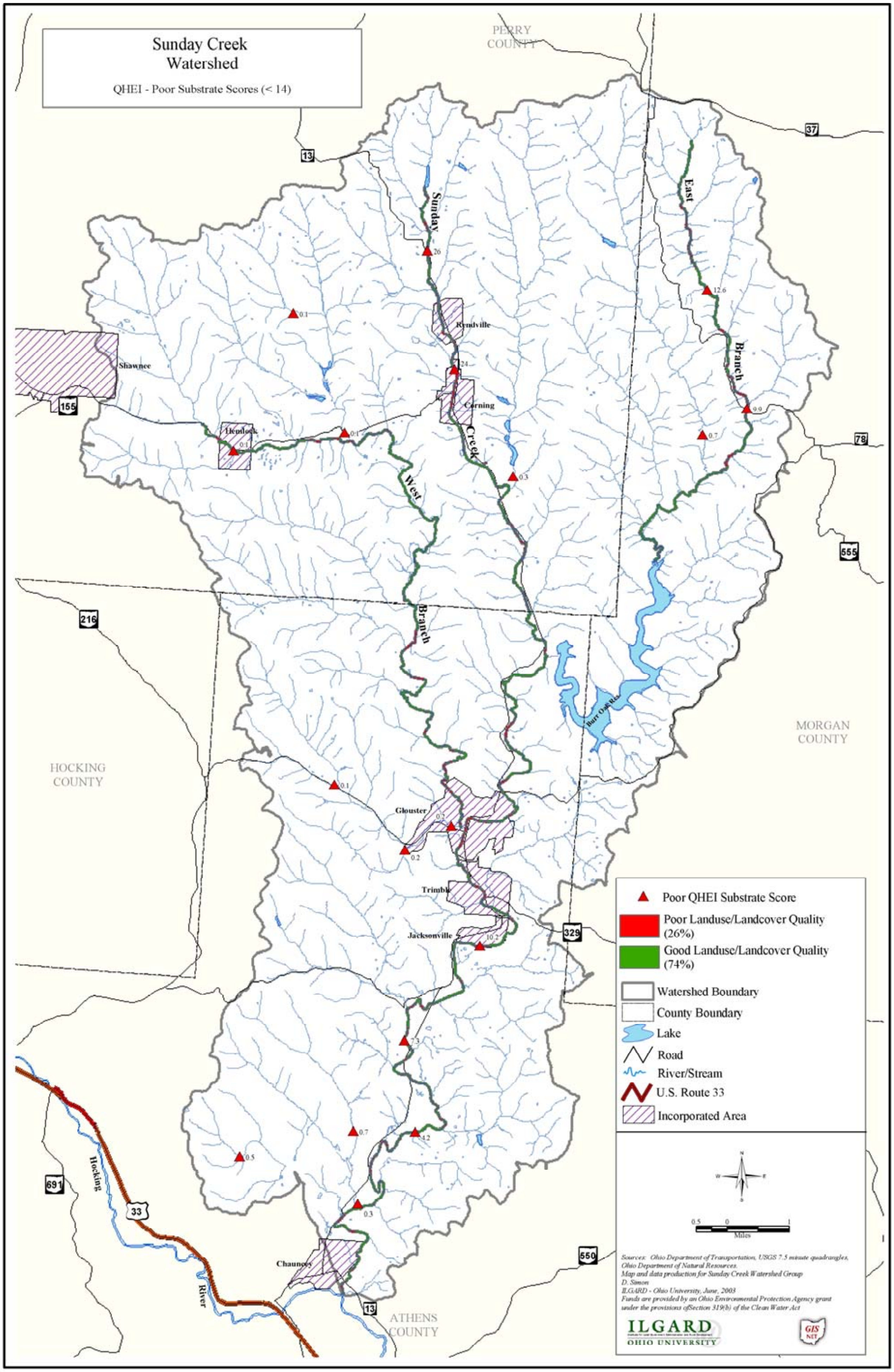
Appendix A

Map of Sites That Scored Below the Substrate Target Score of 13



Sunday Creek
Watershed
QHEI - Poor Substrate Scores (< 14)
PERRY COUNTY
HOCKING COUNTY
MORGAN COUNTY
ATHENS COUNTY
Sunday
Creek
West
Branch
East
Branch
Burr Oak Res.
Hocking
River
Shawnee
Hemlock
Rendville
Corning
Glouster
Trimble
Jacksonville
Chauncey
13
37
155
78
555
216
329
691
33
550
26
0.1
24
12.6
9.9
0.7
0.3
0.2
10.2
7.3
4.2
0.5
Poor QHEI Substrate Score
Poor Landuse/Landcover Quality (26%)
Good Landuse/Landcover Quality (74%)
Watershed Boundary
County Boundary
Lake
Road
River/Stream
U.S. Route 33
Incorporated Area
0.5 0 1
Miles
Sources: Ohio Department of Transportation, USGS 7.5 minute quadrangles, Ohio Department of Natural Resources.
Map and data production for Sunday Creek Watershed Group
D. Simon
ILGARD - Ohio University, June, 2003
Funds are provided by an Ohio Environmental Protection Agency grant under the provisions ofSection 319(b) of the Clean Water Act
ILGARD
OHIO UNIVERSITY
GIS NET

Appendix B

Bacterial Indicator Tool Users Guide

United States Environmental Protection Agency
Office of Water 4305
EPA-823-B-01-003
March 2000

Bacterial Indicator Tool

User's Guide

Bacterial Indicator Tool
User's Guide
March 31, 2000

INTRODUCTION

The Bacterial Indicator Tool is a spreadsheet that estimates the bacteria contribution from multiple sources. Currently, the tool is enabled for fecal coliform. However, the tool could be adapted for other bacterial indicators, such as *E. coli*, if the necessary bacteria production information is available. Output from the tool is used as input to WinHSPF and the Hydrological Simulation Program Fortran (HSPF) water quality model within BASINS. The tool estimates the monthly accumulation rate of fecal coliform bacteria on four land uses (cropland, forest, built-up, and pastureland), as well as the asymptotic limit for that accumulation should no washoff occur. The tool also estimates the direct input of fecal coliform bacteria to streams from grazing agricultural animals and failing septic systems. The Bacterial Indicator Tool was developed to provide starting values for model input, however a thorough calibration of the model is still recommended.

The Bacterial Indicator Tool is based on a modeling study of 10 subwatersheds, composed of four land uses (cropland, forest, built-up, and pastureland). BLUE text found throughout the spreadsheet presents valuable information and assumptions. RED text designates values that should be specified by the user. BLACK text usually presents information that is calculated by the spreadsheet or that should not be changed. The tool contains the following worksheets:

Worksheet Name	Purpose
Land Use	Lists the distributions of built-up land, forestland, cropland, and pastureland in up to 10 subwatersheds.
Animals	Lists the number of agricultural animals in each subwatershed (beef cattle, dairy cattle, swine, chickens, horses, sheep, and other [user-defined]), and the densities of wildlife by land use category (ducks, geese, deer, beaver, raccoons, and other [user-defined]).
Manure Application	Calculates the fraction of the annual manure produced that is available for washoff based on the amount applied to cropland and pastureland in each month and the fraction of manure incorporated into the soil (for hog, beef cattle, dairy cattle, horse, and poultry manure).
Grazing	Lists the days spent confined and grazing for beef cattle, horses, sheep, and other. Beef cattle are assumed to have access to streams while grazing.
References	Lists literature and assumed values for manure content, wildlife densities, and built-up fecal coliform accumulation rates. These values are used in calculations in the remaining worksheets.

Worksheet Name	Purpose
Wildlife	Calculates the fecal coliform bacteria produced by wildlife by land use category.
Cropland	Calculates the monthly rate of accumulation of fecal coliform bacteria on cropland from wildlife, hog, cattle, and poultry manure.
Forest	Calculates the rate of accumulation of fecal coliform bacteria on forestland from wildlife.
Built-up	Calculates the rate of accumulation of fecal coliform bacteria on built-up land using literature values.
Pastureland	Calculates the monthly rate of accumulation of fecal coliform bacteria on pastureland from wildlife, cattle, and horse manure, and cattle, horse, sheep, and other grazing.
Cattle in Streams	Calculates the monthly loading and flow rate of fecal coliform bacteria contributed directly to the stream by beef cattle.
Septics	Calculates the monthly loading and flow rate of fecal coliform bacteria from failing septic systems.
ACQOP&SQOLIM (for land uses)	Summarizes the monthly rate of accumulation of fecal coliform bacteria on the four land uses; calculates the build-up limit for each land use. Provides input paramters for HSPF (ACQOP/MON-ACCUM and SQOLIM/MON-SQOLIM).

The following information must be input by the user:

- Land use distribution for each subwatershed (built-up, forest, cropland, and pastureland, including, to the extent possible, the breakout of built-up land into commercial and services, mixed urban or built-up, residential, and transportation/communications/utilities).
- Agricultural animals in each subwatershed
- Wildlife densities for forest, cropland, and pastureland in the study area (built-up land is assumed not to have wildlife)
- Number of septic systems in the study area
- Number of people served by septic systems in the study area
- Failure rate of septic systems in the study area

Default values are supplied for the following inputs, but they should be modified to reflect patterns in the study watershed:

- Fraction of each manure type that is applied each month
- Fraction of each manure type that is incorporated into the soil
- Time spent grazing and confined by agricultural animals (and in stream for beef cattle only)

Literature values are supplied for the following inputs, but they may be replaced with user values if better information is available for the study watershed:

- Animal waste production rates and fecal coliform bacteria content
- Fecal coliform bacteria accumulation rates for built-up land uses
- Raw sewage fecal coliform bacteria content and per capita waste production

The remainder of this document describes the purpose and use of each worksheet within the Bacterial Indicator Tool, as well as the input required by the user (if any). The symbol "**U**" indicates that user input is required in the sheet being described; the symbol " - " indicates that no input is needed.

LAND USE

U	User Input Required

The modeled land uses are derived from the original land uses by reassigning the original categories to the corresponding model categories. Only four categories are considered in this tool: Cropland, Forest, Built-up, and Pastureland. Reassign the categories in your existing land use database, and calculate the acres of each of the four model land use categories within each subwatershed. Enter the values in the appropriate cells on the Land Use sheet. Total acres by subwatershed and land use category will be calculated automatically.

ANIMALS

U	User Input Required

Fecal contributions from the animals listed in this worksheet are used to derive loading estimates for all land uses except for built-up. Only manure from cattle, swine, and poultry is assumed to be collected and applied to cropland. Cattle manure is also assumed to be applied to pastureland. Horse manure is assumed to be collected and applied to pastureland only. Manure from cattle, horses, sheep and "other" agricultural animals is assumed to be contributed to pastureland in proportion to time spent grazing. Wildlife densities are provided for all land uses except built-up and are assumed to be the same in all subwatersheds. An "other" category is provided for both agricultural animals and wildlife to allow the user to include animals that are not already available in the tool.

In the absence of site-specific data, the number of agricultural animals present in each subwatershed can be determined using county-level data from the Census of Agriculture (http://www.nass.usda.gov/census/census97/highlights/ag-state.htm). The total number of agricultural animals can be estimated for each subwatershed based on a ratio of subwatershed-level pastureland to county-level pastureland area. For example, assume Subwatershed 1 is located entirely within County A and that County A contains 1000 acres of pastureland and 200 dairy cows. If Subwatershed 1 contains 100 acres of pastureland, this subwatershed is assigned [(200/1000)*100] = 20 dairy cows. Calculate the number of agricultural animals (dairy and beef cattle, swine, chickens, horses, sheep, and "other") in each subwatershed and enter these values in the appropriate cells on the Animals sheet. Totals by subwatershed and animal type will be calculated automatically.

The densities of wildlife are estimated based on the best available information. It is assumed that no wildlife are present on built-up land and that the densities of wildlife on each of the remaining land use types (forest, cropland and pastureland) are the same across all subwatersheds. Enter the density for each form of wildlife (ducks, geese, deer, beaver, raccoons, and "other") on each land use type in animals per square mile. The wildlife densities per acre will be calculated automatically.

MANURE APPLICATION

U	User Input Required

This sheet contains information regarding the land application of waste produced by agricultural animals in the study area. Application of hog manure, cattle manure, horse manure, and poultry litter is considered. The information is presented based on the monthly variability of waste application. The annual production of manure is calculated and then applied each month using the information in this sheet. It is assumed that cattle manure is applied to both cropland and pastureland using the same method. Hog manure and poultry litter are assumed to be applied only to cropland. Horse manure is assumed to be applied only to pastureland.

For each of the four major manure sources (hogs, cattle, horses, and poultry), specify the fraction of the annual manure produced that is applied each month (January through December) and the fraction of the manure applied that is incorporated into the soil. The fraction of manure available for washoff each month for each type of manure will then be calculated automatically. Note that the equation used to calculate the fraction available for runoff can be updated if necessary.

GRAZING

U	User Input Required

This sheet contains information relevant to cattle, horses, sheep, and "other" animals grazing in the study area. Dairy cattle are assumed to be kept only in feedlots. Therefore, all of their waste is used for manure application (divided between cropland and pastureland). Beef cattle are assumed to be kept in feedlots or allowed to graze (depending on the season). When they are grazing, a certain proportion is assumed to have direct access to streams. The grazing time spent in streams actually represents a combination of the number of animals with stream access and the percent of time these animals spend contributing waste directly to the streams. Beef cattle waste is therefore applied as manure to cropland and pastureland, contributed directly to pastureland, or contributed directly to streams (referred to by the tool as Cattle in Streams). Horses are assumed to be either kept in stables or allowed to graze. Horse waste is therefore either applied as manure to pastureland or contributed directly to pastureland; horse manure is not applied to cropland. Sheep are assumed to be allowed to graze year-round. Sheep waste is therefore contributed only directly to pastureland. The purpose of the “other” animal category is to allow you to define the grazing patterns of an agricultural animal not available in the default information. To use this category, you must be sure to enter the number of “other” animals in each subwatershed (on the Animals sheet) and to specify a fecal coliform bacteria production rate for this animal (on the References sheet). "Other" animal waste is contributed directly to pastureland only while grazing.

For cattle, horses, sheep, and “other,” enter the fraction of time spent confined each month (from 0, never confined, to 1, always confined). The fraction of time and the number of days per year spent grazing will be calculated automatically. For cattle, you should also specify the fraction of time grazing that is spent in streams. The fraction of time grazing spent in pasture will be calculated automatically.

REFERENCES

-	User Input Required

The data from the References sheet are accessed in the remaining worksheets. Fecal coliform production rates for various animals are presented from several sources, and you may select the source you prefer or enter a value of your own in the “Best Professional Judgement” column. The spreadsheet is set up to use the ASAE values by default. If you prefer to use a different source, be sure to change the values in cells B9 through B23 on the References sheet. To use the “other” agricultural and wildlife animal categories, you must provide the number of “other” animals in each subwatershed (on the Animals sheet) and a fecal coliform bacteria production rate for this animal (on the References sheet). The References sheet also contains fecal coliform accumulation rates for five Built-up land use types. These numbers may also be changed if appropriate.

WILDLIFE

-	User Input Required

This sheet calculates the total fecal coliform bacteria produced by wildlife each day per acre of cropland, pastureland, and forest. This calculation is performed by multiplying the density (animals per acre) of each type of wildlife on each land use by the rate of fecal coliform production for that wildlife type (count per animal per day). The number of fecal coliform bacteria produced is then summed across all wildlife types for each land use to obtain a total wildlife fecal coliform production rate (count per acre per day), which will be used in subsequent sheets.

To use the "other" wildlife category, you must be sure to enter the number of "other" animals in each subwatershed (on the Animals sheet) and to specify a fecal coliform bacteria production rate for this animal (on the References sheet). No user input is required on the Wildlife sheet.

CROPLAND

-	User Input Required

This sheet calculates the total fecal coliform bacteria applied to each acre of cropland by month. The sources of fecal coliform bacteria for cropland are wildlife, hog manure application, cattle manure application, and poultry litter application. No user input is required on the cropland sheet. Chickens and hogs are assumed to be confined all of the time, and their manure is applied only to cropland. Dairy cattle are also assumed to be confined all of the time, and their manure is applied to both cropland and pastureland. Beef cattle are assumed to be either kept in feedlots or allowed to graze, depending on the season. When they are grazing, a certain proportion is assumed to have direct access to streams (as specified in the Grazing sheet.) Beef cattle manure is therefore either applied to cropland and pastureland, contributed directly to pastureland during grazing, or contributed directly to streams (referred to by the tool as Cattle in Streams.)

Wildlife
The fecal coliform bacteria produced by wildlife per acre of cropland is determined for each month as follows:

1. The total wildlife population of each subwatershed is calculated (acres of cropland from the Land Use sheet multiplied by the cropland wildlife density from the Wildlife sheet.)
2. The total daily fecal coliform bacteria load generated by that population is calculated (acres of cropland from the Land Use sheet multiplied by the fecal coliform generated per acre of cropland from the Wildlife sheet).

3. The daily per acre accumulation rate of fecal coliform bacteria from wildlife is calculated by dividing the total load generated by the number of acres of cropland in each subwatershed.

Hog Manure

The fecal coliform bacteria from hog manure applied per acre of cropland is determined for each month as follows:

1. The number of hogs in each subwatershed (from the Animals sheet) is multiplied by the daily fecal coliform production rate per hog (from the References sheet) to obtain the daily hog fecal coliform production rate.
2. The daily rate is then multiplied by 365 to obtain the amount of fecal coliform produced by hogs per year.
3. The fecal coliform bacteria available for washoff is then calculated by multiplying the annual fecal coliform produced by the amount applied and available for washoff in each subwatershed in each month (from the hog manure section of the Manure Application sheet).
4. The monthly total is then divided by the number of days in each month to obtain the daily accumulation rate.
5. Finally, the daily accumulation rate is divided by the number of acres of cropland in each subwatershed to obtain the daily per acre load of fecal coliform bacteria from hog manure.

Cattle Manure

The fecal coliform bacteria from cattle manure applied per acre of cropland is determined for each month as follows:

1. The number of dairy and beef cattle in each subwatershed (from the Animals sheet) is multiplied by the daily fecal coliform production rate per dairy and beef cow (from the References sheet) to obtain the daily dairy and beef cattle fecal coliform production rates.
2. The daily dairy fecal coliform production rate is then multiplied by 365 to obtain the amount of fecal coliform produced by dairy cattle and available for application as manure per year. The daily beef fecal coliform production rate is multiplied by 365 minus the days spent grazing (from the cattle section of the Grazing sheet) to obtain the amount of fecal coliform produced by beef cattle and available for application as manure per year. (The fecal coliform bacteria produced by beef cattle while grazing is assumed to be delivered directly to pastureland.) The total fecal coliform load from cattle manure application is the sum of the dairy and beef loads.
3. The fecal coliform bacteria available for washoff is then calculated by multiplying the annual fecal coliform produced by the amount applied and available for washoff in each subwatershed in each month (from the cattle manure section of the Manure Application sheet).
4. The monthly total is then divided by the number of days in each month to obtain the daily accumulation rate.

5. Finally, the daily accumulation rate is divided between cropland and pastureland and the portion applied to cropland is divided by the number of acres of cropland in each subwatershed to obtain the daily per acre load of fecal coliform bacteria from cattle manure.

