Wednesday, May 9, 2012

**Paper and Poster Sessions**

**Schedule & Abstracts**

![2012 West Virginia GIS Conference Logo](image)

Paper Abstracts: pp. 2-15  
Poster Abstracts: pp. 15-20  
Web Mapping Application Abstracts: pp. 21-22

West Virginia University  
Brooks Hall  
Department of Geology and Geography
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<tr>
<td>Rm 225</td>
<td>8:30 AM</td>
<td>Track 1</td>
<td>*Baker, Benjamin, Graduate Student, Department of Geology and Geography, West Virginia University</td>
<td><em>Forest fragmentation mapping, change detection, and gas well site identification in remotely sensed imagery: the role of spatial resolution</em></td>
<td>Little research has investigated the spatial pattern of land cover change associated with the ongoing expansion of natural gas drilling, particularly across much of the northern Appalachian Region. This research focuses on identifying optimal data and methods for detecting and quantifying land cover change associated with drilling in Appalachia. Mapping land cover change facilitates research of other relevant topics that require knowledge of methodological and scaling issues, particularly concerning environmental impacts of gas well drilling. I found that object-based classification is not significantly more accurate than pixel-based classification at any of the observed spatial resolutions. However, object-based classifications were qualitatively more suitable for identifying well clearings at finer (1 m) resolutions, whereas the pixel-based classifications had a higher proportion of correctly identified well clearings at the coarsest resolution (30 m). Landscape metrics were also used to characterize significant changes in forested areas over time. Landscape metric values derived from random quadrat samples throughout the entire study area differed from values using only samples with high or low densities of new gas well clearings. Changes in metrics for sample areas with low densities of new wells indicate significant increases in forest area and mean patch size. One metric—edge density—was found to be sensitive to natural gas development in areas with high densities of new clearings. This research suggests significant changes to forested ecosystems must be observed at a scale finer than the county level to assess the ecological significance of natural gas development.</td>
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<td>Rm 325</td>
<td>3:10 PM</td>
<td>Track 2</td>
<td>Barnett, Jason, Information Exchange Broker, Booz Allen Hamilton</td>
<td><em>The Homeland Infrastructure Foundation Level Data (HIFLD) to the Regions (HTTR)</em></td>
<td>This effort focuses on supporting State and local priorities and issues to (1) extend awareness and reach of Federal infrastructure protection resources, (2) increase and enhance regional geospatial coordination activities, (3) strengthen Federal, State, local and private sector partnerships, and (4) support the identification, enhancement, sharing, and dissemination of geospatial infrastructure data. The HTTR Information Exchange Brokers (IEBs) serve as field extension support. Their regional presence allows them to continuously engage with partners to promote domestic infrastructure information gathering, sharing, protection, enhancement, visualization, and spatial analysis. IEBs collaborate with and support a variety of stakeholders, including Federal, state, and local government officials to (1) create and foster partnerships with, and relationships between, Federal, state, local, tribal, and private sector stakeholders, (2) share best practices and lessons learned from across the nation to reduce duplication of effort and mature capabilities support special events by bringing together people, partnerships, foundation geospatial infrastructure data and geospatial resources, (3) assist with distribution of the Homeland Security Infrastructure Program (HSIP) Gold and Freedom databases, and encourage feedback from data users, and (4) ensure the best available geospatial data is discovered, improved, and shared among partners.</td>
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**Rm 225  8:30 AM (Track 1)**
Presenter: **Boettner, Fritz**, Principal, GIS Program, Downstream Strategies, Morgantown, WV  
**Clingerman, Jason**, Aquatic Scientist, Downstream Strategies, Morgantown, WV  

**Title:** Modeling Fish Habitat Conditions for the Five Midwest Fish Habitat Partnerships (FHPs) – A GIS Approach  

**Abstract:**  
Fishery and aquatic scientists often assess habitats to understand the distribution, status, threats, and relative abundance of aquatic resources. We developed spatially-explicit aquatic habitat assessment models for multiple fish habitat partnerships (FHPs). These models and analyses using GIS allowed for a deeper understanding of the link between terrestrial and aquatic health.  

We utilized the NHD plus tools to link a suite of GIS-derived watershed characteristics to 1:100k catchments. We then modeled aquatic responses by using these watershed variables as predictor variables in a separate statistical model. From the statistical model, we also produced quantitative metrics of anthropogenic stress and natural habitat quality for each model. Model predictions, stress, and natural quality indices were all spatially-explicit in nature, and provided information necessary to prioritize conservation activities.  

Additionally, a geospatial (ArcMap integrated) decision support tool was developed to give users the ability to understand habitat conditions and stressors based on the status and severity of threats, at a specified location, at the catchment and HUC 12 levels. The tool is also used to develop prioritizations of conservation activities. It interactively quantifies the cumulative effects of the derived metrics on downstream habitat conditions based on customizable future scenarios.

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**Rm 225  8:45 AM (Track 1)**
Presenter: **Boettner, Fritz**, fboettner@downstreamstrategies.com, Principal, GIS Program, and **Clingerman, Jason**, Aquatic Scientist Downstream Strategies, Morgantown, WV  

**Title:** Development of watershed management tools and data for the implementation of a comprehensive watershed management plan. Developed for the Elk Headwaters Association; Slatyfork, WV.  

**Abstract:**  
The Elk River headwaters flow through Pocahontas, Randolph, and Webster Counties, West Virginia; these waters are comprised of unique, high-quality, cold-water streams that support reproducing populations of brook, brown, and rainbow trout. This fragile watershed, located atop karst geology, is not without threats of development and various land uses. Stakeholders sought to understand their watershed, to be informed on how to manage towards sustainable development, and to help influence and provide incentives for land-use decisions based on the knowledge of the environment and its sensitivity.  

A set of data layers and analyses were developed to assist the watershed association and community residents in sustainable planning efforts. Additionally, customized tools were developed to be used locally to understand and monitor change, progress, and impact. The data layers, analyses, and tools make use of GIS to map and analyze location-based data.  

Presented are how the data were developed and how the analyses were performed to create a more detailed picture of the present landscape conditions in the Elk headwaters. Some of these datasets include: groundwater vulnerability, surface water vulnerability, and total suspended solids (TSS) modeling outputs.  

As part of the project, DS created a watershed analysis and management system for the Elk Headwaters. This tool can be used to assess ground- and surface water vulnerability and model sediment loading based on land-use change. This tool allows the user to examine scenarios in relation to development and understand its impact on water resources.
**Rm 325**
9:30 AM (Track 2)
Presenter: **Bragg, Tyler P.**, GIS Specialist, Fayette County, WV Assessor’s Office

**Title:** Mobile GIS for Assessors: Using ArcGIS Mobile to Create a Field Map for Appraisers and Data Collectors

**Abstract:** With the majority of counties in West Virginia having already implemented GIS as a land parcel management system, and with more planning the conversion to GIS, the method of navigating the county using paper line maps (tax maps) by the field personnel is quickly becoming obsolete and inefficient. However, having a custom mobile mapping program developed can be costly and, frankly, out of reach for counties with a tight budget. Using out-of-the-box ArcGIS Mobile, which comes complimentary with each ArcGIS license and is available for purchase if more licenses are needed, counties can economically create a custom map using their own data within ArcMap, export that map to a “Mobile Project,” then deploy that project to any Windows device (Smartphone, Tablet, or Laptop PC) for use in the field. Live GPS information can then be fed to the map, allowing personnel to see their location in real-time, on top of aerial photography, parcels, roads, etc. In addition, the data within the map can be easily queried, allowing the field personnel to locate a land parcel, view attribute information about it, and navigate to it quickly and efficiently. This setup can be created so that each mobile device is a “stand-alone” system, so there is no need for constant internet connectivity. This presentation will walk through the technical process from ArcGIS Desktop to “mobile-map,” as well as highlight the costs for a “mobile package,” some challenges that may be encountered, and lessons learned along the way.

