 1).

A total of 16 sites were sampled within the Little River or its tributaries in the Lower Cumberland River basin. Based on USGS maps, GPS and GIS information, the 16 sites

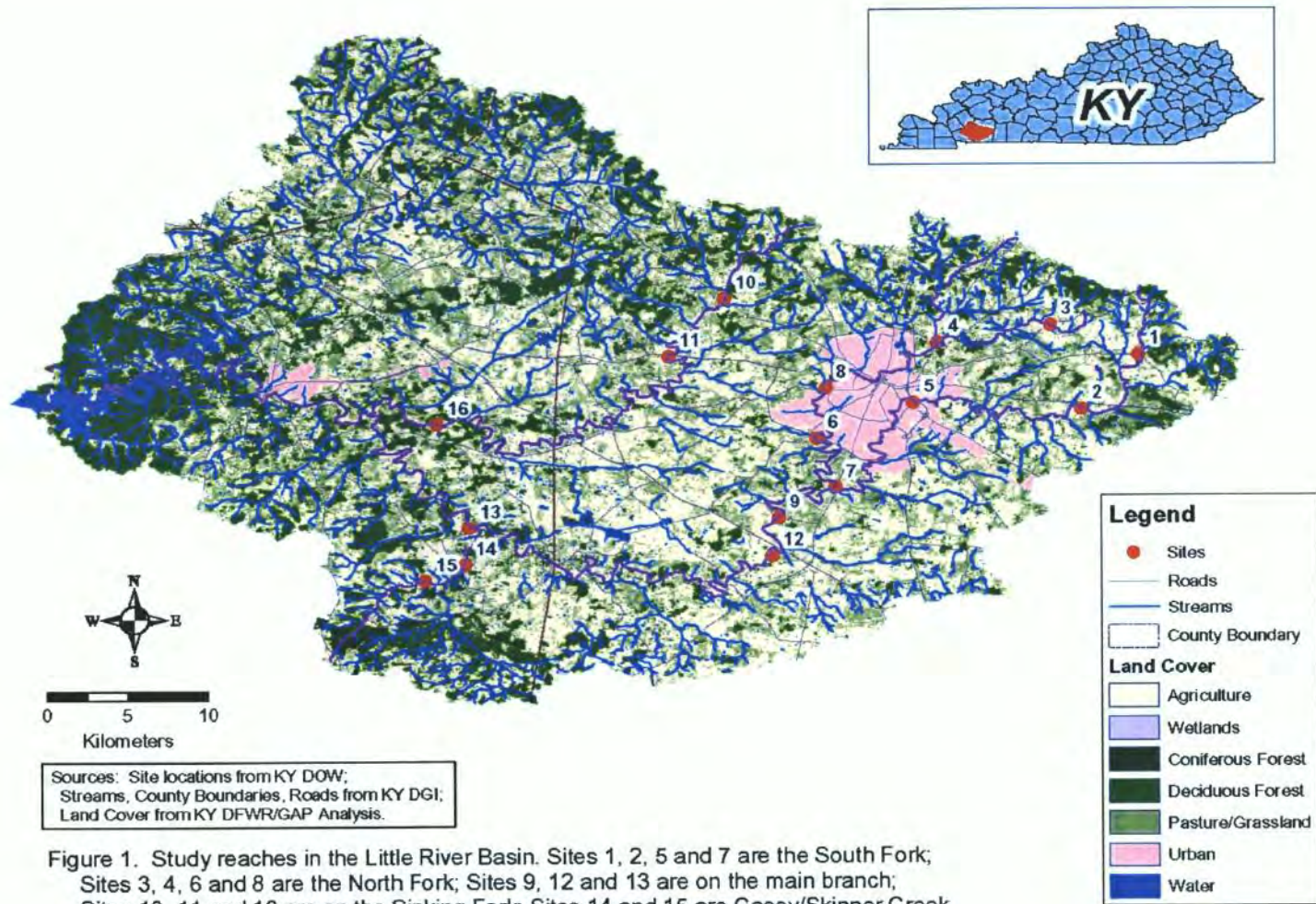


Figure 1. Study reaches in the Little River Basin. Sites 1, 2, 5 and 7 are the South Fork; Sites 3, 4, 6 and 8 are the North Fork; Sites 9, 12 and 13 are on the main branch; Sites 10, 11 and 16 are on the Sinking Fork; Sites 14 and 15 are Casey/Skinner Creek.

included three on Sinking Fork creek, one on Casey Creek, one on Skinner Creek (renamed as such from the Casey Creek of 2000) and the remaining eleven on the Little River. All sites were sampled in May, 2003, during high base flow, and again in September 2003, during low base flow.

### **Ecoregions**

All sites within the Little River basin are in the Interior Plateau ecoregion also known as the Pennyroyal Bioregion – Interior Plateau (Fig. 2, Omernik (1987)). The Interior Plateau ecoregion is the largest region in western Kentucky with the most complete reference data for biological assessments. The geology consists of limestone, sand stone, and shale. Because of the solubility of limestone, many springs, caves, and sinks are present (McGrain, 1983). The plentiful springs produce a more constant base flow throughout the year; surface water temperatures in the summer tend to be variable yet cool for the spring-summer season (range 8-22 °C), and the high alkalinities are reflected in potentially higher biological productivity. The stream substrates are normally dominated by gravel, sand, bedrock, and silt; however, we found much variability in substrate from one study site to the next. The land use is mostly for row cropping (corn, soybeans) and pasture/grazing. Very little riparian corridor is left in the Little River Drainage (KYGAP 2001).

### **Materials and Methods**

Physicochemical measurements were recorded, algae and macroinvertebrates collected, and the habitat was assessed at each site during May and September, 2003. Fish were sampled independently, during July and September, 2003.

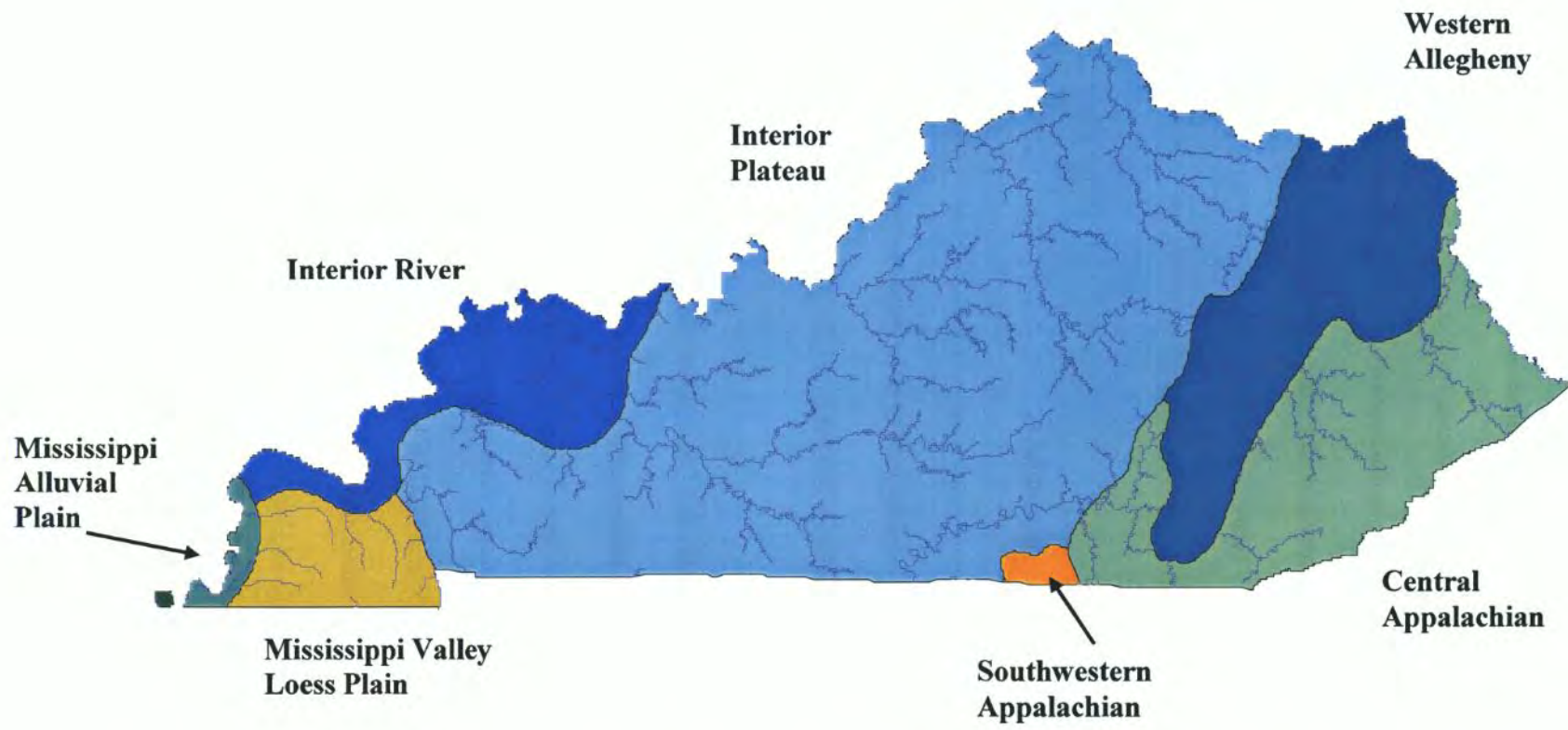


Figure 2. Ecoregions of Kentucky. CRR study sites were located within the far western portion of the Interior Plateau ecoregion.

**Physicochemical measurements.** Physicochemical measurements (dissolved oxygen, turbidity, pH, temperature, specific conductivity, and oxidation-reduction potential) were recorded at each site using a YSI 6820 Multi-Parameter Water Quality Monitor. Stream channel cross-sections were divided into at least four smaller cross-sections, depths were recorded at the center of each section, and water velocity was measured at 0.6 of the depth in each section using a Marsh McBirney 201 D PWCM flow meter. Discharge was calculated using the following equation:  $Q = WDU$  for each cross section of stream where

$Q$  = stream discharge ( $m^3/sec$ );

$W$  = width of cross section (m);

$D$  = average depth of cross section (m);

$U$  = velocity (m/sec).

A roughness factor of 0.9 was multiplied with  $Q$  to account for friction from a rocky-bottomed substrate. All cross sections were summed for total discharge ( $Q$ ).

**Habitat Assessment.** Stream habitat and the riparian area for aquatic organisms were visually assessed at each site. The assessment protocol followed the US EPA's "Rapid Bioassessment Protocols (RBP) for Use in Wadeable Streams and Rivers" (Barbour et al. 1999). The Little River habitats at sites 1-16 were a mix of high and low gradient habitats (Mike Compton, KDOW, pers. comm. 2005); however low gradient habitat assessment sheets were used in this study. Table 1 shows the habitat parameters and scoring for each site. Each parameter is described by Barbour et al. (1999).



Table 1. Habitat assessment variables for high and low gradient streams.

<b>High</b>	<b>Low</b>
1 = Epifaunal Substrate/Available Cover	Same
2 = Embeddedness	Pool substrate characterization
3 = Velocity/Depth Combinations	Pool variability
4 = Sediment Deposition	Same
5 = Channel Flow Status	Same
6 = Channel Alteration	Same
7 = Frequency of Riffles	Channel sinuosity
8a = Bank Stability – Left Bank	Same
8b = Bank Stability – Right Bank	Same
9a = Vegetative Protection – Left Bank	Same
9b = Vegetative Protection – Right Bank	Same
10a = Riparian Width – Left Bank	Same
10b = Riparian Width – Right Bank	Same

A Nonpoint Source data sheet was used for assessing habitat quality, surrounding land use, weather conditions at the time of sampling, percentage substrate components, and other instream features similar to the above assessment form. Variables were assigned scores that were summed to arrive at a Metric Score for each site. Metric Scores provided a “classification” of Habitat Support Criteria by which each site was rated (Table 2).

Table 2. Habitat Support Criteria for Habitat Assessment Values for sites in the Little River Basin and its Tributaries (Pennyroyal Bioregion–Interior Plateau).

<b>Metric Score</b>	<b>Classification</b>
≥ 122	Fully Supporting
121-110	Partially Supporting
< 110	Not Supporting

## Biological Assessment

**Algae.** Composite, qualitative algal samples were collected at all sites. Standard collection and identification methods are described in KDOW (1998). All sampling occurred on natural substrate when stream flow was normal to low. Algae were sampled with a micro-spatula for scraping substrates and a turkey baster for sucking material from substrates. All major habitat and substrate types were sampled including riffles, pools, runs, rock, sand and woody debris. Algae were placed in a 60 ml Nalgene™ bottle as composite samples, preserved in 2% gluteraldehyde and refrigerated until processed.

The non-diatom (soft-bodied) algae were removed from the preserved sample, mounted on pre-cleaned microscope slides, identified to the lowest possible taxon and counted. Diatom frustules were cleared of organic and intercellular material using the Burn-Mount Method (Van Der Werff 1955). This method required placing about 5-10 ml of sample in a 1,000 ml beaker and oxidizing the solution with 100 ml of 30% peroxide ( $H_2O_2$ ) for 24 hours. A micro-spatula of potassium dichromate ( $K_2Cr_2O$ ) was then added to the mixture causing a violent exothermic reaction that oxidizes all organic matter in 5 to 10 minutes leaving only the diatom frustules. The mixture was allowed to settle for 4 hours, decanted, filled with distilled water and allowed to settle again. The decanting process was repeated at least four times. The remaining diatoms were mounted in Zrax (W.P. Dailey, University of Pennsylvania, dailey@sas.upenn.edu) dissolved in toluene on a precleaned slide, identified, and enumerated. A minimum of 3 slides was created for each sample. The criteria for determining a representative sample of diatoms included at least 600 valves with 10 valves of 10 species and/or 100 new species that had not been observed consecutively

(USEPA 1999). Fixed slides, bench sheets and field shields are archived at Hancock Biological Station.

Genus and species of diatoms and numbers of individuals found at each site were entered into the Ecological Data Application System (EDAS vKY3.0.mdb of 5/31/00). KDOW used streams that were shown to be the most representative and least disturbed as reference reaches to determine the most pollutant sensitive metrics for each ecoregion (Table 3). Five of the eleven metrics calculated by EDAS and specific to the diatoms were used to calculate the Diatom Bioassessment Index (DBI). The DBI was calculated by entering the five metrics in Table 3 into the most recent Excel spreadsheet program provided by KDOW (John Brumley, pers. comm.). The DBIs were then rated according to the scoring classification (Table 4). Each metric is described in detail in (KDOW, 1995).

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Table 3: Diatom metrics used to calculate the Diatom Bioassessment Index (DBI). [Note: This Excel program includes a sixth metric (*Fragilaria* Richness) which this version of EDAS does not compute; thus it was excluded from the DBI calculation.] (KDOW 1995)

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Diatom Metrics:	Taxa Richness (TR)
	Diatom Diversity (H)
	Pollution Tolerance Index (PTI)
	Percent <i>Navicula</i> + <i>Nitzschia</i> + <i>Surirella</i> (%NNS)
	<i>Cymbella</i> Group Richness (TR)

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Table 4. Diatom Bioassessment Index rating criteria for sites in the Little River Basin and tributaries. (Pennyroyal Bioregion–Interior Plateau). [Note: Soft-bodied (non-diatom) algae are not included in the metric scoring process, but are reported in Table 11.)]

Metric Score	Classification
≥ 67	Excellent
55-66	Good
50-54	Fair (Partially Supporting)
≤ 49	Poor (Not Supporting)

Non-diatom (soft-bodied) algae give further insight into the quality of the stream but are not a component of the DBI. Non-diatom species are listed separately.

**Macroinvertebrates.** Benthic macroinvertebrates were sampled using two collection methods that varied with stream morphology. All streams with riffles were sampled with a one-meter kick-net in the riffles, and with a D-frame net in the remainder of habitats (undercut banks, woody debris, vegetation, etc). This Multi-habitat sampling method is semi-quantitative (KDOW 1993). In streams where riffles were a significant feature, 2 half-meter kick net samples were taken in the riffle areas, as well as sampling the remainder of the habitat. Available habitat was weighed on a percentage basis, so all sites received comparable sampling effort.

The second sampling type was specific to low gradient, slow flowing, sandy-gravelly bottomed streams. This method, referred to as the Mid-Atlantic Coastal Plain Sampling Method (MACS), was developed by several southeastern states, and is summarized in Barbour et al. (1999) and recently has been adopted by KDOW for use in the Coastal Plain area. It is a semi-quantitative, multi-habitat sampling method using a D-frame net.

Approximately 20 one-meter sweeps of all the major habitats are collected based on the percent habitat available.

Macroinvertebrate genera and number of individuals found at each site were entered into EDAS (vKY3.0.mdb of 5/31/00). Of the 17 metrics calculated by EDAS, either 7 or 8 were used to calculate the Macroinvertebrate Bioassessment Index (MBI) for Wadeable or Headwater streams, respectively. The appropriate metrics for either stream type (Table 5) were determined by the KDOW based on the most sensitive pollution indicators and were entered into the most recent Excel spreadsheet provided by KDOW (Randall Payne, pers. comm.). The metric scores were based on analyses of data from all streams sampled, both reference and impacted (our data and KDOW's), in the Interior Plateau ecoregion.

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Table 5: Macroinvertebrate metrics used to calculate the Macroinvertebrate Bioassessment Index (MBI).

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**Metrics for Wadeable Streams**

Total Number of Genera (G-TR)  
Total Number of Ephemeroptera, Plecoptera, and Trichoptera Genera (G-EPT)  
Modified Hilsenhoff Biotic Index (mHBI)  
Modified % Ephemeroptera Plecoptera and Trichoptera (m%EPT)  
%Chironomidae+Oligochaetes (%Chiro)  
% Clingers (%Cling)  
Total Number of Individuals (TNI)

**Metrics for Headwater Streams**

All of the above  
% Ephemeroptera (%Ephem)

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All of the metric scores are based on the 50<sup>th</sup> and 5<sup>th</sup> percentile calculated for each metric by compiling reference and study site data by KDOW (Randall Payne, pers. comm.). These percentiles result in a ranking of all streams together, including the reference data, so that comparisons could be made among similar streams (based in part on USEPA, 1999) and so that outliers would not adversely affect study site scores. The Macroinvertebrate Bioassessment Index (MBI) is the average of the 7 or 8 metric scores (wadeable or headwater) entered into the most recent KDOW Excel spreadsheet (Randall Payne, pers. comm.). The scoring classifications were assigned according to Table 6.

Table 6. Macroinvertebrate Bioassessment Index Rating Criteria for Headwater and Wadeable Sites (50<sup>th</sup> and 5<sup>th</sup> %iles) in the Little River Basin and its Tributaries (Pennyroyal Bioregion–Interior Plateau).

	<b>Metric Score</b>	<b>Classification</b>
Wadeable	≥ 81	Excellent
	72-80	Good
	49-71	Fair
	25-48	Poor
	0-24	Very Poor
Headwater	≥ 72	Excellent
	65-71	Good
	43-64	Fair
	22-42	Poor
	0-21	Very Poor

**Fish.** Fish were sampled at each site using a seine and a portable backpack electroshocker. A selected 100-meter reach was intensively shocked and seined for approximately 60 minutes. Fish samples were preserved in the field using 10% CaCO<sub>3</sub> buffered formalin. Large specimens were identified in the field, recorded, and released.

Small, easily identifiable fish captured in abundance also were recorded and released.

Representative fish samples were taken back to the laboratory, fixed in formalin, rinsed with water, and preserved in 40% isopropanol. Specimens were identified, enumerated, and recorded.

Fish genus and species and number of individuals caught for each were entered into EDAS (vKY3.0.mbd of 5/31/00). EDAS calculated 16 metrics of which 8 were entered into the most recent KDOW Excel spreadsheet (Mike Compton, pers. comm.) to calculate the Index of Biotic Integrity (IBI, Karr 1981). Because our version of EDAS does not calculate a % Facultative Headwater Individuals (%FHW) metric we adapted the EDAS species classification codes by applying codes for % Headwater to % Pioneers and then recalculated the metric (Mike Compton, pers. comm.). The new % Pioneer metric was substituted for the % Facultative Headwater Individuals in the most recent Excel spreadsheet for calculating the IBI. The IBI uses equally weighted metrics to detect impacted fish populations. Different metrics have been used for different ichthyoregions, as determined by KDOW's analyses of reference data (Compton et al. 2003). In order to compare our study data with the reference data, the 95<sup>th</sup> percentile for all reference data within each ichthyoregion was calculated. The method normalizes the data so that sites with particularly high values were not weighted as heavily. Unusually high values could have caused the remaining study sites to be rated too low.

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Table 7. Metrics Used to Calculate Fish Index of Biotic Integrity (IBI).

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Pennyroyal Ichthyoregion – Interior Plateau Metrics

Total Number of Individuals (TNI)  
Native Species Richness

Darter+Madtom+Sculpin  
 Intolerant Richness  
 Simple Lithophil Richness  
 Percent Insectivores excluding Tolerants  
 Percent Tolerants  
 Percent Facultative Headwater (calculated from recoded EDAS species classification under percent pioneers)

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(Fish metrics assemblages are from KDOW (1997) and Compton et al. (2003).

The resulting IBIs (=KIBIs) were rated according to the criteria established for the Pennyroyal (PR) – Interior Plateau Ichthyoregion (Table 8, Compton et al. 2003).

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Table 8. Ichthyoregion Criteria for Index of Biotic Integrity in the Little River Basin and its Tributaries (Pennyroyal Bioregion–Interior Plateau).

Metric Score	Rating
≥ 67	Excellent
53-66	Good
35-52	Fair
17-34	Poor
0-16	Very Poor

**Data Storage.** Biological and habitat data were entered into the state's Ecological Database System (EDAS), and will be returned to the state for distribution to all participating organizations). Original specimens, slides, datasheets, and bench sheets are archived at the Hancock Biological Station, Murray State University.

## Results

**Habitat Assessment.** The overall average (May + September) habitat assessment score was  $85 \pm 18$ , ranging from 37 to 119 (Table 9). The average habitat assessments for all sites



during May and September were  $89 \pm 15$  and  $82 \pm 21$ , respectively, and were not significantly different ( $t = 1.403$ ,  $p = 0.181$ ,  $df = 15$ ). There were no sites assessed as Fully Supporting of aquatic organisms during either May or September. In May, two sites on the South Fork of the Little River were Partially Supporting (CRR200001 and CRR200002) with the remaining 14 sites deemed as Not Supporting. In September, only one site was Partially Supporting of aquatic biota (Casey Creek, CRR200014) while the rest were Not Supporting. In most cases, low habitat assessment scores were the result of channelized streambeds, unstable banks, little vegetative protection, limited riparian corridor, and pool variability.

Habitat quality did not vary significantly between the two sampling dates for most sites. All of the sampling sites were still wet by September with the exception of one site, CRR200011 (Sinking Fork). Although Sinking Fork site, CRR200010, showed a marked decrease in flow by September, the channel remained wet.

**Water chemistry:** Total annual rainfall for 2003 at the nearest NADP site (LBL-Mulberry Flats operated by Hancock Biological Station) was approximately 48 inches (115 cm). Approximately 36% of the total annual precipitation fell during the months of April, May and June, 17.4 inches (41.9 cm). Stream discharge was normally higher in the spring than in the fall throughout the basin (Table 10, Figure 3). Water temperatures were significantly lower during May ( $16.1\text{ }^{\circ}\text{C}$ ) than during September ( $18.9\text{ }^{\circ}\text{C}$ ) throughout the basin ( $t\text{ stat} = -4.474$ ;  $p < 0.001$ ). Dissolved oxygen concentrations were significantly higher during May ( $10.56\text{ mg L}^{-1}$ ) than during September ( $8.34\text{ mg L}^{-1}$ ) throughout the basin ( $t\text{ stat} = 3.00$ ;  $p < 0.01$ ). Other parameters, pH, conductivity, turbidity and oxidation-reduction potential, were not significantly different between May and September ( $p\text{ values} = 0.402\text{--}0.788$ ). Turbidity was noteworthy in its basin-wide variability ranging from 6 – 60 NTU

**Table 9. Habitat assessment values for study sites in the Little River drainage basin (Interior Plateau Ecoregion). Two assessments were carried out for each site, May and September 2003. PS = Partially Supporting aquatic organisms, FS = Fully Supporting, and NS = Not Supporting. See Tables 1 and 2 in text, for explanations of scoring and use-support criteria.**

Station Code	Stream Name	Stream Gradient	Date	1	2	3	4	5	6	7	8a	8b	9a	9b	10a	10b	Total	Use-Support
CRR200001	South Fork	High	5/14/03	14	10	9	8	19	13	7	7	7	7	7	1	1	110	PS
CRR200001	South Fork	High	9/05/03	17	1	4	13	19	13	6	7	7	8	8	3	3	99	NS
CRR200002	South Fork	High	5/14/03	9	11	14	7	19	12	8	7	7	7	7	1	1	110	PS
CRR200002	South Fork	High	9/05/03	7	14	12	14	14	13	7	5	3	4	3	0	0	96	NS
CRR200003	Lower Branch NF	High	5/14/03	8	8	11	7	17	12	8	7	7	7	7	1	1	101	NS
CRR200003	Lower Branch NF	High	9/05/03	3	3	3	16	18	13	6	9	9	9	9	0	0	98	NS
CRR200004	Upper Branch NF	High	5/13/03	7	6	8	4	18	14	7	3	3	6	6	3	3	88	NS
CRR200004	Upper Branch NF	High	9/05/03	6	8	0	13	18	13	8	6	3	6	3	2	2	88	NS
CRR200005	South Fork	High	5/13/03	4	11	13	13	19	13	3	4	1	8	3	2	2	86	NS
CRR200005	South Fork	High	9/05/03	4	11	15	9	19	8	6	8	2	9	3	0	0	94	NS
CRR200006	North Fork	High	5/15/03	10	8	14	9	19	13	6	3	3	3	3	4	4	99	NS
CRR200006	North Fork	High	9/06/03	10	6	0	0	15	11	3	2	2	5	5	2	2	63	NS
CRR200007	North Fork	High	5/15/03	8	11	14	8	19	15	5	8	4	3	1	1	1	99	NS
CRR200007	North Fork	High	9/06/03	6	10	0	13	7	13	2	3	1	1	1	0	0	58	NS
CRR200008	North Fork	High	5/20/03	2	6	1	2	19	9	4	1	1	1	1	0	0	47	NS
CRR200008	North Fork	High	9/06/03	0	6	0	0	10	13	2	1	1	1	1	1	1	37	NS
CRR200009	Little River	High	5/15/03	7	9	15	9	19	14	4	3	1	2	2	3	3	91	NS
CRR200009	Little River	High	9/06/03	8	14	2	7	11	9	5	9	2	8	4	1	2	82	NS
CRR200010	Sinking Fork	High	5/20/03	8	7	8	10	18	12	6	2	2	2	2	1	1	79	NS
CRR200010	Sinking Fork	High	9/05/03	3	16	0	10	13	10	3	2	3	2	3	2	2	69	NS
CRR200011	Sinking Fork	High	5/20/03	6	7	7	11	10	18	8	7	0	3	0	3	3	83	NS
CRR200011	Sinking Fork	High	9/06/03	8	6	8	5	15	13	9	5	0	2	2	2	3	78	NS
CRR200012	Little River	High	5/15/03	9	11	13	9	19	14	7	4	4	4	4	1	3	102	NS
CRR200012	Little River	High	9/06/03	11	16	0	14	14	11	6	5	5	5	5	3	1	96	NS
CRR200013	Little River	High	5/16/03	8	10	14	10	19	11	7	1	1	1	1	1	0	84	NS
CRR200013	Little River	High	9/07/03	16	16	16	6	6	11	8	2	2	3	3	5	1	95	NS
CRR200014	Casey Creek	High	5/16/03	7	11	12	7	13	13	8	2	3	2	7	1	1	87	NS
CRR200014	Casey Creek	High	9/07/03	13	10	18	10	11	15	8	7	4	7	4	3	8	119	PS
CRR200015	Skinner Creek	High	5/16/03	8	9	7	10	13	13	7	3	3	2	2	0	0	77	NS
CRR200015	Skinner Creek	High	9/07/03	15	10	10	13	13	11	5	5	4	5	4	1	1	92	NS
CRR200016	Sinking Fork	High	5/16/03	6	7	14	7	19	12	6	3	3	0	0	0	0	77	NS
CRR200016	Sinking Fork	High	9/06/03	8	13	2	8	8	11	2	0	0	0	0	1	1	54	NS

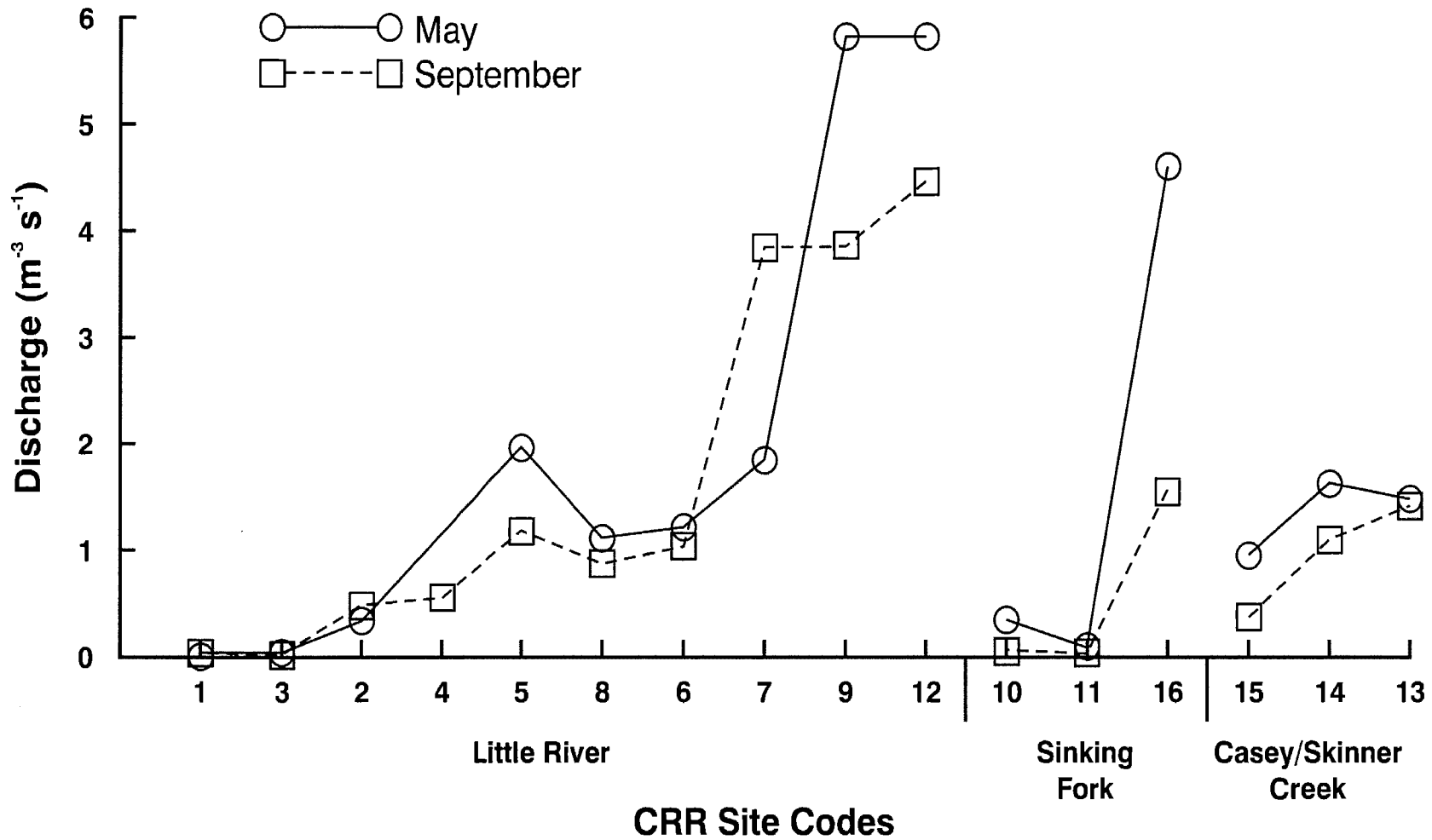


Figure 3. Little River basin stream discharge for study reaches in the Little River (North and South Forks), Sinking Fork and Casey/Skinner Creek. Sites were numbered and ordered in a downstream direction. Station codes are CRR2000 plus the site number (e.g., CRR200001....CRR200016).

**Table 10. Field physicochemical data collected from sites in the Little River Drainage Basin during May and September, 2003. NM = Not Measured, NMF = No Measurable Flow.**

Station Code	Stream Name	Date	Temp (°C)	D.O. (mg/L)	pH	Turb (NTU)	Cond (mS/cm)	ORP (mv)	Channel Width(m)	Discharge (m <sup>3</sup> /sec)
CRR200001	South Fork	5/14/03	17.5	10.55	8.01	60.3	325	419.2	7.0	0.032
CRR200001	South Fork	9/05/03	19.6	9.15	8.15	23.9	321	405.2	7.0	0.056
CRR200002	South Fork	5/14/03	16.3	9.95	7.95	10.2	362	439.9	8.2	0.368
CRR200002	South Fork	9/05/03	18.5	9.56	8.11	17.4	326	430.4	8.6	0.507
CRR200003	Lower Branch NF	5/14/03	17.6	8.83	7.72	24.9	383	434.1	5.5	0.061
CRR200003	Lower Branch NF	9/05/03	21.6	9.99	8.12	22.4	327	394.5	4.5	0.037
CRR200004	Upper Branch NF	5/13/03	NM	NM	NM	NM	NM	NM	NM	NM
CRR200004	Upper Branch NF	9/05/03	22.8	4.94	7.93	9.6	154	365.2	6.0	0.575
CRR200005	South Fork	5/13/03	15.2	10.00	7.3	NM	402	NM	9.9	1.981
CRR200005	South Fork	9/05/03	19.9	8.26	7.8	41.8	316	451.4	8.35	1.191
CRR200006	North Fork	5/15/03	17.9	8.05	7.42	12.0	358	460.5	12.4	1.236
CRR200006	North Fork	9/06/03	19.6	7.00	7.94	26.3	337	378.7	13.0	0.876
CRR200007	North Fork	5/15/03	17.2	9.01	7.57	11.8	388	436.3	10.5	1.859
CRR200007	North Fork	9/06/03	19.5	7.67	7.81	45.5	353	383.1	10.0	1.053
CRR200008	North Fork	5/20/03	19.6	8.48	9.1	NM	247	62.4	13.0	1.143
CRR200008	North Fork	9/06/03	20.3	6.72	7.72	17.7	312	379.4	9.8	0.893
CRR200009	Little River	5/15/03	16.6	11.50	7.8	14.5	390	410.2	20.5	5.827
CRR200009	Little River	9/06/03	19.7	8.23	7.0	17.8	328	303.7	18.0	3.865
CRR200010	Sinking Fork	5/20/03	18.2	19.96	8.0	NM	245	65.1	8.3	0.253
CRR200010	Sinking Fork	9/05/03	20.6	8.95	7.97	44.4	236	374.5	6.0	0.036
CRR200011	Sinking Fork	5/20/03	8.1	9.32	7.83	NM	246	66.0	4.0	0.020
CRR200011	Sinking Fork	9/06/03	17.9	5.33	7.45	11.4	391	388.0	NMF	0.000
CRR200012	Little River	5/15/03	17.1	9.91	7.72	13.8	382	431.0	22.0	5.831
CRR200012	Little River	9/06/03	19.6	9.03	7.9	21.0	354	304.5	13.0	4.472
CRR200013	Little River	5/16/03	15.2	10.69	7.78	10.2	246	415.7	14.0	1.717
CRR200013	Little River	9/07/03	15.4	9.30	8.53	16.7	202	304.5	9.3	1.413
CRR200014	Casey Creek	5/16/03	14.8	9.50	7.38	9.8	237	432.8	9.5	1.858
CRR200014	Casey Creek	9/07/03	15.5	9.20	8.04	8.3	199	405.9	8.0	1.394
CRR200015	Skinner Creek	5/16/03	13.9	11.44	7.32	6.0	234	469.1	9.4	0.821
CRR200015	Skinner Creek	9/07/03	14.8	9.60	7.9	9.3	202	399.0	8.0	0.557
CRR200016	Sinking Fork	5/16/03	16.4	11.26	7.53	30.1	318	436.1	11.6	4.704
CRR200016	Sinking Fork	9/06/03	19.4	8.50	7.94	22.7	287	301.3	11.0	1.758

during the spring and from 8 – 45 NTU during the fall.

**Algae:** One hundred seventy eight (178) algae taxa were collected basin-wide during May, 2003. Of the total, 156 taxa were diatoms (Bacillariophyta), 8 taxa were Chlorophyta, 12 taxa were Cyanophyta, and 2 were Rhodophyta (Table 11; diatom taxa in Appendix B). The most abundant diatom taxa during May included *Achnanthes lanceolata*, *A. minutissima*, *Gomphonema minutum*, *Nitzschia dissipata*, *N. frustulum*, *Melosira italica*, *M. varians*, *Surirella ovalis*, *Rhoicosphenia curvata*, and several species of *Navicula* including *N. cryptotonella*. Many of the taxa above are known to be pollution tolerant. The most abundant non-diatom taxa during May included *Cladophora* sp., *Rhizoclonium hookeri*, *Oscillatoria agardhii*, *O. nigra*, and *O. subbrevis*.

One hundred ninety eight (198) algae taxa were collected basin-wide in September, 2003. Of the total, 177 taxa were diatoms, 10 taxa were chlorophytes, 10 taxa were cyanophytes and 1 taxon was a red alga (Table 11; diatoms in Appendix B). The most abundant diatom taxa during September included *Cocconeis peduculus*, *C. placentula* var. *euglypta*, *Melosira varians*, *Nitzschia pelea*, *Navicula schroeterii*, *N. minima*, *N. contenta*, *N. cryptotonella*, and *Stephanocylus meneghiniana*. Some of the above taxa are known to be organic pollution tolerant. The most abundant non-diatom taxa during September included *Rhizoclonium hieroglyphicum*, *Spirogyra* sp. and *Oscillatoria articulate*. The lowest number of diatom taxa collected was 22 at CRR200008 (North Fork) during May while the highest number of diatom taxa collected was 68 at CRR200005 (South Fork) during September (Table 12). The basin-wide average DBI for combined sampling periods was 55.7. The average DBI for September was not significantly different (58) than the average DBI for May

Table 11. Distribution of soft-bodied algae from 16 Little River sites, (May/September), 2003. A = abundant; C = common; R = rare; (-) denotes absent for either May or September.

Taxa	Little River Sites 2003															
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
<b>Chlorophyta</b>																
<i>Ankistrodesmus facatus</i> var. <i>mirabilis</i>				-/R												
<i>Cladophora</i> sp.	A/R	A/-														
<i>Closterium moniliferum</i>				-/R												
<i>Cylindrocapsa conferta</i>			-/R													
<i>Dichotomosiphon tuberosus</i>										C/-						
<i>Hydrodictyon reticulatum</i>				-/C												
<i>Mougeotia</i> sp.			-/R													
<i>Oedogonium</i> sp.		C/-	C/C	C/-						-/R	R/R		C/-	R/-	R/-	
<i>Rhizoclonium crassipelitum</i>																R/-
<i>R. hieroglyphicum</i>			-/A	-/R						-/R	C/-		R/-	R/-	-/C	
<i>R. hookeri</i>			A/-	A/-		A/-	C/-									
<i>Scenedesmus quadricauda</i>						R/-										
<i>Spirogyra</i> sp.	C/-		C/-	-/A												
<i>Stigeoclonium</i> sp.			-/R													
Unidentified green filament															-/C	-/R
<b>Cyanophyta</b>																
<i>Anabaena</i> sp.			R/-	R/-												
<i>Calothrix</i> sp.										-/R						
<i>Chroococcus</i> sp.										-/R						
<i>Coelosphaerum</i> sp.						-/R										
<i>Dactylococcopsis acicularis</i>	R/-	R/-														
<i>Lyngbya diguetii</i>		C/-	R/-													
<i>L. limnetica</i>							R/-									
<i>L. nana</i>	R/-															
<i>Oscillatoria agardhii</i>																
<i>O. amoena</i>						-/R							R/-	R/-		
<i>O. articulate</i>					-/A											-/R
<i>O. limnetica</i>	-/R															C/-

Table 11. (Soft-bodied algae continued).

	Little River Sites 2003															
	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16
<i>O. nigra</i>						-/C	R/-				A/-	R/A		-/C	C/-	
<i>O. rubescens</i>			R/-	R/-	R/-	R/-										
<i>O. splendida</i>										R/-						
<i>O. subbrevis</i>			C/C	C/-	R/C	C/-	A/R	R/R	A/A	R/C		-/C	-/R	R/C	C/-	R/-
<i>O. tenuis</i>		R/-	C/C		R/C			R/-		A/-	-/C					
<i>O. terebriformis</i>											-/R					
Unidentified BG filaments							-/A	-/R								
Rhodophyta																
<i>Lemanea</i> sp.	R/-		R/-		R/-					R/-						
<i>Rhodochorton</i> sp.		R/-			R/-		R/R			R/-						

Table 12. Diatom Bioassessment Index (DBI) scores for the Little River Basin (Pennyroyal Bioregion – Interior Plateau Ecoregion). \*Excel spreadsheet program (KDOW; per John Brumley).

Station Code	Stream Name	Date	DTR	S	DIV	S	%NNS	S	PTI	S	CymbTR	S	*DBI	Overall Score
CRR200001	South Fork	5/14/03	50	49	1.46	102.1	57.9	43.2	2.17	62.7	6	46.2	60.1	Good
CRR200001	South Fork	9/05/03	52	51	1.40	97.9	48.5	52.9	2.35	67.9	5	38.5	61.6	Good
CRR200002	South Fork	5/14/03	40	39	1.42	99.3	72.6	28.1	2.16	62.4	3	23.1	50.4	Fair
CRR200002	South Fork	9/05/03	42	41	1.38	96.5	49.5	51.8	2.14	61.8	8	61.5	62.6	Good
CRR200003	Lower Branch NF	5/14/03	40	39	1.05	73.4	26.5	75.3	2.15	62.1	5	38.5	57.7	Good
CRR200003	Lower Branch NF	9/05/03	41	40	1.29	90.2	40.0	61.6	2.27	65.6	7	53.8	62.3	Good
CRR200004	Upper Branch NF	5/13/03	44	43	1.26	88.1	24.6	77.4	2.59	74.9	0	0.0	56.7	Good
CRR200004	Upper Branch NF	9/05/03	48	47	1.30	90.9	47.5	53.9	2.11	61.0	1	7.7	52.1	Fair
CRR200005	South Fork	5/13/03	48	47	1.48	103.5	69.7	31.1	2.25	65.0	4	30.8	55.5	Good
CRR200005	South Fork	9/05/03	68	67	1.62	113.3	69.2	31.6	2.50	72.2	4	30.8	62.9	Good
CRR200006	North Fork	5/15/03	47	46	1.35	94.4	75.2	25.4	2.34	67.6	4	30.8	52.9	Fair
CRR200006	North Fork	9/05/03	38	37	1.35	94.4	90.1	10.1	1.95	56.4	2	15.4	42.7	Poor
CRR200007	North Fork	5/15/03	47	46	1.48	103.5	52.8	48.5	2.51	72.5	2	15.4	57.2	Good
CRR200007	North Fork	9/06/03	50	49	1.29	90.2	80.1	20.4	2.23	64.4	3	23.1	49.4	Poor/Fair
CRR200008	North Fork	5/20/03	22	21	0.88	61.5	72.0	28.7	2.39	69.1	0	0.0	36.2	Poor
CRR200008	North Fork	9/06/03	64	62	1.59	111.2	67.5	33.4	2.31	66.8	3	23.1	59.4	Good
CRR200009	Little River	5/15/03	37	36	1.19	83.2	48.4	53.0	2.38	68.8	4	30.8	54.4	Fair
CRR200009	Little River	9/06/03	59	58	1.55	108.4	74.6	26.0	2.18	63.0	5	38.5	58.7	Good
CRR200010	Sinking Fork	5/20/03	33	32	1.14	79.7	23.6	78.4	2.40	69.4	5	38.5	59.7	Good
CRR200010	Sinking Fork	9/05/03	36	35	1.24	86.7	25.3	76.7	2.77	80.1	6	46.2	65.0	Good
CRR200011	Sinking Fork	5/20/03	34	33	1.17	81.8	48.8	52.5	2.76	79.8	2	15.4	52.6	Fair
CRR200011	Sinking Fork	9/06/03	44	43	1.33	93.0	74.4	26.3	2.26	65.3	3	23.1	50.2	Fair
CRR200012	Little River	5/15/03	52	51	1.47	102.8	53.6	47.6	2.87	83.0	1	7.7	58.4	Good
CRR200012	Little River	9/06/03	43	42	1.46	102.1	52.4	48.8	2.60	75.1	1	7.7	55.2	Good
CRR200013	Little River	5/16/03	27	26	1.12	78.3	75.1	25.6	1.83	52.9	4	30.8	42.8	Poor
CRR200013	Little River	9/07/03	48	47	1.45	101.4	55.6	45.5	2.03	58.7	8	61.5	62.8	Good
CRR200014	Casey Creek	5/16/03	31	30	1.20	83.9	62.5	38.5	2.17	62.7	6	46.1	52.3	Fair
CRR200014	Casey Creek	9/07/03	39	38	1.40	97.9	39.6	62.0	2.15	62.1	6	46.1	61.3	Good
CRR200015	Skinner Creek	5/16/03	41	40	1.32	92.3	44.4	57.0	2.33	67.3	5	38.5	59.1	Good
CRR200015	Skinner Creek	9/07/03	48	47	1.47	102.8	36.4	65.3	2.39	69.1	7	53.8	67.6	Excellent
CRR200016	Sinking Fork	5/16/03	38	37	1.37	95.8	67.3	33.6	2.06	59.5	1	7.7	46.8	Poor
CRR200016	Sinking Fork	9/06/03	49	48	1.39	97.2	76.2	24.4	2.00	57.8	6	46.2	54.7	Fair/Good

DTR = Diatom taxa richness

S = Metric Score following each metric value

DIV = Diatom Diversity (H)

DBI = Diatom Bioassessment Index

%NNS = Percent *Navicula*+*Nitzschia*+*Surirella*

PTI = Pollution Tolerance Index (Diatoms)

CymTR = *Cymbella* Group Richness



(53.3) ( $t$  stat = -2.056,  $p$  = 0.06). The DBI scores rated 3 sites as Poor during May (CRR200008, CRR200013 and CRR200016), and 5 sites as Fair during May (CRR200002, CRR200006, CRR200009, CRR200011, and CRR200014). In September, DBI scores rated 2 sites as Poor (CRR200006 and CRR200007) and 3 sites as Fair (CRR200004, CRR200011 and CRR200016). All other sites during both seasons were rated as Good with one Excellent rating occurring in September at CRR200015 (Table 7). Paradoxically, one of the Poor sites has the lowest number of taxa collected (22 at CRR200008), while another Poor/Fair site has one of the highest number of taxa collected (50 at CRR200007). The site with the highest number of taxa collected (68 at CRR200005) resulted in only a modest Good rating. The Poor sites were characterized by the highest silt tolerant diatom composition (% *Nitzschia+Navicula+Surirella*: 75%–90%).

DBI scores were regressed against habitat assessment values to determine any DBI predictive power from the relationship (Figure 4a). Habitat assessment (HA) was only a weak predictor of DBI as there was much unexplained variation around the best fit regression line ( $DBI = 0.154HA + 42.5$ ;  $r^2 = 0.138$ ,  $F$  ratio = 5.983,  $p = 0.021$ ). Because the DBI scores did not fully support the potential indicated by the habitat assessments, some factor other than stream habitat was influencing diatom diversity in the Little River. Other studies have found that where periphyton diversity is low and habitat disturbance is only weakly related to periphyton community structure, periphyton metrics in general may be of limited use in biomonitoring (Mazor and Resh 2005). Thus, DBIs alone may not be a useful tool in assessing water and habitat quality of the Little River system.

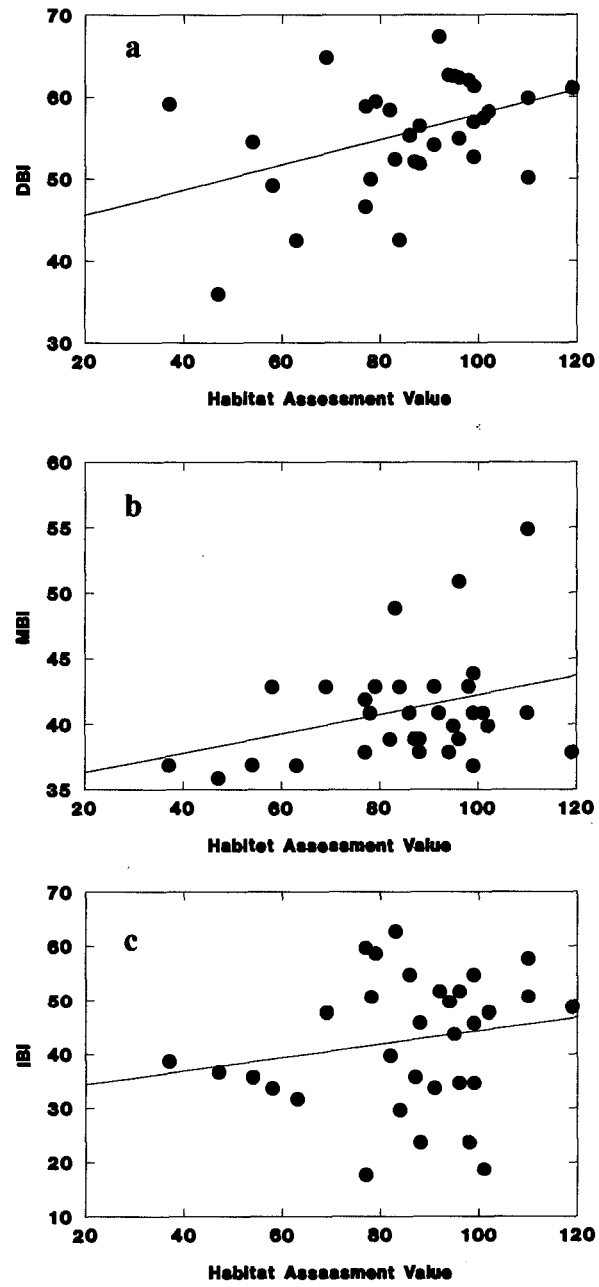


Figure 4. DBI (a), MBI (b), and IBI (c) regressions on Habitat Assessment Values for all sites on the Little River, 2003. See text for regression statistics.

Non-diatom taxa were only qualitatively determined as abundant, common or rare (Table 11). Basinwide, the Chlorophyta were represented by 14 taxa; the Cyanophyta were represented by 18 taxa; and the Rhodophyta by 2 taxa.

**Macroinvertebrates:** One hundred forty four (144) taxa of aquatic insects, oligochaetes, mollusks, decapods, isopods, and amphipods were identified in the Little River system in May, 2003. Abundant taxa collected basinwide were *Polypedium convictum*, *Chironomus*, *Elimia*, *Caecidotea*, *Stenelmis*, *Gammarus* and *Physella*. These are all moderate to highly tolerant of organic pollution (Lenat 1993). In September, 116 taxa were identified with the most abundant being *Polypedium*, *Elimia*, *Chironomus*, *Stenelmis*, and *Gammarus*, but the others were replaced by *Baetis*, *Stenonema* and *Cheumatopsyche* (Appendix B).

Genus richness ranged from a low of 22 at CRR200005 (South Fork) to a maximum of 68 at CRR200001 (South Fork – Headwater) upstream. MBIs ranged from 36 at CRR200008 to a high of 55 at CRR200001 in May. Only four Macroinvertebrate Biotic Indices (MBI) out of 32 resulted in a Fair rating for the sites. All other sites and dates rated as Poor (Table 13) and, therefore, non-supporting of macroinvertebrate communities. Two of the four MBIs resulting in Fair were due to the combination of high Genus Total Richness (GTR) and Genus Ephemeroptera/Plecoptera/Trichoptera (GEPT) metrics.

MBI scores were regressed against habitat assessment scores in order to examine the strength of the relationship between the two and assess the potential predictive power of habitat assessment for MBIs (Fig. 4b). Habitat assessment value was not a significant predictor of MBI as too much variation was not explained by the best fit regression ( $MBI = 0.074HA + 34.85$ ;  $r^2 = 0.078$ ,  $F$  value = 3.627,  $p = 0.066$ ). The lack of a significant

Table 13. Macroinvertebrate Biotic Index (MBI), overall quality rating, and metrics used to calculate MBI in the Little River Drainage Basin (Interior Plateau Ecoregion). Sites CRR20001, CRR20003 and CRR20015 are Headwater streams; all others are Wadeable. [%C+O = %C output from EDAS vKY3.0.mbd]

Station Code	Stream Name	Date	G-TR	G-EPT	mHBI	m%EPT	%C+O	%Cling	TNI	*MBI	*Rating
CRR200001	South Fork	5/14/03	68	13	6.014	10.41	65.51	17.84	3889	55	Fair
CRR200001	South Fork	9/05/03	36	8	6.592	25.29	1.66	32.63	1388	44	Fair
CRR200002	South Fork	5/14/03	46	5	6.437	1.73	39.28	26.66	2138	41	Poor
CRR200002	South Fork	9/05/03	27	7	5.537	59.11	2.72	23.32	626	51	Fair
CRR200003	Lower Branch NF	5/14/03	47	5	7.037	2.79	59.93	18.67	1253	41	Poor
CRR200003	Lower Branch NF	9/05/03	40	10	6.496	11.84	4.40	47.54	591	43	Poor
CRR200004	Upper Branch NF	5/13/03	49	2	7.016	0.09	52.56	9.83	2279	39	Poor
CRR200004	Upper Branch NF	9/05/03	30	6	6.147	3.76	12.35	3.76	372	38	Poor
CRR200005	South Fork	5/13/03	40	5	6.499	2.97	49.72	6.86	539	41	Poor
CRR200005	South Fork	9/05/03	22	3	5.274	12.20	2.44	18.29	246	38	Poor
CRR200006	North Fork	5/15/03	35	4	6.445	1.28	17.09	15.17	1404	37	Poor
CRR200006	North Fork	9/05/03	29	5	6.119	4.22	1.71	43.34	759	37	Poor
CRR200007	North Fork	5/15/03	41	8	6.450	5.53	15.00	36.31	760	41	Poor
CRR200007	North Fork	9/06/03	36	9	6.187	16.21	2.39	40.69	543	43	Poor
CRR200008	North Fork	5/20/03	35	4	6.922	2.30	16.01	5.20	999	36	Poor
CRR200008	North Fork	9/06/03	27	5	6.372	12.42	3.10	17.59	483	37	Poor
CRR200009	Little River	5/15/03	43	8	6.158	6.73	21.31	36.04	788	43	Poor
CRR200009	Little River	9/06/03	30	5	5.593	6.80	2.27	34.50	397	39	Poor
CRR200010	Sinking Fork	5/20/03	30	7	6.058	9.56	35.10	26.95	638	43	Poor
CRR200010	Sinking Fork	9/05/03	33	7	5.975	20.23	0.49	46.32	613	43	Poor
CRR200011	Sinking Fork	5/20/03	51	11	5.966	12.38	31.70	40.50	1817	49	Fair
CRR200011	Sinking Fork	9/06/03	32	5	6.278	22.88	0.65	28.10	765	41	Poor
CRR200012	Little River	5/15/03	45	6	6.391	3.40	3.60	4.90	1000	40	Poor
CRR200012	Little River	9/06/03	29	7	5.438	1.19	9.63	5.42	3116	39	Poor
CRR200013	Little River	5/16/03	40	8	6.080	3.57	39.74	5.60	785	43	Poor
CRR200013	Little River	9/07/03	30	7	5.512	7.86	5.16	13.14	852	40	Poor
CRR200014	Casey Creek	5/16/03	36	6	5.726	1.11	6.47	5.08	1809	39	Poor
CRR200014	Casey Creek	9/07/03	28	3	5.336	3.39	15.71	35.71	560	38	Poor
CRR200015	Skinner Creek	5/16/03	42	8	6.150	2.15	29.24	2.89	2599	42	Poor
CRR200015	Skinner Creek	9/07/03	34	7	5.622	4.95	24.05	13.67	848	41	Poor
CRR200016	Sinking Fork	5/16/03	30	5	6.092	1.88	36.84	14.47	532	38	Poor
CRR200016	Sinking Fork	9/06/03	26	5	5.724	5.56	0.79	16.37	629	37	Poor

G-TR = Genus-Total Richness

G-EPT = Genus-Ephemeroptera/Plecoptera/Trichoptera Index

mHBI = Modified Hilsenhoff Biotic Index

m%EPT = Modified Percent EPT

\*Excel program (KDOW; per Randall Payne, 2005)

%C+O = Percent Chironomidae+Oligochaetes (%Chronomidae)

%Cling = Percent Clingers

TNI = Total number of individuals

MBI = Macroinvertebrate Biotic Index

relationship between MBI and habitat assessment suggested that factors other than habitat were affecting MBIs such as siltation, habitat loss and nutrient enrichment.

**Fish:** Thirty five taxa of fish were collected in July, and 38 taxa were collected in September, 2003. Dominant taxa in July included rosefin shiner, striped shiner, stone roller, bluntnose minnow, and longear sunfish. In September, the banded sculpin and fringed darter replaced stone rollers and striped shiners in the above list. The average IBI score for wadeable streams was 43.5 for both sampling periods; the average IBI score for headwater streams was 42.2 for both sampling periods. For all sites, the average IBI for July was 42 with a range of 18–63, while the average IBI for September was 42.9 ranging from 24–55 and were not significantly different ( $t$  stat = -0.303,  $p$  = 0.766).

IBIs resulted in Good ratings in only two headwater streams (CRR200001 - South Fork) in September and CRR200015 (Skinner Creek) in July (Table 14a). The Lower Branch of the North Fork (CRR200003) was rated Poor during both sampling periods. Poor ratings were a result of low numbers of individuals collected at those sites. IBIs resulted in four Good ratings at wadeable streams (CRR200002 and CRR200005 at South Fork and CRR200010 and CRR200011 at Sinking Fork), all during July (Table 14b). IBIs resulted in several ratings of Poor (CRR200004, CRR200006, CRR200007, CRR200013, and CRR200016) during either July or September and were mostly a result of low numbers of individuals caught at those sites. The remaining sites were rated Fair. There were no Excellent ratings based on IBIs anywhere in the Little River basin in 2003.

IBIs were regressed against habitat assessment scores in order to test for the strength of the relationship between the two and assess the potential predictive power of habitat assessment for IBIs (Fig. 4c). Habitat assessment was not a significant predictor of IBI as too

Table 14a. Index of Biotic Integrity (IBI) for fish samples within the Headwater streams (catchment <10 mi<sup>2</sup>) in the Pennyroyal Bioregion (Interior Plateau Ichthyoregion) of western Kentucky.

