



WV GIS Technical Center 2011 ANNUAL REPORT

Mission and Objectives

The West Virginia GIS Technical Center, located in the Department of Geology and Geography at West Virginia University, provides focus, direction and leadership to users of geographic information systems (GIS), digital mapping and remote sensing within the State of West Virginia. The WV GIS Technical Center (WVGISTC) was established under Executive Order No. 4-93 and continued under Executive Order No. 10-10, which specify that the Technical Center shall provide technical services to support the development and operation of GIS in West Virginia.

The primary objectives of the Center are to reduce the duplication of GIS data development among organizations; disseminate GIS spatial data, Web map services, mapping applications, and other geographic information free-of-charge through the Internet; develop and build new data additions to the West Virginia Spatial Data Infrastructure; assist with strategic planning, development and implementation of GIS and mapping guidelines statewide; provide advisory services and training programs in GIS; and conduct research and provide education towards improvement of geographic information technologies in West Virginia. The Center coordinates with the State GIS Coordinator to accomplish these objectives.

Personnel

The staff consists of two geography professors who serve as co-directors, seven full-time employees, and student and temporary employees hired periodically to accomplish project tasks. This past year external funding permitted the hiring of two additional employees: GIS programmer and analyst.

- Dr. Gregory Elmes, Co-director
- Dr. Trevor Harris, Co-director
- Kurt Donaldson, Manager
- Frank LaFone, Senior Internet Programmer
- Evan Fedorko, GIS Analyst
- Eric Hopkins, GIS Analyst
- Kevin Kuhn, GIS Analyst
- Maneesh Sharma, GIS Analyst
- Xiannian Chen, GIS Programmer

Funding and Programmatic Oversight

Primary FY 2010-11 funding of \$287,863 was received from the state-appropriated Mineral Lands Mapping Program (Fund 0253, Activity 207) approved under House Bill 2222 in February 1995. Fiscal management of this program was delegated to the WV Geological & Economic Survey. Additional external funding was obtained from several grants and service contracts. Programmatic oversight is through the Office of State GIS Coordinator and GIS Policy Council.

Projects and Activities FY 2011

Build and Disseminate State's Spatial Data Infrastructure

The WVGISTC supports digital data conversion, data development, and coordination with federal geospatial data initiatives, statewide mapping programs, and local (county, municipal) data producers. The Center collaborates with the WV Office of GIS Coordinator and other partners to create a value-added, high temporal and spatial resolution base map for West Virginia. Base layers such as imagery, elevation, transportation, streams and administrative map layers benefit the public. Data development efforts for the past fiscal year included the following:

National Hydrology Dataset (NHD): Completed the initial year of NHD stewardship and maintenance in West Virginia. Partners: USGS, NRCS, WV OGC, WV DEP, WVU NRAC.

Road Centerlines: Completed report on the integration of multiple statewide transportation datasets to support linear referencing, routing, and addressing. Partners: WV DOT, RTI.

Orthophotos: Presently the best statewide leaf-off imagery is the 2003 SAMB imagery collected at 1:4800-scale and 2-ft pixel resolution. To improve the spatial and temporal resolutions of the SAMB imagery, other organizations have contributed local resolution imagery, resulting in a mosaic of the best leaf-off imagery in West Virginia (Figure 1). Currently the best leaf off imagery mosaic includes 1"=100' orthophotos from Brooke, Cabell, Hancock, and Monongalia Counties; and 1"=200' orthophotos for the Charleston Area. Partners: local, state, and federal agencies.

Elevation: Created new statewide 10-ft contours and hillshade grid from 2003 SAMD elevation data.

Geographic Names: Updated 168 school features and corresponding mapping application (<http://www.mapwv.gov/schools>). In addition, 864 cultural features that included golf courses, prisons, hospitals, bridges, and shopping centers were updated in the national gazetteer database. Partner: USGS.

Addressable Structures: Updated locator services for site and street address data extracted from Statewide Addressing and Mapping System. Partner: WV DHSEM.

