Proceedings of the U.S. Geological Survey Sixth Biennial Geographic Information Science Workshop, Denver, Colorado, April 24-28, 2006

Scientific Investigations Report 2006-5094

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

Proceedings of the U.S. Geological Survey Sixth Biennial Geographic Information Science Workshop, Denver, Colorado, April 24-28, 2006

Edited by John W. Brakebill, Jennifer B. Sieverling, and Peter G. Chirico

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Introduction

The U.S. Geological Survey's (USGS) Sixth Biennial Geographic Information Science Workshop April 24 - 28, 2006, at the Denver Federal Center in Denver, Colorado, provides a unique opportunity for multi-disciplinary Geographic Information Systems (GIS) and associated scientific professionals to share, learn, present, and discuss a wide variety of geospatial-related topics. Information is exchanged through a series of plenary sessions, hands-on technical workshops, user and commercial vendor demonstrations, lecture and poster sessions, and specialty meetings. Workshop attendance is limited to Department of Interior (DOI) and USGS employees and contractors; however, plenary, hands-on, and lecture sessions have presenters from other Federal agencies, numerous commercial vendors, universities, and several consortia. Over 175 participants are expected to attend the Workshop.

Several prominent speakers are featured at this Workshop. Monday evening Star Guest Speaker and National Aeronautics and Space Administration (NASA) Astronaut Captain Dominic Gorie will talk about his experiences as a veteran of three space flights and over 32 days in space, including the NASA Space Shuttle Radar Topography Mission that mapped more than 47 million miles of the Earth's land surface. Selected as an astronaut candidate by NASA in December 1994, Captain Gorie is currently Chief of the Astronaut Shuttle Branch. Monday evening also features a town hall meeting with Geographic Information Office (GIO) leaders Karen Siderelis, Kevin Gallagher, Bob Pierce, Steve Guptill, Mark DeMulder, John Mahoney, and Mark Negri, who will discuss changes and activities within the GIO in an open discussion format.

Tuesday plenary sessions feature keynote speaker Dr. P. Patrick Leahy, Acting USGS Director. Dr. Leahy holds undergraduate and graduate degrees in geology (1968) and geophysics (1970) from Boston College. In 1979, he received his doctorate in geology from Rensselaer Polytechnic Institute, where he specialized in regional ground-water studies and hydraulics. Dr. Leahy has been with the USGS since 1974, and has held various technical and managerial positions, including Associate Director for Geology and Chief of the National Water-Quality Assessment (NAWQA) Program. Dr. Leahy will be discussing a broad range of topics including Bureau accomplishments, initiatives, and budgets.

The purpose of this proceedings volume is to serve as an activity reference for Workshop attendees as well as an archive of technical abstracts submitted, presented, and discussed at the Workshop. Author, co-author, and presenter names, affiliations, and contact information are listed with presentation titles along with submitted abstracts. Some hands-on sessions are offered twice. In these instances, abstracts submitted for publication are presented in the proceedings on both days they are offered. All acronyms used in these proceedings are explained in the text of each abstract. The term "ArcGIS" refers to an integrated collection of GIS software products produced by Environmental Systems Research Institute, Inc. (ESRI).

Workshop Schedule

The Workshop schedule is presented in the table of contents and in tables 1-5. Tables 1-5 contain a complete list of activities and specialty meetings, including the time, building, and room locations of scheduled events. Morning plenary sessions are held Monday through Thursday and focus on changes within the USGS, trends in GIS, extraterrestrial GIS, data visualization, hazards, health, data standards, enhancements to the National Hydrography Dataset (NHDPlus), GIS partnerships, remote sensing, and USGS geospatial liaisons.

Concurrent hands-on and lecture sessions occur each day after the morning plenary sessions. Plenary and lecture sessions will not be held on Friday, however several hands-on sessions are scheduled. Lecture sessions are approximately 25 minutes in length with 5 minutes for discussion. Hands-on sessions are of variable length and cover a variety of topics including but not limited too: the availability and use of national-scope data, GIS system administration and design, web-based GIS data dissemination, metadata generation, geoprocessing, land and water characterization, GIS-integrated Decision Support Systems (DSS), GIS and public health, image processing, new tools, data sharing, cartography, hazards, modeling, and a variety of USGS programs related to geospatial data.

Several additional topical meetings are scheduled during lunch breaks and in the evenings. These meetings include discussions on USGS Geospatial Liaisons, stream statistics and characterization (StreamStats), Enterprise GIS (EGIS), LIght Detection And Ranging (LIDAR), and geoprocessing. A poster session is held on Tuesday evening from 5:15 pm to 7:30 pm, and awards for various categories are presented at the Thursday morning plenary session. Please see the workshop schedule in Table 1 for details of these and other specialty meetings.

Participating Organizations

Federal Departments and Agencies:
- Centers for Disease Control and Prevention (CDC)
- National Aeronautics and Space Administration (NASA)
- National Oceanic and Atmospheric Administration (NOAA)
  - Coastal GIS Service Center
  - National Geophysical Data Center
- U.S. Department of Agriculture (USDA)
  - Animal and Plant Health Inspection Service (APHIS): Veterinary Services Centers for Epidemiology and Animal Health
- U.S. Department of Interior (DOI)
  - Fish and Wildlife Service (FWS)
  - National Park Service (NPS)
  - U.S. Geological Survey (USGS)
- U.S. Environmental Protection Agency (EPA)

Universities:
- Colorado School of Mines
- Colorado State University, Ft. Collins
- University of California, Santa Barbara
- University of Colorado, Boulder
- University of Colorado, Denver
- University of Washington, Seattle

Commercial:
- eCognition
- Data East, LLC
- Definiens, Inc.
- Digital Globe
- Dynamic Graphics
- Environmental Systems Research Institute, Inc. (ESRI)
- GeoEye
- GCS Research LLC
- IGIS Technologies, Inc.

Leica Geosystems
Merrick & Company
Rockware, Inc.
RSI, Inc.
Safe Software
Sanz Geospatial Solutions Group
Solid Terrain Modeling
SPOT Image Corporartion

Acknowledgments

We would like to thank the many scientists whose contributions and accomplishments are reflected in these proceedings, as their efforts ensure continued success for the USGS. We would like to acknowledge Valerie Gaine, James Gerhart, Andrew LaMotte, and David Litke, for their review comments, and Betzaida Reyes for her assistance with the layout of this manuscript. Thanks are extended to the National Training Center staff for their warm hospitality. Appreciation is also extended to support efforts of the planning committee for organizing a successful USGS GIS 2006 Workshop.

USGS GIS 2006 Planning Committee Members

Workshop Coordinator:
Jennifer Sieverling
USGS Discipline Coordinators:
Biology: Mike Mulligan
Geography: Steve Helterbrand
Geology: James (Luke) Blair
Geospatial Information Office: Barb Ray
Hydrology: John Brakebill
Topic Specialists:
Yvonne Baevsky (In the News: GIS and Public Health)
Steve Char (Land and Water Characterization)
Pete Chirico (Remote Sensing)
Jacque Fahsholtz (Server Technology)
Catherine Costello (Remote Sensing)
Joseph Kerski (Education)
Bill Oatfield (Systems Support)
Curtis Price (Geoprocessing and Analysis)
Barbara Ray (NSDI Partnerships)
Carma San Juan (Land and Water Characterization)
Silvia Terziotti (LIDAR)
Roland Viger (Programming and Scripting)

Table 1. USGS GIS 2006 Schedule, Monday

Monday, April 24											
Building 810 Auditorium											
8:00 AM - 9:15 AM	Welcome: Jennifer Sieverling, (USGS) Workshop Coordinator Plenary Session: Extraterrestrial GIS at the USGS; Trent Hare (USGS) Plenary Session: Web GIS Lingua Franca: Open Source Geospatial Visualization; Patrick Hogan (NASA World Wind)										
9:15 AM – 9:30 AM	Break										
9:30 AM – 10:15 AM	Plenary: USGS Hazards Program; Bill Werkheiser (USGS)										
10:15 AM – 10:30 AM	Break										
ROOM	Copper	Keystone	Breckenridge	Snowmass	Loveland	John B. Weeks	Mesa Verde	ORH Conference	Yucca Mountain Conference	Silver Creek	Building 810 Auditorium
	Hands-on sessions				Lecture sessions						
10:30 AM– 12:25 PM	ERDAS IMAGINE Fundamentals w/ ArcGIS Image Analyst (Leica)	3-D Volumetric Analysis: EarthVision (Dynamic Graphics)	ArcHydro Tools for Watershed Delineation & Characteriza-tion (USGS)	Integrated Geological Data Management, Analysis, & Visualization Using RockWorks /2006 (RockWare, Inc)	Web GIS and Data Visualization Blair and Fahsholtz	Programming, Scripting, and Tools Viger	Hazards 1 (Earth, Wind and Fire) Costello	Elevation 1 (LIDAR) Terziotti	open	open	
	Lunch – lunch schedule below										
12:25 PM - 1:30 PM (LUNCH)							Metadata (BOF)				
1:30 PM - 3:25 PM	(continued)	(continued)	(continued)	(continued)	(continued)	(continued)	(continued)	(continued)	open	open	
3:25PM - 3:45 PM	Break – move to Sheraton Denver West										
4:00PM – 8:30 PM	Star Guest Speaker: STS-99, Radar mapping the earth in 3-D; Astronaut Dom Gorie, Captain, USN GIS Town Hall Meeting: What's going on in the GIO Karen Siderelis (GIO), Kevin Gallagher (ITSO), Bob Pierce (GIIA), Steve Guptill (CEGIS), Mark DeMulder (SIEO), John Mahoney (GIC), Mark Negri (EA /EGIS)										
Evening	Birds of a Feather meetings at Sheraton Denver West Hotel										
Room	Conference Room 1					Conference Room 2					
9PM–11PM	Music BOF (Tom Trombley)					EGIS BOF (all GS Help GIS invited)					

Table 2. USGS GIS 2006 Schedule, Tuesday

Tuesday, April 25											
Building 810 Auditorium											
8:00 AM – 9:20 AM	Plenary Session: Introductions; Tom Casadevall (USGS) Plenary session: Geospatial Line of Business and Geospatial Modernization Blueprint; Karen Siderelis (USGS) Plenary Session: What You Need to Know; Pat Leahy (USGS)										
9:20 AM - 9:35 AM	Break										
9:35 AM – 10:25 AM	Plenary session: Protecting America's Health Using GIS; Brian Kaplan (CDC)										
10:25 AM - 10:40 AM	Break										
10:40 AM - 12:00 AM	Plenary session: GIS Trends; Clint Brown (ESRI)										
12:00 AM – 1:00 PM (LUNCH)	Lunch										
ROOM	Copper	Keystone	Breckenridge	Snowmass	Loveland	John B Weeks	Mesa Verde	ORH Conference	Yucca Mountain Conference	Silver Creek	Building 810 Auditorium
	Hands-on sessions				Lecture sessions						
1:00 PM - 2:55 PM	Advanced Image Processing (Leica)	XTools Pro (DataEast)	Introduction to ArcGIS (IGIST)	Metadata in the Real World (FGDC/USGS)	In the News: GIS and Public Health Baevsky	ArcGIS Road Ahead (ESRI)	Cartography, Data Sharing, Publications, and Archiving Mulligan	National Datasets 1 Costello	open	Doctor's Office	Set up for vendor gallery
2:55 PM - 3:15 PM	Break										
3:15 PM - 5:10 PM	IMAGINE Spatial Modeling and volumetric measure using VirtualGIS (Leica)	Making Maps with ArcGIS (ESRI)	(continued)	ArcGIS Spatial Analyst (ESRI)	(continued)	ArcGIS Road Ahead (ESRI)	(continued)	(continued)	open	Doctor's Office	Set up for vendor gallery
5:15 PM – 7:30 PM	Poster Session and Vendor Gallery at Building 810										
Evening	Birds of a Feather meetings at Sheraton Denver West Hotel										
Room	Conference Room 1					Conference Room 2					
8PM–11PM	Geospatial Liaison BOF					? BOF					

Table 3. USGS GIS 2006 Schedule, Wednesday

	Wednesday, April 26										
	Building 810 Auditorium										
8:00 AM - 9:35 AM	Plenary: State/local partnerships and 50 states initiative; Gene Trobia (Arizona State GIS Coordinator) Plenary: USGS Geospatial Liaisons - Who, What, Where and Why? Chris Kannan, Bruce Bauch, Vicki Lukas, and Lance Clampitt (USGS)										
9:35 AM - 9:50 AM	Break										
9:50 AM - 10:45 AM	Plenary: NBII's Geospatial Interoperability Framework: Making Standards Work! Donna Roy (USGS)										
10:45 AM - 11:00 AM	Break										
11:00 AM - 11:30 AM	Plenary: NHDPlus; Alan Rea (USGS)										
	Lunch – lunch schedule below										
ROOM	Copper	Keystone	Breckenridge	Snowmass	Loveland	John B Weeks	Mesa Verde	ORH Conference	Yucca Mountain Conference	Silver Creek	Building 810 Auditorium
11:30 AM - 1:00 PM (LUNCH)		Internet GIS Application Demos (GCS Research LLC)	GeoSpatial One-Stop BOF				XTools BOF (DataEast)				
	Hands-on sessions				Lecture sessions						
1:00 PM - 2:55 PM	Image Processing w/ ENVI (RSI)	Implementing ArcGIS Server (GCS Research LLC)	Geospatial One-Stop (USGS)	ArcPad 7 (ESRI)	Modeling with ArcGIS 9 (ESRI)	GIS Partnerships / Education Kerski	Productivity Tools for GIS (DataEast)	Elevation 2 Chirico	open	Doctor's Office	
2:55 PM - 3:15 PM	Break										
3:15 PM - 5:10 PM	Hyper-spectral Analysis w/ ENVI (RSI)	(continued)	Finding USGS Data On-Line (USGS)	Geoprocessing in ArcGIS (ESRI)	New, Weird, Wonderful, and the Kitchen Sink Viger	(continued)	Hazards 2 (Earth, Wind and Fire) Costello	MARS: LIDAR Processing Software (Merrick)	open	Doctor's Office	
Evening	Birds of a Feather meetings at Sheraton Denver West Hotel										
Room	Conference Room 1					Conference Room 2					
7 PM–9 PM	Publishing GIS Data BOF					Geoprocessing BOF					

Table 4. USGS GIS 2006 Schedule, Thursday

Thursday, April 27											
Building 810 Auditorium											
8:00 AM - 9:15 AM	Plenary: Land Remote Sensing Program Ron Beck (USGS) Poster Awards: Barb Ray and Jennifer Sieverling (USGS)										
9:15 AM – 9:30 AM	Break										
9:30 AM – 10:15 AM	Plenary: Melinda Laituri (Colorado State University and NSF)										
10:30 AM – 10:45 AM	Break										
10:45 AM - 11:30AM	Plenary: The Future of Remote Sensing; Brian R. Raber (Merrick), Brock McCarty (Digital Globe), Gene Dial (GeoEye), Steven Miller (SPOT Image Corporation)										
	Lunch – lunch schedule below										
ROOM	Copper	Keystone	Breckenridge	Snowmass	Loveland	John B Weeks	Mesa Verde	ORH Conference	Yucca Mountain Conference	Silver Creek	Building 810 Auditorium
11:30 AM - 1:00 PM (LUNCH)											How Me 'an Teddy Mapped San Juan Hill, Ken Lanfear
	Hands-on sessions				Lecture sessions						Hands-on sessions
1:00 PM - 2:55 PM	Feature Extraction from Imagery (eCognition) (Definiens)	ArcSDE for SQL Server (ESRI)	Introducing NHDPlus: A National Geospatial Surfacewater Framework (USGS/EPA)	Geoprocessing in ArcGIS (ESRI)	Land and Water Characterization (San Juan / Char)	GIS Interoperability and Standards (ESRI)	GIS Supporting Decisions Mulligan	GIS System Design (ESRI)	open	Doctor's Office	GPS 101 (USGS)
2:55 PM - 3:15 PM	Break										
3:15 PM - 5:10 PM	Surface Interpolation (ESRI/USGS)	(continued)	PLTS Data creation tools (ESRI)	Fly Through Your Data (ESRI)	(continued)	ArcGIS Data Interoperability Extension (Safe Software)	Data Archiving Roundtable Mulligan	(continued)	open	Doctor's Office	GPS for GIS (USGS)
Evening	Birds of a Feather meetings at Sheraton Denver West Hotel										
Room	Conference Room 1						Conference Room 2				
7 PM-9 PM	StreamStats BOF						LIDAR BOF				

Table 5. USGS GIS 2006 Schedule, Friday

Friday, April 28											
ROOM	Copper	Keystone	Breckenridge	Snowmass	Loveland	John B Weeks	Mesa Verde	ORH Conference	Yucca Mountain Conference	Silver Creek	Building 810 Auditorium
	Hands-on sessions				Lecture Sessions						Hands-on session
8:00 AM - 9:55 AM	ArcGIS Geostatistical Analyst (ESRI)	ArcSDE for Oracle (ESRI)	NHDPlus (USGS/EPA)	Making Maps with ArcGIS (ESRI)							GPS For GIS (USGS)
9:55 AM – 10:10 AM	Break										
10:10 AM - 11:55AM	ArcGIS 3-D Analyst (ESRI)	(continued)	Surface Interpolation (ESRI/USGS)	ArcPad 7 (ESRI)							
	Lunch – lunch schedule below										
11:55 AM - 1:05 PM (LUNCH)											
1:05 PM - 3:00 PM	Feature Extraction from Imagery (eCognition)	ArcGIS Spatial Analyst (ESRI)	PLTS Data creation tools (ESRI)	Fly Through Your Data (ESRI)							
3:00 PM	Adjourn										

Presentation Titles and Abstracts, Monday, April 24, 2006

Monday Plenary, 8:00 am – 10:15 am

Extraterrestrial GIS at the USGS, ***By Trent M. Hare***

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Extraterrestrial GIS is simply the application of GIS technologies to study planetary bodies other than the Earth. Since the mid 1990s, the Astrogeology Team of the USGS has been utilizing GIS applications (e.g. ESRI's (Arc/Info) for planetary data creation and research (Carr 1995; Hare 2003). Like many research teams within the USGS, we have persistently followed the technical advances in GIS and fortunately, the overall experience has been positive. The technical advances made in this field during the last decade are phenomenal. Here I will briefly describe a few avenues the Astrogeology Team has been pursuing regarding this technology.