Poultry Litter
The fecal content of the litter is considered here, despite the fact that litter is the combination of manure and bedding. As such, the fecal coliform bacteria produced by chickens and applied to cropland is estimated from the rate of manure production per chicken and the bacteria content of that manure, rather than from the bacteria content of the combined manure and bedding.

The fecal coliform bacteria from poultry litter applied per acre of cropland is determined for each month as follows:

1. The number of chickens in each subwatershed (from the Animals sheet) is multiplied by the daily fecal coliform production rate per chicken (from the References sheet) to obtain the daily poultry fecal coliform production rate.
2. The daily rate is then multiplied by 365 to obtain the amount of fecal coliform produced by chickens per year.
3. The fecal coliform bacteria available for washoff is then calculated by multiplying the annual fecal coliform produced by the amount applied and available for washoff in each subwatershed in each month (from the poultry litter section of the Manure Application sheet).
4. The monthly total is then divided by the number of days in each month to obtain the daily accumulation rate.
5. Finally, the daily accumulation rate is divided by the number of acres of cropland in each subwatershed to obtain the daily per acre load of fecal coliform bacteria from poultry litter.

The total accumulation rate of fecal coliform bacteria from cropland is calculated as the sum of the accumulation rates from wildlife and hog, cattle, and poultry manure applications.

FOREST

-	User Input Required

The wildlife population is the only fecal coliform contributor to forest considered. No user input is required on the Forest sheet. The fecal coliform bacteria produced by wildlife per acre of forest is determined for each month as follows:

1. The total wildlife population of each subwatershed is calculated (acres of forest from the Land Use sheet multiplied by the forest wildlife density from the Wildlife sheet).

2. The total daily fecal coliform bacteria load generated by that population is calculated (acres of forest from the Land Use sheet multiplied by the fecal coliform generated per acre of forest from the Wildlife sheet).
3. The daily per acre accumulation of fecal coliform bacteria from wildlife is calculated by dividing the total load generated by the number of acres of forest in each subwatershed.

BUILT-UP

U	User Input Required

Because of the lack of animal counts and other specific source information for built-up land, literature values are used. Built-up land is broken out into four categories:

- Commercial and Services
- Mixed Urban or Built-Up
- Residential
- Transportation, Communications and Utilities

1. The percentage breakout of these categories is specified by the user in the Built-up sheet. The acres of each built-up category in each subwatershed are calculated by multiplying the total built-up acres (from the Land Use sheet) by the percentage breakouts specified by the user.
2. A daily per acre fecal coliform bacteria loading rate is calculated for each built-up category using literature values. The loading rates provided in Horner (1992) and presented in the References sheet are applied as follows:

Built-up category	**Fecal coliform loading rate (count per acre per day)**
Commercial and Services	Commercial
Mixed Urban or Built-Up	Average of road, commercial, single-family low-density, single-family high-density, and multifamily residential
Residential	Average of single-family low-density, single-family high-density, and multifamily residential
Transportation, Communications and Utilities	Road

3. A weighted average built-up fecal coliform bacteria accumulation rate is calculated for each subwatershed based on the individual built-up land use categories present and their corresponding accumulation rates.

PASTURELAND

-	User Input Required

This sheet calculates the total fecal coliform bacteria applied to each acre of pastureland by month. The sources of fecal coliform bacteria for pastureland are wildlife, cattle and horse manure application, and beef cattle, horse, sheep, and other grazing. No user input is required on the Pastureland sheet. It is assumed that dairy cattle are confined all of the time and their manure is applied to both cropland and pastureland. Beef cattle are assumed to be kept in feedlots or allowed to graze, depending on the season. When they are grazing, a certain proportion of the cattle is assumed to have direct access to streams (as specified on the Grazing sheet.) Beef cattle manure is therefore applied to cropland and pastureland, contributed directly to pastureland during grazing, or contributed directly to streams (referred to by the tool as Cattle in Streams.) Horse manure that is not deposited in pastureland during grazing is assumed to be collected and applied to pastureland. Sheep and "other" animal manure that is not deposited in pastureland during grazing is assumed to be collected and treated or transported out of the watershed and is tabulated in the last column of the Pastureland sheet (FC collected).

Wildlife
The fecal coliform bacteria produced by wildlife per acre of pastureland is determined for each month as follows:

1. The total wildlife population of each subwatershed is calculated (acres of pastureland from the Land Use sheet multiplied by the pastureland wildlife density from the Wildlife sheet).
2. The total daily fecal coliform bacteria load generated by that population is calculated (acres of pastureland from the Land Use sheet multiplied by the fecal coliform generated per acre of pastureland from the Wildlife sheet).
3. The daily per acre accumulation rate of fecal coliform bacteria from wildlife is calculated by dividing the total load generated by the number of acres of pastureland in each subwatershed.

Cattle Manure
The fecal coliform bacteria from cattle manure applied per acre of pastureland is determined for each month as follows:

1. The number of dairy and beef cattle in each subwatershed (from the Animals sheet) is multiplied by the daily fecal coliform production rate per dairy and beef cow (from the References sheet) to obtain the daily dairy and beef cattle fecal coliform production rates.
2. The daily dairy fecal coliform production rate is then multiplied by 365 days to obtain the annual amount of fecal coliform produced by dairy cattle and available for application as manure. The daily beef fecal coliform production rate is multiplied by 365 days minus the days spent grazing (from the cattle section of the Grazing sheet) to obtain the annual amount of fecal coliform produced by beef cattle and available for application as manure.

(The fecal coliform bacteria produced by beef cattle while grazing is assumed to be delivered directly to pastureland; see below.) The total fecal coliform load from cattle manure application is the sum of the dairy and beef loads.

3. The fecal coliform bacteria available for washoff is then calculated by multiplying the annual fecal coliform produced by the amount applied and available for washoff in each subwatershed in each month (from the cattle manure section of the Manure Application sheet).
4. The monthly total is then divided by the number of days in each month to obtain the daily accumulation rate.
5. Finally, the daily accumulation rate is divided between Cropland and Pastureland and the portion applied to Pastureland is divided by the number of acres of pastureland in each subwatershed to obtain the daily per acre accumulation of fecal coliform bacteria from cattle manure.

Horse Manure

The fecal coliform bacteria from horse manure applied per acre of pastureland is determined for each month as follows:

1. The number of horses in each subwatershed (from the Animals sheet) is multiplied by the daily fecal coliform production rate per horse (from the References sheet) to obtain the daily horse fecal coliform production rate.
2. The daily rate is then multiplied by 365 days minus the days spent grazing (from the horse section of the Grazing sheet) to obtain the amount of fecal coliform produced by horses and available for application as manure per year. (The fecal coliform bacteria produced by horses while grazing is assumed to be delivered directly to pastureland; see below.)
3. The fecal coliform bacteria available for washoff is then calculated by multiplying the annual fecal coliform produced by the amount applied and available for washoff in each subwatershed in each month (from the horse manure section of the Manure Application sheet).
4. The monthly total is then divided by the number of days in each month to obtain the daily accumulation rate.
5. Finally, the daily accumulation rate is divided by the number of acres of pastureland in each subwatershed to obtain the daily per acre accumulation of fecal coliform bacteria from the application of horse manure.

Beef Cattle Grazing

The fecal coliform bacteria from beef cattle manure deposited during grazing per acre of pastureland is determined for each month as follows:

1. The number of beef cattle grazing is calculated by multiplying the number of beef cattle per subwatershed (from the Animals sheet) by the fraction of time spent grazing (from the Grazing sheet).
2. The fecal coliform load delivered directly to pastureland is calculated by multiplying the number of cattle grazing by the fraction of time spent in pasture (as opposed to in

streams, from the Grazing sheet) and by the rate of fecal coliform bacteria production per beef cow (from the References sheet).

3. Finally, the daily grazing beef cattle fecal coliform production is divided by the number of acres of pastureland in each subwatershed to obtain the daily per acre accumulation rate of fecal coliform bacteria from beef cattle grazing.

Horse Grazing

The fecal coliform bacteria from horse manure deposited during grazing per acre of pastureland is determined for each month as follows:

1. The number of horses grazing is calculated by multiplying the number of horses per subwatershed (from the Animals sheet) by the fraction of time spent grazing (from the Grazing sheet).
2. The fecal coliform load delivered directly to Pastureland is calculated by multiplying the number of horses grazing by the rate of fecal coliform bacteria production per horse (from the References sheet).
3. The fecal coliform load in manure collected for application is calculated by subtracting the number of horses grazing from the total number of horses and multiplying by the rate of fecal coliform bacteria production per horse (from the References sheet).
4. Finally, the daily grazing horse fecal coliform production is divided by the number of acres of pastureland in each subwatershed to obtain the daily per acre accumulation rate of fecal coliform bacteria from horse grazing.

Sheep Grazing

The fecal coliform bacteria from sheep manure deposited during grazing per acre of pastureland is determined for each month as follows:

1. The number of sheep grazing is calculated by multiplying the number of sheep per subwatershed (from the Animals sheet) by the fraction of time spent grazing (from the Grazing sheet).
2. The fecal coliform load delivered directly to Pastureland is calculated by multiplying the number of sheep grazing by the rate of fecal coliform bacteria production per sheep (from the References sheet).
3. The fecal coliform load in manure collected for disposal is calculated by subtracting the number of sheep grazing from the total number of sheep and multiplying by the rate of fecal coliform bacteria production per sheep (from the References sheet).
4. Finally, the daily grazing sheep fecal coliform production is divided by the number of acres of pastureland in each subwatershed to obtain the daily per acre accumulation rate of fecal coliform bacteria from sheep grazing.

Other Animal Grazing

The purpose of the “other” animal category is to allow you to define an agricultural animal not available in the default information. To use this category, you must be sure to enter the number of “other” agricultural animals in each subwatershed (on the Animals sheet), to enter the time spent grazing (on the Grazing sheet), and to specify a fecal coliform bacteria production rate (on the References sheet). The fecal coliform bacteria from "other" animal manure deposited during grazing per acre of pastureland is determined for each month as follows:

1. The number of "other" animals grazing is calculated by multiplying the number of "other" animals per subwatershed (from the Animals sheet) by the fraction of time spent grazing (from the Grazing sheet).
2. The fecal coliform load delivered directly to pastureland is calculated by multiplying the number of "other" animals grazing by the rate of fecal coliform bacteria production per "other" animal (from the References sheet).
3. The fecal coliform load in manure collected for disposal is calculated by subtracting the number of "other" animals grazing from the total number of "other" animals and multiplying by the rate of fecal coliform bacteria production per "other" animal (from the References sheet).
4. Finally, the daily grazing "other" animal fecal coliform production is divided by the number of acres of pastureland in each subwatershed to obtain the daily per acre accumulation rate of fecal coliform bacteria from "other" animal grazing.

The total accumulation rate of fecal coliform bacteria from pastureland is calculated as the sum of the accumulation rates from wildlife, cattle and horse manure applications, and beef cattle, horse, sheep and "other" grazing.

CATTLE IN STREAMS

-	User Input Required

This sheet contains information related to the direct contribution of beef cattle fecal coliform bacteria to streams. This contribution can be represented as a point source in HSPF, which requires input of a flow rate (cubic feet per second, or cfs) and a fecal coliform bacteria loading rate (count per hour). No user input is required on this sheet. It is assumed that only beef cattle have access to streams when grazing. The fraction of grazing time spent in streams is specified on the Grazing sheet.

1. The number of beef cattle in streams is calculated by multiplying the total number of beef cattle (from the Animals sheet) by the fraction of time spent grazing and the fraction of grazing time spent in streams (from the Grazing sheet).
2. The fecal coliform bacteria loading rate (count/hr) is calculated by multiplying the number of beef cattle in streams by the fecal coliform production rate per beef cow (from the References sheet.)
3. The beef cattle waste flow rate is calculated by multiplying the number of cattle in streams by the waste production rate per beef cow (from the References sheet) and an assumed beef cattle waste density of 62.4 pounds per cubic foot.

SEPTICS

U	User Input Required

This sheet contains information related to the contribution of failing septic systems to streams. The direct contribution of fecal coliform from septics to a stream can be represented as a point source in the model, which requires input of a flow rate (cfs) and a fecal coliform bacteria loading rate (count/hr).

To estimate the contribution of fecal coliform bacteria from failing septic systems, the number of septic systems, the number of people served by septic systems, and the estimated rate of septic system failure in the study area must be entered. Population and septic tank data can be retrieved from the U.S. Census Bureau web site (http://venus.census.gov/cdrom/lookup). For example, county level populations and septic tank information can be retrieved from this web site as follows:

- Under "Choose a Database to Browse" select STF3A
- On the next screen, click on "Go to level State--County" and choose a State from the list below, and then click on "Submit."
- On the next screen, choose "Retrieve the areas you've selected below" and select a county on the list, and submit.
- Select "Choose TABLES to retrieve" and submit.
- From the list of tables, select "P1" and "H24" and submit
- Select the format for the retrieval (e.g., HTML)
- The information displayed will include a county level summary of population and of housing units with public sewer, septic tank or cesspool, or other.

The estimated rate of septic system failure in the area of interest should be estimated based on local knowledge. From the preceding information, the average number of people served by each septic system, number of failing septic systems, and density of failing septic systems in the study area are calculated.

1. The number of failing septic systems in each subwatershed is calculated by multiplying the total area of each subwatershed (from the Land Use sheet) by the density of failing septic systems.
2. The number of people served by failing septic systems in each subwatershed is calculated by multiplying the number of failing septic systems by the average number of people served by each septic system.
3. The failing septic system flow rate is calculated by multiplying the number of people served by failing septic systems by an assumed daily waste flow of 70 gallons per person.
4. The fecal coliform bacteria loading rate from failing septic systems is calculated by multiplying the failing septic system flow rate by an assumed fecal coliform bacteria

concentration of 10,000 counts per 100 mL of waste flow. Note that any of the assumed values can be updated to represent more appropriate site-specific information.

ACQOP&SQOLIM (FOR LAND USES)

-	User Input Required

This sheet summarizes HSPF input parameter values calculated based on designations made throughout the spreadsheet. It contains values for model inputs ACQOP (or MON-ACCUM if monthly) and SQOLIM (or MON-SQOLIM if monthly). These parameters represent the rate of fecal coliform accumulation and the maximum storage of fecal coliform bacteria on land uses.

1. The values for ACQOP are simply the total fecal coliform bacteria accumulation rates from each land use sheet (Cropland, Pastureland, Forest, and Built-up).
2. The value for SQOLIM is derived using the following die-off equation from Horsley & Whitten (1986):

$N_t = N_0(10^{(-kt)})$ where: N_t = number of fecal coliforms present at time t
N_0 = number of fecal coliforms present at time 0
t = time in days
k = first order die-off rate constant. Typical values for warm months = 0.51/day and for cold months = 0.36/day

In the above equation, N_0 is the count of fecal coliforms applied per acre per day (MON-ACCUM). N_t is the count of fecal coliforms applied on a given day that survive for some number t of days. The maximum buildup of fecal coliform (MON-SQOLIM) is equal to the sum of the fecal coliforms applied on a given day and of the fecal coliforms that were applied on previous days and have survived until that day. When this calculation is done, the maximum buildup is estimated to be approximately 1.5 times the daily buildup rate during warm months (die-off rate of 0.51/day) and 1.8 times the daily buildup rate for colder months (die-off rate of 0.36/day). Warmer months are assumed to be April through September; colder months are October through March. A buildup limit of 1.8 times the daily buildup rate is assumed for nonmonthly varying SQOLIM (Forest and Built-up).

TRANSFERRING DATA FROM THE BACTERIAL INDICATOR TOOL TO WINHSPF

Information contained in three sheets of the Bacterial Indicator Tool can be transferred to WinHSPF. These sheets are Cattle in Streams, Septics, and ACQOP&SQOLIM (for land uses). The information in the Cattle in Streams and Septics sheets are input into the model as point sources. Each sheet contains the fecal coliform loading rate (in count/hr) and flow rate (in cfs) for each subwatershed. The Cattle in Streams loading and flow rates vary monthly, while the septic rates are constant. See "Detailed Functions - Points Sources" of the *WinHSPF Version 2.0 Manual* (USEPA, March 2001) found in the "\basins\docs" folder for detailed instructions on how to incorporate point sources into WinHSPF.

The information contained in the ACQOP&SQOLIM (for land uses) sheet should be input into WinHSPF using the Input Data Editor. See "Detailed Functions - Input Data Editor" of the *WinHSPF Version 2.0 Manual* (USEPA, March 2001) for detailed instructions on using WinHSPF's Input Data Editor. The constant values for forest and built-up land should be input using the *ACQOP* and *SQOLIM* columns in the PERLND\PQUAL\QUAL-INPUT and the IMPLND\IQUAL\QUAL-INPUT tables.

The monthly varying values for cropland and pastureland should be input using the *MON-ACCUM* and *MON-SQOLIM* tables under PERLND\PQUAL\ and IMPLND\IQUAL\.

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Appendix C: Using the Qualitative Habitat Evaluation Index to Derive TMDL Targets for Sediment Impairment in Southeast Ohio

(prepared by Ed Rankin, 2003)

Introduction
Habitat destruction and related sediment and nutrient impacts are among the most prevalent causes of aquatic life impairment in the United States. Here we outline how subcomponents of the QHEI can be used to create aquatic life restoration targets for the TMDL process in southeastern Ohio.

The Concept of Loadings and Restoration Targets
The concept of estimating pollutant loading targets has its history associated with the severe point source problems that were in existence when the Clean Water Act was written. Although the effects on aquatic life are largely related to concentrations of pollutants in the receiving water, it was necessary to calculate the load of a pollutant that needed to be reduced to reach a concentration target to estimate concentrations at various flows and to allow an engineering solution to the problem.

Although loading targets for point sources and other pollutants (acid loading for discrete mine impacts) are obviously important for engineering solutions to these impairments, precise estimates of loads may not be essential to quantify and fix other types of impairments, especially where “loadings” may not be directly related to instream concentrations or condition and where such “pollutants” or stressors are strongly affected by other stream conditions such as habitat, flow, temperature, shading, etc. Rather than spending resources on estimating precise loadings of pollutants, it may be more useful to understand the interactions with the co-factors that influence the effects of the stressor of interest (e.g., sediment) on the biota, which are the primary goal of aquatic life use restoration.

Gross erosion rate, for example, is by itself not a good predictor of ecological effects. Parts of Southeast, Southwest, and Northeast Ohio have the some of the greatest potential erosion rates, however, the high gradient (high stream power) and generally natural stream habitats in these areas can often assimilate or export fine sediments. Local habitat conditions as well as local channel form can have a great influence on the effects of sediment loading to a stream system.

The use of a loading approach is best when: 1.) the relationship between the endpoint and stressors is direct (e.g., direct toxicity from that parameter), and 2.) the relationship between the stressor and endpoint is relatively simple (e.g., effects are largely affected by a single other variable such as hardness and heavy metals). When the effect of a pollutant or stressor is potentially influenced by a moderate to large number of other factors, the most effective approach may be to rely on direct instream monitoring of effects (e.g., biocriteria) and statistically modeling the multiple influences on these parameters with other ambient measures (e.g., habitat, sediment condition measures) or, for example, measures derived from remote sensing (e.g., landuse).

