Compiling GIS Data for West Virginia Trails

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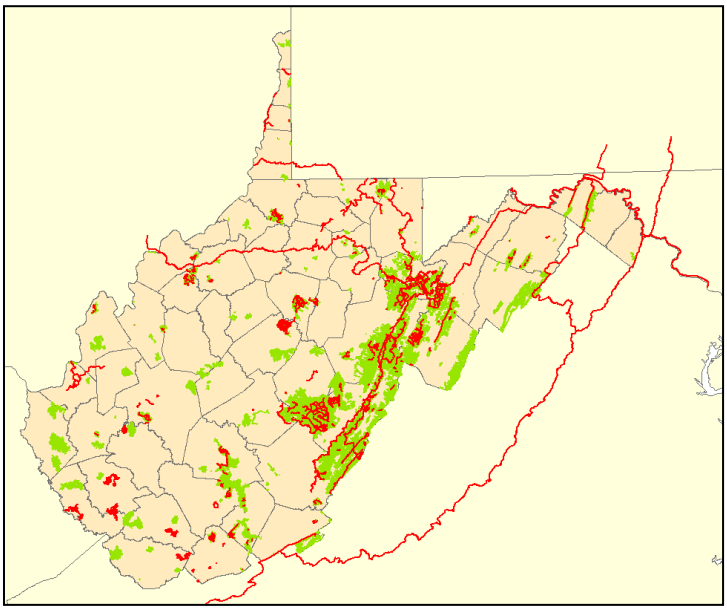
Introduction

This report details efforts carried out by the West Virginia GIS Technical Center (WVGISTC) under contract to the West Virginia Department of Transportation to create a statewide GIS database of publically accessible recreational trails within West Virginia. The report is divided into five sections: Objectives, Source Data, Process, and Conclusions and Future Steps. The report also includes several appendices, each of which is referenced and described in the text of the report.



Objectives

The objectives and deliverables of this project include:

1. A spatial database of trail lines and attributes integrated with the WV State Trail Coordinator's (WVSTC) tabular database of trail information. This dataset will be constructed utilizing the Federal Interagency Trail Data Standard.
2. A gap analysis describing where no spatial data exists for trails.
3. This report, which includes recommended standards and best practices for integration of data in the future and long term maintenance.
4. A statewide trail map.

All stated objectives for this project have been completed.

Source Data

A large number (~35) of spatial datasets were obtained and reviewed for this project. Datasets and associated metadata (if available) were reviewed and compared in order to determine which datasets should be included in the final compilation. Source datasets were compared for currency as well as coverage in order to ensure no repetition of features. Those methods are described in detail in the next section.

We also utilized a tabular database of trail information compiled by the WV State Trails Coordinator. This dataset was only minimally edited and was, in cases where no direct information was available from the trail stakeholder themselves, the authoritative source for usage attributes.

The preceding datasets were all provided by the WVDOT to the WVGISTC for use in this analysis. In some cases, WVGISTC had a more recent version of the dataset available. In those cases, the more recent dataset was selected. The full list of GIS datasets included in the final dataset is recorded in Appendix 2.

Documents describing the Federal Interagency Trail Data Standard was retrieved from the National Park Service (http://www.nps.gov/gis/trails/) and reviewed as attributes were compiled and standardized. Web links to specific key sections of the trail standard are provided in Appendix 4.

Process

This section describes the methods we used to prepare and compile GIS data, integrate that dataset with the WVSTC's tabular database, and undertake a gap analysis. It is broken into five subsections: GIS Data Preparation, GIS Data Compilation, Database Integration, Gap Analysis and Future Data Integration.

GIS Data Preparation. Preparation of the GIS data was concerned with two major schools of problems and solutions; geographic features and the table of attributes. We wanted to ensure that the best and most current spatial data was compiled forward and that all relevant attributes are transferred forward to the final field map.

Early review of the GIS datasets to be utilized in this work revealed that, prior to compilation, it would be necessary to address some basic questions:

- In cases where multiple versions of datasets are available, which version is the most current?
- In areas where datasets overlap, which dataset is the authoritative source?
- Is it possible to address scale issues as datasets are compiled?

We structured the spatial data preparation tasks around these questions.

Assembling Source Data. The first step was to look at the available datasets and determine, in cases where multiple versions of datasets were available, which dataset was the most recently updated. Thankfully, this ended up being a relatively straightforward task - while full metadata was lacking, summary information was provided with most datasets , allowing us to make a first cut of datasets before compilation. Once we determined which datasets would be utilized in the final compilation, we created an ESRI file geodatabase and collected the source datasets within a feature dataset.

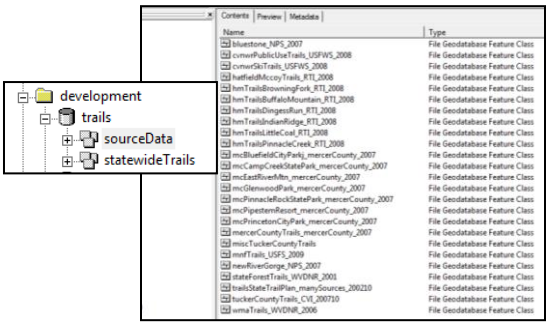


Figure 1. Compiled source data.

The second process, however, was not as clear cut and required county by county, dataset by dataset review of features. Areas of highly dense trail networks (the Monongahela National Forest counties, for example) featuring several source datasets exhibited a large number of inter-dataset overlap and double inclusion. In addition, one important dataset, the 2002 State Trail Plan, included a large number of coarser resolution features which oddly intersected the more detailed local lines. We hoped to resolve many of these issues prior to compilation.