Sharing extraterrestrial data across multiple GIS applications has proven problematic because defining planetary coordinate reference systems (CRSs) in standardized GIS file formats or specifications, like GeoTIFF and Web Mapping Services (WMS), is not well supported. For a little over a year we have interfaced with the Open Geospatial Consortium (OGC) to help resolve this. Thus far we have researched our options with the help of OGC members and have begun to implement methods to resolve the issues, including solutions for WMS, GeoTIFF, JPEG2000, GML, and other data standards (Hare 2006).

Since 1999, we have hosted the PIGWAD or "Planetary Interactive GIS-on-the-Web Analyzable Database" website for serving various planetary datasets and tools for the Moon, Mars, Venus, Titan and several Jovian satellites. The original solution we used was ArcView Internet Mapping Server (IMS), but we have since switched to ESRI's newer ArcIMS and are currently testing ArcMap Server as well as openSource WMS solutions (e.g. MapServer). One of the most attractive aspects of the original ArcViewIMS and ArcMap Server is the ability to not only host the data but also host robust GIS functionality. For example, using ArcViewIMS, we previously maintained a site that helped researchers analyze suitable landing sites for the Mars Exploration Rovers. The most recent on-line GIS application we have implemented, using ArcMap Server, includes a set of Mars crater density tools (Hare 2006). We are also working with the Jet Propulsion Laboratories (JPL) on creating a planetary WMS server based on JPL's OnEarth LandSAT server. This enhanced server will also have powerful Web Coverage Server (WCS) and possibly Web Processing Server (WPS) capabilities (Dobinson 2006).

In conclusion, we will continue to see growing uses for GIS technologies and spatial analysis in extraterrestrial research, mission planning, and mission support tasks.

References:

Carr, M. H., (1995), The Martian drainage system and the origin of networks and fretted channels, Journal of Geophysical Research, 100, pp. 7479-7507

Hare, T., et. al., (2003), GIS 101 for planetary research, ISPRS Working Group IV/9: Extraterrestrial Mapping Workshop, "Advances in Planetary Mapping 2003".

Hare, T., et. al., (2006), Standards Proposal to Support Planetary Coordinate Reference Systems in Open Geospatial Web Services and Geospatial Applications, Lunar Planet Science Conference XXXVII, abs. 1931.
Hare, T., et. al., (2006), Mars Crater Density Tools: Project Report, Lunar Planet Science Conference XXXVII, abs. 2398.

Dobinson, E., et. al., (2006), Adaptation & Use of Open Geospatial© Web Technologies for Multi-Disciplinary Access to Planetary Data, Lunar Planet Science Conference XXXVII, abs. 1463.

Web GIS Lingua Franca: Open Source Geospatial Visualization, ***By Patrick Hogan***

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The web has made access to geospatial information continuous and dynamic. 3D planetary visualization provides the natural context to make this data very interesting. The freely available terabytes of data necessary to map the basic planetary visualization do not even begin to address the need to intelligently access the remaining petabytes of geospatial information. But the web makes this all possible. The web not only provides the opportunity for information retrieval from an expanding universe of data, it also allows for doing this at the very moment the data arrives. That's like being able to witness the very edge of an expanding universe at any moment in time. In our case, the expanding universe is composed of geospatial information.

Visualization of geospatial information, that's the easy part. The hard part is the 'intelligence' needed to readily find the desired data (information retrieval) and then quickly analyze it. This requires additional tools; information retrieval tools to acquire the desired data, and analytical tools to manipulate and understand that data.

Consider a Web GIS success story in the making that could save thousands of lives and billions of dollars. How? Simply by having broad-based and immediate access to information that already exists. Consider a tsunami early warning system. One small plug-in application to a broad-based (free) planetary visualization tool, be it from ESRI, NASA, Google or other, could be listening to a server that alarms when circumspect seismographic data are received. This same server can broadcast wave height and speed as transmitted from oceanic buoys. The arrival time and expected wave run-up can be visually delivered (no translation required) to the entire world immediately, thereby optimizing the time needed for response. Here is a case where geospatial information goes directly into the hands of the people who need it the most.

Free is good, but open source may be even better. One way to stimulate the entrepreneurial spirit and engender solution-driven commercial enterprise is with an open source and open standards visualization platform. Those who build the intelligence tools as proprietary plug-ins will now have the broadest market possible! Highly specialized needs can still be met by in-house experts coupled with a software engineer. The graduate student can more effectively challenge the frontiers of science. And anybody who has a need to understand or communicate geospatial data has the wherewithal to do so.

USGS Hazards Program, *By Bill Werkheiser*

U.S. Geological Survey, National Center, 12201 Sunrise Valley Drive, MS 433, Reston, Va, 20192-0002
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(Abstract not submitted)

Monday Hands-on Sessions

ERDAS IMAGINE: Fundamentals with ArcGIS Image Analysis, 10:30 am – 3:25 pm, *By Joe Mostowy*

Senior Applications Analyst, Leica Geosystems Geospatial Imaging
303-799-9453 ext.19 Joseph.Mostowy@gi.leica-geosystems.com
(Abstract not submitted)

3-D Volumetric Analysis, 10:30 am – 3:25 pm, *By Skip Pack*

Technical Marketing and Business Development, Dynamic Graphics, Inc., 2603 Augusta Drive, Suite 1080, Houston, TX 77057-5639
713-952-2611 skip@houston.dgi.com
(Abstract not submitted)

Using the ArcHydro Tools for Watershed Delineation and Characterization, 10:30 am – 3:25 pm, *By Alan Rea [1] and Peter A. Steeves [2]*

[1] *U.S. Geological Survey Water Science Center, 230 Collins Road, Boise, ID 83702*
208-387-1323 ahrea@usgs.gov
[2] *U.S. Geological Survey Water Science Center, 10 Bearfoot Road, Northborough, MA 01532*
psteeves@usgs.gov

The ArcHydro Tools within ArcGIS provide a convenient, well-integrated means of developing an interactive watershed delineation and characterization environment using digital elevation models (DEM) and other geospatial data. The power and flexibility of the ArcHydro Tools, however, come at the expense of considerable complexity. In this hands-on workshop we will cover how to: 1. Preprocess DEM data for use with the ArcHydro Tools, including techniques for enforcing hydrologic drainage networks and watershed boundaries. 2. Preprocess other data needed by the ArcHydro Tools. 3. Delineate local watersheds and compute built-in watershed characteristics for areas small enough to manage datasets as single units. 4. Modify the ArcHydro configuration to compute other watershed characteristics. 5. Set up a global watershed delineation and characterization environment for areas too large to manage with single datasets.

In addition, we will provide an overview of Geodatabase concepts, and will offer participants the chance to gain hands-on experience using Geodatabase editing tools, topology, and geometric networks. The workshop materials are adapted from a one-week Stream Stats Data Preparation Workshop that was offered for Water Science Centers implementing Stream Stats. For more information on Stream Stats see at URL: http://streamstats.usgs.gov/

Integrated Geological Data Management, Analysis, and Visualization Using RockWorks/2006, 10:30 am – 3:25 pm, *By Jim Reed*

Director of Research & Development, RockWare Inc., 2221 East St., #1, Golden, Colorado 80401
303-278-3534 extension 113, Jim@rockware.com

RockWorks 2006 is the latest version of an integrated collection of programs that are designed for the management, analysis, and graphical display of geological data. This abbreviated hands-on course will focus on borehole and measured section data including lithology, stratigraphy, geochemistry, geophysics, fractures, and water levels. Particular attention will be devoted to generating striplogs, cross-sections, profiles, fence-diagrams, and block models. Other topics include volumetric calculations, gridding, solid-modeling, and logical operations.

Monday Lecture Sessions

Hazards 1, 10:30 am – 3:25 pm, *moderated By Catherine Costello*

Characterization of Post-fire Surface Cover and Soils Using Hyperspectral and Multispectral Remote Sensing Data and Comparisons of Surface Cover and Burn Severity Maps for the Cerro Grande Fire, New Mexico, *By Raymond F. Kokaly, Barnaby W. Rockwell, and Trude V.V. King*

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Ecosystem processes in conifer forests are impacted by fire when living vegetation is consumed and nutrients and cations in soils are increased by deposition of ash and charred organic matter and by litterfall from scorched trees. We analyzed high spatial resolution (2.4m pixel size) Airborne Visible and Infrared Imaging Spectrometer (AVIRIS) data to map post-fire surface cover, including ash, soil minerals, scorched conifers, and green vegetation, on the Cerro Grande fire. This fire occurred near Los Alamos, New Mexico, in May 2000. The AVIRIS data were collected on September 3, 2000. The surface cover map revealed complex patterns of ash, iron oxide minerals, and clay minerals in areas of nearly complete combustion. Scorched conifer trees, which retained dry needles heated by the fire but not consumed by the flames, were found to cover much of the post-fire landscape. These scorched trees were found in narrow zones at the edges of completely burned areas.

A surface cover map was also made using Landsat TM data and a maximum likelihood, supervised classification. When compared to the AVIRIS map, the Landsat classification map grossly overestimated cover by scorched conifer and ash classes and severely underestimated soil and green vegetation cover. The single, broad Landsat band in the 2 to 2.5 micron region was not sufficient to discriminate between lightly scorched and unaffected conifers nor to detect clay minerals in soils.

In a comparison of AVIRIS surface cover to the Burned Area Emergency Rehabilitation (BAER) map of burn severity, the high burn severity areas did not capture the variable patterns of post-fire surface cover by ash, soil, and scorched conifers seen in the AVIRIS map. The BAER map, derived from air photos, also did not capture the distribution of scorched trees that were observed in the AVIRIS map. The Landsat-derived burn severity map, generated from the differenced Normalized Burn Ratio (NBR) calculation, portrayed more variability in burn severity but had twice as much area classified as moderate severity when compared to the area covered by scorched trees. Burn severity and surface cover images were found to contain complementary information, with NBR presenting an image of the degree of fire's transformation of pre-fire surface cover and the AVIRIS-derived surface cover showing the end-state of that transformation.

The GIS of Earthquakes: Using GIS to document, illustrate, and evaluate seismic hazards, ***By Richard Dart[1] and the Geologic Hazards Team[2]***

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[2] U.S. Geological Survey, Earthquake Hazards Program, Golden, CO

Because a level of seismic hazard exists everywhere, GIS applications have become important tools for scientific research and educational outreach related to seismic hazards. Much of the GIS data we use is generated in-house in the form of current and historic earthquake catalogs and maps (global coverage), calculated (probabilistic) earthquake hazard maps for any region or area, a database of geologically active (Quaternary) faults within the US, and information on earthquake-related hazards such as landslides. In addition, we utilize a wide array of GIS products, data, and services available from other institutions and agencies such as the University of Memphis Center for Earthquake Research and Information. We are proud to collaborate with other governmental agencies and educational institutions, for example, Saint Louis University Earthquake Center, and Mississippi Department of Environmental Quality. As part of our outreach effort, our data are available as downloadable map images and statistical files in a wide array of formats.

GIS-based tools for the assessment of post-wildfire debris-flow, ***By Susan H. Cannon, Joseph E. Gartner, Michael G. Rupert, and John A. Michael***

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The increased incidence of catastrophic wildfires in the western United States and the encroachment of human development into fire-prone ecosystems have created a critical need for methods to quantify potential hazards posed by debris flows produced from burned watersheds. Debris flows can be one of the most hazardous consequences of rainfall on recently burned hill slopes. Empirical models developed to estimate the probability of post-wildfire debris-flow activity and the magnitude of the response can be quickly implemented on a GIS platform to generate debris-flow hazard maps following wildfires. A model for the probability of debris-flow production from individual drainage basins was developed using logistic regression analyses on a database from 401 basins that were burned by 15 recent fires located throughout the U.S. Intermountain West. The model describes debris-flow probability as a function of readily-obtained measures of area burned extent, soil properties, basin gradient, and rainfall from short-duration convective rainstorms. In addition, a model for estimating the volume of material that may issue from a basin mouth was developed using a series of multiple regression analyses on a database from 56 basins burned by eight fires. The model describes debris-flow volume as a function of the area of the basin gradient, burned extent and storm rainfall. These models are readily implemented in a GIS to produce hazard maps that identify those basins most likely to produce the largest events. The probability and volume maps can be combined using a simple relational algorithm to provide a relative hazard ranking for each burned basin, thus providing critical information for post-fire mitigation decisions and evacuation planning.

Probabilistic Tsunami Hazard Maps and GIS, Seaside, Oregon, *By Florence Wong[1], Eric Geist[1], and Angie Venturato[2]*

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Probabilistic tsunami hazard mapping is performed at Seaside, Oregon, the site of a pilot study that is part of the Federal Emergency Management Agency's (FEMA) effort to modernize its Flood Insurance Rate Maps (FIRMs). Because of the application of the study to FIRMs, we focus on developing aggregate hazard values (e.g., inundation area, flow depth) for the 1 percent and 0.2 percent annual probability events, otherwise known as the 100-year and 500-year floods. Both the far-field and local tsunami sources are considered, each with assigned probability parameters.

DHS FEMA: GIS for Situational Awareness, *By Drew Douglas*

Federal Emergency Management Agency MS 625, Room 222,500 C Street, SW Washington, DC 20472
202-646-2825 drew.douglas@dhs.gov
(Abstract not submitted)

Programming, Scripting, and Tools, 10:30 am - 3:25 pm, *moderated by Roland Viger*

GIS Tools for Area-Weighted Transfer: The NAWQA Area-Characterization Toolbox, *By Curtis Price*

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The U.S. Geological Survey National Water-Quality Assessment (NAWQA) Program requires the landscape near water sampling sites to be characterized to assist in interpretation of water-quality data. The areas to be characterized may be represented as either simple polygon features (watersheds or aquifer areas) or as buffer polygon features calculated from point feature locations (such as sampled wells or springs). Specific landscape information used to characterize these areas (for example, population or estimated pesticide use) usually is reported as attributes of other polygon features such as county or Census block group boundaries. Thus, the required geographic information system (GIS) analysis involves the area-weighted transfer of attributes from "source" polygon features (county or block group areas) to "target" polygon features (watersheds or well buffers). The GIS processing includes overlay of these data features to develop area weights to estimate values for the target areas.

A set of GIS scripts has been developed to automate the transfer of polygon attributes from one set of polygon features to another. These tools automate the creation of area-weight tables that record the results of the overlay process. These weight tables can then be used to efficiently transfer many attributes (for example, pesticide application data for many compounds recorded by county) from source polygon features to target polygon features using the stored results of a single GIS overlay operation.

Oracle and ArcSDe with RedHat Linux Operating System and Dell Server, ***By Raymond C. Obuch and Christopher Skinner***

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The U.S. Geological Survey Central Energy Resources Team (CERT) Oracle database (1) contains oil, gas, and coal related data in support of domestic and international energy resource surveys and analyses; and (2) serves as CERT's primary spatial database, which is accessed through a variety of desktop and web applications using Environmental Systems Research Institute's (ESRI) ArcSDE middleware product. The database system was designed and implemented using, in addition to Arc SDE, an Oracle database management system and a RedHat Linux operating system on a Dell Server hardware platform. After prototyping the Oracle, ArcSDE, and RedHat Linux operating system on the Dell Server, the architecture was documented and placed in a production environment. In more than a year of operation, this architecture has proven to be a cost-effective way to deliver enhanced functionality with excellent performance while supporting preexisting applications. The documentation developed as part of the CERT database system provides users with a "jump start" guide for the migration to a Dell-Linux-Oracle-ArcSDE environment. Additional benefits of this migration have been the review and documentation of thousands of ArcSDE layers and the development of performance metrics based on the ArcGIS TOFINO tool set extension.

