NYSGIS 2001

17th Annual New York State *Geographic Information Systems Conference*

"GIS... Not So Scary!"

October 29-30, 2001
Holiday Inn- Turf, Albany, New York

Sponsors

Central NY Region of the American Society for Photogrammetry and Remote Sensing
State University of New York College of Environmental Science and Forestry
New York Statewide GIS Coordination Program

Cosponsor

Niagara Mohawk Economic and Community Development

Underwriter

The Chazen Companies

New-- Ask the Expert Session listings

Last Minute Program Changes

GIS tools help solve real world problems in all kinds of areas today, including facilities management, transportation, utilities, environmental protection, health care and epidemiology, land use planning, marketing, conservation, business strategic planning, engineering, education, social services, economic development, and more. Starting seventeen years ago with a small gathering of early GIS users, the New York State GIS Conference has become a major GIS professional development opportunity for hundreds of GIS users in the state. The conference is a great place to discover how New Yorkers are using GIS to accomplish important objectives in the public and private sectors. Technical presentations feature working professionals who share their GIS experiences and solutions in dealing with real world problems like yours.

Meet fellow New Yorkers active in the GIS field, exchange information and experiences, and seek solutions to your geographic data management needs. Professional networking opportunities help you develop a network of fellow GIS users which can continue through the years. In the exhibit area, GIS vendors and consultants display the latest in GIS hardware, software, analytical techniques, and services.

Keynote Speaker: *Susan Carson Lambert*, President Elect, National States Geographic Information Council, and Executive Director, Finance and Administration Cabinet, Kentucky Office of GIS

Banquet Speaker: *Robert Ader*, Geographer, Lands and Realty Program, Bureau of Land Management

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General Information

Exhibits: Exhibit booths are available to GIS software and hardware vendors, consulting firms, agencies, and nonprofit organizations. Please indicate your interest in exhibiting on the response form to receive full information. Or, for more information, contact Horace Shaw at (315) 470-6891 or

hbshaw@esf.edu. Exhibitor information will also be updated on the website.

Job Exchange: Bring resumes and position descriptions to the conference to be posted.

GIS Partnerships Award: The New York State Coordination Program is happy to announce the Second Annual GIS Partnerships Award.

Pre-Conference Workshops

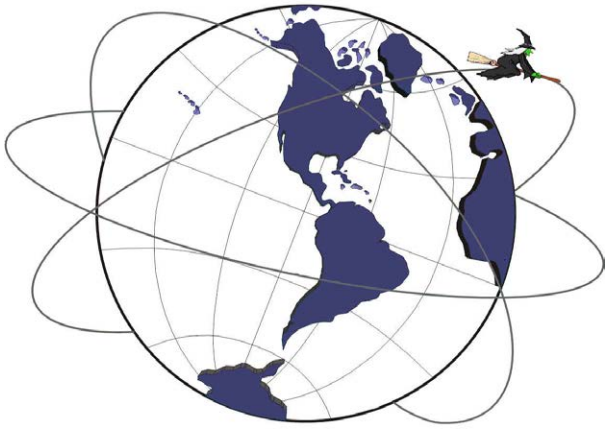
New!!

"Uncloaking the Black Box"
Tutorials will shine some light on such GIS processes and issues which may be taken for granted or lurk within software packages.

"Ask the Doctor"
GIS experts answer your questions on such topics as: moving from ArcView 3.2 to ArcGIS 8; Web Mapping; Digital Orthoimagery; Datums/projections; Geocoding; Census data; Digitizing tax parcels; Finding NYS data; GPS; Satellite imagery; DEMS; Plotting/Printing; MapInfo tips; ESRI tips; Cartographic design; COM objects and programming in GIS; Dynamic segmentation ...

Map to Conference Site

Last Year's Conference



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Preliminary Program

Monday, October 29, 2001

7:00am **Exhibit Set-up**

8:00 **Registration Opens**

8:30 **NYS GIS Coordinating Program Workgroup Meetings**

8:30-10
- **NYS Clearinghouse Workgroup**
- **Standards & Data Coordination Workgroup**
- **Education Workgroup (tentative)**

10:30-Noon
- **Local Government Advisory Council**

Noon-1:00 pm
- **ESRI Water Users Group**

9:00 **Concurrent Sessions 1**

Workshops [Note: Preregistration is required]

9-Noon **Session 1B: Deploying GIS on the Internet**
Larry Spraker and *Austin Fisher*, Applied GIS

9-Noon **Session 1C: Modeling 3D Urban Environments Tutorial**
William Starner, and *David McKeown*, Terrasim

9-11:15 **Session 1D: Introduction to GIS**
Steve Smith, Cornell University Extension

10:15 **Break**

10:30 - Noon **Session 2: GIS Software- The Latest**
ArcGIS – Enterprise GIS, *Chris Attridge*, ESRI-Boston
Oblique Digital Aerial Imagery - A Supplement to Orthophotos, *Scott Sherwood*, Pictrometry, Inc.
Digital Orthophotos: The Good, The Bad, and The Ugly, *Mark Safran*, Triathlon- Macdonald Dettwiler Information Services

11:00 **Exhibits Open**

1:00pm **Conference Welcome and Plenary Session**

1:15 **Keynote Speaker:** *Susan Lambert,* President, National States Geographic Information Council
GIS in the U.S.- What's Now? What's Next?
Susan Carson Lambert is a nationally renowned leader in state GIS. She is a provacative speaker, acclaimed for her passion and insight as well as her boundless energy. Ms. Lambert will discuss national trends ans issues impacting GIS users now and in the future.

2:15 **The State of the State: GIS in NYS Government**, *Bruce Oswald*, NYS Office for Technology
The State of the State in GIS will highlight many of the fast paced changes that have occurred in New York State GIS over the past 12 months. Learn of new programs instituted that may benefit you as well as ones planned for the coming years. See innovations in technology as well as visions for the future. Also, learn how data has been developed and GIS used to directly aid police, fire fighters and rescue workers in New York City in their heroic efforts to recover from the World Trade Center disaster.

3:15 **Break**

3:45 **Concurrent Sessions 3**

Session 3A: Interactive Mapping
Map-NY: Adirondack Park Agency, NYS DEC, Housing and Community Renewal, et al.
NYS DEC Environmental Navigator: A Web-based Mapping Application, *Gerry Colborn, Lois Klatt,* and *Eric Shyer*, NYS DEC

Session 3B: GIS in the Economic & Social Environment

Imagery and Geographic Information System Tools for Residential Real Estate, *Trevis Gigliotti, Chen Shan, Kevin Riordan, Lindi Quackenbush, Paul Hopkins*, NASA Affiliated Research Center at SUNY-ESF, and *Cynthia Dietz*, Geofocus, Skaneateles, NY

Using GIS to Marry Ecology and Economy – The OIK/OS Experience, *Mark Haberle*, Applied GIS, Inc.

GIS for Cultural Resource Management, *Benjamin K. Haavik*, Historic House Trust of New York City

Session 3C: Uncloaking the Black Box – Map Accuracy and Quality

Assessing Map Accuracy, *Steve Stehman*, SUNY-ESF

QA/QC for New York Counties: Techniques and Lessons from Parcel and Land Base Projects, *David Weaver*, Applied Geographics, Inc.

Session 3D: GIS in Education

The 2001 Conference on Remote Sensing Education, Auburn, NY, *Lee Herrington*, SUNY ESF

Developing a GIS Program: The CCC Experience, *Abu Badruddin*, Assistant Professor of GIS, Cayuga Community College

GIS in Action in the Classroom, *Rick Fritschler* and *Kingston School District teachers*

Ask the Expert

5:15 **Reception/ Poster Session/ Exhibits**

6:30 **Banquet , Speaker, Door Prizes, GIS Partnership Award**

Tuesday, October 30, 2001

7:00 am **Continental Breakfast**

NYS GIS Coordinating Program Listening Session

8:00 **Concurrent Sessions 4**

Session 4A: Modeling, Analysis, & Simulation Studies, 1

GIS Archaeological Predictive Modeling in Greene County, New York,*Sheri M. Norton*, Applied GIS, Inc.

Spatial Simulation of the Dynamics of Establishment of Secondary Forest in Abandoned Pastures in the Central Amazon, *Karin T. Rebel, Susan J. Riha, Marco A. Rondon, Ted R. Feldpausch*, and *Erick C.M. Fernandes*, Cornell University

Using Geographic Information Systems (GIS) to Determine the Suitability for Wetland Restoration, Agriculture, and Development within the Cowaselon Creek Watershed Area (CCWA), Madison, New York, *Scott Ingmire*, Madison County Planning Department

Session 4B: GIS and Technology

"Where Am I" - Wireless GIS, *Barry M. Blanchard*, Intergraph Corporation

Use of Internet Mapping Application in a Secure Network Environment, *Linh H. Le*, New York State Department of Health

Customizing ArcIMS--Tips and Tricks, *Mark Scott*, ESRI

Session 4C: Uncloaking the Black Box 2

Tutorial: Designing the Spatial Framework, *Paul Hopkins*, SUNY-ESF

Case Study: Aligning Practice and Theory, *Paul Schenkle*, Monroe County

Developing a GIS Landbase Westchester County, NY – Technical Issues and Lesson's Learned, *James Cannistra*, Sanborn Map Company

Ask the Expert

9:15 **Break**

9:45 **Concurrent Sessions 5**

Session 5A: GIS Bytes the Big Apple

Allan Leidner, NYC Department of Information Technology and Telecommunications and *Rich Goodden*, PlanGraphics

Session 5B: Street-Based Applications

Project SCORECARD: A GIS Based Decision Support System for Maintaining Street Cleanliness in New York City, *Anthony Longo*, Nesw York City Mayor's Office of Operations, and *Evan Gorin*, Bowne Management Systems

A Phased Approach to GIS-based Highway Infrastructure Management, *Laura Lynn Palmer*, Suffolk County Department of Public Works

NYSDOT Photolog Viewer and Route System, *Frank Winters*, New York State Department of Transportation

Session 5C: Uncloaking the Black Box 3– Analyzing Spatial Data

Tutorial: Spatial Data Analysis Techniques, *Art Lembo*, Cornell University
Development of a County-wide Slope Map, *Lucius Willis*, Binghamton University
Application of GIS in Studying the Energy, Economic, and Environmental Benefits of Using Dairy Manure as Renewable Energy Source and Designing Distributed Energy System in New York State, *Jianguo Ma*, Cornell University

Ask the Expert

11:00 **Mini-Break**

11:15 **Concurrent Sessions 6**

Session 6A: Modeling, Analysis, & Simulation 2

Siting Combined Heat and Power (CHP) Facilities Using GIS, *Austin Fisher*, Applied GIS, Inc., Schenectady, NY, *Tom Bourgeois*, Pace University and/or *Dana L. Levy*, NYS Energy Research and Development Authority
Sea Surface Temperature from AVHRR as a Predictor of Crustacean Zooplankton Density, *David Warner* and *Art Lembo*, Cornell University
Brownfield Inventories and Assessments, *Mark Wheeler*, Applied GIS

Session 6B: GIS in the 3rd Dimension

Using Compound Topographic Attribute Data Derived from DEMs to Identify Potential Wetland Areas, *Nick Colas*, Cayuga County Department of Planning and Economic Development and *Mark Bowersox*, Cayuga County Department of Information Technologies
CommunityViz- Visualizing Change in Ontario County, New York, *Kevin Schultz*, Ontario County Planning & Research Department
Real-time 3D Urban Visualization and Simulation, *Dave McKeown*, TerraSim, Inc.

Session 6C: GIS in West Nile Virus Management Programs

Use of GPS and GIS Technology to Monitor and Analyze West Nile Virus in Rockland County,
Doug Schuetz, Rockland County
West Nile Virus and GIS: Determining Spary Boundaries by Tracking patterns of Bird Location,
Jeff Quackenbush, Oneida County
Using GIS Technology to Copmbat West Nile Virus in Metropolitan New York City,
Allan Leidner, NYC Department of Information Technology and Telecommunications

Session 6D: Copyrights and Government Data: The Suffolk County Case

Penny Wells LaValle, Suffolk County and *Darlene Van Sickle*, NYS Office for Technology

Ask the Expert

12:30pm **Lunch**

1:30 **Concurrent Sessions 7**

Session 7A: Modeling, Analysis, & Simulation 3

A Real-time Immersive Virtual Traffic Environment Simulation, *Youngseok Kim* and *T. Kesavadas*, State University of New York at Buffalo
Broome County Traffic Signal Pre-emption, *Steve Lange*, McFarland-Johnson, Inc
Modeling In-Stream Temperature of the Beaverkill Watershed, *Beth Gardner*, Cornell University

Session 7B: Remote Sensing

Land Cover Classification Using Satellite-Sensed Imagery and Its Texture Values, *Tilak B. Shrestha*, PAR Government Systems Corporation
Remote Sensing and Forestry Applications in the Northeast, *Paul F. Hopkins, William M. Stiteler IV, Cheng Zhu* and *Kerry L. Van Siclen*, SUNY-ESF

Session 7C: Census 2000: Data and Geographic Products

Census Data and Access to It; Developing Generic Census Reports of Value to the NYS GIS Community; Developing a NY TIGER Users Group, *Bob Scardamalia*, Empire State Development State Data Center

Ask the Expert

Wednesday, October 31, 2001

9:30 am – 4:30pm **Introduction to Digital Orthoimagery Workshop**
NYS Office for Technology Center for Geographic Information
[Register for workshop on-line at http://www.nysgis.state.ny.us/training/dortho_albany.htm]

17th New York State Geographic Information Systems Conference

GIS Partnerships Award

The New York State GIS Coordination Program is happy to announce the Second Annual GIS Partnership Award.