**Rm 325**
11:25 AM (Track 2)
Presenter: **Brennen, Jayson**, GIS Program Manager, CDM Smith, Charleston, WV

**Title:** Trends in Web and Mobile GIS and Using New Technologies for WebGIS Development at the WV Water Development Authority

**Abstract:** Over the past year, we have seen major advancements in how web and mobile GIS applications are designed, developed, and deployed. During this time, Esri has released new versions of their web mapping and mobile APIs, new mobile devices have become available, and newly released software tools allow for the development of powerful and “pleasing to the eye” applications. These advancements have opened up a whole new realm of possibilities for how agencies can provide data to staff and the public. During this presentation, we will review some of the hot trends in Esri-based web and mobile GIS solutions. Specifically, the WebGIS application developed for the WV Water Development Authority, which uses many of the new enhancements, will be highlighted to demonstrate advanced capabilities of WebGIS environments. In addition, the use of iPads, iPhones and Android devices to extend in-house GIS capabilities within a mobile environment will also be reviewed and demonstrated to show how agencies are using new mobile technologies to support in-field data collection and information access.

**Rm 225**
8:45 AM (Track 1)
Presenter: **Brewer, Jessica**, jbrewer98@gmail.com, Graduate Student, Department of Geology and Geography, West Virginia University

**Title:** Integrating GIS and Historic Preservation: The State Historic Preservation Office Online Interactive Map

**Abstract:** The mission of the Division of Culture and History's State Historic Preservation Office is to encourage, inform, support, and participate in the efforts of the people of West Virginia to identify, recognize, preserve and protect West Virginia's prehistoric and historic structures, objects and sites. The WVGISTC, in conjunction with the State Historic Preservation Office has developed an interactive map to further this mission by making data, formerly solely accessed via the agency, available in a public interface. Architectural, National Register, Civil War and Archaeological site data are available to the public via an online portal that requires registration and the acknowledgement of a user agreement. Each feature within the online interactive map is linked to a downloadable PDF report of National Register nominations, Archaeological Site and Survey forms, and Historic Property Inventory forms. The user not only has the ability to search for individual or a group of sites via query of buffer searches, but also can download PDF and jpeg files of the results for further review. The primary goal of this mapping system is to create an online mapping system that aids in the implementation of the Section 106 process and further cultural resource management initiatives, ensuring that no historic sites in the state of West Virginia are impacted.
**Verification of Wastewater GIS Utilities and Geometric Network Creation for Marine Corps Air Station Cherry Point, North Carolina**

Marine Corps Air Station (MCAS) Cherry Point is a 29,000-acre facility located in eastern North Carolina. With more than 7,500 Marines and 5,700 civilian workers, the installation is equal in size to a small city. MCAS Cherry Point’s electric, water, and wastewater utilities span the facility and are critical to the installation’s core mission. To meet its customers’ requirements for quick outage response, efficient maintenance, and accountability of assets, the GIS Service Center at the Facilities Systems Support Office (FSSO) was tasked with combining existing geographic information systems (GIS), computer-aided drafting and design (CADD) documents, hard copy “as-built” plans, and local knowledge data into one centralized GIS database. URS Group, Inc. (URS) was contracted to integrate the existing data sources into one GIS data set and to field verify utility infrastructure using global positioning system (GPS) receivers. This two-year program yielded GIS wastewater data that MCAS Cherry Point is now using for GIS analysis and modeling, primarily with the ESRI Utility Network Analyst extension for ArcGIS.

**Hampshire County Assessor Web Applications**

The Hampshire County Assessor web map was built using ArcGIS Server 10, Adobe Flex, The ESRI Flex Viewer v2.4 and the ArcGIS Server for Flex API. This web site provides a wide array of map layers, print capabilities and tools. Some of the included layers are parcels linked to current IAS tax roll information, physical addresses, hydrology, and soils. The tools include flood plain layers, screen printing options with label capability and a draw and measure tools. The site also includes a short instructional video. The map can also be accessed from an IAS Data form search window, http://ias.hampshirewv.com/. Searching from here allows access to property sales reports, dwelling information, assessment information and much more. We will continue to add new data to this site from time to time.

**Development of LiDAR-Based Derived Data Products with In-house Demonstrated Uses of a Higher Resolution Hillshade**

After receipt of LiDAR .LAS binary data for the first of several deliverables from WVU’s Natural Resource Analysis Center, WVDEP provided the dataset to Dewberry, FEMA’s quality control assessment contractor. WVDEP’s TAGIS Unit also established a rigorous in-house QC review and editing workflow and successfully produced derived data products consisting of an intensity image, breaklines, digital elevation model, ESRI elevation grid, hillshade, 100 foot contours, twenty foot contours, and slope and aspect datasets. In development, but not yet complete, is a 2 foot contour dataset contiguous over the first deliverable area. Development of an additional vegetation canopy height dataset may yet be initiated. Originally envisioned for production was also a building footprints dataset but, based on our experience creating this dataset for Cabell Count’s LiDAR, this derived data product will not be created because TAGIS’ existing workflow requires too much manual editing to be cost effective and cannot be sufficiently automated. The .LAS files covering the first deliverable area were provided to West Virginia View where they were recently made available to any interested party for download.

The focus of this paper is the expected and unexpected uses of the hillshade dataset in relation to mining permitting, inspection and enforcement by the Agency’s Division of Mining and Reclamation and potential uses for that data product by WVDEP’s Office of Abandoned Mine Lands and Reclamation.
**Rm 302  8:30 AM (Track 3)**
**Presenter:** Croswell, Peter, PMP, GISP, ASPRS-CMS, President, Croswell-Schulte IT Consultants, Frankfort KY, pcroswell@croswell-schulte.com

**Title:** Financing and Resourcing Strategies For GIS Programs and Projects

**Abstract:** This paper will address a topic of ongoing interest to GIS practitioners and managers and senior officials who have the responsibility for allocating funding for GIS programs and initiatives and in seeing the results through actual benefits. The presentation provides practical ideas and examples on approaches and sources for funding and allocating necessary non-monetary resources for GIS development and ongoing operation—with a focus on public sector organizations. It will approach this topic by identifying the necessary role of monetary allocation from an organization’s General Fund but that there are a range of other funding and resourcing mechanisms and sources that can be tapped to provide tangible support. These sources and mechanisms are explained and examples of their use around the USA will be provided. The presentation will also review the need for and format of a sound business cases and how requests for resources should be tied to clear business needs of an organization.

**Rm 225  9:00 AM (Track 1)**
**Presenter:** DeWitt, Jessica, Doctoral Student/Graduate Research Assistant, West Virginia University, Dept. of Geology and Geography, Morgantown, WV, jdewitt.geography@gmail.com

**Title:** Estimating Lake Volume Using NED and Locally Acquired Bottom Surface Data

**Abstract:** TBAA waterskiing club has created a small lake by damming a stream in Caroline County, Virginia. Their dam has a drain at the lower end, which allows them to maintain a specific water level, as well as a spillway to prevent erosion of the dam during flooding. County regulations suggest that lakes above a certain volume must pay for an inspection from a county official. The following method was devised to allow the waterski club to estimate the volume of their lake without requiring expensive procedures (such as a sonar scan). Elevation data in the form of a 30m DEM was acquired from the USGS National Elevation Dataset. It can be assumed that this DEM was interpolated from a digitized version of photogrammetrically created topographic map contours. Elevation values for the ground surface under the lake were estimated based on buoy lengths and other lake maintenance procedures. A point-file version of the DEM was used to create an (underwater) ‘ground’ surface and a ‘water’ surface for the extent of the lake. These point files were converted back to rasters and subtracted, resulting in a raster of lake depths. This raster was exported as an ascii file and volumetric calculations were performed in excel. Through this procedure it was found that the lake was below the volume threshold requiring the waterski club to pay for the expensive county inspection.