Stream Code	Stream Name	Date	Catchment Area (mi <sup>2</sup> )	TNI	NAT	(Raw Metric Values from EDAS)						KIBI	Classif.
						DMS	INT	SL	%INSCT	%TOL	%FHW		
CRR200001	South Fork	7/03	4.20	192	14	1	1	2	61.46	36.45	95.31	51	Fair
CRR200001	South Fork	9/03	4.20	107	15	3	2	4	39.25	42.05	88.78	55	Good
CRR200003	Lower Branch NF	7/03	2.95	24	6	0	0	0	66.67	25.00	100.00	19	Poor
CRR200003	Lower Branch NF	9/03	2.95	33	9	1	1	1	30.30	66.67	96.96	24	Poor
CRR200015	Skinner Creek	7/03	8.25	176	7	2	1	3	75.57	22.15	87.50	60	Good
CRR200015	Skinner Creek	7/03	8.25	90	10	3	2	3	62.22	22.22	40.00	52	Fair

TNI = Total # individuals  
 NAT = Native Species Richness  
 DMS = Darter+Madtom+Sculpin  
 INT = Intolerant Richness

SL = Simple Lithophil Richness  
 %INSCT = % Insectivores excluding Tolerants  
 %FHW = % Facultative Headwater  
 KIBI = Kentucky Index of Biotic Integrity

Table 14b. Index of Biotic Integrity (IBI) for fish samples within the Wadeable streams (catchments >10mi<sup>2</sup>) in the Pennyroyal Bioregion (Interior Plateau Ichthyoregion) of western Kentucky.

Stream Code	Stream Name	Date	Catchment Area (mi <sup>2</sup> )	TNI	NAT	(Raw Metric Values from EDAS)						KIBI	Classif.
						DMS	INT	SL	%INSCT	%TOL	%FWH		
CRR200002	South Fork	7/03	23.29	191	15	3	4	3	68.06	23.03	94.76	58	Good
CRR200002	South Fork	9/03	23.29	255	13	4	4	3	48.24	39.60	70.58	52	Fair
CRR200004	Upper Branch NF	7/03	16.29	17	9	2	3	0	41.18	47.05	88.23	24	Poor
CRR200004	Upper Branch NF	9/03	16.29	94	13	3	3	1	53.19	44.68	89.36	46	Fair
CRR200005	South Fork	7/03	45.39	200	14	5	4	4	74.00	22.50	96.00	55	Good
CRR200005	South Fork	9/03	45.39	116	10	4	4	2	74.14	13.79	75.86	50	Fair
CRR200006	North Fork	7/03	52.40	238	12	2	3	2	83.61	13.02	91.17	46	Fair
CRR200006	North Fork	9/03	52.40	94	12	2	3	1	79.79	17.02	95.74	32	Poor
CRR200007	North Fork	7/03	58.54	194	4	1	1	1	94.33	5.67	97.42	35	Fair
CRR200007	North Fork	9/03	58.54	65	11	3	3	2	67.69	13.84	55.38	34	Poor
CRR200008	North Fork	7/03	46.16	149	8	0	0	2	88.59	11.40	98.65	37	Fair
CRR200008	North Fork	9/03	46.16	117	12	1	1	2	80.34	18.80	98.29	39	Fair
CRR200009	Little River	7/03	126.64	92	14	3	4	5	71.74	25.00	92.39	34	Poor
CRR200009	Little River	9/03	126.64	110	13	4	5	5	58.18	31.81	77.27	40	Fair
CRR200010	Sinking Fork	7/03	16.64	409	13	3	3	3	72.86	25.42	92.66	59	Good
CRR200010	Sinking Fork	9/03	16.64	193	16	2	2	3	46.11	48.70	61.13	48	Fair
CRR200011	Sinking Fork	7/03	30.14	335	13	5	5	4	77.91	20.59	94.92	63	Good
CRR200011	Sinking Fork	9/03	30.14	322	15	3	3	2	71.74	27.63	85.71	51	Fair
CRR200012	Little River	7/03	129.64	109	9	4	5	4	94.50	3.67	93.57	48	Fair
CRR200012	Little River	9/03	129.64	108	11	3	5	3	59.26	30.55	69.44	35	Fair
CRR200013	Little River	7/03	243.72	163	11	4	5	6	34.97	25.14	95.09	30	Poor
CRR200013	Little River	9/03	243.72	133	14	7	5	7	59.40	24.81	60.90	44	Fair
CRR200014	Casey Creek	7/03	30.72	52	6	3	2	3	82.69	17.30	48.07	36	Fair
CRR200014	Casey Creek	9/03	30.72	85	13	3	5	5	67.06	21.17	55.29	49	Fair
CRR200016	Sinking Fork	7/03	106.93	54	7	1	1	2	61.11	38.88	66.66	18	Poor
CRR200016	Sinking Fork	9/03	106.93	133	8	2	2	2	93.23	6.01	42.10	36	Fair

(see Table 9a for column definitions)

much variation around the best fit regression line was unexplained ( $IBI = 0.124HA + 31.89$ ;  $r^2 = 0.004$ , F ratio = 1.117,  $p = 0.299$ ). Of the three regressions (Figure 4a-c), IBI versus habitat assessment was the weakest. Other variables such as nutrient enrichment or siltation were influencing the fish community and species richness.

Sites scores resulting from all biological indices and habitat assessments in the Little River Basin during both sampling periods in 2003 are summarized in Table 15. Particularly noteworthy are the DBI classifications in that they resulted in the most numerous Good classifications. The Macroinvertebrate indices resulted in predominately Poor ratings for most of the Little River basin followed by the IBIs with mostly Poor or Fair ratings; these generally agreed with the habitat assessment classifications (Non-Supporting) for the Little River. A multiple rating system combining biological and habitat assessments is essential in assessing overall stream health particularly where non-point source pollution is a predominating influence.

## **Comparison of 2003 with 1988 and 2000 Little River Studies**

### **Habitat and Biological Assessments**

Table 16 summarizes all taxa information for 1988 (KDOW 1996), 2000 and 2003 from the Little River drainage. A maximum of 224 alga taxa, 177 macroinvertebrate taxa and 31 fish taxa were reported in 1988 (KDOW 1996). An average maximum of 248 alga taxa, 168 macroinvertebrate taxa and 42 fish taxa were collected in 2000. An average maximum of 188 alga taxa, 130 macroinvertebrate taxa and 36 fish taxa were collected in 2003. The general decrease in biological taxa from 1988 to 2003 is in agreement with the mostly Not



Table 15. Summary of assessments resulting in use-support and overall ratings (scores, classifications) of habitat, DBIs, MBIs and IBIs for sixteen Little River sites in 2003. PS = Partially Supporting, NS = Not Supporting.

Station Code	Stream Name	Date	Use-Support	DBI Classif.	MBI Classif.	IBI Classif.
CRR200001	South Fork	5/03	PS	Good	Fair	Fair
CRR200001	South Fork	9/03	NS	Good	Fair	Good
CRR200002	South Fork	5/03	PS	Fair	Poor	Good
CRR200002	South Fork	9/03	NS	Good	Fair	Fair
CRR200003	Lower Branch NF	5/03	NS	Good	Poor	Poor
CRR200003	Lower Branch NF	9/03	NS	Good	Poor	Poor
CRR200004	Upper Branch NF	5/03	NS	Good	Poor	Poor
CRR200004	Upper Branch NF	9/03	NS	Fair	Poor	Fair
CRR200005	South Fork	5/03	NS	Good	Poor	Good
CRR200005	South Fork	9/03	NS	Good	Poor	Fair
CRR200006	North Fork	5/03	NS	Fair	Poor	Fair
CRR200006	North Fork	9/03	NS	Poor	Poor	Poor
CRR200007	North Fork	5/03	NS	Good	Poor	Fair
CRR200007	North Fork	9/03	NS	Fair/Poor	Poor	Poor
CRR200008	North Fork	5/03	NS	Poor	Poor	Fair
CRR200008	North Fork	9/03	NS	Good	Poor	Fair
CRR200009	Little River	5/03	NS	Fair	Poor	Poor
CRR200009	Little River	9/03	NS	Good	Poor	Fair
CRR200010	Sinking Fork	5/03	NS	Good	Poor	Good
CRR200010	Sinking Fork	9/03	NS	Good	Poor	Fair
CRR200011	Sinking Fork	5/03	NS	Fair	Fair	Good
CRR200011	Sinking Fork	9/03	NS	Fair	Poor	Fair
CRR200012	Little River	5/03	NS	Good	Poor	Fair
CRR200012	Little River	9/03	NS	Good	Poor	Fair
CRR200013	Little River	5/03	NS	Poor	Poor	Poor
CRR200013	Little River	9/03	NS	Good	Poor	Fair
CRR200014	Casey Creek	5/03	NS	Fair	Poor	Fair
CRR200014	Casey Creek	9/03	PS	Good	Poor	Fair
CRR200015	Skinner Creek	5/03	NS	Good	Poor	Fair
CRR200015	Skinner Creek	9/03	NS	Excellent	Poor	Fair
CRR200016	Sinking Fork	5/03	NS	Poor	Poor	Poor
CRR200016	Sinking Fork	9/03	NS	Good/Fair	Poor	Fair

Table 16. Comparison of number of taxa identified from the Little River basin: 1988 (KDOW 1996), CRR 2000 and CRR 2003 reports.

	Number of Taxa				
	1988 (Total)	2000 (Jul)	2000 (Sep)	2003 (May)	2003 (Sep)
<b>Algae Phyla</b>					
Bacillariophyta (diatoms)	182	185	203	156	177
Chlorophyta (green algae)	24	42	14	8	10
Cyanophyta (blue-green algae)	11	22	21	12	10
Rhodophyta (red algae)	2	0	2	2	1
Euglenophyta (euglenoids)	3	3	0	0	0
Chrysophyta (yellow-green algae)	2	2	0	0	0
Cryptophyta (cryptomonads)	0	0	1	0	0
<b>Total Algae Taxa</b>	<b>224</b>	<b>254</b>	<b>241</b>	<b>178</b>	<b>198</b>
<b>Macroinvertebrates</b>	<b>177</b>	<b>162</b>	<b>173</b>	<b>144</b>	<b>116</b>
<b>Fish</b>	<b>31</b>	<b>30</b>	<b>55</b>	<b>*35</b>	<b>38</b>

\* fish collected in July

Table 17. Comparison of classifications based on habitat assessments for three studies (KDOW 1988, CRR 2000 and CRR 2003) in the Little River Basin. The KDOW sites of 1996 were chosen from sites most proximate to the CRR sites for comparisons.

Station Codes KDOW/CRR	Habitat Assessment Classifications				
	*1988	**2000		**2003	
		J	S	M	S
14-4/200001	F	PS	PS	PS	NS
14-3/200002	G	NS	NS	PS	NS
13-4/200003	P/F	PS	PS	NS	NS
13-3/200004	P/F	PS	PS	NS	NS
14-2/200005	P	NS	NS	NS	NS
13-1/200006	P	FS	FS	NS	NS
14-1/200007	F	NS	NS	NS	NS
13-2/200008	P/F	NS	NS	NS	NS
12-2/200009	--	PS	PS	NS	NS
10-12/200010	F	FS	FS	NS	NS
10-9/200011	--	PS	PS	NS	NS
12-1,10-6/200012	F	FS	FS	NS	NS
10-4/200013	F	PS	PS	NS	NS
10-13/200014	F	PS	FS	NS	PS
10-14/200015	F	PS	FS	NS	NS
10-3,10-8/200016	F	FS	FS	NS	NS

\* Based on Biotic Assessment Index (BAI; see KDOW 1996).

\*\* Based on KDOW Habitat Evaluation Sheet Metrics.

J = June/July, M = May, S = September, (--) not determined.

FS = Fully Supporting, PS = Partially Supporting, NS = Not Supporting.

Supporting classifications based on habitat assessments (Table 17). Specific comparisons among sampling years follow below.

**Habitat Assessments:** In order to compare habitat classifications for the three studies, both KDOW and CRR station codes were identified as roughly proximate to one another as possible and classifications summarized in Table 17. Because the 1988 study was conducted differently from the 2000 and 2003 studies, only a superficial comparison could be made and caution must be taken in this regard when evaluating overall stream health. Further, the classifications of the 1988 study were based on a biotic assessment index (BAI) which was different from the 2000 and 2003 studies but roughly comparable. All sites in 1988 except for one were evaluated as Poor or Fair. Three sites during both seasons in 2000 were evaluated as Fully Supporting; all others were Partially Supporting or Not Supporting. No sites in 2003 were evaluated as Fully Supporting; all except one were Not Supporting. Thus, although metrics and terminology have changed, the Little River sites, based on habitat assessments, either remain in a degraded state or have regressed into a further degraded state since the first study in 1988.

**Algae:** In order to give a better comparison among the three sampling years and because the Excel spreadsheet program has changed since the 2000 sampling, the 2000 EDAS output was reentered and DBIs were recalculated (Table 18) with ratings (classifications) summarized in Table 19. The 1988 DBIs were scaled from 1-5 and therefore are not directly comparable, but the classifications resulting from the DBIs are comparable among years (Table 19). Upon examination of 2000 and 2003 data in Table 18, all DBIs from 2000 are significantly higher (60.7) than DBIs from 2003 (55.7) ( $t$  stat = -2.589;  $p$  = 0.015).

Table 18. Comparison of DBIs, MBIs and IBIs for two studies (CRR 2000 and CRR 2003) in the Little River Basin. J = June/July, M = May, S = September, O = October. (--) not calculated. EDAS metrics from 2000 were recalculated using the most recent Excel spreadsheets from KDOW. Indices have been rounded to the nearest 1.

Station Codes KDOW/CRR	DBI				MBI				IBI			
	2000		2003		2000		2003		2000	2003		
	J	S	M	S	J	S	M	S	J	S/O	M	S
*CRR200001	57	--	60	62	--	--	55	44	37	--	51	55
CRR200002	60	62	50	63	51	41	41	51	48	42	58	52
*CRR200003	73	70	58	62	31	17	41	43	24	39	19	24
CRR200004	61	62	57	52	38	45	39	38	14	16	24	46
CRR200005	64	67	55	63	40	28	41	38	1	6	55	50
CRR200006	51	58	53	43	41	44	37	37	21	23	46	32
CRR200007	62	60	57	49	38	35	41	43	17	31	35	34
CRR200008	57	62	36	59	35	42	36	37	2	6	37	39
CRR200009	47	43	54	59	43	55	43	39	--	--	34	40
CRR200010	56	65	60	65	39	47	43	43	23	55	59	48
CRR200011	56	56	53	50	35	46	49	41	39	31	63	61
CRR200012	57	68	58	55	49	42	40	39	--	--	48	35
CRR200013	52	55	43	63	38	51	43	40	23	--	30	44
CRR200014	67	61	52	61	41	49	39	38	53	17	36	49
*CRR200015	70	75	59	68	29	31	42	41	46	43	60	52
CRR200016	65	54	47	55	40	38	38	37	0	2	18	36

\* Headwater streams based on catchment areas <10 sq. mi.

Table 19. Comparison of classifications based on Diatom Biotic Indices from three studies (KDOW 1988, CRR 2000 and CRR 2003) in the Little River Basin. The 1988 KDOW sites were selected from sites most proximate to the CRR sites for comparisons.

Station Codes KDOW/CRR	*1988	DBI Classifications			
		**2000 J	S	M	2003 S
14-4/200001	P/F	G	--	G	G
14-3/200002	F/G	G	G	F	G
13-4/200003	P/F	E	E	G	G
13-3/200004	F	G	G	G	F
14-2/200005	G	G	E	G	G
13-1/200006	P	F	G	F	P
14-1/200007	F	G	G	G	P
13-2/200008	P	G	G	P	G
12-2/200009	--	P	P	F	G
10-12/200010	F	G	G	G	G
10-9/200011	--	G	G	F	F
12-1,10-6/200012	P	G	E	G	G
10-4/200013	P/F	F	G	P	G
10-13/200014	F	E	G	F	G
10-14/200015	P/F	E	E	G	E
10-3,10-8/200016	F	G	F/G	P	F/G

\* Based on DBI Classification Criteria of 1-5 for the Little River (see KDOW 1996).

\*\* Based on 2000 EDAS metrics and recalculated DBIs using most recent Excel spreadsheet program (John Brumley, KDOW, 2005).

J = June/July, M = May, S = September, (--) not determined.

E = Excellent, G = Good, F = Fair, P = Poor.

The classifications based on DBIs among sampling years (Table 19) are mixed and range from mostly Poor to Fair in 1988 followed by a mixed but general improvement to several Goods, with only one Excellent in 2003. The Poor sites in 2000 and 2003 were characterized by %NNS (% *Navicula*+*Nitzschia*+*Surirella* complex). These diatoms are highly silt tolerant.

**Macroinvertebrates:** The 1988 MBIs in general indicated a Good to Fair classification for Little River sites (Table 20). MBIs in 2000 showed mixed seasonal differences, some sites improved, but most became worse from July to September. However, in 2003, MBIs indicated Poor classifications almost entirely basinwide. No sites in any of the three studies resulted in Excellent classifications for macroinvertebrates. MBIs from 2000 are not significantly different from 2003 (Table 18; means for 2000 and 2003 = 41.1 and 39.9, respectively;  $t$  stat = 0.545;  $p$  = 0.59).

The Little River remains a severely degraded habitat for macroinvertebrates.

**Fish:** Historical studies (1977-1993) of fish found in the Little River which are intolerant of turbidity, siltation and low dissolved oxygen included smallmouth bass, longear sunfish, northern hog sucker, spotted sucker, and Johnny darter (Rister 1994). In Casey Creek, intolerant fish found in 1987 included longear sunfish, northern hog sucker, greenside darter, orangethroat darter, rockbass, rainbow trout (stocked) and banded sculpin. At Sinking Fork in 1993, intolerant fish found included all of the above plus blackside darter and slabrock darter. Although intolerant species were found, their low catch numbers also indicated impaired fish habitat. The number of intolerant species caught in 2000 and 2003, as indicated by such metrics as “darter+madtom+sculpin” and “intolerant richness” were all very low at all sites during both years (Table 14a, 14b).

Table 20. Comparison of classifications based on Macroinvertebrate Biotic Indices from three studies (KDOW 1988, CRR 2000 and CRR 2003) in the Little River Basin. The KDOW sites of 1996 were chosen from sites most proximate to the CRR sites for comparisons.

Station Codes KDOW/CRR	*1988	MBI Classifications			
		J	S	M	S
14-4/200001	F/G	P	--	F	F
14-3/200002	G	F	F	P	F
13-4/200003	--	F	VP	P	P
13-3/200004	--	P	F	P	P
14-2/200005	--	P	VP	P	P
13-1/200006	P	F	G	P	P
14-1/200007	F	F	P	P	P
13-2/200008	P	P	F	P	P
12-2/200009	--	F	G	P	P
10-12/200010	G	F	G	P	P
10-9/200011	--	VP	G	F	P
12-1,10-6/200012	F	F	F	P	P
10-4/200013	F	F	G	P	P
10-13/200014	F	F	F	P	P
10-14/200015	F	F	P	P	P
10-3,10-8/200016	F	F	P	P	P

\* Classification based on KDOW 1-5 rating criteria (see KDOW 1996).

\*\* Based on 2000 EDAS metrics and recalculated MBIs using most recent (2005) Excel spreadsheet program to recalculate MBIs (Randall Payne, KDOW).

J = June/July, M = May, S = September, (--) not determined.

E = Excellent, G = Good, F = Fair, P = Poor, VP = Very Poor.



Table 21. Comparison of classifications based on Fish Indices of Biotic Integrity (IBIs) from three studies (KDOW 1988, CRR 2000 and CRR 2003) in the Little River Basin. The KDOW sites of 1996 were chosen from sites most proximate to the CRR sites for comparisons.

Station Codes KDOW/CRR	IBI Classifications				
	*1988	**2000		2003	
		J	S	M	S
14-4/200001	--	F	--	F	G
14-3/200002	F	F/G	F	G	F
13-4/200003	P	F	F	P	P
13-3/200004	P	VP	VP	P	F
14-2/200005	P	VP	P/VP	G	F
13-1/200006	P	P/F	F	F	P
14-1/200007	P	P	G	F	P
13-2/200008	P/F	VP	P	F	F
12-2/200009	--	--	--	P	F
10-12/200010	P	P/F	G	G	F
10-9/200011	--	P/F	P/F	G	F
12-1,10-6/200012	P/F	--	--	F	F
10-4/200013	--	F/G	--	P	F
10-13/200014	F	F	VP	F	F
10-14/200015	P	G	F	G	F
10-3,10-8/200016	P	VP	VP	P	F

\* Classification based on KDOW criteria ratings of 1-5 for the Little River (see KDOW 1996).

\*\* Based on 2000 EDAS metrics and recalculated IBIs using the most recent Excel spreadsheet program (Mike Compton, KDOW, 2005).

J = June/July, M = May, S = September, (--) not determined.

E = Excellent, G = Good, F = Fair, P = Poor, VP = Very Poor.

The 1988 IBIs indicated Poor to Fair habitat for fish (Table 21). By 2000, the IBI classifications degenerated to Poor and Very Poor for most sites. This can be attributed to low numbers of individuals caught and low taxa richness at several sites and possibly sampling method (electroshocking in 2000, electroshocking and seining in 2003). In 2003, the IBI classifications appeared to have improved slightly with some sites rating as Good during May but dropping again only to Fairs by September. All IBIs from 2000 were significantly lower than those in 2003 (Table 18; means for 2000 and 2003 = 25.3 and 42.5, respectively;  $t$  stat = 3.822;  $p$  = 0.001).

The Little River remains a highly impaired habitat for fish.

## **Conclusions**

Upon examination of the results of three studies conducted on the Little River from 1988-2003, the overall conclusion is that the Little River remains a severely degraded habitat for aquatic biota. The total number of algae taxa found in the Little River has decreased by about 12% (Table 16) since 1988. The total number of macroinvertebrate taxa found has decreased as well by about 25%. However, total number of fish taxa has remained roughly the same in the Little River since 1988.

Of the sites that are comparable among the 1988, 2000 and 2003 studies (Table 17), habitat degradation in the Little River has continued. In 1988, of the habitat assessments of all comparable sites among three studies (14 sites), 5 or 36% rated Poor. If a "Poor" classification were the equivalent to the more recent "Not Supporting" classification, then in 2000, considering both sampling months, habitat assessments resulted in 8 of 32 sites or 25% as Not Supporting (=Poor). Continuing to 2003, 29 of 32 sites were Not Supporting (=Poor)

during both sampling months. Only CRR200001 and CRR200002 were determined as Partially Supporting in 2003 and only in May. CRR200014 was Partially Supporting, but only in September.

The Diatom Bioassessment Indices were calculated differently among the three studies from 1988-2003. For example, the 1988 DBIs were scaled from 1-5 while 2000 and 2003 DBIs were scaled from 1-100. Thus, only the 2000 and 2003 were numerically similar and only after 2000 data had been recalculated using the most recent procedures and spreadsheets provided by KDOW (per KDOW personnel, 2005). Once the recalculations were made based on identical metrics, DBIs became more comparable between years. Total number of diatom taxa, diversity, and the pollution tolerance index were held in common from 2000 to 2003; however, other metrics such as % *Navicula+Nitzschia+Surirella* (%NNS) rather than % Sensitive Species (%SS), and the *Cymbella* group richness (Cym GR) metric were used as well. “Total number of non-diatom divisions” and “total number of non-diatom species” were not used in the DBI (re)calculations for this comparison. Further, the version of EDAS used in these studies did not give a metric for “*Fragilaria* total richness” which therefore was not included in the DBI calculations.

Our evaluation of the DBIs among the three studies from 1988 through 2003 concluded that the most recent methods for calculating the DBI appear to be the most sensitive for assessing conditions in the Little River by weighting the %NNS and *Cymbella* GR more heavily than non-diatom taxa and %SS. DBIs from 1988 resulted in 7 of 14 sites (50%) rating as Poor; in 2000, only 2 Pooors occurred in 32 sites, yet 7 of 32 sites (22%) were rated as Excellent; in 2003, only one Excellent site occurred and 5 of 32 were rated Poor (Table 19). Although methods for calculated DBIs have improved recently, comparing DBIs

from year to year among many methods continues to confound assessments of habitat over time. Although DBIs indicated that many of the Little River sites were classified as Good in both 2000 and 2003, studies of the relationships between DBIs and habitat assessment need to continue, especially in systems where this relationship is very weak or not well-defined. The Little River is a highly disturbed system having had the riparian canopy opened for agriculture along much of its course and having increased non-point source nutrient inputs which may account for several Good and Excellent classifications from DBIs. For example, the 1988 study revealed not only high nitrogen inputs during April and August, but also very high phosphorus loads (e.g., up to 0.63 mg L<sup>-1</sup> orthophosphate and 1.2 mg L<sup>-1</sup> total phosphorus in the North Fork and up to 1.58 mg L<sup>-1</sup> total phosphorus in the South Fork). [Note: The origin of phosphorus may be from the underlying karstic parent geology at some sites.] However, high nutrient loading at times and a higher amount of sunlight may stimulate diatom growth and diversity in certain river sections, thus confounding the DBI classifications for those sites.

Among comparable sites from 1988 to 2000 and 2003, the Macroinvertebrate Bioassessment Indices (MBIs) continue to show the Little River as highly impaired. Two sites (CRR200001 and CRR200002) were rated Fair in 2003, while mostly Poor classifications prevailed in 2003 (Table 20). Some Very Poor sites from 2000 (CRR200003, CRR200005 and CRR200011) improved to Poor in 2003. No Excellent classifications were found at any time on the Little River based on MBIs.

Fish IBIs among the three studies indicated a slight improvement in habitat classification from 1988 to 2003 (Table 21). From 1988 to 2000 there was a serious degradation of habitat for fish resulting in mostly Poor classifications in 1988 to mostly Poor

and Very Poor in 2000 (CRR200004), mostly attributed to low catch rates. This site also is deeply channelized, runs parallel to a highway with a automobile garage upstream, and contains very silty/clayey bottom, and very little habitat for aquatic biota. In 2003, fish habitat improved to several Fairs and Goods among comparable sites most likely due to higher catch rates (e.g., in 2003 both seining and electroshocking methods were used whereas only electroshocking was used in 2000). However, no Excellent classifications based on IBIs occurred during any of the three studies. By 2003, 80% of the sites were classified as either Poor or Fair.

**Measures of Success.** Based on habitat assessments and three biotic indices, we conclude that the Little River continues to be highly impaired by non-point source pollution and non-supportive of aquatic biota, with most of the impairment coming from agricultural sources of siltation, high turbidity, high nutrient loading and potentially low dissolved oxygen. Although DBI calculation methods continue to improve and to reflect the status of the diatom community in the Little River, habitat assessments, MBIs and IBIs are the best and most consistent indicators of the health of the biotic community.

One manuscript has been accepted for publication by the *Journal of the Kentucky Academy of Sciences*. [Hendricks, S.P., M.R. Luttenton, and S.W. Hunt. Benthic diatom species list and environmental conditions in the Little River basin, western Kentucky, USA.] A second manuscript is in preparation and will be submitted to the same journal. [Hendricks, S.P., M.R. Luttenton, D.S. White, and T. Timmons. Assessing biotic integrity of the Little River using diatom, macroinvertebrate, and fish biotic indices in conjunction with habitat evaluations.]

We suggest a follow-up survey be carried out in 2010 at the same sites on the Little River in order to compare subsequent habitat assessments, and multiple biotic indices with present and past studies. One drawback of this study was that all habitat assessments were carried out using low gradient criteria. We have since decided that sites 9, 12, 14, and 16 are high gradient and, therefore, we suggest that high gradient habitats be assessed with appropriate high gradient criteria.

Habitat assessment forms used in this study are included in Appendix C. All data entered into EDAS are available to KDOW and other interested parties.

**Project Deliverables.** A brief account of each MSU milestone and its status is presented below and in Appendix A.

<u>Milestone</u>	<u>End Date</u>	<u>Status</u>
1. Submit all draft materials to the Cabinet for review and approval.	9/05	Draft Final Report submitted in October 2005 by MSU.
2. Submit advanced written notice on all workshops, demonstrations, and/or field days to the Cabinet.	4/03	All field training/demonstrations were completed in 4/03.
3. Provide assessment forms for reporting biological and habitat data (KDOW).	4/03	KDOW provided MSU with all biological and field assessment forms.
4. Conduct Spring sampling (MSU)	6/03	Completed by 6/03.
5. Conduct taxonomy and data analysis on Spring samples (MSU)	10/04	Completed 10/04.
6. Conduct Summer sampling (MSU).	9/03	Completed 9/03.
7. Conduct taxonomy and data analysis on Summer samples (MSU).	10/04	Completed 10/04.

8. Enter data into EDAS (MSU).	3/05	All data entered into EDAS by 3/05.
9. Make the EDAS Database available to agencies and Universities interested in this watershed (KDOW).	5/06	All data are available to interested parties.
10. Submit completed assessment forms to KDOW (MSU).	5/06	All Habitat assessment forms have been submitted with this report (Appendix).
11. Use the assessment forms to make use-support determinations for inclusion in the Kentucky 2004 305 (b) Report to Congress on Water Quality (KDOW)	5/06	MSU includes support determinations in this report.
12. Use the assessment forms to determine if further 303(d) listings are appropriate (KDOW).	5/06	MSU has provided all appropriate information to KDOW for this milestone.
13. Upon request of the KDOW, Submit Annual Report and/or participate in the Cabinet sponsored Biennial NPS Conference (MSU).	9/05	MSU submitted a draft final report in 9/05.
14. Submit three copies of the final Report and submit three copies of all products produced by the project (MSU).	5/06	MSU submitted a Final Report in 5/06.

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## APPENDIX A.

### Milestones; Financial & Administrative Close-out

**1. Project Milestones and Deliverables.** A brief account of each MSU milestone and its status is presented below.

<u>Milestone</u>	<u>End Date</u>	<u>Status</u>
1. Submit all draft materials to the Cabinet for review and approval.	9/05	Draft Final Report submitted in October 2005 by MSU.
2. Submit advanced written notice on all workshops, demonstrations, and/or field days to the Cabinet.	4/03	All field training/demonstrations were completed in 4/03.
3. Provide assessment forms for reporting biological and habitat data (KDOW).	4/03	KDOW provided MSU with all biological and field assessment forms.
4. Conduct Spring sampling (MSU)	6/03	Completed by 6/03.
5. Conduct taxonomy and data analysis on Spring samples (MSU)	10/04	Completed 10/04.
6. Conduct Summer sampling (MSU).	9/03	Completed 9/03.
7. Conduct taxonomy and data analysis on Summer samples (MSU).	10/04	Completed 10/04.
8. Enter data into EDAS (MSU).	3/05	All data entered into EDAS by 3/05.
9. Make the EDAS Database available to agencies and Universities interested in this watershed (KDOW).	5/06	All data are available to interested parties.
10. Submit completed assessment forms to KDOW (MSU).	5/06	All Habitat assessment forms have been submitted with this report (Appendix).
11. Use the assessment forms to	5/06	MSU includes support determinations in

make use-support determinations for inclusion in the Kentucky 2004 305 (b) Report to Congress on Water Quality (KDOW)

this report.

- |   |      |  |
|---|------|--|
| 12. Use the assessment forms to determine if further 303(d) listings are appropriate (KDOW).                                  | 5/06 | MSU has provided all appropriate information to KDOW for this milestone. |
| 13. Upon request of the KDOW, Submit Annual Report and/or participate in the Cabinet sponsored Biennial NPS Conference (MSU). | 9/05 | MSU submitted a draft final report in 9/05.                              |
| 14. Submit three copies of the final Report and submit three copies of all products produced by the project (MSU).            | 5/06 | MSU submitted a Final Report in 5/06.                                    |

**2. SUMMARIZATION OF ALL BUDGET EXPENDITURES, including matching funds.**  
 Recommendation how excess projects funds should be reallocated.

The original budget for the projects was \$120,000 of which \$72,000 was to come from Section 319(h) funds and \$48,000 from non-federal match. The actual non-federal match totaled \$48,000 with a \$16,435.64 over match that was comprised of release time for senior technical staff and data entry support. Grant expenses from Section 319(h) funds totaled \$72,000 and included \$5,419.05 in expendable supply costs and \$715.86 in travel for sample collection. Total expenditures including Section 319(h) and non-federal match were \$120,000 with a \$16,435.64 over match.

***ORIGINAL BUDGET***

<b>Budget Categories</b>	<b>319 Grant</b>	<b>Murray State University Match</b>	<b>Total</b>
Personnel	48,530.00	34,259.00	82,789.00
Supplies	3,452.00	0	3,452.00
Equipment	0	0	0
Travel	800.00	0	800.00
Contractual	0	0	0
Operating Costs	19,218.00	13,741.00	32,959.00
<b>Other</b>			
<b>TOTAL:</b>	<b>72,000.00</b>	<b>48,000.00</b>	<b>120,000.00</b>

**FINAL BUDGET\***

<b>Budget Categories</b>	<b>319 Grant*</b>	<b>Murray State University Match</b>	<b>Total</b>
Personnel	46,991.16	47,327.76	94,318.92
Supplies	5,419.05	0	5,419.05
Equipment	0	0	0
Travel	715.86	0	715.86
Contractual	0	0	0
Operating Costs	18,873.93	17,107.88	35,981.81
<u>Other (excess expenditures)</u>		<u>(16,435.64)</u>	<u>(16,435.64)</u>
<b>TOTAL:</b>	<b>72,000.00</b>	<b>48,000.00</b>	<b>120,000.00</b>

\*The KY Division of Water approved changes in budget categories from the original 319 Grant.

There were no excess project funds to be reallocated.

**2. Equipment:** No equipment was purchased with project funds, and there was no equipment purchased with a fair market value exceeding \$5,000.

## **APPENDIX B**

### **Quality Assurance Project Plan for Biological Baseline Conditions in the Little River Watershed, 2002**

Project officer: Dr. David S. White, 561 Emma Drive, Murray, KY 42071.

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Field sampling supervisor: Ms. Kelly W. Bush, 561 Emma Drive, Murray, KY 42071.

Phone: (270) 474-2272

Laboratory supervisor: Dr. Pinar Balci, 561 Emma Drive, Murray, KY 42071.

Phone: (270) 474-2272

Laboratory used: Hancock Biological Station, 561 Emma Drive, Murray, KY 42071

Waterbody name: Little River, Casey Creek (tributary), Sinking Fork Creek (tributary)

Stream locations: Christian and Trigg counties, Lower Cumberland River Basin

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**A4: Project/Task organization**

Name:	Project Title/ Responsibility	Telephone Number



Dr. David White	Project QA Manager	(270) 474-2272
Ms. Kelly Bush	Field Sampling Supervisor	(270) 474-2272
Dr. Pinar Balci	Laboratory Supervisor	(270) 474-2272

#### **A5: Problem Definition/Background**

The Little River and its tributaries are located in Christian and Trigg counties in western Kentucky. Its watershed is comprised of agricultural land, several small urban areas, and one significant urban area, the city of Hopkinsville (population > 30,000). The Little River receives point source pollution from a wastewater treatment plant in eastern Hopkinsville, and nonpoint source pollution from agricultural and urban runoff.

The purpose of this project is to assess and identify streams in Western Kentucky that are impacted by nonpoint source pollution. Biological baseline conditions in the Little River have been documented in the past by KDOW (1996) and the Center for Reservoir Research (2001).

#### **A6: Project/Task description**

The project will involve collection and identification of fish, algae, and macroinvertebrates from 16 sites in summer 2002, during high base flow, and again in fall 2002, during low base flow. Habitat assessments and physicochemical analyses will be conducted to supplement biological data. The 16 sites to be sampled include 9 sites along the Little River, four sites on Casey Creek, and three on Sinking Fork Creek. Casey Creek and Sinking Fork Creek are tributaries of Little River.

The biological data obtained will be used to calculate biological metrics, which will be supplemented by the habitat and physicochemical data. These metrics will be compared to a previous KDOW survey of the same sites. A final report will be submitted to KDOW within two years.

#### **A7: Quality Objectives and Criteria**

All data will be gathered according to protocols outlined in the KDOW "Methods for Assessing Biological Integrity of Surface Water" (1993) manual and the "Quality Assurance Guidelines" (1986) manual. These internal Division of Water guidelines are a part of the EPA approved Department of Environmental Protection QA/QC Plan.

All of the macroinvertebrate metric scores will be based on a 95<sup>th</sup> percentile calculated for each metric by compiling reference and study site data (Greg Pond, Ecological Support, KDOW). The actual values of each metric will be divided by the calculated 95<sup>th</sup> percentile and multiplied by 100, ranking all streams together, including the reference data, so that comparisons can be made among similar streams (USEPA, 1999) and so that outliers will not adversely effect study site scores.

When calculating fish metrics, different metrics will be used for different ecoregions, as determined by KDOW's analyses of reference data. In order to compare our study data with the reference data, the 95<sup>th</sup> percentile for all reference data within each ecoregion will be calculated. This method will normalize the data so that sites with particularly high values are not weighted as heavily.

Four diatom metrics will be scored and averaged to give the Diatom Biotic Index (DBI) according to "Algal and habitat Assessments For Reference Reach Stations" (KDOW, 1995, p.120).

Biological and habitat data will be entered into the state's Ecological Database System (EDAS) and will be returned to the state for distribution to all participating organizations. Original specimens, slides, datasheets, and bench sheets will be archived at the Hancock Biological Station.

#### **A8: Special Training/Certification**

All field personnel will be trained in fish, algal, and macroinvertebrate collection techniques according to KDOW sampling protocols. A training session for these sampling protocols was given by KDOW at the Hancock Biological Station in 2000. Personnel collecting fish have completed a course in Ichthyology and have experience with fish electroshocking and seining. Personnel collecting macroinvertebrates are lead by a Master's level stream ecologist with a background in entomology. Personnel collecting algae will be trained by a Ph.D. level phycologist and a Master's level stream ecologist who has attended KDOW training. Macroinvertebrates will be identified by a doctorate-level entomologist. Fish will be identified in the laboratory by a Ph.D. level fisheries biologist.

#### **A9: Documents and Records**

All data gathered in the field is written in a waterproof field book and entered into spreadsheets upon arrival to Hancock Biological Station. These data are saved on the computer's hard drive and on floppy disk. Information recorded on field data sheets will include: Site name, site description, names of field technicians, date, time, results of physicochemical measurements, numbers of containers of collected specimens, and notes on stream and riparian conditions. Habitat data sheets are kept in a waterproof container and are

stored at the Hancock Biological Station. Digital images of each site are downloaded and saved on computer hard drive and on compact disk (CD).

Upon completion of the biological metrics, biological and habitat data will be entered into the Kentucky's Ecological Database System (EDAS).

### **B1: Sampling Process Design**

To reduce variability among stations resulting from sampling error, a maximum of four full-coverage (algae + macroinvertebrates + fish) stations are collected per day. The 16 sites to be sampled include 9 sites along the Little River, four sites on Casey Creek, and three on Sinking Fork Creek. Casey Creek and Sinking Fork Creek are tributaries of Little River. All sites are to be sampled once in summer during high base flow and again in fall during low base flow. Locations of the sites to be sampled are as follows:

<b>Site Code</b>	<b>Stream Name</b>	<b>Latitude</b>	<b>Longitude</b>
<b>CRR200001</b>	<b>South Fork LR</b>	<b>36.88174</b>	<b>-87.34167</b>
<b>CRR200002</b>	<b>South Fork LR</b>	<b>36.84893</b>	<b>-87.37433</b>
<b>CRR200003</b>	<b>Lower Branch LR</b>	<b>36.89947</b>	<b>-87.39161</b>
<b>CRR200004</b>	<b>North Fork LR</b>	<b>36.88908</b>	<b>-87.45583</b>
<b>CRR200005</b>	<b>North Fork LR</b>	<b>36.85292</b>	<b>-87.46967</b>
<b>CRR200006</b>	<b>North Fork LR</b>	<b>36.841000</b>	<b>-87.53022</b>
<b>CRR200007</b>	<b>North Fork LR</b>	<b>36.80178</b>	<b>-87.51382</b>
<b>CRR200008</b>	<b>North Fork LR</b>	<b>36.86183</b>	<b>-87.51936</b>
<b>CRR200009</b>	<b>Little River</b>	<b>36.78336</b>	<b>-87.54604</b>
<b>CRR2000010</b>	<b>Sinking Fork</b>	<b>36.91603</b>	<b>-87.57668</b>
<b>CRR2000011</b>	<b>Sinking Fork</b>	<b>36.8812</b>	<b>-87.60839</b>
<b>CRR2000012</b>	<b>Little River</b>	<b>36.76038</b>	<b>-87.5501</b>
<b>CRR2000013</b>	<b>Little River</b>	<b>36.77781</b>	<b>-87.7223</b>
<b>CRR2000014</b>	<b>Casey Creek</b>	<b>36.75579</b>	<b>-87.72483</b>

<b>CRR2000015</b>	<b>Casey Creek</b>	<b>36.74586</b>	<b>-87.74755</b>
<b>CRR2000016</b>	<b>Sinking fork</b>	<b>36.84078</b>	<b>-87.74045</b>

All site-specific data are recorded on field data sheets at the time of collections. Data include station name and number, date and time (start to finish) of sampling, type of collections made, location of station, name of person recording data, and names of all people sampling at that station. Copies of the data sheets to be used have been provided to MSU by KDOW.

Samples are labeled with station number and location, date and time of collection, name of collector, and type of preservative used.

All available habitat types are sampled during biological collections. Samples are representative of the entire community; therefore, effort is made to recognize and collect all possible habitats (e.g., pools, riffles, banks).

Sample equipment such as nets, seines, grabs, buckets, and artificial substrates are cleaned thoroughly and dried after each use.

All staff involved in collections receive specific training in collection techniques and in the use of computers for data analysis.

Biological samples are preserved at the time of collection using the following preservatives:

1. Algae (identification and counting) in 2% buffered glutaraldehyde.
2. Fish in 10% formalin buffered with CaCO<sub>3</sub>.
3. Macroinvertebrates in 70% ethanol.

All biological samples are recorded in the proper logbooks upon delivery to the Biological Station. The biological data obtained will be used to calculate biological metrics, which will be supplemented by the habitat and physicochemical data. These metrics will be compared to a previous KDOW survey of the same sites.

## **B2: Sampling Methods**

### Algae

Algae sampling and analyses follow the Kentucky Division of Water's (KDOW) "Methods for Assessing Biological Integrity of Surface Waters in Kentucky" (2002). Qualitative samples are collected from all available substrates by selective hand picking/scraping. Microhabitats are sampled in roughly the proportion that they occur at each site. All sites are sampled only during low flow periods. In the field, the algal community is qualitatively ranked (1 = lowest, 5 = highest) and recorded based on the following criteria: 1, no algae visible or if present they are in the form of thick blue-green or green algal mats; 3, algae visible on substrates and may

include some *Cladophora* or small floating mats; and 5, algae on substrates appear diverse but not floating mats present.

Wet mount slides (a minimum of three) for non-diatom taxa are examined at 200x and 400x. Taxa present are recorded in a logbook along with estimated relative abundance (abundant, common, rare). In determining abundance, colonial, connubial, or filamentous forms are recorded as units rather than counting the individual cells present. Digital photographs of each taxon are taken and used to create a species archive. All identifications are verified by at least two people knowledgeable in algal identification.

Diatoms are examined using the hydrogen peroxide/potassium dichromate oxidation method for clearing. Cleared diatoms are mounted in Nephrax. A minimum of 300 to 500 valves is identified and the numbers of each taxon recorded on bench data sheets. Digital photographs of each taxon are taken and used to create a species archive. All identifications are verified by at least two people knowledgeable in algal identification.

### Fish

Fish sampling and analyses follow the Kentucky Division of Water's (KDOW) "Methods for Assessing Biological Integrity of Surface Waters in Kentucky" (2002). All fish are collected using backpack electro-fishing techniques and/or seines depending on habitat type or bottom complexity. All field personnel are trained how to safely use electro-fishing equipment prior to use in the field.

All available habitats at each stream site are sampled. Sites are sampled for a minimum of 60 minutes active seining/electro-fishing effort.

Fish are identified to the lowest possible taxonomic unit and verified by at least two people knowledgeable in fish identification. All data are entered into field notebooks. Voucher specimens are saved and preserved in 10% formalin buffered with CaCO<sub>3</sub> and identifications are verified.

### Macroinvertebrates

Macroinvertebrate sampling and analyses follow the Kentucky Division of Water's (KDOW) "Methods for Assessing Biological Integrity of Surface Waters in Kentucky" (2002). Collections from all methods listed below are composited into one or two wash buckets with No. 30 mesh screen bottoms. Wash buckets are set in shallow water during sampling and picking to keep organisms alive.

1. The 1-meter<sup>2</sup> Kicknet Sample: The kicknet is placed about mid-riffle, the lead-line is secured against the substrate, and the net is tilted back so that the maximum amount of surface area is in the water without the water flowing over the top of the net. About a square meter of substrate is disturbed directly in front of the net. Any large rocks are hand washed into a wash-bucket.

2. Sweep Sample: This method involves sampling a variety of habitats using a D-frame net. Each habitat is sampled in three replicates whenever possible.
  - i. Undercut Banks: The principal habitat in undercut banks is submerged roots. Note - if undercut banks are present in both riffle and pool areas, each is sampled separately.
  - ii. Marginal Emergent Vegetation Sample (exclusive of *Justicia* beds): A triangular or D-frame kicknet is placed in the vegetation and about 1 meter is swept. Any sticks, leaves, and vegetation are thoroughly washed before discarding.
  - iii. Bedrock or Slabrock Sample: The edge of the D-frame or triangular kicknet is placed flush on the substrate and about 1/3 of a square meter of area in front of the kicknet is sampled.
  - iv. *Justicia* Beds Sample: Along the edge of the *Justicia* bed, the D-frame or triangular kicknet is worked over about one meter section in a jabbing motion and any *Justicia* stems are thoroughly washed, then discarded.
  - v. Leaf Pack Sample: Small, aged leaf and stick packs from a variety of locations, i.e. riffles, runs and pools, are collected and placed in a wash-bucket and thoroughly rinsed.
3. Silt, Sand, and Fine Gravel Sample: This type of material is sampled using two methods.
  - i. Sieving: A number 10 sieve is used to sort out larger invertebrates from silt, sand, and gravel. The sieve is scooped through each of the substrate types, penetrating the substrate at least five cm. Fine material is rinsed away from the sample. Each substrate type (silt, sand, and gravel) is sampled three times.
  - ii. Netting: A fine-mesh Surber Sampler or a fine-mesh bag (300  $\mu$ m), is used to collect an area of about 1/3 square meter in sand and silt depositional areas. All materials are removed from the sampler and placed in a pan for sorting.
4. Aufwuchs Sample: This habitat is collected by washing rocks, sticks, leaves, filamentous algae, and moss in a medium to large-sized bucket 1/2 to 2/3 full of water. After sample material is washed and discarded, the elutriate in the bucket is swirled and poured through a Nitex sampler. The sampler is placed in 95% alcohol and let stand from 5 to 15 minutes before sorting.

5. **Rock Picking Sample:** 30 rocks are selected from the site. Ten rocks each are taken from the riffles, runs, and pools. The sizes of the rocks range from that of a softball to a small dinner plate (10-30 cm). Rocks are placed in a sorting pan, carefully picked, removing all invertebrates and cases, which are placed in a collection jar. Rocks are replaced into the streams.
6. **Wood Sample:** About 20 linear feet of submerged wood ranging in diameter from 5 to 8 cm are selected. Wood is placed into the wash-bucket and rinsed of all surface material. Wood is inspected for burrowing invertebrates. Large diameter logs are hand picked. Well-seasoned wood (log, limb, etc) is exposed to air for 15-20 minutes, because many burrowing types will crawl to the surface.
7. **Sorting:** After the collections have been made, the samples are sorted in the field. All collected material is sorted in a white pan. Sorting is accomplished with the following procedures:
  - i. Place a small amount of water in the pan (no more than a quarter inch.)
  - ii. From the wash buckets, remove about a tablespoon of material and place in the pan.
  - iii. Swirl the material to distribute it evenly throughout the pan.
  - iv. Remove invertebrates from the pan with forceps and place into a collection jar, filled with 95% alcohol.
8. **Preservation and labeling:** Samples are sorted into collection jars containing 95% ethyl alcohol in the field. Samples are transferred to 70% ethyl alcohol solution in the laboratory. Before leaving the site, all invertebrates are placed in the sample jar(s) and all jars are completely filled with 95% alcohol. Completely filling jars reduces damaging movement of the enclosed invertebrates.
9. In the field, a label is placed in each collection jar. The label includes the site number, stream name, location, and date sampled. When changing the sample over in the laboratory a permanent label is placed in the collection jar. This label includes the site number, stream name, state, county, locality, date, mile-point, latitude, longitude, and collectors' names.
10. **Identification:** All macroinvertebrates are identified to the lowest possible taxonomic level. In most cases, this is species level. When listing the organism on the Macroinvertebrate Laboratory Data Sheet (MLDS) the family name also is included so that the data can be entered easily into the

biological database. A MLDS is completed for each site. After the data from the MLDS have been entered into EDAS, the MLDS is filed under the appropriate segment in the Intensive Survey files.

11. One goal of the Intensive Survey program is to establish a voucher specimen of every macroinvertebrate taxon found in Kentucky. Vouchers will be used to verify identifications. Vouchers will be sent to acknowledged experts for verification. The vouchers will be stored in the Macroinvertebrate Laboratory and organized by order. Voucher specimens kept in 70% ethyl alcohol are placed in tightly capped vials. Chironomids, oligochaetes, and other slide-mounted species are kept in slide cabinets. All specimens contain a label that includes order, family, genus, and species; site number; stream name, and date collected.

### **B3: Sample Handling and Custody**

Macroinvertebrate preservation and labeling: Samples are sorted into collection jars containing 95% ethyl alcohol in the field. Samples are transferred to 70% ethyl alcohol solution in the laboratory. Before leaving the site, all invertebrates are placed in the sample jar(s) and all jars are completely filled with 95% alcohol. Completely filling jars reduces damaging movement of the enclosed invertebrates.

In the field, a label is placed in each collection jar. The label includes site number, stream name, location, and date sampled. When changing the sample over in the laboratory a permanent label is placed in the collection jar. This label includes the site number, stream name, state, county, locality, date, mile-point, latitude, longitude, and collectors' names.

Fish are identified to the lowest possible taxonomic unit and verified by at least two people knowledgeable in fish identification. All data are entered into field notebooks. Voucher specimens are saved and preserved in 10% formalin buffered with CaCO<sub>3</sub> and identifications are verified.

Wet mount slides (a minimum of three) for non-diatom taxa are examined at 200x and 400x. Taxa present are recorded in a logbook along with estimated relative abundance (abundant, common, rare). In determining abundance, colonial, connubial, or filamentous forms are recorded as units rather than counting the individual cells present. Digital photographs of each taxon are taken and used to create a species archive. All identifications are verified by at least two people knowledgeable in algal identification.

Diatoms are examined using the hydrogen peroxide/potassium dichromate oxidation method for clearing. Cleared diatoms are mounted in NephraX. A minimum of 300 to 500 valves is identified and the numbers of each taxon recorded on bench data sheets. Digital photographs of each taxon are taken and used to create a species archive. All identifications are verified by at least two people knowledgeable in algal identification.

### **B4: Analytical Methods**



A YSI multiparameter environmental monitoring system will be used to measure dissolved oxygen, temperature, turbidity, oxidation-reduction potential, pH, and conductivity. This instrument is calibrated each day sampling is to occur. A digital flow meter is used to measure discharge. A pH meter and digital titrator will be used in the laboratory to calculate alkalinity. The pH meter will be calibrated for each use.

#### **B5: Quality Control**

All algal identifications are verified by at least two people knowledgeable in algal identification. Fish are identified to the lowest possible taxonomic unit and verified by at least two people knowledgeable in fish identification. Macroinvertebrates are identified to the lowest possible taxonomic unit and verified by at least two people knowledgeable in macroinvertebrate identification.

#### **B6: Instrument/Equipment Testing, Inspection, and Maintenance**

All field monitoring equipment will be calibrated in accordance with the manufacturer's user's manuals.

#### **B7: Instrument/Equipment Calibration and Frequency**

The YSI and pH meter will be calibrated on each sample date.

#### **B8: Inspection/Acceptance of Supplies and Consumables**

Supplies and consumables will be provided and inspected by Hancock Biological Station and the Center for Reservoir Research.

#### **B9: Non-direct Measurements**

Detailed topographic maps (1:150,000) of the sampling area are used to locate sampling sites.

#### **B10: Data Management**

At the end of each day, the Field Sampling Supervisor will check all field data sheets for completeness and accuracy. The sheets are taken to Hancock Biological Station and the data are entered into spreadsheets. All data will be examined and evaluated by the project officer.

#### **C1: Assessments and Response Actions**

The Project Officer will review the biological sampling project on a regular basis and will communicate with KDOW. The Field Sampling Supervisor will train all field workers and require them to periodically review established sampling protocols.

## **C2: Reports to Management**

Project officer will submit reports as required by KDOW.

## **D1: Data Review, Verification, and Validation**

Data is to be compared to previous KDOW (1996) study of the same sites.

Multi-metric scoring systems will be used to integrate algae, macroinvertebrate, and fish metrics (Fish Index of Biotic Integrity (IBI), Macroinvertebrate Bioassessment Index (MBI), and Diatom Bioassessment Index (DBI) and Non-diatom Scores).

Biological and habitat data will be entered into the Kentucky's Ecological Database System (EDAS).

## **D2: Verification and Validation Methods**

The Project Officer will regularly review all data resulting from this project and determine whether it is acceptable.

Biological data collected during this project will be compared to two previous studies on the same sites. Ten percent of samples (invertebrates, fish, and algae) will be submitted to KDOW/NPS for verification.

## **D3: Reconciliation with User Requirements**

Soon after each sampling event, data will be evaluated for completeness, precision, and accuracy. If data are not acceptable, re-sampling will occur. Depending upon the cause of the problem, corrective measures will be made.

