
West Virginia's Participation in The National Map

Final 2004 CAP Report (D-R-A-F-T)

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2994 CAP Grant Parameters

- *Cooperative Agreement Number:* USGS Award No. 04HQAG0189; WVU Award No. 10007010.1.1002781R; award amount \$36,588.
- *Project Title:* West Virginia Web Map Service Development for The National Map (FY 2004)
- *Project start and end dates:* 8/26/2004 to 6/30/2005
- *Lead project organization:* WV GIS Technical Center, West Virginia University
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- *USGS Mapping State Liaison:* Bruce Bauch
- *Collaborating Organization(s):* West Virginia Office of State GIS Coordinator; West Virginia GIS Technical Center, West Virginia University; West Virginia Addressing and Mapping Board; USGS Eastern Region Geography WMS Implementation Team.

Overview

This is a final report summarizing West Virginia's 2004 CAP Participation in *The National Map*, and also serves as a progress report for implementing *The National Map* (TNM) in West Virginia. Notable achievements include:

- (1) Registering OGC-compliant Web map services into TNM Catalog
- (2) Establishing a statewide public portal to access TNM layers
- (3) Creating a customized regional viewer application of TNM layers
- (4) Incorporating new statewide "local resolution" data into NSDI

This project advanced the development and public access of TNM layers in West Virginia. The West Virginia GIS Technical Center (WVGISTC) will continue to work closely with the FGDC/USGS, WV Office of State GIS Coordinator, and other partners in developing and providing current, accurate, and consistent digital geographic information about West Virginia.

WMS Registration with *The National Map Catalog*

The primary goal of the CAP project was to create OGC-compliant Web mapping services using ArcIMS software, and then register them with the TNM Catalog and Geospatial One Stop (GOS) portal. Within the statewide GIS community popular geographic layers were identified which are of higher spatial and temporal accuracy than the TNM layers currently accessible from remote mapping servers. Appendix A lists the targeted layers for inclusion into TNM. The data list is subdivided into three categories: federal vector layers, state vector layers, and statewide orthophotos. The targeted layers contribute something new to TNM and are datasets that are in demand by the State's geospatial community.

WVGISTC's catalog support team (CST) included Arthur Eckerson and Angela Mitchell of the Eastern Region Geography (ERG) Center; our GOS support contact and FGDC Metadata Support Liaison was Melissa Wegner.

Statewide Orthophotos: Special consideration had to be given to the statewide orthophoto layer because of its multiple projections, numerous tiles (8,000), and large file sizes which totaled to 550 GB for the entire State. The USGS Denver Mapping Center reprojected the original SAMPB orthophoto format from State Plane north and south zones into a single zone, UTM Zone 17, and re-tiled the orthos to the USGS quarter quad index.

Redundant Services: WVGISTC is interested in redundant services for both metadata search engines and catalog failover services. Failover services over a distributed GIS network should be implemented so that if a Web mapping service fails, another redundant service takes its place.

State Mapping Portal

mapWV.com (also mapWV.net, mapWV.org, and <http://www.wv.gov/gis>), similar to Kentucky's Geographic Services (<http://www.kentucky.gov/gis/>), was created to serve as a public gateway to West Virginia's digital geographic information. Other state agencies will be solicited to publish links to their Internet mapping applications at this website. Appendices B and C describe the initial website content and vision statement.

State Viewer Applications

WVGISTC created a customized viewer *WVbasemap* which allows the public to view, query, print, and download national map layers in West Virginia. The base mapping viewer application *WVbasemap* can also serve as a template for customizing other state agency Internet mapping applications. WVGISTC will utilize the *WVbasemap* viewer to customize Internet applications requested by the West Virginia Division of Homeland Security and State Historic Preservation Office. Only authorized users will be able to access viewer applications that display sensitive data.

In developing West Virginia's *WVbasemap* viewer application, WVGISTC referenced Delaware's DataMIL, Kentucky's Base Map, North Carolina's One Map, and USGS' National Map viewers. WVGISTC chose to emulate the state of Kentucky's online Internet base mapping viewers for disseminating core geographic layers to the public. Currently Kentucky provides a simplistic base map viewer application for the layman or casual user, as well as alternative link to a sophisticated base map viewer application for those users seeking more advanced map display, downloading, and printing functions. Likewise, WVGISTC created a simple base map viewer (*WVEZMap*) and more sophisticated base map viewer (*WVbasemap*) that offers more spatial tools.