Trails: Collected and validated statewide trails for northern West Virginia. Integrated trail data of various stakeholders, resulting in an updated statewide trail database. Partners: WV DOT, RTI.

Mineral Parcels: WVGISTC contributed to the State Tax Department, Property Tax Division (PTD) Mined Minerals GIS project by spatially locating, digitizing and attributing mineral parcels. In 2010 WVGIS mapped 4,690 parcels and geo-rectified 580 mineral maps; in 2011 WVGISTC produced 1,954 polygons of mined areas and geo-rectified 799 mine maps. Partners: WV DTR, WV OGC.

Cultural Resources: Digitized 366 Civil War battles and skirmishes; conducted an audit of archeological sites and survey features. Partner: SHPO

Flood Hazard Layers: Created a statewide seamless file of flood hazard data. Partners: FEMA, WV DHSEM NFIP Office, private sector.

Mapping Projects and Applications

During fiscal year 2011, WVGISTC participated in a number of mapping projects. Select projects are highlighted below:

Flood Hazard Mapping and Hazard Determination Tool: In partnership with the WV National Flood Insurance Program Office & FEMA, WVGISTC released a new version of the WV Flood Tool utilizing ArcGIS 10 Server technology (Figure 2). The WV Flood Tool allows floodplain managers, insurance agents, developers, real estate agents, local planners and citizens to make informed decisions about the degree of flood risk for a specific area or property. Both casual and expert users can navigate or zoom to the location of interest, and then click on the map to query flood hazard information. The tool includes the best available flood and reference data, and includes connections to other Web map services hosted by other state agencies like WV DOT and WV DEP. The online mapping application and documentation can be accessed at the following link: <http://www.mapwv.gov/flood>.

Feature Highlights:

- Includes the best available flood mapping data from FEMA and other approved sources
- Incorporates the best available background and reference layers (aerial photos, roads, 10-ft. contours, addresses, etc.) from commercial and local data sources
- Includes three customized map views (Public, Expert, and Risk MAP) for general and advanced users for determining flood hazards and mitigating flood risks
- Provides multiple ways to zoom to geographic locations, including by street address, coordinates, place names, and navigation controls
- Permits users to view high-resolution aerial photography at a zoomed-in map scale of 1:1,128
- Displays the approximate elevation of the ground at any location with a vertical accuracy of ± 10 feet
- Links specific areas of the map to local floodplain manager contacts or FEMA's online map service center to view official flood maps
- Allows users to publish or exchange links of flood maps
- Displays and queries HAZUS 100-year flood event information to assist in mitigating flood risks
- Employs ArcGIS Server 10 technology to improve performance and visual appearance of map features

SHPO Cultural Mapping: In cooperation with the State Historic Preservation Office, WVGISTC provided continual support for the archeological and architectural resources application using ArcGIS Server. The application permits different levels of access to cultural resources.

Energy Research and Mapping: An updated and redesigned version of the National Carbon Sequestration Database and Geographic Information System (NATCARB) was launched on the NETL website. The interactive online tool integrates a wealth of information about worldwide efforts to deploy CCS technologies. Link: http://www.netl.doe.gov/technologies/carbon_seq/

Mass Evacuation Modeling & Simulation: WVGISTC and other contractors to the WV Department of Military Affairs and Public Safety completed an online mapping application to simulate a mass evacuation event from the National Capitol Region to rural regions like West Virginia. The simulation model was developed for emergency planners and is hosted on WVGISTC servers.

WV Base Map: WVGISTC is progressing on completing the new WV BaseMap application using ArcGIS Server technology. The application will incorporate the best available public data and enhanced functions for viewing and querying geographic information in West Virginia.

Other Internet Mapping Applications: WVGISTC continued support for a Trout Stream Stocking application for the WV Division of Natural Resources (<http://157.182.212.223/website/dnr/viewer.htm>), and created a new source water assessment and protection application for the WV Department of Health and Human Resources.