**APPENDIX C**

**PHOTOGRAPHS OF EACH STUDY SITE**

## **SOUTH FORK OF LITTLE RIVER**

**CRR200001**



Predominant Substrate: Sand (40%), Gravel (25%), Bedrock(18%), Silt (10%), Cobble (3%), Boulder (2%), Detritus (2%)

Canopy Cover: Partially Shaded (50-75%)

Habitat Cover Types: Undercut Banks, Tree Roots, Coarse Woody Debris, Large Boulders

Surrounding Land Use: Row Crops, Pasture Grazing, Residential

Erosion: Moderate

## **SOUTH FORK OF LITTLE RIVER**

**CRR20002**



Predominant Substrate: Sand (30%), Silt (20%), Bedrock (20%), Clay (10%), Cobble (10%),  
Detritus (5%), Boulder (5%)

Canopy Cover: Partially Shaded (50-75%)

Habitat Cover Types: Undercut Banks, Tree Roots, Coarse Woody Debris, Boulders

Surrounding Land Use: Row Crops, Pasture Grazing

Erosion: Moderate-Heavy

## LOWER BRANCH OF LITTLE RIVER

**CRR200003**



Predominant Substrate: Clay (60%), Sand (20%), Silt (10%), Gravel (10%)

Canopy Cover: Partially Exposed (25-50%)

Habitat Cover Types: Undercut Banks, Tree Roots, Coarse Woody Debris

Surrounding Land Use: Row Crops, Pasture Grazing, Residential

Erosion: Moderate

## UPPER BRANCH OF LITTLE RIVER

CRR200004



Predominant Substrate: Sand (55%), Silt (20%), Boulder (10%), Detritus (10%), Cobble (5%)

Canopy Cover: Partially Shaded (50-75%)

Habitat Cover Types: Under Cut Banks, Rock Ledges, Tree Roots, Coarse Woody Debris, Boulders

Surrounding Land Use: Row Crops, Automobile Shop

Erosion: Moderate

## **SOUTH FORK OF LITTLE RIVER**

**CRR200005**



**Predominant Substrate: Cobble (45%), Silt (20%), Sand (20%), Clay (5%), Boulder (5%), Detritus (5%)**

**Canopy Cover: Partially Exposed (25-50%)**

**Habitat Cover Types: Undercut Banks, Rock Ledges, Tree Roots, Coarse Woody Debris, Boulders**

**Surrounding Land Use: Industrial, Residential**

**Erosion: Moderate**



## NORTH FORK OF LITTLE RIVER

CRR200006



Predominant Substrate: Sand (40%), Silt (20%), Clay (20%), Boulder (5%), Cobble (5%), Gravel (5%),  
Detritus (5%)

Canopy Cover: Partially Shaded (50-75%)

Habitat Cover Types: Undercut Banks, Rock Ledges, Coarse Woody Debris, Man-made Objects

Surrounding Land Use: Row Crops, Pasture Grazing, Residential

Erosion: Moderate

## NORTH FORK OF LITTLE RIVER

CRR200007



Predominant Substrate: Clay (50%), Silt (20%), Sand (20%), Detritus (10%)

Canopy Cover: Partially Shaded (50-75%)

Habitat Cover Types: Undercut Banks, Rock Ledges, Tree Roots, Coarse Woody Debris, Man-made Objects

Surrounding Land Use: Waste Water Treatment Plant, Row Crops, Residential, Forest

Erosion: Heavy

## NORTH FORK OF LITTLE RIVER

CRR200008



Predominant Substrate: Sand (60%), Silt (20%), Detritus (10%), Cobble (5%), Gravel (5%)

Canopy Cover: Partially Shaded (50-75%)

Habitat Cover Types: Undercut Banks, Tree Roots, Coarse Woody Debris, Man-made Objects

Surrounding Land Use: Row Crops, Residential

Erosion: Heavy

## LITTLE RIVER

CRR200009



Predominant Substrate: Sand (30%), Silt (25%), Detritus (20%), Bedrock (20%), Boulder (5%)

Canopy Cover: Partially Exposed (25-50%)

Habitat Cover Types: Rock Ledges, Tree Roots, Coarse Woody Debris

Surrounding Land Use: Residential, Row Crops, Forest, Pasture Grazing

Erosion: Moderate

## **SINKING FORK CREEK**

**CRR200010**



Predominant Substrate: Bedrock (50%), Gravel (20%), Detritus (10%), Sand (5%), Silt (5%),  
Cobble (5%), Boulder (5%)

Canopy Cover: Partially Shaded (50-75%)

Habitat Cover Types: Undercut Banks, Tree Roots, Coarse Woody Debris, Boulders

Surrounding Land Use: Row Crops, Pasture Grazing, Residential

Erosion: Moderate

## SINKING FORK

CRR200011



Predominant Substrate: Sand (30%), Bedrock (30%), Clay (15%), Detritus (15%) Gravel (5%), Silt (5%)

Canopy Cover: Partially Shaded (50-75%)

Habitat Cover Types: Undercut Banks, Tree Roots, Coarse Woody Debris

Surrounding Land Use: Row Crops, Pasture Grazing, Residential

Erosion: Moderate

## LITTLE RIVER

CRR200012



Predominant Substrate: Bedrock (50%), Sand (15%), Silt (12%), Gravel (10%), Cobble (5%), Detritus (5%),  
Boulder (3%)

Canopy Cover: Partially Exposed (25-50%)

Habitat Cover Types: Undercut Banks, Rock Ledges, Tree Roots, Coarse Woody Debris

Surrounding Land Use: Row Crop, Forest, Pasture Grazing, Residential

Erosion: Moderate

## LITTLE RIVER

CRR200013



Predominant Substrate: Gravel (40%), Sand(20%), Cobble (20%), Silt (8%), Clay(8%), Boulder (2%),  
Detritus (2%)

Canopy Cover: Fully Exposed (0-25%)

Habitat Cover Types: Undercut Banks, Tree Roots, Coarse Woody Debris

Surrounding Land Use: Row Crops, Pasture Grazing, Residential

Erosion: Moderate



## CASEY CREEK

CRR200014



Predominant Substrate: Gravel (60%), Sand (20%), Cobble (10%), Silt (5%), Detritus (5%)

Canopy Cover: Partially Exposed (25-50%)

Habitat Cover Types: Undercut Banks, Tree Roots, Coarse Woody Debris

Surrounding Land Use: Row Crops, Forest, Pasture Grazing

Erosion: Minimal-Moderate

## CASEY CREEK

CRR200015



Predominant Substrate: Gravel (50%), Sand (20%), Silt (10%), Clay (5%) , Bedrock (5%) ,  
Detritus (5%) , Cobble (5%)

Canopy Cover: Partially Exposed (50-75%)

Habitat Cover Types: Undercut Banks, Tree Roots, Coarse Woody Debris

Surrounding Land Use: Row Crops, Pasture Grazing, Forest

Erosion: Moderate

## **SINKING FORK**

**CRR200016**

Predominant Substrate:

**Gravel (50%), Sand (30%), Detritus (10%),  
Cobble (5%), Boulder (5%)**

Canopy Cover: Partially Shaded (50-75%)

Habitat Cover Types:

Undercut Banks, Tree Roots, Coarse Woody Debris

Surrounding Land Use: Row Crops, Forest

Erosion: Moderate



**APPENDIX D**

**TAXA LIST**

**Station ID:** CRR200001  
**Basin:** LOWER CUMBERLAND  
**County:** CHRISTIAN  
**Catchment Area:** 4.2  
**Lat Dec:** 36.88174  
**Location:** S.R. 508 @ BRIDGE

**Ecoregion:** INTERIOR PLATEAU  
**Stream Name:** SOUTH FORK LITTLE RIVER  
**Map Name:** HONEY GROVE  
**River Mile:** 80.74    **Stream Order:** 4  
**Long Dec:** -87.34167

**FISHES**

<b>Common Name</b>	<b>Scientific Name</b>	<b>Individuals</b>	<b>July 2003</b>
Largescale Stoneroller	<i>Campostoma oligolepis</i>	4	
Striped Shiner	<i>Luxilus chrysocephalus</i>	27	
Rosefin Shiner	<i>Lythrurus fasciolaris</i>	87	
Bluntnose Minnow	<i>Pimephales notatus</i>	18	
Creek Chub	<i>Semotilus atromaculatus</i>	2	
White Sucker	<i>Catostomus commersoni</i>	1	
Creek Chubsucker	<i>Erimyzon oblongus</i>	1	
Yellow Bullhead	<i>Ameiurus natalis</i>	3	
Blackspotted Topminnow	<i>Fundulus olivaceus</i>	18	
Green Sunfish	<i>Lepomis cyanellus</i>	14	
Bluegill	<i>Lepomis macrochirus</i>	5	
Longear Sunfish	<i>Lepomis megalotis</i>	1	
Redear Sunfish	<i>Lepomis microlophus</i>	4	
Fringed Darter	<i>Etheostoma crossopteron</i>	7	

**INVERTEBRATES**

<b>Taxa</b>	<b>Individuals</b>	<b>May 2003</b>
Oligochaeta	32	
<i>Valvata</i> sp	8	
<i>Physella</i> sp	62	
<i>Elimia</i> sp	26	
<i>Gyraulus</i> sp	1	
<i>Planorbella</i> sp	3	
<i>Corbicula fluminea</i>	2	
<i>Isotoma</i> sp	3	
<i>Paraleptophlebia</i> sp	15	
<i>Stenonema</i> sp	39	
Heptageniidae	5	
<i>Eurylophella</i> sp	3	
<i>Caenis</i> sp	4	
<i>Acentrella</i> sp	21	
<i>Baetis</i> sp	130	
<i>Procloeon</i> sp	68	
Baetidae	80	
<i>Enallagma</i> sp	1	
<i>Calopteryx maculata</i>	2	
<i>Aeshna</i> sp	1	
<i>Somatochlora</i> sp	4	

<i>Cordulegaster</i> sp	1
<i>Isoperla</i> sp	1
<i>Perlesta</i> sp	37
Homoptera (not aquatic)	1
<i>Microvelia</i> sp	9
<i>Gerris</i> sp	14
<i>Cheumatopsyche</i> sp	130
<i>Hydropsyche</i> sp	2
Carabidae sp (adult)	1
<i>Helichus striatus</i> (adult)	3
<i>Peltodytes</i> sp (adult)	18
<i>Hydrobius</i> sp (adult)	4
<i>Agabus</i> sp (adult)	3
<i>Hydaticus</i> sp (adult)	8
<i>Hydroporus</i> sp (adult)	3
<i>Stenelmis</i> sp (adult)	123
<i>Tipula</i> sp	3
<i>Tetanocera</i>	1
Chironomidae (pupae)	45
<i>Ablabesmyia mallochi</i> gr	1
<i>Apedilum elachistum</i>	116
<i>Brillia</i> sp	5
<i>Chironomus</i> sp	1128
<i>Conchapelopia</i> sp	17
<i>Cricotopus</i> sp	102
<i>Cricotopus/Orthocladius</i> gr	22
<i>Helopelopia</i> sp	1
<i>Larsia</i> sp	3
<i>Limnophyes</i> sp	62
<i>Paratrichocladius</i> sp.	20
<i>Parametriocnemus</i> sp	46
<i>Phaenopsectra</i> sp	128
<i>Polypedilum aviceps</i>	128
<i>Polypedilum convictum</i>	396
<i>Polypedilum tritum</i>	23
<i>Potthastia</i> sp	5
<i>Psectrocladius</i> sp	5
<i>Rheopelopia</i> sp	7
<i>Stictochironomus</i> sp	256
<i>Tanytarsus</i> sp	13
Orthoclad	19
<i>Psychoda</i> sp.	1
<i>Simulium</i> sp	351
<i>Chrysops</i> sp	1
<i>Atrichopogon</i> sp	1
<i>Bezzia</i> sp	2

<i>Culicoides</i> sp	2
<i>Caecidotea</i> sp	2
<i>Asellus</i> sp.	2
<i>Lirceus</i> sp.	50
<i>Orconectes</i> sp	56
Hydracarina	1

## DIATOMS

Taxa	Individuals	May 2003
<i>Achnanthes lanceolata</i>	31	
<i>Achnanthes pusilla</i>	2	
<i>Achnantheidium minutissima</i> var. <i>saprophila</i>	5	
<i>Achnantheidium minutissimum</i>	18	
<i>Caloneis bacillum</i>	2	
<i>Cocconeis pediculus</i>	15	
<i>Cocconeis placentula</i> var. <i>euglypta</i>	41	
<i>Cyclotella</i> sp.	2	
<i>Cymbella minuta</i>	7	
<i>Cymbella naviculiformis</i>	1	
<i>Cymbella silesiaca</i>	8	
<i>Diatoma vulgare</i>	1	
<i>Gomphonema angustatum</i>	4	
<i>Gomphonema minutum</i>	76	
<i>Gomphonema parvulum</i>	18	
<i>Hippodonta capitata</i>	10	
<i>Meridion circulare</i>	1	
<i>Navicula auriculata</i>	2	
<i>Navicula capitatoradiata</i>	15	
<i>Navicula contenta</i>	3	
<i>Navicula cryptocephala</i>	14	
<i>Navicula cryptocephala</i> var. <i>veneta</i>	8	
<i>Navicula cryptotenella</i>	30	
<i>Navicula decussis</i>	13	
<i>Navicula menisculus</i>	10	
<i>Navicula menisculus</i> var. <i>upsaliensis</i>	16	
<i>Navicula minima</i>	3	
<i>Navicula pupula</i>	5	
<i>Navicula secreta</i> var. <i>apiculata</i>	12	
<i>Navicula seminulum</i>	26	
<i>Navicula subhamulata</i>	6	
<i>Navicula tantula</i>	8	
<i>Navicula tripunctata</i>	6	
<i>Navicula trivialis</i>	24	
<i>Nitzschia amphibia</i>	1	
<i>Nitzschia capitellata</i>	6	
<i>Nitzschia clausii</i>	6	

<i>Nitzschia dissipata</i>	13
<i>Nitzschia fonticola</i>	3
<i>Nitzschia palea</i>	60
<i>Nitzschia</i> sp. 3	1
<i>Nitzschia</i> sp	1
<i>Pinnularia microstauron</i>	1
<i>Rhoicosphenia curvata</i>	6
<i>Stephanocyclus meneghiniana</i>	2
<i>Surirella angustata</i>	8
<i>Surirella ovata</i>	43
<i>Surirella ovata</i> var. <i>pinnata</i>	7
<i>Synedra acus</i>	2
<i>Synedra ulna</i>	19

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### FISHES

Common Name	Scientific Name	Individuals	Sept 2003
Largescale Stoneroller	<i>Campostoma oligolepis</i>	20	
Striped Shiner	<i>Luxilus chrysocephalus</i>	12	
Rosefin Shiner	<i>Lythrurus fasciolaris</i>	4	
Bluntnose Minnow	<i>Pimephales notatus</i>	9	
Creek Chub	<i>Semotilus atromaculatus</i>	6	
White Sucker	<i>Catostomus commersoni</i>	5	
Creek Chubsucker	<i>Erimyzon oblongus</i>	7	
Yellow Bullhead	<i>Ameiurus natalis</i>	1	
Blackspotted Topminnow	<i>Fundulus olivaceus</i>	4	
Green Sunfish	<i>Lepomis cyanellus</i>	11	
Bluegill	<i>Lepomis macrochirus</i>	1	
Longear Sunfish	<i>Lepomis megalotis</i>	21	
Fringed Darter	<i>Etheostoma crossopterygum</i>	3	
Snubnose Darter	<i>Etheostoma simoterygum</i>	1	
Orangethroat Darter	<i>Etheostoma spectabile</i>	2	

### INVERTEBRATES

Taxa	Individuals	Sept 2003
<i>Planaria</i> sp	10	
<i>Elimia</i> sp	472	
<i>Stenonema</i> sp	239	
<i>Caenis</i> sp	54	
<i>Procladius</i> sp	51	
<i>Argia</i> sp	10	
<i>Enallagma</i> sp	131	
<i>Calopteryx maculata</i>	28	
<i>Basiaeschna</i> sp	3	
<i>Boyeria</i> sp	4	
<i>Dromogomphus</i> sp	2	
<i>Libellula</i> sp	9	



<i>Saldula</i> sp	10
<i>Gerris</i> sp	1
<i>Agraylea</i> sp	1
<i>Brachycentrus</i> sp	1
<i>Cheumatopsyche</i> sp	66
<i>Hydropsyche</i> sp	1
<i>Potamyia flava</i>	4
<i>Helichus striatus</i> (adult)	2
<i>Peltodytes</i> sp (adult)	23
<i>Scirtes</i> sp (adult)	1
<i>Berosus</i> sp (adult)	1
<i>Gyrinus</i> sp (adult)	4
<i>Ancyronyx variegates</i> (adult).	1
<i>Macronychus glabratus</i> (adult)	7
<i>Stenelmis</i> sp (adult)	7
<i>Stenelmis</i> sp (larvae)	127
<i>Tipula</i> sp	1
<i>Pericoma</i> sp	2
<i>Simulium</i> sp	5
Chironomidae (pupae)	23
<i>Stratiomys</i> sp	1
<i>Tabanus</i> sp	14
<i>Bezzia</i> sp	2
<i>Caecidotea</i> sp	58
<i>Orconectes</i> sp	12

## DIATOMS

Taxa	Individuals	Sept 2003
<i>Achnanthes lanceolata</i>	25	
<i>Achnanthes minutissima</i>	26	
<i>Achnanthes</i> sp. 2	16	
<i>Achnanthes</i> sp.1	3	
<i>Achnanthidium minutissima</i> var. <i>saprophila</i>	10	
<i>Achnanthidium minutissimum</i>	4	
<i>Amphora perpusilla</i>	3	
<i>Amphora submontana</i>	11	
<i>Cocconeis pediculus</i>	93	
<i>Cocconeis placentula</i> var. <i>euglypta</i>	3	
<i>Cymbella minuta</i>	6	
<i>Diploneis</i> sp.	5	
<i>Gomphonema gracile</i>	6	
<i>Gomphonema intricatum</i> var. <i>pulvinatum</i>	9	
<i>Gomphonema parvulum</i>	27	
<i>Gomphonema sphaerophorum</i>	14	
<i>Gyrosigma scalproides</i>	11	
<i>Gyrosigma spencerii</i> var. <i>curvula</i>	1	
<i>Melosira varians</i>	7	

<i>Meridion circulare</i>	2
<i>Navicula capitatoradiata</i>	1
<i>Navicula cryptocephala</i>	3
<i>Navicula cryptotenella</i>	16
<i>Navicula decussis</i>	24
<i>Navicula hustedtii</i>	2
<i>Navicula minima</i>	46
<i>Navicula molestiformis</i>	2
<i>Navicula schadei</i>	3
<i>Navicula schroeterii</i>	14
<i>Navicula secreta var. apiculata</i>	1
<i>Navicula seminulum</i>	2
<i>Navicula sp.</i>	1
<i>Navicula sp. 9a</i>	6
<i>Navicula subminuscula</i>	4
<i>Navicula tantula</i>	4
<i>Navicula tenelloides</i>	67
<i>Navicula tripunctata</i>	4
<i>Navicula trivialis</i>	1
<i>Nitzschia amphibia</i>	16
<i>Nitzschia constricta</i>	1
<i>Nitzschia dissipata</i>	4
<i>Nitzschia fonticola</i>	1
<i>Nitzschia frustulum</i>	7
<i>Nitzschia linearis</i>	1
<i>Nitzschia palea</i>	24
<i>Nitzschia parvula</i>	9
<i>Nitzschia sp.</i>	6
<i>Nitzschia sp. 4</i>	1
<i>Sellophora pupula</i>	1
<i>Stephanocyclus meneghiniana</i>	3
<i>Synedra parasitica var. subconstricta</i>	4
<i>Tryblionella victoriae</i>	2

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<b>Station ID:</b> CRR200002	<b>Ecoregion:</b> INTERIOR PLATEAU
<b>Basin:</b> LOWER CUMBERLAND RIVER	<b>Stream Name:</b> SOUTH FORK LITTLE RIVER
<b>County:</b> CHRISTIAN	<b>Map Name:</b> PEMBROKE
<b>Catchment Area:</b> 23.29	<b>River Mile:</b> 76.22 <b>Stream Order:</b> 3
<b>Lat Dec:</b> 36.84893	<b>Long Dec:</b> -87.37433
<b>Location:</b> E. HOPKINSVILLE UPSTREAM OF HWY 68-80 BRIDGE	

**FISHES**

<b>Common Name</b>	<b>Scientific Name</b>	<b>Individuals</b>	<b>July 2003</b>
Largescale Stoneroller	<i>Campostoma oligolepis</i>	5	
Striped Shiner	<i>Luxilus chrysocephalus</i>	16	
Rosefin Shiner	<i>Lythrurus fasciolaris</i>	105	
Bluntnose Minnow	<i>Pimephales notatus</i>	22	
White Sucker	<i>Catostomus commersoni</i>	2	
Yellow Bullhead	<i>Ameiurus natalis</i>	2	
Blackspotted Topminnow	<i>Fundulus olivaceus</i>	3	
Banded Sculpin	<i>Cottus carolinae</i>	2	
Rockbass	<i>Ambloplites rupestris</i>	11	
Green Sunfish	<i>Lepomis cyanellus</i>	1	
Bluegill	<i>Lepomis macrochirus</i>	1	
Longear Sunfish	<i>Lepomis megalotis</i>	12	
Largemouth Bass	<i>Micropterus salmoides</i>	1	
Fringed Darter	<i>Etheostoma crossopterygum</i>	3	
Snubnose Darter	<i>Etheostoma simoterygum</i>	5	

**INVERTEBRATES**

<b>Taxa</b>	<b>Individuals</b>	<b>May 2003</b>
Oligochaeta	67	
<i>Planaria</i> sp	7	
<i>Physella</i> sp	5	
<i>Elimia</i> sp	495	
<i>Planorbella</i> sp	5	
<i>Pisidium</i> sp	1	
<i>Stenonema</i> sp	14	
<i>Eurylophella</i> sp	7	
<i>Caenis</i> sp	14	
<i>Argia</i> sp	2	
<i>Enallagma</i> sp	28	
<i>Calopteryx maculata</i>	2	
<i>Boyeria</i> sp	2	
<i>Gomphus</i> sp	1	
<i>Epitheca (Epicordulia)</i> sp	2	
<i>Hydroptila</i> sp	2	
<i>Cheumatopsyche</i> sp	94	
<i>Peltodytes</i> sp (adult)	3	

<i>Hydrobius</i> sp (adult)	4
<i>Dineutus</i> sp (adult)	1
<i>Dytiscus</i> sp (adult)	1
<i>Ancyronyx variegates</i> (adult)	3
<i>Stenelmis</i> sp (adult)	188
<i>Dicranopselaphus</i> sp (adult)	2
Curculionidae (adult)	64
<i>Tipula</i> sp	1
<i>Apedilum elachistum</i>	56
<i>Brillia</i> sp	7
<i>Conchapelopia</i> sp	3
<i>Cricotopus</i> sp	90
<i>Cricotopus/Orthocladius</i> gr	28
<i>Dicrotendipes</i> sp	36
<i>Glyptotendipes</i> sp	21
<i>Parachironomus</i> sp	21
<i>Paratrichocladius</i> sp.	14
<i>Parametriocnemus</i> sp	10
<i>Phaenopsectra</i> sp	57
<i>Polypedilum</i> sp	162
<i>Polypedilum convictum</i>	212
<i>Polypedilum tritum</i>	42
<i>Psectrocladius</i> sp	3
<i>Pseudochironomus</i> sp	35
<i>Stenochironomus</i> sp	14
<i>Tanytarsus</i> sp	15
<i>Tribelos</i> sp	14
<i>Simulium</i> sp	265
<i>Chrysops</i> sp	1
Hydracarina	16
<i>Orconectes</i> sp 1	

## DIATOMS

Taxa	Individuals	May 2003
<i>Achnanthes lanceolata</i>	11	
<i>Achnanthes lanceolata var.dubia</i>	14	
<i>Achnanthes minutissima</i>	16	
<i>Achnanthes pinnata</i>	14	
<i>Achnanthes</i> sp. 2	4	
<i>Amphora perpusilla</i>	5	
<i>Amphora submontana</i>	2	
<i>Caloneis bacillum</i>	14	
<i>Cocconeis pediculus</i>	9	
<i>Cocconeis placentula var. lineata</i>	3	
<i>Cymbella minuta</i>	4	
<i>Gomphonema intricatum var. pulvinatum</i>		13
<i>Gomphonema minutum</i>	34	

<i>Gyrosigma scalproides</i>	4
<i>Melosira varians</i>	13
<i>Meridion circulare</i>	2
<i>Navicula capitatoradiata</i>	13
<i>Navicula cryptocephala</i>	8
<i>Navicula cryptotenella</i>	22
<i>Navicula decussis</i>	41
<i>Navicula menisculus var. upsaliensis</i>	51
<i>Navicula minima</i>	18
<i>Navicula phyllepta</i>	8
<i>Navicula subminuscula</i>	33
<i>Navicula tripunctata</i>	10
<i>Navicula trivialis</i>	9
<i>Navicula viridula var. rostellata</i>	7
<i>Nitzschia amphibia</i>	4
<i>Nitzschia capitellata</i>	12
<i>Nitzschia dissipata</i>	62
<i>Nitzschia frustulum</i>	21
<i>Nitzschia palea</i>	17
<i>Nitzschia parvula</i>	10
<i>Nitzschia recta</i>	7
<i>Nitzschia sp.</i>	44
<i>Rhoicosphenia curvata</i>	3
<i>Stephanocyclus meneghiniana</i>	2
<i>Surirella ovata</i>	61
<i>Synedra rumpens var. familiaris</i>	3
<i>Synedra ulna</i>	3

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## FISHES

Common Name	Scientific Name	Individuals	Sept 2003
Largescale Stoneroller	<i>Campostoma oligolepis</i>	26	
Common Carp	<i>Cyprinus carpio</i>	1	
Striped Shine	<i>Luxilus chrysocephalus</i>	27	
Rosefin Shiner	<i>Lythrurus fasciolaris</i>	42	
Bluntnose Minnow	<i>Pimephales notatus</i>	63	
Yellow Bullhead	<i>Ameiurus natalis</i>	2	
Banded Sculpin	<i>Cottus carolinae</i>	41	
Rockbass	<i>Ambloplites rupestris</i>	5	
Green Sunfish	<i>Lepomis cyanellus</i>	7	
Bluegill	<i>Lepomis macrochirus</i>	1	
Longear Sunfish	<i>Lepomis megalotis</i>	6	
Fringed Darter	<i>Etheostoma crossopterygum</i>	6	
Snubnose Darter	<i>Etheostoma simoterygum</i>	26	
Orangethroat Darter	<i>Etheostoma spectabile</i>	2	

**INVERTEBRATES**

<b>Taxa</b>	<b>Individuals</b>	<b>Sept 2003</b>
<i>Planaria</i> sp	12	
<i>Elimia</i> sp	49	
<i>Stenacron</i> sp	9	
<i>Stenonema</i> sp	29	
<i>Caenis</i> sp	3	
<i>Baetis</i> sp	325	
<i>Enallagma</i> sp	4	
<i>Calopteryx maculata</i>	22	
<i>Basiaeschna</i> sp	9	
<i>Boyeria</i> sp	2	
<i>Microvelia</i> sp	5	
<i>Gerris</i> sp	6	
<i>Orthotrichia</i> sp	2	
<i>Cheumatopsyche</i> sp	68	
<i>Chimarra</i> sp	2	
<i>Helichus striatus</i> (adult)	3	
<i>Psephenus herricki</i> (larvae)	2	
<i>Peltodytes</i> sp (adult)	1	
<i>Peltodytes</i> sp (larva)	5	
<i>Hydrobius</i> sp (adult)	1	
<i>Dineutus</i> sp (adult)	3	
<i>Dineutus</i> sp (larva)	1	
<i>Hydrovatus</i> sp (adult)	1	
<i>Ancyronyx variegatus</i> . (adult)	1	
<i>Stenelmis</i> sp (adult)	8	
<i>Stenelmis</i> sp (larva)	4	
Chironomidae (pupae)	17	
<i>Tipula</i> sp	5	
<i>Simulium</i> sp	19	
<i>Orconectes</i> sp	8	

**DIATOMS**

<b>Taxa</b>	<b>Individuals</b>	<b>Sept 2003</b>
<i>Achnanthes lanceolata</i>	16	
<i>Achnanthes minutissima</i>	37	
<i>Achnanthes biasoletiana</i>	19	
<i>Achnanthes pusilla</i>	46	
<i>Achnanthes</i> sp. 2	14	
<i>Achnanthes</i> sp.1	21	
<i>Amphora perpusilla</i>	4	
<i>Cocconeis pediculus</i>	11	
<i>Cymatopleura solea</i>	1	
<i>Cymbella affinis</i>	32	
<i>Cymbella minuta</i>	11	
<i>Cymbella silesiaca</i>	12	

<i>Gomphonema affine</i>	4	
<i>Gomphonema intricatum</i> var. <i>pulvinatum</i>		7
<i>Gomphonema minutum</i>	4	
<i>Gomphonema parvulum</i>	16	
<i>Gyrosigma spencerii</i> var. <i>curvula</i>	1	
<i>Luticola mutica</i>	6	
<i>Navicula capitatoradiata</i>	34	
<i>Navicula cryptotenella</i>	60	
<i>Navicula decussis</i>	8	
<i>Navicula minima</i>	53	
<i>Navicula pupula</i>	1	
<i>Navicula schroeterii</i>	20	
<i>Navicula</i> sp. 9a	4	
<i>Navicula tantula</i>	6	
<i>Navicula tripunctata</i>	13	
<i>Navicula trivialis</i>	6	
<i>Nitzschia amphibia</i>	68	
<i>Nitzschia capitellata</i>	2	
<i>Nitzschia constricta</i>	2	
<i>Nitzschia dissipata</i>	6	
<i>Nitzschia frustulum</i>	3	
<i>Nitzschia palea</i>	18	
<i>Nitzschia parvula</i>	3	
<i>Nitzschia</i> sp.	3	
<i>Planothidium lanceolata</i>	4	
<i>Rhoicosphenia curvata</i>	61	
<i>Stephanocyclus meneghiniana</i>	1	
<i>Surirella ovata</i>	4	
<i>Synedra parasitica</i> var. <i>subconstricta</i>		3
<i>Synedra ulna</i>	1	

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<b>Station ID:</b> CRR200003	<b>Ecoregion:</b> INTERIOR PLATEAU
<b>Basin:</b> LOWER CUMBERLAND	<b>Stream Name:</b> LOWER BRANCH NORTH FORK LITTLE RIVER
<b>County:</b> CHRISTIAN	<b>Map Name:</b> KELLY
<b>Catchment Area:</b> 2.95	<b>River Mile:</b> 79.54 <b>Stream Order:</b> 3
<b>Lat Dec:</b> 36.89947	<b>Long Dec:</b> -87.39161
<b>Location:</b> 507 N.E. HOPKINSVILLE-BEHIND CHURCH APP. 150 M	

**FISHES**

<b>Common Name</b>	<b>Scientific Name</b>	<b>Individuals</b>	<b>July 2003</b>
Bluntnose Minnow	<i>Pimephales notatus</i>	1	
Yellow Bullhead	<i>Ameiurus natalis</i>	3	
Blackspotted Topminnow	<i>Fundulus olivaceus</i>	13	
Green Sunfish	<i>Lepomis cyanellus</i>	2	
Longear Sunfish	<i>Lepomis megalotis</i>	3	
Largemouth Bass	<i>Micropterus salmoides</i>	2	

**INVERTEBRATES**

<b>Taxa</b>	<b>Individuals</b>	<b>May 2003</b>
Oligochaeta	124	
<i>Planaria</i> sp	3	
<i>Fossaria</i> sp	4	
<i>Physella</i> sp	65	
<i>Menetus dilatatus</i>	4	
<i>Planorbella</i> sp	4	
<i>Pisidium</i> sp	2	
<i>Sphaerium</i> sp	1	
Hirudinea	1	
<i>Stenacron</i> sp	1	
<i>Caenis</i> sp	1	
<i>Baetis</i> sp	28	
Baetidae	5	
<i>Argia</i> sp	3	
<i>Enallagma</i> sp	5	
<i>Calopteryx maculata</i>	1	
<i>Gomphus</i> sp	2	
<i>Trichocorixa</i> sp	2	
<i>Cheumatopsyche</i> sp	27	
<i>Helichus striatus</i> (adult)	2	
<i>Peltodytes</i> sp (adult)	2	
<i>Hydrobius</i> sp (adult)	1	
<i>Ancyronyx variegates</i> (adult)	1	
<i>Dubiraphia</i> sp (adult)	1	
<i>Dubiraphia</i> sp (larvae)	1	
<i>Stenelmis</i> sp (adult)	15	
<i>Lixus</i> sp	1	
<i>Limonia</i> sp	3	



<i>Dictya</i> sp	1
Chironomidae (pupae)	62
<i>Apedilum elachistum</i>	24
<i>Brillia</i> sp	4
<i>Chironomus</i> sp	25
<i>Cricotopus</i> sp	101
<i>Cricotopus/Orthocladius</i> gr	89
<i>Cryptochironomus</i> sp	9
<i>Dicrotendipes</i> sp	17
<i>Endochironomus</i> sp	34
<i>Glyptotendipes</i> sp	17
<i>Paratrichocladius</i> sp.	8
<i>Phaenopsectra</i> sp	26
<i>Polypedilum</i> sp	17
<i>Polypedilum convictum</i>	291
<i>Polypedilum tritum</i>	17
<i>Pothastia</i> sp	6
Orthoclad	4
<i>Simulium</i> sp	188
<i>Culicoides</i> sp	1
<i>Asellus</i> sp.	1
<i>Orconectes</i> sp	1

## DIATOMS

Taxa	Individuals	May 2003
<i>Achnanthes lanceolata</i>	2	
<i>Achnanthes minutissima</i>	61	
<i>Achnanthes curtissima</i>	5	
<i>Achnanthes</i> sp. 3	6	
<i>Achnantheidium minutissima</i> var. <i>saprophila</i>	52	
<i>Caloneis bacillum</i>	7	
<i>Cocconeis pediculus</i>	5	
<i>Cymbella minuta</i>	6	
<i>Cymbella silesiaca</i>	6	
<i>Gomphonema angustatum</i>	4	
<i>Gomphonema minutum</i>	220	
<i>Gomphonema parvulum</i>	11	
<i>Gyrosigma scalproides</i>	1	
<i>Meridion circulare</i>	1	
<i>Navicula contenta</i>	3	
<i>Navicula cryptocephala</i>	7	
<i>Navicula cryptotenella</i>	11	
<i>Navicula decussis</i>	10	
<i>Navicula minima</i>	10	
<i>Navicula secreta</i> var. <i>apiculata</i>	28	
<i>Navicula seminulum</i>	2	

<i>Navicula subminuscula</i>	3
<i>Navicula trivialis</i>	6
<i>Nitzschia acicularis</i>	2
<i>Nitzschia apiculata</i>	1
<i>Nitzschia dissipata</i>	8
<i>Nitzschia gracilis</i>	2
<i>Nitzschia linearis</i>	2
<i>Nitzschia palea</i>	20
<i>Nitzschia perminuta</i>	2
<i>Nitzschia sp. 5</i>	1
<i>Rhoicosphenia curvata</i>	1
<i>Stauroneis anceps</i>	2
<i>Surirella angustata</i>	3
<i>Surirella ovata</i>	24
<i>Synedra acus</i>	3
<i>Synedra rumpens var. familiaris</i>	2
<i>Synedra ulna</i>	4

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#### FISHES

Common Name	Scientific Name	Individuals	Sept 2003
Bluntnose Minnow	<i>Pimephales notatus</i>	3	
Yellow Bullhead	<i>Ameiurus natalis</i>	1	
Blackspotted Topminnow	<i>Fundulus olivaceus</i>	2	
Green Sunfish	<i>Lepomis cyanellus</i>	3	
Warmouth	<i>Lepomis gulosus</i>	1	
Bluegill	<i>Lepomis macrochirus</i>	15	
Longear Sunfish	<i>Lepomis megalotis</i>	6	
Largemouth Bass	<i>Micropterus salmoides</i>	1	
Snubnose Darter	<i>Etheostoma simoterum</i>	1	

#### INVERTEBRATES

Taxa	Individuals	Sept 2003
<i>Planaria</i> sp	2	
<i>Elimia</i> sp	3	
<i>Heptagenia</i> sp	8	
<i>Stenacron</i> sp	2	
<i>Stenonema</i> sp	3	
<i>Caenis</i> sp	15	
<i>Fallceon</i> sp	31	
<i>Enallagma</i> sp	83	
<i>Calopteryx maculata</i>	8	
<i>Basiaeschna</i> sp	5	
<i>Gomphus</i> sp	1	
<i>Didymops</i> sp	2	
<i>Epitheca (Epicordulia)</i> sp	1	

<i>Libellula</i> sp	2
<i>Microvelia</i> sp	32
<i>Gelastocoris occulata</i>	1
<i>Aquarius</i> sp	1
<i>Gerris</i> sp	5
<i>Hydroptila</i> sp	1
<i>Neotrichia</i> sp	3
<i>Cheumatopsyche</i> sp	223
<i>Potamyia flava</i>	5
<i>Lype diversa</i>	2
<i>Helichus striatus</i> (adult)	7
<i>Pelonomus obscurus</i> (adult)	1
<i>Peltodytes</i> sp (adult)	11
<i>Berosus</i> sp (adult)	1
<i>Micralymma</i> sp (adult)	1
<i>Dineutus</i> sp (adult)	63
<i>Gyrinus</i> sp (adult)	5
<i>Hydrovatus</i> sp (adult)	1
<i>Ancyronyx variegates</i> (adult)	3
<i>Dubiraphia</i> sp (larvae)	3
<i>Stenelmis</i> sp (larvae)	6
Chironomidae (pupae)	26
<i>Hemerodromia</i> sp	2
<i>Simulium</i> sp	18
<i>Stratiomys</i> sp	1
<i>Caecidotea</i> sp	2
<i>Orconectes</i> sp	1

## DIATOMS

Taxa	Individuals	Sept 2003
<i>Achnanathes minutissima</i>	49	
<i>Achnanthidium minutissima</i> var. <i>saprophila</i>	12	
<i>Achnanthidium minutissimum</i>	12	
<i>Amphipleura pellucida</i>	1	
<i>Caloneis bacillum</i>	3	
<i>Cocconeis pediculus</i>	9	
<i>Craticula cuspidata</i>	1	
<i>Cymatopleura elliptica</i>	1	
<i>Cymbella affinis</i>	42	
<i>Cymbella silesiaca</i>	12	
<i>Cymbella triangulum</i>	1	
<i>Cymbella tumida</i>	1	
<i>Cymbella turgidula</i>	6	
<i>Diploneis</i> sp.	3	
<i>Gomphonema parvulum</i>	4	
<i>Gomphonema sphaerophorum</i>	16	
<i>Gomphonema truncatum</i>	6	

<i>Hantzschia amphioxys</i>	2
<i>Hippodonta capitata</i>	1
<i>Melosira varians</i>	28
<i>Navicula capitatoradiata</i>	36
<i>Navicula cryptocephala</i>	23
<i>Navicula decussis</i>	5
<i>Navicula phyllepta</i>	1
<i>Navicula schroeterii</i>	44
<i>Navicula secreta</i> var. <i>apiculata</i>	2
<i>Navicula tenelloides</i>	1
<i>Navicula trivialis</i>	4
<i>Navicula viridula</i> var. <i>rostellata</i>	29
<i>Nitzschia constricta</i>	1
<i>Nitzschia denticula</i>	18
<i>Nitzschia dissipata</i>	7
<i>Nitzschia palea</i>	26
<i>Nitzschia palea</i> var. <i>tenuirostris</i>	8
<i>Nitzschia sinuata</i> var. <i>tabellaria</i>	8
<i>Nitzschia</i> sp.	6
<i>Rhoicosphenia curvata</i>	2
<i>Stephanocyclus meneghiniana</i>	118
<i>Surirella angustata</i>	2
<i>Surirella ovata</i> var. <i>pinnata</i>	3
<i>Synedra ulna</i>	11

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<b>Station ID:</b> CRR200004	<b>Ecoregion:</b> INTERIOR PLATEAU
<b>Basin:</b> LOWER CUMBERLAND	<b>Stream Name:</b> UPPER BRANCH NORTH FORK LITTLE RIVER
<b>County:</b> CHRISTIAN	<b>Map Name:</b> KELLY
<b>Catchment Area:</b> 16.29	<b>River Mile:</b> 74.47 <b>Stream Order:</b> 3
<b>Lat Dec:</b> 36.88908	<b>Long Dec:</b> -87.45583
<b>Location:</b> 107 N.E. HOPKINSVILLE -CLOSE TO 1682 INTERSECTION	

#### FISHES

<b>Common Name</b>	<b>Scientific Name</b>	<b>Individuals</b>	<b>July 2003</b>
Bluntnose Minnow	<i>Pimephales notatus</i>	2	
Yellow Bullhead	<i>Ameiurus natalis</i>	3	
Blackspotted Topminnow	<i>Fundulus olivaceus</i>	1	
Western Mosquitofish	<i>Gambusia affinis</i>	2	
Banded Sculpin	<i>Cottus carolinae</i>	1	
Rockbass	<i>Ambloplites rupestris</i>	2	
Bluegill	<i>Lepomis macrochirus</i>	1	
Longear Sunfish	<i>Lepomis megalotis</i>	4	
Fringed Darter	<i>Etheostoma crossopterygum</i>	1	

#### INVERTEBRATES

<b>Taxa</b>	<b>Individuals</b>	<b>May 2003</b>
Oligochaeta	225	
<i>Physella</i> sp	69	
<i>Elimia</i> sp	439	
<i>Gyraulus</i> sp	2	
<i>Planorbella</i> sp	5	
<i>Pisidium</i> sp	2	
<i>Corbicula fluminea</i>	3	
Hirudinea	12	
<i>Isotoma</i> sp	1	
Baetidae	1	
<i>Calopteryx maculata</i>	3	
<i>Boyeria</i> sp	1	
<i>Libellula</i> sp	2	
<i>Trichocorixa</i> sp	2	
<i>Oecetis</i> sp	1	
<i>Microbledius</i> sp (adult)	2	
<i>Dineutus</i> sp (adult)	22	
<i>Hydroporus</i> sp (adult)	1	
<i>Neoporus</i> sp (adult)	5	
<i>Dubiraphia</i> sp (larvae)	5	
Unidentified Elmidae (larva)	1	
<i>Antocha</i> sp	1	
<i>Limonia</i> sp	1	
Chironomidae (pupae)	243	
<i>Apedilum elachistum</i>	12	

<i>Ablabesmyia rhamphe</i>	7
<i>Chironomus</i> sp	25
<i>Conchapelopia</i> sp	7
<i>Cricotopus</i> sp	60
<i>Cricotopus/Orthocladus</i> gr	18
<i>Dicrotendipes</i> sp	73
<i>Glyptotendipes</i> sp	24
<i>Helopelopia</i> sp	4
<i>Parachironomus</i> sp	36
<i>Paratrichocladus</i> sp.	13
<i>Phaenopsectra</i> sp	49
<i>Polypedilum convictum</i>	390
<i>Polypedilum tritum</i>	183
<i>Potthastia</i> sp	14
<i>Pseudochironomus</i> sp	12
<i>Tanytarsus</i> sp	12
Chironomidae	12
Orthoclad	4
<i>Simulium</i> sp	217
<i>Bezzia</i> sp	2
<i>Serromyia</i> sp	1
<i>Gammarus</i> sp	39
<i>Caecidotea</i> sp	1
<i>Lirceus</i> sp.	1
<i>Orconectes</i> sp	14

## DIATOMS

Taxa	Individuals	May 2003
<i>Achnanthes lanceolata</i>	6	
<i>Achnanthes minutissima</i>	1	
<i>Asterionella formosa</i>	1	
<i>Aulacoseira granulata</i>	68	
<i>Cocconeis pediculus</i>	24	
<i>Cocconeis placentula</i> var. <i>euglypta</i>	6	
<i>Gomphonema angustatum</i>	3	
<i>Gomphonema intricatum</i> var. <i>pulvinatum</i>		16
<i>Gomphonema parvulum</i>	26	
<i>Melosira ambigua</i>	45	
<i>Melosira granulata</i> var. <i>angustissima</i>	10	
<i>Melosira italica</i>	171	
<i>Melosira varians</i>	9	
<i>Navicula capitatoradiata</i>	12	
<i>Navicula contenta</i>	3	
<i>Navicula cryptocephala</i>	4	
<i>Navicula cryptocephala</i> var. <i>veneta</i>	3	
<i>Navicula cryptotenella</i>	3	
<i>Navicula helensis</i>	2	

<i>Navicula ingenua</i>	6
<i>Navicula menisculus</i>	3
<i>Navicula minima</i>	26
<i>Navicula seminulum</i>	4
<i>Navicula tripunctata</i>	6
<i>Navicula trivialis</i>	3
<i>Navicula viridula</i>	3
<i>Neidium affine</i>	2
<i>Nitzschia amphibia</i>	6
<i>Nitzschia apiculata</i>	1
<i>Nitzschia clausii</i>	6
<i>Nitzschia dissipata</i>	33
<i>Nitzschia palea</i>	5
<i>Nitzschia sp.</i>	8
<i>Rhoicosphenia curvata</i>	64
<i>Stephanocyclus meneghiniana</i>	2
<i>Stephanodiscus hantzschii</i>	8
<i>Stephanodiscus sp.</i>	6
<i>Stephanodiscus tenuis</i>	2
<i>Surirella angustata</i>	6
<i>Surirella ovata</i>	14
<i>Surirella ovata var. pinnata</i>	6
<i>Synedra acus</i>	1
<i>Synedra rumpens var. familiaris</i>	14
<i>Synedra rumpens var. meneghiniana</i>	14

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## FISHES

Common Name	Scientific Name	Individuals	Sept 2003
Rosefin Shiner	<i>Lythrurus fasciolaris</i>	1	
Bluntnose Minnow	<i>Pimephales notatus</i>	12	
Yellow Bullhead	<i>Ameiurus natalis</i>	2	
Blackspotted Topminnow	<i>Fundulus olivaceus</i>	5	
Western Mosquitofish	<i>Gambusia affinis</i>	16	
Banded Sculpin	<i>Cottus carolinae</i>	3	
Green Sunfish	<i>Lepomis cyanellus</i>	1	
Warmouth	<i>Lepomis gulosus</i>	7	
Bluegill	<i>Lepomis macrochirus</i>	11	
Longear Sunfish	<i>Lepomis megalotis</i>	27	
Largemouth Bass	<i>Micropterus salmoides</i>	2	
Fringed Darter	<i>Etheostoma crossopterygum</i>	1	
Slabrock Darter	<i>Etheostoma smithi</i>	6	

**INVERTEBRATES**

<b>Taxa</b>	<b>Individuals</b>	<b>Sept 2003</b>
<i>Planaria</i> sp	180	
<i>Elimia</i> sp	38	
<i>Stenacron</i> sp	1	
<i>Caenis</i> sp	6	
<i>Argia</i> sp	7	
<i>Enallagma</i> sp	5	
<i>Calopteryx maculata</i>	1	
<i>Boyeria</i> sp	6	
<i>Libellula</i> sp	1	
<i>Microvelia</i> sp	2	
<i>Notonecta</i> sp	1	
<i>Rhyacophila</i> sp	1	
<i>Agapetus</i> sp	2	
<i>Hydropsyche</i> sp	1	
<i>Potamyia flava</i>	3	
<i>Haliphus</i> sp (adult)	6	
<i>Peltodytes</i> sp (adult)	11	
<i>Berosus</i> sp (adult)	4	
<i>Berosus</i> sp (larva)	1	
<i>Dineutus</i> sp (adult)	1	
<i>Hydrobiomorpha</i> sp (adult)	1	
<i>Hydrovatus</i> sp (adult)	4	
<i>Dubiraphia</i> sp (adult)	18	
<i>Dubiraphia</i> sp (larvae)	6	
Chironomidae (pupae)	46	
<i>Dolichopeza</i> sp	1	
<i>Ephydra</i> sp	1	
<i>Psychoda</i> sp.	1	
<i>Chrysops</i> sp	3	
<i>Probezzia</i> sp	1	
<i>Gammarus</i> sp	10	
<i>Lirceus</i> sp	2	

**DIATOMS**

<b>Taxa</b>	<b>Individuals</b>	<b>Sept 2003</b>
<i>Achnanthes lanceolata</i> var. <i>dubia</i>	5	
<i>Amphora</i> sp.	1	
<i>Caloneis bacillum</i>	2	
<i>Caloneis</i> sp.	3	
<i>Cymatopleura solea</i>	1	
<i>Cymbella minuta</i>	4	
<i>Fragilaria capucina</i> var. <i>mesolepta</i>	10	
<i>Gomphonema affine</i>	2	
<i>Gomphonema clavatum</i>	7	
<i>Gomphonema intricatum</i> var. <i>pulvinatum</i>		17
<i>Gomphonema parvulum</i>	9	



<i>Gyrosigma scalproides</i>	3
<i>Gyrosigma spencerii</i> var. <i>curvula</i>	18
<i>Hippodonta capitata</i>	6
<i>Melosira ambigua</i>	11
<i>Melosira varians</i>	154
<i>Navicula capitatoradiata</i>	5
<i>Navicula cryptocephala</i>	33
<i>Navicula cryptotenella</i>	18
<i>Navicula decussis</i>	7
<i>Navicula elginensis</i>	7
<i>Navicula halophila</i>	1
<i>Navicula ingenua</i>	1
<i>Navicula minima</i>	17
<i>Navicula molestiformis</i>	2
<i>Navicula pupula</i>	31
<i>Navicula schadei</i>	3
<i>Navicula schroeterii</i>	2
<i>Navicula seminulum</i>	2
<i>Navicula</i> sp.	1
<i>Navicula</i> sp. 7	7
<i>Navicula</i> sp. 9a	1
<i>Navicula subminuscula</i>	2
<i>Navicula tantula</i>	9
<i>Navicula tenelloides</i>	10
<i>Navicula viridula</i> var. <i>rostellata</i>	34
<i>Nitzschia amphibia</i>	12
<i>Nitzschia constricta</i>	1
<i>Nitzschia dissipata</i>	2
<i>Nitzschia palea</i>	12
<i>Nitzschia</i> sp.	18
<i>Rhoicosphenia curvata</i>	6
<i>Stauroneis smithii</i>	2
<i>Stephanocyclus meneghiniana</i>	24
<i>Surirella angustata</i>	3
<i>Surirella ovata</i> var. <i>pinnata</i>	3
<i>Surirella</i> sp.	1
<i>Tryblionella victoriae</i>	1

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<b>Station ID:</b> CRR200005	<b>Ecoregion:</b> INTERIOR PLATEAU
<b>Basin:</b> LOWER CUMBERLAND	<b>Stream Name:</b> SOUTH FORK LITTLE RIVER
<b>County:</b> CHRISTIAN	<b>Map Name:</b> HOPKINSVILLE
<b>Catchment Area:</b> 45.39	<b>River Mile:</b> 67.18 <b>Stream Order:</b> 4
<b>Lat Dec:</b> 36.85292	<b>Long Dec:</b> -87.46967
<b>Location:</b> TRAIL OF TEARS COMMEMORATIVE PARK	

**FISHES**

<b>Common Name</b>	<b>Scientific Name</b>	<b>Individuals</b>	<b>July 2003</b>
Large Stoneroller	<i>Campostoma oligolepis</i>	3	
Striped Shiner	<i>Luxilus chrysocephalus</i>	5	
Rosefin Shiner	<i>Lythrurus fasciolaris</i>	135	
Bluntnose Minnow	<i>Pimephales notatus</i>	32	
Blackspotted Topminnow	<i>Fundulus olivaceus</i>	2	
Banded Sculpin	<i>Cottus carolinae</i>	4	
Rockbass	<i>Ambloplites rupestris</i>	3	
Bluegill	<i>Lepomis macrochirus</i>	8	
Longear Sunfish	<i>Lepomis megalotis</i>	2	
Spotted Bass	<i>Micropterus punctulatus</i>	1	
Greenside Darter	<i>Etheostoma blennioides</i>	1	
Fringed Darter	<i>Etheostoma crossopterygum</i>	2	
Snubnose Darter	<i>Etheostoma simoterygum</i>	1	
Orangethroat Darter	<i>Etheostoma spectabile</i>	1	

**INVERTEBRATES**

<b>Taxa</b>	<b>Individuals</b>	<b>May 2003</b>
Oligochaeta	26	
<i>Physella</i> sp	4	
<i>Elimia</i> sp	149	
<i>Pisidium</i> sp	2	
<i>Sphaerium</i> sp	4	
<i>Corbicula fluminea</i>	12	
<i>Stenacron</i> sp	2	
<i>Eurylophella</i> sp	2	
<i>Caenis</i> sp	7	
Baetidae	5	
<i>Argia</i> sp	1	
<i>Enallagma</i> sp	3	
<i>Calopteryx maculata</i>	1	
<i>Boyeria</i> sp	1	
<i>Cheumatopsyche</i> sp	32	
<i>Peltodytes</i> sp (adult)	2	
<i>Ancyronyx variegatus</i> (adult)	2	
<i>Macronychus glabratus</i> (adult)	3	
<i>Stenelmis</i> sp (adult)	1	
<i>Hexatoma</i> sp	1	
<i>Tipula</i> sp	1	

Chironomidae (pupae)	20
<i>Apedilum elachistum</i>	16
<i>Brillia</i> sp	1
<i>Chironomus</i> sp	8
<i>Cricotopus</i> sp	33
<i>Cricotopus/Orthocladius</i> gr	11
<i>Dicrotendipes</i> sp	8
<i>Endochironomus</i> sp	36
<i>Larsia</i> sp	2
<i>Phaenopsectra</i> sp	8
<i>Polypedilum convictum</i>	52
<i>Polypedilum tritum</i>	60
<i>Potthastia</i> sp	1
<i>Pseudochironomus</i> sp	4
<i>Tanytarsus</i> sp	8
Ephydriidae	1
Hydracarina	2
<i>Gammarus</i> sp	2
<i>Lirceus</i> sp	3
<i>Orconectes</i> sp	2

## DIATOMS

Taxa	Individuals	May 2003
<i>Achnanthes lanceolata</i>	3	
<i>Achnanthes minutissima</i>	29	
<i>Achnanthes exigua</i>	2	
<i>Achnanthes hauckiana</i>	5	
<i>Amphora ovalis</i> var. <i>pediculus</i>	8	
<i>Cocconeis pediculus</i>	7	
<i>Cocconeis placentula</i> var. <i>euglypta</i>	22	
<i>Cymbella minuta</i>	8	
<i>Cymbella silesiaca</i>	6	
<i>Gomphonema intricatum</i> var. <i>pulvinatum</i>		2
<i>Gomphonema minutum</i>	14	
<i>Gomphonema olivaceum</i>	21	
<i>Gomphonema parvulum</i>	28	
<i>Gyrosigma scalproides</i>	7	
<i>Hippodonta capitata</i>	1	
<i>Meridion circulare</i>	3	
<i>Navicula capitatoradiata</i>	28	
<i>Navicula cryptocephala</i>	7	
<i>Navicula cryptocephala</i> var. <i>veneta</i>	8	
<i>Navicula cryptotenella</i>	73	
<i>Navicula decussis</i>	8	
<i>Navicula helensis</i>	2	
<i>Navicula menisculus</i> var. <i>upsaliensis</i>	8	
<i>Navicula minima</i>	16	

<i>Navicula secreta</i> var. <i>apiculata</i>	32
<i>Navicula seminulum</i>	11
<i>Navicula</i> sp.	4
<i>Navicula</i> sp. 1	9
<i>Navicula</i> sp. 3	4
<i>Navicula</i> sp. 4	1
<i>Navicula tripunctata</i>	28
<i>Navicula trivialis</i>	13
<i>Nitzschia apiculata</i>	1
<i>Nitzschia dissipata</i>	47
<i>Nitzschia fonticola</i>	3
<i>Nitzschia frustulum</i>	11
<i>Nitzschia linearis</i>	14
<i>Nitzschia palea</i>	16
<i>Nitzschia perminuta</i>	11
<i>Nitzschia</i> sp.	4
<i>Nitzschia</i> sp. 4	4
<i>Nitzschia</i> sp. 5	5
<i>Rhoicosphenia curvata</i>	12
<i>Stephanocyclus meneghiniana</i>	3
<i>Surirella angustata</i>	3
<i>Surirella ovata</i>	41
<i>Surirella ovata</i> var. <i>pinnata</i>	6
<i>Synedra rumpens</i> var. <i>familiaris</i>	2

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## FISHES

Common Name	Scientific Name	Individuals	Sept 2003
Rosefin Shiner	<i>Lythrurus fasciolaris</i>	20	
Bluntnose Minnow	<i>Pimephales notatus</i>	11	
Blackspotted Topminnow	<i>Fundulus olivaceus</i>	7	
Banded Sculpin	<i>Cottus carolinae</i>	18	
Rockbass	<i>Ambloplites rupestris</i>	14	
Green Sunfish	<i>Lepomis cyanellus</i>	5	
Longear Sunfish	<i>Lepomis megalotis</i>	29	
Greenside Darter	<i>Etheostoma blennioides</i>	2	
Fringed Darter	<i>Etheostoma crossopterygum</i>	2	
Snubnose Darter	<i>Etheostoma simoterygum</i>	8	

## INVERTEBRATES

Taxa	Individuals	Sept 2003
<i>Elimia</i> sp	154	
<i>Stenacron</i> sp	8	
<i>Argia</i> sp	3	
<i>Enallagma</i> sp	22	
<i>Basiaeschna</i> sp	1	
<i>Boyeria</i> sp	1	

<i>Microvelia</i> sp	1
<i>Rhagovelia</i> sp	1
<i>Ochrotrichia</i> sp	4
<i>Potamyia flava</i>	18
<i>Helichus striatus</i> (adult)	2
<i>Psephenus herricki</i> (larvae)	3
<i>Peltodytes</i> sp (adult)	1
<i>Berosus</i> sp (adult)	1
<i>Ancyronyx variegates</i> (adult)	1
<i>Ancyronyx variegates</i> (larvae)	2
<i>Dineutus</i> sp (adult)	2
<i>Dubiraphia</i> sp (larvae)	1
<i>Macronychus glabratus</i> (adult)	2
<i>Stenelmis</i> sp (larvae)	4
Chironomidae (pupae)	6
<i>Simulium</i> sp	5
<i>Hydrodroma</i> sp	3

## DIATOMS

Taxa	Individuals	Sept 2003
<i>Achnanthes lanceolata</i>	16	
<i>Achnanthes lanceolata</i> var. <i>dubia</i>	7	
<i>Achnanthes minutissima</i>	3	
<i>Achnanthes pinnata</i>	3	
<i>Achnanthes</i> sp. 2	4	
<i>Amphora ovalis</i>	1	
<i>Amphora perpusilla</i>	9	
<i>Amphora submontana</i>	4	
<i>Caloneis bacillum</i>	3	
<i>Cocconeis pediculus</i>	4	
<i>Cocconeis placentula</i> var. <i>euglypta</i>	11	
<i>Craticula cuspidata</i>	1	
<i>Cymbella minuta</i>	17	
<i>Cymbella silesiaca</i>	13	
<i>Diploneis</i> sp.	6	
<i>Fallacia pygmaea</i>	3	
<i>Fragilaria vaucheriae</i>	1	
<i>Gomphonema affine</i>	1	
<i>Gomphonema brasiliense</i>	2	
<i>Gomphonema olivaceum</i>	6	
<i>Gomphonema parvulum</i>	7	
<i>Gomphonema sphaerophorum</i>	1	
<i>Gyrosigma scalproides</i>	5	
<i>Gyrosigma spencerii</i> var. <i>curvula</i>	3	
<i>Hantzschia amphioxys</i>	2	
<i>Hippodonta capitata</i>	5	
<i>Luticola mutica</i>	2	

<i>Melosira varians</i>	13
<i>Meridion circulare</i>	4
<i>Navicula capitatoradiata</i>	24
<i>Navicula cf. goeppertiana</i>	14
<i>Navicula contenta</i>	4
<i>Navicula cryptocephala</i>	19
<i>Navicula cryptotenella</i>	18
<i>Navicula decussis</i>	40
<i>Navicula integra</i>	3
<i>Navicula menisculus var. upsaliensis</i>	3
<i>Navicula minima</i>	15
<i>Navicula pupula</i>	3
<i>Navicula schadei</i>	13
<i>Navicula schroeterii</i>	48
<i>Navicula sp.</i>	21
<i>Navicula sp. 9a</i>	3
<i>Navicula subminuscula</i>	5
<i>Navicula tantula</i>	6
<i>Navicula tenelloides</i>	19
<i>Navicula tenera</i>	1
<i>Navicula tripunctata</i>	1
<i>Navicula trivialis</i>	11
<i>Navicula viridula</i>	1
<i>Navicula viridula var. rostellata</i>	23
<i>Nitzschia amphibia</i>	1
<i>Nitzschia dissipata</i>	6
<i>Nitzschia fonticola</i>	1
<i>Nitzschia frustulum</i>	2
<i>Nitzschia linearis</i>	4
<i>Nitzschia palea</i>	18
<i>Nitzschia sinuata var. tabellaria</i>	1
<i>Nitzschia sp.</i>	4
<i>Rhoicosphenia curvata</i>	4
<i>Stauroneis smithii</i>	2
<i>Stephanocyclus meneghiniana</i>	9
<i>Surirella angustata</i>	3
<i>Surirella linearis var. helvetica</i>	1
<i>Surirella ovata</i>	25
<i>Synedra acus</i>	1
<i>Synedra ulna</i>	5
<i>Tryblionella levidensis</i>	3

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<b>Station ID:</b> CRR200006	<b>Ecoregion:</b> INTERIOR PLATEAU
<b>Basin:</b> LOWER CUMBERLAND RIVER	<b>Stream Name:</b> NORTH FORK LITTLE RIVER
<b>County:</b> CHRISTIAN	<b>Map Name:</b> CHURCH HILL
<b>Catchment Area:</b> 54.2	<b>River Mile:</b> 63.58 <b>Stream Order:</b> 5
<b>Lat Dec:</b> 36.83155	<b>Long Dec:</b> -87.52454
<b>Location:</b> HOPKINSVILLE BYPASS 3495 SOUTH SIDE-200 m UPSTREAM FROM BRIDGE	

**FISHES**

<b>Common Name</b>	<b>Scientific Name</b>	<b>Individuals</b>	<b>July 2003</b>
Largescale Stoneroller	<i>Campostoma oligolepis</i>	7	
Spotfin Shiner	<i>Cyprinella spiloptera</i>	1	
Common Carp	<i>Cyprinus carpio</i>	1	
Striped Shiner	<i>Luxilus chrysocephalus</i>	15	
Rosefin Shiner	<i>Lythrurus fasciolaris</i>	174	
Redtail Chub	<i>Nocomis effusus</i>	3	
Golden Shiner	<i>Notemigonus crysoleucas</i>	1	
Bluntnose minnow	<i>Pimephales notatus</i>	12	
Creek Chub	<i>Semotilus atromaculatus</i>	2	
Banded Sculpin	<i>Cottus carolinae</i>	18	
Longear Sunfish	<i>Lepomis megalotis</i>	2	
Fringed Darter	<i>Etheostoma crossopterus</i>	1	
Freshwater Drum	<i>Aplodinotus grunniens</i>	1	