Although more challenging programmatically, WVGISTC chose to create catalog-driven applications that access a distributed network of map servers and geographic services. In the future, WVGISTC would like to work with USGS to improve its data extraction capabilities from more than one server. Presently, users are limited to the types of data that can be extracted from the West Virginia viewers. Users can only download vector (line-based) layers from the West Virginia's *WVbasemap* viewer which access GIS databases on WVGISTC's local server. Raster (image-based) layers must be downloaded from *The National Map Seamless Data Distribution System*.

Table 1. Base map viewers. Viewers being developed by WVGISTC are in the development phase. See Appendices D-G for more information,

	VIEWER	DEVELOPER
1	WV EZMap: Simple viewer for layman or casual user (basic map display functions)	WVGISTC
2	WV's Basemap: Basemap viewer with more advanced functions http://157.182.136.70/website/NationalMapView/viewer.htm	WVGISTC
3	National Map Viewer: The National Map with WV bounding-box start-up option http://nmviewogc.cr.usgs.gov/viewer.htm?bbox=-82.68,37.18,-77.72,40.66	USGS
4	Seamless Data Distribution Center http://seamless.usgs.gov/website/seamless/viewer.php	USGS

Framework Base Layer Development

The West Virginia Statewide Addressing and Mapping Board (SAMB) is implementing an emergency response mapping program which will include a more current and accurate base map for West Virginia (<http://addressingwv.org/>). At the scale of 1:4800, these datasets will supplant maps and GIS data currently derived from the USGS 7.5' topographic quadrangles, many of which are outdated and do not accurately reflect the changing geographic features in many areas of the State. WVGISTC is working with the Statewide Addressing and Mapping Board, Baker Project Management Team, State GIS Coordinator, and other state and federal partners to ingest SAMB data into consistent, seamless, national mapping databases that reside in the public domain.

Much data development activity currently exists in the State because of the SAMB program and other federal map modernization programs, especially Census MAF/TIGER and FEMA's flood mapping programs. WVGISTC is actively involved in these statewide mapping programs, and provides leadership and services to advance the National Spatial Data Infrastructure (NSDI) in West Virginia. Appendix H lists focal areas for developing framework base data layers in West Virginia.

In 2005, USGS was directly involved in multiple map modernization activities in West Virginia. Below is a brief summary of NSDI data development activities specifically involving WVGISTC and the USGS:

Orthophotos: WVGISTC coordinated with the USGS Denver Mapping Center to convert statewide SAMB orthophotos captured in 2003 to a single UTM Zone projection so that the State and USGS can create Web mapping services of the orthophotos for various Internet mapping applications.

Elevation: WVGISTC is cooperating with the USGS Rolla Mapping Center to convert SAMB elevation mass points and breaklines into a raster surface for inclusion into the National Elevation Dataset (NED). The horizontal resolution and vertical accuracy of this statewide Digital Elevation Model (DEM) will be 3 meters. The conversion will be completed in 2006. *West Virginia will be the first state in the nation to have NED coverage at the 3-meter product level.*

Hydrography: WVGISTC and other partners are coordinating with the USGS Rolla Mapping Center to create a "local resolution" National Hydrography Dataset (NHD) for West Virginia. In June 2005, USGS evaluated the SAMB hydro data and reported favorably on the feasibility of ingesting the local SAMB data into the NHD. In the fall 2005, WVGISTC will begin an NHD pilot study, and hopes to begin the production phase of the conversion in May 2006. It is estimated that the conversion will be completed in 2007. *West Virginia will be the second state in the nation to have local resolution (1:4800-scale) NHD coverage.*

Geographic Names: In cooperation with the WV Army National Guard and WV Department of Education, WVGISTC submitted 900 grade schools for submission into USGS' Geographic Names Information System (GNIS). *West Virginia is the first state in the nation to submit batch corrections to update an entire feature class of the GNIS.*

Resources

Implementing TNM in West Virginia is a challenging endeavor, requiring much coordination and resources. The estimated cost of the hardware, software, and human resources for WVGISTC to implement and maintain certain aspects of the TNM in West Virginia for the next two years is \$200,000.

Outsourcing was necessary for certain specialized tasks. Consultants assisted WVGISTC with the configuration, installation, and tuning of the hardware system. Private consultants comprised of ESRI Professional Services, Baker Engineering, Timmons Group, and Strategic Consulting International. In addition, both Pennsylvania and North Dakota, which are implementing enterprise mapping systems, reviewed our system design and provided useful feedback.

