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Development of a GIS Geodatabase as a Tool for Analyzing Spatial Relationships in the Species Distributions of West Virginia Fishes

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DEVELOPMENT OF A GIS GEODATABASE AS A TOOL FOR ANALYZING SPATIAL RELATIONSHIPS IN THE SPECIES DISTRIBUTIONS OF WEST VIRGINIA FISHES

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by

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ABSTRACT

Development of a GIS Geodatabase as a Tool for Analyzing Spatial Relationships in the Species Distributions of West Virginia Fishes

By Nathan D. Bowe

One of the most complete references to date of fish species distribution in West Virginia is a 1995 book entitled "The Fishes of West Virginia" (Stauffer, et al.). In this project, geographic information systems (GIS) and relational database technology have been utilized to adapt that reference into a system where spatially arranged collection site features are related to distribution data through a series of common fields among tables in a geodatabase. The geodatabase is stored in an MDB-formatted database management system (DBMS) which is readable by Microsoft Access and useful in its own right as a means to query distribution data when there is no need for a mapping environment. A search form was built-in to assist in the most common search parameters, and results display in print-formatted reports. Much of the same search potential is achieved by loading the geodatabase into the GIS package ArcGIS®. In addition to traditional query power, the geodatabase houses the shapefile data layers used in mapping and spatial analysis. This system has been applied in a preliminary assessment to examine distribution data versus land use for four small streams under study by Marshall University.

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CHAPTER I - Introduction

Background

Ongoing studies assessing diversity of West Virginia fisheries are dependent on advancements in distribution data management. New technologies such as GIS and global positioning system (GPS) enable researchers to collect various data at higher precision and accuracy. Increasing accuracy of GIS spatial data sets such as land cover and elevation, coupled with better collection data, facilitates the combination of all data into a system where the highest number of statistical operations can be made. A system of this type allows researchers to relate spatial distributions of fish species that were difficult or impossible to process beforehand.

In this work, a geodatabase was developed as the initial step in the development of a comprehensive data system for West Virginia fishes. It was previously possible to store relational data in a standard relational database, but the associated GIS data was always file-based (McCain 2003). An "open GIS" movement was spawned shortly after the arrival of the first all-relational models. New models became capable of storing both spatial and attribute data in a relational database when standards organizations such as the Open GIS Consortium (OGC), the International Organization for Standardization, and the U.S. Federal Geographic Data Committee began promoting the idea of data sharing through spatial data standards ("Spatial Data Standards…" 2003). Environmental Systems Research Institute (ESRI) actively participated in these developments, and so the geodatabase structure was born. The geodatabase developed here houses tabular species distribution data along with spatial data layers of collection sites, rivers, streams and lakes for the southern part of West Virginia. Discussed in this paper are the reasoning and methodology behind the system's creation, how to navigate the geodatabase in Microsoft Access and ESRI's ArcGIS for data retrieval, directions for adding new collection data, and a basic example of the system's use.

GIS Capabilities

The desktop mapping systems on the market today range from display-only systems such as electronic atlases to full-featured GIS applications. The dividing lines between one type of system and the next are not sharply defined. The systems do differ in a number of important ways: how they link geographic locations with information about those locations, the accuracy with which they specify geographic locations, the level of analysis they perform, and the way they present information as graphic drawings. Electronic atlases, for instance, allow you to display pictures of geographic areas on your computer screen. They provide limited information about the geographic areas, and limited ability to alter graphics. Without any tools for analyzing the information, these systems are most useful for providing graphics that can be used in presentations and reports.

Desktop GIS has the ability to analyze geographic location and the information linked to those locations. It is dynamic; maps can be created that are not limited to a single moment in time, information can be linked to a map, and data can be visualized and analyzed in new ways, revealing previously hidden relationships, patterns and trends. GIS supports formulation of a conceptual site model and evaluation of projected present and future use scenarios. Many valuable analysis and visualization algorithms are available as standard tools (Dunn & Klausmeier 2002).

Study Area

This project focuses on distribution data from the southern section of West Virginia, which has been defined for this purpose as the portion of the state south of (and including) the Little Kanawha, Elk and Greenbrier river drainages (Appendix A).

Big Sandy River/Tug Fork

Tug Fork arises in southern West Virginia and flows west to the Big Sandy River, which comprises a section of the West Virginia state boundary. The 196-km stretch is commonly considered as one stream. The Big Sandy River/Tug Fork drains approximately 11,092 km^2 of the Appalachian Plateau Physiographic Province (Stauffer et al. 1995).

Elk River

The Elk River, a major tributary of the Kanawha River, arises in Pocahontas County and flows 290 km to its confluence with the Kanawha River near Charleston, West Virginia. In the Elk River basin is a 600-ha impoundment, Sutton Lake. The Elk River drains approximately 3,968 km^2 of the unglaciated portion of the Appalachian Plateau Physiographic Province (Stauffer et al. 1995).

Gauley River

The Gauley River, a major tributary of the New River, originates on Gauley Mountain in northwest Pocahontas County and flows 171 km to its confluence with the New River at Gauley Bridge, West Virginia. Gauley River drains about 3,682 km^2 and its basin contains an 1100-ha impoundment, Summersville Lake (Stauffer et al. 1995).

Greenbrier River

The Greenbrier River, a major tributary of the New River, arises in Pocahontas County and drains approximately 4,289 km^2. It flows south for 233 km, where it converges with the New River near Hinton, West Virginia (Stauffer et al. 1995).

Guyandotte River

The Guyandotte River arises in southwest Raleigh County and flows 268 km to its confluence with the Ohio River near Huntington, West Virginia. It drains about 4,348 km^2 of the Appalachian Plateau Physiographic Province. The Guyandotte River is characterized by narrow valley floors, and its basin holds R. D. Bailey Lake, a 255-ha impoundment (Stauffer et al. 1995).

James River

The James River drainage is represented by two small stream systems in West Virginia. Potts Creek originates at the confluence of the North and South Forks of Potts Creek and drains a total area of 143.7 km^2. Cove Creek arises in Monroe County near Wiley Church and drains a total of 32.1 km^2. All of the West Virginia tributaries of the James River are characterized by steep gradients, ranging from 17.3 m/km in Cove Creek to 41.6 m/km in the North Fork of Potts Creek (Stauffer et al. 1995).

Kanawha River

The Kanawha River begins at the confluence of the Gauley and New Rivers just upstream of Kanawha Falls. It flows 149 km to the Ohio River, draining 10,052 km^2 downstream of Kanawha Falls. The Kanawha River supports large commercial barge traffic and is controlled by three U.S. Army Corps of Engineers lock and dam facilities (Stauffer et al. 1995).

Little Kanawha River

The Little Kanawha River arises in Upshur County in north-central West Virginia and flows 270 km to its confluence with the Ohio River near Parkersburg, West Virginia. In the basin is a 392-ha impoundment, Burnsville Lake. The basin drains a total of 5,729 km^2 of the Appalachian Plateau Physiographic Province; it is characterized by steep hills and narrow valleys in the upstream areas and broad valleys near its confluence with the Ohio River (Stauffer et al. 1995).

New River

The New River arises in North Carolina, flows north through Virginia, and meanders approximately 140 km through West Virginia, where it joins with the Gauley River to form the Kanawha River. The New River drains 17,918 km^2. In West Virginia, the river has been designated a Wild and Scenic River and the basin is completely in the Appalachian Plateau Physiographic Province. Of particular interest is the New River Gorge, which begins at Sandstone Falls below Hinton, West Virginia. The gorge contains a series of waterfalls and rapids, admired by rafting and kayaking enthusiasts.

The Bluestone River, a major tributary of the New River, arises in Virginia and extends into Mercer and Summers counties in West Virginia. It drains a total of 969 km^2, and contains in its basin an 830-ha impoundment, Bluestone Lake (Stauffer et al. 1995).

Ohio River

Most of West Virginia, comprising approximately 75% of the total area of the state, is drained by the Ohio River. The Ohio River drains approximately 528,127 km^2, 47,182 km^2 of which are in West Virginia. The main channel of the Ohio River begins at the confluence of the Monongahela and Allegheny Rivers at Pittsburgh, Pennsylvania. It flows 981 km to its confluence with the Mississippi River in Illinois. A 443.2-km stretch of the main channel forms the western border of West Virginia. This portion of the river contains seven lock and dam facilities, operated the U.S. Army Corps of Engineers.

The Ohio River basin drains the Appalachian Plateau Physiographic Province, and is characterized by steep valleys and narrow flood plains. Raw materials found in the drainage include limestone, sandstone, sand, gravel, brine, petroleum, natural gas and coal. Two major impoundments, East Lynn Lake and Beech Fork Lake, are in the Twelvepole Creek watershed and occupy a total of 700 ha (Stauffer et al. 1995).

Problem Statement

The immediate need for this work stems from a research project at Marshall University wherein fish movement/migration is compared to natural stream structure and roadway culverts. The goal of the project is to determine the negative effects (if any) of particular culvert designs on the movement of fishes. New collections are being taken periodically, but researchers need to know what species have been collected on certain streams in the past. The best source for these data is "The Fishes of West Virginia" (Stauffer, et al. 1995), but it is very time-consuming to analyze distribution from paper maps in a book. Thus, this system, that adapts data from the book into digital format, has been developed. It also provides a structure that will be useful for appending and analyzing collection records in the future.

CHAPTER II – Base Map Methodology

Collection of Data Layers

Most GIS data for this project were gathered from the West Virginia GIS Data Center (http://wvgis.wvu.edu). Sets from this source (Appendix D) include major water features (major rivers and lakes), watershed boundaries, West Virginia county boundaries, cities from the Geographic Names Information System (GNIS), mining permit polygons, underground mining limit polygons, valley fill polygons, and the National Land Cover Dataset (NLCD). Detailed river and stream data layers were collected from ESRI's "Data & Maps" 2002 and 2003 CDROM series (Appendix D). Additional layers that were used for quality control purposes (and not incorporated into the project) include DOQQs and digitized topographic maps stored by Marshall University.

Data Layer Manipulation

Some data sets required for this project were not prearranged in a suitable format; consequently, they were reformed to an appropriate level of detail. Often, a set must be manipulated in one fashion or another. A shapefile may hold more detail than is required and warrants merging or dissolving features together. Two data sets may collectively represent a feature better than either set does on its own; one set may gain better accuracy when edited with another, more accurate set (McCoy & Johnston 2002). In any case, decisions must be made on how to maneuver inside, around and among various sets of spatial data. This section summarizes the decisions made concerning the data used in this project.

Rivers and Streams

Although the 2003 ESRI data set is comprised of many more feature parts per feature (which makes analysis more difficult by presenting a more complex picture than required), the overall alignments are more accurate than those of the 2002 ESRI set. In cases that were problematic due to large missing segments (from 2002 set) such as Little Coal River and Pocatalico River, the improvement is substantial. However, the 2002 data set—derived from TIGER/Line files—provides more accurate and complete stream naming. Therefore, spatial alignments were corrected to the 2003 set as well as DOQQ imagery, and the names were checked against the 2002 set and digitized topographic maps as necessary.

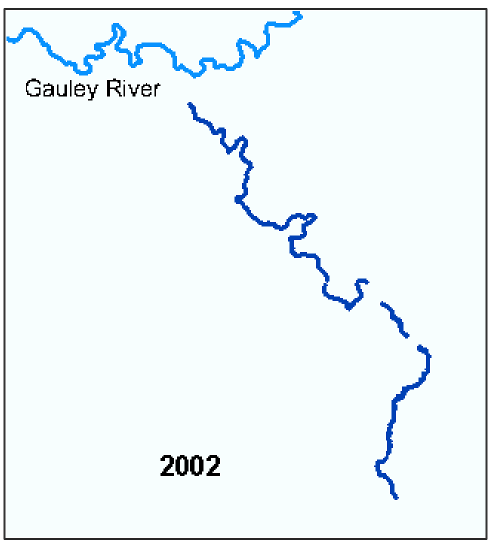


Figure 1: Meadow River segments from ESRI Data & Maps 2002.

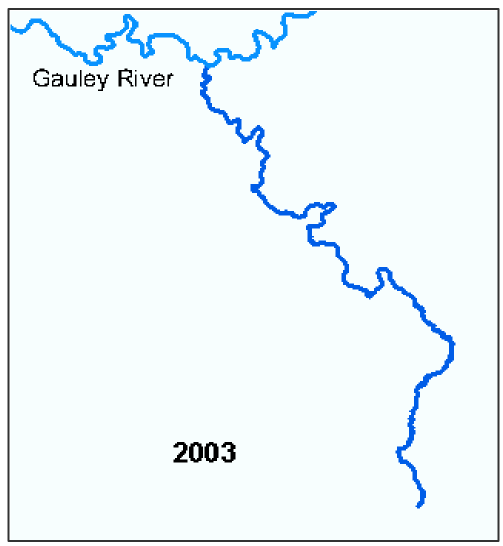


Figure 2: Meadow River segments from ESRI Data & Maps 2003.

For example: Meadow River (Figures 1 and 2), a tributary of Gauley River, had no named records in the 2003 set. The 2002 set had named records (so the general location was known) but the alignment was badly segmented; also, the alignment nearest the Gauley was totally missing. To solve this issue, both 2002 and 2003 sets were displayed together as layers in ArcMap. Using "Select by Attributes", all segments with "Meadow River" in field "Name" were selected in the 2002 set. Upon zooming to the selected region, it was obvious where the missing segments should align based on the improved spatial accuracy of the 2003 set. All segments representing Meadow River in the 2003 set (although unnamed) were selected and exported, and included in the Gauley River set. Segments of Meadow River were merged to one with the Editor Toolbar, and proper naming was added to the attribute table.

For those alignments that were already isolated based on the 2002 set (before the 2003 set became available), a variation of the aforementioned process for Meadow River was performed, where the spatial accuracy was checked against the 2003 set. For tributaries not completed as of receiving the 2003 set, alignments were isolated directly from that set and then naming was verified based on the 2002 set and topographic maps.

The variation of alignment updating is as follows:

Where streams isolated from the 2002 set were accurate except for some missing segments, a union operation was performed to add those missing segments from the 2003 set. Then, a merge operation joined all segments to one record and the naming was added. Extraneous fields in the attribute table, some of which were no longer accurate after the editing process, were deleted.

Where streams isolated from the 2002 data set were inaccurate in some places (i.e. segments branch off instead of maintaining only one alignment), all segments were imported from the 2003 data set using the paper maps (Stauffer et al. 1995) and the 2002 data set as templates only. Then, those segments were merged and names obtained from the 2002 set. Extraneous fields in the attribute table, some of which were no longer accurate, were deleted as a proactive approach to database quality control (McCain 2003).

Watersheds

Sub-watersheds found in the original watershed shapefile (Appendix D) were merged together with the Editor Toolbar into the twelve main watersheds in the project (Appendix A). The "FNAME" field in the watershed attribute table, which assigns each sub-watershed to its parent watershed, was used to select all feature parts for an individual watershed. The Editor Toolbar's "Merge" command combined the parts into one polygon, and extraneous fields were deleted because of tabular inaccuracies due to the merge operation.

Conversion to Raster

The large, numbered collection site map (Stauffer et al. 1995) was scanned to the Tiff raster format. Because the map was black-and-white, the resultant was a raster with two pixel values, 0 and 1. By setting the pixel value representing white to a null color, the image could be overlaid as black text, points and lines on any GIS layer. However, the image was not in a geographic coordinate space until it was loaded and georeferenced (McCoy & Johnston 2002) to at least 20 control points in UTM Zone 17 North – mostly unique state boundary geography such as points and angles, but also stream intersections from finished tributary shapefiles. The Georeferencing Toolbar in

ArcMap was used for this process. A shapefile of the West Virginia outline (Appendix D) was used as the template spatial alignment:

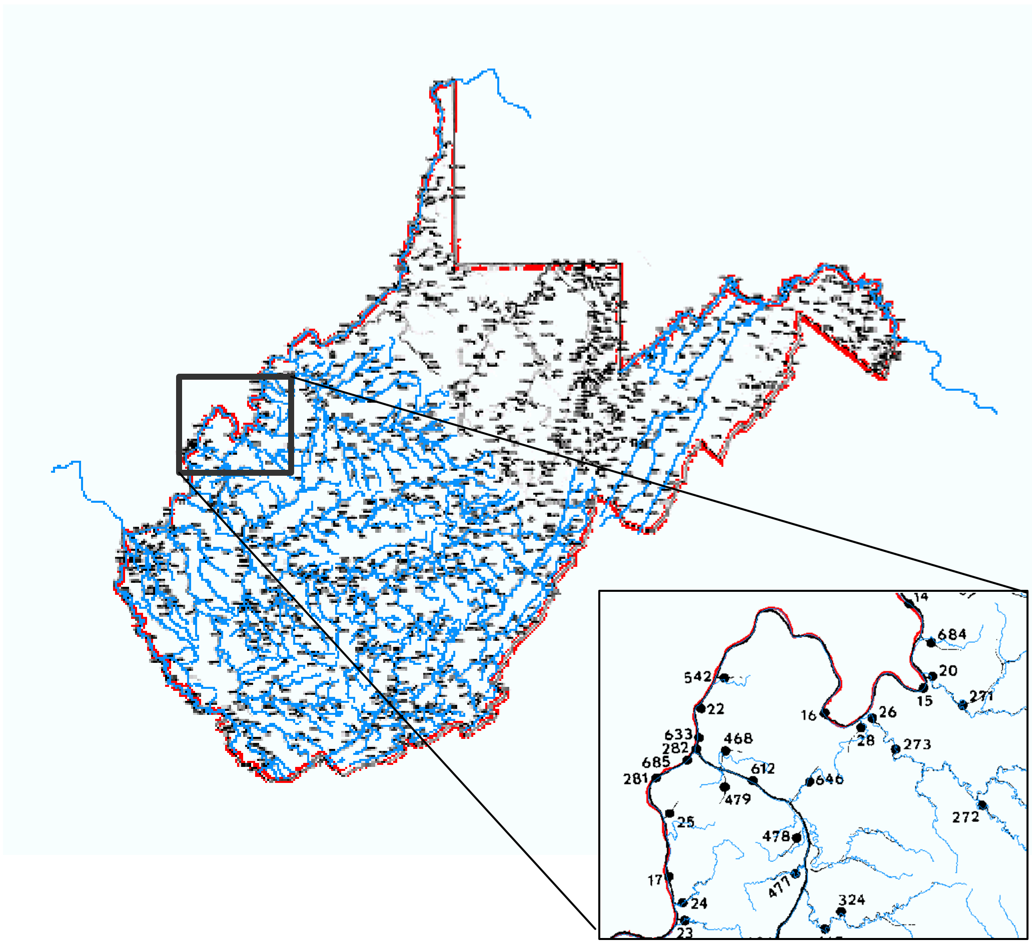


Figure 3: Raster collection site map georeferenced to digital layers.

To georeference a raster dataset from image space to a real-world coordinate system, the location of recognizable features in both coordinate spaces must be known. These locations are used to create control points. The control points are used to build a polynomial transformation that will warp the image from one coordinate space to another.

Control points are locations that can be accurately identified on the raster dataset and in real-world coordinates. These identifiable locations may be road and stream intersections, building corners, bridges, the mouth of a stream, rock outcrops, and identifiable points on geometric landscape features such as the end of a jetty of land.

For each control point selected on the input raster dataset, the output location may be specified either by graphically selecting a point that is already in the desired output coordinate system (as in this project) or by typing in the known output coordinates. The relationship between the control points chosen in the raster dataset and the output coordinate space is then determined.

Using this relationship and a polynomial transformation, the raster dataset is converted from nonreal-world space to real-world space. A polynomial transformation computed using the specified control points is applied so the input locations approximate the specified output using a least-fit. This polynomial transformation yields two formulas, one for computing the output x-coordinate for an input (x, y) location and one for computing the y-coordinate for an input (x, y) location. The goal of the least-fit is to derive a general formula that can be applied to all points, usually at the expense of slight movement of the to-positions of the control points. The more control points of equal quality used, the more accurately the polynomial can convert the input data to output coordinates.

The cells of a raster dataset will always be square and of equal area with respect to the Cartesian coordinate system (map coordinate space) associated with the raster dataset. The shape and area a cell represents on the surface of the earth will never be constant across a raster dataset. Since the area represented (on the face of the earth) by the cells will vary across the raster dataset, the output cell size and the number of rows and columns may change when projected.

Converting from one projection to another can also change the shape and area a cell represents on the surface of the earth. Each projection treats the relationship between a three-dimensional world and a two-dimensional one differently.

When displaying and performing analysis with raster datasets, they should be in the same coordinate space and in the same projection. If two raster datasets are in different coordinate systems, the values of the coordinates are on different scales. Errors will occur when comparing such datasets because they will represent different locations.

Upon inspecting the raster dataset sample points in comparison to the watershed and tributary data, a new method of quality control was noted. The scanned data points and alignments matched well enough with the isolated watershed tributaries that they were used in a reactive approach to further correct alignments previously chosen by eye from the source map prior to scan.

Collection Sites as a GIS Layer (Vectorization)

In many cases, an automatic vectorization operation can be performed to create vectors from a source raster backdrop. However, the raster image of the collection sites consisted of additional text (site numbers) and lines (drawn streams) that would have contributed to a sloppy vectorization. For this reason it had been decided to vectorize the point sites by hand.

ArcCatalog is an application within ArcGIS Desktop that helps to organize and manage all GIS data; this includes the construction of new files in various GIS data formats, such as shapefiles, geodatabases, tables and layers. A new point shapefile was created in ArcCatalog and assigned the UTM Zone 17 North spatial reference. The shapefile was loaded in ArcMap and an editing session was started with it as the target. Before adding the new sample points to the shapefile, "snapping" was set to the stream layers. By doing so, it was ensured that new sites would gravitate toward streams when added—another method of quality control. The point site shapefile was also set to be the only selectable layer for the editing process.

The collection points were added with the pencil tool from the Editor Toolbar. Site numbers and descriptive fields (see "Sites Table", page 16) were added to the attribute table for the shapefile and filled as the procedure progressed. Numerous checks were made during the creation of the new data, and errors are expected to be unlikely due to the number of times each point was examined.

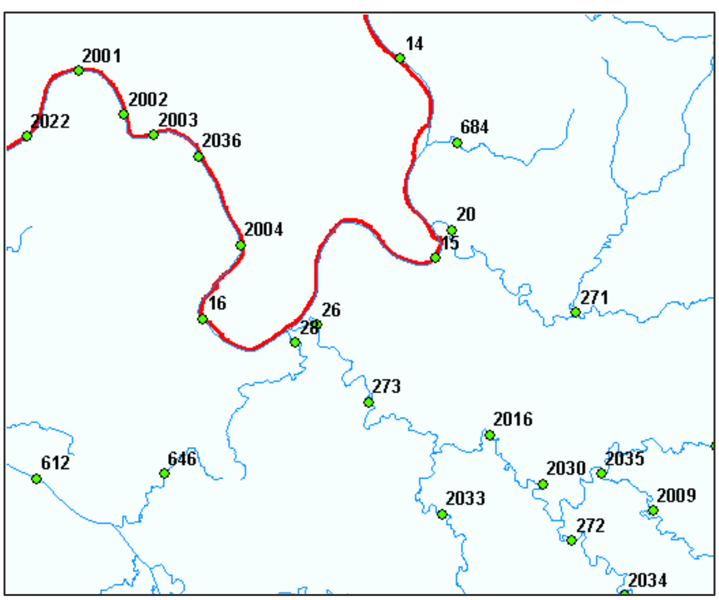


Figure 4: Closeup of vector point collection sites.

CHAPTER III – Geodatabase Methodology

Data Entry and Table Design

The data are contained entirely in three tables: Fishes, Sites, and Collections, related by common fields. Microsoft Excel was used for data entry in the Fishes and Collections tables, and they were subsequently saved in the dBase IV file format (*.dbf). Sites data were entered in the attribute table of the collection sites shapefile, which is automatically saved into a separate dBase file by ArcMap. The following section outlines the design of and data types contained in each table:

Fishes Table

The Fishes table contains indexed taxonomic and common names of fish species known to exist within the state of West Virginia as listed (Stauffer et al.). Fields include:

FishID – Indexed identification number assigned to each discrete fish species. It is formatted as F001, F002, F003, and so on. There is no repetition of records in this field and it is used as the primary key of the table.

Family – Taxonomic family name of fish, as a text string. This field may have duplicates.

Genus – Taxonomic genus name of fish, as a text string. This field may have duplicates.

Species – Taxonomic species name of fish, as a text string. This field does not have duplicates. Subspecies and hybrids are formatted as '[Sp]. [SUBSPECIES]' and '[SPECIES] x [SPECIES]', respectively.

Common – Common name of fish species, as a text string. This field does not have duplicates.

Sites Table

The Sites table originated as the attribute table for the collection sites shapefile. Descriptions of fields in this table are as follows:

SiteID – Indexed identification number assigned to each discrete collection site, as a number. It is formatted to match the site numbers taken from the foldout map (Stauffer et al.). There are cases where sites found on individual species maps are absent from the large foldout map. Those sites were assigned identification numbers starting at 2000, 2001, 2002, and so on. They were designated in order of when they were discovered. There are other cases in which a species is presumed to be in a region, or 'zone' of the state. These instances have been described on a case-by-case basis, and assigned identification numbers starting at 3000, 3001, and so on. This field has no duplicates, and is used as the primary key of the table.

Location – Description of the unique physical location of the collection site, as a text string. This field contains no duplicates. When the location is described using its position relative to a stream or city, it is always referring to a stream or city that exists in the data sets (Appendix D) used in this project. Identifiers such as 'above' or 'below' typically signify a location that is within one mile above or below a feature. ‘Near’ implies that the closest municipality to the collection site is not streamside.

County – List of the county name in which collection site is located, as a text string. The field may contain duplicates, and in some cases holds more than one county name (e.g., sometimes the sample site lies on a county boundary.)

Drainage – Name of the major drainage (Appendix A) in which the collection site exists, as a text string. The field may contain duplicates.

NearestRiv (Nearest River) – This field holds the name of the larger stream one to three levels downstream of the collection site, as a text string. The motivation for the creation of this field was to boost query capability by narrowing the scope within a major watershed. Querying this field for “Mud River”, for example, will return records from all immediate tributaries of the Mud River. Whenever the collection was made in the channel of one of the larger rivers (i.e. any stream named as a ‘river’), this field will contain the name of that river. Because of this, users will have all sites within Mud River returned in addition to all its tributaries. The field will not contain the name of the next larger stream in these cases because the major rivers are large enough that the returned list of sites will often exceed those sites sought by users. This field may contain duplicates.

StreamName – Name of the stream where the collection took place, as a text string. This field may have duplicates.