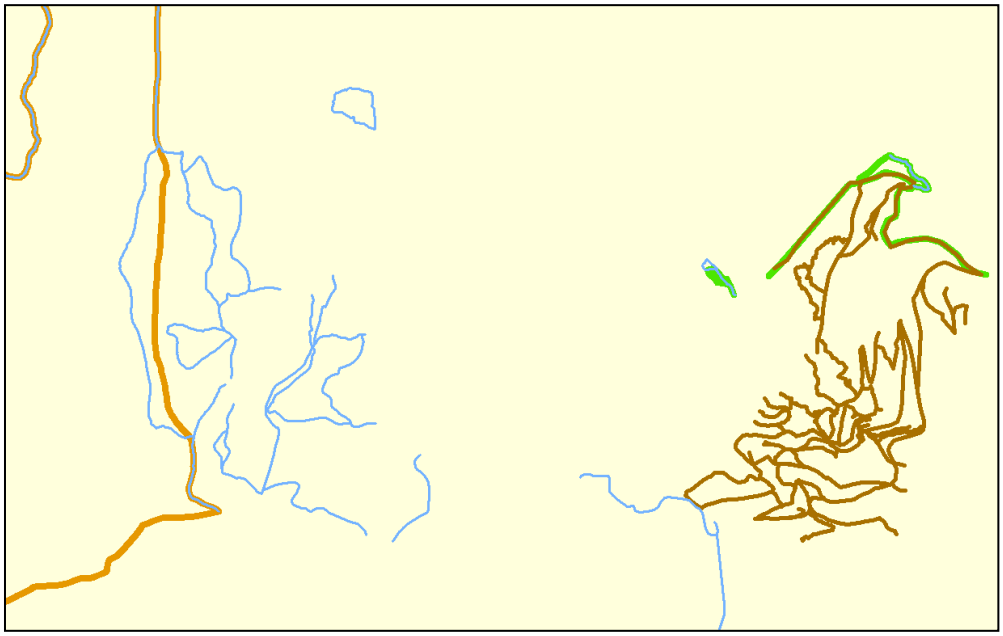


Figure 2. Area of inter-dataset overlap and double inclusion.

As can be seen in Figure 2 several datasets also include a number of lines obviously sourced from another dataset in addition to their own unique features. Using land ownership polygons for public land along with metadata, we determined which dataset contained the authoritative lines for that area. We then edited the offending dataset to remove the repeated line work. The final linework (Figure 3, colored by source dataset) had the characteristics of being complete and containing only unique features.

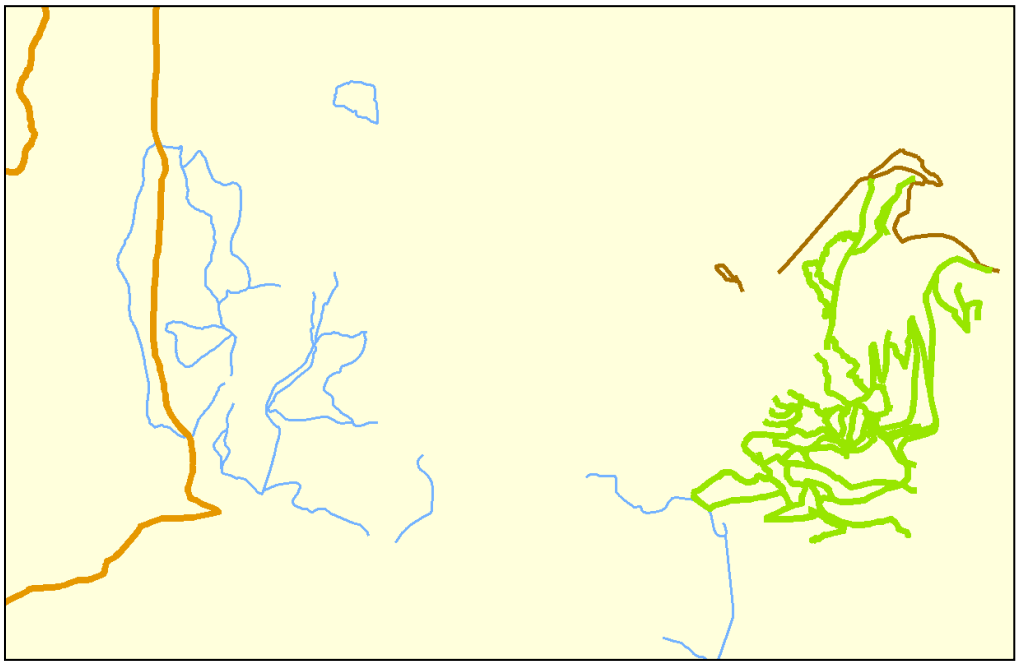


Figure 3. Edited source data, colored by source dataset.

This process was repeated around the state for all datasets. This left us with a complete set of source geometry (25 feature classes) ready for the next step of the process - field mapping.

Developing the Field Map. As previously mentioned, we intended to utilize the Federal Interagency Trail Data Standard (FITDS) for the development of the final dataset. This standard was developed by the FGDC in conjunction with all federal agencies who collect and maintain GIS data for trails. The standard describes a series of required attributes for all trail lines and is published and described in a large but clear and concise document. To begin the process of field mapping, we took the FITDS required attributes and examined the data to be compiled to determine what information was available within those datasets to satisfy the standard. Figure 4 is a sample of that crosswalk table.

fed standard/new atts	WV Trails (2002)	Mercer County Trails	DNR – state forests
AGENCY DATA SOURCE		*Mercer County*	*WVDOF/WVDNR??*
TRAIL NAME	trail_name	trail_name	comment_2
TRAIL NUMBER			
INTERAGENCY IDENTIFICATION CODE			
TRAIL STATUS			
TRAIL LENGTH	length	length	
SHARED SYSTEM			
TRAIL SURFACE		surface	
ADMIN ORG		owner	
MANAGING ORG			
CONGRESSIONAL DISTRICT			
COUNTY		*Mercer*	
JURISDICTION			

Figure 4. Exploratory attribute crosswalk table.

As we explored the FITDS, comparing it with the GIS data and the WVSTC's tabular dataset as well as taking into consideration of future updates, it became clear that the final field map would

require additional attributes to accommodate customer and functional requirements. For example, the FITDS includes only one attribute field for information about the appropriate uses of that trail. Clearly, this poses some querying problems as very few trails are useable by only one user class. The final field map would need to reflect this and other concerns.

FEDERAL FIELD	GIS FIELD	FORMAT NOTES	FIELD DEF	FIELD LENGTH
AGENCY DATA SOURCE	dataAgency		Text	10
Date of Last Data Used to Update	sourceDate	YYYYMM	date	6
Date of Last Update	updated	YYYYMM	date	6
Dataset link (if available)	dataLink	http://....	weblink	50
Source Dataset	sourceDataset		Text	50
TRAIL NAME	trailName		Text	50
TRAIL NUMBER	trailNumber		Text	10
TRAIL STATUS	trailStatus		Text	10
TRAIL LENGTH	trailLength	miles	Number	XXX.X
SHARED SYSTEM	sharedSystem		Text	30
TRAIL SURFACE	trailSurface		Text	30
ADMIN ORG	adminOrg		Text	30
MANAGING ORG	manageOrg		Text	30
CONGRESSIONAL DISTRICT	congress		Number	XX
COUNTY	county		Text	20
JURISDICTION	jurisdic		Text	30
MUNICIPALITY	municip		Text	30
STATE	state		Text	4
TRAIL SYSTEM	trailSystem		Text	30
ROAD SYSTEM	roadSystem		Text	30
LAND USE PLAN	landUsePlan		Text	50
PRIMARY TRAIL MAINTAINER	maintainer		Text	30
TRAIL CLASS	trailClass		Text	10
hiking allowed	hike	y/n	Text	4
bicycles allowed	bike	y/n	Text	4
horses allowed	horse	y/n	Text	4
xc ski allowed	xcski	y/n	Text	4
backpacking allowed	backpack	y/n	Text	4
Interpretive Trail	interp	y/n	Text	4
fitness trail	fitness	y/n	Text	4
American Disability Act Compliant	ada	y/n	Text	4
water trail	water	y/n	Text	4
MOTORIZED	motorized	y/n	Text	4
suitable for atvs	atv	y/n	Text	4
suitable for OHVs	ohv	y/n	Text	4
suitable for dirt bikes	dirtbike	y/n	Text	4
PROHIBITED USE	prohibUse		Text	30
ACCESSIBILITY STATUS	accessStatus		Text	10
HISTORIC SIGNIFICANCE	historic	y/n	Text	4
NATIONAL TRAIL DESIGNATION	nationalTrail	y/n	Text	4
RIGHTS-OF-WAY	rightsOfWay		Text	30
SPECIAL MGMT AREA	mgmtArea		Text	50
TRAIL CONDITION	condition		Text	10