Partnerships are an important way to share in the development of GIS and geospatial data sets, and to enhance the usefulness of those that are already developed. One of the ways that the NY State GIS Coordinating Body is encouraging the formation of GIS partnerships in New York State is by publishing a short description of real GIS partnerships on a web page at the NY State GIS Clearinghouse web site. The Clearinghouse web page is at http://www.nysgis.state.ny.us , and the GIS Partnership Summary page is at http://www.nysgis.state.ny.us/datcoord/partners.htm

The GIS Partnership Summary page has been set up so those who are interested in learning more about a particular partnership or partnerships in general can read current summaries about others' experience. Contact information is included in the summary in case the reader is interested in participating in the partnership, or in learning more about it.

The goal of this contest is to improve the effectiveness of this page by generating more summaries and by increasing the awareness of its existence. An award for the best partnership will be presented at the Annual NYS GIS Conference. To become eligible, submit a summary in the correct format about your GIS Partnership that includes participants from New York before September 30, 2001. Partnership summaries may be submitted through our simple on-line form at: http://www.nysgis.state.ny.us/gis/forms/partform.htm, or by e-mail to nysgis@oft.state.ny.us. If your summary is accepted for inclusion on the summary page, it will automatically become eligible to win. Examples and links to the format are provided on the GIS Partnership Summary page given above. Entries will be judged by a select subcommittee of the NY State GIS Coordinating Body on their originality and innovation, and the scope of the partnership, such as the number or diversity of participants or the dollar savings of the partnership. Partners whose summaries are accepted for inclusion on the GIS Partnership Summary page will also be asked to keep their summary current on a periodic basis.

Contact Bruce Oswald at bruce.oswald@oft.state.ny.us or (518) 473-5622, or Ed Freeborn at freeborn@nystec.com or (315)255-1743 x469 for answers to any questions.

17th New York State Geographic Information Systems Conference

Pre/Post-Conference Workshops & Tutorials

Please register for your choice(s) on the registration form.

Introduction to GIS, *Steve Smith*, Cornell University Extension

A workshop designed for the uninitiated. Participants will gain an understanding of geographic information systems - their complexity, utility, and limitations. This introduction will include hands-on experience through classroom exercises. **Workshop registration is limited to 16 participants** who will share 8 laptop computers.

Deploying GIS on the Internet/Intranet, *Larry Spraker* and *Mark Haberle*, Applied GIS, Inc.

The proliferation of web-based GIS mapping software has given many organizations another option for serving GIS and data to larger numbers of end users without the usual administrative hassles of installation, maintenance, and upgrades. This workshop will provide attendees with valuable insight into the use of this exciting and rapidly growing area of GIS technology. Topics to be covered include:

· The current state of the web-based GIS technology
· Deployment options
· Typical barriers to implementation
· Pros and cons versus traditional system implementation
· System components
· Costs (one time and ongoing)
· System administration requirements
· Demonstrations and application examples

Modeling 3D Urban Environments Tutorial - An Overview of Modern Urban Simulation Database Generation Using TerraTools
William Starmer and *David McKeown*, Terrasim, Pittsburgh, PA [Phone: (412) 232-3646 Email:wjs@terrasim.com, dmm@terrasim.com]

Tutorial Content: Applications for 3D urban databases are diverse, including urban planning, driving simulation, entertainment, and education. However, the widespread adoption of urban visual simulation has been limited by the lack of suitably detailed cartographic data, particularly building models, and the complexity of generating databases which can be viewed in real time on a PC workstation.

This tutorial will cover standard model formats, the considerations and tradeoffs in using them, manual and automatic model placement and orientation, and model texturing. We will also discuss automated 3D building model generation using 2D footprints and actual or derived appearance attribution. The lack of detailed cartographic data often requires the addition of geotypical details, such as curbs, poles, fire hydrants, etc. Techniques for handling these geotypical features will be covered. This tutorial will cover:

- Overview of applications of 3D urban modeling and simulation
- Cartographic source data considerations
- Review of terrain skin (TIN) construction
- Model types and formats
- Model placement
- Model generation
- Case studies

Who Should Attend: City planners, architects, developers, and GIS users working with urban data for urban planning, design, or development with an interest in 3D urban visualization.

Knowledge and Skills to be Attained : Participants will receive instruction in the construction of 3D urban simulation/visualization environments and also an understanding of the techniques and tradeoffs involved, including level of detail vs. polygon count and the use of geospecific vs. geotypical models. They will understand the import, placement and texturing of models in an urban database and the techniques involved in the automated generation of geotypical details such as poles and curbs.

Introduction to Digital Orthoimagery

Sponsored by NYS Office for Technology Center for Geographic Information.

Digital Orthoimagery (DO) is simply aerial photography that has the positional accuracy of a map. DO is an ideal data source for Geographic Information Systems (GIS) and can be used to serve a wide variety of purposes. For example, planners can use digital ortho images to identify open space and growth patterns, facility managers can develop infrastructure inventories, disaster responders can quickly determine field conditions and access to aid, health officials can identify likely mosquito breeding habitat to guide insecticide application, environmental professionals can identify wetland areas or manage watershed resources, and much, much more.

This introductory seminar will introduce attendees to digital orthoimagery by explaining what it is, how it is created, and how it can be used in GIS by state agencies and local agencies. In addition, the Office for Technology's newly established Statewide Digital Orthoimagery Program will be introduced. Come learn more about this exciting technology and find out how you can take advantage of digital orthoimagery that state and local governments are now producing.

For more information and to register on-line, please go to http://www.nysgis.state.ny.us/training/dortho_albany.htm

17th New York State Geographic Information Systems Conference
Presentation Abstracts

Listed in alphabetical order by presenter's last name

ArcGIS - Enterprise GIS

Chris Attridge, ESRI-Boston, 100 Conifer Hill Drive, Suite 305, Danvers, MA 01923 [Phone: (978) 777-4543 x8420 Fax: (978) 777-8476 Email: caatridge@esri.com]

ArcGIS is a scalable system of software for geographic data creation, management, integration, analysis, and dissemination for every organization, from an individual to a globally distributed network of people. As GIS expands into new applications and user communities, ArcGIS meets the challenge of providing the data and services to a geographically literate world. Strong editing, analysis, and modeling, along with cutting-edge data models and management, continue to distinguish the ArcGIS software family as the leading GIS software. Users can deploy multiple ArcGIS clients (ArcView, ArcEditor, ArcInfo) seats and ArcGIS servers (ArcSDE and ArcIMS) to meet their needs for scalable GIS solutions.

Developing a GIS Program: The CCC Experience

Abu Badruddin, Assistant Professor of GIS, Cayuga Community College, Auburn, NY 13021-3099 [Phone: (315)255-1743 Fax: (315)255-3117 Email: badruddin@cayuga-cc.edu]

GIS education is getting popular at two-year colleges and Cayuga Community College (CCC) is the 1st community college in New York State to jump-start its GIS degree program in 2000. The Associate of Science degree in GIS at CCC is designed to train students with skills required to pursue career opportunities in the fields of GIS, GPS, and remote sensing or to transfer directly to a four-year program at participating universities. Cayuga's GIS program is supported by the NASA and closely associated with the Institute for the Application of GeoSpatial Technology established at the college. Currently GIS students are working as student interns on various GIS projects at the Institute. This presentation will discuss some of the issues and challenges in curriculum development, articulation with 4-year schools, and implementing technical courses. Expectations and challenges of running GIS programs at two-year colleges and the impact of ever-changing technology in shaping GIS curriculum will be discussed.

"Where am I" - Wireless GIS

Barry M. Blanchard, Sales Representative - GIS Solutions, Intergraph Corporation, 243 Cooper Rd., Northbridge, MA 01534 [Phone: (508)234-3608 eFax: (360)838-0605 Fax: (508)234-3678 Email: bmblanch@ingr.com]

Wireless technology has penetrated GIS and now proves to be the next explosion in the industry. Imagine being able to receive an instant trouble report, generate driving directions and maps, see a schematic of the repair job, and update the status report in the database - all from your cell phone. Imagine finding your ultimate home site and with the press of a button on your PDA be able to see all the property fore sale within 1/2 mile of your location. Imagine driving in an unfamiliar city and say the words "where am I" and automatically have a map appear on your car dashboard. This paper explores some of the technology, terminology, limitations, and uses of this latest explosion in GIS. Wireless GIS is here and expanding. The time is ripe to learn about the innovations in handheld mapping.

Developing a GIS Landbase Westchester County, NY – Technical Issues and Lesson's Learned

James Cannistra, Sr. Vice President Strategic Accounts, Sanborn Map Company, Suite 306, 2 Pidgeon Hill Drive, Sterling, VA 20165 [Email: Jcannistra@sanmap.com]

Westchester County, NY is nearly complete with the development of its large-scale base map. This base map consists of highly accurate color digital orthophotography, planimetric data, and topographic information. This presentation will provide an overview of the project, focusing on unique aspects of the project (particularly the use of LIDAR technology) technical and management issues encountered, and lessons learned throughout the production process. The presentation will be done from the perspective of the mapping company responsible for developing the base map.

Using Compound Topographic Attribute Data Derived from DEMs to Identify Potential Wetland Areas

Nick Colas, Cayuga County Department of Planning and Economic Development and
Mark Bowersox, Cayuga County Department of Information Technologies

Combinations of primary topographic attributes derived from digital elevation data can be used to characterize terrain features that cannot be described by primary attributes alone. One example of such a combination is the Compound Topographic Index, or CTI, sometimes also referred to as the Steady State Wetness Index. A function of slope gradient and specific catchment area, CTI is useful in quantifying the effects of topography on the location and size of saturated areas.

Cayuga County staff have performed a GIS-based analysis of 10-meter DEMs to calculate and map CTI values for Cayuga County and the Owasco Lake Watershed. These data, when analyzed with NYS DEC wetland data, National Wetland Inventory data, satellite imagery and aerial orthoimagery provide a means of identifying potential, previously unmapped wetland areas. GIS Investigations incorporating the Compound Topographic Index have assisted in land use planning, environmental management, development review, and planning to prevent threats to public health.

NYS DEC Environmental Navigator: A Web-based Mapping Application

Gerry Colborn, *Lois Klatt*, and *Eric Shyer*, DIS GIS Unit, NYS Dept. of Environmental Conservation, 625 Broadway, 3rd Floor, Albany NY 12233-2751 [Phone: (518)402-9863 Fax: (518)402-9031 Email: ebshyer@gw.dec.state.ny.us]

The NYS DEC Environmental Navigator is an ArcIMS application that currently maps the following locations of environmental facilities or sites regulated by the DEC: superfund sites, significant SPDES discharge facilities, air emission sources, active solid waste management facilities, facilities discharging certain types of wastes and major electric generation facilities, both existing and proposed. As new datasets are developed they will be added to provide additional information to the public and industry.

ESRI's ArcIMS is currently being run in a Unix environment on a Sun E250 with two Gig of ram. We have configured ArcIMS using two spatial servers, gis0_1 and gis0_2 with a total of eight instances for the virtual image server, four for gis0_1 and four for gis0_2; four instances for the virtual query server, two for gis0_1 and two for gis0_2; and four instances for the virtual geocode server, two for gis0_1 and two for gis0_2. This present configuration was settled on after several rounds of testing the response times of the servers to large control groups within the DEC which made simultaneous requests to the image, query and geocoding servers.

Customization of the "front end" application which involved much javascript coding was accomplished with assistance by Applied GIS of Schenectady, New York..

Siting Combined Heat and Power (CHP) Facilities Using GIS

Austin Fisher, Applied GIS, Inc., 137 Jay Street, Schenectady, NY 12305 [Phone: (518)346-0942 x201 Fax: (518)346-5322 Email: afisher@appliedgis.com Website: www.appliedgis.com] and
Tom Bourgeois, Pace University and/or *Dana L. Levy*, NYS Energy Research and Development Authority

This presentation will focus on how GIS technology can be used in locating CHP facilities. It will include an overview of CHP, describing this type of energy production and its relative benefits. Also included will be a discussion of the geographic and non-geographic factors that are considered in the CHP siting process. The remainder of the presentation will address how GIS can be used to identify prime locations for CHP, and evaluate candidate CHP sites as well as problems and issues encountered with this approach.