Water Availability Screening Tool, ***By Scott Hoffman***

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As part of the Pennsylvania State Water Plan Update, water availability needs to be assessed in watersheds across Pennsylvania. The Water Availability Screening Tool, developed by the USGS, Pennsylvania Water Science Center, will provide the first step in this assessment. At selected points on streams throughout the State, the Screening Tool provides an estimate of how much water is available after net upstream water use is taken into consideration.

The Tool is based on the ArcHydro data model and is supported by a hydrologically-enforced digital elevation model (DEM) for all drainage basins flowing into the State. ArcObjects were used to develop the Screening Tool and give the cooperator flexibility in generating scenarios and updating the State's water-use database.

ArcMap Tool for NWISWeb, ***By Steven K Predmore***

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The U.S. Geological Survey national water database (NWIS) contains a wealth of ground-water, surface-water, and water-quality data that is available to the public on the national website (NWISWeb). However, querying data from the NWISWeb is difficult when using geographic information systems such as ArcMap. To simplify this task, an ArcMap tool was developed to query and download data from the NWISWeb for a selected map extent. Data are downloaded for the included sites and a temporary shape file is created. The shape file is displayed on the map with a hotlink that connects to the NWISWeb "Site Description" page for each site. This tool also allows the user to select a site and explore ground-water, surface-water, and (or) water-quality data related to the site, through the hotlink to NWISWeb. These data can then be downloaded in a tabular format to use in ArcMap.

Utilizing Mobile Computing to Inventory Ground-Water Sites, *By Steven K Predmore and Tyler Johnson*

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With the advent of more sophisticated handheld and tablet type computers, the ability to enter groundwater levels and site information directly into a digital format in the field has become an attractive option. One of the first uses of this new technology was the development of the Multi Optional Network Key Entry System (MONKES). MONKES was initially developed to enter ground-water level data into the USGS national water-level information system (NWIS) from files created on Pocket PC handheld devices. In 2002, MONKES2 was developed to help people canvas and establish new groundwater sites using the Pocket PC. Due to the success of the MONKES project, the California Ground-Water Ambient Monitoring and Assessment (GAMA) Program wanted to take MONKES to the next level (MONKES2). Preliminary work on MONKES2 indicated that the screen on a Pocket PC was too small to enter site location information easily. Computing advances and the advent of Tablet PCs presented a solution to this drawback.

As a result, the Alternate Place Entry (APE) Form was created to canvas and create new ground-water site batch files on the Tablet PC, which has the advantages of a larger screen size, more powerful processors, and more memory in both RAM and hard drive than its Pocket PC predecessor. In addition, the Tablet PC runs Windows XP Tablet edition, giving it the ability to run most Windows XP programs and therefore connect with most peripheries that can be attached to a computer. Despite these advantages, the Tablet PC has some disadvantages. It costs more than the Pocket PC, boots up more slowly, and is larger in weight and size. However, for GAMA's work, the Tablet PC advantages outweighed its disadvantages, and APE was developed.

The current version of APE allows the site location data to be entered electronically. With the help of Geographic Information System (GIS) technology embedded into the APE program, some of the NWIS fields like county name, USGS topographic map name, and hydrologic unit code can be automatically populated from the latitude and longitude value. The 8-page Ground-Water Site Schedule (form 9-1904-A), the California Ground-Water canvas sheet, site photos, and a site sketch maps can all be printed directly from the APE. Finally, the latitude and longitude of the site can be validated with the help of the embedded GIS, and a batch file created for uploading the new ground-water site into NWIS.

Using ArcGIS and Python to process and analyze NAWQA 3-dimensional reach transect data, *By Zachary D. Wilson and Brian D. Reece*

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To characterize stream habitat for the National Water-Quality Assessment Program (NAWQA), stream transect data are often collected using survey equipment and recorded as X, Y, Z values and a description of the point in ASCII text format. Transect and reach characterization parameters are then calculated by copying-and-pasting these data into a spreadsheet containing formulas. Since not all reach surveys have the same number of survey points, the spreadsheet layout and formulas must be modified each time, which increases the probability of error. Additionally, parameters calculated in a spreadsheet cannot be easily imported to a database, making information more difficult to retrieve and analyze. Utilizing ArcGIS geoprocessing functionality and the Python scripting language, a program was written to produce a 3-dimensional point feature class of surveyed cross-section data. The program allows the user to translate survey data from ASCII file format to a feature class and assign attributes to the feature class based on the original point description recorded in the field. Display in ArcMap allows the feature class attributes to be verified in a spatial environment. Attribute errors are corrected using basic ArcGIS Editing functions. Transect and reach characterization parameters are then calculated from the edited point feature class using a second Python script and output in a database-compatible format.

Rendering Borehole Geophysical and Lithologic Data Using ArcGIS coupled with Viewlog Software, *By Jack Monti*
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(Abstract not submitted)

WebGIS and Data Visualization, 10:30 am – 3:25 pm, *moderated by Luke Blair and Jacqueline Fahsholtz*

Visualizing spatial data with Google Earth, *By Amar Nayegandhi[1], John C. Brock[1], and C. Wayne Wright[2]*
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High-resolution, geo-rectified imagery in digitized format is often difficult to visualize without the expertise and availability of sophisticated GIS software. Google Earth is a new interactive 3D visualization tool for personal computers that combines satellite imagery and maps from Google's database. Google Earth software can also be used to visualize raster imagery and GIS data from other sources. Formatted data, hosted on a web server, can be shared with a network of end users running the Google Earth client software. Google Earth's intuitive interface allows everyone in the organization to interact meaningfully with technical datasets without any expensive, time-consuming formal training. We present methods to ingest layers of GIS data products, such as LIDAR DEM imagery and airborne photography, into Google Earth. We demonstrate the ability to use Google Earth with several 100 gigabytes of data acquired from a post- Hurricane Katrina survey over the Gulf Islands National Seashore in Florida and Mississippi.

Solutions to Post-Earthquake Information Response and Visualization, ***By David Wald***

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(Abstract not submitted)

Delivering Scientific Information on the Web Using Google Maps, ***By Gregory L. Gunther***

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The rapidly changing landscape of Internet GIS technologies has made it faster, easier, and more cost effective to deliver location-based scientific information over the web than traditional internet mapping technologies. Complicated, multitiered, and "finicky" internet mapping applications are no longer needed in many cases, given the maturation of service-based technologies such as Google Maps. This presentation provides a technological overview of Google Maps, and discusses their implementation and potential application by USGS scientists. An example application will be given, illustrating the registration, construction, and display of a simple "mashup".

A Virtual Tour of the 1906 Earthquake, ***By Luke Blair***

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(Abstract not submitted)

Mapping Data Warehouses with a Web Browser, ***By Nathaniel L Booth and Eric Everman***

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The USGS Middleton Data Center has developed a web-based thematic mapping application framework for use in decision support, spatial modeling and other web-based mapping applications that query large data warehouses. The framework has been used to develop several web mapping applications in support of several USGS projects including the National Water-Quality Assessment Program Data Warehouse.

Much progress has been made by USGS in making vast geospatial data resources available on-line to the public via web-based GIS applications. An area that remains less explored is the melding of these web technologies with large data warehouses to offer decision support and modeling capabilities. This framework seeks to provide an extensible platform from which applications can be built that 1) offer form based selections to filter data by theme or spatial extent, 2) integrate statistical methods to enhance visual display and, 3) serve base maps from existing web services to provide spatial context and comparisons selectable through familiar web form controls.

The main design criteria for the framework include the following characteristics. Geographically relevant Web mapping services (WMS) are offered as base map layers from sources including the National Map catalog. Using this framework, applications can be structured to meet users where they are in terms of web mapping familiarity by offering "saved" predefined themes that load up a package of base maps, thematic map instructions, and area of interest. For a selected theme and geographic region of focus, dynamically generated time-series plots can be created by the user to explore temporal

variability and box-plots can be created to describe data distributions. Finally, the framework packages common export utilities including MS Excel and Google Earth KML. Google Earth exports preserve the symbology and point-based attributes of the theme.

The framework is built on the Java 2 platform using Oracle's Mapviewer and is tailored to work best with data warehouses stored in the Oracle RDBMS version 9i and above. Standards based service-oriented approaches were applied including J2EE, OGC web mapping services, National Map WMS, XML, Ajax, XHTML, and HTML.

Realtime Earthquakes in Google Earth, *By Scott Haefner*
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(Abstract not submitted)

Implementing a database IMS - The Good, the Bad, and the Ugly, *By Susan Rhea*
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With 15 years of experience using GIS software from ESRI, a background in html and website construction, an ancient background in computer programming, and a general "can do" attitude, I optimistically approached implementing an interactive map service for the United States Quaternary Fault and Fold Database project for the Earthquake Hazards Team. With the tender loving care of GIS professionals in the USGS and ESRI, system administrators to handle web delivery and security issues, and years of practice, we started serving the IMS to the public in January 2004. By January 2006 we were serving geodatabases through Oracle, ArcSDE, a PC server, multiple firewalls, and the National Web Server System (NatWeb).

The Good? The software now works as advertised. Users can get information off the web about faults that are potentially earthquake causing. Users can download the spatial and textual databases into a variety of applications. The software will keep on running for months with no attention, even while you edit the databases behind it.

The Bad? Attention to detail is critical in every step of the way. You can end up pulling your hair out over misplaced semicolons and spaces. Sometimes you can edit your AXL while the Administrator is running the project, save, and refresh the map service, and sometimes you have to stop and delete the service before you can save an edited file. It is terribly frustrating when you can't get the software to act in a consistent manner.

The Ugly? Even if you do everything right, the software is so complex, it can still come crashing down around your ears and send you home hoping that "tomorrow is another day" (Scarlett in Gone With the Wind). And sometimes a reboot of all systems does fix the problem.

Elevation 1 (LIDAR), 10:30 am – 3:25 pm, *moderated by Silvia Terziotti*

LIDAR 101 Video, *By Jason Stoker*
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(Abstract not submitted)

Using LIDAR Evaluation and Edit Tools in Partnership with the Coeur d'Alene Tribe, *By Tracy Joe Fuller*

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In fiscal year 2005, USGS entered into a Cooperative Agreement with the Coeur d'Alene Tribe in Idaho. One of the objectives of the agreement was to support the Tribe in reviewing and editing LIDAR point data that the Tribe had obtained through contract. Post-edit, high-resolution, shaded relief elevation data were made available to USGS for display in The National Map through Geospatial One-Stop registration of a Tribal IMS server. The Coeur 'd Alene Tribe collaborated with the University of Idaho to develop a toolset built on ESRI ArcMap software to visually review and edit the LIDAR point data. The tools allow raw point data to be displayed over derived Triangulated Irregular Network and shaded relief images. Operators visually inspect the data for elevation spike and dip aberrations, mask suspect points, and recalculate a resultant shaded relief dataset. The system proved easy to use for the two USGS employees and the two Tribal summer interns that worked on the project, and final datasets are being used by the Tribe in multiple GIS projects. Having internal resources review and process the points saved approximately fifty percent of what it would have cost to contract for full data delivery.

Some Challenges in Using LIDAR-Drived Data for Hydrologic Applications, *By Silvia Terziotti*

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(Abstract not submitted)

LIDAR and Multispectral Imagery Exploitation on the Gunnison Gorge National Conservation Area, Colorado, *By John J. Kosovich[1], Richard I. Grauch[2], John G. Elliott[3], Geneva Chong[4], and Paul von Guerard[5]*

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High-resolution LIDAR, orthorectified digital imagery, and a fused product of these data are being exploited over part of the Gunnison Gorge National Conservation Area (GGNCA) in western Colorado to fulfill several research goals: 1) evaluation of advanced sensor data fusion capabilities; 2) LIDAR

feature extraction applications from data fusion products; and 3) topographic, geomorphologic, geologic, and biologic science requirements and land management needs of the Mancos Shale Landscapes interdisciplinary project involving the U.S. Geological Survey (USGS), Bureau of Land Management (BLM), and several other federal, state, and local groups. Using the LIDAR elevation data, USGS scientists are quantifying high-resolution areas of unique slope and aspect into highly accurate polygons of similar geomorphologic characteristics. USGS and BLM hydrologists and soil scientists plan to use these geomorphologic units and fusion-extracted features (vegetation, trails, and disturbed surfaces) in runoff, sedimentation, and vegetation models for the Mancos Shale selenium transport studies on the Upper Colorado River and in support of BLM land management issues on the GGNCA. The high-resolution imagery and categorized LIDAR/imagery fusion data are also being used by USGS and BLM ecologists and biologists to help quantify plant distribution over the study site.

Deriving vegetation metrics using LIDAR, ***By Amar Nayegandhi[1], John C. Brock[1], and C. Wayne Wright[2]***

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NASA's Experimental Advanced Airborne Research LIDAR (EAARL) is a raster-scanning, temporal-waveform-resolving, green-wavelength LIDAR designed to map nearshore bathymetry, topography, and vegetative structure simultaneously. The EAARL sensor records the time history of the return waveform within a small footprint (15-20 cm at nominal flying altitude of 300 m) for each laser pulse, enabling characterization of canopy structure and 'bare earth' under a variety of vegetation types. EAARL data acquired over the coastal vegetated communities at Assateague Island National Seashore (ASIS) in Maryland, and Terra Ceia Preserve at the southeast coast of Tampa Bay, Florida, were used to evaluate the capability of LIDAR data to determine the vertical distribution of canopy and sub-canopy across a diverse set of vegetation classes. A collection of individual waveforms combined within a synthesized large footprint was used to define four metrics: canopy height, “bare-Earth” elevation (BEE), canopy reflection ratio, and height of median energy. The metrics derived from these composite waveforms were tested for accuracy and reproducibility. BEE values were derived from the individual waveforms to limit the spreading of the ground return on steep slopes and enable the ability to distinguish between ground and low shrubs. Results show that combining several individual small-footprint laser pulses to define a composite “large-footprint” waveform is a possible method to describe the vertical structure of a vegetated canopy.

Integrating LIDAR and Bathymetric Surveys of the South San Francisco Bay Area to Aid in Marsh Restoration Efforts, ***By Amy C. Foxgrover and Bruce E. Jaffe***

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Since the California Gold Rush of 1849 over 80% of the tidal wetlands in the South San Francisco Bay area have been lost due to agriculture, commercial salt production and urbanization. The California Coastal Conservancy, in conjunction with other state and federal agencies, is currently managing the restoration of approximately 61 km2 (15,100 acres) of salt evaporation ponds to mixed intertidal habitat. Obtaining accurate marsh elevations and pond and bay depths is critical for documenting baseline conditions, developing successful restoration strategies, and tracking morphologic change throughout the restoration process. A series of surveys were conducted from 2003 to 2005 to gather this crucial information. An airborne topographic LIDAR survey was used to collect elevations of the exposed intertidal mudflats, levees, marsh, dry salt ponds, and surrounding areas including the 100-year floodplain. The survey collected greater than 250 million elevation points over an area of approximately 335 km2 resulting in a data density greater than one point per square meter. Bathymetric surveys collected over 2.6 million depth soundings over an area of 235 km2 within the bay and select sloughs as well as in a number of the salt ponds. The intricacies of working with such large data sets in a GIS as well as methodologies used in the evaluation and merging of these data collected using different technologies and at different densities will be discussed.

Monday GIS Town Hall Meeting, 4:00pm – 8:30 pm, moderated by Jennifer B. Sieverling

STS-99, Radar Mapping the Earth in 3-D, ***By Captain Dominic L. Pudwull Gorie***
USN NASA Astronaut, Commander, Chief of the Astronaut Shuttle Branch
Lyndon B. Johnson Space Center, Houston, Texas, 77058
(Abstract not submitted)

Establishing a Center of Excellence for GIScience, ***By Stephen C. Guptill***
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The Geospatial Information Office (GIO) of the U.S. Geological Survey has assumed a leadership role within the Bureau in defining an overall Geospatial Information Science (GIScience) research agenda, in championing GIScience research as a component of the Bureau's science portfolio, and in conducting, supporting, and collaborating in research to address critical GIScience questions of importance to the USGS. Since the Bureau includes geography, water, geology, and biology disciplines, the role of the GIO in providing an integrating framework for information among these disciplines is an important element of GIScience at the USGS.