**INVERTEBRATES**

<b>Taxa</b>	<b>Individuals</b>	<b>May 2003</b>
Oligochaeta	31	
<i>Planaria</i> sp	1	
<i>Physella</i> sp	1	
<i>Elimia</i> sp	496	
<i>Planorbella</i> sp	2	
<i>Corbicula fluminea</i>	10	
<i>Stenacron</i> sp	13	
<i>Caenis</i> sp	4	
<i>Argia</i> sp	33	
<i>Enallagma</i> sp	5	
<i>Boyeria</i> sp	1	
<i>Epitheca (Epicordulia)</i> sp	4	
<i>Hydroptila</i> sp	1	
Cheumatopsyche sp	184	
Homoptera (not aquatic)	1	
Curculionidae (adult)	14	
<i>Microbledius</i> sp (adult)	1	
<i>Helichus striatus</i> (adult)	1	
<i>Berosus</i> sp (adult)	1	
<i>Ancyronyx variegates</i> (adult)	7	

<i>Stenelmis</i> sp (adult)	13
Chironomidae (pupae)	9
<i>Ablabesmyia</i> sp	1
<i>Conchapelopia</i> sp	6
<i>Cryptochironomus</i> sp	20
<i>Dicrotendipes</i> sp	4
<i>Helopelopia</i> sp	2
<i>Larsia</i> sp	3
<i>Phaenopsectra</i> sp	32
<i>Polypedilum convictum</i>	123
<i>Polypedilum tritum</i>	28
<i>Stictochironomus</i> sp	8
<i>Tanytarsus</i> sp	4
<i>Simulium</i> sp	1
<i>Bezzia</i> sp	1
<i>Ceratopogon</i> sp	4
<i>Caecidotea</i> sp	328
<i>Orconectes</i> sp	6

#### DIATOMS

Taxa	Individuals	May 2003
<i>Achnanthes minutissima</i>	12	
<i>Achnanthes hauckiana</i>	4	
<i>Achnanthes</i> sp.	2	
<i>Asterionella formosa</i>	2	
<i>Cocconeis pediculus</i>	1	
<i>Cocconeis placentula</i> var. <i>euglypta</i>	3	
<i>Cyclotella pseudostelligera</i>	13	
<i>Cymbella minuta</i>	3	
<i>Gomphonema intricatum</i> var. <i>pulvinatum</i>		6
<i>Gomphonema minutum</i>	11	
<i>Gomphonema olivaceum</i>	11	
<i>Gomphonema parvulum</i>	8	
<i>Gyrosigma attenuatum</i>	1	
<i>Melosira granulata</i> var. <i>angustissima</i>	2	
<i>Navicula capitatoradiata</i>	18	
<i>Navicula contenta</i>	3	
<i>Navicula cryptocephala</i>	1	
<i>Navicula cryptotenella</i>	23	
<i>Navicula ingenua</i>	4	
<i>Navicula menisculus</i>	13	
<i>Navicula minima</i>	42	
<i>Navicula secreta</i> var. <i>apiculata</i>	57	
<i>Navicula seminulum</i>	63	
<i>Navicula</i> sp.	98	
<i>Navicula trivialis</i>	17	
<i>Navicula viridula</i> var. <i>rostellata</i>	12	



<i>Neidium affine</i> var. <i>longiceps</i>	2
<i>Nitzschia amphibia</i>	3
<i>Nitzschia apiculata</i>	7
<i>Nitzschia capitellata</i>	6
<i>Nitzschia clausii</i>	2
<i>Nitzschia dissipata</i>	41
<i>Nitzschia frustulum</i>	2
<i>Nitzschia linearis</i>	1
<i>Nitzschia palea</i>	13
<i>Pinnularia subcapitata</i>	1
<i>Reimeria sinuata</i>	1
<i>Rhoicosphenia curvata</i>	4
<i>Stephanocyclus meneghiniana</i>	3
<i>Stephanodiscus hantzschii</i>	41
<i>Stephanodiscus tenuis</i>	9
<i>Surirella angustata</i>	1
<i>Surirella ovata</i>	23
<i>Surirella ovata</i> var. <i>pinnata</i>	12
<i>Synedra rumpens</i> var. <i>familiaris</i>	11
<i>Synedra ulna</i>	1

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## FISHES

Common Name	Scientific Name	Individuals	Sept 2003
Largescale Stoneroller	<i>Campostoma oligolepis</i>	1	
Striped Shiner	<i>Luxilus chrysocephalus</i>	2	
Rosefin Shiner	<i>Lythrurus fasciolaris</i>	60	
Bluntnose Minnow	<i>Pimephales notatus</i>	7	
Blackspotted Topminnow	<i>Fundulus olivaceus</i>	4	
Western Mosquitofish	<i>Gambusia affinis</i>	2	
Banded Sculpin	<i>Cottus carolinae</i>	2	
Rockbass	<i>Ambloplites rupestris</i>	2	
Green Sunfish	<i>Lepomis cyanellus</i>	3	
Bluegill	<i>Lepomis macrochirus</i>	2	
Longear Sunfish	<i>Lepomis megalotis</i>	7	
Fringed Darter	<i>Etheostoma crossopteryum</i>	2	

## INVERTEBRATES

Taxa	Individuals	Sept 2003
<i>Planaria</i> sp	11	
<i>Elimia</i> sp	207	
<i>Stenacron</i> sp	14	
<i>Brachycercus</i> sp	1	
<i>Heterocloeon curiosum</i>	11	
<i>Argia</i> sp	88	
<i>Enallagma</i> sp	6	
<i>Calopteryx maculata</i>	5	

<i>Basiaeschna</i> sp	3
<i>Ladona exusta</i>	1
<i>Macromia</i> sp	3
<i>Microvelia</i> sp	17
<i>Rhagovelia</i> sp	1
<i>Gerris</i> sp	1
<i>Ochrotrichia</i> sp	6
<i>Cheumatopsyche</i> sp	268
<i>Peltodytes</i> sp (adult)	3
<i>Berosus</i> sp (adult)	1
<i>Ancyronyx variegates</i> (adult)	1
<i>Ancyronyx variegates</i> (larvae)	14
<i>Dubiraphia</i> sp (adult)	1
<i>Dubiraphia</i> sp (larvae)	5
<i>Stenelmis</i> sp (adult)	15
<i>Hemerodromia</i> sp	2
<i>Simulium</i> sp	21
Chironomidae (pupae)	13
<i>Ceratopogon</i> sp	1
<i>Gammarus</i> sp	2
<i>Caecidotea</i> sp	34
<i>Lirceus</i> sp.	1
<i>Orconectes</i> sp	2

## DIATOMS

Taxa	Individuals	Sept 2003
<i>Achnanthes minutissima</i>	4	
<i>Achnanthes</i> sp. 2	14	
<i>Achnantheidium minutissima</i> var. <i>saprophila</i>	6	
<i>Amphora perpusilla</i>	11	
<i>Aulacoseira granulata</i>	3	
<i>Gomphonema brasiliense</i>	8	
<i>Gomphonema intricatum</i> var. <i>pulvinatum</i>	3	
<i>Gomphonema truncatum</i>	3	
<i>Gyrosigma scalproides</i>	2	
<i>Melosira varians</i>	2	
<i>Navicula capitatoradiata</i>	13	
<i>Navicula</i> cf. <i>goeppertiana</i>	8	
<i>Navicula contenta</i>	21	
<i>Navicula cryptocephala</i>	11	
<i>Navicula cryptotenella</i>	7	
<i>Navicula hustedtii</i>	6	
<i>Navicula menisculus</i>	7	
<i>Navicula minima</i>	73	
<i>Navicula schroeterii</i>	68	
<i>Navicula secreta</i> var. <i>apiculata</i>	8	
<i>Navicula seminulum</i>	7	

<i>Navicula</i> sp.	18
<i>Navicula</i> sp. 9a	23
<i>Navicula subminuscula</i>	23
<i>Navicula tenelloides</i>	42
<i>Navicula tripunctata</i>	2
<i>Navicula trivialis</i>	3
<i>Navicula viridula</i> var. <i>rostellata</i>	53
<i>Nitzschia acicularis</i>	4
<i>Nitzschia amphibia</i>	14
<i>Nitzschia constricta</i>	1
<i>Nitzschia dissipata</i>	9
<i>Nitzschia dissipata</i> var. <i>media</i>	9
<i>Nitzschia frustulum</i>	9
<i>Nitzschia palea</i>	51
<i>Nitzschia</i> sp.	14
<i>Surirella angustata</i>	2
<i>Surirella ovata</i>	5

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<b>Station ID:</b> CRR200007	<b>Ecoregion:</b> INTERIOR PLATEAU
<b>Basin:</b> LOWER CUMBERLAND RIVER	<b>Stream Name:</b> NORTH FORK LITTLE RIVER
<b>County:</b> CHRISTIAN	<b>Map Name:</b> CHURCH HILL
<b>Catchment Area:</b> 58.54	<b>River Mile:</b> 58.34 <b>Stream Order:</b> 5
<b>Lat Dec:</b> 36.80178	<b>Long Dec:</b> -87.51382
<b>Location:</b> 107 TO GRAY LANE-JUST BELOW WASTE WATER TREATMENT PLANT	

**FISHES**

<b>Common Name</b>	<b>Scientific Name</b>	<b>Individuals</b>	<b>July 2003</b>
Striped Shiner	<i>Luxilus chrysocephalus</i>	11	
Rosefin Shiner	<i>Lythrurus fasciolaris</i>	176	
Banded Sculpin	<i>Cottus carolinae</i>	5	
Longear Sunfish	<i>Lepomis megalotis</i>	2	

**INVERTEBRATES**

<b>Taxa</b>	<b>Individuals</b>	<b>May 2003</b>
Oligochaeta	79	
<i>Planaria</i> sp	2	
<i>Physella</i> sp	9	
<i>Elimia</i> sp	96	
<i>Corbicula fluminea</i>	4	
Hirudinea	1	
<i>Stenacron</i> sp	26	
Heptageniidae	8	
<i>Eurylophella</i> sp	1	
<i>Caenis</i> sp	1	
<i>Baetis</i> sp	3	
Baetidae	2	
<i>Argia</i> sp	80	
<i>Enallagma</i> sp	16	
<i>Calopteryx maculata</i>	1	
<i>Hagenius brevistylus</i>	1	
<i>Epitheca (Epicordulia)</i> sp	1	
<i>Macromia</i> sp	1	
<i>Hydroptila</i> sp	1	
<i>Cheumatopsyche</i> sp	172	
<i>Ancyronyx variegates</i> (adult)	17	
<i>Dubiraphia</i> sp (adult)	2	
<i>Macronychus glabratus</i> (adult)	1	
<i>Stenelmis</i> sp (adult)	66	
Chironomidae (pupae)	15	
<i>Chironomus</i> sp	5	
<i>Conchapelopia</i> sp	6	
<i>Cricotopus</i> sp	5	
<i>Cryptochironomus</i> sp	8	

<i>Dicrotendipes</i> sp	2
<i>Endochironomus</i> sp	7
<i>Phaenopsectra</i> sp	1
<i>Polypedilum convictum</i>	47
<i>Polypedilum tritum</i>	10
<i>Potthastia</i> sp	1
<i>Psectrocladius</i> sp	1
<i>Tanytarsus</i> sp	6
<i>Simulium</i> sp	2
<i>Ceratopogon</i> sp	1
<i>Gammarus</i> sp	19
<i>Caecidotea</i> sp	31
<i>Orconectes</i> sp	2

## DIATOMS

Taxa	Individuals	May 2003
<i>Achnanthes lanceolata</i>	16	
<i>Achnanthes minutissima</i>	8	
<i>Amphora perpusilla</i>	4	
<i>Caloneis bacillum</i>	13	
<i>Cocconeis pediculus</i>	21	
<i>Cocconeis placentula</i> var. <i>euglypta</i>	7	
<i>Cyclotella pseudostelligera</i>	7	
<i>Cymbella minuta</i>	2	
<i>Fragilaria capucina</i> var. <i>mesolepta</i>	3	
<i>Gomphonema intricatum</i> var. <i>pulvinatum</i>		15
<i>Gomphonema minutum</i>	10	
<i>Gomphonema olivaceum</i>	6	
<i>Gomphonema parvulum</i>	16	
<i>Gyrosigma scalproides</i>	4	
<i>Hippodonta capitata</i>	2	
<i>Melosira ambigua</i>	19	
<i>Melosira granulata</i> var. <i>angustissima</i>	13	
<i>Melosira varians</i>	13	
<i>Navicula capitatoradiata</i>	14	
<i>Navicula</i> cf. <i>goeppertiana</i>	11	
<i>Navicula cryptocephala</i>	6	
<i>Navicula cryptotenella</i>	37	
<i>Navicula menisculus</i>	4	
<i>Navicula menisculus</i> var. <i>upsaliensis</i>	13	
<i>Navicula minima</i>	40	
<i>Navicula secreta</i> var. <i>apiculata</i>	37	
<i>Navicula seminulum</i>	11	
<i>Navicula</i> sp.	18	
<i>Navicula tenera</i>	1	
<i>Navicula tripunctata</i>	54	
<i>Navicula trivialis</i>	4	

<i>Nitzschia amphibia</i>	11
<i>Nitzschia apiculata</i>	2
<i>Nitzschia dissipata</i>	31
<i>Nitzschia frustulum</i>	2
<i>Nitzschia hungarica</i>	1
<i>Nitzschia ignorata</i>	2
<i>Nitzschia linearis</i>	4
<i>Nitzschia palea</i>	2
<i>Punctastriata pinnata</i>	3
<i>Reimeria sinuata</i>	3
<i>Rhoicosphenia curvata</i>	58
<i>Stephanodiscus hantzschii</i>	8
<i>Stephanodiscus tenuis</i>	4
<i>Synedra rumpens</i> var. <i>familiaris</i>	11
<i>Synedra rumpens</i> var. <i>fragilarioides</i>	8
<i>Synedra ulna</i>	3

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**FISHES**

<b>Common Name</b>	<b>Scientific Name</b>	<b>Individuals</b>	<b>Sept 2003</b>
Largescale Stoneroller	<i>Campostoma oligolepis</i>	1	
Spotfin Shiner	<i>Cyprinella spiloptera</i>	2	
Striped Shiner	<i>Luxilus chrysocephalus</i>	4	
Western Mosquitofish	<i>Gambusia affinis</i>	1	
Banded Sculpin	<i>Cottus carolinae</i>	29	
Rockbass	<i>Ambloplites rupestris</i>	11	
Green Sunfish	<i>Lepomis cyanellus</i>	3	
Bluegill	<i>Lepomis macrochirus</i>	1	
Longear Sunfish	<i>Lepomis megalotis</i>	11	
Greenside Darter	<i>Etheostoma blennioides</i>	1	
Smallscale Darter	<i>Etheostoma microlepidum</i>	1	

**INVERTEBRATES**

<b>Taxa</b>	<b>Individuals</b>	<b>Sept 2003</b>
<i>Planaria</i> sp	1	
<i>Elimia</i> sp	73	
<i>Heptagenia</i> sp	1	
<i>Stenacron</i> sp	18	
<i>Stenonema</i> sp	7	
<i>Caenis</i> sp	4	
<i>Heterocloeon frivolus</i>	2	
<i>Argia</i> sp	72	
<i>Enallagma</i> sp	4	
<i>Calopteryx maculata</i>	27	
<i>Boyeria</i> sp	2	
<i>Libellula</i> sp	4	

<i>Microvelia</i> sp	23
<i>Rhagovelia</i> sp	10
<i>Gerris</i> sp	1
<i>Agraylea</i> sp	11
<i>Cheumatopsyche</i> sp	53
<i>Potamyia flava</i>	43
<i>Wormaldia</i> sp	2
Carabidae sp (adult)	1
<i>Helichus striatus</i> (adult)	1
<i>Psephenus herricki</i> (larva)	1
<i>Scirtes</i> sp (larvae)	11
<i>Tropisternus</i> sp (adult)	1
<i>Dineutus</i> sp (adult)	1
<i>Ancyronyx variagatus</i> (adult)	19
<i>Ancyronyx variagatus</i> (larvae)	7
<i>Dubiraphia</i> sp (larvae)	1
<i>Macronychus glabratus</i>	3
<i>Optioservus</i> sp (larvae)	2
<i>Stenelmis</i> sp (adult)	30
<i>Stenelmis</i> sp(larvae)	48
<i>Simulium</i> sp	3
Chironomidae (pupae)	13
<i>Stratiomys</i> sp	1
<i>Gammarus</i> sp	1
<i>Caecidotea</i> sp	38
<i>Orconectes</i> sp	3

## DIATOMS

Taxa	Individuals	Sept 2003
<i>Achnanthes lanceolata</i>	2	
<i>Achnanthes minutissima</i>	2	
<i>Achnanthes pinnata</i>	6	
<i>Achnanthes</i> sp. 2	8	
<i>Amphora perpusilla</i>	28	
<i>Amphora submontana</i>	14	
<i>Caloneis bacillum</i>	4	
<i>Cocconeis placentula</i> var. <i>euglypta</i>	6	
<i>Cyclostephanos dubius</i>	1	
<i>Cyclotella stelligera</i>	1	
<i>Diploneis</i> sp.	2	
<i>Fragilaria vaucheriae</i>	1	
<i>Gomphonema brasiliense</i>	3	
<i>Gomphonema intricatum</i> var. <i>pulvinatum</i>		4
<i>Gomphonema parvulum</i>	6	
<i>Gyrosigma attenuatum</i>	2	
<i>Gyrosigma scalproides</i>	7	
<i>Gyrosigma spencerii</i> var. <i>curvula</i>	4	

<i>Hippodonta capitata</i>	1
<i>Navicula auriculata</i>	6
<i>Navicula cf. goeppertiana</i>	5
<i>Navicula contenta</i>	1
<i>Navicula cryptocephala</i>	2
<i>Navicula elginensis</i>	1
<i>Navicula hustedtii</i>	8
<i>Navicula ingenua</i>	17
<i>Navicula menisculus</i>	5
<i>Navicula minima</i>	120
<i>Navicula pupula</i>	6
<i>Navicula schadei</i>	4
<i>Navicula schroeterii</i>	24
<i>Navicula secreta var. apiculata</i>	5
<i>Navicula seminulum</i>	16
<i>Navicula sp.</i>	1
<i>Navicula sp. 9a</i>	4
<i>Navicula tantula</i>	4
<i>Navicula tenelloides</i>	79
<i>Navicula tripunctata</i>	7
<i>Navicula viridula var. rostellata</i>	4
<i>Nitzschia amphibia</i>	9
<i>Nitzschia dissipata</i>	22
<i>Nitzschia dissipata var. media</i>	12
<i>Nitzschia sigma</i>	1
<i>Pinnularia microstauron</i>	1
<i>Reimeria sinuata</i>	1
<i>Rhoicosphenia curvata</i>	2
<i>Stauroneis smithii</i>	1
<i>Synedra rumpens var. familiaris</i>	1
<i>Tryblionella levidensis</i>	61
<i>Tryblionella victoriae</i>	5

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<b>Station ID:</b> CRR200008	<b>Ecoregion:</b> INTERIOR PLATEAU
<b>Basin:</b> LOWER CUMBERLAND RIVER	<b>Stream Name:</b> NORTH FORK LITTLE RIVER
<b>County:</b> CHRISTIAN	<b>Map Name:</b> CHURCHHILL
<b>Catchment Area:</b> 46.16	<b>River Mile:</b> 67.00 <b>Stream Order:</b> 5
<b>Lat Dec:</b> 36.86183	<b>Long Dec:</b> -87.51936
<b>Location:</b> 272 W. SIDE HOPKINSVILLE-200 M UPSTREAM FROM BRIDGE	

### FISHES

<b>Common Name</b>	<b>Scientific Name</b>	<b>Individuals</b>	<b>July 2003</b>
Striped Shiner	<i>Luxilus chrysocephalus</i>	1	
Rosefin Shiner	<i>Lythrurus fasciolaris</i>	96	
Bluntnose Minnow	<i>Pimephales notatus</i>	10	
Creek Chub	<i>Semotilus atromaculatus</i>	2	
Spotted Sucker	<i>Minytrema melanops</i>	12	
Bluegill	<i>Lepomis macrochirus</i>	4	
Longear Sunfish	<i>Lepomis megalotis</i>	23	
Redear Sunfish	<i>Lepomis microlophus</i>	1	

### INVERTEBRATES

<b>Taxa</b>	<b>Individuals</b>	<b>May 2003</b>
Oligochaeta	265	
<i>Physella</i> sp	14	
<i>Elimia</i> sp	374	
<i>Planorbella</i> sp	4	
<i>Pisidium</i> sp	5	
<i>Corbicula fluminea</i>	6	
Hirudinea	1	
<i>Stenacron</i> sp	2	
<i>Caenis</i> sp	19	
<i>Argia</i> sp	50	
<i>Enallagma</i> sp	12	
<i>Calopteryx maculata</i>	2	
<i>Epitheca (Epicordulia)</i> sp	3	
<i>Libellula</i> sp	1	
<i>Macromia</i> sp	1	
<i>Hydroptila</i> sp	2	
<i>Cheumatopsyche</i> sp	48	
Curculionidae (adult)	3	
<i>Peltodytes</i> sp (adult)	1	
<i>Ancyronyx variegates</i> (adult)	1	
<i>Tipula</i> sp	3	
Chironomidae (pupae)	13	
<i>Ablabesmyia</i> sp	2	
<i>Chironomus</i> sp	3	
<i>Conchapelopia</i> sp	8	
<i>Cryptochironomus</i> sp	5	

<i>Dicrotendipes</i> sp	13
<i>Endochironomus</i> sp	40
<i>Phaenopsectra</i> sp	33
<i>Polypedilum</i> sp	5
<i>Polypedilum convictum</i>	20
<i>Polypedilum tritum</i>	10
<i>Psectrocladius</i> sp	1
<i>Tanytarsus</i> sp	7
<i>Ceratopogon</i> sp	1
<i>Gammarus</i> sp	1
<i>Caecidotea</i> sp	10
<i>Orconectes</i> sp	10

## DIATOMS

Taxa	Individuals	May 2003
<i>Achnanathes lanceolata</i>	8	
<i>Asterionella formosa</i>	3	
<i>Aulacoseira granulata</i>	4	
<i>Cyclotella pseudostelligera</i>	3	
<i>Melosira varians</i>	107	
<i>Navicula contenta</i>	3	
<i>Navicula cryptocephala</i>	5	
<i>Navicula menisculus</i>	7	
<i>Navicula minima</i>	11	
<i>Navicula pupula</i>	7	
<i>Navicula secreta</i> var. <i>apiculata</i>	22	
<i>Navicula viridula</i> var. <i>rostellata</i>	12	
<i>Nitzschia capitellata</i>	3	
<i>Nitzschia dissipata</i>	12	
<i>Nitzschia palea</i>	13	
<i>Nitzschia</i> sp.	8	
<i>Stephanocyclus meneghiniana</i>	3	
<i>Stephanodiscus</i> sp.	24	
<i>Surirella angustata</i>	4	
<i>Surirella ovalis</i>	241	
<i>Surirella ovata</i>	22	
<i>Surirella ovata</i> var. <i>pinnata</i>	21	

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## FISHES

Common Name	Scientific Name	Individuals	Sept 2003
Striped Shiner	<i>Luxilus chrysocephalus</i>	1	
Rosefin Shiner	<i>Lythrurus fasciolaris</i>	64	
Bluntnose Minnow	<i>Pimephales notatus</i>	3	
Creek Chub	<i>Semotilus atromaculatus</i>	1	
Spotted Sucker	<i>Minytrema melanops</i>	1	
Yellow Bullhead	<i>Ameiurus natalis</i>	1	

Blackspotted Topminnow	<i>Fundulus olivaceus</i>	1
Western Mosquitofish	<i>Gambusia affinis</i>	5
Redbreast Sunfish	<i>Lepomis auritus</i>	8
Green Sunfish	<i>Lepomis cyanellus</i>	3
Longear Sunfish	<i>Lepomis megalotis</i>	27
Largemouth Bass	<i>Micropterus salmoides</i>	1
Fringed Darter	<i>Etheostoma crossopterum</i>	1

#### INVERTEBRATES

Taxa	Individuals	Sept 2003
<i>Elimia</i> sp	206	
<i>Stenacron</i> sp	48	
<i>Caenis</i> sp	7	
<i>Argia</i> sp	88	
<i>Enallagma</i> sp	28	
<i>Calopteryx maculata</i>	6	
<i>Aeshna</i> sp	1	
<i>Boyeria</i> sp	1	
<i>Macromia</i> sp	2	
<i>Perithemis</i> sp	4	
<i>Microvelia</i> sp	3	
<i>Rhagovelia</i> sp	1	
<i>Aquarius</i> sp	3	
<i>Gerris</i> sp	8	
<i>Molanna</i> sp	4	
<i>Ochrotrichia</i> sp	1	
<i>Cheumatopsyche</i> sp	29	
<i>Scirtes</i> sp (larvae)	6	
<i>Ancyronyx variegates</i> (adult)	1	
<i>Dubiraphia</i> sp (adult)	2	
<i>Stenelmis</i> sp (adult)	3	
<i>Stenelmis</i> sp(larvae)	1	
<i>Tipula</i> sp	1	
Chironomidae (pupae)	15	
<i>Simulium</i> sp	3	
<i>Odontomyia</i> sp	2	
<i>Chrysops</i> sp	1	
<i>Caecidotea</i> sp	8	

#### DIATOMS

Taxa	Individuals	Sept 2003
<i>Achnanthes lanceolata</i>	22	
<i>Achnanthes curtissima</i>	5	
<i>Achnanthes pinnata</i>	6	
<i>Amphora submontana</i>	14	
<i>Caloneis bacillum</i>	16	
<i>Cocconeis pediculus</i>	2	
<i>Cocconeis placentula</i> var. <i>euglypta</i>	20	

<i>Cyclotella pseudostelligera</i>	2	
<i>Cyclotella stelligera</i>	8	
<i>Diploneis</i> sp.	7	
<i>Frustulia vulgaris</i>	3	
<i>Gomphonema intricatum</i> var. <i>pulvinatum</i>	8	8
<i>Gomphonema parvulum</i>	22	
<i>Gyrosigma scalproides</i>	4	
<i>Hippodonta capitata</i>	6	
<i>Melosira ambigua</i>	6	
<i>Melosira distans</i> var. <i>alpigena</i>	33	
<i>Melosira granulata</i>	11	
<i>Navicula</i> cf. <i>goeppertiana</i>	4	
<i>Navicula clementis</i>	6	
<i>Navicula contenta</i>	91	
<i>Navicula cryptocephala</i>	21	
<i>Navicula cryptotenella</i>	14	
<i>Navicula hustedtii</i>	4	
<i>Navicula ingenua</i>	8	
<i>Navicula menisculus</i>	14	
<i>Navicula minima</i>	37	
<i>Navicula phyllepta</i>	2	
<i>Navicula placentula</i>	3	
<i>Navicula pupula</i>	3	
<i>Navicula schroeterii</i>	36	
<i>Navicula secreta</i> var. <i>apiculata</i>	3	
<i>Navicula seminulum</i>	6	
<i>Navicula</i> sp.	26	
<i>Navicula subhamulata</i>	3	
<i>Navicula subminuscula</i>	3	
<i>Navicula subtilissima</i>	4	
<i>Navicula tenelloides</i>	61	
<i>Navicula tenera</i>	7	
<i>Navicula tripunctata</i>	5	
<i>Navicula trivialis</i>	3	
<i>Navicula viridula</i> var. <i>rostellata</i>	16	
<i>Neidium binode</i>	5	
<i>Nitzschia amphibia</i>	11	
<i>Nitzschia constricta</i>	4	
<i>Nitzschia dissipata</i>	9	
<i>Nitzschia dissipata</i> var. <i>media</i>	3	
<i>Nitzschia frustulum</i>	11	
<i>Nitzschia palea</i>	14	
<i>Nitzschia parvula</i>	3	
<i>Nitzschia</i> sp.	17	
<i>Nitzschia</i> sp. 5	2	
<i>Pinnularia biceps</i>	3	

<i>Reimeria sinuata</i>	2
<i>Rhoicosphenia curvata</i>	18
<i>Stauroneis smithii</i>	3
<i>Stephanocyclus meneghiniana</i>	4
<i>Stephanodiscus</i> sp.	14
<i>Surirella angustata</i>	3
<i>Surirella linearis</i> var. <i>helvetica</i>	3
<i>Surirella ovata</i>	9
<i>Synedra rumpens</i> var. <i>familiaris</i>	4
<i>Tryblionella levidensis</i>	24
<i>Tryblionella victoriae</i>	3

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<b>Station ID:</b> CRR200009	<b>Ecoregion:</b> INTERIOR PLATEAU
<b>Basin:</b> LOWER CUMBERLAND	<b>Stream Name:</b> LITTLE RIVER
<b>County:</b> CHRISTIAN	<b>Map Name:</b> CHURCH HILL
<b>Catchment Area:</b> 126.64	<b>River Mile:</b> 53.48 <b>Stream Order:</b> 5
<b>Lat Dec:</b> 36.78336	<b>Long Dec:</b> -87.54604
<b>Location:</b> HUFFMAN MILL RD.-AT OLD DAM, DOWNSTREAM FROM BRIDGE - DEEP WATER	

**FISHES**

<b>Common Name</b>	<b>Scientific Name</b>	<b>Individuals</b>	<b>July 2003</b>
Largescale Stoneroller	<i>Campostoma oligolepis</i>	2	
Spotfin Shiner	<i>Cyprinella spiloptera</i>	6	
Striped Shiner	<i>Luxilus chrysocephalus</i>	17	
Rosefin Shiner	<i>Lythrurus fasciolaris</i>	41	
Redtail Chub	<i>Nocomis effusus</i>	2	
Bluntnose Minnow	<i>Pimephales notatus</i>	5	
Northern Hogsucker	<i>Hypentelium nigricans</i>	1	
Blackspotted Topminnow	<i>Fundulus olivaceus</i>	6	
Banded Sculpin	<i>Cottus carolinae</i>	3	
Rockbass	<i>Ambloplites rupestris</i>	1	
Bluegill	<i>Lepomis macrochirus</i>	1	
Longear Sunfish	<i>Lepomis megalotis</i>	3	
Snubnose Darter	<i>Etheostoma simoterum</i>	3	
Logperch	<i>Percina caprodes</i>	1	

**INVERTEBRATES**

<b>Taxa</b>	<b>Individuals</b>	<b>May 2003</b>
Oligochaeta	62	
<i>Physella</i> sp	3	
<i>Elimia</i> sp	155	
<i>Sphaerium</i> sp	4	
<i>Corbicula fluminea</i>	1	
Hirudinea	1	
<i>Stenacron</i> sp	13	
<i>Stenonema</i> sp	4	
<i>Caenis</i> sp	5	
Baetidae	6	
<i>Baetis</i> sp	17	
<i>Argia</i> sp	4	
<i>Enallagma</i> sp	18	
<i>Boyeria</i> sp	1	
Gomphidae	1	
<i>Hydroptila</i> sp	7	
<i>Oecetis</i> sp	1	
<i>Cheumatopsyche</i> sp	235	
<i>Peltodytes</i> sp	2	
Hydrophilidae (adult)	1	

<i>Psephenus herricki</i> (larvae)	6
<i>Ancyronyx variegates</i> (adult)	9
<i>Dubiraphia</i> sp (adult)	1
<i>Dubiraphia</i> sp (larvae)	1
<i>Macronychus glabratus</i> (adult)	12
<i>Stenelmis</i> sp (adult)	22
<i>Tipula</i> sp	1
Chironomidae (pupae)	5
<i>Ablabesmyia</i> sp	1
<i>Apedilum elachistum</i>	5
<i>Conchapelopia</i> sp	1
<i>Cricotopus</i> sp	1
<i>Endochironomus</i> sp	18
<i>Helopelopia</i> sp	1
<i>Paratrichocladius</i> sp.	1
<i>Phaenopsectra</i> sp	3
<i>Polypedilum convictum</i>	101
<i>Polypedilum tritum</i>	21
<i>Potthastia</i> sp	2
<i>Tanytarsus</i> sp	8
<i>Simulium</i> sp	2
Tabanidae	1
<i>Gammarus</i> sp	7
<i>Caecidotea</i> sp	13
<i>Lirceus</i> sp.	2
<i>Orconectes</i> sp	2

## DIATOMS

Taxa	Individuals	May 2003
<i>Achnanathes lanceolata</i>	2	
<i>Achnanathes minutissima</i>	2	
<i>Achnanthidium minutissima</i> var. <i>saprophila</i>	12	
<i>Caloneis bacillum</i>	14	
<i>Cocconeis pediculus</i>	7	
<i>Cocconeis placentula</i> var. <i>euglypta</i>	13	
<i>Cymbella minuta</i>	3	
<i>Cymbella minuta</i> var. <i>pseudogracilis</i>	3	
<i>Fragilaria vaucheriae</i>	8	
<i>Gomphonema minutum</i>	33	
<i>Gomphonema olivaceum</i>	3	
<i>Gomphonema parvulum</i>	3	
<i>Gomphonema</i> sp. 2	1	
<i>Gyrosigma scalproides</i>	2	
<i>Hippodonta capitata</i>	3	
<i>Luticola mutica</i>	3	
<i>Melosira varians</i>	137	
<i>Navicula contenta</i>	6	

<i>Navicula cryptotenella</i>	61
<i>Navicula decussis</i>	2
<i>Navicula menisculus</i>	5
<i>Navicula minima</i>	14
<i>Navicula phyllepta</i>	2
<i>Navicula secreta var. apiculata</i>	7
<i>Navicula tripunctata</i>	74
<i>Nitzschia amphibia</i>	1
<i>Nitzschia dissipata</i>	33
<i>Nitzschia frustulum</i>	3
<i>Nitzschia hantzschiana</i>	1
<i>Nitzschia palea</i>	13
<i>Nitzschia sp. 5</i>	4
<i>Reimeria sinuata</i>	6
<i>Rhoicosphenia curvata</i>	34
<i>Stephanocyclus meneghiniana</i>	2
<i>Surirella angustata</i>	8
<i>Surirella ovata</i>	30
<i>Synedra ulna</i>	3

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## FISHES

Common Name	Scientific Name	Individuals	Sept 2003
Largescale Stoneroller	<i>Campostoma oligolepis</i>	2	
Striped Shiner	<i>Luxilus chrysocephalus</i>	32	
Rosefin Shiner	<i>Lythrurus fasciolaris</i>	25	
Redtail Chub	<i>Nocomis effusus</i>	8	
Bluntnose Minnow	<i>Pimephales notatus</i>	3	
Creek Chubsucker	<i>Erimyzon oblongus</i>	1	
Northern Hogsucker	<i>Hypentelium nigricans</i>	1	
Banded Sculpin	<i>Cottus carolinae</i>	15	
Rockbass	<i>Ambloplites rupestris</i>	9	
Longear Sunfish	<i>Lepomis megalotis</i>	1	
Greenside Darter	<i>Etheostoma blennioides</i>	1	
Smallscale Darter	<i>Etheostoma microlepidum</i>	3	
Snubnose Darter	<i>Etheostoma simoterum</i>	9	

## INVERTEBRATES

Taxa	Individuals	Sept 2003
<i>Planaria sp</i>	3	
<i>Elimia sp</i>	133	
<i>Heptagenia sp</i>	5	
<i>Stenacron sp</i>	9	
<i>Procloeon sp</i>	6	
<i>Argia sp</i>	21	
<i>Enallagma sp</i>	21	
<i>Calopteryx maculata</i>	4	



<i>Boyeria</i> sp	2
<i>Microvelia</i> sp	2
<i>Rhagovelia</i> sp	2
<i>Gerris</i> sp	3
<i>Ochrotrichia</i> sp	7
<i>Cheumatopsyche</i> sp	18
<i>Psephenus herricki</i> (larvae)	7
<i>Scirtes</i> sp (larvae)	4
<i>Berosus</i> sp (adult)	1
<i>Tropisternus</i> sp (adult)	1
<i>Ancyronyx variegates</i> (adult)	6
<i>Ancyronyx variegates</i> (larvae)	4
<i>Macronychus glabratus</i> (adult)	12
<i>Macronychus glabratus</i> (larva)	1
<i>Stenelmis</i> sp (adult)	13
<i>Stenelmis</i> sp (larvae)	19
<i>Chaoborus</i> sp	1
<i>Tipula</i> sp	1
<i>Hemerodromia</i> sp	10
<i>Simulium</i> sp	25
<i>Simulium</i> sp	34
Chironomidae (pupae)	9
<i>Atrichopogon</i> sp	3
<i>Culicoides</i> sp	1
<i>Gammarus</i> sp	3
<i>Caecidotea</i> sp	6

## DIATOMS

Taxa	Individuals	Sept 2003
<i>Achnanthes lanceolata</i>	11	
<i>Achnanthes curtissima</i>	6	
<i>Achnanthes pusilla</i>	3	
<i>Achnanthidium minutissima</i> var. <i>saprophila</i>	11	
<i>Amphora perpusilla</i>	8	
<i>Amphora submontana</i>	3	
<i>Caloneis bacillum</i>	5	
<i>Cocconeis placentula</i> var. <i>euglypta</i>	18	
<i>Cyclotella pseudostelligera</i>	2	
<i>Cyclotella</i> sp.	3	
<i>Cymbella minuta</i>	8	
<i>Diploneis</i> sp.	3	
<i>Gomphonema gracile</i>	2	
<i>Gomphonema intricatum</i> var. <i>pulvinatum</i>	4	
<i>Gomphonema parvulum</i>	8	
<i>Gyrosigma scalproides</i>	8	
<i>Hantzschia amphioxys</i>	5	
<i>Luticola mutica</i>	9	

<i>Melosira granulata</i>	2
<i>Melosira varians</i>	3
<i>Navicula cf. goeppertiana</i>	8
<i>Navicula contenta</i>	2
<i>Navicula cryptocephala</i>	13
<i>Navicula cryptotenella</i>	18
<i>Navicula decussis</i>	2
<i>Navicula hustedtii</i>	8
<i>Navicula ingenua</i>	3
<i>Navicula menisculus</i>	5
<i>Navicula minima</i>	46
<i>Navicula pupula</i>	2
<i>Navicula schadei</i>	6
<i>Navicula schroeterii</i>	81
<i>Navicula secreta var. apiculata</i>	11
<i>Navicula seminulum</i>	15
<i>Navicula sp. 4</i>	3
<i>Navicula subminuscula</i>	18
<i>Navicula subtilissima</i>	7
<i>Navicula tantula</i>	7
<i>Navicula tenelloides</i>	31
<i>Navicula tripunctata</i>	10
<i>Navicula trivialis</i>	8
<i>Navicula viridula</i>	34
<i>Nitzschia capitellata</i>	2
<i>Nitzschia constricta</i>	6
<i>Nitzschia denticula</i>	2
<i>Nitzschia dissipata</i>	16
<i>Nitzschia frustulum</i>	5
<i>Nitzschia hungarica</i>	3
<i>Nitzschia palea</i>	26
<i>Nitzschia sp.</i>	14
<i>Reimeria sinuata</i>	7
<i>Rhoicosphenia curvata</i>	8
<i>Stauroneis smithii</i>	6
<i>Stephanocyclus meneghiniana</i>	1
<i>Stephanodiscus sp.</i>	2
<i>Surirella ovata</i>	9
<i>Synedra rumpens var. familiaris</i>	3
<i>Synedra ulna</i>	6

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<b>Station ID:</b> CRR200010	<b>Ecoregion:</b> INTERIOR PLATEAU
<b>Basin:</b> LOWER CUMBERLAND	<b>Stream Name:</b> SINKING FORK
<b>County:</b> CHRISTIAN	<b>Map Name:</b> PLEASANT GREEN HILL
<b>Catchment Area:</b> 16.64	<b>River Mile:</b> 30.39 <b>Stream Order:</b> 4
<b>Lat Dec:</b> 36.91603	<b>Long Dec:</b> -87.57668
<b>Location:</b> S.R. 91-PRINCETON @ BRIDGE	

### FISHES

Common Name	Scientific Name	Individuals	July 2003
Largescale Stoneroller	<i>Campostoma oligolepis</i>	2	
Striped Shiner	<i>Luxilus chrysocephalus</i>	71	
Rosefin Shiner	<i>Lythrurus fasciolaris</i>	250	
Bluntnose Minnow	<i>Pimephales notatus</i>	24	
Creek Chub	<i>Semotilus atromaculatus</i>	3	
Northern Hogsucker	<i>Hypentelium nigricans</i>	2	
Blackspotted Topminnow	<i>Fundulus olivaceus</i>	8	
Banded Sculpin	<i>Cottus carolinae</i>	10	
Bluegill	<i>Lepomis macrochirus</i>	6	
Longear Sunfish	<i>Lepomis megalotis</i>	13	
Largemouth Bass	<i>Micropterus salmoides</i>	5	
Fringed Darter	<i>Etheostoma crossopterus</i>	10	
Slabrock Darter	<i>Etheostoma smithi</i>	5	

### INVERTEBRATES

Taxa	Individuals	May 2003
Oligochaeta	28	
<i>Physella</i> sp	2	
<i>Elimia</i> sp	83	
<i>Gyraulus</i> sp	1	
<i>Planorbella</i> sp	2	
<i>Sphaerium</i> sp	37	
<i>Paraleptophlebia</i> sp	5	
<i>Stenonema</i> sp	6	
<i>Caenis</i> sp	16	
<i>Acentrella</i> sp	21	
Baetidae	4	
<i>Enallagma</i> sp	2	
<i>Perlesta</i> sp	9	
<i>Trichocorixa</i> sp	1	
<i>Cheumatopsyche</i> sp	43	
Curculionidae (adult)	2	
Lampyridae (larva)	1	
<i>Peltodytes</i> sp (adult)	2	
<i>Thinobius</i> sp (adult)	1	
<i>Hydroporus</i> sp (adult)	1	
<i>Neoporus</i> sp (adult)	2	
<i>Dubiraphia</i> sp (adult)	1	

<i>Dubiraphia</i> sp (larvae)	2
<i>Macronychus glabratus</i> (adult)	1
<i>Stenelmis</i> sp (adult)	8
Elmidae (larva)	1
Chironomidae (pupae)	10
<i>Ablabesmyia</i> sp	2
<i>Apedilum elachistum</i>	8
<i>Conchapelopia</i> sp	16
<i>Cryptochironomus</i> sp	3
<i>Dicrotendipes</i> sp.	8
<i>Endochironomus</i> sp	84
<i>Larsia</i> sp	3
<i>Phaenopsectra</i> sp	17
<i>Polypedilum</i> sp	6
<i>Polypedilum convictum</i>	48
<i>Polypedilum tritum</i>	6
<i>Psectrocladius</i> sp	2
<i>Tanytarsus</i> sp	11
<i>Simulium</i> sp	103
<i>Caecidotea</i> sp	9
<i>Lirceus</i> sp.	2
<i>Orconectes</i> sp	17
Hydracarina	1

## DIATOMS

Taxa	Individuals	May 2003
<i>Achnanthes lanceolata</i>	12	
<i>Achnanthes minutissima</i>	205	
<i>Achnanthes pusilla</i>	8	
<i>Achnanthes</i> sp. 2	12	
<i>Achnanthes</i> sp.1	20	
<i>Achnanthidium minutissima</i> var. <i>saprophila</i>	38	
<i>Amphora perpusilla</i>	6	
<i>Caloneis bacillum</i>	14	
<i>Cocconeis pediculus</i>	16	
<i>Cocconeis placentula</i> var. <i>euglypta</i>	14	
<i>Ctenophora pulchella</i>	3	
<i>Cymbella minuta</i>	3	
<i>Diploneis</i> sp.	1	
<i>Frustulia vulgaris</i>	1	
<i>Gomphonema minutum</i>	36	
<i>Gomphonema parvulum</i>	6	
<i>Gyrosigma scalproides</i>	1	
<i>Hantzschia amphioxys</i>	1	
<i>Hippodonta capitata</i>	2	
<i>Navicula cryptocephala</i>	10	
<i>Navicula cryptotenella</i>	16	

<i>Navicula menisculus var. upsaliensis</i>	14
<i>Navicula minima</i>	18
<i>Navicula secreta var. apiculata</i>	10
<i>Navicula subminuscula</i>	6
<i>Navicula tripunctata</i>	7
<i>Nitzschia amphibia</i>	4
<i>Nitzschia dissipata</i>	31
<i>Nitzschia frustulum</i>	16
<i>Nitzschia palea</i>	4
<i>Rhoicosphenia curvata</i>	61
<i>Stephanocyclus meneghiniana</i>	2
<i>Surirella ovata</i>	4

### FISHES

Common Name	Scientific Name	Individuals	Sept 2003
Largescale Stoneroller	<i>Campostoma oligolepis</i>	10	
Striped Shiner	<i>Luxilus chrysocephalus</i>	29	
Rosefin Shiner	<i>Lythrurus fasciolaris</i>	3	
Bluntnose Minnow	<i>Pimephales notatus</i>	14	
Creek Chub	<i>Semotilus atromaculatus</i>	19	
White Sucker	<i>Catostomus commersoni</i>	2	
Creek Chubsucker	<i>Erimyzon oblongus</i>	11	
Yellow Bullhead	<i>Ameiurus natalis</i>	2	
Pirate Perch	<i>Aphredoderus sayanus</i>	3	
Blackspotted Topminnow	<i>Fundulus olivaceus</i>	1	
Western Mosquitofish	<i>Gambusia affinis</i>	1	
Green Sunfish	<i>Lepomis cyanellus</i>	23	
Bluegill	<i>Lepomis macrochirus</i>	4	
Longear Sunfish	<i>Lepomis megalotis</i>	15	
Friged Darter	<i>Etheostoma crossopterygum</i>	36	
Slabrock Darter	<i>Etheostoma smithi</i>	20	

### INVERTEBRATES

Taxa	Individuals	Sept 2003
<i>Planaria</i> sp	23	
<i>Elimia</i> sp	93	
<i>Choroterpes</i> sp	8	
<i>Heptagenia</i> sp	95	
<i>Stenacron</i> sp	8	
<i>Caenis</i> sp	10	
<i>Procladius</i> sp	1	
<i>Argia</i> sp	24	
<i>Enallagma</i> sp	13	
<i>Calopteryx maculata</i>	16	
<i>Boyeria</i> sp	3	
<i>Dromogomphus</i> sp	1	

<i>Epitheca (Epicordulia) sp</i>	1
<i>Microvelia sp</i>	34
<i>Aquarius sp</i>	2
<i>Gerris sp</i>	9
<i>Molanna sp</i>	2
<i>Cheumatopsyche sp</i>	118
<i>Helichus striatus (adult)</i>	11
<i>Ectopria nervosa (larva)</i>	1
<i>Scirtes sp (larva)</i>	1
<i>Hydroporus sp (adult)</i>	1
<i>Hydrovatus sp (adult)</i>	1
<i>Dubiraphia sp (adult)</i>	12
<i>Dubiraphia sp (larvae)</i>	10
<i>Optioservus sp(larvae)</i>	1
<i>Stenelmis sp (adult)</i>	13
<i>Stenelmis sp (larvae)</i>	18
<i>Limonia sp</i>	2
<i>Molophilus sp</i>	1
<i>Hemerodromia sp</i>	1
Chironomidae (pupae)	3
<i>Simulium sp</i>	1
<i>Lirceus sp.</i>	74
<i>Orconectes sp</i>	1

## DIATOMS

Taxa	Individuals	Sept 2003
<i>Achnanthes lanceolata var.dubia</i>	3	
<i>Achnanthes biasoletiana</i>	8	
<i>Achnanthes curtissima</i>	19	
<i>Achnanthes pinnata</i>	67	
<i>Achnanthes sp. 2</i>	23	
<i>Achnanthidium minutissima var. saprophila</i>	46	
<i>Amphora perpusilla</i>	73	
<i>Amphora submontana</i>	6	
<i>Caloneis bacillum</i>	53	
<i>Cocconeis pediculus</i>	4	
<i>Cocconeis placentula</i>	2	
<i>Diploneis sp.</i>	13	
<i>Gomphonema brasiliense</i>	13	
<i>Gyrosigma scalproides</i>	3	
<i>Navicula cryptotenella</i>	9	
<i>Navicula helensis</i>	6	
<i>Navicula hustedtii</i>	4	
<i>Navicula minima</i>	30	
<i>Navicula pupula</i>	3	
<i>Navicula schadei</i>	12	
<i>Navicula seminulum</i>	6	

<i>Navicula subminuscula</i>	3
<i>Navicula tripunctata</i>	2
<i>Navicula viridula</i>	3
<i>Nitzschia amphibia</i>	6
<i>Nitzschia capitellata</i>	3
<i>Nitzschia constricta</i>	3
<i>Nitzschia denticula</i>	36
<i>Nitzschia fonticola</i>	3
<i>Nitzschia frustulum</i>	6
<i>Nitzschia palea</i>	4
<i>Nitzschia sinuata</i> var. <i>tabellaria</i>	9
<i>Nitzschia</i> sp. 4	3
<i>Reimeria sinuata</i>	3
<i>Rhoicosphenia curvata</i>	109

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<b>Station ID:</b> CRR200011	<b>Ecoregion:</b> INTERIOR PLATEAU
<b>Basin:</b> LOWER CUMBERLAND	<b>Stream Name:</b> SINKING FORK
<b>County:</b> CHRISTIAN	<b>Map Name:</b> PLEASANT GREEN HILL
<b>Catchment Area:</b> 30.14	<b>River Mile:</b> 14.15 <b>Stream Order:</b> 4
<b>Lat Dec:</b> 36.8812	<b>Long Dec:</b> -87.60839
<b>Location:</b> HWY 68-SAMPLE BEHIND OLD GREY CHURCH-200 M BELOW 68-80 BRIDGE	

**FISHES**

<b>Common Name</b>	<b>Scientific Name</b>	<b>Individuals</b>	<b>July 2003</b>
Largescale Stoneroller	<i>Campostoma oligolepis</i>	4	
Striped Shiner	<i>Luxilus chrysocephalus</i>	22	
Rosefin Shiner	<i>Lythrurus fasciolaris</i>	239	
Bluntnose Minnow	<i>Pimephales notatus</i>	33	
Western Mosquitofish	<i>Gambusia affinis</i>	1	
Banded Sculpin	<i>Cottus carolinae</i>	4	
Rockbass	<i>Ambloplites rupestris</i>	1	
Bluegill	<i>Lepomis macrochirus</i>	13	
Longear Sunfish	<i>Lepomis megalotis</i>	4	
Fringed Darter	<i>Etheostoma crossopterus</i>	8	
Snubnose Darter	<i>Etheostoma simoterum</i>	4	
Slabrock Darter	<i>Etheostoma smithi</i>	1	
Logperch	<i>Percina maculata</i>	1	

**INVERTEBRATES**

<b>Taxa</b>	<b>Individuals</b>	<b>May 2003</b>
Oligochaeta	70	
<i>Planaria</i> sp	1	
<i>Viviparus</i> sp	1	
<i>Physella</i> sp	10	
<i>Elimia</i> sp	179	
<i>Sphaerium</i> sp	46	
<i>Corbicula fluminea</i>	6	
Hirudinea	2	
<i>Stenacron</i> sp	7	
<i>Stenonema</i> sp	34	
<i>Caenis</i> sp	30	
<i>Acentrella</i> sp	19	
<i>Baetis</i> sp	72	
<i>Argia</i> sp	2	
<i>Enallagma</i> sp	2	
<i>Boyeria</i> sp	2	
<i>Dromogomphus</i> sp	3	
<i>Libellula</i> sp	1	
<i>Somatochlora</i> sp	1	
<i>Perlesta</i> sp	50	
<i>Alloperla</i> sp	2	



<i>Microvelia</i> sp	1
<i>Hydrometra martini</i>	1
<i>Hydroptila</i> sp	5
<i>Cheumatopsyche</i> sp	297
<i>Hydropsyche</i> sp	1
<i>Chimarra</i> sp	5
<i>Helichus striatus</i> (adult)	1
<i>Peltodytes</i> sp (adult)	3
<i>Dubiraphia</i> sp (adult)	1
<i>Dubiraphia</i> sp (larvae)	2
<i>Stenelmis</i> sp (adult)	317
Chironomidae (pupae)	12
<i>Apedilum elachistum</i>	27
<i>Conchapelopia</i> sp	78
<i>Corynoneura</i> sp	1
<i>Cricotopus</i> sp	2
<i>Cricotopus/Orthocladius</i> gr	2
<i>Cryptochironomus</i> sp	18
<i>Endochironomus</i> sp	81
<i>Larsia</i> sp	2
<i>Paratrichocladius</i> sp.	2
<i>Phaenopsectra</i> sp	27
<i>Polypedilum</i> sp	9
<i>Polypedilum convictum</i>	286
<i>Polypedilum tritum</i>	9
<i>Potthastia</i> sp	1
<i>Psectrocladius</i> sp	1
<i>Tanytarsus</i> sp	18
<i>Simulium</i> sp	15
<i>Chrysops</i> sp	1
<i>Ceratopogon</i> sp	4
<i>Lirceus</i> sp.	1
<i>Orconectes</i> sp	42
Hydracarina	4

## DIATOMS

Taxa	Individuals	May 2003
<i>Achnanthes lanceolata</i>	3	
<i>Achnanthes lanceolata</i> var. <i>dubia</i>	3	
<i>Achnanthes pusilla</i>	4	
<i>Achnantheidium minutissima</i> var. <i>saprophila</i>	21	
<i>Amphora ovalis</i>	2	
<i>Amphora perpusilla</i>	5	
<i>Caloneis bacillum</i>	16	
<i>Cocconeis pediculus</i>	44	
<i>Cocconeis placentula</i> var. <i>euglypta</i>	4	
<i>Gomphonema brasiliense</i>	2	

<i>Gomphonema minutum</i>	25
<i>Gomphonema olivaceum</i>	18
<i>Gyrosigma scalproides</i>	3
<i>Melosira varians</i>	8
<i>Navicula cryptocephala</i>	9
<i>Navicula cryptotenella</i>	100
<i>Navicula helensis</i>	7
<i>Navicula menisculus</i>	4
<i>Navicula minima</i>	5
<i>Navicula secreta var. apiculata</i>	6
<i>Navicula seminulum</i>	2
<i>Navicula tripunctata</i>	22
<i>Navicula trivialis</i>	4
<i>Nitzschia amphibia</i>	3
<i>Nitzschia apiculata</i>	2
<i>Nitzschia dissipata</i>	63
<i>Nitzschia fonticola</i>	15
<i>Nitzschia frustulum</i>	1
<i>Nitzschia linearis</i>	7
<i>Nitzschia sp. 5</i>	4
<i>Rhoicosphenia curvata</i>	125
<i>Stauroneis smithii</i>	2
<i>Surirella ovata</i>	19
<i>Synedra ulna</i>	1

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**FISHES**

<b>Common Name</b>	<b>Scientific Name</b>	<b>Individuals</b>	<b>Sept 2003</b>
Largescale Stoneroller	<i>Campostoma oligolepis</i>	1	
Striped Shiner	<i>Luxilus chrysocephalus</i>	15	
Rosefin Shiner	<i>Lythrurus fasciolaris</i>	188	
Bluntnose Minnow	<i>Pimephales notatus</i>	57	
Creek Chub	<i>Semotilus atromaculatus</i>	10	
Creek Chubsucker	<i>Erimyzon oblongus</i>	1	
Yellow Bullhead	<i>Ameiurus natalis</i>	2	
Blackspotted Topminnow	<i>Fundulus olivaceus</i>	3	
Banded Sculpin	<i>Cottus carolinae</i>	8	
Green Sunfish	<i>Lepomis cyanellus</i>	2	
Bluegill	<i>Lepomis macrochirus</i>	3	
Longear Sunfish	<i>Lepomis megalotis</i>	3	
Largemouth Bass	<i>Micropterus salmoides</i>	1	
Fringed Darter	<i>Etheostoma crossopterus</i>	25	
Slabrock Darter	<i>Etheostoma smithi</i>	3	

**INVERTEBRATES**

<b>Taxa</b>	<b>Individuals</b>	<b>Sept 2003</b>
<i>Planaria sp</i>	6	

<i>Laevapex</i> sp	8
<i>Elimia</i> sp	217
<i>Heptagenia</i> sp	95
<i>Stenacron</i> sp	53
<i>Caenis</i> sp	22
<i>Argia</i> sp	9
<i>Enallagma</i> sp	52
<i>Calopteryx maculata</i>	3
<i>Anax</i> sp	1
<i>Boyeria</i> sp	8
<i>Perithemis</i> sp	7
<i>Microvelia</i> sp	40
<i>Belostoma</i> sp	1
<i>Aquarius</i> sp	1
<i>Gerris</i> sp	7
<i>Climacia</i> sp	2
<i>Cheumatopsyche</i> sp	2
<i>Chimarra</i> sp	5
<i>Helichus striatus</i> (adult)	7
<i>Ectopria nervosa</i> (larva)	9
<i>Peltodytes</i> sp (adult)	22
<i>Scirtes</i> sp (larvae)	2
<i>Berosus</i> sp (adult)	3
<i>Berosus</i> sp (larvae)	6
<i>Dubiraphia</i> sp (adult)	48
<i>Dubiraphia</i> sp (larvae)	6
<i>Microcylloepus pusillus</i> (adult)	4
<i>Stenelmis</i> sp (adult)	7
<i>Stenelmis</i> sp (larvae)	27
Chironomidae (pupae)	5
<i>Aedes cinereus</i>	1
<i>Gammarus</i> sp	59
<i>Lirceus</i> sp.	8
<i>Orconectes</i> sp	12

## DIATOMS

Taxa	Individuals	Sept 2003
<i>Achnanthes lanceolata</i>	10	
<i>Achnanthes curtissima</i>	12	
<i>Achnantheidium minutissima</i> var. <i>saprophila</i>	48	
<i>Amphora ovalis</i> var. <i>pediculus</i>	4	
<i>Amphora submontana</i>	9	
<i>Caloneis bacillum</i>	2	
<i>Caloneis hyalina</i>	8	
<i>Cocconeis placentula</i> var. <i>euglypta</i>	7	
<i>Cymbella minuta</i>	3	
<i>Diploneis</i> sp.	11	

<i>Gomphonema parvulum</i>	5
<i>Gomphonema</i> sp.	8
<i>Gomphonema sphaerophorum</i>	5
<i>Gyrosigma scalproides</i>	3
<i>Gyrosigma spencerii</i> var. <i>curvula</i>	6
<i>Hantzschia amphioxys</i>	6
<i>Hippodonta capitata</i>	4
<i>Navicula capitatoradiata</i>	18
<i>Navicula</i> cf. <i>goeppertiana</i>	4
<i>Navicula cryptocephala</i>	16
<i>Navicula cryptotenella</i>	147
<i>Navicula decussis</i>	4
<i>Navicula hustedtii</i>	7
<i>Navicula menisculus</i>	14
<i>Navicula minima</i>	8
<i>Navicula pupula</i>	6
<i>Navicula schadei</i>	46
<i>Navicula schroeterii</i>	18
<i>Navicula seminulum</i>	5
<i>Navicula</i> sp.	29
<i>Navicula trivialis</i>	6
<i>Navicula viridula</i>	14
<i>Nitzschia amphibia</i>	24
<i>Nitzschia capitellata</i>	3
<i>Nitzschia constricta</i>	2
<i>Nitzschia dissipata</i>	49
<i>Nitzschia linearis</i>	2
<i>Nitzschia palea</i>	87
<i>Nitzschia</i> sp. 4	6
<i>Pinnularia biceps</i>	3
<i>Rhoicosphenia curvata</i>	22
<i>Stauroneis smithii</i>	3
<i>Stephanocyclus meneghiniana</i>	5
<i>Surirella ovata</i>	3