Collections Table

The Collections table contains records relating collection sites per fish species. Primary references for this data were the individual species maps (Stauffer et al. 1995). It is the vital link that relates each fish species to its corresponding collection sites throughout southern West Virginia.

FishID – Individual fish species identification number, related to the field of the same name in the Fishes table.

SiteID – Individual collection site identification number, related to the field of the same name in the Sites table.

Comments – Description of the fish collection. Most sites are described as ‘point sites’, which mean that the SiteID number refers an actual point that exists in the species maps (Stauffer et al.). Other descriptive terms include zonal identifiers such as ‘statewide’ or ‘New River drainage only’.

Creating the Geodatabase

In contrast to file-based formats (such as shapefiles, which store feature and attribute information in separate files) the geodatabase has the ability to store several types of information in an off-the-shelf database management system (DBMS) ("Working with the Geodatabase…" 2002). All crucial files for the project were eventually bundled into this geodatabase system, thereby condensing the project into one file available to different operations. For this project, the geodatabase is stored in MBD, the format native to Microsoft Access. It is technically referred to as a personal geodatabase by ArcGIS, a delineation that does not require the purchase of additional software programs to access or manage it ("Working with the Geodatabase…" 2002). However, it is sometimes desirable to gather specific tabular data without the need for a map interface. To accommodate this need, particular additions have been designed inside MS Access as described in the next section of this document. A new personal geodatabase was produced in ArcCatalog by right-clicking in the "Contents" window, and the pertinent data were imported in the same fashion: collection site, river, lake and tributary shapefiles, along with the Fishes and Collections dBase tables.

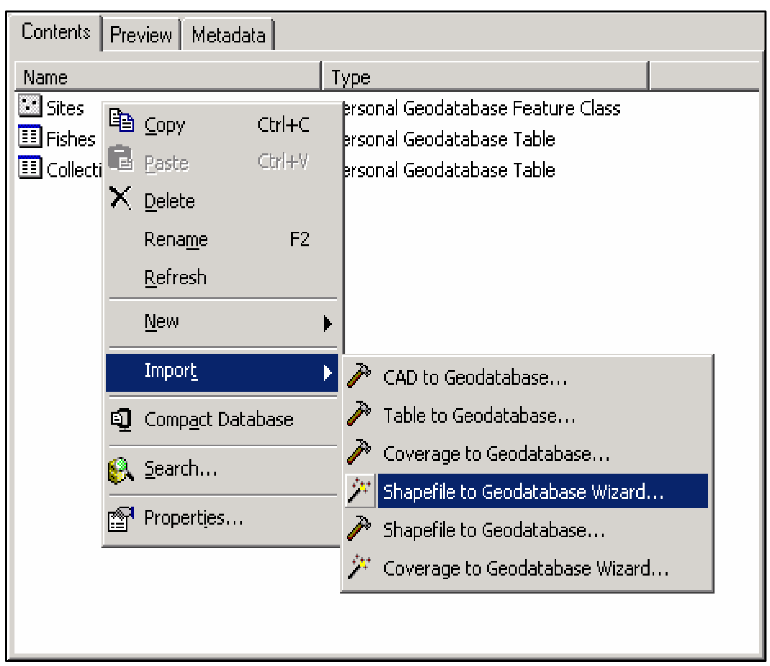


Figure 5: ArcCatalog import dataset selection.

Incorporation to a Traditional Relational Database

The geodatabase (since it is an MDB file) can be directly opened by Access and modified within the application without affecting its interaction with ArcGIS ("Working with the Geodatabase…" 2002), as long as tables automatically created by ArcGIS are not manipulated or deleted. Most of the ArcGIS table names begin with "GDB_".

Description of Relationships

The record relationships (cardinality) between tables describe how individual record values relate to each other. Fishes and Collections have a one-to-many cardinality, which means that individual records from Fishes may be repeated for many related records in Collections. Collections and Sites are many-to-one, meaning that many records from Collections may reference a singular related record in Sites. Cardinality, while not as important inside the Access environment for this work, was vital in determining which table associations should be performed later in ArcGIS.

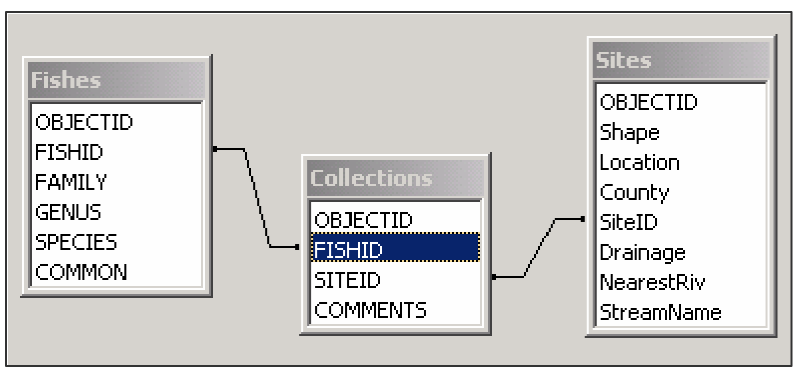


Figure 6: Relationships among tables as seen in Access.

Database Add-ons

Search Form

Each text box in the search form is loaded with values from a select query – the "Nearest River" dropdown contains all unique values from the field of the same name from the Site table. The "Genus/Species" dropdown displays each unique FishID, Genus, Species and Common record. When the user selects a record from either of the dropdowns, it provides the criteria for a parameter query. Clicking on the "GO" button for either type of search activates the event procedure that displays a report based on the selected criteria. For example, selecting "Cherry River" from "Nearest River" will display a report containing information for every collection site on the Cherry River and its tributaries. Selecting "F112" from "Genus/Species" will return a report outlining information about every site where yellow bullheads were collected. The search form displays immediately when the geodatabase is opened in Access.

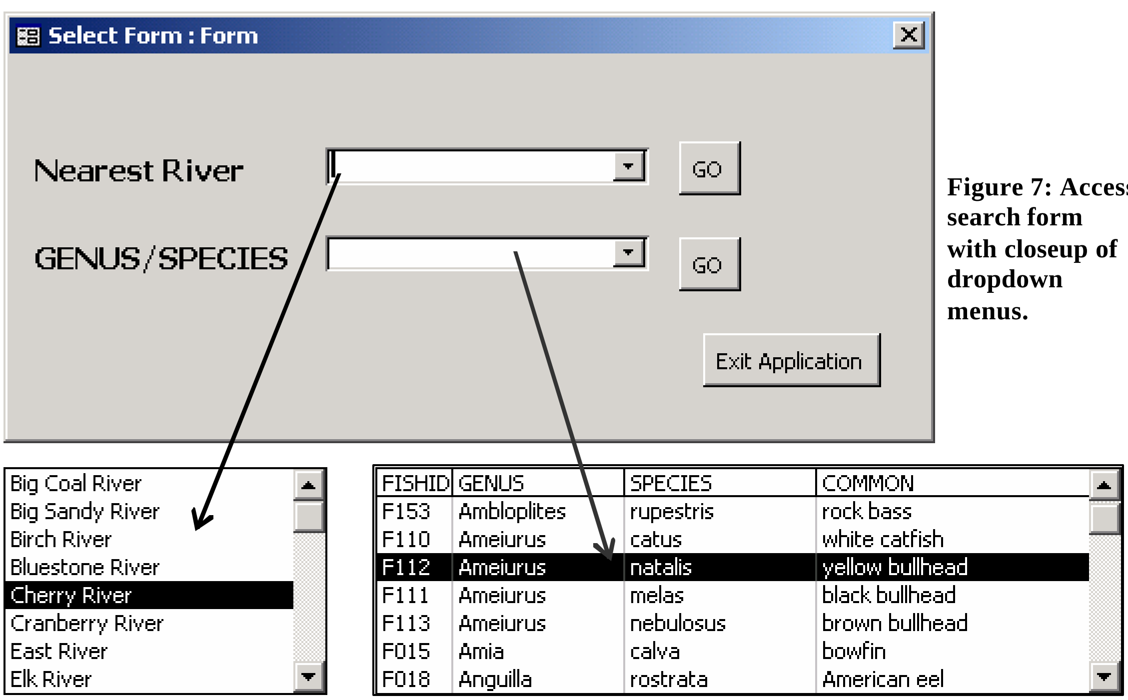


Figure 7: Access search form with closeup of dropdown menus.

Reports

MS Access reports are loaded with data borne from the results of parameter queries and activated (displayed) by the search form. Each is formatted for standard printing.

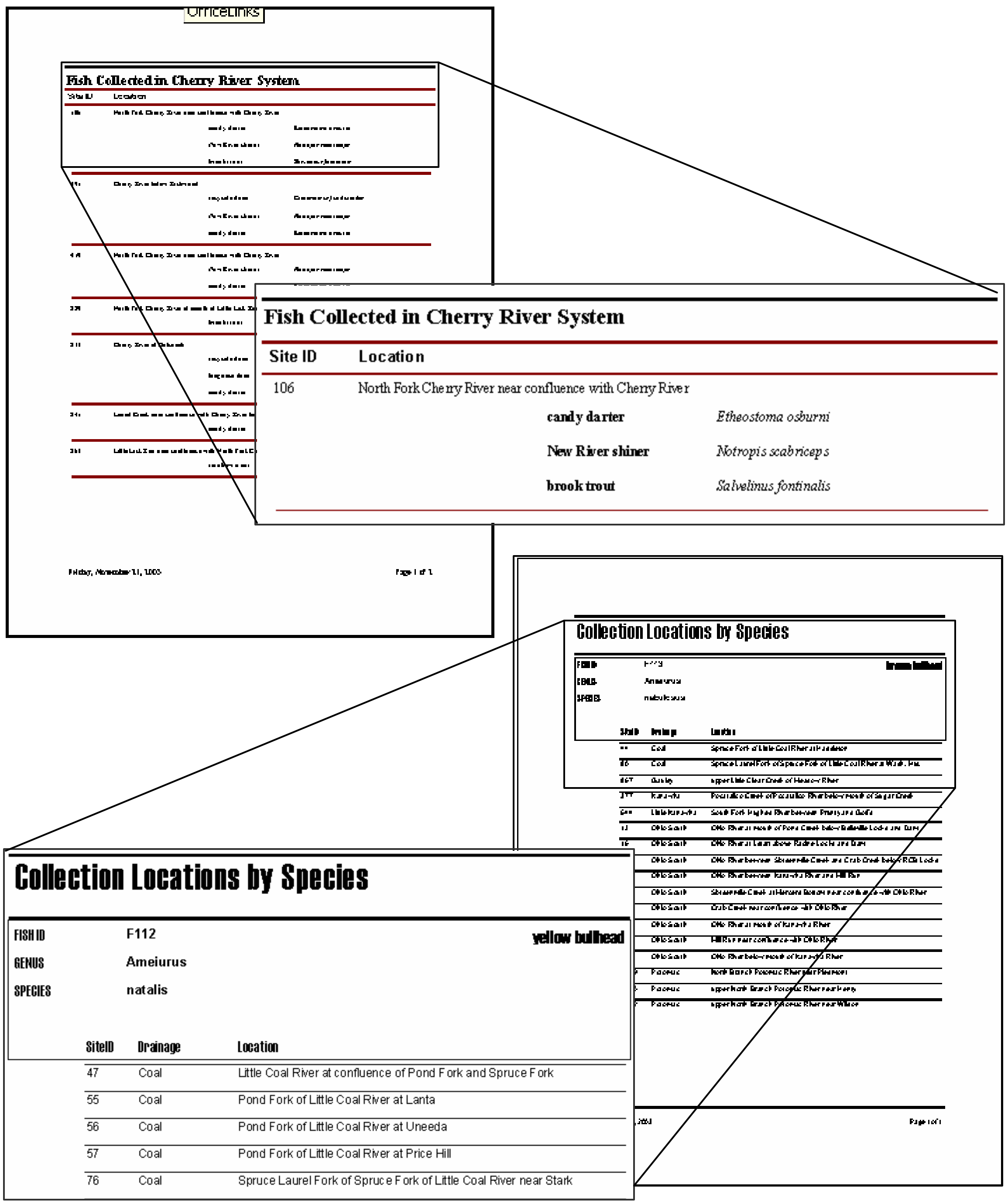


Figure 8: Results from search form displayed in Access reports.

CHAPTER IV – Geodatabase/GIS Interaction

ArcGIS Geodatabase Methodology

Much of the same search parameters used in Access can be applied in ArcMap. However, there are some differences in procedure for the GIS end of this project that must be addressed beforehand. Most notably, relationships between tables must be forged differently in each software package. Data retrieval in ArcMap also requires an adequate GIS background, whereas users with no experience can simply choose criteria from the search form in Access.

Joins and Relates

ArcMap provides two methods to associate data stored in tables with geographic features: joins and relates. When two tables are joined, you append the attributes from one onto the other based on a field common to both tables. When you relate tables, a relationship is defined between the two tables – also based on a common field – but the attributes of one is not appended to the other. Instead, the related data can be accessed when necessary. Joins are designed for tables with one-to-one or one-to-many cardinality. For other cardinalities such as many-to-one or many-to-many, using a join will omit all records after the first match for each primary key value – a relate must be made instead.

In ArcGIS, similar relationships to those in Access must be prepared between ‘Fishes’ and ‘Collections’ as well as ‘Sites’ and ‘Collections’. The procedure described here is slightly more complicated than in Access, and the more expensive licenses of ArcGIS, because the basic version of ArcGIS (ArcView 8.2) was used for the operation. More information about this choice can be found in chapter six (page 37).

Procedure

The relationships described herein must be reestablished each time the geodatabase is loaded into a new map. Repetition of this process can be avoided by saving the map document with the geodatabase loaded into the data frame or by saving a layer file for the sites shapefile included in the geodatabase (after the relationships have been made). Fishes and Collections have a one-to-many cardinality, while Collections and Sites have a many-to-one relationship. Thus, Fishes can be *joined* to Collections and the resulting temporary table "Collections_Fishes" *related* to Sites. (Joins must always be performed before relates.) The most basic method, however, employs *relates* for both relationships. The latter choice will be discussed here, because a scenario of data retrieval exists that would benefit (species by site). To set up the relationships:

(1) Open ArcMap and add the following files from the geodatabase – Sites, Collections, and Fishes. Make sure the table of contents is set to "source" (otherwise, the Collections and Fishes tables will not be visible).

(2) Right-click on Collections and choose "Joins and Relates >> Relate…" This brings up the relate dialog box. Fill in the dialog box to match Figure 9 and click OK (name of relate does not matter). Data from Fishes is related to Collections via the FishID field.

(3) To continue this relationship to the site data, right-click on Sites and choose "Joins and Relates >> Relate…" This brings up the relate dialog box again.

(4) Fill in the relate dialog box as shown in Figure 10 and click OK. Data from Collections (and consequently from Fishes) is related to Sites via the SiteID field. (Once again, the name of relate does not matter.) Data retrieval is enabled.

Note: After this process is completed, it would be a good idea to save a map document or layer file as explained in the introduction to this section.

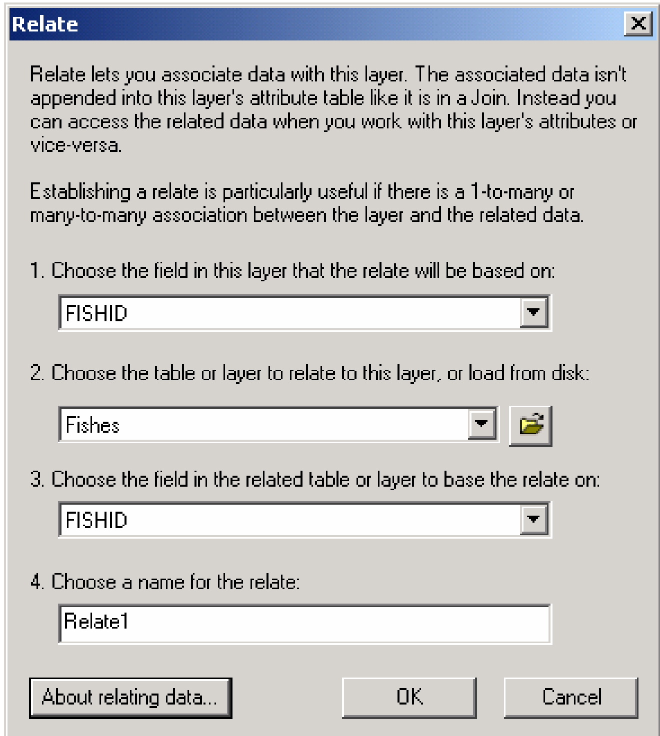


Figure 9: Relating Fishes to Collections in ArcMap.

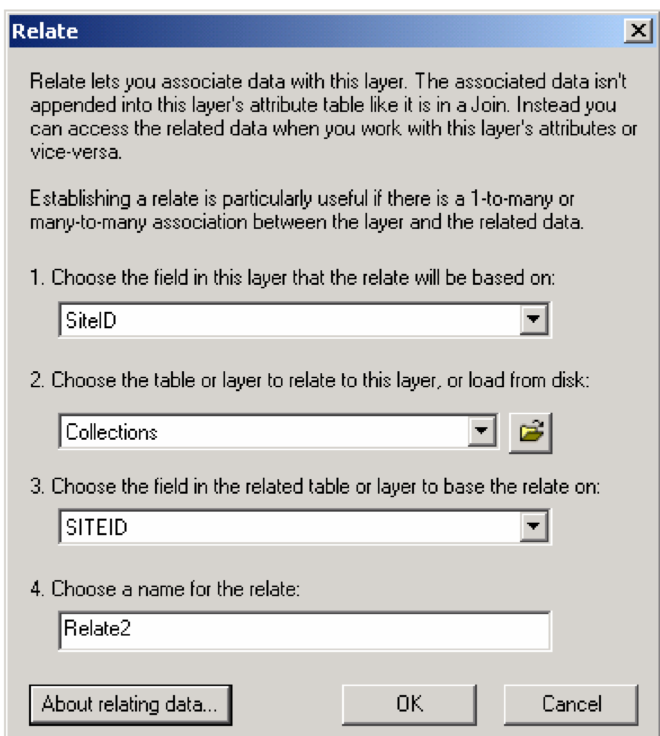


Figure 10: Relating Collections to Sites in ArcMap.

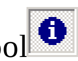
Retrieval of Records

This section is a step-by-step user guide for isolating specific site or collection records from the geodatabase in the ArcMap 8.x environment:

<u>Species by Site</u>

Scenario: The site location is known, and the user wishes to list all species collected.

Option 1, the single site point-and-click "Identify" method:

1) With the geodatabase loaded in ArcMap, choose the Identify tool . This changes the cursor to an Identify pointer. Click on the site point. This opens the Identify Results window, which displays attributes of the site.

2) Navigate through the left side of the results window to reveal collection records.

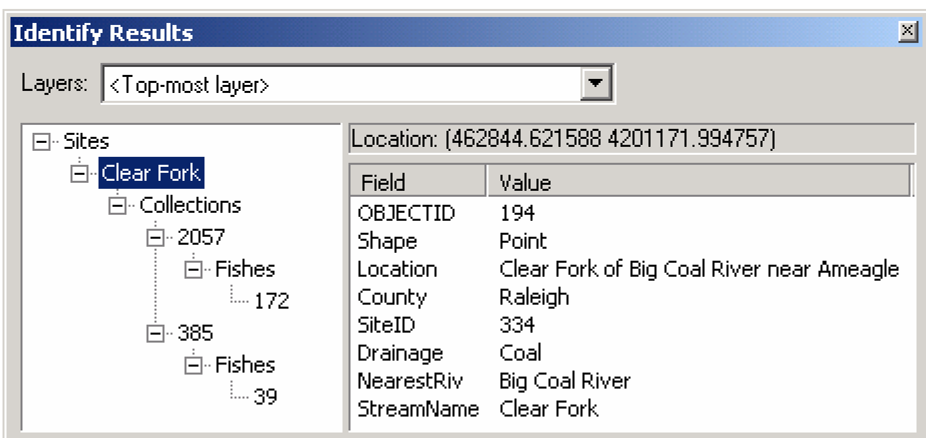


Figure 11: Identify results window.

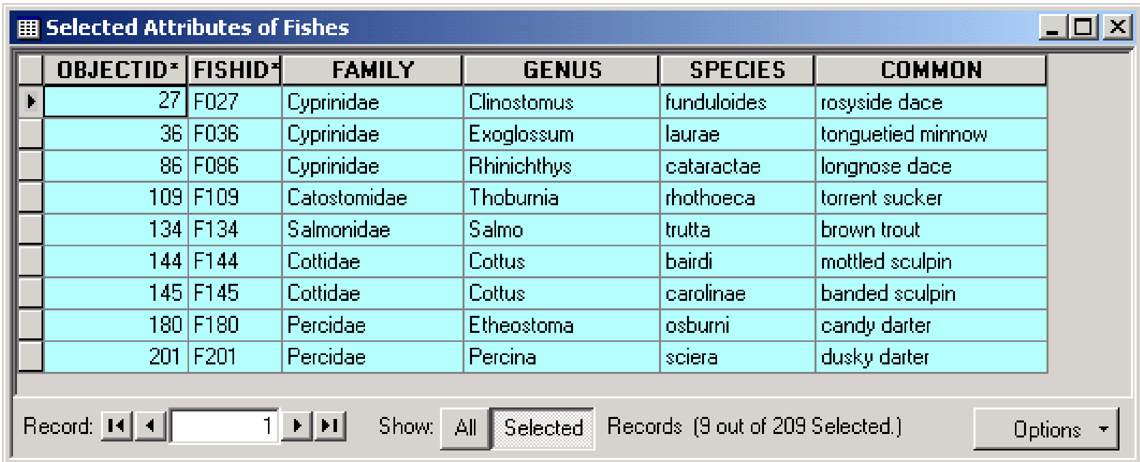
Option 2, selecting one or more sites through the Sites attribute table:

1) Open the Sites attribute table. Select the site (or sites) in question, either by hand or "Options >> Select by Attributes". Selected records are blue by default.

2) In the Sites attribute table, navigate to "Options >> Related Tables >> Collections". This opens Collections and automatically selects all records related to the chosen sites.

3) In the Collections attribute table, navigate to “Options >> Related Tables >> Fishes”. This opens Fishes and selects all species collected at the chosen sites.

4) Click on “Show: Selected” to show only the species collected (Figure 12).



OBJECTID*	FISHID*	FAMILY	GENUS	SPECIES	COMMON
27	F027	Cyprinidae	Clinostomus	funduloides	rosyside dace
36	F036	Cyprinidae	Exoglossum	laurae	tonguetied minnow
86	F086	Cyprinidae	Rhinichthys	cataractae	longnose dace
109	F109	Catostomidae	Thoburnia	rhothoeca	torrent sucker
134	F134	Salmonidae	Salmo	trutta	brown trout
144	F144	Cottidae	Cottus	bairdi	mottled sculpin
145	F145	Cottidae	Cottus	carolinae	banded sculpin
180	F180	Percidae	Etheostoma	osburni	candy darter
201	F201	Percidae	Percina	sciera	dusky darter

Figure 12: Selected attributes of Fishes.

5) To export the results as a dBase table or text file, navigate to “Options >> Export”, choose file name, and save. (Make sure to choose to export “selected records” unless the entire species list is desired.)

<u>All Sites of Specific Species</u>

Whereas a potential user can choose a site(s) and find all species collected there, it is also possible to choose a species (or multiple) and find all its collection sites. The process is similar to “Species by Site” option 2, with the only difference being that the user begins by selecting records from Fishes instead of from Sites. After selecting the desired (single or multiple) species in Fishes, navigate through “Options >> Related Tables >> Collections”. Then, in Collections, proceed to “Options >> Related Tables >> Sites”. The sites that satisfy the user’s query will automatically highlight both on the map and in the Sites attribute table.

Combinational Queries

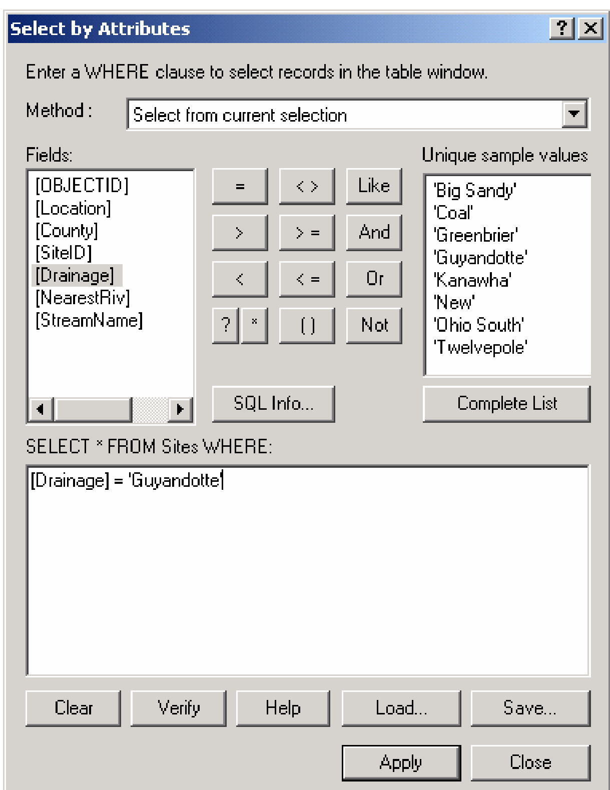
As in a RDMS such as Access, data can be segregated by more than one field in more than one related table. The same process takes multiple steps in ArcMap using the geodatabase system developed here.

Scenario: How many collection sites in the Guyandotte drainage held rainbow darters?

1) Select the record for rainbow darter in the attribute table of Fishes either by choosing it from the list or "Options >> Select by Attributes"

2) Navigate through "Options >> Related Tables" (as in "All Sites of Specific Species") until the rainbow darter collection sites are highlighted.

3) In the Sites attribute table, navigate to "Options >> Select by Attributes". Ensure that Method = "Select from current selection" and formulate the expression, [Drainage] = 'Guyandotte' (Figure 13). Rainbow darter collection sites within the Guyandotte river system are highlighted.



Note: This is one example of a combinational query. Permutations of this procedure will allow the user to filter data in other ways, providing that queries originate in the attribute tables of either Sites or Fishes. The collections table is a "bridge" between the two, and only useful for querying if either the SiteID or FishID is known.

Figure 13: Select by Attributes dialog window.

Tabular Export

Any tabular records can be exported as a text file or dBase table. Also, selected records (blue) can be exported independently of the dataset as a whole. With the desired table open in ArcMap, navigate to "Options >> Export…" Choose either the selected records or all records and the preferred path/filename for the export file (Figure 14). Click OK to finish the procedure.

