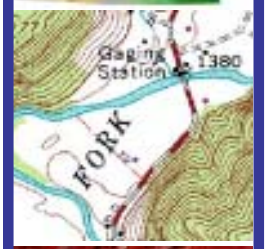
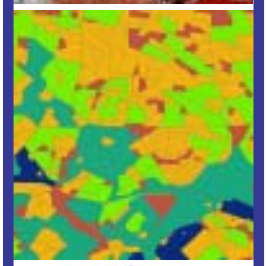
The Virginia Geospatial Newsletter

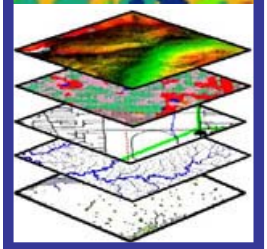
Showcasing GIS, Remote Sensing and GPS Supported Products and Services in the Commonwealth

Volume 2, Number 1 **Winter, 2004**

The Virginia Geospatial Extension Program is a partnership between the Virginia Space Grant Consortium and Virginia Cooperative Extension



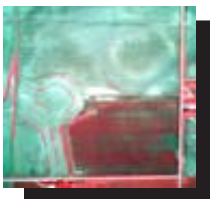




For more information contact:

The Virginia Geospatial Extension Program
(540) 231-2428
www.cnr.vt.edu/gep
jmcg@vt.edu

Using GIS/GPS Tools to Implement Precision Farming



by Bobby Grisso
Professor, Biological Systems Engineering
Virginia Tech

Precision Farming (PF), also referred to as precision agriculture or variable rate technology, is the process used to vary management of crop production across a field. Midwestern farmers have been using PF technologies for several years and it is now becoming popular in Virginia. Crop producers can use relevant information and develop the ability to implement PF technologies in traditional crop production.

Precision farming requires farmers to use information technology and decision support to increase economic returns.

Precision Farming vs. Traditional Agriculture

In PF, the farm field is broken into "management zones" based on soil pH, yield rates, pest infestation, and other factors that affect crop production. Management decisions are based on the requirements of each zone and PF tools (e.g. GPS/GIS) are used to control zone inputs. In contrast, traditional farming methods have used a "whole field" approach where the field is treated as a homogeneous area. In traditional farming, decisions are based on field averages, and inputs are applied uniformly across a field. The advantage of PF is that management zones with a higher potential for economic return receive more inputs if needed, than less productive areas. Therefore, the maximum economic return can be achieved for each input.

Information, Technology, and Decision Support

PF relies on three main elements: information, technology, and decision support (management).

Information: Timely and accurate information is the modern farmer's most valuable resource. This information should include data on crop characteristics, hybrid responses, soil properties, fertility requirements, weather predictions, weed and pest populations, plant growth responses, harvest yield, post-harvest processing, and marketing projections. Precision farmers must find, analyze, and use the available information (Figure 1) at each step in the crop

(Continued on Page 7)

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

K-12 Education

Implementing GPS/GIS in the Classroom through the OVERspace Program

by Chris Carter
Educational Programs Manager
Virginia Space Grant Consortium

The Virginia Space Grant Consortium (VSGC), in cooperation with the Virginia Department of Education (VDOE), is sponsoring the OVERspace (Observing Virginia's Environmental Resources from Space) program. NASA Langley Research Center, the Virginia Tech College of Natural Resources, and Virginia Cooperative Extension are also partners. OVERspace is a professional development program for teachers. It teaches them how to utilize GIS (Geographic Information Systems) and GPS (Global Positioning Systems) as educational tools in the classroom. The VSGC and VDOE are providing this training because of the strong educational value of using geospatial data to create meaningful learning experiences in many disciplines such as math, science, technology, geography, social studies, and language arts.

OVERspace workshops are led by highly trained and motivated educators, leaving teachers equipped with the necessary skills, lesson-plan materials, and follow-up support to provide GPS and GIS instruction that meets Virginia SOLs in grades 4 through 12. The SOL-relevant lesson plans and software provided in the workshops help teachers to go back to their classrooms and implement their training to engage the students. Participants will also be provided with many wonderful data resources for classroom use.

Teachers are empowered to bring the excitement of GIS technology into current events. Dynamic maps, created with GIS, give teachers a creative way to help learners 'see' what the data are predicting or confirming related to the topic/subject the students are researching. The use of these data in this manner allows for more critical thinking and reveals a multidimensional approach to teaching, engaging many of the learning modalities present in one classroom.

The OVERspace program also provides teachers with hands-on experience using a GPS unit. GPS technologies allow teachers to engage students in real-world field data collections. Teachers learn to identify satellite signals, latitude and longitude, ground speed and elevation, and to collect and store waypoints. Throughout the program, educators take part in discussions on the current and future applications of GIS/GPS technology.

OVERspace workshops are led by highly trained and motivated educators...