Geographic Information Network Services

WVGISTC provides a suite of Internet services to disseminate geographic data and information, including the MapWV.gov (<http://www.mapwv.gov/>) portal, State GIS Data Clearinghouse, and GIS People Directory. This past year external funding allowed for updating the hardware infrastructure with new virtualized servers and expanded storage to 48 TB, along with the deployment of ArcGIS 10 Desktop and Server software.

MapWV.gov: MapWV.gov is a public gateway to online mapping resources in the Mountain State, providing a wealth of high-quality maps and geographic data via the Internet. The site provides access to static and dynamic maps as well as Web map services. The target audience of MapWV.gov is the general public or casual user who is seeking geospatial information.

Data Clearinghouse: The State GIS Data Clearinghouse continues to grow each year. Currently, the Data Clearinghouse features over 320 separate datasets valued at more than \$50 million dollars. Mapping professionals in the state and nation are the target audience for this website. Data is accessed by FTP download, Web map services, or links to data stewards who routinely post geospatial data on their websites. The Data clearinghouse can be found at <http://wvgis.wvu.edu//data/data.php>.

GIS Contacts and News: WVGISTC maintains a list of people interested in GIS news, events and activities in West Virginia. A WV GIS People Directory is maintained by an Access Database connected to a Web interface, accessible through the WVGISTC website. WVGISTC also provides support with news postings, online surveys, electronic mail lists, and the Constant Contact email marketing service utilized by the WV Association of Geospatial Professionals.

Assists with strategic planning, development, and implementation of statewide mapping guidelines.

WVGISTC continued its efforts with other partners on standards and business plans to advance the State's Spatial Data Infrastructure. Specifically, WVGISTC provided strategic planning efforts focused on statewide cadastral and trail GIS data produced by multiple stakeholders.

Trail Standards: In cooperation with the Rahall Transportation Institute, WVGISTC created a spatial database of trail lines and attributes integrated with the WV State Trail Coordinator's (WVSTC) tabular database of trail information. This dataset was constructed utilizing WV DOT guidelines and the Federal Interagency Trail Data Standard.

Cadastral Standards: WVGISTC participated in meetings convened by the State GIS Coordinator to draft a cadastral business plan. In addition, the GIS Manager of WVGISTC is Chair of the Tax Mapping Committee of the Property Valuation Training & Procedures Commission that has been charged with modernizing tax map procedures, map sales, and data distribution guidelines.

Technical Support, Educational and Training Services

WVGISTC provides outreach, educational and training support, and advisory services to the citizens, government agencies, non-profit organizations, and businesses of West Virginia in the area of GIS and related spatial data technologies.

2012 WV GIS Conference: Since 2004, WVGISTC has been a lead organizer and administrative supporter of the biennial state GIS conference. The WVGISTC will be a host for the 2012 WV GIS Conference at WVU on May 8-11.

GIS Training Survey: WVGISTC assisted with an online GIS training survey to identify and prioritize GIS training for the WV GIS community.

Certified Instructor-Led Training: WVGISTC organized and presented instructor-led training throughout the year. An ArcGIS 10 authorized instructor provided training to over 100 GIS professionals in the State, and this same staff member also became a certified instructor for the URISA Cartography and Map Design Workshop. In June 2011, WVGISTC led a GIS workshop at the WVAGP Annual Meeting in Shepherdstown; and as in the past several years, in July 2011, WVGISTC provided GIS training to K-12 teachers. Lastly, WVGISTC served as a training host site for FGDC metadata training and the new WV IJDC mapping application.

2010 GIS Day at Capitol: On November 17, 2010, GIS professionals converged on the Capitol to increase the awareness of geospatial technologies in the State. Governor Tomblin signed a GIS Proclamation prepared by Tony Simental, WV State GIS Coordinator.

Technical Support: WVGISTC provided a wide range of technical support services related to GIS data, map services, technical proposals, etc.

WV Association of Geospatial Professionals: WVGISTC provided administrative support for the GIS User Group.

Other Outreach Efforts: Presented GIS papers at ESRI and AAG conferences; co-authored an article on rural health research. Instrumental in approval of GISCI certification resolution and WVSPS allied membership.