Figure 5. Final field map.

Figure 5 lists the final attributes to be included in the compiled dataset. Appendix 1 includes a detailed description of these attributes and Appendix 2 contains a larger version of Figure 5. The sources of these attributes vary - some are within the source GIS datasets themselves, some within the WVSTC's database and some derivable from GIS. Still other attributes will require research to properly populate. Several of the attributes are not included in the FITDS, but the top five (highlighted in red) warrant further discussion.

One of the principal questions we faced as we developed this dataset was how to ensure that future data updates could be easily and efficiently integrated. We determined that it would be important to store within the dataset several pieces of information per feature: the agency or entity that provided the line, the publication date of the line, the date that the line was compiled into this dataset, a web link to a source dataset (if available) and the name of the source dataset. Using this information in tandem with general GIS practices, we believe that future updates to the dataset will be smooth and clear. These attributes amount to feature level metadata.

GIS Data Compilation. The next major step in the development of this dataset was to compile the source data together into a single dataset and edit that dataset to ensure geometric consistency.

Initial Compilation. Once we designed the final attribute table, we edited each dataset such that they included each of the four feature metadata attributes described above. We also double checked the crosswalk table to ensure that all attributes available to slot into the final field map were recorded. Using the now fully defined field map and a new feature dataset we created an empty feature class to store the compiled trails data. We used the ArcGIS **merge** tool to, one dataset at a time, import the source data into the compiled dataset.

Topological Editing. Geometric editing prior to compilation ensured a mostly clean dataset, but it was necessary to topologically enforce the dataset in order to ensure connectivity, remove pseudo nodes and perform other basic editing tasks. We took this opportunity to perform two major editing tasks, as well: cleaning of apparently non-post-processed GPS data and (some) integration of coarse scale (>1:100,000) data for long trails with more accurate lines. Figure 6 depicts the topological rules we used to develop this dataset.

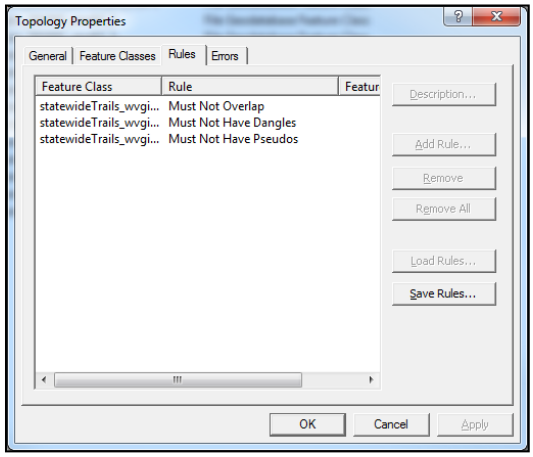


Figure 6. Dataset topology.

The topological rules allowed us to ferret out very small and localized problems with the geometry of the source datasets, such as interconnection between datasets:

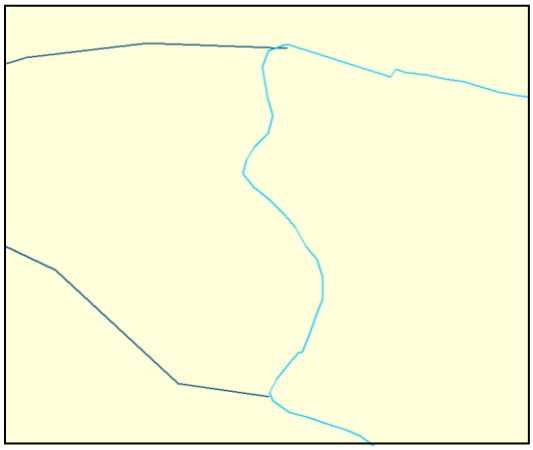


Figure 7. Dataset interconnection problems; overshoot (top)

and undershoot (bottom).

There were also similar problems within individual source datasets that only became obvious once compiled and topologically enforced. Figure 7 depicts two common errors, most likely related to incomplete GPS post processing. The image on the left depicts an area where an area was most likely double mapped. The image on the right depicts a series of undershoots that, given the gap (< 5 m), were meant to connect. This editing, like previous steps, was completed on a county by county basis.

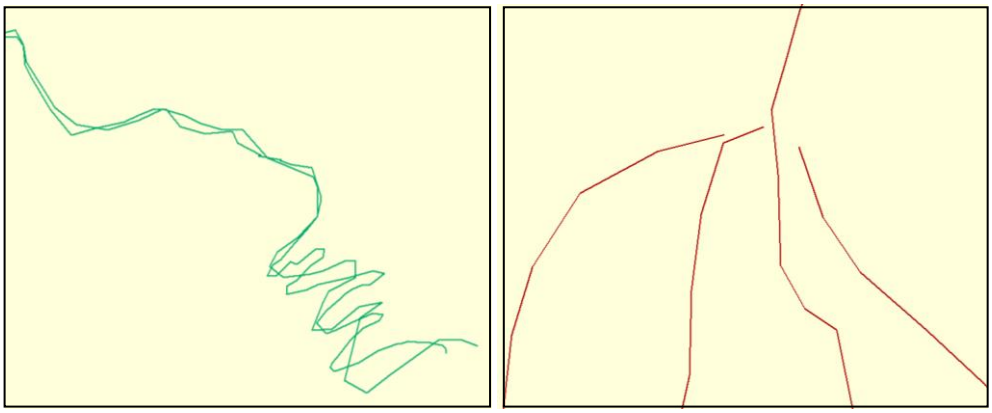


Figure 7. Geometric errors most likely related to incomplete post-processing of GPS data.