**Rm 225  10:45 AM (Track 1)**
**Presenter:** Fedorko, Evan, GIS Specialist, West Virginia GIS Technical Center, WVU Department of Geology & Geography, Evan.Fedorko@mail.wvu.edu

**Title:** Rare and Endangered Species Web Tool

**Abstract:** The Interagency Coordination Tool (ICT), designed in concert with a number of partners, elegantly solves a problem common to government agencies: Can rote processes like permitting and regulation compliance be streamlined and expedited with the help of geospatial technology? We developed a tool that accomplishes just that, and greatly improves the NRCS’ ability to comply with the Endangered Species Act. This presentation will describe the spatial analysis behind the ICT and discuss its benefits.
Rm 225  2:10 PM (Track1)
Presenter:  Ferguson, Don, Mountaineer Area Rescue Group, Appalachian Search and Rescue Conference, dferguso@mix.wvu.edu

Title:  Optimization of Wilderness Search and Rescue Operations through the Application of GISystems

Abstract:  Wilderness Search and Rescue (WSAR) is a unique field within emergency response that is inherently geospatial. Operations typically encompass large geographical areas that must be investigated with often very limited available resources. To do this, search managers must employ tactics that are efficient and do not pose unnecessary risk to rescue personnel. The application of Operational Research (OR) and behavioral geography through the study of lost person behavior has led to the development of strategies to improve decision-making and maximize efficiency. The further additional of GISystems offers the potential of improved resource management, complex terrain analysis and habitat interpretation that could significantly reduce the time required to locate a lost subject.

This presentation offers a general overview of the application of GISystems to Wilderness Search and Rescue to improve workflow and enhance decision-making in determining where to look for a lost subject. A brief summary of GISystem tools developed collectively within the WSAR community is provided followed by a case study review of applying Operational Research and behavioral geographic strategies to improve effectiveness and efficiency.

Rm 302  8:50 AM (Track 3)
Presenter:  Garcia, Lou, Sr. GIS Manager, EA Engineering Science & Technology, Sparks, MD, lgarcia@eaest.com

Title:  Asset Management, not a scary or costly concept

Abstract:  Defining, planning & implementing an Asset Management Program in a phased process, leveraging existing GIS efforts to maximize success and control costs, doing more with less. Asset management is typically viewed as a large and fiscally expensive program. It does not need to be. The ability to leverage advances in software and data interoperability create the very real environment for a cost effective and robust asset management program. With a well thought out approach and leverage of past and existing efforts it is possible to do “more with less”.

To achieve this, the program needs to be properly defined, expectations set and managed, and a phased approach built upon previous successes must be utilized. This presentation will begin with defining what asset management is, what an asset management program should be and how the program can be defined and developed for a specific entity. The presentation will then move to how a strategically and politically driven approach is developed so that quick success can be realized and built upon. The most logical approach may not always be the most advantageous in securing future funding, therefore an approach that allows for some quick returns while supporting the overall strategy can be developed. The presentation will also discuss how past, current and future GIS initiatives can be and should be centric to an asset management program.

Rm 108  Geovirtual CAVE: 10:45, 11:45, and 11:25 AM (Track 3)
Presenter:  Harris, Trevor, Professor, and H. Franklin Lafone, Sr. Internet Applications Programmer, Dept. of Geology and Geography, Morgantown, WV, Frank.Lafone@mail.wvu.edu

Title:  Geographic Information Science and immersion in a stereo-enabled 3D virtual reality CAVE

Abstract:  Immersion is not an uncommon experience for many of us. We can often get so engrossed in a book or a film that we become oblivious to much that is going on around us and feel immersed and a part of the plot or story that is unfolding. So it is with the concepts of immersion and the CAVE except here we use technology to provide largely visual cues to mislead our senses into suspending reality and enveloping us within a virtual world created for the purpose. A CAVE (cave automatic virtual environment) uses a combination of projectors to project an image onto the walls of a ‘room’ within which a user can navigate and interact as if in that world. In this way we no longer look at a map exogenously, so much as navigate and explore the map from within – as if being part of that world. The CAVE in the Department of Geology and Geography at WVU provides a teaching and research platform that combines GIS with virtual reality and rendering software to create a remarkable series of scenes for display and interaction. This session will discuss the hardware and software components of the CAVE and demonstrate a number of projects in which we are currently involved. A mini-CAVE is also under development that uses large format high resolution TV screens to achieve similar (but cheaper) results to the primary CAVE.
Rm 302  
**1:30 PM (Track 3)**  
**Presenter:** He, Xiaoning, and Brian J. Anderson, Department of Chemical Engineering, West Virginia University, Morgantown, WV, brian.anderson@mail.wvu.edu  
**Title:** An Economic Analysis of Geothermal District Heating System by Using ArcGIS  
**Abstract:** According to the US Energy Information Administration, space, water heating, and air conditioning contributed to 21.4% of the total US energy demand in 2010, mostly provided by burning natural gas, fuel oil and propane [EIA, 2011]. The potential for using geothermal district heating systems is receiving increased attention as a clean and sustainable alternative to supply these low-temperature end uses. This paper describes an economic evaluation of a geothermal district heating system (GDHS), focusing on the influence of the geothermal gradient and population density on the total cost of a GDHS project and the levelized cost ($/MMBtu) of the geothermal energy. The levelized cost decreases with increasing geothermal gradients because of the decrease in drilling depth necessary to access the desired temperature. The levelized cost also decreases when population density increases since the energy market increases and the distribution network costs decrease. The SMU Geothermal Laboratory recently performed a detailed study of bottom-hole temperatures in West Virginia, using basic ArcMap processes to make a WV temperature-gradient map along with a Python code to calculate the geothermal gradient in the state. This work combines the SMU results with WV census data at the tract level to determine the gradient and population density data to assess potential supply and demand for geothermal direct use. Finally a mathematical function of these factors was derived to generate a levelized cost map of West Virginia. Future work includes extending the method to other geothermally-active parts of the US to produce a nationwide direct-use supply curve.

Rm 325  
**11:05 AM (Track 2)**  
**Presenter:** Hopkins, Eric J., eric.hopkins@mail.wvu.edu, GIS Specialist, and Kurt Donaldson, Project Manager, West Virginia GIS Technical Center, West Virginia University, Morgantown, WV  
**Title:** West Virginia Flood Tool Web Mapping Application  
**Abstract:** The West Virginia Flood Tool is the product of a partnership between FEMA, the West Virginia Division of Homeland Security and Emergency Management (DHSEM) and the West Virginia GIS Technical Center, with important data contributions from private sector mapping partners/contractors. The Flood Tool combines the best available flood data with the latest imagery, elevation, searchable addressed structures, roads, streams and populated place data. It is intended to help stakeholders quickly find their property, structure or location of interest and determine if it is in, out of or near the 1% annual chance regulatory floodplain, thus reducing the potential expense of onsite evaluations. The Flood Tool has become very popular with users ranging from state and county floodplain managers, insurance agents, developers, and realtors, to local planners and citizens.

GIS offers obvious advantages when applied to flood hazard data, including an effective visual representation of a complex flood information database, and extensive ability to update multiple base map and data overlays as new products become available. Web map services take these capabilities to a new level, providing GIS functionality over the Internet for decision makers and citizens.

