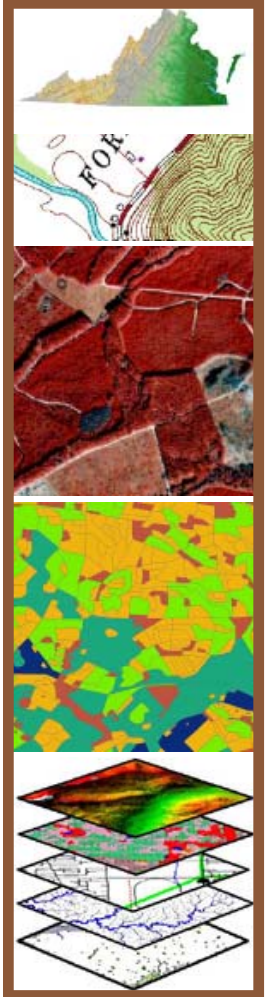
The Virginia Geospatial Newsletter

Showcasing GIS, Remote Sensing and GPS Supported Products and Services in the Commonwealth

Volume 6, Number 4 Fall, 2008



For more information contact:

The Virginia Geospatial Extension Program
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Remote Sensing Initiative Supports Local Government Urban Tree Canopy Policies

By:
Jen McKee,
Geospatial Project Developer,
and
John McGee
Geospatial Extension Specialist
The Virginia Geospatial Extension Program

Urban forests can be defined as the sum of all woody and associated vegetation in and around dense human settlements. The people living in and around urban forests receive many direct and indirect benefits, such as the cooling effect of strategically placed trees around a house or the reduced costs of stormwater management. In order to estimate the benefits being provided by an urban forest, the amount of tree canopy cover must first be estimated.

What is the value of our urban forests?

Fairfax county, Virginia, has estimated that trees contribute more than $54 million dollars worth of cost savings (through ecosystem service benefits) each year.

The urban tree canopy project is a partnership between the Chesapeake Bay Program, the Virginia Department of Forestry (VDOF), the Virginia Geospatial Extension Program (VGEP) at Virginia Tech, and the localities participating in the program. The goal of the program is to assist local communities, by providing localities with the tools, data, and technical infrastructure to assess urban tree canopy coverage. Once a baseline of urban tree canopy has been established, then the program will work further with each of the respective localities to support their efforts to maintain or increase urban tree canopy coverage.

The Benefits of Urban Forests

By increasing their canopy cover, the community ecosystem service benefits will also increase.

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The Virginia Geospatial Newsletter is a quarterly publication developed through the Virginia Geospatial Extension Program, a partnership between the Virginia Space Grant Consortium (VSGC) and Virginia Cooperative Extension (VCE). The newsletter is published in conjunction with The Virginia Geographic Information Network (VGIN).

The purpose of the Virginia Geospatial Newsletter is to highlight innovative geospatial products and services throughout the Commonwealth and to widely disseminate geospatial knowledge and awareness throughout Virginia.

If you have suggestions or comments, or if you would like to contribute to the newsletter, please contact John McGee at the Virginia Geospatial Extension Program (jmcg@vt.edu or [540] 231-2428).

What's Inside

VAMLIS Update

By:
Qiana C. Foote,
President, VAMLIS

Seasons Greetings from the VAMLIS Executive Board. We are pleased to announce the public launch date for our newly revised website

(http://www.vamlis.org) on January 5th, 2009!

Most of the organization's activities and information will be managed and accessible through this new website. On the new website you will find a president's message that will keep members up-to-date with the goings on of VAMLIS. As the year continues, the website shall expand to include such items as an officer directory, membership lists, committee listings, legislative information, upcoming events and links to important GIS resources. The website will also be the source for the VAMLIS Annual meeting as well as a portal for the 2009 GIS Conference. Please be sure to visit the new site and provide any comments or questions through office@vamlis.org.

In the next calendar year as many agencies and companies face a challenging economy VAMLIS is working to provide cost effective educational opportunities for the Virginia GIS Community. The VAMLIS annual meeting will be held in May 2009. Typically, a business meeting for the organization; it has also been a chance for professionals to be educated and exchange information through presentations of the latest technology.

This year the VAMLIS Board is exploring some potential options for broadcasting the annual meeting that may be consumed via a web browser. This would provide members the ability to attend without leaving the office. As more information is available about this possibility it will be posted on the web site. We look forward to your participation and feedback at the 2009 VAMLIS Annual meeting.

In addition to the VAMLIS Annual meeting, progress is continually being made on the 2009 GIS (Statewide) Conference. The conference committee is meeting once a month to pull this event together. The 2009 Conference is going to be held on September 21st thru 23rd in Richmond.

There is an easy opportunity for any member of the Virginia Geospatial Community to assist with the 2009 Conference through the conference theme contest (see Page 12). The winner will receive a free full conference registration. The Committee will be reviewing the themes in the upcoming meetings. Significant progress has been made on the Conference yet there is still much more to do. If you are interested in participating in any way, please contact one of the Conference Committee Chairs (Russell Minich or Matt Miller) The collaborative effort by both organizations has been great and is going to yield a quality professional event.

Looking forward to it!