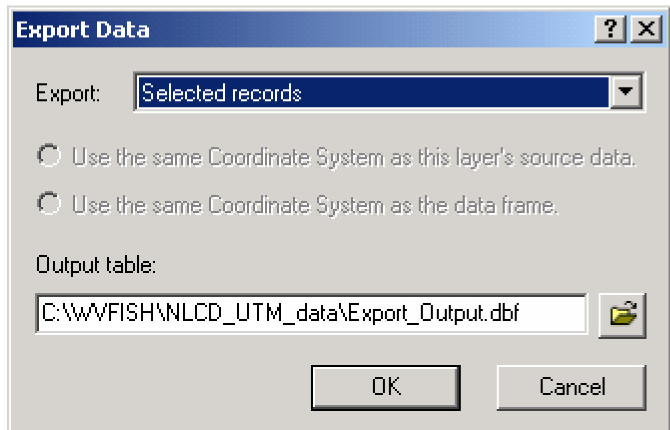


Figure 14: Export tabular data dialog window.

Appending the Collection Data

One of the advantages of the geodatabase structure is that geometry is stored as a tabular attribute (Joselyn 2002) in the MDB – a feature that allows for the manipulation of the database in either Access or ArcMap. Still, a potential user must account for the type of data that will be appended. New collections at old sites can be added in Access or ArcMap, with no mapping required. New collection sites, however, must include the spatial characteristics of the points which the user cannot edit in Access. Therefore, new collection site vectors must be added in ArcMap first. Then, tabular data can be appended in either Access or ArcMap.

Scenario: After revisiting sites already in the geodatabase, new collection records are ready to be added.

Before adding new records, use the Fishes table to find the FishID of those collected and the Sites table to find the SiteID of the corresponding collection sites.

Option 1, in Access:

1) After geodatabase is loaded and the search form pops up, navigate to "Window >> Unhide…" on the main menu bar. Choose to unhide the database window.

2) Double-click on Collections in the "Tables" section to open it.

3) Scroll to the bottom and enter each FishID/SiteID pair, as well as any comments.

4) Save and exit.

Option 2, in ArcMap:

1) Load only the Collections table from the geodatabase.

2) If the Editor Toolbar is not visible, navigate to "View >> Toolbars >> Editor" to open it (Figure 15).

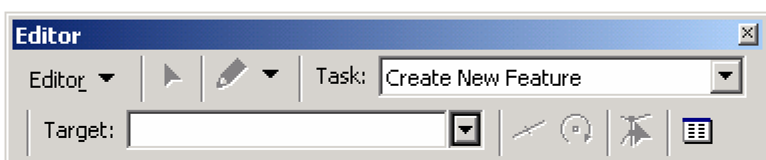


Figure 15: Editor Toolbar.

3) Click "Editor >> Start Editing". The "Target" should be blank as in Figure 15.

4) Open Collections and scroll to the bottom. There will be a blank row where new records can be added. Enter the FishID/SiteID pairs.

5) When finished, select "Editor >> Stop Editing" and click "Yes" when asked to save edits.

Scenario: New collections are taken at new sites.

In ArcMap:

1) Load the Sites and all water shapefiles and open the Editor Toolbar.

2) Choose "Editor >> Start Editing" and make sure the target is set to Sites.

3) Navigate to "Editor >> Snapping…" and set snapping to the edge of major river and tributaries (Figure 16).

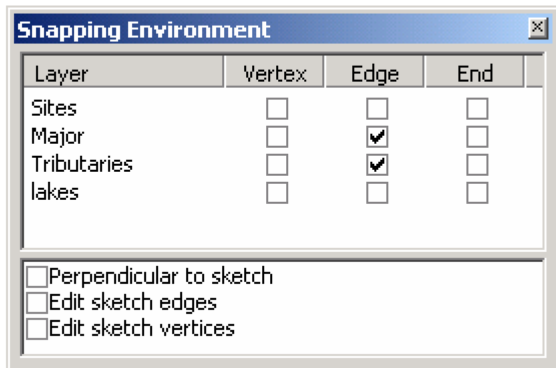


Figure 16: Snapping Environment window.

4) Choose the "Create New Feature" tool  and add new sites. By changing "View >> Data Frame Properties >> General >> Units >> Display" to decimal degrees or degrees minutes seconds, the real-time coordinates of the pointer will be displayed at the bottom of the screen as it is scrolled across the data frame.

5) For each site, add descriptive data (especially SiteID) into Site's attribute table.

6) When finished adding sites, go to "Editor >> Stop Editing" and choose "Yes" when asked to save edits.

7) To associate new collections of species to the new sites, update Collections using either of the two methods described in the previous scenario (page 30).

CHAPTER V – Distribution and Land Use

Overview

Four small streams were chosen by researchers at Marshall University for a study of the effects of highway development – culverts, in particular – on the migration of fishes. Each stream was selected because of the predominant land use (from land covers "agricultural", "developed", or "mining") of its area:

1) Agricultural
   - Whites Creek of Big Sandy River (3 collection sites)
2) Developed (urban/suburban)
   - Hurricane Creek of Kanawha River (1 site)
3) Coal Mining
   - Huff Creek of Guyandotte River (1 site)
   - Pinnacle Creek of Guyandotte River (2 sites)

To test whether each stream is truly representative of its intended land use, the geodatabase developed in this project was applied to (1) query the list of fish species collected in each stream through Access, (2) highlight all sites throughout southern West Virginia where each species was collected, and (3) compare the results with spatial data layers, chiefly the NLCD (Appendix D). See Appendix C for images used in the analysis described in this chapter. It should be noted that especially common species (distributions described as "statewide") were not included in the investigation. The NLCD is a satellite sensor-derived 30-meter ground resolution raster image (Appendix D). Pixel values were assigned to a class system (Appendix D) using unsupervised classification by the U.S.

Geological Survey (USGS), thereby enlisting computers to detect pixel value ranges representing homogeneous features. The system was designed to function primarily by the interpretation of remote sensor data, without collecting data *in situ* (Jensen 1996). SQL commands through Raster Calculator (McCoy & Johnston 2002) were used to create three tiff rasters, isolating the pixel value range representing each of the three land covers in question. These rasters were converted to 1000-meter cell size vector features with Spatial Analyst, which generalized the land cover locations (McCoy & Johnston 2002). A new polygon shapefile was prepared in ArcCatalog, and polygons were created that encompass each predominant land cover (most prevalent of the three land covers).

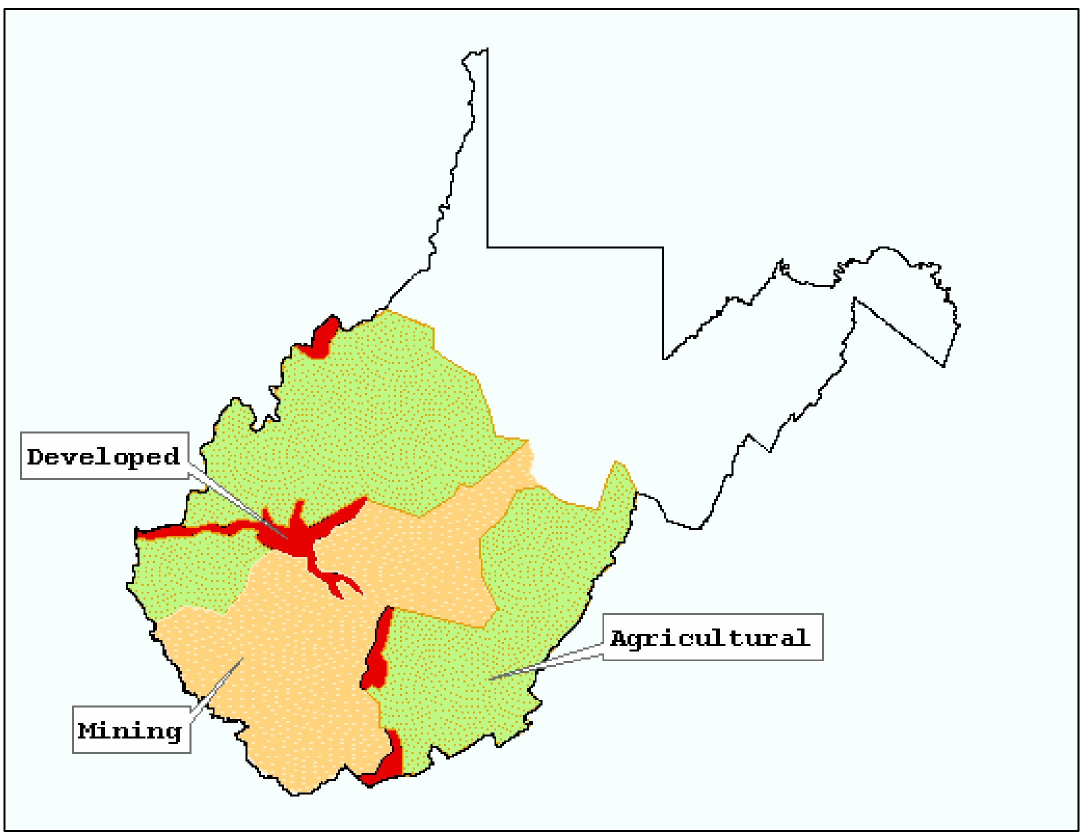


Figure 17: Generalized land cover of West Virginia.

Low spatial accuracy of the original site map and georeferencing inaccuracies due to the digital conversion process enables this broad generalization. Future collections appended to the geodatabase should be analyzed using datasets of higher resolution.

<u>Agricultural</u>

Three collection sites on Whites Creek yielded the following species: *Etheostoma caeruleum* (rainbow darter), *Labidesthes sicculus* (brook silverside), *Lampetra aepyptera* (least brook lamprey), and *Lythrurus umbratilus* (redfin shiner).

As Figure 17 illustrates, there are two large zones of agricultural land cover on either side of the mining zone. All species with exception of *E. caeruleum* were found to exist is streams with predominantly agricultural land cover. *L. umbratilus* collections were taken 95% of 38 times in the agricultural zones on the west side of the state. *L. sicculus* and *L. aepyptera* were collected in agricultural zones 84% and 86%, respectively. All but two sites are on the western side of the mining zone. The one exception to this pattern, *E. caeruleum*, seems to be correlated (60% of 147 sites) with areas of mine activity in the state. This is not reason for surprise, however, for Whites Creek flows on the outskirts of mining areas. In fact, there is possible mining activity near the mouth of Whites Creek, according to the NLCD and mining permit records. Also, 35% of *E. caeruleum* collections were in agricultural areas.

It is suggested by these results that Whites Creek is an acceptable choice to represent a stream draining primarily agricultural land. However, this study also proposes that Whites Creek be used in characterizing the western agricultural land of West Virginia and that a stream in perhaps the Greenbrier watershed would be more informative in characterizing the eastern side of the state.

Developed

One collection site on Hurricane Creek yielded a single species, *Percopsis omiscomaycus* (trout-perch). Of 76 sites where this fish was collected, 20% are in one of the outlined zones of development (urban/suburban). The other 80% lies on western agricultural land. Approximately the lower half of Hurricane Creek meanders through sporadic farmland. Based on the limited number of non-"statewide" fish records on this stream, it is difficult to accept or reject Hurricane Creek as representatively "developed". It can be inferred from the NLCD, however, that it flows through a more transitional land cover than the other streams in the study. A stream closer to the Charleston area may show to have a more uniformly urban/suburban watershed.

Mined

One collection site on Huff Creek yielded a single species, *Etheostoma caeruleum* (rainbow darter). Two sites on Pinnacle Creek yielded three species: *Clinostomus funduloides* (rosyside dace), *Etheostoma caeruleum* (rainbow darter), and *Etheostoma variatum* (variegate darter).

Both streams drain to the Guyandotte River and have similar dense spatial patterns of mining activity based on the NLCD and shapefiles of mining permits. They are approximately forty miles apart, Pinnacle Creek above Huff Creek. As stated in the "Agricultural" section, *E. caeruleum* collections were made in mining areas for 60% of

147 sites. Of 111 *E. variatum* collections, 46% were from the mining zone; most taken outside the zone were found in the Little Kanawha system (32% of total). *C. funduloides* collections were in the generalized mining area 23% of 26 times and in eastern agricultural use for 77%. Due to the combination of land cover and relative fish distribution, this study suggests that Huff and Pinnacle creeks are suitable for representing mining-impacted streams.

Chapter VI – Conclusions

This project has been designed as a straightforward solution for querying and analyzing fish distribution records. A potential user with modest GIS background should be able to obtain any requested information from the system with little difficulty. In this respect, the project is a success. As with any software-related endeavor, however, one can always depend on the need for updating and upgrading the system. Software versions change over time and ultimately become obsolete; users tend to prefer more and more simplified graphical user interfaces (GUIs). Prospective development of the geodatabase is suggested to include new collection records, as well as data sets related to West Virginia stream health. Efforts must be made to incorporate temporal (time/date of collection) and locational (map coordinate) characteristics of new records into the geodatabase so that full GIS analysis capability can be realized.

Software Limitations

New versions of ArcGIS (8.x) can be accessed using three software products, all sharing common architecture and each providing a higher level of functionality. So, while data manipulated with any of the three can be viewed with any of the three, certain editing procedures are only allowed in the higher-end products. ArcView provides comprehensive mapping and analysis tools along with simple editing and geoprocessing tools. It is the most basic (and least expensive) of the three products. This project was designed with simplicity and the widest availability to users in mind, and therefore employed ArcView for the process. The decision to do so left ample room to expand the project using one of the two remaining products.

ArcEditor includes the full functionality of ArcView, with the addition of advanced editing capabilities for coverages and geodatabases. It encompasses the potential for the greatest leap in the system's capability. ArcInfo extends the functionality of both to include advanced geoprocessing and applications from what was previously distributed as the ArcInfo Workstation.

An example of system limitation encountered by employing ArcView rather than ArcEditor or ArcInfo is the "relationship class". Relationship classes store associations between objects in a geodatabase that can include spatial objects (features in feature classes), nonspatial objects (rows in a table), or spatial and nonspatial objects. They can be viewed in ArcView, but created and edited only in either of the more expensive products. As a result, this system makes use of the join/relate structure.

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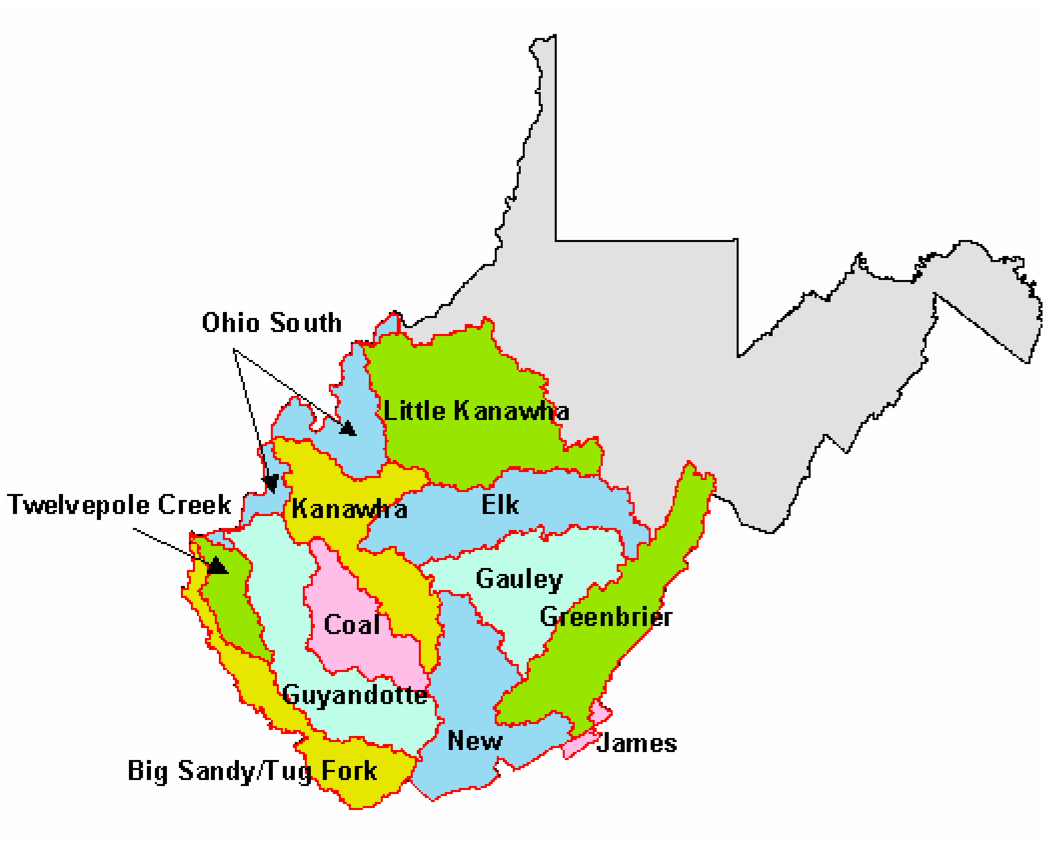
Software Inventory

NAME	VERSION	VENDOR	WEBSITE	TYPE
Access	XP	Microsoft	www.microsoft.com	DBMS
Acrobat	4.0	Adobe	www.adobe.com	TXT
ArcGIS®	8.2	ESRI	www.esri.com	GIS
SnagIt	6.20	TechSmith	www.snagit.com	IMG
WinZip	8.1	WinZip Computing	www.winzip.com	ZIP
Word	XP	Microsoft	www.microsoft.com	TXT

Geodatabase: WVFishGeo.mdb (3.81 MB)

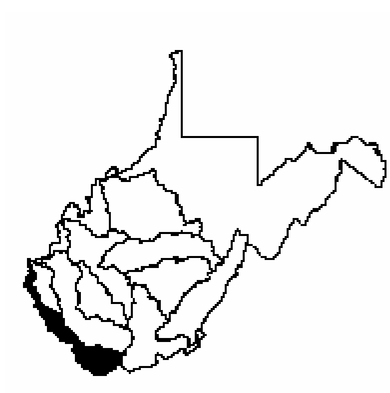
Appendix A – Southern West Virginia Watersheds

Southern West Virginia, for the purpose of this document, is defined as the portion of the state south of and including the Little Kanawha, Elk and Greenbrier River drainages:



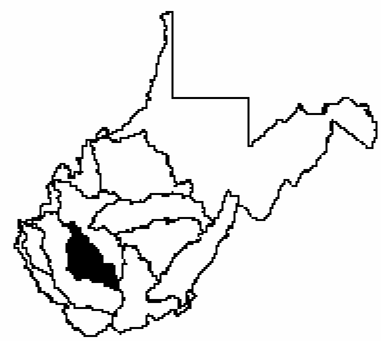
Big Sandy River and Tug Fork – includes tributaries:

- Beech Creek
- Big Creek
- Dry Fork
- Elkhorn Creek
- Jacobs Fork
- Laurel Fork
- Mill Creek
- Panther Creek
- Pigeon Creek
- War Creek
- Whites Creek



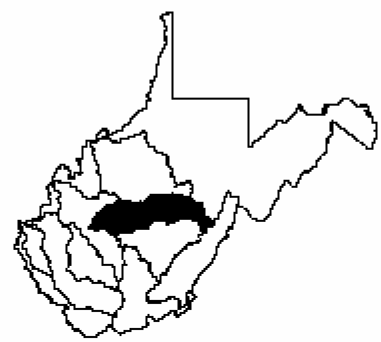
Coal River – includes Big Coal and Little Coal Rivers and tributaries:

- Camp Creek
- Clear Fork
- Hewett Creek
- Hopkins Fork
- Joes Creek
- Laurel Creek
- Marsh Fork
- Pond Fork
- Sandlick Creek
- Spruce Fork
- Spruce Laurel Fork
- Turtle Creek
- West Fork Pond Fork
- White Oak Creek



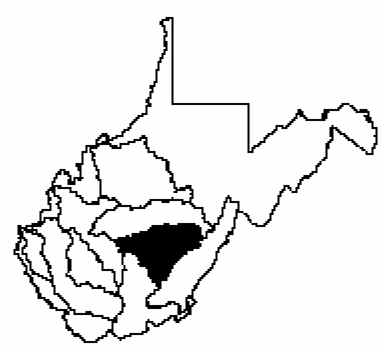
Elk River – includes Birch and Holly Rivers, Sutton Lake, and tributaries:

- Back Fork Elk River
- Big Otter Creek
- Big Sandy Creek
- Big Spring Fork
- Blue Creek
- Buffalo Creek
- Falling Rock Creek
- Laurel Creek
- Left Hand Run
- Little Sandy Creek
- Strange Creek



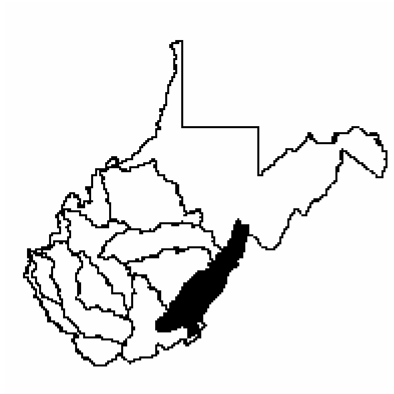
Gauley River – includes Cherry, Cranberry, Meadow and Williams Rivers, Summersville Lake, and tributaries:

- Bells Creek
- Big Beaver Creek
- Big Clear Creek
- Big Creek
- Big Ditch Run
- Boggs Creek
- Brushy Meadow Creek
- Collison Creek
- Deer Creek
- Dogwood Creek



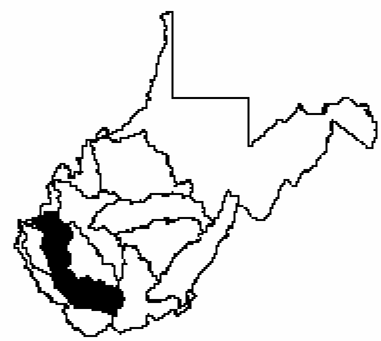
- Grassy Creek
- Hominy Creek
- Little Clear Creek
- Little Sewell Creek
- Muddlety Creek
- Panther Creek
- Patterson Creek
- Peters Creek
- Sewell Creek
- South Fork Big Clear Creek
- Twentymile Creek

<u>Greenbrier River</u> – including Little River and tributaries:



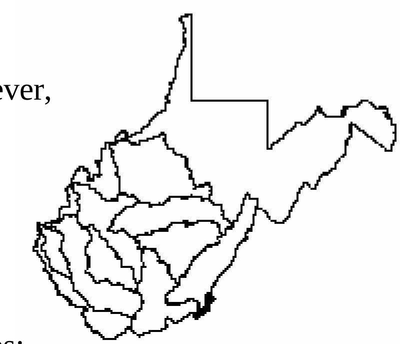
- Abes Run
- Anthony Creek
- Cochran Creek
- Deer Creek
- Douthat Creek
- Dry Creek
- Galford Run
- Harts Run
- Howard Creek
- Kitchen Creek
- Knapp Creek
- Laurel Creek
- Little Creek
- Mill Creek
- Muddy Creek
- North Fork
- North Fork Anthony Creek
- Robbins Run
- Second Creek
- Shellington Creek
- Shock Run
- Sinking Creek
- Spring Creek
- Stony Creek
- Sulphur Lick Run
- Thorny Creek
- Wolf Creek

Guyandotte River – including Mud River, R.D. Bailey Lake, and tributaries:



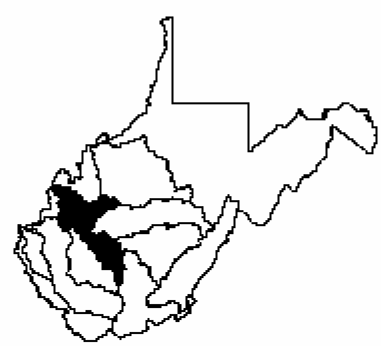
- Barkers Creek
- Big Creek
- Big Harts Creek
- Big Ugly Creek
- Buffalo Creek
- Clear Fork
- Devils Fork
- Elk Creek
- Garrett Fork
- Gooney Otter Creek
- Huff Creek
- Indian Creek
- Island Creek
- Laurel Fork
- Little Huff Creek
- Pinnacle Creek
- Slab Fork
- Tommy Creek
- Trace Fork
- Winding Gulf

James River – does not flow within West Virginia. However, some tributaries of the James exist in Monroe County:



- Cove Creek
- Dunlap Creek
- Potts Creek

Kanawha River – includes Pocatalico River and tributaries:

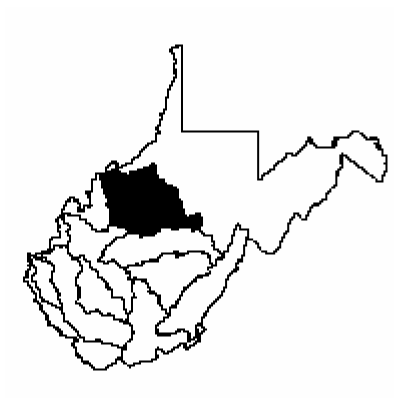


- Cabin Creek
- Campbells Creek
- Cherry Fork
- Davis Creek
- Eightmile Creek
- Five and Twenty Mile Creek
- Hughes Creek
- Hurricane Creek
- Kellys Creek
- Lens Creek
- Loop Creek
- Mudlick Fork

- Paint Creek
- Pond Branch
- Poplar Fork
- Sixteenmile Creek
- Tenmile Creek
- Thirteenmile Creek
- Threemile Creek
- Twomile Creek
- Witcher Creek

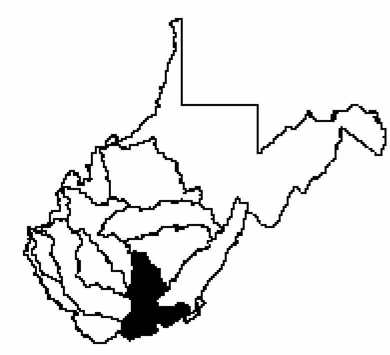
Little Kanawha River – including Hughes River, Burnsville Lake, and tributaries:

- Beech Fork
- Cedar Creek
- Copen Run
- Cove Creek
- Fink Creek
- Henry Fork
- Indian Fork
- Leading Creek
- Left Fork Reedy Creek
- Left Fork Spring Creek
- Left Fork Steer Creek
- Left Fork West Fork Little Kanawha River
- Little Bear Fork
- Middle Fork Reedy Creek
- Millstone Creek
- Oil Creek
- Reedy Creek
- Right Fork Little Kanawha River
- Right Fork Steer Creek
- Saltlick Creek
- Sand Fork
- Sinking Creek
- Spring Creek
- Steer Creek
- Stillwell Creek
- Tanner Creek
- Tygart Creek
- Walker Creek
- West Fork Little Kanawha River
- Worthington Creek



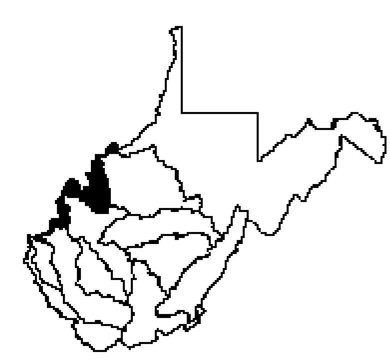
<u>New River</u> – including East, Bluestone and Little Bluestone Rivers, Bluestone Lake, and tributaries:

- Adair Run
- Arbuckle Creek
- Beaver Creek
- Brush Creek
- Camp Creek
- Dropping Lick Creek
- Cry Creek
- Dunloup Creek
- Glade Creek
- Hans Creek
- Indian Creek
- Laurel Branch
- Laurel Creek
- Lick Creek
- Little Beaver Creek
- Manns Creek
- Meadow Creek
- Mill Creek
- Mountain Creek
- Piney Creek
- Pipestem Creek
- Rich Creek
- Rock Camp Creek
- Rockbottom Creek
- Toms Run
- Turkey Creek
- Wolf Creek



<u>Ohio River South</u> – including tributaries:

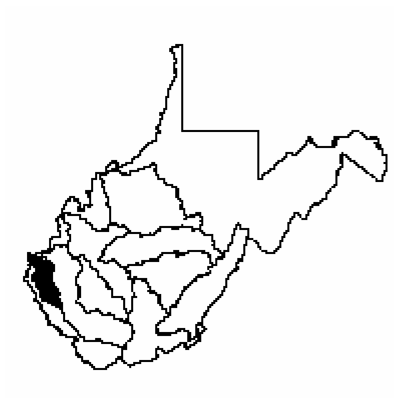
- Crab Creek
- Eighteenmile Creek
- Elk Fork
- Guyan Creek
- Lee Creek
- Left Fork Sandy Creek
- Little Mill Creek
- Little Sandy Creek
- Middle Fork Lee Creek
- Mill Creek
- Mill Run
- Nesselroad Run



- North Fork Lee Creek
- Parchment Creek
- Pond Creek
- Right Fork Sandy Creek
- Sandy Creek
- Sixteenmile Creek
- South Fork Lee Creek
- Tug Fork

Twelvepole Creek – including Beech Fork and East Lynn Lakes, and tributaries:

- Beech Fork
- Brush Creek
- Buffalo Creek
- Cove Creek
- Fisher Bowen Branch
- Garrett Creek
- Millers Fork



Appendix B – Glossary of Terms

(Kennedy 2001)

alignment – For this project, alignment refers to the linear position of a river or stream channel.

