

North Carolina Division of Water Quality  
Surface Water Protection Section – Program Development Unit  
Watershed Assessment Team  
October 3, 2008

**Addendum to the Draft Water Quality Monitoring Plan for Indian and Howard’s Creeks  
Catawba, Lincoln, and Gaston Counties**

Catawba River Basin  
Catalog Unit # 03050102  
HU # 050010, 040030, and 040040

This document is a revision to the draft monitoring plan dated 16 May 2008. This revision is based on the results of the preliminary reconnaissance and monitoring activities conducted through August 2008. The originally proposed sites at which water chemistry and benthic monitoring were conducted are shown in Figure 1. A brief summary of the findings of the preliminary reconnaissance is provided below. Wetland functional assessments using the NC Wetland Assessment Method (NC WAM) were conducted by Division of Water Quality (DWQ) Watershed Assessment Team (WAT) and other DWQ personnel in August 2008 and will not be addressed in this revision.

**I. Overview of the Results of the Preliminary Watershed Reconnaissance and Monitoring**

**A. Field Metrics, Water Chemistry, and Fecal Coliforms**

Field metrics to date have revealed very few problems within the Indian and Howard’s Creek watersheds, including their tributaries. The initial low pH measurements in Mill Creek appear to have been a one-time phenomenon and may possibly have been the result either of something that had spilled into the water or possibly a pH meter malfunction. The facts that the pH increased to almost normal at the most downstream site on Mill Creek on that date and that data collected on the same date at other sites as well as on subsequent dates in Mill Creek and throughout the rest of the watershed appear to eliminate meter malfunction as the cause of this low reading. No pH problems occurred elsewhere.

Water chemical analyses indicated that metals were not an issue anywhere in the LWP watersheds. The primary water chemistry issues appear to be phosphorus at stations below the Cherryville WWTP, nitrite + nitrate nitrogen in Howard’s Creek and mainstem Indian Creek, and ammonia nitrogen in the headwaters of Howard’s Creek and Indian Creek at the sites just above and immediately below the Cherryville WWTP. Ammonia nitrogen also was elevated on one occasion each in Mill Creek, Leonard Fork, and Tanyard Creek within the LWP area, as well as once in Leeper’s Creek (benthos reference creek for this region and also the reference creek for this study). This appears to be due largely to the presence of livestock in or near the streams in the headwaters of the smaller creeks.