2009 Virginia GIS Conference
September 21st – 23rd, 2009
Richmond, VA

VGIN Update

2008 NAIP Imagery Now Available for Virginia

By:
Dan Widner
VGIN Coordinator

The first deliverable from the US Department of Agriculture's National Agricultural Imagery Program (NAIP) is now available for download. These data are in the form of "compressed county mosaics" (CCMs) that cover geographies determined by the USDA (mostly counties with exceptions). The second deliverable will be individual quarter quadrangle orthoimages with more rigorous QA/QC, delivered by Sept. 2009.

The CCMs were flown in the summer of 2008. Details include:

- one meter resolution "leaf on" imagery available in the public domain
- minimal quality control performed to expedite delivery time
- cover 100% of Virginia land mass
- 4 band color (3 true color, 1 near infrared)
- JPEG2000 file format
- VBMP orthoimagery control points used where possible to enhance accuracy

Primary cost of the NAIP is covered by the USDA and includes some Virginia cost share. Because of a Virginia partnership we were able to get the Commonwealth prioritized for 2008 completion that included higher resolution (one meter versus two), added the color infrared as a fourth band, and improved the ground control by making the VBMP control available to the USDA. Partnership support was provided by the Virginia Department of Forestry, the Virginia Department of Transportation, and the Virginia Information Technologies Agency (VGIN).

Data can be downloaded from VGIN at http://gismaps.virginia.gov/naip/ and from the Radford University GIS site at http://geoserve.asp.radford.edu

The NAIP imagery can be useful to the Virginia GIS community as a data source "filler" between the high resolution Virginia Base Mapping Program orthophotography. Example applications using the 4 band color imagery include:

Figure 1: Using NAIP for Water Feature Extraction
(True color imagery (above) and NIR imagery (below)

Figure 2: NAIP Supported Change Detection Analysis

2007 VBMP

2008 NAIP

-Urban Tree Canopy assessments (see article, page 1)
-Water feature detection (Figure 1)
-Change detection (Figure 2)

For more information about the NAIP, visit the NAIP Information Sheet at http://www.fsa.usda.gov/Internet/FSA_File/naip_2007_infosheetpdf.pdf

4-Year Colleges & Universities

The Virginia Tech eCorridors Community Broadband Map: Mapping Internet Access from the Grassroots

By:
Seth Peery
Senior GIS Architect
Enterprise GIS Research and Development Administration
Virginia Tech

In order to understand the relationship between advanced telecommunications and economic development, it's essential to know the geographic location of telecommunications infrastructure and services. The problem is that this sort of information, as well as connection speeds and pricing at the local level, is difficult or impossible to obtain because service providers regard such information as proprietary.

As an alternative, Virginia Tech's eCorridors Program has developed a "grassroots" approach to determining regional broadband service availability. The "Community Broadband Access Map" is driven by the voluntary contribution of connectivity information by broadband customers, a form of "volunteered geographic information" or "crowdsourcing" that affords researchers and policymakers the opportunity to inductively determine the location of infrastructure based on customers' first-hand reports.

The eCorridors Community Broadband Map has been collecting connectivity data since August 2006. The original scope of the project was to provide an interactive map targeted towards the residents of the Town of Blacksburg to allow them to report on their home broadband connectivity. However, the manner in which the project was implemented provided the opportunity to expand the original vision to a state and even national level and beyond. To date, over 1000 unique IP addresses have run speed tests from the application. Of those, more than 400 users from 38 U.S. states, as well as Sweden, Poland, Germany, Italy, Netherlands, and the United Kingdom have added their connection information to the map display. To ensure depiction of only current data, the map only displays speed tests from the last 12 months. However, all data collected since the program began is archived and available upon request.