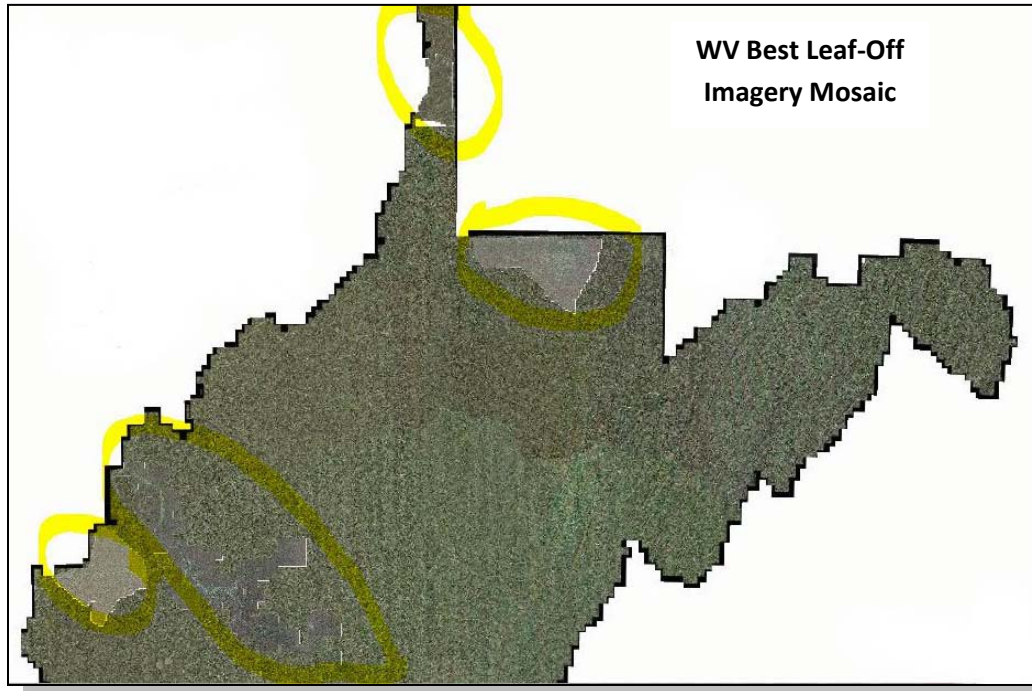


Figure 1: High resolution imagery for Charleston, Huntington, Morgantown, and Weirton areas incorporated into SAMB 2003 statewide leaf-off imagery