A Center of Excellence for Geospatial Information Science (CEGIS) has been established within the GIO to conduct, lead, and influence the research and innovative solutions required by the National Spatial Data Infrastructure (NSDI) and the emerging GeoSpatial Web. The mission of CEGIS is to:

1) Provide leadership to identify, conduct, and collaborate on GIScience research issues of national importance
2) Provide timely, efficient, and intelligent access to new and archived USGS geographic data needed to conduct science and support policy decisions.
3) Develop innovative methods of modeling and information synthesis, fusion, and visualization to improve our ability to explore geographic data and create new knowledge.
4) Develop credible and accessible geographic research, tools, and methods to support decision making related to the human and environmental consequences of land change.
5) Assess, influence, and recommend for implementation technological innovations for geospatial data and applications.
6) Maintain world class expertise and leadership, and a body of knowledge in support of the NSDI.

CEGIS will also conduct, support, and collaborate in research to address critical geographic information science questions of importance to the USGS as a whole and to the broader geospatial community. As an outgrowth of and complement to this research program, the CEG will support and collaborate in technological innovations that further the implementation of the NSDI. A prioritized research agenda of GIScience issues of national importance will identify the most critical needs and provide a framework for future collaboration with other USGS disciplines and other government, academic, and industry partners. Since CEGIS expects to leverage resources through collaboration, the creation of this research agenda will be a joint undertaking among potential participants both within and outside the Bureau.

Presentation Titles and Abstracts for Tuesday, April 25, 2006

Tuesday Plenary, 8:00 am – 11:45 am

Geospatial Line of Business and Geospatial Modernization Blueprint, *By Karen Siderelis*
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(Abstract not submitted)

Keynote Presentation: What you Need to Know, *By Patrick Leahy*
Acting Director
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(Abstract not submitted)

Protecting America's Health using GIS, *By Brian Kaplan*
MS, MA Geospatial Research, Analysis, and Services Program, Office of the Director, Division of Health Studies/ATSDR, Centers for Disease Control and Prevention, 1600 Clifton Rd., NE, MS E-60, Atlanta,Georgia 30333
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The Centers for Disease Control and Prevention (CDC) is using GIS to protect America's health for all people in all places. CDC began to use GIS in the early 1990s in its National Center for Environmental Health/Agency for Toxic Substances and Disease Registry (NCEH/ATSDR) and its use has since diffused to other parts of CDC. In this talk, the use of GIS to protect people's health in all communities from infections, and occupational, environmental, and terrorist threats will be discussed. The presentation will present an overview of CDC's GIS data, infrastructure, applications, activities, products, people and organizational structure.

The findings and conclusions in this presentation have not been formally disseminated by the Centers for Disease Control and Prevention/the Agency for Toxic Substances and Disease Registry and should not be construed to represent any agency determination or policy.

GIS Trends, By Clint Brown
ESRI, 380 New York Street
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(Abstract not submitted)

Tuesday Hands-On Sessions

Advanced Image Processing, 1:00 pm – 2:55 pm, *By Joe Mostowy*
Senior Applications Analyst, Leica Geosystems Geospatial Imaging
303-799-9453 ext.19 Joseph.Mostowy@gi.leica-geosystems.com
(Abstract not submitted)

Using XTools Pro 3.1, 1:00 pm – 2:55 pm, By Andrei Elobogoev and Viatcheslav Ananev
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This workshop will provide an overview, demonstration, and hands-on exercise using Data East's XTools Pro 3.1 software. All participants will become familiar with the capabilities of XTools Pro, and any questions about the software will be welcomed and addressed by the presenters.

Introduction to ArcGIS, 1:00 pm – 5:10 pm, *By Andres Abeyta*
President, IGIS Technologies, Inc., 10393 San Diego Mission Rd., Suite 212, San Diego, CA 92108
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(Abstract not submitted)

Metadata in the Real World, 1:00 pm – 2:55 pm, *By Sharon Shin[1] and Peter Schweitzer[2]*
[1]U.S. Geological Survey, Denver Federal Center, Box 25046, MS 302, Denver Co., 80225-0046
303-202-4230 Sharon_shin@usgs.gov
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703-648-6533 pschweitzer@usgs.gov
(Abstract not submitted)

IMAGINE Spatial Modeling and Volumetric Measure Using VirtualGIS, 3:15 – 5:10, *By Joe Mostowy*
Senior Applications Analyst, Leica Geosystems Geospatial Imaging
303-799-9453 ext.19 Joseph.Mostowy@gi.leica-geosystems.com
(Abstract not submitted)

Making Maps with ArcGIS, 3:15 pm – 5:10 pm, *By Heather Paskevic*
ESRI, Denver Tech Marketing, One International Court, Broomfield, CO 80021
303-449-7779
(Abstract not submitted)
ArcGIS Spatial Analyst 3:15 pm – 5:10 pm, *By Steve Kopp*
ESRI, 380 New York St, Redlands, CA 92373-8100
909-793-2853 skopp@esri.com
(Abstract not submitted)

Tuesday Lecture Sessions

In the News: GIS and Public Health, 1:00 pm – 5:10 pm, moderated by Yvonne Baevsky

Rapid Response Environmental- and Health-Hazard Characterization of Materials Generated by Extreme Events, ***By Geoffrey S. Plumlee Ph.D., and Greg Meeker***

U.S. Geological Survey, Crustal Imaging and Characterization Team, MS964 Denver Federal Center, Denver, CO 80225
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Large volumes of solid, gaseous, or liquid materials that are of potential concern from an environmental or public health perspective are commonly produced by extreme natural or anthropogenic events such as earthquakes, volcanic eruptions, forest fires, urban fires, landslides, hurricanes, tsunamis and other floods, windstorms, building demolition, and building collapse. The USGS can play a unique role in rapid-response characterization of materials generated by these types of extreme events. A broad spectrum of analytical capabilities spanning USGS regions and disciplines can be applied to help emergency response authorities and the public health community in their initial HAZMAT (hazardous materials) assessments immediately following the events. However, more importantly and more uniquely, USGS expertise can also provide important insights into a) sources of the materials, b) spatial dispersal of materials into the environment, c) how the materials may respond to environmental processes, and d) processes by which the materials may influence toxicity to exposed humans and ecosystems. Geospatial data and GIS technologies are crucial throughout all phases of any rapid response assessment, ranging from the initial response planning through interpretation of results.

The USGS has recently funded a Venture Capital project to investigate the feasibility of establishing a formal Bureau rapid-response capability for characterizing the mineralogy, geochemistry, microbiology, and ecological and human toxicity of dusts, other airborne constituents, and sediments produced by catastrophic natural or anthropogenic events. This talk will use examples from past or ongoing USGS rapid response characterization efforts (2001 World Trade Center, 2004-2005 Mt. St. Helens eruptions, 2005 hurricanes Katrina and Rita) to help illustrate the USGS role, examine lessons learned, and underscore future opportunities for truly interdisciplinary collaboration, including integration of GIS expertise and technologies.

Digital map and database compilations of sites of naturally occurring asbestos in the U.S., ***By Bradley S. Van Gosen***

U.S. Geological Survey, Central Region Mineral Resources Program, Denver Federal Center, M.S. 973, Box 25046, Denver, CO 80225
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The U.S. Geological Survey (USGS) has an ongoing study to locate and characterize known deposits of natural asbestos in the U.S. The first part of this effort was published in 2005 as USGS Open-File Report 2005-1189. That report provided information on historic asbestos mines, asbestos prospects, and reported asbestos occurrences in the Eastern U.S. The map in that report is accompanied by a digital database, which provides information on location, mineralogy, geology, and relevant literature for each asbestos site. These data are being used in a variety of asbestos-related analyses conducted by Federal, State, and local agencies at a wide range of scales. This information has also contributed to a public awareness of the specific distribution of natural asbestos occurrences in the country. Such information is an aid to public and private entities that conduct asbestos research, and assists all concerned with developing scientifically based asbestos procedures and policies designed to minimize asbestos exposures. Similar map-database compilations of sites of naturally occurring asbestos are in preparation for other regions of the U.S.

Mapping Naturally Occurring Asbestos using Imaging Spectroscopy, *By Gregg Swayze, Ph.D.*

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Naturally occurring asbestos (NOA) has been the focus of recent media attention in El Dorado County, part of a rapidly growing suburban community just east of Sacramento in the foothills of the Sierra Nevada in California. The U.S. Geological Survey and the California Geological Survey have teamed up to test promising remote-sensing technology that can identify minerals by their diagnostic spectral signatures using airborne sensors. In 2001, the Airborne Visible/InfraRed Imaging Spectrometer (AVIRIS) was used to collect spectral data in approximately 3-kilometer-wide swaths over selected areas in El Dorado County that contain serpentinite and ultramafic rocks to determine if potentially asbestos-bearing rocks could be spectrally identified. Four flight lines of AVIRIS data were analyzed over areas selected to show trends in the degree of surface exposure as a function of elevation and vegetation cover. Mineral maps created from the data were successfully used to delineate exposures of serpentine and tremolite-actinolite-talc in areas with up to 70 percent vegetation cover. In some cases, the vegetation density is so high that it prevents spectral identification of minerals using remote sensing in those areas. Thus, there may be more serpentine and amphiboles present than are shown on the mineral maps. Currently we cannot spectrally distinguish fibrous from non-fibrous forms of serpentine and amphibole. Not all serpentine and amphiboles are fibrous; just because serpentine or amphiboles were mapped does not necessarily mean they are asbestiform. In particular, it is difficult to spectrally distinguish tremolite-actinolite amphiboles from talc using AVIRIS data, as they are often found intimately intergrown. Field checking at 25 accessible locations has verified the accuracy of the mineral maps. Serpentine has been detected outside known serpentinite outcrop areas, mostly as aggregate that covers unpaved roads. AVIRIS mineral mapping has shown promise as a complement to field mapping but cannot replace it. Because AVIRIS is a remote-sensing technology, the presence of serpentine or tremolite-actinolite needs to be verified in the field by direct observation and by appropriate sampling and laboratory analysis, if needed. At this time, no conclusion regarding the presence or absence of asbestos minerals in the identified areas is possible from the AVIRIS data alone. Unambiguous identification of asbestos minerals in the identified areas would require appropriate sampling and laboratory analysis of the materials in those areas. However, AVIRIS mapping can be used to help guide field work by identifying potentially asbestos-bearing outcrops that might otherwise be missed given time, budget, and access constraints on field work.

The collaboration of CDC's GIS Program with USGS (asbestos, avian flu, pesticides, and water), *By Brian Kaplan MS, MA*

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To protect America's health, the Centers for Disease Control and Prevention (CDC) use GIS to evaluate the spatial distribution and factors of exposure and disease during acute and chronic events. The GIS group at the National Center for Environmental Health/Agency for Toxic Substances and Disease Registry (NCEH/ATSDR) is collaborating with USGS scientists on two projects: 1) exposure to naturally occurring asbestos and 2) the relationships of disease with pollutants in aquifers. Parallel interests with pesticides and avian flu also exist. USGS data is used in these and many other GIS projects at CDC. NCEH/ATSDR staff will discuss these collaborations and propose closer working relationships on projects of national significance in order to create synergies of expertise and infrastructure for surveillance and response.

The findings and conclusions in this presentation have not been formally disseminated by the Centers for Disease Control and Prevention/the Agency for Toxic Substances and Disease Registry and should not be construed to represent any agency determination or policy.

Overview of Activities Linking USGS-NAWQA Data to Public Health, ***By Patty Toccalino Ph.D.***
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(Abstract not submitted)

Are Environmental Exposures to Chlorophenoxy Herbicides Associated with an Increase in Adverse Human Health Effects?, ***By Dina M. Schreinemachers, DrPH***
Epidemiology and Biomarkers Branch, Human Studies Division, National Health and Environmental Effects Research Laboratory, Ofiice of Research and Development, U.S. Environmental Protection Agency, Mail drop 58-A, Research Triangle Park, NC 27711
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Background: Associations between adverse health effects and environmental exposures are difficult to study because exposures may be widespread, low-dose in nature, and common throughout the study population. Individual risk-factor epidemiology may not be able to initially identify an association. A series of multilevel, multidisciplinary studies, starting with an inter-region comparison for the purpose of hazard identification may be required. Existing databases routinely collected by Federal Agencies can be used for this purpose. Examples are provided in the following studies. Minnesota, Montana, North Dakota, and South Dakota produce most of the spring- and durum wheat grown in the U.S. Chlorophenoxy herbicides have been the predominant herbicides applied to wheat. Because information on herbicide use is not available for individual counties, wheat acreage per county is used as a surrogate exposure measure to study the association between rates of adverse health effects and environmental exposures to chlorophenoxy herbicides and/or contaminants. Previous population studies showed that cancer mortality and birth malformations in rural, agricultural counties of Minnesota, Montana, North Dakota, and South Dakota are associated with wheat acreage per county. This presentation will show associations with ischemic heart disease and diabetes.

Methods: Information on mortality from ischemic heart disease and diabetes during 1979-1988 and 1989-1998 (underlying cause of death) was obtained from the National Center for Health Statistics mortality database. Agricultural information was obtained from the U.S. Department of Agriculture website. Analyses were performed on grouped counties, based on the intensity of their wheat agriculture (low, medium, and high).

Results: Comparison of high- with low-wheat counties with adjustment for age, sex, year of death, and poverty index, showed that mortality from ischemic heart disease and diabetes was increased by 8% and 16%, respectively. Mortality from acute myocardial infarction, the major subgroup of ischemic heart disease, showed an increase of 20%. These results were statistically significant.

Conclusions: Because chlorophenoxy herbicides are among the most widely used herbicides in the U.S., further investigations, including GIS studies, are needed to confirm the observed associations.

Dose and route of exposure, distance from cropland, and weather patterns are additional factors that merit attention in future studies.

Disclaimer: This is an abstract of a proposed presentation and does not necessarily reflect EPA policy.

Geospatial Approaches to Animal Disease Management within USDA Veterinary Services, *By Priscilla L. FitzMaurice and Jerome E. Freier, Ph.D.*

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Epidemiologists, veterinary medical officers, and animal health technicians within Veterinary Services (VS) are actively utilizing global positioning system (GPS) technologies in the field for surveillance and emergency response efforts. Several geospatial applications, including GPS receivers and GPS cameras, are used to obtain locational data on livestock and poultry operations throughout the U.S., specifically for disease surveillance and eradication. Data gathered for surveillance purposes are stored within VS' Generic Disease Database (GDB). Alternatively, if the data collected are in response to an animal disease outbreak, they are recorded in VS' Emergency Management Resource System (EMRS).

The GIS and Geospatial Analysis group within the Center for Epidemiology and Animal Health (CEAH) has established minimum data accuracy standards for VS' GPS receivers and provides training to field personnel in data acquisition procedures to ensure that field-collected geographic coordinates are as accurate as possible. Coordinates collected in the field are validated by several methods, including overlaying coordinate points onto aerial photographs or geocoding facility addresses using a detailed road database, such as Tele Atlas.

This presentation will highlight and show examples of how VS is using geospatial analysis and modeling to support disease surveillance, risk assessment, and predict the spread of disease.

Spatial and Temporal Autocorrelation of Emerging Diseases, *By F. Lee De Cola*

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Although an epidemic/epizootic is a series of host-parasite events in time and space, epidemiological data are often counts of such events binned into regular periods and polygonal regions. We may therefore apply autocorrelation techniques to understand changes in intensity and variations in spatial complexity in order to model processes at local to global scales. I have developed an S-PLUS/ArcGIS system that uses yearly U.S. state data for reported pertussis cases to calculate spatial and temporal autocorrelation. The temporal component of the system uses S-PLUS forecasting tools to filter times series data into linear and auto correlated terms that describe trends and cycles and also forecast future levels. Next, the geographic information system (GIS) component uses simple ArcGIS tools to create a database of regional centroids and boundaries that are processed in S-PLUS to produce adjacency matrices. Spatial autocorrelation analysis, applied to historical and forecasted report rates for the nodes of the graph, is used to 1) reveal spatial structure, 2) estimate spatial regression coefficients, and

3) generate finer-scale interpolation. This system is being used to analyze county-level pertussis reports among the states of the U.S. to determine where reporting may be deficient. For example, we find a significant cyclical component to reporting that may be due to underlying epidemiological feedback, but there are regional low-intensity clusters that may reflect state-level inadequacies in reporting practices. A major challenge in understanding new and re-emerging diseases is the analysis of rapidly changing time/space patterns, but equally critical is the use of such analysis to improve reporting systems built upon local, regional, and national public health infrastructure. The system is therefore being expanded to analyze weekly county-level human and avian West Nile virus data for the U.S. as well as broader 'state'-level data for North America (Canada, US, Mexico). However, the approach can be used for any dataset measured for regions at regular time periods. An obvious extension of this approach would be to link regions temporally using directed edges from one time 'layer' to the next. A major technical challenge of this work is the integration of space/time models and tools across statistical and GIS technologies, a critical topic to be explored at this Workshop.