A great deal of excitement has been generated by bringing these real-life technologies to students and witnessing the learning that results from the real-world applicability of data about the Earth from space and airborne missions. "Many of my students are hunters and fishermen, and they realize the importance of being able to locate their position coordinates in order to arrive at their destination and to return home safely. My students anxiously await the GPS lessons!" said Barbara Kolb, teacher, James River High School, Buchanan. "I am really excited about the opportunities for the students in association with this program. The students are excited when they compare what they do in their classes to what scientists actually do in the field. It really makes their assignments 'real world,'" said Kim LaFrance, teacher, Kemps Landing Magnet School, Virginia Beach.

OVERspace training is provided at a modest cost and can be underwritten by school professional development funds. Training may also be sponsored by external VSGC grants as funding becomes available. For more information on OVERspace or to schedule a workshop, please contact Chris Carter, Educational Programs Manager – VSGC, at (757) 766-5210 or email: cxcarter@odu.edu. Visit the OVERspace program on the internet at http://www.vsgc.odu.edu.

OVERspace teachers are provided with cutting edge training.

The ESRI Virtual Campus Is Available to Virginia's Community Colleges

by Kathy Williams
Information Applications Analyst
Virginia Tech

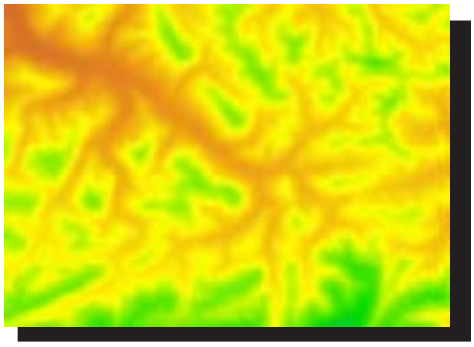
ESRI Virtual Campus courses combine hands-on experience, interactivity, and instructional support for a variety of ESRI products. Through the ESRI contract for Virginia state-supported universities and community colleges, many of these courses are offered free of charge to all faculty, staff, and students in the Virginia Community College System. "This is an excellent resource to supplement quality classroom instruction." added Bob Bailey, Director of the Institute of Excellence of Applied Technology (IE-AT) at the Virginia Community College System (VCCS).

ESRI's Virtual Campus courses are designed to supplement quality classroom instruction.

If you would like to take a course you can contact the Virtual Campus Subscription Representative at your community college or university, or by contacting Kathy Williams (kathyw@vt.edu).

Campus courses require access to the Internet and specific ESRI software to complete course exercises. The software needed should be available at your institution through the statewide Higher Education Site License.

Any courses that are not offered free of charge should still qualify for the 40 percent educational discount.



The ESRI Virtural Campus Courses for the VCCS include:

ArcGIS and Extensions (8.1 or higher)
- Creating and Editing Geodatabase Features (for ArcEditor and ArcInfo)
- Creating and Editing Geodatabase
- Topology (for ArcEditor and ArcInfo)
- Creating and Editing Linearly Referenced Features (for ArcEditor and ArcInfo)
- Creating, Editing, and Managing Geodatabases for ArcGIS 8.2
- Creating, Editing, and Managing Geodatabases for ArcGIS 8.3
- Learning ArcGIS 3D Analyst
- Learning ArcGIS 8, Part I
- Learning ArcGIS 8, Part II
- Learning ArcGIS Spatial Analyst
- Working with Rasters in ArcGIS

ArcIMS
- Customizing ArcIMS 4
- Learning ArcIMS 4

ArcInfo and Extensions
- Introduction to ArcInfo Using ArcTools

ArcView 3.x and Extensions
- Introduction to ArcView 3.x
- Introduction to ArcView 3D Analyst
- Introduction to ArcView Business Analyst
- Introduction to ArcView Network Analyst
- Introduction to ArcView Spatial Analyst

Avenue
- Programming with Avenue

Visual Basic
- Introduction to Visual Basic 6

INSTITUTE OF ADVANCED TECHNOLOGY

4-Year Colleges and Universities

Wetland Mitigation and Restoration - A GIS Landscape Approach to Site Selection

by Marcia R. Berman
Director, Comprehensive Coastal Inventory Program
Virginia Institute of Marine Science

Restoration of wetlands for environmental enhancement or mitigation poses great challenges in a rapidly developing landscape. Site selection for wetland construction in the coastal plain of Virginia is constrained as much by existing development as hydro-geomorphic processes. This is the case in the southeast region of Virginia known as Hampton Roads. Since the 1930s, rapid urbanization in response to military and industrial expansion filled extensive wetlands. Increased interest in agriculture in the region resulted in the conversion of wetlands to farmland.

Unlike the beginning of the 20th century, compensatory mitigation is now required for wetland impacts. Unfortunately site selection is frequently based on economics rather than good science. There is a demonstrated need, therefore, to develop mechanisms to communicate scientific information and guidance to managers, developers, and regulators at all levels of government.