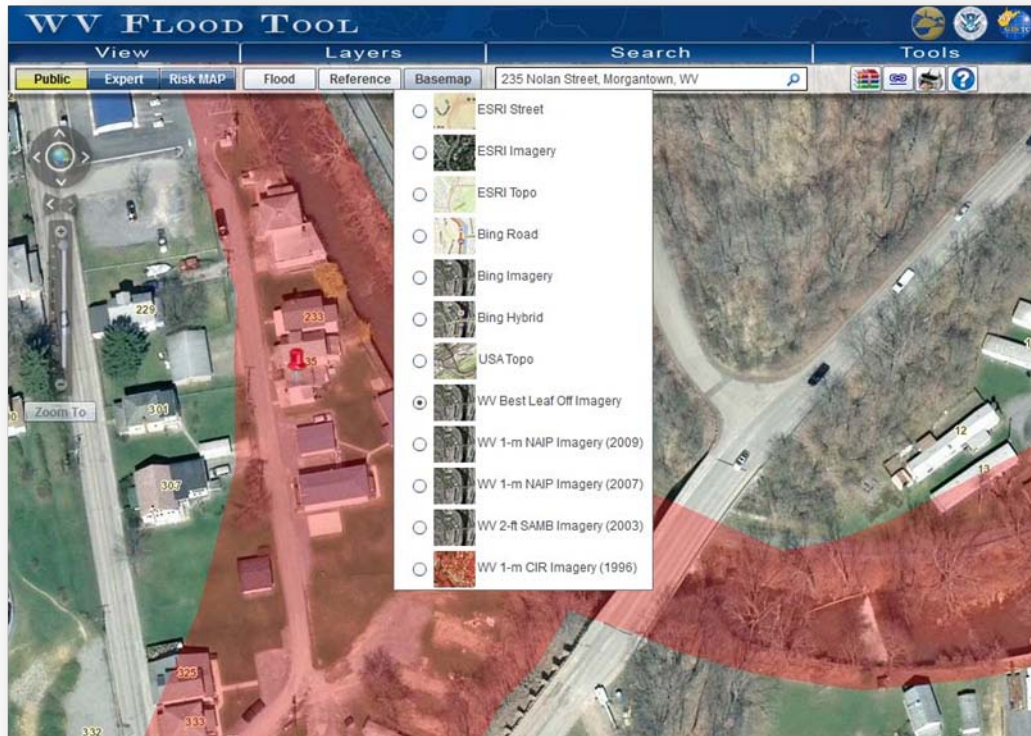


Figure 2: WV Flood Tool mapping application (www.mapwv.gov/flood)

WVGISTC Annual Report Outline (October 2011)

- 1) Highlights
 - a) **Personnel:** External funding permitted the hiring of two additional employees: GIS programmer and analyst.
 - b) **System Architecture:** External funding allowed for updating the hardware infrastructure with new virtualized servers and expanded storage to 48 TB. Deployed ArcGIS 10 Desktop and Server software.
 - c) **Data Development & Services:** Continued update and publishing of base layer GIS data and services to include geographic names, road centerlines, trails, streams, elevation contours, addresses locator services, and statewide orthophoto mosaic. Also supported GIS database development of mineral parcels, flood layers, and cultural resources. Processed numerous public requests by phone and email for GIS data and services. Permitted discovery of geographic data and services via MapWV.gov and WV GIS Data Clearinghouse (www.wvgis.wvu.edu).
 - d) **ArcGIS Server Online Map Application Development:** Completed new online mapping applications for US DOE, WV NFIP Office, and WV DHHR. Finalizing other ArcGIS Server applications for WV DNR, SHPO, and base map for WV OGC. Technical support for county web services.
 - e) **Training:** A staff member attained certified instructor status for three Esri ArcGIS 10 Desktop courses and the URISA Cartography & Map Design Workshop. Led GIS training workshop at Shepherdstown GIS meeting and for K-12 instructors in Morgantown. Conducted training survey of GIS professionals to identify and prioritize training needs. Served as host for FGDC metadata workshop and WV IJDC mapping application.
 - f) **Outreach:** Participated in 2010 GIS Day at Capitol. Provided support services for WVAGP communication and outreach efforts, to include registration and training for Shepherdstown GIS meeting and other various workshops. Instrumental in approval of GISCI certification resolution and WVSPS allied membership. Maintained GIS People Directory and several electronic mailing lists. A lead organizer of 2010 and 2012 WV GIS Conference. Presented on GIS accomplishments at ESRI and AAG. Co-authored article on rural health research.
 - g) **Standards:** Continued efforts with other partners on standards and business plans for statewide cadastral and trail data layers.

- 2) GIS Data Development and Web Services
 - a) Geographic Names / Gazetteer.
 - i) GNIS Schools: Updated 168 school features. See [Schools GNIS Report](#). USGS provided funding support.
 - ii) GNIS Cultural Features: Updated 864 structures and cultural features for golf courses, prisons, hospitals, bridges, and shopping centers. See [Cultural Features GNIS Report](#). USGS funding support.
 - iii) GNIS Data Clearinghouse link: <http://wvgis.wvu.edu/data/dataset.php?ID=99>