ArcGIS® - The geographic information system (GIS) software package developed by Environmental Systems Research Institute (ESRI). Included in ArcGIS are applications ArcMap, ArcCatalog, ArcToolbox and others.

attribute – A piece of information describing a map feature. Attributes of a river might include its name, length, and average depth.

attribute table – A table containing descriptive attributes for a set of geographic features, usually arranged so that each row represents a feature and each column represents one attribute. Each cell in a column stores the value of that column's attribute for that row's feature.

background image – A satellite image or aerial photograph (such as a DOQQ) over which vector data is displayed. Although the image can be used to align coordinates, it is not linked to attribute information and is not part of the spatial analysis in a GIS.

basemap – A map depicting geographic features such as landforms, drainage, roads, landmarks, and political boundaries, used for locational reference.

cardinality – In a relationship between objects in a database, the number of objects of one type that are associated with objects of another type. A relationship can have a cardinality of one-to-one, one-to-many (many-to-one), or many-to-many.

control point – A point that represents the identical location on two different spatial layers; used in georeferencing one layer to another.

Digital Orthophoto Quarter Quadrangle (DOQQ) – An aerial photograph in one-quarter increments of the standard USGS quadrangle format. An orthophotograph has the same scale throughout and can be used as a map.

editor – In this project, refers to the Editor toolbar in ArcMap used for creating and manipulating vector shapefile features.

export – To move data from one computer system to another, and often, in the process, from one file format to another.

feature – A shape in a spatial data layer, such as a point, line, or polygon, that represents a geographic object.

feature class – In a shapefile, a collection of spatial data with the same shape type (e.g., point, line, or polygon).

geodatabase – An ArcInfo 8 data storage format. A geodatabase represents geographic features and attributes as objects and is hosted inside a relational database management system.

geographic coordinate system – A reference system using latitude and longitude to define the locations of points on the surface of a sphere or spheroid.

geographic information system (GIS) – A configuration of computer hardware and software that captures, stores, analyzes and displays geographic information

georeference – To assign coordinates from a known reference system, such as latitude/longitude, UTM, or State Plane to the page coordinates of an image or planar map.

import – To load data from one computer system or application into another, often involving some form of data conversion.

land use – The classification of land according to how it is used; for example, agricultural, industrial, residential, urban, rural or commercial. Natural features of the land such as forest, pastureland, brushland and bodies of water are also often classified in this manner.

layer – 1. A set of vector data organized by subject matter, such as roads, rivers, or political boundaries. Vector layers act as digital transparencies that can be laid atop one another for viewing or spatial analysis. 2. A set of raster data representing a particular geographic area, such as an aerial photograph or a remotely sensed image. In both (1) and (2), layers covering the same geographical space are registered to one another by means of a common coordinate system.

merge – In GIS, a method by which unnecessary boundaries between features are removed.

parameter query – A query that when run displays its own dialog box prompting you for information, such as criteria for retrieving records or a value you want to insert in a field; handy when used as the basis for forms, reports, and data access pages.

personal geodatabase – A geodatabase that stores data in a single-user relational database management system (RDBMS). A personal geodatabase can be read simultaneously by several users, but only one user at a time can write data into it.

primary key – The attribute column that uniquely identifies each row in a table, such as the unique number assigned to each parcel within a county.

projected coordinate system – Latitude and longitude coordinates projected to x,y coordinates in a planar coordinate system.

query (attribute query) – A statement or logical expression used to select features or records from a database. In ArcMap, queries are typically written in Structured Query Language (SQL).

raster image – A matrix of pixels whose values represent the level of energy reflected or emitted by the surface being photographed, scanned, or otherwise sensed.

raster-to-vector conversion (vectorization) – The conversion of cell data into points, lines, and polygons.

relational database – Data stored in table that are associated by shared attributes. Any data element can be found in the database through the name of the table, the attribute (column) name, and the value of the primary key. In contrast to hierarchical and network database structures, the data can be arranged in different combinations.

segment – A line that connects vertices.

select query – The most common type of query. It retrieves data from one or more tables and displays the results in a datasheet where you can update the records (with some restrictions).

shapefile – A vector file format for storing the location, shape, and attributes of geographic features. It is stored in a set of related files and contains one feature class.

snapping – Moving a feature, or a portion of it, to coincide with the coordinates of another feature.

spatial analysis – Studying the locations and shapes of geographic features and the relationships between them.

spatial data – Information about the locations and shapes of geographic features, and the relationships between them; usually stored as coordinates and topology.

Structured Query Language (SQL) – A syntax for defining and manipulating data in a relational database. Developed by IBM in the 1970s, it has become an industry standard for query languages in most relational database management systems.

topographic map – A map showing relief, often as contour lines, along with other natural and human-made features; map sheets published by the U.S. Geological Survey in the 7.5-minute or 15-minute quadrangle series.

topological overlay – Superimposing two or more geographic data sets in order to produce a new geographic layer with a new set of attributes; method of spatial analysis.

transformation (rectification) – Converting the coordinates of a map or an image from one system to another , typically by shifting, rotating, scaling, skewing or projecting them.

union - Combines features from different layers into one feature while maintaining the original features and attributes.

universal transverse Mercator (UTM) – A commonly used projected coordinate system that divides the globe into sixty zones, starting at -180 degrees longitude. Each zone extends north-south from 84 degrees north to 80 degrees south, spans 6 degrees of longitude, and has its own central meridian. Most of the state of West Virginia, including the entire portion of the state represented in this project, is in UTM Zone 17 North.

vector – A data structure used to represent linear geographic features. Features are made of ordered lists of x,y coordinates and represented by points, lines, or polygons; points connect to become lines, and lines connect to become polygons. Attributes are associated with each feature (as opposed to a raster data structure, which associates attributes with grid cells).

Appendix C – Glossary of Spatial Analysis

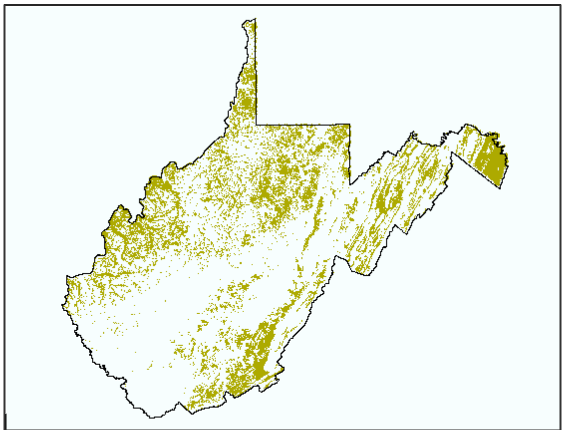


Image 1 – NLCD "herbaceous planted/cultivated" land cover

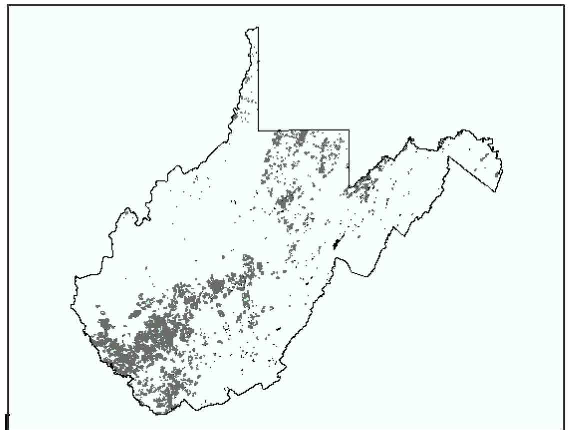


Image 2 – NLCD "barren" land cover plus mining permits, valley fill permits.

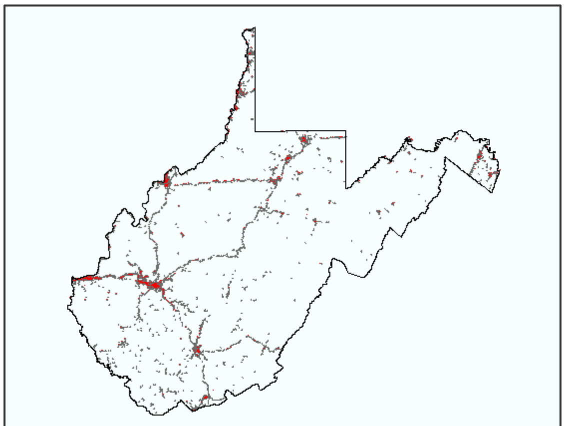


Image 3 – NLCD "developed" land cover

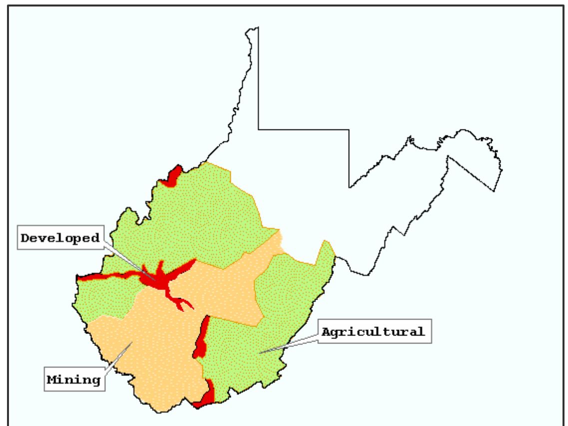


Image 4 – Generalized polygons of land cover types

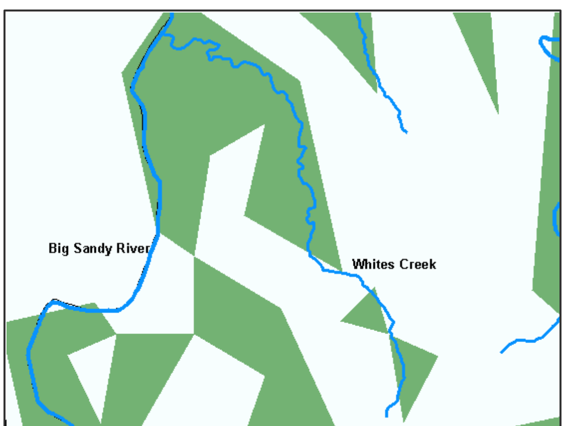


Image 5 – Whites Creek with agricultural land cover polygons

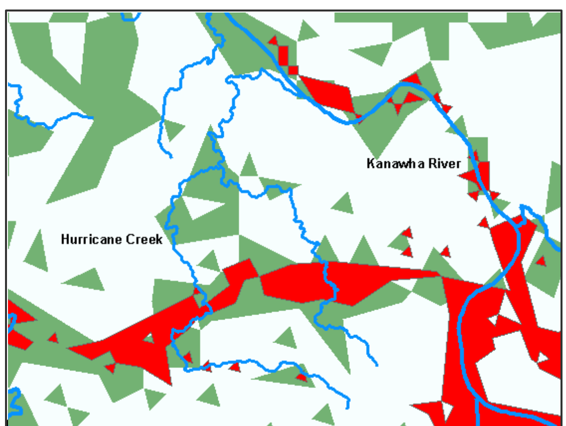


Image 6 – Hurricane Creek with agricultural (green) and developed (red) land cover polygons

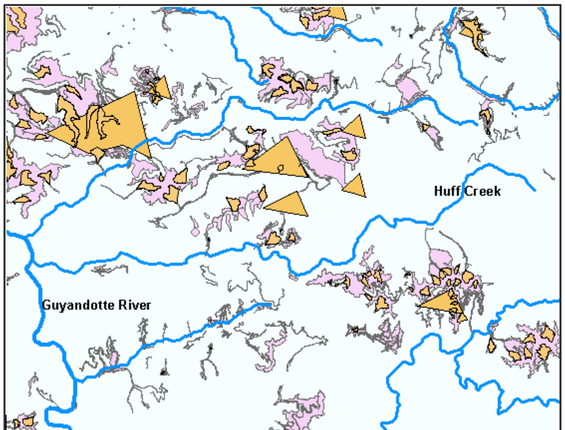


Image 7 – Huff Creek with "barren" polygons, mine permit boundaries, valley fill permit boundaries

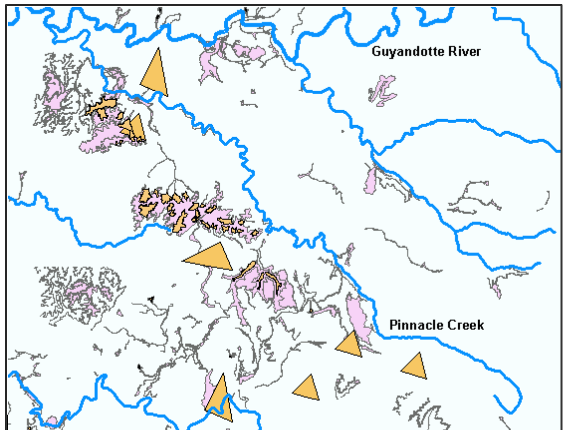


Image 8 – Pinnacle Creek with "barren" polygons, mine permit boundaries, valley fill permits

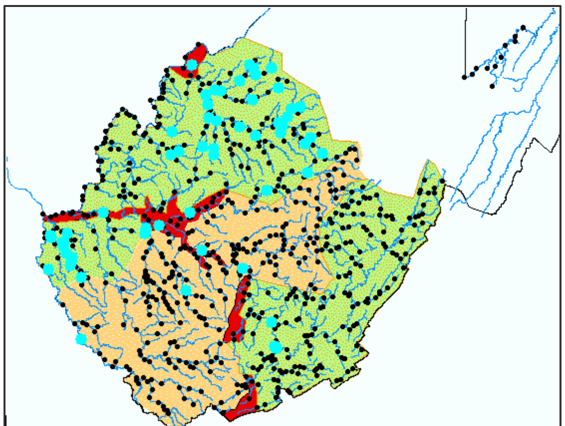


Image 9 – Distribution of *L. sicculus* (brook silverside)

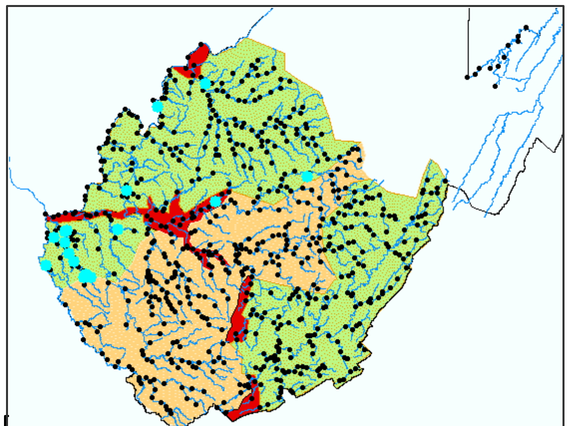


Image 10 – Distribution of *L. aepyptera* (least brook lamprey)

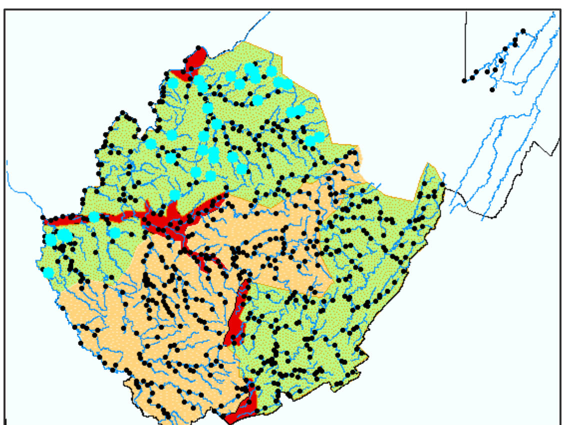


Image 11 – Distribution of *L. umbratilus* (redfin shiner)

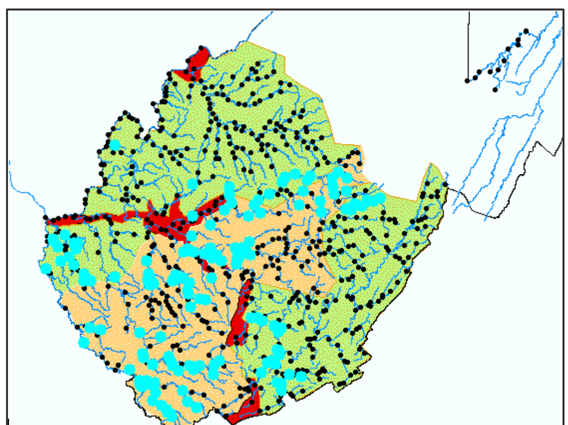


Image 12 – Distribution of *E. caeruleum* (rainbow darter)

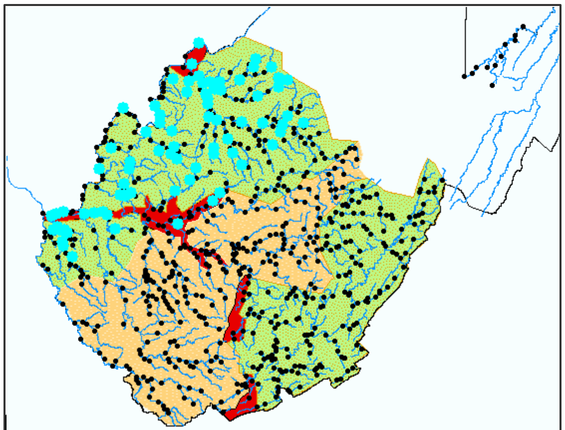


Image 13 – Distribution of *P. omiscomaycus* (trout-perch)

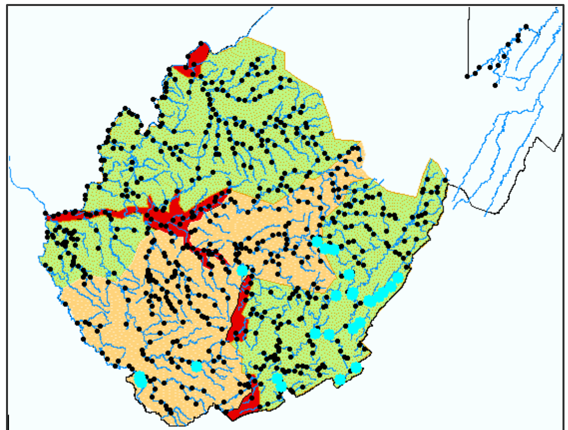


Image 14 – Distribution of *C. funduloides* (rosyside dace)

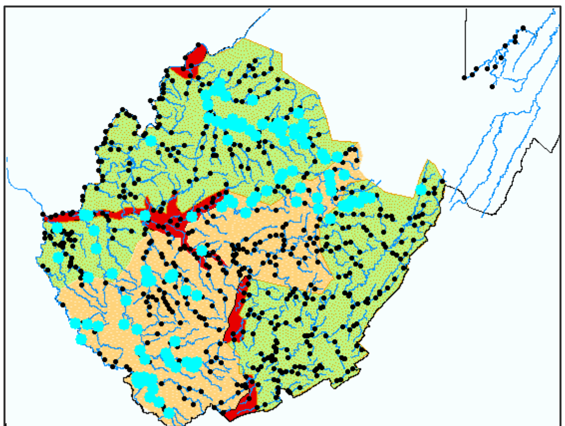


Image 15 – Distribution of *E. variatum* (variegate darter)

Appendix D – Metadata

Data Sources Made Available by the West Virginia GIS Data Center: (http://wvgis.wvu.edu)

Watersheds

<u>Description</u>
"Watershed" hydrologic units, a subdivision within a sub-basin, represent the 5th level (10-digits) in the hydrologic unit hierarchy. Watersheds range in size from 40,000 to 250,000 acres.
<u>Scale</u>
1:100,000
<u>Location</u>
Statewide
<u>Data Source Lineage</u>
During the late 1970's the Natural Resources Conservation Service (NRCS), formerly the Soil Conservation Service, initiated a national program to further subdivide HUC's into smaller watersheds for water resources planning, resulting in the 5th level, or 10-digit HUCs. In the mid-1990's the NRCS delineated and digitized watersheds (Level 5 hydrologic units) on 1:100,000-scale USGS topographic maps. In 2001 new national standards for delineating watershed hydrologic units adopted a 10-digit format instead of 11 digits. This coverage will be updated when more detailed watershed/subwatershed mapping is completed as part of the Watershed Boundary Dataset, a national geospatial database containing the hydrologic unit boundaries for the 1st through 6th level units. This dataset was downloaded from the WV Department of Environmental Protection and converted from NAD 27 to NAD 83. Published January 2002.
<u>Coordinate System</u>
UTM Zone 17 (NAD 83) in meters
<u>File Format</u>
Compressed ESRI shapefiles

Counties

<u>Description</u>
West Virginia County Boundaries
<u>Scale</u>
1:24,000
<u>Location</u>
Statewide
<u>Data Source Lineage</u>
Digitized from USGS 1:24,000-scale digital raster graphics (scanned topographic maps) by the West Virginia Department of Environmental Protection. Published January 2002.
<u>Coordinate System</u>

UTM Zone 17 (NAD 83)
File Format
Compressed ESRI shapefile

Cities

Description
Populated Places recorded in the Geographic Names Information System
Scale
1:24,000
Location
Statewide
Data Source Lineage
The Geographic Names Information System (GNIS), developed by the U.S. Geological Survey (USGS) in cooperation with the U.S. Board on Geographic Names (BGN), contains information about physical and cultural geographic features. Publication Date: 05-01-1981.
Coordinate System
UTM Zone 17 (NAD 83)
File Format
Compressed ESRI point shapefiles (double precision)

Major Water

Description
Major water bodies intended for use in making statewide cartographic maps.
Scale
1:100,000
Location
Statewide
Data Source Lineage
Line and polygon coverages derived from the USGS National Hydrological Dataset (NHD) and Digital Line Graphs (DLG). Compiled and edited by the WV GIS Technical Center. Published 2002.
Coordinate System
UTM Zone 17 (NAD 83)
File Format
Compressed ESRI line and polygon shapefiles

Mining Permit Boundaries

Description
Permit oundaries digitized from West Virginia Department of Environmental Protection's (WVDEP) Division of Mining and Reclamation (DMR) permit maps.

Scale
1:24,000
Location
Statewide
Data Source Lineage
Permit Boundaries from 1:24,000-scale or larger DMR permit maps were digitized by the WVU Natural Resource Analysis Center (NRAC) and then validated by DMR personnel for completeness.
Coordinate System
UTM Zone 17 (NAD 27)
File Format
Compressed ESRI shapefiles

Underground Mining Limits

Description
Underground Mining Limits digitized from West Virginia Department of Environmental Protection's Division of Mining and Reclamation (DMR) permit maps.
Scale
1:24,000
Location
Statewide
Data Source Lineage
Underground Mining Limits from 1:24,000-scale or larger DMR permit maps were digitized by the WVU Natural Resource Analysis Center (NRAC) and then validated by DMR personnel for completeness.
Coordinate System
UTM Zone 17 (NAD 27)
File Format
Compressed ESRI shapefiles

Valley Fills

Description
Valley fills digitized from West Virginia Department of Environmental Protection's Division of Mining and Reclamation (DMR) permit maps.
Scale
1:24,000
Location
Statewide
Data Source Lineage
Valley fills from 1:24,000-scale or larger DMR permit maps were digitized by the WVU Natural Resource Analysis Center (NRAC) and then validated by DMR personnel for completeness.

Coordinate System
UTM Zone 17 (NAD 27)
File Format
Compressed ESRI shapefiles

National Land Cover Dataset (NLCD) 1992

Description
The National Land Cover Dataset (NLCD), produced as a cooperative effort between the U.S. Geological Survey (USGS) and the U.S. Environmental Protection Agency (US EPA), provides a consistent, land cover data layer for the conterminous U.S. using early 1990s Landsat thematic mapper (TM) data purchased by the Multi-resolution Land Characterization (MRLC) Consortium. This data can be used for landscape scale analysis in various disciplines such as wildlife ecology, forestry, or land use planning.
Scale
1:50,000
Location
Statewide
Data Source Lineage
The National Land Cover Dataset was compiled from Landsat satellite TM imagery (circa 1992) with a spatial resolution of 30 meters and supplemented by various ancillary data. Map projection of original NLCD data set converted from Albers Conical Equal Area to a UTM (Zone 17) and Geographic coordinate system by WVGISTC. Information: WV NLCD Version 05-27-99 (Updated: January, 1996; February, 1997; July, 1998, May, 1999; March, 2000).
Coordinate System
UTM Zone 17 (NAD 83)
File Format
Compressed ESRI ARC/INFO grid

National Land Cover Data Key:

NOTE - All Classes May NOT Be Represented in a specific state data set.