Modeling In-Stream Temperature of the Beaverkill Watershed

Beth Gardner, Cornell University, 204 Fernow Hall, Ithaca, NY 14853 [Phone: (607) 255-2149 Email: bgg43@cornell.edu]

Stream temperature is an important component in fish community dynamics, as temperature directly affects trout growth, mortality, production, and population structure. Trout health is threatened when stream temperatures reach 22 degrees C. The stream temperatures of the lower Beaver Kill, a watershed in the Catskill Mountains of New York, commonly reach levels over 23 degrees C during summer months.

This project examined the fine scale spatial and temporal stream temperatures throughout the Beaver Kill watershed to identify areas of thermal stress and/or thermal refugia for fish. For this project, 72 temperature loggers were placed throughout the watershed during the summer of 2000. Three separate kriging models for predicting temperature across the watershed were created using ArcView and SPlus. The models were then evaluated and compared to determine the most appropriate kriging method for interpolating temperatures along a linear network.

Imagery and Geographic Information System Tools for Residential Real Estate: A Project Conducted at the NASA Affiliated Research Center

Trevis Gigliotti, Chen Shan, Kevin Riordan, Lindi Quackenbush, Paul Hopkins, NASA Affiliated Research Center SUNY College of Environmental Science and Forestry, Syracuse, NY 13210 and
Cynthia Dietz, Geofocus, Skaneateles, NY 13152

GeoFocus was established in 1995 to pursue business opportunities relating to geographic information systems (GISs). GeoFocus worked with the NASA Affiliated Research Center at the SUNY College of Environmental Science and Forestry (ESF) to investigate the utilization of imagery and GIS techniques for applications in the residential real-estate market. Specifically, the project aimed to evaluate the benefits of combining high resolution digital orthophotography and various other spatial data with digitized tax maps, property, and multiple listing service (MLS) databases. The impetus behind the project was a belief that linking such data would enhance business and profits of residential real estate professionals and improve the service provided to their clients. The project explored two concepts that had high potential for aiding a realtor. The first involved creating an enhanced competitive market analysis by using a merged dataset that incorporated MLS, tax map, and spatially derived data layers, and then visualizing the property and neighborhood. The results of the analysis uncovered more properties at a faster rate, when compared to traditional analysis, while providing a visual display. The infusion of spatial data allows real estate agents and their clients to characterize a property by slope, aspect, and land cover without leaving the office. In addition, image drapes over digital elevation models display neighborhood topography and a property's viewshed. The second component of the study examined and developed three-dimensional fly-throughs for visualization of a residential subdivision plan. Incorporating the proposed subdivision plan into the visualization will benefit buyers by reducing their search time for a property that will suit their needs. Creating a three-dimensional visualization will also promote the effective and efficient use of the existing natural topography and ground cover during the planning and development stages.

The Affiliated Research Center at the State University of New York College of Environmental Science and Forestry was established in 1998. The ARC program is sponsored by NASA's Geospace Applications and Development Directorate (GADD). The mission of GADD is to enhance and improve the commercial use of remote sensing and spatial information. The ARC at ESF provides companies with a unique opportunity to participate in research projects that explore commercially viable uses of geo-spatial data.

GIS for Cultural Resource Management

Benjamin K. Haavik, Property Manager/GIS Coordinator, Historic House Trust of New York City, The Arsenal, Room 203, Central Park, New York, NY 10021 [Phone: (212)360-8279 Email: parliament@parks.nyc.gov]

The Historic House Trust of New York City (the Trust), a non-profit organization, was created in 1989 to preserve and promote the historic houses owned by the City of New York / Department of Parks & Recreation. With twenty sites and a number of possible acquisitions, the Trust is responsible for over 70 structures. These sites, spread throughout all five boroughs of the city, range from the Wyckoff House, the earliest remaining built structure in New York State, to the Little Red Lighthouse, a late nineteenth-century lighthouse located near the George Washington Bridge. In addition to the historic houses, there are a number of other resources at each site including auxiliary structures, walls, stairs, plaques, signs, public art, archeological remains, and gardens.

In an effort to better manage these diverse cultural resources, the Trust is utilizing an extensive database that stores over 400 unique pieces of information for each site. This data includes a wide array of information ranging from historical information to building maintenance information to a room by room, facade by facade survey of physical conditions. Linked to a GIS, the system allows for the instantaneous analysis of information. Site and condition photos taken with a digital camera on site are accessible with a click of the mouse.

The Trust is using GIS for all facets of facility management. Tracking furnaces and boilers, monitoring alarms and documenting building conditions are just the beginning. The system can be applied to many more uses including map creation, natural resource analysis, analysis of building conditions, acquisition analysis, community demographics, visitation demographics, historical and archeological analysis, and much more.

Using GIS to Marry Ecology and Economy – The OIK/OS Experience

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Applied GIS, Inc. and The Wilderness Society have teamed up to develop an on-line spatially enabled data examination tool called OIK/OS. "*Oikos*," Greek for house, is the root of the "eco" in economics and ecology. The intent of the application is to enable users to explore the Census' Regional Economic Indicator Series (REIS) data in an intuitive and spatial manner. The user can use a spatially enabled GIS front end to define a region of interest at the county or state level. After defining the region, the user can then examine the REIS data through a suite of dynamically generated charts based on the selected region. In addition to this functionality the user can generate PDF reports and thematic maps. Having assembled the data in these ways the user is able to better make sustainable decisions based on the latest economic indicator data.

The core theme for this presentation is discovery of the appropriate roles for the technology within the framework of your end product. The OIK/OS experience clearly defines the need to look beyond simple deployment of a GIS to find effective solutions. Alone a GIS is a very useful tool yet combined with other development tools (dynamic charting and report generation) it becomes an extremely powerful means of creating knowledge and facilitating decision making.

This presentation will review the technical solutions deployed to enable the OIK/OS application. Discussion will cover the migration from the Phase 1 architecture (MOIMS, ColdFusion, and CFXGraphicsServer) to the present architecture (ArcIMS, ASP, GraphicsServer, and PDFWriter). Time allowing we can have Q&A discussions covering lessons learned and tricks of the trade.

The 2001 Conference on Remote Sensing Education, Auburn, NY

Lee Herrington, SUNY College of Environmental Science and Forestry, 320 Bray Hall, 1 Forestry Drive, Syracuse, NY 13210 [Email: lpherrin@syr.edu]

One June 27-30, 2001 Cayuga Community College and the Resources Application Center for the Northeast hosted 90 K-14 teachers for the 2001 CORSE (Conference on Remote Sensing Education) in Auburn, NY. The conference was designed to teach the teachers how to use GIS (ArcView), GPS, and Remote Sensing software (MultiSpec) through hands-on laboratory training. This paper will describe the structure of the conference and report the evaluations of the attendees. Since there is some opinion that teachers don't really want to know how to use the software but only want to be able to run canned exercises or have their students learn the technology the evaluations of the components of this conference could be interesting.

Using Geographic Information Systems (GIS) to Determine the Suitability for Wetland Restoration, Agriculture, and Development within the Cowaselon Creek Watershed Area (CCWA), Madison, New York

Scott Ingmire, Madison County Planning Department, P.O. Box 606, Wampsville, NY 13163 [Phone: (315)366-2376]

Land use activities in the Cowaselon Creek Watershed Area (CCWA) have moved forward without a well defined set of goals. Using GIS, three activities receiving recent attention: development; agriculture; and wetland restoration, were intensively examined and modeled with the ultimate goal of prioritizing the most suitable uses. A simple modeling approach was used to mathematically combine GIS layers relevant to each of the three land use categories. In addition, GIS was used to show the plethora of factors effecting the area including: hydrology, soils, topography, land cover, sites of wetland restoration, agricultural areas, and much more. Five hundred and twenty one soil cores were taken on over 6,000 acres and were used in an agricultural suitability model which showed that 1,694 acres of the muck remain most viable. A cumulative suitability model created for wetland restoration showed that 11,214 acres of the CCWA are best suited for wetland restoration.

A Real-time Immersive Virtual Traffic Environment Simulation

Youngseok Kim and *T. Kesavadas*, Virtual Reality Laboratory, State University of New York at Buffalo, Department.of Mechanical & Aerospace Engineering, 809 Furnas Hall, Buffalo, NY 14260 [Phone: (716)645-2593 x2260]

Traffic Terrain generation has been used recently for driving simulators and as a navigation aid for the vehicles in a virtual environment. Using C and OpenGL,the standard graphic language, at the Virtual Reality Laboratory of SUNY at Buffalo we have implemented a complex traffic simulation with Real-time immersive stereo-view. This paper discusses the techniques of traffic generation, Real-time optimal path finding, traffic simulation and visualization. We also discuss the role of GIS in developing such Virtual simulators for training drivers in various hazardous driving situations.

Broome County Traffic Signal Pre-emption

Steve Lange, McFarland-Johnson, Inc., 49 Court Street, P.O. Box 1980, Binghamton, NY 13902-1980 [Phone: (607) 723-9421 Fax: (607) 723-4979]

Currently the metropolitan areas of Broome County have approximately sixty signalized intersections that contain signal pre-emption detectors. As part of this Phase II project another one hundred are being planned for other signalized intersections. A signal pre-emption is a device linked to traffic signals that will detect approaching fire and ambulance emergency vehicles. This detection will then pre-empt or interrupt the signal phasing allowing the emergency vehicle to have a green signal phase for added safety. The County's goal is to implement emergency vehicle signal pre-emption at every signalized intersection in Broome County.

This presentation will demonstrate how ArcView was used to create an interactive map of Broome County combining visualization and database management for every signalized intersection. A variety of ArcView applications were used such as; inputting and displaying graphical data by definition, linking inventory databases and linking photos. The map displays arrows pointing in the direction of each signal pre-emption detector.

With a simple click on the detector arrow, ArcView will display an up-to-date linked database with any important or desired information along with photos of each intersection approach and a sketch of the intersection signal layout and lane-use.

This map will be used for future projects that will implement signal pre-emption until the inventory database for Broome County is complete. The map will then be used for continuous monitoring allowing quick and easy data updates, querying of any desired information and also displaying maps accordingly.

Copyrights and Government Data: The Suffolk County Case

Penny Wells LaValle, Suffolk County and *Darlene Van Sickle*, NYS Office for Technology

Upon becoming Director of Real Property in 1996, I pursued what I believed to be the right of the people of Suffolk to protect their investment and the integrity of the information that they could access. REDI, now First American Title Insurance, was clearly violating the rights of the County. My focus on this issue convinced the County Attorney's office to take action to define our rights and seek damages. The County assigned one of its best trial attorneys to challenge the international giant.

Jeltje deJong, now the Chief of the General Litigation Bureau, commenced action in the form of a Complaint on August 5, 1999, against Experian, and all it's aliases, for declaratory and injunctive relief and for monetary damages for violation of the copyright laws of the United States.

Use of Internet Mapping Application in a Secure Network Environment

Linh H. Le, New York State Department of Health [Phone: 518-473-1809 Email: lhl02@health.state.ny.us]

The New York State Department of Health has recently been able to deploy a secure Internet Mapping Application using ArcIMS 3.1 technology of ESRI. The project was funded by a grant of Center for Disease Control and Prevention (CDC) to design an Internet Mapping Application that can meet the new Health Insurance Portability and Accountability Act (HIPAA) standards of transferring electronic medical information. This application was developed for SUN/Solaris Operating System using Native Servlet Engine of IPlanet Webserver. In order to meet the HIPAA security standards, the application was designed to run on SSL 3.1 and behind a reverse proxy. Instead of using ArcSDE to be the data gateway, we developed a Java application to connect the Internet Mapping Application with our existing Sybase database.

GIS Challenges in New York City

Allan Leidner, GIS Manager, NYC Department of Information Technology and Telecommunications and
Rich Goodden, VP PlanGraphics Eastern Region

This half-day panel session will explore the many facets of GIS in New York City. The City's Department of Information Technology and Telecommunications is currently contracted with PlanGraphics for several GIS related tasks. Staff from the City and PlanGraphics will present and discuss the creation of the City's GIS Utility and the integration of its varied GIS databases. The overall project involves numerous city departments.

New York City presents many challenges for contemporary GIS's as well as for traditional approaches to GIS implementation planning. The panel will present and discuss many of these challenges. The panel will also discuss the unique solutions that New York City requires to fully implement a Citywide GIS.

As part of the panel discussions, and preceding the open discussions, several PlanGraphics and New York City staff will present key updates and progress reports on specific projects that are underway. Currently, 27 GIS projects have been identified, are planned or are underway. Presentations and open discussion will cover the development of a City GIS Utility and address database design, implementation, system design, application development, and training, data loading and data creation efforts, several GIS Needs Assessments GIS Studies and pilot programs, the Federal I-Team and the development of NYC department GIS web sites.