- b) Road Centerlines
 - i) WV DOT Feasibility Study: Investigated the integration of multiple statewide transportation datasets to support linear referencing, routing, and addressing. Partners: WVDOT, RTI. See [WV DOT Feasibility Study](#).
 - ii) 2011 TIGER Roads: Edited and posted new 2011 Census TIGER Roads on the Data Clearinghouse: <http://wvgis.wvu.edu/data/dataset.php?ID=300>
- c) Streams & Water Bodies
 - i) NHD streams development. Funded by USGS & WVOGC. See [NHD Stewardship Report](#).
- d) Orthophotos
 - i) Best Leaf-Off Imagery Mosaic (Counties/State/Federal Sources)
 - ii) Demonstrated ability to import new Pictometry imagery into ArcGIS 10
- e) Addresses
 - i) Updated statewide locator services in November 2010 from WVDHSEM addressing and mapping files
 - ii) WV Addressing Locator Services: <http://wvgis.wvu.edu/data/dataset.php?ID=411>
- f) Recreational Trails
 - i) Funded by WV DOT; RTI a partner
 - ii) WVGISTC collecting and validation trails for northern West Virginia
 - iii) Published new trail standard for stakeholders
 - iv) Published new recreational trails data for West Virginia: <http://wvgis.wvu.edu/data/dataset.php?ID=413>
 - v) See [2011 Trails Development Report](#) for Monongalia County.
- g) Elevation
 - i) 10-ft contours: <http://www.wvgis.wvu.edu/data/dataset.php?ID=423>
 - ii) Produced new hillshaded grid from 3-meter SAMB elevation data
- h) Land Cover
 - i) Posted new land cover data sets on Clearinghouse: <http://www.wvgis.wvu.edu/data/dataset.php?ID=422>
- i) Mineral Mapping
 - i) 2010 Mineral Parcel Mapping Project. Funding from MLMP.
 - (1) Completed mapping and final QC for 24 counties (4,690 parcels total)
 - (2) Enhanced 3,307 parcels from Geocode 3 to Geocode 4 status, 70.5% of those assigned
 - (3) Geo-rectified mineral maps (580 images total) for 43 counties
 - (4) Created detailed documents with parcel mapping status and supporting information
 - (5) Created a training manual detailing the course of the project
 - (6) See [2010 Mineral Parcel Mapping Project](#)
 - ii) 2011 Mine Map Data Extraction Project. Funding from MLMP.
 - (1) Converted, re-projected, and digitized 936 maps, resulting in 1,954 new polygons of mined areas.
 - (2) Geo-referenced 799 mine maps
 - (3) See [2011 Mine Map Data Extraction Final Report](#)
- j) Flood Data Layers (FEMA, WVDHSEM)
 - i) Advisory Flood Heights (Water Surface Elevations) - <http://wvgis.wvu.edu/data/dataset.php?ID=414>