Linking Biological Measures with Sediment and Habitat Stressors
To use an ambient "modeling" approach to setting sediment endpoints for TMDLs, there must be a measurable link between the response variable (IBI, IBI metric, species abundance) and the stressor (substrate condition, habitat quality). For endpoints such as the IBI there is a significant relationship between the IBI and the overall QHEI score and between the IBI and components of the QHEI, both statewide and in the Western Allegheny Plateau ecoregion (WAP). Figure 1 illustrates the correlation between the QHEI and IBI for all reference sites (least impacted or natural and physically modified[1] reference sites). This illustrates a fairly strong link for direct habitat influences on aquatic life. Figure 2 illustrates the strong relationship between the substrate metric and the overall habitat score indicated the importance of this component.

The substrate metric of the QHEI is composed of some measures of predominant size and condition, specifically the pervasiveness of embeddedness and silt cover throughout a station. Figure 3 illustrates the relationship of embeddedness to IBI at the same reference sites used earlier. There is a clear association of the IBI with embeddedness with a WAP ecoregion IBI biocriteria value of 44 for headwater and wadeable streams. Fewer than 25% of streams with moderate embeddedness achieving this IBI score and very few streams with severe embeddedness achieve this value. Thus we can use the low-no embeddedness range as an endpoint for sediment impaired streams.

Figure 4 illustrates a random selection of sites in the WAP ecoregion and a subset of these that were reference sites. We have used a linear regression line as to help us derive average expectation between the substrate metric and the IBI for this ecoregion. A line drawn from an IBI value of 44 (WAP biocriteria for headwater and wading sites) provides a useful baseline substrate metric goal of about 13-14 for WWH streams.

The endpoints derived above are site-specific goals for restoration, but it needs to be reinforced that watershed management activities need to occur through a watershed. Sampling coverage can never reach 100% of the watershed, but instead is designed to sample enough sites, where possible, to provide estimates of condition in various parts of watersheds. Statewide data illustrates that habitat has effects at scales greater than a reach or station. Figures 5-7 illustrate the effects of the scale of impact on QHEI and the substrate metric and their influence on the IBI and the expected number of sensitive fish species in Ohio. Habitat measures are medians for any data within that subbasin and IBIs are 90th percentiles within these watersheds are a measure of best remaining biological condition. There are significant relationships between these variables suggesting that the degree of habitat loss in a watershed exerts a strong influence on the achievement of biological integrity. This argues for watershed wide application of best management practices rather than an effort to fix only sites that were monitored. Raccoon Creek and

[1] Physically modified reference sites are station that have had direct physical manipulation of habitat (e.g., channelization, dredging, etc), but that do not have influence from point sources or acute impacts from livestock or agriculture. Nutrients are typically elevated from loss of riparian and/or encroachment of landuses, but enrichment is not supplemented by heavy manure or fertilizer runoff.

certain other WAP watersheds typically fall toward the higher end on these relationships indicating that these streams, from a physical habitat perspective are highly restorable. This may not be true, however in certain very extensively impacted subwatersheds, thus scale of impact should be considered in restoration activities.

The baseline TMDL restoration goals for the Western Allegheny Plateau ecoregion are listed below:

QHEI Substrate Metric Endpoint for WWH streams:

13-14

QHEI Embeddedness Measure:

Low-None

Mean Watershed Substrate Endpoint:

13-14

Examination of the plots used to derive these goals shows some scatter or variability around these endpoints. These are useful endpoints to drive restoration activities even with some variability. The biological data will be the ultimate arbiter of success. If these physical goals are achieved and the IBI does not recover after sufficient time has elapsed the watershed will be reexamined for other remaining stressors. Similarly the stream may recover biologically under certain conditions without reaching the final substrate goals, especially the overall substrate score endpoint.

Some low gradient streams may find it difficult to reach a 13-14 score, however, proper stream and watershed restoration actions may be sufficient to restore other habitat features in these stream that did not require a “TMDL” under the regulation. Such factors, however, may have been more limiting than substrate in some instances (e.g., instream cover, channel condition metrics). Thus, to restore the biology it will be important to consider BMPs that restore other features of habitat other than sediment measures alone that are derived because sediment is considered to be a “pollutant” while other habitat limitations are considered “pollution” by the TMDL process. This is illustrated well in Figure 8 which shows the relationship between the degree of channelization as measured by the QHEI and the QHEI substrate metric. It is clear that better quality substrates are associated with natural or “recovered” sites and that poor channel condition results in fine substrates, not likely to achieve the endpoints presented here. This strongly supports the use of BMPs that focus on channel restoration where channelization or channel simplifications are associated with sediment impairments.

Finally a goal of using this type of information to develop “TMDLs” or restoration endpoints is 1.) to develop and refine a model that will incorporate stream types and other stream classification procedures into this process as that data becomes available, and 2.)

to examine links between IBI, the QHEI substrate metric, and pebble count procedures (e.g., zig-zag method) to provide a bit more precise measure of surface substrate and an useful interim measure of progress.

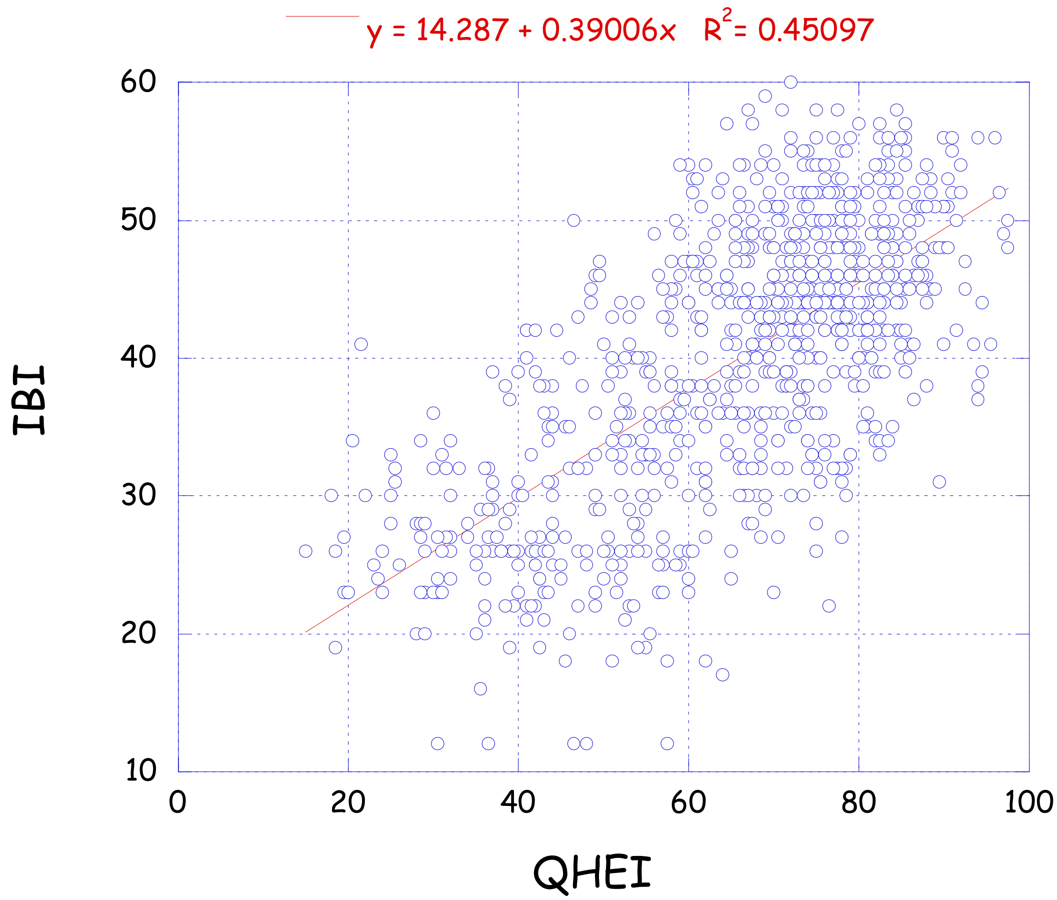

Figure 1. Relationship between QHEI and IBI for all reference sites in Ohio (natural and physically modified).

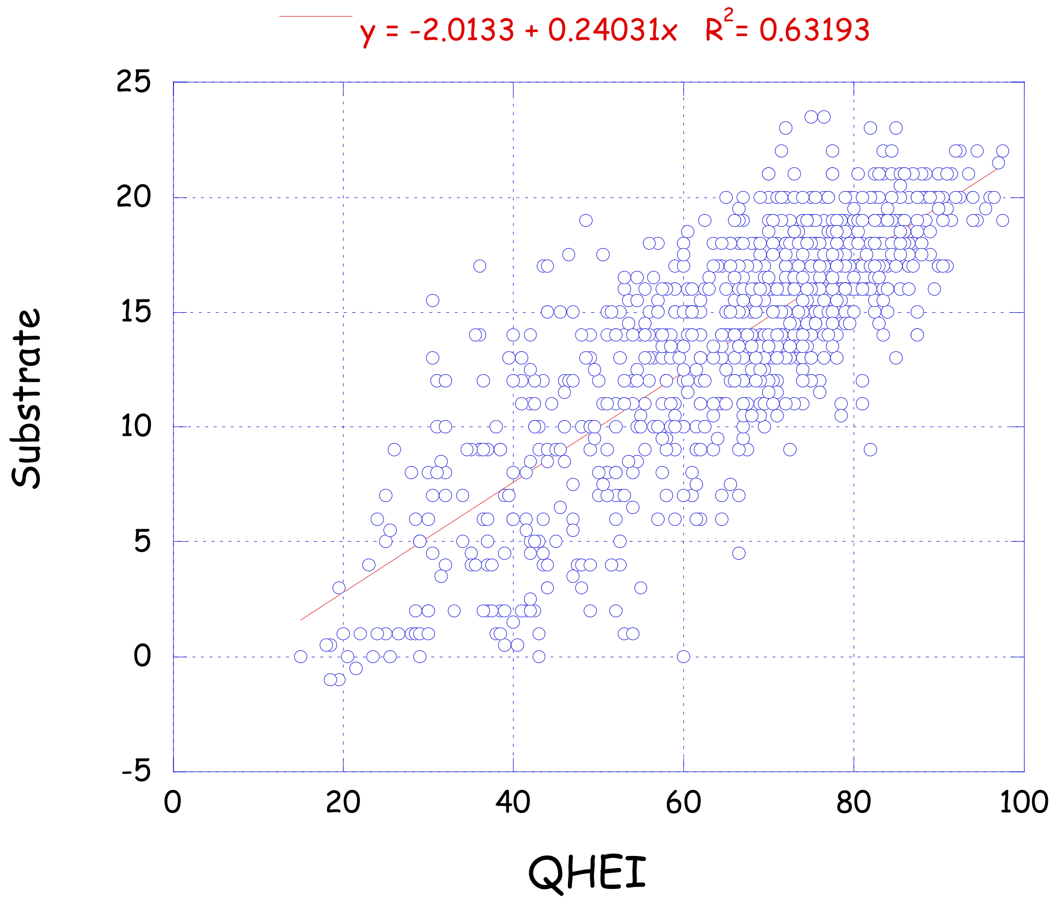

Figure 2. Relationship between the QHEI and the substrate metric of the QHEI for all reference sites in Ohio (natural and physically modified).

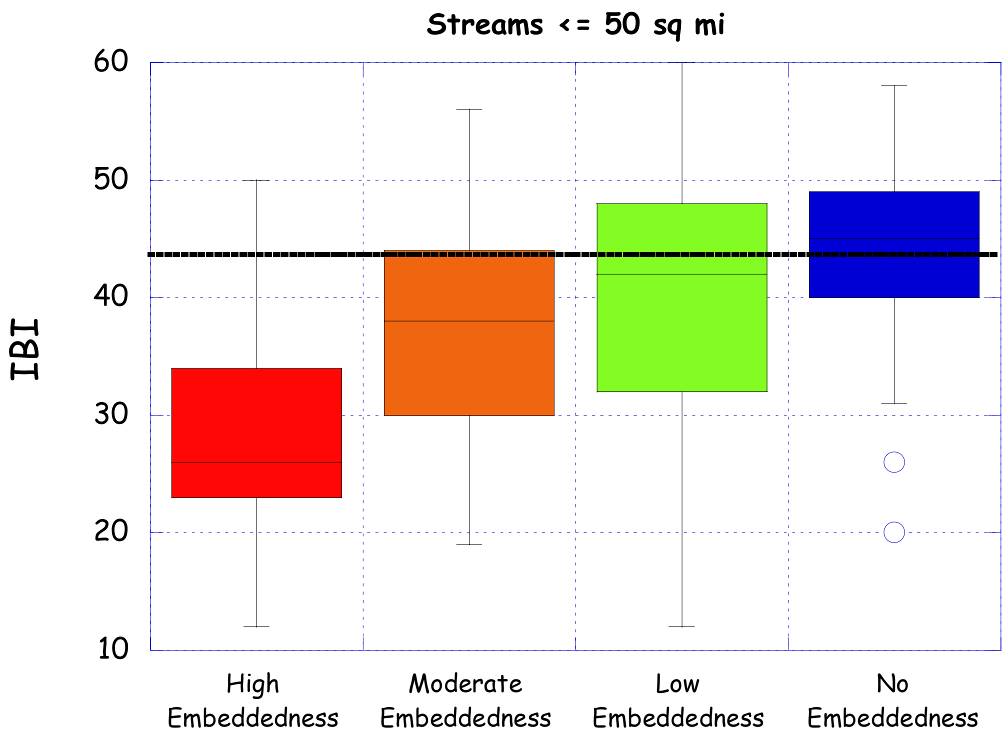

Figure 3. Relationship between the embeddedness subcomponent of the substrate metric of the QHEI and IBI for all reference sites in Ohio (natural and physically modified) of less than or equal to 50 sq mi drainage size.

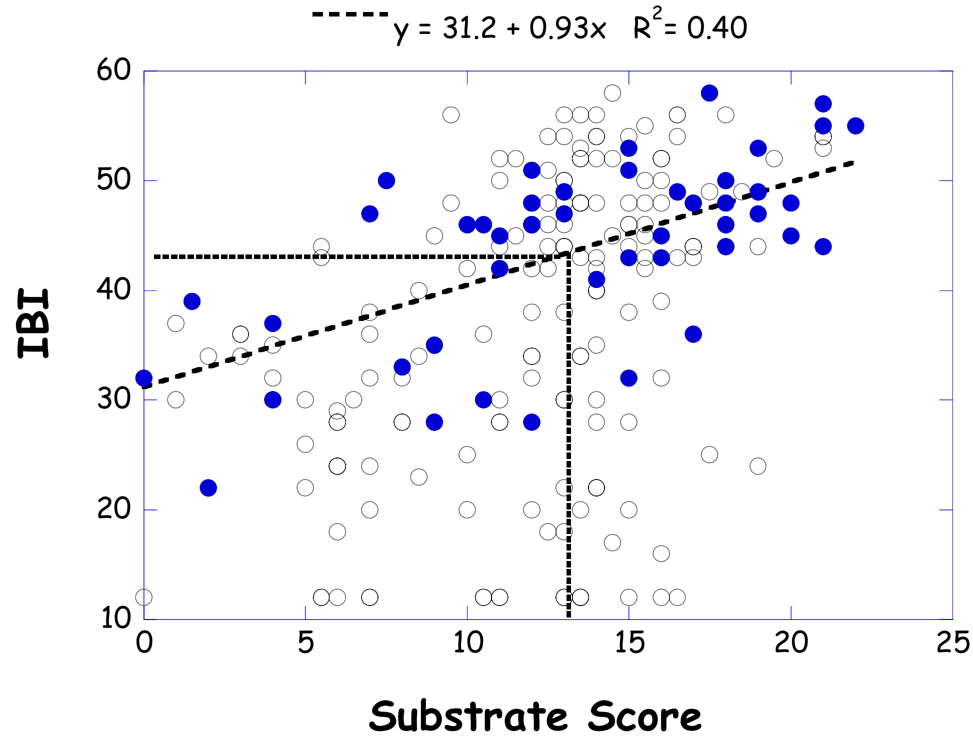

Figure 4. Relationship between the embeddedness substrate metric of the QHEI and IBI for a random subset of all sites and reference sites (natural and physically modified) in the Western Allegheny Plateau ecoregion. Dash lines drawn to the regression line indicate average substrate score needed to protect .

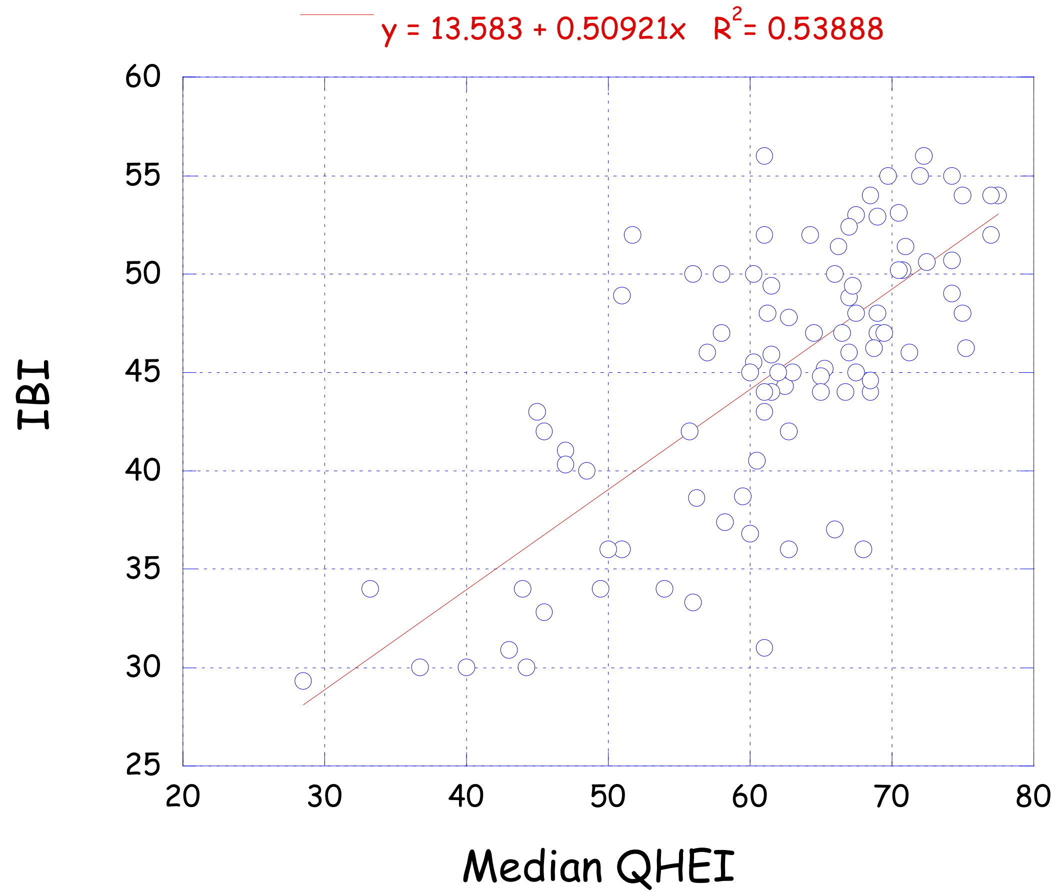

Figure 5. Relationship between the median QHEI scores in each of 93 Ohio subbasins and 90th percentile IBI scores in these subbasins (measure of best sites remaining).