A GIS-based tool was developed to target sites in the landscape appropriate for wetland creation. It has application for wetland restoration or mitigation projects. The tool outputs selected sites based on a hierarchical protocol that evaluates suitability on the basis of five parameters: presence of hydric soils, hydrology, adjacency to existing wetlands, current landuse with opportunity for landscape conversion, and proximity to designated conservation areas. A ranking system assigns descriptive values to polygons which meet designated conditions. The application draws from a variety of data sources including National Wetlands Inventory Program, and the National Land Cover Dataset (NLCD). Since the model was developed for application to large regional areas, classified satellite data is appropriate. NLCD products are derived from Landsat TM with a 30-meter pixel resolution.

Level	Conditions Necessary	Rank
Level 1	hydric soils and hydrology	potential
Level 2	Level 1, adjacent to wetland	moderate
Level 3a	Level 2, landcover is forested	good
Level 3b	Level 2, landuse is agricultural	high
Level 4a	Level 3a, adjacent to conservation area	high
Level 4b	Level 3b, adjacent to conservation area	excellent

Table 1: Summary of Hierarchical Levels

The targeting model first addresses hydro-geomorphic requirements for wetland creation (levels 1-2) followed by landuse/ landcover conditions (levels 3-4). Four hierarchical levels and specific conditions must be met at each level. Table 1 summarizes the hierarchy. In Level 3, forest habitat is recognized for its ecological value. Therefore polygons that are agricultural have a slightly higher suitability ranking.

Figure 1 illustrates a Level 1 assessment from the Princess Anne topographic quadrangle. The model was tested in the Hampton Roads area. Maps delineating the output are available at this website: http://ccrm.vims.edu/cci/wet_target. More details related to the protocol are also available. Figure 2 illustrates a Level 4 assessment from the Princess Anne topographic quadrangle.

Phase II of this project uses ArcIMS technology to generate a query system where users define parameters important to their mitigation project: acreage requirement, hydrologic unit, locality, etc. Queries submitted through this interface will identify polygons that meet these explicit conditions. The application is useful for sorting through a potentially large number of available sites to only a few. This application can also be accessed from the website above.

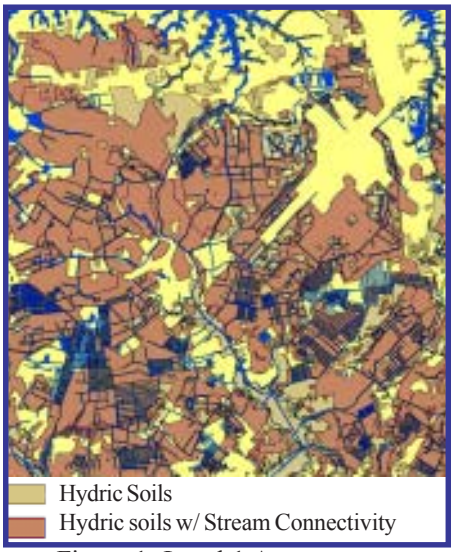


Figure 1: Level 1 Assessment

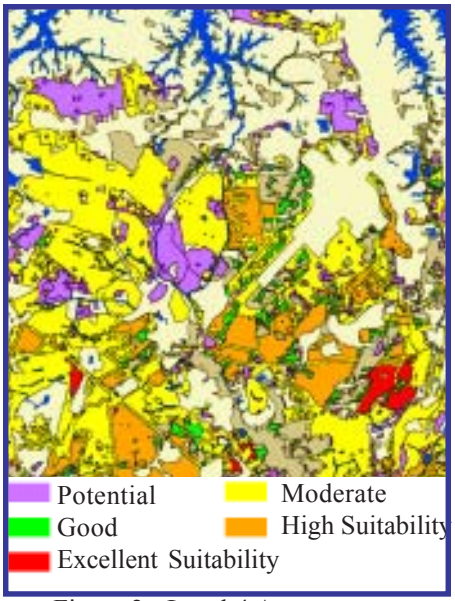


Figure 2: Level 4 Assessment

Local Government

Geospatial Tools: Supporting Wireless 911 in a Rural Community

by Wes Ashley
Director
Martinsville-Henry County 911
Communications Center

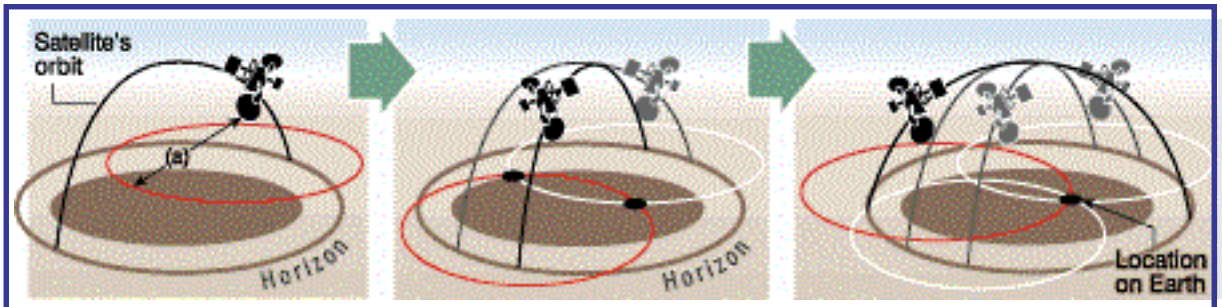
What is Wireless 911?