The class number represents the digital value of the class in the data set.
NLCD Land Cover Classification System Key - Rev. July 20, 1999

Water
11 Open Water
12 Perennial Ice/Snow

Developed
21 Low Intensity Residential
22 High Intensity Residential
23 Commercial/Industrial/Transportation

Barren
31 Bare Rock/Sand/Clay
32 Quarries/Strip Mines/Gravel Pits
33 Transitional

Forested Upland
41 Deciduous Forest
42 Evergreen Forest
43 Mixed Forest

Shrubland
51 Shrubland

Non-natural Woody
61 Orchards/Vineyards/Other

Herbaceous Upland
71 Grasslands/Herbaceous

Herbaceous Planted/Cultivated
81 Pasture/Hay
82 Row Crops
83 Small Grains
84 Fallow
85 Urban/Recreational Grasses

Wetlands
91 Woody Wetlands
92 Emergent Herbaceous Wetlands

NLCD Land Cover Classification System Land Cover Class Definitions:

Water - All areas of open water or permanent ice/snow cover.

11. Open Water - All areas of open water; typically 25 percent or greater cover of water (per pixel).

12. Perennial Ice/Snow - All areas characterized by year-long cover of ice and/or snow.

Developed - Areas characterized by a high percentage (30 percent or greater) of constructed materials (e.g. asphalt, concrete, buildings, etc).

21. Low Intensity Residential - Includes areas with a mixture of constructed materials and vegetation. Constructed materials account for 30-80 percent of the cover. Vegetation may account for 20 to 70 percent of the cover. These areas most commonly

include single-family housing units. Population densities will be lower than in high intensity residential areas.

22. High Intensity Residential - Includes highly developed areas where people reside in high numbers. Examples include apartment complexes and row houses. Vegetation accounts for less than 20 percent of the cover. Constructed materials account for 80 to 100 percent of the cover.

23. Commercial/Industrial/Transportation - Includes infrastructure (e.g. roads, railroads, etc.) and all highly developed areas not classified as High Intensity Residential.

Barren - Areas characterized by bare rock, gravel, sand, silt, clay, or other earthen material, with little or no "green" vegetation present regardless of its inherent ability to support life. Vegetation, if present, is more widely spaced and scrubby than that in the "green" vegetated categories; lichen cover may be extensive.

31. Bare Rock/Sand/Clay - Perennially barren areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, beaches, and other accumulations of earthen material.

32. Quarries/Strip Mines/Gravel Pits - Areas of extractive mining activities with significant surface expression.

33. Transitional - Areas of sparse vegetative cover (less than 25 percent of cover) that are dynamically changing from one land cover to another, often because of land use activities. Examples include forest clear-cuts, a transition phase between forest and agricultural land, the temporary clearing of vegetation, and changes due to natural causes (e.g. fire, flood, etc.).

Forested Upland - Areas characterized by tree cover (natural or semi-natural woody vegetation, generally greater than 6 meters tall); tree canopy accounts for 25-100 percent of the cover.

41. Deciduous Forest - Areas dominated by trees where 75 percent or more of the tree species shed foliage simultaneously in response to seasonal change.

42. Evergreen Forest - Areas dominated by trees where 75 percent or more of the tree species maintain their leaves all year. Canopy is never without green foliage.

43. Mixed Forest - Areas dominated by trees where neither deciduous nor evergreen species represent more than 75 percent of the cover present.

Shrubland - Areas characterized by natural or semi-natural woody vegetation with aerial stems, generally less than 6 meters tall, with individuals or clumps not touching to interlocking. Both evergreen and deciduous species of true shrubs, young trees, and trees or shrubs that are small or stunted because of environmental conditions are included.

51. Shrubland - Areas dominated by shrubs; shrub canopy accounts for 25-100 percent of the cover. Shrub cover is generally greater than 25 percent when tree cover is less than 25 percent. Shrub cover may be less than 25 percent in cases when the cover of other life forms (e.g. herbaceous or tree) is less than 25 percent and shrubs cover exceeds the cover of the other life forms.

Non-natural Woody - Areas dominated by non-natural woody vegetation; non-natural woody vegetative canopy accounts for 25-100 percent of the cover. The non-natural woody classification is subject to the availability of sufficient ancillary data to differentiate non-natural woody vegetation from natural woody vegetation.

61. Orchards/Vineyards/Other - Orchards, vineyards, and other areas planted or maintained for the production of fruits, nuts, berries, or ornamentals.

Herbaceous Upland - Upland areas characterized by natural or semi-natural herbaceous vegetation; herbaceous vegetation accounts for 75-100 percent of the cover.

71. Grasslands/Herbaceous - Areas dominated by upland grasses and forbs. In rare cases, herbaceous cover is less than 25 percent, but exceeds the combined cover of the woody species present. These areas are not subject to intensive management, but they are often utilized for grazing.

Planted/Cultivated - Areas characterized by herbaceous vegetation that has been planted or is intensively managed for the production of food, feed, or fiber; or is maintained in developed settings for specific purposes. Herbaceous vegetation accounts for 75-100 percent of the cover.

81. Pasture/Hay - Areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops.

82. Row Crops - Areas used for the production of crops, such as corn, soybeans, vegetables, tobacco, and cotton.

83. Small Grains - Areas used for the production of graminoid crops such as wheat, barley, oats, and rice.

84. Fallow - Areas used for the production of crops that are temporarily barren or with sparse vegetative cover as a result of being tilled in a management practice that incorporates prescribed alternation between cropping and tillage.

85. Urban/Recreational Grasses - Vegetation (primarily grasses) planted in developed settings for recreation, erosion control, or aesthetic purposes. Examples include parks, lawns, golf courses, airport grasses, and industrial site grasses.

Wetlands - Areas where the soil or substrate is periodically saturated with or covered with water.

91. Woody Wetlands - Areas where forest or shrubland vegetation accounts for 25-100 percent of the cover and the soil or substrate is periodically saturated with or covered with water.

92. Emergent Herbaceous Wetlands - Areas where perennial herbaceous vegetation accounts for 75-100 percent of the cover and the soil or substrate is periodically saturated with or covered with water.

Data Sources Obtained from Environmental Systems Research Institute, Inc. Data & Maps Publications:

ESRI Data & Maps 2002

U.S. Rivers

Description
U.S. Rivers provides a data set of the U.S. rivers for each state of the United States and the District of Columbia.
Scale
1:100,000
Location
United States
Data Source Lineage
This data set was extracted from the standard GDT line water layer and includes only FCC codes H10 (this code no longer exists, but at the time was described as stream) and H11 that represent perennial rivers, streams, and streams of unknown minor category (perennial, intermittent, or braided). These line segments were chained and thinned to serve as a reference cartographic layer. Many of the cartographic problems inherent in the original 1:100,000-scale source data remain; however, for small areas these rivers make a nice cartographic addition to many basemaps.
Coordinate System
GCS North American 1983
File Format
ESRI shapefile

West Virginia Rivers

Description
West Virginia Rivers represents streams and rivers within West Virginia. It provides a reference cartographic layer that is chained and thinned to reduce size and improve draw performance.
Scale
Largest scale when displaying the data: 1:100,000.
Location
Statewide
Data Source Lineage
Geographic Data Technology, Inc. (GDT)
The data included in the boundary files was extracted from the 1990 Census Version TIGER/Line files (CD–ROM edition). The following steps were performed by ESRI: Extracted data sets from GDT Dynamap/2000 v7.3. Ran ArcView Avenue request ReturnConnected, and generalized. Converted all states to North American Datum of 1983 (NAD83). Recalculated any attributes based on length. Created ArcGIS™ layer file (.lyr). Created ArcView legend file (.avl). Created projection file (.prj). Ran ArcView Avenue request ExportClean, and created spatial indices.
The geospatial part of this data set was extracted from the 1990 Census Version TIGER/Line™ files (CD–ROM edition). The positional accuracy of the TIGER/Line coordinates at best meets the established National Map Accuracy standards (+/- 167 feet approximately) for the 1:100,000-scale source maps from the USGS. The level of positional accuracy in the TIGER/Line files is not suitable for high-precision measurement applications such as engineering problems, property transfers, or other uses that might require highly accurate measurements of the earth's surface. No duplicate features are present. The shapefile is exported using Avenue request ExportClean. This request verifies and enforces the correctness of shapes. After processing, the data set is checked for drawing display and number of records and file sizes compared with source materials. Some of the cartographic problems with this data inherent in the original 1:100,000 USGS Topographic Quadrangle source data remain in that the density of features can change abruptly.
Coordinate System
GCS North American 1983
File Format
ESRI shapefile

ESRI Data & Maps 2003

U.S. Rivers and Streams

Description
U.S. Rivers and Streams represent detailed rivers and streams in the United States. The data set provides a database of linear water features that interconnects and identifies the stream segments or reaches that comprise the surface water drainage system of the

United States. The detailed and comprehensive rivers and streams are from the National Hydrography Dataset by the U.S. Geological Survey in cooperation with the U.S. Environmental Protection Agency.

Scale

1:24,000

Location

United States

Data Source Lineage

The following steps were performed by ESRI: Extracted NHD Route DRAIN from National Hydrography Dataset (NHD). Added STRM_LEVEL and NAME attributes from NHD Route RCH. Removed unneeded attributes. Split the data set by U.S. states (for easier processing). Unsplit features based on combining NAME, FTYPE, FCODE, and STRM_LEVEL attributes. Merged the data sets into one. Recalculated the lengths for the METERS attribute. Formatted the attributes.

Coordinate System

GCS North American 1983

File Format

ESRI shapefile

Appendix E – Data Tables

FISHID	FAMILY	GENUS	SPECIES	COMMON
F001	Petromyzontidae	Ichthyomyzon	bdellium	Ohio lamprey
F002	Petromyzontidae	Ichthyomyzon	castaneus	
F003	Petromyzontidae	Ichthyomyzon	greeleyi	mountain brook lamprey
F004	Petromyzontidae	Ichthyomyzon	unicuspis	silver lamprey
F005	Petromyzontidae	Lampetra	aepyptera	least brook lamprey
F006	Petromyzontidae	Lampetra	appendix	American brook lamprey
F007	Petromyzontidae	Petromyzon	marinus	
F008	Acipenseridae	Acipenser	brecirostrum	
F009	Acipenseridae	Acipenser	fulvescens	lake sturgeon
F010	Acipenseridae	Acipenser	oxyrhynchus	
F011	Acipenseridae	Scaphirhynchus	platorynchus	shovelnose sturgeon
F012	Polyodontidae	Polyodon	spathula	paddlefish
F013	Lepisosteidae	Lepisosteus	osseus	longnose gar
F014	Lepisosteidae	Lepisosteus	platostomus	shortnose gar
F015	Amiidae	Amia	calva	bowfin
F016	Hiodontidae	Hiodon	alosoides	goldeye
F017	Hiodontidae	Hiodon	tergisus	mooneye
F018	Anguillidae	Anguilla	rostrata	American eel
F019	Clupeidae	Alosa	aestivalis	
F020	Clupeidae	Alosa	chrysochloris	skipjack herring
F021	Clupeidae	Alosa	pseudoharengus	alewife
F022	Clupeidae	Dorosoma	cepedianum	gizzard shad
F023	Clupeidae	Dorosoma	petenense	threadfin shad
F024	Cyprinidae	Campostoma	anomalum	Central stoneroller
F025	Cyprinidae	Carassius	auratus	goldfish
F026	Cyprinidae	Clinostomus	elongatus	redside dace
F027	Cyprinidae	Clinostomus	funduloides	rosyside dace
F028	Cyprinidae	Cyprinella	analostana	satinfin shiner
F029	Cyprinidae	Cyprinella	galactura	whitetail shiner
F030	Cyprinidae	Cyprinella	spiloptera	spotfin shiner
F031	Cyprinidae	Cyprinella	whipplei	steelcolor shiner
F032	Cyprinidae	Cyprinus	carpio	common carp
F033	Cyprinidae	Ericymba	buccata	silverjaw minnow
F034	Cyprinidae	Erimystax	dissimilis	streamline chub
F035	Cyprinidae	Erimystax	x-punctatus	gravel chub
F036	Cyprinidae	Exoglossum	laurae	tonguetied minnow
F037	Cyprinidae	Exoglossum	maxillingua	cutlips minnow
F038	Cyprinidae	Hybognathus	regius	Eastern silvery minnow
F039	Cyprinidae	Hybopsis	amblops	bigeye chub
F040	Cyprinidae	Luxilus	albeolus	white shiner
F041	Cyprinidae	Luxilus	cerasinus	crescent shiner
F042	Cyprinidae	Luxilus	chrysocephalus	striped shiner
F043	Cyprinidae	Luxilus	coccogenis	

FISHID	FAMILY	GENUS	SPECIES	COMMON
F044	Cyprinidae	Luxilus	cornutus	common shiner
F045	Cyprinidae	Lythrurus	ardens	rosefin shiner
F046	Cyprinidae	Lythrurus	umbratilus	redfin shiner
F047	Cyprinidae	Macrhybopsis	aestivalis	speckled chub
F048	Cyprinidae	Macrhybopsis	storeriana	silver chub
F049	Cyprinidae	Margariscus	margarita	pearl dace
F050	Cyprinidae	Nocomis	biguttatus	hornyhead chub
F051	Cyprinidae	Nocomis	leptocephalus	bluehead chub
F052	Cyprinidae	Nocomis	micropogon	river chub
F053	Cyprinidae	Nocomis	platyrhynchus	bigmouth chub
F054	Cyprinidae	Nocomis	raneyi	
F055	Cyprinidae	Notemigonus	crysoleucas	golden shiner
F056	Cyprinidae	Notropis	amoenus	comely shiner
F057	Cyprinidae	Notropis	ariommus	popeye shiner
F058	Cyprinidae	Notropis	atherinoides	emerald shiner
F059	Cyprinidae	Notropis	bifrenatus	
F060	Cyprinidae	Notropis	blennius	river shiner
F061	Cyprinidae	Notropis	boops	bigeye shiner
F062	Cyprinidae	Notropis	buchanani	ghost shiner
F063	Cyprinidae	Notropis	chiliticus	
F064	Cyprinidae	Notropis	dorsalis	bigmouth shiner
F065	Cyprinidae	Notropis	hudsonius	spottail shiner
F066	Cyprinidae	Notropis	leuciodus	
F067	Cyprinidae	Notropis	ludibundus	sand shiner
F068	Cyprinidae	Notropis	photogenis	silver shiner
F069	Cyprinidae	Notropis	p. procne	swallowtail shiner
F070	Cyprinidae	Notropis	p. longiceps	swallowtail shiner
F071	Cyprinidae	Notropis	rubellus	rosyface shiner
F072	Cyprinidae	Notropis	rubricroceus	
F073	Cyprinidae	Notropis	scabriceps	New River shiner
F074	Cyprinidae	Notropis	semperasper	roughhead shiner
F075	Cyprinidae	Notropis	telescopus	telescope shiner
F076	Cyprinidae	Notropis	volucellus	mimic shiner
F077	Cyprinidae	Phenacobius	mirabilis	suckermouth minnow
F078	Cyprinidae	Phenacobius	teretulus	Kanawha minnow
F079	Cyprinidae	Phoxinus	erythrogaster	Southern redbelly dace
F080	Cyprinidae	Phoxinus	oreas	mountain redbelly dace
F081	Cyprinidae	Pimephales	notatus	bluntnose minnow
F082	Cyprinidae	Pimephales	promelas	fathead minnow
F083	Cyprinidae	Pimephales	vigilax	bullhead minnow
F084	Cyprinidae	Rhinichthys	atratulus	blacknose dace
F085	Cyprinidae	Rhinichthys	bowersi	Cheat minnow
F086	Cyprinidae	Rhinichthys	cataractae	longnose dace
F087	Cyprinidae	Scardinius	erythrophthalmus	rudd
F088	Cyprinidae	Semotilus	atromaculatus	creek chub

FISHID	FAMILY	GENUS	SPECIES	COMMON
F089	Cyprinidae	Semotilus	corporalis	fallfish
F090	Catostomidae	Carpiodes	carpio	river carpsucker
F091	Catostomidae	Carpiodes	cyprinus	quillback
F092	Catostomidae	Carpiodes	velifer	highfin carpsucker
F093	Catostomidae	Catostomus	catostomus	longnose sucker
F094	Catostomidae	Catostomus	commersoni	white sucker
F095	Catostomidae	Cycleptus	elongatus	blue sucker
F096	Catostomidae	Erimyzon	oblongus	creek chubsucker
F097	Catostomidae	Erimyzon	sucetta	lake chubsucker
F098	Catostomidae	Hypentelium	nigricans	Northern hog sucker
F099	Catostomidae	Ictiobus	bubalus	smallmouth buffalo
F100	Catostomidae	Ictiobus	cyprinellus	bigmouth buffalo
F101	Catostomidae	Ictiobus	niger	black buffalo
F102	Catostomidae	Minytrema	melanops	spotted sucker
F103	Catostomidae	Moxostoma	anisurum	silver redhorse
F104	Catostomidae	Moxostoma	carinatum	river redhorse
F105	Catostomidae	Moxostoma	duquesnei	black redhorse
F106	Catostomidae	Moxostoma	erythrurum	golden redhorse
F107	Catostomidae	Moxostoma	macrolepidotum	shorthead redhorse
F108	Catostomidae	Scartomyzon	cervinus	black jumprock
F109	Catostomidae	Thoburnia	rhothoeca	torrent sucker
F110	Ictaluridae	Ameiurus	catus	white catfish
F111	Ictaluridae	Ameiurus	melas	black bullhead
F112	Ictaluridae	Ameiurus	natalis	yellow bullhead
F113	Ictaluridae	Ameiurus	nebulosus	brown bullhead
F114	Ictaluridae	Ictalurus	furcatus	blue catfish
F115	Ictaluridae	Ictalurus	punctatus	channel catfish
F116	Ictaluridae	Noturus	eleutherus	mountain madtom
F117	Ictaluridae	Noturus	flavus	stonecat
F118	Ictaluridae	Noturus	gilberti	
F119	Ictaluridae	Noturus	gyrinus	tadpole madtom
F120	Ictaluridae	Noturus	insignis	margined madtom
F121	Ictaluridae	Noturus	miurus	brindled madtom
F122	Ictaluridae	Noturus	nocturnus	
F123	Ictaluridae	Noturus	stigmosus	Northern madtom
F124	Ictaluridae	Pylodictis	olivaris	flathead catfish
F125	Esocidae	Esox	a. americanus	redfin pickerel
F126	Esocidae	Esox	a. vermiculatus	grass pickerel
F127	Esocidae	Esox	lucius	Northern pike
F128	Esocidae	Esox	masquinongy	muskellunge
F129	Esocidae	Esox	niger	chain pickerel
F130	Umbridae	Umbra	limi	Central mudminnow
F131	Umbridae	Umbra	pygmaea	
F132	Salmonidae	Oncorhynchus	mykiss	rainbow trout
F133	Salmonidae	Oncorhynchus	nerka	

FISHID	FAMILY	GENUS	SPECIES	COMMON
F134	Salmonidae	Salmo	trutta	brown trout
F135	Salmonidae	Salvelinus	fontinalis	brook trout
F136	Osmeridae	Osmerus	mordax	
F137	Percopsidae	Percopsis	omiscomaycus	trout-perch
F138	Aphredoderidae	Aphredoderus	sayanus	
F139	Fundulidae	Fundulus	catenatus	Northern studfish
F140	Fundulidae	Fundulus	diaphanus	banded killifish
F141	Fundulidae	Fundulus	heteroclitus	
F142	Poeciliidae	Gambusia	affinis	
F143	Atherinidae	Labidesthes	sicculus	brook silverside
F144	Cottidae	Cottus	bairdi	mottled sculpin
F145	Cottidae	Cottus	carolinae	banded sculpin
F146	Cottidae	Cottus	cognatus	slimy sculpin
F147	Cottidae	Cottus	girardi	Potomac sculpin
F148	Percichthyidae	Morone	americana	
F149	Percichthyidae	Morone	chrysops	white bass
F150	Percichthyidae	Morone	mississippiensis	
F151	Percichthyidae	Morone	saxatilis	striped bass
F152	Centrarchidae	Acantharchus	pomotis	
F153	Centrarchidae	Ambloplites	rupestris	rock bass
F154	Centrarchidae	Centrarchus	maropterus	
F155	Centrarchidae	Enneacanthus	gloriosus	
F156	Centrarchidae	Enneacanthus	obesus	
F157	Centrarchidae	Lepomis	auritus	redbreast sunfish
F158	Centrarchidae	Lepomis	cyanellus	green sunfish
F159	Centrarchidae	Lepomis	gibbosus	pumpkinseed
F160	Centrarchidae	Lepomis	gulosus	warmouth
F161	Centrarchidae	Lepomis	humilis	orangespotted sunfish
F162	Centrarchidae	Lepomis	macrochirus	bluegill
F163	Centrarchidae	Lepomis	megalotis	longear sunfish
F164	Centrarchidae	Lepomis	microlophus	redear sunfish
F165	Centrarchidae	Micropterus	dolomieu	smallmouth bass
F166	Centrarchidae	Micropterus	punctulatus	spotted bass
F167	Centrarchidae	Micropterus	salmoides	largemouth bass
F168	Centrarchidae	Pomoxis	annularis	white crappie
F169	Centrarchidae	Pomoxis	nigromaculatus	black crappie
F170	Percidae	Chrystallaria	asprella	crystal darter
F171	Percidae	Etheostoma	blennioides	greenside darter
F172	Percidae	Etheostoma	caeruleum	rainbow darter
F173	Percidae	Etheostoma	camurum	bluebreast darter
F174	Percidae	Etheostoma	flabellare	fantail darter
F175	Percidae	Etheostoma	kanawhae	Kanawha darter
F176	Percidae	Etheostoma	longimanum	longfin darter
F177	Percidae	Etheostoma	maculatum	spotted darter
F178	Percidae	Etheostoma	nigrum	johnny darter

FISHID	FAMILY	GENUS	SPECIES	COMMON
F179	Percidae	Etheostoma	olmstedi	tesselated darter
F180	Percidae	Etheostoma	osburni	candy darter
F181	Percidae	Etheostoma	pellucidum	Eastern sand darter
F182	Percidae	Etheostoma	simoterum	Tennessee snubnose darter
F183	Percidae	Etheostoma	spectabile	orangethroat darter
F184	Percidae	Etheostoma	tippecanoe	Tippecanoe darter
F185	Percidae	Etheostoma	variatum	variegate darter
F186	Percidae	Etheostoma	vitreum	
F187	Percidae	Etheostoma	zonale	banded darter
F188	Percidae	Perca	flavescens	yellow perch
F189	Percidae	Percina	caprodes	logperch
F190	Percidae	Percina	copelandi	channel darter
F191	Percidae	Percina	evides	gilt darter
F192	Percidae	Percina	gymnocephala	Appalachia darter
F193	Percidae	Percina	macrocephala	longhead darter
F194	Percidae	Percina	maculata	blackside darter
F195	Percidae	Percina	n. notogramma	stripeback darter
F196	Percidae	Percina	n. montuosa	stripeback darter
F197	Percidae	Percina	oxyrhynchus	sharpnose darter
F198	Percidae	Percina	peltata	shield darter
F199	Percidae	Percina	phoxocephala	slenderhead darter
F200	Percidae	Percina	roanoka	Roanoke darter
F201	Percidae	Percina	sciera	dusky darter
F202	Percidae	Percina	shumardi	river darter
F203	Percidae	Stizostedion	canadense	sauger
F204	Percidae	Stizostedion	vitreum	walleye
F205	Sciaenidae	Aplodinotus	grunniens	freshwater drum
F206	Esocidae	Esox	masquinongy X lucius	tiger musky
F207	Salmonidae	Salmo	trutta X fontinalis	tiger trout
F208	Percichthyidae	Morone	chrysops X saxatilis	white X striped bass hybrid
F209	Percidae	Stizostedion	canadense X vitreum	saugeye

SITEID	LOCATION	COUNTY	DRAINAGE	NEARESTRIV	STREAMNAME
11	Ohio River at Vienna	Wood	Ohio South	Ohio River	Ohio River
12	Ohio River at Tallmans	Wood	Ohio South	Ohio River	Ohio River
13	Ohio River at mouth of Pond Creek below Belleville Locks and Dam	Jackson-Wood line	Ohio South	Ohio River	Ohio River
14	Ohio River at Runkle	Jackson	Ohio South	Ohio River	Ohio River
15	Ohio River north of Pleasant View	Jackson	Ohio South	Ohio River	Ohio River
16	Ohio River at Letart above Racine Locks and Dam	Mason	Ohio South	Ohio River	Ohio River
17	Ohio River between Sixteenmile Creek and Crab Creek below RCB Locks	Mason	Ohio South	Ohio River	Ohio River
18	Ohio River south of Millersport	Cabell	Ohio South	Ohio River	Ohio River
19	Ohio River between West Huntington and Westmoreland	Wayne	Ohio South	Ohio River	Ohio River
20	Sandy Creek near confluence with Ohio River	Jackson	Ohio South	Ohio River	Sandy Creek
21	Ohio River at Meldahl	Wood	Ohio South	Ohio River	Ohio River
22	Ohio River between Kanawha River and Mill Run	Mason	Ohio South	Ohio River	Ohio River
23	Eighteenmile Creek near confluence with Ohio River	Mason	Ohio South	Ohio River	Eighteenmile Creek
24	Sixteenmile Creek at Mercers Bottom near confluence with Ohio River	Mason	Ohio South	Ohio River	Sixteenmile Creek
25	Crab Creek near confluence with Ohio River	Mason	Ohio South	Ohio River	Crab Creek
26	Mill Creek at Ripley Landing near confluence with Ohio River	Jackson	Ohio South	Ohio River	Mill Creek
27	Ohio River at Lesage	Cabell	Ohio South	Ohio River	Ohio River
28	Little Mill Creek at Millwood near confluence with Ohio River	Jackson	Ohio South	Ohio River	Little Mill Creek
29	Guyandotte River near confluence with Ohio River	Cabell	Ohio South	Guyandotte River	Guyandotte River
30	Ohio River at mouth of Twelvepole Creek	Wayne	Ohio South	Ohio River	Twelvepole Creek
35	Peters Creek of Gauley River at Gilboa	Nicholas	Gauley	Gauley River	Peters Creek
36	Abes Run of East Fork Greenbrier River	Pocahontas	Greenbrier	Greenbrier River	Abes Run
37	Arbuckle Creek of New River at Minden	Fayette	New	New River	Arbuckle Creek
38	Laurel Creek of Hopkins Fork of Big Coal River	Boone	Coal	Big Coal River	Laurel Creek
39	Hopkins Fork near confluence with Big Coal River	Boone	Coal	Big Coal River	Hopkins Fork
40	Little Coal River at mouth of Turtle Creek at Danville	Boone	Coal	Little Coal River	Little Coal River
41	Spruce Fork of Little Coal River at Sodom	Logan	Coal	Little Coal River	Spruce Fork
42	Spruce Fork of Little Coal River at mouth of Spruce Laurel Fork	Boone-Logan line	Coal	Little Coal River	Spruce Fork
43	Laurel Creek of Hopkins Fork of Big Coal River	Boone	Coal	Big Coal River	Laurel Creek
44	Spruce Fork of Little Coal River at Haddleton	Boone	Coal	Little Coal River	Spruce Fork