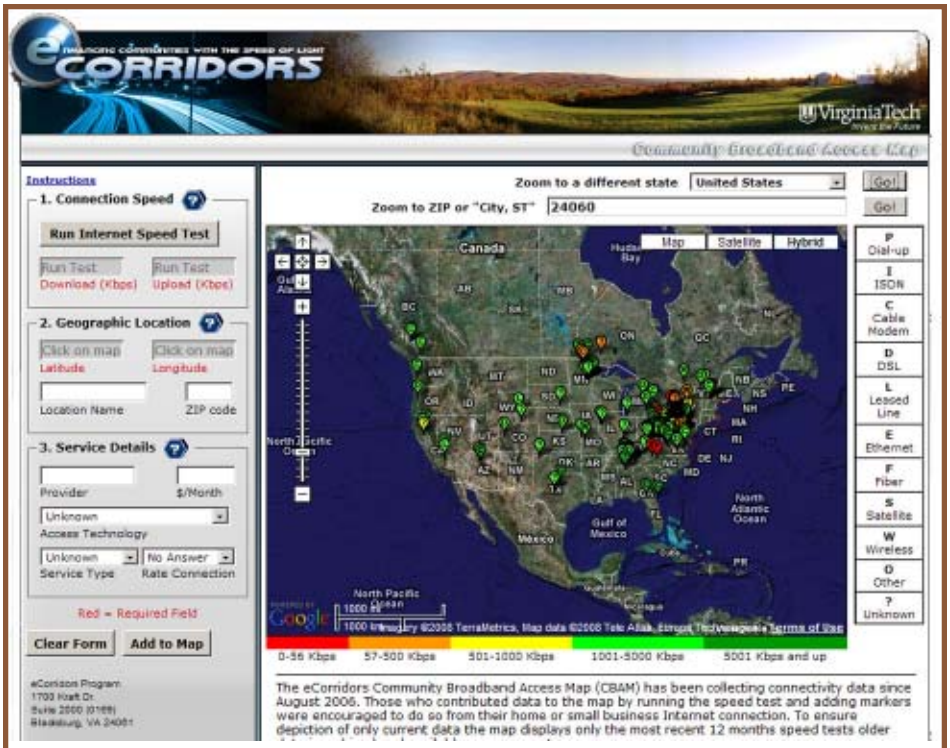

Figure 1: The eCorridors Broadband Mapping User Interface is built off of GoogleEarth, and open-source Network Diagnostic Toolkit (NDK).

Interest in the broadband map has reached new heights of visibility with inquiries from a number of national

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Planning District Commissions

From the Eyes of a Regional GIS Office

By:
Robbie Huff
GIS Manager
Central Shenandoah
PDC

Greetings from the GIS Department at the Central Shenandoah Planning District Commission!
After a period of inactivity, the GIS Department has been re-established and is now fully functional, providing new and continued services to our member jurisdictions and agency planners. The need for GIS assistance and the number of GIS projects has grown to the point where new staff became necessary, and in April of this year, Phillip Alexander was hired to the position of GIS Specialist.

The main goal of the department is to provide GIS assistance to all of our jurisdictions and coordinate regional GIS projects, while also limiting project expenses by obtaining grant funds when applicable. Below are some highlights of products and services that are available to our members and citizens throughout the Central Shenandoah Valley, which include the counties of Augusta, Bath, Highland, Rockbridge, and Rockingham, the cities of Buena Vista, Harrisonburg, Lexington, Staunton, and Waynesboro, and the towns of Bridgewater, Broadway, Craigsville, Dayton, Elkton, Glasgow, Goshen, Grottoes, Monterey, Mount Crawford, and Timberville. Please visit our site at: www.cspdc.org

Inventory of Public Infrastructure:
GPS data collection has been a service offered by the CSPDC since the early 1990's, but recently the GIS Department has upgraded to new equipment and techniques to accommodate the needs of the localities within the region. This past summer a new GPS unit and associated software was acquired, which included a Trimble GeoXH unit, TerraSync, and GPS Pathfinder. With this new equipment, we are able to export post-processed data with sub-foot accuracy, and to improve efficiency, the Planning Utility of GPS Pathfinder was used to create data dictionaries for each locality and/or project. Here is a list of a few projects that have recently been completed or are currently being worked on.

1. We recently completed an update process on the Town of Broadway's Utility Map Books. These Map Books were updated with new sewer line and waterline data, 2007 orthoimagery, and a new grid (1000'x1000') which allowed a more user friendly product for the Town's administrative and maintenance departments.

2. Beginning late this past summer, the GIS staff began collecting the sewer and water data for the City of Buena Vista. A complete inventory of the city's utilities is planned, and will continue until both systems are collected in their entirety, at which time their staff will be provided with Utility Map Books.

3. Sidewalk inventories are becoming a popular project to help communities analyze where and when new sidewalks should be constructed to maintain linkages to major activity centers and public transportation. Last year we completed a sidewalk inventory for the Rockingham-Harrisonburg Metropolitan Planning Organization (HRMPO), in the Towns of Bridgewater, Dayton, and Mt. Crawford. The HRMPO receives federal funding for a variety of projects, and a Sidewalk Connectivity Study is planned for next year. Just recently, we also completed a sidewalk inventory for the Town of Grottoes, which assists staff in planning for future construction.

4. There are a variety of public transportation services throughout the valley, and the GIS Department has assisted several groups in mapping their routes and stops. We have digitized the routes for the Staunton Trolley, Route 250 Connector, and BRCC (Blue Ridge Community College) Shuttle. In Harrisonburg, MPO funds were used to GPS all of the bus stops on their five full-time routes and digitize the routes using the stop locations. This data was then shared with the Harrisonburg

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Urban Tree Project

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These benefits may include, but are not limited to: increased air quality, increased water quality, reduced stormwater runoff, carbon storage and sequestration and reduced energy consumption due to the cooling and buffering effects of the tree canopy.

Every individual tree contributes ecosystem service benefits to the community. The non-profit American Forests, for example, estimates that a single mature tree can sequester 667 pounds of carbon from the atmosphere per year. Obviously, these values are compounded when the entire urban forest is taken into consideration.

Urban forests provide an array of ecosystem service benefits. In economic terms, for example, it is estimated that a single tree can generate over $90,000 of ecosystem benefits (not including aesthetic, social and natural [wildlife habitat]) over the lifetime of the tree. These ecosystem benefits may include: reducing stormwater runoff, cooling effects, air quality benefits, and reduced energy consumption.

When calculated over an entire city/town, county, region, or even state, the ecosystem service benefits associated with urban forests are impressive. Fairfax County, for example, has estimated that trees contribute more than $54 million dollars worth of cost savings (through ecosystem service benefits) each year (for additional information on Fairfax County's Urban Tree Program, see http://www.fairfaxcounty.gov/nvswcd/newsletter/canopygoal.htm). A separate study conducted in Roanoke (2002), maintained that Roanoke's urban forests contributed approximately $16.9 million in air quality ecosystem service benefits alone.