ArcGIS Road Ahead, 1:00 pm – 5:10 pm, *By Bart Killpack*

ESRI, Denver Regional Office Manager, One International Court, Broomfield, CO 80021
303-449-7779
(Abstract not submitted)

Cartography, Data Sharing, Publications, and Archiving, 1:00 pm – 5:10 pm, *moderated By Barb Ray and Mike Mulligan*

CLICK: The New USGS Center for LIDAR Information Coordination & Knowledge, *By Jordan Menig*

U.S. Geological Survey, EROS Data Center, 47914 252nd Street, Sioux Falls, SD 57198-0001
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The Center for LIDAR Information Coordination & Knowledge (CLICK) was created to facilitate data access, user coordination, and education related to raw point cloud light detection and ranging (LIDAR) data for scientific needs. CLICK provides an easy point of contact for partners and potential partners to coordinate efforts on LIDAR data collection and data availability, which reduces costs to all interested parties. This effort will complement the National Digital Elevation Program (NDEP), a consortium of Federal agencies working together to facilitate the collection and use of high-resolution elevation data, as well as the National Elevation Dataset (NED), by allowing access to more elevation data than only bare-earth digital elevation models (DEM). All data collected through CLICK will feed NDEP discovery and acquisition activities and vice versa. The primary mission will not be purchasing LIDAR data, but collecting, processing, researching, distributing, and organizing LIDAR data that has already been acquired, as well as helping potential future collections. The CLICK Web page (http:\\lidar.cr.usgs.gov) is a virtual center where scientists and managers can pose and answer LIDAR-related questions. The Web page consists of a data viewer, a bulletin board, and a page for peer-reviewed journal references and Web links to help users find their own solutions. This virtual center provides access, information, coordination, and training for using LIDAR data, calling upon the expertise and knowledge of LIDAR research and projects throughout the U.S. Geological Survey (USGS) and beyond. This centralized coordination tool will allow for use of data not traditionally available to scientists and managers due to cost, access, or simply lack of communication. CLICK will be a powerful tool not only for the USGS, but for anyone interested in any aspect of LIDAR data.

USGS Digital Imagery Quality Assurance Plan, *By Gregory Stensaas*

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(Abstract not submitted)

It's Time to Renew Your Cartographic License: Brushing up on Basic Cartographic Principles, *By Maria McCormick*
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(Abstract not submitted)

DHS FEMA Geospatial Service Center: A Reference Implementation of the DHS Geospatial Enterprise Architecture, *By Drew Douglas and Fawad Siraj*
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703-961-3371
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Physical Terrain Modeling in a Digital Age, *By Lawrence Faulkner*
President, Solid Terrain Modeling, Inc., 340 Fillmore St., Fillmore, CA 93015
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(Abstract not submitted)

Enriching the Geospatial Web Experience, *By Peter N. Schweitzer and Bruce R. Johnson*
U.S. Geological Survey, Geology, Eastern Mineral Resources Team, MS 954 National Center, 12201 Sunrise Valley Drive, Reston VA 20192
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Internet map services in their current form provide geospatial scientific data in only minimally understandable ways. This is because web map systems have been developed with a primary focus on the geographic content of the information, and typically make the assumption that the user possesses complete scientific knowledge of the data through previous experience. To be usable by people who do not already have specialized knowledge of the data presented, the web map service needs to be coupled with informative reference services (in addition to formal metadata) and link directly to web services that facilitate downloading the data for further scientific processing, possibly outside the GIS environment.

The USGS Mineral Resources On-line Spatial Data web site shows ways in which these concerns can be addressed using a combination of GIS, web, and information technologies. Scientific data can be shown on maps using standard web browsers, accessed through GIS clients, and downloaded selectively using separate database services. All of these are tied together through consistency of terminology and ready explanations.

Guidelines on Releasing Geospatial Data, *By Jennifer B. Sieverling[1] and Gregory Allord[2]*
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(Abstract not submitted)

National Datasets – 1:00pm – 5:10 pm, *moderated by Catherine Costello*

CENSUS Data, *By Jim Castagneri*

U.S. Census Bureau
303-969-5191 castagne@census.gov
(Abstract not submitted)

National Map Vector Dataset Development, *By Paul Wiese*

U.S. Geological Survey, Geographic Information Office, PO Box 25046, MS 509, Denver, CO 80225-0046
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The USGS, National Geospatial Technical Operations Center (NGTOC), has developed four National vector datasets for the National Map: hydrography, transportation, structures, and governmental units. Leveraging resources of multiple agencies to design and build the datasets, a system containing over 50 million features is in place to begin a process of continuous improvement through transactional data exchanges with local, state, and regional cooperators. In addition to our traditional requirements for mapping and resource management, the USGS has worked with ESRI and other cooperators to design a data model that encompasses the core data considered critical to homeland security efforts for disaster planning and response. These four data themes are a subset of this model and the first national implementation of this approach. The system design is a geodatabase data model running on ArcSDE 9.1/Oracle 10G with interfaces in ArcIMS 9.1 for data viewing and data download and in ArcGIS 9.1 for data packaging to shapefile, geodatabase, or coverage formats. The data are developed using tools ranging from ArcView 3+ to ArcGIS 9.1 with the Data Interoperability extension. The system architecture involves proxy, web application, and spatial servers set up in parallel processing paths for failover and load balancing. The databases are distributed over multiple systems consisting of working databases for change management and a separate system optimized for data distribution with public access. Other developments around the corner include automated two-way data synchronization with local and regional data centers and implementation of remote standby databases and systems for more robust failover and recovery capabilities.

Active Mines and Mineral Processing Plants - 2004 Updates and Applications, *By Robert M. Callaghan[1] and John F. Papp[2]*

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The minerals information mission of the U.S. Geological Survey is to collect, analyze, and disseminate information on the domestic and international supply of and demand for minerals and mineral-based materials essential to the United States. Fundamental to this mission is the geographic aspect of mining and mineral material processing. GIS studies of active mines and mineral plants undertaken by the USGS include projects that can result in both economic and environmental benefits. An example can be found in Open File Report 2004-1336 "Lime Kiln Dust as a Potential Raw Material in Portland Cement Manufacturing" which identifies potential cooperative relationships between lime plants that need to dispose of lime kiln dust and cement plants that can use it.

The USGS conducts more than 140 voluntary surveys on commodities ranging from abrasives to zirconium. These surveys cover both production and consumption of minerals and mineral materials and are sent to over 18,000 establishments. Publications, available at URL: http://minerals.usgs.gov/minerals/ include Minerals Yearbooks, Mineral Commodity Summaries, Mineral Industry Surveys, Metal Industry Indicators, and Nonmetallic Mineral Products Industry Indexes. While proprietary data such as individual company production amounts cannot be released to the public, regionalized studies can be undertaken to show production at state or county level. Thematic maps can be found in some of the Minerals Yearbook chapters. Internally, thematic maps of production were used in creating the generalized maps showing major producing regions that can be found in the Mineral Commodity Summaries. Spatial data are published through the National Atlas (URL:http://www.nationalatlas.gov), through the Mineral Resources On-Line Spatial Data Website (URL:http://mrdata.usgs.gov) and through two CD-ROMs. One is called the Aggregates Industry Atlas of the United States CD-ROM Version 2, which is a cooperative project with the National Stone, Sand and Gravel Association, and the other is a cooperative project with the Mineral Information Institute called Minerals in Your World Version 2.

The active mines and plants data set produced by the USGS is continually updated because the activity status of operations changes from year to year and because new methods are being developed to improve the quality of data through using multiple sources of data and cross-checking. Currently, the 2003 data set is being updated to 2004.

Background Status and Applications of the 2001 National Landcover Database, *By Joyce A. Fry, Collin Homer, and Michael Coan*

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The National Land Cover Database (NLCD 2001) project is under the supervision of the United States Geological Survey (USGS) in cooperation with eight other Federal partners. Landsat-7 imagery provides the foundation for the database that includes the following: (1) normalized landsite imagery for three time periods per path/row, (2) ancillary data including a 30 m DEM, slope, aspect, and a positional index, (3) per-pixel estimates of percent imperviousness and percent tree canopy, (4) 21 classes of land-cover data derived from the imagery, ancillary data, and derivatives, (5) classification rules, confidence estimates, and metadata from the land cover classification, and (6) a change detection product. These NLCD 2001 components provide data for many applications in areas such as fire fuels mapping, watershed runoff modeling, wildlife habitat analysis, and hazards modeling. This database employs a mapping zone approach, with 65 zones in the continental U.S. and 12 zones in Alaska. Now in the production phase, this project takes advantage of extensive partnering in the federal government and outsourcing to the private sector, to meet the planned completion date of year's end 2006. All completed data are web enabled to allow user review and download. The background and current status of the database will be reviewed, with application examples to illustrate how different groups are using the data.

NASA LP DAAC and USGS EROS Data: What We Have and Where to Get It, *By Roger Oleson and Jon Walkes*

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The U.S. Geological Survey (USGS) Center for Earth Resources Observation and Science (EROS) User Services and NASA Earth System Science, Land Processes Distributed Active Archive Center (LP DAAC) User Services, hosted at the USGS EROS in Sioux Falls, South Dakota, will present the following introductory presentation focusing on data specifications, availability, and access for the full suite of NASA LP DAAC and USGS remote sensing data products and services offered by EROS.

We will offer information on the data products available from NASA and the USGS. The NASA LP DAAC products that will be discussed begins with a brief overview of the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) instrument on board the Terra satellite and the Moderate Resolution Imaging Spectroradiometer (MODIS) instruments on both the Terra and Aqua platforms. Next, methods for locating, reviewing and ordering these data through the EOS Data Gateway (EDG) and Data Pool will be presented. We will conclude with an overview of a variety of tools available for manipulating data format, projection, and sub-setting, and providing data analysis and quality assessment. Examples of data output and data applications will be on display during the workshop. We will also offer data set specifications and information on a variety of other USGS EROS products.

The LP DAAC and USGS User Services are responsible for guiding the development and testing of data search and access tools, ensuring that products conform to the expectations of the user community, testing products and software compatibility, providing technical assistance to users, processing order and DAR requests, and provides outreach to our user community.

Progress and Status of the Watershed Boundary Dataset (WBD), ***By Michael T. Laitta[1] and Karen Hasen[2]***

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(Abstract not submitted)

Tuesday Poster Session, 5:15 pm – 7:30 pm

GIS Activities in the USGS Central Energy Resources Team: A Model for Expanding GIS Utilization, ***By Laura R.H. Biewick[1], Gregory L. Gunther[2], Christopher C. Skinner[2], and David A. Ferderer[2]***

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The U.S. Geological Survey (USGS) is responsible for providing the Federal Government with objective scientific information to support decisions regarding land management, environmental quality, and economic, energy, and strategic policy. To fulfill this responsibility, the USGS conducts geologic framework studies to periodically assess (1) the Nation's oil, gas, and coal resources; and (2) resources in the principal petroleum provinces throughout the world.

A primary objective for the implementation of Geographic Information System (GIS) technologies by the Central Energy Resources Team (CERT) is to improve access to maps, assorted data sources, and other geospatial services. Because GIS improves the capability of decision makers to analyze layers of disparate data, the goal is to simplify discovery, access, and use of these geospatial data and services for USGS scientists, as well as for potential outside customers.
Use of GIS technologies by the CERT is enhancing research activities related to project workflow and information access and discovery by providing (1) efficient, centralized data management and data visualization; (2) ease in sharing data and interpretations among project personnel; and (3) dissemination of information and products to customers in an easily usable format.

CERT GIS activities include Internet Map Services and Metadata Services, which are also being leveraged in global networks that provide the infrastructure needed to support the sharing of geographic information. These portals include the National Spatial Data Infrastructure, the Geography Network, and the GeoSpatial One-Stop. Major tasks include thorough treatment of the technical issues related to application deployment, security, and system architecture. Demonstrations of the National Assessment of Oil and Gas (NOGA) Online, Gulf Coast Geology (GCG) Online, Gulf Coast Information Access System, and World Energy Assessment applications illustrate how interactive maps and publication services provide easy access to organized assessment results, geology, and other CERT project data and interpretations.

This poster presentation provides information on how the USGS is using Environmental Systems Research Institute (ESRI), ArcGIS tools to provide its scientists with groups of data layers that they can work with in either ArcMap or via their browsers. The technical aspects of GIS operations are advanced and complex. This poster presentation will not go into the details of all technical aspects, but will provide sources for such information.

Using a Wheel-Based Mounted GPS System for Rapid Data Collection and Digital Elevation Model Creation, *By Jason Masoner and Marvin Abbott*
U.S. Geological Survey, Oklahoma Water Science Center, 202 NW 66th St., Oklahoma City, OK 73116
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The USGS, in cooperation with the Osage Nation, Department of Energy, and U.S. Environmental Protection Agency, is investigating the effects of hydrocarbons and produced water (brines) on soil and ground and surface water. The study is focused on the natural processes that may be mitigating effects of hydrocarbons and brines at two sites adjacent to Skiatook Lake in the southeastern part of the Osage Reservation in northeastern Oklahoma. A high- resolution Digital Elevation Model (DEM) is needed to visualize conditions and calculate terrain characteristics.

A high-resolution DEM was created using topographic data collected using a dual-frequency kinematic Global Positioning System (GPS) receiver and Geographic Information System (GIS) surface-interpolation techniques. The GPS equipment consisted of a Trimble 4700 base station, transmission antenna, transmitter, GPS rover, and a data logger. The GPS rover antenna was fastened to a wheel-mounted data collection unit. A person pushed the wheel-mounted data collection unit and the GPS record a position every 5 seconds. Two sites (A-Site and B-Site), each about 20 acres, were surveyed over a four day period. A DEM with a 0.5 meter cell size was created using the Topogrid module in ArcInfo. Contours were created with a 0.2 meter contour interval.

Over 3,100 data points were collected at A-Site and 5,000 points were collected at B-Site, completed using the wheel-mounted data collection unit. Quality assurance was performed by 3-minute occupations of survey monuments, previously established at both the A-Site and B-Site. Results at A-Site showed that National Mapping Standard at a 1:1,500 scale could be achieved. Results at B-Site showed that National Mapping Standards at a 1:1,000 scale were exceeded. The additional topographic points collected at the B-Site allowed for better resolution of topographic features.

Digital Data Atlas of the Fort Cobb Watershed, *By Jason Masoner and Seth Tribbey*
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Numerous data have been collected by state and Federal agencies in the Fort Cobb Watershed. However, to date, these data have not been compiled in a form that can be adequately queried to evaluate the effects of conservation practices. To aid in the decision-making process, the USGS has developed a Digital Data Atlas for the Fort Cobb Watershed that consists of spatial and environmental data in a 3,200 square mile 8-digit hydrologic unit. The Digital Data Atlas of the Fort Cobb Watershed contains 25 digital-map data sets and environmental data covering parts of Beckham, Caddo, Canadian, Comanche, Custer, Dewey, Grady, Kiowa, and Washita Counties in southwestern Oklahoma.

Environmental data included in the atlas were retrieved from the USGS National Water Information System database. Data were collected by the U.S. Geological Survey, U.S. Army Corps of Engineers, U.S. Department of Agriculture, Oklahoma Conservation Commission, and the Oklahoma Department Health. These data include more than 150,000 measurements of surface-water and ground-water quality, stream flow, and ground-water levels between 1903 and 2005. Additional water-quality and biological data from the USGS Biological Resources Discipline were provided from a biological assessment study of the Fort Cobb Reservoir in 2000–2003.

Comparing Geographic Information System Stream Slope Methods to Field Measurements in Minnesota, *By Christopher A. Sanocki[1], Matt Kocian[2], and Bruce C. Vondracek[3]*
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Existing methods for determining stream slope using Geographic Information System (GIS) hydrologic models and U.S. Geological Survey digital elevation models (DEMs) will be compared with field measurements of stream reaches. The objective is to compare slopes derived from various GIS techniques and identify a method for estimating stream slope from DEMs that best emulates field measurements. Stream slope is required when calculating stream power and is used to measure the erosive capacity of moving water. A stream segment with high slope (and thus, high stream power) will often have a significantly greater amount of course substrate and provide more heterogeneous habitat than a nearby segment with low stream slope. Although field techniques for measuring stream slope are standardized such GIS methods have the potential to expedite slope estimates over larger areas in a consistent and efficient manner. By estimating slope values at different sites throughout Minnesota, the expectation is to examine possible relations between fish assemblages, and stream power. This effort has been possible through partnerships with the U.S. Geological Survey, University of Minnesota and the Minnesota Department of Transportation.