In Virginia, most citizens have access to enhanced 911 (E-911) services for their land lines, or traditional telephone lines. Many Virginia citizens can, for example, call 911 from a land line. Through E- 911, both the phone number and the location of the phone number (an address) are made available to the dispatcher.

Obviously, the wireless E-911 solution is more challenging. Cellular phones are not tied to any single address, as these calls can potentially be made from almost any location. This can present life-threatening situations, if the caller is unable to speak, or if the caller does not know his or her location. This can result in increased response times by public safety officials.

There are three phases associated with wireless 911. Phase 0 simply refers to wireless 911 calls that are made from a cellular phone, and are answered by a dispatcher or other public safety official. Phase I refers to wireless 911 calls that have a call-back number associated with them. Phase II refers to wireless 911 calls that can be associated with a geographic location and can therefore be tracked.

There are two potential Phase II solutions associated with the implementation of wireless Phase II E-911: handset-based solutions and network-based solutions.



Handset-based solutions rely on GPS

http://www.shelby911.org/wireless911.htm

The handset-based solution

The handset-based solution seamlessly integrates GPS (Global Positioning System) that is built into the cell phone. When a wireless caller calls 911 using the handset-based solution, the geographic coordinates of the cell phone are transmitted to the 911 Center, and the location of the caller can be accurately pin-pointed. GPS uses a minimum of three satellites to triangulate the location of the cell phone and is usually accurate to within a few meters.

The network-based solution

The other Phase II option is a network-based solution. The network-based solution identifies the location of the handset by triangulating the cell phone signal from a minimum of three cell towers.

The accuracy of wireless 911 Phase II calls is contingent on the number of cell towers, the distance to the respective tower(s), terrain, elevation, structures, urban canyons, and tree foliage, as well as the Phase II solution being used.

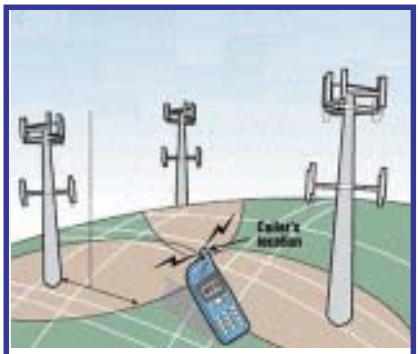
The Martinsville-Henry County Wireless 911 Experience

Rural communities as well as urban communities can provide effective county/citywide emergency services for cell-phone users through wireless Phase I and Phase II. Martinsville and Henry County have a combined population of 72,000 people, and cover an area of approximately 400 square miles. Martinsville and Henry County maintain a joint 911 Center with six positions and 22 fulltime dispatchers. Currently, approximately 50 percent of all incoming 911 calls in the region are wireless.

The Martinsville-Henry County 911 Center became operational in 1990 as a 911 service center. The service area is currently 100 percent wireless Phase I and Phase II. Capabilities of the Center have been demonstrated to approximately thirty-five localities from Virginia, North Carolina, and Tennessee.

The Martinsville-Henry County 911 Center has extensive mapping capabilities through its geographic information system (GIS). The GIS (powered by Microdata) interprets the incoming data stream and displays information both as text and visually on a digital map.

(Continued on page 10)



Network-based solutions rely on the triangulation of cell towers

http://www.shelby911.org/wireless911.htm

The Virginia Fish and Wildlife Information Service

by Amy Martin
Wildlife Diversity Division
Virginia Department of Game and Inland Fisheries

The Virginia Department of Game and Inland Fisheries (VDGIF), in cooperation with the Conservation Management Institute (CMI) at Virginia Tech, has re-engineered the Virginia Fish and Wildlife Information Service (VAFWIS) in order to improve its functionality and ease of use. The VAFWIS is an online system of databases that makes the most current and comprehensive information about Virginia's wildlife species available over the Internet to other government entities, private consultants, engineers, educators and the general public.

VAFWIS is a valuable tool that is extremely useful to those making decisions about land management, planning, and environmental impacts...

The VAFWIS is a valuable tool that is extremely useful to those making decisions about land management, planning, and the environmental impacts of projects. Users have access to nine databases that contain geo-referenced information on over 3,000 of Virginia's native and naturalized wildlife species. Users can access life-history information; query geographically for the presence of threatened and endangered species, trout streams, anadromous fish use areas, and other wildlife resources; perform custom queries of the databases; and create species lists for various geographic units within the commonwealth.