Remote Sensing – A Tool for Estimating Urban Tree Canopy

To estimate the baseline canopy cover for a participating locality, analysts at the Virginia Geospatial Extension Program and the Virginia Department of Forestry use 1 meter resolution National Agriculture Imagery Program (NAIP) 4 band (three visible bands, and one near infrared band) aerial imagery acquired during the summer of 2008 (http://gismaps.virginia.gov/NAIP/). The imagery is first masked using the geographical boundary of each respective locality. Using ERDAS Imagine, the analysts then begin the largely manual process classifying the multi-spectral imagery. A minimum mapping unit of 4 pixels (4 square meters) is applied during the classification process. The result is an image consisting of four classes which include: tree canopy, other vegetation, impervious, and water (Figure 1).

Once the initial classification has been completed, an accuracy assessment is performed using the 2006 – 2007 Virginia Base Mapping Program (VBMP) imagery. After accuracy is assessed and deemed acceptable the canopy cover assessment is released to the locality. The localities receive a digital copy of the canopy cover assessment. This information not only provides basic statistics associated with the status of the urban forest, it can also be used to visualize the areas of the community where urban tree canopy is dense, connected, and open.

Increasing Tree Canopy

The baseline tree canopy information is essential to support the efforts of local

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Figure 1: 1-meter, 4-band NAIP imagery (above) and a post-processed image (below). The urban tree canopy is shaded as dark green, other vegetation (grass/shrub) is associated with light green, impervious surfaces are shaded in violet, and water is in blue.

Urban Tree Project

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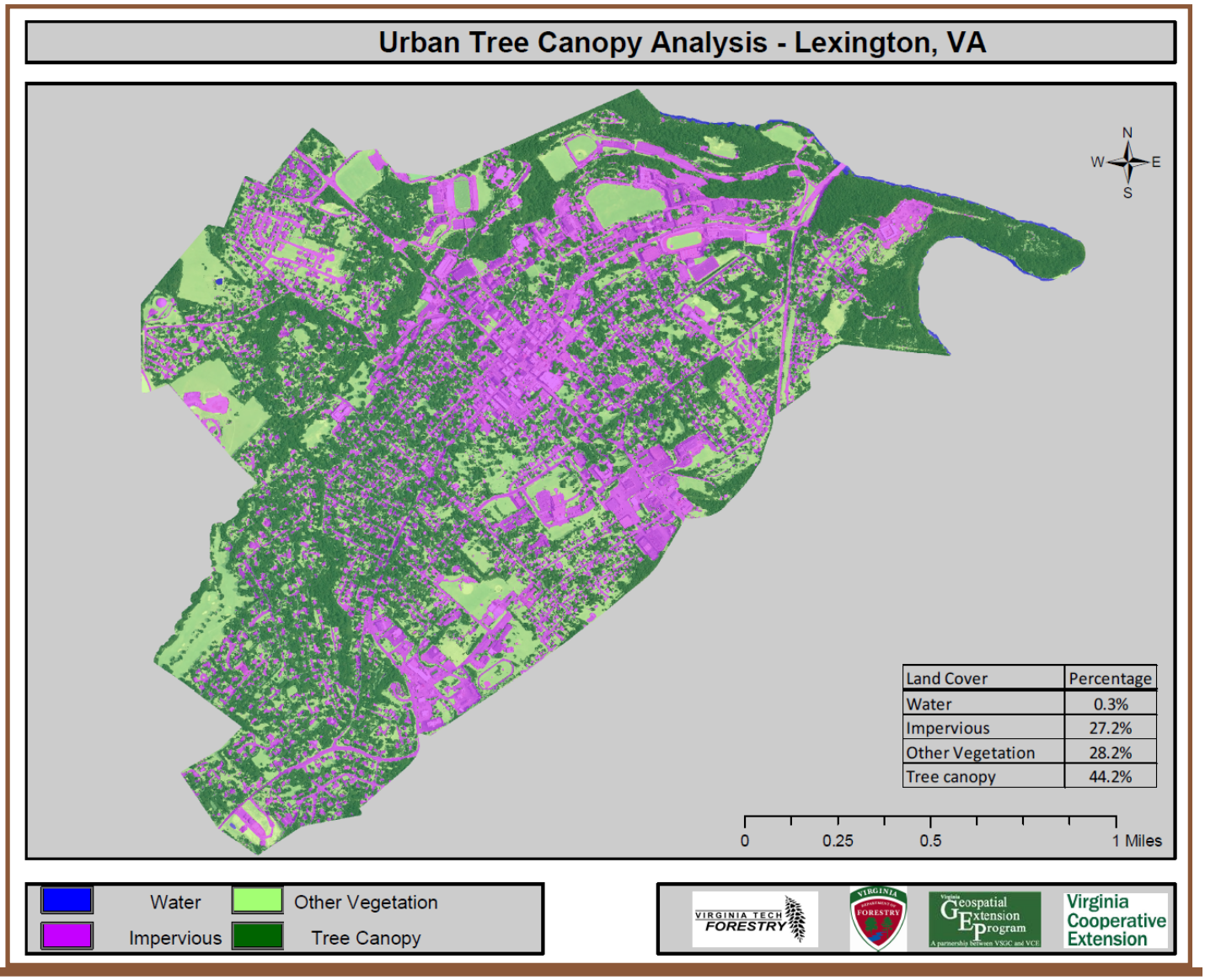
governments to define tree canopy targets, identify policies to support these targets, as well as other instruments that can be integrated to support the attainment of tree canopy goals. Local government decision makers are provided assistance and guidance by project partners in these efforts. Tree canopy can be increased by: managing and preserving the existing canopy and by strategically planting new trees that can be managed over a long period of time, which will add to the canopy.