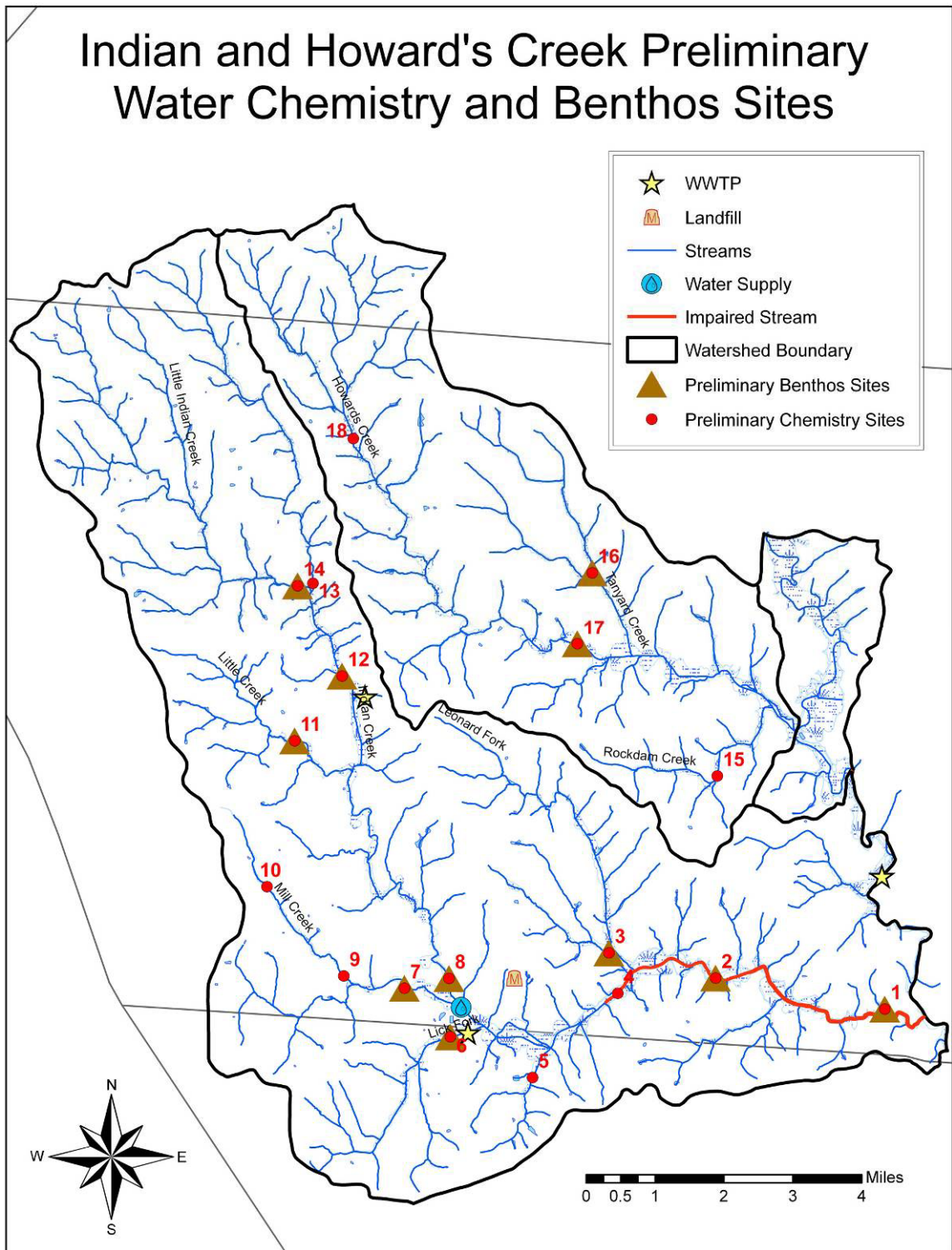


Figure 1. The Indian and Howard Creeks LWP area showing streams, watershed boundaries, and the preliminary monitoring locations for water chemistry and benthos. The numbers adjacent to the monitoring points correspond to map points listed in Table 1.

Table 1. Individual Site Parameters and Monitoring Frequency.<sup>1</sup>

Map Point	Station Location	Road Name	Benthos (Oct.)	Habitat Assessments	Field Metrics	Baseflow		Stormflow
						Chemistry (nutrients, TSS, Fecal Coliform, Cu, Turbidity, only)	Chemistry (P, NH <sub>3</sub> , NO <sub>x</sub> , Fecal Coliform, Cu, only)	Chemistry (nutrients, TSS, Fecal Coliform, Metals, Turbidity) <sup>3</sup>
1	Indian Cr @ SR1252	Laboratory Road	X		M	M		Q
2	Indian Cr @ SR1177	Pleasant Grove Ch Rd	X		M	M		
3	Leonard Fork @ SR1180	George Brown Rd					Site dropped	
4	Indian Cr @ SR1169	Crouse Road		X			Site dropped <sup>2</sup>	
5	UT to Indian Cr @ SR1636	Robert Road		X	Q		Q	
6	Lick Fork @ SR1637	Tot Dellinger Rd					Site dropped	
7	Mill Cr @ SR1168	Johnstown Road					Site dropped	
8	Indian Cr @ SR1168	Johnstown Road	X		M	M		
9	Mill Cr @ SR1158	Fish Pond Road		X			Site dropped <sup>2</sup>	
10	Mill Cr @ SR1150	Bess Chapel Ch Rd		X			Site dropped <sup>2</sup>	
11	Little Cr @ SR1150	Bess Chapel Ch Rd					Site dropped	
12	Indian Cr @ NC27	NC 27					Site dropped	
13	Little Indian Cr @ SR1129	Beam Lumber Rd	X		Q		Q	
14	Indian Cr @ SR1129	Beam Lumber Rd		X	Q		Q	
15	Rockdam Cr @ NC27	NC 27		X			Site dropped <sup>2</sup>	
16	Tanyard Cr @ SR1113	Reepsville Road			Q		Q	
17	Howard's Cr @ SR1200	Alf Hoover Road	X		M	M		Q
18	Howard's Cr @ SR1113	Reeps Grove Ch Rd					Site dropped	
none	Leeper's Cr @ SR1354	Asbury Ch Road	X	X	Q		Q	

<sup>1</sup>X indicates assessments to be conducted at least once during the study; M = monthly; Q = quarterly.