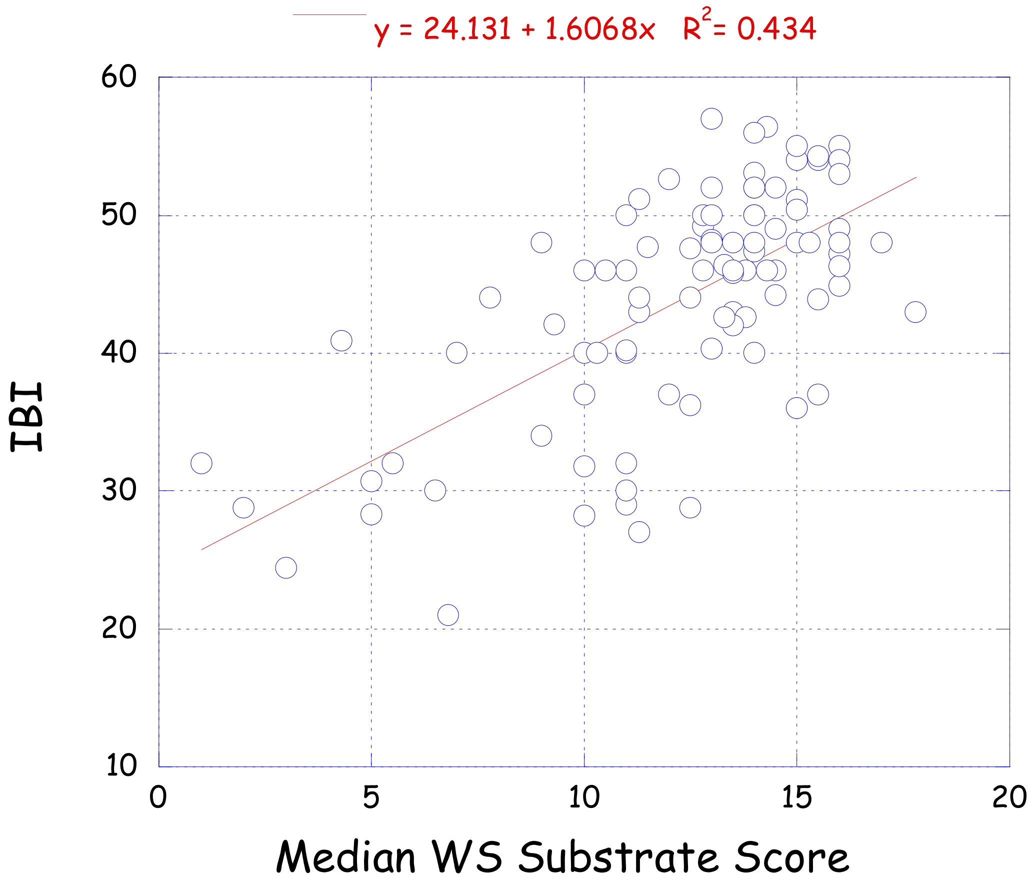

Figure 6. Relationship between the median watershed QHEI substrate metric scores in each of 93 Ohio subbasins and 90th percentile IBI scores in these subbasins (measure of best sites remaining).

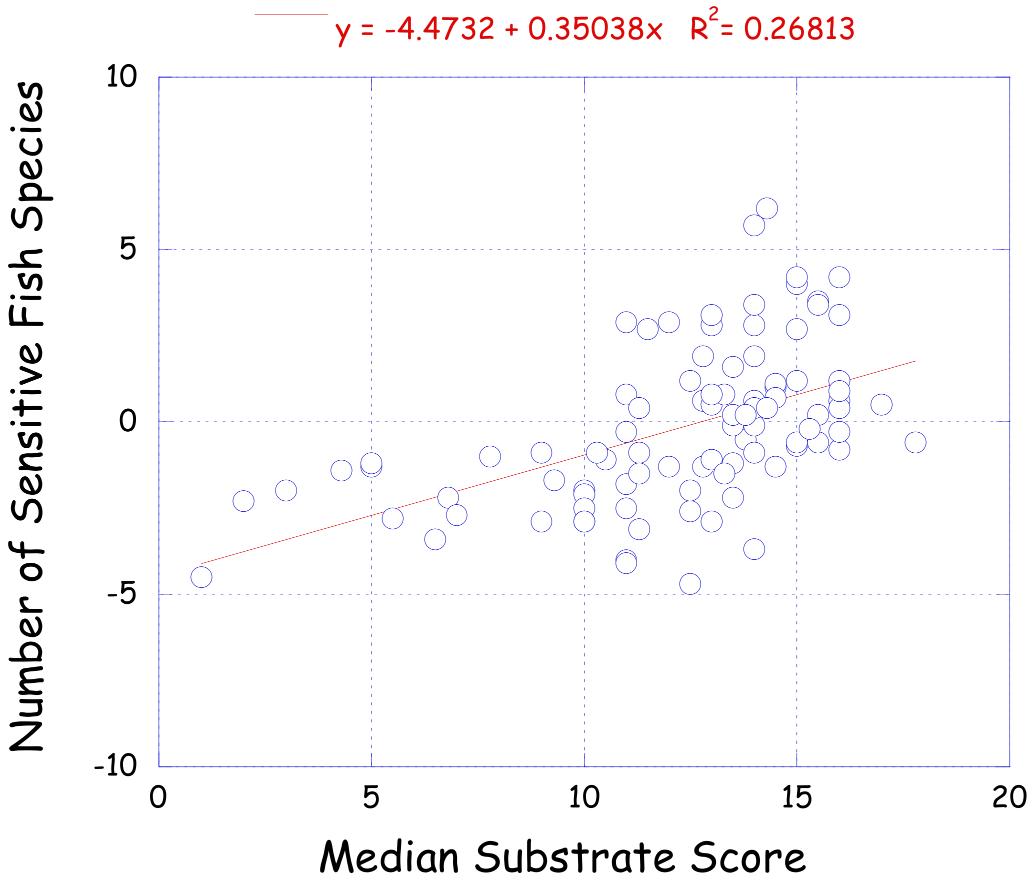

Figure 7. Relationship between the median watershed QHEI substrate metric scores in each of 93 Ohio subbasins and 90th percentile expected sensitive fish species numbers in these subbasins (measure of best sites remaining). Expected numbers of sensitive fish species were calculated as the number observed minus the minimum number expected to score a 5 for a given drainage size for the IBI.

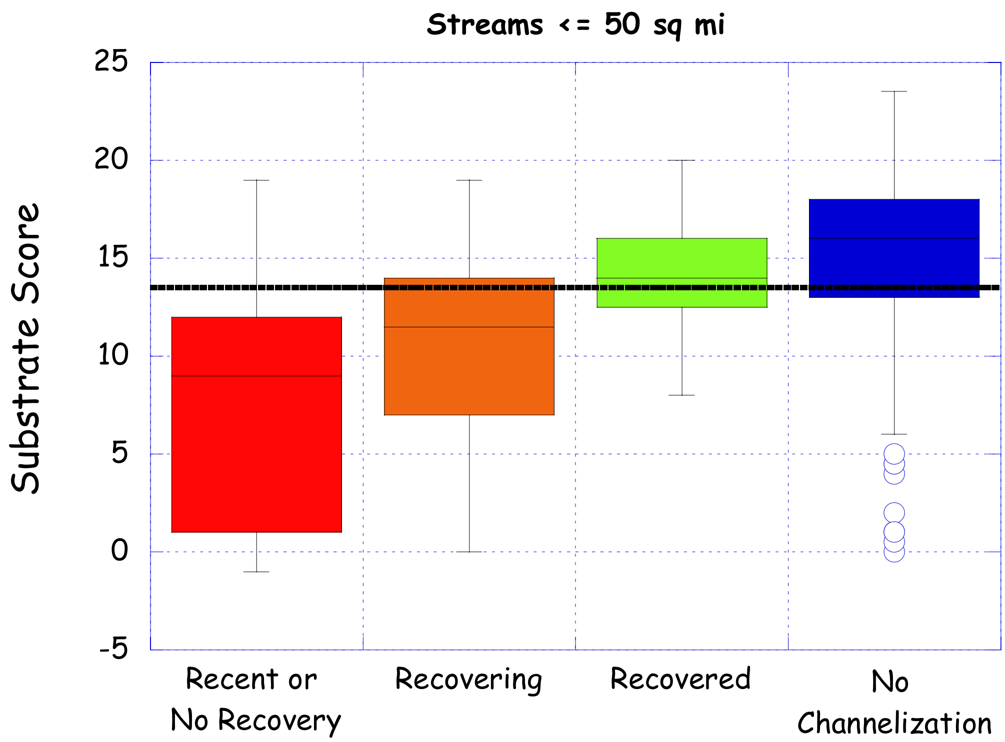

Figure 8. Relationship between the channelization subcomponent of the channel condition metric of the QHEI and the substrate metric of the QHEI for all reference sites in Ohio (natural and physically modified) of less than or equal to 50 sq mi drainage size.

Appendix D

Model of Existing Instream Net Acidity Conditions

Sunday Creek TMDL Pretreatment/Existing Conditions Model

LOCATION	RM1	RM2	RM3	RM4	RM5	RM6	COMMON NAME	DATE	adjusted site Q w/multiple site Q avg.	adjusted site acid conc. w/multiple site conc. avg.	net acid load	cumulative load	cumulative Q	cumulative conc.
								Result of E Br. to upst. W Br.				-538.359	13.165	-41
								Result of W Br.				-403.115	8.946	-45
											sum	-941.474	22.111	-43
									-5.976	-32	193.526	-747.948	16.135	-46
SC @ RM 12.7 Glouster	42.93	12.70					Mainstem	8/14/01	16.135	-46	-747.948			
SC @ RM 12.7 Glouster	42.93	12.70					Mainstem	9/4/01						
SC @ RM 12.7 Glouster	42.93	12.70					Mainstem	9/18/01						
SC @ RM 12.7, Glouster	42.93	12.70					Mainstem	7/30/01						
SC @ RM 12.7, Glouster	42.93	12.70					Mainstem	7/2/01						
SC @ RM 12.7, Glouster	42.93	12.70					Mainstem	7/17/01						
RM 2.2, SC 22	42.93	11.50	2.20				Congress Run	7/17/01	0.000	-160	0.000			
RM 1.3, SC 21	42.93	11.50	1.30				Congress Run	7/17/01	0.000	-127	0.000			
Mouth-Trimble	42.93	11.50	0.01				Congress Run	9/6/00	0.190	-144	-27.422	-775.370	16.326	-47
Sm.trib/seep,culvert Sce	42.93	10.33	0.19				WB Mass Balance	8/6/01	0.053	-137	-7.337	-782.707	16.379	-48
Sm.trib/seep,culvert Sce	42.93	10.33	0.19				WB Mass Balance	4/7/02						
									0.816	-60	-48.750	-831.456	17.195	-48
SC @ RM 10.2 S. of Jac	42.93	10.20					Mainstem	8/14/01	17.195	-48	-831.456			
SC @ RM 10.2, S. of Jac	42.93	10.20					Mainstem	7/2/01						
SC @ RM 10.2 Crossing	42.93	10.20					Mainstem	9/4/01						
SC @ RM 10.2 Crossing	42.93	10.20					Mainstem	9/18/01						
SC @ RM 10.2, S. of Jac	42.93	10.20					Mainstem	7/30/01						
SC @ RM 10.2, S. of Jac	42.93	10.20					Mainstem	7/17/01						
SC 24, RM 0.4	42.93	9.02	0.40				SC Trib III	9/18/01	0.170	-96	-16.293	-847.749	17.365	-49
SC 24, RM 0.4	42.93	9.02	0.40				SCTrib III	8/14/01				-847.749	17.365	-49

RM 0.4, SC 24, Sunday	42.93	9.02	0.40		SC trib III	7/17/01				-847.749	17.365	-49
SC 14, RM 1.7	42.93	7.83	1.70		Green's Run	9/18/01				-847.749	17.365	-49
RM 1.7, SC 14	42.93	7.83	1.70		Greens Run	7/17/01				-847.749	17.365	-49
SC 14, RM 1.7	42.93	7.83	1.70		Greens Run	8/14/01				-847.749	17.365	-49
SC 15, RM 0.7	42.93	7.83	0.75	0.70	Little Gr Run	9/18/01				-847.749	17.365	-49
RM 0.7, SC 15	42.93	7.83	0.75	0.70	Little Greens Run	7/17/01				-847.749	17.365	-49
SC 15, RM 0.7	42.93	7.83	0.75	0.70	Little Greens Run	8/14/01				-847.749	17.365	-49
Mouth of Little Greens R	42.93	7.83	0.75	0.01	Green's Run	4/2/02				-847.749	17.365	-49
Bridge SR 685, upst. Of	42.93	7.83	0.55		Green's Run	6/25/01				-847.749	17.365	-49
Greens Run, after 1st tril	42.93	7.83	0.23		Green's Run	4/2/02				-847.749	17.365	-49
1st trib.Greens Run, ditc	42.93	7.83	0.13	0.01	Green's Run	6/25/01				-847.749	17.365	-49
1st trib.Greens Run, ditc	42.93	7.83	0.13	0.01	Green's Run	4/2/02				-847.749	17.365	-49
Mouth of Greens Run	42.93	7.83	0.12		Green's Run	6/25/01	0.461	-117	-54.139	-901.888	17.826	-51
Mouth of Greens Run	42.93	7.83	0.12		Green's Run	4/2/02				-901.888	17.826	-51
RM 0.1, SC 13	42.93	7.83	0.10		Greens Run	7/17/01				-901.888	17.826	-51
SC 13, RM 0.1	42.93	7.83	0.10		Greens Run	8/14/01				-901.888	17.826	-51
SC 13, RM 0.1	42.93	7.83	0.10		Green's Run	9/18/01				-901.888	17.826	-51
Truetown Rd. seep, S. o	42.93	7.65			Truetown Rd seep	8/27/01	0.050	-185	-9.260	-911.148	17.876	-51
Truetown Rd. seep, S. o	42.93	7.65			Covered Bridge	3/18/02				-911.148	17.876	-51
							6.357	-56	-355.700	-1266.848	24.233	-52
S. of Redtown, SR 13	42.93	7.30			Mainstem	9/6/00	24.233	-52	-1266.848			
Co. Rd 93 - 1/2 mile abo	42.93	7.30			Mainstem	12/7/00						
S. of Redtown, SR 13	42.93	7.30			Mainstem	12/3/01						
Co. Rd 93 - 1/2 mile abo	42.93	7.30			Mainstem	1/17/01						
SC 12 Sunday Ck @ RM	42.93	7.30			Mainstem	8/14/01						
Co. Rd 93 - 1/2 mile abo	42.93	7.30			Mainstem	2/13/01						
Sunday Ck @ RM 7.3 u	42.93	7.30			Mainstem	9/4/01						
SC @ RM 7.3, upst. Of 1	42.93	7.30			Mainstem	7/2/01						
Co. Rd 93 - 1/2 mile abo	42.93	7.30			Mainstem	4/19/01						
S. of Redtown, SR 13	42.93	7.30			Mainstem	3/13/02						
Co. Rd 93 - 1/2 mile abo	42.93	7.30			Mainstem	5/29/01						
Co. Rd 93 - 1/2 mile abo	42.93	7.30			Mainstem	3/27/01						
S. of Redtown, SR 13	42.93	7.30			Mainstem	11/14/00						

Sunday Ck @ RM 7.3 u	42.93	7.30			Mainstem	9/18/01						
S. of Redtown, SR 13	42.93	7.30			Mainstem	10/23/00						
RM 7.3, SC 12	42.93	7.30			Mainstem	7/17/01						
RM 7.3, SC 12	42.93	7.30			Mainstem	7/30/01						
S. of Redtown, SR 13	42.93	7.30			Mainstem	4/1/02						
Truetown mine drain	42.93	6.70	0.20	0.05	Truetown seep	4/19/01				-1266.848	24.233	-52
Truetown mine drain	42.93	6.70	0.20	0.05	Truetown seep	2/13/01				-1266.848	24.233	-52
Truetown mine drain	42.93	6.70	0.20	0.05	Truetown seep	12/7/00				-1266.848	24.233	-52
Truetown mine drain	42.93	6.70	0.20	0.05	Truetown seep	3/27/01				-1266.848	24.233	-52
RM 0.2, Truetown seep t	42.93	6.70	0.20	0.05	Truetown Trib	7/2/01				-1266.848	24.233	-52
Truetown mine drain	42.93	6.70	0.20	0.05	Truetown seep	1/17/01				-1266.848	24.233	-52
Mouth of trib - below dis	42.93	6.70	0.20	0.03	Truetown seep	4/2/02				-1266.848	24.233	-52
Mouth of trib - below dis	42.93	6.70	0.20	0.03	Truetown seep	9/6/00				-1266.848	24.233	-52
Mouth of trib - below dis	42.93	6.70	0.20	0.03	Truetown seep	5/29/01				-1266.848	24.233	-52
Mouth of trib - below dis	42.93	6.70	0.20	0.03	Truetown seep	11/14/00				-1266.848	24.233	-52
Mouth of trib - below dis	42.93	6.70	0.20	0.03	Truetown seep	10/23/00				-1266.848	24.233	-52
Mouth of trib - below dis	42.93	6.70	0.20	0.03	Truetown seep	12/3/01		NOTE:the site below is r		-1266.848	24.233	-52
SC 11, RM ~0.05	42.93	6.70	0.05		SCTrib IV	9/4/01	3.621	1289	4666.195	3399.347	27.854	122
SC 11, RM~0.05	42.93	6.70	0.05		SCTrib IV	8/14/01				3399.347	27.854	122
SC 11, RM 0.05	42.93	6.70	0.05		SC Trib IV	9/18/01				3399.347	27.854	122
RM ~0.05, SC 11, tributa	42.93	6.70	0.05		Truetown Trib	7/17/01				3399.347	27.854	122
RM 0.05, SC11	42.93	6.70	0.05			7/30/01				3399.347	27.854	122
							-4.663	498	-2323.956	1075.391	23.191	46
Co. Rd 93 - 1/4 mile bel	42.93	6.60			Mainstem	2/13/01	23.191	46	1075.391			
Co. Rd 93 - 1/4 mile bel	42.93	6.60			Mainstem	12/7/00						
Co. Rd 93 - 1/4 mile bel	42.93	6.60			Mainstem	1/17/01						
Co. Rd 93 - 1/4 mile bel	42.93	6.60			Mainstem	4/19/01						
Co. Rd 93 - 1/4 mile bel	42.93	6.60			Mainstem	3/27/01						
N. of Millfield, SR 13	42.93	6.60			Mainstem	5/29/01						
N. of Millfield, SR 13	42.93	6.60			Mainstem	12/3/01						
N. of Millfield, SR 13	42.93	6.60			Mainstem	4/1/02						
Sunday Ck @ RM 6.6, d	42.93	6.60			Mainstem	7/2/01						
N. of Millfield, SR 13	42.93	6.60			Mainstem	9/5/00						