Presentation Titles and Abstracts for Wednesday, April 26, 2006

Wednesday Plenary, 8:00 am – 11:30 am

State/local Partnerships and the 50 States Initiative, *By Gene Trobia*
State Cartographer, Arizona State Land Department, 1616 W. Adams Street, Phoenix, Arizona 85007
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(Abstract not submitted)

USGS Geospatial Liaisons - Who, What, Where and Why?, *By Christopher Kannan, Bruce Bauch, Vicki Lukas, and Lance Clampitt*
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The National Geospatial Programs Office has made a commitment to its State and local partners to establish National Spatial Data Infrastructure (NSDI) Partnership Offices and place a U.S. Geological Survey (USGS) Geospatial Liaison in each State to support the community in developing components of the NSDI. These offices are managed by the Regional Geospatial Information Offices (RGIOs) and are collocated primarily with Water or Biology Science Centers across the country. Recently, there has been an effort to develop and standardize the functions of the Geospatial Liaison position and to develop consistency in the services provided across USGS Regions, including interactions and roles with USGS colleagues in all disciplines. This presentation will give an overview of the Geospatial Liaison position and its functions and roles. Current examples of how Geospatial Liaisons are working with their host Centers will be highlighted. Other highlighted topics will be interactions with other disciplines and the broader science community.

NBII's Geospatial Interoperability Framework: Making Standards Work!, *By Donna Roy*
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In the role of fulfilling its mission of bringing biological information to the internet, U.S. Geological Survey's National Biological Information Infrastructure Program (USGS-NBII), NBII nodes and NBII partners have developed dozens of live ArcIMS HTML Viewer and other mapping applications. While each application may be developed for users working within a particular biological issue or concern, the focus of NBII's Geospatial Interoperability Framework is to provide users of each of these individual biological issue or concern based ArcIMS applications, the capability to discover and visualize additional biological content from within that application.

Therefore, NBII is building a Geospatial Interoperability Framework (NBII-GIF), leveraging the OGC specifications to allow for increased functionality for NBII's end users. Using those specifications

that provide practical, sustainable results in a production environment, NBII is realizing gains in productivity and data accessibility. The NBII Geospatial Interoperability Framework (GIF) is a comprised of a series of services and components designed to allow the NBII, its Nodes and Partners, and users, the capability of searching and discovering geospatially referenced biological resources.

NBII has completed the installation of the Phase 1 components, including the core of the GIF which is an OGC Catalog Server. NBII has developed a series of toolkits for accessing the OGC Catalog server and other geospatial services from existing ArcIMS HTML-based applications, for new rapid deployment of interoperable Internet Mapping applications. These toolkits allow NBII Nodes to create interoperable Internet Map Services within days, not the weeks or often months of normal development.

From within the applications built upon these templates, the NBII user can search from a list of available OGC catalog servers (such as NBII's Catalog, NASA Catalog, or even the Geospatial One-Stop Catalog) or provide any other OGC catalog server URL, to find additional content. Users can dynamically add layers from the search of these OGC services and perform identify, zoom-in, zoom-out, show legend, show metadata, and perform other operations on it. This enhancement has provided the non-sophisticated users of these biological issue or concern based ArcIMS applications with the tremendous flexibility of performing data analysis not envisioned by the developers of those applications, all without the timely and cumbersome process of loading spatial data onto a server.

Introducing the NHDPlus, *By Alan Rea*
U.S. Geological Survey, Idaho Water Science Center, 230 Collins Road, Boise, ID 83702
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The NHDPlus Version 1.0 is an integrated suite of application-ready geospatial datasets that incorporate many of the best features of the National Hydrography Dataset (NHD), and National Elevation Dataset (NED). The NHDPlus includes a stream network, based on the medium resolution 1:100,000-scale NHD, improved networking, naming, and "value-added attributes". NHDPlus also includes elevation-derived catchments that were produced using a drainage enforcement technique first broadly applied for the New England SPARROW model, and thus dubbed "The New-England Method". This technique involves enforcing the 1:100,000-scale NHD drainage network by burning it into the NED and using the national Watershed Boundary Dataset (WBD), when available, to enforce hydrologic divides. The resulting modified digital elevation model is used to produce catchments (or areas that drain directly to each NHD flowline) that closely conform to the WBD. An interdisciplinary team from the U.S. Geological Survey (USGS), U.S. Environmental Protection Agency (USEPA), and contractors, over a two-year period (2003-4) found that this method produced the best quality catchments feasible in a relatively short time frame. In addition to catchment areas, land-cover categories, mean annual precipitation, and mean annual temperatures for each catchment have been computed. These catchments attributes have been accumulated using the NHDPlus flow network to compute cumulative attributes for each flow line in the network. The cumulative attributes have been used to compute estimates of mean annual stream flow volume and mean annual stream velocity for each flow line. These integrated geospatial datasets constitute a national geospatial surface-water framework—the NHDPlus.

Wednesday Hands-On Sessions

Image Processing with ENVI, 1:00 pm - 2:55 pm, *By Adam O'Connor*
RSI, 4990 Pearl East Circle, Boulder, CO, 80301
303-786-9900 ext 1433 aoconnor@rsinc.com

(Abstract not submitted)

Implementing ArcGIS Server, 1:00 pm - 5:10 pm, *By John Waterman*

Director Of Geospatial Services, GCS Research LLC
802-473-4009 jwaterman@gcs-research.com

(Abstract not submitted)

Geospatial One-Stop, 1:00 pm - 2:55 pm, *By Robert Dollison[1] and Jacque Fahsholtz[2]*

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(Abstract not submitted)

ArcPad 7.0, 1:00 pm – 2:55 pm, *By Finn Dahl*

ESRI, DC Tech Marketing, One International Court, Broomfield, CO 80021
303-449-7779

(Abstract not submitted)

Hyper-spectral Analysis with ENVI, 3:15 pm - 5:10 pm, *By Adam O'Connor*

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(Abstract not submitted)

Finding USGS Geospatial Data Online - 3:15 pm - 5:10 pm, *By Joseph Kerski[1] and Curtis Price[2]*

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U.S. Geological Survey (USGS) geospatial data is available from many sources inside and outside the USGS. The variety of Web sites and Web services delivering these data can involve many different formats, scales, and spatial extents and may present a challenge to users of Geographic Information Systems (GIS) technology. This workshop will provide GIS users with the practical skills and information they need to locate and access USGS geospatial data sets. Some of the most important data distribution sites will be highlighted, including the National Map Seamless Server, the National Atlas of the United States, the National Hydrography Dataset portal, Geospatial One-Stop, the USGS Publications Warehouse, and the GeoCommunity portal. Workshop attendees should be familiar with ESRI ArcGIS software so they can fully participate in a guided hands-on exercise in locating, downloading, and analyzing raster and vector geospatial data using ArcGIS Desktop version 9.1.

Geoprocessing in ArcGIS 3:15 – 5:10 pm, *By Corey Tucker and Steve Kopp*

ESRI, 380 New York St, Redlands, CA 92373-8100
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GIS professionals require a system that allows the automation of their workflows within a GIS in order to accomplish large tasks and reproduce their work. The combination of several hundred tools and the geoprocessing framework with ArcGIS fulfills this requirement. This session will explore the tools that may be used to solve hundreds of tasks that fall into categories such as analysis and data management. It will also show how to create workflows using ModelBuilder, an easy to use visual tool for creating custom workflows, and demonstrate the Python scripting environment, which gives users a powerful and flexible environment to accomplish their scientific computing needs.

Wednesday Lecture Sessions

Modeling with ArcGIS, 1:00 pm – 2:55 pm, *By Corey Tucker and Steve Kopp*

ESRI, 380 New York St, Redlands, CA 92373-8100
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ArcGIS provides a framework for the creation, integration, and sharing of spatial models and modeling processes. The first half of the session will present the framework, techniques and guidelines for the integration and sharing of spatial models. The second half will discuss how to use tools in ModelBuilder and scripts to do process and simulation modeling and also discuss what techniques can be incorporated into the modeling process to perform sensitivity and error analysis on model results.

GIS Partnerships and Education, 1:00 pm – 5:10 pm, *moderated by Joseph Kerski*

Development of Local Resolution National Hydrography Dataset in North Carolina, *By Christopher Kannan, Silvia Terziotti, Steve Strader, and Chad Wagner*

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The North Carolina Studies Act of 2004, Senate Bill 1152, called for a plan to improve the mapping and digital representation of surface waters in North Carolina. The North Carolina Stream Mapping Working Group was established in October 2004 in response to the bill. The working group consists of members from local, State and Federal governments and academia. The resulting plan was presented to the N.C. Environmental Review Commission on January 13, 2005. Information on the working group and plan can be found at http://cgia.cgia.state.nc.us/streammap/

In addition, the Hurricane Recovery Act of 2005 included funding to implement the plan for 19 counties in western North Carolina declared Federal disaster areas as a result from Hurricanes Frances and Ivan. The plan specifically calls for the generation of a local resolution stream product that will depict attributed streams with drainage areas greater than 6 acres. To accomplish this, a Streambed Mapping Advisory Group has been formed. The U.S. Geological Survey (USGS) N.C. Water Science Center and N.C. National Spatial Data Infrastructure (NSDI) Partnership Office personnel are part of this advisory group. The advisory group has recommended that the local resolution stream product be part of the National Hydrography Dataset (NHD).

Multiple USGS disciplines and regions are involved in this effort, and this presentation will provide an overview of the plan and participation by the USGS for developing the local resolution NHD product. In addition, current techniques for generating the line work and geodatabase design will be outlined.

Project Homeland - Colorado Pilot, ***By Chuck Matthys***

U.S. Geological Survey, National Geospatial Technical Operations Center 2, Box 25046, MS 509, Denver, Colorado, 80225-0046
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Availability of geospatial data to first responders is critical across jurisdictional boundaries. The Project Homeland Colorado Pilot, consisting of USGS, ESRI, and the State of Colorado, is designed to initiate the development of data sharing and the synchronization of national, state, and local geospatial data. The Homeland Security Best Practices Model and the ability to convert data to and from this data model is a key component to producing up-to-date nationally consistent data in support of Homeland Security.

Data Partnerships – Existing Models for Orthophoto Collection – Case Studies, ***By Dick Vraga[1] and Christopher T Kannan[2]***

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The USGS has realigned the geospatial programs for which it has a leadership responsibility into a National Geospatial Programs Office (NGPO) to serve the needs and interests of the geospatial community throughout the Nation. With the creation of the NGPO, the essential components of delivering the National Spatial Data Infrastructure (NSDI) and capitalizing on the power of place will be managed as a unified portfolio that benefits the entire geospatial community. The emphasis of the NGPO will be to engage partners throughout the geospatial community in its planning and in ensuring that its unified portfolio meets the needs of those on the landscape.

The NGPO, through the Geospatial Liaisons, is developing partnerships for collection and access to digital orthophotos. Digital orthophoto-imagery is an essential framework data layer and cooperative efforts provide significant savings for all parties involved in acquiring and accessing it. This presentation will discuss some of the different coordination models that are being used in several states including Wisconsin, Illinois, Indiana, and North Carolina. A new proposed approach, "Imagery for the Nation", will be included in the discussion. Points of emphasis will include the environmental factors that lead to the use of these models and some of the costs and benefits of each. The goal is to provide insight into the various approaches that have been used and lessons learned during the process.

Educational Developments in GIScience, *By Joseph J. Kerski*

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Understanding the latest developments in GIScience education can help USGS employees seek the best resources in their own professional development and more effectively partner with other organizations. Education and research have always been inextricably linked throughout the history of the USGS, beginning with John Wesley Powell's tenure as a public school teacher. Educational partnerships can lead to data and research partnerships with universities, professional societies, nonprofit organizations, and private enterprise. With new web mapping services appearing daily, online courses, tools such as Google Earth and NASA WorldWind, new textbooks, and government studies and funding, the field of GIScience education is rapidly expanding and changing. In 2004, the U.S. Department of Labor included geotechnologies in their list of the three fields that promised to expand the most during the 21st Century. In 2006, the National Academy of Sciences issued a report entitled "Learning to Think Spatially: GIS Across the Curriculum." This report provides another example of the increasing ties between GIS research and education and gives additional opportunities for partnerships. This session's presentation of these new resources and developments may enable USGS employees to advance their professional growth and partnerships in the field of GIS.

The U.S. Geological Survey's Role at United States Northern Command, *By Lee W. Aggers[1] and Sherry Durst[2], and David Bortnem[2]*

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US Northern Command (NORTHCOM) is headquartered in Colorado Springs, CO. NORTHCOM is responsible for the U.S. Military's Homeland Defense and Defense Support Civil Authorities. USNORTHCOM executes mission responsibilities through its traditional staff Directorates as well as an Interagency Directorate. The Interagency Coordination Directorate is responsible for supporting the NORAD-NORTHCOM (N-NC) Joint Interagency Coordination Group (JIACG), which currently consists of over 50 resident Agency Representatives (Reps), Component and other Combatant Command Liaisons (LNOs), the Interagency Directorate support staff, and Reps from each of the Command Directorates.

In September 2002, a Memorandum of Agreement was signed between NORTHCOM and the US Geological Survey (USGS). The agreement formalizes coordination and information sharing capabilities between NORTHCOM and USGS. Through this MOA USGS provides personnel to NORTHCOM who participate in day-to-day operations, real-world events, training/exercises and working groups at the command.

As part of the NORTHCOM DSCA mission, NORTHCOM is interested in all hazards, man-made and natural. As such, USGS science, remote sensing and GIS assist NORTHCOM and other Federal agencies develop situational awareness and obtain natural hazard education/support. USGS scientists and other personnel have supported NORTHCOM in events such as the volcanic eruptions of Mt. St Helens (2004), St. Augustine, significant seismic events, hurricanes Katrina/Rita, California wildfires and more.

National Hydrography Dataset (NHD) Stewardship and Maintenance Program, *By Paul Kimsey*

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The National Hydrography Dataset (NHD) concept revolves around a nationwide partnership to produce and maintain a single source of high resolution (1:24,000) and local resolution (1:5,000) scale hydrography data. Initial data integration and creation have been a huge success and with 80% completion of high resolution, now is the time to continue that success in data maintenance. With NHD in the hands of so many active users, the sophisticated applications of these users have created a demand for an even greater level of data capability. The USGS is working with those agencies or groups that are interested in becoming a NHD data steward. Common needs and interests offer opportunities for partnerships to collect, maintain, access, and use basic spatial data among federal agencies and with other public organizations, notably state and regional organizations. The most direct benefit of shared maintenance is the ability to know about changes on the landscape and to receive spatial data that faithfully represents those changes.

Trends in Federal Policy and the Implications for Federal Program Managers and Information Technology Professionals, *By John Steffenson*

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This is a discussion of the importance of geospatial systems as a critical component of enterprise information technology in the context of fiscal year 2007 budget direction, evolving Office of Management and Budget (OMB) policy, and Federal Enterprise Architecture (FEA). As organizations move towards compliance with these new policies and guidance, geospatial requirements must be considered as part of the overall architecture and evaluated in an integrated fashion with all other mission information systems. Service-Oriented Architecture (SOA) is discussed, highlighting the benefits and agility of this architecture and the critical importance of being able to clearly articulate the geospatial lines of business as called for in the President's budget.

Productivity Tools, 1:00 pm – 2:55 pm

Data East's Productivity Tools For GIS, *By Andrei Elobogoev and Viatcheslav Ananev*

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This session will present the software products and services of the company Data East. This session will give the participants some general ideas about the company: who they are, what they do and what they want to contribute to the USGS Workshop. Then a more detailed overview of Data East's software products will be presented, including XTools Pro, Personal Internet Map Server, TAB Reader for ArcGIS, and Smart Search for ArcGIS.

Elevation 2, 1:00 pm – 2:55 pm, *moderated by Pete Chirico*

ASTER DEM Development in Mountainous Terrain for Natural Resource Assessments in Afghanistan, *By Michael Warner and Peter G. Chirico*

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There are numerous challenges associated with DEM extraction from Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) sensor data in the mountainous terrain of Afghanistan. Currently, the highest resolution, publicly available DEM dataset for Afghanistan is the 3 arc-second (90 m), Shuttle Radar Topography Mission (SRTM) data, which has limited utility beyond macro-scale DEM analysis and mapping. Higher resolution data, 1 arc-second (30 m), are more suitable for landform classification, geologic structure analysis, and natural resource assessment applications. The ASTER visible and near infrared sensor (VNIR) system generates along-track stereo images that can be used to develop higher resolution (30 m) DEMs using digital photogrammetry and stereo-auto correlation techniques.

Previous studies demonstrate the ability to derive 30 m DEMs from ASTER for a variety of applications. Few studies focus on regional-scale projects where multiple ASTER DEMs are edge matched and mosaicked. Even fewer have assessed DEMs developed in high mountainous terrain. Our study presents the challenges and solutions associated with regional-scale DEM production in high mountainous terrain, and how terrain factors, slope and the pointing angle of ASTER's VNIR sensor affect the output elevation product.

For this study, 86 absolute DEMS were created and extracted using PCI Geomatica's Orthoengine software. The resultant DEMs exhibited common errors from the stereo-auto correlation process that occurred in image areas corresponding to cloudy and snow covered areas, lakes, steep slope areas, and southeastern facing slopes. As a result of these features, poorly correlated elevation values produced erroneous holes, large pits and spikes in the initial elevation model output.