<sup>2</sup>Habitat assessments will be conducted on these dropped sites, as no habitat assessments have been done.

<sup>3</sup>Metals include: Cu, Mn, Ni, Pb, and Zn.

Fecal coliform counts were elevated on at least one occasion each in the headwaters of Indian and Howard's Creeks, as well as in Leonard Fork, Rockdam Creek, Tanyard Creek, the UT to Indian Creek at SR 1636 (drains northeastern Cherryville), and the most downstream station on Mill Creek. All of these elevated coliform counts appear to reflect the presence of livestock in or near the streams.

Pertinent water chemistry and fecal coliform data are shown in the attached Appendix.

## **B. Benthic Macroinvertebrates**

WAT personnel (Larry Eaton and Cathy Tyndall) collected benthic macroinvertebrates in June 2008 to assess the impacts of the 2007 fall and winter drought on benthic invertebrate populations. Full-scale assessments were conducted at three sites, including Indian Creek at Laboratory Rd. (existing DWQ ambient monitoring and benthos site), Indian Creek at SR 1168 (new site above Cherryville WWTP), and Howard's Creek at SR 1200 (existing DWQ benthos site). An attempt also was made to assess Indian Creek at SR 1177 (existing DWQ benthos at this site caused Indian Creek to be placed on the 303 (d) list as impaired). This site was abandoned due to lack of sufficient habitat to support good benthic macroinvertebrate populations. Eight other new sites were evaluated using the Qual 4 method because of concerns that a potential summer drought might impact flow sufficiently to prevent the planned fall benthos collections by BAU. Habitat assessments were conducted at all 12 sites in association with each benthos collection. The results reported below are tentative upon calculation of the biotic indices (BI) for each site.

The number of taxa and relative abundances of species observed in June 2008 suggested moderate to good water quality in Indian and Howard's Creeks. Only one stream, Mill Creek, appeared to have severe water quality problems. Good ratings were given to Leonard Fork, Howard's Creek and Indian Creek above the confluence with Mill Br. Water quality was rated Good-Fair at all other sites. Most of the streams in the watershed contain large amounts of sand, reducing the habitat available for aquatic life. The best habitat was at Little Indian Creek, where good riffles supported the stoneflies *Tallaperla* and *Pteronarcys bilobata*, two species usually associated with mountain streams. Following sediment, the next greatest problem in the watershed is access of cattle or inflow of their wastes to the streams. Streambanks at Tanyard Cr have been destabilized by cattle access to the stream and direct nutrient inputs were witnessed. Although cattle were fenced out of Mill Creek, the fence was immediately at the top of the bank; nutrients and sediment most likely washed in every time it rained.

There also appeared to be some urban impacts to Lick Fork from the town of Cherryville. Low flows may be impacting aquatic communities in the headwaters of the Indian and Howard's Creek watersheds (e.g. Indian Creek at NC 27 and Howard's Creek at SR 1113). These impacts likely were exacerbated during the summer drought. Based on our inability to find adequate habitat to conduct a survey at Indian Creek at SR 1177 during this survey, it is possible that the Fair rating given to this segment of Indian Creek in 2006 (only one taxon short of a Good-Fair rating) was due to insufficient habitat rather than water quality impairment and that the subsequent listing of Indian Creek on the 303(d) list was inappropriate. These sites should be

sampled again to investigate this possibility and, if verified, perhaps have Indian Creek removed from the impaired stream list.

## **II. Revision to Monitoring Approach Based on the Results of the Preliminary Watershed Reconnaissance and Monitoring Activities**

This revision reflects only those activities to be completed during the remainder of the project. Further monitoring efforts on the Indian Creek and Howard's Creek watersheds will include physical (habitat and field metrics), chemical, and biological (bacteriological and benthic macroinvertebrates). Monitoring stations for the revised monitoring plan are shown in Figure 2.