Project SCORECARD: A GIS Based Decision Support System for Maintaining Street Cleanliness in New York City

Anthony Longo, Deputy Director, New York City Mayor's Office of Operations, 100 Church St - 20th Floor, New York, NY 10007 [Phone: (212) 788-1677] and
Evan Gorin, Director of Programming, Bowne Management Systems, 235 E. Jericho Turnpike., Mineola, NY 11501 [Phone: (516) 746-2350 Email: egorin@bownemgmt.com]

Project Scorecard is the New York City Mayor's Office of Operations computerized rating system that, by performing daily inspections of selected streets and sidewalks, provides cleanliness ratings for sanitation districts and Business Improvement districts in all five boroughs. Project Scorecard

has been in use by the Mayor's Office for 27 years, and was recently upgraded to a GIS platform.

The system integrates field inspection data collected using hand-held computers, with the City's geographic information system (GIS). The GIS, developed using ESRI's ArcView/Avenue, can be used to display and edit daily routes and sanitation sections, and has the capability to provide thematic mapping for daily, monthly, quarterly, and year-to-date rating maps. The decision support system (DSS), based on Microsoft SQL Server and Visual Basic, generates reports of areas and individual block faces, schedules inspections for geographic areas, and provides customized management level queries for better decision-making.

The use of GIS and DSS technology within the Mayor's Office of Operations has enabled New York City to better manage its street cleaning operations, and be more proactive in identifying problem areas requiring additional service. This presentation will describe the system design, implementation, and demonstrate the system use.

Application of GIS in Studying the Energy, Economic, and Environmental Benefits of Using Dairy Manure as Renewable Energy Source and Designing Distributed Energy System in New York State

Jianguo Ma, Department of Agricultural & Biological Engineering, Cornell University, 58 Riley-Robb Hall, Ithaca, NY 14853

Energy conservation and renewable energy resources, such as biomass, are widely recognized as a means of reducing the Nation's dependence on non-renewable fossil fuel and meanwhile, improve environmental quality. This study focuses on the case of dairy farm industry in New York State and evaluates the potential of using dairy manure as renewable energy source in terms of energy, economic, and environmental benefits. The reasons for choosing dairy manure as the subject are: (1) Today, because of the use of milking parlors, cooling and storage facilities, animal comfort systems, the average dairy farm in upstate New York consumes approximately 750 kWh annually for each cow, which increase energy consumption at the expense of economic cost and environmental cost; (2) Dairy manure is not only odorous but also emits greenhouse gases such as methane and nitrous oxide into the air as it decomposes; and (3) It is also the leading cause of non-point source water pollution in the United States.

There is already an on-going research studying the economic and environmental benefits of using dairy manure to generate electricity with diesel engine at farm level. However, this proposed research will employ geographic information system (GIS) as a tool to build a spatial database and investigate the whole issue at state level. We will look at the spatial distribution and pattern of dairy farms in New York State, associating other information such as population density, household or house unit distribution and energy demands, land use, environmental regulations, etc. GIS will be useful on regional and local energy planning to identify available resources, end use applications and barriers to implementation.

Finally, distributed small-scale electricity system has been strongly pushed in the United States to replace the conventional centralized electricity system. Empirical data has showed that certain size dairy farm has great potential of playing a role by using its manure as biomass to build small-scale power generation station to supply electricity and heat to surrounding communities. This study will employ GIS to study how to design a distributed energy system in New York State, particularly in rural areas. GIS can be very useful to select the best site of building power facilities such as digesters based on multi-criteria (land use, population density, electricity demands, etc.)

Real-time 3D Urban Visualization and Simulation

Dave McKeown, TerraSim, Inc., One Gateway Center, Suite 2050 , 420 Fort Duquesne Blvd., Pittsburgh, PA 15222 [Phone: (412) 232-3646 Fax: (412) 232-3649 Email: dmm@terrasim.com Web: http://www.terrasim.com/]

Modern development and urban planning are increasingly concerned with accurately understanding and depicting the relationships between a development and its surroundings. The ability to interactively inspect a 3D urban model enables a number of high-value applications, including marketing and evaluation of development sites, city asset marketing via information kiosks, and infrastructure analysis and planning.

Recent advances in real-time 3D visualization provide the ability to generate high-fidelity urban models automatically, from existing GIS and CAD data. By utilizing existing investments in GIS and geospatial infrastructure, city planners can exploit modern visualization tools to produce accurate interactive simulations, and rapidly update these 3D simulations without manual intervention as updates are made to the GIS source base.

Real-time interactive environments often lead to tradeoffs between the level of detail depicted in the simulation and the real-time performance of that simulation as the number of polygons increases. Case studies for a number of complex urban environments will be presented, highlighting these tradeoffs and illustrating the level of performance that can be achieved from typical GIS databases.

About TerraSim: TerraSim is a high-technology company that provides software solutions and services for advanced visual simulation database construction using cartographic data. TerraTools®, their primary product, is available for both SGI IRIX and Windows NT/2000 workstations, and has been used in the fully automated construction of dense urban environments incorporating land use information, detailed building models and transportation infrastructure, and site-specific cartographic detail. TerraSim also provides database construction services and advanced technology development for a wide range of customers.

GIS Archaeological Predictive Modeling in Greene County, New York

Sheri M. Norton, Applied GIS, Inc., 137 Jay Street, Schenectady, NY 12305 [Phone: (518)346-0942 x 208 Email: snorton@appliedgis.com]

GIS is a powerful analytical tool that can be implemented to improve our understanding of the past. An archaeological predictive model was developed for Greene County using this technology. This endeavor was undertaken to create a practical guide for cultural resource investigations.

Digital data sets were developed, modified, and/or acquired to represent ten variables. These layers were then integrated into a logistic regression model using ESRI's ArcInfo GRID and ArcView Spatial Analyst extensions. The final product was a "sensitivity" map partitioning the County into three zones – low, medium, and high probability of finding prehistoric sites.

A Phased Approach to GIS-based Highway Infrastructure Management

Laura Lynn Palmer, Principal Planner (Transportation), Highway Planning & Permits Section, Suffolk County Department of Public Works, 335 Yaphank Avenue, Yaphank, NY 11980 [Phone: (631)852-4090 Fax: (631)852-4079 Email: laura.palmer@co.suffolk.ny.us]

The Suffolk County Department of Public Works maintains approximately 432 centerline miles of road, which provide access to the regional arterial highway and expressway network. These roadways traverse the length and breadth of the County's 1,377 square miles, interlinking ten townships and fifteen villages. With the advent of GASB 34 and an ongoing emphasis on fiscal restraint, the Department has experienced an increasing need to maintain current and accurate data relative to the physical and operational conditions of its extensive highway system in order to accurately forecast future travel demands and identify the most critical highway improvement needs and costs.

While the Department currently maintains data relative to the physical and operation condition of its road network, it has never been able to efficiently use that data or insure its currency. The principal reasons for this are the lack of a central repository for highway related data as well as the paucity of tools for users to easily interact with that data. Subsequently, the Department has fragmented data residing in numerous ad-hoc databases and spreadsheets throughout the Department, many of which contain duplicate data. In an effort to remedy this situation, the Department has begun to build a system that will unite the disparate sources of data that currently exist into a single RDBMS and provide users with a GIS-enabled desktop application through which they can interact with the data.

The new system is being built in phases and will eventually comprise a complete highway infrastructure management solution. The first (current) phase of development includes the creation of a linear-referenced model of the County road network; the creation of a central database for highway attribute data; the conversion, for import, of existing data; and the development of a desktop GIS-enabled application to query, view, edit and add attribute data.

Subsequent phases will address: 1) The integration of existing budgetary data and processes associated with Capital Budget and Program development; 2) The integration of imaged plans, drawings, and maps created with our existing document imaging system; 3) Complaint tracking; 4) Freedom of Information (FOIL) request preparation and tracking; and finally, 5) Work order generation and tracking.

Spatial Simulation of the Dynamics of Establishment of Secondary Forest in Abandoned Pastures in the Central Amazon

Karin T. Rebel, *Susan J. Riha*, *Marco A. Rondon*, *Ted R. Feldpausch*, and *Erick C.M. Fernandes*, Cornell University, 1106 Bradfield Hall, Ithaca, NY 14853 [Phone: (607)255-2281]

In the Amazon, approximately 35 million hectares of primary forest that was converted to pasture is now being abandoned. This represents about 70% of all pastureland that was previously established. The dynamics of re-conversion of this land to secondary forest is of interest because the length of time required for pasture to convert to secondary forest will impact net primary productivity and the amount of carbon being stored on abandoned pastures. In addition, the length of time required for pasture to convert to secondary forest may depend on pasture productivity at the time of abandonment. Pasture productivity at the time of abandonment will depend primarily on the age structure of the pasture grasses and on weediness, which are influenced by grazing and fire history. Also, an understanding of the dynamics of conversion of pastureland to forest can serve as the basis for management strategies to inhibit pasture conversion. A spatial, dynamic model of the conversion of pasture to secondary forest was developed using the PCRaster Dynamic Modeling Package. This software provides a computer language specially developed for modeling temporal and spatial processes in a GIS, and is well suited for the development of ecological, dynamic models. The model of pasture conversion is implemented for the central Amazon. We assume that succession involves only three plant types: pasture grass, weeds and woody plants. The pasture grass is parameterized for Brachiaria (brizantha, humidicola), the weeds for Borreria and Rolandra, and the woody plants for Vismia spp.

The model uses a 1m x 1m grid and 2-month time step. Each initial plant and each surviving propagule is referred to as a plant and only occupies one grid cell. A number of values are calculated for each grid cell for each time-step. These include whether vegetation is present and, if so, which species, the age of the species, the current standing biomass of the cell, the productivity of the cell for the current time step, and, in the case of woody plants, the height of the plant. The spatial distribution of these variables is available for every time step, as well as values that are integrated

over the entire area of the simulation.

In this simulation study, low grazing resulted in rapid decline of NPP of Brachiaria and rapid weed invasion resulting in an acceleration of dominance by Vismia. This led to higher standing biomass at the end of 20 years relative to other management scenarios. With high grazing, weeds are never as dominant as in low grazing systems because more Brachiaria remain vigorous. With frequent burning (2, 3 and 4 years) and high grazing, Brachiaria covers 50% of the pasture even after 8 years. But by 12 years, there is only a small amount of grass and weed coverage in any of the systems.

Digital Orthophotos: the Good, the Bad, & the Ugly

Mark Safran, Regional Manager - Northeastern US, Triathlon – MacDonald Dettwiler Information Services [Phone: (215) 962-7209 Fax: (215) 702-1089 E-mail: msafran@triathloninc.com

This presentation will cover issues regarding digital orthophotography, specifically some of the anomalies that can occur within the aerial imagery. In many cases, even if orthophotos are spatially accurate, they can possess visually unappealing oddities. Alternatively, some orthophotos may look terrific, but may not be as "accurate" as you assume. Using visual examples, I will explain why these strange features occur, how you can try to avoid them, and why you may be need to accept some peculiarities for what they are. The audience should come away from this talk with a general understanding of what to ask for and what to expect when ordering digital aerial imagery.

Census Data and Access to It; Developing Generic Census Reports of Value to the NYS GIS Community; Developing a NY TIGER Users Group

Bob Scardamalia, Empire State Development State Data Center [Phone: (518) 292-5300 Fax: (518) 292-5806 Email: rscardamalia@empire.state.ny.us Website: http://www.empire.state.ny.us/data_home.html]

My presentation will focus on three topics: a brief review of Census 2000 products and availability, discussion of access to Census data, and the need for a statewide TIGER user group. The discussion of access to Census data will request input from the audience regarding the type of data extracts and geographic summary levels that are useful to the GIS community. We'd like to reduce duplication of effort and provide the most useful data to users.

The final item will address various issues related to TIGER data and updating and again seek input regarding the need for a group of users to monitor changes and provide input to the Census Bureau.

CommunityViz - Visualizing Change in Ontario County New York

Kevin J. Schultz, Ontario County Planning & Research Department

In April of 2000 the Ontario County Planning & Research Department became a beta test community for a new ArcView extension known as CommunityViz. CommunityViz is a suite of software tools being developed by The Orton Family Foundation designed to assist communities with spatial decision-making and analysis of land-use scenarios.

This suite of integrated ArcView extensions helps users view, project, analyze and understand potential changes to their community by offering three-dimensional exploration, alternative scenario-building and analysis, as well as regional forecasting for community land-use planning.

Planers in Ontario County studied the potential impacts of a sewer extension into the Town of Seneca. This extension can have a profound impact on the historically significant Rt. 5 and 20 regional transportation corridor. CommunityViz is allowing Ontario County, the towns of Seneca and Geneva to model alternative land use development scenarios and their varying demands for sewage transmission and treatment facilities.