Status of the Project

The following localities have already had their baseline canopy assessments completed in 2008; Purcellville, Leesburg, Charlottesville, Lynchburg, Lexington and Winchester. These localities will serve as models for the rest of the state. Other localities that are in line to have urban tree canopy baselines generated include: Roanoke City and County, Salem, Vinton, Virginia Beach, Norfolk, Chesapeake, Manassas, Blacksburg, Radford and Arlington. This project may ultimately serve as a foundation to support the development of a tree canopy cover mosaic for the entire state of Virginia. Additional information about urban tree canopy assessments can be found at http://nrs.fs.fed.us/urban/utc/ or by contacting Jen McKee (jmckee@vt.edu | [540] 231-9115) at the Virginia Geospatial Extension Program, or Barbara White (Barbara.White@dof.virginia.gov | [434] 220-9041) with the Virginia Department of Forestry.



Broadband Mapping

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broadband policy organizations and other states, as well as international interest in adopting the model for use in Europe. The broadband map was mentioned in testimony to the FCC on July 18, 2008 and was featured in a Richmond Times-Dispatch article, generating over 200 new markers on the map in a 24-hour period. eCorridors staff have given multiple presentations intended to disseminate awareness of the map to both internal and external stakeholders, including one by Brenda van Gelder for the Broadband Properties Summit in Dallas TX in May 2008; Jean Plymale at the Broadband Census for America Conference in Washington, D.C. in September 2008, and by Seth Peery on April 4 at the Virginia Tech GIS & Remote Sensing Symposium. The ConnectedNation/ Connect Kentucky group (http://www.connectednation.com/) has expressed interest in the eCorridors mapping method, as has the Internet Technology Innovation Foundation. Broadband Census.com (http://www.broadbandcensus.com) worked directly with eCorridors to build their site around the Broadband Map's testing engine (see Figure 1).

The Broadband Map combines a Google Map (http://maps.google.com) with the open-source Network Diagnostic Toolkit, or NDT (http://e2epi.internet2.edu/ndt/). Upon visiting the site, users first mark their location by clicking on the Google Map. Then, they take a Java-based speed test that measures both upload and download speeds, and the results are automatically copied back to the main form. Then, users can optionally record additional data including their service provider, access technology, type of service (e.g., residential, business), and satisfaction with service. The whole process takes only a few minutes to complete (see Figure 2).