Preliminary analysis was performed on the slope values of the 90 m SRTM data and the ASTER scene metadata. The results indicate that erroneous elevation values corresponded with steep slopes and scenes collected with high, off-nadir pointing angles. To address these errors, multiple scenes were acquired with low off-nadir pointing angles and overlapping DEMs were produced and mosaicked to fill void areas. In addition, a progressive morphologic filter was applied as a post processing step to remove pits and spikes. These post-processed and mosaicked DEMs produce more accurate and visually appealing elevation models for landform classification, geologic structure analysis, and natural resource assessment applications.

Improving the accuracy and quality of photogrammetrically derived high-resolution digital elevation models through the development of a raster-based progressive morphological filter, *By Peter G. Chirico*

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High-resolution digital elevation models (DEMs) can be derived from stereo aerial photographs or satellite imagery by utilizing digital photogrammetric and stereo-autocorrelation techniques. Stereo auto-correlation algorithms measure the amount of parallax and calculate elevation values on a pixel-by-pixel basis for all pixels matched in a set of stereo images. Poorly matched pixel values result in erroneous elevation values or failed values which are exhibited in the output DEM as pits, spikes, and void areas.

To improve the quality of output DEMs, most software routines employ a low pass filtering technique to smooth elevation values. This technique reassigns a mean elevation value for a 3x3, 5x5, or 7x7 pixel window around all cell values. Calculating a mean elevation in a window containing a large pit or spike biases the values of all cells within that window and reduces, but does not eliminate the erroneous value. A progressive morphological filter was developed to target and filter only erroneous pit and spike data values in raw DEM data produced from a stereo auto-correlation process.

The progressive morphological filter iteratively compares individual raw elevation values to a set of focal neighborhood statistics and a user defined threshold value. Elevation differences between the raw value and the neighborhood statistics are compared to the threshold value. Raw values that exceed the threshold are replaced with a focal minimum, focal maximum, or focal median value based on the characteristics of the elevation value in question. The filter progresses through four stages whereby elevation values are compared to increasingly smaller neighborhoods and a progressively reduced threshold value. The result is that only elevation values that exceed the defined parameters are replaced; all other values remain unchanged and the overall output quality is improved without degrading the high resolution fidelity of the DEM.

Latest Trends and Successes in LIDAR Feature Filtering and Fused Dataset Classifications, *By Mark Romano*
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(Abstract not submitted)

Elevation Derivatives for National Applications - Past, Present and Future, *By Susan Greenlee[1], Kristine Verdin[1], Bruce Worstellca[1], and the Science Applications International Corporation[2]*
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The U.S. Geological Survey (USGS) Geography Discipline, in collaboration with the National Weather Service, the Environmental Protection Agency, and the USGS Water Discipline, generated the initial version of the Elevation Derivatives for National Applications (EDNA) database in 2000. A snapshot of the National Elevation Dataset (NED) was processed to produce an elevation surface with filled artificial depressions, flow direction, flow accumulation, slope, aspect, compound topographic index, synthetic reaches and their catchments, and shaded relief. Over the past five years, EDNA has been used in many applications, including a national low-head dam power assessment, national flash flood warning system, and objective national sampling designs. These applications have facilitated the addition of precipitation, temperature, land cover, and other variables into the EDNA database as flow-accumulated variables. EDNA Web-based tools have been developed to visualize the data, compute and download watersheds for any point in the conterminous United States, and calculate elevation profiles along stream courses. Since 2000, there have been significant improvements in topographic geospatial data for the United States. Three of those improvements are the major impetus for a new version of EDNA. First, NED is now composed primarily of 10-meter source data compared to the 30-meter predominance in 2000. Second, the 24,000-scale National Hydrography Database (NHD) is now available for most of the conterminous United States. Third, light detection and ranging (LIDAR) collection costs have decreased dramatically and are leading to a growing number of statewide LIDAR collections. NED is incorporating the LIDAR data as it becomes available. The new version of EDNA, now being prototyped, will have a 10-meter resolution. Areas with LIDAR coverage will be processed with highest priority. The new version will be produced through newly-developed techniques that incorporate a comparison to best-available hydrography in the calculation of derivatives. This process will bring the national elevation and hydrography data sets into a state of better integration. LIDAR data sources are expected to continue to be produced across the United States and will eventually become the key to the ultimate integration of hydrography and elevation. The hydrography that can be derived from LIDAR is often suitable to improving upon the 24,000-scale hydrography; therefore, in the new EDNA process, this comparison and merging can be achieved while at the same time accomplishing integration with the entire elevation surface.

New, Weird, Wonderful, and the Kitchen Sink, 3:15 pm – 5:10 pm, *moderated by Roland Viger*

Open Source Software tools to create web-based GIS solutions, *By Rafael Moreno*

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(Abstract not submitted)

GEOLEM: Improving the Integration of Geographic Information in Environmental Modeling Through Semantic Interoperability, *By Roland Viger*

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(Abstract not submitted)

Numerical Simulation of Three-dimensional Variable-Density flow of Manhasset Neck, New York, *By Jack Monti*

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(Abstract not submitted)

Filling in the DLG Gap: A Data Thesaurus Experiment, *By Barbara P. Buttenfield*

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The creation of a single, detailed cartographic database supporting map representations at multiple scales and for multiple purposes continues to challenge the GIS discipline. National mapping agencies compile geospatial data to meet standardized 'anchor' map scale and cartographic design specifications. These specifications reflect historic conventions for data capture developed within the constraints of targeting agency mission and driven by agency intention to balance data usability with data production costs. Digital Line Graph (DLG) data form a vector base mapping framework for many GIS applications across a continuum of scales, with data concentrated around 1:24,000

1:100,000 and 1: 2,000,000. A gap in the continuum occurs roughly between 1:300,000 and 1:700,000, within which mapping experiments show that geoprocessing and/or symbol redesign of the DLG data are not sufficient to produce a full range of mapping products. To generate a fully operational multi-resolution vector database (MRDB) for base map data production, that gap needs to be filled.

This paper explores a relational database experiment fusing DLG and VMAP (DIGEST) data schemas for a geographical footprint in southern California. Two factors complicated the merging of DLG model features with VMAP features compiled by another agency. First, features captured at different resolutions vary in geometry, content, dimensionality and singularity, making them difficult to link together. Second, feature codes vary among federal agencies, creating redundancies, omissions and commissions in the fused thesaurus. This presentation covers the experiment to integrate the VMAP schema into the DLG data model, highlighting three types of schema discrepancies (new feature geometries, emerging feature types, and changes to schema hierarchy).

Hazards 2, 3:15 pm – 5:10 pm, *moderated by Catherine Costello*

Examining the coastal response to Hurricane Katrina using a storm-impact scaling model, *By Hilary F. Stockdon and Asbury H. Sallenger, Jr.*

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One of the goals of the USGS Coastal and Marine Program is a national assessment of coastal change hazards, which includes coastal vulnerability to extreme storms and hurricanes. By quantifying the magnitudes of storm-induced coastal change and identifying the processes responsible for this change, we work towards the capability to predict beach response to an approaching storm. Over the past ten years, the USGS and our partners at NASA and the U.S. Army Corps of Engineers (USACE) have acquired pre- and post-storm laser altimetry (LIDAR) surveys that provide an unprecedented topographic data set for examining storm impacts. Together with aerial video and still photography, the LIDAR surveys are used to characterize the nature, magnitude, and spatial variability of coastal change resulting from hurricanes.

Hurricane Katrina, which made landfall as a category 4 storm in Plaquemines Parish, Louisiana on August 29, 2005, resulted in scales of hurricane-induced coastal change that are rarely seen. On August 31 and September 1, 2005, the USGS, NASA, USACE, and the University of New Orleans collected aerial video, still photography, and LIDAR surveys of post-storm beach conditions for comparison with earlier, pre-storm data. Changes observed along the barrier island of Louisiana, Mississippi, and Alabama illustrate the dramatic coastal impacts of this major hurricane. Approximately 70 km east of Katrina's landfall, large waves and storm surge left the uninhabited, low-lying Chandeleur Islands stripped of sand, while heavily fragmenting the remaining marsh outcrops. Further to the east, Dauphin Island, Alabama, experienced extensive over wash as sand was removed from the gulf-side of the island, transported inland, and deposited in Mississippi Sound. Many structures were destroyed and the center of the island suffered a breach over 2-km wide. We investigate the extent to which spatially-variable responses to hurricanes, such as Katrina, can be explained through a simple scaling model that examines the elevation of extreme water levels relative to island morphology. After continued verification and refinement, this model may ultimately be used to facilitate coastal planning by defining areas that are most vulnerable to extreme change during storms.

Aggregation of Data to Support Storm Surge & Sea Level Rise Response in Worcester County, MD, *By Roger Barlow[1] and Inga Clark[2]*

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The Maryland Department of Natural Resources (MD-DNR) Coastal Zone Management group requested assistance of USGS in preparing a simple modeling dataset to support local planning and first responders in coastal flooding scenarios for the 2005 Hurricane Season. 1:1200-scale Orthoimagery and 18cm vertical resolution LIDAR were provided from MD-DNR, and combined those Framework datasets with Federal Emergenncy Management Agency (FEMA) Q3 delineations and NOAA average storm surge height for four categories of hurricanes. The 2004 Orthoimage data and 2003 LIDAR data were geo-registered, which provided a data assemblage that local users could predict basic flood levels which Worcester County is using to prioritize residential evacuation both in terms of what areas flood first, and what transportation routes will be unusable first. The NOAA Sea, Lake and Overland Surges from Hurricanes (SLOSH) model was examined for application of wind and tide data to the LIDAR and orthoimagery, but the disparity of scales between NOAA SLOSH model and the Worcester County data assemblage was deemed too great for immediate integration. USGS provided training in use and interpretation of the data assemblage to the Worcester County Dept of Comprehensive Planning, and received useful feedback from County data users on how various flood levels corresponded with the spatial data.

HAZUS-MH, Multi-Hazard Loss Estimation Tool, *By Doug Bausch*

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Presented by Rich Hansen
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The Federal Emergency Management Agency has developed HAZUS (Hazards U.S.), a standardized GIS-based, nationally applicable natural hazards loss estimation model. HAZUS-MH is a powerful risk assessment software program for analyzing potential losses from floods, hurricane winds and earthquakes. In HAZUS-MH, current scientific and engineering knowledge is coupled with the latest Geographic Information Systems (GIS) technology to produce estimates of hazard related damage before, or after, a disaster occurs. HAZUS-MH takes into account various impacts of a hazard event such as: physical damage: damage to residential and commercial buildings, schools, critical facilities, and infrastructure; economic loss: lost jobs, business interruptions, repair and reconstruction costs; and social impacts: impacts to people, including requirements for shelters and medical aid. The presentation will concentrate on describing the more than 200 data layers that were obtained and developed to support the loss estimation methodology.

MARS: LIDAR Processing Software, 3:15 pm – 5:10 pm, By Bill Emison and Mark Romano

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(Abstract not submitted)

Presentation Titles and Abstracts for Thursday April 27, 2006

Thursday Plenary, 8:00 am – 11:30 am

Land Remote Sensing Program, *By Ron Beck*

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(Abstract not submitted)

Colorado State University and NSF, *By Melinda Laituri*

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(Abstract not submitted)

The Future of Remote Sensing, a Roundtable Discussion, *By Brian R. Raber[1], Brock Adam McCarty[2], Gene Dial[3], and Steven Miller[4]*

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A roundtable discussion with remote sensing representatives from the private sector presenting future trends, sensors, technology, and partnerships that will help to shape the future of remote sensing and geospatial science applications.

(Abstract not submitted)

Thursday Special Lunch Session, 11:30 am – 1:00 pm

How Me 'an Teddy Mapped San Juan Hill, *By Kenneth J. Lanfear*

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This talk will present a historical perspective of GIS development in USGS, with emphasis on GIS use in water resources. It is intended to show how some of the GIS activities and practices in USGS came to be the way they are. Some of the early efforts in digital mapping at USGS set the stage for modern GIS development by providing a critical base of maps. Within the (then) Water Resources Division, however, GIS came to be seen as an analytical tool. A training program focused on teaching fundamental GIS principles and helped to develop a cadre of scientists who applied GIS to ground-water modeling and other water studies. Although growing computing power played a role, key advances were almost always marked by an intellectual insight into a scientific problem. The lesson is that brain power still counts!

Thursday Hands-On Sessions

Feature Extraction from Imagery, 1:00 pm – 2:55 pm, *By eCognition*

ECognition – Definiens, Definiens Inc./Earth Business Unit, 4450 Arapahoe Ave, Suite 100, Boulder, CO 80303
303-546-7935 boulder.geo@definiens.com

(Abstract not submitted)

ArcSDE for SQL Server, 1:00 pm – 5:10 pm, *By Tom Murray*

ESRI, Denver Tech Marketing, One International Court, Broomfield, CO 80021
303-449-7779

(Abstract not submitted)

Introducing NHDPlus: A National Geospatial Surfacewater Framework, 1:00 pm – 2:55 pm, *By Richard B. Moore and Craig M. Johnston*

U.S. Geological Survey, New Hampture -Vermont Water Science Center, 361 Commerce Way, Pembroke, NH 03275
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This 2-hour workshop is intended to provide Geographic Information System practitioners and resource modelers with an opportunity to learn about NHDPlus for use in their water resources applications. NHDPlus is a suite of geospatial products that build upon and extend the capabilities of the National Hydrography Dataset (NHD) by integrating the NHD with the National Elevation Dataset and the Watershed Boundary Dataset (where it exists). NHDPlus includes improved NHD names and networking; value-added attributes (such as stream order) that enable advanced query, analysis and display; elevation-derived catchments that integrate the land surface with the network, associated flow direction and accumulation grids; and annual stream-flow and velocity estimates for use in SPARROW and other pollutant models.

Geoprocessing in ArcGIS, 1:00 pm – 2:55 pm, *By Corey Tucker*

ESRI, 380 New York St, Redlands, CA 92373-8100
909-793-2853 ctucker@esri.com

(Abstract not submitted)

Global Positioning Systems (GPS) 101, 1:00 pm – 2:55 pm, *By Steve Reiter[1] and Joseph Kerski[2]*

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303-202-4315 jjkerski@usgs.gov

(Abstract not submitted)

Surface Interpolation, 3:15 pm – 5:10 pm, *By Steve Lynch*

ESRI, 380 New York St, Redlands, CA 92373-8100
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One of the most important kinds of spatial analysis is analysis of trends and patterns in geospatial data. A common application is the development of a continuous surface from samples of that surface in the form of point locations or contours. Different techniques address this problem from both deterministic and statistical approaches. This workshop will discuss several methods of surface interpolation and demonstrate how they can be applied using ArcGIS software.

PLTS Data Creation Tools, 3:15 pm – 5:10 pm, *By Jonathan Weaver*

ESRI Denver, Global Navigation Technology Advisor, One International Court, Broomfield, CO 80021
TEL 303.449.7779 ext. 8279

(Abstract not submitted)

Fly Through Your Data, 3:15 pm – 5:10 pm, *By Tamrat Belayneh*

ESRI, 380 New York St, Redlands, CA 92373-8100
909-793-2853 tbelayneh@esri.com

This session will present interactive 3-D visualization of GIS data using 3-D Analyst's ArcGlobe and ArcScene Applications. Topics will include data preparation guidelines, display optimization techniques, best practices and recommended workflows in building interactive 3-D documents and animations, and general tips and tricks to achieve maximum usability. This session will also cover new 3-D functionalist that will be released with ArcGIS 9.2.

GPS for GIS, 3:15 pm – 5:10 pm, *By Steve Reiter[1] and Joseph Kerski[2]*

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303-202-4315 jjkerski@usgs.gov

(Abstract not submitted)

Land and Water Characterization, 1:00 pm – 5:10 pm, *moderated by Carma San Juan and Stephen J. Char*

Displaying Surface-Water Data and Spatial Information for USGS Gaging and Water-Quality Stations in Minnesota, *By Christopher A. Sanocki*

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The U.S. Geological Survey (USGS) Minnesota Water Science Center is developing a system to display surface-water information using database capabilities and a geographic information system. This system allows users to easily query and display spatial data for continuous recording, low-flow, high-flow, and water-quality stations. The data can be accessed and downloaded from the USGS National Water Information System (NWIS) and will contain all historical and active sites within Minnesota. The data file can be used by hydrologists, biologists, scientists and engineers to easily locate USGS data available within the area of interest. This effort has been possible through partnerships with the Minnesota Department of Transportation and the Minnesota Pollution Control Agency.