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<b>Station ID:</b> CRR200012	<b>Ecoregion:</b> INTERIOR PLATEAU
<b>Basin:</b> LOWER CUMBERLAND	<b>Stream Name:</b> LITTLE RIVER
<b>County:</b> CHRISTIAN	<b>Map Name:</b> CHURCH HILL
<b>Catchment Area:</b> 129.64	<b>River Mile:</b> 50.63 <b>Stream Order:</b> 5
<b>Lat Dec:</b> 36.76038	<b>Long Dec:</b> -87.5501
<b>Location:</b> 117 TO STRIPED BRIDGE RD	

### FISHES

<b>Common Name</b>	<b>Scientific Name</b>	<b>Individuals</b>	<b>July 2003</b>
Largescale Stoneroller	<i>Campostoma oligolepis</i>	1	
Striped Shiner	<i>Luxilus chrysocephalus</i>	4	
Rosefin Shiner	<i>Lythrurus fasciolaris</i>	92	
Redtail Chub	<i>Nocomis effusus</i>	3	
Banded Sculpin	<i>Cottus carolinae</i>	4	
Rockbass	<i>Ambloplites rupestris</i>	1	
Saffron Darter	<i>Etheostoma flavum</i>	2	
Smallscale Darter	<i>Etheostoma microlepidum</i>	1	
Orangethroat Darter	<i>Etheostoma spectabile</i>	1	

### INVERTEBRATES

<b>Taxa</b>	<b>Individuals</b>	<b>May 2003</b>
Oligochaeta	78	
<i>Valvata</i> sp.	2	
<i>Fossaria</i> sp	1	
<i>Physella</i> sp	2	
<i>Elimia</i> sp	595	
<i>Planorbella</i> sp	1	
<i>Sphaerium</i> sp	3	
<i>Corbicula fluminea</i>	5	
<i>Stenonema</i> sp	9	
<i>Eurylophella</i> sp	2	
<i>Caenis</i> sp	15	
<i>Baetis</i> sp	6	
<i>Argia</i> sp	7	
<i>Enallagma</i> sp	11	
<i>Dromogomphus</i> sp	1	
<i>Hagenius brevistylus</i>		1
<i>Epitheca (Tetragoneuria)</i> sp	1	
<i>Somatochlora</i> sp	1	
<i>Rhagovelia</i> sp	2	
<i>Oecetis</i> sp	2	
<i>Cheumatopsyche</i> sp	21	
Staphylinidae (adult)	1	
<i>Psephenus herricki</i> (larvae)	13	
<i>Ancyronyx variegates</i> (adult)	3	
<i>Dubiraphia</i> sp (adult)	2	

<i>Macronychus glabratus</i> (adult)	12
<i>Stenelmis</i> sp (adult)	15
<i>Limonia</i> sp	2
<i>Tipula</i> sp	10
Chironomidae (pupae)	7
<i>Ablabesmyia</i> sp	2
<i>Apedilum elachistum</i>	3
<i>Brillia</i> sp	1
<i>Conchapelopia</i> sp	2
<i>Cricotopus/Orthocladius</i> gr	2
<i>Dicrotendipes</i> sp	1
<i>Glyptotendipes</i> sp	2
<i>Larsia</i> sp	1
<i>Phaenopsectra</i> sp	3
<i>Polypedilum</i> sp	2
<i>Polypedilum convictum</i>	7
<i>Tanytarsus</i> sp	3
Ephydridae	2
<i>Simulium</i> sp	2
<i>Culicoides</i> sp	2
<i>Gammarus</i> sp	124
<i>Caecidotea</i> sp	10

## DIATOMS

Taxa	Individuals	May 2003
<i>Achnanthes lanceolata</i>	14	
<i>Amphora perpusilla</i>	2	
<i>Aulacoseira granulata</i>	3	
<i>Caloneis bacillum</i>	26	
<i>Cocconeis pediculus</i>	11	
<i>Cocconeis placentula</i> var. <i>euglypta</i>	22	
<i>Cyclostephanos dubius</i>	1	
<i>Cyclotella pseudostelligera</i>	2	
<i>Cymbella minuta</i>	3	
<i>Fragilaria vaucheriae</i>	4	
<i>Gomphonema intricatum</i> var. <i>pulvinatum</i>		8
<i>Gomphonema minutum</i>	9	
<i>Gomphonema olivaceum</i>	16	
<i>Gomphonema parvulum</i>	53	
<i>Gyrosigma scalproides</i>	10	
<i>Hippodonta capitata</i>	2	
<i>Melosira varians</i>	26	
<i>Meridion circulare</i>	9	
<i>Navicula atomus</i>	6	
<i>Navicula auriculata</i>	7	
<i>Navicula cryptocephala</i>	3	
<i>Navicula cryptocephala</i> var. <i>veneta</i>	5	

<i>Navicula cryptotenella</i>	74
<i>Navicula decussis</i>	4
<i>Navicula integra</i>	3
<i>Navicula menisculus</i>	5
<i>Navicula menisculus</i> var. <i>upsaliensis</i>	4
<i>Navicula minima</i>	13
<i>Navicula phyllepta</i>	3
<i>Navicula pupula</i>	3
<i>Navicula secreta</i> var. <i>apiculata</i>	6
<i>Navicula seminulum</i>	9
<i>Navicula</i> sp.	4
<i>Navicula tripunctata</i>	32
<i>Navicula trivialis</i>	6
<i>Nitzschia apiculata</i>	1
<i>Nitzschia dissipata</i>	55
<i>Nitzschia fonticola</i>	3
<i>Nitzschia gracilis</i>	5
<i>Nitzschia ignorata</i>	4
<i>Nitzschia linearis</i>	7
<i>Nitzschia palea</i>	2
<i>Nitzschia</i> sp.	7
<i>Nitzschia</i> sp. 5	5
<i>Punctastriata pinnata</i>	3
<i>Rhoicosphenia curvata</i>	27
<i>Stephanodiscus tenuis</i>	7
<i>Surirella angustata</i>	14
<i>Surirella ovata</i>	27
<i>Surirella</i> sp. 1	1
<i>Synedra ulna</i>	21

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## FISHES

Common Name	Scientific Name	Individuals	Sept 2003
Spotfin Shiner	<i>Cyprinella spiloptera</i>	3	
Striped Shiner	<i>Luxilus chrysocephalus</i>	19	
Rosefin Shiner	<i>Lythrurus fasciolaris</i>	24	
Redtail Chub	<i>Nocomis effusus</i>	1	
Western Mosquitofish	<i>Gambusia affinis</i>	1	
Banded Sculpin	<i>Cottus carolinae</i>	32	
Rockbass	<i>Ambloplites rupestris</i>	11	
Green Sunfish	<i>Lepomis cyanellus</i>	8	
Bluegill	<i>Lepomis macrochirus</i>	5	
Saffron Darter	<i>Etheostoma flavum</i>	1	
Smallscale Darter	<i>Etheostoma microlepidum</i>	3	

**INVERTEBRATES**

<b>Taxa</b>	<b>Individuals</b>	<b>Sept 2003</b>
<i>Planaria</i> sp	1	
<i>Elimia</i> sp	2781	
<i>Isonychia</i> sp	1	
<i>Stenacron</i> sp	7	
<i>Stenonema</i> sp	12	
<i>Baetis</i> sp	11	
<i>Argia</i> sp	12	
<i>Enallagma</i> sp	6	
<i>Calopteryx maculata</i>	1	
<i>Boyeria</i> sp	1	
<i>Microvelia</i> sp	7	
<i>Rhagovelia</i> sp	2	
<i>Gerris</i> sp	6	
<i>Cheumatopsyche</i> sp	30	
<i>Macrostemum zebratum</i>	2	
<i>Potamyia flava</i>	4	
<i>Psephenus herricki</i> (larvae)	14	
<i>Peltodytes</i> sp (adult)	1	
<i>Ancyronyx variegates</i> (adult)	3	
<i>Ancyronyx variegates</i> (larvae)	3	
<i>Dubiraphia</i> sp (adult)	5	
<i>Macronychus glabratus</i> (adult)	22	
<i>Microcyloepus pusillus</i> (adult)	3	
<i>Stenelmis</i> sp (adult)	21	
<i>Stenelmis</i> sp (larvae)	56	
<i>Tipula</i> sp	3	
Chironomidae (pupae)	3	
<i>Hemerodromia</i> sp	1	
<i>Simulium</i> sp	2	
<i>Simulium</i> sp	18	
<i>Gammarus</i> sp	75	
<i>Caecidotea</i> sp	2	

**DIATOMS**

<b>Taxa</b>	<b>Individuals</b>	<b>Sept 2003</b>
<i>Achnanthes lanceolata</i>	18	
<i>Amphora perpusilla</i>	11	
<i>Amphora</i> sp.	4	
<i>Amphora submontana</i>	24	
<i>Caloneis bacillum</i>	18	
<i>Cocconeis pediculus</i>	16	
<i>Cocconeis placentula</i> var. <i>euglypta</i>	86	
<i>Cyclotella</i> sp.	16	
<i>Fragilaria vaucheriae</i>	9	
<i>Gomphonema intricatum</i> var. <i>pulvinatum</i>		14
<i>Gyrosigma scalproides</i>	8	



<i>Melosira granulata</i>	3
<i>Melosira varians</i>	21
<i>Navicula auriculata</i>	3
<i>Navicula cf. goeppertiana</i>	14
<i>Navicula contenta</i>	14
<i>Navicula cryptocephala</i>	8
<i>Navicula cryptotenella</i>	19
<i>Navicula decussis</i>	12
<i>Navicula menisculus</i>	16
<i>Navicula minima</i>	52
<i>Navicula schroeterii</i>	64
<i>Navicula secreta var. apiculata</i>	6
<i>Navicula seminulum</i>	15
<i>Navicula subtilissima</i>	3
<i>Navicula tenelloides</i>	51
<i>Navicula tripunctata</i>	16
<i>Navicula trivialis</i>	7
<i>Navicula viridula</i>	4
<i>Nitzschia amphibia</i>	6
<i>Nitzschia constricta</i>	8
<i>Nitzschia dissipata</i>	16
<i>Nitzschia palea</i>	12
<i>Nitzschia recta</i>	8
<i>Nitzschia sp.</i>	12
<i>Reimeria sinuata</i>	14
<i>Rhoicosphenia curvata</i>	46
<i>Sellophora pupula var. elliptica</i>	8
<i>Sellophora pupula var. mutata</i>	5
<i>Stauroneis smithii</i>	3
<i>Stephanocyclus meneghiniana</i>	4
<i>Synedra ulna</i>	6
<i>Tryblionella victoriae</i>	2

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<b>Station ID:</b> CRR200013	<b>Ecoregion:</b> INTERIOR PLATEAU
<b>Basin:</b> LOWER CUMBERLAND	<b>Stream Name:</b> LITTLE RIVER
<b>County:</b> TRIGG	<b>Map Name:</b> CALEDONIA
<b>Catchment Area:</b> 243.72	<b>River Mile:</b> 31.46 <b>Stream Order:</b> 5
<b>Lat Dec:</b> 36.77781	<b>Long Dec:</b> -87.7223
<b>Location:</b> SSR 1253-ABOVE CASEY CREEK CONFLUENCE W/ LITTLE RIVER	

**FISHES**

<b>Common Name</b>	<b>Scientific Name</b>	<b>Individuals</b>	<b>July 2003</b>
Largescale Stoneroller	<i>Campostoma oligolepis</i>	65	
Striped Shiner	<i>Luxilus chrysocephalus</i>	38	
Rosefin Shiner	<i>Lythrurus fasciolaris</i>	32	
Redtail Chub	<i>Nocomis effusus</i>	3	
Bluntnose Minnow	<i>Pimephales notatus</i>	3	
Northern Hogsucker	<i>Hypentelium nigricans</i>	3	
Spotted Sucker	<i>Minytrema melanops</i>	1	
Banded Sculpin	<i>Cottus carolinae</i>	1	
Saffron Darter	<i>Etheostoma flavum</i>	2	
Smallscale Darter	<i>Etheostoma microlepidum</i>	13	
Snubnose Darter	<i>Etheostoma simoterum</i>	2	

**INVERTEBRATES**

<b>Taxa</b>	<b>Individuals</b>	<b>May 2003</b>
Oligochaeta	15	
<i>Planaria</i> sp	4	
<i>Physella</i> sp	1	
<i>Elimia</i> sp	63	
<i>Isonychia</i> sp	1	
<i>Stenacron</i> sp	1	
<i>Stenonema</i> sp	4	
<i>Eurylophella</i> sp	11	
<i>Caenis</i> sp	3	
Baetidae	6	
<i>Calopteryx maculata</i>	2	
<i>Somatochlora</i> sp	1	
<i>Oecetis</i> sp	1	
<i>Cernotina</i> sp	1	
<i>Psephenus herricki</i> (larvae)	1	
<i>Helichus striatus</i> (adult)	2	
<i>Peltodytes</i> sp (adult)	3	
<i>Thinobius</i> sp (adult)	1	
<i>Hydaticus</i> sp (adult)	1	
<i>Hydroporus</i> sp (adult)	1	
<i>Neoporus</i> sp (adult)	1	
Dyticidae (adult)	2	
<i>Macronychus glabratus</i> (adult)	7	
<i>Stenelmis</i> sp (adult)	2	

Chironomidae (pupae)	28
<i>Ablabesmyia</i> sp	2
<i>Apedilum elachistum</i>	10
<i>Brillia</i> sp	10
<i>Conchapelopia</i> sp	4
<i>Corynoneura</i> sp	6
<i>Cricotopus/Orthocladius</i> gr	2
<i>Endochironomus</i> sp	10
<i>Larsia</i> sp	5
<i>Paratanytarsus</i> sp	10
<i>Phaenopsectra</i> sp	5
<i>Polypedilum</i> sp	15
<i>Tanytarsus</i> sp	205
<i>Simulium</i> sp	13
<i>Gammarus</i> sp	322
<i>Lirceus</i> sp.	1
Cambaridae	2

#### DIATOMS

Taxa	Individuals	May 2003
<i>Achnanthes lanceolata</i>	34	
<i>Achnanthes lanceolata</i> var. <i>dubia</i>	12	
<i>Achnanthes curtissima</i>	20	
<i>Achnanthes pusilla</i>	14	
<i>Achnanthidium minutissima</i> var. <i>saprophila</i>	20	
<i>Amphora perpusilla</i>	8	
<i>Gomphonema gracile</i>	3	
<i>Melosira varians</i>	11	
<i>Meridion circulare</i>	2	
<i>Navicula cryptocephala</i>	6	
<i>Navicula cryptotenella</i>	2	
<i>Navicula menisculus</i>	3	
<i>Navicula menisculus</i> var. <i>upsaliensis</i>	62	
<i>Navicula secreta</i> var. <i>apiculata</i>	8	
<i>Navicula seminulum</i>	4	
<i>Navicula subhamulata</i>	1	
<i>Navicula trivialis</i>	8	
<i>Navicula viridula</i> var. <i>rostellata</i>	3	
<i>Nitzschia dissipata</i>	64	
<i>Nitzschia dissipata</i> var. <i>media</i>	4	
<i>Nitzschia frustulum</i>	136	
<i>Nitzschia palea</i>	43	
<i>Nitzschia</i> sp.	15	
<i>Planothidium lanceolata</i>	16	
<i>Surirella angustata</i>	2	
<i>Surirella ovata</i>	61	

**FISHES**

<b>Common Name</b>	<b>Scientific Name</b>	<b>Individuals</b>	<b>Sept 2003</b>
Longnose Gar	<i>Lepisosteus osseus</i>	1	
Largescale Stoneroller	<i>Campostoma oligolepis</i>	13	
Striped Shiner	<i>Luxilus chrysocephalus</i>	31	
Bluntnose Minnow	<i>Pimephales notatus</i>	2	
Northern Hogsucker	<i>Hypentelium nigricans</i>	1	
Banded Sculpin	<i>Cottus carolinae</i>	37	
Rockbass	<i>Ambloplites rupestris</i>	6	
Largemouth Bass	<i>Micropterus salmoides</i>	1	
Greenside Darter	<i>Etheostoma blennioides</i>	1	
Rainbow Darter	<i>Etheostoma caeruleum</i>	4	
Smallscale Darter	<i>Etheostoma microlepidum</i>	24	
Snubnose Darter	<i>Etheostoma simoterum</i>	10	
Logperch	<i>Percina caprodes</i>	1	
Slenderhead Darter	<i>Percina phoxocephala</i>	1	

**INVERTEBRATES**

<b>Taxa</b>	<b>Individuals</b>	<b>Sept 2003</b>
<i>Planaria</i> sp	11	
<i>Elimia</i> sp	307	
<i>Choroterpes</i> sp	1	
<i>Heptagenia</i> sp	60	
<i>Caenis</i> sp	1	
<i>Calopteryx maculata</i>	20	
<i>Boyeria</i> sp	3	
<i>Leuctra</i> sp	2	
<i>Aquarius</i> sp	6	
<i>Microvelia</i> sp	7	
<i>Rhagovelia</i> sp	3	
<i>Ranatra</i> sp	2	
<i>Hydrometra martini</i>	1	
<i>Agraylea</i> sp	2	
<i>Hydroptila</i> sp	1	
<i>Cheumatopsyche</i> sp	26	
<i>Berosus</i> sp (adult)	1	
<i>Gyrinus</i> sp (adult)	1	
<i>Laccophilus</i> sp (adult)	1	
<i>Ancyronyx variegates</i> (adult)	1	
<i>Optioservus</i> sp (larvae)	7	
<i>Stenelmis</i> sp (adult)	3	
<i>Stenelmis</i> sp (larvae)	3	
<i>Tipula</i> sp	1	
Chironomidae (pupae)	44	
<i>Hemerodromia</i> sp	3	
<i>Simulium</i> sp	1	
<i>Simulium</i> sp	8	

<i>Stratiomys</i> sp	1
<i>Gammarus</i> sp	319
<i>Lirceus</i> sp.	4
<i>Orconectes</i> sp	1

## DIATOMS

Taxa	Individuals	Sept 2003
<i>Achnanthes lanceolata</i>	30	
<i>Achnanthes lanceolata</i> var. <i>dubia</i>	7	
<i>Achnanthes minutissima</i>	34	
<i>Achnanthes pusilla</i>	34	
<i>Achnanthes</i> sp. 2	7	
<i>Achnanthes</i> sp. 3	10	
<i>Achnanthes</i> sp.1	4	
<i>Achnanthidium minutissima</i> var. <i>saprophila</i>	23	
<i>Amphora perpusilla</i>	8	
<i>Cocconeis placentula</i> var. <i>euglypta</i>	31	
<i>Cymbella minuta</i>	17	
<i>Cymbella silesiaca</i>	8	
<i>Gomphonema brasiliense</i>	3	
<i>Gomphonema intricatum</i> var. <i>pulvinatum</i>	4	
<i>Gomphonema minutum</i>	2	
<i>Gomphonema</i> sp.	5	
<i>Melosira varians</i>	5	
<i>Meridion circulare</i>	2	
<i>Navicula capitatoradiata</i>	29	
<i>Navicula contenta</i>	6	
<i>Navicula cryptocephala</i>	13	
<i>Navicula cryptotenella</i>	15	
<i>Navicula decussis</i>	1	
<i>Navicula helensis</i>	9	
<i>Navicula hustedtii</i>	1	
<i>Navicula menisculus</i>	6	
<i>Navicula minima</i>	88	
<i>Navicula schadei</i>	2	
<i>Navicula schroeterii</i>	4	
<i>Navicula secreta</i> var. <i>apiculata</i>	4	
<i>Navicula seminulum</i>	27	
<i>Navicula</i> sp. 4	13	
<i>Navicula tantula</i>	8	
<i>Navicula tripunctata</i>	4	
<i>Navicula trivialis</i>	2	
<i>Navicula viridula</i>	7	
<i>Nitzschia capitellata</i>	4	
<i>Nitzschia dissipata</i>	21	
<i>Nitzschia fonticola</i>	22	
<i>Nitzschia palea</i>	14	

<i>Nitzschia sinuata</i> var. <i>tabellaria</i>	2
<i>Nitzschia</i> sp.	1
<i>Reimeria sinuata</i>	3
<i>Rhoicosphenia curvata</i>	6
<i>Stauroneis smithii</i> var. <i>incisa</i>	1
<i>Staurosirella leptostauron</i>	2
<i>Stephanocyclus meneghiniana</i>	2
<i>Surirella ovata</i>	8

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<b>Station ID:</b> CRR200014	<b>Ecoregion:</b> INTERIOR PLATEAU
<b>Basin:</b> LOWER CUMBERLAND	<b>Stream Name:</b> CASEY CREEK
<b>County:</b> TRIGG	<b>Map Name:</b> CALEDONIA
<b>Catchment Area:</b> 30.72	<b>River Mile:</b> 33.66 <b>Stream Order:</b> 4
<b>Lat Dec:</b> 36.75579	<b>Long Dec:</b> -87.72483
<b>Location:</b> ROARING SPRINGS RD-PUBLIC FISHING AREA HWY 525	

**FISHES**

<b>Common Name</b>	<b>Scientific Name</b>	<b>Individuals</b>	<b>July 2003</b>
Striped Shiner	<i>Luxilus chrysocephalus</i>	5	
Rosefin Shiner	<i>Lythrurus fasciolaris</i>	20	
Creek Chub	<i>Semotilus atromaculatus</i>	4	
Banded Sculpin	<i>Cottus carolinae</i>	1	
Snubnose Darter	<i>Etheostoma simoterum</i>	4	
Orangethroat Darter	<i>Etheostoma spectabile</i>	18	

**INVERTEBRATES**

<b>Taxa</b>	<b>Individuals</b>	<b>May 2003</b>
Oligochaeta	27	
<i>Elimia</i> sp	51	
<i>Gyraulus</i> sp	1	
<i>Stenacron</i> sp	4	
<i>Attenella</i> sp	1	
<i>Eurylophella</i> sp	8	
<i>Caenis</i> sp	1	
<i>Baetis</i> sp	6	
<i>Enallagma</i> sp	1	
<i>Calopteryx maculata</i>	5	
Corduliidae	2	
<i>Boyeria</i> sp	1	
<i>Cheumatopsyche</i> sp	1	
<i>Helichus striatus</i> (adult)	2	
Scirtidae (larva)	1	
<i>Agabus</i> sp (adult)	1	
<i>Copelatus</i> sp (adult)	1	
<i>Hydaticus</i> sp (adult)	1	
<i>Optioservus</i> sp (adult)	22	
Chironomidae (pupae)	15	
<i>Apedilum elachistum</i>	3	
<i>Brillia</i> sp	15	
<i>Chironomus</i> sp	1	
<i>Conchapelopia</i> sp	6	
<i>Cricotopus</i> sp	1	
<i>Dicrotendipes</i> sp	2	
<i>Endochironomus</i> sp	3	
<i>Larsia</i> sp	1	
<i>Paratanytarsus</i> sp	8	

<i>Phaenopsectra</i> sp	2
<i>Polypedilum convictum</i>	3
<i>Polypedilum tritum</i>	1
<i>Potthastia</i> sp	1
<i>Tanytarsus</i> sp	55
<i>Simulium</i> sp	46
<i>Gammarus</i> sp	1467
<i>Lirceus</i> sp.	40
Hydracarina	2

## DIATOMS

Taxa	Individuals	May 2003
<i>Achnanthes deflexa</i>	18	
<i>Achnanthidium minutissima</i> var. <i>saprophila</i>		16
<i>Amphora perpusilla</i>	7	
<i>Cocconeis placentula</i> var. <i>euglypta</i>	3	
<i>Cymbella minuta</i>	5	
<i>Cymbella silesiaca</i>	8	
<i>Gomphonema parvulum</i>	17	
<i>Gomphonema</i> sp.	26	
<i>Gyrosigma scalproides</i>	6	
<i>Melosira varians</i>	6	
<i>Meridion circulare</i>	5	
<i>Navicula cryptocephala</i>	14	
<i>Navicula cryptotenella</i>	3	
<i>Navicula decussis</i>	3	
<i>Navicula minima</i>	86	
<i>Navicula pupula</i>	1	
<i>Navicula radiosa</i> var. <i>tenella</i>	2	
<i>Navicula secreta</i> var. <i>apiculata</i>	1	
<i>Navicula seminulum</i>	69	
<i>Navicula tripunctata</i>	1	
<i>Navicula trivialis</i>	12	
<i>Nitzschia dissipata</i>	38	
<i>Nitzschia fonticola</i>	56	
<i>Nitzschia linearis</i>	3	
<i>Nitzschia palea</i>	7	
<i>Reimeria sinuata</i>	11	
<i>Rossithidium linearis</i>	74	
<i>Stephanocyclus meneghiniana</i>	1	
<i>Surirella ovata</i>	36	
<i>Surirella ovata</i> var. <i>pinnata</i>	8	
<i>Synedra ulna</i>	1	



**FISHES**

<b>Common Name</b>	<b>Scientific Name</b>	<b>Individuals</b>	<b>Sept 2003</b>
Largescale Darter	<i>Campostoma oligolepis</i>	6	
Striped Shiner	<i>Luxilus chrysocephalus</i>	9	
Rosefin Shiner	<i>Lythrurus fasciolaris</i>	25	
Redtail Chub	<i>Nocomis effuses</i>	1	
Creek Chub	<i>Semotilus atromaculatus</i>	7	
Golden Redhorse	<i>Moxostoma erythrurum</i>	1	
Steelhead	<i>Onchorhynchus mykiss</i>	3	
Pirate Perch	<i>Aphredoderus sayanus</i>	1	
Banded Sculpin	<i>Cottus carolinae</i>	20	
Rockbass	<i>Ambloplites rupestris</i>	1	
Bluegill	<i>Lepomis macrochirus</i>	2	
Redear Sunfish	<i>Lepomis microlophus</i>	1	
Rainbow Darter	<i>Etheostoma caeruleum</i>	4	
Saffron Darter	<i>Etheostoma flavum</i>	4	

**INVERTEBRATES**

<b>Taxa</b>	<b>Individuals</b>	<b>Sept 2003</b>
<i>Planaria</i> sp	36	
<i>Elimia</i> sp	68	
<i>Heptagenia</i> sp	1	
<i>Calopteryx maculata</i>	5	
<i>Boyeria</i> sp	6	
<i>Perithemis</i> sp	2	
<i>Leuctra</i> sp	18	
<i>Microvelia</i> sp	4	
<i>Aquarius</i> sp	5	
<i>Ranatra</i> sp	3	
<i>Cheumatopsyche</i> sp	36	
<i>Scirtes</i> sp (larva)	1	
<i>Hydrophilus triangularis</i> (adult)	1	
<i>Gyrinus</i> sp (adult)	1	
<i>Celina</i> sp (adult)	1	
<i>Ancyronyx variegates</i> (adult)	1	
<i>Dubiraphia</i> sp (adult)	1	
<i>Optioservus</i> sp(larvae)	22	
<i>Aedes cinereus</i>	8	
<i>Chelifera</i> sp	5	
Chironomidae (pupae)		88
<i>Hemerodromia</i> sp	19	
<i>Simulium</i> sp	141	
<i>Atrichopogon</i> sp	2	
<i>Gammarus</i> sp	79	
<i>Caecidotea</i> sp	2	
<i>Lirceus</i> sp.	1	

*Orconectes* sp 3

DIATOMS

Taxa	Individuals	Sept 2003
<i>Achnanthes lanceolata</i>	58	
<i>Achnanthes lanceolata</i> var. <i>dubia</i>	11	
<i>Achnanthes minutissima</i>	14	
<i>Achnanthes curtissima</i>	7	
<i>Achnanthes pusilla</i>	16	
<i>Achnanthes</i> sp.	31	
<i>Achnanthidium minutissima</i> var. <i>saprophila</i>	53	
<i>Amphora perpusilla</i>	8	
<i>Cocconeis placentula</i> var. <i>euglypta</i>	42	
<i>Cocconeis placentula</i> var. <i>lineata</i>	4	
<i>Cymbella minuta</i>	41	
<i>Cymbella silesiaca</i>	8	
<i>Diploneis puella</i>	1	
<i>Gomphonema acuminatum</i>	4	
<i>Gomphonema parvulum</i>	26	
<i>Gomphonema truncatum</i>	5	
<i>Gyrosigma scalproides</i>	5	
<i>Melosira varians</i>	19	
<i>Meridion circulare</i>	11	
<i>Navicula capitatoradiata</i>	31	
<i>Navicula cryptocephala</i>	3	
<i>Navicula cryptotenella</i>	11	
<i>Navicula menisculus</i>	11	
<i>Navicula menisculus</i> var. <i>upsaliensis</i>	2	
<i>Navicula minima</i>	69	
<i>Navicula pupula</i>	4	
<i>Navicula seminulum</i>	24	
<i>Navicula tenera</i>	3	
<i>Navicula tripunctata</i>	4	
<i>Navicula trivialis</i>	12	
<i>Navicula viridula</i> var. <i>rostellata</i>	8	
<i>Nitzschia dissipata</i>	17	
<i>Nitzschia fonticola</i>	13	
<i>Nitzschia palea</i>	14	
<i>Nitzschia</i> sp. 5	4	
<i>Stephanocyclus meneghiniana</i>	3	
<i>Surirella ovata</i>	14	
<i>Synedra</i> sp.	1	
<i>Synedra ulna</i>	4	

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<b>Station ID:</b> CRR200015	<b>Ecoregion:</b> INTERIOR PLATEAU
<b>Basin:</b> LOWER CUMBERLAND	<b>Stream Name:</b> CASEY CREEK
<b>County:</b> TRIGG	<b>Map Name:</b> ROARING SPRING
<b>Catchment Area:</b> 8.25	<b>River Mile:</b> 0 <b>Stream Order:</b> 4
<b>Lat Dec:</b> 36.74586	<b>Long Dec:</b> -87.74755
<b>Location:</b> UP BERKLEY ROAD (ALLEN FARM) TO HOUSE, TAKE LEFT TO STREAM, CROSS, CUT THROUGH FIELD	

**FISHES**

<b>Common Name</b>	<b>Scientific Name</b>	<b>Individuals</b>	<b>July 2003</b>
Largescale Stoneroller	<i>Campostoma oligolepis</i>	4	
Striped Shiner	<i>Luxilus chrysocephalus</i>	35	
Rosefin Shiner	<i>Lythrurus fasciolaris</i>	115	
Blacknose Dace	<i>Rhinichthys atratulus</i>	1	
Creek Chub	<i>Semotilus atromaculatus</i>	3	
Banded Sculpin	<i>Cottus carolinae</i>	10	
Orangethroat Darter	<i>Etheostoma spectabile</i>	8	

**INVERTEBRATES**

<b>Taxa</b>	<b>Individuals</b>	<b>May 2003</b>
Oligochaeta	65	
<i>Physella</i> sp	4	
<i>Elimia</i> sp	602	
<i>Pisidium</i> sp	4	
<i>Isonychia</i> sp	8	
<i>Stenonema</i> sp	2	
<i>Eurylophella</i> sp	8	
<i>Caenis</i> sp	2	
<i>Acentrella</i> sp	27	
Unidentified Baetid	8	
<i>Boyeria</i> sp	1	
<i>Somatochlora</i> sp	1	
<i>Trichocorixa</i> sp	1	
<i>Cheumatopsyche</i> sp	2	
<i>Hydropsyche</i> sp	1	
<i>Helichus striatus</i> (adult)	1	
<i>Peltodytes</i> sp (adult)	1	
<i>Agabus</i> sp (adult)	4	
<i>Hydaticus</i> sp (adult)	2	
Curculionidae (adult)	11	
Dytiscidae (adult)	3	
<i>Macronychus glabratus</i> (adult)	1	
<i>Stenelmis</i> sp (adult)	1	
Chironomidae (pupae)	48	
<i>Ablabesmyia</i> sp	1	
<i>Apedilum elachistum</i>	14	
<i>Brillia</i> sp	18	

<i>Chironomus</i> sp	14
<i>Conchapelopia</i> sp	4
<i>Corynoneura</i> sp	1
<i>Cricotopus/Orthocladius</i> gr	1
<i>Dicrotendipes</i> sp	58
<i>Larsia</i> sp	5
<i>Polypedilum convictum</i>	145
<i>Potthastia</i> sp	1
<i>Procladius</i> sp	1
<i>Tanytarsus</i> sp	449
<i>Simulium</i> sp	60
Hydracarina	4
<i>Gammarus</i> sp	978
<i>Asellus</i> sp.	1
<i>Lirceus</i> sp.	35
<i>Orconectes</i> sp	1

## DIATOMS

Taxa	Individuals	May 2003
<i>Achnanthes lanceolata</i>	108	
<i>Achnanthes lanceolata</i> var. <i>dubia</i>	11	
<i>Achnanthes biasoletiana</i>	13	
<i>Achnanthidium minutissima</i> var. <i>saprophila</i>	26	
<i>Amphora perpusilla</i>	4	
<i>Cocconeis placentula</i> var. <i>euglypta</i>	5	
<i>Cocconeis placentula</i> var. <i>lineata</i>	3	
<i>Cymbella minuta</i>	3	
<i>Cymbella silesiaca</i>	18	
<i>Eunotia tenella</i>	3	
<i>Hantzschia amphioxys</i>	2	
<i>Melosira varians</i>	13	
<i>Meridion circulare</i>	18	
<i>Navicula contenta</i>	3	
<i>Navicula cryptocephala</i>	7	
<i>Navicula cryptotenella</i>	6	
<i>Navicula minima</i>	11	
<i>Navicula secreta</i> var. <i>apiculata</i>	8	
<i>Navicula seminulum</i>	2	
<i>Navicula</i> sp. 3	1	
<i>Navicula trivialis</i>	2	
<i>Nitzschia acicularis</i>	3	
<i>Nitzschia amphibia</i>	6	
<i>Nitzschia dissipata</i>	15	
<i>Nitzschia fonticola</i>	14	
<i>Nitzschia frustulum</i>	3	
<i>Nitzschia linearis</i>	2	
<i>Nitzschia palea</i>	30	

<i>Nitzschia</i> sp.	66	
<i>Pinnularia nodosa</i>	2	
<i>Pinnularia subcapitata</i> var. <i>paucistriata</i>	7	7
<i>Reimeria sinuata</i>	7	
<i>Sellophora pupula</i> var. <i>capitata</i>	4	
<i>Stauroneis anceps</i>	1	
<i>Staurosirella leptostauron</i>	2	
<i>Stephanocyclus meneghiniana</i>	3	
<i>Surirella ovata</i>	32	
<i>Surirella ovata</i> var. <i>pinnata</i>	13	
<i>Synedra rumpens</i> var. <i>familiaris</i>	5	
<i>Synedra socia</i>	10	
<i>Synedra ulna</i>	12	

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## FISHES

Common Name	Scientific Name	Individuals	Sept 2003
Largescale Stoneroller	<i>Campostoma oligolepis</i>	12	
Striped Shiner	<i>Luxilus chrysocephalus</i>	10	
Rosefin Shiner	<i>Lythrurus fasciolaris</i>	7	
Creek Chub	<i>Semotilus atromaculatus</i>	7	
Creek Chubsucker	<i>Erimyzon oblongus</i>	2	
Grass Pickerel	<i>Esox americanus vermiculatus</i>	2	
Banded Sculpin	<i>Cottus caroliniae</i>	14	
Green Sunfish	<i>Lepomis cyanellus</i>	3	
Saffron Darter	<i>Etheostoma flavum</i>	1	
Orangethroat Darter	<i>Etheostoma spectabile</i>	32	

## INVERTEBRATES

Taxa	Individuals	Sept 2003
<i>Planaria</i> sp	8	
<i>Elimia</i> sp	66	
<i>Heptagenia</i> sp	7	
<i>Acentrella</i> sp	3	
<i>Fallceon</i> sp	7	
<i>Calopteryx maculata</i>	4	
<i>Boyeria</i> sp	4	
<i>Epitheca (Epicordulia)</i> sp	1	
<i>Leuctra</i> sp	7	
<i>Microvelia</i> sp	3	
<i>Notonecta</i> sp	1	
<i>Aquarius</i> sp	1	
<i>Gerris</i> sp	20	
<i>Sialis</i> sp	2	
<i>Lepidostoma</i> sp	1	
<i>Glossosoma</i> sp	17	
<i>Cheumatopsyche</i> sp	43	

<i>Helichus striatus</i> (adult)	1
<i>Hydrophilus triangularis</i> (adult)	1
<i>Copelatus</i> sp (adult)	1
<i>Dytiscus</i> sp (adult)	1
<i>Hydrovatus</i> sp (adult)	1
<i>Laccophilus</i> sp (adult)	1
<i>Ancyronyx variegates</i> (adult)	1
<i>Optioservus</i> sp (adult)	6
<i>Optioservus</i> sp(larvae)	3
<i>Antocha</i> sp	2
<i>Hexatoma</i> sp	3
<i>Chelifera</i> sp	10
Chironomidae (pupae)	204
<i>Hemerodromia</i> sp	9
<i>Simulium</i> sp	1
<i>Simulium</i> sp	36
<i>Atrichopogon</i> sp	1
<i>Gammarus</i> sp	346
<i>Lirceus</i> sp.	25

## DIATOMS

Taxa	Individuals	Sept 2003
<i>Achnanathes lanceolata</i>	60	
<i>Achnanathes lanceolata</i> var. <i>dubia</i>	14	
<i>Achnanathes minutissima</i>	14	
<i>Achnanthes pusilla</i>	6	
<i>Achnanthidium minutissima</i> var. <i>saprophila</i>	37	
<i>Amphora perpusilla</i>	10	
<i>Caloneis bacillum</i>	3	
<i>Cocconeis placentula</i> var. <i>euglypta</i>	14	
<i>Cocconeis placentula</i> var. <i>lineata</i>	11	
<i>Cymatopleura solea</i>	2	
<i>Cymbella cistula</i>	6	
<i>Cymbella minuta</i>	56	
<i>Cymbella minuta</i> var. <i>pseudogracilis</i>	8	
<i>Cymbella tumida</i>	3	
<i>Gomphonema parvulum</i>	21	
<i>Gyrosigma scalproides</i>	7	
<i>Hippodonta capitata</i>	5	
<i>Melosira varians</i>	61	
<i>Meridion circulare</i>	22	
<i>Navicula capitatoradiata</i>	11	
<i>Navicula contenta</i>	9	
<i>Navicula cryptocephala</i>	13	
<i>Navicula cryptotenella</i>	10	
<i>Navicula minima</i>	19	
<i>Navicula pseudoreinhundtii</i>	1	

<i>Navicula secreta</i> var. <i>apiculata</i>	3
<i>Navicula seminulum</i>	5
<i>Navicula</i> sp. 1	8
<i>Navicula tantula</i>	4
<i>Navicula tenelloides</i>	11
<i>Navicula viridula</i>	9
<i>Neidium affine</i>	2
<i>Nitzschia amphibia</i>	3
<i>Nitzschia dissipata</i>	15
<i>Nitzschia fonticola</i>	24
<i>Nitzschia gracilis</i>	34
<i>Nitzschia palea</i>	2
<i>Nitzschia parvula</i>	2
<i>Nitzschia</i> sp.	7
<i>Reimeria sinuata</i>	8
<i>Rhoicosphenia curvata</i>	4
<i>Sellophora pupula</i> var. <i>mutata</i>	3
<i>Staurosirella leptostauron</i>	10
<i>Stephanocyclus meneghiniana</i>	2
<i>Surirella ovata</i>	26
<i>Synedra rumpens</i> var. <i>familiaris</i>	1
<i>Synedra ulna</i>	3
<i>Tryblionella levidensis</i>	1

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<b>Station ID:</b> CRR200016	<b>Ecoregion:</b> INTERIOR PLATEAU
<b>Basin:</b> LOWER CUMBERLAND	<b>Stream Name:</b> SINKING FORK
<b>County:</b> TRIGG	<b>Map Name:</b> CALEDONIA
<b>Catchment Area:</b> 106.93	<b>River Mile:</b> 4.12 <b>Stream Order:</b> 4
<b>Lat Dec:</b> 36.84078	<b>Long Dec:</b> -87.74045
<b>Location:</b> KINGS CHURCH ROAD@ BRIDGE	

**FISHES**

<b>Common Name</b>	<b>Scientific Name</b>	<b>Individuals</b>	<b>July 2003</b>
Striped Shiner	<i>Luxilus chrysocephalus</i>	15	
Rosefin Shiner	<i>Lythrurus fasciolaris</i>	19	
Golden Shiner	<i>Notemigonus crysoleucas</i>	1	
Bluntnose Minnow	<i>Pimephales notatus</i>	1	
Creek Chub	<i>Semotilus atromaculatus</i>	4	
Northern Hogsucker	<i>Hypentelium nigricans</i>	2	
Banded Sculpin	<i>Cottus carolinae</i>	12	

**INVERTEBRATES**

<b>Taxa</b>	<b>Individuals</b>	<b>May 2003</b>
Oligochaeta	18	
<i>Valvata</i> sp.	8	
<i>Planaria</i> sp	2	
<i>Physella</i> sp	9	
<i>Elimia</i> sp	86	
<i>Corbicula fluminea</i>	2	
<i>Ephemerella</i> sp	1	
<i>Eurylophella</i> sp	3	
<i>Caenis</i> sp	4	
<i>Argia</i> sp	1	
<i>Enallagma</i> sp	1	
<i>Calopteryx maculata</i>	4	
<i>Boyeria</i> sp	2	
<i>Cheumatopsyche</i> sp	16	
<i>Hydropsyche</i> sp	2	
Curculionidae (adult)	1	
Lampyridae (larva)	1	
<i>Macronychus glabratus</i> (adult)	6	
<i>Optioservus</i> sp (adult)	10	
Chironomidae (pupae)	13	
<i>Apedilum elachistum</i>	31	
<i>Brillia</i> sp	21	
<i>Cricotopus/Orthocladius</i> gr	1	
<i>Dicrotendipes</i> sp	9	
<i>Endochironomus</i> sp	13	
<i>Paratrichocladius</i> sp.	1	
<i>Polypedilum</i> sp	13	
<i>Polypedilum convictum</i>	69	



<i>Polypedilum tritum</i>	12
<i>Tanytarsus</i> sp	13
<i>Simulium</i> sp	45
<i>Gammarus</i> sp	93
<i>Caecidotea</i> sp	19
<i>Orconectes</i> sp	2

## DIATOMS

Taxa	Individuals	May 2003
<i>Achnanthes lanceolata</i>	42	
<i>Achnanthes lanceolata</i> var. <i>dubia</i>	6	
<i>Achnanthes minutissima</i>	12	
<i>Achnanthidium minutissima</i> var. <i>saprophila</i>	4	
<i>Amphora perpusilla</i>	12	
<i>Amphora submontana</i>	3	
<i>Caloneis bacillum</i>	4	
<i>Cocconeis pediculus</i>	4	
<i>Cocconeis placentula</i> var. <i>euglypta</i>	9	
<i>Gomphonema minutum</i>	16	
<i>Gomphonema parvulum</i>	6	
<i>Gyrosigma scalproides</i>	7	
<i>Luticola mutica</i>	2	
<i>Melosira granulata</i>	4	
<i>Melosira varians</i>	22	
<i>Meridion circulare</i>	9	
<i>Navicula capitatoradiata</i>	6	
<i>Navicula contenta</i>	4	
<i>Navicula cryptocephala</i>	11	
<i>Navicula cryptotenella</i>	34	
<i>Navicula menisculus</i>	8	
<i>Navicula menisculus</i> var. <i>upsaliensis</i>	22	
<i>Navicula minima</i>	63	
<i>Navicula secreta</i> var. <i>apiculata</i>	2	
<i>Navicula seminulum</i>	7	
<i>Navicula</i> sp. 1	4	
<i>Navicula</i> sp. 3	6	
<i>Navicula subminuscula</i>	11	
<i>Navicula tripunctata</i>	22	
<i>Navicula trivialis</i>	4	
<i>Nitzschia dissipata</i>	64	
<i>Nitzschia dissipata</i> var. <i>media</i>	2	
<i>Nitzschia frustulum</i>	21	
<i>Nitzschia palea</i>	21	
<i>Nitzschia parvula</i>	1	
<i>Nitzschia</i> sp.	7	
<i>Nitzschia</i> sp. 5	9	
<i>Stauroneis smithii</i>	1	

**FISHES**

<b>Common Name</b>	<b>Scientific Name</b>	<b>Individuals</b>	<b>Sept 2003</b>
Largescale Stoneroller	<i>Campostoma oligolepis</i>	1	
Striped Shiner	<i>Luxilus chrysocephalus</i>	6	
Rosefin Shiner	<i>Lythrurus fasciolaris</i>	47	
Creek Chub	<i>Semotilus atromaculatus</i>	2	
Pirate Perch	<i>Aphredoderus sayanus</i>	1	
Banded Sculpin	<i>Cottus carolinae</i>	74	
Longear Sunfish	<i>Lepomis megalotis</i>	1	
Saffron Darter	<i>Etheostoma flavum</i>	1	

**INVERTEBRATES**

<b>Taxa</b>	<b>Individuals</b>	<b>Sept 2003</b>
<i>Planaria</i> sp	2	
<i>Elimia</i> sp	333	
<i>Heptagenia</i> sp	23	
<i>Fallceon</i> sp	7	
<i>Calopteryx maculata</i>	26	
<i>Boyeria</i> sp	3	
<i>Gomphus</i> sp	1	
<i>Rhagovelia</i> sp	3	
<i>Gelastocoris occulata</i>	1	
<i>Aquarius</i> sp	1	
<i>Gerris</i> sp	1	
<i>Rhyacophila</i> sp	4	
<i>Glossosoma</i> sp	1	
<i>Cheumatopsyche</i> sp	34	
<i>Helichus striatus</i> (adult)	1	
<i>Peltodytes</i> sp (adult)	1	
<i>Ancyronyx variegates</i> (adult)	2	
<i>Ancyronyx variegates</i> (larvae)	5	
<i>Macronychus glabratus</i> (adult)s	5	
<i>Stenelmis</i> sp (adult)	1	
<i>Stenelmis</i> sp (larvae)	4	
<i>Antocha</i> sp	1	
Chironomidae (pupae)	5	
<i>Hemerodromia</i> sp	2	
<i>Simulium</i> sp	34	
<i>Gammarus</i> sp	84	
<i>Caecidotea</i> sp	39	
<i>Orconectes</i> sp	5	

**DIATOMS**

<b>Taxa</b>	<b>Individuals</b>	<b>Sept 2003</b>
<i>Achnanthes lanceolata</i>	22	
<i>Achnanthes lanceolata var.dubia</i>	8	
<i>Achnanthes minutissima</i>	5	
<i>Achnanthes curtissima</i>	4	

<i>Achnanthes pinnata</i>	4	
<i>Achnanthes</i> sp. 2	4	
<i>Amphora perpusilla</i>	4	
<i>Amphora submontana</i>	14	
<i>Cocconeis placentula</i> var. <i>euglypta</i>	8	
<i>Cymbella minuta</i>	4	
<i>Cymbella</i> sp.	2	
<i>Fallacia pygmaea</i>	2	
<i>Gomphonema intricatum</i> var. <i>pulvinatum</i>	4	4
<i>Gomphonema minutum</i>	4	
<i>Gomphonema olivaceum</i>	4	
<i>Gomphonema parvulum</i>	2	
<i>Gyrosigma scalproides</i>	10	
<i>Navicula capitatoradiata</i>	2	
<i>Navicula contenta</i>	21	
<i>Navicula cryptotenella</i>	16	
<i>Navicula hustedtii</i>	8	
<i>Navicula menisculus</i>	8	
<i>Navicula minima</i>	137	
<i>Navicula notha</i>	4	
<i>Navicula schadei</i>	8	
<i>Navicula schroeterii</i>	12	
<i>Navicula secreta</i> var. <i>apiculata</i>	4	
<i>Navicula seminulum</i>	32	
<i>Navicula</i> sp.	34	
<i>Navicula</i> sp. 2	4	
<i>Navicula subminuscula</i>	4	
<i>Navicula subtilissima</i>	4	
<i>Navicula tantula</i>	18	
<i>Navicula tenelloides</i>	42	
<i>Navicula tripunctata</i>	6	
<i>Navicula trivialis</i>	6	
<i>Navicula viridula</i> var. <i>rostellata</i>	6	
<i>Nitzschia amphibia</i>	11	
<i>Nitzschia capitellata</i>	1	
<i>Nitzschia dissipata</i>	8	
<i>Nitzschia frustulum</i>	12	
<i>Nitzschia palea</i>	11	
<i>Nitzschia</i> sp.	12	
<i>Planothidium lanceolata</i>	24	
<i>Rhoicosphenia curvata</i>	4	
<i>Stauroneis</i> sp.	1	
<i>Stephanocyclus meneghiniana</i>	4	
<i>Surirella linearis</i>	1	
<i>Surirella ovata</i>	2	

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**APPENDIX E**

**Habitat Assessment Forms**

### Low Gradient Stream Data Sheet

STREAM NAME: <u>CRE 2000 01 South Fork</u>		LOCATION:		
STATION #: <u>2000 01</u> MILE:		BASIN/WATERSHED: <u>Little River</u>		
LAT.: _____ LONG.: _____		COUNTY: <u>Christian</u> USGS 7.5 TOPO:		
DATE: <u>05/14/03</u> TIME: <u>9:00</u> <input checked="" type="checkbox"/> AM <input type="checkbox"/> PM		INVESTIGATORS: <u>P.B. M.D. J.W.</u>		
TYPE SAMPLE: <input type="checkbox"/> P-CHEM <input type="checkbox"/> Macroinvertebrate <input type="checkbox"/> FISH <input type="checkbox"/> BACT. <input type="checkbox"/> ALGAE				
WEATHER: Now _____ Past 24 hours _____ Has there been a heavy rain in the last 7 days? <input type="checkbox"/> <input type="checkbox"/> Heavy rain <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> <input type="checkbox"/> Steady rain Air Temperature _____ °C. Inches rainfall in past 24 hours _____ in. <input type="checkbox"/> <input type="checkbox"/> Intermittent showers 100 % Cloud Cover <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> Clear/sunny				
P-Chem: Temp(°C) _____ D.O. (mg/l) _____ %Saturation _____ pH(S.U.) _____ Cond. _____ <input type="checkbox"/> Grab				
INSTREAM WATERSHED FEATURES: Stream Width _____ ft Range of Depth _____ ft Average Velocity _____ ft/s Discharge _____ cfs Est. Reach Length _____		LOCAL WATERSHED FEATURES: Predominant Surrounding Land Use: <input type="checkbox"/> Surface Mining <input type="checkbox"/> Construction <input type="checkbox"/> Forest <input type="checkbox"/> Deep Mining <input checked="" type="checkbox"/> Commercial <input checked="" type="checkbox"/> Pasture/Grazing <input type="checkbox"/> Oil Wells <input type="checkbox"/> Industrial <input type="checkbox"/> Silviculture <input type="checkbox"/> Land Disposal <input checked="" type="checkbox"/> Row Crops <input type="checkbox"/> Urban Runoff/Storm Sewers		
Hydraulic Structures: <input type="checkbox"/> Dams <input checked="" type="checkbox"/> Bridge Abutments <input checked="" type="checkbox"/> Island <input type="checkbox"/> Waterfalls <input type="checkbox"/> Other _____		Stream Flow: <input type="checkbox"/> Dry <input type="checkbox"/> Pooled <input type="checkbox"/> Low <input checked="" type="checkbox"/> Normal <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> High <input type="checkbox"/> Very Rapid or Torrential <input type="checkbox"/> Ephemeral <input type="checkbox"/> Seep		
Riparian Vegetation: Dom. Tree/Shrub Taxa Dominate Type: <u>FRAXINUS</u> <input checked="" type="checkbox"/> Trees <input type="checkbox"/> Shrubs <u>SYCAMORE</u> <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous Number of strata _____		Canopy Cover: <input type="checkbox"/> Fully Exposed (0-25%) <input type="checkbox"/> Partially Exposed (25-50%) <input type="checkbox"/> Partially Shaded (50-75%) <input checked="" type="checkbox"/> Fully Shaded (75-100%)		
Channel Alterations: <input type="checkbox"/> Dredging <input type="checkbox"/> Channelization (Full Partial)				
Substrate <input type="checkbox"/> Est. <input type="checkbox"/> P.C.	Riffle <u>5</u> %	Run <u>70</u> %	Pool <u>25</u> %	
Silt/Clay (<0.06 mm)		✓	✓	
Sand (0.06 – 2 mm)		✓	✓	
Gravel (2-64 mm)	✓			
Cobble (64 – 256 mm)	✓	✓	✓	
Boulders (>256 mm)		✓		
Bedrock	✓	✓		
<b>Habitat</b>	<b>Condition Category</b>			
<b>Parameter</b>	<b>Optimal</b>	<b>Suboptimal</b>	<b>Marginal</b>	<b>Poor</b>
<b>1. Epifaunal Substrate/ Available Cover</b>	Greater than 50% 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).	30-50% 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).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
<b>SCORE</b>	20 19 18 17 16	15 <u>14</u> 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>2. Pool Substrate Characterization</b>	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	<u>10</u> 9 8 7 6	5 4 3 2 1 0
<b>3. Pool Variability</b>	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 <u>9</u> 8 7 6	5 4 3 2 1 0

<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>5. Channel Flow Status</b>	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 little water in channel and mostly present as standing pools.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.	Some 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.	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 gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	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 sloughing; 60-100% of bank has erosional scars.
<b>SCORE (LB)</b>	Left Bank 10 9	8 7 6	5 4 3	2 1 0
<b>SCORE (RB)</b>	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>9. Vegetative Protection (score each bank)</b>	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.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
<b>SCORE (LB)</b>	Left Bank 10 9	8 7 6	5 4 3	2 1 0
<b>SCORE (RB)</b>	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
<b>SCORE (LB)</b>	Left Bank 10 9	8 7 6	5 4 3	2 1 0
<b>SCORE (RB)</b>	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score

110

NOTES/COMMENTS:

### Low Gradient Stream Data Sheet

STREAM NAME: <u>CP 2000 01</u>		LOCATION: <u>SR 508 @ bridge</u>		
STATION #: <u>South Fork Little River</u> MILE: _____		BASIN/WATERSHED: <u>Little River</u>		
LAT.: _____	LONG.: _____	COUNTY: <u>Christian</u>	USGS 7.5 TOPO: _____	
DATE: <u>09/05/03</u> TIME: <u>11:50</u> <input checked="" type="checkbox"/> AM <input type="checkbox"/> PM		INVESTIGATORS: <u>John, Finar, Ken, Natalie</u>		
TYPE SAMPLE: <input type="checkbox"/> P-CHEM <input checked="" type="checkbox"/> Macroinvertebrate <input type="checkbox"/> FISH <input type="checkbox"/> BACT. <input type="checkbox"/> ALGAE				
WEATHER: Now _____ Past 24 hours _____ Has there been a heavy rain in the last 7 days? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No				
<input type="checkbox"/> <input type="checkbox"/> Heavy rain <input type="checkbox"/> <input type="checkbox"/> Steady rain <input type="checkbox"/> <input type="checkbox"/> Intermittent showers <input type="checkbox"/> <input checked="" type="checkbox"/> Clear/sunny				
Air Temperature _____ °C. Inches rainfall in past 24 hours _____ in. _____ % Cloud Cover				
P-Chem: Temp(°C) _____ D.O. (mg/l) _____ %Saturation _____ pH(S.U.) _____ Cond. _____ <input type="checkbox"/> Grab				
<b>INSTREAM WATERSHED FEATURES:</b> Stream Width _____ ft Range of Depth _____ ft Average Velocity _____ ft/s Discharge _____ cfs Est. Reach Length _____		<b>LOCAL WATERSHED FEATURES:</b> <b>Predominant Surrounding Land Use:</b> <input type="checkbox"/> Surface Mining <input type="checkbox"/> Construction <input type="checkbox"/> Forest <input type="checkbox"/> Deep Mining <input type="checkbox"/> Commercial <input type="checkbox"/> Pasture/Grazing <input type="checkbox"/> Oil Wells <input type="checkbox"/> Industrial <input type="checkbox"/> Silviculture <input type="checkbox"/> Land Disposal <input checked="" type="checkbox"/> Row Crops <input type="checkbox"/> Urban Runoff/Storm Sewers		
<b>Hydraulic Structures:</b> <input type="checkbox"/> Dams <input checked="" type="checkbox"/> Bridge Abutments <input checked="" type="checkbox"/> Island <input type="checkbox"/> Waterfalls <input type="checkbox"/> Other _____		<b>Stream Flow:</b> <input type="checkbox"/> Dry <input type="checkbox"/> Pooled <input type="checkbox"/> Low <input checked="" type="checkbox"/> Normal <input type="checkbox"/> High <input type="checkbox"/> Very Rapid or Torrential		
<b>Riparian Vegetation:</b> Dom. Tree/Shrub Taxa: <u>Green Ash</u> <input checked="" type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous Number of strata <u>2</u> <u>Sycamore</u>		<b>Channel Alterations:</b> <input type="checkbox"/> Dredging <input checked="" type="checkbox"/> Channelization <input type="checkbox"/> Full <input type="checkbox"/> Partial		
<b>Stream Type:</b> <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Ephemeral <input type="checkbox"/> Seep				
Substrate <input type="checkbox"/> Est. <input type="checkbox"/> P.C.	Rifle <u>15</u> %	Run <u>15</u> %	Pool <u>10</u> %	
Silt/Clay (<0.06 mm)				
Sand (0.06 - 2 mm)	✓	5	✓	
Gravel (2-64 mm)	✓	5	✓	
Cobble (64 - 256 mm)	✓	3	✓	
Boulders (>256 mm)	✓	7	✓	
Bedrock	✓	80	✓	
<b>Habitat</b>	<b>Condition Category</b>			
<b>Parameter</b>	<b>Optimal</b>	<b>Suboptimal</b>	<b>Marginal</b>	<b>Poor</b>
1. Epifaunal Substrate/Available Cover	Greater than 50% 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).	30-50% 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).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20	15	10	5
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20, 19, 18, 17, 16	15, 14, 13, 12, 11	10, 9, 8, 7, 6, 5	4, 3, 2, 1, 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20, 19, 18, 17, 16	15, 14, 13, 12, 11	10, 9, 8, 7, 6, 5	4, 3, 2, 1, 0