The original ArcIMS application was redesigned for ArcGIS Server in 2011. The application service environment includes ArcGIS Server 10, with publishing via REST services. Development was done using ArcGIS Server Flex API version 2.2 (Adobe Flash based).

Rm 325  
**4:10 PM (Track 1)**  
**Presenter:** Kuhn, Kevin, kevin.kuhn@mail.wvu.edu, GIS Specialist, West Virginia GIS Technical Center, West Virginia University, Morgantown, WV.  
**Title:** WV Basemap Viewer  
**Abstract:** MapWV.gov Map Viewer is West Virginia's contribution to the National Map. The interactive Map Viewer uses the best available local data to provide a detailed, current look at the geographies of the state. This past year has seen a significant change of the ESRI web platform, moving away from the older Internet Map Service (IMS) technology and towards an Adobe Flex Viewer. This change has been applied to all of WVGISSTC's daughter websites, including MapWV, the WV Flood tool and the Nation Carbon Sequestration tool. This session will discuss some of the tools, data and cartography for the MapWV.gov Viewer.
**Title:** WVU Recycling Capstone: The importance of geospatial principles in creating effective and mutually beneficial neogeography projects for students and stakeholders

**Abstract:**
Over 70% of the issues that state and local government deal with on a daily basis are location-based, yet most undergraduate students are not exposed to spatial principles. Many jobs related to government and non-profit prefer applicants with some GIS or geospatial experience. Senior capstone projects were created to give students real world experience to add skill sets, improve resumes, and build community, yet when done poorly are viewed as ineffectual and time-consuming by everyone involved. This has been found to be particularly true in regards to neogeography projects, which when done correctly benefit students and community in deep ways. This paper presents a successful WVU Political Science Capstone recycling project which used policy evaluation, spatial analyses, and the ‘student lens’ to change how students and stakeholders understand solid waste policy, regulation and the role of students themselves in Monongalia County. This paper presents the approach, methods, outcomes, and working relationship of the mentor and the capstone students. The outcome of the project was a WVU Recycling Directory to be used at WVU Orientation and WVU, Sustainable Student Living Guide available at the MCSWA website, spatially tagged recycling location pictures, Google Map, and analysis of recycling regulations/jurisdictions in Mon County. Audience members will leave with insight into how to get the most and the best out of student neogeography projects and a new perspective on solid waste policy.

**Title:** Creation of High Resolution Land Cover and Forest Cover for West Virginia Relative to 2011 NAIP Orthophotography

**Abstract:**
As new image analysis processes become available that can take advantage of high resolution imagery with reduced spectral resolution, there is a need to apply such methodologies to land cover mapping at a statewide level. We are currently working to develop a statewide high resolution land cover dataset and forest cover dataset for West Virginia. We argue that there is a need for land cover that exceeds the resolution of the National Land Cover Dataset for environmental modeling and habitat research. This dataset is being developed for the state of West Virginia relative to 2011 National Agriculture Imagery Program (NAIP) orthophotography, which contains four spectral bands and represents growing season conditions. Our goal is a sub-five meter pixel size representation of land cover. This dataset is being created using object-based image analysis, which utilizes spectral and textural components of imagery, and GIS decision rules. From the derived forest cover, forest fragmentation can be extracted using morphological image analysis to differentiate patch, edge, perforated, and multiple levels of core forest. This research highlights the nature of the imagery being processed, the methodology being implemented, and the ancillary GIS data being used. Initial error assessment utilizing a randomized methodology and also visual assessment of the thematic products have shown promising results with overall accuracy approaching 90%. Our results support the claim that object-based methods to extract general land cover from NAIP imagery, which is free and collected every two years, is an accurate means of extracting high resolution thematic data that can be updated.
Landform Alterations Induced by Mountaintop Mining: A Case Study in the Coal River Watershed

In the Southern Coalfields of West Virginia, it has been estimated that surface mining, specifically mountaintop removal with valley fills, displaces more material than river systems and geomorphic processes. Remote sensing methodologies have been utilized to assess such landscape change, and these methods generally rely on a volumetric analysis in which absolute elevation data are compared representing different dates, potentially pre- and post-mining. We suggest an additional methodology to assess terrain change utilizing categorical data as Ecological Land Units (ELUs) that categorize the terrain into landforms such as cliffs, steep slopes, coves, and flats. We utilized digital elevation models (DEMs) derived from Light Detection and Ranging (LiDAR) data collected in the spring of 2010 along with legacy DEMs representing pre-mining conditions to assess the alteration of ELUs resulting from surface mining, and this study was conducted throughout the extent of the Coal River Watershed in West Virginia. Landform alteration was compared using multiple comparisons including the following: areas in Surface Mining Control and Reclamation Act (SMCRA) permits that have been reclaimed and areas that are in permit but have not yet been reclaimed, landforms within filled areas between 2003 and 2010, and areas in cut or excavated areas between 2003 and 2010. This research supports the conclusion that the post-mining terrain is very different from pre-mining conditions. Results indicate that slopes are generally flattened post-reclamation and the distribution of landforms or ELUs is statistically altered. While the result was expected the main contribution is the methodology and improvement for assessing the impact of terrain alteration on terrestrial habitat, ecosystems, and biodiversity at the landscape scale.

Using ArcGIS.com for Interweb Mapping Applications

With the heightened need to provide geospatial data and maps to the public, coupled with shrinking budgets, ESRI’s ArcGIS Online is emerging as a straightforward solution. ArcGIS Online is a cloud-based collaborative content management system for maps, apps, data and other geographic information. At no cost, GIS professionals with no programming experience (who may even refer to the internet as the “interweb”) can create and deploy internet mapping applications on the ArcGIS.com map viewer using their own data. ESRI hosts the user data and internet mapping applications which can be private, shared with a group or with the public. These applications have the option of being embedded into a separate website and shared through social media or electronic mail. Users are faced with limitations in the data type, size and feature number that can be imported in ArcGIS Online. The author will demonstrate the use of publicly available data to create an internet mapping application using ArcGIS Online, as well as explore functionality through examples.

Using map algebra and raster grids to extract water land cover from NLCD data for analysis.

An analysis of water bodies and wetlands can be done using National Land Cover data from multiple years. Extracting those features alone from the NLCD land cover grid and saving as a new grid can be performed using map algebra and conditional statements in ArcGIS. These techniques can be applied to other continuous data grids-- for instance you may want to extract only urban areas and other barren lands to produce a percent impervious data layer, or calculate change in forest or farm area over time from different datasets, including digital raster graphics (DRG’s). Some considerations that will improve the outcome and common mistakes will be discussed.
**Rm 325**

**1:50 PM** (Track 2)

**Presenter:** Perkins, Jessica D., GIS Programmer Analyst 2, West Virginia Department of Transportation, Division of Highways, Geospatial Transportation Information, Charleston, WV, jessica.d.perkins@wv.gov.

**Title:** West Virginia Transportation Roadway Network: Integrating Routing Capabilities and Best Practices through Detailed Editing and an Updated Data Model

**Abstract:**

With the continual goal of adopting advanced standards and using the most up-to-date geospatial data, West Virginia Department of Transportation (WVDOT), Division of Highways is in the process of updating their roadway network. WVDOT is integrating several sources of data using more current geometry and attributes and making vehicle routing and networking possible. This presentation will: (1) identify and describe the sources of data; (2) explain the methods used to combine the sources into a fully integrated dataset; (3) examine maintenance steps to continually update the data and strengthen the process; and (4) discuss future project ideas using the new data. Data sources that are being integrated include WV State Addressing and Mapping Centerline Dataset (including addressing, county-level edits, and split geometry at intersections), WVDOT Routes (current linear referencing system), Non-State Public Routes, and Ramps. The new linear referencing system that is being created will be integrated with the Road Inventory Log and additional business assets through Esri’s new Roads and Highways solution data model. Combining the various sources of data will produce a fully integrated state-wide dataset and will make vehicle routing and modeling possible where it was not before using WV-specific data. Future project ideas and updates that will build from this data include an improved Federal Highway Performance Monitoring System reporting mechanism; enhanced connections to local routes on printed and web-based maps; and updated routing for analysis in the desktop and web mapping environments. These projects will bring more usable applications and improved transportation to the public.