SITEID	LOCATION	COUNTY	DRAINAGE	NEARESTRIV	STREAMNAME
47	Little Coal River at confluence of Pond Fork and Spruce Fork	Boone	Coal	Little Coal River	Little Coal River
48	Little Coal River at Madison	Boone	Coal	Little Coal River	Little Coal River
52	Greenbrier River west of Bargers Springs	Summers	Greenbrier	Greenbrier River	Greenbrier River
54	Clear Fork of Guyandotte River at Lillyhaven	Wyoming	Guyandotte	Guyandotte River	Clear Fork
55	Pond Fork of Little Coal River at Lanta	Boone	Coal	Little Coal River	Pond Fork
56	Pond Fork of Little Coal River at Uneeda	Boone	Coal	Little Coal River	Pond Fork
57	Pond Fork of Little Coal River at Price Hill	Boone	Coal	Little Coal River	Pond Fork
59	upper Pond Fork of Little Coal River near Echart	Boone	Coal	Little Coal River	Pond Fork
60	West Fork of Pond Fork of Little Coal River near Lindytown	Boone	Coal	Little Coal River	West Fork
61	Pond Fork of Little Coal River at Bald Knob	Boone	Coal	Little Coal River	Pond Fork
63	Abram Creek of N. Branch Potomac River at mouth of Johnnycake Run	Grant	Potomac	North Branch Potomac River	Abram Creek
64	Pond Fork of Little Coal River at Pondco	Boone	Coal	Little Coal River	Pond Fork
65	Pond Fork of Little Coal River at Bim	Boone	Coal	Little Coal River	Pond Fork
66	Tug Fork of Big Sandy River at mouth of Dry Fork	McDowell	Big Sandy	Tug Fork	Tug Fork
70	Greenbrier River at mouths of East Fork and West Fork Greenbrier River	Pocahontas	Greenbrier	Greenbrier River	Greenbrier River
71	upper Laurel Creek of Hopkins Fork of Big Coal River	Boone	Coal	Big Coal River	Laurel Creek
73	Bluestone River south of Rich Creek	Mercer	New	Bluestone River	Bluestone River
74	upper Trace Fork of Mud River	Cabell	Guyandotte	Mud River	Trace Fork
76	Spruce Laurel Fork of Spruce Fork of Little Coal River near Stark	Boone	Coal	Little Coal River	Spruce Laurel Fork
80	Spruce Laurel Fork of Spruce Fork of Little Coal River at Wash. Hts.	Boone	Coal	Little Coal River	Spruce Laurel Fork
81	Bluestone River north of Little Bluestone River	Summers	New	Bluestone River	Bluestone River
83	Trace Fork near confluence with Mud River	Lincoln	Guyandotte	Mud River	Trace Fork
84	Mud River near confluence with Guyandotte River	Cabell	Guyandotte	Mud River	Mud River
95	New Creek of North Branch Potomac River near New Creek (town)	Mineral	Potomac	North Branch Potomac River	New Creek
99	Potts Creek	Monroe	James	James River	Potts Creek
100	Little Creek of Anthony Creek of Greenbrier River near Sue	Greenbrier	Greenbrier	Greenbrier River	Little Creek
101	Anthony Creek near confluence with Greenbrier River	Greenbrier	Greenbrier	Greenbrier River	Anthony Creek
102	Anthony Creek at mouth of North Fork Anthony Creek	Greenbrier	Greenbrier	Greenbrier River	Anthony Creek
103	Spring Creek near confluence with Greenbrier River	Greenbrier	Greenbrier	Greenbrier River	Spring Creek

SITEID	LOCATION	COUNTY	DRAINAGE	NEARESTRIV	STREAMNAME
104	Anthony Creek of Greenbrier River at mouth of Little Creek	Greenbrier	Greenbrier	Greenbrier River	Anthony Creek
105	Howard Creek of Greenbrier River between Dry Creek and Harts Run	Greenbrier	Greenbrier	Greenbrier River	Howard Creek
106	North Fork Cherry River near confluence with Cherry River	Nicholas	Gauley	Cherry River	North Fork Cherry River
112	North Fork of Greenbrier River near Green Bank	Pocahontas	Greenbrier	Greenbrier River	North Fork
113	East Fork Greenbrier River near Bartow	Pocahontas	Greenbrier	Greenbrier River	East Fork Greenbrier River
115	Williams River near Dyer	Webster	Gauley	Williams River	Williams River
137	Bluestone River north of Rich Creek near Spanishburg	Mercer	New	Bluestone River	Bluestone River
140	East River at Hardy	Mercer	New	East River	East River
149	Dry Fork of Tug Fork of Big Sandy River above War Creek	McDowell	Big Sandy	Tug Fork	Dry Fork
176	Dry Fork of Tug Fork of Big Sandy River at mouth of Jacobs Fork	McDowell	Big Sandy	Tug Fork	Dry Fork
209	Sutton Lake	Braxton	Elk	Elk River	Sutton Lake
210	New River above mouth of Meadow Creek	Raleigh-Summers line	New	New River	New River
221	Back Fork Elk River near confluence with Elk River	Webster	Elk	Elk River	Back Fork Elk River
222	Little Kanawha River at Falls Mill	Braxton	Little Kanawha	Little Kanawha River	Little Kanawha River
223	mouths of Dunlap Creek and Cove Creek near VA state line	Monroe	James	James River	Dunlap Creek
224	Potts Creek	Monroe	James	James River	Potts Creek
225	Second Creek of Greenbrier River at mouth of Devil Creek	Monroe	Greenbrier	Greenbrier River	Second Creek
226	Indian Creek of New River at mouth of Turkey Creek	Monroe	New	New River	Indian Creek
227	Greenbrier River at mouth of Griffith Creek	Summers	Greenbrier	Greenbrier River	Greenbrier River
228	Greenbrier River at mouth of Howard Creek	Greenbrier	Greenbrier	Greenbrier River	Greenbrier River
229	Knapp Creek of Greenbrier River at mouth of Douthat Creek	Pocahontas	Greenbrier	Greenbrier River	Knapp Creek
230	upper Big Spring Fork of Elk River	Pocahontas	Elk	Elk River	Big Spring Fork
231	North Fork of Greenbrier River below mouth of Deer Creek	Pocahontas	Greenbrier	Greenbrier River	North Fork
235	Turtle Creek near confluence with Little Coal River	Boone	Coal	Little Coal River	Turtle Creek
236	Big Coal River below mouth of Elk Run	Boone	Coal	Big Coal River	Big Coal River
237	Big Coal River at Peytona	Boone	Coal	Big Coal River	Big Coal River
238	Howard Creek of Greenbrier River at mouth of Dry Creek near WS Springs	Greenbrier	Greenbrier	Greenbrier River	Howard Creek
240	Elk River below Shadyside	Braxton	Elk	Elk River	Elk River
241	Strange Creek near confluence with Elk River	Braxton	Elk	Elk River	Strange Creek
242	Little Coal River near Adams	Boone	Coal	Little Coal River	Little Coal River

SITEID	LOCATION	COUNTY	DRAINAGE	NEARESTRIV	STREAMNAME
243	Birch River near confluence with Elk River	Braxton	Elk	Birch River	Birch River
245	Ohio River above mouth of Guyandotte River	Cabell	Guyandotte	Ohio River	Ohio River
246	Mud River near Ona	Cabell	Guyandotte	Mud River	Mud River
247	Little Kanawha River above Grantsville	Calhoun	Little Kanawha	Little Kanawha River	Little Kanawha River
248	Big Otter Creek of Elk River	Clay	Elk	Elk River	Big Otter Creek
249	Elk River between Big Otter Creek and Buffalo Creek	Clay	Elk	Elk River	Elk River
251	New River at mouth of Mill Creek near Hawks Nest	Fayette	New	New River	Mill Creek
252	Bear Fork of Little Kanawha River	Gilmer	Little Kanawha	Little Kanawha River	Bear Fork
256	Mill Creek of Ohio River near Saltpetre	Wayne	Ohio South	Ohio River	Mill Creek
257	Greenbrier River at mouth of Second Creek	Greenbrier	Greenbrier	Greenbrier River	Second Creek
258	Little Coal River near McCorkle	Kan-Lin-Boone line	Coal	Little Coal River	Little Coal River
259	Greenbrier River at mouth of Muddy Creek	Gbrier-Monroe line	Greenbrier	Greenbrier River	Muddy Creek
260	Camp Creek near confluence with Little Coal River	Boone	Coal	Little Coal River	Camp Creek
271	Sandy Creek of Ohio River at mouths of Left Fk and Right Fk Sandy Ck	Jackson	Ohio South	Ohio River	Sandy Creek
272	Tug Fork of Mill Creek of Ohio River near Skidmore	Jackson	Ohio South	Ohio River	Tug Fork
273	Mill Creek of Ohio River below Angerona	Jackson	Ohio South	Ohio River	Mill Creek
274	upper Little Mill Creek of Mill Creek of Ohio River	Jackson	Ohio South	Ohio River	Little Mill Creek
275	Kanawha River near Nitro	Kanawha	Kanawha	Kanawha River	Kanawha River
276	Big Coal River near Upper Falls	Kanawha	Coal	Big Coal River	Big Coal River
277	upper Davis Creek of Kanawha River	Kanawha	Kanawha	Kanawha River	Davis Creek
278	Davis Creek near confluence with Kanawha River	Kanawha	Kanawha	Kanawha River	Davis Creek
280	Spruce Fork of Little Coal River near Five Block	Logan	Coal	Little Coal River	Spruce Fork
281	Ohio River near Gallipolis	Mason	Ohio South	Ohio River	Ohio River
282	Ohio River at mouth of Kanawha River	Mason	Ohio South	Ohio River	Kanawha River
283	Tug Fork of Big Sandy River at mouth of Panther Creek	McDowell	Big Sandy	Tug Fork	Tug Fork
284	Brush Creek of Bluestone River near Princeton	Mercer	New	Bluestone River	Brush Creek
285	Bluestone River near VA state line	Mercer	New	Bluestone River	Bluestone River
286	Bluestone River above Flipping	Mercer	New	Bluestone River	Bluestone River
287	Laurel Creek of Brush Creek of Bluestone River near Speedway	Mercer	New	Bluestone River	Laurel Creek
289	Beech Creek of Tug Fork of Big Sandy River below Hinch	Mingo	Big Sandy	Tug Fork	Beech Creek
290	Tug Fork of Big Sandy River below Williamson	Mingo	Big Sandy	Tug Fork	Tug Fork
291	Big Coal River near Dartmont	Boone	Coal	Big Coal River	Big Coal River

SITEID	LOCATION	COUNTY	DRAINAGE	NEARESTRIV	STREAMNAME
292	Cove Creek near Pedro	Monroe	James	James River	Cove Creek
293	Devil Ck of Second Ck of Greenbrier River at mouth of Little Devil Ck	Monroe	Greenbrier	Greenbrier River	Devil Creek
294	Potts Creek	Monroe	James	James River	Potts Creek
295	Little Devil Ck of Devil Crk of Second Creek of Greenbrier River	Monroe	Greenbrier	Greenbrier River	Little Devil Creek
296	Indian Creek of New River below mouth of Hans Creek	Monroe	New	New River	Indian Creek
297	Gauley River at entrance of Summersville Lake	Nicholas	Gauley	Gauley River	Summersville Lake
309	Hopkins Fork of Big Coal River at mouth of Laurel Creek	Boone	Coal	Big Coal River	Hopkins Fork
310	Greenbrier River at mouth of Stony Creek	Pocahontas	Greenbrier	Greenbrier River	Stony Creek
311	Big Coal River at Bloomingrose	Boone	Coal	Big Coal River	Big Coal River
312	upper Thorny Creek of Greenbrier River at Dilleys Mill	Pocahontas	Greenbrier	Greenbrier River	Thorny Creek
313	Little River near confluence with East Fork Greenbrier River	Pocahontas	Greenbrier	Little River	Little River
314	West Fork Greenbrier River at Olive	Pocahontas	Greenbrier	Greenbrier River	West Fork Greenbrier River
315	Knapp Creek of Greenbrier River below Huntersville	Pocahontas	Greenbrier	Greenbrier River	Knapp Creek
316	Big Spring Fork of Elk River near Walnut	Pocahontas	Elk	Elk River	Big Spring Fork
321	White Oak Creek of Big Coal River	Boone	Coal	Big Coal River	White Oak Creek
323	Pocatalico River near Poplar Point Estates	Putnam	Kanawha	Pocatalico River	Pocatalico River
324	Eightmile Creek of Kanawha River below Extra	Putnam	Kanawha	Kanawha River	Eightmile Creek
325	New River at mouth of Piney Creek near McCreery	Raleigh	New	New River	New River
326	Winding Gulf of Guyandotte River at Stotesbury	Raleigh	Guyandotte	Guyandotte River	Winding Gulf
327	Big Coal River above Sylvester	Boone	Coal	Big Coal River	Big Coal River
328	Devils Fork of Guyandotte River above Madeline	Raleigh	Guyandotte	Guyandotte River	Devils Fork
330	Paint Creek of Kanawha River near Standard	Kanawha	Kanawha	Kanawha River	Paint Creek
332	Stony Creek of Greenbrier River above Campbelltown	Pocahontas	Greenbrier	Greenbrier River	Stony Creek
334	Clear Fork of Big Coal River near Ameagle	Raleigh	Coal	Big Coal River	Clear Fork
340	Beech Fork of Twelvepole Creek below Beech Fork Lake Dam	Wayne	Twelvepole	Twelvepole Creek	Beech Fork
341	Clear Fork of Big Coal River below Dorothy	Raleigh	Coal	Big Coal River	Clear Fork
343	Marsh Fork of Big Coal River near Eunice	Raleigh	Coal	Big Coal River	Marsh Fork
344	Marsh Fork of Big Coal River at Masseyville	Raleigh	Coal	Big Coal River	Marsh Fork
345	Marsh Fork of Big Coal River near Shiloh	Raleigh	Coal	Big Coal River	Marsh Fork
347	Spring Creek of Little Kanawha River near Spencer	Roane	Little Kanawha	Little Kanawha River	Spring Creek
348	Trace Fork of Pocatalico River at Harmony	Roane	Kanawha	Pocatalico River	Trace Fork

SITEID	LOCATION	COUNTY	DRAINAGE	NEARESTRIV	STREAMNAME
349	Lick Creek of New River above New Richmond	Summers	New	New River	Lick Creek
352	Indian Creek of New River above mouth of Rock Camp Creek	Monroe	New	New River	Indian Creek
358	Twelvepole Creek below Wayne	Wayne	Twelvepole	Twelvepole Creek	Twelvepole Creek
360	Reedy Creek of Little Kanawha River below Two Run	Wirt	Little Kanawha	Little Kanawha River	Reedy Creek
361	Little Kanawha River near Standingstone	Wirt	Little Kanawha	Little Kanawha River	Little Kanawha River
363	upper Tygart Creek of Kanawha River above Fountain Spring	Wood	Kanawha	Kanawha River	Tygart Creek
364	Indian Creek of Guyandotte River near Fanrock	Wyoming	Guyandotte	Guyandotte River	Indian Creek
366	Big Sandy Creek near confluence with Elk River at Clendenin	Kanawha	Elk	Elk River	Big Sandy Creek
367	Williams River below mouth of Big Laurel Creek	Pocahontas	Gauley	Williams River	Williams River
368	Knapp Creek of Greenbrier River at Huntersville	Pocahontas	Greenbrier	Greenbrier River	Knapp Creek
369	Ohio River at Huntington	Cabell	Ohio South	Ohio River	Ohio River
370	Elk River below mouth of Little Sandy Creek	Kanawha	Elk	Elk River	Elk River
371	Piney Creek of New River near Fitzpatrick	Raleigh	New	New River	Piney Creek
374	Little Beaver Creek of Beaver Creek of Piney Creek of New River	Raleigh	New	New River	Little Beaver Creek
375	Glade Creek of New River below Glade Springs	Raleigh	New	New River	Glade Creek
376	Collins Branch of Paint Creek of Kanawha River	Kanawha	Kanawha	Kanawha River	Collins Branch
377	Pocatalico Creek of Pocatalico River below mouth of Sugar Creek	Kanawha	Kanawha	Pocatalico River	Pocatalico Creek
378	Loop Creek of Kanawha River above Robson	Fayette	Kanawha	Kanawha River	Loop Creek
381	Rich Creek of Bluestone River below Beeson	Mercer	New	Bluestone River	Rich Creek
383	Rich Creek of Bluestone River above Spanishburg	Mercer	New	Bluestone River	Rich Creek
384	Camp Creek of Bluestone River above Eads Mill	Mercer	New	Bluestone River	Camp Creek
386	lower Indian Creek of New River	Monroe	New	New River	Indian Creek
387	Indian Creek of New River above mouth of Hans Creek	Monroe	New	New River	Indian Creek
388	Indian Creek of New River at mouth of Laurel Creek	Monroe	New	New River	Indian Creek
389	Wolf Creek near confluence with Greenbrier River	Monroe	Greenbrier	Greenbrier River	Wolf Creek
390	Mill Creek of Muddy Creek of Greenbrier River near Blaker Mills	Greenbrier	Greenbrier	Greenbrier River	Mill Creek
391	Cherry River below Richwood	Nicholas	Gauley	Cherry River	Cherry River
392	Muddy Creek of Greenbrier River near Palestine	Greenbrier	Greenbrier	Greenbrier River	Muddy Creek
393	New River above mouth of Laurel Creek	Fayette	New	New River	New River
394	Second Creek of Greenbrier River at mouth of Forest Run	Monroe	Greenbrier	Greenbrier River	Second Creek

SITEID	LOCATION	COUNTY	DRAINAGE	NEARESTRIV	STREAMNAME
395	Second Creek of Greenbrier River below Hollywood	Monroe	Greenbrier	Greenbrier River	Second Creek
396	Second Creek of Greenbrier River above Patton	Gbrier-Monroe line	Greenbrier	Greenbrier River	Second Creek
398	Millers Fk of Beech Fk of Twelvepole Ck at Beech Fk Lake	Wayne	Twelvepole	Twelvepole Creek	Beech Fork Lake
399	Beech Fork near confluence with Twelvepole Creek	Wayne	Twelvepole	Twelvepole Creek	Beech Fork
400	Anthony Creek of Greenbrier River below Shryock	Greenbrier	Greenbrier	Greenbrier River	Anthony Creek
401	East Fork Greenbrier River above Thornwood	Pocahontas	Greenbrier	Greenbrier River	East Fork Greenbrier River
402	Deer Creek of North Fork of Greenbrier River below Boyer	Pocahontas	Greenbrier	Greenbrier River	Deer Creek
403	North Fork of Greenbrier River above Green Bank	Pocahontas	Greenbrier	Greenbrier River	North Fork
404	Shellington Creek of Greenbrier River at Dunmore	Pocahontas	Greenbrier	Greenbrier River	Shellington Creek
405	upper Knapp Creek of Greenbrier River	Pocahontas	Greenbrier	Greenbrier River	Knapp Creek
406	Millers Fk of Beech Fk of Twelvepole Ck at mouth of Fisher Bowen Br	Wayne	Twelvepole	Twelvepole Creek	Millers Fork
407	upper Elk River above Big Spring Fork	Pocahontas	Elk	Elk River	Elk River
408	Big Laurel Creek of Williams River	Pocahontas	Gauley	Williams River	Big Laurel Creek
409	Williams River near Pocahontas-Webster county line	Pocahontas	Gauley	Williams River	Williams River
410	upper Cranberry River near headwaters	Pocahontas	Gauley	Cranberry River	Cranberry River
411	Williams River near Pocahontas-Webster county line	Webster	Gauley	Williams River	Williams River
412	Big Spring Fork of Elk River near Linwood	Pocahontas	Elk	Elk River	Big Spring Fork
413	Elk River above Bergoo	Webster	Elk	Elk River	Elk River
414	Right Fork Holly River at mouth of Grassy Creek	Webster	Elk	Holly River	Right Fork Holly River
415	upper Birch River above Boggs	Webster	Elk	Elk River	Birch River
416	southwest portion of Sutton Lake of Elk River	Braxton	Elk	Elk River	Sutton Lake
417	Gauley River above Bolair	Webster	Gauley	Gauley River	Gauley River
418	Laurel Creek of Elk River at Erbacon	Webster	Elk	Elk River	Laurel Creek
419	North Fork Cherry River near confluence with Cherry River	Nicholas	Gauley	Cherry River	North Fork Cherry River
420	Peters Creek of Gauley River near Lockwood	Nicholas	Gauley	Gauley River	Peters Creek
421	upper Peters Creek of Gauley River above Enon	Nicholas	Gauley	Gauley River	Peters Creek
422	Cranberry River near confluence with Gauley River	Nicholas	Gauley	Cranberry River	Cranberry River
423	Little Clear Creek of Meadow River below Kieffer	Greenbrier	Gauley	Meadow River	Little Clear Creek
424	Meadow River at mouth of Sewell Creek	Greenbrier	Gauley	Meadow River	Meadow River
425	Muddlety Creek near confluence with Gauley River	Nicholas	Gauley	Gauley River	Muddlety Creek
426	Muddlety Creek of Gauley River above Hookersville	Nicholas	Gauley	Gauley River	Muddlety Creek
427	Twentymile Creek of Gauley River above Vaughan	Nicholas	Gauley	Gauley River	Twentymile Creek

SITEID	LOCATION	COUNTY	DRAINAGE	NEARESTRIV	STREAMNAME
428	Little Sandy Creek near confluence with Elk River	Kanawha	Elk	Elk River	Little Sandy Creek
429	Blue Creek of Elk River near Coalridge	Kanawha	Elk	Elk River	Blue Creek
430	middle Falling Rock Creek of Elk River	Kanawha	Elk	Elk River	Falling Rock Creek
431	upper Pocatalico River between Stringtown and Walton	Roane	Kanawha	Pocatalico River	Pocatalico River
432	Left Hand Run of Big Sandy Creek of Elk River	Roane	Elk	Elk River	Left Hand Run
433	Big Sandy Creek of Elk River near Wellford	Kanawha	Elk	Elk River	Big Sandy Creek
434	Buffalo Creek of Elk River near Jamestown	Clay	Elk	Elk River	Buffalo Creek
435	Buffalo Creek of Elk River between Widen and Eakle	Clay	Elk	Elk River	Buffalo Creek
436	Millers Fork of Beech Fork of Twelvepole Creek below Crockett	Wayne	Twelvepole	Twelvepole Creek	Millers Fork
437	upper Indian Creek of New River	Monroe	New	New River	Indian Creek
438	East River near Oakvale	Mercer	New	East River	East River
439	New River at mouth of Indian Creek in Bluestone Lake	Summers	New	New River	Bluestone Lake
440	Bluestone Lake between Toms Run and Pipestem Creek	Summers	New	New River	Bluestone Lake
441	Rich Creek of New River below mouth of Dry Creek	Monroe	New	New River	Rich Creek
442	Bluestone Lake below mouth of Indian Creek	Summers	New	New River	Bluestone Lake
444	New River near Barksdale	Summers	New	New River	New River
446	Lick Creek of New River at Green Sulphur Springs	Summers	New	New River	Lick Creek
447	Bluestone Lake near mouth of Blustone River	Summers	New	New River	Bluestone Lake
448	New River between Terry and McKendree	Fayette-Raleigh line	New	New River	New River
449	New River at mouth of Laurel Creek near Quinnimont	Fayette-Raleigh line	New	New River	New River
450	Laurel Creek of New River near Laurel Creek town	Fayette	New	New River	Laurel Creek
451	Piney Creek of New River near Sullivan	Raleigh	New	New River	Piney Creek
452	New River at mouth of Arbuckle Creek	Fayette	New	New River	New River
453	Bluestone River above Lake Shawnee	Mercer	New	Bluestone River	Bluestone River
454	Laurel Creek of New River below Dempsey	Fayette	New	New River	Laurel Creek
455	New River near confluence with Gauley River	Fayette	New	New River	New River
456	Big Creek of Gauley River above Brownsville	Fayette	Gauley	Gauley River	Big Creek
457	Cabin Creek of Kanawha River near Dry Branch	Kanawha	Kanawha	Kanawha River	Cabin Creek
458	Paint Creek near confluence with Kanawha River	Kanawha	Kanawha	Kanawha River	Paint Creek
459	Kanawha River at mouth of Paint Creek	Kanawha	Kanawha	Kanawha River	Kanawha River
460	Kanwaha River at mouth of Lens Creek	Kanawha	Kanawha	Kanawha River	Kanawha River
461	Campbells Creek of Kanawha River at Tad	Kanawha	Kanawha	Kanawha River	Campbells Creek