Hardware Resources: The high performance, scalable system includes two Web servers, two application servers, one database server, an additional firewall, and a storage area network (SAN) device with a capacity of 4.8 TB of raw storage. The power servers are Dell PowerEdge 2850 servers (dual P4 3.6GHz/2MB Cache, Xeon, 4GB memory, 2 73GB SCSI drives) and the storage unit is a Dell EMC CX300 Storage Array (6 x 73GB 10k Fibre RPM Drives, 15x320GB PATA 5.4k RPM Drives). A 2004 FGDC CAP award and other state grants paid for the hardware costs which totaled to \$82,000.

Software Resources: The operating system software is Windows Server 2003. ESRI's ArcIMS map servers and spatial database engine (ArcSDE) are utilized. Oracle10g is the relational database which stores the geospatial data. Services were contracted to Dell and ESRI to assist in the installation, configuring, and optimizing of software during certain phases of the project. West Virginia University pays \$18,000 per year for an ESRI higher education site license, and \$800,000 per year for 30,000 Oracle seats. Limited Oracle technical support is provided by the university.

Human Resources: WVGISTC has one full-time and two student workers who have computer science backgrounds to implement programming, software, and hardware components of the system. We also have staff who can register FGDC metadata into the Geospatial One-Stop portal and TNM Catalog. Other personnel focus on framework data development and data dissemination via our Geographic Information Network. Federal partners such as the USGS and Census Bureau will need to continue to provide technical support services for the specifications, seamless integration, and certification of their stewardship data as well as software tools and business rules to assist with data maintenance.

Future Directions

GOAL 1 – CREATE VIEWER APPLICATIONS WHICH ACCESS MORE REMOTE WEB MAPPING SERVICES: WVGISTC prefers to create viewer applications that access data layers over a distributed network instead of serving all geospatial data on its local server. Certain functions, such as print-on-demand maps and data extraction, are more challenging to program via a distributed computing network. WVGISTC is also concerned that accessing remote servers may result in longer access viewing times. The reliability of remote services is another concern, in the event that a remote service becomes non-operational.

GOAL 2 – ASSIST OTHER STATE ORGANIZATIONS TO REGISTER WEB MAPPING SERVICES WITH THE NATIONAL MAP CATALOG: In cooperation with the USGS, WVGISTC would like to provide technical assistance to other organizations wanting to register their Web mapping services for TNM. If a state or local organization does not have the hardware, software, or human resources to publish Web mapping services in-house, then WVGISTC can assist that agency, particularly if that organization is a steward for framework base mapping layers.

GOAL 3 – PRODUCE NEXT-GENERATION TOPOGRAPHIC MAPS: WVGISTC would like to cooperate with the USGS and other partners in developing the next-generation topographic maps for West Virginia. This includes both print-on-demand maps created via the Internet, and high-quality cartographic maps produced from production line tool software. The State envisions where high-quality cartographic products are generated annually from continually maintained, consistent base mapping layers.

APPENDIX A: Targeted Catalog Layers

A. Descriptive Layer Name, Metadata URL, and Service URL:

**** FEDERAL VECTOR LAYERS ****

- National Wildlife Refuge Boundaries
<http://wvqis.wvu.edu/data/dataset.php?action=search&ID=236> bdry_nwr.sde
- National Forests Surface Ownership Boundaries
<http://wvqis.wvu.edu/data/dataset.php?action=search&ID=259> bdry_nationalforest_s.sde
- National Park Service Proclamation Boundaries
<http://wvqis.wvu.edu/data/dataset.php?action=search&ID=57> bdry_nationalpark_p.sde

**** STATE VECTOR LAYERS ****

- County Boundaries (1:24k)
<http://wvqis.wvu.edu/data/dataset.php?action=search&ID=136> bdry_county24k.sde
- State Forest
<http://wvqis.wvu.edu/data/dataset.php?action=search&ID=58> bdry_stateforest.sde
- State Park
<http://wvqis.wvu.edu/data/dataset.php?action=search&ID=203> bdry_statepark.sde
- State Wildlife Management Area (minus WMAs on USFS Lands)
<http://wvqis.wvu.edu/data/dataset.php?action=search&ID=59> bdry_wma_no_USFS.sde
- Tax District (1:24k)
<http://wvqis.wvu.edu/data/dataset.php?action=search&ID=3> bdry_tax_districts.sde