RM 6.6, SC 10	42.93	6.60			Mainstem	7/30/01						
N. of Millfield, SR 13	42.93	6.60			Mainstem	11/13/00						
N. of Millfield, SR 13	42.93	6.60			Mainstem	10/23/00						
SC Sunday Ck @ RM 6.	42.93	6.60			Mainstem	8/14/01						
SC @ RM 6.6 dst. Truet	42.93	6.60			Mainstem	9/4/01						
RM 6.6, SC 10	42.93	6.60			Mainstem	7/17/01						
SC @ RM 6.6 dst. Truet	42.93	6.60			Mainstem	9/18/01						
Co. Rd 93 - 1/4 mile belc	42.93	6.46			Mainstem	7/17/01						
East Millfield	42.93	5.21	?????		Jackson Run	9/5/00	0.794	-105	-83.239	992.152	23.985	41
RM 0.2, SC 09 Jackson	42.93	5.21	0.20		Jackson Run	7/17/01				992.152	23.985	41
SC 09, RM 0.2	42.93	5.21	0.20		Jackson Run	8/14/01				992.152	23.985	41
							-0.230	-1914	440.326	1432.478	23.755	60
Sunday Ck @ RM 3.6, p	42.93	3.60			Mainstem	7/30/01	23.755	60	1432.478			
Sunday Ck @ RM 3.6, p	42.93	3.60			Mainstem	7/2/01						
SC @ RM 3.6 ust. Big B	42.93	3.60			Mainstem	8/14/01						
SC @ RM 3.6 ust. Big B	42.93	3.60			Mainstem	9/4/01						
Sunday Ck @ RM 3.6, p	42.93	3.60			Mainstem	7/17/01						
SC @ RM 3.6 ust. Big B	42.93	3.60			Mainstem	9/18/01						
BB, upst. Of BB01, CR 2	42.93	2.29	1.25		Big Bailey	4/2/02	0.888	-50	-44.111	-44.111	0.888	-50
Seep into wetland	42.93	2.29	1.05	0.03	Big Bailey	4/2/02	0.396	-187	-73.868	-117.978	1.285	-92
Seep into wetland	42.93	2.29	1.05	0.03	Big Bailey	10/3/01				-117.978	1.285	-92
SC 04, RM 0.9	42.93	2.29	0.90		Big Bailey	9/18/01				-117.978	1.285	-92
SC 04, RM 0.9	42.93	2.29	0.90		Big Bailey	8/14/01				-117.978	1.285	-92
RM0.9, SC04	42.93	2.29	0.90		Big Bailey	7/17/01				-117.978	1.285	-92
Seep on Big Bailey Trib	42.93	2.29	0.80	0.03	Big Bailey	10/3/01	0.057	57	3.226	-114.752	1.341	-86
Seep on Big Bailey Trib	42.93	2.29	0.80	0.03	Big Bailey	4/2/02				-114.752	1.341	-86
BB, upst. Of Carr Bailey	42.93	2.29	0.71		Big Bailey	4/2/02				-114.752	1.341	-86
RM 0.7, SC06	42.93	2.29	0.70	0.70	Carr Bailey	7/17/01	0.508	-21	-10.573	-125.326	1.849	-68
SC 06, RM 0.7	42.93	2.29	0.70	0.70	Carr Bailey	8/14/01				-125.326	1.849	-68
mouth of Carr Bailey	42.93	2.29	0.70	0.01	Big Bailey	4/2/02	0.676	-105	-71.159	-196.485	2.525	-78
Mouth of Big Bailey trib	42.93	2.29	0.65	0.01	Big Bailey	10/3/01				-196.485	2.525	-78
Seep @ Rt. 13	42.93	2.29	0.35	0.03	Big Bailey	4/2/02	0.189	256	48.361	-148.124	2.714	-55

Seep @ Rt. 13	42.93	2.29	0.35	0.03	Big Bailey	10/3/01				-148.124	2.714	-55
							-1.693	-104	175.293	27.169	1.021	27
Rt. 13 bridge	42.93	2.29	0.30		Big Bailey	10/23/00	1.021	27	27.169			
Rt. 13 bridge	42.93	2.29	0.30		Big Bailey	12/13/00						
Rt. 13 bridge	42.93	2.29	0.30		Big Bailey	9/5/00						
Rt. 13 bridge	42.93	2.29	0.30		Big Bailey	12/3/01						
Rt. 13 bridge	42.93	2.29	0.30		Big Bailey	2/20/01						
Rt. 13 bridge	42.93	2.29	0.30		Big Bailey	4/23/01						
Rt. 13 bridge	42.93	2.29	0.30		Big Bailey	5/29/01						
Rt. 13 bridge	42.93	2.29	0.30		Big Bailey	3/21/01						
Rt. 13 bridge	42.93	2.29	0.30		Big Bailey	1/15/00						
Rt. 13 bridge	42.93	2.29	0.30		Big Bailey	11/13/00						
Rt. 13 bridge	42.93	2.29	0.30		Big Bailey	4/2/02						
Mouth of Big Bailey	42.93	2.29	0.30		Big Bailey	10/3/01						
SC 07 Big Bailey @ RM	42.93	2.29	0.30		Big Bailey	8/14/01						
Rt. 13 bridge	42.93	2.29	0.30		Big Bailey	7/17/01						
BB @ RM 0.3	42.93	2.29	0.30		Big Bailey	9/18/01						
										1432.478	23.755	60
										27.169	1.021	27
									sum	1459.647	24.776	59
							3.224	-486	-1567.673	-108.026	28.000	-4
Mainstem-Chauncey	42.93	0.20			Mainstem	5/29/01	28.000	-4	-108.026			
Mainstem-Chauncey	42.93	0.20			Mainstem	3/21/01						
Mainstem-Chauncey	42.93	0.20			Mainstem	4/23/01						
Mainstem-Chauncey	42.93	0.20			Mainstem	2/20/01						
Mainstem-Chauncey	42.93	0.20			Mainstem	12/3/01						
Mainstem-Chauncey	42.93	0.20			Mainstem	9/5/00						
SC 01 Sunday Ck @ RM	42.93	0.20			Mainstem	7/30/01						
Mainstem-Chauncey	42.93	0.20			Mainstem	11/13/00						
Mainstem-Chauncey	42.93	0.20			Mainstem	4/2/02						
SC 01 Sunday Ck @ RM	42.93	0.20			Mainstem	8/14/01						
Mainstem-Chauncey	42.93	0.20			Mainstem	1/15/00						

Mainstem-Chauncey	42.93	0.20	Mainstem	10/23/00
Mainstem-Chauncey	42.93	0.20	Mainstem	12/13/00
SC 01 Sunday Ck @ RM	42.93	0.20	Mainstem	7/2/01
SC 01 Sunday Ck @ RM	42.93	0.20	Mainstem	9/4/01
SC 01 Sunday Ck @ RM	42.93	0.20	Mainstem	7/17/01
SC 01 Sunday Ck @ RM	42.93	0.20	Mainstem	9/18/01

indicates provisional Q data, see Q calc. Notes

indicates a trib. Not mainstem or seep.

indicates a seep.

indicates a mianstem site.

indicates a sub mainstem site, i.e. E Br., W Br.

Appendix E

Model of Post Treatment Instream Net Acidity Conditions

Sunday Creek TMDL Post Treatment (Corrected) Conditions Model

LOCATION	RM1	RM2	RM3	RM4	RM5	RM6	COMMON NAME	DATE	adjusted site Q w/multiple site Q avg.	adjusted site acid conc. w/multiple site conc. avg.	net acid load	cumulative load	cumulative Q	cumulative conc.
								Result of E Br. to upst. W Br.				-574.751	13.210	-44
								Result of W Br.				-543.198	9.098	-60
											sum	-1117.949	22.308	-50
									-5.976	-32	193.526	-924.423	16.332	-57
SC @ RM 12.7 Glouster	42.93	12.70					Mainstem	8/14/01	16.135	-46	-747.948			
SC @ RM 12.7 Glouster	42.93	12.70					Mainstem	9/4/01						
SC @ RM 12.7 Glouster	42.93	12.70					Mainstem	9/18/01						
SC @ RM 12.7, Glouste	42.93	12.70					Mainstem	7/30/01						
SC @ RM 12.7, Glouste	42.93	12.70					Mainstem	7/2/01						
SC @ RM 12.7, Glouste	42.93	12.70					Mainstem	7/17/01						
RM 2.2, SC 22	42.93	11.50	2.20				Congress Rur	7/17/01	0.000	-160	0.000			
RM 1.3, SC 21	42.93	11.50	1.30				Congress Rur	7/17/01	0.000	-127	0.000			
Mouth-Trimble	42.93	11.50	0.01				Congress Rur	9/6/00	0.190	-144	-27.422	-951.845	16.522	-58
Sm.trib/seep,culvert Sce	42.93	10.33	0.19				WB Mass Bal	8/6/01	0.053	-137	-7.337	-959.181	16.576	-58
Sm.trib/seep,culvert Sce	42.93	10.33	0.19				WB Mass Bal	4/7/02						
									0.816	-60	-48.750	-1007.931	17.392	-58
SC @ RM 10.2 S. of Ja	42.93	10.20					Mainstem	8/14/01	17.195	-48	-831.456			
SC @ RM 10.2, S. of Ja	42.93	10.20					Mainstem	7/2/01						
SC @ RM 10.2 Crossing	42.93	10.20					Mainstem	9/4/01						
SC @ RM 10.2 Crossing	42.93	10.20					Mainstem	9/18/01						
SC @ RM 10.2, S. of Ja	42.93	10.20					Mainstem	7/30/01						
SC @ RM 10.2, S. of Ja	42.93	10.20					Mainstem	7/17/01						
SC 24, RM 0.4	42.93	9.02	0.40				SC Trib III	9/18/01	0.170	-96	-16.293	-1024.224	17.562	-58
SC 24, RM 0.4	42.93	9.02	0.40				SCTrib III	8/14/01				-1024.224	17.562	-58

RM 0.4, SC 24, Sunday	42.93	9.02	0.40		SC trib III	7/17/01				-1024.224	17.562	-58
SC 14, RM 1.7	42.93	7.83	1.70		Green's Run	9/18/01				-1024.224	17.562	-58
RM 1.7, SC 14	42.93	7.83	1.70		Greens Run	7/17/01				-1024.224	17.562	-58
SC 14, RM 1.7	42.93	7.83	1.70		Greens Run	8/14/01				-1024.224	17.562	-58
SC 15, RM 0.7	42.93	7.83	0.75	0.70	Little Gr Run	9/18/01				-1024.224	17.562	-58
RM 0.7, SC 15	42.93	7.83	0.75	0.70	Little Greens F	7/17/01				-1024.224	17.562	-58
SC 15, RM 0.7	42.93	7.83	0.75	0.70	Little Greens F	8/14/01				-1024.224	17.562	-58
Mouth of Little Greens R	42.93	7.83	0.75	0.01	Green's Run	4/2/02				-1024.224	17.562	-58
Bridge SR 685, upst. Of	42.93	7.83	0.55		Green's Run	6/25/01				-1024.224	17.562	-58
Greens Run, after 1st tril	42.93	7.83	0.23		Green's Run	4/2/02				-1024.224	17.562	-58
1st trib.Greens Run, ditc	42.93	7.83	0.13	0.01	Green's Run	6/25/01				-1024.224	17.562	-58
1st trib.Greens Run, ditc	42.93	7.83	0.13	0.01	Green's Run	4/2/02				-1024.224	17.562	-58
Mouth of Greens Run	42.93	7.83	0.12		Green's Run	6/25/01	0.461	-117	-54.139	-1078.363	18.023	-60
Mouth of Greens Run	42.93	7.83	0.12		Green's Run	4/2/02				-1078.363	18.023	-60
RM 0.1, SC 13	42.93	7.83	0.10		Greens Run	7/17/01				-1078.363	18.023	-60
SC 13, RM 0.1	42.93	7.83	0.10		Greens Run	8/14/01				-1078.363	18.023	-60
SC 13, RM 0.1	42.93	7.83	0.10		Green's Run	9/18/01				-1078.363	18.023	-60
Truetown Rd. seep, S. o	42.93	7.65			Truetown Rd s	8/27/01	0.050	-185	-9.260	-1087.623	18.073	-60
Truetown Rd. seep, S. o	42.93	7.65			Covered Bridg	3/18/02				-1087.623	18.073	-60
							6.357	-56	-355.700	-1443.323	24.430	-59
S. of Redtown, SR 13	42.93	7.30			Mainstem	9/6/00	24.233	-52	-1266.848			
Co. Rd 93 - 1/2 mile abo	42.93	7.30			Mainstem	12/7/00						
S. of Redtown, SR 13	42.93	7.30			Mainstem	12/3/01						
Co. Rd 93 - 1/2 mile abo	42.93	7.30			Mainstem	1/17/01						
SC 12 Sunday Ck @ RM	42.93	7.30			Mainstem	8/14/01						
Co. Rd 93 - 1/2 mile abo	42.93	7.30			Mainstem	2/13/01						
Sunday Ck @ RM 7.3 u	42.93	7.30			Mainstem	9/4/01						
SC @ RM 7.3, upst. Of T	42.93	7.30			Mainstem	7/2/01						
Co. Rd 93 - 1/2 mile abo	42.93	7.30			Mainstem	4/19/01						
S. of Redtown, SR 13	42.93	7.30			Mainstem	3/13/02						
Co. Rd 93 - 1/2 mile abo	42.93	7.30			Mainstem	5/29/01						
Co. Rd 93 - 1/2 mile abo	42.93	7.30			Mainstem	3/27/01						
S. of Redtown, SR 13	42.93	7.30			Mainstem	11/14/00						

Sunday Ck @ RM 7.3 u	42.93	7.30			Mainstem	9/18/01						
S. of Redtown, SR 13	42.93	7.30			Mainstem	10/23/00						
RM 7.3, SC 12	42.93	7.30			Mainstem	7/17/01						
RM 7.3, SC 12	42.93	7.30			Mainstem	7/30/01						
S. of Redtown, SR 13	42.93	7.30			Mainstem	4/1/02						
Truetown mine drain	42.93	6.70	0.20	0.05	Truetown see	4/19/01				-1443.323	24.430	-59
Truetown mine drain	42.93	6.70	0.20	0.05	Truetown see	2/13/01				-1443.323	24.430	-59
Truetown mine drain	42.93	6.70	0.20	0.05	Truetown see	12/7/00				-1443.323	24.430	-59
Truetown mine drain	42.93	6.70	0.20	0.05	Truetown see	3/27/01				-1443.323	24.430	-59
RM 0.2, Truetown seep t	42.93	6.70	0.20	0.05	Truetown Trib	7/2/01				-1443.323	24.430	-59
Truetown mine drain	42.93	6.70	0.20	0.05	Truetown see	1/17/01				-1443.323	24.430	-59
Mouth of trib - below dis	42.93	6.70	0.20	0.03	Truetown see	4/2/02				-1443.323	24.430	-59
Mouth of trib - below dis	42.93	6.70	0.20	0.03	Truetown see	9/6/00				-1443.323	24.430	-59
Mouth of trib - below dis	42.93	6.70	0.20	0.03	Truetown see	5/29/01				-1443.323	24.430	-59
Mouth of trib - below dis	42.93	6.70	0.20	0.03	Truetown see	11/14/00				-1443.323	24.430	-59
Mouth of trib - below dis	42.93	6.70	0.20	0.03	Truetown see	10/23/00				-1443.323	24.430	-59
Mouth of trib - below dis	42.93	6.70	0.20	0.03	Truetown see	12/3/01		NOTE:the site below is r		-1443.323	24.430	-59
SC 11, RM ~0.05	42.93	6.70	0.05		SCTrib IV	9/4/01	3.621	1289	4667.323	3224.000	28.051	115
SC 11, RM~0.05	42.93	6.70	0.05		SCTrib IV	8/14/01		1289.00		3224.000	28.051	115
SC 11, RM 0.05	42.93	6.70	0.05		SC Trib IV	9/18/01		orig conc		3224.000	28.051	115
RM ~0.05, SC 11, tributa	42.93	6.70	0.05		Truetown Trib	7/17/01				3224.000	28.051	115
RM 0.05, SC11	42.93	6.70	0.05			7/30/01				3224.000	28.051	115
							-4.663	498	-2323.956	900.044	23.388	38
Co. Rd 93 - 1/4 mile bel	42.93	6.60			Mainstem	2/13/01	23.191	46	1075.391			
Co. Rd 93 - 1/4 mile bel	42.93	6.60			Mainstem	12/7/00						
Co. Rd 93 - 1/4 mile bel	42.93	6.60			Mainstem	1/17/01						
Co. Rd 93 - 1/4 mile bel	42.93	6.60			Mainstem	4/19/01						
Co. Rd 93 - 1/4 mile bel	42.93	6.60			Mainstem	3/27/01						
N. of Millfield, SR 13	42.93	6.60			Mainstem	5/29/01						
N. of Millfield, SR 13	42.93	6.60			Mainstem	12/3/01						
N. of Millfield, SR 13	42.93	6.60			Mainstem	4/1/02						
Sunday Ck @ RM 6.6, d	42.93	6.60			Mainstem	7/2/01						
N. of Millfield, SR 13	42.93	6.60			Mainstem	9/5/00						

RM 6.6, SC 10	42.93	6.60			Mainstem	7/30/01						
N. of Millfield, SR 13	42.93	6.60			Mainstem	11/13/00						
N. of Millfield, SR 13	42.93	6.60			Mainstem	10/23/00						
SC Sunday Ck @ RM 6.	42.93	6.60			Mainstem	8/14/01						
SC @ RM 6.6 dst. Truet	42.93	6.60			Mainstem	9/4/01						
RM 6.6, SC 10	42.93	6.60			Mainstem	7/17/01						
SC @ RM 6.6 dst. Truet	42.93	6.60			Mainstem	9/18/01						
Co. Rd 93 - 1/4 mile belc	42.93	6.46			Mainstem	7/17/01						
East Millfield	42.93	5.21	?????		Jackson Run	9/5/00	0.794	-105	-83.239	816.805	24.182	34
RM 0.2, SC 09 Jackson	42.93	5.21	0.20		Jackson Run	7/17/01				816.805	24.182	34
SC 09, RM 0.2	42.93	5.21	0.20		Jackson Run	8/14/01				816.805	24.182	34
							-0.230	-1914	440.326	1257.131	23.951	52
Sunday Ck @ RM 3.6, p	42.93	3.60			Mainstem	7/30/01	23.755	60	1432.478			
Sunday Ck @ RM 3.6, p	42.93	3.60			Mainstem	7/2/01						
SC @ RM 3.6 ust. Big B	42.93	3.60			Mainstem	8/14/01						
SC @ RM 3.6 ust. Big B	42.93	3.60			Mainstem	9/4/01						
Sunday Ck @ RM 3.6, p	42.93	3.60			Mainstem	7/17/01						
SC @ RM 3.6 ust. Big B	42.93	3.60			Mainstem	9/18/01						
BB, upst. Of BB01, CR 2	42.93	2.29	1.25		Big Bailey	4/2/02	0.888	-50	-44.111	-44.111	0.888	-50
Seep into wetland	42.93	2.29	1.05	0.03	Big Bailey	4/2/02	0.396	-187	-73.868	-117.978	1.285	-92
Seep into wetland	42.93	2.29	1.05	0.03	Big Bailey	10/3/01				-117.978	1.285	-92
SC 04, RM 0.9	42.93	2.29	0.90		Big Bailey	9/18/01				-117.978	1.285	-92
SC 04, RM 0.9	42.93	2.29	0.90		Big Bailey	8/14/01				-117.978	1.285	-92
RM0.9, SC04	42.93	2.29	0.90		Big Bailey	7/17/01				-117.978	1.285	-92
Seep on Big Bailey Trib	42.93	2.29	0.80	0.03	Big Bailey	10/3/01	0.057	-12	-0.688	-118.666	1.341	-88
Seep on Big Bailey Trib	42.93	2.29	0.80	0.03	Big Bailey	4/2/02				-118.666	1.341	-88
BB, upst. Of Carr Bailey	42.93	2.29	0.71		Big Bailey	4/2/02				-118.666	1.341	-88
RM 0.7, SC06	42.93	2.29	0.70	0.70	Carr Bailey	7/17/01	0.508	-21	-10.573	-129.240	1.849	-70
SC 06, RM 0.7	42.93	2.29	0.70	0.70	Carr Bailey	8/14/01				-129.240	1.849	-70
mouth of Carr Bailey	42.93	2.29	0.70	0.01	Big Bailey	4/2/02	0.676	-105	-71.159	-200.399	2.525	-79
Mouth of Big Bailey trib	42.93	2.29	0.65	0.01	Big Bailey	10/3/01				-200.399	2.525	-79
Seep @ Rt. 13	42.93	2.29	0.35	0.03	Big Bailey	4/2/02	0.189	256	48.361	-152.038	2.714	-56