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**Rm 225**

**9:15 AM** (Track 1)

**Presenter:** *Roedl, George,* groedl@gmail.com, Graduate Student, and Gregory Elmes, greg.elmes@mail.wvu.edu, Professor, Dept. of Geology and Geography, West Virginia University, Morgantown, WV

**Title:** Safer College Campuses and Communities Through the Use of Geospatial Information Technology

**Abstract:**

This research summarizes objectives and results from a two year collaboration between university researchers and practitioners from two adjacent law enforcement jurisdictions. This crime mapping and analysis partnership represents the first such initiative in the state of West Virginia. The goal of the partnership is to increase the safety of students both on and off campus by mapping crime incidents and identifying crime clusters which enable proactive policing efforts specifically targeted to high crime areas. Crime incidents are examined for spatial, temporal and spatio-temporal trends within and across jurisdictional borders through the use of exploratory spatial data analysis (ESDA) techniques, point density analysis, space-time interaction tests, and spatial regression. Geographic variables are used to identify potential causal variables and mechanisms associated with spatial and temporal crime patterns.

This applied research project supports and contributes to current literature on the value of geospatial information in campus and surrounding law enforcement agencies. Several significant findings emerged from the research and the partnership. Analyses confirm crime clusters spatially and temporally within and across jurisdictions, signifying the importance of cross-jurisdictional crime mapping. Furthermore, total crime rates are found to be predictable; however, the type of crime incident likely to occur at any given location is found to be more random. With an observed decline in crime rates, the implications for this partnership suggest that researchers and multiple law enforcement jurisdictions can effectively work together to identify and solve community problems.
Rm 225  
**2:30 PM (Track 1)**  
**Presenter:** Rohrer, Debra, GISP, President, Geo-Rhea, LLC, Charleston, WV, [www.georhea.com](http://www.georhea.com).  
**Title:** Using small Unmanned Aircraft Systems (sUAS) for GIS 3D Earth Modeling  
**Abstract:**  
Geo-Rhea, LLC, is a West Virginia, woman owned, small business, specializing in aerial data acquisition, using small Unmanned Aircraft Systems (sUAS) technologies for Geographic Information Systems (GIS) earth modeling. Geo-Rhea is recognized as a leader in the application of sUAS technology for real earth modeling. This presentation will demonstrate how applying (s)UAS technology for GIS data collection can be a cost-effective, time efficient, environmentally friendly, approach to accurate data acquisition. With resolutions at 1 ½'' or better, Geo-Rhea will provide examples of detailed accurate 3D modeling, as well as examples of precision volumetric analysis. Readily deployed, (s)UAS aircraft can provide a solution for smaller scaled missions where time and dollars for manned aircraft may not be provided.  
It is estimated that 80% of information has a “what and where” component. All facets of government and industry make decisions every day based on the location and information concerning their operations. Using unmanned winged and Vertical Taking Off and Landing (VTOL) technologies, Geo-Rhea has successfully applied (s)UAS technologies to provide critical information, enabling better decision-making using real world information.

Rm 225  
**1:50 PM (Track 1)**  
**Presenter:** Sealy, Jason, District Manager for Delaware, Maryland and West Virginia, Pictometry, Frederick, MD  
**Title:** Enhancing WV’s Oblique Imagery Capture to Meet the Needs of Public Safety  
**Abstract:**  
Are you wondering what was delivered to the counties from the oblique imagery flight of 2010/2011? Are you fearful that your Sheriff, EMA Director or 911 Director will come to you looking for answers? This session will give you the knowledge you need to get started. We will discuss CAD mapping integrations, who has rights to access the imagery, the need for imagery updates and the use of Critical 360 for school safety and security. If you already have the imagery implemented in your county, feel free to attend and share your success stories.

Rm 302  
**1:50 PM (Track 3)**  
**Presenter:** Shilenn, Michael, CP, Vice President, Photo Science, West Chester, PA, [www.photoscience.com](http://www.photoscience.com).  
**Title:** Mobile Mapping Technology in Support of Geospatial Data Development  
**Abstract:**  
Mobile Mapping is one of the most exciting technologies to come along in the mapping profession over the last ten years. This technology combines multiple Lidar sensors and calibrated digital cameras on a moving platform and allows the acquisition of a considerable amount of data (3D point cloud, calibrated digital imagery, video, etc.) in the vicinity of the driven path of the mobile platform. The acquisition results in the creation of a highly detailed, very accurate digital model of the landscape that can be used to support a wide variety of end user applications including transportation mapping, 3D GIS, visualization, etc. This session will focus on real world examples in transportation, specifics of accuracy analyses completed by Photo Science, and the comparison and contrasting of this technology versus ground surveying and more conventional aerial mapping techniques.
**Rm 325** 8:30 AM (Track 2)
**Presenter:** Songer, Brad, Account Executive, Esri, Chesterbrook, PA, bsonger@esri.com.

**Title:** Voter Engagement using ArcGIS for Local Government

**Abstract:** How is the voter turnout in your County for an election? During election season, how often does the phone ring with the same questions about polling locations, hours, district boundaries, or incumbent representatives? Are you able to quickly publish the results of an election as an easy-to-understand map? These are some of the recurring challenges during election season that GIS can address. As a West Virginia County, this challenge is multiplied two-fold in 2012: You’ve just redrawn districts and we’re electing a President.

ArcGIS for Local Government helps Counties provide voters with an official online destination to learn where and when to vote, or access a map-based view of election results simply by entering their address or clicking on the map. Offering this resource to your voters promotes election participation, and reduces the staff hours spent on public inquiries before and after election day. This session will show some demos, and then illustrate how a GIS staff can successfully deploy these resources in time for the 2012 presidential election.

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**Rm 325** 3:30 PM (Track 2)
**Presenter:** Stevens, Brian, Marketing Facilitator, Woolpert, Charlotte, NC, kristin.worley@woolpert.com, www.woolpert.com.

**Title:** Statewide ortho projects - Connecting Organizations and benefiting communities

**Abstract:** The need for improved planning, assessment and response is a heightened subject of concern for federal, state and local agencies nationwide. As conditions in the economy increasingly impact resources, more cost-effective and efficient means of managing and maintaining a state’s assets are becoming more of a challenge. Statewide orthoimagery provides a current, accurate and seamless solution to produce an interoperable resource used by all agencies, eliminating duplication of maintenance and collection efforts while providing improved communication between organizations.

This presentation offers a review of the benefits of a statewide imagery program, including value-added products, which can be gained from the initial investment through the use of feature extraction techniques to produce data layers such as building outlines, impervious surfaces, land cover, etc.

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**Rm 302** 9:10 AM (Track 3)

**Title:** Seminar: Smart web editing and workflow optimization

**Abstract:** Target audience:
GIS AND non-GIS users in federal, state, and local organizations, such as planning, tax, rail, law enforcement, forest, agriculture, and land management. Also infrastructure companies, such as utility, asset management, mass transit, water/wastewater, and transport.