A more complicated problem was how to address the problem of source data of coarse quality. A prime example is the American Discovery Trail, a "coast to coast non-motorized recreational trail (http://www.discoverytrail.org/)." The only source data for this trail comes from a 2002 dataset prepared by the National Park Service, mostly at scales coarser than 1:100,000. Figure 8 shows the trail as it was depicted in the source data:

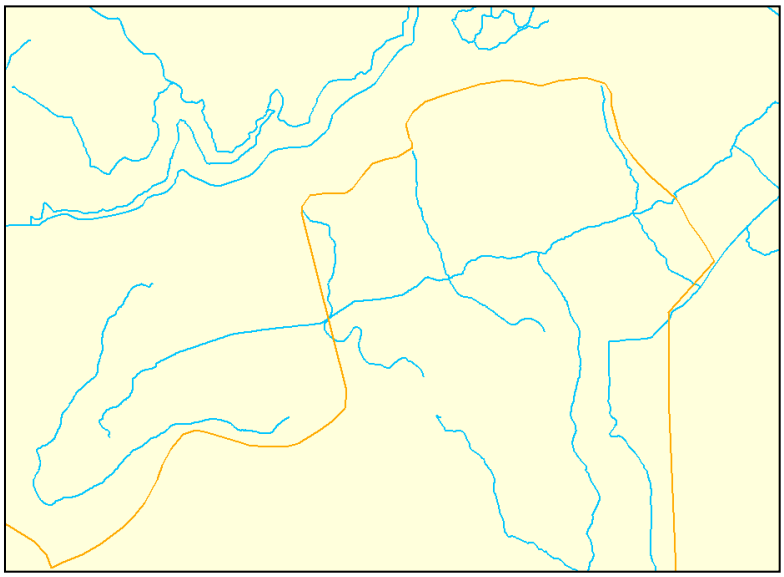


Figure 8. American Discovery Trail (orange) in the Canaan Mountain area

of the Monongahela National Forest.

The website for the American Discovery Trail includes fairly descriptive point to point directions for navigating the twists and turns of this trail. In many areas of the existing GIS dataset the trail is the only feature and, as such, no major geometric edits were made. In areas like that depicted above, however, we were able to attribute a secondary name to several trail lines and improve the spatial accuracy of the line for this extensive trail. In small areas (such as the area depicted above) we were also able to digitize the trail's route in those areas where it follows roads. Figure 9 depicts the result:

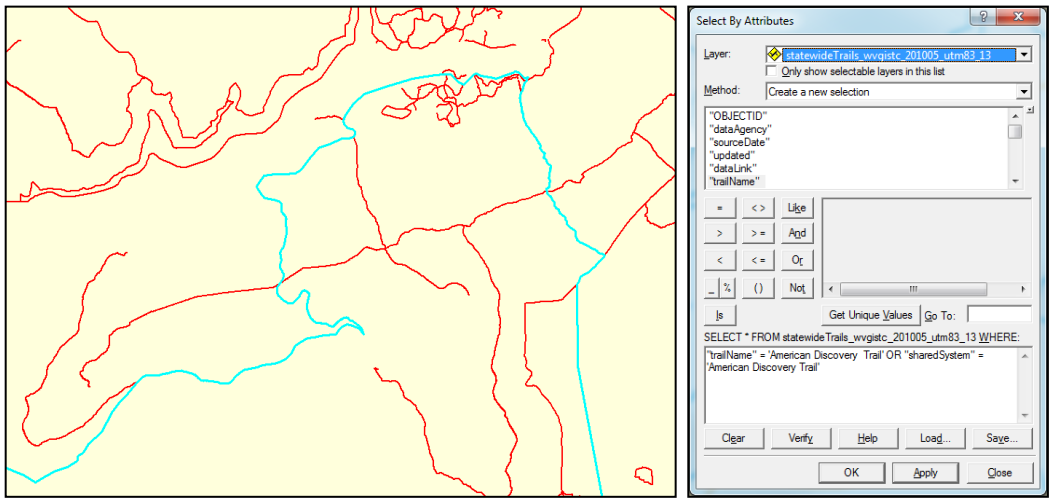


Figure 9. Newly conflated route for the American Discovery Trail. This graphic was created using the query on the right.

While this type of conflation and editing could not be completed for the full length of this trail line (or similar lines), we endeavored to make this style of repair in areas where it the work was feasible.

Database Integration. Following the completion of geometric editing, we began the task of developing derivable attributes (county, special management area, etc) and integrating attributes from the WVSTC's tabular database. The integration task is also an important part of the gap analysis, described later in this report.

Tabular to Spatial Comparison. Perhaps the most crucial task of this project was to compare the WVSTC's tabular database to the spatial data compiled in the previous steps. The WVSTC has compiled a very large database of information about trails in West Virginia. The database contains a lot of information about suitable (and allowable) uses for trails - a category of information that is largely absent from existing GIS datasets. After exploring several options, it became apparent that the only way to integrate the information in the WVSTC's database into the GIS database was by manual transfer, one record at a time.

We added to each database a pair of attributes that allow us to keep track of the process of integration as we move through the databases. To the WVSTC's tabular database we add two attributes,

both yes/no type variables: **checked** and **inGIS**. The **checked** column indicates whether or not the record has been examined and compared with the GIS data. The **inGIS** column indicates that the record in question has corresponding lines in the GIS dataset. Similarly, the GIS dataset has two additional attributes: **checked** and **inDB**. As before, the **checked** column indicates that the record was compared with the tabular database. The **inDB** column indicates that the feature has a corresponding record in the database. See Table 1 for more information.

TABULAR	Description
inGIS	1 or 0. Indicates whether the record has a corresponding record in the GIS database. A 0 in this field indicates a probable data gap.
checked	1 or 0. Indicates whether the record has been reviewed and compared to the GIS database. At the end of the cross walk process, all records should have a value of 1 for this attribute.
GIS	
inDB	1 or 0. This value indicates that the record corresponds to a record in the WVSTC's trail database and that the information in that database record has been conflated to the GIS record(s).
checked	1 or 0. This field indicates that the record has been reviewed and compared to the WVSTC's database. Cases where this value is attributed with a "1" and the inDB record is attributed with a "0" indicates that the trail in question is adjacent to or in the same land area as a trail in the DB and is clearly absent from the WVSTC's database. This is a probable gap.

Table 1. Database comparison attributes described.

As in previous steps, we worked on a county by county basis, looking, in this case, at sets of lines in the WVSTC's database one county at a time. We examined each record and, using all information available to us, we attempted to identify the spatial feature that corresponded to each database record. If no corresponding feature could be identified, we marked the record as "checked" and moved on. When a corresponding feature is identified, we update the GIS record using the attributes in the WVSTC's tabular database. Likewise, we updated the tracking attributes for both the feature and the database record - a yes for **inDB** and a yes for **inGIS**.