**** STATEWIDE ORTHOIMAGERY ****

- SAMB Orthophotos (not available yet)
<http://wvqis.wvu.edu/data/dataset.php?action=search&ID=254> SAMB_orthos_2003_2ft

B. Footprint Description: Statewide

C. Queryable: All vector layers queryable

D. Legend URL: Styled layer descriptors (SLD)?

E. Data Extract Service: WVGISTC would like all vector layers to be extractable

F. Viewing Restrictions: None

G. Viewscale Range for Statewide Orthophotos: 1:2000 to 1:120000 (testing required)

H. Spatial Reference: UTM Zone 17, NAD83, map units meters

I. Credit Line: The name that should appear on the National Map credit line → WVGISTC for WV GIS Technical Center

J. General website URL: <http://wvgis.wvu.edu/>

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L. USGS National Map Catalog Resources <http://helios.er.usgs.gov/catalog/index.html>

APPENDIX B: Web page content for public gateway to State's Geographic Services (mapWV.com)

mapWV.com (also mapWV.net and mapWV.org) is a public gateway to West Virginia's digital geographic information. This information can be viewed and downloaded via a high-speed Internet connection. See West Virginia's mapWV vision statement for more information.

WV Basemap Viewers

West Virginia EZMap: A lightweight map viewer geared for the general public for basic map information about West Virginia. It includes major roads, rivers, and other commonly referenced base mapping layers.

West Virginia's Basemap: This map viewer provides access to the commonly referenced base mapping layers for West Virginia. The data layers include transportation, hydrography, structures, elevation, and imagery that constitute West Virginia's portion of The National Map. It includes more advanced tools for viewing, querying, and downloading geographic data. Refer to vision statement for the statewide framework of geographic information.

U.S. Geological Survey's National Map Viewer:

<http://nmviewogc.cr.usgs.gov/viewer.htm?bbox=-82.68,37.18,-77.72,40.66>

The National Map provides public access to high-quality, geospatial data and information from multiple partners to help support decision making by resource managers and the public. The National Map is the product of a consortium of federal, state, and local partners including West Virginia. Viewers can link to the USGS Seamless Data Distribution System <http://seamless.usgs.gov/website/seamless/viewer.php> to download raster data.

WV Data Clearinghouses

West Virginia GIS Data Clearinghouse: This clearinghouse contains geographic information and documentation for over 200 GIS datasets that constitute the West Virginia Spatial Data Infrastructure.

West Virginia View (WVView): WVView is a consortium that promotes remote sensing in West Virginia. The consortium supports research, education and applied remote sensing activities, as well as the open sharing of imagery.

Other State Internet Applications

APPENDIX C: Vision statement for public gateway to State's Geographic Services (mapWV.com)

Vision Statement (copied from NC ONE Map)

West Virginia aims to have a statewide framework of geographic information that is seamless, current, and consistent with established standards. That framework will promote the maintenance of economic vitality in our communities, public health and safety, and the quality of life for all West Virginia. Our citizens will take the availability of comprehensive geographic information for granted.

*The foundation of the vision is a comprehensive statewide geographic data resource, called **MapWV**. Data content, accuracy and scales of the resource will be determined through consensus and in recognition of the critical uses to which it is applied. MapWV will serve the basic information requirements for decision-making in the community, statewide, and in support of national priorities.*

MapWV will provide information to support the daily business processes of numerous organizations and their functions. While any user may have a unique view of the resource and it ostensibly may be physically distributed and maintained by a variety of data producers, it will appear to users as consolidated and integrated.

*MapWV will include data that are current and accessible over the **Internet** to all statewide sectors including government agencies, utilities, private firms, schools, universities and individual citizens. Data on the Internet will be free to search, discover, view and acquire. It will be available 24 hours per day and seven days per week.*

***Standards and procedures** will ensure that data contain no unnecessary redundancies or inconsistencies, and that data are adequately and **uniformly documented**.*

Security measures will be implemented to protect confidential/restricted data and to limit access to any user's esoteric, local data.

*Innovative **partnerships** and cooperative agreements between municipal, county, regional, state, federal agencies, utilities, and others will be in place to ensure that the geographic information infrastructure endures and continues to meet user needs.*

*This vision will be realized through the leadership of the **WV GIS Technical Center, West Virginia Office of State GIS Coordinator, and State GIS Steering Committee** in collaborative endeavors with numerous organizations.*

MapWV will include, but not be limited to the following characteristics:

MapWV data are free to view and download in accordance with federal and state privacy, security, and data confidentiality laws.