Proficiency Level: Beginner

Working in multi-disciplinary environments introduces complex requirements and challenges that many conventional GIS solutions cannot support. While all users in an organization may require access to common data, access to specific records may vary depending on department, role, or geographic jurisdiction. User access may also vary as responsibilities change over the course of a project lifecycle. You need a solution that meets the needs of multidisciplinary organizations such as Departments of Transportation or municipal government, with highly configurable rules and a workflow engine that enables the implementation of dynamic life-cycle workflows, feature-level access control, data validation and behavior, and integration to other systems. Discover the breadth of organizations that have deployed such a solution, from municipalities, through transportation and utility infrastructure operators, to government emergency management agencies.
**Rm 325**  
**8:50 AM** (Track 2)  
**Presenter:** Van Aken, Seth, Regional Sales Manager, State and Local Government Sector, Esri, Chesterbrook, PA, svanaken@esri.com  
**Title:** *Esri Cloud Strategy*  
**Abstract:** The presentation will provide an overview of Esri’s cloud computing strategy: where Esri is now and the direction the company will be taking in the future. We will discuss how users can leverage Esri’s cloud infrastructure and software as a service (SaaS) offerings to extend the utilization of their existing GIS investment. Esri’s investment in the cloud is significant and represents a strategic direction for the ArcGIS platform. Come learn how you can take advantage of these new capabilities.

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**Rm 325**  
**1:30 PM** (Track 2)  
**Presenter:** Wu, Yueming, PhD, GISP, GIS Manager I, West Virginia Department of Transportation, Division of Highways, Geospatial Transportation Information Section, Charleston, WV, yueming.wu@wv.gov  
**Title:** *WVDOT GIS Strategic and Business Plan and Its Implementation*  
**Abstract:** Although West Virginia Department of Transportation (WVDOT) had been utilizing geospatial (GIS, Remote Sensing, & GPS) technology ever since it became available, its GIS program was not available until 2005. Since its inception the young program is able to learn from its peers and leverage professional services, therefore keeping building small successes and growing healthily. However, the biggest challenge that it faced is how to strategically improve its geospatial infrastructure to meet existing and projected needs for geospatial data and services across the Agency. As a result, in 2009 WVDOT initiated a project to develop a GIS Strategic and Business Plan. Through a partnership with Esri the Plan was completed in 2010. The major work to get the job done includes conducting an Agency wide survey, assessing business needs, and drafting a phased Road Map. The Road Map highlights strategic objectives for Enterprise GIS (EGIS) at WVDOT and provides strategic and tactical recommendations based on information gathered from stakeholders, Esri’s technologies, and industry best practices. Following the Plan WVDOT successfully improved its EGIS and integrated it into the WVDOT information system infrastructure. The current EGIS includes separate production and testing/staging environments, separate editing and publication GIS databases, disparate statewide GIS databases, and client side applications. The effort was recognized by Esri at its 2011 International User Conference with a Special Achievement in GIS Award. This presentation will give an overview of the WVDOT Strategic and Business Plan and its ongoing implementation and share lessons learned from the project.

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**Rm 325**  
**4:10 PM** (Track 2)  
**Presenter:** Wu, Yueming, PhD, GISP, GIS Manager I, West Virginia Department of Transportation, Division of Highways, Geospatial Transportation Information Section, Charleston, WV, yueming.wu@wv.gov  
**Title:** *Automation Using Python for WVDOT GIS Data Management*  
**Abstract:** West Virginia Department of Transportation (WVDOT) is responsible for managing geospatial data concerning transportation assets, roads, and trails. The data is stored in separate editing and publication GIS databases and disparate GIS databases at WVDOT’s districts. The workflow of data management includes collecting the data, updating the WVDOT editing GIS database, replicating changes to related GIS database, and publishing the data in a variety of formats for internal and external usages. Such a sequence of tasks used to be performed manually, which is time consuming, labor intensive, and error prone. Since ArcPy became fully integrated into ArcGIS 10, WVDOT started leveraging Python and ArcGIS to automate part of the workflow. Generally, ArcGIS Model Builder is used to create a model for one of the tasks by chaining together geo-processing tools in ArcGIS Toolbox; the model is exported into a Python script; the script is then modified to make it fit for the WVDOT enterprise GIS environment; and finally the script is run as a windows scheduler’s task at a fixed time on a regular basis. Major benefits from the automation include reduced manual operations and improved productivity and efficiency. This presentation will give an overview of the WVDOT geospatial data storage infrastructure and explain how Python scripts are built into the workflow. Common issues encountered from the work will be discussed and solutions will be offered. Lessons learned from the work will be shared too.
**Appalachian Development Highway System Cost to Complete Estimate GIS Project**

The Appalachian Development Act of 1965 established the ADHS, which was designed to promote economic development in previously isolated areas and better connect the Appalachia region to the interstate system. The Appalachian Regional Commission (ARC) along with the Federal Highway Administration (FHWA) and 13 Appalachian State DOTs need to conduct ADHS Cost-to-Complete Estimates (CCE) studies every five years to provide bases for Congress and the administration to establish new federal funding level and to determine the apportionment factors.

During the past CCE efforts, each State DOTs prepared and submitted CCE information and maps in different formats and standards. In addition, ARC experienced frequent change of ADHS coordinator and personnel in State DOTs and FHWA State Division Offices requiring additional time and resources to train them. After the CCE in 2002, ARC and FHWA seek to make CCE process and the ADHS program management more efficient and effective through better use of advanced technologies like GIS. As a result, the ADHS GIS project was established shortly after the 2002 CCE.

This project was undertaken by ARC and the Nick J. Rahall II. Appalachian Transportation Institute (RTI), and jointly funded by both organizations. It involved 13 Appalachian State DOTs and FHWA State Division Offices in the Appalachian region. The main goal of the project was to develop an integrated and comprehensive GIS System, the ADHS GIS system, to provide a tool which allows the ARC, States, and FHWA Division Offices to store, update, manage, and disseminate the ADHS CCE information across the Appalachian region.

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**2012 General Highway Map**

West Virginia Department of Transportation General Highway Map was prepared by Geospatial Transportation Information section, produced at 1:640:00 scale, and about 36 inches by 32 inches. The General Highway Map emphasizes West Virginia route network system through 55 counties. Detailed feature information includes airports, railroads, trails, boundaries, public services, and Wildlife Management Area (WMA). Map also includes a mileage diagram and small larger-scale maps of cities: Beckley, Bluefield, Clarksburg, Charleston & South Charleston, Fairmont, Morgantown, Martinsburg, St. Albans, Parkersburg & Vienna, Weirton, and Wheeling. This map is available as an image in .pdf format.

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**Evaluating Geomorphic Differences Resulting from Mountaintop Mining in the Southern Coal Fields of West Virginia**

As mountain top removal extends throughout the south-central Appalachians, it is important to map and measure the disturbed environment for natural resource management. This study examined the landscape and geomorphic changes induced by mountaintop removal in the southern coal fields of West Virginia through the comparative analysis of LiDAR (light detection and ranging) imagery and photogrammetric-derived DEMs (digital elevation models). Topographic change was investigated from a subset of chosen mine sites over a seven year span. The sites were used to create elevation difference models to determine the geographic change. Elevation difference models alone were unable to produce adequate results; therefore, a set of rules were applied to the geospatial environment to determine major cut or fill volumetric features, as well as to eliminate errors associated with the two different types of DEMs. This study demonstrates how different spatial and temporal elevation models can be utilized to describe major cut or fill features associated with mountaintop mining.
Assessment of Potential Sources of Water Pollution

The Glady Fork Watershed is a subdivision of the Monongahela National Forest in eastern West Virginia in the Allegheny Mountains; the Glady Fork watershed encompasses 63 mi2 of land which is maintained by the West Virginia Division of Natural Resources. The main river in the Glady Fork Watershed, the Glady Fork, is a tributary to the Dry Fork which is one of five of the dominant headwater tributaries of the Cheat River. Several sources of potential groundwater and surface water pollutants are located within the watershed. One pollution discharge site is located within the watershed with four additional sites within five miles of the watershed. In addition, the watershed has a major highway bisecting it, numerous roads, and a 5.4 mile long section of the Western Maryland Railway track in the southwest section which all increase surface runoff and likely add pollutants such as petroleum products and solid wastes.