### **A. Revised Objectives of the Draft Monitoring Plan**

The objectives of the continuing monitoring activities are to:

- Address the biological impairment of lower Indian Creek, with the goal of identifying specific stressors that may be causing the impairment and determining their sources;
- Characterize and compare water quality conditions among the Indian and Howard's Creek watersheds and a reference stream;
- Identify sources of pollution and determine their impacts on water quality;
- Compare water quality in the urbanized subwatersheds with those in rural watersheds;
- Determine whether or not water quality standards/action levels are being violated in the Indian and Howard's Creek watersheds, particularly above the source water intake for the City of Cherryville;
- Find potential locations for implementation of Best Management Practices (BMPs), stream enhancements, and stream restorations.

### **B. Physical, chemical, and biological monitoring sites and frequencies of sampling**

A total of 18 monitoring sites (Figure 1) originally were chosen on the basis of preliminary field measurements (water temperature, dissolved oxygen, specific conductance, and pH) and limited water chemistry and fecal coliform bacterial analyses at selected locations across the LWP area. Additionally, a subset of twelve of these sites was selected within the LWP area for benthic macroinvertebrate assessments, including the two existing BAU benthos sites and ten new locations (Figure 1). Leeper's Creek, the existing BAU benthos reference stream for this region, was chosen as the reference creek for both benthos and water chemistry. Habitat assessments have been conducted at all 12 of these benthos sites.

**1. Physical assessments.** The previously proposed physical assessments (habitat assessments, stream flow) and field metrics (water temperature, dissolved oxygen, specific conductance, and pH) for this project will continue. Habitat assessments will be conducted at the six sites in the Indian and Howard's Creeks watersheds that have not yet been assessed and also at Leeper's Creek. Field metrics will continue to be taken on each date at which a sampling station is visited. Other measurement procedures (e.g., deployment of datasondes for continuous monitoring of temperature, dissolved oxygen, and pH) may be used, if warranted.