Mr. Schultz has been a Planning Aide for the Ontario County Planning & Research Department since 1999. Before coming to work for Ontario County Kevin worked in the Economic Development office for two major utility companies. His experience includes GIS management, database design and development, web development, 9-1-1 addressing, and land use and environmental planning. He holds a B.A. in Environmental Design (1997) and a Master of Urban Planning (1999) both from the University at Buffalo.

Land Cover Classification Using Satellite-Sensed Imagery and Its Texture Values

Tilak B. Shrestha, PAR Government Systems Corporation

Computer-automated classification of remotely sensed imagery from satellites has proven useful for applications in land cover evaluation and land use planning. However, the lack of accuracy in land cover recognition hinders the usual spectral differentiation method. One technique to enhance

accuracy of land cover recognition is the use of texture images, defined as a set of local statistics or other local properties of an image, which are constant, slowly varying, or approximately periodic.

In this study, two test sites near Tampa, Florida, were used to test whether the incorporation of the texture measures within the computer automated classification techniques increases classification accuracy. LANDSAT-TM and SPOT-Panchromatic images were merged to optimize spatial and spectral resolution. Reference land covers were taken from existing classifications according to a) the Florida Land Use and Cover Classification System (FLUCCS) and b) the Florida Game and Fresh Water Fish Commission (FGFWFC) – land cover classification system. Error matrices and the Kappa coefficients of agreement were used to describe classification accuracy. Twenty-seven different texture measures (three non-directional and six directional, using 3x3 window size for each of the spectral bands) were computed and used along with the spectral bands as variables for supervised, unsupervised, and hybrid methods of land cover classifications. In subsequent analyses highly correlated bands were merged using principal component transformation, land cover classes with close proximity (as measured by the Jefferies-Matushita distances) were combined, and a Bayesian maximum-likelihood classifier was also added to enhance classification accuracies. Finally, a new mixed classification method was developed and applied, allowing separate band combinations for each of the land cover classes. The classification accuracies obtained by the Gaussian maximum-likelihood method using only the spectral bands were taken as reference, and accuracies of other methods were compared with them.

Use of all the spectral and texture bands together produced lower land cover classification accuracies as compared to the reference values. The Bayesian method resulted in better classification. The methods with highest accuracy differed between the sites. The hybrid technique of classification yielded poor results, while the mixed combination classification method improved land cover classification results. In most cases, texture variables added only marginal information towards differentiating land cover classes.

The results show a modest increase in accuracies of the classifications. The increased accuracies indicate the marginal usefulness of the texture measures under the present constraints. However, the study indicates enough merit in texture measures to warrant further research of its potential.

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Sea Surface Temperature from AVHRR as a Predictor of Crustacean Zooplankton Density

David Warner, Department of Natural Resources, Cornell University, Fernow Hall, Cornell University, Ithaca, NY 14853 [Phone: (607)256-2649 Email: dmw33@cornell.edu] and
Art Lembo, Department of Soil and Crop Sciences, Cornell University, Rice Hall, Cornell University, Ithaca, NY 14853 [Email: ajl53@cornell.edu]

In Lake Ontario and other lakes, crustacean zooplankton play a major role in the transfer of energy from primary producers to fish and humans. Abundance, distribution, and production of zooplankton are all strongly influenced by water temperature. Accurate estimates of zooplankton abundance or production are valuable to managers of sport fish because the abundance of alewives (*Alosa pseudoharengus*), the primary Lake Ontario forage fish is in part regulated by the abundance and production of zooplankton. Because zooplankton distribution can be patchy, expensive and time-consuming large-scale surveys of abundance are necessary. The current sampling regime allows lake-wide sampling twice per year. Because of the linkage between temperature and zooplankton distribution, abundance, and production, I hypothesized that prediction of zooplankton abundance from satellite AVHRR data should be possible for any cloudless day. Use of remote sensing data would greatly improve the temporal range of sampling without the added expense of lake-wide cruises. In this study, predictions from a zooplankton abundance (measured) and sea surface temperature (SST) regression equation were compared to predictions from ordinary kriging. The range of predictions from SST was smaller than the observed range, while the range of predictions from kriging was quite similar to the observed range. Additionally, predictions from SST were much more variable than those from kriging. These results indicate that crustacean zooplankton density cannot be

accurately predicted from satellite-derived SST.

QA/QC for New York Counties: Techniques and Lessons from Parcel and Land Base Projects

David Weaver, Vice President, Applied Geographics, Inc, 255 Congress St., Boston, MA 02210

AGI has performed basemap QA/QC and related services for Oswego and Westchester Counties. Oswego County's Parcel database follows the NY ORPS Watershed Digitizing specifications (ArcInfo Regions). Westchester County's new 100-scale land base includes color orthophotos, planimetric features and topography. The presentation will give an overview of what good QA/QC inspects for, the techniques and software tools, and the important lessons that would be of use to other counties planning similar base mapping projects.

Brownfield Inventories and Assessments

Mark Wheeler, Applied GIS, Schenectady, NY

Recent changes in federal and state regulations have created numerous funding opportunities for municipal agencies seeking to redevelop brownfields. In an effort to obtain federal dollars for remediation, municipalities must first identity their brownfields and select those with the greatest need for remediation. Since brownfield redevelopment is also an attempt by a community to spur economic growth, environmental needs must be balanced with economic and cultural factors. According to brownfield advocates, redevelopment can obtain multiple goals including remediation, health and safety hazards, generation of new jobs, and contribution to the tax base.

There are a number of obstacles to preparing brownfield inventories and assessments. First, adequate data on contaminated sites may not exist at the local level. Even if local officials are aware of a number of brownfield sites, they may not know the extent of the contamination or how to evaluate this data in combination with other real estate fundamentals. Secondly, federal funding for site investigations and remediation are limited to publicly owned property. This creates a situation where communities may only consider an inventory of public sites worthwhile. As a result, privately owned brownfields with strong real estate fundamentals may be overlooked when local officials plan for economic redevelopment and investments in favor of public sites with lesser location-based attributes. Third, the term "brownfield" is a contentious label. Some communities may not want a list of brownfields compiled for fear that public knowledge of the list will promote a negative view of the city or town.

The use of a GIS does not by itself resolve any one of the fore mentioned problems. Combined with clear objectives and a rational approach to assessment, a GIS can provide for efficient data development and analysis. A GIS may be used to evaluate multiple real estate values, inclusive of contamination and ownership, and permit users to quantify locational advantages of brownfields based on site and proximity attributes. In this presentation, examples of municipal inventory programs using a GIS will be discussed including New York City and Buffalo. Special attention will be given to a discussion of Bridgeport, Connecticut's brownfields program which employed a concise method for scoring and ranking sites for redevelopment potential.

Development of a County-wide Slope Map

Lucius Willis, GIS Analyst, Geography Department, Binghamton University

As Geographic Information Systems become widely used for economic development and environmental planning, an interest in and a need for detailed slope maps that can be used as an active layer in such systems has been growing. In this presentation the development of a detailed slope map for Broome County, NY, starting from USGS digital elevation models, is followed and each step is carefully explained.

NYSDOT Photolog Viewer and Route System

Frank Winters, GIS Manager, New York State Department of Transportation

NYSDOT collects photolog imagery for every state highway. The "driver's eye" view this imagery offers is valuable for a wide range of applications. Scanning of the film is underway, which will make photolog imagery available to even more users in the Department. The GIS Unit has developed a prototype ArcView extension to retrieve and display the digital photolog images. Creating the route systems to support this tool will progress as scanned images become available.

17th New York State Geographic Information Systems Conference
Poster Abstracts

Listed in alphabetical order by presenter's last name

Bridge Management System

Josephine Amato, Westchester County Geographic Information Systems (GIS), Department of Information Technology, 148 Martine Avenue, Room 305, White Plains, NY 10601 [Phone: (914)995-3853 Email: Jja9@westchestergov.com]

Over the past six months, Westchester County GIS and the Department of Public Works have been working together on the development of an entry-level Bridge Management System (BMS). Developed with Dialog Designer extension in ArcView GIS 3.2, the BMS provides access to both Westchester County and New York State Department of Transportation (NYS DOT) data, as well as the functionality to include photographs, as-built drawings, and inspection reports for each bridge. While designed primarily for county government, the application will also be made available for local government GIS programs. This proposed conference poster will include a series of ArcView screen shots illustrating a range of data products available in the application.

Assessing Systematic Positional Error in Automated Geocoding of Residential Addresses

Michael R. Cayo and *Thomas O. Talbot*, Geographic Research and Analysis Section, Bureau of Environmental & Occupational Epidemiology, New York State Department of Health, 547 River St, Room 200, Troy, NY 12180-2216 [Phone: (518)402-7960 Email: mrc02@health.state.ny.us, tot01@health.state.ny.us]

The use of Geographic Information System (GIS) technology is rapidly becoming an integral part of many public health studies and analyses. GIS offers the potential to analyze spatial relationships between disease and environmental exposure to contaminants. Geocoding is one component of this technology that allows researchers to match study participant residential addresses to reference files containing geographic coordinates. Often times the residence location is used as a surrogate measure of exposure and to determine whether that residence is within a zone, which may be potentially impacted from a hazardous waste site or other emission source.

Although many different types of error are possible, this project focuses on developing methods that can provide qualitative and quantitative measures of positional error when residential addresses are geocoded through an *automated* process. This can better prepare researchers in evaluating whether this error may affect the results of their research. Future research will concentrate more specifically as to how the measured error effects the misclassification of study participants in a health study with respect to exposure.

Westchester County GIS Web Based Interactive Maps

Xiaobo Cui, Geographic Information System, Department of Information Technology, Westchester County, 148 Martine Ave, Room 305, White Plains, NY 10601 [Phone: (914)995-3781 Fax: (914)995-3269 E-Mail: xxc1@westchestergov.com]

Westchester County GIS has recently developed a series of web based interactive maps which are used in supporting both county and local government applications. This conference poster will highlight applications in the areas of the West Nile virus, 2001 County Legislative Redistricting, samples of orthophoto image and planimetric data from the on-going county-wide base mapping project, and an environmental features map.

Westchester County GIS has also implemented the ESRI geodatabase model using standard Oracle relational databases with an ArcSDE application server. The poster will also include an architecture diagram for producing web-based interactive maps which includes ESRI's ArcIMS.

Municipal GIS Development and Support in Westchester County, New York

Ana Hiraldo, Westchester County Geographic Information Systems (GIS), Department of Information Technology, 148 Martine Avenue, Room 305, White Plains, NY 10601 [Phone: (914)285-4416 Fax: (914)285-3269 E-mail: aeh2@westchestergov.com]

Westchester County GIS staff has been providing technical support, consulting services, training, and other GIS related services to local municipalities for over a decade. This conference poster is a *composite* of examples of recent work by Westchester County GIS in support of local

government GIS projects. Examples include work with the Town of Greenburgh (infrastructure), Town of Lewisboro (open space), Village of Hastings-on-Hudson (trail mapping), City of Mt. Vernon (recycling districts), and Town of Cortlandt (tax mapping and digital orthophotography).

Utilizing GIS in the Support and Development of a Computer Aided Dispatch (CAD) System for Westchester County, New York

Carrie Keneally and *Greg Sullivan*, Geographic Information Systems, Department of Information Technology, Westchester County, 148 Martine Ave, Room 305, White Plains, NY 10601 [Phone: (914)995-3014 Fax: (914)995-3269 E-Mail: cek1@westchestergov.com]

Westchester County GIS, working in concert with the county's Department of Emergency Services, is supporting the development of a new *state-of-the art* computer aided emergency dispatching system. While overall system development requires the integration of several systems (records management, E911, etc.), county GIS staff are utilizing both GIS and GPS tools to maintain and develop spatial data layers such as road networks, mile markers, police and fire stations, district boundaries, and special features such as schools, libraries, hospitals, and similar congregate care facilities. Currently ESRI software tools are being used for spatial data development and maintenance which are then imported into the new Intergraph Public Safety (IPS) dispatching system. This conference poster will include a series of maps which highlight both mapping and dispatching functions associated with the IPS system.

How America Voted: A Spatial Approach for Analyzing Voting Patterns During the 2000 Presidential Election

Arthur J. Lembo, Jr., Department of Crop and Soil Sciences, Cornell University, 305 Rice Hall, Ithaca, NY 14853 [Phone: (607)255-6328 Email: ajl53@cornell.edu] and
Paul Overberg, USAToday. [Email: poverberg@usatoday.com]

Although the 2000 Presidential election was one of the closest in recent history, many commentators noted that the voting patterns exhibited a striking "cultural divide", with urban areas voting for Al Gore, and rural areas voting for George W. Bush. These comments were primarily based on a subjective view of county voting patterns during the election. This project attempts to provide a quantifiable measurement of the voting patterns exhibited during the 2000 election. Specifically, we were interested in determining if a statistically significant clustering pattern existed based on county-wide results, and if each candidate won their assumed cultural association (Gore: Urban; Bush: Rural).