GNIS Cultural Feature Update 2012

The Geographic Names Information System (GNIS) is the Federal and national standard for geographic nomenclature. The U.S. Geological Survey developed the GNIS in support of the U.S. Board on Geographic Names as the official repository of domestic geographic names data, the official vehicle for geographic names use by all departments of the Federal Government, and the source for applying geographic names to Federal electronic and printed products.

The GNIS contains information about physical and cultural geographic features of all types in the United States, associated areas, and Antarctica, current and historical, but not including roads and highways. The database holds the federally recognized name of each feature and defines the feature location by state, county, USGS topographic map, and geographic coordinates.

The WVGISTC has been working in collaboration with the US Geographical Names Information System since 2004 to update the system for a variety of feature sets. Features included in the latest update are summits, state capitols, city/town halls, courthouses, post offices, libraries, convention centers, auditoriums, concert halls, theaters, opera houses, sports arenas, stadiums, cemeteries and police/fire stations. In the collection of data, a number of sources were consulted, including the WV Cemetery Preservation Association (WVCPA), the WV Department of Commerce (WVDC), the West Virginia Library Commission and the WV Courthouse Facilities Improvement Authority (WVCFIA). In addition, the WVGISTC developed an algorithm that calculated the precise locations of each of the 1,050 summits currently in the GNIS database, adjusting points where necessary.

Kanawha County, WV Crime Hot Spots

The map is a crime analysis of the unincorporated areas of Kanawha County, WV. The information was pulled together from crimes reported from 2008 through 2011. The data is stored in the Kanawha County Metro 911 Computer Aided Dispatch (CAD) system. The density polygon layer was created using the open source crime mapping tool known as CrimeStat and also generated by using the method known as Kernel Density Estimation. The map was requested by the West Virginia State Police.
**Presenter:** *Davis, Clinton*, cdavis49@mix.wvu.edu, geography graduate student, Department of Geology and Geography, West Virginia University, Morgantown, WV

**Title:** Sandpile Density Estimation: A New Tool for Interpolating Surfaces from Point Data

**Abstract:** I am developing a point to surface interpolation method based loosely on the Bak-Tang-Wiesenfeld (BTW) Sandpile Model. The BTW Model was originally developed by complexity physicists to model Self-Organized Criticality, by defining a grid in which each cell can hold a limited number of particles before passing them to its neighbors. As particles are passed, neighboring cells may also reach a critical height causing a cascade of particles to pass from cell to cell until the system reaches a relaxed state. I will use this basic model, with some modifications, to take in spatial point data, allow the system to relax, and output a smooth estimation surface. The model is in the early stages of development and is being presented for the purpose of receiving feedback on how best to move forward with the project.

**Presenter:** Ferguson, Don, PhD, Morgantown, WV, dferguso@mix.wvu.edu

**Title:** Application of GIS for Search and Rescue: Search for Missing Aircraft

**Abstract:** GIS is used to aid in the search for a missing aircraft in the Eastern panhandle of WV.

**Presenter:** Gooding, Sarah, gooding@geosrv.wvnet.edu, and Paula J. Hunt, Geologists and GIS Cartographers, West Virginia Geological and Economic Survey (WVGES), Morgantown, WV; David L. Matchen, Joseph L. Allen, Robert C. Peck, David Mercier (Map Authors), Department of Geology and Physical Sciences, Concord University, Athens, WV.

**Title:** Bedrock Geologic Map of the Bluestone National Scenic River, Flat Top and Pipestem 7.5' Quadrangles, West Virginia

**Abstract:** This poster is a reduced-size version of WVGES Publication OF-1101, which at full 1:24,000 scale measures 36 x 75 inches. This map of the bedrock geology in and around the National Park Service’s Bluestone National Scenic River covers the Flat Top and Pipestem 7½-minute U. S. G. S. topographic quadrangles in Summers, Mercer, and Raleigh counties, West Virginia. The geologic layers for the map, as well as for the cross section and stratigraphic diagrams were all produced using ArcMap. The map layout and all final cartography were also completely done in ArcMap.

**Presenter:** *Hildreth, Travis*, undergraduate student, Department of Geology and Geography, West Virginia University, Morgantown, WV

**Title:** Using Abandoned Mountaintop Removal Surface Mine Sites as Solar Farms

**Abstract:** Mountaintop removal/valley fill (MTR/VF) mining has greatly impacted the landscape of Appalachia over the past few decades. This method of surface mining removes the top layers of overburden soil to access underlying coal seams. Removed overburden is deposited on adjacent slopes and valleys. According to SMCRA laws, mining operations must restore mined area to a gentle rolling contour that obscures any remaining highwalls, and revegetate mined land. In recent decades these practice have consistently resulted in a grassland environment on gently rolling (nearly flat), plateau-like hills. Though there are cases where mined land is then utilized for other productive endeavors, such as grazing or commercialization, in many cases the flat grasslands are not utilized and cannot return to their original forested state. This project suggests that these flattened areas be used as solar farms, allowing for continued energy production from the mined land. Site optimization was considered, as well as the viability of solar production in the Appalachians.
Landenberger, Rick, rlanden@mail.wvu.edu, and Tim Warner, Dept. of Geology and Geography, and Jim Rye, Dept. of Human Resources and Education, West Virginia University, Morgantown, WV; Todd Ensign, NASA Independent Validation and Verification Facility, Fairmont, WV; Stefan Smolski, Grafton High School, Taylor County, WV.

West Virginia Watershed Dynamics: A Teacher Professional Development Project at West Virginia University

Through an interdisciplinary partnership at West Virginia University involving the Eberly College of Arts and Sciences and the Department of Human Resources and Education, the authors recently taught an integrated, two course sequence in science education called ‘Geospatial Elements of the Water Cycle’ for in-service K-12 West Virginia science teachers. The project’s primary goal involved providing a teacher professional development experience aimed at understanding how watersheds function and to facilitate mapping of local land use / land cover. The objective involved developing project-based teaching units that explore questions about land use and runoff in the watersheds where the schools were located. For teachers to accomplish this it was first necessary to understand spatial and temporal variability in land use, requiring spatial thinking and the technical skills necessary to frame, explore, and understand land use change and its effect on runoff. Fortunately, it is becoming easier to teach spatial thinking using technology because GIS, GPS, and remote sensing have become more user-friendly and accessible. Using GIS, GPS, and remote sensing, teachers were able to engage their students in exciting, relevant, inquiry-based lessons and activities in the classroom, lab, and field while strengthening their skills in STEM (Science, Technology, Engineering, and Math) principles. By visualizing, exploring, and analyzing watersheds using geospatial technology, teachers and students gained a better understanding of the connections between land use and runoff, and were subsequently able to better understand how watersheds function.

Leisure, Rob, Robert.M.Leisure@wv.gov, and Johnny Bragg, West Virginia State Tax Department, Property Tax Division, Charleston, WV.