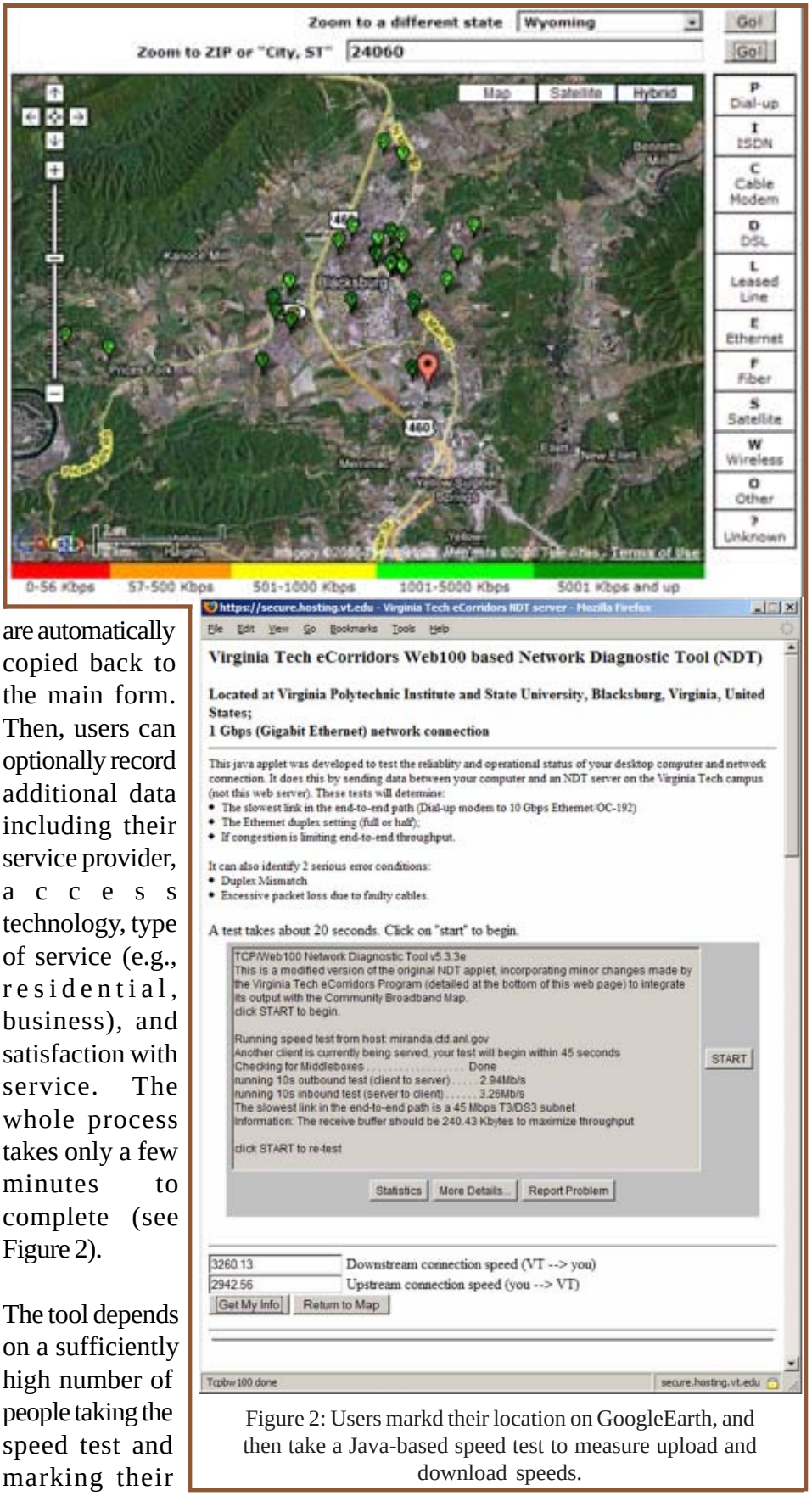

Figure 2: Users markd their location on GoogleEarth, and then take a Java-based speed test to measure upload and download speeds.

The tool depends on a sufficiently high number of people taking the speed test and marking their location to obtain an adequate sample size for analytical rigor and a higher degree of confidence in any generalizations. But as more and more points are added, the eCorridors

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Broadband Mapping

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program hopes to generate new knowledge about the location and, in some cases, conspicuous absence of broadband services through a variety of analysis techniques. The first summary analyses from the first year of continuous operation of the Broadband Map are available at http://www.ecorridors.vt.edu/maps/CBAM/. Additional analyses that seek to use spatial statistical methods to "connect the dots" and infer the location of telecommunications infrastructure are forthcoming. Seth Peery, creator of the Community Broadband Map, is working to develop a robust technique for predictive modeling of the location of telecommunications networks from user-contributed data and using that as an input to rural high-tech economic development policy in his PhD dissertation (See Figure3).

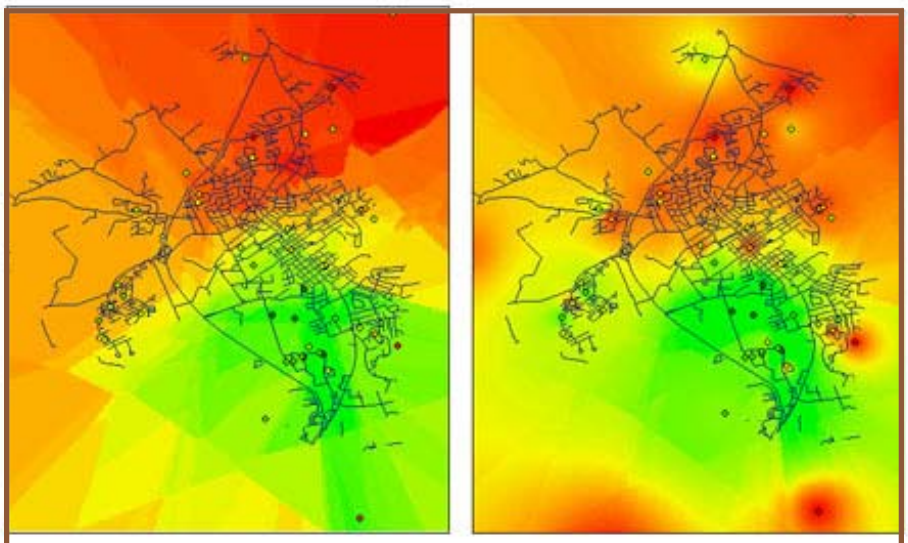

Figure 3: Techniques for predictive modeling of the location of telecommunications networks from user-contributed data: Left: Kriging; Right:Inverse distance weighting.

The Broadband Map is more than a research tool, however; it has numerous practical policy applications. Over time and with enough data points, localities could use the Broadband Map and its associated data in a number of ways. For example:

- In areas where the map reveals an abundance of high-speed connectivity, communities could use the map as a means to attract technology workers and employers as well as promote entrepreneurial growth of emerging network economy businesses.
- In areas where the map reveals a lack of high-speed connectivity, communities could use the map to justify the need for competitive service provision and/or the development of local broadband infrastructure.
- Service providers could use the map as a tool for locating new market areas for expansion or expeditionary marketing.
- Citizens could use the map as input for personal location decisions, to identify workforce training opportunities, and distance education capabilities.
- To provide on the ground data that can be used by consumers or municipalities in corroborating and assessing advertised bandwidth service levels, when averages of multiple data points can be determined.