Seep @ Rt. 13	42.93	2.29	0.35	0.03	Big Bailey	10/3/01				-152.038	2.714	-56
							-1.693	-104	175.293	23.255	1.021	23
Rt. 13 bridge	42.93	2.29	0.30		Big Bailey	10/23/00	1.021	27	27.169			
Rt. 13 bridge	42.93	2.29	0.30		Big Bailey	12/13/00						
Rt. 13 bridge	42.93	2.29	0.30		Big Bailey	9/5/00						
Rt. 13 bridge	42.93	2.29	0.30		Big Bailey	12/3/01						
Rt. 13 bridge	42.93	2.29	0.30		Big Bailey	2/20/01						
Rt. 13 bridge	42.93	2.29	0.30		Big Bailey	4/23/01						
Rt. 13 bridge	42.93	2.29	0.30		Big Bailey	5/29/01						
Rt. 13 bridge	42.93	2.29	0.30		Big Bailey	3/21/01						
Rt. 13 bridge	42.93	2.29	0.30		Big Bailey	1/15/00						
Rt. 13 bridge	42.93	2.29	0.30		Big Bailey	11/13/00						
Rt. 13 bridge	42.93	2.29	0.30		Big Bailey	4/2/02						
Mouth of Big Bailey	42.93	2.29	0.30		Big Bailey	10/3/01						
SC 07 Big Bailey @ RM	42.93	2.29	0.30		Big Bailey	8/14/01						
Rt. 13 bridge	42.93	2.29	0.30		Big Bailey	7/17/01						
BB @ RM 0.3	42.93	2.29	0.30		Big Bailey	9/18/01						
										1257.131	23.951	52
										23.255	1.021	23
									sum	1280.386	24.973	51
							3.224	-486	-1567.673	-287.287	28.197	-10
Mainstem-Chauncey	42.93	0.20			Mainstem	5/29/01	28.000	-4	-108.026			
Mainstem-Chauncey	42.93	0.20			Mainstem	3/21/01						
Mainstem-Chauncey	42.93	0.20			Mainstem	4/23/01						
Mainstem-Chauncey	42.93	0.20			Mainstem	2/20/01						
Mainstem-Chauncey	42.93	0.20			Mainstem	12/3/01						
Mainstem-Chauncey	42.93	0.20			Mainstem	9/5/00						
SC 01 Sunday Ck @ RM	42.93	0.20			Mainstem	7/30/01						
Mainstem-Chauncey	42.93	0.20			Mainstem	11/13/00						
Mainstem-Chauncey	42.93	0.20			Mainstem	4/2/02						
SC 01 Sunday Ck @ RM	42.93	0.20			Mainstem	8/14/01						
Mainstem-Chauncey	42.93	0.20			Mainstem	1/15/00						

Mainstem-Chauncey	42.93	0.20	Mainstem	10/23/00
Mainstem-Chauncey	42.93	0.20	Mainstem	12/13/00
SC 01 Sunday Ck @ RM	42.93	0.20	Mainstem	7/2/01
SC 01 Sunday Ck @ RM	42.93	0.20	Mainstem	9/4/01
SC 01 Sunday Ck @ RM	42.93	0.20	Mainstem	7/17/01
SC 01 Sunday Ck @ RM	42.93	0.20	Mainstem	9/18/01

indicates provisional Q data, see Q calc. Notes
indicates a trib. Not mainstem or seep.
indicates a seep.
indicates a mianstem site.
indicates a sub mainstem site, i.e. E Br., W Br.

Appendix F. Details of 2001 Watershed Assessment

Table F.1. List of sampling locations [Fish Community-F, Benthic Macroinvertebrates-B, Water column Chemistry (including fecal coliform counts)-C, and Sediment Analysis (organics and metals)-S] in the 2001 Sunday Creek study area.

Stream **River Mile**	**Sample Type**	**Drain. Area (mi^2)**	**Latitude/Longitude**	**Landmarks**	**USGS 7.5' Quad.**
***Sunday Creek*: (01-200)**					
26.6	(F,B,C)	2.2	39°38'38"/82°05'51"	CR 22, near TR 197	Devertown
26.0	(F,B,C,S)	3.6	39°38'07"/82°05'45"	SR 13 (DNR-077)	Devertown
24.0	(F,B,C)	8.5	39°36'30"/82°05'17"	Ust. Corning Seep, first crossing ust. SR 155	Corning
21.9	(F,B,C,S)	11.2	39°35'06"/82°04'41"	Dst Corning Seep, adj. SR 13 (DNR-075)	Corning
18.4	(B,)	24.0	39°32'40"/82°03'43"	Ust. East Branch Sunday Cr., SR 13	Corning
18.2	(F,C, S)	24.2	39°32'41"/82°03'42"	Ust. East Branch Sunday Cr., SR 13	Corning
14.6	(F,B,C,S)	61.0	39°30'34"/82°04'28"	SR 78 (DNR LT-074)	Corning
12.7	(F,B,C)	105.0	39°29'43"/82°05'18"	Glouster City Park	Jacksonville
10.2	(F,B,C)	110.0	39°28'23"/82°04'50"	CR 27	Jacksonville
7.3	(F,B,C,S)	120.0	39°27'06"/82°06'15"	Ust. Truetown Seep (DNR-073)	Jacksonville
6.6	(B,C,S)	122.0	39°26'38"/82°06'23"	Dst. Truetown Seep (DNR-072)	Jacksonville
6.4	(F)	122.0	39°26'47"/82°06'15"	Dst Truetwon Seep	Jacksonville
4.2	(F)	126.0	39°25'47"/82°06'04"	Ust. Big Bailey Seep (via Big Bailey Run)	Jacksonville
3.6	(B,C)	127.0	39°25'26"/82°06'49"	Ust. Big Bailey Seep (via Big Bailey Run) private	Jacksonville
0.2	(F,B,C,S)	138.0	39°23'42"/82°07'20"	Dst. Big Bailey Run, SR 13 (DNR-071)	Jacksonville
***Sunday Creek Tributary I @ 26.40* (01-207)**					
0.1	(F,B,C)	1.0	39°38'31"/82°05'42"	Junction of TR197 and CR 22 (sec.33)	Deavertown
***Sunday Creek Tributary II @ RM 25.44* (01-202)**					
0.1	(F,B,C)	0.7	39°37'42"/82°05'38"	SR 13	Deavertown
Corning Seep					
NA	(C)	NA	39°36'14"/82°05'18"	Corning Ballpark	Corning
***Eighteen Run* (01-256)**					
0.1	(F,B,C)	2.2	39°37'37"/82°05'44"	Near mouth at RR crossing	Deavertown
***Dotson Creek* (01-260)**					
3.8	(B)	2.2	39°37'59"/82°03'39"	Gravel Lane (sec 2)	Deavertown
3.2	(F)	4.6	39°37'40"/82°03'59"	Chapel Hill Rd. (experimental site)	Deavertown
3.1	(F,B,C)	4.6	39°37'08"/82°04'07"	Chapel Hill Rd.	Corning
0.3	(F,B,C)	7.7	39°34'60"/82°04'12"	TR 291, dst. impoundments	Corning
***East Branch Sunday Creek* (01-250)**					
12.6	(F,C)	2.7	39°37'59"/82°00'58"	CR 16	Deavertown
11.2	(F,B,C)	4.5	39°36'57"/82°00'21"	adj. SR 555	Corning
10.0	(B)	8.1	39°36'00"/81°59'59"	SR 555	Ringgold
9.9	(F,C)	8.1	39°35'56"/82°00'00"	SR 555	Ringgold
8.3	(F,B,C)	17.0	39°34'55"/82°00'49"	Ust. Burr Oak Res., CR 58	Corning
0.1	(F,B,C)	32.9	39°32'28"/82°03'35"	Dst. Burr Oak Res.	Corning

Table F.1. Continued

Stream River Mile	Sample Type	Drain. Area (mi^2)	Latitude/Longitude	Landmarks	USGS 7.5' Quad.
***Eels Run* (01-255)**					
0.1	(F)	1.4	39°34'23"/82°01'54"	CR 58	Corning
***Cedar Run* (01-252)**					
1.0	(F,B,C)	2.3	39°35'23"/82°01'42"	TR 112	Corning
0.1	(F,B,C)	3.1	39°34'35"/82°01'35"	CR 58	Corning
***San Toy Creek (* 01-208)**					
5.0	(F)	2.6	39°38'31"/82°02'12"	TR 308	Deavertown
4.9	(F,B,C)	2.7	39°38'30"/82°02'11"	TR 308 (experimental site)	Deavertown
3.5	(F,B,C)	4.2	39°37'29"/82°01'57"	TR 13, near Perry/Morgan Co. Line	Corning
0.7	(F,C)	7.3	39°35'34"/82°00'47"	TR 114	Corning
***Long Run* (01-209)**					
0.1	(F,B,C)	0.8	39°32'08"/82°04'27"	SR 13	Corning
***West Branch Sunday Creek* (01-240)**					
13.3	(F,B,C)	5.4	39°35'46"/82°09'55"	SR 155, dst. Pine Run-misc. Seeps(DNR-WB004)	New Straitsville
10.4	(F,B,C)	18.1	39°35'29"/82°07'12"	Scenic Rd.-misc. Seeps(DNR-WB003)	Corning
6.2	(F,B,C)	25.0	39°33'29"/82°06'10"	Constill Rd./CR 21(DNR-WB002)	Corning
1.8	(F,B,C)	40.0	39°31'06"/82°05'08"	TR 315	Corning
0.1	(F,B,C)	42.5	39°30'04"/82°05'10"	Oakdale Rd.(DNR-WB025)	Corning
***West Branch Sunday Creek Tributary I @ RM 12.41* (01-254)**					
0.1	(F,B,C)	2.0	39°35'19"/82°09'18"	Dst. Major Seep, TR 269	New Straitsville
***Pine Run* (01-244)**					
2.4	(F,B,C)	1.0	39°37'37"/82°10'54"	Sulphur Springs Rd., ust Pond	New Lexington
2.3	(B)	1.0	39°37'31"/82°07'31"	Sulphur Springs Rd., dst Pond	New Lexington
2.0	(F,B,C)	2.2	39°37'16"/82°10'47"	Lane off Sulphur Springs Rd. (sec. 11)	New Lexington
0.1	(F,B,C)	4.4	39°35'47"/82°09'57"	SR 155	New Lexington
Pine Run Seep (Ditch Seep)					
0.1	(C)	NA	39°36'11"/82°10'11"	Adj. Sulphur Springs Rd.	New Straitsville
***West Branch Sunday Creek Tributary II @ RM 10.73* (01-247)**					
1.0	(F,C)	5.0	39°36'08"/82°07'34"	Scenic Rd. (sec. 17)	New Straitsville
0.9	(B)	5.0	39°36'07"/82°07'31"	Scenic Rd. (sec 17)	New Straitsville
0.1	(F,B)	7.8	39°35'34"/82°07'12"	SR 155	Corning
***Tributary of W. Br. Tributary II @ RM 10.73/2.32* (01-253)**					
0.1	(F,B)	1.6	39°37'16"/82°08'42"	Gated lane near mouth (sec. 7)	New Straitsville
***Tributary of W. Br. Tributary II @ RM 10.73/0.9* (01-249)**					
1.0	(F, C)	1.9	39°36'28"/82°08'30"	Gated lane off TR 216 (sec 18)	New Straitsville
0.9	(B)	1.9	39°36'24"/82°08'26"	Gated lane off TR 216 (sec. 18)	New Staritsville
***Johnson Run* (01-242)**					
2.4	(F,B,C)	1.9	39°33'17"/82°08'21"	Adj. CR 68 (sec. 30)	New Sraitsville
0.1	(F,B,C)	4.1	39°32'37"/82°06'13"	Oakdale Rd.	Corning

Table F.1. Continued

Stream River Mile	Sample Type	Drain. Area (mi²)	Latitude/Longitude	Landmarks	USGS 7.5' Quad.
***Indian Run* (01-243)**					
2.2	(F)	2.1	39°34'16"/82°07'53"	TR 435	New Straitsville
2.0	(B,C)	2.1	39°34'15"/82°07'43"	TR 435 (sec 29)	New Straitsville
0.1	(F,B,C)	3.4	39°33'09"/82°06'11"	Oakdale Ed	Corning
***West Branch Sunday Creek Tributary III @ RM 3.45* (01-248)**					
0.4	(F,C)	1.0	39°32'11"/82°06'36"	TR 312 (sec. 23)	Corning
0.2	(B)	1.0	39°32'02"/82°06'22"	TR 312 (sec. 23)	Corning
***Mud Fork* (01-241)**					
3.1	(F,B,C)	1.9	39°30'58"/82°07'33"	Hunderton Rd., Trimble WLA	New Straitsville
2.2	(F,C)	4.5	39°30'20"/82°06'58"	TR 304	Corning
1.6	(B)	5.0	39°30'00"/82°06'31"		Jacksonville
1.1	(B)	6.4	39°29'50"/82°06'05"		Jacksonville
0.2	(F,B,C)	7.2	39°30'05"/82°05'20"	At mouth	Corning
***Mud Fork Tributary I @ RM 2.87* (01-246)**					
0.1	(F,B,C)	1.3	39°30'40"/82°07'31"	SR 78	New Straitsville
***Mud Fork Tributary II @ RM 1.06* (01-245)**					
0.2	(F,B,C)	1.3	39°29'46"/82°06'13"	TR 307	Jacksonville
***Congress Run (2001)*: 01-230**					
2.2	(F,B,C)	1.0	39°29'57"/82°03'20"	TR 1259	Jacksonville
1.3	(F,B,C)	2.3	39°29'44"/82°04'11"	TR 77	Jacksonville
***Sunday Creek Tributary III @ RM 9.02* (01-206)**					
0.4	(F,B,C)	2.0	39°27'59"/82°04'53"	Lane South of Trimble, at Tipple	Jacksonville
***Greens Run* (01-220)**					
1.7	(F,B,C)	1.1	39°28'07"/82°07'48"	TR 302, at Modoc	Nelsonville
0.1	(F,B,C)	5.2	39°27'37"/82°06'15"	SR 93	Jacksonville
***Little Greens Run* (01-222)**					
2.1	(F,B,C)	1.0	39°29'16"/82°07'34"	Adj. New Straightsville Rd.	Nelsonville
0.7	(F,B,C)	2.2	39°28'22"/82°06'41"	Greens Run Rd.	Jacksonville
***Sunday Creek Trib. IV @ RM 6.71, Oregon Ridge* (01-205)**					
0.1	(F,B)	1.0	39°26'48"/82°06'36"	Crossing South of Truetown, ust Truetown seep	Jacksonville
0.05	(B,C)	1.0	39°26'42"/82°06'27"	At mouth, dst. Truetown seep	Jacksonville
***Jackson Run* (01-204)**					
0.2	(F,B,C)	3.2	39°25'47"/82°05'23"	E. Millfield, near landing strip	Jacksonville
***Big Bailey Run* (01-210)**					
2.6	(C)	1.0	39°26'36"/82°08'24"	Ust. Middle Bailey Run, adj. TR 29	Nelsonville
2.4	(F,B)	1.0	39°26'17"/82°08'15"	Ust. Middle Bailey Run, adj. TR 29	Nelsonville
1.7	(F,B)	4.7	39°25'57"/82°07'58"	Dst. Middle Bailey Run, adj. TR 29	Nelsonville
0.9	(C)	5.3	39°25'20"/82°07'17"	Ust. Carr Bailey Run, adj CR 29	Nelsonville
0.3	(F,B,C)	7.8	39°24'57"/82°07'09"	Dst. Big Bailey Seep, SR 13 (DNR-005)	Jaclsonville

Table F.1. Continued

Stream River Mile	Sample Type	Drain. Area (mi^2)	Latitude/Longitude	Landmarks	USGS 7.5' Quad.
***Middle Bailey Run* (01-213)**					
0.9	(B)	2.2	39°25'20"/82°08'25"	West of mining access Rd.	Nelsonville
0.1	(F,B)	2.7	39°25'58"82°07'31"	At mouth	Nelsonville
***Carr Bailey Run* (01-211)**					
0.7	(F,B,C)	2.2	39°25'48"/82°07'11"	TR 299	Jacksonville
***West Bailey Run* (01-214)**					
0.5	(F,B,C)	1.0	39°25'26"/82°09'14"	TR 293	Nelsonville

Table F.2. Aquatic life use attainment status based on the existing or recommended aquatic life use for streams sampled in the Sunday Creek study area, 2001.