After this work was completed, we were left with a picture - a blurry picture, but a picture nonetheless - of what trails (as recorded by the WVSTC) have GIS data and which do not:

	Total Records	inDB	inGIS	Percentage
Database	1005	--	369	37%
GIS	1321	372	--	28%

Table 2. WVSTC database to GIS database comparison.

Based on this chart, it would appear that most trails are without GIS data. There are some extremely important caveats, however:

- Not all trails are "identifiable" in the GIS. There are many areas GIS data exists and a corresponding record most likely exists in the database, but due to the lack of identifying attributes in the GIS, no "match" can be made. Many of these records are marked with a 1 in the **checked** field and a 0 in the **inDB** field. We were able to mark these as checked due to the fact that the database contained other records within the management area, so we can be sure that the WVSTC is aware of trails in the area (example: Kanawha State Forest).
- During the course of the analysis we noted many trails in the DB that were attributed as being in one county but were in fact located in another county. We made the necessary change in the database and cross walked information where possible, but undoubtedly some of these were missed.
- Approximately 24% of the lines in the GIS database were not checked against the WVSTC's database. Many of these trails (~50%) are unnamed or ambiguously named making any cross checking difficult. Some of these records fall within public land areas that are not included in the WVSTC's database (example: Hughes River Wildlife Management Area).
- The WVSTC's database includes several roads (example: Thomas Mountain Road, within Seneca State Forest). No road lines are presently included in the GIS trails database, but that data could be included with relative ease.

These and other observations are expanded upon and clarified in the next section, **Gap Analysis.**

Gap Analysis. The last major task facing us was to perform a gap analysis. For our purposes, a successful gap analysis will further elucidate on the results of the cross database work such that future data refinement and data collection can be planned and focused.

Known Omissions and Major Mismatches. Some types of data or areas are missing data and we are aware of those omissions - they require no analysis to uncover. These include:

- We included no GIS data for the George Washington or Jefferson National Forests.
- Aside from lengthy rail-trails, almost no GIS data is available for municipal trails, including city and county parks.
- Most GIS trail data comes from a public agency and is for publicly owned or managed land. Therefore, most trails listed in the WVSTC's database as being on private land have no GIS data.
- Across six areas, the GIS data includes 309 individual trails for the Hatfield and McCoy Trails system. The WVGISTC database, however, includes only two records for each of the six areas. This is a large mismatch between the two datasets.
- No water trails are included in the GIS dataset at this time.

Counties. We examined the compiled trail dataset in relation to West Virginia counties. Seven counties contain no trail lines and should be considered counties with no data coverage. Those counties are: Calhoun, Clay, Gilmer, Hancock, Pleasants, Tyler and Wayne.

Nine additional counties contain only lines sourced from the low resolution dataset, "State Trail Plan, 2002," and should be considered counties with poor data coverage: Berkeley, Brooke, Doddridge, Hardy, Harrison, Jefferson, Marion, Morgan, and Putnam.

Public Lands. We utilized the completed GIS dataset and a boundary dataset of four types of public land in West Virginia: state forests, wildlife management areas, state parks and National Park Service land. Quite simply, within GIS software, we selected and attributed public lands with either a "yes" or a "no" in regards to whether or not final trail data intersected those lands. Most (if not all) public land in these categories include some kind of trail. While this analysis cannot determine how complete the GIS data is for a particular public land parcel, it does indicate which public lands have no data at all. We leave one major public land from this analysis, the Monongahela National Forest, as that area has a great deal of trail GIS data available and included in this dataset.

	Total	WMAs	SFs	SPs	NPS
All	136	86	9	39	2
GIS Data	56	33	7	14	2
Perc.	41.18%	38.37%	77.78%	35.90%	100.00%

Table 3. Counts and percentages of public lands with and without trail GIS data.

As can be seen in Table 3, only 40% of the public land areas in this analysis are intersected by GIS data for trails. Some categories of land are better represented than others - seven of the nine state forests have some trail data within their boundaries. Those categories with the least coverage - wildlife management areas and state parks - should be targeted for data acquisition. Please see Appendix 3 for a list of public lands by presence and absence of GIS data for trails.

Scale. A less obvious "gap" is that which results from the inclusion of coarser scale data (> 1:100,000) in the final GIS dataset. At least one of the source GIS datasets in this compilation (State Trail Plan, 2002) is made up entirely of very general lines. This dataset constitutes many of the longer, multi-county or multi-state trails that intersect the state, including several rail-trails.

The problem with this data is not typical of gaps in that the data is present, but of less than acceptable quality. Figure 10 depicts two areas of the North Bend Rail Trail. The image on the left is the original, coarse scale data. Clearly, this line is spatially inaccurate. This inaccuracy results in incorrect depiction of trail and road intersections and trail length, among other things. Fortunately, in this case, this error is relatively easy to fix - rail trails are visible on aerial photography. The image on the right depicts an area where we were able to, with minimal effort, align the trail line with the feature on the ground. This will not be possible in all areas, but is certainly an option for future edits.

Figure 10. Scale issues, North Bend Rail Trail, original data (left), repaired data (right)

Multiple System Trails. Again, a less noticeable gap in the data is within a specific pair of attributes: **trailName** and **sharedSystem**. The first attribute has an obvious definition - this is the name of the trail segement. The second attribute, however, serves a more ambiguous purpose - it is, essentially, a second name for a trail. Many (if not all) of the long trails that intersect the state of West Virginia are actually trail systems that utilize existing roads and trails to create a single route. A cardinal example of this type of trail is the Allegheny Trail, a long trail that runs northeast-southwest through West Virginia.

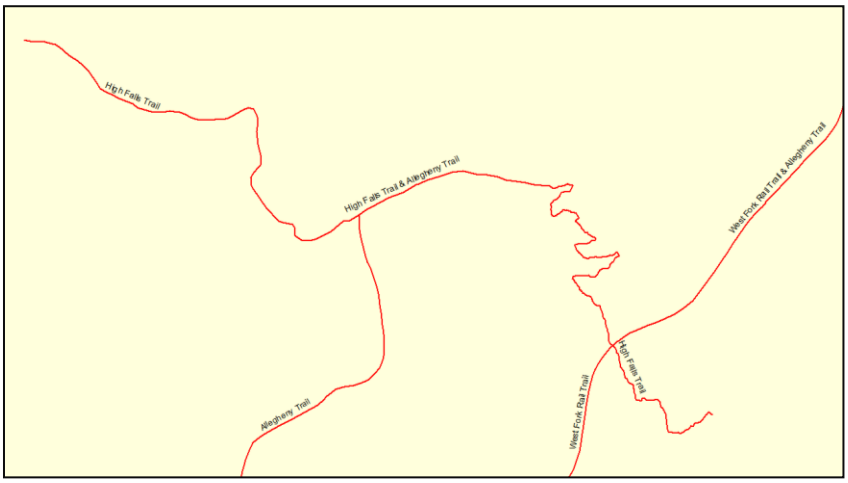


Figure 11. Multiple system trail example; Allegheny Trail near Bemis.