You can help! Please visit our site at http://www.ecorridors.vt.edu/maps/ and take the speed test. As data points are collected over time, a more complete picture of broadband availability in your area will emerge. Each individual marker contributes to the ability to make accurate generalizations regarding connectivity in a given area. Over time, we hope that this application will provide a valuable service to both researchers and policymakers interested in the impact of the Internet on our communities.

Central Shenandoah PDC

(Continued from Page 5)

Department of Public Transportation and is being used in several related projects, including the Sidewalk Connectivity Study.

Parcel Conversion & Maintenance Services

In order to provide our member jurisdictions with full service GIS assistance, the GIS Department acquired the expertise necessary to provide parcel editing services for our member's land records (Figure 1). Conversion to digital data, ongoing maintenance, and secure data storage are necessary for parcel datasets to be fully utilized by their jurisdiction's staff and citizens. Currently, we are assisting Bath County correct errors and make updates to their digital parcel data. This work is being funded by Virginia's FY09 PSAP Grant Program through June 30th, 2009. The parcels are edited using the COGO (coordinate geometry) and Topology Tools inside of the ArcGIS software. GIS staff has worked with surveyors, assessment groups, and local staff in the efforts to make the parcel data as accurate as possible.

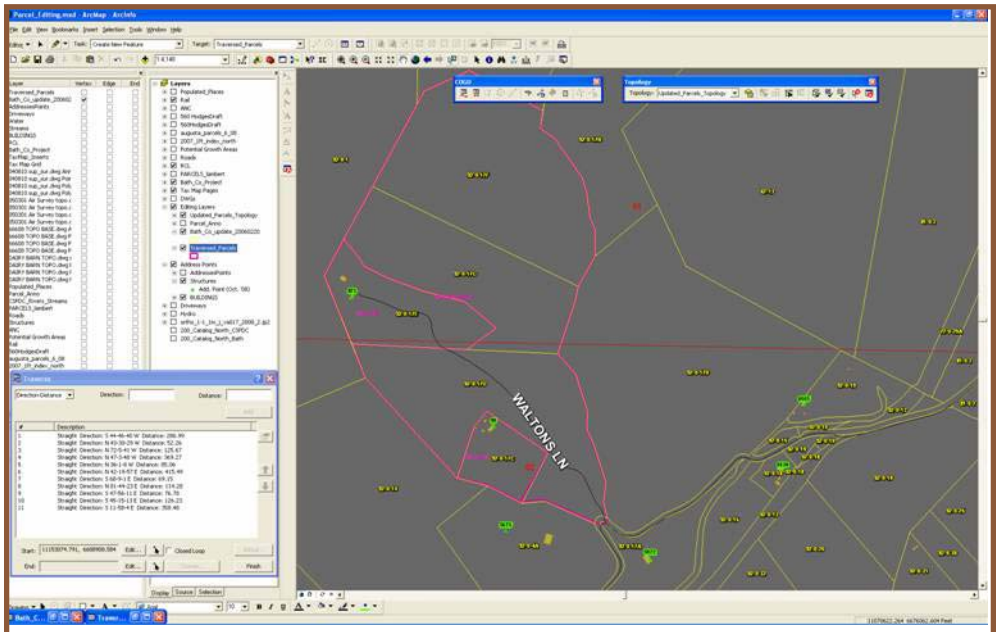

Figure 1: A screenshot of parcel data and parcel editing tools

Bike Route Mapping

In 2004, the CSPDC solicited membership to the Bike-Ped Committee comprised of local, regional, and state government staff, and avid cyclists from throughout the region. Through their experience and knowledge of cycling, the members were given forms for which they could submit viable bike routes. These routes were then digitized into shapefiles, mapped at various scales, and distributed to various agencies for planning purposes.

Once the inventory of these routes reached 43, the committee decided it was time to take it to the next step and begin providing the maps along with turn-by-turn directions to the general public via the internet (Figure 2).

Research into mapping programs revealed a product that would not only automatically generate the turn-by-turn directions, but would also provide an elevation profile for the route. Once all of the routes were created, they needed to be reversed so that cyclists could have directions regardless of their starting point. A web designer was procured to develop a website to post the routes and other bicycle information and resources. The website went live in October 2008,

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Figure 2: Bike the Valley Website

Central Shenandoah PDC

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and will now be maintained in-house. Please visit our site at: www.bikethevalley.org

Wind Energy Resource Maps

The CSPDC has over 10 years of planning experience in educating our communities on the facts behind wind energy and site development. Planning staff also has hands-on experience through participation on an Advisory Working Group that developed a scoring workbook for land use planning and wind power development called the VRS3 (Virginia Renewables Siting Scoring System). GIS staff gained hands-on experience as a GIS Technician/Analyst for this team, assigned by the Virginia Dept. of Mines, Minerals, and Energy to create such a workbook, at James Madison University. Due to the region's topography, many of the ridgelines have a wind resource strong enough to attract developers for large scale projects and provide a source of on-site renewable energy for citizens. The GIS staff has provided wind resource maps and data to its localities, and is currently doing research into several grants and other funding sources to assist the member jurisdictions in education and implementation of wind projects. The CSPDC was a local sponsor for the Virginia Wind Energy Workshop held in Fincastle on Sept. 11th, 2008.