Land Cover TRENDS Project Results for the Puget Lowland Ecoregion, *By Daniel G. Sorenson*

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Information about land use and land cover change is important in addressing ecosystem health and for future land use planning, but data on a national scale are scarce. The Land Cover Trends Project, sponsored by the U.S. Geological Survey's Geographic Analysis and Monitoring (GAM) program, is a national effort that describes the rates, driving forces, and consequences of land cover change on an ecoregion basis between 1973 and 2000. Results for the Puget Lowland, one of the 84 ecoregions determined by the U.S. Environmental Protection Agency's Level III ecoregions of the United States, will be presented. The project utilizes a stratified random-sample strategy that identified 32 10-km by 10-km sample blocks to adequately characterize the ecoregion. Analysis of land cover change within these sample blocks is based on manual interpretation of 60-m pixel scenes of Landsat MSS, TM, and ETM+ data for the core dates 1973, 1980, 1986, 1992, and 2000. Land cover change with the sample blocks in the Puget Lowland ranged from 4% to 62%. Overall the land cover change with Puget Lowland over the 30-year study period is 28.7%, the greatest change in all the ecoregions so far studied in the Land Cover Trends Project. Dominant land cover conversions, which are associated with the region's timber industry, occur between the land cover classes addressing forest harvesting and regrowth (such as forest cover to mechanically disturbed, mechanically disturbed to a grass/shrub recovery state, and grass/shrub cover to recovered forest). The forest cover class declined the most over the entire ecoregion: from 60.8% in 1973 to 50.1% in 2000. The developed class, including residential, industrial, and commercial development, gained the most: 7% over the 30-year study period. This project will serve to document the drivers of change both in this ecoregion and on a national level, helping provide a "census" of the landscape.

Referencing and Analyzing Stream Gages to the National Hydrography Dataset, *By David Buchholz*

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Stream Gages are highly significant features in the analysis of a stream network. Fortunately, two GIS databases can be brought together to make the analysis of dams a feasible and efficient process. The National Hydrography Dataset (NHD) provides a database of the nation's surface water that includes flow modeling and linear addressing capabilities. The National Water Information System (NWIS) provides a database of stream gage locations and characteristics. By snapping and addressing these Stream Gages to the NHD, the stream gages can be located on the appropriate flow path, greatly enhancing their value to GIS analysis by allowing their detection in upstream or downstream searches. Using linear addresses with the NHD logical flow table, it is possible to create sophisticated queries to search and analyze highly unique scenarios. Experiences learned in indexing the NID demonstrate the capabilities and limitations possible with this dataset. Examples of query techniques also demonstrate the level of sophistication that can be achieved.

Development of a Framework to Calculate and Manage Watershed Characteristics, ***By John Brakebill[1], Stephen D. Preston[2], and Cassandra C. Ladino[3]***

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Watershed characteristics are an important part of evaluating conditions monitored by water-quality and streamflow networks. These conditions can be related to the natural and human factors that affect the deposition, transport, and delivery of nutrients and sediment to estuaries like the Chesapeake Bay. Spatial data derived from the High-Resolution National Hydrography Dataset (NHD), National Elevation Dataset (NED), and the National Watershed Boundary Dataset (WBD) were modified to produce an enhanced Digital Elevation Model (DEM) in the Chesapeake Bay watershed. This enhanced DEM exhibits the enforcement of drainage patterns flowing into a single channel provided by modified NHD centerline-flow data, and watershed boundary enforcement from the WBD. The ArcHydro data model provides a framework and the necessary tools for an automated development of watershed boundaries at selected monitoring stations, using stream segments and catchments in the stream network. Catchments merged with other spatial data sets produce drainage basin characteristics that are being used to evaluate the representativeness of existing monitoring stations, the locations of potential monitoring stations, and help identify areas of potential water-quality degradation. This information is critical for the planning, implementation, and revision of nutrient- and sediment-reduction management actions designed to improve water quality in the Chesapeake Bay.

Using the National Hydrography Dataset Plus for drainage area delineation and Site matching, ***By Kirsten Cassingham and Silvia Terziotti***

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National Hydrography Dataset Plus (NHDPlus) linework and associated sub watersheds (catchments) are being used in the U.S. Geological Survey's (USGS) National Water-Quality Assessment (NAWQA) program to accelerate the completion of tasks that previously have been extremely time-intensive, such as drainage area delineation and site matching for water-quality sites. The lines from the NHDPlus represent stream networks and are corrected so all are pointing upstream, and a one-to-one relation exists between each stream segment and the sub watershed that drains to it. In basin delineation, the outflow point (usually a streamflow gage) is used to initiate a trace of all upstream reaches, collecting the catchments as the stream network is traced. This process is being used to automate the delineation of hundreds of basins much more quickly and accurately than using elevation data alone.

The NHDPlus is extremely valuable in matching drainage characteristics of two separate data sets. The study area includes a large number of water quality monitoring sites without an associated streamflow gage. Drainage area ratio was used as the criterion for a goodness of match between monitoring site and streamflow gage; a paring with a ratio between 0.75 and 1.25 was considered an acceptable match. The trace command was automated to find the closest NHD stream to the ungaged site, collect the associated catchments, and calculate the total drainage area. If a steamflow gage was within the upstream or downstream catchment areas, drainage areas were compared to see if they were within the threshold. The program creates screen snapshots of each site and a file listing potential matches. The NHD-Plus enables accurate basin delineation and site matching more consistent with national data.

Ecosystem Mapping, *By Roger Sayre*

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(Abstract not submitted)

The Use of GIS in Modeling Ground-Water Vulnerability to Nitrate in the High Plains aquifer,
By Sharon Lisa Qi[1] and Jason J. Gurdak[2]

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GIS is often used as an important tool in developing ground-water vulnerability models and corresponding maps, which are valuable for ground-water resource management and planning. In this study, which is an expansion of a pilot study, ArcGIS Desktop and Workstation were used to extract geospatial data from various large data sets for input to a logistic regression model of ground-water vulnerability and to produce a corresponding vulnerability map. The map illustrates the predicted probability of recently recharged (defined as less than 50 years) ground water of the High Plains aquifer to non-point source nitrate contamination. Spatial data from 31 individual vector and raster layers were extracted for each of 6,946 well locations throughout the study area. These layers included information about saturated thickness, depth to water, precipitation, percent irrigated/nonirrigated/agricultural land, nitrogen applications, soil characteristics, lithology of unsaturated zone, playa lakes, and water use. Extractions for categorical data and certain continuous data sets were performed using a series of identity overlays, directly from the layer at the location of each well. Ninety-degree sectors of varying radii, which was determined by hydraulic conductivity, were created upgradient from each well for extraction of data where information needed to be related to a well location. These variables were inventoried for the 90-degree sector areas using both vector-union techniques and raster map-algebra techniques. The extracted data were used as input for logistic regression analyses to determine which of the variables (layers) or combination of variables were significantly correlated with observed water-quality conditions and would be used in a model of the probability of predicting nitrate concentrations greater than 4 milligrams per liter (as N) in ground water. Five variables were considered significant (depth to water, organic content of soils, amount of irrigated/nonirrigated land, and the amount of clay in the unsaturated zone) in the final two models that were developed to represent different regions of the study area. The appropriate GIS layers were converted to raster data sets in order to use the map algebra capabilities of ArcGIS. The two model equations and the various coefficients for each layer were fed back into ArcGIS and, using map algebra, the probability surface was calculated and then easily visualized across the entire study area with GIS.

GIS Interoperability and Standards, 1:00 pm – 2:55 pm, *By Jeanne Foust*
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(Abstract not submitted)

GIS Supporting Decisions, 1:00 pm – 2:55 pm, moderated by Mike Mulligan

Spatially explicit modeling of alternative futures for forest landscapes using TELSA/VDDT *By David P. Hockman-Wert[1], Christian E. Torgersen[1], John H. Cissel[2], Chris D. Sheridan[3], and John H. Guetterman[3]*
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Researchers and managers have begun to use spatially explicit tools for visualizing and understanding the impacts of human and natural disturbances on forest ecosystems at a landscape scale. Spatial modeling with a GIS provides a visual, intuitive interface that makes it possible for scientists to (1) present different management options and (2) demonstrate how these scenarios play out in a dynamic landscape. The landscape modeling approach allows scientists and managers to provide feedback both in the development of alternative management scenarios and in the refinement of the spatial models.

The Landscape Scenario Analysis Project, initiated and funded by the Bureau of Land Management (BLM), is facilitating interactions between scientists from the USGS Forest and Rangeland Ecosystem Science Center and BLM managers regarding broad-scale implications of vegetation management for forest ecosystems in western Oregon. Landscape scenarios have been developed for BLM lands in the Oregon Coast Range, depicting potential forest conditions (cover type and structural stage) resulting from density management, hardwood treatments, and other forest and riparian treatments.

Spatially explicit modeling is performed with ESSA Technologies' Tool for Exploratory Landscape Scenario Analyses/Vegetation Dynamics Development Tool (TELSA/VDDT), a software package developed specifically for modeling interactions between natural disturbances and forest management. The spatial module in TELSA integrates directly with a geographical information system (ArcView 3.x) and provides the functionality to build models using existing spatial data layers such as forest stand characteristics, planning zones, and disturbance-prone areas. The flexibility of TELSA/VDDT

makes it possible to develop model structures suitable for different ecological settings and management applications. The TELSA/VDDT software package also contains numerous mechanisms to control management and disturbance at landscape scales based on mapped characteristics (e.g., fire regime, rain-on-snow zone, Northern spotted owl home range, aquatic large wood source area). Landscape scenarios can be represented at a very coarse resolution initially and then refined over time as skills and insight are acquired.

Maps and graphs of temporal trends generated by the models have helped managers visualize the effects of natural and management disturbances on forest landscape and stand structure, and were specifically used in BLM planning and consultation processes. In particular, results from the model were used to help assess cumulative effects from timber harvest since data were compiled across ownerships and land-use allocations.

USGS/NPS Vegetation Mapping supporting management decisions in the Parks, *By Karl Brown*
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(Abstract not submitted)

Developing Web-Based GIS Decision Support Tools for Urban Areas, *By Cassandra Ladino[1], Paul Hearn[1], and John Aguinaldo[2]*
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The U.S. Geological Survey's (USGS) Comprehensive Urban Ecosystems Studies (CUES) initiative is a component of The National Map and is an integrated venture of Geography's Geographic Analysis and Monitoring, Land Remote Sensing and Cooperative Topographic Mapping Programs, and other USGS, Department of the Interior, Federal, State and local partners. CUES utilizes USGS data and science expertise to provide an internet environment for decision support tools and other practical applications to help meet critical needs facing the Nation's urban areas. Issues addressed by CUES cover a range of environmental concerns.

There are currently four East Coast urban areas participating in the CUES initiative, including Baltimore MD, Memphis TN, Charleston SC, and Miami FL. Decision-support tool and application development are driven by issues specific to each area. Key issues being addressed in CUES study areas include the assessment of urban ecosystem services in all sites, coastal flooding in Charleston, Baltimore, and Miami, earthquake risk mitigation in Memphis and Charleston, and the protection of National Parks and wildlife refuges in the Miami area.

The newly released Mapguide Open Source Application, a collaboration between Autodesk and Minnesota University's MapServer is the platform for the CUES web map interface. This new map interface is the core component of a reusable GIS application framework upon which various GIS applications can be built. Current CUES applications being developed address overlapping issues between the four participating urban areas. The first, a web-application jointly developed by the USGS and American Forests, utilizes USGS National Land Cover Data and parts of American Forests' CITY Green software to provide regional-scale analyses of ecosystem services in U.S. urban areas. The second web-based application is intended to assist coastal urban areas by providing a visual representation of potential inundation on top of National Map layers. Applications specific to Baltimore, including water-quality monitoring and biological habitat tudies, will be developed through a cooperative partnership between the University of Maryland Baltimore County's Center for Urban Environmental Research and Education (CUERE) and the USGS National Biological Information Infrastructure (NBII) Program.

GIS System Design, 1:00 pm – 2:55 pm, *By David Peters*
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(Abstract not submitted)

ArcGIS Data Interoperability Extension, 3:15 pm – 5:10 pm, *By Don Murray*
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(Abstract not submitted)

Round Table Discussion, 3:15 pm – 5:10 pm, *moderated by Mike Mulligan*

Data Archiving and Publishing, *By Terry D'Erchia[1], John L Faundeen[2], Peter Schweitzer[3], and Michael McDermott[4]*
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(Abstract not submitted)

Presentation Titles and Abstracts for Friday, April 28, 2006

Friday Hands-On Sessions

Introduction to Geostatistical Analyst, 8:00 am – 9:55 am, *By Steve Lynch*
ESRI, 380 New York St, Redlands, CA 92373-8100
909-793-2853 slynch@esri.com

This session is an introduction to the ArcGIS Geostatistical Analyst extension, performing exploratory spatial data analysis, variography, with an overview of the available interpolation options, and some discussion about new features coming in version 9.2.

ARCSDE for Oracle – 8:00 am – 11:55 am, *By Tim Clark*
ESRI, DC Tech Marketing, One International Court, Broomfield, CO 80021
303-449-7779

(Abstract not submitted)

Introducing NHDPlus: A National Geospatial Surface Water Framework, 8:00 am – 9:55 am, *By Richard B. Moore and Craig M. Johnston*

U.S. Geological Survey, New Hampture -Vermont Water Science Center, 361 Commerce Way, Pembroke, NH 03275
603-226-7825 rmoore@usgs.gov, cmjohnst@usgs.gov

This 2-hour workshop is intended to provide Geographic Information System practitioners and resource modelers with an opportunity to learn about NHDPlus for use in their water resources applications. NHDPlus is a suite of geospatial products that build upon and extend the capabilities of the National Hydrography Dataset (NHD) by integrating the NHD with the National Elevation Dataset and the Watershed Boundary Dataset (where it exists). NHDPlus includes improved NHD names and networking; value-added attributes (such as stream order) that enable advanced query, analysis and display; elevation-derived catchments that integrate the land surface with the network, associated flow direction and accumulation grids; and annual stream-flow and velocity estimates for use in SPARROW and other pollutant models.

Making Maps with ArcGIS – 8:00 am – 9:55 am, *By Heather Paskevic*

ESRI, Denver Tech Marketing, One International Court, Broomfield, CO 80021
303-449-7779

(Abstract not submitted)

GPS for GIS – 8:00 am – 9:55 am, *By Steve Reiter[1] and Joseph Kerski[2]*

[1]*U.S. Geological Survey, Box 25046, Denver Federal Training Center, MS 306 Denver, Co., 80225-0046*
303-202-4168 snreiter@usgs.gov
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303-202-4315 jjkerski@usgs.gov

(Abstract not submitted)

ArcGIS 3-D Analyst – 10:10 am – 11:55 am, *By Steve Kopp and Tamrat Belayneh*

ESRI, 380 New York St, Redlands, CA 92373-8100
909-793-2853 skopp@esri.com tbelayneh@esri.com

(Abstract not submitted)

Surface Interpolation – 10:10 am – 11:55 am, *By Steve Lynch*

ESRI, 380 New York St, Redlands, CA 92373-8100
909-793-2853 slynch@esri.com

One of the most important kinds of spatial analysis is analysis of trends and patterns in geospatial data. A common application is the development of a continuous surface from samples of that surface in the form of point locations or contours. Different techniques address this problem from both deterministic and statistical approaches. This workshop will discuss several methods of surface interpolation and demonstrate how they can be applied using ArcGIS software.

ArcPad 7 - 10:10 am – 11:55 am, *By Finn Dahl*

ESRI, DC Tech Marketing, One International Court, Broomfield, CO 80021
303-449-7779

(Abstract not submitted)

Feature Extraction from Imagery – 1:05 pm – 3:00 pm, *By eCognition*

ECognition – Definiens, Definiens Inc./Earth Business Unit, 4450 Arapahoe Ave, Suite 100, Boulder, CO 80303
303-546-7935 boulder.geo@definiens.com
(Abstract not submitted)

ArcGIS Spatial Analyst - 1:05 pm – 3:00 pm, *By Steve Kopp*

ESRI, 380 New York St, Redlands, CA 92373-8100
909-793-2853 skopp@esri.com
(Abstract not submitted)

PLTS Data Creation Tools - 1:05 pm – 3:00 pm, *By Jonathan Weaver*

ESRI Denver, Global Navigation Technology Advisor, One International Court, Broomfield, CO 80021
TEL 303-449-7779 ext. 8279
(Abstract not submitted)

Fly Through Your Data - 1:05 pm – 3:00 pm, *By Tamrat Belayneh*

ESRI, 380 New York St, Redlands, CA 92373-8100
909-793-2853 tbelayneh@esri.com

This session will present interactive 3-D visualization of GIS data using 3-D Analyst's ArcGlobe and ArcScene Applications. Topics will include data preparation guidelines, display optimization techniques, best practices and recommended workflows in building interactive 3-D documents and animations, and general tips and tricks to achieve maximum usability. This session will also cover new 3-D functionalist that will be released with ArcGIS 9.2.