SITEID	LOCATION	COUNTY	DRAINAGE	NEARESTRIV	STREAMNAME
462	Twomile Creek of Kanawha River below Guthrie	Kanawha	Kanawha	Kanawha River	Twomile Creek
463	Davis Creek of Kanawha River below Loudendale	Kanawha	Kanawha	Kanawha River	Davis Creek
464	Big Coal River at mouth of Little Coal River	Kanawha	Coal	Big Coal River	Big Coal River
465	Kanawha River near Belle	Kanawha	Kanawha	Kanawha River	Kanawha River
466	Pocatalico River at mouth of Clay Bank Branch near Rocky Fork	Kanawha	Kanawha	Pocatalico River	Pocatalico River
467	middle Eightmile Creek of Kanawha River	Putnam	Kanawha	Kanawha River	Eightmile Creek
468	Threemile Creek near confluence with Kanawha River	Mason	Kanawha	Kanawha River	Threemile Creek
469	Sinking Creek of Greenbrier River near Cornstalk	Greenbrier	Greenbrier	Greenbrier River	Sinking Creek
471	Greenbrier River above mouth of Spring Creek	Greenbrier	Greenbrier	Greenbrier River	Greenbrier River
472	Dry Fork of Tug Fork of Big Sandy River at mouth of War Creek	McDowell	Big Sandy	Tug Fork	Dry Fork
473	Wolf Creek of Greenbrier River below Wolfcreek town	Monroe	Greenbrier	Greenbrier River	Wolf Creek
475	Hurricane Creek of Kanawha River below mouth of Poplar Fork	Putnam	Kanawha	Kanawha River	Hurricane Creek
476	upper Five and Twenty Mile Creek of Kanawha River	Putnam	Kanawha	Kanawha River	Five and Twenty Mile Creek
477	Sixteenmile Creek near confluence with Kanawha River	Mason	Kanawha	Kanawha River	Sixteenmile Creek
478	Little Sixteenmile Creek of Kanawha River near Southside	Mason	Kanawha	Kanawha River	Little Sixteenmile Creek
479	middle Threemile Creek of Kanawha River	Mason	Kanawha	Kanawha River	Threemile Creek
480	middle Five and Twenty Mile Creek of Kanawha River	Putnam	Kanawha	Kanawha River	Five and Twenty Mile Creek
481	Kanawha River at mouth of Five and Twenty Mile Creek	Putnam	Kanawha	Kanawha River	Kanawha River
482	Kanawha River at mouth of Hurricane Creek	Putnam	Kanawha	Kanawha River	Kanawha River
483	Kanawha River at mouth of Little Hurricane Creek	Putnam	Kanawha	Kanawha River	Kanawha River
484	Kanawha River above mouth of Big Coal River near Sattes	Kanawha	Kanawha	Kanawha River	Kanawha River
485	Kanawha River near Dunbar	Kanawha	Kanawha	Kanawha River	Kanawha River
486	Elk River below mouth of Big Otter Creek near Gould	Clay	Elk	Elk River	Elk River
487	Elk River at mouth of King Shoals Run	Kanawha	Elk	Elk River	Elk River
488	Elk River at mouth of Little Sandy Creek	Kanawha	Elk	Elk River	Elk River
489	Elk River at mouth of Elk Creek	Kanawha	Elk	Elk River	Elk River
490	Muddlety Creek of Gauley River at mouth of Duffy Branch	Nicholas	Gauley	Gauley River	Muddlety Creek
491	Panther Creek near confluence with Gauley River	Nicholas	Gauley	Gauley River	Panther Creek
492	Grassy Creek of Brushy Meadow Creek of Hominy Creek of Gauley River	Nicholas	Gauley	Gauley River	Grassy Creek
493	Gauley River near Bolair	Webster	Gauley	Gauley River	Gauley River
494	Fisher Bowen Branch of Millers Fork of Beech Fork of Twelvepole Creek	Wayne	Twelvepole	Twelvepole Creek	Fisher Bowen Branch

SITEID	LOCATION	COUNTY	DRAINAGE	NEARESTRIV	STREAMNAME
501	Elk River near Curtin	Webster	Elk	Elk River	Elk River
502	Hominy Creek of Gauley River at mouth of Sugar Branch	Nicholas	Gauley	Gauley River	Hominy Creek
504	Cranberry River at mouth of Dogway Fork	Webster	Gauley	Cranberry River	Cranberry River
505	Williams River at mouth of White Oak Fork	Webster	Gauley	Williams River	Williams River
507	lower Pigeon Run of Big Sandy Creek of Elk River	Roane	Elk	Elk River	Pigeon Run
508	Right Fork Holly River below Fishers Crossing	Webster	Elk	Holly River	Right Fork Holly River
509	Birch River above Herold	Braxton	Elk	Birch River	Birch River
511	Turkey Creek of Indian Creek of New River	Monroe	New	New River	Turkey Creek
512	Bluestone River bet mouths of Little Bluestone River and Mountain Ck	Summers	New	Bluestone River	Bluestone River
513	Elk River near mouth of Wolfpen Run	Webster	Elk	Elk River	Elk River
514	Elk River below Cherry Falls	Webster	Elk	Elk River	Elk River
516	Gauley River at mouth of Big Creek at Brownsville	Fayette	Gauley	Gauley River	Gauley River
517	Gauley River at mouth of Twentymile Creek at Belva	Nicholas	Gauley	Gauley River	Gauley River
518	lower Twentymile Creek of Gauley River	Nicholas	Gauley	Gauley River	Twentymile Creek
519	Elk River below Skidmore Crossing	Webster	Elk	Elk River	Elk River
520	lower Hughes Creek of Kanawha River	Kanawha	Kanawha	Kanawha River	Hughes Creek
523	Birch River above Birch River town	Nicholas	Elk	Birch River	Birch River
524	Big Ditch Run of Gauley River at Welch Glade	Webster	Gauley	Gauley River	Big Ditch Run
525	Sugar Creek of Back Fork Elk River at mouth of Mill Run	Webster	Elk	Elk River	Sugar Creek
526	Birch River at mouth of Rich Fork above Skyles	Nichls-Webster line	Elk	Birch River	Birch River
527	Elk River at mouth of Little Run	Webster	Elk	Elk River	Elk River
528	Elk River above Webster-Randolph line	Randolph	Elk	Elk River	Elk River
529	Beech Fork Lake of Beech Fork of Twelvepole Creek	Wayne	Twelvepole	Twelvepole Creek	Beech Fork Lake
530	Stony River near Mount Storm below Mt. Storm Lake	Grant	Potomac	Stony River	Stony River
533	Guyandotte River between Corinne and Beechwood	Wyoming	Guyandotte	Guyandotte River	Guyandotte River
534	Greenbrier River at mouth of Leatherbark Run	Pocahontas	Greenbrier	Greenbrier River	Greenbrier River
535	Marsh Fork of Big Coal River near Arnett	Raleigh	Coal	Big Coal River	Marsh Fork
536	Beech Fork Lake of Beech Fork of Twelvepole Creek	Wayne	Twelvepole	Twelvepole Creek	Beech Fork Lake
537	Little Kanawha River at mouth of West Fork Little Kanawha	Wirt	Little Kanawha	Little Kanawha River	Little Kanawha River
538	Guyandotte River at mouth of Mud River	Cabell	Guyandotte	Guyandotte River	Guyandotte River
539	Island Creek of Guyandotte River at Micco	Logan	Guyandotte	Guyandotte River	Island Creek
540	Mud River at mouth of Dry Creek	Cabell	Guyandotte	Mud River	Mud River

SITEID	LOCATION	COUNTY	DRAINAGE	NEARESTRIV	STREAMNAME
541	Twelvepole Creek below mouth of Wilson Creek	Wayne	Twelvepole	Twelvepole Creek	Twelvepole Creek
542	Mill Run near confluence with Ohio River	Mason	Ohio South	Ohio River	Mill Run
543	West Fork Twelvepole Creek near Coleman	Wayne	Twelvepole	Twelvepole Creek	West Fork Twelvepole Creek
547	East Fork Twelvepole Creek at mouths of Camp Ck and Little Lynn Ck	Wayne	Twelvepole	Twelvepole Creek	East Fork Twelvepole Creek
549	New Creek of North Fork Potomac River near Claysville	Mineral	Potomac	North Branch Potomac	New Creek
550	Guyandotte River at Glover	Wyoming	Guyandotte	Guyandotte River	Guyandotte River
551	Garrett Creek near confluence with Twelvepole Creek	Wayne	Twelvepole	Twelvepole Creek	Garrett Creek
552	upper Garrett Creek of Twelvepole Creek	Wayne	Twelvepole	Twelvepole Creek	Garrett Creek
553	Little Kanawha River below mouth of Big Root Run	Calhoun	Little Kanawha	Little Kanawha River	Little Kanawha River
554	middle Buffalo Creek Twelvepole Creek	Wayne	Twelvepole	Twelvepole Creek	Buffalo Creek
555	Whites Creek between Rocklick Branch and Sours Creek	Wayne	Big Sandy	Big Sandy River	Whites Creek
557	Little River of West Fork Greenbrier River above Burner	Pocahontas	Greenbrier	Little River	Little River
559	Kanawha River near London	Kanawha	Kanawha	Kanawha River	Kanawha River
560	South Fork Hughes River at mouth of Lick Run	Ritchie	Little Kanawha	Hughes River	South Fork Hughes River
561	Gauley River above mouth of Williams River	Webster	Gauley	Gauley River	Gauley River
562	New River at mouth of Wolf Creek	Fayette	New	New River	New River
563	Greenbrier River at mouth of Anthony Creek	Greenbrier	Greenbrier	Greenbrier River	Greenbrier River
564	Elk River at mouth of Upper Two Run near Hartland	Clay	Elk	Elk River	Elk River
565	Whites Creek near confluence with Big Sandy River	Wayne	Big Sandy	Big Sandy River	Whites Creek
566	upper Whites Creek of Big Sandy River above Centerville	Wayne	Big Sandy	Big Sandy River	Whites Creek
567	Little Kanawha River at mouth of Annamoriah Run	Calhoun	Little Kanawha	Little Kanawha River	Little Kanawha River
568	Culverson Creek of Greenbrier River near Fort Donnally	Greenbrier	Greenbrier	Greenbrier River	Culverson Creek
569	Leading Creek of Little Kanawha River at mouth of Flat Run	Gilmer	Little Kanawha	Little Kanawha River	Leading Creek
570	Hills Creek of Greenbrier River near Lobelia	Pocahontas	Greenbrier	Greenbrier River	Hills Creek
572	Harts Run near confluence with Howard Creek of Greenbrier River	Greenbrier	Greenbrier	Greenbrier River	Harts Run
573	Little Kanawha River at mouth of Bells Run	Calhoun	Little Kanawha	Little Kanawha River	Little Kanawha River
574	Big Sandy River at mouth of Whites Creek	Wayne	Big Sandy	Big Sandy River	Big Sandy River
577	Lick Ck branch of East Lynn Lake of East Fork Twelvepole Creek	Wayne	Twelvepole	Twelvepole Creek	East Lynn Lake
578	main East Lynn Lake of East Fork Twelvepole Creek	Wayne	Twelvepole	Twelvepole Creek	East Lynn Lake
579	East Fork Twelvepole Ck near confluence with West Fork Twelvepole Ck	Wayne	Twelvepole	Twelvepole Creek	East Fork Twelvepole Creek

SITEID	LOCATION	COUNTY	DRAINAGE	NEARESTRIV	STREAMNAME
580	Twelvepole Creek between Beech Fork and Buffalo Creek	Wayne	Twelvepole	Twelvepole Creek	Twelvepole Creek
581	Bonds Creek of North Fork Hughes River at mouth of McGregor Run	Ritchie	Little Kanawha	Hughes River	Bonds Creek
582	Cove Ck branch of East Lynn Lake of East Fork Twelvepole Creek	Wayne	Twelvepole	Twelvepole Creek	East Lynn Lake
583	Dry Fork of Tug Fork of Big Sandy River at mouth of Barrenshe Creek	McDowell	Big Sandy	Tug Fork	Dry Fork
584	Loop Creek of Kanawha River at mouth of Big Righthand Fork	Fayette	Kanawha	Kanawha River	Loop Creek
585	Panther Creek of Tug Fork of Big Sandy River at mouth of Trap Fork	McDowell	Big Sandy	Tug Fork	Panther Creek
586	Tug Fork of Big Sandy River at mouth of South Fork Tug Fork	McDowell	Big Sandy	Tug Fork	Tug Fork
587	East Lynn Lake of East Fork Twelvepole Creek at mouth of Kiah Creek	Wayne	Twelvepole	Twelvepole Creek	East Lynn Lake
588	lower Panther Creek of Tug Fork of Big Sandy River	McDowell	Big Sandy	Tug Fork	Panther Creek
590	Little Birch River at mouth of Twolick Run	Braxton	Elk	Birch River	Little Birch River
592	Twelvepole Creek at mouth of Beech Fork	Wayne	Twelvepole	Twelvepole Creek	Twelvepole Creek
593	upper Little Kanawha River near Canaan	Upshur	Little Kanawha	Little Kanawha River	Little Kanawha River
594	upper Little Kanawha River at Wildcat	Lewis	Little Kanawha	Little Kanawha River	Little Kanawha River
595	North Fork Hughes River at mouth of Spring Run	Ritchie	Little Kanawha	Hughes River	North Fork Hughes River
596	lower Kiah Creek of East Fork Twelvepole Creek near East Lynn Lake	Wayne	Twelvepole	Twelvepole Creek	Kiah Creek
597	East Fork Twelvepole Creek at mouth of Milam Creek	Wayne	Twelvepole	Twelvepole Creek	East Fork Twelvepole Creek
599	Brush Creek branch of East Lynn Lake of East Fork Twelvepole Creek	Wayne	Twelvepole	Twelvepole Creek	East Lynn Lake
600	Elk River at Queen Shoals	Clay-Kanawha line	Elk	Elk River	Elk River
601	Elk River at mouth of Blue Creek	Kanawha	Elk	Elk River	Elk River
604	Elk River at mouth of Dulls Creek near Procious	Clay	Elk	Elk River	Elk River
605	Anthony Creek of Greenbrier River above mouth of N Fork Anthony Creek	Greenbrier	Greenbrier	Greenbrier River	Anthony Creek
606	Elk River at Gassaway	Braxton	Elk	Elk River	Elk River
607	Elk River near mouth of Groves Creek	Clay	Elk	Elk River	Elk River
608	Goose Creek of Little Kanawha River at mouth of Nutter Fork	Ritchie	Little Kanawha	Little Kanawha River	Goose Creek
610	Anthony Creek Greenbrier River above mouth of Little Creek	Greenbrier	Greenbrier	Greenbrier River	Anthony Creek
611	Pocatalico River below mouth of Kelly Creek	Kanawha	Kanawha	Pocatalico River	Pocatalico River
612	Kanawha River near Brighton	Mason	Kanawha	Kanawha River	Kanawha River

SITEID	LOCATION	COUNTY	DRAINAGE	NEARESTRIV	STREAMNAME
613	Buffalo Creek of Guyandotte River at mouth of Davy Branch	Logan	Guyandotte	Guyandotte River	Buffalo Creek
614	Elk Creek of Guyandotte River at mouth of Moore Fork	Logan	Guyandotte	Guyandotte River	Elk Creek
616	Clay Bank Branch of Pocatalico River at mouth of Finney Branch	Kanawha	Kanawha	Pocatalico River	Clay Bank Branch
617	upper East Fork Twelvepole Creek above East Lynn Lake	Wayne	Twelvepole	Twelvepole Creek	East Fork Twelvepole Creek
618	Guyan Creek near confluence with Ohio River	Cabell	Ohio South	Ohio River	Guyan Creek
619	Left Fork Spring Ck of Little Kanawha River at mouth of Vandale Fork	Roane	Little Kanawha	Little Kanawha River	Left Fork Spring Creek
622	Guyandotte River at mouth of Cabin Creek	Wyoming	Guyandotte	Guyandotte River	Guyandotte River
624	Pigeon Creek of Tug Fork of Big Sandy River above Laurel Fork	Mingo	Big Sandy	Tug Fork	Pigeon Creek
628	Huff Creek of Guyandotte River at mouth of Beech Branch	Logan-Wyoming line	Guyandotte	Guyandotte River	Huff Creek
630	Charles Fk near confluence with Left Fk Spring Ck of Little Knwha Rvr	Roane	Little Kanawha	Little Kanawha River	Charles Fork
632	Guyandotte River near Gilbert	Mingo	Guyandotte	Guyandotte River	Guyandotte River
633	Ohio River at mouth of Crooked Creek	Mason	Ohio South	Ohio River	Ohio River
634	Lee Creek near confluence with Little Kanawha River	Wirt	Little Kanawha	Little Kanawha River	Lee Creek
635	Little Kanawha River at mouth of England Run near Gregory	Braxton	Little Kanawha	Little Kanawha River	Little Kanawha River
636	Little Kanawha River above Reedy Creek	Wirt	Little Kanawha	Little Kanawha River	Little Kanawha River
638	Mud River at mouth of Little Twomile Creek	Cabell	Guyandotte	Mud River	Mud River
639	Saltlick Ck of Little Kanawha River at mouth of Right Fork Saltlick Ck	Braxton	Little Kanawha	Little Kanawha River	Saltlick Creek
640	Laurel Fork of Clear Fork of Guyandotte River at Matheny	Wyoming	Guyandotte	Guyandotte River	Laurel Fork
641	upper Guyandotte River at mouths of Tommy Creek and Winding Gulf	Raleigh	Guyandotte	Guyandotte River	Guyandotte River
642	middle Indian Creek of Guyandotte River	Wyoming	Guyandotte	Guyandotte River	Indian Creek
644	South Fork Hughes River between Prunty and Goffs	Ritchie	Little Kanawha	Hughes River	South Fork Hughes River
646	Tenmile Creek of Kanawha River near Rollins	Mason	Kanawha	Kanawha River	Tenmile Creek
647	Hushers Run of North Fork Hughes River near Lamberton	Ritchie	Little Kanawha	Hughes River	Hushers Run
648	Paint Creek of Kanawha River below East Kingston	Fayette	Kanawha	Kanawha River	Paint Creek
649	Birch River between Diatter Run and Middle Run	Braxton	Elk	Birch River	Birch River
650	Indian Creek of South Fork Hughes River at mouth of Dog Run	Ritchie	Little Kanawha	Hughes River	Indian Creek
651	East Lynn Lake of East Fork Twelvepole Creek below dam	Wayne	Twelvepole	Twelvepole Creek	East Lynn Lake
652	Paint Creek of Kanawha River near Lively	Fayette	Kanawha	Kanawha River	Paint Creek
654	South Fork Hughes River at mouth of Lamb Run near Fonzo	Ritchie	Little Kanawha	Hughes River	South Fork Hughes River

SITEID	LOCATION	COUNTY	DRAINAGE	NEARESTRIV	STREAMNAME
655	Millstone Creek of West Fork Little Kanawha River near Millstone town	Calhoun	Little Kanawha	Little Kanawha River	Millstone Creek
656	Fink Creek of Leading Creek of Little Kanawha River near Vadis	Lewis	Little Kanawha	Little Kanawha River	Fink Creek
657	Tug Fork of Big Sandy River near mouth of Ben Creek	Mingo	Big Sandy	Tug Fork	Tug Fork
658	Oil Creek near confluence with Little Kanawha River	Braxton	Little Kanawha	Little Kanawha River	Oil Creek
659	Big Ugly Creek of Guyandotte River at mouth of Big Branch	Lincoln	Guyandotte	Guyandotte River	Big Ugly Creek
660	Little Kanawha River at mouth of Spring Creek near Sanoma	Wirt	Little Kanawha	Little Kanawha River	Little Kanawha River
661	Reedy Creek of Little Kanawha River at mouth of Conrad Run	Wirt	Little Kanawha	Little Kanawha River	Reedy Creek
662	Walker Creek near confluence with Little Kanawha River	Wood	Little Kanawha	Little Kanawha River	Walker Creek
664	Marsh Fork of Big Coal River at mouth of Ellis Creek near Montcoal	Raleigh	Coal	Big Coal River	Marsh Fork
665	Greenbrier River at mouth of Woodramtown Branch	Summers	Greenbrier	Greenbrier River	Greenbrier River
668	New River at mouth of Greenbrier River below Bluestone Dam	Summers	New	New River	New River
669	lower Bluestone Lake	Summers	New	Bluestone River	Bluestone Lake
673	New River below mouth of Greenbrier River	Summers	New	New River	New River
674	New River below Hinton	Raleigh-Summers line	New	New River	New River
678	North Fork Hughes River at mouth of Rush Run	Ritchie	Little Kanawha	Hughes River	North Fork Hughes River
681	North Fork Anthony Creek of Greenbrier River at mouth of Onemile Run	Greenbrier	Greenbrier	Greenbrier River	North Fork Anthony Creek
682	Potts Creek between Laurel Branch town and Virginia state line	Monroe	James	James River	Potts Creek
683	Elk River at mouth of Big Run	Webster	Elk	Elk River	Elk River
684	Little Sandy Creek near confluence with Ohio River above Sherman	Jackson	Ohio South	Ohio River	Little Sandy Creek
685	Ohio River below mouth of Kanawha River	Mason	Ohio South	Ohio River	Ohio River
686	Big Coal River near Coopertown	Boone	Coal	Big Coal River	Big Coal River
690	Little Kanawha River at mouth of Cub Run	Upshur	Little Kanawha	Little Kanawha River	Little Kanawha River
691	Meadow Creek of New River below Claypool	Summers	New	New River	Meadow Creek
692	Wolf Creek of New River near mouth of Levisee Creek	Fayette	New	New River	Wolf Creek
801	Guyandotte River at mouth of Pinnacle Creek	Wyoming	Guyandotte	Guyandotte River	Guyandotte River
802	Pinnacle Creek of Guyandotte River at mouth of Little White Oak Creek	Wyoming	Guyandotte	Guyandotte River	Pinnacle Creek
803	Guyandotte River at mouth of Indian Creek	Wyoming	Guyandotte	Guyandotte River	Guyandotte River
804	Clear Fork of Guyandotte River at mouth of Laurel Fork	Wyoming	Guyandotte	Guyandotte River	Clear Fork
805	Slab Fork of Guyandotte River at mouth of Marsh Fork near	Wyoming	Guyandotte	Guyandotte River	Slab Fork

SITEID	LOCATION	COUNTY	DRAINAGE	NEARESTRIV	STREAMNAME
	Maben				
806	Pinnacle Creek of Guyandotte River at mouth of Belcher Branch	Wyoming	Guyandotte	Guyandotte River	Pinnacle Creek
807	Little Huff Creek of Guyandotte River near Hanover	Wyoming	Guyandotte	Guyandotte River	Little Huff Creek
808	Guyandotte River near Tamcliff	Mingo	Guyandotte	Guyandotte River	Guyandotte River
809	Guyandotte River at mouth of White Oak Branch	Mingo	Guyandotte	Guyandotte River	Guyandotte River
810	Guyandotte River at mouths of Mill Creek and King Shoal Branch	Logan	Guyandotte	Guyandotte River	Guyandotte River
811	Guyandotte River near Taplin	Logan	Guyandotte	Guyandotte River	Guyandotte River
812	Big Creek of Guyandotte River at mouths of Trace Fork and Garrett Fork	Logan	Guyandotte	Guyandotte River	Big Creek
813	Guyandotte River at mouth of Fourmile Creek near Branchland	Lincoln	Guyandotte	Guyandotte River	Guyandotte River
814	Mud River at mouth of Middle Fork Mud River	Lincoln	Guyandotte	Mud River	Mud River
815	Guyandotte River below Salt Rock	Cabell	Guyandotte	Guyandotte River	Guyandotte River
816	Mud River above Milton	Cabell	Guyandotte	Mud River	Mud River
819	Locust Creek of Greenbrier River above Spice	Pocahontas	Greenbrier	Greenbrier River	Locust Creek
821	Hominy Creek of Gauley River above Summersville Dam	Nicholas	Gauley	Gauley River	Hominy Creek
822	Gauley River at mouth of Meadow River	Fayette-Nichls line	Gauley	Gauley River	Gauley River
823	Meadow River at mouth of Anglins Creek	Fayette-Nichls line	Gauley	Meadow River	Meadow River
824	Collison Creek near confluence with Gauley River	Nicholas	Gauley	Gauley River	Collison Creek
825	Meadow River at Russellville	Fayette-Gbrier line	Gauley	Meadow River	Meadow River
826	Gauley River at Beech Glen	Fayette-Nichls line	Gauley	Gauley River	Gauley River
827	Cranberry River below North Fork near Pocahontas-Webster line	Pocahontas	Gauley	Cranberry River	Cranberry River
828	Cranberry River below Glade Run near Nicholas-Webster line	Nicholas	Gauley	Cranberry River	Cranberry River
829	North Fork Cherry River at mouth of Little Lick Run	Greenbrier	Gauley	Cherry River	North Fork Cherry River
830	Peters Creek of Gauley River below Drennen	Nicholas	Gauley	Gauley River	Peters Creek
831	Meadow River at mouth of Arrowood Creek	Fayette-Nichls line	Gauley	Meadow River	Meadow River
832	Big Clear Creek of Meadow River at mouth of South Fork Big Clear Creek	Greenbrier	Gauley	Meadow River	Big Clear Creek
833	Cherry River at Holcomb	Nicholas	Gauley	Cherry River	Cherry River
834	Bells Creek of Twentymile Creek of Gauley River above Dixie	Nicholas	Gauley	Gauley River	Bells Creek
835	upper Gauley River at mouth of Big Run	Webster	Gauley	Gauley River	Gauley River
836	upper Gauley River near Jerryville	Webster	Gauley	Gauley River	Gauley River
837	Gauley River near Gauley Mills	Webster	Gauley	Gauley River	Gauley River