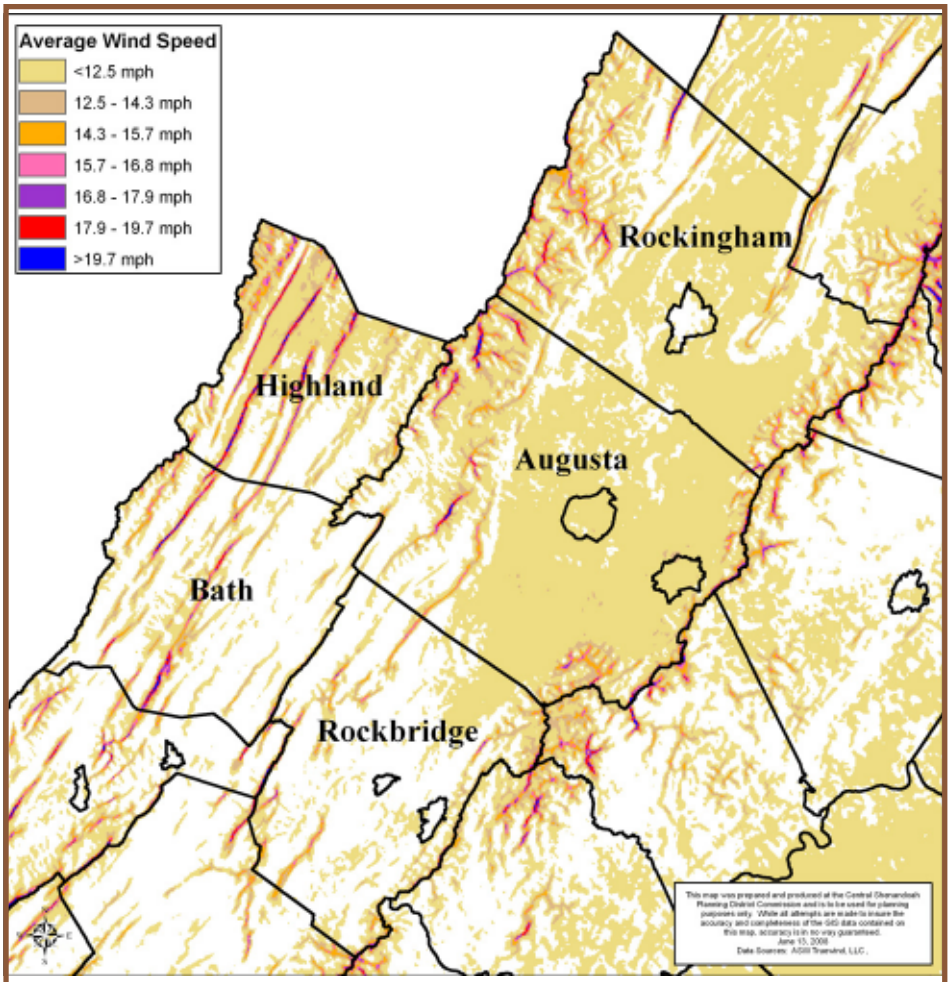

Figure 3: A map depicting the wind energy resources in the Central Shenandoah Valley

Save the Date!

VAMLIS Annual Meeting
May 2009 (TBA)

2009 ESRI Federal User Conference
February 18-20th,
Washington, DC.

2009 ESRI Educational User Conference,
July 11-14,
San Diego, CA

2009 ESRI International User Conference
July 17-19th,
San Diego, CA

2009 Virginia GIS Conference
September 21–23rd, 2009
Richmond, VA

GIS Conference Theme Competition

Dear Virginia GIS Professional:

As you are hopefully aware, a renewed partnership has been formed between the Virginia Association of Planning District Commissions (VAPDC) and the Virginia Association for Mapping and Land Information Systems (VAMLIS). The purpose of this partnership is to plan, organize, and hold a single statewide conference for Virginia GIS professionals. The first such conference will be held September 21 to 23, 2009 in Richmond.

In celebration of this event, the Conference Committee is holding a competition to compose the theme of the 2009 Conference. The winner of this competition will receive a **free registration for the entirety of the conference**. We are asking GIS professionals throughout the Commonwealth to compose and submit theme ideas that demonstrate the spirit of the 2009 gathering.

The Committee asks that theme entries attempt to stress the partnership and statewide aspect of the conference. When preparing your entries, please consider such words and phrases as:

- Partnership
- Unity
- Alliance
- Making a connection
- Forming a bond
- Statewide
- Integrated
- Sharing

Please submit your entries no later than **December 10, 2008** and send them to:

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Thank you very much for your assistance on this matter. We are very excited about the upcoming conference and hope you are too. Please feel free to contact any of the Committee members if you have questions. See you in '09!

Sincerely,

2009 Virginia GIS Conference Committee

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Virginia Geospatial Extension Program
A partnership between VSGC and VCE

Virginia Cooperative Extension
Knowledge for the CommonWealth

Virginia Tech
VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

VIRGINIA STATE UNIVERSITY

Virginia Space Grant Consortium
Aerospace Partnerships in Education, Research and Industry

VGIN