<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>5. Channel Flow Status</b>	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 little water in channel and mostly present as standing pools.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.	Some 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.	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 gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.  Note: determine left or right side by facing downstream.	Moderately stable; infrequent, small areas of erosion-mostly healed over. 5-30% of bank in reach has areas of erosion.	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 sloughing; 60-100% of bank has erosional scars.
<b>SCORE (LB)</b>	Left Bank 10 9	8 7 6	5 4 3	2 1 0
<b>SCORE (RB)</b>	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>9. Vegetative Protection (score each bank)</b>	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.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
<b>SCORE (LB)</b>	Left Bank 10 9	8 7 6	5 4 3	2 1 0
<b>SCORE (RB)</b>	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
<b>SCORE (LB)</b>	Left Bank 10 9	8 7 6	5 4 3	2 1 0
<b>SCORE (RB)</b>	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score

99

NOTES/COMMENTS:



Low Gradient Stream Data Sheet

STREAM NAME: South Fork Little River LOCATION: CNE 2000 02  
 STATION #: 2 MILE: \_\_\_\_\_ BASIN/WATERSHED: \_\_\_\_\_  
 LAT.: \_\_\_\_\_ LONG.: \_\_\_\_\_ COUNTY: Christian USGS 7.5 TOPO: \_\_\_\_\_  
 DATE: 5-14-03 TIME: 2:20  AM  PM INVESTIGATORS: P.B., M.D., J.W.  
 TYPE SAMPLE:  P-CHEM  Macroinvertebrate  FISH  BACT.  ALGAE BALCI, DULGUID, WYATT  
 WEATHER: Now \_\_\_\_\_ Past 24 hours \_\_\_\_\_ Has there been a heavy rain in the last 7 days?  
 Heavy rain  Yes  No  
 Steady rain  Intermittent showers Air Temperature \_\_\_\_\_ °C. Inches rainfall in past 24 hours \_\_\_\_\_ in.  
 Clear/sunny  Clear/sunny 100 % Cloud Cover

P-Chem: Temp(°C) \_\_\_\_\_ D.O. (mg/l) \_\_\_\_\_ %Saturation \_\_\_\_\_ pH(S.U.) \_\_\_\_\_ Cond. \_\_\_\_\_  Grab

<b>INSTREAM WATERSHED FEATURES:</b> Stream Width _____ ft Range of Depth _____ ft Average Velocity _____ ft/s Discharge _____ cfs Est. Reach Length _____	<b>LOCAL WATERSHED FEATURES:</b> Predominant Surrounding Land Use: <input type="checkbox"/> Surface Mining <input type="checkbox"/> Construction <input type="checkbox"/> Forest <input type="checkbox"/> Deep Mining <input type="checkbox"/> Commercial <input checked="" type="checkbox"/> Pasture/Grazing <input type="checkbox"/> Oil Wells <input type="checkbox"/> Industrial <input type="checkbox"/> Silviculture <input type="checkbox"/> Land Disposal <input checked="" type="checkbox"/> Row Crops <input type="checkbox"/> Urban Runoff/Storm Sewers
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<b>Hydraulic Structures:</b> <input type="checkbox"/> Dams <input checked="" type="checkbox"/> Bridge Abutments <input type="checkbox"/> Island <input type="checkbox"/> Waterfalls <input type="checkbox"/> Other _____	<b>Stream Flow:</b> <input type="checkbox"/> Dry <input type="checkbox"/> Pooled <input type="checkbox"/> Low <input checked="" type="checkbox"/> Normal <input type="checkbox"/> High <input type="checkbox"/> Very Rapid or Torrential	<b>Stream Type:</b> <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Ephemeral <input type="checkbox"/> Seep
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Riparian Vegetation: Dom. Tree/Shrub Taxa <u>Fraxinus</u> Dominate Type: <input checked="" type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous Number of strata _____	Canopy Cover: <input type="checkbox"/> Fully Exposed (0-25%) <input type="checkbox"/> Partially Exposed (25-50%) <input checked="" type="checkbox"/> Partially Shaded (50-75%) <input type="checkbox"/> Fully Shaded (75-100%)	Channel Alterations: <input type="checkbox"/> Dredging <input checked="" type="checkbox"/> Channelization <input type="checkbox"/> Full <input type="checkbox"/> Partial
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Substrate	Riffle <u>10</u> %	Run <u>26</u> %	Pool <u>10</u> %
Silt/Clay (<0.06 mm)		✓	✓
Sand (0.06 – 2 mm)	✓	✓	✓
Gravel (2-64 mm)	✓	✓	✓
Cobble (64 – 256 mm)			
Boulders (>256 mm)		✓	✓
Bedrock			

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
<b>1. Epifaunal Substrate/Available Cover</b> Greater than 50% 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).	30-50% 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).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.	SCORE: 20 19 18 17 16   15 14 13 12 11   10 9 8 7 6   5 4 3 2 1 0
<b>2. Pool Substrate Characterization</b> Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.	SCORE: 20 19 18 17 16   15 14 13 12 11   10 9 8 7 6   5 4 3 2 1 0
<b>3. Pool Variability</b> Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.	SCORE: 20 19 18 17 16   15 14 13 12 11   10 9 8 7 6   5 4 3 2 1 0

<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>5. Channel Flow Status</b>	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 little water in channel and mostly present as standing pools.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.	Some 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.	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 gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	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 sloughing; 60-100% of bank has erosional scars.
<b>SCORE (LB)</b>	Left Bank 10 9	8 7 6	5 4 3	2 1 0
<b>SCORE (RB)</b>	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>9. Vegetative Protection (score each bank)</b>	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.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
<b>SCORE (LB)</b>	Left Bank 10 9	8 7 6	5 4 3	2 1 0
<b>SCORE (RB)</b>	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
<b>SCORE (LB)</b>	Left Bank 10 9	8 7 6	5 4 3	2 1 0
<b>SCORE (RB)</b>	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score

110

NOTES/COMMENTS:

### Low Gradient Stream Data Sheet

STREAM NAME: <u>South Fork Little River</u>		LOCATION: <u>E. hopkewille upstream</u>	
STATION #: <u>CR2200002</u> MILE:		BASIN/WATERSHED: <u>Little River</u>	
LAT.: _____ LONG.: _____		COUNTY: <u>Christian</u> USGS 7.5 TOPO:	
DATE: <u>09/05/03</u> TIME: <u>10:15</u> <input checked="" type="checkbox"/> AM <input type="checkbox"/> PM		INVESTIGATORS: <u>John, Ann, Natalie, Amanda, Matt, Ken</u>	
TYPE SAMPLE: <input type="checkbox"/> P-CHEM <input checked="" type="checkbox"/> Macroinvertebrate <input type="checkbox"/> FISH <input type="checkbox"/> BACT <input checked="" type="checkbox"/> ALGAE			
WEATHER:		Has there been a heavy rain in the last 7 days?	
Now <input type="checkbox"/> Past 24 hours <input type="checkbox"/> Heavy rain <input type="checkbox"/> <input type="checkbox"/> Steady rain <input type="checkbox"/> <input type="checkbox"/> Intermittent showers <input checked="" type="checkbox"/> Clear/sunny		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Air Temperature <u>78</u> °F Inches rainfall in past 24 hours _____ in. _____ % Cloud Cover	
P-Chem: Temp(°C) _____ D.O. (mg/l) _____ %Saturation _____ pH(S.U.) _____ Cond. _____ <input type="checkbox"/> Grab			
<b>INSTREAM WATERSHED FEATURES:</b> Stream Width _____ ft Range of Depth _____ ft Average Velocity _____ ft/s Discharge _____ cfs Est. Reach Length _____		<b>LOCAL WATERSHED FEATURES:</b> Predominant Surrounding Land Use: <input type="checkbox"/> Surface Mining <input type="checkbox"/> Construction <input type="checkbox"/> Forest <input type="checkbox"/> Deep Mining <input type="checkbox"/> Commercial <input checked="" type="checkbox"/> Pasture/Grazing <input type="checkbox"/> Oil Wells <input type="checkbox"/> Industrial <input type="checkbox"/> Silviculture <input type="checkbox"/> Land Disposal <input checked="" type="checkbox"/> Row Crops <input type="checkbox"/> Urban Runoff/Storm Sewers	
Hydraulic Structures: <input type="checkbox"/> Dams <input checked="" type="checkbox"/> Bridge Abutments <input type="checkbox"/> Island <input type="checkbox"/> Waterfalls <input type="checkbox"/> Other _____		Stream Flow: <input type="checkbox"/> Dry <input type="checkbox"/> Pooled <input type="checkbox"/> Low <input type="checkbox"/> Normal <input checked="" type="checkbox"/> High <input type="checkbox"/> Very Rapid or Torrential	
Stream Type: <input type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Ephemeral <input type="checkbox"/> Seep		Riparian Vegetation: Dom. Tree/Shrub Taxa Dominate Type: <input checked="" type="checkbox"/> Trees <input checked="" type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous Number of strata _____	
Canopy Cover: <input type="checkbox"/> Fully Exposed (0-25%) <input checked="" type="checkbox"/> Partially Exposed (25-50%) <input type="checkbox"/> Partially Shaded (50-75%) <input type="checkbox"/> Fully Shaded (75-100%)		Channel Alterations: <input checked="" type="checkbox"/> Dredging <input checked="" type="checkbox"/> Channelization <input checked="" type="checkbox"/> Full <input type="checkbox"/> Partial	
Substrate <input type="checkbox"/> Est. <input type="checkbox"/> P.C.	Rifle <input checked="" type="checkbox"/> %	Run <u>90</u> %	Pool <u>10</u> %
Silt/Clay (<0.06 mm)			
Sand (0.06 - 2 mm)		<u>60</u> %	<u>60</u> %
Gravel (2-64 mm)		<u>10</u> %	<u>5</u> %
Cobble (64 - 256 mm)		<u>10</u> %	<u>5</u> %
Boulders (>256 mm)		<u>20</u> %	<u>30</u> %
Bedrock			
<b>Habitat</b>	<b>Condition Category</b>		
<b>Parameter</b>	<b>Optimal</b>	<b>Suboptimal</b>	<b>Marginal</b>
<b>1. Epifaunal Substrate/Available Cover</b>	Greater than 50% 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).	30-50% 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).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6
<b>2. Pool Substrate Characterization</b>	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6
<b>3. Pool Variability</b>	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6

<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>5. Channel Flow Status</b>	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 little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.	Some 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.	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 gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	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 sloughing; 60-100% of bank has erosional scars.
Note: determine left or right side by facing downstream.				
SCORE (LB)	10 9 8 7 6	5 4 3 2 1 0	5 4 3 2 1 0	5 4 3 2 1 0
SCORE (RB)	10 9 8 7 6	5 4 3 2 1 0	5 4 3 2 1 0	5 4 3 2 1 0
<b>9. Vegetative Protection (score each bank)</b>	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.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	10 9 8 7 6	5 4 3 2 1 0	5 4 3 2 1 0	5 4 3 2 1 0
SCORE (RB)	10 9 8 7 6	5 4 3 2 1 0	5 4 3 2 1 0	5 4 3 2 1 0
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	10 9 8 7 6	5 4 3 2 1 0	5 4 3 2 1 0	5 4 3 2 1 0
SCORE (RB)	10 9 8 7 6	5 4 3 2 1 0	5 4 3 2 1 0	5 4 3 2 1 0

Total Score

96

NOTES/COMMENTS:

## Low Gradient Stream Data Sheet

STREAM NAME: <u>Lower Branch</u>		LOCATION:		
STATION #: <u>CR200003</u> MILE:		BASIN/WATERSHED: <u>Kittle River</u>		
LAT.: _____ LONG.: _____		COUNTY: <u>Christian</u> USGS 7.5 TOPO:		
DATE: <u>05/14/03</u> TIME: <u>11:00</u> <input checked="" type="checkbox"/> AM <input type="checkbox"/> PM		INVESTIGATORS: <u>P.B., M.D</u>		
TYPE SAMPLE: <input type="checkbox"/> P-CHEM <input type="checkbox"/> Macroinvertebrate <input type="checkbox"/> FISH <input type="checkbox"/> BACT. <input type="checkbox"/> ALGAE				
WEATHER: Now <input type="checkbox"/> Past 24 hours <input type="checkbox"/>		Has there been a heavy rain in the last 7 days?		
<input type="checkbox"/> Heavy rain <input type="checkbox"/>		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		
<input type="checkbox"/> Steady rain <input type="checkbox"/>		Air Temperature <u>20</u> °C. Inches rainfall in past 24 hours _____ in.		
<input type="checkbox"/> Intermittent showers <input type="checkbox"/>		<u>20</u> % Cloud Cover		
<input checked="" type="checkbox"/> Clear/sunny				
P-Chem: Temp(°C) _____ D.O. (mg/l) _____ %Saturation _____ pH(S.U.) _____ Cond. _____ <input type="checkbox"/> Grab				
<b>INSTREAM WATERSHED FEATURES:</b> Stream Width _____ ft Range of Depth _____ ft Average Velocity _____ ft/s Discharge _____ cfs Est. Reach Length _____		<b>LOCAL WATERSHED FEATURES:</b> Predominant Surrounding Land Use: <input type="checkbox"/> Surface Mining <input type="checkbox"/> Construction <input type="checkbox"/> Forest <input type="checkbox"/> Deep Mining <input type="checkbox"/> Commercial <input type="checkbox"/> Pasture/Grazing <input type="checkbox"/> Oil Wells <input type="checkbox"/> Industrial <input type="checkbox"/> Silviculture <input type="checkbox"/> Land Disposal <input type="checkbox"/> Row Crops <input type="checkbox"/> Urban Runoff/Storm Sewers		
<b>Hydraulic Structures:</b> <input type="checkbox"/> Dams <input checked="" type="checkbox"/> Bridge Abutments <input type="checkbox"/> Island <input type="checkbox"/> Waterfalls <input type="checkbox"/> Other _____		<b>Stream Flow:</b> <input type="checkbox"/> Dry <input type="checkbox"/> Pooled <input type="checkbox"/> Low <input type="checkbox"/> Normal <input checked="" type="checkbox"/> High <input type="checkbox"/> Very Rapid or Torrential		
<b>Riparian Vegetation:</b> Dom. Tree/Shrub Taxa _____ Dominate Type: <input checked="" type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous Number of strata _____		<b>Stream Type:</b> <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Ephemeral <input type="checkbox"/> Seep		
<b>Canopy Cover:</b> <input type="checkbox"/> Fully Exposed (0-25%) <input type="checkbox"/> Partially Exposed (25-50%) <input checked="" type="checkbox"/> Partially Shaded (50-75%) <input type="checkbox"/> Fully Shaded (75-100%)		<b>Channel Alterations:</b> <input type="checkbox"/> Dredging <input checked="" type="checkbox"/> Channelization ( <input type="checkbox"/> Full <input type="checkbox"/> Partial )		
Substrate <input type="checkbox"/> Est. <input type="checkbox"/> P.C.	Rifle _____ %	Run <u>50</u> %	Pool <u>50</u> %	
Silt/Clay (<0.06 mm)		✓ (edge)		
Sand (0.06 – 2 mm)			✓	
Gravel (2-64 mm)				
Cobble (64 – 256 mm)		✓	✓	
Boulders (>256 mm)				
Bedrock		✓	✓ (edge)	
<b>Habitat</b>	<b>Condition Category</b>			
<b>Parameter</b>	<b>Optimal</b>	<b>Suboptimal</b>	<b>Marginal</b>	<b>Poor</b>
<b>1. Epifaunal Substrate/Available Cover</b>	Greater than 50% 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).	30-50% 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).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 <u>8</u> 7 6	5 4 3 2 1 0
<b>2. Pool Substrate Characterization</b>	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 <u>8</u> 7 6	5 4 3 2 1 0
<b>3. Pool Variability</b>	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 <u>11</u>	10 9 8 7 6	5 4 3 2 1 0

<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>5. Channel Flow Status</b>	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 little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.	Some 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.	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 gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	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 sloughing; 60-100% of bank has erosional scars.
Note: determine left or right side by facing downstream.				
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>9. Vegetative Protection (score each bank)</b>	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.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score

101

NOTES/COMMENTS:

## Low Gradient Stream Data Sheet

STREAM NAME: <u>Lower Branch Little River</u>		LOCATION: <u>507 NE Hopkinsville</u>		
STATION #: <u>CR2200003</u> MILE:		BASIN/WATERSHED: <u>Little River</u>		
LAT.:	LONG.:	COUNTY: <u>Christian</u> USGS 7.5 TOPO:		
DATE: <u>09/05/03</u> TIME: <u>2:10</u> <input type="checkbox"/> AM <input checked="" type="checkbox"/> PM		INVESTIGATORS: <u>Pinar, Gohn, Key, Nadel, ex modo, Matt</u>		
TYPE SAMPLE: <input type="checkbox"/> P-CHEM <input type="checkbox"/> Macroinvertebrate <input type="checkbox"/> FISH <input type="checkbox"/> BACT. <input type="checkbox"/> ALGAE				
WEATHER:		Has there been a heavy rain in the last 7 days?		
<input type="checkbox"/> Now <input type="checkbox"/> Past 24 hours <input type="checkbox"/> Heavy rain <input type="checkbox"/> Steady rain <input type="checkbox"/> Intermittent showers <input checked="" type="checkbox"/> Clear/sunny		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Air Temperature <u>80</u> °C. Inches rainfall in past 24 hours <u>0</u> in. <u>30</u> % Cloud Cover		
P-Chem: Temp(°C) _____ D.O. (mg/l) _____ %Saturation _____ pH(S.U.) _____ Cond. _____ <input type="checkbox"/> Grab				
<b>INSTREAM WATERSHED FEATURES:</b> Stream Width _____ ft Range of Depth _____ ft Average Velocity _____ ft/s Discharge _____ cfs Est. Reach Length _____		<b>LOCAL WATERSHED FEATURES:</b> Predominant Surrounding Land Use: <input type="checkbox"/> Surface Mining <input type="checkbox"/> Construction <input type="checkbox"/> Forest <input type="checkbox"/> Deep Mining <input type="checkbox"/> Commercial <input checked="" type="checkbox"/> Pasture/Grazing <input type="checkbox"/> Oil Wells <input type="checkbox"/> Industrial <input type="checkbox"/> Silviculture <input type="checkbox"/> Land Disposal <input checked="" type="checkbox"/> Row Crops <input type="checkbox"/> Urban Runoff/Storm Sewers		
<b>Hydraulic Structures:</b> <input type="checkbox"/> Dams <input checked="" type="checkbox"/> Bridge Abutments <input type="checkbox"/> Island <input type="checkbox"/> Waterfalls <input type="checkbox"/> Other _____		<b>Stream Flow:</b> <input type="checkbox"/> Dry <input type="checkbox"/> Pooled <input type="checkbox"/> Low <input type="checkbox"/> Normal <input checked="" type="checkbox"/> High <input type="checkbox"/> Very Rapid or Torrential		
<b>Riparian Vegetation:</b> Dom. Tree/Shrub Taxa Dominate Type: <input type="checkbox"/> Trees <input checked="" type="checkbox"/> Shrubs <input checked="" type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous Number of strata _____		<b>Canopy Cover:</b> <input checked="" type="checkbox"/> Fully Exposed (0-25%) <input type="checkbox"/> Partially Exposed (25-50%) <input type="checkbox"/> Partially Shaded (50-75%) <input type="checkbox"/> Fully Shaded (75-100%)		
		<b>Channel Alterations:</b> <input type="checkbox"/> Dredging <input checked="" type="checkbox"/> Channelization <input checked="" type="checkbox"/> Full <input type="checkbox"/> Partial		
Substrate <input type="checkbox"/> Est. <input type="checkbox"/> P.C.		Riffle <u>15</u> %	Run <u>85</u> %	
Silt/Clay (<0.06 mm)				
Sand (0.06 - 2 mm)		<u>5</u>	<u>5</u>	
Gravel (2-64 mm)		<u>5</u>	<u>5</u>	
Cobble (64 - 256 mm)				
Boulders (>256 mm)				
Bedrock		<u>90</u>	<u>90</u>	
<b>Habitat</b>	<b>Condition Category</b>			
<b>Parameter</b>	<b>Optimal</b>	<b>Suboptimal</b>	<b>Marginal</b>	<b>Poor</b>
1. Epifaunal Substrate/ Available Cover	Greater than 50% 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).	30-50% 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).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE				
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8	0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>5. Channel Flow Status</b>	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 little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.	Some 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.	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 gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected. Note: determine left or right side by facing downstream.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	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 sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>9. Vegetative Protection (score each bank)</b>	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.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score

98

NOTES/COMMENTS:



## Low Gradient Stream Data Sheet

STREAM NAME: <u>North Fork of Little River</u>		LOCATION:		
STATION #: <u>CR200004</u> MILE:		BASIN/WATERSHED: <u>Little River</u>		
LAT.: _____ LONG.: _____		COUNTY: <u>Christian</u> USGS 7.5 TOPO:		
DATE: <u>05/13/03</u> TIME: <u>1:12 pm</u> <input type="checkbox"/> AM <input checked="" type="checkbox"/> PM		INVESTIGATORS: <u>P.B, S.H, M.D, S, B</u>		
TYPE SAMPLE: <input type="checkbox"/> P-CHEM <input type="checkbox"/> Macroinvertebrate <input type="checkbox"/> FISH <input type="checkbox"/> BACT. <input type="checkbox"/> ALGAE				
WEATHER:		Has there been a heavy rain in the last 7 days?		
Now <input type="checkbox"/> Past 24 hours <input type="checkbox"/> <input type="checkbox"/> Heavy rain <input type="checkbox"/> <input type="checkbox"/> Steady rain <input type="checkbox"/> <input type="checkbox"/> Intermittent showers <input type="checkbox"/> <input checked="" type="checkbox"/> Clear/sunny <input checked="" type="checkbox"/>		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Air Temperature <u>24</u> °C. Inches rainfall in past 24 hours _____ in. <input type="checkbox"/> _____ % Cloud Cover		
P-Chem: Temp(°C) _____ D.O. (mg/l) _____ %Saturation _____ pH(S.U.) _____ Cond. _____ <input type="checkbox"/> Grab				
<b>INSTREAM WATERSHED FEATURES:</b> Stream Width _____ ft Range of Depth _____ ft Average Velocity _____ ft/s Discharge _____ cfs Est. Reach Length _____		<b>LOCAL WATERSHED FEATURES:</b> Predominant Surrounding Land Use: <input type="checkbox"/> Surface Mining <input type="checkbox"/> Construction <input type="checkbox"/> Forest <input type="checkbox"/> Deep Mining <input checked="" type="checkbox"/> Commercial <input checked="" type="checkbox"/> Pasture/Grazing <input type="checkbox"/> Oil Wells <input type="checkbox"/> Industrial <input type="checkbox"/> Silviculture <input type="checkbox"/> Land Disposal <input checked="" type="checkbox"/> Row Crops <input checked="" type="checkbox"/> Urban Runoff/Storm Sewers		
<b>Hydraulic Structures:</b> <input type="checkbox"/> Dams <input type="checkbox"/> Bridge Abutments <input type="checkbox"/> Island <input type="checkbox"/> Waterfalls <input type="checkbox"/> Other _____		<b>Stream Flow:</b> <input type="checkbox"/> Dry <input checked="" type="checkbox"/> Pooled <input type="checkbox"/> Low <input type="checkbox"/> Normal <input checked="" type="checkbox"/> High <input type="checkbox"/> Very Rapid or Torrential ↘ correct one		
<b>Riparian Vegetation:</b> Dom. Tree/Shrub Taxa Dominate Type: <input checked="" type="checkbox"/> Trees <input checked="" type="checkbox"/> Shrubs <input checked="" type="checkbox"/> Grasses <input checked="" type="checkbox"/> Herbaceous Number of strata _____		<b>Stream Type:</b> <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Ephemeral <input type="checkbox"/> Seep		
<b>Canopy Cover:</b> <input type="checkbox"/> Fully Exposed (0-25%) <input checked="" type="checkbox"/> Partially Exposed (25-50%) <input type="checkbox"/> Partially Shaded (50-75%) <input type="checkbox"/> Fully Shaded (75-100%)		<b>Channel Alterations:</b> <input type="checkbox"/> Dredging <input checked="" type="checkbox"/> Channelization ( <input type="checkbox"/> Full <input type="checkbox"/> Partial )		
Substrate <input type="checkbox"/> Est. <input type="checkbox"/> P.C.	Riffle <u>0</u> %	Run <u>50</u> %	Pool <u>50</u> %	
Silt/Clay (<0.06 mm)		✓	✓	
Sand (0.06 – 2 mm)				
Gravel (2-64 mm)				
Cobble (64 – 256 mm)				
Boulders (>256 mm)		✓ (edge)	✓ (edge)	
Bedrock				
<b>Habitat</b>	<b>Condition Category</b>			
<b>Parameter</b>	<b>Optimal</b>	<b>Suboptimal</b>	<b>Marginal</b>	<b>Poor</b>
<b>1. Epifaunal Substrate/Available Cover</b>	Greater than 50% 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).	30-50% 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).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>2. Pool Substrate Characterization</b>	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>3. Pool Variability</b>	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

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<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>5. Channel Flow Status</b>	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 little water in channel and mostly present as standing pools.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.	Some 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.	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 gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	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 sloughing; 60-100% of bank has erosional scars.
Note: determine left or right side by facing downstream.				
<b>SCORE (LB)</b>	Left Bank 10 9	8 7 6	5 4 3	2 1 0
<b>SCORE (RB)</b>	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>9. Vegetative Protection (score each bank)</b>	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.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
<b>SCORE (LB)</b>	Left Bank 10 9	8 7 6	5 4 3	2 1 0
<b>SCORE (RB)</b>	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
<b>SCORE (LB)</b>	Left Bank 10 9	8 7 6	5 4 3	2 1 0
<b>SCORE (RB)</b>	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score

88

NOTES/COMMENTS:

## Low Gradient Stream Data Sheet

STREAM NAME: <u>Upper Branch North Fork</u>		LOCATION: <u>107 NE Hopskville</u>	
STATION #: <u>CR200004</u> MILE:		BASIN/WATERSHED: <u>Little River</u>	
LAT.: _____ LONG.: _____		COUNTY: <u>Christian</u> USGS 7.5 TOPO:	
DATE: <u>09/05/03</u> TIME: <u>2:50</u> <input type="checkbox"/> AM <input checked="" type="checkbox"/> PM		INVESTIGATORS: <u>John, Pinar, Ken, Matt, Amanda</u>	
TYPE SAMPLE: <input type="checkbox"/> P-CHEM <input checked="" type="checkbox"/> Macroinvertebrate <input type="checkbox"/> FISH <input type="checkbox"/> BACT. <input type="checkbox"/> ALGAE			
WEATHER: Now _____ Past 24 hours _____		Has there been a heavy rain in the last 7 days? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
<input type="checkbox"/> Heavy rain <input type="checkbox"/> Steady rain <input type="checkbox"/> Intermittent showers <input checked="" type="checkbox"/> Clear/sunny		Air Temperature <u>80</u> °C. Inches rainfall in past 24 hours _____ in. <u>30</u> % Cloud Cover	

*Notaire*

P-Chem: Temp(°C) \_\_\_\_\_ D.O. (mg/l) \_\_\_\_\_ %Saturation \_\_\_\_\_ pH(S.U.) \_\_\_\_\_ Cond. \_\_\_\_\_  Grab

<b>INSTREAM WATERSHED FEATURES:</b> Stream Width _____ ft Range of Depth _____ ft Average Velocity _____ ft/s Discharge _____ cfs Est. Reach Length _____	<b>LOCAL WATERSHED FEATURES:</b> Predominant Surrounding Land Use: <input type="checkbox"/> Surface Mining <input type="checkbox"/> Construction <input type="checkbox"/> Forest <input type="checkbox"/> Deep Mining <input type="checkbox"/> Commercial <input type="checkbox"/> Pasture/Grazing <input type="checkbox"/> Oil Wells <input type="checkbox"/> Industrial <input type="checkbox"/> Silviculture <input type="checkbox"/> Land Disposal <input checked="" type="checkbox"/> Row Crops <input type="checkbox"/> Urban Runoff/Storm Sewers
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<b>Hydraulic Structures:</b> <input type="checkbox"/> Dams <input checked="" type="checkbox"/> Bridge Abutments <input type="checkbox"/> Island <input type="checkbox"/> Waterfalls <input type="checkbox"/> Other _____	<b>Stream Flow:</b> <input type="checkbox"/> Dry <input type="checkbox"/> Pooled <input type="checkbox"/> Low <input type="checkbox"/> Normal <input checked="" type="checkbox"/> High <input type="checkbox"/> Very Rapid or Torrential	<b>Stream Type:</b> <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Ephemeral <input type="checkbox"/> Seep
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Riparian Vegetation: Dom. Tree/Shrub Taxa Dominate Type: <u>Sycamore</u> <input checked="" type="checkbox"/> Trees <input checked="" type="checkbox"/> Shrubs <u>Box Elder</u> <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous Number of strata _____	Canopy Cover: <input type="checkbox"/> Fully Exposed (0-25%) <input type="checkbox"/> Partially Exposed (25-50%) <input checked="" type="checkbox"/> Partially Shaded (50-75%) <input type="checkbox"/> Fully Shaded (75-100%)	Channel Alterations: <input type="checkbox"/> Dredging <input checked="" type="checkbox"/> Channelization ( <input type="checkbox"/> Full <input checked="" type="checkbox"/> Partial)
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Substrate <input type="checkbox"/> Est. <input type="checkbox"/> P.C.	Riffle <input type="checkbox"/> %	Run <u>100</u> %	Pool _____ %
Silt/Clay (<0.06 mm)		<u>100</u>	
Sand (0.06 - 2 mm)			
Gravel (2-64 mm)			
Cobble (64 - 256 mm)			
Boulders (>256 mm)			
Bedrock			

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/Available Cover	Greater than 50% 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).	30-50% 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).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20	15	10	5
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20, 19, 18, 17, 16	15, 14, 13, 12, 11	10, 9, 8	5
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20, 19, 18, 17, 16	15, 14, 13, 12, 11	10, 9, 8, 7, 6	5, 4, 3, 2, 1, 0

<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>5. Channel Flow Status</b>	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 little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.	Some 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.	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 gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion; mostly healed over. 5-30% of bank in reach has areas of erosion.	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 sloughing; 60-100% of bank has erosional scars.
Note: determine left or right side by facing downstream.				
SCORE (LB)	10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	10 9	8 7 6	5 4 3	2 1 0
<b>9: Vegetative Protection (score each bank)</b>	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.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	10 9	8 7 6	5 4 3	2 1 0
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	10 9	8 7 6	5 4 3	2 1 0

Total Score

NOTES/COMMENTS:

88

## Low Gradient Stream Data Sheet

STREAM NAME: <u>So Fork Little River</u>		LOCATION: <u>Trail of Tears Park</u>	
STATION #: <u>CR20005</u> MILE:		BASIN/WATERSHED: <u>Little River</u>	
LAT.: _____ LONG.: _____		COUNTY: <u>Christ</u> USGS 7.5 TOPO: _____	
DATE: <u>5/13/03</u> TIME: <u>11:30</u> <input checked="" type="checkbox"/> AM <input type="checkbox"/> PM		INVESTIGATORS: <u>HBS &amp; KDW personnel</u> <span style="float: right;">Pierce</span>	
TYPE SAMPLE: <input type="checkbox"/> P-CHEM <input checked="" type="checkbox"/> Macroinvertebrate <input checked="" type="checkbox"/> FISH <input type="checkbox"/> BACT. <input checked="" type="checkbox"/> ALGAE			
WEATHER:		Has there been a heavy rain in the last 7 days?	
Now <input type="checkbox"/> Past 24 hours <input type="checkbox"/> <input type="checkbox"/> Heavy rain <input type="checkbox"/> <input type="checkbox"/> Steady rain <input type="checkbox"/> <input type="checkbox"/> Intermittent showers <input type="checkbox"/> <input checked="" type="checkbox"/> Clear/sunny <input checked="" type="checkbox"/>		Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Air Temperature <u>70</u> °C. Inches rainfall in past 24 hours <u>0</u> in. <u>5</u> % Cloud Cover	
P-Chem: Temp(°C) <u>15.2</u> D.O. (mg/l) <u>10</u> %Saturation <u>103</u> pH(S.U.) <u>7.3</u> Cond. <u>40.19</u> <input type="checkbox"/> Grab			
<b>INSTREAM WATERSHED FEATURES:</b> Stream Width _____ ft Range of Depth _____ ft Average Velocity _____ ft/s Discharge _____ cfs Est. Reach Length _____		<b>LOCAL WATERSHED FEATURES:</b> Predominant Surrounding Land Use: <input type="checkbox"/> Surface Mining <input type="checkbox"/> Construction <input checked="" type="checkbox"/> Forest <input type="checkbox"/> Deep Mining <input checked="" type="checkbox"/> Commercial <input checked="" type="checkbox"/> Pasture/Grazing <input type="checkbox"/> Oil Wells <input checked="" type="checkbox"/> Industrial <input type="checkbox"/> Silviculture <input type="checkbox"/> Land Disposal <input checked="" type="checkbox"/> Row Crops <input checked="" type="checkbox"/> Urban Runoff/Storm Sewers	
<b>Hydraulic Structures:</b> <input type="checkbox"/> Dams <input type="checkbox"/> Bridge Abutments <input type="checkbox"/> Island <input type="checkbox"/> Waterfalls <input type="checkbox"/> Other		<b>Stream Flow:</b> <input type="checkbox"/> Dry <input type="checkbox"/> Pooled <input type="checkbox"/> Low <input type="checkbox"/> Normal <input checked="" type="checkbox"/> High <input type="checkbox"/> Very Rapid or Torrential	
<b>Riparian Vegetation:</b> Dominate Type: <u>Ash-Hackberry</u> <input checked="" type="checkbox"/> Trees <input checked="" type="checkbox"/> Shrubs <u>Willow</u> <input checked="" type="checkbox"/> Grasses <input checked="" type="checkbox"/> Herbaceous <u>Cottonwood</u> Number of strata _____		<b>Stream Type:</b> <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Ephemeral <input type="checkbox"/> Seep	
<b>Canopy Cover:</b> <input type="checkbox"/> Fully Exposed (0-25%) <input type="checkbox"/> Partially Exposed (25-50%) <input checked="" type="checkbox"/> Partially Shaded (50-75%) <input type="checkbox"/> Fully Shaded (75-100%)		<b>Channel Alterations:</b> <input type="checkbox"/> Dredging <input checked="" type="checkbox"/> Channelization ( <input type="checkbox"/> Full <input checked="" type="checkbox"/> Partial)	
Substrate <input checked="" type="checkbox"/> Est. <input type="checkbox"/> P.C.	Riffle <u>10</u> %	Run <u>40</u> % <u>45</u>	Pool <u>40</u> % <u>45</u> <span style="float: right;">P.B.</span>
Silt/Clay (<0.06 mm)	✓	✓	✓
Sand (0.06 – 2 mm)			
Gravel (2-64 mm)			
Cobble (64 – 256 mm)	✓	✓	
Boulders (>256 mm)	✓	✓	
Bedrock			
<b>Habitat</b>	<b>Condition Category</b>		
<b>Parameter</b>	<b>Optimal</b>	<b>Suboptimal</b>	<b>Marginal</b>
<b>1. Epifaunal Substrate/Available Cover</b>	Greater than 50% 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).	30-50% 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).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6 5 4 3 2 1 0
<b>2. Pool Substrate Characterization</b>	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6 5 4 3 2 1 0
<b>3. Pool Variability</b>	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools. Majority of pools small-shallow or pools absent.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6 5 4 3 2 1 0

<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>5. Channel Flow Status</b>	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 little water in channel and mostly present as standing pools.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.	Some 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.	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 gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.  Note: determine left or right side by facing downstream.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	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 sloughing; 60-100% of bank has erosional scars.
<b>SCORE (LB)</b>	Left Bank 10 9	8 7 6	5 4 3	2 1 0
<b>SCORE (RB)</b>	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>9. Vegetative Protection (score each bank)</b>	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.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
<b>SCORE (LB)</b>	Left Bank 10 9	8 7 6	5 4 3	2 1 0
<b>SCORE (RB)</b>	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
<b>SCORE (LB)</b>	Left Bank 10 9	8 7 6	5 4 3	2 1 0
<b>SCORE (RB)</b>	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score

86

NOTES/COMMENTS:

Low Gradient Stream Data Sheet

Copy

STREAM NAME: <u>So Fork Little River</u>		LOCATION: <u>Trail of Tears Park</u>		
STATION #: <u>CR20005</u> MILE:		BASIN/WATERSHED: <u>Little River</u>		
LAT.:	LONG.:	COUNTY: <u>Christ</u> USGS 7.5 TOPO:		
DATE: <u>5/13/03</u> TIME: <u>11:30</u> <input checked="" type="checkbox"/> AM <input type="checkbox"/> PM		INVESTIGATORS: <u>HBS &amp; KDW personnel</u>		
TYPE SAMPLE: <input type="checkbox"/> P-CHEM <input checked="" type="checkbox"/> Macroinvertebrate <input type="checkbox"/> FISH <input type="checkbox"/> BACT. <input checked="" type="checkbox"/> ALGAE				
WEATHER: Now		Past 24 hours		
<input type="checkbox"/>		<input type="checkbox"/> Heavy rain		
<input type="checkbox"/>		<input type="checkbox"/> Steady rain		
<input type="checkbox"/>		<input type="checkbox"/> Intermittent showers		
<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/> Clear/sunny		
		Has there been a heavy rain in the last 7 days? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		
		Air Temperature <u>70</u> °C. Inches rainfall in past 24 hours <u>0</u> in.		
		<u>5</u> % Cloud Cover		
P-Chem: Temp(°C) <u>15.2</u> D.O. (mg/l) <u>10</u> %Saturation <u>103</u> pH(S.U.) <u>7.3</u> Cond. <u>40.19</u> <input type="checkbox"/> Grab				
INSTREAM WATERSHED FEATURES:		LOCAL WATERSHED FEATURES:		
Stream Width _____ ft		Predominant Surrounding Land Use:		
Range of Depth _____ ft		<input type="checkbox"/> Surface Mining		
Average Velocity _____ ft/s		<input type="checkbox"/> Deep Mining		
Discharge _____ cfs		<input type="checkbox"/> Oil Wells		
Est. Reach Length _____		<input type="checkbox"/> Land Disposal		
		<input type="checkbox"/> Construction		
		<input checked="" type="checkbox"/> Commercial		
		<input checked="" type="checkbox"/> Industrial		
		<input checked="" type="checkbox"/> Row Crops		
		<input checked="" type="checkbox"/> Forest		
		<input type="checkbox"/> Pasture/Grazing		
		<input type="checkbox"/> Silviculture		
		<input checked="" type="checkbox"/> Urban Runoff/Storm Sewers		
Hydraulic Structures:		Stream Flow:		
<input type="checkbox"/> Dams <input type="checkbox"/> Bridge Abutments		<input type="checkbox"/> Dry <input type="checkbox"/> Pooled <input type="checkbox"/> Low <input type="checkbox"/> Normal		
<input type="checkbox"/> Island <input type="checkbox"/> Waterfalls		<input checked="" type="checkbox"/> High <input type="checkbox"/> Very Rapid or Torrential		
<input type="checkbox"/> Other _____		Stream Type:		
		<input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent		
		<input type="checkbox"/> Ephemeral <input type="checkbox"/> Seep		
Riparian Vegetation: Dom. Tree/Shrub Taxa		Canopy Cover:		
Dominate Type: <u>Ash-Hackberry</u>		<input type="checkbox"/> Fully Exposed (0-25%)		
<input checked="" type="checkbox"/> Trees <input checked="" type="checkbox"/> Shrubs		<input type="checkbox"/> Partially Exposed (25-50%)		
<input checked="" type="checkbox"/> Grasses <input checked="" type="checkbox"/> Herbaceous		<input checked="" type="checkbox"/> Partially Shaded (50-75%)		
Number of strata _____ <u>Cottonwood</u>		<input type="checkbox"/> Fully Shaded (75-100%)		
		Channel Alterations:		
		<input type="checkbox"/> Dredging		
		<input checked="" type="checkbox"/> Channelization		
		<input type="checkbox"/> Full <input checked="" type="checkbox"/> Partial		
Substrate <input checked="" type="checkbox"/> Est. <input type="checkbox"/> P.C.	Riffle <u>10</u> %	Run <u>40</u> % <u>45</u>	Pool <u>40</u> % <u>45</u>	
Silt/Clay (<0.06 mm)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Sand (0.06 - 2 mm)				
Gravel (2-64 mm)				
Cobble (64 - 256 mm)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
Boulders (>256 mm)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
Bedrock				
Habitat	Condition Category			
Parameter	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% 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).	30-50% 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).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

P.B.

4. Sediment Deposition 7	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 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 little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some 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.	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 gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
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 minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	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 sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3 2 1 0	5 4 3 2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3 2 1 0	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.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 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.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score

86

NOTES/COMMENTS:



## Low Gradient Stream Data Sheet

STREAM NAME: <u>South Fork Little River</u>		LOCATION: <u>Trait of Tears Park</u>	
STATION #: <u>CR200005</u> MILE:		BASIN/WATERSHED: <u>Little River</u>	
LAT.: _____ LONG.: _____		COUNTY: <u>Christian</u> USGS 7.5 TOPO: _____	
DATE: <u>09/05/03</u> TIME: <u>9:00</u> <input checked="" type="checkbox"/> AM <input type="checkbox"/> PM		INVESTIGATORS: <u>Sohn, Pinar, Matt, Ken, Natolie, Amanda</u>	
TYPE SAMPLE: <input type="checkbox"/> P-CHEM <input checked="" type="checkbox"/> Macroinvertebrate <input type="checkbox"/> FISH <input type="checkbox"/> BACT. <input type="checkbox"/> ALGAE			
WEATHER: Now _____ Past 24 hours _____		Has there been a heavy rain in the last 7 days? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
<input type="checkbox"/> Heavy rain <input type="checkbox"/> Steady rain <input type="checkbox"/> Intermittent showers <input checked="" type="checkbox"/> Clear/sunny		Air Temperature <u>78</u> °C. Inches rainfall in past 24 hours <u>0</u> in. <u>0</u> % Cloud Cover	
P-Chem: Temp(°C) _____ D.O. (mg/l) _____ %Saturation _____ pH(S.U.) _____ Cond. _____ <input type="checkbox"/> Grab			
<b>INSTREAM WATERSHED FEATURES:</b> Stream Width _____ ft Range of Depth _____ ft Average Velocity _____ ft/s Discharge _____ cfs Est. Reach Length _____		<b>LOCAL WATERSHED FEATURES:</b> Predominant Surrounding Land Use: <input type="checkbox"/> Surface Mining <input type="checkbox"/> Construction <input type="checkbox"/> Forest <input type="checkbox"/> Deep Mining <input checked="" type="checkbox"/> Commercial <input type="checkbox"/> Pasture/Grazing <input type="checkbox"/> Oil Wells <input type="checkbox"/> Industrial <input type="checkbox"/> Silviculture <input type="checkbox"/> Land Disposal <input type="checkbox"/> Row Crops <input checked="" type="checkbox"/> Urban Runoff/Storm Sewers	
<b>Hydraulic Structures:</b> <input type="checkbox"/> Dams <input checked="" type="checkbox"/> Bridge Abutments <input type="checkbox"/> Island <input type="checkbox"/> Waterfalls <input type="checkbox"/> Other _____		<b>Stream Flow:</b> <input type="checkbox"/> Dry <input type="checkbox"/> Pooled <input type="checkbox"/> Low <input type="checkbox"/> Normal <input checked="" type="checkbox"/> High <input type="checkbox"/> Very Rapid or Torrential	
<b>Riparian Vegetation:</b> Dom. Tree/Shrub Taxa _____ Dominate Type: <u>Boxelder</u> <input checked="" type="checkbox"/> Trees <input checked="" type="checkbox"/> Shrubs <u>Sycamore</u> <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous _____ Number of strata _____		<b>Channel Alterations:</b> <input type="checkbox"/> Dredging <input checked="" type="checkbox"/> Channelization ( <input type="checkbox"/> Full <input type="checkbox"/> Partial )	
Substrate <input type="checkbox"/> Est. <input type="checkbox"/> P.C.		Riffle <u>5</u> %      Run <u>80</u> %      Pool <u>15</u> %	
Silt/Clay (<0.06 mm)			
Sand (0.06 - 2 mm)		✓	
Gravel (2-64 mm)		✓	
Cobble (64 - 256 mm)		✓	
Boulders (>256 mm)		✓	
Bedrock			
<b>Habitat</b>		<b>Condition Category</b>	
<b>Parameter</b>	<b>Optimal</b>	<b>Suboptimal</b>	<b>Marginal</b>
1. Epifaunal Substrate/ Available Cover	Greater than 50% 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).	30-50% 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).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6

<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>5. Channel Flow Status</b>	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 little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.	Some 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.	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 gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	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 sloughing; 60-100% of bank has erosional scars.
Note: determine left or right side by facing downstream.				
SCORE (LB)	10 9 8 7 6	5 4 3 2 1 0	5 4 3 2 1 0	5 4 3 2 1 0
SCORE (RB)	10 9 8 7 6	5 4 3 2 1 0	5 4 3 2 1 0	5 4 3 2 1 0
<b>9. Vegetative Protection (score each bank)</b>	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.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	10 9 8 7 6	5 4 3 2 1 0	5 4 3 2 1 0	5 4 3 2 1 0
SCORE (RB)	10 9 8 7 6	5 4 3 2 1 0	5 4 3 2 1 0	5 4 3 2 1 0
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	10 9 8 7 6	5 4 3 2 1 0	5 4 3 2 1 0	5 4 3 2 1 0
SCORE (RB)	10 9 8 7 6	5 4 3 2 1 0	5 4 3 2 1 0	5 4 3 2 1 0

Total Score

NOTES/COMMENTS:

94

## Low Gradient Stream Data Sheet

STREAM NAME: <u>North Fork of Little River</u>		LOCATION: <u>Hopkinsville Bypass 3495</u>	
STATION #: <u>CR200006</u> MILE: _____		BASIN/WATERSHED: <u>Little River</u>	
LAT.: _____	LONG.: _____	COUNTY: <u>Christian</u> USGS 7.5 TOPO: _____	
DATE: <u>05/15/03</u> TIME: <u>10:20</u> <input checked="" type="checkbox"/> AM <input type="checkbox"/> PM		INVESTIGATORS: <u>J.W, P.B, M.D</u>	
TYPE SAMPLE: <input type="checkbox"/> P-CHEM <input type="checkbox"/> Macroinvertebrate <input type="checkbox"/> FISH <input type="checkbox"/> BACT. <input type="checkbox"/> ALGAE			
WEATHER: <u>cloudy/sprinkles</u>		Now: <input type="checkbox"/> Heavy rain <input checked="" type="checkbox"/> Intermittent showers <input type="checkbox"/> Clear/sunny Past 24 hours: <input type="checkbox"/> Heavy rain <input type="checkbox"/> Steady rain <input checked="" type="checkbox"/> Intermittent showers <input type="checkbox"/> Clear/sunny Has there been a heavy rain in the last 7 days? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Air Temperature <u>17</u> °C. Inches rainfall in past 24 hours _____ in. <u>100</u> % Cloud Cover	
P-Chem: Temp(°C) _____ D.O. (mg/l) _____ %Saturation _____ pH(S.U.) _____ Cond. _____ <input type="checkbox"/> Grab			
<b>INSTREAM WATERSHED FEATURES:</b> Stream Width _____ ft Range of Depth _____ ft Average Velocity _____ ft/s Discharge _____ cfs Est. Reach Length _____		<b>LOCAL WATERSHED FEATURES:</b> Predominant Surrounding Land Use: <input type="checkbox"/> Surface Mining <input type="checkbox"/> Construction <input type="checkbox"/> Forest <input type="checkbox"/> Deep Mining <input checked="" type="checkbox"/> Commercial <input checked="" type="checkbox"/> Pasture/Grazing <input type="checkbox"/> Oil Wells <input type="checkbox"/> Industrial <input type="checkbox"/> Silviculture <input type="checkbox"/> Land Disposal <input checked="" type="checkbox"/> Row Crops <input checked="" type="checkbox"/> Urban Runoff/Storm Sewers	
Hydraulic Structures: <input type="checkbox"/> Dams <input checked="" type="checkbox"/> Bridge Abutments <input checked="" type="checkbox"/> Island <input type="checkbox"/> Waterfalls <input type="checkbox"/> Other _____		Stream Flow: <input type="checkbox"/> Dry <input type="checkbox"/> Pooled <input type="checkbox"/> Low <input checked="" type="checkbox"/> Normal <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> High <input type="checkbox"/> Very Rapid or Torrential <input type="checkbox"/> Ephemeral <input type="checkbox"/> Seep	
Riparian Vegetation: Dom. Tree/Shrub Taxa Dominate Type: <u>Acer</u> <input checked="" type="checkbox"/> Trees <input type="checkbox"/> Shrubs <u>Fraxinus</u> <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous Number of strata _____		Canopy Cover: <input type="checkbox"/> Fully Exposed (0-25%) <input type="checkbox"/> Partially Exposed (25-50%) <input type="checkbox"/> Partially Shaded (50-75%) <input checked="" type="checkbox"/> Fully Shaded (75-100%)	
Channel Alterations: <input type="checkbox"/> Dredging <input checked="" type="checkbox"/> Channelization ( <input type="checkbox"/> Full <input checked="" type="checkbox"/> Partial)			
Substrate <input type="checkbox"/> Est. <input type="checkbox"/> P.C.	Rifle <u>5</u> %	Run <u>25</u> %	Pool <u>70</u> %
Silt/Clay (<0.06 mm)	✓	✓	✓
Sand (0.06 – 2 mm)	✓	✓	✓
Gravel (2-64 mm)	✓	✓	✓
Cobble (64 – 256 mm)		✓	✓
Boulders (>256 mm)			✓
Bedrock			
<b>Habitat</b>	<b>Condition Category</b>		
<b>Parameter</b>	<b>Optimal</b>	<b>Suboptimal</b>	<b>Marginal</b>
<b>1. Epifaunal Substrate/ Available Cover</b>	Greater than 50% 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).	30-50% 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).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6
<b>2. Pool Substrate Characterization</b>	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6
<b>3. Pool Variability</b>	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6

<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>5. Channel Flow Status</b>	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 little water in channel and mostly present as standing pools.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.	Some 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.	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 gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.  Note: determine left or right side by facing downstream.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	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 sloughing; 60-100% of bank has erosional scars.
<b>SCORE (LB)</b>	Left Bank 10 9	8 7 6	5 4 3	2 1 0
<b>SCORE (RB)</b>	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>9. Vegetative Protection (score each bank)</b>	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.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
<b>SCORE (LB)</b>	Left Bank 10 9	8 7 6	5 4 3	2 1 0
<b>SCORE (RB)</b>	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
<b>SCORE (LB)</b>	Left Bank 10 9	8 7 6	5 4 3	2 1 0
<b>SCORE (RB)</b>	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score

99

NOTES/COMMENTS:

## Low Gradient Stream Data Sheet

STREAM NAME: <u>CR20006</u>		LOCATION: <u>Hopkinton By Pass 3495</u>	
STATION #: <u>North Fork Little Pine</u> MILE:		BASIN/WATERSHED: <u>V</u>	
LAT.:	LONG.:	COUNTY: <u>Cheshire</u> USGS 7.5 TOPO:	
DATE: <u>09/06/03</u> TIME: <u>10:15</u> <input checked="" type="checkbox"/> AM <input type="checkbox"/> PM		INVESTIGATORS: <u>Ker, John, Matt, Sara</u>	
TYPE SAMPLE: <input type="checkbox"/> P-CHEM <input checked="" type="checkbox"/> Macroinvertebrate <input type="checkbox"/> FISH <input type="checkbox"/> BACT <input checked="" type="checkbox"/> ALGAE			
WEATHER: Now <input type="checkbox"/> Past 24 hours <input type="checkbox"/>		Has there been a heavy rain in the last 7 days? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
<input type="checkbox"/> Heavy rain		Air Temperature <u>72</u> °F	
<input type="checkbox"/> Steady rain		Inches rainfall in past 24 hours _____ in.	
<input type="checkbox"/> Intermittent showers		<input type="checkbox"/> % Cloud Cover	
<input checked="" type="checkbox"/> Clear/sunny			

P-Chem: Temp(°C) \_\_\_\_\_ D.O. (mg/l) \_\_\_\_\_ %Saturation \_\_\_\_\_ pH(S.U.) \_\_\_\_\_ Cond. \_\_\_\_\_  Grab

<b>INSTREAM WATERSHED FEATURES:</b> Stream Width _____ ft Range of Depth _____ ft Average Velocity _____ ft/s Discharge _____ cfs Est. Reach Length _____	<b>LOCAL WATERSHED FEATURES:</b> <b>Predominant Surrounding Land Use:</b> <input type="checkbox"/> Surface Mining <input type="checkbox"/> Construction <input type="checkbox"/> Forest <input type="checkbox"/> Deep Mining <input type="checkbox"/> Commercial <input type="checkbox"/> Pasture/Grazing <input type="checkbox"/> Oil Wells <input type="checkbox"/> Industrial <input type="checkbox"/> Silviculture <input type="checkbox"/> Land Disposal <input type="checkbox"/> Row Crops <input type="checkbox"/> Urban Runoff/Storm Sewers
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<b>Hydraulic Structures:</b> <input type="checkbox"/> Dams <input checked="" type="checkbox"/> Bridge Abutments <input type="checkbox"/> Island <input type="checkbox"/> Waterfalls <input type="checkbox"/> Other _____	<b>Stream Flow:</b> <input type="checkbox"/> Dry <input type="checkbox"/> Pooled <input type="checkbox"/> Low <input checked="" type="checkbox"/> Normal <input type="checkbox"/> High <input type="checkbox"/> Very Rapid or Torrential	<b>Stream Type:</b> <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Ephemeral <input type="checkbox"/> Seep
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<b>Riparian Vegetation:</b> Dom. Tree/Shrub Taxa _____ Dominate Type: <input checked="" type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous Number of strata _____	<b>Canopy Cover:</b> <input type="checkbox"/> Fully Exposed (0-25%) <input checked="" type="checkbox"/> Partially Exposed (25-50%) <input type="checkbox"/> Partially Shaded (50-75%) <input type="checkbox"/> Fully Shaded (75-100%)	<b>Channel Alterations:</b> <input type="checkbox"/> Dredging <input checked="" type="checkbox"/> Channelization <input type="checkbox"/> Full <input checked="" type="checkbox"/> Partial
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Substrate <input type="checkbox"/> Est. <input type="checkbox"/> P.C.	Rifle <u>5</u> %	Run <u>95</u> %	Pool <u>0</u> %
Silt/Clay (<0.06 mm)		<u>95</u>	
Sand (0.06 - 2 mm)	<u>25</u>		
Gravel (2-64 mm)	<u>50</u>		
Cobble (64 - 256 mm)			
Boulders (>256 mm)	<u>25</u>	<u>5</u>	
Bedrock			

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
<b>1. Epifaunal Substrate/Available Cover</b> Greater than 50% 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).	30-50% 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).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.	SCORE: 20 19 18 17 16   15 14 13 12 11   10 9 8 7 6   5 4 3 2 1 0
<b>2. Pool Substrate Characterization</b> Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.	SCORE: 20 19 18 17 16   15 14 13 12 11   10 9 8 7 6   5 4 3 2 1 0
<b>3. Pool Variability</b> Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.	SCORE: 20 19 18 17 16   15 14 13 12 11   10 9 8 7 6   5 4 3 2 1 0

<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>5. Channel Flow Status</b>	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 little water in channel and mostly present as standing pools.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.	Some 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.	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 gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	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 sloughing; 60-100% of bank has erosional scars.
Note: determine left or right side by facing downstream.				
<b>SCORE (LB)</b>	Left Bank 10 9	8 7 6	5 4 3	2 1 0
<b>SCORE (RB)</b>	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>9. Vegetative Protection (score each bank)</b>	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.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
<b>SCORE (LB)</b>	Left Bank 10 9	8 7 6	5 4 3	2 1 0
<b>SCORE (RB)</b>	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
<b>SCORE (LB)</b>	Left Bank 10 9	8 7 6	5 4 3	2 1 0
<b>SCORE (RB)</b>	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score

63

NOTES/COMMENTS:

### Low Gradient Stream Data Sheet

STREAM NAME: <i>North Fork of Little R.</i>		LOCATION: <i>107 to Gray Lane</i>		
STATION #: <i>CR2-2000 07</i> MILE:		BASIN/WATERSHED: <i>Little River</i>		
LAT.: _____ LONG.: _____		COUNTY: <i>Christian</i> USGS 7.5 TOPO: _____		
DATE: <i>05/15/03</i> TIME: <i>11:37</i> <input checked="" type="checkbox"/> AM <input type="checkbox"/> PM		INVESTIGATORS: <i>F.B., M.D., J.W.</i>		
TYPE SAMPLE: <input type="checkbox"/> P-CHEM <input type="checkbox"/> Macroinvertebrate <input type="checkbox"/> FISH <input type="checkbox"/> BACT. <input type="checkbox"/> ALGAE				
WEATHER: Now: <input type="checkbox"/> Cloudy / <input type="checkbox"/> sprinkles (now) Past 24 hours: <input type="checkbox"/> Heavy rain <input type="checkbox"/> Steady rain <input checked="" type="checkbox"/> Intermittent showers <input type="checkbox"/> Clear/sunny Has there been a heavy rain in the last 7 days? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Air Temperature _____ °C. Inches rainfall in past 24 hours _____ in. 100% Cloud Cover				
P-Chem: Temp(°C) _____ D.O. (mg/l) _____ %Saturation _____ pH(S.U.) _____ Cond. _____ <input type="checkbox"/> Grab				
<b>INSTREAM WATERSHED FEATURES:</b> Stream Width _____ ft Range of Depth _____ ft Average Velocity _____ ft/s Discharge _____ cfs Est. Reach Length _____		<b>LOCAL WATERSHED FEATURES:</b> Predominant Surrounding Land Use: <input type="checkbox"/> Surface Mining <input type="checkbox"/> Construction <input type="checkbox"/> Forest <input type="checkbox"/> Deep Mining <input type="checkbox"/> Commercial <input checked="" type="checkbox"/> Pasture/Grazing <input type="checkbox"/> Oil Wells <input type="checkbox"/> Industrial <input type="checkbox"/> Silviculture <input type="checkbox"/> Land Disposal <input checked="" type="checkbox"/> Row Crops <input checked="" type="checkbox"/> Urban Runoff/Storm Sewers		
<b>Hydraulic Structures:</b> <input type="checkbox"/> Dams <input checked="" type="checkbox"/> Bridge Abutments <input type="checkbox"/> Island <input type="checkbox"/> Waterfalls <input type="checkbox"/> Other		<b>Stream Flow:</b> <input type="checkbox"/> Dry <input type="checkbox"/> Pooled <input type="checkbox"/> Low <input type="checkbox"/> Normal <input checked="" type="checkbox"/> High <input type="checkbox"/> Very Rapid or Torrential		
<b>Riparian Vegetation:</b> Dom. Tree/Shrub Taxa: <i>Sycamore Boxelder</i> Dominate Type: <input checked="" type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous Number of strata _____		<b>Channel Alterations:</b> <input type="checkbox"/> Dredging <input checked="" type="checkbox"/> Channelization <input checked="" type="checkbox"/> Full <input type="checkbox"/> Partial		
Substrate <input type="checkbox"/> Est. <input type="checkbox"/> P.C.		Riffle <i>3</i> %	Run <i>177</i> %	Pool <i>20</i> %
Silt/Clay (<0.06 mm)			✓	✓
Sand (0.06 – 2 mm)			✓	
Gravel (2-64 mm)		✓	✓	✓
Cobble (64 – 256 mm)				
Boulders (>256 mm)		✓	✓	✓
Bedrock				
Habitat	Condition Category			
Parameter	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/Available Cover	Greater than 50% 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).	30-50% 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).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>5. Channel Flow Status</b>	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 little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.	Some 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.	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 gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	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 sloughing; 60-100% of bank has erosional scars.
Note: determine left or right side by facing downstream.				
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>9. Vegetative Protection (score each bank)</b>	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.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score