The VAFWIS re-engineering provided for the migration of the associated databases into SQL Server™ which will enable the system to more easily interface with Geographic Information System software such as ArcIMS™. We were also able to increase GIS capabilities, update the look and feel of the system, and improve its functionality. We have increased the mapping options, provided new query and reporting options, and added new databases and spatial data layers such as the Threatened and Endangered Species' Waters and Anadromous Fish Use Areas and Impediments databases.

Since the initial release of the re-engineered VAFWIS, the project team has continued to work on enhancements to the system. These include, but are not limited to, the ability to draw a custom search area for querying the databases, the ability to download entire data sets, and the integration of databases that are currently under revision, such as the Wildlife Mapping and Observation Book databases. The project team also is considering the use of ArcIMS™ to replace or augment the custom programming currently in place for displaying spatial data. Until some of the enhancements are in place, and all system testing is complete, the re-engineered VAFWIS will run parallel to the "old" VAFWIS in order to facilitate a smooth transition for its users.

As the agency with regulatory authority over threatened and endangered species and all wildlife on the state level, VDGIF is committed to maintaining current data on wildlife resources and providing this information to the public as well as to natural resource managers. Please visit the VAFWIS at www.vafwis.org. If you would like more information regarding the Virginia Fish and Wildlife Information Service or have suggestions for future enhancements to the system, please do not hesitate to contact Amy Martin, VDGIF, at (804) 367-2211, or by email at martina@dgif.state.va.us.

The VAFWIS has been re-engineered to enhance performance and functionality through a new user-friendly interface.

Precision Farming

(Continued from Page 1)

system. An enormous database is available on the Internet. This data is both accessible and quickly updated.

Technology: Precision farmers must assess how new technologies can be adapted to their operations. For example, the personal computer (PC) can be used to effectively organize, analyze, and manage data. Record keeping is easy on a PC and information from past years can be easily accessed. Computer software including spreadsheets, databases, geographic information systems (GIS), and other types of application software are readily available and most are easy to use.

Another technology that precision farmers use is the global positioning system (GPS). GPS allows producers and agricultural consultants to locate specific field positions within a few feet of accuracy. As a result, numerous observations and measurements can be taken at a specific position. Geographic information systems (GIS) can be used to create field maps based on GPS data to record and assess the impact of farm management decisions.

Data sensors used to monitor soil properties, crop stress, growth conditions, yields, or post harvest processing are either available or under development. These sensors provide the precision farmer with instant (real-time) information that can be used to adjust or control operational inputs.

Precision farming uses three general technologies or sets of tools:

1. Crop, soil, and positioning sensors – these include both remote and vehicle-mounted, "on-the-go" sensors that detect soil texture, soil moisture levels, crop stress, and disease and weed infestations;
2. Machine controls – these are used to guide field equipment and can vary the rate, mix, and location of water, seeds, nutrients, or chemical applications;
3. Computer-based systems – these include GIS maps and databases that use sensor information to "prescribe" specific machine controls.

Decision support (management): Decision support combines traditional management skills with PF tools to help precision farmers make the best management choices or "prescriptions" for their crop production system. Building databases based on the relationships between inputs and potential yields, refining analytical tools, and increasing agronomic knowledge at the local level are yet to be accomplished. Most agricultural researchers agree that decision support remains the least developed area of PF. Diagnostic and database development will eventually replace technologies as the real benefit of PF.

Figure 1. The learning cycle with equipment use and technology overlaid. The precision farming tools provide a means to record and save information for year-to-year comparisons of a location.

Example of Site-Specific Crop Management

Developing management strategies is the most difficult part of the PF process. Precision farmers must consider the steps of crop production that can best be controlled and managed to provide the greatest economic return.

A farmer wants to "fine tune" his nutrient management plans for optimal economic returns. He starts by evaluating the soil characteristics within a field. Next, the farmer classifies the field into areas or "management zones" based on common soil types or crop potentials. Within these zones, the farmer decides on the combination of operating strategies (e.g. conservation tillage with variable rate fertilizer application) needed to obtain the maximum profit from that field. He can fine-tune the nutrient management plan based on weather and market forecasts.

The fine-tuning job does not end at harvest. The farmer should gather yield data and information on the amount of residual nutrients not utilized by the crop. He should compare these results to his yield goals and economic returns to determine whether his management decision worked.

PF is used to vary crop production management across a field. This practice requires farmers to use information, technology and decision support to increase economic returns.