To test these hypotheses, two separate spatial analysis methods were performed on county-wide voting patterns within the United States. The first method utilized a principle of spatial autocorrelation called *join count* analysis to determine if voting patterns exhibited evidence of spatial clustering. The second method used map overlay and chi-square analysis to determine the correlation between urban areas and votes for Al Gore, and rural areas with votes for George W. Bush.

Combining the USLE and GIS/ArcView for Soil Erosion Estimation in Fall Creek Watershed in Ithaca, New York

Jianguo Ma, Department of Agricultural & Biological Engineering, Cornell University, 58 Riley-Robb Hall, Ithaca, NY 14853

Soil erosion by water has been identified as a research priority today. To model erosion a vast amount of data needs to be included in order to attempt to accurately predict how much soil will be moved from one point to another. The amount of information that must be accounted for and prepared for entry into the model can make modeling a very labor-intensive operation. The automated method allows for storage, manipulation, analysis and display of the model with high accuracy and efficiency. Geographical information systems (GIS) are being evaluated as a means of improving such modeling practices. The study area selected is the Fall Creek watershed in the Ithaca area of New York State.

The major research findings and conclusions are as following: The USLE was used to predict soil erosion in the Fall Creek Watershed. As seen from the derived erosion map, most areas have minor soil erosion which is less than 1 tons/ac/yr. The areas of highest erosion occurred in the places where the slopes are the greatest and also the places located near the water edge. The reason probably is that the sediment travel time before entering the lake is minimum in these places compared to other places. The estimated erosion values mostly are below the usual "tolerable soil loss" of 3 tons/ac/yr. Because of extreme slopes throughout the Fall Creek Watershed, the LS values were possibly overestimated as the USLE was originally developed for mild slopes in agricultural areas.

Development of the Westchester County Base Map

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In 1998, Westchester County began planning for the development of the first-ever, digital, high-accuracy (1' = 100') base map of the entire county. Covering the entire 486-square miles of the county (and a 200' buffer beyond the county boundary), the project was designed to produce a wide range of digital products which could be used and integrated into the growing number of government applications based on spatial data (emergency dispatching, transportation, infrastructure management, tax mapping, health and human services, etc.), as well as a wide range of basic geographic

information systems (GIS) initiatives. The project is being carried out at the direction of the County Executive and the Westchester GIS Task Force, a group which includes representation from county and local government, business, and utilities.

Examples of the various products, which will be delivered upon final completion of the project, will be illustrated in this poster in map form. The deliverables will include; true color digital orthophotography images in both compressed Mr. SID and uncompressed TIFF file formats, over 30 layers of planimetric data with 5' contour lines, and a county-wide Digital Elevation Model (DEM), which was compiled using Light Detection And Ranging (LIDAR).

Social Accounting Matricies and Landscape Change in Dutchess County, New York

Audra Nowosielski, Department of Economics, Rensselaer Polytechnic Institute 110 8th Street Troy, New York 12180 [Email: nowosa@rpi.edu]

The overall goal of this study of development in the Hudson River valley is to incorporate measures of economic activity, land use change, and environmental quality together in a linked framework capable of evaluating scenarios for policy analysis. The analytical building blocks for the ecological economic model include a Social accounting Matrix (SAM), a Geographical Information System (GIS) of land use and geophysical attributes, and a series of indicators of river ecosystem functions. Most economic models do not include spatial variation of activity, however, location is critical to estimating environmental loading. In this project, GIS data is incorporated to incorporate spatial aspects as well as (1) characterize the household sectors of the SAM model, (2) locate business establishments within the watershed to regionalize the SAM model, (3) provide a land inventory for local development scenarios, and (4) characterize land parcels by location and geophysical attributes.

BASINS Modeling of the Buffalo River Watershed: Affect of Rainfall Variability on Hydrologic Modeling

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The EPA's Better Assessment Science Integrating Point and Non-point Sources system (BASINS) (version 2.1) is composed of a suite of mathematical models that can be applied in support of watershed planning and water quality analysis. The BASINS model and related databases are available for download from the EPA web site. The spatial data consist of four types: (1) watershed boundary and associated data such as land use, soil, gauge stations; (2) elevation data; (3) general and detailed stream network data; (4) meteorological data. The system uses ArcView GIS as a platform.

In our study, the Non Point Source Model (NPSM) extension of BASINS was used to compare USGS observed flow data to simulated flow within the Buffalo River watershed. USGS gauge stations on Cazenovia Creek, Buffalo Creek, and Cayuga Creek were used for model calibration and validation. The accuracy of flow estimates at these sites is dependent on the quality of the rainfall data uses as model input. The meteorological data available with BASINS are recorded at the Greater Buffalo Airport. This weather station lies several miles outside of the Buffalo River watershed to the north. Historical model simulations for 1990, 1992 and 1995 revealed that discrepancies in peak flow rates were largely the result of the inability of the Buffalo Airport site to accurately reflect the spatial variability of storms observed at the eastern end of Lake Erie.

This poster presents the use of NPSM to model hydrology of the Buffalo River Watershed from an initial project set up for calibration and end results. It concludes with a discussion of modeling inadequacies, specifically with rainfall data. ArcView Spatial Analyst is used to show the spatial variability of rainfall within the Buffalo River watershed using a network of local rain gauge sites.

A Spatial Approach for Linking Economic Trends to Land Use Change in the Hudson River Valley

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Land use in the Hudson River Valley is determined by economic activities and social policies, and is a key determinant for the health and use of the immediate ecosystem. There is a direct correlation of land use change to the health of the Hudson River, because economic and population changes determine land use, and the land supplies nutrients to the river.

Land use change models sensitive to local characteristics are needed to develop scenarios for evaluation. To achieve these projections, a GIS database is employed to do a socio-economic analysis of households within Dutchess County in New York. The database contains detailed socio-economic household characteristics at the census block level for the 1990 census year and year 2000 and 2005 projections. County-level tax parcel data is used in conjunction with bio-geophysical attributes to calculate and project growth trends for developed and undeveloped land parcels. The GIS was used to calculate distances from each parcel to central business districts in the county, as well as to create a neighborhood index that provides a weighting system for which property class a parcel will likely be developed into.

The land inventory provides the basis to forecast development trends in a dynamic mapping format. Data is assembled with a GIS software program, MapInfo. To complement the GIS maps, a pictorial history, using satellite and other imagery, is used to visually illustrate land use changes under different economic conditions.

Development of a Land Cover Database with LANDSAT Imagery in Westchester County, New York

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Sam Wear and *Carrie Keneally*, Westchester County GIS, Department of Information Technology, Westchester County, New York [Website: http://giswww.westchestergov.com]

With the increased availability and accessibility of geospatial data, combined with more powerful and user-friendly mapping software, local governments are building more advanced Geographic Information Systems (GIS) applications. In particular, a wide range of new remotely sensed (RS) data products are being combined with GIS to support government programs in the areas of land use and transportation planning, emergency management, and the characterization and monitoring of environmental and human health conditions. Westchester County GIS has recently teamed with the Center for International Earth Science Information Network (CIESIN) at Columbia University to develop a land cover map of the county utilizing LANDSAT imagery. The land cover map will serve as initial baseline data in comparing earlier Westchester County GIS land use inventories (1988 and 1996), as well as being combined with spatial data products being developed with the current Westchester County base mapping project.

Using Ripley's K to Determine Data Clustering and Codependence: Applications in Kenya

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Animal herd and human settlement location data obtained from a 2000 aerial census of Amboseli National Park and the surrounding Amboseli Ecosystem are analyzed for evidence of spatial clustering or non-randomness. Data points analyzed include elephants, buffalo, cattle, shoats (sheep and goats), watering holes, and bomas (human dwellings). The locations of animal herds and human settlements are also analyzed for spatial codependence between the species. These analyses are performed using the Ripley's K function and relevant adaptations for the 'between species' calculation. The K functions show evidence that each data set is non-random, therefore indicating autocorrelation. Finally, the point sets are analyzed to show codependence between data sets. The codependence analysis illustrates that bomas and shoats 'attract' each other while elephants and shoats display repulsion. This use of Ripley's K demonstrates some of the possible applications of spatial statistics for analysis within a GIS environment.

Armchair Flow Estimation in the Black River Watershed

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The focus of this analysis is to create a simplified model for predicting stream flow with Arcview GIS using only landscape-based variables and a small number of flow estimates from the EPA (for calibration). Predictions from the model were compared with the actual flow measurements obtained from USGS gauge stations.

A wide variety of flow models already exist through agency and academic sources. However, these models often have a steep learning curve, require an extensive amount of data for program input, and often take days to run. This analysis examined the possibility of using a single function in Arcview GIS, applied to a limited number of landscape-based variables to estimate flow in the Black River Watershed, a 2000 square mile drainage in northern New York State.

The flexibility of ArcView's flow accumulation function allows a user to derive a wide range of information about a single grid cell's contributing area (watershed). In particular, the flow accumulation functions were used to derive the area, average elevation, average slope, and average precipitation. In addition, the percent of forest cover, percent of poorly drained soil and percent of urbanization for the watersheds were obtained from other sources. The total watershed area consisted of over 50 million 10 x 10m grid cells.

The ArcView data was imported into S-Plus to analyze the statistical relationships between the variables listed above and average annual flow.

The results show a very strong correlation ($p << 0.0001$) between mean flow and the area of the watershed. While inclusion of precipitation and soil type improves slightly the accuracy of the flow estimates, the correlation was not statistically significant at the .05 level ($p=0.1077, 0.1069$ respectively). These numbers suggest that while precipitation and soil type improve flow estimates in this instance, the correlation may in fact be solely due to coincidence. Overall, area of the watershed alone accounts for 99.76% of the variation in flow, while the three variables combined explain 99.81%.

Using the area of the watershed, precipitation, and soil type as input variables, the model adequately predicted flow in watersheds greater than 250 square miles. On average, the model predicted the average annual flow to within 2% of the observed values for the 13 watersheds greater 250 square miles. However, the model poorly estimated flow in smaller watersheds with predictions averaging a 20% deviation from observed values.

These differences are presumably due to the lower effective sample size a smaller area provides regarding the effect of rainfall on flow.

Development of a GeoSpatial Exposure Model (GeoSEM) for Human Health and Ecological Risk Assessments

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One source of uncertainty in risk assessment is the exposure point concentration (EPC), which represents the chemical concentration to which a human or ecological receptor may be exposed to for a toxicologically relevant time period within a geographic area called an exposure unit (EU). Biased sampling methods are often employed during site characterization. This, coupled with the assumption that contaminants are log-normally distributed, may contribute to overly conservative estimates of the EPC, and associated risk, and may result in excessive cleanup costs. Geostatistical methods allow the spatial information present in sample data to be incorporated in the estimate of the EPC, which should reduce the uncertainty in the EPC and risk estimates. However, the application of geostatistics introduces another source of uncertainty (i.e. model uncertainty) into risk estimates and risk management decisions. While there are some examples of the use of geostatistics in risk assessment and remediation design, the available geostatistics software packages are not designed for exposure assessment specifically and, therefore, require considerable experience in geostatistics to produce estimates that are appropriate for human health and ecological exposure assessment. We have developed the GeoSpatial Exposure Model (GeoSEM), a software tool that combines geostatistical algorithms and mapping capabilities in a format that does not require the user to be an expert in geographic information systems (GIS) or geostatistics.

We believe that GeoSEM will fill a need for a user-friendly tool that risk assessors and remedial project managers can use to investigate the role of spatial information in estimating exposures to potential human and ecological receptors and that will produce more informed estimates of risk. GeoSEM will connect risk assessors with easily implemented, robust geospatial statistical routines, such as kriging (ordinary, indicator, log-normal and normal score kriging) and simulation (Gaussian and indicator), and area weighting approaches such as Thiessen polygons, within a single software platform. GeoSEM is a GIS-based application that is designed to run in the Microsoft Windows® environment. GeoSEM is capable of using a wide variety of GIS vector and raster file formats including DOD vector product format (VPF), ESRI ArcView® Shapefiles, ARC/INFO® coverages and spatial database engine (SDE®) layers, computer-aided design (CAD) drawings, binary and ascii grids and many types of standard georeferenced image formats such as geoTIFFs, bitmaps, GIFs, JPEGs and ERDAS. Linkage of GeoSem to the Integrated Stochastic Exposure (ISE) model (developed by SRC) provides risk assessors with a complete geospatial/probabilistic exposure model that can be applied to risk assessments at Superfund sites.

Spatial Analysis of 2000 Census Population Figures in Westchester County, New York

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Recently U. S. Census Bureau released the 2000 Census Population data. Preliminary studies show that the total population and its racial composition of Westchester County have changed dramatically from those of 1990. This map analyzed those changes from the angle of racial distribution change of population across the county. It would be of great interest to the public.