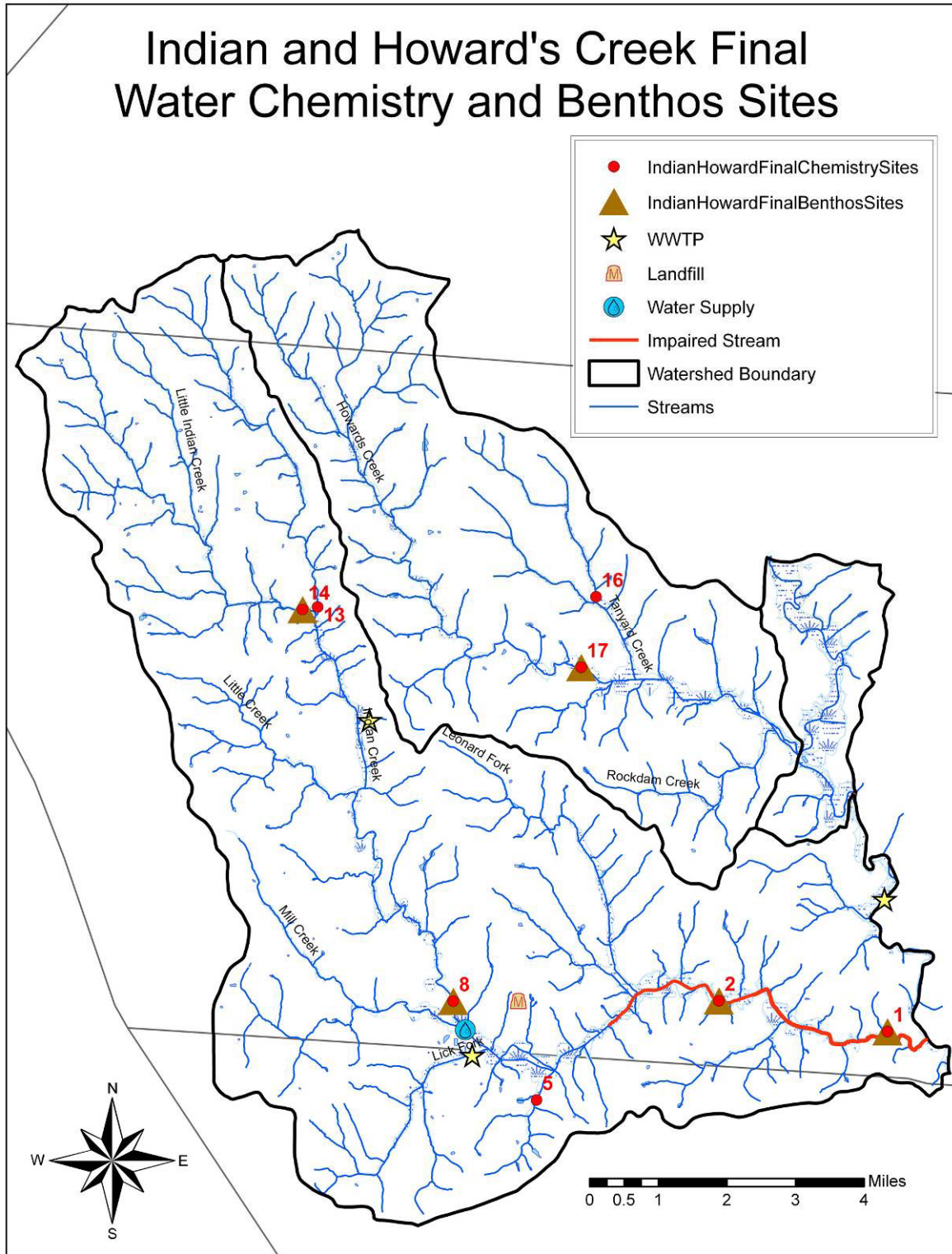


Figure 2. Locations of final water chemistry and benthos monitoring sites in the Indian and Howard Creeks LWP. The numbers adjacent to the monitoring points correspond to the same numbers for those sites in Figure 1 and to the map points shown in Table 1.

**2. Water chemistry and fecal coliform monitoring.** The results of preliminary water chemistry monitoring indicated that most of the baseflow chemistry could be reduced to quarterly sampling. Four sites (three on Indian Creek and one on Howard's Creek) will continue to be monitored monthly with a reduced complement of analyses (nutrients, fecal coliforms, copper, TSS, and turbidity). The monthly baseflow monitoring and analyses on these stations are necessary to address the issue of impairment in Indian Creek. Ten stations have been dropped entirely (Table 1, stations shown in red). Three stations within the larger Indian Creek watershed, one within the Howard's Creek watershed, and Leeper's Creek (regional benthic reference station) will be monitored quarterly with a further reduction in analyses (ammonia nitrogen, nitrite + nitrate nitrogen, phosphorus, fecal coliforms, and copper). Stormflow sampling will be conducted quarterly at the two most downstream sites on Indian and Howard's Creeks. Analyses for stormflow will include all analyses conducted at the monthly baseflow sites, plus four additional potentially toxic metals (nickel, lead, manganese, and zinc). Individual analyses that do not provide useful data from stormflow sampling during the first sampling date either may be dropped during subsequent stormflow sampling, or further stormflow sampling may be terminated entirely, pending agreement with EEP personnel. Individual parameters for monitoring and frequency of monitoring for each station are shown in Table 1. A revised project timetable is presented in Table 2.

**3. Biological monitoring.** Biological monitoring (benthic invertebrate collections) by BAU will be conducted in early October. The number of monitoring sites has been reduced from 13 (twelve in the Indian-Howard's Creek watersheds + Leeper's Creek) to six, based on the results from the June 2008 surveys by WAT benthic biologists, preliminary evaluations of other physical and chemical monitoring data, and concern about low flow and its impacts (i.e., the summer 2008 drought) throughout the Indian-Howard Creek LWP area, particularly in the smaller subwatersheds. Full-scale collections will occur at six sites (Table 1) including three on Indian Creek, one on Little Indian Creek (site appears to be near reference quality), one site on Howard's Creek, and at the regional benthos reference station on Leeper's Creek. The objective is to minimize unnecessary expenditure of personnel time and resources while still adequately addressing the issue of biological impairment on Indian Creek.