The Status of Virginia's SSURGO Soils

by Pamela J. Thomas, Ph.D.
Soil Scientist, Virginia State Office,
USDA-Natural Resources Conservation Service

The focus of the National Cooperative Soil Survey is shifting from producing static, printed soil survey reports to providing a dynamic resource of soils information for a wide range of needs. The National Soil Information System (NASIS) and the Soil Survey Geographic database (SSURGO) are the core components of this change and are designed to manage and maintain soil data from collection to dissemination. The USDA-Natural Resources Conservation Service (NRCS) has been creating and archiving digital soils data for the United States since 1994. SSURGO data are the most detailed level of soil mapping done by NRCS and duplicates the original soil survey maps, typically by county or multi-counties. Mapping scales generally range from 1:12,000 to 1:24,000. SSURGO consists of:

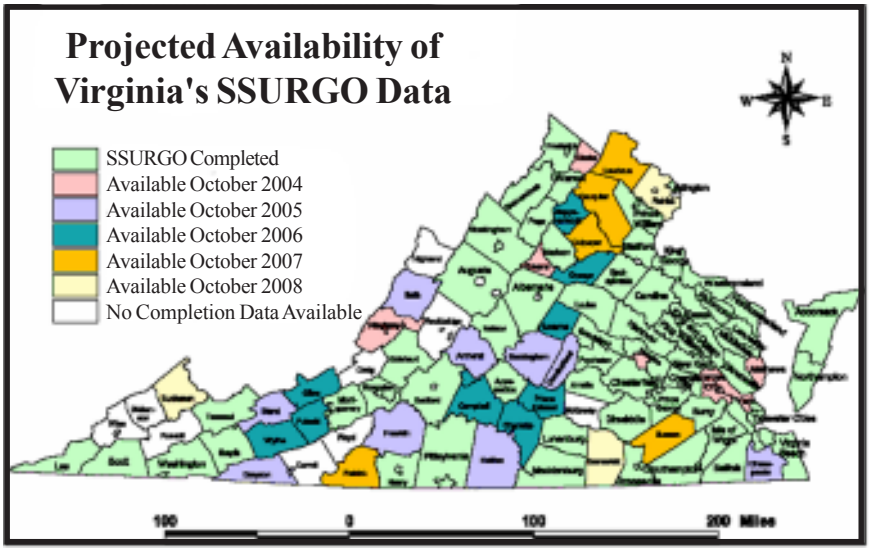
- spatial data, such as the digital soil survey map, and
- attribute data, such as the soil survey area soil property data from the National Soil Information System and associated source information (metadata).

This level of mapping is designed for use by landowners, towns, and counties for natural resource planning and management. The user should be knowledgeable of soils data and their characteristics. As of January 2004, SSURGO data are available for 57 counties and cities in Virginia and approximately 1,710 nationwide. All of Virginia is expected to have digital soils coverage by the end of 2006.

One-stop shopping is now available for digital data at the USDA Geospatial Data Gateway at http://lighthouse.nrcs.usda.gov/gateway/gatewayhome.html. In addition to SSURGO data, other natural resource data are available; examples are transportation, hydrography, elevation (DEM), topographic images (DRG), orthoimagery (DOQ), hydrologic units, and land use cover. Data are available by ftp download at no cost or can be ordered on a CD-ROM for $50.

SSURGO data are available in three formats from the Geospatial Data Gateway, ESRI shapefiles, ESRI coverages, or ESRI ASCII Export (.e00); and in three projections, geographic, UTM, or State Plane (all NAD83). Within the zipped download file are spatial data for soils, topographic quad boundaries, county boundary, and special features (wet spots, gravel pits, etc.). Attribute data is included in a Microsoft Access database which needs to be imported in an Access template; detailed instructions for importing the database into the template are included with the download.

For ease of use of digital soils data, the USDA-NRCS has developed an extension for ArcView (3.2x or higher) called Soil Data Viewer. The Soil Data Viewer extension is free and available for download (http://www.itc.nrcs.usda.gov/soildataviewer/).



Detailed user's guides are also available from the website. Using the Soil Data Viewer, data can be shown for many soil properties at different depths. For example saturated hydraulic conductivity from 50 to 100 cm or for soil interpretations such as suitability for septic tank absorption fields or road construction can be shown through a viewer for a particular county.

Soil information is dynamic and with increasing knowledge and technology this information can and will be made available to the public as quickly as possible. For more information, please contact Pam Thomas at (804) 287-1647 or email pam.thomas@va.usda.gov.

Featured Organization

VAMLIS - the Virginia Association for Mapping and Land Information Systems

by Chris Stephan
President
VAMLIS

In 1989, a group of individuals from throughout Virginia began meeting to lay the foundation for a statewide, nonprofit membership association. This group, realizing the need to bring people and organizations involved and concerned with the mapping sciences together, prepared a Constitution and Bylaws to form the Virginia Association for Mapping and Land Information Systems. This document was approved in January 1990 with numerous objectives, most of which concentrated on promoting, advising, educating, and otherwise advancing the profession of GIS and related technologies.

On July 3, 1990 the Virginia State Corporation Commission certified the Virginia Association for Mapping and Land Information Systems (VAMLIS) as a corporation licensed to transact business in the Commonwealth of Virginia.

VAMLIS remains the only GIS association within the commonwealth that is comprised of local officials, state agencies, and private businesses. The benefits of membership are not only based on the objectives listed within our charter, but also by the ability for state and local officials to coordinate efforts and for the public and private sectors to meet and exchange thoughts and ideas.