The production of this map was done using ESRI Spatial Analyst in order to represent the data in a unique way. Utilizing the Density Function, the software distributes the measured census tract population percentage change of the input census tract centroid point theme throughout the county to produce a continuous surface. The color differences of the surface indicate the various degrees population change over the last ten years. Five variables: *Total, White, Black, Asian, and Other* are used to produce 5 different population distribution change maps. Other geographic features were added to the map to provide reference and context.

17th New York State Geographic Information Systems Conference

Currently Registered Exhibitors

Listed in alphabetical order

Applied Geographics, Inc., Boston, MA

Applied Geographics, Inc. (AGI) is a leader in developing and implementing Geographic Information System (GIS) solutions for local, county, and state government. Because of its exclusive focus on GIS consulting, AGI delivers state-of-the-art technical support and services including:

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- RFP Development and Vendor Selection
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AGI works with the leading GIS packages and programming tools, and has a depth of experience in ESRI, Intergraph, and Autodesk software, as well as relational databases and various Internet mapping environments. AGI's established portfolio includes local, county, and state government clients across the eastern seaboard, including Westchester, Oswego, Clinton, and Chenango counties in New York, various towns in New York, and corporations such as Kodak, New York Power Authority, and Long Island Railroad. Based on its experience, AGI is familiar with and complies with all the requirements of the SARA Grant Program. In addition, AGI is a certified vendor on the NY OGS Back-Drop Contract for Computer Counseling, Systems Integration and Training Services, a program which provides for streamlined purchasing of IT services for government entities in the state of New York.

Applied GIS, Inc., Schenectady, NY

Founded in 1992, Applied GIS, Inc. is one of the Northeast's leading GIS consulting companies, providing our clients with a full range of services including: application development; data conversion; database design and development; digitizing; geocoding; custom mapping; needs assessment; system design; technical support; training, and software sales. A particular focus of the company is internet/intranet deployment of GIS technology, including GIS enabled web site development and site hosting. Visit www.maphost.com, www.appliedgis.com, or contact Applied GIS for more details.

Avatech Solutions, Liverpool, NY

Bergmann Associates, Rochester, NY

Bergmann Associates is a multi-disciplinary engineering, surveying, planning and design firm that provides comprehensive Geographic Information Systems services. Our Geographic Information Systems/Visualization Group specializes in the design, development and maintenance of geographic databases, mapping and applications for a variety of clients and disciplines. We are involved in the development of a GIS database from initial project objectives (needs assessment) through automation of the geographic data (digitizing and conversion) and development of the mapping database to the operational use of the GIS.

Bergmann Associates can assist you on any GIS project you may have. We are comfortable at all levels from project planning, needs assessment, application development and quality control down to database and feature creation and editing. Our staff are experienced with many GIS software packages, including ArcGIS, ArcInfo, ArcView, MapInfo, Atlas GIS, and ERDAS. Our programmers are experienced in several programming

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Bergmann Associates can bring the resources of the entire firm to your assistance on any project. Bergmann staff includes experienced engineers (civil, traffic, industrial), planners (transportation, environmental, land use, site development), landscape architects, water resource specialists, environmental specialists (health & safety, permitting, environmental impacts), CAD specialists (designers, technicians), surveyors, information technologists (networks systems experts, PC technicians), computer graphics specialists (simulation and visualization developers, graphic artists), and experienced project managers who can bring together all of these resources.

From our offices in Rochester, Pittsburgh, Philadelphia, Hoboken, Buffalo, Ft. Lauderdale, Jacksonville, Detroit, Lansing and Toledo, we provide comprehensive multi-disciplinary and GIS services to numerous clients throughout the eastern United States and in Canada. These clients include agencies at all levels of government, educational, commercial, retail, institutional and industrial leaders.

Bowne Management Systems, Inc., Mineola, NY

Bowne Management Systems Inc. (BMS) is a leading integrator of Information Technology (IT) and Geographic Information Systems (GIS). Since 1982, the firm has been assisting public and private sector clients implement a broad range of IT solutions varying from enterprise-wide spatial data warehouses utilizing Internet and Intranet technology to solution-specific custom applications.

With a staff consisting of GIS specialists, system analysts, programmers, licensed professional engineers and surveyors, cartographers, certified trainers, computer hardware experts, and operations technicians; the firm possesses the expertise and experience to provide comprehensive GIS services. This strong background and experience in GIS, combined with specialized information management expertise, provides customers with the comprehensive skills required for a successful project.

Services range from needs assessment, requirements definition and system design on through acquisition assistance, implementation and on-going support. This includes full lifecycle consulting and management for GIS implementation, workflow management, application development, legacy integration, data conversion and integration, quality control, and systems integration.

BMS can address all aspects of the integration of GIS into existing and new information systems including local and wide area networks, contemporary operating systems, commercial database management systems, and application software utilizing the full range of multi-vendor computer hardware found at most customer locations.

Applications developed by BMS include spatial data warehousing, land records management, infrastructure management, business geographies, transportation, global positioning (GPS), cartographic transformations, field data collection, and data conversion quality control. BMS also provides planning, integration, design and development services for computerized modeling, facilities and asset management, imaging and document management.

C. T. Male Associates. P.C., Latham, NY

C.T. Male Associates, P.C. is an interdisciplinary consulting firm offering civil engineering, architecture and building systems, environmental services and survey, land information & GIS services. You may obtain total project management, or select a combination of services to satisfy the particular demands of a project, from feasibility studies through detailed design and construction management. Headquartered in Latham, NY, C.T. Male is currently staffed with 150 design professionals, scientists, and technicians and support personnel.

With today's technology, information takes on a new dimension. Bits of data, once locked within spreadsheets and reports, can now be integrated to form a more complete picture that portrays otherwise hidden information.

With your information organized according to location, you'll be able to visualize the relationships between and among infrastructure, land records, environmental characteristics, and other geospatial data layers. And with current inter/intranet technology, these data can now readily be made available to large base of end-users or customers in a very cost effective manner.

To gain access to this broader view, you must first integrate old data, and legacy systems, with new applications. For that, you need an experienced partner. And you'll find one in C.T. Male. We provide a full range of information system consulting services specializing in the application of spatially-oriented data management, visualization, and analysis tools.

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Chas H. Sells, Inc., Charlton, MA

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C.R.A., Waterloo, Ontario, Canada

Conestoga-Rovers & Associates (CRA) is a multi-disciplinary environmental, engineering, and IT services firm with 1400 employees and 45 offices throughout North America. The Information Technology capabilities of CRA integrate many GIS-related services including; technology and needs consulting, infrastructure management, data conversion, environmental data management, GPS sales/service, environmental visualization, electronic graphics design, and custom software development.

Our core GIS technology skill base includes:

- Geographic Information Systems. CRA is an ESRI business partner providing expertise with products including ArcGIS 8.1, ArcFM 8.1, ArcSDE, ArcView, MapObjects, and ArcIMS 3.1. In addition, we provide ortho-imaging, Autodesk's AutoCAD 2000 and AutoCAD Map, and GPS capability.

- Database Management Systems. Expertise with various database management systems including Microsoft Access, Microsoft SQL Server, Oracle, and FoxPro.

- Software Development. Skilled at developing software for desktop computers and the Internet.

- GPS Sales and Service. As representatives for Leica Geosystems, we provide a complete package for asset data collection and management.

Cybertech Systems Inc., Trevose, PA

CyberTech helps you meet your business objectives and achieve a rapid return on your investment. We match high-value solutions to our clients' business, not the other way around. Partnering with ESRI-the leader in the field of Geographic Information Systems (GIS), our team of professionals defines functional and technical architectures to address your specific requirements. We are the source for complete solutions, including applications and infrastructure - ensuring that each element of every solution will work together to produce powerful results. We rapidly deploy scaleable solutions- Mapping the e-world.

APPLICATION DEVELOPMENT

ArcGIS is a scaleable system of software for geographic data creation, management, integration, analysis, and dissemination for every organization from an individual to a globally distributed network of people.

ArcInfo is the most comprehensive, integrated, saleable GIS solution in the world. It defines standards in creating, managing, browsing and organizing geographic and tabular data and solves the entire range of spatial queries.

ArcView is the premier solution for desktop GIS analysis and map presentation. It includes tools and data you can use immediately to visualize and analyze geographic information.

MapObjects, is a deployment programming tool that allows the integration of GIS functionalities with other stand-alone applications.

ArcIMS sets the standard for fast and powerful Internet mapping and GIS tools. ArcIMS features an out-of-the-box solution for creating, designing, and managing Internet sites that incorporate mapping and GIS capabilities.

Route Map offers a simple solution to web enable routing solutions.

GEODATABASE DESIGN SERVICES

Moving all existing spatial data from a flat file to a Geodatabase using ArcSDE including building an application using ArcGIS, ArcIMS or any of the

ESRI Technology.

INTEGRATION SERVICES

Integration Mapping Expertise: CyberTech has integrated ArcIMS and ArcView to SAP R/3 enabling our customers with a seamless interface between business and GIS applications.

Additionally, CyberTech has successfully built a GIS-CRM-ERP interface between Map Objects, Siebel and SAP. This solution offers a vital spatial analysis element to the business data. We have also integrated RouteMAP IMS with Siebel. The integration of mapping functionalities with industry standard partners SAP, i2, Hyperion, IBM, and Siebel offers a complete customized solution for interpreting information to meet business objectives and analyze marketing and sales information.

WEB ENABLE ALL APPLICATIONS.

Creating web-interfaces and web-pages to various GIS applications.

Davis Associates, Inc., Bay Shore, NY

EarthData International, Gaithersburg, MD

EarthData represents a unique combination of specialized expertise and experience in all areas of spatial data acquisition, development, analysis and utilization. Founded close to half a century ago, at the group's core is an appreciation of the fundamentals of photogrammetry, combined with the understanding that to truly serve our customers, the spatial data we deliver must solve problems and provide answers. Earth Data offers the following technical services and products: complete airborne data acquisition services including airborne GPS, LIDAR, thermal, and soil moisture data; photographic laboratory services; conventional and softcopy photogrammetric mapping services; digital orthophotography; photo-interpretation for land-use, land-cover, watersheds; comprehensive GIS development and training.

ERDAS, Greenwood Village, CO

ERDAS® is a mapping software company specializing in Geographic Imaging solutions since 1978. The company is the world leader in highly customizable, easy-to-learn-and-use Geographic Imaging software, and has sold over 25,000 licenses of its products to professionals in over 105 countries. ERDAS products are commonly used for oil/gas/mineral exploration, natural resources management, urban and regional planning, environmental monitoring, forestry, academia, engineering, telecommunications, utilities, cartography, oceanography, meteorology, hydrology and military applications.

Corporate and International headquarters are located in Atlanta, Georgia, USA, and the company has six U.S. Sales offices, a subsidiary office in Cambridge, U.K., four training centers, and a network of over 60 international distributors.

Erdman Anthony & Associates, Rochester, NY

ESRI, Redlands, CA

With annual sales of more than $340 million, ESRI has been the world leader in the geographic information system (GIS) software industry for more than 30 years. As the leader in GIS technology, ESRI offers innovative solutions that will help you create, visualize, analyze, and present information better and more clearly. Working with location information, ESRI's GIS software and solutions give you the power to solve problems you encounter every day. Organizations around the world, as well as local, state, and federal government agencies, are using ESRI GIS software to make smart and timely decisions. ESRI provides powerful GIS solutions to more than 300,000 clients in more than 189 countries. In fact, ESRI is leading the industry in providing mapping technology that meets today's global needs. ESRI offers GIS solutions to help you unlock the spatial component of your valuable data and see your organization's information from a new perspective. www.esri.com

Fulton-Montgomery Community College Spatial Information Technology Center, Johnstown, NY

The Spatial Information Technology Center, or SITC, is a joint effort between NASA's Stennis Space Center in Mississippi and Fulton-Montgomery Community College. The Center began offering credit courses to the public in September 2000.

With a large demand for skilled workers, the field of Spatial Information Technology offers a bright forecast for those who wish to pursue a career in technology.

FMCC offers the Spatial Information Technology Certificate and an Associates of Science degree in the same field. While the certificate provides a 30 credit hour professional and technical education foundation, the 67 credit hour degree is designed to help students jump-start active careers in spatial information management or serve as a foundation for bachelor or graduate degrees. Each program involves the disciplines of Geographic Information Systems (GIS), Global Positioning Systems (GPS), Remote Sensing and Cartography.

The Center introduces students to the basic philosophy that Spatial Information Systems deal with geographical information, or data, such as where something is located, where it comes from, or how it fits together with other geographic data. Geographic Information Systems allow us to conduct spatial analysis in ways that are expanding daily.

SITC emphasizes that spatial analysis is an essential process used in decision making for business, industry and government. The diversity of applications is highlighted throughout the program.

Issues unique to Upstate New York, or those having a global impact, are examined and analyzed. Career paths and opportunities are presented with an eye to a rapidly expanding field.