Automation of mapping processes with ArcGIS Model Builder and Python Scripting

In 1999, the Property Tax Division of the West Virginia State Tax Department implemented a new method for the valuation of coal reserves in the state requiring the use of a Geographic Information System. Since the beginning of this directive, the Mined Minerals Unit has taken steps over the years to more efficiently and accurately create and utilize the data needed for this process through automation of mapping processes and methods. Most recently, the Mined Minerals Unit has begun using ArcGIS Model Builder and Python to further streamline the process and reduce the man hours and resources required to complete various mapping and database tasks. This poster will look at some of the steps that we, as a unit, have taken towards incorporating these streamlined methods into the Mineral Lands Mappings Project (MLMP), show some examples of how these steps have made the Mined Minerals Unit more productive and efficient, and provide a glimpse of the current MLMP mapping status across the state.
Some Geospatial Tools and Techniques for Geologic Mapping in West Virginia’s Plateaus

In a 1987 UK Department of Environment Report titled Handling Geographic Information Lord Chorley stated “Such a system (GIS) is as significant to spatial analysis as the invention of the microscope and telescope were to science, the computer to economics, and the printing press to information dissemination”. We embraced this view soon after and began incorporating available geospatial tools in our geologic work.

In 2001 we began geologic mapping in the relatively flat lying rocks of West Virginia’s plateaus. Most recently we are mapping most of the lower New River Gorge and the surrounding Fayette Plateau. We are fortunate to have access to a wide range of data sources including Lidar and photos flown by the US Army Corps of Engineers, West Virginia’s SAMB datasets, various generations of air photos, numerous coal exploration cores, some similar cores drilled for scientific purposes, numerous oil and gas well logs, numerous older field observations, and an area where much of the history has been recorded and is available. Our current tools include GIS, GPS, and a laser range finder, plus mundane field tools like rock hammers, rulers, and acid bottles. Through all of our work we have found local history important in interpreting otherwise confusing problems.

Our poster will detail several vignettes from the field and office to illustrate how current geospatial technology can be used to interpret geology and produce geologic information in the plateaus of both northern and southern West Virginia.

West Virginia Watershed Assessment Pilot Project

The goal of the West Virginia Watershed Assessment Pilot Project (WVWAPP) is to develop a methodology to prioritize restoration and protection activities within 5 HUC-8 watersheds, with the long-term goal of expanding the assessments to all watersheds in West Virginia, given funding availability. The watersheds were divided into two sets of hierarchical planning units, defined first by HUC-12 watersheds and secondly by modified NHD Plus catchments. Each planning unit was divided into three separate landscapes: Streams and Riparian Areas, Wetlands, and Uplands. In the first phase of the assessment, each landscape was ranked independently based on multiple metrics to assess the condition of the landscapes according to factors such as water quality, flow alteration, habitat quality, and connectivity. The second phase of the assessment consisted of an evaluation of projected future threats, including population and development trends, changes in land use, projected energy impacts, and climate change. The final products of the WVWAPP will include detailed watershed reports and an interactive web tool that will allow partners and stakeholders to identify priority planning units for restoration and protection of riparian areas, wetlands, and upland areas, and to assess the suitability of areas within planning units for targeted activities.

Weatherholt, Kyle S., Kyle.s.weatherholt@wv.gov, Carl Ross, Kelly Thompson, and Robin Goff, West Virginia Department of Transportation, Division of Highways, Program Planning and Administration Division, Geospatial Technology Information Section, Charleston, WV.

West Virginia Department of Transportation, 2011 County Map Book Series

The State of West Virginia currently has two separate roadway GIS layers. One is the WVDOT road centerline layer, the other is the Homeland Security SAMB road layer. It is common for a single road to have separate names in each dataset. This causes confusion for WVDOT workers responding to requests from the public as well as other consumers of these two data sources. A long term project is currently underway to incorporate 911 names and addresses into the WVDOT GIS road layer; however a short term solution was deemed necessary to assist users. The County Map Book Series was developed by the WVDOT Geospatial Transportation Information Section to provide our district and county offices a solution in cross referencing names and route numbers and viewing both layers on a map.
**Index of Interactive Web Mapping Application Submissions**

**Author(s):** Brennen, Jayson, brennenjd@cdm.com, GIS Program Manager, CDM Smith (local office), Charleston, WV; Michael Duminiak, mduminiak@wwnda.org, West Virginia Infrastructure & Jobs Development Council, West Virginia Water Development Authority, Charleston, WV.

**Title:** West Virginia Infrastructure & Jobs Development Council GIS Data Portal/Project Tracking System.

**URL:** [http://gis.wvinfrastructure.com](http://gis.wvinfrastructure.com)

**Abstract:**

The WV Water Development Authority (WDA) and the WV Infrastructure and Jobs Development Council (IJDC) anticipates that over the next five years, $200 to $325 million will be available annually for funding water and wastewater projects. To maximize the use of these funds and address the needs of the unserved and underserved population, the WDA/IJDC implemented an enterprise GIS environment to provide tools and data to help more effectively plan, prioritize, and track infrastructure projects.

The WebGIS application developed as part of this project is based on Esri’s ArcGIS Server 10 technology and the Flex API. From within this environment, staff and the public can easily access real-time project information (locations of projects, project status, project costs, etc). In addition users can also access detailed information for the state’s 650+ water and wastewater utilities, as well as extensive topographical, demographic, and cultural information. A series of innovative tools are provided to support tracking projects (by time, cost, and status), ranking projects, completing demographic analysis, and analyzing the viability of projects.

An extensive effort was put-forth to develop an interface that is both visually pleasing and highly functional. To support this, skinning and charting techniques were used and the system was integrated, real-time, with IJDC’s project tracking. This site makes reference to over 1,000 utility/project locations, 1.3M address points, gigabytes of demographic and topographical information, and many state and Esri-based map services. In the past three months, this site has been accessed by thousands of people from 87 countries.

**Author(s):** Cox, Aaron, HampshireGIS@Gmail.com, Hampshire County GIS Coordinator, Romney, WV; Mark Bratcher, mbratcher@atlasgeodata.com, GIS Analyst and Project Manager, Atlas Geographic Data, Wilmington, NC.

**Title:** Hampshire County Assessor Web Applications

**URL:** [http://ags.hampshirewv.com/map/](http://ags.hampshirewv.com/map/)
[http://ias.hampshirewv.com/](http://ias.hampshirewv.com/)

**Abstract:**

The Hampshire County Assessor web map was built using ArcGIS Server 10, Adobe Flex, The ESRI Flex Viewer v2.4 and the ArcGIS Server for Flex API. This web site provides a wide array of map layers, print capabilities and tools. Some of the included layers are parcels linked to current IAS tax roll information, physical addresses, hydrology, and soils. The tools include flood plain layers, screen printing options with label capability and a draw and measure tools. The site also includes a short instructional video. The map can also be accessed from an IAS Data form search window, [http://ias.hampshirewv.com/](http://ias.hampshirewv.com/). Searching from here allows access to property sales reports, dwelling information, assessment information and much more. We will continue to add new data to this site from time to time.
The WV Flood Tool (www.mapswv.gov/flood) 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. The user simply navigates or zooms to the location of interest, and then clicks on the map to query flood hazard information.

The online tool provides three customized views (public, expert, and risk map) for the general public and more advanced users, and allows users multiple ways to locate areas of interest, including by address, coordinates, place names, and navigation controls. Map layers are subdivided into base map layers, overlay reference layers, and flood data layers. Importantly, the WV Flood Tool provides access to the best available web map services from ESRI, Bing, WV Department of Environmental Protection, WV Division of Highways, WV GIS Technical Center, and other sources. The application is designed to allow users to zoom in to a map scale of 1:1,128 to view the high resolution aerial photography obtained from local sources. Flood hazard queries display the approximate elevation of the ground at any location with a vertical accuracy of 10 feet, and also provide links to local floodplain manager contacts or FEMA's online map service center to view official flood maps. In addition to identifying flood hazard information, users can also query HAZUS 100-year flood event information to assist in mitigating flood risks. The application employs ArcGIS Server 10 technology and caching to improve performance.