RIVER MILE Fish/Macro.	IBI	MIwb	ICI	QHEI	Use Attainment Status[a]	Comments
***Sunday Creek (2001)*: 01-200**						
Western Allegheny Plateau-LRW/WWH Use Designation (Existing/Recommended)						
26.6_H/26.6	36*	NA	F*	59.0	FULL/**NON**	CR 22, near TR 197
26.0_H/26.0	36*	NA	MG^{ns}	57.0	FULL/PARTIAL	SR 13 (ODNR-077)
24.0_H/24.0	35*	NA	F*	50.5	FULL/**NON**	Ust. Corning Seep, crossing ust. SR
21.9_H/21.9	24*	NA	4*	75.0	FULL/**NON**	Dst Corning Seep, adj. SR 13 (DNR-075)
18.2_W/18.4	34*	6.6*	28*	70.5	FULL/**NON**	Ust. East Branch Sunday Cr., SR 13
14.6_W/14.6	31*	7.5*	42	58.0	FULL/PARTIAL	SR 78 (DNR LT-074)
12.7_W/12.7	35*	7.6*	26*	62.5	FULL/**NON**	Glouster City Park
10.2_W/10.2	39*	7.8*	36	55.5	FULL/PARTIAL	CR 27
7.3_W/7.3	38*	7.7*	38	59.5	FULL/PARTIAL	Ust. Truetown Seep (DNR-073)
6.4_W/6.6	14*	4.2*	0*	75.5	**NON**	Dst. Truetown Seep (DNR-072)
4.2_W/3.6	14*	4.6*	2*	56.0	**NON**	Ust. Big Bailey Seep (via Big Bailey Run)
0.2_W/0.2	21*	5.3*	10*	62.5	FULL/**NON**	Dst. Big Bailey Run, SR 13 (DNR-071)
***Sunday Creek Tributary I @ 26.40 (2001)*: 01-207**						
Western Allegheny Plateau-WWH Use Designation (Recommended)						
0.1_H/0.1	34*	NA	G	49.5	PARTIAL	TR197 and CR 22 (sec.33)
***Sunday Creek Tributary II @ RM 25.44 (2001)*: 01-202**						
Western Allegheny Plateau-WWH Use Designation (Recommended)						
0.1_H/0.1	46	NA	G	73.0	FULL	SR 13
***Eighteen Run (2001)*: 01-256**						
Western Allegheny Plateau-WWH Use Designation (Recommended)						
0.1_H/0.1	44	NA	F*	69.5	PARTIAL	Near mouth at RR crossing
***Dotson Creek (2001)*: 01-260**						
Western Allegheny Plateau-WWH Use Designation (Existing)						
- /3.8	-	-	G	-	(FULL)	Gravel Lane (sec 2)
3.2_H/ -	44	NA	-	66.0	(FULL)	Chapel Hill Rd. (experimental site)
3.1_H /3.1	42^{ns}	NA	G	79.5	FULL	Chapel Hill Rd.
0.3_H/0.3	26*	NA	F*	57.5	**NON**	TR 291, dst. impoundment

Table F.2. continued.

RIVER MILE Fish/Macro.	IBI	MIwb	ICI	QHEI	Use Attainment Status[a]	Comments
***East Branch Sunday Creek (2001)*: 01-250**						
			Western Allegheny Plateau-EWH/WWH Use Designation (Existing/Recommended)			
12.6$_{H}$/ -	34*	NA	-	28.0	**(NON/NON)**	CR 16
11.2$_{H}$/11.2	44$^{*/-}$	NA	E	59.5	PARTIAL/FULL	adj. SR 555
9.9$_{H}$/10.0	36*	NA	F*	59.5	**NON**	SR 555
8.3$_{H}$/8.3	31*	NA	40$^{*/-}$	66.5	**NON**/PARTIAL	Ust. Burr Oak Res., CR 58
			Western Allegheny Plateau-WWH Use Designation (Existing)			
0.1$_{W}$/0.1	42^{ns}	7.7*	4*	57.0	**NON**	Dst. Burr Oak Res.
***Eels Run (2001)*: 01-255**						
			Western Allegheny Plateau-WWH Use Designation (Recommended)			
0.1$_{H}$/ -	44	NA	-	67.0	(FULL)	CR 58
***Cedar Run (2001)*: 01-252**						
			Western Allegheny Plateau-WWH Use Designation (Existing)			
1.0$_{H}$/1.0	42^{ns}	NA	VG	75.5	FULL	TR 112
0.1$_{H}$/0.2	40^{ns}	NA	G	70.5	FULL	CR 58
***San Toy Creek (2001)*: 01-208**						
			Western Allegheny Plateau-WWH Use Designation (Recommended)			
5.0$_{H}$/ -	46	NA	-	47.5	(FULL)	TR 308
4.9$_{H}$/4.9	44	NA	VG	73.0	FULL	TR 308 (experimental site)
3.5$_{H}$/3.5	44	NA	VG	82.0	FULL	TR 13, near Perry/Morgan Co. Line
0.7$_{H}$/ -	36*	NA	-	54.5	(**NON**)	TR 114
***Long Run (2001)*: 01-209**						
			Western Allegheny Plateau-WWH Use Designation (Recommended)			
0.1$_{H}$/0.1	28*	NA	MG^{ns}	58.5	PARTIAL	SR 13
***West Branch Sunday Creek (2001)*: 01-240**						
			Western Allegheny Plateau-LWH/WWH Use Designation (Existing/Recommended)			
13.3$_{H}$/13.3	20$^{-/*}$	NA	VP*	82.5	**NON**	SR 155, dst. Pine Run-Seeps (DNR-WB004)
10.4$_{H}$/10.4	29$^{-/*}$	NA	VP*	60.0	**NON**	Scenic Rd.-Seeps (DNR-WB003)

Table F.2. continued.

RIVER MILE Fish/Macro.	IBI	MIwb	ICI	QHEI	Use Attainment Status[a]	Comments
***West Branch Sunday Creek (2001)*: 01-240**						
Western Allegheny Plateau-LWH/WWH Use Designation (Existing/Recommended)						
$6.2_W/6.2$	38*	7.1*	42	63.5	PARTIAL	Constill Rd./CR 21[(DNR-WB002)]
$1.8_W/1.8$	38*	8.2[ns]	48	64.5	PARTIAL	TR 315
$0.1_W/0.1$	38*	8.1[ns]	36	74.0	PARTIAL	Oakdale Rd.[(DNR-WB025)]
***West Branch Sunday Creek Tributary I @ RM 12.41 (2001)*: 01-254**						
Western Allegheny Plateau-MWH[c] Use Designation (Recommended)						
$0.1_H/0.1$	36	NA	<u>P</u>*	45.0	**NON**	TR 269
***Pine Run (2001)*: 01-244**						
Western Allegheny Plateau-WWH/MWH[c] Use Designation (Existing/Recommended)						
$2.4_H/2.4$	36	NA	<u>VP</u>*	45.5	**NON**	Sulphur Springs Rd.
- /2.3	-	NA	MF*	-	**NON**	Sulfur Springs Rd.
$2.0_H/2.0$	30	NA	<u>P</u>*	67.5	**NON**	Lane off Sulphur Springs Rd. (sec. 11)
$0.1_H/0.1$	<u>12</u>*	NA	<u>VP</u>*	78.5	**NON**	SR 155
***West Branch Sunday Creek Tributary II @ RM 10.73 (2001)*: 01-247 *(AKA: Congo Run*)**						
Western Allegheny Plateau-WWH Use Designation (Recommended)						
$1.0_H/0.9$	44	NA	MF*	69.0	PARTIAL	Scenic Rd. (sec. 17)
$0.1_H/0.1$	38*	NA	<u>P</u>*	58.5	**NON**	SR 155
Tributary of W. Br. Tributary II @ RM 10.73/2.32 (2001)*: 01-253 *(AKA: Congo Run Tributary)						
Western Allegheny Plateau-LRW[d] Use Designation (Recommended)						
$0.1_H/0.1$	<u>20</u>	NA	<u>VP</u>*	46.5	**NON**	(sec. 7)
Tributary of W. Br. Tributary II @ RM 10.73/0.9 (2001)*: 01-249 *(AKA Congo Run Tributary)						
Western Allegheny Plateau-WWH Use Designation (Recommended)						
$1.0_H/0.9$	36*	NA	G	57.5	PARTIAL	Gated lane off TR 216 (sec. 18)

Table F.2. continued.

RIVER MILE Fish/Macro.	IBI	MIwb	ICI	QHEI	Use Attainment Status[a]	Comments
***Johnson Run (2001)*: 01-242**						
		Western Allegheny Plateau-WWH Use Designation (Exsiting)				
2.4_H/2.4	44	NA	MG^{ns}	65.5	FULL	Adj. CR 68 (sec. 30)
0.1_H/0.1	<u>26</u>*	NA	F*	47.0	**NON**	Oakdale Rd.
***Indian Run (2001)*: 01-243**						
		Western Allegheny Plateau-WWH Use Designation (Existing)				
2.2_H/2.0	38*	NA	G	68.5	PARTIAL	TR 435
0.1_H/0.1	32*	NA	MG^{ns}	66.5	PARTIAL	Oakdale Ed
***West Branch Sunday Creek Tributary III @ RM 3.45 (2001)*: 01-248**						
		Western Allegheny Plateau-WWH Use Designation (Recommended)				
0.4_H/0.2	42^{ns}	NA	<u>VP</u>*	66.5	**NON**	TR 312
***Mud Fork (2001)*: 01-241**						
		Western Allegheny Plateau-WWH Use Designation (Existing)				
3.1_H/3.1	48	NA	VG	56.0	FULL	Hunderton Rd.
2.2_H/ -	48	NA	-	71.5	(FULL)	TR 304
- /1.6	-	-	G	-	(FULL)	
- /1.1	-	-	MG^{ns}	-	(FULL)	
0.2_H/0.2	36*	NA	F*	50.5	**NON**	At mouth
***Mud Fork Tributary I @ RM 2.87 (2001)*: 01-246**						
		Western Allegheny Plateau-WWH Use Designation (Recommended)				
0.1_H/0.1	42^{ns}	NA	MG^{ns}	45.5	FULL	SR 78
***Mud Fork Tributary II @ RM 1.06 (2001)*: 01-245**						
		Western Allegheny Plateau-WWH Use Designation (Recommended)				
0.2_H/0.2	46	NA	MG^{ns}	46.0	FULL	TR 307
***Congress Run (2001)*: 01-230**						
		Western Allegheny Plateau-WWH Use Designation (Existing)				
2.2_H/2.2	50	NA	MG^{ns}	59.5	FULL	TR 1259
1.3_H/1.3	48	NA	E	68.0	FULL	TR 77

Table F.2. continued.

RIVER MILE Fish/Macro.	IBI	MIwb	ICI	QHEI	Use Attainment Status[a]	Comments
***Sunday Creek Tributary III @ RM 9.02 (2001)*: 01-206**						
			Western Allegheny Plateau-WWH Use Designation (Recommended)			
0.4_H/0.4	44	NA	MG^{ns}	71.5	FULL	Lane South of Trimble, at Tipple
***Greens Run (2001)*: 01-220**						
			Western Allegheny Plateau-WWH Use Designation (Existing)			
1.7_H/1.7	44	NA	P*	45.0	**NON**	TR 302
0.1_H/0.1	32*	NA	MG^{ns}	72.5	PARTIAL	SR 93
***Little Greens Run (2001)*: 01-222**						
			Western Allegheny Plateau-WWH Use Designation (Undesignated)			
2.1_H/2.1	38*	NA	F*	59.0	**NON**	Adj. New Straightsville Rd.
0.7_H/0.7	46	NA	G	57.5	FULL	Greens Run Rd.
***Sunday Creek Trib. IV @ 6.71, Oregon Ridge (2001)*: 01-205**						
			Western Allegheny Plateau-LRW[d] Use Designation (Recommended)			
0.1_H/0.1	20	NA	F	45.0	FULL	Crossing South of Truetwon
- /0.05	-	NA	VP*	-	(**NON**)	At mouth, dst. Truetown seep
***Jackson Run (2001):* 01-204**						
			Western Allegheny Plateau-WWH Use Designation (Existing)			
0.2_H/0.2	32*	NA	MF*	61.5	**NON**	E. Millfield, near landing strip
***Big Bailey Run (2001)*: 01-210**						
			Western Allegheny Plateau-WWH Use Designation (Existing)			
2.4_H/2.4	38*	NA	VP*	61.5	**NON**	Ust. Middle Bailey R., adj. CR 29
1.7_H/1.7	46	NA	VG	82.0	FULL	Dst. Middle Bailey R., adj. CR 29
			Western Allegheny Plateau-WWH/LRW[d] Use Designation (Existing/Recommended)			
0.3_H/0.3	26	NA	VP*	56.0	**NON**	Dst. Big Bailey Seep, SR 13 (DNR-005)
***Middle Bailey Run (2001)*: 01-213**						
			Western Allegheny Plateau-WWH Use Designation (Recommended)			
- /0.9	-	-	E	-	(FULL)	West of mining access Rd.
0.1_H/0.1	48	NA	G	74.0	FULL	near Mouth

Table F.2. continued.

RIVER MILE Fish/Macro.	IBI	MIwb	ICI	QHEI	Use Attainment Status[a]	Comments
***Carr Bailey Run (2001)*: 01-211**						
		Western Allegheny Plateau-MWH[c] Use Designation (Recommended)				
0.7_H/0.7	34	NA	MF*	30.5	PARTIAL	TR 299
***West Bailey Run (2001)*: 01-214**						
		Western Allegheny Plateau-WWH[c] Use Designation (Recommended)				
0.5_H/0.5	36	NA	MF*	54.0	PARTIAL	TR 293

* -Significant departure from ecoregional biocriterion; poor and very poor results are underlined.
ns -Nonsignificant departure from biocriterion (≤ 4 IBI or ICI units; ≤ 0.5 MIwb units).
a -Use attainment status based on one organism is parenthetically expressed.
b -Narrative evaluation based on qualitative benthic macroinvertebrate sample (E-exceptional, G-good, MG-marginally good, F-fair, MF-marginally fair, P-poor, and VP-very poor.
c -MWH Mine Drainage.
d -LRW Acid Mine Drainage.
H -Headwaters (station < 20 miles^2).
W -Wading methods employed to evaluate fish community.
NA -MIwb not applicable at headwater (H) sites.

Ecoregional Biocriteria:
(WWH, EWH, MWH-MD from OAC 3745-1-07, Table 7-15)

Western Allegheny Plateau *(WAP)*

INDEX - Site Type	WWH	EWH	MWH-MD[c]	LRW-AMD[d]
IBI - Headwaters/Wading	44	50	24	18
MIwb - Wading	8.4	9.4	5.5	4.5
ICI	36	46	30	8

Table F.3. Sunday Creek Waterbody Summary

<table>
<tr><th rowspan="2">Waterbody [Identification Number]</th><th colspan="2">Aquatic Life Use</th><th rowspan="2">Indicators[1,2]</th><th rowspan="2">Leading Causes/Sources of Aquatic Life Impairment</th><th rowspan="2">Other Beneficial Uses</th></tr>
<tr><th>Existing</th><th>Rec.</th></tr>
<tr><td rowspan="2">Sunday Creek
(01-200)</td><td>LRW+</td><td>WWH+</td><td>1) Partial and non-attainment (very poor to fair biology)
2) Adequate macrohabitat quality
3) Highly elevated AMD parameters, including numerous pH violations.</td><td>1) AMD[3]
2) Upper site interstitial</td><td>AWS+
IWS+
PCR+</td></tr>
<tr><td colspan="5">Comments: Conditions generally fair to poor, but a few sites nearly meet WWH in 2001. Major sources on the mainstem are Truetown and Corning seeps. Unfortunately, abatement projects for these controlling sources are too costly at this time. Definitely WWH potential IF these sources are abated, but not certain if this can be achieved in the near term (5-10 years).

Only areas above RM 26.0 are free from influence of mining. Impairment upstream from this point (monitored at RM 26.6) were derived from intermittent flow (RM 26.6 represents the upper limit of the 2001 effort).

Planned AMD Abatement Projects: At this time projects in the watershed are directed at tributaries, seeps or other sources of mine drainage affecting the mainstem.</td></tr>
<tr><td rowspan="2">Sunday Cr Trib. I at RM 26.4
(01-207)</td><td>NA</td><td>WWH+</td><td>1) Partial attainment (fair community performance)
2) No evidence of significant AMD.
3) Marginal macrohabitat (in addition to diminished stream discharge).
4) Low DO, including exceedence of WWH average criterion.</td><td>1) Interstitial flow (natural)
2) Marginal habitat</td><td>AWS+
IWS+
SCR+

SCR: Interstitial flow and shallow; max residual pool depth 40cm.</td></tr>
<tr><td colspan="5">Comments: Impairment appeared to be associated primarily with intermittent flow.

Planned AMD Abatement Projects: NA</td></tr>
<tr><td rowspan="2">Sunday Cr. Trib II at RM 25.55
(01-202)</td><td>NA</td><td>WWH+</td><td>FULL Attainment</td><td>NA</td><td>AWS+
IWS+
PCR+</td></tr>
<tr><td colspan="5">Comments: none

Planned AMD Abatement Projects: NA</td></tr>
<tr><td>Eighteen Run
(01-256)</td><td>NA</td><td>WWH+</td><td>1) PARTIAL attainment (fair community performance)
2) Adequate macrohabitat
2) Selected AMD indicators elevated.</td><td>1) AMD, relocated channel, draining reclaimed mine lands.
2) Station located dst. from small impoundment. Possible, affected flow regime.</td><td>AWS+
IWS+
PCR+</td></tr>
</table>

Table F.3. Sunday Creek Waterbody Summary

Waterbody [Identification Number]	Aquatic Life Use		Indicators[1,2]	Leading Causes/Sources of Aquatic Life Impairment	Other Beneficial Uses
	Existing	Rec.			
	Comments: Communities not profoundly impacted. High probability of successful abatement of AMD. As such, WWH use appeared appropriate. **Planned AMD Abatement Projects:** Limestone channel, settling pond, and leach bed.				
Dotson Creek (01-260)	NA	WWH+	1) Of 4 miles assessed, only 0.3 miles impaired. Remainder meet WWH biocriteria. 2) Adequate macrohabitat quality 3) Low DO, including exceedence of WWH average criterion (limited to the lower reach). 4) Barium, TDS, and copper(limited to lower reach).	1) Oil and gas extraction at lower site. 2) Upstream impoundments. 3) Beaver influence (lower site)	AWS+ IWS+ PCR+
	Comments: Lower 0.3 miles courses through a large oil/gas operation. Also, lower reach situated downstream from two small impoundments. Oil observed in stream at lower site. Also, stream flow nearly absent, likely reflective of upstream impoundments or possibly on-site withdrawals associated with mineral extraction. Beaver dams present throughout site, contributed to slack flow. **Planned AMD Abatement Projects:** NA				
East Br Sunday Creek (01-250)	EWH* and WWH*	WWH+ (excluding Reservoir)	1) Mix of FULL and PARTIAL (fair to good biology). 2) Low DO (values as low as 1.02ppm) and highly elevated fecal coliform counts ust. from Burr Reservoir. 3) Marginal to poor habitat 4) Selected AMD parameters elevated. 5) Strong hydrogen sulfide recorded downstream reservoir.	1) Reservoir (flow and bottom release) lower 0.1 miles. 2) Livestock (ust reservoir.) 3) Intermittent flow (uppermost site) 4) Modest AMD (up and down-stream from reservoir.)	AWS+ IWS+ PCR+
	Comments: Multiple sources combined to render East Branch Sunday Creek impaired. Upstream from Burr Oak, unrestricted cattle access, riparian encroachment, and stream intermittence appeared the principle stressors. Bottom releases from Burr Oak likely resulted in low DO and elevated ammonia-N, downstream from reservoir. Although this phenomenon was not captured by WQ sampling, the affected reach possessed a strong odor of hydrogen sulfide, indicating discharge from summer hypolimnion. Mine drainage was considered secondary to the above mentioned stressors. **Planned AMD Abatement Projects**: NA				

Table F.3. Sunday Creek Waterbody Summary

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<tr><th rowspan="2">Waterbody [Identification Number]</th><th colspan="2">Aquatic Life Use</th><th rowspan="2">Indicators[1,2]</th><th rowspan="2">Leading Causes/Sources of Aquatic Life Impairment</th><th rowspan="2">Other Beneficial Uses</th></tr>
<tr><th>Existing</th><th>Rec.</th></tr>
<tr><td rowspan="2">Eels Run
(01-255)</td><td>NA</td><td>WWH+</td><td>FULL attainment</td><td></td><td>AWS+
IWS+
PCR+</td></tr>
<tr><td colspan="5">Comments: none

Planned AMD Abatement Projects: NA</td></tr>
<tr><td rowspan="2">Cedar Run
(01-252)</td><td>NA</td><td>WWH+</td><td>FULL attainment</td><td></td><td>AWS+
IWS+
PCR+</td></tr>
<tr><td colspan="5">Comments: none

Planned AMD Abatement Projects: NA</td></tr>
<tr><td rowspan="2">San Toy Creek
(01-208)</td><td>NA</td><td>WWH+</td><td>1) Of the 5 miles assessed, only the lower 0.7 miles impaired. Not a profound impact, as community performance no worse than fair.
2) WQ: low DO, pH (no exceedences or violations) and elevated ammonia-N
3) Fair macrohabitat
4) Selected AMD parameters suggest very modest mine drainage influence through lower mile.</td><td>1) Naturally low gradient swamp/beaver affected stream.
2) Possible low level AMD</td><td>AWS+
IWS+
PCR+</td></tr>
<tr><td colspan="5">Comments: Impairment limited to lower 0.7 miles, associated with low gradient wetland conditions. Reach was further simplified by numerous beaver dams. Lower 0.7 miles little more than a series of pools. Low turnover associated with natural features (low gradient and beaver) appeared responsible for low DO and elevated ammonia-N (i.e. reducing environment). Low pH may reflect this as well, but acidity higher and alkalinity lower than observed in ust segment. Possible low-grade AMD. Ultimately community appeared controlled by physical stream features. Remaining five miles FULL attainment.