MapWV data are redistributable, without restriction.

MapWV is accessible 24 hours per day and seven days per week on the Internet and data are searchable using key word and geographic prompts.

MapWV includes the minimum of 7 framework data themes, including geodetic control, elevation, orthophotography, surface waters, cadastral, streets and other transportation features, and jurisdictional boundaries.

MapWV may include other critical and strategic data, such as land use, land cover, water lines and systems, sanitary sewer lines and system; and demographics, but is not limited to these themes.

Although map scale is not specified, MapWV data are derived from large map scales and/or high resolution sources that are typical of products traditionally derived by counties and municipalities.

Historic and temporal data will be maintained and available.

MapWV provides data that represent the most current version of a data holding.

MapWV data are reliably maintained by the data provider organization through partners and formal arrangements.

MapWV data are reliably funded through partners and cost shares.

MapWV provides data that are based on accepted and published standards.

MapWV data are documented using published standards.

APPENDIX D: *WVbasemap* Viewer Layout

MAIN COMPONENTS

- Heading with logo and application title
- Layers
- Legend
- State Locator Map
- Partners: (USGS, WV Office of State GIS Coordinator, WV View)
- Text Frames
- Tools (toolbar and standalone tools)
- Help Section

VIEWER TOOLS

ZOOM and PAN

The Pan tools move the map horizontally and vertically. The Zoom tools change the map's scale and geographic extent.

- 1) Pan any direction
- 2) *Pan North, West, South, East (Xiannian)
- 3) Zoom In
- 4) Zoom Out
- 5) Zoom to Full Extent
- 6) Zoom to Last Extent
- 7) *Zoom to County (Xiannian)
- 8) *Zoom to City (Xiannian)
- 9) *Zoom to Scale tool (Xiannian)
- 10) *Zoom to Coordinate (Xiannian, Sam)
- 11) *Zoom to Address (Sam)

QUERY

The Query tools allow the user to view the tabular (attribute) data associated with features in the map view. These tools include the Query Builder, Identify, Find, and Buffer Tools.

Geographic Selection

- 12) Identify active layer
- 13) *Identify visible layers (Xiannian)
- 14) Buffer - find the features of one layer within a set buffer distance of another layer
- 15) Select by polygon
- 16) Clear Selection

Attribute (text) Selection

- 17) Query Builder
- 18) Find – locate features based on text string

QUERY and ZOOM

19) *Find Place (zoom to point) (Frank/Sam)

SPATIAL OPERATIONS

20) Measure

MAP VIEWER OPTIONS

21) Set Units

22) *Bookmark current view – image or URL (Sam)

ANNOTATION TOOLS

23) *Draw Box on image (Sam)

24) *Clear Box on image (Sam)

PRINT

25) *Print current view (Frank, Sam, Xiannian)

DOWNLOAD

26) *Extract vector only, local server only (Xiannian)

* Customized tools by WV GIS Technical Center

- County Boundary (1:24k) http://wvqis.wvu.edu/data/dataset.php?action=search&ID=136	bdry_county24k
- Incorporated Place http://wvqis.wvu.edu/data/dataset.php?action=search&ID=8	census_incorp_100k_poly
PUBLIC LAND BONDARIES	
- National Forest (Surface Ownership) http://wvqis.wvu.edu/data/dataset.php?action=search&ID=259	bdry_nationalforest_s.sde
- National Park (Proclamation Boundary) http://wvqis.wvu.edu/data/dataset.php?action=search&ID=57	bdry_nationalpark_p
- National Wildlife Refuge http://wvqis.wvu.edu/data/dataset.php?action=search&ID=236	bdry_nwr
- State Forest http://wvqis.wvu.edu/data/dataset.php?action=search&ID=58	bdry_stateforest
- State Park http://wvqis.wvu.edu/data/dataset.php?action=search&ID=203	bdry_statepark
- State Wildlife Management Area (minus WMAs on USFS Lands) http://wvqis.wvu.edu/data/dataset.php?action=search&ID=59	bdry_wma_no_USFS
TAX DISTRICT BOUNDARIES	
- Tax District http://wvqis.wvu.edu/data/dataset.php?action=search&ID=3	bdry_tax_districts
HISTORICAL	
- National Register of Historic Places (points) http://wvqis.wvu.edu/data/dataset.php?action=search&ID=20	NR_points
- National Register of Historic Places (polygons) http://wvqis.wvu.edu/data/dataset.php?action=search&ID=20	NR_polygons
ELEVATION	
- 30-Meter NED http://wvqis.wvu.edu/data/dataset.php?action=search&ID=29	NED_30m.sde
BASE IMAGERY	
- NED Shaded Relief* http://ned.usgs.gov/	
- SAMB Orthophotos http://wvqis.wvu.edu/data/dataset.php?action=search&ID=254	SAMB_orthos_2003_2ft
- SPOT Imagery http://wvqis.wvu.edu/data/dataset.php?action=search&ID=90	SPOT_imagery2000_10m
- TerraServer DOQ* http://terraserver.microsoft.com/	
- TerraServer DRG* http://terraserver.microsoft.com/	