99

NOTES/COMMENTS:



## Low Gradient Stream Data Sheet

STREAM NAME: <u>North Fork Little River</u>		LOCATION: <u>272 W. side Hopkinsville</u>		
STATION #: <u>CRF 200008</u> MILE:		BASIN/WATERSHED: <u>Little River</u>		
LAT.: _____ LONG.: _____		COUNTY: <u>Christian</u> USGS 7.5 TOPO:		
DATE: <u>09/06/03</u> TIME: <u>9:30</u> <input checked="" type="checkbox"/> AM <input type="checkbox"/> PM		INVESTIGATORS: <u>John, Pinar, Key, Matt</u>		
TYPE SAMPLE: <input type="checkbox"/> P-CHEM <input checked="" type="checkbox"/> Macroinvertebrate <input type="checkbox"/> FISH <input type="checkbox"/> BACTERIA <input checked="" type="checkbox"/> ALGAE				
WEATHER: Now _____ Past 24 hours _____		Has there been a heavy rain in the last 7 days? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		
<input type="checkbox"/> Heavy rain <input type="checkbox"/> Steady rain <input type="checkbox"/> Intermittent showers <input checked="" type="checkbox"/> Clear/sunny		Air Temperature <u>77</u> °F Inches rainfall in past 24 hours _____ in. <u>10</u> % Cloud Cover		
P-Chem: Temp(°C) _____ D.O. (mg/l) _____ % Saturation _____ pH(S.U.) _____ Cond. _____ <input type="checkbox"/> Grab				
<b>INSTREAM WATERSHED FEATURES:</b> Stream Width _____ ft Range of Depth _____ ft Average Velocity _____ ft/s Discharge _____ cfs Est. Reach Length _____		<b>LOCAL WATERSHED FEATURES:</b> <u>Predominant Surrounding Land Use:</u> <input type="checkbox"/> Surface Mining <input type="checkbox"/> Construction <input type="checkbox"/> Forest <input type="checkbox"/> Deep Mining <input type="checkbox"/> Commercial <input type="checkbox"/> Pasture/Grazing <input type="checkbox"/> Oil Wells <input type="checkbox"/> Industrial <input type="checkbox"/> Silviculture <input type="checkbox"/> Land Disposal <input type="checkbox"/> Row Crops <input type="checkbox"/> Urban Runoff/Storm Sewers		
<b>Hydraulic Structures:</b> <input type="checkbox"/> Dams <input checked="" type="checkbox"/> Bridge Abutments <input type="checkbox"/> Island <input type="checkbox"/> Waterfalls <input type="checkbox"/> Other _____		<b>Stream Flow:</b> <input type="checkbox"/> Dry <input type="checkbox"/> Pooled <input type="checkbox"/> Low <input checked="" type="checkbox"/> Normal <input type="checkbox"/> High <input type="checkbox"/> Very Rapid or Torrential		
<b>Riparian Vegetation:</b> Dom. Tree/Shrub Taxa _____ Dominate Type: <input checked="" type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous Number of strata _____		<b>Stream Type:</b> <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Ephemeral <input type="checkbox"/> Seep		
<b>Canopy Cover:</b> <input type="checkbox"/> Fully Exposed (0-25%) <input type="checkbox"/> Partially Exposed (25-50%) <input checked="" type="checkbox"/> Partially Shaded (50-75%) <input type="checkbox"/> Fully Shaded (75-100%)		<b>Channel Alterations:</b> <input type="checkbox"/> Dredging <input checked="" type="checkbox"/> Channelization ( <input type="checkbox"/> Full <input checked="" type="checkbox"/> Partial)		
Substrate <input type="checkbox"/> Est. <input type="checkbox"/> P.C.	Riffle <u>0</u> %	Run <u>100</u> %	Pool <u>0</u> %	
Silt/Clay (<0.06 mm)		<u>95</u>		
Sand (0.06 - 2 mm)				
Gravel (2-64 mm)				
Cobble (64 - 256 mm)				
Boulders (>256 mm)		<u>5</u>		
Bedrock				
<b>Habitat</b>	<b>Condition Category</b>			
<b>Parameter</b>	<b>Optimal</b>	<b>Suboptimal</b>	<b>Marginal</b>	<b>Poor</b>
<b>1. Epifaunal Substrate/ Available Cover</b>	Greater than 50% 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 <u>not</u> new fall and not transient).	30-50% 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).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>2. Pool Substrate Characterization</b>	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>3. Pool Variability</b>	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>5. Channel Flow Status</b>	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 little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.	Some 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.	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 gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	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 sloughing; 60-100% of bank has erosional scars.
Note: determine left or right side by facing downstream.				
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>9. Vegetative Protection (score each bank)</b>	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.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score

37

NOTES/COMMENTS:

## Low Gradient Stream Data Sheet

STREAM NAME: <u>North Fork of Little River</u>		LOCATION: <u>272 W. side Hopkumville</u>		
STATION #: <u>002200008</u> MILE:		BASIN/WATERSHED: <u>Little River</u>		
LAT.:	LONG.:	COUNTY: <u>Christian</u> USGS 7.5 TOPO:		
DATE: <u>05/20/03</u> TIME: <u>10:10</u> <input checked="" type="checkbox"/> AM <input type="checkbox"/> PM		INVESTIGATORS: <u>P-B, M-D, J-W</u>		
TYPE SAMPLE: <input type="checkbox"/> P-CHEM <input type="checkbox"/> Macroinvertebrate <input type="checkbox"/> FISH <input type="checkbox"/> BACT. <input type="checkbox"/> ALGAE				
WEATHER:		Has there been a heavy rain in the last 7 days?		
Now <input type="checkbox"/> Heavy rain <input type="checkbox"/> Steady rain <input type="checkbox"/> Intermittent showers <input type="checkbox"/> Clear/sunny		Past 24 hours <input type="checkbox"/> Heavy rain <input type="checkbox"/> Steady rain <input checked="" type="checkbox"/> Intermittent showers <input type="checkbox"/> Clear/sunny		
		Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Air Temperature <u>17</u> °C. Inches rainfall in past 24 hours _____ in. <u>100</u> % Cloud Cover		
P-Chem: Temp(°C) _____ D.O. (mg/l) _____ %Saturation _____ pH(S.U.) _____ Cond. _____ <input type="checkbox"/> Grab				
<b>INSTREAM WATERSHED FEATURES:</b> Stream Width _____ ft Range of Depth _____ ft Average Velocity _____ ft/s Discharge _____ cfs Est. Reach Length _____		<b>LOCAL WATERSHED FEATURES:</b> Predominant Surrounding Land Use: <input type="checkbox"/> Surface Mining <input type="checkbox"/> Construction <input type="checkbox"/> Forest <input type="checkbox"/> Deep Mining <input checked="" type="checkbox"/> Commercial <input type="checkbox"/> Pasture/Grazing <input type="checkbox"/> Oil Wells <input type="checkbox"/> Industrial <input type="checkbox"/> Silviculture <input type="checkbox"/> Land Disposal <input type="checkbox"/> Row Crops <input checked="" type="checkbox"/> Urban Runoff/Storm Sewers		
<b>Hydraulic Structures:</b> <input type="checkbox"/> Dams <input checked="" type="checkbox"/> Bridge Abutments <input type="checkbox"/> Island <input type="checkbox"/> Waterfalls <input type="checkbox"/> Other		<b>Stream Flow:</b> <input type="checkbox"/> Dry <input type="checkbox"/> Pooled <input type="checkbox"/> Low <input checked="" type="checkbox"/> Normal <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> High <input type="checkbox"/> Very Rapid or Torrential <input type="checkbox"/> Ephemeral <input type="checkbox"/> Seep		
Riparian Vegetation: Dom. Tree/Shrub Taxa Dominate Type: <u>Acer</u> <input checked="" type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous Number of strata _____ <u>Fraxinus</u>		Canopy Cover: <input type="checkbox"/> Fully Exposed (0-25%) <input type="checkbox"/> Partially Exposed (25-50%) <input type="checkbox"/> Partially Shaded (50-75%) <input checked="" type="checkbox"/> Fully Shaded (75-100%)		
		Channel Alterations: <input type="checkbox"/> Dredging <input checked="" type="checkbox"/> Channelization ( <input type="checkbox"/> Full <input checked="" type="checkbox"/> Partial )		
Substrate <input type="checkbox"/> Est. <input type="checkbox"/> P.C.	Riffle <input type="checkbox"/> %	Run <u>100</u> %	Pool <input type="checkbox"/> %	
Silt/Clay (<0.06 mm)		✓		
Sand (0.06 – 2 mm)		✓		
Gravel (2-64 mm)		✓		
Cobble (64 – 256 mm)				
Boulders (>256 mm)				
Bedrock				
Habitat	Condition Category			
Parameter	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% 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).	30-50% 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).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>5. Channel Flow Status</b>	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 little water in channel and mostly present as standing pools.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.	Some 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.	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 gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	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 sloughing; 60-100% of bank has erosional scars.
Note: determine left or right side by facing downstream.				
<b>SCORE (LB)</b>	Left Bank: 10 9	8 7 6	5 4 3	2 1 0
<b>SCORE (RB)</b>	Right Bank: 10 9	8 7 6	5 4 3	2 1 0
<b>9. Vegetative Protection (score each bank)</b>	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.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
<b>SCORE (LB)</b>	Left Bank: 10 9	8 7 6	5 4 3	2 1 0
<b>SCORE (RB)</b>	Right Bank: 10 9	8 7 6	5 4 3	2 1 0
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
<b>SCORE (LB)</b>	Left Bank: 10 9	8 7 6	5 4 3	2 1 0
<b>SCORE (RB)</b>	Right Bank: 10 9	8 7 6	5 4 3	2 1 0

Total Score

47

NOTES/COMMENTS:

### Low Gradient Stream Data Sheet

STREAM NAME: <u>Northfork Little River</u>		LOCATION: <u>107 to Gray Lane</u>	
STATION #: <u>022000007</u> MILE:		BASIN/WATERSHED: <u>Little River</u>	
LAT.: _____ LONG.: _____		COUNTY: <u>Christiana</u> USGS 7.5 TOPO:	
DATE: <u>09/06/03</u> TIME: <u>11:11</u> <input checked="" type="checkbox"/> AM <input type="checkbox"/> PM		INVESTIGATORS: <u>Pinon Ken, John, Matty, Meredith</u>	
TYPE SAMPLE: <input type="checkbox"/> P-CHEM <input checked="" type="checkbox"/> Macroinvertebrate <input type="checkbox"/> FISH <input type="checkbox"/> BACT <input checked="" type="checkbox"/> ALGAE			
WEATHER: Now _____ Past 24 hours _____		Has there been a heavy rain in the last 7 days? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
<input type="checkbox"/> Heavy rain <input type="checkbox"/> Steady rain <input type="checkbox"/> Intermittent showers <input type="checkbox"/> Clear/sunny		Air Temperature <u>76</u> °C. Inches rainfall in past 24 hours _____ in. <u>0</u> % Cloud Cover	

P-Chem: Temp(°C) \_\_\_\_\_ D.O. (mg/l) \_\_\_\_\_ %Saturation \_\_\_\_\_ pH(S.U.) \_\_\_\_\_ Cond. \_\_\_\_\_  Grab

**INSTREAM WATERSHED FEATURES:**

Stream Width \_\_\_\_\_ ft  
 Range of Depth \_\_\_\_\_ ft  
 Average Velocity \_\_\_\_\_ ft/s  
 Discharge \_\_\_\_\_ cfs  
 Est. Reach Length \_\_\_\_\_

**LOCAL WATERSHED FEATURES:**  
 Predominant Surrounding Land Use:

<input type="checkbox"/> Surface Mining	<input type="checkbox"/> Construction	<input type="checkbox"/> Forest
<input type="checkbox"/> Deep Mining	<input type="checkbox"/> Commercial	<input type="checkbox"/> Pasture/Grazing
<input type="checkbox"/> Oil Wells	<input type="checkbox"/> Industrial	<input type="checkbox"/> Silviculture
<input type="checkbox"/> Land Disposal	<input type="checkbox"/> Row Crops	<input type="checkbox"/> Urban Runoff/Storm Sewers

**Hydraulic Structures:**

Dams  Bridge Abutments  
 Island  Waterfalls  
 Other Treatment Plant

**Stream Flow:**

Dry  Pooled  Low  Normal  High  
 Very Rapid or Torrential

**Stream Type:**

Perennial  Intermittent  
 Ephemeral  Seep

Riparian Vegetation: Dom. Tree/Shrub Taxa \_\_\_\_\_

Dominate Type:

Trees  Shrubs  
 Grasses  Herbaceous  
 Number of strata \_\_\_\_\_

**Canopy Cover:**

Fully Exposed (0-25%)  
 Partially Exposed (25-50%)  
 Partially Shaded (50-75%)  
 Fully Shaded (75-100%)

**Channel Alterations:**

Dredging  
 Channelization  
 ( Full  Partial)

Substrate <input type="checkbox"/> Est. <input type="checkbox"/> P.C.	Riffle <u>10</u> %	Run <u>90</u> %	Pool <u>0</u> %
Silt/Clay (<0.06 mm)		<u>30%</u>	
Sand (0.06 - 2 mm)		<u>20%</u>	
Gravel (2-64 mm)			
Cobble (64 - 256 mm)	<u>5%</u>	<u>20%</u>	
Boulders (>256 mm)	<u>195%</u>	<u>30%</u>	
Bedrock			

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
<b>1. Epifaunal Substrate/ Available Cover</b>	Greater than 50% 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).	30-50% 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).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>2. Pool Substrate Characterization</b>	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>3. Pool Variability</b>	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Best Available Copy

<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>5. Channel Flow Status</b>	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 little water in channel and mostly present as standing pools.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.	Some 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.	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 gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.  Note: determine left or right side by facing downstream.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	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 sloughing; 60-100% of bank has erosional scars.
<b>SCORE (LB)</b>	10 9 8 7 6 5 4 3 2 1 0	8 7 6 5 4 3 2 1 0	5 4 3 2 1 0	3 2 1 0
<b>SCORE (RB)</b>	10 9 8 7 6 5 4 3 2 1 0	8 7 6 5 4 3 2 1 0	5 4 3 2 1 0	3 2 1 0
<b>9. Vegetative Protection (score each bank)</b>	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.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
<b>SCORE (LB)</b>	10 9 8 7 6 5 4 3 2 1 0	8 7 6 5 4 3 2 1 0	5 4 3 2 1 0	3 2 1 0
<b>SCORE (RB)</b>	10 9 8 7 6 5 4 3 2 1 0	8 7 6 5 4 3 2 1 0	5 4 3 2 1 0	3 2 1 0
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
<b>SCORE (LB)</b>	10 9 8 7 6 5 4 3 2 1 0	8 7 6 5 4 3 2 1 0	5 4 3 2 1 0	3 2 1 0
<b>SCORE (RB)</b>	10 9 8 7 6 5 4 3 2 1 0	8 7 6 5 4 3 2 1 0	5 4 3 2 1 0	3 2 1 0

Total Score

58

NOTES/COMMENTS:

## Low Gradient Stream Data Sheet

STREAM NAME: <u>Sinking Fork</u>		LOCATION: <u>2.5 mi. Church Road</u>		
STATION #: <u>CEP200016</u> MILE:		BASIN/WATERSHED: <u>Little River</u>		
LAT.: _____ LONG.: _____		COUNTY: <u>Christian</u> USGS 7.5 TOPO:		
DATE: <u>07/06/03</u> TIME: <u>3:45</u> <input type="checkbox"/> AM <input checked="" type="checkbox"/> PM		INVESTIGATORS: <u>Ken, John, Pinar, Matt</u>		
TYPE SAMPLE: <input type="checkbox"/> P-CHEM <input checked="" type="checkbox"/> Macroinvertebrate <input type="checkbox"/> FISH <input type="checkbox"/> BACT. <input checked="" type="checkbox"/> ALGAE				
WEATHER: Now _____ Past 24 hours _____		Has there been a heavy rain in the last 7 days?		
<input type="checkbox"/> Heavy rain		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		
<input type="checkbox"/> Steady rain		Air Temperature <u>80</u> °C. Inches rainfall in past 24 hours _____ in.		
<input type="checkbox"/> Intermittent showers		<u>0</u> % Cloud Cover		
<input checked="" type="checkbox"/> Clear/sunny				
P-Chem: Temp(°C) _____ D.O. (mg/l) _____ %Saturation _____ pH(S.U.) _____ Cond. _____ <input type="checkbox"/> Grab				
<b>INSTREAM WATERSHED FEATURES:</b> Stream Width _____ ft Range of Depth _____ ft Average Velocity _____ ft/s Discharge _____ cfs Est. Reach Length _____		<b>LOCAL WATERSHED FEATURES:</b> Predominant Surrounding Land Use: <input type="checkbox"/> Surface Mining <input type="checkbox"/> Construction <input type="checkbox"/> Forest <input type="checkbox"/> Deep Mining <input type="checkbox"/> Commercial <input type="checkbox"/> Pasture/Grazing <input type="checkbox"/> Oil Wells <input type="checkbox"/> Industrial <input type="checkbox"/> Silviculture <input type="checkbox"/> Land Disposal <input checked="" type="checkbox"/> Row Crops <input type="checkbox"/> Urban Runoff/Storm Sewers		
Hydraulic Structures: <input type="checkbox"/> Dams <input checked="" type="checkbox"/> Bridge Abutments <input type="checkbox"/> Island <input type="checkbox"/> Waterfalls <input type="checkbox"/> Other _____		Stream Flow: <input type="checkbox"/> Dry <input type="checkbox"/> Pooled <input type="checkbox"/> Low <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> High <input type="checkbox"/> Very Rapid or Torrential <input type="checkbox"/> Ephemeral <input type="checkbox"/> Seep		
Riparian Vegetation: Dom. Tree/Shrub Taxa _____ Dominate Type: <input checked="" type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous Number of strata _____		Canopy Cover: <input type="checkbox"/> Fully Exposed (0-25%) <input type="checkbox"/> Partially Exposed (25-50%) <input checked="" type="checkbox"/> Partially Shaded (50-75%) <input type="checkbox"/> Fully Shaded (75-100%)		
		Channel Alterations: <input type="checkbox"/> Dredging <input checked="" type="checkbox"/> Channelization ( <input type="checkbox"/> Full <input checked="" type="checkbox"/> Partial)		
Substrate <input type="checkbox"/> Est. <input type="checkbox"/> P.C.	Riffle <u>20</u> %	Run <u>75</u> %	Pool <u>5</u> %	
Silt/Clay (<0.06 mm)		10	50	
Sand (0.06 - 2 mm)	10	10	50	
Gravel (2-64 mm)	40	40		
Cobble (64 - 256 mm)	30	30		
Boulders (>256 mm)	20	10		
Bedrock				
Habitat	Condition Category			
Parameter	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% 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).	30-50% 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).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>5. Channel Flow Status</b>	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 little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.	Some 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.	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 gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	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 sloughing; 60-100% of bank has erosional scars.
Note: determine left or right side by facing downstream.				
SCORE (LB)	Left Bank 10 9 8 7 6	5 4 3 2 1 0	5 4 3 2 1 0	5 4 3 2 1 0
SCORE (RB)	Right Bank 10 9 8 7 6	5 4 3 2 1 0	5 4 3 2 1 0	5 4 3 2 1 0
<b>9. Vegetative Protection (score each bank)</b>	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.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	Left Bank 10 9 8 7 6	5 4 3 2 1 0	5 4 3 2 1 0	5 4 3 2 1 0
SCORE (RB)	Right Bank 10 9 8 7 6	5 4 3 2 1 0	5 4 3 2 1 0	5 4 3 2 1 0
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	Left Bank 10 9 8 7 6	5 4 3 2 1 0	5 4 3 2 1 0	5 4 3 2 1 0
SCORE (RB)	Right Bank 10 9 8 7 6	5 4 3 2 1 0	5 4 3 2 1 0	5 4 3 2 1 0

Total Score

54

NOTES/COMMENTS:



### Low Gradient Stream Data Sheet

STREAM NAME: <i>Little River</i>		LOCATION: <i>Huffman Mill Rd</i>	
STATION #: <i>CR 2000 09</i> MILE:		BASIN/WATERSHED: <i>Little River</i>	
LAT.: _____ LONG.: _____		COUNTY: <i>Christian</i> USGS 7.5 TOPO:	
DATE: <i>05/15/03</i> TIME: <i>1:35 pm</i> <input type="checkbox"/> AM <input checked="" type="checkbox"/> PM		INVESTIGATORS: <i>P.B., J.W., M.D.</i>	
TYPE SAMPLE: <input checked="" type="checkbox"/> P-CHEM <input checked="" type="checkbox"/> Macroinvertebrate <input type="checkbox"/> FISH <input type="checkbox"/> BACT <input checked="" type="checkbox"/> ALGAE			
WEATHER: Now _____ Past 24 hours _____		Has there been a heavy rain in the last 7 days?	
<i>cloudy / sprinkles (now)</i>		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
<input type="checkbox"/> Heavy rain		Air Temperature <i>17</i> °C. Inches rainfall in past 24 hours _____ in.	
<input type="checkbox"/> Steady rain		<i>100</i> % Cloud Cover	
<input type="checkbox"/> Intermittent showers			
<input type="checkbox"/> Clear/sunny			
P-Chem: Temp(°C) _____ D.O. (mg/l) _____ %Saturation _____ pH(S.U.) _____ Cond. _____ <input type="checkbox"/> Grab			
<b>INSTREAM WATERSHED FEATURES:</b>		<b>LOCAL WATERSHED FEATURES:</b>	
Stream Width _____ ft		Predominant Surrounding Land Use:	
Range of Depth _____ ft		<input type="checkbox"/> Surface Mining <input type="checkbox"/> Construction <input type="checkbox"/> Forest	
Average Velocity _____ ft/s		<input type="checkbox"/> Deep Mining <input type="checkbox"/> Commercial <input type="checkbox"/> Pasture/Grazing	
Discharge _____ cfs		<input type="checkbox"/> Oil Wells <input type="checkbox"/> Industrial <input type="checkbox"/> Silviculture	
Est. Reach Length _____		<input type="checkbox"/> Land Disposal <input type="checkbox"/> Row Crops <input type="checkbox"/> Urban Runoff/Storm Sewers	
<b>Hydraulic Structures:</b>		<b>Stream Flow:</b>	
<input checked="" type="checkbox"/> Dams <input checked="" type="checkbox"/> Bridge Abutments		<input type="checkbox"/> Dry <input type="checkbox"/> Pooled <input type="checkbox"/> Low <input type="checkbox"/> Normal	
<input type="checkbox"/> Island <input type="checkbox"/> Waterfalls		<input checked="" type="checkbox"/> High <input type="checkbox"/> Very Rapid or Torrential	
<input type="checkbox"/> Other _____		<b>Stream Type:</b>	
		<input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent	
		<input type="checkbox"/> Ephemeral <input type="checkbox"/> Seep	
<b>Riparian Vegetation:</b>		<b>Canopy Cover:</b>	
Dom. Tree/Shrub Taxa _____		<input type="checkbox"/> Fully Exposed (0-25%)	
Dominate Type: <i>Maple (Acer)</i>		<input checked="" type="checkbox"/> Partially Exposed (25-50%)	
<input checked="" type="checkbox"/> Trees <input type="checkbox"/> Shrubs		<input type="checkbox"/> Partially Shaded (50-75%)	
<input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous		<input type="checkbox"/> Fully Shaded (75-100%)	
Number of strata _____		<b>Channel Alterations:</b>	
		<input type="checkbox"/> Dredging	
		<input checked="" type="checkbox"/> Channelization	
		<input checked="" type="checkbox"/> Full <input type="checkbox"/> Partial	
Substrate <input type="checkbox"/> Est. <input type="checkbox"/> P.C.		Riffle <i>10</i> %	
Silt/Clay (<0.06 mm)		Run <i>70</i> %	
Sand (0.06 - 2 mm)		Pool <i>20</i> %	
Gravel (2-64 mm)			
Cobble (64 - 256 mm)			
Boulders (>256 mm)			
Bedrock			
<b>Habitat</b>		<b>Condition Category</b>	
<b>Parameter</b>		<b>Optimal</b>	
		<b>Suboptimal</b>	
		<b>Marginal</b>	
		<b>Poor</b>	
<b>1. Epifaunal Substrate/Available Cover</b>		Greater than 50% 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).	
		30-50% 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).	
		10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	
		Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.	
<b>SCORE</b>		20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0	
<b>2. Pool Substrate Characterization</b>		Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	
		Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	
		All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	
		Hard-pan clay or bedrock; no root mat or vegetation.	
<b>SCORE</b>		20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0	
<b>3. Pool Variability</b>		Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	
		Majority of pools large-deep; very few shallow.	
		Shallow pools much more prevalent than deep pools.	
		Majority of pools small-shallow or pools absent.	
<b>SCORE</b>		20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0	

Best Available Copy

<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>5. Channel Flow Status</b>	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 little water in channel and mostly present as standing pools.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.	Some 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.	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 gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	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 sloughing; 60-100% of bank has erosional scars.
<b>Note:</b> determine left or right side by facing downstream.				
<b>SCORE (LB)</b>	Left Bank 10 9	8 7 6	5 4 3	2 1 0
<b>SCORE (RB)</b>	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>9. Vegetative Protection (score each bank)</b>	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.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
<b>SCORE (LB)</b>	Left Bank 10 9	8 7 6	5 4 3	2 1 0
<b>SCORE (RB)</b>	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
<b>SCORE (LB)</b>	Left Bank 10 9	8 7 6	5 4 3	2 1 0
<b>SCORE (RB)</b>	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score

91

NOTES/COMMENTS:

## Low Gradient Stream Data Sheet

STREAM NAME: <u>CR 2000 09</u>		LOCATION: <u>Huffman Mill Rd</u>		
STATION #: <u>Little River</u> MILE:		BASIN/WATERSHED: <u>Little River</u>		
LAT.:	LONG.:	COUNTY: <u>Christiansburg</u> USGS 7.5 TOPO:		
DATE: <u>09/06/03</u> TIME: <u>1:10</u> <input type="checkbox"/> AM <input checked="" type="checkbox"/> PM		INVESTIGATORS: <u>Ken, John, Peter, Matt</u>		
TYPE SAMPLE: <input type="checkbox"/> P-CHEM <input checked="" type="checkbox"/> Macroinvertebrate <input type="checkbox"/> FISH <input type="checkbox"/> BACT <input checked="" type="checkbox"/> ALGAE				
WEATHER:		Has there been a heavy rain in the last 7 days?		
Now <input type="checkbox"/> Past 24 hours <input type="checkbox"/> Heavy rain <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Steady rain <input type="checkbox"/> Intermittent showers <input type="checkbox"/> Air Temperature <u>78</u> °C. Inches rainfall in past 24 hours _____ in. <input type="checkbox"/> Clear/sunny <input checked="" type="checkbox"/> % Cloud Cover <u>0</u>				
P-Chem: Temp(°C) _____ D.O. (mg/l) _____ %Saturation _____ pH(S.U.) _____ Cond. _____ <input type="checkbox"/> Grab				
<b>INSTREAM WATERSHED FEATURES:</b> Stream Width _____ ft Range of Depth _____ ft Average Velocity _____ ft/s Discharge _____ cfs Est. Reach Length _____		<b>LOCAL WATERSHED FEATURES:</b> Predominant Surrounding Land Use: <input type="checkbox"/> Surface Mining <input type="checkbox"/> Construction <input type="checkbox"/> Forest <input type="checkbox"/> Deep Mining <input type="checkbox"/> Commercial <input type="checkbox"/> Pasture/Grazing <input type="checkbox"/> Oil Wells <input type="checkbox"/> Industrial <input type="checkbox"/> Silviculture <input type="checkbox"/> Land Disposal <input type="checkbox"/> Row Crops <input type="checkbox"/> Urban Runoff/Storm Sewers		
<b>Hydraulic Structures:</b> <input type="checkbox"/> Dams <input checked="" type="checkbox"/> Bridge Abutments <input type="checkbox"/> Island <input type="checkbox"/> Waterfalls <input type="checkbox"/> Other _____		<b>Stream Flow:</b> <input type="checkbox"/> Dry <input type="checkbox"/> Pooled <input type="checkbox"/> Low <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> High <input type="checkbox"/> Very Rapid or Torrential <input type="checkbox"/> Ephemeral <input type="checkbox"/> Seep		
Riparian Vegetation: Dom. Tree/Shrub Taxa Dominate Type: <input checked="" type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous Number of strata _____		Canopy Cover: <input type="checkbox"/> Fully Exposed (0-25%) <input checked="" type="checkbox"/> Partially Exposed (25-50%) <input type="checkbox"/> Partially Shaded (50-75%) <input type="checkbox"/> Fully Shaded (75-100%)		
		Channel Alterations: <input type="checkbox"/> Dredging <input checked="" type="checkbox"/> Channelization ( <input type="checkbox"/> Full <input type="checkbox"/> Partial )		
Substrate <input type="checkbox"/> Est. <input type="checkbox"/> P.C.	Rifle <u>20%</u>	Run <u>80%</u>	Pool <u>0%</u>	
Silt/Clay (<0.06 mm)		<u>50%</u>		
Sand (0.06 - 2 mm)		<u>20%</u>		
Gravel (2-64 mm)		<u>10%</u>		
Cobble (64 - 256 mm)		<u>10%</u>		
Boulders (>256 mm)	<u>10%</u>	<u>10%</u>		
Bedrock	<u>90%</u>			
Habitat	Condition Category			
Parameter	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/Available Cover	Greater than 50% 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).	30-50% 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).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

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4. Sediment Deposition	Is the stream channel free of silt, sand or fine gravel? Is the channel bed level? Is the channel bed level? Is the channel bed level?	Is the stream channel free of silt, sand or fine gravel? Is the channel bed level? Is the channel bed level? Is the channel bed level?	Is the stream channel free of silt, sand or fine gravel? Is the channel bed level? Is the channel bed level? Is the channel bed level?	Heavy deposits of fine material, increased bar development; 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	5 4 3 2 1 0	5 4 3 2 1 0	5 4 3 2 1 0	5 4 3 2 1 0
5. Channel Flow Status	What percent of the channel is in a natural state? Is the channel bed level? Is the channel bed level? Is the channel bed level?	What percent of the channel is in a natural state? Is the channel bed level? Is the channel bed level? Is the channel bed level?	What percent of the channel is in a natural state? Is the channel bed level? Is the channel bed level? Is the channel bed level?	Very little water in channel and mostly present as standing pools.
SCORE	5 4 3 2 1 0	5 4 3 2 1 0	5 4 3 2 1 0	5 4 3 2 1 0
6. Channel Alteration	Channel has been dredged, altered or straightened with man-made structures.	Channel has been dredged, altered or straightened with man-made structures.	Channel has been dredged, altered or straightened with man-made structures.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	5 4 3 2 1 0	5 4 3 2 1 0	5 4 3 2 1 0	5 4 3 2 1 0
7. Channel Sinuosity	What is the channel sinuosity? Is the channel bed level? Is the channel bed level? Is the channel bed level?	What is the channel sinuosity? Is the channel bed level? Is the channel bed level? Is the channel bed level?	What is the channel sinuosity? Is the channel bed level? Is the channel bed level? Is the channel bed level?	Channel straight; waterway has been channelized for a long distance.
SCORE	5 4 3 2 1 0	5 4 3 2 1 0	5 4 3 2 1 0	5 4 3 2 1 0
8. Bank Stability (score each bank)	Is the bank stable? Is the bank stable? Is the bank stable? Is the bank stable?	Is the bank stable? Is the bank stable? Is the bank stable? Is the bank stable?	Is the bank stable? Is the bank stable? Is the bank stable? Is the bank stable?	Unstable; many eroded areas; "raw" areas frequent along straight sections and roads; obvious bank sloughing; 60-100% of bank are erosional scars.
Note: determine left or right side by facing downstream.				
SCORE (L)	5 4 3 2 1 0	5 4 3 2 1 0	5 4 3 2 1 0	5 4 3 2 1 0
SCORE (R)	5 4 3 2 1 0	5 4 3 2 1 0	5 4 3 2 1 0	5 4 3 2 1 0
9. Vegetative Protection (score each bank)	Is the bank protected by vegetation? Is the bank protected by vegetation? Is the bank protected by vegetation? Is the bank protected by vegetation?	Is the bank protected by vegetation? Is the bank protected by vegetation? Is the bank protected by vegetation? Is the bank protected by vegetation?	Is the bank protected by vegetation? Is the bank protected by vegetation? Is the bank protected by vegetation? Is the bank protected by vegetation?	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 50 centimeters or less in average stubble height.
SCORE (L)	5 4 3 2 1 0	5 4 3 2 1 0	5 4 3 2 1 0	5 4 3 2 1 0
SCORE (R)	5 4 3 2 1 0	5 4 3 2 1 0	5 4 3 2 1 0	5 4 3 2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	What is the riparian zone width? Is the riparian zone width? Is the riparian zone width? Is the riparian zone width?	What is the riparian zone width? Is the riparian zone width? Is the riparian zone width? Is the riparian zone width?	What is the riparian zone width? Is the riparian zone width? Is the riparian zone width? Is the riparian zone width?	Width of riparian zone < 6 meters; little or no riparian vegetation due to human activities.
SCORE (L)	5 4 3 2 1 0	5 4 3 2 1 0	5 4 3 2 1 0	5 4 3 2 1 0
SCORE (R)	5 4 3 2 1 0	5 4 3 2 1 0	5 4 3 2 1 0	5 4 3 2 1 0

Total score  
82

## Low Gradient Stream Data Sheet

STREAM NAME: <u>Sinking fork</u>		LOCATION: <u>S.R. 91 - Princeton</u>		
STATION #: <u>cel2000 10</u> MILE:		BASIN/WATERSHED: <u>Little River</u>		
LAT.:	LONG.:	COUNTY: <u>Christon</u> USGS 7.5 TOPO:		
DATE: <u>5.20.03</u>	TIME: <u>1:13</u> <input checked="" type="checkbox"/> AM <input type="checkbox"/> PM	INVESTIGATORS: <u>P.B., M.D., J.W.</u>		
TYPE SAMPLE: <input type="checkbox"/> P-CHEM <input type="checkbox"/> Macroinvertebrate <input type="checkbox"/> FISH <input type="checkbox"/> BACT. <input type="checkbox"/> ALGAE				
WEATHER: Now		Past 24 hours		
<input type="checkbox"/>		<input type="checkbox"/> Heavy rain		
<input type="checkbox"/>		<input type="checkbox"/> Steady rain		
<input type="checkbox"/>		<input checked="" type="checkbox"/> Intermittent showers		
<input type="checkbox"/>		<input type="checkbox"/> Clear/sunny		
Has there been a heavy rain in the last 7 days? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No				
Air Temperature <u>17</u> °C. Inches rainfall in past 24 hours _____ in. <u>100</u> % Cloud Cover				
P-Chem: Temp(°C) _____ D.O. (mg/l) _____ %Saturation _____ pH(S.U.) _____ Cond _____ <input type="checkbox"/> Grab				
INSTREAM WATERSHED FEATURES:		LOCAL WATERSHED FEATURES:		
Stream Width _____ ft		Predominant Surrounding Land Use:		
Range of Depth _____ ft		<input type="checkbox"/> Surface Mining		
Average Velocity _____ ft/s		<input type="checkbox"/> Deep Mining		
Discharge _____ cfs		<input type="checkbox"/> Oil Wells		
Est. Reach Length _____		<input type="checkbox"/> Land Disposal		
		<input type="checkbox"/> Construction		
		<input type="checkbox"/> Commercial		
		<input type="checkbox"/> Industrial		
		<input checked="" type="checkbox"/> Row Crops		
		<input type="checkbox"/> Forest		
		<input checked="" type="checkbox"/> Pasture/Grazing		
		<input type="checkbox"/> Silviculture		
		<input type="checkbox"/> Urban Runoff/Storm Sewers		
Hydraulic Structures:		Stream Flow:		
<input type="checkbox"/> Dams <input checked="" type="checkbox"/> Bridge Abutments		<input type="checkbox"/> Dry <input type="checkbox"/> Pooled <input type="checkbox"/> Low <input checked="" type="checkbox"/> Normal		
<input type="checkbox"/> Island <input type="checkbox"/> Waterfalls		<input type="checkbox"/> High <input type="checkbox"/> Very Rapid or Torrential		
<input type="checkbox"/> Other _____		Stream Type:		
		<input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent		
		<input type="checkbox"/> Ephemeral <input type="checkbox"/> Seep		
Riparian Vegetation: Dom. Tree/Shrub Taxa		Canopy Cover:		
Dominate Type: <u>oak</u>		<input type="checkbox"/> Fully Exposed (0-25%)		
<input checked="" type="checkbox"/> Trees <input type="checkbox"/> Shrubs		<input type="checkbox"/> Partially Exposed (25-50%)		
<input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous		<input checked="" type="checkbox"/> Partially Shaded (50-75%)		
Number of strata _____		<input type="checkbox"/> Fully Shaded (75-100%)		
		Channel Alterations:		
		<input type="checkbox"/> Dredging		
		<input checked="" type="checkbox"/> Channelization		
		<input type="checkbox"/> Full <input type="checkbox"/> Partial		
Substrate <input type="checkbox"/> Est. <input type="checkbox"/> P.C.	Rifle <u>10</u> %	Run <u>70</u> %	Pool <u>20</u> %	
Silt/Clay (<0.06 mm)		✓	✓	
Sand (0.06 - 2 mm)		✓		
Gravel (2-64 mm)	✓			
Cobble (64 - 256 mm)	✓			
Boulders (>256 mm)			✓	
Bedrock		✓		
Habitat	Condition Category			
Parameter	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/Available Cover	Greater than 50% 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).	30-50% 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).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>5. Channel Flow Status</b>	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 little water in channel and mostly present as standing pools.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.	Some 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.	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 gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.  Note: determine left or right side by facing downstream.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	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 sloughing; 60-100% of bank has erosional scars.
<b>SCORE (LB)</b>	Left Bank 10 9	8 7 6	5 4 3	2 1 0
<b>SCORE (RB)</b>	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>9. Vegetative Protection (score each bank)</b>	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.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
<b>SCORE (LB)</b>	Left Bank 10 9	8 7 6	5 4 3	2 1 0
<b>SCORE (RB)</b>	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
<b>SCORE (LB)</b>	Left Bank 10 9	8 7 6	5 4 3	2 1 0
<b>SCORE (RB)</b>	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score

79

NOTES/COMMENTS:

Low Gradient Stream Data Form

STREAM NAME: <u>Sinking Fork</u>		LOCATION: <u>S.R. 91 - Princeton</u>		
STATION #: <u>02200010</u> MILE:		BASIN/WATERSHED: <u>Little River</u>		
LAT: _____ LONG: _____		COUNTY: <u>Cherokee</u> USGS 7.5 TOPO: _____		
DATE: <u>09/05/03</u> TIME: <u>4:00</u> <input type="checkbox"/> AM <input checked="" type="checkbox"/> PM		INVESTIGATORS: <u>Andy Gohn, Ker, Matt, Natalie</u>		
TYPE SAMPLE: <input type="checkbox"/> P-CHEM <input checked="" type="checkbox"/> Macroinvertebrate <input type="checkbox"/> FISH <input type="checkbox"/> PACT <input type="checkbox"/> ALGAE		<u>Amorpha</u>		
WEATHER: Now _____ Past 24 hours _____ Has there been a heavy rain in the last 7 days? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No				
<input type="checkbox"/> Heavy rain <input type="checkbox"/> Steady rain <input type="checkbox"/> Intermittent showers <input checked="" type="checkbox"/> Clear/sunny				
Air Temperature <u>82</u> °F. Inches rainfall in past 24 hours _____ in. <input type="checkbox"/> 0-2% Cloud cover				
P-Chem: Temp(°C) _____ D.O. (mg/l) _____ % Saturation _____ pH (25°C) _____ Cond. _____ <input type="checkbox"/> Grab				
INSTREAM WATERSHED FEATURES: Stream Width _____ ft Range of Depth _____ ft Average Velocity _____ ft/s Discharge _____ cfs Est. Reach Length _____		LOCAL WATERSHED FEATURES: Predominant Surrounding Land Use: <input type="checkbox"/> Surface Mining <input type="checkbox"/> Coal storage <input type="checkbox"/> Forest <input type="checkbox"/> Deep Mining <input type="checkbox"/> Coal mine <input type="checkbox"/> Pasture/Grazing <input type="checkbox"/> Oil Wells <input type="checkbox"/> Industrial <input type="checkbox"/> Silviculture <input type="checkbox"/> Land Disposal <input checked="" type="checkbox"/> Flow Control <input type="checkbox"/> Urban Runoff/Storm Sewers		
Hydraulic Structures: <input type="checkbox"/> Dams <input checked="" type="checkbox"/> Bridge Abutments <input type="checkbox"/> Island <input type="checkbox"/> Waterfalls <input type="checkbox"/> Other _____		Stream Flow: <input type="checkbox"/> Dry <input type="checkbox"/> Pooled <input type="checkbox"/> Low <input checked="" type="checkbox"/> Normal <input type="checkbox"/> High <input type="checkbox"/> Very Rapid _____		
Riparian Vegetation: Dom. Tree/Shrub Taxa _____ Dominate Type: <input checked="" type="checkbox"/> Trees <input type="checkbox"/> Shrubs <u>Sycamore</u> <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous <u>Alumina</u> Number of strata _____		Channel Alterations: <input type="checkbox"/> Dredging <input type="checkbox"/> Channelization <input checked="" type="checkbox"/> Full <input checked="" type="checkbox"/> Partial		
Substrate <input type="checkbox"/> Est. <input type="checkbox"/> P.C.		Rifle <u>10</u> % Run <u>50</u> % Pool <u>0</u> %		
Silt/Clay (<0.06 mm)				
Sand (0.06 - 2 mm)		<u>10</u>		
Gravel (2-64 mm)		<u>30</u>		
Cobble (64 - 256 mm)		<u>30</u>		
Boulders (>256 mm)		<u>30</u>		
Bedrock				
Habitat		Condition Category		
Parameter	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/Available Cover	Greater than 50% 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).	30-50% 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 (mostly at high end of scale).	10-20% mix of stable habitat; habitat availability less than desirable; substrate (recently) disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20	15	10	5
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand mud, or clay; mud not predominant; some root mats and submerged vegetation present.	Silt and/or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20	15	10	5
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few small-deep.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20	15	10	5

<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>5. Channel Flow Status</b>	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 little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.	Some 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.	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 gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.  Note: determine left or right side by facing downstream.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	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 sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	Left Bank 10 9 8 7 6	8 7 6	5 4 3 2 1 0	5 4 3 2 1 0
SCORE (RB)	Right Bank 10 9 8 7 6	8 7 6	5 4 3 2 1 0	5 4 3 2 1 0
<b>9. Vegetative Protection (score each bank)</b>	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.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	Left Bank 10 9 8 7 6	8 7 6	5 4 3 2 1 0	5 4 3 2 1 0
SCORE (RB)	Right Bank 10 9 8 7 6	8 7 6	5 4 3 2 1 0	5 4 3 2 1 0
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	Left Bank 10 9 8 7 6	8 7 6	5 4 3 2 1 0	5 4 3 2 1 0
SCORE (RB)	Right Bank 10 9 8 7 6	8 7 6	5 4 3 2 1 0	5 4 3 2 1 0

Total Score

69

NOTES/COMMENTS:



### Low Gradient Stream Data Sheet

STREAM NAME: <u>Sinking Fork</u>		LOCATION: <u> Hwy 68 - sample</u>		
STATION #: <u>CEL 2000 11</u> MILE:		BASIN/WATERSHED: <u>Little River</u>		
LAT.:	LONG.:	COUNTY: <u>Cherokee</u> USGS 7.5 TOPO:		
DATE: <u>5/20</u>	TIME: <u>1:30</u> <input type="checkbox"/> AM <input checked="" type="checkbox"/> PM	INVESTIGATOR: <u>PB, MD, JW</u>		
TYPE SAMPLE: <input type="checkbox"/> P-CHEM <input type="checkbox"/> Macroinvertebrate <input type="checkbox"/> FISH <input type="checkbox"/> BACT. <input type="checkbox"/> ALGAE				
WEATHER: <u>sprinkling rain</u>		Has there been a heavy rain in the last 7 days? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		
<input type="checkbox"/> Now <input type="checkbox"/> Past 24 hours		Air Temperature _____ °C. Inches rainfall in past 24 hours _____ in.		
<input type="checkbox"/> <input type="checkbox"/> Heavy rain		<u>100</u> % Cloud Cover		
<input type="checkbox"/> <input type="checkbox"/> Steady rain				
<input type="checkbox"/> <input checked="" type="checkbox"/> Intermittent showers				
<input type="checkbox"/> <input type="checkbox"/> Clear/sunny				
P-Chem: Temp(°C) _____ D.O. (mg/l) _____ % Saturation _____ pH(3.0) _____ Cond. _____ <input type="checkbox"/> Grab				
<b>INSTREAM WATERSHED FEATURES:</b>		<b>LOCAL WATERSHED FEATURES:</b>		
Stream Width _____ ft		Predominant Surrounding Land Use:		
Range of Depth _____ ft		<input type="checkbox"/> Surface Mining <input type="checkbox"/> Construction <input type="checkbox"/> Forest		
Average Velocity _____ ft/s		<input type="checkbox"/> Deep Mining <input type="checkbox"/> Commercial <input checked="" type="checkbox"/> Pasture/Grazing		
Discharge _____ cfs		<input type="checkbox"/> Oil Wells <input type="checkbox"/> Industrial <input type="checkbox"/> Silviculture		
Est. Reach Length _____		<input checked="" type="checkbox"/> Land Disposal <input checked="" type="checkbox"/> Row Crops <input type="checkbox"/> Urban Runoff/Storm Sewers		
<b>Hydraulic Structures:</b>		<b>Stream Flow:</b>		
<input type="checkbox"/> Dams <input type="checkbox"/> Bridge Abutments		<input type="checkbox"/> Dry <input type="checkbox"/> Pooled <input type="checkbox"/> Low <input checked="" type="checkbox"/> Normal		
<input type="checkbox"/> Island <input type="checkbox"/> Waterfalls		<input type="checkbox"/> High <input type="checkbox"/> Very Rapid or Torrential		
<input type="checkbox"/> Other _____		<b>Stream Type:</b>		
		<input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent		
		<input type="checkbox"/> Ephemeral <input type="checkbox"/> Seep		
<b>Riparian Vegetation:</b> Dom. Tree/Shrub Taxa _____		<b>Canopy Cover:</b>		
Dominate Type: <input checked="" type="checkbox"/> Trees <input type="checkbox"/> Shrubs		<input type="checkbox"/> Fully Exposed (0-25%)		
<input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous		<input checked="" type="checkbox"/> Partially Exposed (25-50%)		
Number of strata _____		<input type="checkbox"/> Partially Shaded (50-75%)		
		<input type="checkbox"/> Fully Shaded (75-100%)		
		<b>Channel Alterations:</b>		
		<input type="checkbox"/> Dredging		
		<input type="checkbox"/> Channelization		
		<input type="checkbox"/> Full <input type="checkbox"/> Partial		
<b>Substrate</b> <input type="checkbox"/> Est. <input type="checkbox"/> P.C.		<b>Riffle</b> <u>5</u> %		
		<b>Run</b> <u>22</u> %		
		<b>Pool</b> <u>75</u> %		
Silt/Clay (<0.06 mm)				
Sand (0.06 - 2 mm)				
Gravel (2-64 mm)				
Cobble (64 - 256 mm)				
Boulders (>256 mm)				
Bedrock				
<b>Habitat</b>	<b>Condition Category</b>			
<b>Parameter</b>	<b>Optimal</b>	<b>Suboptimal</b>	<b>Marginal</b>	<b>Poor</b>
<b>1. Epifaunal Substrate/Available Cover</b>	Greater than 50% 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).	30-50% 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).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>2. Pool Substrate Characterization</b>	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All sand or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>3. Pool Variability</b>	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>5. Channel Flow Status</b>	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 little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.	Some 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.	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 gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	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 sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>9. Vegetative Protection (score each bank)</b>	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.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score

8

NOTES/COMMENTS:

Low Gradient Stream Data Sheet

STREAM NAME: Sinking Fork LOCATION:  Hwy 68 - Sample behind old grey church  
 STATION #: CEL200011 MILE: \_\_\_\_\_ BASIN/WATERSHED: Little River  
 LAT.: \_\_\_\_\_ LONG.: \_\_\_\_\_ COUNTY: Cherokee USGS 7.5 TOPO: \_\_\_\_\_  
 DATE: 09/06/03 TIME: 8:15  AM  PM INVESTIGATORS: Pratt, Robt, Ker, Matt  
 TYPE SAMPLE:  P-CHEM  Macroinvertebrate  FISH  BACT.  ALGAE

WEATHER: Now \_\_\_\_\_ Past 24 hours \_\_\_\_\_ Has there been a heavy rain in the last 7 days?  
 Heavy rain  No  
 Steady rain Air Temperature \_\_\_\_\_ °C Inches rainfall in past 24 hours \_\_\_\_\_ in.  
 Intermittent showers \_\_\_\_\_ % Cloud Cover  
 Clear/sunny

P-Chem: Temp(°C) \_\_\_\_\_ D.O. (mg/l) \_\_\_\_\_ %Saturation \_\_\_\_\_ pH(25°C) \_\_\_\_\_ Cond. \_\_\_\_\_  Grab

INSTREAM WATERSHED FEATURES: Stream Width \_\_\_\_\_ ft  
 Range of Depth \_\_\_\_\_ ft Average Velocity \_\_\_\_\_ ft/s  
 Discharge \_\_\_\_\_ cfs Est. Reach Length \_\_\_\_\_

LOCAL WATERSHED FEATURES: Predominant Surrounding Land Use:  
 Surface Mining  Construction  Forest  
 Deep Mining  Commercial  Pasture/Grazing  
 Oil Wells  Industrial  Silviculture  
 Land Disposal  Row Crops  Urban Runoff/Storm Sewers

Hydraulic Structures:  Dams  Bridge Abutments  Island  Waterfalls  Other \_\_\_\_\_

Stream Flow:  Dry  Pooled  Low  Normal  High  Very Rapid or Torrential

Stream Type:  Perennial  Intermittent  Ephemeral  Seep

Riparian Vegetation: Dom. Tree/Shrub Taxa \_\_\_\_\_  
 Dominate Type:  Trees  Shrubs  Grasses  Herbaceous  
 Number of strata \_\_\_\_\_

Canopy Cover:  Fully Exposed (0-25%)  Partly Exposed (25-50%)  Partly Shaded (50-75%)  Fully Shaded (75-100%)

Channel Alterations:  Dredging  Channelization (  Full  Partial )

Substrate	Est. %	Riffle %	Run %	Pool %
Silt/Clay (<0.06 mm)				
Sand (0.06 - 2 mm)		5	5	25
Gravel (2-64 mm)		5	5	5
Cobble (64 - 256 mm)		20	20	20
Boulders (>256 mm)		50	60	40
Bedrock		20	10	10

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 50% 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).	30-50% 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 be at high end of scale).	10-30% mix of stable habitat, but cover availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>5. Channel Flow Status</b>	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 little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.	Some 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.	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 gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion; mostly healed over. 5-30% of bank in reach has areas of erosion.	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 sloughing; 60-100% of bank has erosional scars.
Note: determine left or right side by facing downstream.				
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>9. Vegetative Protection (score each bank)</b>	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.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score

78

NOTES/COMMENTS:

## Low Gradient Stream Data Sheet

STREAM NAME: <u>Little River</u>		LOCATION:	
STATION #: <u>CEL 2000 12</u> MILE:		BASIN/WATERSHED: <u>Little River</u>	
LAT.:	LONG.:	COUNTY: <u>Cherokee</u> USGS 7.5 TOPO:	
DATE: <u>05/15/03</u> TIME: <u>3:35</u> <input type="checkbox"/> AM <input checked="" type="checkbox"/> PM		INVESTIGATOR: <u>                    </u>	
TYPE SAMPLE: <input checked="" type="checkbox"/> P-CHEM <input checked="" type="checkbox"/> Macroinvertebrate <input type="checkbox"/> FISH <input type="checkbox"/> BACT <input checked="" type="checkbox"/> ALGAE			
WEATHER: Now <input type="checkbox"/> <u>Partly cloudy (now)</u>		Past 24 hours <input checked="" type="checkbox"/> Heavy rain <input type="checkbox"/> Steady rain <input checked="" type="checkbox"/> Intermittent showers <input type="checkbox"/> Clear/sunny Has there been a heavy rain in the last 7 days? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Air Temperature <u>22</u> °C. Inches rainfall in past 24 hours <u>          </u> in. % Cloud Cover <u>          </u>	
P-Chem: Temp(°C) <u>          </u> D.O. (mg/l) <u>          </u> %Saturation <u>          </u> pH <u>          </u> Cond. <u>          </u> <input type="checkbox"/> Grab			
<b>INSTREAM WATERSHED FEATURES:</b> Stream Width <u>          </u> ft Range of Depth <u>          </u> ft Average Velocity <u>          </u> ft/s Discharge <u>          </u> cfs Est. Reach Length <u>          </u>		<b>LOCAL WATERSHED FEATURES:</b> Predominant Surrounding Land Use: <input type="checkbox"/> Surface Mining <input type="checkbox"/> Construction <input type="checkbox"/> Forest <input type="checkbox"/> Deep Mining <input type="checkbox"/> Commercial <input type="checkbox"/> Pasture/Grazing <input type="checkbox"/> Oil Wells <input type="checkbox"/> Industrial <input type="checkbox"/> Silviculture <input type="checkbox"/> Land Disposal <input checked="" type="checkbox"/> Flow Lines <input checked="" type="checkbox"/> Urban Runoff/Storm Sewers	
<b>Hydraulic Structures:</b> <input type="checkbox"/> Dams <input checked="" type="checkbox"/> Bridge Abutments <input type="checkbox"/> Island <input type="checkbox"/> Waterfalls <input type="checkbox"/> Other		<b>Stream Flow:</b> <input type="checkbox"/> Dry <input type="checkbox"/> Flooded <input type="checkbox"/> Low <input type="checkbox"/> Normal <input type="checkbox"/> High <input type="checkbox"/> Very Rapid or Turbulent <b>Stream Type:</b> <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Ephemeral <input type="checkbox"/> Seep	
Riparian Vegetation: Dom. Tree/Shrub Taxa <u>          </u> Dominant Type: <input checked="" type="checkbox"/> Trees <input type="checkbox"/> Shrubs <u>Acer Elm</u> <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous Number of strata <u>          </u>		Canopy Cover: <input type="checkbox"/> Fully Exposed (0-25%) <input type="checkbox"/> Partially Exposed (27-50%) <input checked="" type="checkbox"/> Partially Shaded (50-75%) <input type="checkbox"/> Fully Shaded (75-100%) Channel Alterations: <input type="checkbox"/> Dredging <input checked="" type="checkbox"/> Channelization (Fully/Partial)	
Substrate <input type="checkbox"/> Est. <input type="checkbox"/> P.C.	Riffle <input type="checkbox"/> %	Run <input type="checkbox"/> %	Pool <input checked="" type="checkbox"/> %
Silt/Clay (<0.06 mm)			<input checked="" type="checkbox"/>
Sand (0.06 - 2 mm)			<input checked="" type="checkbox"/>
Gravel (2-64 mm)			
Cobble (64 - 256 mm)			
Boulders (>256 mm)			<input checked="" type="checkbox"/>
Bedrock			
<b>Habitat</b>	<b>Condition Categories</b>		
<b>Parameter</b>	<b>Optimal</b>	<b>Suboptimal</b>	<b>Poor</b>
1. Epifaunal Substrate/Available Cover	Greater than 50% 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).	30-50% mix of stable habitat; well suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (freshly cut at high end of scale).	10-30% mix of stable habitat; habitat availability less than potential; substrate frequently disturbed or removed.
SCORE	20 19 18 17 16	15 14 13 12 11 10	9 8 7 6 5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of silt, sand, mud, or clay and may be transient; some root mats and submerged vegetation present.	Alluvial clay or sand bottom; no or no root mats; no submerged vegetation.
SCORE	20 19 18 17 16	15 14 13 12 11 10	9 8 7 6 5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools. Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11 10	9 8 7 6 5 4 3 2 1 0

<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>5. Channel Flow Status</b>	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 little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.	Some 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.	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 gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	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 sloughing; 60-100% of bank has erosional scars.
Note: determine left or right side by facing downstream.				
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>9. Vegetative Protection (score each bank)</b>	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.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score

102

NOTES/COMMENTS:

Low Gradient Stream Data Sheet

STREAM NAME: Little River LOCATION: 117 So. Skipped  
 STATION #: 08200012 MILE: \_\_\_\_\_ BASIN/WATERSHED: Little River  
 LAT: \_\_\_\_\_ LONG: \_\_\_\_\_ COUNTY: \_\_\_\_\_ USGS 7.5 TOPO: \_\_\_\_\_  
 DATE: 1/9/88 TIME: 2:15  AM  PM INVESTIGATORS: Donny, John, Ken, Morel, Lth  
 TYPE SAMPLE:  P-CHEM  Macroinvertebrate  FISH  BACT.  ALGAE  
 WEATHER: Now \_\_\_\_\_ Past 24 hours \_\_\_\_\_ Has there been a storm in the last 7 days?  Yes  No  
 Heavy rain  Steady rain  Intermittent showers  Clear/sunny  
 Air Temperature: 70 °F - Inches rainfall in past 24 hours: 0 in.  
 % Cloud Cover: \_\_\_\_\_

P-Chem: Temp(°C) \_\_\_\_\_ D.O. (mg/l) \_\_\_\_\_ %Saturation \_\_\_\_\_ pH: 7.4 Cond. \_\_\_\_\_  Grab