Planned AMD Abatement Projects: NA</td></tr>
<tr><td rowspan="2">Long Run
(01-209)</td><td>NA</td><td>WWH+</td><td>1) PARTIAL attainment (fair biology)
2) No WQ problems evidenced in chem. results.
3) Adequate macrohabitat</td><td>1) Interstitial Flow (natural)</td><td>AWS+
IWS+
PCR+

PCR: Although interstitial, residual pool depth 70cm.</td></tr>
<tr><td colspan="5">Comments: Stream very small and flow intermittent. Possible PHWH. Impairment appeared derived from natural phenomenon.

Planned AMD Abatement Projects:.NA</td></tr>
</table>

Table F.3. Sunday Creek Waterbody Summary

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<tr><th rowspan="2">Waterbody [Identification Number]</th><th colspan="2">Aquatic Life Use</th><th rowspan="2">Indicators[1,2]</th><th rowspan="2">Leading Causes/Sources of Aquatic Life Impairment</th><th rowspan="2">Other Beneficial Uses</th></tr>
<tr><th>Existing</th><th>Rec.</th></tr>
<tr><td rowspan="2">West Br Sunday Cr
(01-240)</td><td>WWH*
(LWH)</td><td>WWH+</td><td>1) NON and PARTIAL (poor to fair biology).
2) Elevated AMD parameters, including numerous WWH pH violations.
3) Good to exceptional macrohabitat</td><td>1) AMD (severe to moderate)</td><td>AWS+
IWS+
PCR+</td></tr>
<tr><td colspan="5">Comments: Numerous sources of AMD within sub-basin, including Pine Run, a major source within the sub-basin. Only upper 4-6 miles severely impacted (poor/very biology). High probability of successful abatement. As such, WWH recommended.

Planned AMD Abatement Projects: Limestone channels, leach beds, limestone dikes, and subsidence closures.</td></tr>
<tr><td rowspan="2">West Br Trib. I at RM 12.41
(01-254)</td><td>NA</td><td>MWH+</td><td>1) Non-attainment (fair/poor biology)
2) Most AMD parameters elevated.
3) pH below at or below 7.0
4) Ammonia-N elevated (above background)
5) One high DO, suggest modest enrichment</td><td>1) AMD (moderate)
2) Poor habitat</td><td>AWS+
IWS+
PCR+</td></tr>
<tr><td colspan="5">Comments: As no abatement projects planned, modest AMD impacts likely to persist into foreseeable future. Impacts not profound and appeared exacerbated by non-mining problems. As such LRW excluded. MWH (mine affected) appeared more appropriate use.

Planned AMD Abatement Projects: None</td></tr>
<tr><td>Pine Run
(01-344)</td><td>WWH*</td><td>MWH+</td><td>1) Only 0.3 miles meet MWH biocriteria (very poor/fair biology)
2) AMD parameters elevated.
3) pH below at or below 6.6, with values as low as 3.65.
4) Ammonia-N elevated (well above background)
5) DO violation upper site (3.09 ppm).</td><td>1) AMD (severe to moderate, numerous seeps)
2) Interstitial flow (upper reach).
3) Low gradient wetland/beaver influence (natural).</td><td>AWS+
IWS+
PCR+</td></tr>
</table>

Table F.3. Sunday Creek Waterbody Summary

<table>
<tr><th rowspan="2">Waterbody [Identification Number]</th><th colspan="2">Aquatic Life Use</th><th rowspan="2">Indicators[1,2]</th><th rowspan="2">Leading Causes/Sources of Aquatic Life Impairment</th><th rowspan="2">Other Beneficial Uses</th></tr>
<tr><th>Existing</th><th>Rec.</th></tr>
<tr><td></td><td colspan="5">Comments: Numerous sources of AMD within basin, including many seeps (Pine Run major source within the West Br. sub-basin). Also, upper reach courses through reclaimed and unreclaimed minelands, and mine spoil. Lastly, middle segment possesses natural limiting features, namely, low gradient wetland/beaver influences. Ultimately AMD appeared the controlling influence, with others considered secondary. Given the uncertainties regarding the ultimate success of planned abatement activities, existing biology, the presence non-mining problems, the MWH (mine affected) use designation appeared appropriate.

Planned AMD Abatement Projects: Close and fill subsidence, limestone injection, limestone channel, limestone dikes, gob remediation, and treatment wetlands.</td></tr>
<tr><td rowspan="2">West Br Trib. II at RM 10.73
(01-247)

AKA Congo Run</td><td>NA</td><td>WWH+</td><td>1) Partial and non-attainment (fair to poor biology)
2) Adequate macrohabitat
3) Selected AMD parameters elevated.</td><td>1) Moderate AMD
2) Low Gradient Swamp Stream natural</td><td>AWS+
IWS+
PCR+</td></tr>
<tr><td colspan="5">Comments: Abatement efforts exclusively target subsidence closures, with the dual aim of returning relatively clean flow to the conveyances within the sub-basin and diminishing seeps through the reduction or elimination of inter and intra-basin water transfer.

Planned AMD Abatement Projects: Numerous subsidence closures.</td></tr>
<tr><td rowspan="2">Trib. of W. Br Trib II At RM10.73/2.32
(01-253)

Congo Run
(basin)</td><td>NA</td><td>LRW+</td><td>1) Non-attainment of LRW criteria (poor to very poor biology)
2) Marginal/poor habitat
3) No chem data collected.</td><td>1) AMD (Severe) -numerous surface and submerged seeps.
2) Low gradient wetland stream.
3) Modified habitat.</td><td>AWS+
IWS+
PCR+</td></tr>
<tr><td colspan="5">Comments: Stream courses through wetland complex near reclaimed mine, channel likely artificial. Very poor to poor communities appeared associated with AMD. Although habitat somewhat limiting AMD appeared most influential. Unfortunately, no abatement developed. As such, LRW recommended.

Planned AMD Abatement Projects: none</td></tr>
</table>

Table F.3. Sunday Creek Waterbody Summary

<table>
<tr><th rowspan="2">Waterbody [Identification Number]</th><th colspan="2">Aquatic Life Use</th><th rowspan="2">Indicators[1,2]</th><th rowspan="2">Leading Causes/Sources of Aquatic Life Impairment</th><th rowspan="2">Other Beneficial Uses</th></tr>
<tr><th>Existing</th><th>Rec.</th></tr>
<tr><td rowspan="2">Trib. of W. Br Trib II at RM 10.73/0.9 (01-249)

Congo Run (basin)</td><td>NA</td><td>WWH+</td><td>1) Partial attainment (fair to good biology).
2) Adequate habitat
3) Low DO, including two exceedences of the WWH minimum criterion.</td><td>1) Flows through reclaimed surface mine. No evidence of AMD.
2) Interstitial flow, likely a result of previous mining (subsidence or modified hydrology associated with mining /reclamation efforts)</td><td>AWS+
IWS+
PCR+</td></tr>
<tr><td colspan="5">Comments: Courses through reclaimed minelands. Interstitial flow likely a result of previous mining: subsidence(s) and/or modified hydrology associated with reclamation.

Planned AMD Abatement Projects: none</td></tr>
<tr><td rowspan="2">Johnson Run (01-242)</td><td>WWH*</td><td>WWH+</td><td>1) Full and non-attainment, impairment limited to lower reach.
2) Poor macrohabitat, including true intermittence, associated with impairment
3) No WQ problems identified from chem. results.</td><td>1) Poor habitat
2) True intermittent flow (natural)</td><td>AWS+
IWS+
PCR+

PCR: Despite intermittent flow, residual pool depth 70cm, and private residences adjacent.</td></tr>
<tr><td colspan="5">Comments: Based upon field observations, intermittent stream discharge appeared the controlling feature.

Planned AMD Abatement Projects: NA</td></tr>
<tr><td rowspan="2">Indian Run (01-243)</td><td>WWH*</td><td>WWH+</td><td>1) Partial attainment (fair/good biology).
2) Adequate macrohabitat
3) No evidence of AMD
4) Low DO, including violation of WWH minimum criterion, and elevated ammonia-N.</td><td>1) unknown source, possibly failing septic systems, but no fecal coliform exceedences or violations; or agriculture spill or release?</td><td>AWS+
IWS+
PCR+</td></tr>
<tr><td colspan="5">Comments: Community not profoundly degraded. However, ammonia-N, and low DO suggest community performance below natural limiting factors. Possible PHWH

Planned AMD Abatement Projects: NA</td></tr>
</table>

Table F.3. Sunday Creek Waterbody Summary

Waterbody [Identification Number]	Aquatic Life Use		Indicators[1,2]	Leading Causes/Sources of Aquatic Life Impairment	Other Beneficial Uses
	Existing	Rec.			
West Br Trib. III at RM3.45 (01-248)	NA	WWH+	1) Non-attainment (M.good fish/very poor bugs) 2) No evidence of AMD in WQ data. 3) Adequate macrohabitat 4) Drains small wildlife area 5) DO, Ammonia-N, and nutrients near background. 6) Single fecal coliform exceedence (3000/100ml)	1) Interstitial or possible bonafide intermittent flow (natural).	AWS+ IWS+ PCR+ *PCR:* Despite interstitial flow and shallow depth (40cm), site is very accessible through a small active ford.
	Comments: Stream in a natural state, drains and courses through Wildlife Area. Perhaps community performance is reflective in innate potential. May go dry on an annual basis. Possible PHWH. **Planned AMD Abatement Projects:** NA				
Mud Fork (01-241)	WWH*	WWH+	1) Impairment limited to lower 0.2 miles. Remaining three miles full attainment. 2) Marginal habitat, at impaired site. 3) Low DO, including violations of average and minimum criteria, and fecal exceedences 4) No significant evidence of AMD.	1) Failing on-site septic systems. 2) Marginal habitat.	AWS+ IWS+ PCR+
	Comments: Numerous private residences adjacent to lower reach. Failing on-site septic systems likely source of impairment. Marginal habitat likely served to exacerbate modest pollutant load through reduced assimilative capacity. **Planned AMD Abatement Projects:** NA				
Mud Fork Trib. I at RM 2.87 (01-246)	NA	WWH+	FULL attainment		AWS+ IWS+ PCR+ *PCR:* Shallow depth, but numerous private residences adjacent to stream.
	Comments: none **Planned AMD Abatement Projects:** NA				

Table F.3. Sunday Creek Waterbody Summary

Waterbody [Identification Number]	Aquatic Life Use		Indicators[1,2]	Leading Causes/Sources of Aquatic Life Impairment	Other Beneficial Uses
	Existing	Rec.			
Mud Fork Trib. II at RM (01-245)	NA	WWH+	FULL attainment		AWS+ IWS+ PCR+ *PCR:* Despite shallow depth, private residences adjacent to stream.
	Comments: none **Planned AMD Abatement Projects:** NA				
Congress Run (01-230)	NA	WWH+	FULL attainment		AWS+ IWS+ PCR+
	Comments: none **Planned AMD Abatement Projects:** NA				
Sunday Creek Trib. III (01-206)	NA	WWH+	FULL attainment		AWS+ IWS+ PCR+
	Comments: none **Planned AMD Abatement Projects:** NA				
Greens Run (01-220)	WWH*	WWH+	1) Partial and non-attainment (poor to good biology, contradictory at upper site) 2) Nearly all AMD indicators at or near background, including pH (3) Low DO and elevated Ammonia-N. 4) Marginal habitat at upper site. 5) Fecal coliform exceedences	1) Failing septic home system(s) 2) Modest AMD 3) Marginal habitat	AWS+ IWS+ PCR+
	Comments: Very modest AMD. Other WQ issues responsible for failure to meet WWH. As such, WWH appeared appropriate. **Planned AMD Abatement Projects:** None				

Table F.3. Sunday Creek Waterbody Summary

Waterbody [Identification Number]	Aquatic Life Use		Indicators[1,2]	Leading Causes/Sources of Aquatic Life Impairment	Other Beneficial Uses
	Existing	Rec.			
Little Greens Run (01-222)	NA	WWH+	1) Full and partial attainment (fair/good biology) 2) No chemical evidence of AMD. All indicators at or near background. 3) Low DO and fecal coliform exceedences.	1) Marginal habitat 2) Failing home septic system(s)	AWS+ IWS+ PCR+ *PCR:* Despite shallow depth, numerous private residences adjacent to stream.
	Comments: Impairment derived from non-AMD sources. **Planned AMD Abatement Projects:** NA				
Oregon Ridge (Sunday Cr Trib. IV, at RM 6.71) (01-205)	NA	LRW+	1) Based upon LRW, full and non-attainment. 2) All AMD parameters elevated, including numerous WWH pH violation	1) Severe AMD (outlet for major seep). 2) Intermittent flow	AWS+ IWS+ SCR+ SCR: very small and shallow stream.
	Comments: Full attainment of LRW indicated upstream from seep. Performance reduced to very poor downstream. **Planned AMD Abatement Projects:** Too costly to remediate at this time.				
Jackson Run (01-204)	WWH*	WWH+	1) Partial attainment (Fair biology) 2) Adequate habitat 3) No WQ evidence of strong AMD, as all parameters were near background levels (including pH). 4) Nutrients, ammonia and demand parameters all normal 5) Low DO and fecal coliform exceedence	1) Failing septic systems 2) Intermittent flow (observation made while collecting macrobenthos, not form habitat assessment)	AWS+ IWS+ PCR+
	Comments: No evidence of AMD. Impacts appeared derived from non-mining sources. As such WWH appropriate. **Planned AMD Abatement Projects:** NA				

Table F.3. Sunday Creek Waterbody Summary

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<tr><th>Existing</th><th>Rec.</th></tr>
<tr><td rowspan="2">Big Bailey Run
(01-210)</td><td>WWH*</td><td>WWH+ and MWH+ (see below)</td><td>1) Very good to very poor biology (variation coincidental with sources of mine drainage.
2) Only selected AMD parameter elevated, ust from Big Bailey seep. Dst Big Bailey seep, strong evidence of AMD present, but pH did not plumate, ranged between (6.3-6.6).
3) Low DO dst Big Bailey seep. Likely associated with anoxic mine drainage or associate increased oxygen demand.</td><td>1) AMD modest to severe
2) Intermittent flow (upper site)</td><td>AWS+
IWS+
PCR+</td></tr>
<tr><td colspan="5">Comments: Site immediately downstream from Middle Bailey Run easily meet WWH (middle site). Lower site dst Big Bailey seep (one of the major sources in the Sunday Creek watershed) impaired. Upper site did not contain abundant evidence of AMD, but failed tp meet WWH. Impairment at upper station may be a result of small stream size and intermittent flow, as the reach may run dry on an annual basis. Upper site possible PHWH.

WWH+: Segment upstream from Big Bailey seep (headwater to RM 0.4)
MHW+ (mine affected): Downstream from Big Bailey seep (RM 0.4 to mouth)

Planned AMD Abatement Projects: Treatment wetland, ALD, and settling basin (primarily metals treatment/attenuation).</td></tr>
<tr><td rowspan="2">Middle Bailey Run
(01-213)</td><td>NA</td><td>WWH+</td><td>FULL attainment</td><td></td><td>AWS+
IWS+
PCR+</td></tr>
<tr><td colspan="5">Comment: none

Planned AMD Abatement: NA</td></tr>
<tr><td>Carr Bailey Run (North Branch)
(01-211)</td><td>NA</td><td>MWH+</td><td>1) Fair biology
2) Most AMD parameters at or below background (pH ranged between 6.37 and 7.43).
3) Low DO (4.66-6.93ppm)
4) Ammonia-N elevated.
5) Very poor habitat: artificial channel with mine-related sediment deposits up to 12' in depth, and intermittent flow. Stream largely courses through mine spoil.</td><td>1) Modest AMD load.
2) True Intermittent flow
3) Post surface mining landscape w/beavers
4) Poor habitat</td><td>AWS+
IWS+
SCR+

SCR: Very shallow and intermittent.</td></tr>
</table>

Table F.3. Sunday Creek Waterbody Summary

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<tr><th rowspan="2">Waterbody [Identification Number]</th><th colspan="2">Aquatic Life Use</th><th rowspan="2">Indicators[1,2]</th><th rowspan="2">Leading Causes/Sources of Aquatic Life Impairment</th><th rowspan="2">Other Beneficial Uses</th></tr>
<tr><th>Existing</th><th>Rec.</th></tr>
<tr><td></td><td colspan="5">Comments: see above

Planned AMD Abatement Projects: None</td></tr>
<tr><td rowspan="2">West Bailey Run
(01-214)</td><td>NA</td><td>WWH+</td><td>1) Fair biology
2) Nearly all AMD parameters at or below background.
3) pH ranged between 6.48 and 7.43
4) Very low DO (2.72-3.7ppm)
5)Adequate habitat</td><td>1) Low gradient wetland/beaver influence (natural)
or
Post surface mining landscape with beavers.
2) Possible losing stream.
3) Modest AMD load.</td><td>AWS+
IWS+
SCR:

SCR: Very shallow and interstitial flow</td></tr>
<tr><td colspan="5">Comments: Evidence of non-mining impacts. As such WWH appeared appropriate. Impairments likely associated with natural phenomenon (interstitial flow and beaver).

Planned AMD Abatement Projects: None</td></tr>
</table>

1- Including but not limited to, iron, aluminum, manganese, sulfate, TDS, specific conductance, alkalinity (low), and pH.
2 - Attainment based upon existing (retained) or recommended aquatic life use.
3 - Acid Mine Drainage (AMD).
PHWH: Primary Headwater Habitat