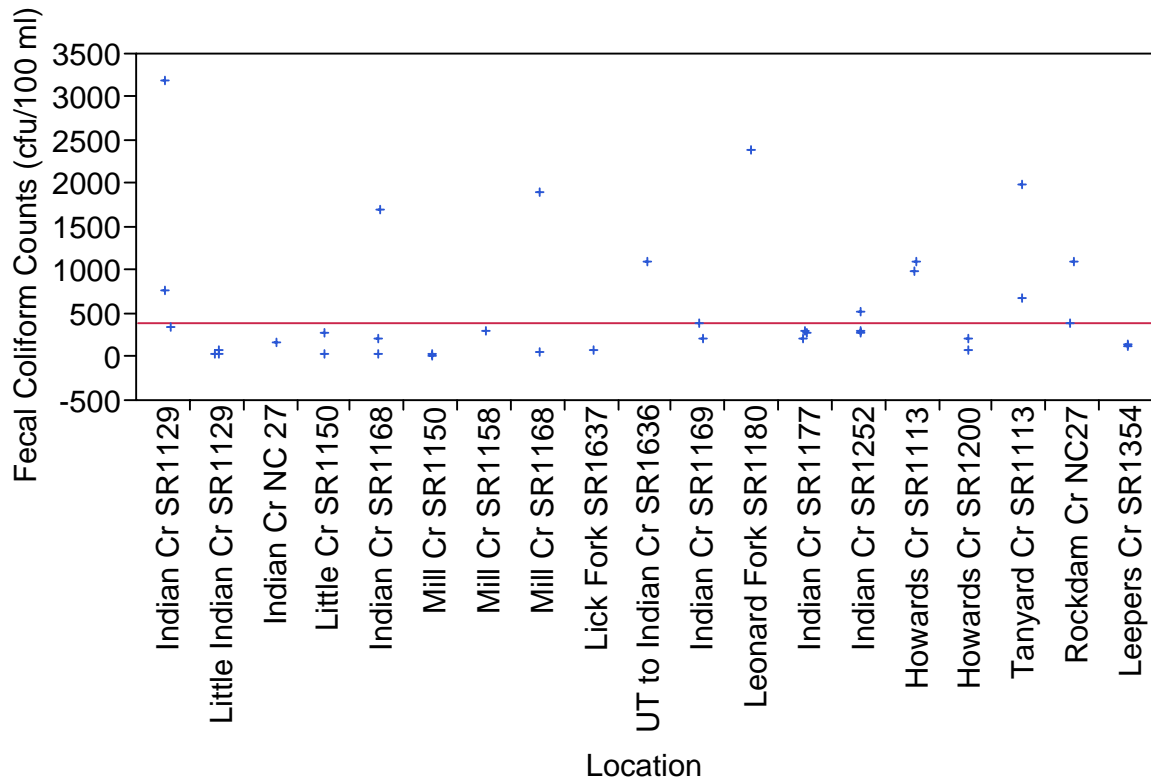
Table 2. Revised project timetable.

<b>Activity</b>	<b>Apr 08</b>	<b>May 08</b>	<b>Jun 08</b>	<b>Jul 08</b>	<b>Aug 08</b>	<b>Sep 08</b>	<b>Oct 08</b>	<b>Nov 08</b>	<b>Dec 08</b>	<b>Jan 09</b>	<b>Feb 09</b>	<b>Mar 09</b>	<b>Apr 09</b>	<b>May 09</b>	<b>Jun 09</b>
Preliminary reconnaissance	X	X	X	X	X										
Field parameters			X	X	X	X	X	X	X	X	X	X			
Habitat assessments			X			X									
Baseflow water chemistry			X	X	X	X	X	X	X	X	X	X			
Fecal coliforms			X	X	X	X	X	X	X	X	X	X			
Benthos collections			X				X								
Stormflow water chemistry						X			X			X			
Wetland assessments					X										
Wetland report							X								
Data Analysis													X	X	
Report Writing														X	X
Final report															X

## APPENDIX

### Fecal Coliform Counts, Nutrients, and Specific Conductance Data from Preliminary Monitoring Activities in the Indian and Howard's Creek LWP Area and a Reference Site, Leeper's Creek

(Sampling stations are shown left to right in an upstream to downstream orientation. The black lines represent the grand means of all measurements taken at all locations)



The dashed red line represents a reference level of 400 cfu/100 ml.