**INSTREAM WATERSHED FEATURES:**  
 Stream Width \_\_\_\_\_ ft  
 Range of Depth \_\_\_\_\_ ft  
 Average Velocity \_\_\_\_\_ ft/s  
 Discharge \_\_\_\_\_ cfs  
 Est. Reach Length \_\_\_\_\_

**LOCAL WATERSHED FEATURES:**  
 Predominant Surrounding Land Use:  
 Surface Mining  Construction  Forest  
 Deep Mining  Concrete  Pasture/Grazing  
 Oil Wells  Industrial  Silviculture  
 Land Disposal  Law Crops  Urban Runoff/Storm Sewers

**Hydraulic Structures:**  
 Dams  Bridge Abutments  
 Island  Waterfalls  
 Other \_\_\_\_\_

**Stream Flow:**  
 Dry  Shaded  Low  Normal  
 High  Yes, kind of \_\_\_\_\_

**Stream Type:**  
 Perennial  Intermittent  
 Ephemeral  Seep

**Riparian Vegetation:** Dom. Tree/Shrub Taxa \_\_\_\_\_  
 Dominant Type:  
 Trees  Shrubs  
 Grasses  Herbaceous  
 Number of strata \_\_\_\_\_

**Canopy Cover:**  
 Full Exposure (0-45%)  
 Partially Shaded (25-75%)  
 Fully Shaded (50-100%)  
 Fully Shaded (5-100%)

**Channel Alterations:**  
 Dredging  
 Channelization  
 Partial

Substrate	Est. %	Riffle %	Run %	Pool %
Silt/Clay (<0.06 mm)				
Sand (0.06 - 2 mm)		10		
Gravel (2-64 mm)		15		
Cobble (64 - 256 mm)		20		
Boulders (>256 mm)		55	50	
Bedrock				

Habitat	Condition Categories			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/Available Cover	Greater than 50% 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).	30-50% mix of stable to well-sited 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 be a high rate of scale).	50-80% mix of stable habitat; not as well-sited as optimal; less than desirable; substrate often disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mix of fine sand, silt, clay; mud may be present; some root mats and submerged vegetation present.	Mud or fine silt or sand prevalent; root mats and submerged vegetation absent.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Small shallow much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>5. Channel Flow Status</b>	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 little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.	Some 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.	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 gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	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 sloughing; 60-100% of bank has erosional scars.
Note: determine left or right side by facing downstream.				
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>9. Vegetative Protection (score each bank)</b>	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.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	Left Bank 10 9 8 7 6	5 4 3 2 1 0	5 4 3 2 1 0	2 1 0
SCORE (RB)	Right Bank 10 9 8 7 6	5 4 3 2 1 0	5 4 3 2 1 0	2 1 0
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	Left Bank 10 9 8 7 6	5 4 3 2 1 0	5 4 3 2 1 0	2 1 0
SCORE (RB)	Right Bank 10 9 8 7 6	5 4 3 2 1 0	5 4 3 2 1 0	2 1 0

Total Score

96

NOTES/COMMENTS:



### Low Gradient Stream Data Sheet

STREAM NAME: <u>Little River</u>		LOCATION: <u>SSR 1253 - Above Caser</u>		
STATION #: <u>Cell 200013</u> MILE:		BASIN/WATERSHED: <u>Little River</u>		
LAT.:	LONG.:	COUNTY: <u>Trigg</u>	USGS 7.5 TOPO:	
DATE: <u>09/07/03</u> TIME: <u>9:07</u> <input checked="" type="checkbox"/> AM <input type="checkbox"/> PM		INVESTIGATORS: <u>Penar, Key, John, Matt</u>		
TYPE SAMPLE: <input type="checkbox"/> P-CHEM <input checked="" type="checkbox"/> Macroinvertebrate <input type="checkbox"/> FISH <input type="checkbox"/> BACT. <input checked="" type="checkbox"/> ALGAE				
WEATHER: Now <input type="checkbox"/> Past 24 hours <input type="checkbox"/> Heavy rain <input type="checkbox"/> Steady rain <input type="checkbox"/> Intermittent showers <input type="checkbox"/> Clear/sunny				
Has there been a heavy rain in the last 7 days? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No				
Air Temperature _____ °C. Inches rainfall in past 24 hours _____ in.				
% Cloud Cover <u>0</u>				
P-Chem: Temp(°C) _____ D.O. (mg/l) _____ %Saturation _____ pH(S.U.) _____ Cond. _____ <input type="checkbox"/> Grab				
<b>INSTREAM WATERSHED FEATURES:</b> Stream Width _____ ft Range of Depth _____ ft Average Velocity _____ ft/s Discharge _____ cfs Est. Reach Length _____		<b>LOCAL WATERSHED FEATURES:</b> <b>Predominant Surrounding Land Use:</b> <input type="checkbox"/> Surface Mining <input type="checkbox"/> Construction <input type="checkbox"/> Forest <input type="checkbox"/> Deep Mining <input type="checkbox"/> Commercial <input type="checkbox"/> Pasture/Grazing <input type="checkbox"/> Oil Wells <input type="checkbox"/> Industrial <input type="checkbox"/> Siliculture <input type="checkbox"/> Land Disposal <input checked="" type="checkbox"/> Row Crops <input type="checkbox"/> Urban Runoff/Storm Sewers		
<b>Hydraulic Structures:</b> <input type="checkbox"/> Dams <input checked="" type="checkbox"/> Bridge Abutments <input type="checkbox"/> Island <input type="checkbox"/> Waterfalls <input type="checkbox"/> Other _____		<b>Stream Flow:</b> <input type="checkbox"/> Dry <input type="checkbox"/> Pooled <input type="checkbox"/> Low <input type="checkbox"/> Normal <input type="checkbox"/> High <input type="checkbox"/> Very Rapid or Torrential		
<b>Stream Type:</b> <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Ephemeral <input type="checkbox"/> Seep				
<b>Riparian Vegetation:</b> Dom. Tree/Shrub Taxa Dominate Type: <u>Sycamore</u> <input checked="" type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous Number of strata <u>20</u>		<b>Canopy Cover:</b> <input type="checkbox"/> Fully Exposed (0-25%) <input checked="" type="checkbox"/> Partially Exposed (25-50%) <input type="checkbox"/> Partially Shaded (50-75%) <input type="checkbox"/> Fully Shaded (75-100%)		
<b>Channel Alterations:</b> <input type="checkbox"/> Dredging <input checked="" type="checkbox"/> Channelization ( <input type="checkbox"/> Full <input checked="" type="checkbox"/> Partial )				
Substrate <input type="checkbox"/> Est. <input type="checkbox"/> P.C.	Rifle <u>15</u> %	Run <u>70</u> %	Pool <u>15</u> %	
Silt/Clay (<0.06 mm)		<u>30</u>	<u>20</u>	
Sand (0.06 - 2 mm)	<u>10</u>	<u>10</u>	<u>80</u>	
Gravel (2-64 mm)	<u>70</u>	<u>30</u>	<u>30</u>	
Cobble (64 - 256 mm)	<u>20</u>	<u>10</u>		
Boulders (>256 mm)		<u>20</u>		
Bedrock				
Habitat	Condition Category			
Parameter	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/Available Cover	Greater than 50% 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 <u>not</u> new fall and not transient).	30-50% 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).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>5. Channel Flow Status</b>	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 little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.	Some 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.	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 gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	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 sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>9. Vegetative Protection (score each bank)</b>	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.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score

95

NOTES/COMMENTS:

## Low Gradient Stream Data Sheet

STREAM NAME: <u>Casey Creek</u>		LOCATION: <u>Hoarup Springs Rd.</u>		
STATION #: <u>SR20014</u> MILE:		BASIN/WATERSHED:		
LAT.: _____ LONG.: _____		COUNTY: <u>Trigg</u> USGS 7.5 TOPO:		
DATE: <u>05/16/03</u> TIME: <u>12:15</u> <input type="checkbox"/> AM <input checked="" type="checkbox"/> PM		INVESTIGATORS: <u>P.B., M.A., J.W.</u>		
TYPE SAMPLE: <input type="checkbox"/> P-CHEM <input type="checkbox"/> Macroinvertebrate <input type="checkbox"/> FISH <input type="checkbox"/> BACT. <input type="checkbox"/> ALGAE				
WEATHER: Now _____ Past 24 hours _____ Has there been a heavy rain in the last 7 days? <u>cloudy</u> <input type="checkbox"/> <input type="checkbox"/> Heavy rain <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> <input type="checkbox"/> Steady rain Air Temperature <u>75</u> °C. Inches rainfall in past 24 hours _____ in. <input type="checkbox"/> <input checked="" type="checkbox"/> Intermittent showers Air <u>95</u> % Cloud Cover <input type="checkbox"/> <input type="checkbox"/> Clear/sunny				
P-Chem: Temp(°C) _____ D.O. (mg/l) _____ %Saturation _____ pH(S.U.) _____ Cond. _____ <input type="checkbox"/> Grab				
<b>INSTREAM WATERSHED FEATURES:</b> Stream Width _____ ft Range of Depth _____ ft Average Velocity _____ ft/s Discharge _____ cfs Est. Reach Length _____		<b>LOCAL WATERSHED FEATURES:</b> Predominant Surrounding Land Use: <input type="checkbox"/> Surface Mining <input type="checkbox"/> Construction <input checked="" type="checkbox"/> Forest <input type="checkbox"/> Deep Mining <input type="checkbox"/> Commercial <input checked="" type="checkbox"/> Pasture/Grazing <input type="checkbox"/> Oil Wells <input type="checkbox"/> Industrial <input type="checkbox"/> Silviculture <input type="checkbox"/> Land Disposal <input checked="" type="checkbox"/> Row Crops <input type="checkbox"/> Urban Runoff/Storm Sewers		
<b>Hydraulic Structures:</b> <input type="checkbox"/> Dams <input checked="" type="checkbox"/> Bridge Abutments <input checked="" type="checkbox"/> Island <input type="checkbox"/> Waterfalls <input type="checkbox"/> Other _____		<b>Stream Flow:</b> <input type="checkbox"/> Dry <input type="checkbox"/> Pooled <input type="checkbox"/> Low <input checked="" type="checkbox"/> Normal <input type="checkbox"/> High <input type="checkbox"/> Very Rapid or Torrential <b>Stream Type:</b> <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Ephemeral <input type="checkbox"/> Seep		
Riparian Vegetation: Dom. Tree/Shrub Taxa Dominate Type: <u>Maple Sycamore</u> <input checked="" type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous Number of strata _____		Canopy Cover: <input type="checkbox"/> Fully Exposed (0-25%) <input type="checkbox"/> Partially Exposed (25-50%) <input checked="" type="checkbox"/> Partially Shaded (50-75%) <input type="checkbox"/> Fully Shaded (75-100%)		
Channel Alterations: <input type="checkbox"/> Dredging <input checked="" type="checkbox"/> Channelization ( <input type="checkbox"/> Full <input checked="" type="checkbox"/> Partial)				
Substrate <input type="checkbox"/> Est. <input type="checkbox"/> P.C.	Riffle <u>20</u> %	Run <u>60</u> %	Pool <u>20</u> %	
Silt/Clay (<0.06 mm)			✓	
Sand (0.06 – 2 mm)			✓	
Gravel (2-64 mm)	✓	✓	✓	
Cobble (64 – 256 mm)	✓	✓		
Boulders (>256 mm)	✓			
Bedrock				
Habitat	Condition Category			
Parameter	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/Available Cover	Greater than 50% 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).	30-50% 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).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 <u>7</u> 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 13 12 <u>11</u>	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 <u>12</u> 11	10 9 8 7 6	5 4 3 2 1 0

<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 <b>7</b> 6	5 4 3 2 1 0
<b>5. Channel Flow Status</b>	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 little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 <b>13</b> 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.	Some 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.	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 gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 <b>13</b> 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 <b>8</b> 7 6	5 4 3 2 1 0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected. Note: determine left or right side by facing downstream.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	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 sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	<b>2</b> 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 <b>3</b>	2 1 0
<b>9. Vegetative Protection (score each bank)</b>	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.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	<b>2</b> 1 0
SCORE (RB)	Right Bank 10 9	8 <b>7</b> 6	5 4 3	2 1 0
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 <b>1</b> 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 <b>1</b> 0

Total Score

87

NOTES/COMMENTS:

## Low Gradient Stream Data Sheet

STREAM NAME: <u>Casey Creek</u>		LOCATION: <u>Roaring Springs Rd</u>	
STATION #: <u>CEL200014</u> MILE:		BASIN/WATERSHED: <u>Little River</u>	
LAT.: _____ LONG.: _____		COUNTY: <u>Tripp</u> USGS 7.5 TOPO: _____	
DATE: <u>09/07/03</u> TIME: <u>10:00</u> <input checked="" type="checkbox"/> AM <input type="checkbox"/> PM		INVESTIGATORS: <u>Russell, John, Kea, Piro</u>	
TYPE SAMPLE: <input type="checkbox"/> P-CHEM <input type="checkbox"/> Macroinvertebrate <input type="checkbox"/> FISH <input type="checkbox"/> BACT. <input type="checkbox"/> ALGAE			
WEATHER: Now _____ Past 24 hours _____		Has there been a heavy rain in the last 7 days? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
<input type="checkbox"/> Heavy rain		Air Temperature <u>75</u> °C. Inches rainfall in past 24 hours <u>0</u> in.	
<input type="checkbox"/> Steady rain		<input checked="" type="checkbox"/> % Cloud Cover _____	
<input type="checkbox"/> Intermittent showers			
<input checked="" type="checkbox"/> Clear/sunny			
P-Chem: Temp(°C) _____ D.O. (mg/l) _____ %Saturation _____ pH(S.U.) _____ Cond. _____ <input type="checkbox"/> Grab			
<b>INSTREAM WATERSHED FEATURES:</b> Stream Width _____ ft Range of Depth _____ ft Average Velocity _____ ft/s Discharge _____ cfs Est. Reach Length _____		<b>LOCAL WATERSHED FEATURES:</b> Predominant Surrounding Land Use: <input type="checkbox"/> Surface Mining <input type="checkbox"/> Construction <input type="checkbox"/> Forest <input type="checkbox"/> Deep Mining <input type="checkbox"/> Commercial <input type="checkbox"/> Pasture/Grazing <input type="checkbox"/> Oil Wells <input type="checkbox"/> Industrial <input type="checkbox"/> Silviculture <input type="checkbox"/> Land Disposal <input type="checkbox"/> Row Crops <input type="checkbox"/> Urban Runoff/Storm Sewers	
<b>Hydraulic Structures:</b> <input type="checkbox"/> Dams <input checked="" type="checkbox"/> Bridge Abutments <input type="checkbox"/> Island <input type="checkbox"/> Waterfalls <input type="checkbox"/> Other _____		<b>Stream Flow:</b> <input type="checkbox"/> Dry <input type="checkbox"/> Pooled <input type="checkbox"/> Low <input checked="" type="checkbox"/> Normal <input type="checkbox"/> High <input type="checkbox"/> Very Rapid or Torrential	
<b>Stream Type:</b> <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Ephemeral <input type="checkbox"/> Seep			
Riparian Vegetation: Dom. Tree/Shrub Taxa <u>Sycamore</u> Dominate Type: <input checked="" type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous Number of strata _____		<b>Canopy Cover:</b> <input type="checkbox"/> Fully Exposed (0-25%) <input checked="" type="checkbox"/> Partially Exposed (25-50%) <input type="checkbox"/> Partially Shaded (50-75%) <input type="checkbox"/> Fully Shaded (75-100%)	
		<b>Channel Alterations:</b> <input type="checkbox"/> Dredging <input type="checkbox"/> Channelization ( <input type="checkbox"/> Full <input type="checkbox"/> Partial)	
Substrate <input type="checkbox"/> Est. <input type="checkbox"/> P.C.		Riffle <u>25</u> %      Run <u>50</u> %      Pool <u>25</u> %	
Silt/Clay (<0.06 mm)		30	
Sand (0.06 - 2 mm)		10      10      30	
Gravel (2-64 mm)		30      30      40	
Cobble (64 - 256 mm)		60      60	
Boulders (>256 mm)			
Bedrock			
<b>Habitat</b>		<b>Condition Category</b>	
<b>Parameter</b>	<b>Optimal</b>	<b>Suboptimal</b>	<b>Marginal</b>
<b>1. Epifaunal Substrate/ Available Cover</b>	Greater than 50% 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).	30-50% 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).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6
<b>2. Pool Substrate Characterization</b>	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6
<b>3. Pool Variability</b>	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6

<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>5. Channel Flow Status</b>	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 little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.	Some 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.	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 gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 2 to 3 times longer than; if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected. <small>Note: determine left or right side by facing downstream.</small>	Moderately stable; infrequent, small areas of erosion, mostly healed over. 5-30% of bank in reach has areas of erosion.	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 sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	10 9 8 7 6 5 4 3 2 1 0	8 7 6 5 4 3 2 1 0	5 4 3 2 1 0	2 1 0
SCORE (RB)	10 9 8 7 6 5 4 3 2 1 0	8 7 6 5 4 3 2 1 0	5 4 3 2 1 0	2 1 0
<b>9. Vegetative Protection (score each bank)</b>	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.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	10 9 8 7 6 5 4 3 2 1 0	8 7 6 5 4 3 2 1 0	5 4 3 2 1 0	2 1 0
SCORE (RB)	10 9 8 7 6 5 4 3 2 1 0	8 7 6 5 4 3 2 1 0	5 4 3 2 1 0	2 1 0
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	10 9 8 7 6 5 4 3 2 1 0	8 7 6 5 4 3 2 1 0	5 4 3 2 1 0	2 1 0
SCORE (RB)	10 9 8 7 6 5 4 3 2 1 0	8 7 6 5 4 3 2 1 0	5 4 3 2 1 0	2 1 0

Total Score

NOTES/COMMENTS:

129

## Low Gradient Stream Data Sheet

STREAM NAME: <u>Casey Creek</u>		LOCATION: <u>up Berkeley Road</u>		
STATION #: <u>022000/5</u> MILE:		BASIN/WATERSHED: <u>Little River</u>		
LAT.: _____ LONG.: _____		COUNTY: <u>Trip</u> USGS 7.5 TOPO: _____		
DATE: <u>05/16/03</u> TIME: <u>10:45 am</u> <input checked="" type="checkbox"/> AM <input type="checkbox"/> PM		INVESTIGATORS: <u>P.R. J.W., M.D.</u>		
TYPE SAMPLE: <input type="checkbox"/> P-CHEM <input type="checkbox"/> Macroinvertebrate <input type="checkbox"/> FISH <input type="checkbox"/> BACT. <input type="checkbox"/> ALGAE				
<b>WEATHER:</b> Now _____ Past 24 hours _____ Has there been a heavy rain in the last 7 days? <input type="checkbox"/> <input type="checkbox"/> Heavy rain <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <u>cloudy</u> <input type="checkbox"/> <input type="checkbox"/> Steady rain Air Temperature <u>20</u> °C. Inches rainfall in past 24 hours _____ in. <u>(now)</u> <input type="checkbox"/> <input checked="" type="checkbox"/> Intermittent showers <u>70</u> % Cloud Cover <input type="checkbox"/> <input type="checkbox"/> Clear/sunny				
P-Chem: Temp(°C) _____ D.O. (mg/l) _____ %Saturation _____ pH(S.U.) _____ Cond. _____ <input type="checkbox"/> Grab				
<b>INSTREAM WATERSHED FEATURES:</b> Stream Width _____ ft Range of Depth _____ ft Average Velocity _____ ft/s Discharge _____ cfs Est. Reach Length _____		<b>LOCAL WATERSHED FEATURES:</b> <b>Predominant Surrounding Land Use:</b> <input type="checkbox"/> Surface Mining <input type="checkbox"/> Construction <input type="checkbox"/> Forest <input type="checkbox"/> Deep Mining <input type="checkbox"/> Commercial <input checked="" type="checkbox"/> Pasture/Grazing <input type="checkbox"/> Oil Wells <input type="checkbox"/> Industrial <input type="checkbox"/> Silviculture <input type="checkbox"/> Land Disposal <input checked="" type="checkbox"/> Row Crops <input type="checkbox"/> Urban Runoff/Storm Sewers		
<b>Hydraulic Structures:</b> <input type="checkbox"/> Dams <input type="checkbox"/> Bridge Abutments <input checked="" type="checkbox"/> Island <input type="checkbox"/> Waterfalls <input type="checkbox"/> Other _____		<b>Stream Flow:</b> <input type="checkbox"/> Dry <input type="checkbox"/> Pooled <input type="checkbox"/> Low <input checked="" type="checkbox"/> Normal <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> High <input type="checkbox"/> Very Rapid or Torrential <input type="checkbox"/> Ephemeral <input type="checkbox"/> Seep		
<b>Riparian Vegetation:</b> Dom. Tree/Shrub Taxa Dominate Type: <u>Sycamore</u> <input checked="" type="checkbox"/> Trees <input type="checkbox"/> Shrubs <u>Ash</u> <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous <u>Mapples</u> Number of strata _____		<b>Canopy Cover:</b> <input type="checkbox"/> Fully Exposed (0-25%) <input checked="" type="checkbox"/> Partially Exposed (25-50%) <input type="checkbox"/> Partially Shaded (50-75%) <input type="checkbox"/> Fully Shaded (75-100%)		
<b>Channel Alterations:</b> <input type="checkbox"/> Dredging <input checked="" type="checkbox"/> Channelization <input type="checkbox"/> Full <input checked="" type="checkbox"/> Partial				
Substrate <input type="checkbox"/> Est. <input type="checkbox"/> P.C.		Riffle <u>5</u> % Run <u>80</u> % Pool <u>15</u> %		
Silt/Clay (<0.06 mm)				
Sand (0.06 – 2 mm)		✓		
Gravel (2-64 mm)		✓		
Cobble (64 – 256 mm)		✓		
Boulders (>256 mm)				
Bedrock				
<b>Habitat</b>	<b>Condition Category</b>			
<b>Parameter</b>	<b>Optimal</b>	<b>Suboptimal</b>	<b>Marginal</b>	<b>Poor</b>
<b>1. Epifaunal Substrate/Available Cover</b>	Greater than 50% 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).	30-50% 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).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>2. Pool Substrate Characterization</b>	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>3. Pool Variability</b>	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>5. Channel Flow Status</b>	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 little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.	Some 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.	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 gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected. <small>Note: determine left or right side by facing downstream.</small>	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	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 sloughing; 60-100% of bank has erosional scars.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>9. Vegetative Protection (score each bank)</b>	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.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score

77

NOTES/COMMENTS:



## Low Gradient Stream Data Sheet

STREAM NAME: <u>Cassy Creek</u>		LOCATION: <u>UP Betty Road</u>		
STATION #: <u>CR2000.5</u> MILE: _____		BASIN/WATERSHED: <u>Little River</u>		
LAT.: _____ LONG.: _____		COUNTY: <u>Troop</u> USGS 7.5 TOPO: _____		
DATE: <u>09/07/03</u> TIME: <u>11:00</u> <input checked="" type="checkbox"/> AM <input type="checkbox"/> PM		INVESTIGATORS: <u>John, Ker, Russell, Anar</u>		
TYPE SAMPLE: <input type="checkbox"/> P-CHEM <input checked="" type="checkbox"/> Macroinvertebrate <input type="checkbox"/> FISH <input type="checkbox"/> BACT. <input checked="" type="checkbox"/> ALGAE				
WEATHER:      Now      Past 24 hours      Has there been a heavy rain in the last 7 days? <input type="checkbox"/> <input checked="" type="checkbox"/> Heavy rain <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> <input type="checkbox"/> Steady rain      Air Temperature <u>72</u> °C. Inches rainfall in past 24 hours <u>0</u> in. <input type="checkbox"/> <input type="checkbox"/> Intermittent showers <u>0</u> % Cloud Cover <input type="checkbox"/> <input type="checkbox"/> Clear/sunny				
P-Chem: Temp(°C) _____ D.O. (mg/l) _____ %Saturation _____ pH(S.U.) _____ Cond. _____ <input type="checkbox"/> Grab				
<b>INSTREAM WATERSHED FEATURES:</b> Stream Width _____ ft Range of Depth _____ ft Average Velocity _____ ft/s Discharge _____ cfs Est. Reach Length _____		<b>LOCAL WATERSHED FEATURES:</b> Predominant Surrounding Land Use: <input type="checkbox"/> Surface Mining <input type="checkbox"/> Construction <input type="checkbox"/> Forest <input type="checkbox"/> Deep Mining <input type="checkbox"/> Commercial <input type="checkbox"/> Pasture/Grazing <input type="checkbox"/> Oil Wells <input type="checkbox"/> Industrial <input type="checkbox"/> Silviculture <input type="checkbox"/> Land Disposal <input checked="" type="checkbox"/> Row Crops <input type="checkbox"/> Urban Runoff/Storm Sewers		
<b>Hydraulic Structures:</b> <input type="checkbox"/> Dams <input type="checkbox"/> Bridge Abutments <input type="checkbox"/> Island <input type="checkbox"/> Waterfalls <input type="checkbox"/> Other _____		<b>Stream Flow:</b> <input type="checkbox"/> Dry <input type="checkbox"/> Pooled <input type="checkbox"/> Low <input checked="" type="checkbox"/> Normal <input type="checkbox"/> High <input type="checkbox"/> Very Rapid or Torrential		
<b>Riparian Vegetation:</b> Dom. Tree/Shrub Taxa Dominate Type: <input checked="" type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous Number of strata _____		<b>Channel Alterations:</b> <input type="checkbox"/> Dredging <input checked="" type="checkbox"/> Channelization ( <input type="checkbox"/> Full <input checked="" type="checkbox"/> Partial)		
Substrate <input type="checkbox"/> Est. <input type="checkbox"/> P.C.		Riffle <u>10</u> %      Run <u>80</u> %      Pool <u>10</u> %		
Silt/Clay (<0.06 mm)		10      70      30		
Sand (0.06 – 2 mm)		10      10      30		
Gravel (2-64 mm)		20      20      20		
Cobble (64 – 256 mm)		50      40      30		
Boulders (>256 mm)		20      20      0		
Bedrock				
<b>Habitat</b>	<b>Condition Category</b>			
<b>Parameter</b>	<b>Optimal</b>	<b>Suboptimal</b>	<b>Marginal</b>	<b>Poor</b>
<b>1. Epifaunal Substrate/Available Cover</b>	Greater than 50% 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).	30-50% 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).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>2. Pool Substrate Characterization</b>	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>3. Pool Variability</b>	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>5. Channel Flow Status</b>	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 little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.	Some 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.	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 gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	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 sloughing; 60-100% of bank has erosional scars.
Note: determine left or right side by facing downstream.				
SCORE (LB)	Left Bank 10 9 8	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9 8	8 7 6	5 4 3	2 1 0
<b>9. Vegetative Protection (score each bank)</b>	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.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	Left Bank 10 9 8	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9 8	8 7 6	5 4 3	2 1 0
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	Left Bank 10 9 8	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9 8	8 7 6	5 4 3	2 1 0

Total Score

92

NOTES/COMMENTS:

## Low Gradient Stream Data Sheet

STREAM NAME: <u>Sinkmp Fork</u>		LOCATION: <u>Kings Church Road</u>	
STATION #: <u>CR200016</u> MILE: _____		BASIN/WATERSHED: _____	
LAT.: _____ LONG.: _____		COUNTY: <u>Trapp</u> USGS 7.5 TOPO: _____	
DATE: <u>05/16/03</u> TIME: <u>2:45</u> <input type="checkbox"/> AM <input checked="" type="checkbox"/> PM		INVESTIGATORS: <u>P.B., J.W., M.D.</u>	
TYPE SAMPLE: <input type="checkbox"/> P-CHEM <input type="checkbox"/> Macroinvertebrate <input type="checkbox"/> FISH <input type="checkbox"/> BACT. <input type="checkbox"/> ALGAE			
WEATHER: <u>sprinkles now</u>		Now <input type="checkbox"/> Past 24 hours <input type="checkbox"/> Heavy rain <input type="checkbox"/> <input type="checkbox"/> Steady rain <input type="checkbox"/> Intermittent showers <input type="checkbox"/> Clear/sunny <input type="checkbox"/>	
		Has there been a heavy rain in the last 7 days? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Air Temperature <u>20</u> °C. Inches rainfall in past 24 hours _____ in. <u>100</u> % Cloud Cover	
P-Chem: Temp(°C) _____ D.O. (mg/l) _____ %Saturation _____		pH(S.U.) _____ Cond. _____ <input type="checkbox"/> Grab	
<b>INSTREAM WATERSHED FEATURES:</b> Stream Width _____ ft Range of Depth _____ ft Average Velocity _____ ft/s Discharge _____ cfs Est. Reach Length _____		<b>LOCAL WATERSHED FEATURES:</b> Predominant Surrounding Land Use: <input type="checkbox"/> Surface Mining <input type="checkbox"/> Construction <input type="checkbox"/> Forest <input type="checkbox"/> Deep Mining <input type="checkbox"/> Commercial <input checked="" type="checkbox"/> Pasture/Grazing <input type="checkbox"/> Oil Wells <input type="checkbox"/> Industrial <input type="checkbox"/> Silviculture <input type="checkbox"/> Land Disposal <input checked="" type="checkbox"/> Row Crops <input type="checkbox"/> Urban Runoff/Storm Sewers	
<b>Hydraulic Structures:</b> <input type="checkbox"/> Dams <input checked="" type="checkbox"/> Bridge Abutments <input type="checkbox"/> Island <input type="checkbox"/> Waterfalls <input type="checkbox"/> Other _____		<b>Stream Flow:</b> <input type="checkbox"/> Dry <input type="checkbox"/> Pooled <input type="checkbox"/> Low <input type="checkbox"/> Normal <input checked="" type="checkbox"/> High <input type="checkbox"/> Very Rapid or Torrential	
<b>Stream Type:</b> <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Ephemeral <input type="checkbox"/> Scap			
Riparian Vegetation: Dom. Tree/Shrub Taxa Dominate Type: <u>Maple</u> <input checked="" type="checkbox"/> Trees <input type="checkbox"/> Shrubs <u>Sycamore</u> <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous Number of strata _____		Canopy Cover: <input type="checkbox"/> Fully Exposed (0-25%) <input type="checkbox"/> Partially Exposed (25-50%) <input type="checkbox"/> Partially Shaded (50-75%) <input checked="" type="checkbox"/> Fully Shaded (75-100%)	
		Channel Alterations: <input type="checkbox"/> Dredging <input type="checkbox"/> Channelization ( <input type="checkbox"/> Full <input type="checkbox"/> Partial)	
Substrate <input type="checkbox"/> Est. <input type="checkbox"/> P.C.		Riffle <u>5</u> %	
		Run <u>85</u> %	
		Pool <u>10</u> %	
Silt/Clay (<0.06 mm)			
Sand (0.06 - 2 mm)			
Gravel (2-64 mm)			
Cobble (64 - 256 mm)			
Boulders (>256 mm)			
Bedrock			
<b>Habitat</b>		<b>Condition Category</b>	
<b>Parameter</b>	<b>Optimal</b>	<b>Suboptimal</b>	<b>Marginal</b>
<b>1. Epifaunal Substrate/Available Cover</b>	Greater than 50% 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).	30-50% 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).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6
<b>2. Pool Substrate Characterization</b>	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6
<b>3. Pool Variability</b>	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.
<b>SCORE</b>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6
			5 4 3 2 1 0

<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>5. Channel Flow Status</b>	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 little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.	Some 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.	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 gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	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 sloughing; 60-100% of bank has erosional scars.
Note: determine left or right side by facing downstream.				
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>9. Vegetative Protection (score each bank)</b>	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.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score

77

NOTES/COMMENTS:

## Low Gradient Stream Data Sheet

STREAM NAME: <u>Little River</u>		LOCATION: <u>SSSR 1253</u>		
STATION #: <u>CEL200013</u> MILE: _____		BASIN/WATERSHED: <u>Little River</u>		
LAT.: _____ LONG.: _____		COUNTY: <u>Tapp</u> USGS 7.5 TOPO: _____		
DATE: <u>05/16/03</u> TIME: <u>16:55</u> <input type="checkbox"/> AM <input checked="" type="checkbox"/> PM		INVESTIGATOR: <u>J-B, MD</u>		
TYPE SAMPLE: <input type="checkbox"/> P-CHEM <input type="checkbox"/> Macroinvertebrate <input type="checkbox"/> FISH <input type="checkbox"/> BACT. <input type="checkbox"/> ALGAE				
WEATHER:      Now      Past 24 hours      Has there been a heavy rain in the last 7 days? <input type="checkbox"/> <input type="checkbox"/> Heavy rain <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> <input type="checkbox"/> Steady rain      Air Temperature <u>20</u> °C. Inches rainfall in past 24 hours _____ in. <input type="checkbox"/> <input type="checkbox"/> Intermittent showers <u>100</u> % Cloud Cover <input type="checkbox"/> <input type="checkbox"/> Clear/sunny				
P-Chem: Temp(°C) _____ D.O. (mg/l) _____ %Saturation _____ pH(S.U.) _____ Cond. _____ <input type="checkbox"/> Grab				
<b>INSTREAM WATERSHED FEATURES:</b> Stream Width _____ ft Range of Depth _____ ft Average Velocity _____ ft/s Discharge _____ cfs Est. Reach Length _____		<b>LOCAL WATERSHED FEATURES:</b> Predominant Surrounding Land Use: <input type="checkbox"/> Surface Mining <input type="checkbox"/> Construction <input type="checkbox"/> Forest <input type="checkbox"/> Deep Mining <input type="checkbox"/> Commercial <input type="checkbox"/> Pasture/Grazing <input type="checkbox"/> Oil Wells <input type="checkbox"/> Industrial <input type="checkbox"/> Silviculture <input type="checkbox"/> Land Disposal <input type="checkbox"/> Row Crops <input type="checkbox"/> Urban Runoff/Storm Sewers		
Hydraulic Structures: <input type="checkbox"/> Dams <input checked="" type="checkbox"/> Bridge Abutments <input checked="" type="checkbox"/> Island <input type="checkbox"/> Waterfalls <input type="checkbox"/> Other _____		Stream Flow: <input type="checkbox"/> Dry <input type="checkbox"/> Pooled <input type="checkbox"/> Low <input type="checkbox"/> Normal <input checked="" type="checkbox"/> High <input type="checkbox"/> Very Rapid or Torrential		
Stream Type: <input checked="" type="checkbox"/> Perennial <input type="checkbox"/> Intermittent <input type="checkbox"/> Ephemeral <input type="checkbox"/> Seep		Riparian Vegetation:      Dom. Tree/Shrub Taxa Dominate Type: <u>Sycamore</u> <input checked="" type="checkbox"/> Trees <input type="checkbox"/> Shrubs <u>Ash</u> <input checked="" type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous <u>Box elder</u> Number of strata _____		
Canopy Cover: <input checked="" type="checkbox"/> Fully Exposed (0-25%) <input type="checkbox"/> Partially Exposed (25-50%) <input type="checkbox"/> Partially Shaded (50-75%) <input type="checkbox"/> Fully Shaded (75-100%)		Channel Alterations: <input type="checkbox"/> Dredging <input checked="" type="checkbox"/> Channelization <input type="checkbox"/> Full <input checked="" type="checkbox"/> Partial		
Substrate <input type="checkbox"/> Est. <input type="checkbox"/> P.C.	Riffle <u>10</u> %	Run <u>80</u> %	Pool <u>10</u> %	
Silt/Clay (<0.06 mm)		✓	✓	
Sand (0.06 – 2 mm)		✓	✓	
Gravel (2-64 mm)	✓	✓	✓	
Cobble (64 – 256 mm)	✓	✓	✓	
Boulders (>256 mm)				
Bedrock				
Habitat	Condition Category			
Parameter	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/Available Cover	Greater than 50% 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).	30-50% 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).	10-30% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Pool Substrate Characterization	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud, or clay; mud may be dominant; some root mats and submerged vegetation present.	All mud or clay or sand bottom; little or no root mat; no submerged vegetation.	Hard-pan clay or bedrock; no root mat or vegetation.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Pool Variability	Even mix of large-shallow, large-deep, small-shallow, small-deep pools present.	Majority of pools large-deep; very few shallow.	Shallow pools much more prevalent than deep pools.	Majority of pools small-shallow or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

<b>4. Sediment Deposition</b>	Little or no enlargement of islands or point bars and less than 20% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; 80% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>5. Channel Flow Status</b>	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 little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.	Some 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.	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 gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>7. Channel Sinuosity</b>	The bends in the stream increase the stream length 3 to 4 times longer than if it was in a straight line. (Note - channel braiding is considered normal in coastal plains and other low-lying areas. This parameter is not easily rated in these areas.)	The bends in the stream increase the stream length 2 to 3 times longer than if it was in a straight line.	The bends in the stream increase the stream length 2 to 1 times longer than if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>8. Bank Stability (score each bank)</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	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 sloughing; 60-100% of bank has erosional scars.
Note: determine left or right side by facing downstream.				
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>9. Vegetative Protection (score each bank)</b>	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.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
<b>10. Riparian Vegetative Zone Width (score each bank riparian zone)</b>	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score

84

NOTES/COMMENTS:

**Quality Assurance Project Plan for Biological Baseline Conditions in the Little  
River Watershed, 2003**

Project officer: Dr. David S. White, 561 Emma Drive, Murray, KY 42071.

Phone: (270) 474-2272

Field sampling supervisor: Dr. David S. White, 561 Emma Drive, Murray, KY 42071.

Phone: (270) 474-2272

Laboratory supervisor: Dr. Pinar Balci, 561 Emma Drive, Murray, KY 42071.

Phone: (270) 474-2272

Laboratory used: Hancock Biological Station, 561 Emma Drive, Murray, KY 42071

Waterbody name: Little River, Casey Creek (tributary), Sinking Fork Creek (tributary)

Stream locations: Christian and Trigg counties, Lower Cumberland River Basin

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**Any changes to this plan will be submitted to the Kentucky Division of Water (KDOW) in writing.**

### **A3: Distribution List**

This plan will be distributed to all parties involved in this project, including all personnel involved in fieldwork. A complete listing of these people will be developed and submitted to KDOW. The plan will be distributed to the following individuals, as well.

1. Michele Koziol  
NPS Grant Administrator  
Kentucky Division of Water  
(502) 564-3410 ext. 598  
(502) 564-0111 (fax)
2. Dr. David S. White  
Director  
Hancock Biological Station  
Murray State University  
(270) 474-2272  
(270) 474-0120 (fax)
3. Dr. Pinar Balci  
Hancock Biological Station  
Murray State University  
(270) 474-2272  
(270) 474-0120 (fax)
4. Dr. Tom Timmons  
Hancock Biological Station  
Murray State University  
(270) 474-2272  
(270) 474-0120 (fax)
5. Gary Rice  
Hancock Biological Station  
Murray State University  
(270) 474-2272

(270) 474-0120 (fax)

**A4: Project/Task Organization**

Name:	Project Title/ Responsibility	Telephone Number
Dr. David White	Project QA Manager	(270) 474-2272
Dr. David White	Field Sampling Supervisor	(270) 474-2272
Dr. Pinar Balci	Laboratory Supervisor	(270) 474-2272

**A5: Problem Definition/Background**

The Little River and its tributaries are located in Christian and Trigg counties in western Kentucky. Its watershed is comprised of agricultural land, several small urban areas, and one significant urban area, the city of Hopkinsville (population > 30,000). The Little River receives point source pollution from a wastewater treatment plant in eastern Hopkinsville, and nonpoint source pollution from agricultural and urban runoff.

The purpose of this project is to assess and identify streams in Western Kentucky that are impacted by nonpoint source pollution. Biological baseline conditions in the Little River have been documented in the past by KDOW (1996) and the Center for Reservoir Research (2001).

**A6: Project/Task Description**

The project will involve collection and identification of fish, algae, and macroinvertebrates from 16 sites in summer 2003, during high base flow, and again in fall 2002, during low base flow. Habitat assessments and physicochemical analyses will be conducted to supplement biological data. The 16 sites to be sampled include 9 sites along the Little River, four sites on Casey Creek, and three on Sinking Fork Creek. Casey Creek and Sinking Fork Creek are tributaries of Little River.

The biological data obtained will be used to calculate biological metrics, which will be supplemented by the habitat and physicochemical data. These metrics will be compared to a previous KDOW survey of the same sites. A final report will be submitted to KDOW within two years.

## **A7: Quality Objectives and Criteria**

All data will be gathered according to protocols outlined in the KDOW manual "Methods for Assessing Biological Integrity of Surface Waters in Kentucky" (2002).

All of the macroinvertebrate metric scores will be based on a 95<sup>th</sup> percentile calculated for each metric by compiling reference and study site data (Greg Pond, Ecological Support, KDOW). The actual values of each metric will be divided by the calculated 95<sup>th</sup> percentile and multiplied by 100, ranking all streams together, including the reference data, so that comparisons can be made among similar streams (USEPA, 1999) and so that outliers will not adversely effect study site scores.

When calculating fish metrics, different metrics will be used for different ecoregions, as determined by KDOW's analyses of reference data. In order to compare our study data with the reference data, the 95<sup>th</sup> percentile for all reference data within each ecoregion will be calculated. This method will normalize the data so that sites with particularly high values are not weighted as heavily.

Four diatom metrics will be scored and averaged to give the Diatom Biotic Index (DBI) according to "Methods for Assessing Biological Integrity of Surface Waters in Kentucky" (2002).

Biological and habitat data will be entered into the state's Ecological Database System (EDAS) and will be returned to the state for distribution to all participating organizations. Original specimens, slides, datasheets, and bench sheets will be archived at the Hancock Biological Station.

## **A8: Special Training/Certification**

All field personnel will be trained in fish, algal, and macroinvertebrate collection techniques according to KDOW sampling protocols. A training session for these sampling protocols will be given by KDOW at the Hancock Biological Station and nearby Ledbetter Creek in late 2002 or early 2003. All personnel involved in sampling will complete this training. Personnel collecting macroinvertebrates are lead by a Ph.D. level stream ecologist with a background in entomolgy. Fish will be identified in the laboratory by a Ph.D. level fisheries biologist.

## **A9: Documents and Records**

All data gathered in the field is written in a waterproof field book and entered into spreadsheets upon arrival to Hancock Biological Station. These data are saved on the computer's hard drive and on floppy disk. Information recorded on field data sheets will include: Site name, site description, names of field technicians, date, time, results of physicochemical measurements, numbers of containers of collected specimens, and notes on stream and riparian conditions. Habitat data sheets are kept in a waterproof container

and are stored at the Hancock Biological Station. Digital images of each site are downloaded and saved on computer hard drive and on compact disk (CD).

Upon completion of the biological metrics, biological and habitat data will be entered into the Kentucky's Ecological Database System (EDAS).

### **B1: Sampling Process Design**

To reduce variability among stations resulting from sampling error, a maximum of four full-coverage (algae + macroinvertebrates + fish) stations are collected per day. The 16 sites to be sampled include 9 sites along the Little River, four sites on Casey Creek, and three on Sinking Fork Creek. Casey Creek and Sinking Fork Creek are tributaries of Little River. All sites are to be sampled once in summer during high base flow and again in fall during low base flow. Locations of the sites to be sampled are as follows:

<b>Site Code</b>	<b>Stream Name</b>	<b>Latitude</b>	<b>Longitude</b>
<b>CRR200001</b>	<b>South Fork LR</b>	<b>36.88174</b>	<b>-87.34167</b>
<b>CRR200002</b>	<b>South Fork LR</b>	<b>36.84893</b>	<b>-87.37433</b>
<b>CRR200003</b>	<b>Lower Branch LR</b>	<b>36.89947</b>	<b>-87.39161</b>
<b>CRR200004</b>	<b>North Fork LR</b>	<b>36.88908</b>	<b>-87.45583</b>
<b>CRR200005</b>	<b>North Fork LR</b>	<b>36.85292</b>	<b>-87.46967</b>
<b>CRR200006</b>	<b>North Fork LR</b>	<b>36.841000</b>	<b>-87.53022</b>
<b>CRR200007</b>	<b>North Fork LR</b>	<b>36.80178</b>	<b>-87.51382</b>
<b>CRR200008</b>	<b>North Fork LR</b>	<b>36.86183</b>	<b>-87.51936</b>
<b>CRR200009</b>	<b>Little River</b>	<b>36.78336</b>	<b>-87.54604</b>
<b>CRR2000010</b>	<b>Sinking Fork</b>	<b>36.91603</b>	<b>-87.57668</b>
<b>CRR2000011</b>	<b>Sinking Fork</b>	<b>36.8812</b>	<b>-87.60839</b>
<b>CRR2000012</b>	<b>Little River</b>	<b>36.76038</b>	<b>-87.5501</b>
<b>CRR2000013</b>	<b>Little River</b>	<b>36.77781</b>	<b>-87.7223</b>
<b>CRR2000014</b>	<b>Casey Creek</b>	<b>36.75579</b>	<b>-87.72483</b>

<b>CRR2000015</b>	<b>Casey Creek</b>	<b>36.74586</b>	<b>-87.74755</b>
<b>CRR2000016</b>	<b>Sinking fork</b>	<b>36.84078</b>	<b>-87.74045</b>

All site-specific data are recorded on field data sheets at the time of collections. Data include station name and number, date and time (start to finish) of sampling, type of collections made, location of station, name of person recording data, and names of all people sampling at that station. Copies of the data sheets to be used have been provided to MSU by KDOW.

Samples are labeled with station number and location, date and time of collection, name of collector, and type of preservative used.

All available habitat types are sampled during biological collections. Samples are representative of the entire community; therefore, effort is made to recognize and collect all possible habitats (e.g., pools, riffles, banks).

Sample equipment such as nets, seines, grabs, buckets, and artificial substrates are cleaned thoroughly and dried after each use.

All staff involved in collections receive specific training in collection techniques and in the use of computers for data analysis.

Biological samples are preserved at the time of collection using the following preservatives:

1. Algae (identification and counting) in 2% buffered glutaraldehyde.
2. Fish in 10% formalin buffered with CaCO<sub>3</sub>.
3. Macroinvertebrates in 70% ethanol.

All biological samples are recorded in the proper logbooks upon delivery to the Biological Station. The biological data obtained will be used to calculate biological metrics, which will be supplemented by the habitat and physicochemical data. These metrics will be compared to a previous KDOW survey of the same sites.

## **B2: Sampling Methods**

### Algae

Algae sampling and analyses follow the Kentucky Division of Water's (KDOW) "Methods for Assessing Biological Integrity of Surface Waters in Kentucky" (2002). Qualitative samples are collected from all available substrates by selective hand picking/scraping. Microhabitats are sampled in roughly the proportion that they occur at each site. All sites are sampled only during low flow periods. In the field, the algal community is qualitatively ranked (1 = lowest, 5 = highest) and recorded based on the following criteria: 1, no algae visible or if present they are in the form of thick blue-green or green algal mats; 3, algae visible on substrates and may include some *Cladophora* or

small floating mats; and 5, algae on substrates appear diverse but not floating mats present.

Wet mount slides (a minimum of three) for non-diatom taxa are examined at 200x and 400x. Taxa present are recorded in a logbook along with estimated relative abundance (abundant, common, rare). In determining abundance, colonial, connubial, or filamentous forms are recorded as units rather than counting the individual cells present. Digital photographs of each taxon are taken and used to create a species archive. All identifications are verified by at least two people knowledgeable in algal identification.

Diatoms are examined using the hydrogen peroxide/potassium dichromate oxidation method for clearing. Cleared diatoms are mounted in Nephrax. A minimum of 300 to 500 valves is identified and the numbers of each taxon recorded on bench data sheets. Digital photographs of each taxon are taken and used to create a species archive. All identifications are verified by at least two people knowledgeable in algal identification.

### Fish

Fish sampling and analyses follow the Kentucky Division of Water's (KDOW) "Methods for Assessing Biological Integrity of Surface Waters in Kentucky" (2002). All available habitats at each stream site are sampled.

At wadeable sites, the reach length is a minimum of 100 meters and does not exceed 200 meters. Documentation of the sample reach is noted. The sample reach consists of at least two riffles, runs, and pools each. In cases where two riffles, runs, and pools cannot be sampled, either one riffle, run, and pool is sampled or the recommended reach length of the stream is sampled. Sampling is done using a seine and a backpack electrofisher. The seine is used for approximately 30-60 minutes from start to finish. The electrofisher is used in areas not efficiently sampled with the seine (e.g., root masses, undercut banks, rock slabs, boulder/cobble substrates, fallen trees, etc.). The electrofisher is used for a least 600 "shocking" seconds to a maximum of 1800 "shocking" seconds of effort.

At headwater sites, the sample reach ranges between 100 and 125 meters in length. The reach consists of riffles, runs, and pools if they are present. Sampling in headwater streams consists of using a backpack electrofisher unit working in an upstream manner. The electrofishing duration within the sample reach is a minimum of 600 "shocking" seconds and a maximum of 1000 "shocking" seconds. In streams with a larger pool habitat, a seine is used to sample the area more efficiently.

Fish are identified to the lowest possible taxonomic unit and verified by at least two people knowledgeable in fish identification. All data are entered into field notebooks. Voucher specimens are saved and preserved in 10% formalin buffered with CaCO<sub>3</sub> and identifications are verified.

## Macroinvertebrates

Macroinvertebrate sampling and analyses follow the Kentucky Division of Water's (KDOW) "Methods for Assessing Biological Integrity of Surface Waters in Kentucky" (2002). Collections from all methods listed below are composited into one or two wash buckets with No. 30 mesh screen bottoms. Wash buckets are set in shallow water during sampling and picking to keep organisms alive.

1. Kicknet Samples: Four 0.25 m<sup>2</sup> kicks are done. The kicknet is placed about mid-riffle, the lead-line is secured against the substrate, and the net is tilted back so that the maximum amount of surface area is in the water without the water flowing over the top of the net. Approximately 0.25 m<sup>2</sup> of substrate is disturbed directly in front of the net. Any large rocks are hand washed into a wash-bucket.
2. Sweep Sample: This method involves sampling a variety of habitats using a D-frame net. Each habitat is sampled in three replicates whenever possible.
  - i. Undercut Banks: The principal habitat in undercut banks is submerged roots. Note - if undercut banks are present in both riffle and pool areas, each is sampled separately.
  - ii. Marginal Emergent Vegetation Sample (exclusive of *Justicia* beds): A triangular or D-frame kicknet is placed in the vegetation and about 1 meter is swept. Any sticks, leaves, and vegetation are thoroughly washed before discarding.
  - iii. Bedrock or Slabrock Sample: The edge of the D-frame or triangular kicknet is placed flush on the substrate and about 1/3 of a square meter of area in front of the kicknet is sampled.
  - iv. *Justicia* Beds Sample: Along the edge of the *Justicia* bed, the D-frame or triangular kicknet is worked over about one meter section in a jabbing motion and any *Justicia* stems are thoroughly washed, then discarded.
  - v. Leaf Pack Sample: Small, aged leaf and stick packs from a variety of locations, i.e. riffles, runs and pools, are collected and placed in a wash-bucket and thoroughly rinsed.
3. Silt, Sand, and Fine Gravel Sample: This type of material is sampled using two methods.
  - i. Sieving: A number 10 sieve is used to sort out larger invertebrates from silt, sand, and gravel. The sieve is scooped

through each of the substrate types, penetrating the substrate at least five cm. Fine material is rinsed away from the sample. Each substrate type (silt, sand, and gravel) is sampled three times.

- ii. Netting: A fine-mesh Surber Sampler or a fine-mesh bag (300  $\mu$ m), is used to collect an area of about 1/3 square meter in sand and silt depositional areas. All materials are removed from the sampler and placed in a pan for sorting.
4. Aufwuchs Sample: This habitat is collected by washing rocks, sticks, leaves, filamentous algae, and moss in a medium to large-sized bucket 1/2 to 2/3 full of water. After sample material is washed and discarded, the elutriate in the bucket is swirled and poured through a Nitex sampler. The sampler is placed in 95% alcohol and let stand from 5 to 15 minutes before sorting.
  5. Rock Picking Sample: Thirty rocks are selected from the site. Ten rocks each are taken from the riffles, runs, and pools. The sizes of the rocks range from that of a softball to a small dinner plate (10-30 cm). Rocks are placed in a sorting pan, carefully picked, removing all invertebrates and cases, which are placed in a collection jar. Rocks are replaced into the streams.
  6. Wood Sample: About 20 linear feet of submerged wood ranging in diameter from 5 to 8 cm are selected. Wood is placed into the wash-bucket and rinsed of all surface material. Wood is inspected for burrowing invertebrates. Large diameter logs are hand picked. Well-seasoned wood (log, limb, etc) is exposed to air for 15-20 minutes, because many burrowing types will crawl to the surface.
  7. Sorting: After the collections have been made, the samples are sorted in the field. All collected material is sorted in a white pan. Sorting is accomplished with the following procedures:
    - i. Place a small amount of water in the pan (no more than a quarter inch.)
    - ii. From the wash buckets, remove about a tablespoon of material and place in the pan.
    - iii. Swirl the material to distribute it evenly throughout the pan.
    - iv. Remove invertebrates from the pan with forceps and place into a collection jar, filled with 95% alcohol.



8. Preservation and labeling: Samples are sorted into collection jars containing 95% ethyl alcohol in the field. Samples are transferred to 70% ethyl alcohol solution in the laboratory. Before leaving the site, all invertebrates are placed in the sample jar(s) and all jars are completely filled with 95% alcohol. Completely filling jars reduces damaging movement of the enclosed invertebrates.
9. In the field, a label is placed in each collection jar. The label includes the site number, stream name, location, and date sampled. When changing the sample over in the laboratory a permanent label is placed in the collection jar. This label includes the site number, stream name, state, county, locality, date, mile-point, latitude, longitude, and collectors' names.
10. Identification: All macroinvertebrates are identified to the lowest possible taxonomic level. In most cases, this is species level. When listing the organism on the Macroinvertebrate Laboratory Data Sheet (MLDS) the family name also is included so that the data can be entered easily into the biological database. A MLDS is completed for each site. After the data from the MLDS have been entered into EDAS, the MLDS is filed under the appropriate segment in the Intensive Survey files.
11. One goal of the Intensive Survey program is to establish a voucher specimen of every macroinvertebrate taxon found in Kentucky. Vouchers will be used to verify identifications. Vouchers will be sent to acknowledged experts for verification. The vouchers will be stored in the Macroinvertebrate Laboratory and organized by order. Voucher specimens kept in 70% ethyl alcohol are placed in tightly capped vials. Chironomids, oligochaetes, and other slide-mounted species are kept in slide cabinets. All specimens contain a label that includes order, family, genus, and species; site number; stream name, and date collected.

### **B3: Sample Handling and Custody**

Macroinvertebrate preservation and labeling: Samples are sorted into collection jars containing 95% ethyl alcohol in the field. Samples are transferred to 70% ethyl alcohol solution in the laboratory. Before leaving the site, all invertebrates are placed in the sample jar(s) and all jars are completely filled with 95% alcohol. Completely filling jars reduces damaging movement of the enclosed invertebrates.

In the field, a label is placed in each collection jar. The label includes site number, stream name, location, and date sampled. When changing the sample over in the laboratory a permanent label is placed in the collection jar. This label includes the site number, stream name, state, county, locality, date, mile-point, latitude, longitude, and collectors' names.

Fish are identified to the lowest possible taxonomic unit and verified by at least two people knowledgeable in fish identification. All data are entered into field notebooks. Voucher specimens are saved and preserved in 10% formalin buffered with  $\text{CaCO}_3$  and identifications are verified.

Wet mount slides (a minimum of three) for non-diatom taxa are examined at 200x and 400x. Taxa present are recorded in a logbook along with estimated relative abundance (abundant, common, rare). In determining abundance, colonial, connubial, or filamentous forms are recorded as units rather than counting the individual cells present. Digital photographs of each taxon are taken and used to create a species archive. All identifications are verified by at least two people knowledgeable in algal identification.

Diatoms are examined using the hydrogen peroxide/potassium dichromate oxidation method for clearing. Cleared diatoms are mounted in Nephrax. A minimum of 300 to 500 valves is identified and the numbers of each taxon recorded on bench data sheets. Digital photographs of each taxon are taken and used to create a species archive. All identifications are verified by at least two people knowledgeable in algal identification.

#### **B4: Analytical Methods**

A YSI multiparameter environmental monitoring system will be used to measure dissolved oxygen, temperature, turbidity, oxidation-reduction potential, pH, and conductivity. This instrument is calibrated each day sampling is to occur. A digital flow meter is used to measure discharge. A pH meter and digital titrator will be used in the laboratory to calculate alkalinity. The pH meter will be calibrated for each use.

#### **B5: Quality Control**

All algal identifications are verified by at least two people knowledgeable in algal identification. Fish are identified to the lowest possible taxonomic unit and verified by at least two people knowledgeable in fish identification. Macroinvertebrates are identified to the lowest possible taxonomic unit and verified by at least two people knowledgeable in macroinvertebrate identification. Ten percent of samples will be submitted to KDOW for verification.

#### **B6: Instrument/Equipment Testing, Inspection, and Maintenance**

All field monitoring equipment will be calibrated in accordance with the manufacturer's user's manuals.

#### **B7: Instrument/Equipment Calibration and Frequency**

The YSI and pH meter will be calibrated on each sample date.

#### **B8: Inspection/Acceptance of Supplies and Consumables**

Supplies and consumables will be provided and inspected by Hancock Biological Station and the Center for Reservoir Research.

**B9: Non-direct Measurements**

Detailed topographic maps (1:150,000) of the sampling area are used to locate sampling sites.

**B10: Data Management**

At the end of each day, the Field Sampling Supervisor will check all field data sheets for completeness and accuracy. The sheets are taken to Hancock Biological Station and the data are entered into spreadsheets. All data will be examined and evaluated by the Project Officer.

**C1: Assessments and Response Actions**

The Project Officer will review the biological sampling project on a regular basis and will communicate with KDOW. The Field Sampling Supervisor will train all field workers and require them to periodically review established sampling protocols.

**C2: Reports to Management**

Project officer will submit reports as required by KDOW.

**D1: Data Review, Verification, and Validation**

Data is to be compared to previous KDOW (1996) study of the same sites.

Multi-metric scoring systems will be used to integrate algae, macroinvertebrate, and fish metrics (Fish Index of Biotic Integrity (IBI), Macroinvertebrate Bioassessment Index (MBI), and Diatom Bioassessment Index (DBI) and Non-diatom Scores).

Biological and habitat data will be entered into the Kentucky's Ecological Database System (EDAS).

**D2: Verification and Validation Methods**

The Project Officer will regularly review all data resulting from this project and determine whether it is acceptable.

Biological data collected during this project will be compared to two previous studies on the same sites. Ten percent of samples (invertebrates, fish, and algae) will be submitted to KDOW/NPS for verification.

### **D3: Reconciliation with User Requirements**

Soon after each sampling event, data will be evaluated for completeness, precision, and accuracy. If data are not acceptable, re-sampling will occur. Depending upon the cause of the problem, corrective measures will be made.

### **Literature Cited**

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