* Data served from remote Web mapping service

APPENDIX F: WVbasemap Default Visible Layers

STATE SCALE

County Boundary
Major Cities
Interstates

COUNTY SCALE

County Boundary
Incorporated Places
Major Roads (Interstate, US Highway, and State Routes)
Major Rivers and Lakes

LOCAL SCALE

County Boundary
Incorporated Places
Populated Places
All roads
24k hydro

APPENDIX G: Useful Websites for creating *WVbasemap* Viewer Application

FEDERAL

The National Map	http://nationalmap.gov/
Seamless Data Distribution System	http://seamless.usgs.gov/

STATE

** KENTUCKY **	
Kentucky's Geographic Network	http://kygeonet.ky.gov/
Kentucky GeoPortal	http://kgsmmap.uky.edu/website/KGSGeoPortal/
Kentucky GIS Services	http://www.kentucky.gov/gis/

** NORTH CAROLINA **	
NC One Map	http://www.nconemap.net/

** DELAWARE **	
DataMIL	http://datamil.delaware.gov/

COUNTY

Greenwood County, SC	http://165.166.39.5/giswebsite/default.htm
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APPENDIX H: WV Framework Data Development

Data development of statewide geographic mapping layers requires lines of communication, authority, and defined stewardship roles. Focal issues may include data maintenance, data distribution, published data standards, and effective business models for supporting data development activities.

MAPPING LAYER	PRINCIPAL STEWARDS			DATA DEVELOPMENT FOCAL ISSUES
	Local	State	Federal	
ORTHOPHOTOS		SAMB	USGS USDA	(1) Digital Globe's Land Base update program. Change detection pilot studies. (2) USDA National Agricultural Imagery Program (NAIP) statewide coverage acquisition in 2006-2007. State's cost for one-meter, leaf on, color-infrared orthophoto product.
TRANSPORTATION ROADS	E-911 Address Coord.	SAMB WV DOH	Census USDOT USFS	Implement SAMB maintenance system. Identify physical location, partners, and funding.
RAILROADS		WV PSC	Census USDOT	(1) Assessment of SAMB railroad data (2) Identify statewide stewards (3) Improve attribution of Census TIGER
TRAILS		Multiple state agencies	NPS USDOJ	(1) Assessment of SAMB trail data (2) Identify statewide stewards
NAVIGABLE STREAMS			USACE	Identify statewide stewards
HYDROGRAPHY		WV DEP	USGS	Initiate pilot to convert SAMB hydrographic data to local resolution National Hydrography Dataset (NHD)
ELEVATION		WV DEP WV DOH	USGS	Complete SAMB elevation conversion to USGS 3-meter National Elevation Dataset
STRUCTURES	E-911 Address Coord.	SAMB	Census USGS	
BOUNDARIES POLITICAL	Assessors & Clerks	SAMB WV Leg.	Census	(1) Establish geographic partnership program between state entities and Census' Boundary Annexation Survey (BAS) office. (2) Enact procedural rules for local governments
PUBLIC LANDS		WV DNR	USDOJ	(1) Collect both proclamation and surface ownership boundaries (2) Resolve coincidental boundary issues
TAX	Assessors	WV Code	USGS	
LAND COVER			USGS	Incorporate patchwork of local resolution land cover datasets into the USGS National Land Cover Dataset (NLCD)
GEOGRAPHIC NAMES		WVGISTC WV GES	USGS	Update cultural resources in USGS Geographic Names Information System
CADASTRAL (TAX)	Assessors	WV DTR	BLM	Revise procedural rules for maintaining manual tax maps to include digital rules