VAMLIS's core membership has widely expanded since its inception due to the rapidly evolving possibilities GIS brings to the various commercial, governmental, and educational enterprises and activities throughout Virginia. From law enforcement to agriculture and every possible profession in between, GIS is a tool that is quickly becoming a mainstream catalyst, allowing easy data acquisition and more enlightened decision-making processes for all lines of work.

Over the past two years, VAMLIS has more than doubled its membership and tripled its budget. Our success as an organization is marked by the numerous activities we are involved in and the critical assistance we deliver to those in need. VAMLIS has helped many employers fill job vacancies; we hosted a delegation of GIS professionals from China; we have provided DPOR a summary of the GIS community's response to the photogrammetry issue; we provide countless networking opportunities; our annual scholarship has given financial aid to two students this past year; our conference hospitality event is always a great social gathering; and our annual conference is an outstanding educational event that presents the technological advancements and industry standards that our membership depends on for benchmarking their own programs.

The future of VAMLIS should continue to expand our role as Virginia's only public/private mapping and land information organizations. We are dedicated to the advancement of the GIS profession and our future looks bright. If you or anyone you know would be interested in our educational and regional workshops, GIS networking events, community outreach, technical articles in our newsletters, conferences, Web links, and topic surveys, please feel free to have them visit our website at www.vamlis.org and become members.

Questions From the Field...

How can I receive immediate responses to my geospatial related questions?

The Geospatial Extension Program now has an online question entry form on our Website. Answers to your questions will be answered promptly by email. Access "Questions from the field" online from the Geospatial Extension Program's homepage: http://www.cnr.vt.edu/gep

How can I download data from my GPS and view this data?

Downloading waypoints requires a serial cable for your particular GPS unit. Sometimes the cable comes with the unit, sometimes you have to purchase it separately. Furthermore, you need a program that knows how to talk to your GPS unit and download the data.

There are many different software programs that do this. However, three different methods for downloading your waypoints will be discussed here.

The first method downloads directly into ArcMap, though this method only works for Garmin GPS recievers. This utility is called GPSi (Author: Owen Earley; Portions of the work are copyright by Waymex IT - http://www.waymex.co.uk/), and can be found on ESRI's Website. Go to http://support.esri.com/ and search under downloads for GPSi.

The second method uses a freely available piece of software called GPS Utility (Author: Alan Murphy – http://www.gpsu.co.uk/) which is a mini-GIS but also creates shapefiles that you can import into ArcGIS. GPSUtility costs $40 for a single license (although, a demo version is available).

The final method is using a software called USA Photomaps (Author: Doug Cox – http://jdmcox.com). This program enables you to enter a coordinate, and the program will go out and search for the

(Continued on page 11)

Wireless E-911 Application

(Continued from Page 5)

Two of five wireless carriers in the Martinsville-Henry County region (Alltel and Nextel Partners) have the ability to permit "rebids" while the caller is moving, either walking or driving. In other words, the dispatcher can track a 911 call while the cell phone is on the move, by repeated "rebids," if the dispatcher and caller remain connected.

The Virginia Information Technologies Agency (VITA), formerly the Virginia E-911 Wireless Services Board, has served as a technological and financial resource to support the implementation of wireless E-911 throughout Virginia. In addition, one of the more significant informational resources to support public safety in the Martinsville-Henry County 911 Center, is the use of color digital aerial photography. The Virginia Based Mapping Program (VBMP) has led the initiative to provide the high resolution digital imagery to all localities.

The Martinsville-Henry County 911 Center uses VBMP imagery that is compressed (MrSid format). This provides higher performance, without a significant degradation in image quality.

Phase II wireless can associate the geographic location of a cell phone call. Some 911 centers can show the location of the call on an aerial photograph almost instantly.

Martinsville
Henry County
Virginia

This imagery is displayed almost instantly to the dispatchers. The digital photography provides the dispatchers an additional dimension or perspective that may make the difference in locating the caller. In addition, an appropriate means of response can quickly be identified. Dispatchers, law enforcement, as well as public safety personnel in both Martinsville and Henry County use the aerial photography to support their responsibilities as well. The Martinsville-Henry County 911 Center also has the capability to display color digital photos of all structure. These images are available instantaneously to the dispatchers, as shown in figure above. The digital photographs were generated through the support of the Commissioner of the Revenue's Office in both Martinsville and Henry County.

A number of additional layers, including landing zones, fire hydrants, waterways, parcel boundaries, flood warning gauges (IFLOWS), structure footprints, mobile home parks, apartments, gas pipelines, and cell towers, are also integrated into the GIS system. The center also has integrated the VBMP aerial photography from the counties that surround Henry County. These counties include: Pittsylvania, Patrick, and Franklin, as well as the City of Danville. The center will continue to expand the capabilities of the system by integrating other GIS layers and associated attribute data as they become available.