While much of the length of the trail has only one name, certain sections of the trail utilize other trails to make connections, such as the area depicted in Figure 11. Coming from the south, hikers on the Allegheny Trail follow the High Falls Trail east to the West Fork Rail Trail north, which eventually connects back to the single name Allegheny Trail. Rather than utilize multiple lines that depict a single trail in reality, we use two attributes.

However, due to the coarseness of the data (as mentioned in the previous sub-section), it is very likely that many of these multiple system/name trails have not been conflated or attributed properly in the GIS dataset. Where possible, we have worked to make these types of corrections, but some areas of the dataset received little to no attention. Some trails, such as the American Discovery Trail, follow very

complicated routes and, as a result, have not been completely conflated to their respective routes in most areas.

Future Data Integration. Maintenance of a large, integrated dataset such as this will require stringent adherence to best practices. The data model was designed with consideration given to future additions to the database as well as delete and replace type operations. This sub-section details recommendations for best practices and procedures for the maintenance of this dataset.

Stakeholder Adoption. Without a doubt, providing subsets of this data to stakeholders and assisting them in adopting this data model for their own future maintenance and updates will greatly expedite future updates to the compiled dataset. One on one interaction between the WV State Trail Coordinator and key agency stakeholders will aid in the adoption of the dataset among those parties. It is our opinion that this data model will be positively received by interested parties.

Update Process. The data model is designed with future updates and additions in mind. As with any multi-source compilation of GIS data, future augmentations will require careful dataset to dataset comparison to ensure that features are not repeated. The attributes currently included - **dataAgency**, **sourceDate**, **updateDate**, and **sourceDataset** specifically - will allow a technician to quickly and easily determine if a "new" feature is genuinely new. These attributes are also designed to easily identify, remove and replace entire datasets.

For example, if the WVDNR publishes an entirely new dataset of trails for State Forests, a technician can easily remove all of the lines from the original Trails of State Forests dataset by selecting all records with that name in the **sourceDataset** field and then migrating the new dataset over to the compiled dataset with the merge command.

Naturally, as with any large, multi-source GIS dataset, good practices for the long term maintenance of the data will include GIS tasks such as topological enforcement, geometric editing and careful QA/QC of attribute fields. Engaging trail data stakeholders will help ensure that at least some of this work is completed by those with the most on the ground knowledge.

Conclusions and Future Steps

This work is a major steppingstone towards a single GIS dataset for trails of all types in West Virginia. The dataset already draws upon many resources from agencies and entities of varying backgrounds and scope and includes trails with a variety of unique characteristics. By merging the database maintained by the WV State Trail Coordinator with GIS data, a stronger, more complete and ultimately more useful dataset has been generated.

All of that being said, as with any project, many lessons can be gleaned from this work and can guide future work. Continued maintenance and development of this dataset will be a challenge, but we believe it is a worthwhile task.

Lessons Learned. The strongest lessons and observations we can make deal with the attributes and data model of existing trail data in West Virginia. Generally speaking, trail data stakeholders maintain only a

few attributes within trails GIS datasets. In fact, the only attribute common to all datasets (other than GIS derivable information like length) is trail name. Both the FITDS and the WVSTC's database skew towards more complete information. By beginning to compile that information independently, it may be easier for the WVSTC to encourage trail data stakeholders to check and continue to collect more detailed information about trails.

The data model itself does have a few weaknesses, however. Oddly enough, the FITDS contains no attributes designed to record scale or accuracy of the features. This seems strange given that the data model is, in fact, designed with GIS data in mind. We recommend developing an attribute that accounts for scale, especially in light of the scale issues with some of the data in this dataset.

Future Steps. Clearly, based on the gap analysis section of this document, there are a number of tasks that can be completed in the future in order to improve this dataset. Here, we present recommendations for future work organized into three subject areas, (1) Content, (2) Maintenance and Updates and (3) Validation and Outreach.

<u>Content</u>

- Critically examine and discuss the data model and make changes as needed.
- Compile and include lines for water trails.
- Compile and include lines for WV trails in the George Washington and Jefferson National Forests.
- There are several instances of GIS data for certain public lands (ex: state forests and state parks) containing insufficient attributes to compare and crosswalk with WVSTC's database. We believe that further research, using published trail maps and other resources, will allow this data to be improved.
- Lines for major rail trails can be improved through either the acquisition of new lines from stakeholders or through digitizing.
- Unprocessed road line data from the 2003 SAMB project may be a useful source for some trail lines, rail trails and former logging roads, in particular. This should be explored.
- Using gap analysis results and the **inGIS** attribute of the WVSTC's database, contact pertinent parties and attempt to collect GIS data for trails in those areas. Of particular concern are municipal trails.
- Consider adding other ancillary features such as trail heads, parking areas and waypoints for trail intersections.

<u>Maintenance and Updates</u>

- Utilize gap analysis and overall mission interests to target specific areas for data improvement.
- Test update process and protocols and modify best practices as needed.

<u>Validation and Outreach</u>

- Consider development of a volunteer geographic information portal to confirm and collect trail information from non-GIS users.

- Publish downloadable version of the database for public use.
- Provide subsets of newly compiled and attributed datasets to relevant stakeholders (ie, provide the Monongahela National Forest Trails to MNF personnel) and encourage maintenance of the data in that format.
- Distribute draft of trail standard and report to trail stakeholders for review and comments.
- Identify GIS personnel within the WV Department of Transportation to provide technical support to the State Trail Coordinator.

APPENDIX 1

The following table contains detailed descriptions of the attribute fields included in this database. They are based on, but deviate from, the National Interagency Trail Data Standard. Field names in all capital letters are taken directly from the FITDS and field names in all lower case letters fields added to the data model by the WVGISTC.