- ii) DFIRMs - <http://wvgis.wvu.edu/data/dataset.php?ID=367>
- iii) Statewide Flood Polygons - <http://wvgis.wvu.edu/data/dataset.php?ID=373>
- iv) HAZUS Level 1 - <http://wvgis.wvu.edu/data/dataset.php?ID=419>
- k) Cultural Resources (SHPO)
 - i) Civil War Sites: 366 Civil War battles and skirmishes digitized. See [Final Report](#).
 - ii) Archeological Sites & Surveys Audit. Draft of Final Report completed.
- 3) ArcGIS Server Mapping Application Development & Support
 - a) WV DMAPS - Catastrophic Modeling & Simulation Project
 - i) Subcontractor to MATRIC and Azimuth on this project
 - ii) Hosted on WVGISTC servers
 - iii) Website: <http://www.massevacsim.com/>
 - b) WV Rural Health Center & DHHS HRSA
 - i) Research and spatial analysis of environmental health for rural populations
 - c) WV DHHR (Source Water Assessment and Protection Program)
 - i) The new ArcGIS Server application provides authorized users with a determination of an identified location relative to Public water system, sources, DEP and EPA Locations. The goal is to reduce the time and costs required to make these initial determinations and to facilitate in further analysis. Program link: <http://www.wvdhhr.org/oehs/eed/swap/>
 - ii) ArcGIS Server Application Link: <http://157.182.212.211/dhhr/>
 - d) US DOE (NATCARB)
 - i) An updated and redesigned version of the National Carbon Sequestration Database and Geographic Information System (NATCARB) was launched on the NETL website. The interactive online tool integrates a wealth of information about worldwide efforts to deploy CCS technologies. The tabs within NATCARB open different maps for query and analysis capabilities, including an (1) RCSP tab; (2) ATLAS tab; (3) FIELD PROJECTS tab; and (4) WCCS tab. The NATCARB Viewer is accessible from: http://www.netl.doe.gov/technologies/carbon_seq/
 - ii) Brine Tool: National Brine GIS Database Application - <http://www.natcarbviewer.com/brine/>
 - e) WV DNR (trout streams, R&E species)
 - i) Rare & Endangered Species – funded by NRCS & WV DNR
 - ii) Trout Stocked Streams - Converting application to ArcGIS Server <http://157.182.212.223/website/dnr/viewer.htm>
 - f) WV DHSEM & FEMA
 - i) Updated new WV Flood Tool (<http://www.mapwv.gov/flood/>) which incorporated new functions and Web services, including consuming data services from WV DEP & WV DOT.
 - g) WV SHPO (cultural) – Revising to cultural resources application: <http://157.182.212.212/shpo/#>
 - h) WV OGC (base map) / Community Base Map – Integrated base map layers and enhanced functions accessible to the public.
 - i) WV LegSVC (state/delegate districts) – New application with 2012 redistricting files
 - j) County Web Services Support (Monongalia, Harrison, Jefferson, Preston, etc.)

- 4) Standards Development
 - a) Trails
 - i) Published new trail data models for WV DOT
 - b) Cadastral
 - i) Participated in meetings convened by State GIS Coordinator to develop a cadastral business plan
 - ii) Chair of the Tax Mapping Committee of the Property Valuation Training & Procedures Commission charged with modernizing tax map procedures, map sales, and data distribution guidelines.

- 5) Outreach Services and Technical Support
 - a) Conference Planning – 2012 WV GIS Conference
 - b) WVAGP administrative support – communication services, workshop registrations, GIS certification, information exchange, etc.
 - c) Training
 - i) Certified Instructor-led ESRI ArcGIS 10 Desktop Levels I, II, III (Quarterly 2011)
 - ii) Certified Instructor-led URISA Cartography & Map Design (Spring 2011)
 - iii) K-12 teachers course (July 2011)
 - iv) Training host site
 - d) Communications Services
 - i) GIS People Directory
 - ii) Electronic Mail Listings
 - iii) Online Surveys
 - e) Technical Support queries
 - f) Map proposal assistance for counties

- 6) Hardware - This past year the Tech Center made a major upgrade to its computing infrastructure. To accommodate the increased data serving demands as well as increases in application technology updates, the Tech Center moved to a virtualized infrastructure for its server environment. This virtualization will allow for easier expansion of server capabilities as needed and a rapid turnaround from needs assessment to server implementation. The Tech Center took the opportunity to expand the capabilities of the servers during the upgrade. In terms of power, the servers were upgraded to latest generation Xeon processors and RAM was upgraded from 4GB per server to 48GB per server. Storage was upgraded from 18TB of raw storage to 48TB of raw storage to accommodate currently expected and future large imagery datasets.

- 7) Future GIS & Metadata Development in Year 2012
 - a) 2012 NHD maintenance
 - b) 2012 GNIS – update of 15 named features
 - c) 2011 Census data
 - d) 2012 WV Legislature Redistricting
 - e) Metadata for Broadband GIS data
 - f) Metadata for WV IJDC/WDA water/sewer utilities

- g) 2011 NAIP processing
- h) Update Web Services Catalog; Data Clearinghouse maintenance & updates
- i) Lidar & local aerial photo status maps
- j) WVU Land Holdings
- k) 2012 Trails Data
- l) Countywide Parcel Data Layer
- m) Integrated topographic basemap