SITEID	LOCATION	COUNTY	DRAINAGE	NEARESTRIV	STREAMNAME
838	Gauley River at mouth of Cherry River	Nicholas	Gauley	Gauley River	Gauley River
839	Gauley River near Swiss	Fayette-Nichls line	Gauley	Gauley River	Gauley River
840	Big Beaver Creek of Gauley River above Beaver	Nicholas	Gauley	Gauley River	Big Beaver Creek
841	Laurel Creek near confluence with Cherry River below Saxman	Nicholas	Gauley	Cherry River	Laurel Creek
842	Muddlety Creek of Gauley River below Muddlety	Nicholas	Gauley	Gauley River	Muddlety Creek
843	Hominy Creek branch of Summersville Lake of Gauley River	Nicholas	Gauley	Gauley River	Hominy Creek
844	Campbells Creek of Kanawha River below Coal Fork	Kanawha	Kanawha	Kanawha River	Campbells Creek
845	Kanawha River at mouth of Cabin Creek	Kanawha	Kanawha	Kanawha River	Kanawha River
846	Lens Creek of Kanawha River at mouth of Left Fork Lens Creek	Kanawha	Kanawha	Kanawha River	Lens Creek
847	Kanawha River at mouth of Kellys Creek	Kanawha	Kanawha	Kanawha River	Kanawha River
848	Kellys Creek of Kanawha River near Ward	Kanawha	Kanawha	Kanawha River	Kellys Creek
850	Knapp Creek of Greenbrier River near Sunset	Pocahontas	Greenbrier	Greenbrier River	Knapp Creek
851	Wolf Creek of Greenbrier River near Elmhurst	Monroe	Greenbrier	Greenbrier River	Wolf Creek
852	Spring Creek of Greenbrier River at mouth of Rockcamp Run	Greenbrier	Greenbrier	Greenbrier River	Spring Creek
853	Sinking Creek of Greenbrier River near Hughart	Greenbrier	Greenbrier	Greenbrier River	Sinking Creek
854	Hughart Creek of Greenbrier River near Hughart	Greenbrier	Greenbrier	Greenbrier River	Hughart Creek
855	Sewell Creek of Meadow River above Rainelle	Greenbrier	Gauley	Meadow River	Sewell Creek
856	lower Gauley River above Gamoca	Fayette	Gauley	Gauley River	Gauley River
857	Meadow River above mouth of Little Clear Creek	Greenbrier	Gauley	Meadow River	Meadow River
858	upper Meadow River above Patterson Creek near Grassy Meadows	Greenbrier	Gauley	Meadow River	Meadow River
859	Patterson Creek near confluence with upper Meadow River	Greenbrier	Gauley	Meadow River	Patterson Creek
860	Meadow River above Sewell Creek near McRoss	Greenbrier	Gauley	Meadow River	Meadow River
861	Little Clear Creek of Meadow River near Shawvers Crossing	Greenbrier	Gauley	Meadow River	Little Clear Creek
862	Sewell Creek of Meadow River above Sims	Fayette	Gauley	Meadow River	Sewell Creek
863	Little Lick Run near confluence with North Fork Cherry River	Greenbrier	Gauley	Cherry River	Little Lick Run
864	Dogwood Creek of Meadow River near Jenky	Fayette	Gauley	Meadow River	Dogwood Creek
865	Little Sewell Creek of Sewell Creek of Meadow River above Boggs Creek	Greenbrier	Gauley	Meadow River	Little Sewell Creek
866	Big Clear Creek near confluence with Meadow River	Greenbrier	Gauley	Meadow River	Big Clear Creek
867	upper Little Clear Creek of Meadow River	Greenbrier	Gauley	Meadow River	Little Clear Creek
868	Laurel Creek of Cherry River above Jetsville	Greenbrier	Gauley	Cherry River	Laurel Creek
869	South Fork Cherry River near confluence with North Fork	Greenbrier	Gauley	Cherry River	South Fork Cherry River

SITEID	LOCATION	COUNTY	DRAINAGE	NEARESTRIV	STREAMNAME
	Cherry River				
870	Gauley River between Peters Junction and Swiss	Fayette-Nichls line	Gauley	Gauley River	Gauley River
871	Deer Creek of Hominy Creek of Gauley River near Deepwell	Nicholas	Gauley	Gauley River	Deer Creek
872	Paint Creek of Kanawha River at mouth of Toms Branch near Whittaker	Kanawha	Kanawha	Kanawha River	Paint Creek
873	Witcher Creek of Kanawha River at mouth of Dry Branch	Kanawha	Kanawha	Kanawha River	Witcher Creek
874	Kanawha River at Smithers	Fayette	Kanawha	Kanawha River	Kanawha River
875	Clear Fork of Guyandotte River above Sun Hill	Wyoming	Guyandotte	Guyandotte River	Clear Fork
877	Stony River between Stony River Reservoir and Mt. Storm Lake	Grant	Potomac	Stony River	Stony River
892	middle Robbins Run of Spring Creek of Greenbrier River	Greenbrier	Greenbrier	Greenbrier River	Robbins Run
893	Greenbrier River at mouth of Clover Creek near Clover Lick	Pocahontas	Greenbrier	Greenbrier River	Greenbrier River
894	Galford Run of Shellington Creek of Greenbrier River	Pocahontas	Greenbrier	Greenbrier River	Galford Run
895	Hills Creek of Greenbrier River near Pocahontas-Greenbrier line	Pocahontas	Greenbrier	Greenbrier River	Hills Creek
906	Kanawha River at confluence of Gauley River and New River	Fayette	Kanawha	Kanawha River	Kanawha River
914	Left Fork Holly River at mouth of Kelly Run below Poling	Webster	Elk	Holly River	Left Fork Holly River
915	Left Fork Holly River at mouth of Laurel Fork near Hacker Valley	Webster	Elk	Holly River	Left Fork Holly River
916	Back Fork Elk River near Skelt	Webster	Elk	Elk River	Back Fork Elk River
917	upper Elk River at mouth of Big Spring Fork	Pocahontas	Elk	Elk River	Elk River
918	upper Difficult Creek of North Branch Potomac River	Grant	Potomac	North Branch Potomac River	Difficult Creek
919	upper New Creek of North Branch Potomac River near Laurel Dale	Mineral	Potomac	North Branch Potomac River	New Creek
920	upper Elk River below Big Spring Fork	Pocahontas	Elk	Elk River	Elk River
921	Elk River below Bergoo	Webster	Elk	Elk River	Elk River
925	Elk River above mouth of Laurel Creek	Webster	Elk	Elk River	Elk River
926	Grassy Creek of Right Fork Holly River between Orndoff and Chapman	Webster	Elk	Holly River	Grassy Creek
927	Desert Fork near confluence with Right Fork Holly River	Webster	Elk	Holly River	Desert Fork
944	Elk River below Frametown	Braxton	Elk	Elk River	Elk River
945	upper New Creek of North Branch Potomac River	Grant	Potomac	North Branch Potomac	New Creek
946	Bluestone River at mouth of Mountain Creek	Mercer	New	Bluestone River	Bluestone River
947	New River at mouth of Glade Creek	Fayette-Raleigh line	New	New River	New River
948	Lick Creek near confluence of New River upper Bluestone Lake	Summers	New	New River	Lick Creek

SITEID	LOCATION	COUNTY	DRAINAGE	NEARESTRIV	STREAMNAME
950	Dropping Lick Creek of Rock Camp Creek of Indian Creek of New River	Monroe	New	New River	Dropping Lick Creek
951	Mountain Creek near confluence with Bluestone River	Mercer	New	Bluestone River	Mountain Creek
952	Pipestem Ck near confluence with Bluestone River lower Bluestone Lake	Summers	New	Bluestone River	Pipestem Creek
953	New River at mouth of Toms Run middle Bluestone Lake	Summers	New	New River	New River
954	Adair Run of New River near Virginia state line	Mercer	New	New River	Adair Run
955	Laurel Creek near confluence with New River above Cotton Hill	Fayette	New	New River	Laurel Creek
956	Brush Creek of New River near Virginia state line	Monroe	New	New River	Brush Creek
957	Rockbottom Creek of New River at Lovern near Virginia state line	Mercer	New	New River	Rockbottom Creek
958	Rich Creek of New River above Peterstown near Virginia state line	Monroe	New	New River	Rich Creek
959	Hans Creek near confluence with Indian Creek of New River	Monroe	New	New River	Hans Creek
960	Brush Creek near confluence with Bluestone River	Mercer	New	Bluestone River	Brush Creek
961	Indian Creek near confluence with New River upper Bluestone Lake	Monroe	New	New River	Indian Creek
962	New River at Sandstone above mouth of Lick Creek	Raleigh-Summers line	New	New River	New River
963	Little Bluestone River below Streeter	Summers	New	Bluestone River	Little Bluestone River
964	Mill Creek of New River below Opossum Creek	Fayette	New	New River	Mill Creek
965	Glade Creek of Manns Creek of New River near Landisburg	Fayette	New	New River	Glade Creek
966	middle Bluestone Lake of New River	Summers	New	New River	Bluestone Lake
967	Little Bluestone River near confluence with Bluestone River	Summers	New	Bluestone River	Little Bluestone River
968	Cooper Branch of New River on Virginia state line	Mercer	New	New River	Cooper Branch
969	Cochran Ck of Laurel Ck of Knapp Ck of Greenbrier River above Rimel	Pocahontas	Greenbrier	Greenbrier River	Cochran Creek
970	Howell Run of North Branch Potomac River	Mineral	Potomac	North Branch Potomac River	Howell Run
971	Barkers Creek of Guyandotte River at mouth of Gooney Otter Creek	Wyoming	Guyandotte	Guyandotte River	Barkers Creek
973	middle Limestone Run of North Branch Potomac River	Mineral	Potomac	North Branch Potomac River	Limestone Run
974	upper Little Birch River at mouth of Right Fork	Braxton	Elk	Birch River	Little Birch River
1003	West Fork Little Kanawha River above Henry Fork	Calhoun	Little Kanawha	Little Kanawha River	West Fork Little Kanawha River
1004	Reedy Creek at mouths of Left Fork and Middle Fork Reedy	Roane	Little Kanawha	Little Kanawha River	Reedy Creek

SITEID	LOCATION	COUNTY	DRAINAGE	NEARESTRIV	STREAMNAME
	Creek				
1005	Sinking Creek above confluence with Little Kanawha River	Gilmer	Little Kanawha	Little Kanawha River	Sinking Creek
1006	Right Fork Steer Creek of Little Kanawha River above Rosedale	Braxton	Little Kanawha	Little Kanawha River	Right Fork Steer Creek
1007	Cedar Creek of Little Kanawha near Cedarville	Gilmer	Little Kanawha	Little Kanawha River	Cedar Creek
1008	Henry Fork of West Fork Little Kanawha River at mouth of Beech Fork	Calhoun-Roane line	Little Kanawha	Little Kanawha River	Henry Fork
1009	Sand Fork of Little Kanawha River above Indian Fork	Gilmer	Little Kanawha	Little Kanawha River	Sand Fork
1010	West Fork Little Kanawha River at Chloe	Calhoun	Little Kanawha	Little Kanawha River	West Fork Little Kanawha River
1011	Oil Creek of Little Kanawha River near Bennett	Lewis	Little Kanawha	Little Kanawha River	Oil Creek
1012	Tanner Creek near confluence with Little Kanawha River above Latonia	Gilmer	Little Kanawha	Little Kanawha River	Tanner Creek
1013	Litttle Kanawha River at mouth of Sand Fork	Gilmer	Little Kanawha	Little Kanawha River	Little Kanawha River
1014	West Fork Little Kanawha River below Henry Fork	Calhoun-Roane line	Little Kanawha	Little Kanawha River	West Fork Little Kanawha River
1015	Cove Creek near confluence with Leading Creek of Little Kanawha River	Gilmer	Little Kanawha	Little Kanawha River	Cove Creek
1016	Cedar Creek near confluence with Little Kanawha River	Gilmer	Little Kanawha	Little Kanawha River	Cedar Creek
1017	South Fork Hughes River near Oxford	Doddridge	Little Kanawha	Hughes River	South Fork Hughes River
1018	Right Fork Little Kanawha River at Lewis-Upshur-Webster line	Lws-Upshr-Wbstr line	Little Kanawha	Little Kanawha River	Right Fork Little Kanawha River
1019	Saltlick Creek of Little Kanawha River near Corley	Braxton	Little Kanawha	Little Kanawha River	Saltlick Creek
1020	Tanner Creek of Little Kanawha River below Bull Fork	Gilmer	Little Kanawha	Little Kanawha River	Tanner Creek
1021	Leading Creek of Little Kanawha River above Fink Creek	Gilmer	Little Kanawha	Little Kanawha River	Leading Creek
1022	upper Little Kanawha River at Arlington	Upshur	Little Kanawha	Little Kanawha River	Little Kanawha River
1023	Beech Fork of Henry Fork of West Fork Little Kanawha River above Milo	Calhoun	Little Kanawha	Little Kanawha River	Beech Fork
1024	Duskcamp Run near confluence with Little Kanawha River	Gilmer	Little Kanawha	Little Kanawha River	Duskcamp Run
1025	Left Fork Reedy Creek of Little Kanawha River near Mount Olive	Roane	Little Kanawha	Little Kanawha River	Left Fork Reedy Creek
1026	upper Little Kanawha River between Arlington and Ingo	Upshur	Little Kanawha	Little Kanawha River	Little Kanawha River
1027	Little Kanawha River at Hyers near Braxton-Gilmer line	Braxton	Little Kanawha	Little Kanawha River	Little Kanawha River
1028	Indian Fork near confluence with Sand Fork Little Kanawha River	Gilmer	Little Kanawha	Little Kanawha River	Indian Fork
1029	Left Fork Steer Creek of Little Kanawha River near Lockney	Gilmer	Little Kanawha	Little Kanawha River	Left Fork Steer Creek
1030	Hughes River below confluence of North Fk and South Fk	Ritchie-Wirt line	Little Kanawha	Hughes River	Hughes River

SITEID	LOCATION	COUNTY	DRAINAGE	NEARESTRIV	STREAMNAME
	Hughes River				
1031	upper South Fork Hughes River below Porto Rico	Doddridge	Little Kanawha	Hughes River	South Fork Hughes River
1032	Steer Creek near confluence with Little Kanawha River near Staten	Calhoun	Little Kanawha	Little Kanawha River	Steer Creek
1033	Little Kanawha River above Elizabeth	Wirt	Little Kanawha	Little Kanawha River	Little Kanawha River
1034	Little Kanawha River near Wirt-Calhoun county line	Calhoun	Little Kanawha	Little Kanawha River	Little Kanawha River
1035	Cedar Creek of Little Kanawha River above Spruce Run	Gilmer	Little Kanawha	Little Kanawha River	Cedar Creek
1036	Leading Creek near confluence of Little Kanawha River	Gilmer	Little Kanawha	Little Kanawha River	Leading Creek
1037	Little Kanawha River at Glenville	Gilmer	Little Kanawha	Little Kanawha River	Little Kanawha River
1038	Bone Creek of South Fork Hughes River below Holbrook	Ritchie	Little Kanawha	Hughes River	Bone Creek
1039	Bonds Creek of North Fork Hughes River at Pike	Ritchie	Little Kanawha	Hughes River	Bonds Creek
1040	Tygart Creek near confluence with Little Kanawha River	Wood	Little Kanawha	Little Kanawha River	Tygart Creek
1041	Stillwell Creek near confluence with Little Kanawha River	Wood	Little Kanawha	Little Kanawha River	Stillwell Creek
1042	Hughes River at mouth of Goose Creek	Wirt	Little Kanawha	Hughes River	Hughes River
1043	Walker Creek of Little Kanawha River at Walker	Wood	Little Kanawha	Little Kanawha River	Walker Creek
1044	Little Kanawha River at Leachtown	Wood	Little Kanawha	Little Kanawha River	Little Kanawha River
1045	Worthington Creek of Little Kanawha River near Woodland Park	Wood	Little Kanawha	Little Kanawha River	Worthington Creek
1046	South Fork Hughes River at mouth of Big Island Run	Ritchie	Little Kanawha	Hughes River	South Fork Hughes River
1047	North Fork Hughes River below Hannahdale	Ritchie	Little Kanawha	Hughes River	North Fork Hughes River
1048	North Fork Hughes River above mouth of Cabin Run	Ritchie	Little Kanawha	Hughes River	North Fork Hughes River
1083	North Fork Lee Creek of Ohio River near Eli	Wood	Ohio South	Ohio River	North Fork Lee Creek
1084	Lee Creek of Ohio River at mouth of Middle Fork Lee Creek	Wood	Ohio South	Ohio River	Lee Creek
1085	North Fork Lee Creek near confluence with Lee Creek of Ohio River	Wood	Ohio South	Ohio River	North Fork Lee Creek
1086	South Fork Lee Creek near confluence with Lee Creek of Ohio River	Wood	Ohio South	Ohio River	South Fork Lee Creek
1087	Pond Creek near confluence with Ohio River	Wood	Ohio South	Ohio River	Pond Creek
1088	Hewett Creek of Spruce Fork of Little Coal River at Hewett	Boone	Coal	Little Coal River	Hewett Creek
1089	Spruce Laurel Fork near confluence with Spruce Fk of Little Coal River	Boone	Coal	Little Coal River	Spruce Laurel Fork
1090	upper Spruce Fork of Little Coal River above Sovereign	Logan	Coal	Little Coal River	Spruce Fork
1091	Big Coal River at mouth of Island Creek on Kanawha-Lincoln county line	Kanawha-Lincoln line	Coal	Big Coal River	Big Coal River
1092	Dunloup Creek of New River at Dewitt	Fayette	New	New River	Dunloup Creek

SITEID	LOCATION	COUNTY	DRAINAGE	NEARESTRIV	STREAMNAME
1098	Guyandotte River at mouth of Big Harts Creek	Lincoln	Guyandotte	Guyandotte River	Guyandotte River
1099	Little Coal River near confluence with Big Coal River	Kanawha-Lincoln line	Coal	Little Coal River	Little Coal River
1123	upper Marsh Fork of Big Coal River above Surveyor	Raleigh	Coal	Big Coal River	Marsh Fork
1124	Sandlick Creek near confluence with Marsh Fork of Big Coal River	Raleigh	Coal	Big Coal River	Sandlick Creek
1125	Marsh Fork of Big Coal River above Naoma	Raleigh	Coal	Big Coal River	Marsh Fork
1126	Pond Fork of Little Coal River near Barrett	Boone	Coal	Little Coal River	Pond Fork
1127	Pond Fork of Little Coal River near Cazy	Boone	Coal	Little Coal River	Pond Fork
1128	West Fork Pond Fork of Little Coal River above Van	Boone	Coal	Little Coal River	West Fork Pond Fork
1129	Hopkins Fork of Big Coal River at Prenter	Boone	Coal	Big Coal River	Hopkins Fork
1130	upper Clear Fork of Big Coal River above Clear Creek town	Raleigh	Coal	Big Coal River	Clear Fork
1131	Big Coal River at mouth of Joes Creek near Comfort	Boone	Coal	Big Coal River	Big Coal River
1132	Big Coal River at Ashford	Boone	Coal	Big Coal River	Big Coal River
1136	North Branch Potomac River at mouth of New Creek	Mineral	Potomac	North Branch Potomac River	North Branch Potomac River
1137	North Branch Potomac River between Shaw and Barnum	Mineral	Potomac	North Branch Potomac River	North Branch Potomac River
1138	North Branch Potomac River at Blaine	Mineral	Potomac	North Branch Potomac River	North Branch Potomac River
1139	North Branch Potomac River near Piedmont	Mineral	Potomac	North Branch Potomac River	North Branch Potomac River
1140	upper North Branch Potomac River near Henry	Grant	Potomac	North Branch Potomac River	North Branch Potomac River
1141	upper North Branch Potomac River above Beechwood	Grant-Preston line	Potomac	North Branch Potomac River	North Branch Potomac River
1142	upper North Branch Potomac River near Wilson	Grant	Potomac	North Branch Potomac River	North Branch Potomac River
1147	upper Anthony Creek of Greenbrier River above Trainer	Greenbrier	Greenbrier	Greenbrier River	Anthony Creek
1148	lower Spring Creek of Greenbrier River	Greenbrier	Greenbrier	Greenbrier River	Spring Creek
1149	upper Spring Creek of Greenbrier River near Cordova	Greenbrier	Greenbrier	Greenbrier River	Spring Creek
1180	Tug Fork of Big Sandy River at War Eagle	Mingo	Big Sandy	Tug Fork	Tug Fork
1181	Pigeon Creek of Tug Fork of Big Sandy River below Bias	Mingo	Big Sandy	Tug Fork	Pigeon Creek
1182	Pigeon Creek of Tug Fork of Big Sandy River at Lenore	Mingo	Big Sandy	Tug Fork	Pigeon Creek
1183	Tug Fork of Big Sandy River at mouth of Beech Creek	Mingo	Big Sandy	Tug Fork	Tug Fork
1184	Tug Fork of Big Sandy River at Matewan	Mingo	Big Sandy	Tug Fork	Tug Fork

SITEID	LOCATION	COUNTY	DRAINAGE	NEARESTRIV	STREAMNAME
1185	Tug Fork of Big Sandy River above Thacker	Mingo	Big Sandy	Tug Fork	Tug Fork
1186	Tug Fork of Big Sandy River at mouth of Pigeon Creek	Mingo	Big Sandy	Tug Fork	Tug Fork
1187	Big Sandy River above Whites Creek	Wayne	Big Sandy	Big Sandy River	Big Sandy River
1188	Mill Creek of Tug Fork of Big Sandy River near Fort Gay	Wayne	Big Sandy	Tug Fork	Mill Creek
1189	Tug Fork of Big Sandy River above Crum	Wayne	Big Sandy	Tug Fork	Tug Fork
1190	upper Tug Fork of Big Sandy River near Gary	McDowell	Big Sandy	Tug Fork	Tug Fork
1191	Elkhorn Creek of Tug Fork of Big Sandy River at Kyle	McDowell	Big Sandy	Tug Fork	Elkhorn Creek
1192	Dry Fork of Tug Fork of Big Sandy River at Bartley	McDowell	Big Sandy	Tug Fork	Dry Fork
1193	Tug Fork of Big Sandy River near Hull	McDowell	Big Sandy	Tug Fork	Tug Fork
1194	Tug Fork of Big Sandy River above Iager	McDowell	Big Sandy	Tug Fork	Tug Fork
1195	Dry Fork of Tug Fork of Big Sandy River at Avondale	McDowell	Big Sandy	Tug Fork	Dry Fork
1196	Dry Fork of Tug Fork of Big Sandy River at Lex	McDowell	Big Sandy	Tug Fork	Dry Fork
1197	Tug Fork of Big Sandy River above Clear Fork Junction	McDowell	Big Sandy	Tug Fork	Tug Fork
1198	Elkhorn Creek of Tug Fork of Big Sandy River below Kimball	McDowell	Big Sandy	Tug Fork	Elkhorn Creek
2000	Ohio River at mouth of Big Sandy River	Wayne	Ohio South	Ohio River	Ohio River
2001	Ohio River near Mason	Mason	Ohio South	Ohio River	Ohio River
2002	Ohio River at Hartford City	Mason	Ohio South	Ohio River	Ohio River
2003	Ohio River near New Haven	Mason	Ohio South	Ohio River	Ohio River
2004	Ohio River near Longdale	Mason	Ohio South	Ohio River	Ohio River
2005	Ohio River at mouth of Little Kanawha River	Wood	Ohio South	Ohio River	Ohio River
2006	Ohio River near Williamstown	Wood	Ohio South	Ohio River	Ohio River
2007	Pocatalico River at mouth of Trace Fork	Roane	Kanawha	Pocatalico River	Pocatalico River
2008	Ohio River at mouth of Crab Creek	Mason	Ohio South	Ohio River	Ohio River
2009	Elk Fork of Mill Creek of Ohio River below Gay	Jackson	Ohio South	Ohio River	Elk Fork
2010	Tug Fork of Big Sandy River at mouth of Elkhorn Creek at Welch	McDowell	Big Sandy	Tug Fork	Tug Fork
2011	Goose Creek of Hughes River at mouth of Pigeonroost Run	Ritchie	Little Kanawha	Hughes River	Goose Creek
2012	South Fork Hughes River above Macfarlan	Ritchie	Little Kanawha	Hughes River	South Fork Hughes River
2013	Spring Creek of Little Kanawha River at Millard	Roane	Little Kanawha	Little Kanawha River	Spring Creek
2014	Right Fork Steer Creek of Little Kanawha River near Shock	Gilmer	Little Kanawha	Little Kanawha River	Right Fork Steer Creek
2015	Left Fork Steer Creek of Little Kanawha River above Orton	Gilmer	Little Kanawha	Little Kanawha River	Left Fork Steer Creek
2016	Mill Creek of Ohio River below Ripley	Jackson	Ohio South	Ohio River	Mill Creek
2017	Big Sandy Creek of Elk River at Osbornes Mill	Roane	Elk	Elk River	Big Sandy Creek

SITEID	LOCATION	COUNTY	DRAINAGE	NEARESTRIV	STREAMNAME
2018	Little Kanawha River near Cherry	Wirt	Little Kanawha	Little Kanawha River	Little Kanawha River
2019	Steer Creek of Little Kanawha River at mouth of Little Bear Fork	Calhoun	Little Kanawha	Little Kanawha River	Steer Creek
2020	Elk River at mouth of Falling Rock Creek	Kanawha	Elk	Elk River	Elk River
2021	Little Kanawha River at Hattie on Calhoun-Gilmer county line	Calhoun-Gilmer line	Little Kanawha	Little Kanawha River	Little Kanawha River
2022	Ohio River between West Columbia and Clifton	Mason	Ohio South	Ohio River	Ohio River
2023	Little Kanawha River between Nicolette and Stewart	Wood	Little Kanawha	Little Kanawha River	Little Kanawha River
2024	North Fork Hughes River at mouth of Bonds Creek at Cornwallis	Ritchie	Little Kanawha	Hughes River	North Fork Hughes River
2025	South Fork Hughes River below Berea	Ritchie	Little Kanawha	Hughes River	South Fork Hughes River
2026	West Fork Little Kanawha River between Creston and Richardson	Calhoun-Roane line	Little Kanawha	Little Kanawha River	West Fork Little Kanawha River
2027	Henry Fork of West Fork Little Kanawha River at Tristan	Calhoun-Roane line	Little Kanawha	Little Kanawha River	Henry Fork
2028	West Fork Little Kanawha River at Altizer	Calhoun	Little Kanawha	Little Kanawha River	West Fork Little Kanawha River
2029	Little Kanawha River above Burnsville	Braxton	Little Kanawha	Little Kanawha River	Little Kanawha River
2030	Mill Creek of Ohio River above Ripley	Jackson	Ohio South	Ohio River	Mill Creek
2031	Pocatalico River below Cicerone	Roane	Kanawha	Pocatalico River	Pocatalico River
2032	Gauley River at mouth of Peters Creek at Peters Junction	Fayette-Nichls line	Gauley	Gauley River	Gauley River
2033	Parchment Creek of Mill Creek of Ohio River above Mount Mariah	Jackson	Ohio South	Ohio River	Parchment Creek
2034	Tug Fork of Mill Creek of Ohio River at Statts Mills	Jackson	Ohio South	Tug Fork	Tug Fork
2035	Mill Creek of Ohio River at mouths of Little Mill Creek and Elk Fork	Jackson	Ohio South	Ohio River	Mill Creek
2036	Ohio River at mouth of Little Broad Run	Mason	Ohio South	Ohio River	Ohio River
2037	Ohio River below Crown City	Cabell	Ohio South	Ohio River	Ohio River
2038	Kanawha River at mouth of Armstrong Creek at Boomer	Fayette	Kanawha	Kanawha River	Kanawha River
2039	Brush Fork of Bluestone River near Virginia state line	Mercer	New	Bluestone River	Brush Fork
2040	Elk River near Elk Hills	Kanawha	Elk	Elk River	Elk River
2041	Trace Fork of Pigeon Ck of Tug Fork of Big Sandy River above Myrtle	Mingo	Big Sandy	Big Sandy River	Trace Fork
2042	Ohio River at Murraysville	Jackson	Ohio South	Ohio River	Ohio River
2043	Mount Storm Lake of Stony River	Grant	Potomac	Stony River	Mount Storm Lake