LONG NAME	GIS NAME	DESCRIPTION
Data Source Agency	dataAgency	Agency or entity that created the dataset where the original line was sourced from.
Date of Last Data Used to Update	sourceDate	Publication date of source dataset, if available.
Date of Last Update	updated	Date line was added to the compiled dataset.
Dataset link (if available)	dataLink	Weblink to source dataset, if available.
Source Dataset Title	sourceDataset	The name of the source dataset where the line originated from.
TRAIL NAME	trailName	Name of the trail.
TRAIL NUMBER	trailNumber	Trail number.
TRAIL STATUS	trailStatus	Open/closed.
TRAIL LENGTH	trailLength	Trail length, in miles.
SHARED SYSTEM	sharedSystem	Alternative name or system a trail may be a part of. Example: Allegheny Trail
TRAIL SURFACE	trailSurface	Primary surface of the trail. Examples include: grass, dirt, gravel.
ADMIN ORG	adminOrg	Organization with primary administrative responsibility.
MANAGING ORG	manageOrg	Organization with primary management responsibility.
CONGRESSIONAL DISTRICT	congress	Congressional district the trail falls within.
COUNTY	county	County the trail falls within.
JURISDICTION	jurisdic	Other jurisdiction the trail falls within.
MUNICIPALITY	municip	Town/City trail falls within.
STATE	state	State trail falls within.
TRAIL SYSTEM	trailSystem	The trail network to which the segment belongs (if applicable).
ROAD SYSTEM	roadSystem	The road network to which the trail belongs, in the case of trails that utilize roads.
LAND USE PLAN	landUsePlan	Planning document regulating development of the trail.
PRIMARY TRAIL MAINTAINER	maintainer	Agency or entity with responsibility for trail maintenance.
TRAIL CLASS	trailClass	The prescribed scale of trail development, representing the intended design and management standards of the trail.
hiking allowed	hike	(yes/no) Hiking is a reccomended/allowed use for this trail.
bicycles allowed	bike	(yes/no) Biking is a reccomended/allowed use for this trail.
horses allowed	horse	(yes/no) Horseback riding is a reccomended/allowed use for this trail.
xc ski allowed	xcski	(yes/no) Cross Country skiing is a reccomended/allowed use for this trail.
backpacking allowed	backpack	(yes/no) Backpacking is a reccomended/allowed use for this trail.
Interpretive Trail	interp	(yes/no) This is an interpretative trail (ie, nature or educational trail).
fitness trail	fitness	(yes/no) Fitness stations are available on this trail.
AMERICAN DISABILITY ACT	ada	(yes/no) Trail is compliant with the Americans with Disabilities Act.

LONG NAME	GIS NAME	DESCRIPTION
COMPLIANT		
water trail	water	(yes/no) Trail is a water trail - ie, a river or canal.
MOTORIZED	motorized	(yes/no) Motorized vehicles are allowed on the trail.
suitable for atvs	atv	(yes/no) Trail is motorized and is suitable for ATVs.
suitable for OHVs	ohv	(yes/no) Trail is motorized and is suitable for OHVs.
suitable for dirt bikes	dirtbike	(yes/no) Trail is motorized and is suitable for dirt bikes/motorcycles.
PROHIBITED USE	prohibUse	Mode(s) of travel officially prohibited.
ACCESSIBILITY STATUS	accessStatus	Access guidline compliance status for hiking trails.
HISTORIC SIGNIFICANCE	historic	(yes/no) Historically significant trail.
NATIONAL TRAIL DESIGNATION	nationalTrail	National designation of a trail, which can include: National Historic Trails (NHT), National Scenic Trails (NST), Connecting or Side Trails (C-S), and National Recreation Trails (NRT); and also includes National Millennium Trails (NMT) and Millennium Legacy Trails (NLT).
RIGHTS-OF-WAY	rightsOfWay	Rights of way or permits required for trail travel.
SPECIAL MGMT AREA	mgmtArea	Special management area that a trail falls within, such as a park or wilderness area.
TRAIL CONDITION	condition	Physical condition of the trail.

APPENDIX 2

The following table contains detailed field type information for the data model. As in Appendix 1, field names in all capital letters are taken directly from the FITDS and field names in all lower case letters fields added to the data model by the WVGISTC.

FEDERAL FIELD	GIS FIELD	FORMAT NOTES	FIELD DEFINITION	FIELD LENGTH
Data Source Agency	dataAgency		Text	10
Date of Last Data Used to Update	sourceDate	YYYYMM	date	6
Date of Last Update	updated	YYYYMM	date	6
Dataset link (if available)	dataLink	http://….	weblink	50
Source Dataset	sourceDataset	_	Text	50
TRAIL NAME	trailName		Text	50
TRAIL NUMBER	trailNumber		Text	10
TRAIL STATUS	trailStatus		Text	10
TRAIL LENGTH	trailLength	miles	Number	XXX.X
SHARED SYSTEM	sharedSystem		Text	30
TRAIL SURFACE	trailSurface		Text	30
ADMIN ORG	adminOrg		Text	30
MANAGING ORG	manageOrg		Text	30
CONGRESSIONAL DISTRICT	congress		Number	XX
COUNTY	county		Text	20
JURISDICTION	jurisdic		Text	30
MUNICIPALITY	municip		Text	30
STATE	state		Text	4
TRAIL SYSTEM	trailSystem		Text	30
ROAD SYSTEM	roadSystem		Text	30
LAND USE PLAN	landUsePlan		Text	50
PRIMARY TRAIL MAINTAINER	maintainer		Text	30
TRAIL CLASS	trailClass		Text	10
hiking allowed	hike	y/n	Text	4
bicycles allowed	bike	y/n	Text	4
horses allowed	horse	y/n	Text	4
xc ski allowed	xcski	y/n	Text	4
backpacking allowed	backpack	y/n	Text	4
Interpretive Trail	interp	y/n	Text	4
fitness trail	fitness	y/n	Text	4
AMERICAN DISABILITY ACT COMPLIANT	ada	y/n	Text	4

FEDERAL FIELD	GIS FIELD	FORMAT NOTES	FIELD DEFINITION	FIELD LENGTH
water trail	water	y/n	Text	4
MOTORIZED	motorized	y/n	Text	4
suitable for atvs	atv	y/n	Text	4
suitable for OHVs	ohv	y/n	Text	4
suitable for dirt bikes	dirtbike	y/n	Text	4
PROHIBITED USE	prohibUse		Text	30
ACCESSIBILITY STATUS	accessStatus		Text	10
HISTORIC SIGNIFICANCE	historic	y/n	Text	4
NATIONAL TRAIL DESIGNATION	nationalTrail	y/n	Text	4
RIGHTS-OF-WAY	rightsOfWay		Text	30
SPECIAL MGMT AREA	mgmtArea		Text	50
TRAIL CONDITION	condition		Text	10

APPENDIX 3

The following is a table of source GIS datasets utilized in the compilation of the final dataset.