Questions from the Field

(Continued from page 9)

corresponding aerial photography on the Internet (Terraserver). The software will then place the photogaphic images beneath your waypoints or tracks. This software is free.

Download links and instructions on how to use each of these software tools are available on the Geospatial Extension Program's Website (http://www.cnr.vt.edu/gep/tools.pl).

What are projections and why are they important?

Projection is the process of taking a view of a spherical globe and transferring that information onto a flat piece of paper. Projections define the coordinate system of the data, and without a coordinate system, locations and distances could not accurately be located, analyzed or measured on your map.

It is important to have a basic understanding of projections because, quite often, different data layers will have different projections. When overlaying layers with different coordinate systems, the data will not plot correctly. For example, the coordinates for Blacksburg are 37.23 degrees North and 80.42 degrees West. However, if you were to try to plot these data on a layer with a UTM (Universal Transverse Mercator) projection, it would not plot correctly at all. This is because the coordinates for Blacksburg in a UTM projection are 550,722.00 North and 4,120,860.00 West.

To see for yourself how projections can affect the location of your data, follow the simple tutorial created by ESRI (Technical Article # 24646):

1. Start ArcMap.
2. Click Add Data and navigate to: arcgis\arcexeXX\Reference Systems. This folder contains some very useful test data.
3. Select dcw.shp. This is the grid used to identify Digital Chart of the World data. The shapefile's extent is -180 West to +180 East, and -90 South to 90 North, covering the entire surface of the world. Note the coordinate system GCS_WGS_1984, the North Pole and South Pole, which are points, are displayed as lines at the top and bottom of the data, and that these lines are as long as the equator. This graphically demonstrates the distortion while using a Geographic Coordinate System for data.
4. Click on View > Data Frame properties > Coordinate System tab. This shows the projection of the data frame in the upper window, from dcw.shp, as GCS_WGS_1984. In the lower window, select a different projection for the data frame.
5. While in the lower window, click Predefined > Projected Coordinate Systems > UTM > WGS 1984, and select UTM Zone 18N as the projection; click Apply. The projection of the data frame is changed; notice the shape of the square boxes from dcw.shp has also changed. Also, because of the limitations of the UTM projection, most of the globe disappears from the view.
6. Experiment with other projections on this shapefile:
   A. Click Clear on the Coordinate System tab.
   B. Click the Layers folder in the lower window.
   C. Open dcw.shp, and select GCS_WGS_1984.
   D. Click Apply. Dcw.shp returns to the original shape.
   E. Click Predefined > Projected Coordinate Systems > Continental. The World folder contains projections for the continents of the world. Experiment with the different projections as shown in the steps above.

Different organizations will use different projections for their data. Analyzing and processing data in different projections can produce erroneous results. Therefore, if you need to process the data in any way, you should use ESRI's "Define Projection" and "Reproject Wizard" located in ArcToolbox to reproject each layer to a common projection. This can be annoying and time consuming if all you want to do is view the data. That is why ESRI created the "Projection-on-the-Fly" functionality. This functionality lets you quickly view data in different projections. All that is required is that each layer has a defined projection. If ArcMap can determine the projection for each layer, "Projection-on-the-Fly" will automatically reproject the data as necessary to make the layers overlay correctly.

Where can I download data for my GIS?

There are many sources that can be used to download data. These souces include: federal , state, and local government Websites. Furthermore, the private sector actively provides and disseminates GIS data (sometimes at a cost). Non-governemental organizations (NGO's) may also maintain and share GIS data.

The Geospatial Extension Program provides links to GIS data sources from local, state, federal, and the private sector (http://www.cnr.vt.edu/gep/data.pl). This Website provides direct links to several federal and state level geospatial stakeholders, including: The Virginia Geographic Information Network (VGIN), the Virginia Economic Development Partnership (VEDP), the Virginia Department of Forestry (VDOF) and the Virginia Department of Transportation (VDOT), the U.S. Fish and Wildlife Service (USFW), and the U.S. Geological Survey (USGS).

The majority of Virginia's local goverments have developed sophisticated GIS's. Local governments should be contacted individually.

The Geospatial One-Stop (http://www.geodata.gov) serves as a public gateway for improving access to geospatial information and data. The Geospatial One-Stop is maintained by the federal government. This site provides links to both spatial data and metadata.

The Virginia Geospatial Extension Program
319 Cheatham Hall (0324)
Blacksburg, VA 24061
(540) 231-2428
http://www.cnr.vt.edu/gep

The Virginia Geospatial Newsletter is published by the Virginia Geospatial Extension Program, a parternship between the Virginia Space Grant Consortium and Virginia Cooperative Extension.

The newsletter is developed in conjunction with the Virginia Geographic Information Network (VGIN).

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

Virginia Cooperative Extension
Knowledge for the CommonWealth

Virginia Tech
VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

VIRGINIA STATE UNIVERSITY