Geographic Data Technology, Lebanon, NH

Geographic Data Technology, Inc. is the largest developer of premier map databases that provide the foundation for applications such as site selection, routing packages, environmental mapping and direct marketing. GDT's state-of-the-art technology, leading edge products and strong customer commitment make it one of the leading companies in the business geographics industry. Founded in 1980, GDT was a pioneer in the development of cartographic data for business use and provides complete, current and comprehensive geographic data. With its street, postal, census and other geographic databases, GDT is a leading supplier of cartographic data to all major GIS and desktop mapping vendors.

Intergraph Mapping and GIS Solutions, Houston, TX

Intergraph Mapping and GIS Solutions delivers comprehensive geospatial solutions to government, commercial, and international markets. The company provides core and industry-specific software products, solutions for map production and enterprisewide mapping and GIS, and services ranging from project implementation to production. A technology innovator and market leader, Intergraph helps customers merge their geospatial data with information technology and business process tools to meet their enterprise and operational goals and to enable data sharing enterprisewide.

Intergraph's industry-proven mapping and GIS technology -- the GeoMedia, Digital Cartographic Studio, and MGE platforms -- continues to broaden the way people think about and use geospatial data around the world. IntelliWhere is a division of Intergraph Corporation's Mapping and GIS Solutions vertical business, created explicitly to focus on the emerging market of location-based technology and services. The division combines over 30 years of experience in spatial and location-based technologies, with a global infrastructure and the ability to implement solutions around the world.

Visit the IntelliWhere Web site at www.intelliwhere.com. Headquartered in Huntsville, Alabama, Intergraph Mapping and GIS Solutions is a division of Intergraph Corporation (NASDAQ: INGR) and is represented in more than 60 countries through its global distributor and partner network. Visit the company's Web site at www.intergraph.com/imgs.

James W. Sewall Company, Old Town. ME

With offices in Maine and Kentucky, James W. Sewall Company provides full GIS implementation; GIS consulting; orthophotography, surveying/GPS, aerial photography, traditional and close-range photogrammetry, data warehousing

Lizardtech, Inc., Seattle, WA

LizardTech, a private company formed in 1992, develops imaging software and solutions that simplify and enhance the

distribution, management and control of digital images and documents. LizardTech's imaging solutions includes its patented MrSID and DjVu imaging technologies and the LizardTech Content Server.

MrSID Geo:
MrSID Geo is a powerful wavelet based image encoder (compressor), viewer and file format designed specifically for GIS professionals to enable true portability of massive images.

DjVu:
DjVu is the ultimate solution for creating digital documents for easy storage and transmission of existing paper assets, such as leases, contracts, financial records and more. The DjVu family of products turns scanned or electronic documents into Web-ready image files that retain the sharpness of the originals yet are often 1000 times smaller than the original TIFF files and just two percent of the size of corresponding PDF files.

LizardTech Content Server:
The LizardTech Content Server is the extensible, scalable Internet application designed to enable the serving of high-resolution photographs and perfect reproductions of scanned documents. Content Server implementation supports industry-standard file formats and open standards, such as TIFF, JPEG. Optimized delivery is achieved by use of LizardTech's MrSID format for images and DjVu format for documents.

MapInfo Corporation, Troy, NY

A global company and technology leader, MapInfo provides location intelligence solutions that are deployed across government organizations to help them use and share geographic information to better understand and meet the needs of constituents. MapInfo designs, develops, licenses, markets and supports software and data products, together with a range of consulting, training and technical support services. These products and services enable government organizations to correlate, visualize, and analyze location-based information in their databases and to deploy applications throughout their organizations. MapInfo helps improve the way citizens view government services by providing easy-to-access, self-service interfaces to government information- making government more accessible. Enterprise applications using MapInfo's integrated suite of software and data products allow government organizations to use location to transform information into advantage. On a federal level, agencies are leveraging location intelligence to manage resources, generate funding for and deliver valuable programs. State agencies are exceeding citizen expectations with location-enabled, web-based applications that offer easy access to important information. And local governments are managing day-to-day operations easier than ever before. MapInfo's solutions fit seamlessly within government IT infrastructure- from PC to enterprise-wide to Internet and wireless applications- MapInfo offers a complete line of integrated products.

With more than 700 employees worldwide, MapInfo's global footprint includes subsidiaries in Canada, the United Kingdom, Germany, Australia and Japan; distribution relationships throughout Europe and Asia; and a worldwide network of channel partners. MapInfo is headquartered in Troy, New York and is on the World Wide Web at www.mapinfo.com.

Microdesk, Waltham, MA

Microdesk is a leading provider of GIS/FM solutions based around Autodesk and ESRI technologies. We view our role within the GIS industry as a technical ally to our clients. We differentiate ourselves by not only being a CAD and GIS software supplier but also a technical resource offering computer hardware, training, consulting and support services, Microdesk consists of a group of highly experienced technology experts who know this industry like you do.

NYSTEC, Rome, NY

The New York State Technology Enterprise Corporation is a not-for-profit engineering company headquartered in Rome NY with offices in Albany and Syracuse NY. In a unique partnership with New York State and the federal government, NYSTEC applies technologies and resources from the Air Force Research Laboratory’s Rome Research Site to provide technology-management assistance and engineering services to New York State organizations.

NYSTEC taps the technology and expertise of a premier Air Force laboratory to help New York State agencies plan and manage the acquisition and implementation of new computing and communications systems. The company also offers engineering services across a wide range of technology disciplines, including communications, Information Security, and Geographic Information Technology — including Geographic Information Systems.

NYSTEC applies its GIS expertise to help organizations analyze infrastructure and operations data, design and acquire GIS networks, evaluate GIS prototypes and products, develop spatial databases, and perform demographic and market assessments. NYSTEC also provides customized mapping solutions, field data collection and analysis, geospatial analysis and modeling, and remote-sensing engineering.

If your project calls for the collection or analysis of geographically distributed data, NYSTEC can help. The company's GIS specialists are experts in gathering and integrating geographic information that is reliable, understandable, and of real value to your organization.

Optem, Fairport, NY

The DTS™ is most useful in applications requiring the use of hard copy aerial photography where the ultimate goal is to be able to see and extract the finest ground information directly into a GIS. It is a high performance zoom stereoscope that also provides for viewing individual photos with both eyes, as well as viewing a computer monitor display superimposed onto one photo of a stereo pair. This is done using an internal LCD monitor and optics built into the DTS.

One of the primary design goals of the DTS concept was ease of use with minimum training. For GIS applications, the users should not have to be photogrammetric specialists, but should be able to concentrate on their own area of expertise.

The compilation process is a direct graphical transfer by the operator of what is seen on the photos into ESRI's ArcView. The underlying concept of the DTS is to change the size, shape, position, and orientation of the shape file as necessary to fit the aerial photography. Then you can make edits or additions directly into the shape file and, once the changes are complete, the shape files are reverted back to their original geographic position. The photography can be viewed in both stereo and mono modes.

The DTS software is an extension to ArcView. The software provides functions for continuous zoom, warping, rotating and stretching the shapefile to fit the photography. Operators select from these functions to use those that best fit their needs.

PAR Government Systems Corporation, Rome, NY

PAR Government Systems Corporation (PGSC) provides expert services in environmental data management, water resources modeling and assessment, Geographic Information Systems (GIS), and remote sensing applications. Diverse application domains include:

- GIS-based flood modeling and mapping
- Water resources, including water quality modeling and assessment
- Aerial surveys and digital terrain model development
- Watershed data management
- GIS database development and applications

PGSC is a certified ESRI Business Partner under the ESRI-Developer and Consultant Program. PGSC's Flood*Ware™ product, an advanced flood plain modeling and mapping methodology and software suite, supports the New York State re-mapping initiative and the FEMA Map Modernization Program.

PGSC acquires aerial color and color IR digital imagery, LiDAR, and multispectral data to incorporate into our geospatial analysis and resulting products. PGSC supports the acquisition and processing of color and color IR digital imagery for Digital Orthophoto Quarter Quadrangle (DOQQ) production with its business partners Emerge and Landcare Aviation.

PlanGraphics, Inc., Frankfort, KY

PlanGraphics, Inc., is a systems integration and implementation company that provides a broad range of services in the design and implementation of GIS and other spatial information technologies. PlanGraphics serves as both a system "architect" and as an overseer and active participant in the development of succesful spatial information systems.

PlanGraphics provides a comprehensive set of advisory, implementation, and data integration services:

- Strategic and Implementation Planning
- System Design, Specification, and Procurement
- System Implementation
- Applications Development and Programming
- Outsourcing/Staff Augmentation
- Project Management and QA/QC
- Management Consulting and Organizational Analysis
- User Training and Education

Integration with Other Systems

Turnkey System Implementation.

PlanGraphics has an exceptional degree of experience with GIS at all levels of government and utilities. We understand the programs and operations of local government and regional planning agencies. Likewise, we understand utility operations in both the public and private sectors, their requirements for GIS, and the nature of the relationship between utility and government organizations. And we have worked with more state governments that any other GIS consulting company.

PlanGraphics has worked widely in New York State: our clients include the counties of Dutchess, Erie, Genesee, Tompkins, and Westchester; Niagara Mohawk Power; Niagara Mohawk Gas; New York Power Authority; the New York City Department of Environmental Protection; the New York City Department of Information Technology and Telecommunications; and the New York City Economic Development Corporation.

Sanborn Map Company, Pelham, NY

At Sanborn, we're proud of our 130-year history and tradition of mapping excellence. But that doesn't mean we're not pursuing new technologies…in fact, as times have changed, so has Sanborn. Linking technology with tradition, we've combined advances in the GIS field with our extensive mapping experience to offer state-of-the-art products and services carefully designed to meet your every mapping need.

· GIS
· Tax Parcel Maps
· Digital Orthophotos
· Planimetric Maps
· GPS Surveys
· Maintenance
· Base Map Creation
· Database Design
· Digital Terrain Models
· Topographic Maps
· Airborne GPS
· More!

Call us today to learn more about how we can help you design, build, and maintain an accurate and cost-effective geographic information system.
(800)930-3298

TerraSim, Pittsburg, PA

TerraSim provides software solutions and services for advanced simulation database construction using a wide variety of commercial and military cartographic data sources. Our product, TerraTools®, can fully automate the construction of geospatial databases ranging from dense urban environments to regional military exercises. TerraSim also provides database construction services and advanced technology concept development in areas ranging from real-time visualization for city planning to specialized defense applications.

Triathlon, Richmond, BC, Canada

Triathlon, with branches throughout North America, is a full-service geomatics company that provides an extensive range of high-quality geomatics and mapping services to satisfied clients around the world. Total commitment to innovation, quality and customer service has made Triathlon one of the largest photogrammetric, mapping and digital imaging companies in the world. For the GIS professional, Triathlon meets the demand for clean, accurate digital vector data and images suitable for integration into GIS databases.

Triathlon's scope of services includes everything for the modern geomatics industry:

Data Acquisition

- Aerial Photography
- Satellite Imagery
- LiDAR
- Radar

Digital Mapping & Imaging

- Planimetry
- Surface Modeling
- Orthophotography
- Thematic Mapping
- Aerotriangulation

- Cadastral Mapping
- Scanning
- Surveying
- Forestry & Vegetation

Consulting

- Project Design & Management
- Customized Solutions
- Application Development
- Forestry

The combined expertise of Triathlon's professional staff members is complimented by a commitment to quality assurance and customer service. Technically, all Triathlon project work is supported by the best production-oriented scanning, photogrammetric and digital mapping/imaging equipment currently available. The benefit to Triathlon clients is a cost-effective suite of services that ensures product accuracy and quality, with reduced production times. Triathlon can custom-design, manage and implement either full projects or selected services to optimize solutions that suit every client's project requirements.

Triathlon is owned by MacDonald, Dettwiler and Associates Ltd. (TSE:MDA). Around the world MacDonald Dettwiler is known as the information company that delivers essential information businesses need to make decisions.

Waypoint Technology Group, LLC, Albany, NY

Founded in Albany, New York in 1997, Waypoint Technology Group provides a wide range of Global Positioning System ("GPS") mapping and surveying solutions for businesses, government, and educational institutions in New York State. In addition to GPS equipment rental, system integration, and training, Waypoint offers customized field mapping and managing field assets, resources, and other physical features or conditions.

At Waypoint Technology Group, our principle focus is in providing a full range of GPS services designed to help our clients acquire georeferenced data and, in turn, translate that data into *information* that can be used in making sound business decisions. Waypoint's clients include ecological consultants, municipal planners, land surveyors, engineers, golf course developers, and mining and telecommunications companies.

Waypoint is an authorized dealer of survey and mapping-grade GPS systems for Trimble Navigation, Ltd., the worldwide leader in GPS. As a Trimble dealer, Waypoint provides product distribution and technical support fot he full line of Trimble GPS survey and mapping products.

Waypoint Technology Group is on the Worldwide Web at www.waypointtech.com

Weiler Mapping, Inc., Horsehelds, NY