Source Dataset	Source Agency	Year	Area of Coverage
State Trail Plan	NPS	2002	Statewide
Trails of WMAs	WVDNR	2005	Wildlife Mgmt. Areas
CVI Trails	CVI	2007	CVI Property
Monongahela National Forest Trails	USFS	2009	Monongahela National Forest
State Forest Trails	WVDNR	2001	State Forests
Canaan Valley NWR Ski Trails	USFWS	2006	Canaan Valley NWR
Canaan Valley NWR Public Use Trails	USFWS	2006	Canaan Valley NWR
Hatfield-McCoy Trails	RTI	2008	Six small areas across six counties
Trails of Mercer County	Mercer County	2007	Mercer County and parts of adjacent counties
Misc. Trails of Tucker County	Tucker County Trails, Inc.	Unk.	Tucker County
New River Gorge Trails	NPS	2007	New River Gorge Area
Bluestone National Scenic River Area Trails	NPS	2007	Bluestone River area

APPENDIX 4

This is a list of selected public lands, ordered by type and name, and whether or not trail data is available in that area.

Area Name	Data	Area Type
Bluestone National Scenic River	yes	np
New River Gorge NRA	yes	np
Cabwaylingo State Forest	no	sf
Calvin Price State Forest	yes	sf
Camp Creek State Forest	yes	sf
Coopers Rock State Forest	yes	sf
Greenbrier State Forest	yes	sf
Kanawha State Forest	yes	sf
Kumbrabow State Forest	yes	sf
Panther State Forest	no	sf
Seneca State Forest	yes	sf
Audra State Park	no	sp
Babcock State Park	no	sp
Beartown State Park	no	sp
Beech Fork Lake State Park	no	sp
Berkley Springs State Park	no	sp
Blackwater Falls State Park	yes	sp
Blennerhasset Island State Park	no	sp
Bluestone Lake State Park	no	sp
Bluestone State Park	no	sp
Cacapon State Park	yes	sp
Camp Creek State Park	yes	sp
Canaan Valley State Park	yes	sp
Carnifex Ferry State Park	no	sp
Cass Scenic RR State Park	yes	sp
Cathedral State Park	no	sp
Cedar Creek State Park	no	sp
Chief Logan State Park	no	sp
Droop Mountain State Park	no	sp
Fairfax Stone State Park	no	sp
Grave Creek Mound State Park	no	sp
Hawks Nest State Park	no	sp
Holly River State Park	no	sp
Little Beaver State Park	no	sp
Lost River State Park	no	sp

Area Name	Data	Area Type
Moncove Lake State Park	yes	sp
Moncove State Park	yes	sp
North Bend State Park	yes	sp
Pinnacle Rock State Park	yes	sp
Pipestem State Park	yes	sp
Pipestem State Park Resort	yes	sp
Pricketts Fort State Park	no	sp
Stonewall Jackson Lake State Park	yes	sp
Tomlinson Run State Park	no	sp
Tu-Endie-Wie State Park	no	sp
Twin Falls State Park	no	sp
Tygart Lake State Park	yes	sp
Valley Falls State Park	no	sp
Watoga State Park	yes	sp
Watters Smith Memorial State Park	no	sp
Allegheny WMA	yes	wma
Amherst\Plymouth WMA	no	wma
Anawalt Lake WMA	no	wma
Andrew Rowan WMA	no	wma
Bear Rocks Lake WMA	yes	wma
Beckys Creek WMA	no	wma
Beech Fork Lake WMA	no	wma
Berwind Lake WMA	no	wma
Big Ditch WMA	yes	wma
Big Ugly WMA	no	wma
Bluestone Lake WMA	yes	wma
Briery Mountain WMA	yes	wma
Bruceton Mills Public Fishing Area	yes	wma
Buery Mountain WMA	no	wma
Buffalo Run WMA	no	wma
Burches Run WMA	yes	wma
Burnsville Lake WMA	yes	wma
Castleman Run WMA	no	wma
Cecil H. Underwood WMA	no	wma
Center Branch WMA	no	wma
Chief Cornstalk WMA	no	wma
Conaway Run Lake WMA	no	wma
Cove Creek WMA	no	wma
Cross Creek WMA	no	wma
Dunkard Fork WMA	no	wma

Area Name	Data	Area Type
East Lynn Lake WMA	no	wma
Edwards Run WMA	no	wma
Elk River WMA	no	wma
Fork Creek WMA	no	wma
Fort Mill Ridge WMA	yes	wma
Frozencamp WMA	yes	wma
Green Bottom WMA	yes	wma
Handley WMA	no	wma
Hilbert WMA	no	wma
Hillcrest WMA	no	wma
Horse Creek WMA	no	wma
Hughes River WMA	yes	wma
Huttonsville State Farm WMA	no	wma
Lantz Farm and Nature Preserve	yes	wma
Laurel Lake WMA	no	wma
Lewis Wetzel WMA	yes	wma
Lincoln County Shooting Range	yes	wma
Little Indian Creek WMA	no	wma
McClintic WMA	yes	wma
Meadow River WMA	no	wma
Mill Creek WMA	no	wma
Moncove Lake WMA	yes	wma
Morris Creek WMA	no	wma
Mount Wood Community Park	yes	wma
Nathaniel Mountain WMA	yes	wma
O'brien Lake WMA	no	wma
Panther WMA	no	wma
Pedlar WMA	no	wma
Pleasant Creek WMA	yes	wma
Plum Orchard WMA	no	wma
Pruntytown State Farm	yes	wma
R D Bailey Lake WMA	no	wma
Ritchie Mines WMA	yes	wma
Rollins Lake WMA	yes	wma
Sand Hill WMA	yes	wma
Shannondale Springs WMA	no	wma
Short Mountain WMA	yes	wma
Slaty Fork WMA	no	wma
Sleepy Creek WMA	yes	wma
Smoke Camp WMA	yes	wma

Area Name	Data	Area Type
Snake Hill WMA	yes	wma
South Branch WMA	no	wma
Stonecoal Lake WMA	yes	wma
Stonewall Jackson Lake WMA	yes	wma
Stumptown WMA	no	wma
Summersville Lake WMA	no	wma
Tate Lohr WMA	yes	wma
Teter Creek Lake WMA	yes	wma
The Jug WMA	no	wma
Thorn Creek WMA'	no	wma
Tug Fork WMA	no	wma
Turkey Run Lake WMA	no	wma
Upper Deckers Creek WMA	no	wma
Upper Mud Lake WMA	yes	wma
Valley Bend Wetlands WMA	no	wma
Walback WMA	no	wma
Warden Lake WMA	no	wma
Wheeling Jesuit Unitversity Camp	no	wma
Widmeyer WMA	no	wma
Woodrum Lake WMA	no	wma

APPENDIX 5

The following is a list of web links where information about the National Interagency Trail Data Standard can be found.

Main Page: http://www.nps.gov/gis/trails/

Attributes Listed By Core Question:
http://www.nps.gov/gis/trails/documents/AttributesbyCoreQuestion.pdf

Power Pont presentation: http://www.nps.gov/gis/trails/documents/ITDS_Update_9_10_2007.ppt